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ICE ATLAS 1985 - 1986 MONONGAHELA RIVER ALLEGHENY RIVER 1/14

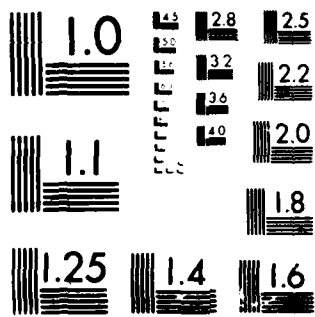
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Special Report 87-20

November 1987

ICE ATL

1985 - 1986

LAWRENCE W. GATTO
STEVEN F. DALY
KEVIN L. CAREY

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US Army Corps
of Engineers
Cold Regions Research &
Engineering Laboratory

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WILLIAM W. GATTO
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Prepared for
OFFICE OF THE CHIEF OF ENGINEERS

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ALLEGHENY RIVER
OHIO RIVER
ILLINOIS RIVER
KANKAKEE RIVER

Unclassified

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19 ABSTRACT (Continue on reverse if necessary and identify by block number) Ice conditions on inland rivers can change rapidly, and adversely affect navigation. Ice atlases were prepared to document the 1985-86 ice conditions on those reaches of the Allegheny, Ohio, Illinois and Kankakee Rivers that are included in study areas for the River Ice Management (RIM) Program, namely river mile 0 to 12 on the Monongahela River, Pennsylvania, mile 0 to 437 on the Ohio, mile 120 to 273 on the Illinois and mile 0 to 2 on the Kankakee. The atlases were prepared from interpretation of vertical aerial video imagery taken from aircraft. The interpreted ice conditions were classified into five units and transferred to a map of the river reach.				

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aphv	Illinois River	Monongahela River
r	Kankakee River	Ohio River
	Landsat imagery	River ice

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Illinois and mile 0 to 21 on the Kankakee. The maps
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its and transferred to base maps by reference to

SOURCE OF FUNDING NUMBERS			
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Frazil Slush and Pans was the most common ice
er with Open-Water Areas was the most common
er and Fragmented Ice Cover with Open-Water
cal Dam on the Ohio; Ice Floes or Frazil Slush and
mented Ice Cover and Fragmented Ice Cover with
on the lake-like areas of the Illinois River, while
e Floes or Frazil Slush and Pans predominated else-
t Ice Cover were the most common ice units on
ons of flights of the Ohio, Allegheny and Mononga-
ceilings. Various options are being explored to get

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PREFACE

This report was prepared by Lawrence W. Gatto, Geologist, Geological Sciences Branch, Research Division; Steven F. Daly, Research Hydraulic Engineer, and Kevin L. Carey, Research Hydraulic Engineer, both of the Ice Engineering Research Branch, Experimental Engineering Division, U.S. Army Cold Regions Research and Engineering Laboratory. The work was funded by the Office of the Chief of Engineers, under the River Ice Management (RIM) Program, Work Units 32228, *Remote Ice Monitoring System*, and 32227, *Forecasting Ice Conditions on Inland Rivers*.

Northland Video Associates, Inc., of Lebanon, New Hampshire, under contract to CRREL, acquired the aerial video tapes used for mapping ice conditions on the Monongahela, Allegheny and Ohio Rivers. Video Production Group, Pekin, Illinois, acquired the tapes for the Illinois and Kankakee Rivers. Photographic Interpretation Corporation (PIC) of Lyme, New Hampshire, prepared the river ice maps under a contract to the New England Division of the Corps of Engineers. Vernon Anderson of PIC interpreted and mapped ice conditions from the video tapes, and Roger Arend of PIC measured the areal extent of the ice types and percentages of ice concentration. The authors thank Darryl Calkins and Michael Ferrick for technical reviews of the manuscript, Eleanor Huke for her assistance in planning and preparing the base maps, and Charles Clark and Richard Sterling for assisting in the collection of the air and water temperature data.

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ILLUSTRATIONS

Figure

1. General location of study areas.
2. Study areas.
3. Daily discharge.
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2. Ice conditions as a function of river pool.
3. Summary of ice conditions.

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Pool, River	December				January												
	18	19	28	30	2	7	8	9	10	15	16	17	21	22	23	24	27
Emsworth, Monongahela	7	—	35	—	63	65	67	—	71	81	—	—	—	109	119	—	—
Emsworth, Allegheny	7	—	35	—	63	65	67	—	71	81	—	—	—	109	119	—	—
L/D 2, Allegheny*	8	—	36	—	64	66	68	—	72	82	—	—	—	110	120	—	—
L/D 3, Allegheny	8	—	36	—	64	66	68	—	72	82	—	—	—	110	120	—	—
Emsworth, Ohio	—	9	—	37	—	—	69	—	73	—	83	—	—	111	121	—	—
Dashields, Ohio	—	9	—	37	—	—	69	—	73	—	83	—	—	111	121	—	—
Montgomery, Ohio	—	10	—	38	—	—	—	—	74	—	84	—	—	112	122	—	—
New Cumberland, Ohio	—	11	—	39	—	—	—	—	75	—	85	—	—	113	123	—	—
Pike Island, Ohio	—	12	—	40	—	—	—	—	76	—	86	—	—	114	124	—	—
Hannibal, Ohio	—	14	—	42	—	—	—	—	78	—	88	—	—	116	126	—	—
Willow Island, Ohio	—	16	—	44	—	—	—	—	—	—	90	—	—	—	—	—	—
Belleville, Ohio	—	18	—	46	—	—	—	—	—	—	92	—	—	—	—	—	—
Racine, Ohio	—	21	—	49	—	—	—	—	—	—	95	—	—	—	—	—	—
Gallipolis, Ohio	—	23	—	51	—	—	—	—	—	—	97	—	—	—	—	—	—
Greenup, Ohio	—	25	—	53	—	—	—	—	—	—	99	—	—	—	—	—	—
Meldahl, Ohio	—	29	—	57	—	—	—	—	—	—	103	—	—	—	—	—	—
La Grange, Illinois	—	—	—	—	—	143	—	—	163	175	—	187	199	—	—	211	223
Peoria, Illinois	—	—	—	—	—	145	—	—	155	165	177	—	189	201	—	—	213
Starved Rock, Illinois	—	—	—	—	—	149	—	—	159	169	181	—	193	205	—	—	217
Marseilles, Illinois	—	—	—	—	—	150	—	—	160	170	182	—	194	206	—	—	218
Kankakee	—	—	—	—	—	152	—	—	172	184	—	196	208	—	—	220	232

* L/D—lock and dam.

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January										February								March	
15	16	17	21	22	23	24	27	28	30	9	11	13	15	21	25	27	28	2	5
81	—	—	—	109	119	—	—	129	—	—	—	—	—	—	—	131	—	—	—
81	—	—	—	109	119	—	—	129	—	—	—	—	—	—	—	131	—	—	—
82	—	—	—	110	120	—	—	130	—	—	—	—	—	—	—	132	—	—	—
82	—	—	—	110	120	—	—	130	—	—	—	—	—	—	—	132	—	—	—
—	83	—	—	111	121	—	—	—	—	—	—	—	—	—	—	133	—	—	—
—	83	—	—	111	121	—	—	—	—	—	—	—	—	—	—	133	—	—	—
—	84	—	—	112	122	—	—	—	—	—	—	—	—	—	—	134	—	—	—
—	85	—	—	113	123	—	—	—	—	—	—	—	—	—	—	135	—	—	—
—	86	—	—	114	124	—	—	—	—	—	—	—	—	—	—	136	—	—	—
—	88	—	—	116	126	—	—	—	—	—	—	—	—	—	—	138	—	—	—
—	90	—	—	—	—	—	—	—	—	—	—	—	—	—	—	140	—	—	—
—	92	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	97	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	99	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	103	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
75	—	187	199	—	—	211	223	—	235	247	259	271	283	295	307	—	—	319	331
77	—	189	201	—	—	213	225	—	237	249	261	273	285	297	309	—	—	321	333
81	—	193	205	—	—	217	229	—	241	253	265	277	289	301	313	—	—	325	337
82	—	194	206	—	—	218	230	—	242	254	266	278	290	302	314	—	—	326	338
84	—	196	208	—	—	220	232	—	244	256	268	280	292	304	316	—	—	328	340

Ice Atlas, 1985-1986

Monongahela River, Allegheny River, Ohio River, Illinois

LAWRENCE W. GATTO, STEVEN F. DALY AND KEVIN

INTRODUCTION

Background

This atlas is the second in a series of atlases that will provide a permanent record of the ice conditions over portions of the Monongahela, Allegheny, Ohio, Illinois and Kankakee Rivers (Fig. 1). This information is required throughout the winter during CRREL's River Ice Management (RIM) Program as input data and "ground truth" for developing a river ice forecast model and for developing and evaluating various remote sensing devices for real time monitoring of ice conditions. The atlas series should also prove valuable to any future research. Additional discussion of the purposes and objectives of RIM is given in *Ice Atlas for the Ohio, Allegheny and Monongahela Rivers, 1984-85*.*

The purpose of this ice atlas is to document the areal extent and variation through time of river ice and open water in the area of study during the 1985-86 winter. No detailed analyses of the ice conditions were done in preparing this atlas beyond placing the observed ice into general categories. The *Results* section provides an overview of ice conditions, highlighting the ice categories and providing an introduction and guide to the ice information contained in the maps themselves.

documented on Havana, Illinois; the Kankakee stream to the V discussed in the always possible

There are 12 Ohio, one along tion channels c There are four Illinois River. navigation on t along this reach

Data on the and water temp and meteorology lected. The data are representative sheds.

Table 1.

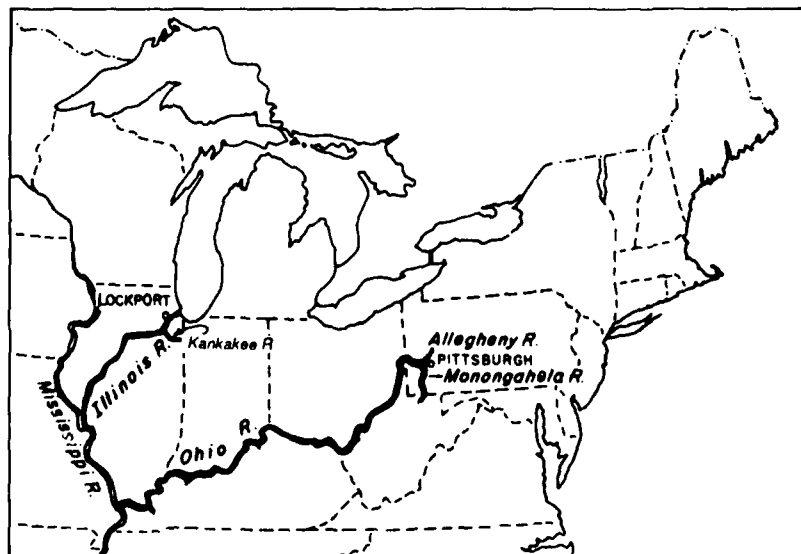


Figure 1. General location of rivers studied.

Pool start t

Pittsburgh Po
Dam 2 to river

Pittsburgh Po
Dam 2 to Dar
Dam 3 to river

Pittsburgh Po
Emsworth to
Dashields to
Montgomery
New Cumberland
Pike Island to
Hannibal to
William, Illinois

1-1986

River, Illinois River, Kankakee River

ALY AND KEVIN L. CAREY

documented on the Illinois Waterway (Fig. 2b; Table 1) from mile 120, at Havana, Illinois, to mile 273, at Dresden Island Lock and Dam, and on the Kankakee River from its confluence with the Des Plaines River upstream to the Warner Bridge, approximately 21 river miles. However, as discussed in the *Results* section, coverage of the entire study area was not always possible on each flight date.

There are 12 dams and associated locks along the surveyed reach of the Ohio, one along the Monongahela, and two on the Allegheny. Navigation channels of at least 9 ft deep are maintained along these reaches. There are four dams and associated locks along the surveyed reach of the Illinois River. A 9-ft navigation channel is also maintained. There is no navigation on the Kankakee River but ice jam flooding occurs frequently along this reach, and for this reason it was included in the surveys.

Data on the Ohio River and Illinois River discharges (Fig. 3) and air and water temperatures (Fig. 4) are shown to display general hydraulic and meteorologic conditions during the time the video imagery was collected. The data are from specific locations as indicated; however, they are representative of the general conditions experienced in the watersheds.

Table 1. River pools monitored with video tapes, 1985-86.

<i>Pool start to stop points (river miles)</i>	<i>Length (mi)</i>	<i>Pool surface area ($\times 10^6 m^2$)</i>
Monongahela River		
Pittsburgh Point (0) to Dam 2 (11.2)	11.2	4.73
Dam 2 to river mile 12	0.8	0.43
Allegheny River		
Pittsburgh Point (0) to Dam 2 (6.7)	6.7	3.07
Dam 2 to Dam 3 (14.5)	7.8	4.02
Dam 3 to river mile 17	2.5	1.14
Ohio River		
Pittsburgh Point (0) to Emsworth (6.2)	6.2	4.49
Emsworth to Dashields (13.3)	7.1	5.00
Dashields to Montgomery (31.7)	18.4	11.27
Montgomery to New Cumberland (54.4)	22.7	14.87
New Cumberland to Pike Island (84.2)	29.8	18.92
Pike Island to Hannibal (126.4)	42.2	22.46
Hannibal to Willow Island (161.7)	35.3	21.21

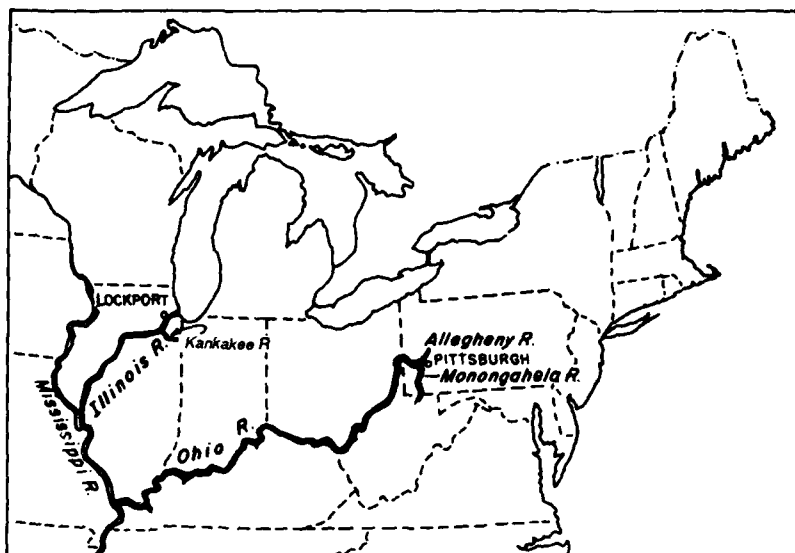


Figure 1. General location of rivers studied.

Area of study

During the 1985-86 winter season, ice conditions were documented on the Monongahela River (Fig. 2a, Table 1) from Pittsburgh Point (river mile 0) to mile 12, just upstream of Lock and Dam 2; on the Allegheny from the Point (mile 0) to mile 17 between Lock and Dam 3 and Lock and Dam 4; and on the Ohio from the Point (mile 0) to river mile 437, just downstream of Meldahl Locks and Dam. Ice conditions were also

* Gatto, L., S.F. Daly and K. Carey (1986) Ice atlas, 1984-1985: Ohio River, Allegheny River, Monongahela River. US Army Cold Regions Research and Engineering Laboratory, Special Report 86-23.

Poo

Pittsbu
Dam 2

Pittsbu
Dam 2
Dam 3

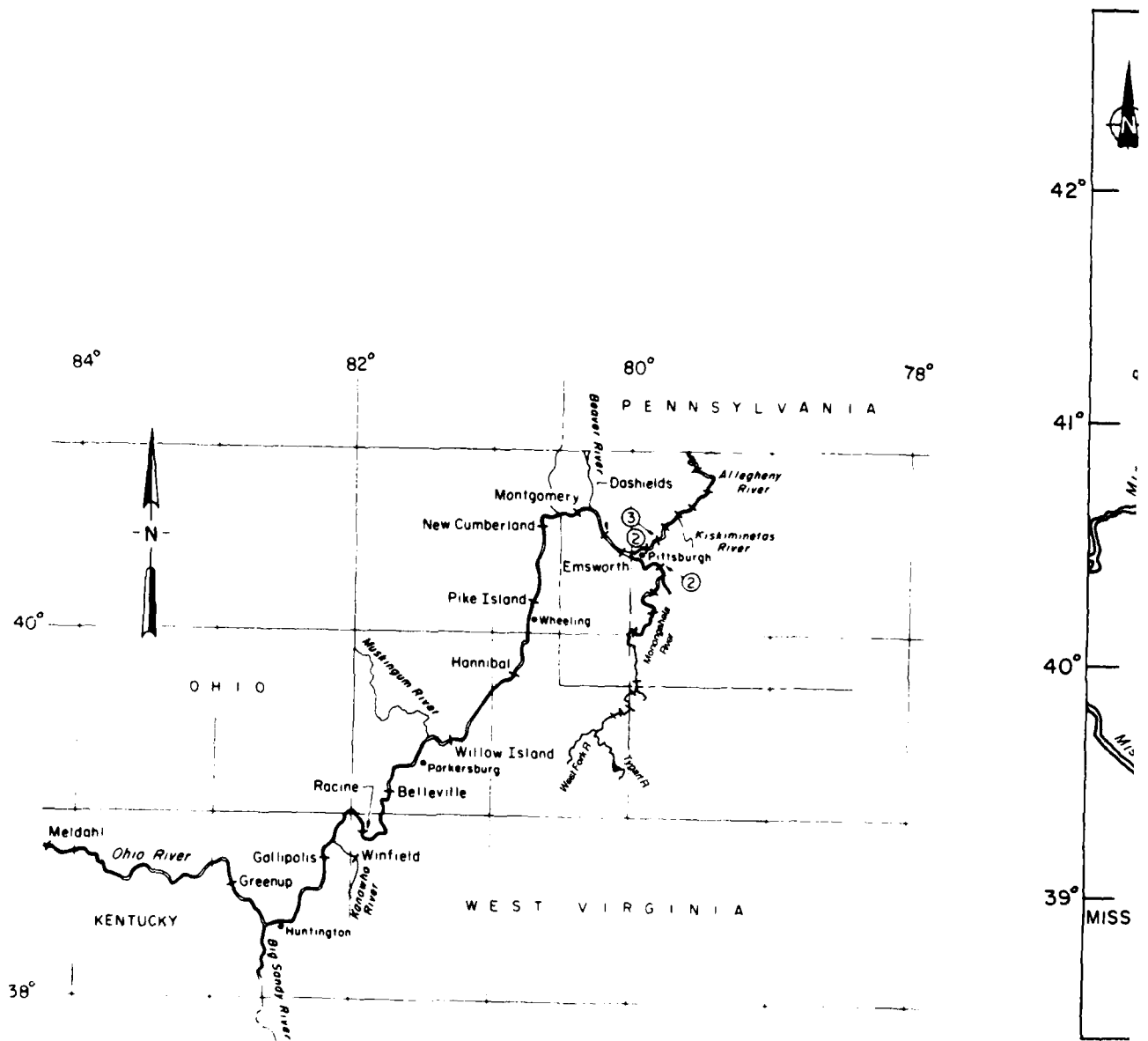
Pittsbur
Emswor
Dashiel
Montgo
New Cu
Pike Isla
Hanniba
Willow l
Belleville
Racine to
Gallipoli
Greenup

River mil
Peoria to
Starved I
Marseille

Mouth to

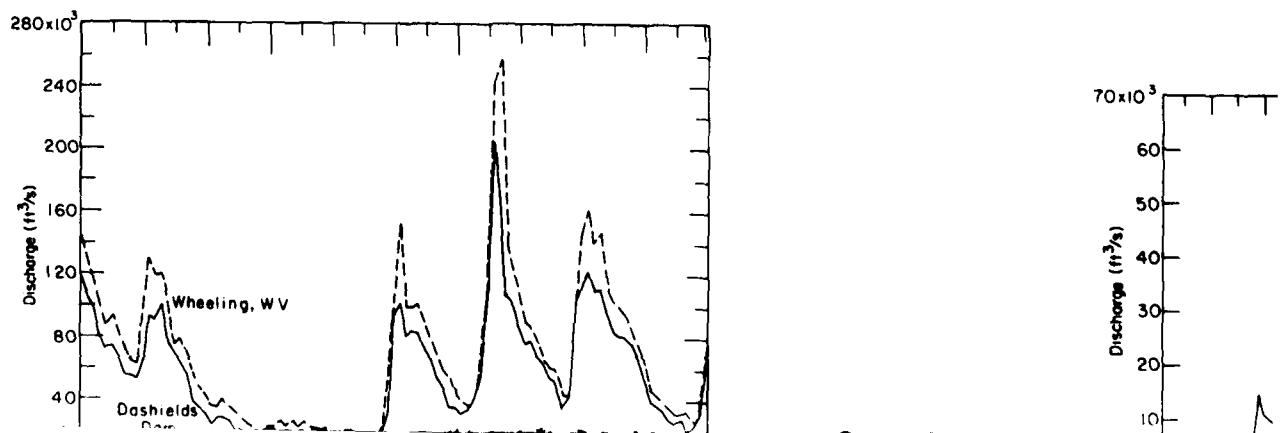
Table 1. River pools monitored with video tapes, 1985-86.

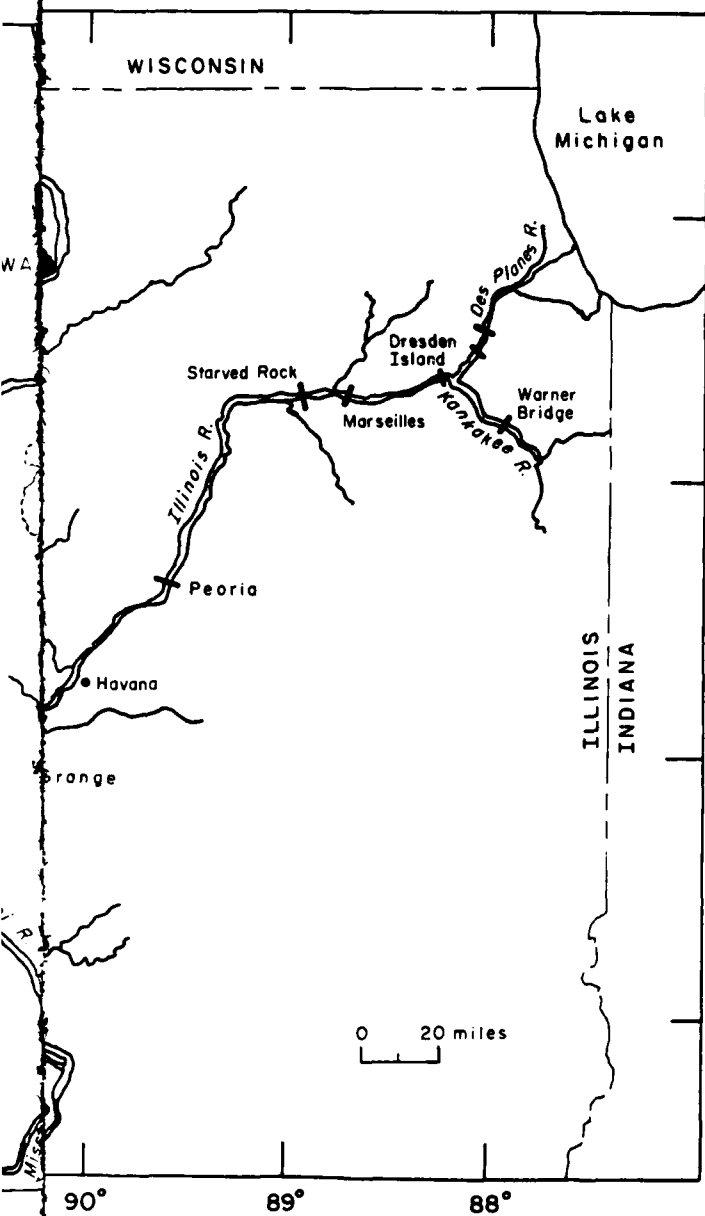
<i>Pool start to stop points (river miles)</i>	<i>Length (mi)</i>	<i>Pool surface area ($\times 10^6 \text{ m}^2$)</i>
Monongahela River		
Pittsburgh Point (0) to Dam 2 (11.2)	11.2	4.73
Dam 2 to river mile 12	0.8	0.43
Allegheny River		
Pittsburgh Point (0) to Dam 2 (6.7)	6.7	3.07
Dam 2 to Dam 3 (14.5)	7.8	4.02
Dam 3 to river mile 17	2.5	1.14
Ohio River		
Pittsburgh Point (0) to Emsworth (6.2)	6.2	4.49
Emsworth to Dashields (13.3)	7.1	5.00
Dashields to Montgomery (31.7)	18.4	11.27
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New Cumberland to Pike Island (84.2)	29.8	18.92
Pike Island to Hannibal (126.4)	42.2	22.46
Hannibal to Willow Island (161.7)	35.3	21.24
Willow Island to Belleville (203.9)	42.2	27.28
Belleville to Racine (237.5)	33.6	19.89
Racine to Gallipolis (279.2)	41.7	24.65
Gallipolis to Greenup (341.0)	61.8	41.19
Greenup to Meldahl (436.2)	95.2	73.77
Illinois River		
River mile 120 to Peoria (157.6)	37.6	11.71
Peoria to Starved Rock (231.1)	73.5	81.33
Starved Rock to Marseilles Lock (244.3)	13.2	10.19
Marseilles Lock to river mile 273	28.7	8.19
Kankakee River		
Mouth to river mile 21	21	7.30



a. Monongahela, Allegheny and Ohio Rivers.

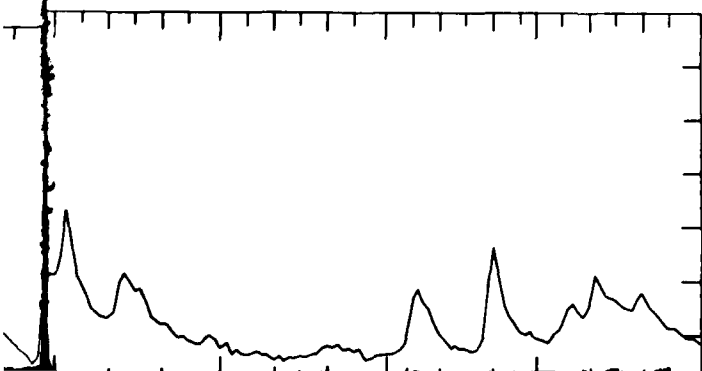
Figure 2. Study areas; locations of locks and d





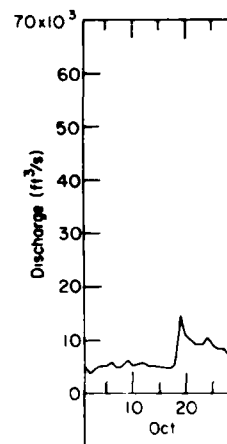
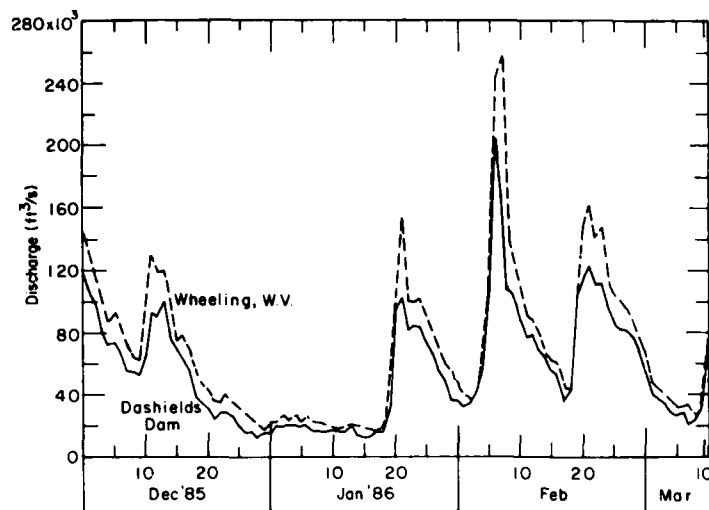
h. Illinois and Kankakee Rivers.

hov



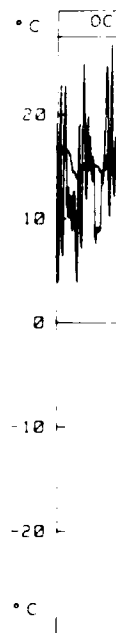
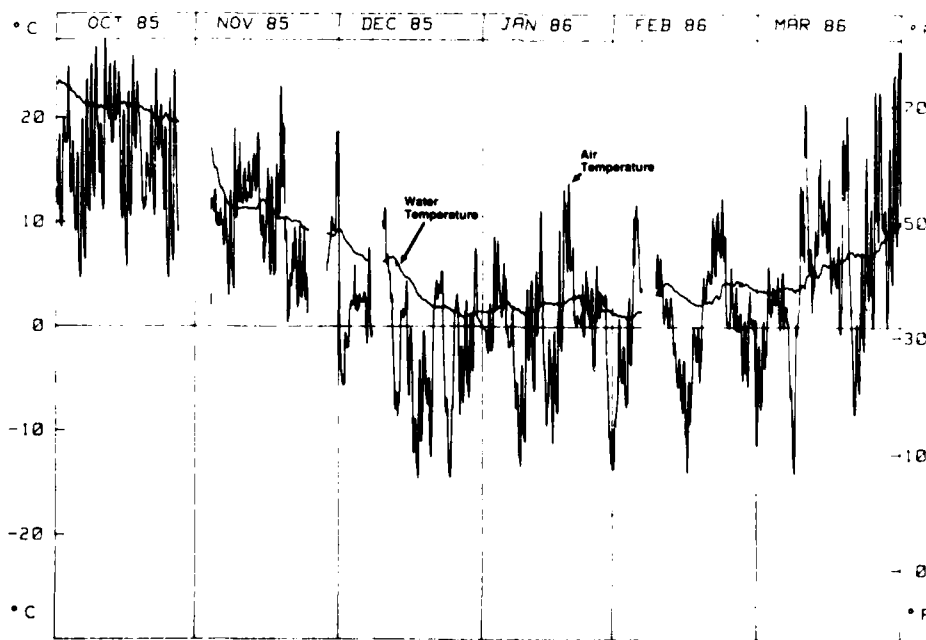
a. Monongahela, Allegheny and Ohio Rivers.

Figure 2. Study areas; locations of locks and dam



a. Dashiels Dam and Wheeling (West Virginia), Ohio River.

Figure 3. Daily discharge.



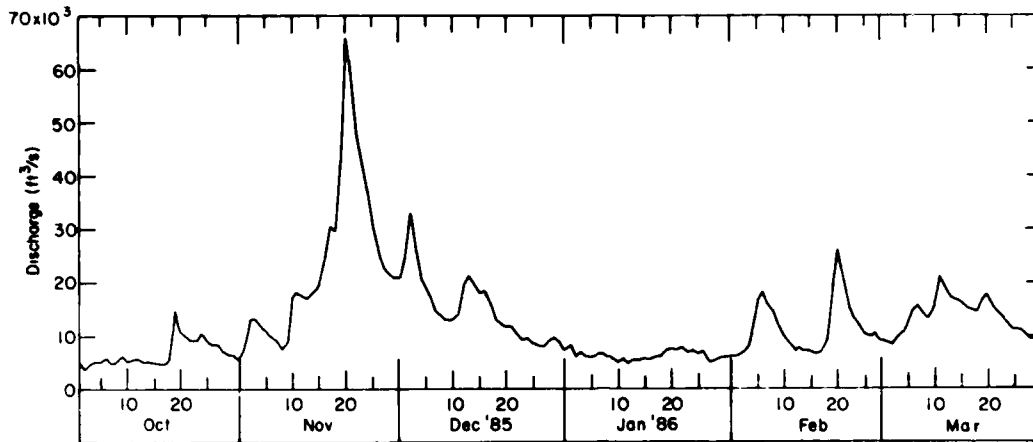
a. Hannibal Lock and Dam, Ohio River.

Figure 4. Hourly air temperature and hourly average water temperature.



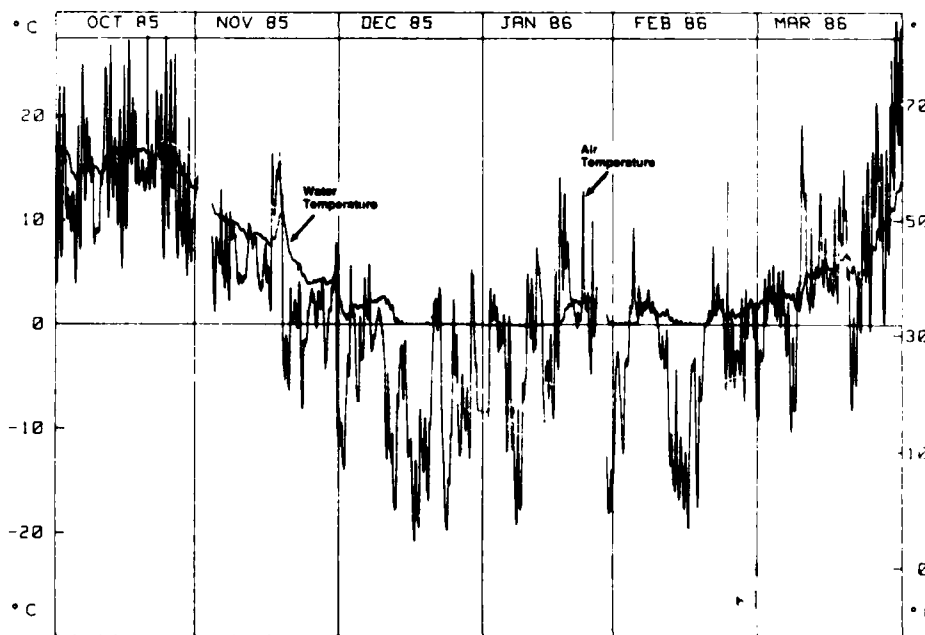
b. Illinois and Kankakee Rivers.

study areas; locations of locks and dams shown.



b. Marseilles Dam, Illinois River.

Figure 3. Daily discharge.



b. Starved Rock Lock and Dam, Illinois River.

temperature and hourly average water temperature.

APPROACH

Video tapes (1/2-in. VHS) of the Ohio, Allegheny and Monongahela Rivers were taken vertically through a covered port with a Panasonic 777 video camera with a 12:1 zoom lens from a Cessna 172 fixed-wing aircraft, usually at an altitude between 2000 and 3500 ft above the ground. Aircraft altitude varied, depending on cloud conditions. Occasionally, the aircraft was not cleared to enter the controlled air space around Pittsburgh International Airport, and thus on those occasions tapes could not be acquired of the Ohio River from Pittsburgh Point to the vicinity of Ambridge, Pennsylvania (river mile 0 to 24).

For the Kankakee and Illinois Rivers, video tapes (1/2-in. VHS) were taken vertically with a JVC KY1900 video camera with a 10:1 zoom lens. The video was taken from a Cessna 172 through an open port, usually at an altitude between 2500 and 4500 ft. At Peoria Lake and the Starved Rock Dam Pool, the Illinois River is quite wide, and the contractor maintained the 4500-ft altitude over these sections. At Peoria Lake two side-by-side passes were required.

The tapes were viewed on a TV monitor and the observed ice was visually interpreted and classified into five units (Table 2). The acquisition of "ground truth" was not required, since the image interpretation was limited to the classification of the ice conditions as seen on the video tapes by an experienced ice interpreter-observer, and did not attempt to infer characteristics that could only be measured on the ground (e.g., porosity, strength or thickness). Boundaries between the units were transferred to 1:24,000 base maps by reference to Corps of Engineers navigation charts and U.S. Geological Survey topographic maps. The maps are organized according to the pools that exist between the dams. A pool is named for the dam at its downstream end, as listed in the *Index* and subsequently in this report.

The ice maps show the areal extent of the five ice types and open water. These six units were selected because they are readily identifiable on video imagery and they satisfactorily describe the range of ice that can occur on inland waterways.

The area of each map unit in a pool was measured from the base maps with a Los Angeles Scientific Instruments Co. digital compensating polar planimeter. The accuracy of areas reported is influenced by the accuracy of positioning the map unit boundaries on the maps while the imagery interpreter viewed the video tapes on a monitor (in part a subjective and

Table 2. Ice

Map unit
Open water
Solid ice cover
Solid ice cover with open-water areas
Fragmented ice cover
Fragmented ice cover with open-water areas
Ice floes or frazil slush and pans

judgmental process), a video tapes provided b ing of map unit boun and Anderson* estima 10% of the actual are coverage, the areas of 1 of actual. The planim provides an estimated

For map units comp Open-Water Areas, F Floes or Frazil Slush a unit area was visually e surface concentrations are always 100% (Tabl tions are listed in App

* Personal communication Corp. 1986.

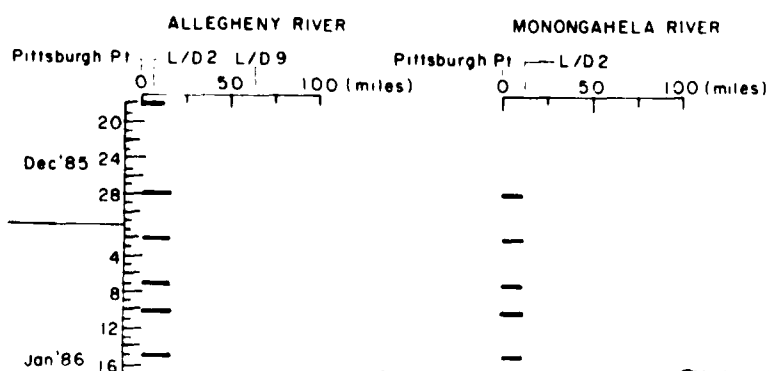


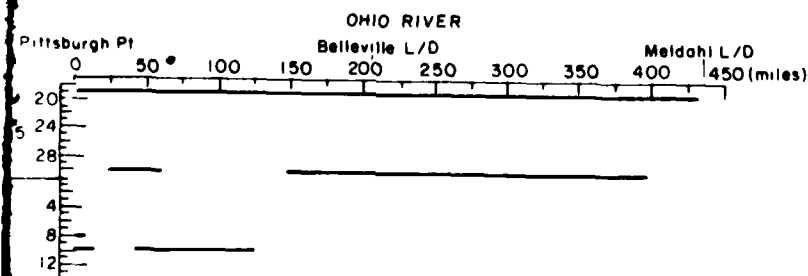
Table 2. Ice conditions as observed on video tapes.

Map unit	Description
Open water	River is ice-free; no ice apparent.
Solid ice cover	River is completely covered (100%) with ice; no individual ice pans, blocks or chunks are visible; ice may be snow-covered.
Solid ice cover with open water areas	River is partially covered with solid ice (as described above) but has open (ice-free) areas.
Fragmented ice cover	River is completely covered (100%) with ice that has distinct, variably sized, individual ice pans, blocks or chunks.
Fragmented ice cover with open-water areas	River is partially covered with fragmented ice (as described above) but has open (ice-free) areas.
Floes or frazil and pans	River is primarily open (ice-free) with floating ice floes, slush or pans.

mental process), and by the planimeter measuring procedure. When tapes provided bank-to-bank coverage of a river, the best reference map unit boundaries to shoreline features was achieved. Arend and Anderson* estimate that the area of each mapped unit is within 8 to 10% of the actual area. When the tapes did not provide bank-to-bank coverage, the areas of mapped units are estimated to be within 20 to 25% of the actual. The planimeter measuring procedure is straightforward and provides an estimated $\pm 2\%$ accuracy in areas reported.

Map units comprising both ice and open water—*Solid Ice with Open Water Areas*, *Fragmented Ice with Open-Water Areas*, and *Ice Floes or Frazil Slush and Pans*—the surface concentration of ice to total area was visually estimated with a probable accuracy of $\pm 5\%$.* The ice concentrations for the *Solid Ice Cover* and *Fragmented Ice Cover* are always 100% (Table 2). The measured areas and estimated concentrations are listed in Appendix A.

*Personal communication with R. Arend and V. Anderson, Photographic Interpretation of Aerial Photographs, 1986.



with a Los Angeles Scientific Instruments Co. digital compensating polar planimeter. The accuracy of areas reported is influenced by the accuracy of positioning the map unit boundaries on the maps while the imagery interpreter viewed the video tapes on a monitor (in part a subjective and

surface correct
are always 100
tions are listed

* Personal communication
Corp. 1986.

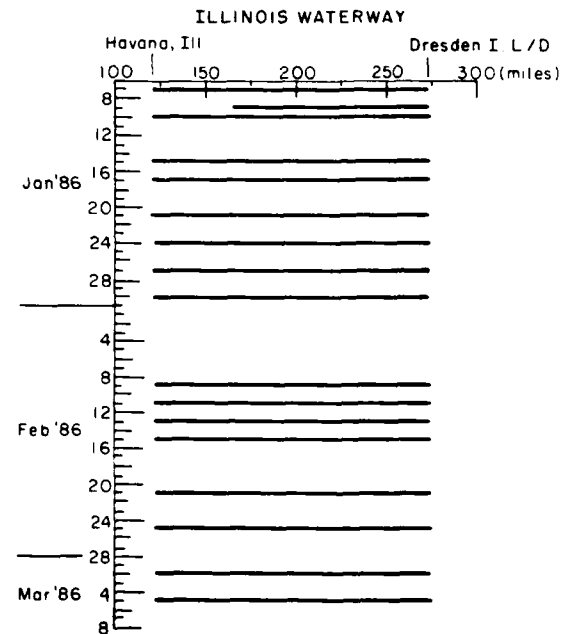
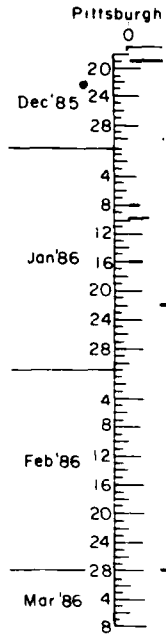
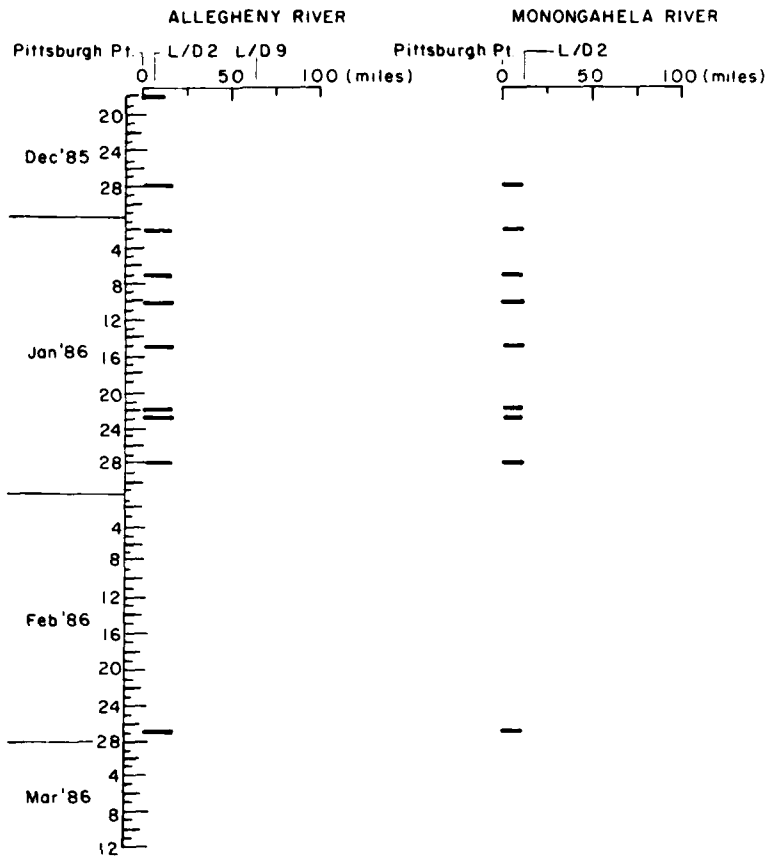


Figure 5. Dates of video tape acquisition (see also App

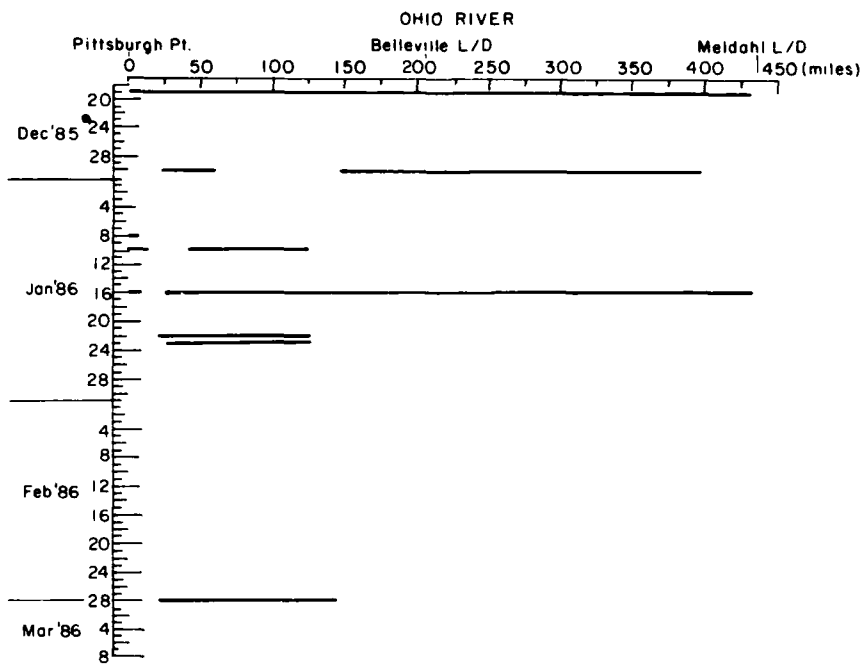
base maps
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surface concentrations for the *Solid Ice* and *Fragmented Ice* Cover
are always 100% (Table 2). The measured areas and estimated concentra-
tions are listed in Appendix A.

* Personal communication with R. Arend and V. Anderson, Photographic Interpretation
Corp. 1986.

RIVER

100 (miles)



INOIS WATERWAY

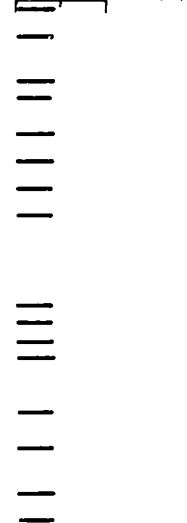
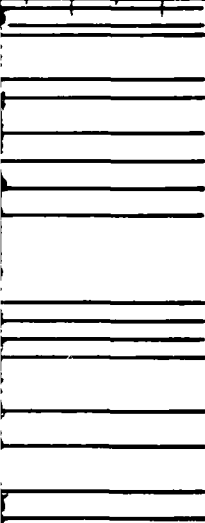
Dresden I. L/D

KANKAKEE RIVER

Warner Br.

200 250 300 (miles)

0 50 (miles)



of video tape acquisition (see also Appendix B).

RESULTS

Video surveys were conducted on 29 dates during the 1985-86 winter (Fig. 5). Portions of the Monongahela were covered 9 times, the Allegheny 10 times, the Ohio 8 times, the Illinois 17 times and the Kankakee 16 times. Generally, cloud conditions did not interfere with video acquisition on the Illinois and Kankakee Rivers to the degree that it did on the Ohio, Allegheny and Monongahela Rivers. There were fewer flights along the Ohio River in 1985-86 than in the 1984-85 season because there was less observed ice in 1985-86 and poor weather and low ceilings were more frequent. Generally, in the areas surveyed, the ice cover was not as extensive and did not last as long in 1985-86 as in 1984-85.

Monongahela River

Ice Floes or Frazil Slush and Pans was the only ice unit present when ice was first observed on 28 December. Ice within this unit covered 16% of the study area. This was also the maximum ice coverage. Ice was last observed on 28 January when 1% of the reach was covered with floes and frazil. *Solid Ice Cover*, *Solid Cover with Open-Water Areas* and *Fragmented Ice Cover with Open-Water Areas* were not observed this year.

Allegheny River

Ice was first observed on 28 December (Table 3). It was found primarily within *Fragmented Ice Cover with Open-Water Areas*, and the ice within this unit covered 21% of the study area. Ice within the other four ice types covered 26% of the river. Maximum ice cover occurred on 8 January and covered 56% of the river; this ice was also primarily found within *Fragmented Ice Cover with Open-Water Areas*. Ice was last observed on 28 January when it covered 1% of the river, and was predominantly within *Ice Floes or Frazil Slush and Pans*. Very little *Solid Ice Cover* or *Solid Ice Cover with Open-Water Areas* formed this year.

Ohio River

Above Hannibal Lockber; it covered 18% of the study area in the *Fragmented Ice Cover with Open-Water Areas*. This was also first observed on 28 December. *Ice Floes or Frazil Slush and Pans* was also the maximum ice cover at Hannibal. Maximum ice cover was observed at Hannibal, and the ice was last observed on 16 January. *Open-Water Areas* were not observed. The ice within *Ice Floes or Frazil Slush and Pans* covered 3% of the study area and was last observed on 16 January. Very little *Open-Water Areas* formed. Ice cover form was limited to the *Ice Floes or Frazil Slush and Pans*.

Illinois River

When the first flight was made, the river was covered with *Fragmented Ice Cover with Open-Water Areas*. The river was covered with ice in the other four ice types. The maximum ice cover at this time. *Ice Floes or Frazil Slush and Pans* was the dominant ice type in the La Grange Pool. *Ice Floes or Frazil Slush and Pans* and *Open-Water Areas* were most common. The Peoria Pool was generally covered with ice throughout the winter. Ice was last observed on 5 March and covered 1% of the river. The Illinois River channel was generally covered with ice in response to changing river discharge.

Table 3. Summary of ice conditions, 1985-1986 (data in Appendix 1)

		<i>Total ice (all ice types)</i>		<i>Predominant ice type</i>
		<i>Total ice area</i>	<i>Percent* of river</i>	
	<i>Date</i>	<i>($\times 10^6 \text{ m}^2$)</i>	<i>(%)</i>	<i>Name</i>
Monongahela River ($5.16 \times 10^6 \text{ m}^2$)				
First ice observed	28 Dec 85 ^a	0.80	16	Ice floes or frazil slush and pans
Maximum ice extent observed	28 Dec 85	0.80	16	Ice floes or frazil slush and pans
Last ice observed	28 Jan 86	0.05	1	Ice floes or frazil slush and pans
Allegheny River ($8.23 \times 10^6 \text{ m}^2$)				
First ice observed	28 Dec 85	3.87	47	Fragmented ice cover with open-water areas
Maximum ice extent observed	8 Jan 86	4.58	56	Fragmented ice cover with open-water areas

Ohio River

Above Hannibal Lock and Dam, ice was first observed on 30 December; it covered 18% of this portion of the river, and was predominantly in the *Fragmented Ice Cover* unit. Below Hannibal Lock and Dam, ice was also first observed on 30 December. This ice was primarily within the *Ice Floes or Frazil Slush and Pans* unit, and covered 1% of the area. This was also the maximum ice coverage for the river area downstream of Hannibal. Maximum ice coverage (19%) occurred on 16 January above Hannibal, and the ice was primarily within *Fragmented Ice Cover with Open-Water Areas*. The last ice observed above Hannibal was primarily within *Ice Floes or Frazil Slush and Pans*, was observed on 23 January, and covered 3% of the area. Downstream of Hannibal, the same ice type was last observed on 16 January and covered so little of the area as to be reported as 0%. Very little *Solid Ice Cover* and *Solid Ice Cover with Open-Water Areas* formed during the 1985-86 winter, and what did form was limited to the Ohio River above Willow Island Dam.

Illinois River

When the first flight was made on 7 January, 28% of the area of study was covered with *Fragmented Ice Cover*, while an additional 36% was covered with ice in the other ice types. The ice cover was also at its maximum at this time. *Ice Floes or Frazil Slush and Pans* was the predominant ice type in the La Grange and Marseilles Pools, while *Solid Ice Cover*, *Fragmented Ice Cover* and *Fragmented Ice Cover with Open-Water Areas* were most common on the Peoria and Starved Rock pools. The Peoria Pool was generally covered with solid ice that remained in place throughout the winter. *Solid Ice Cover* was the last ice type observed on 5 March and covered 2% of the area. The extent of the ice area on the Illinois River changed dramatically during the winter, primarily in response to changing weather conditions rather than to significant changes in river discharge (see Fig. 3 and 4).

ons, 1985-1986 (data in Appendix A).

ices)	Predominant ice types		
	Name	Total ice area ($\times 10^6 \text{ m}^2$)	Percent* of river (%)

liver ($5.16 \times 10^6 \text{ m}^2$)

Ice floes or frazil slush and pans	0.80	16
Ice floes or frazil slush and pans	0.80	16
Ice floes or frazil slush and pans	0.05	1

er ($8.23 \times 10^6 \text{ m}^2$)

Fragmented ice cover with open-water areas	1.75	21
Fragmented ice cover with open-water areas	2.95	36
Ice floes or frazil slush	0.05	1

Table 3. Summary of ice conditions, 1985-1986 (data

		Total ice (all ice types)		
	Date	Total ice area ($\times 10^6 \text{ m}^2$)	Percent* of river (%)	Notes
Monongahela River ($5.16 \times 10^6 \text{ m}^2$)				
First ice observed	28 Dec 85 ^a	0.80	16	Ice floes or fra and pans
Maximum ice extent observed	28 Dec 85	0.80	16	Ice floes or fra and pans
Last ice observed	28 Jan 86	0.05	1	Ice floes or fra and pans
Allegheny River ($8.23 \times 10^6 \text{ m}^2$)				
First ice observed	28 Dec 85	3.87	47	Fragmented ice open-water a
Maximum ice extent observed	8 Jan 86	4.58	56	Fragmented ice open-water a
Last ice observed	28 Jan 86	0.08	1	Ice floes or fra and pans
Ohio River above Hannibal Lock and Dam (77.1)				
First ice observed	30 Dec 85 ^c	13.78	18	Fragmented ice
Maximum ice extent observed	16 Jan 85 ^d	14.62	19	Fragmented ice open-water a
Last ice observed	23 Jan 86 ^d	2.31	3	Ice floes or fra and pans
Ohio River below Hannibal Lock and Dam (208)				
First ice observed	30 Dec 85 ^f	1.07	1	Ice floes or fra and pans
Maximum ice extent observed	30 Dec 85 ^f	1.07	1	Ice floes or fra and pans
Last ice observed	16 Jan 85 ^b	0.40	0	Ice floes or fra and pans
Illinois River ($111.42 \times 10^6 \text{ m}^2$)				
First ice observed	7 Jan 86 ^{a,g}	71.58	64	Fragmented ice
Maximum ice extent observed	7 Jan 86 ^{b,h}	71.58	64	Fragmented ice
Last ice observed	5 Mar 86 ^{a,i}	1.92	2	Solid ice cover
Kankakee River ($7.30 \times 10^6 \text{ m}^2$)				
First ice observed	7 Jan 86 ^{a,i}	5.46	75	Fragmented ice open-water a
Maximum ice extent observed	15 Jan 86 ^j	6.65	91	Fragmented ice
Last ice observed	5 Mar 86 ^{b,k}	0.41	6	Solid ice cover

* Rounded to nearest percent.

a—First date of video coverage.

b—Last date of video coverage.

c—No video coverage for $52.85 \times 10^6 \text{ m}^2$.d—No video coverage for $10.57 \times 10^6 \text{ m}^2$.e—No video coverage for $16.45 \times 10^6 \text{ m}^2$.f—No video coverage for $42.83 \times 10^6 \text{ m}^2$.

g—No video coverage for 18.9

h—No video coverage for 27.3

i—No video coverage for 1.17

j—No video coverage for 0.12

k—No video coverage for 0.13

Summary of ice conditions, 1985-1986 (data in Appendix A).

	Total ice (all ice types)		Predominant ice types	
	Total ice area ($\times 10^6 \text{ m}^2$)	Percent* of river (%)	Name	Total ice area ($\times 10^6 \text{ m}^2$) Percent* of river (%)
Monongahela River ($5.16 \times 10^6 \text{ m}^2$)				
sh	0.80	16	Ice floes or frazil slush and pans	0.80 16
sh	0.80	16	Ice floes or frazil slush and pans	0.80 16
sh	0.05	1	Ice floes or frazil slush and pans	0.05 1
Allegheny River ($8.23 \times 10^6 \text{ m}^2$)				
r w	3.87	47	Fragmented ice cover with open-water areas	1.75 21
r w	4.58	56	Fragmented ice cover with open-water areas	2.95 36
sh	0.08	1	Ice floes or frazil slush and pans	0.05 1
0th river above Hannibal Lock and Dam ($77.01 \times 10^6 \text{ m}^2$)				
er	13.78	18	Fragmented ice cover	8.57 11
er w	14.62	19	Fragmented ice cover with open-water areas	5.50 7
ash	2.31	3	Ice floes or frazil slush and pans	1.98 3
10th river below Hannibal Lock and Dam ($208.02 \times 10^6 \text{ m}^2$)				
ush	1.07	1	Ice floes or frazil slush and pans	1.07 1
ush	1.07	1	Ice floes or frazil slush and pans	1.07 1
ush	0.40	0	Ice floes or frazil slush and pans	0.26 0
Illinois River ($111.42 \times 10^6 \text{ m}^2$)				
er	71.58	64	Fragmented ice cover	31.33 28
er	71.58	64	Fragmented ice cover	31.33 28
	1.92	2	Solid ice cover	1.91 2
Kankakee River ($7.30 \times 10^6 \text{ m}^2$)				
er w	5.46	75	Fragmented ice cover with open-water areas	2.65 36
er	6.65	91	Fragmented ice cover	3.18 44
	0.41	6	Solid ice cover	0.39 5

g—No video coverage for $18.92 \times 10^6 \text{ m}^2$.

h—No video coverage for $27.35 \times 10^6 \text{ m}^2$.

i—No video coverage for $1.17 \times 10^6 \text{ m}^2$.

j—No video coverage for $0.12 \times 10^6 \text{ m}^2$.

k—No video coverage for $0.13 \times 10^6 \text{ m}^2$.

Kankakee River

On 7 January, 75% of the area of study was ice-covered, primarily classified within *Fragmented Ice Cover with Open-Water Areas*. On 15 January, ice was at its maximum, with 44% of the area covered with *Fragmented Ice Cover*, while 47% was covered with *Solid Ice Cover* and ice within *Fragmented Ice Cover with Open-Water Areas*. By mid-February *Solid Ice Cover* and the ice portion of *Solid Ice Cover with Open-Water Areas* covered about 74%; these units were more common than the fragmented ice types (Appendix A). *Solid Ice Cover* covered 5% of the area on 5 March and persisted in the backwater pool created by the Dresden Island Dam later than 5 March, when the last flight was made.

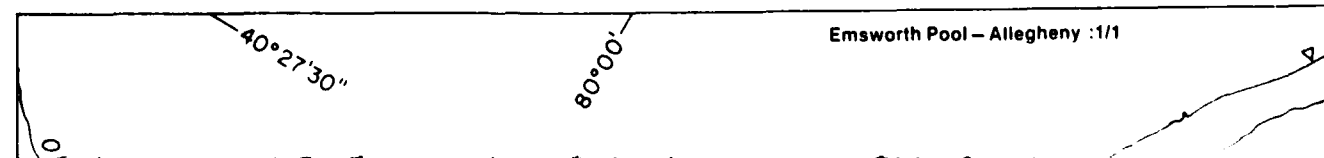
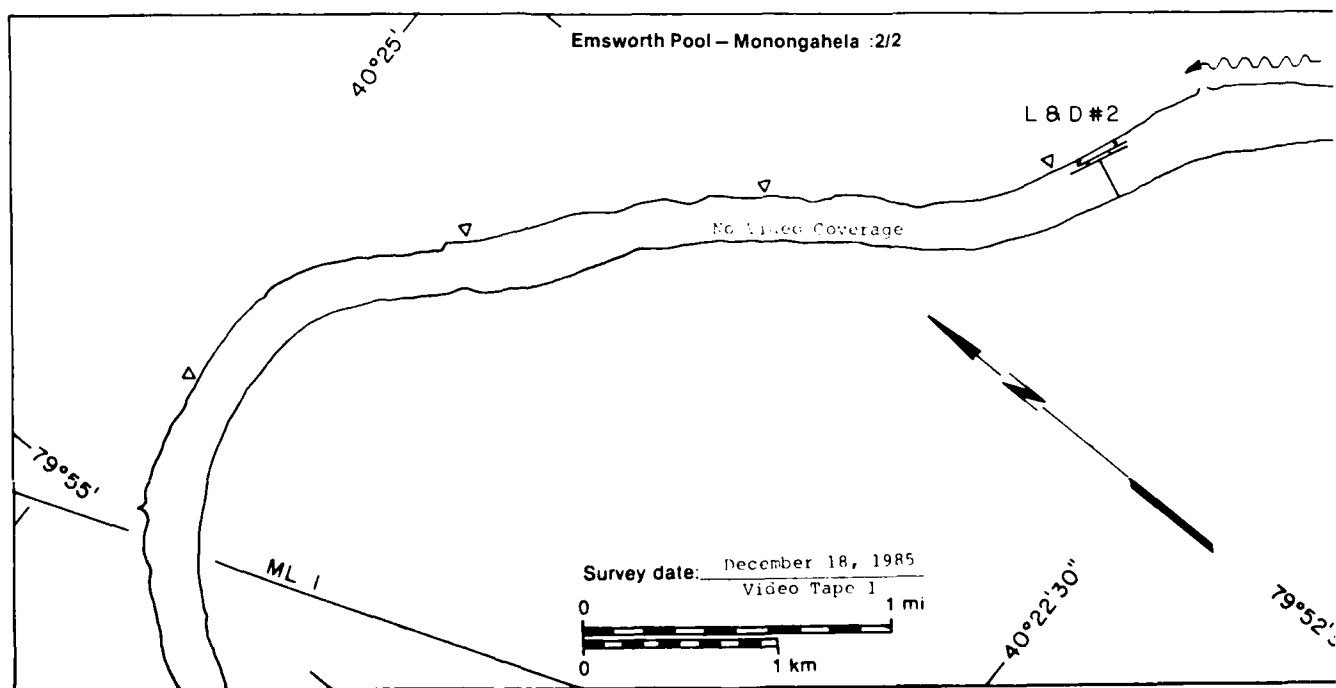
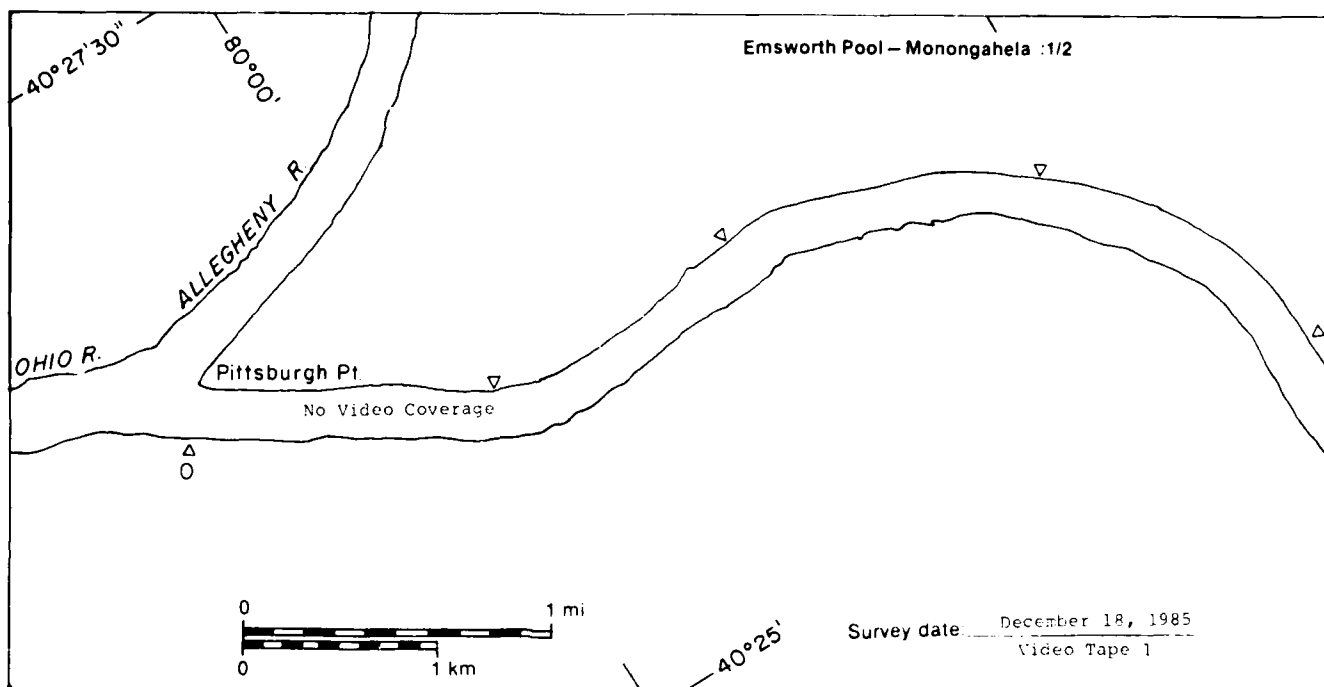
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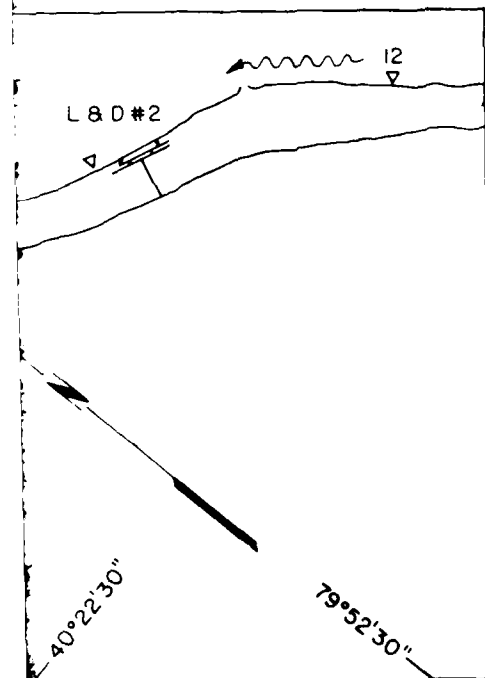
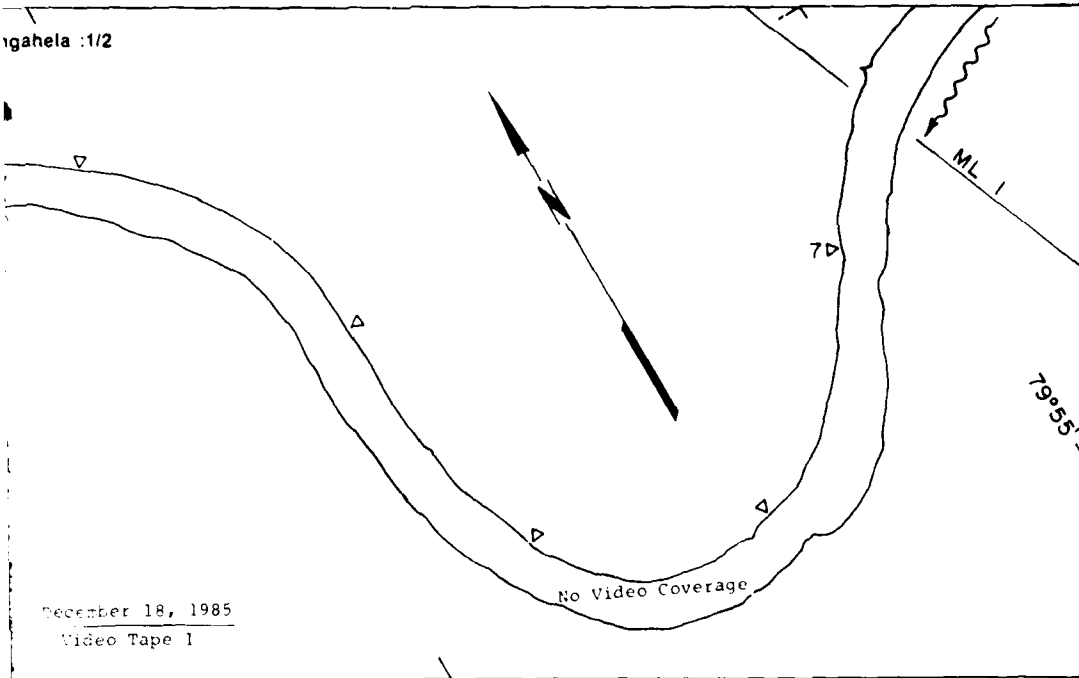
CONCLUSIONS

Ice conditions on the rivers change rapidly, often daily. Generally, the ice cover was less extensive and did not last as long during 1985-86 as during 1984-85. Poor flying weather with low ceilings occurred more frequently during 1985-86 and restricted the opportunities for getting more frequent video coverage, and sometimes caused large gaps between dates of video acquisition. In spite of these problems, videography is an economical, effective and accurate way to document the rapidly changing ice conditions. Videographic techniques also provide near-real-time data during periods of extreme ice conditions. Various options are being explored to get more frequent coverage in the future.

MAPS OF ICE CONDITIONS ON THE MONONGAHELA, ALLEGHENY AND OHIO RIVERS



18 December 1985

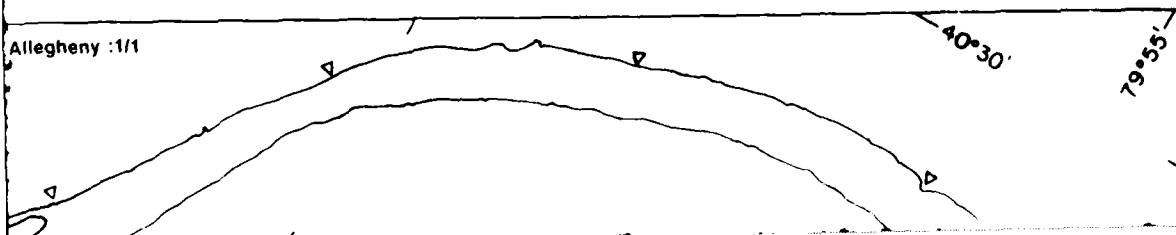


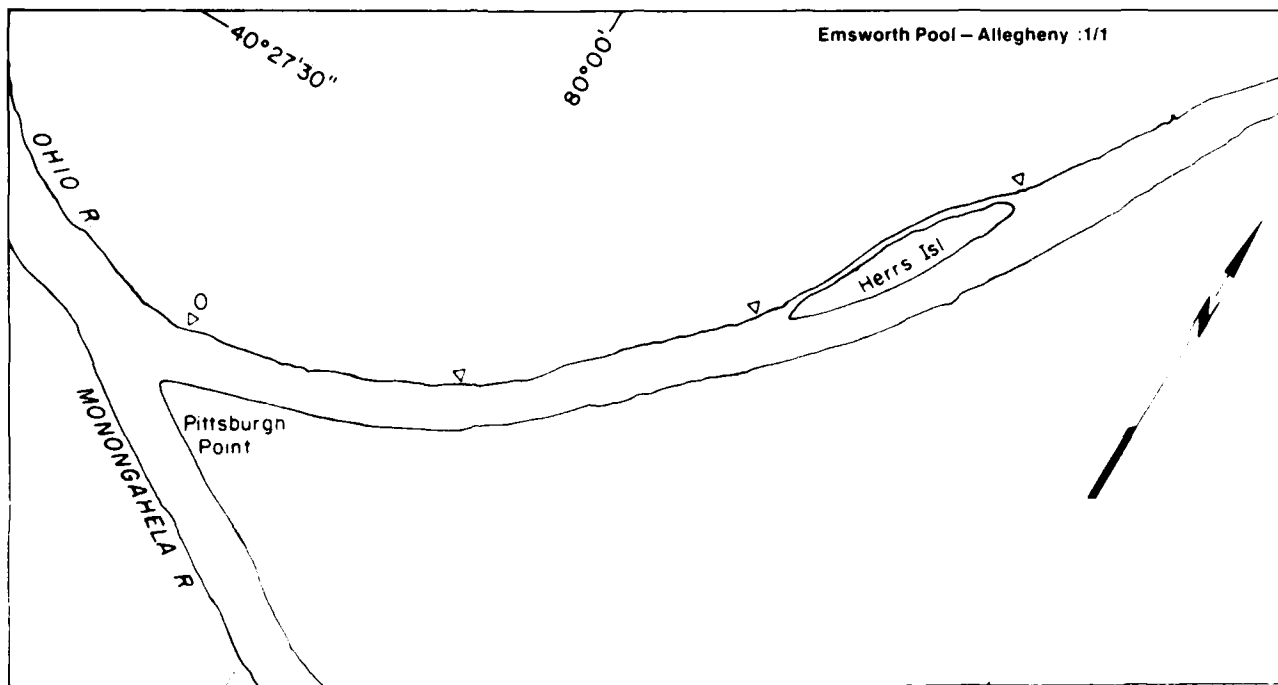
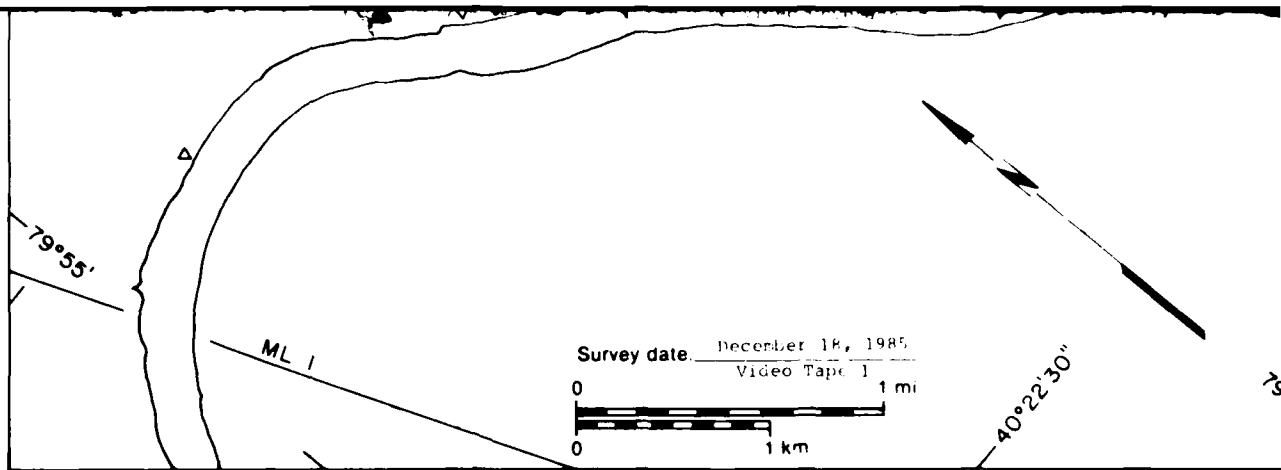
Emsworth Pool - Monongahela

Material	Area (m ² x 10 ⁶)	Notes
Open Water	0.00	NA
Shrub	0.00	NA
Hardwood with 25% open water canopy	0.00	—
Highly forested	0.00	NA
Highly forested with 25% open water canopy	0.00	—
Low forested	0.00	—

Total area (m² x 10⁶)

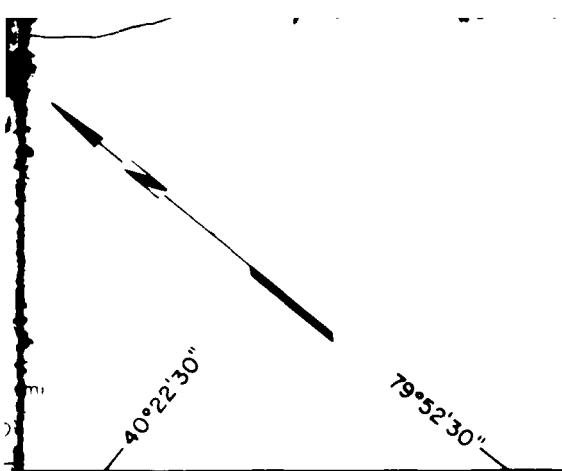
5.16*
* Includes 5.16 x 10⁶ m² of no video coverage





Emsworth Pool - Allegheny

Map	Area ($m^2 \times 10^6$)	
	3.07	
	0.00	
	0.00	
	0.00	
	0.00	
	0.00	
	0.00	
Total area ($m^2 \times 10^6$)	3.07	



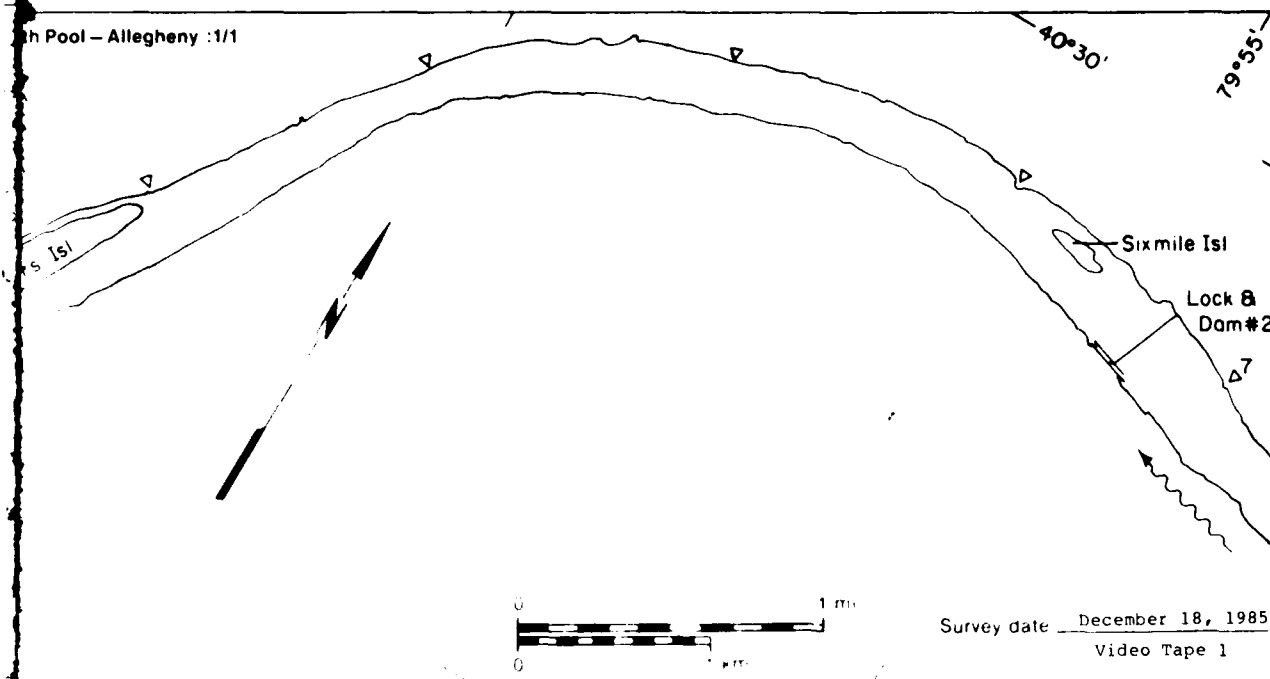
Emsworth Pool - Monongahela

Map	Area (m ² x 10 ⁶)	%A
Water	0.00	NA
Shrub	0.00	NA
Grass	0.00	—
Forest	0.00	NA
Barren	0.00	—
Other	0.00	—

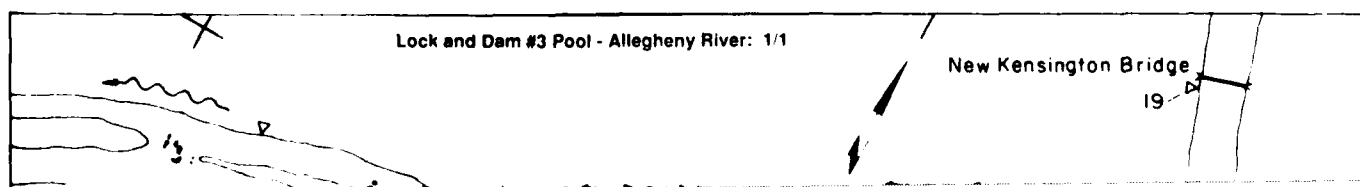
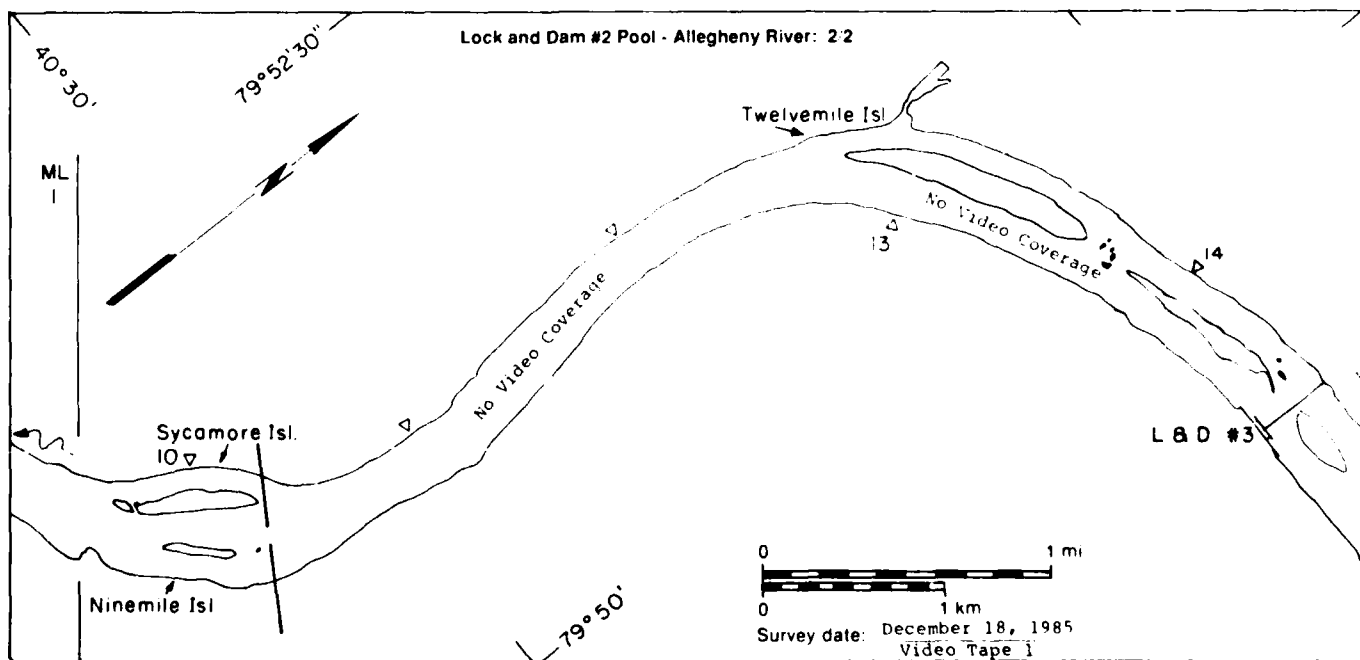
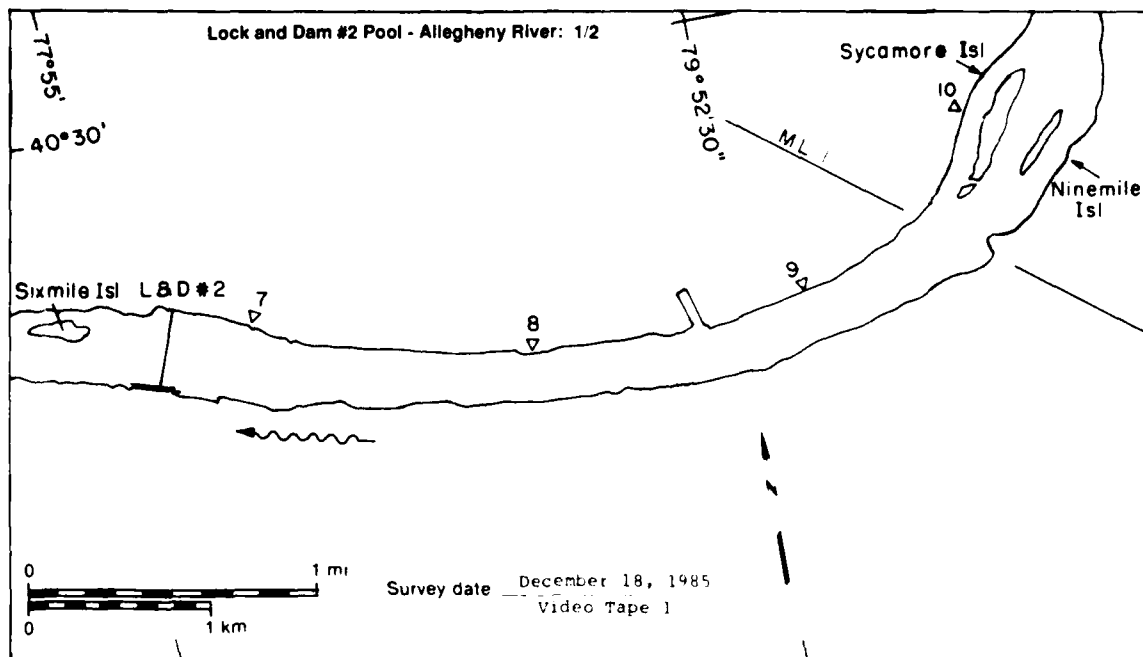
Total area (m² x 10⁶)

5.16* * Includes 5.16 x 10⁶ m² of no video coverage

h Pool - Allegheny :1/1



18 December 1985



Lock and Dam #2 Pool

MAP UNITS



Open water



Solid ice cover



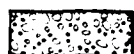
Solid ice cover with open-water areas



Fragmented ice cover



Fragmented ice cover with open-water areas



Ice floes or frazil slush and pans

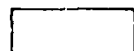
Total area ($m^2 \times 10^6$)

Area ($m^2 \times 10^6$)	Surface concentration (%)
1.90	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
0.00	—
4.02*	

* Includes 2.12×10^6
of no video coverage

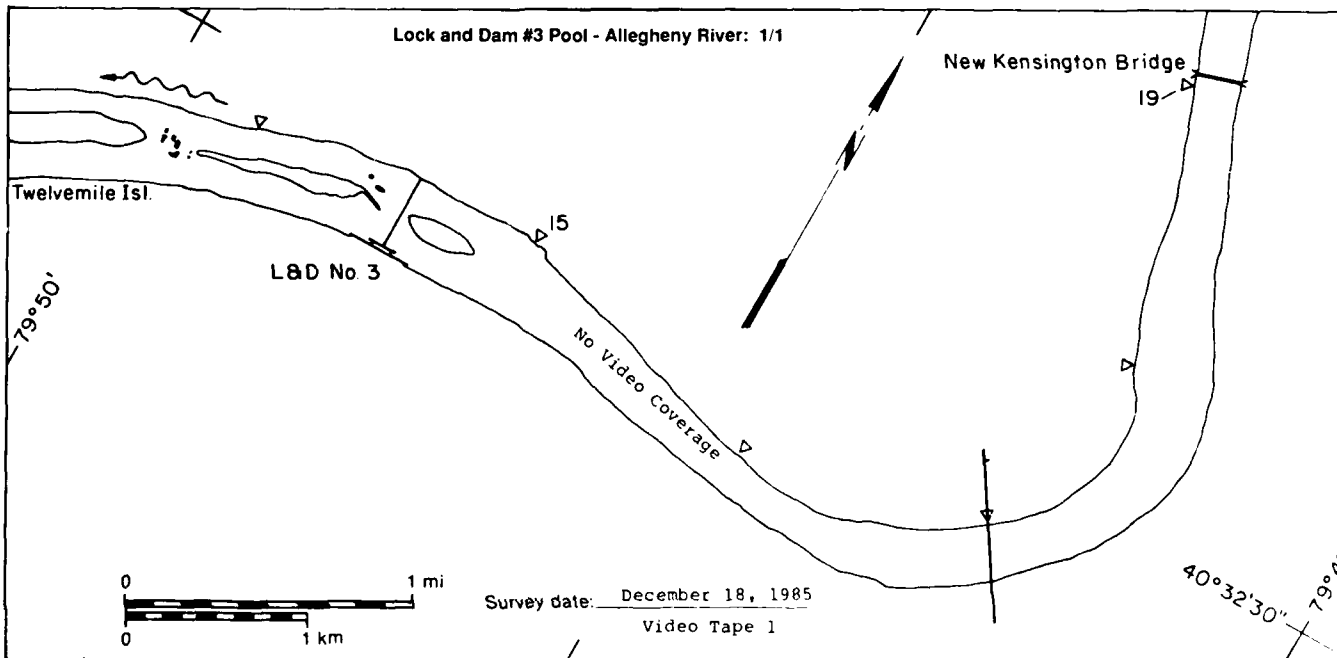
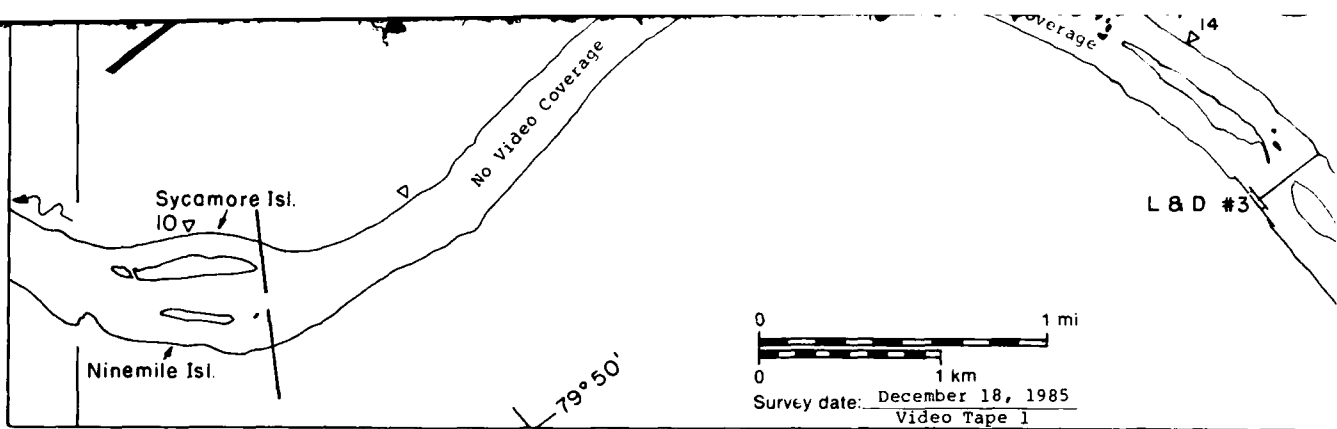
Lock and Dam #3 Pool

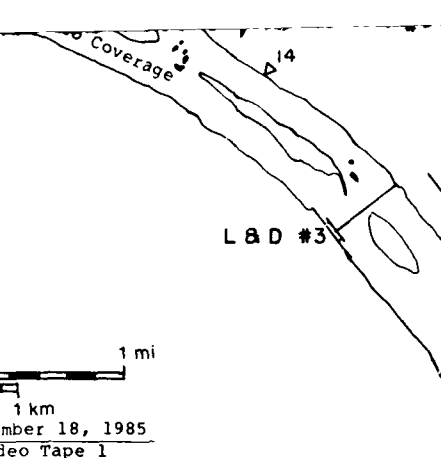
MAP UNITS



Open water

Area ($m^2 \times 10^6$)	Surface concentration (%)
0.00	NA





Solid ice cover

0.00

NA



Solid ice cover with open-water areas

0.00

—



Fragmented ice cover

0.00

NA



Fragmented ice cover with open-water areas

0.00

—



Ice floes or frazil slush and pans

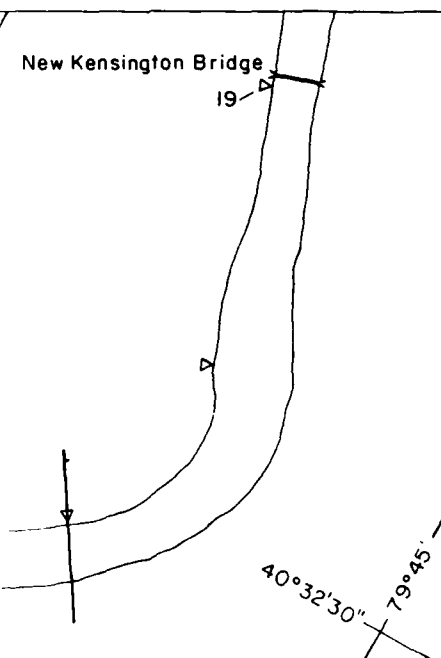
0.00

—

Total area ($m^2 \times 10^6$)

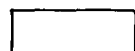
4.02*

* Includes 2.12×10^6 of no video coverage



Lock and Dam #3 Pool

MAP UNITS



Open water

Area
($m^2 \times 10^6$)

0.00

Surface
concentration
(%)

NA



Solid ice cover

0.00

NA



Solid ice cover with open-water areas

0.00

—



Fragmented ice cover

0.00

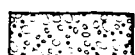
NA



Fragmented ice cover with open-water areas

0.00

—



Ice floes or frazil slush and pans

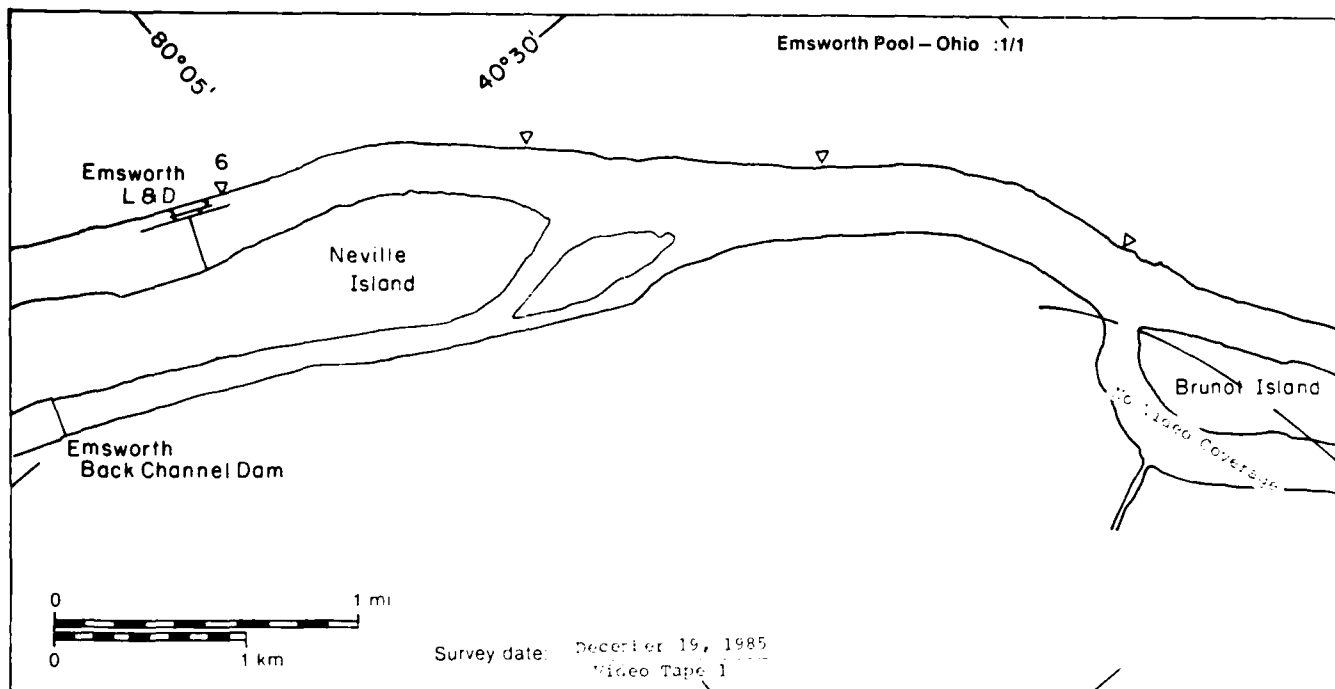
0.00

—

Total area ($m^2 \times 10^6$)

1.14*

* Includes 1.14×10^6 of no video coverage



Emsworth Pool - Ohio

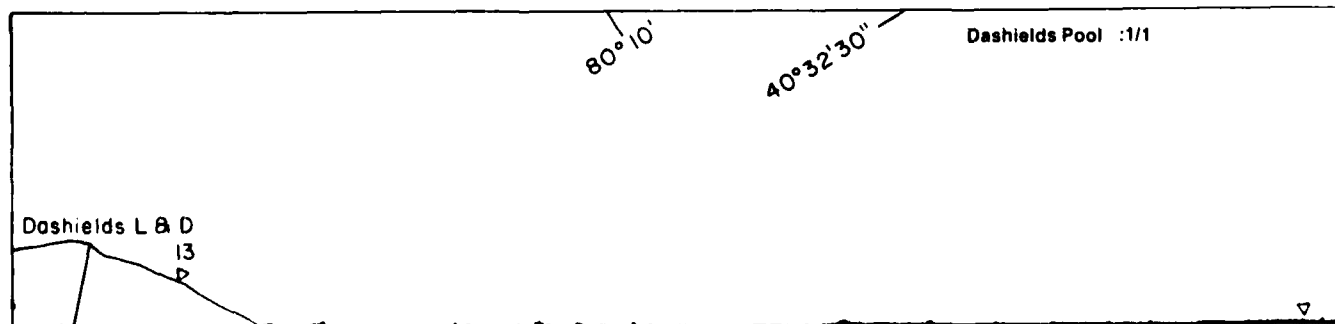
MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

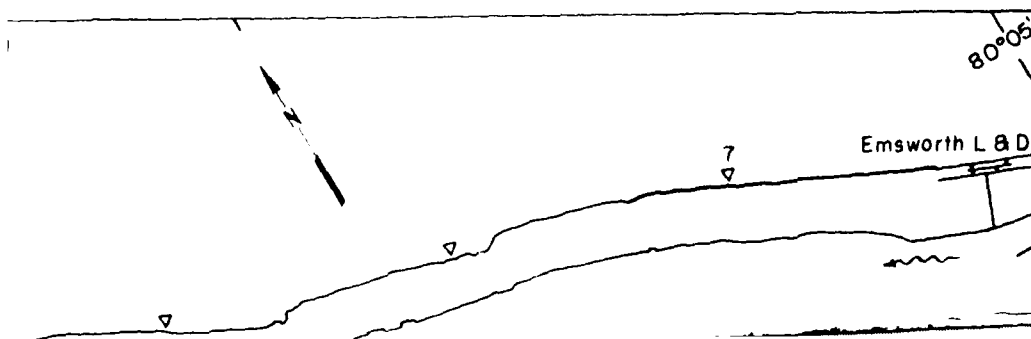
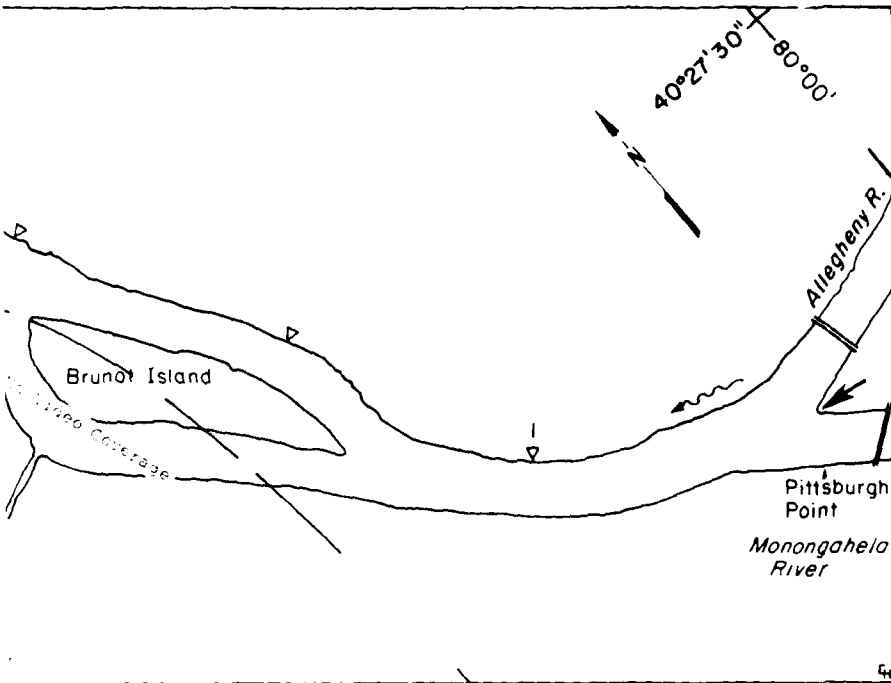
Area ($m^2 \times 10^6$)	Surface concentration (%)
4.01	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
0.00	—
4.49*	

Total area ($m^2 \times 10^6$)

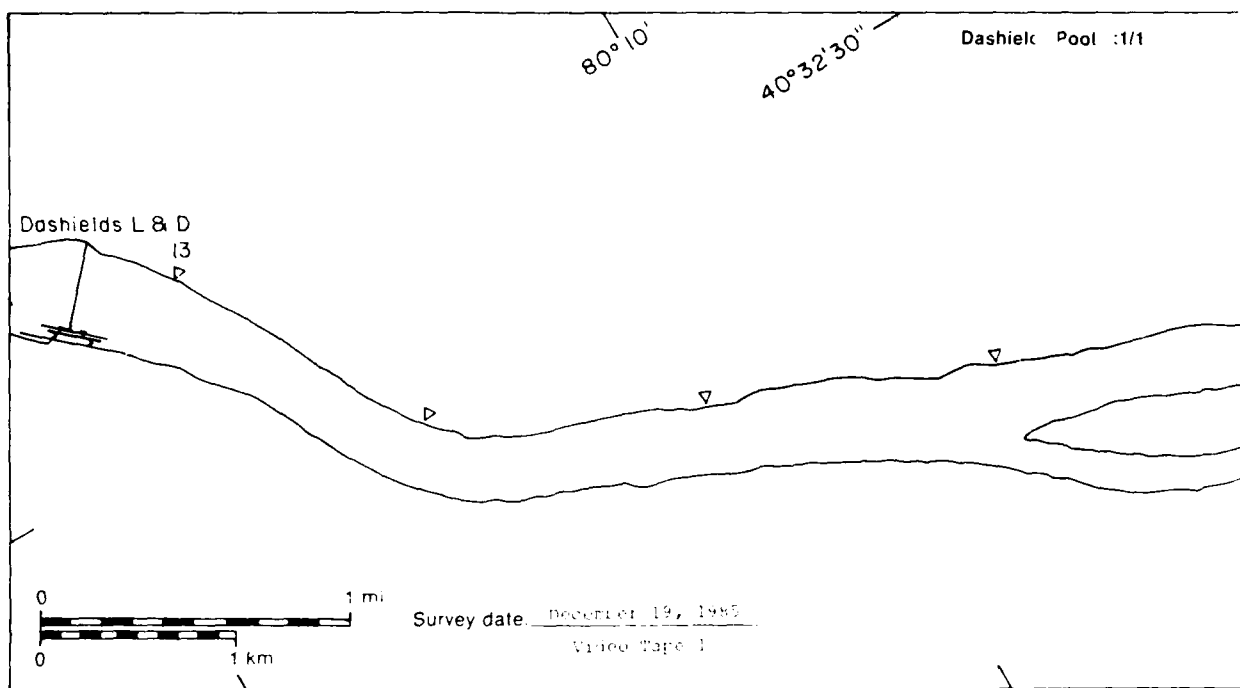
* Includes $0.48 \times 10^6 m^2$ of no video coverage



19 December 1985



	Open water	0.00	—
	Fragmented ice cover	0.00	1.4
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		4.49*	* Includes $0.49 \times 10^6 m^2$ of the Vilek Channel



Dashields Pool		Area	Surface
MAP UNITS		($m^2 \times 10^6$)	concentration
	Open water	5.00	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		5.00	

Dashields Pool :1/1

80°05'

Emsworth L & D

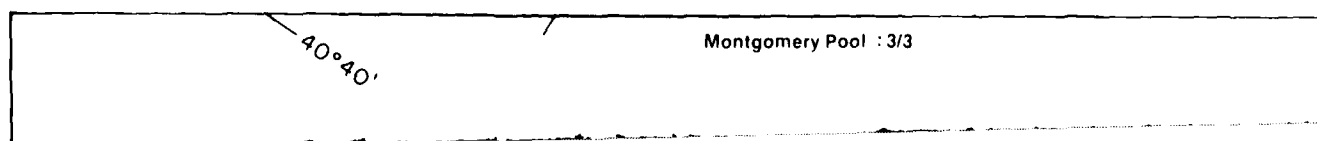
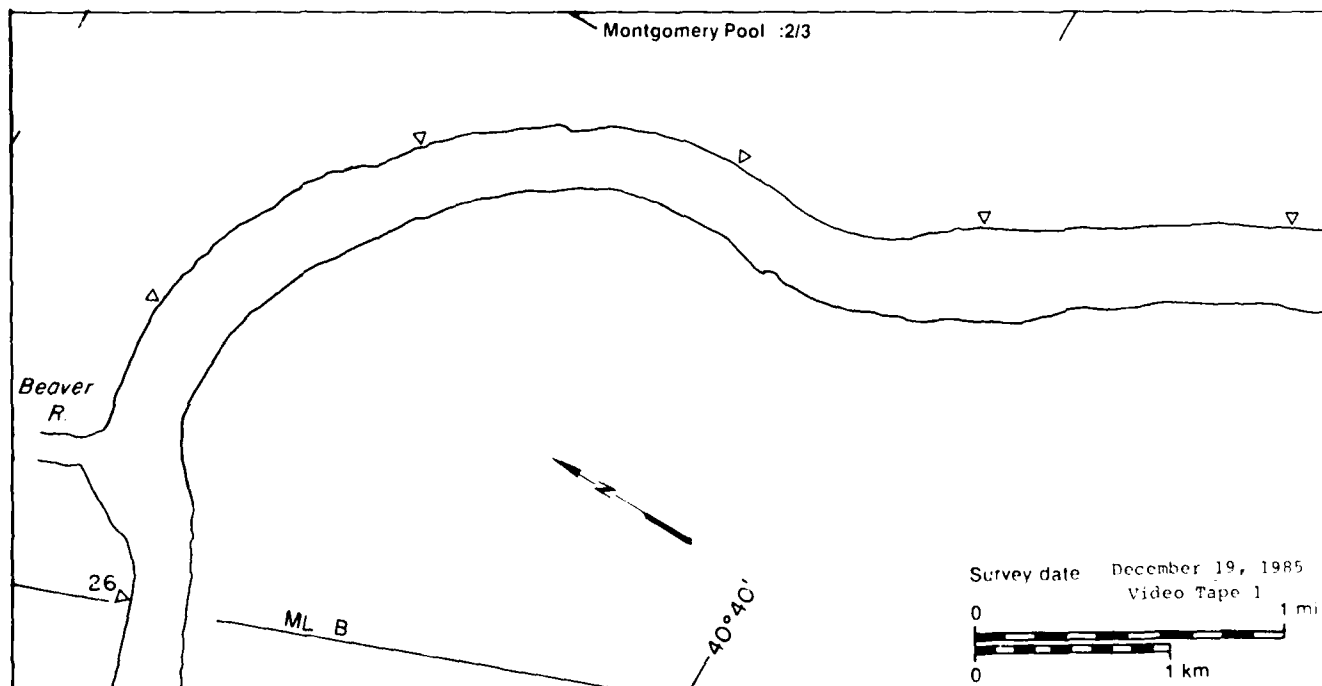
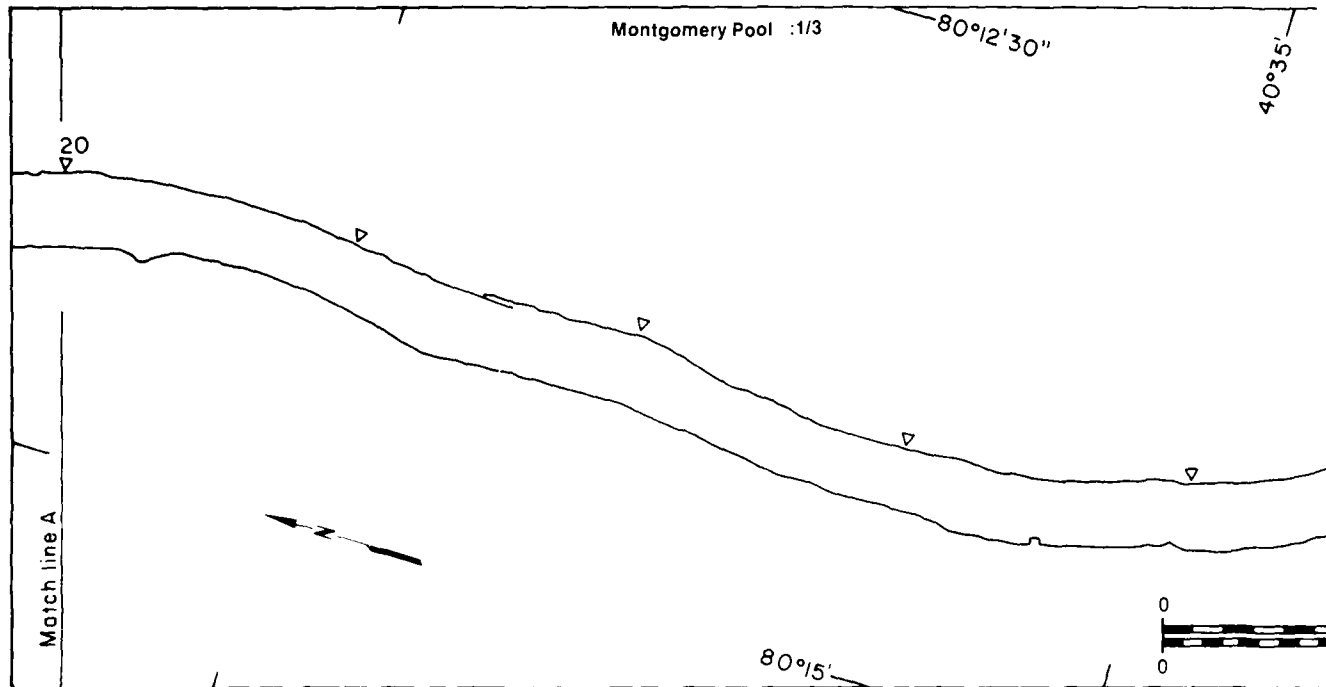
7

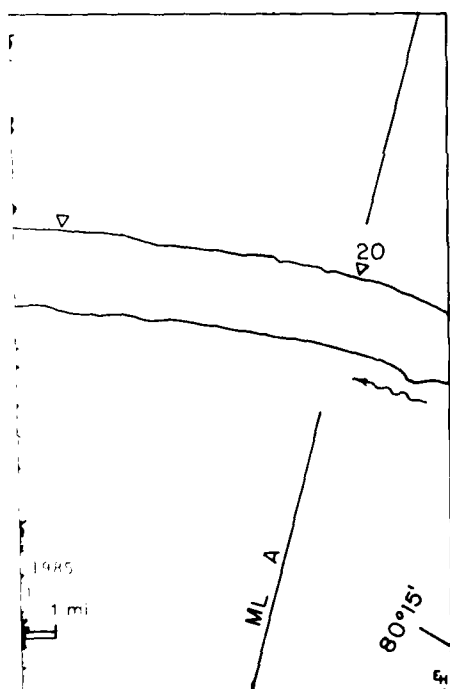
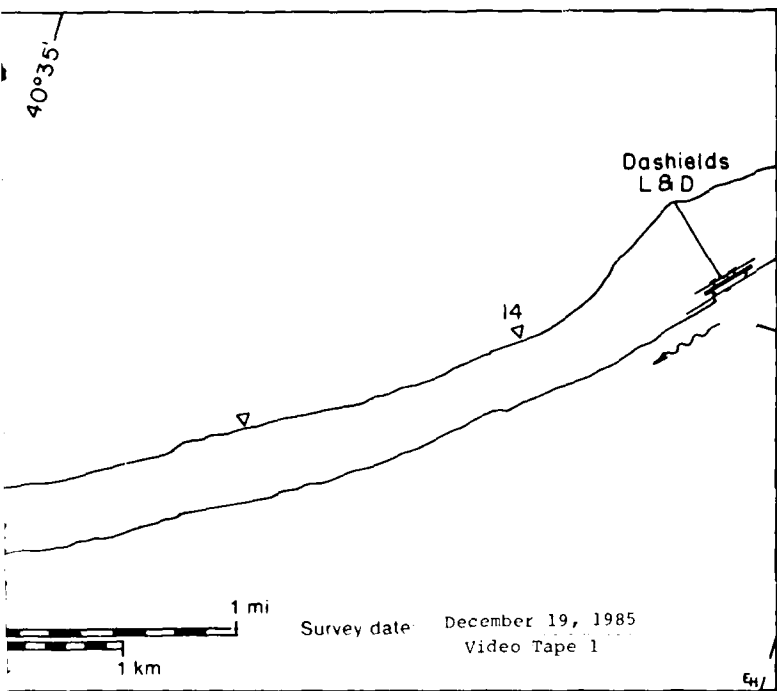
Neville Island

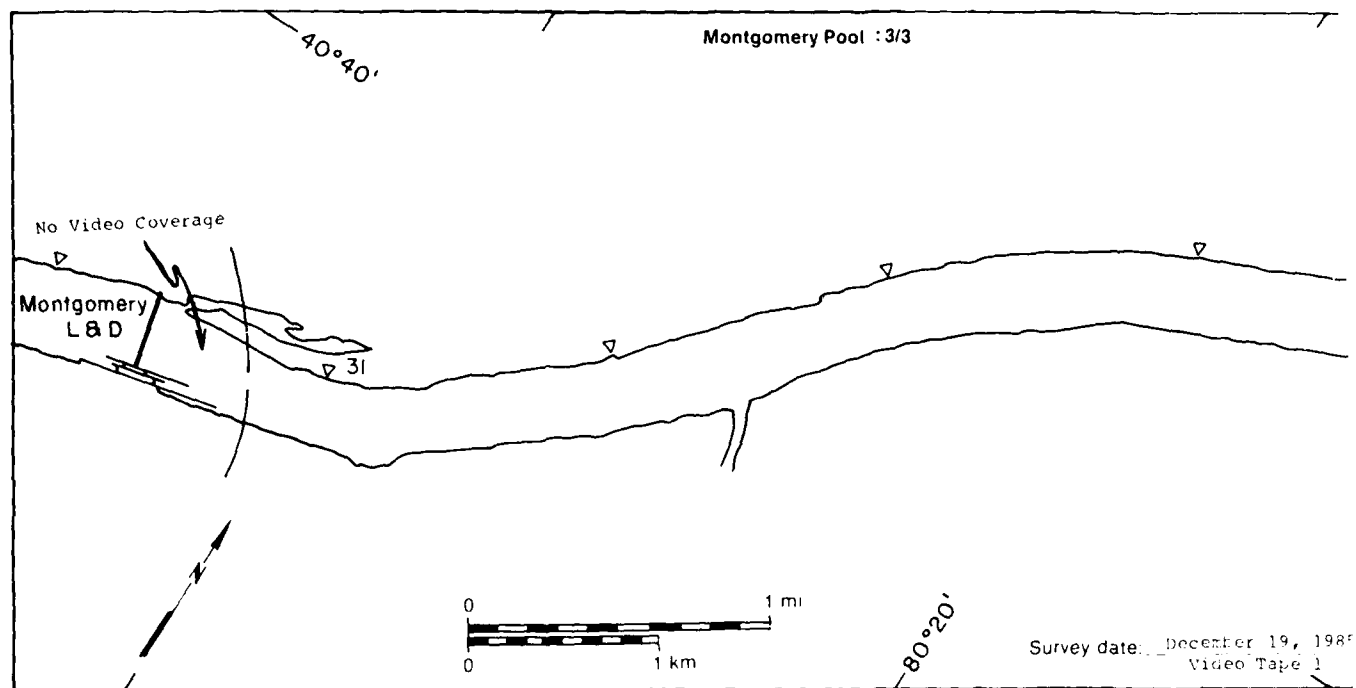
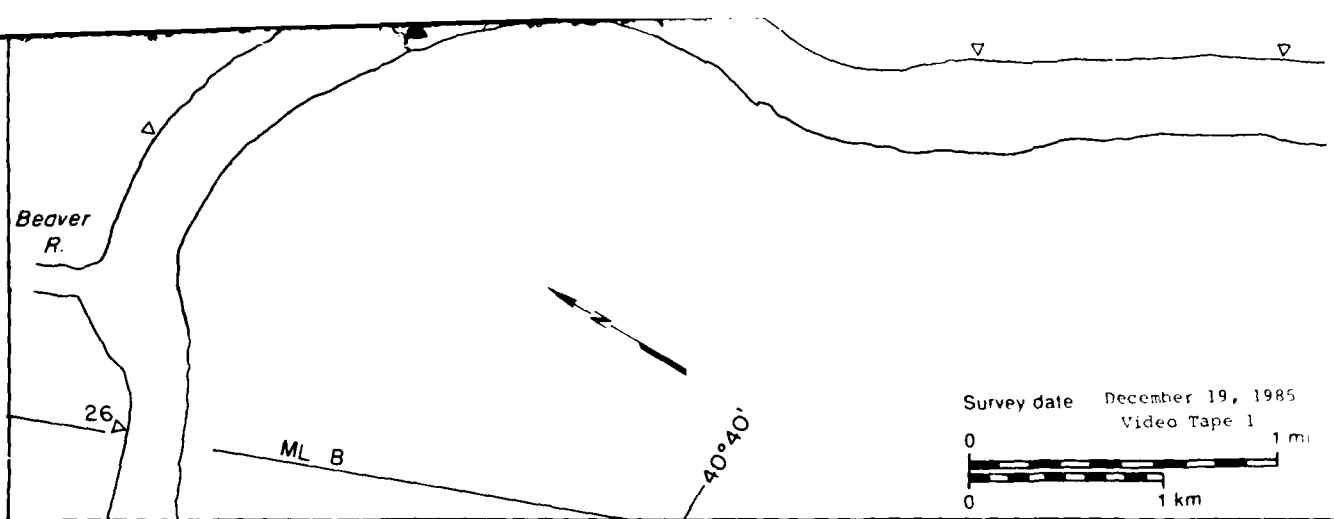
Emsworth
Back Channel Dam

40°30'

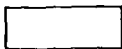



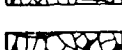

19 December 1985







Montgomery Pool

MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
	10.99	NA
	0.00	NA
	0.00	—
	0.00	NA
	0.00	—
	0.00	—
Total area ($m^2 \times 10^6$)	11.27*	

* Includes $0.28 \times 10^6 m^2$ of no video coverage

date December 19, 1985
Video Tape 1

1 mi

1 km

ML A

80°15'

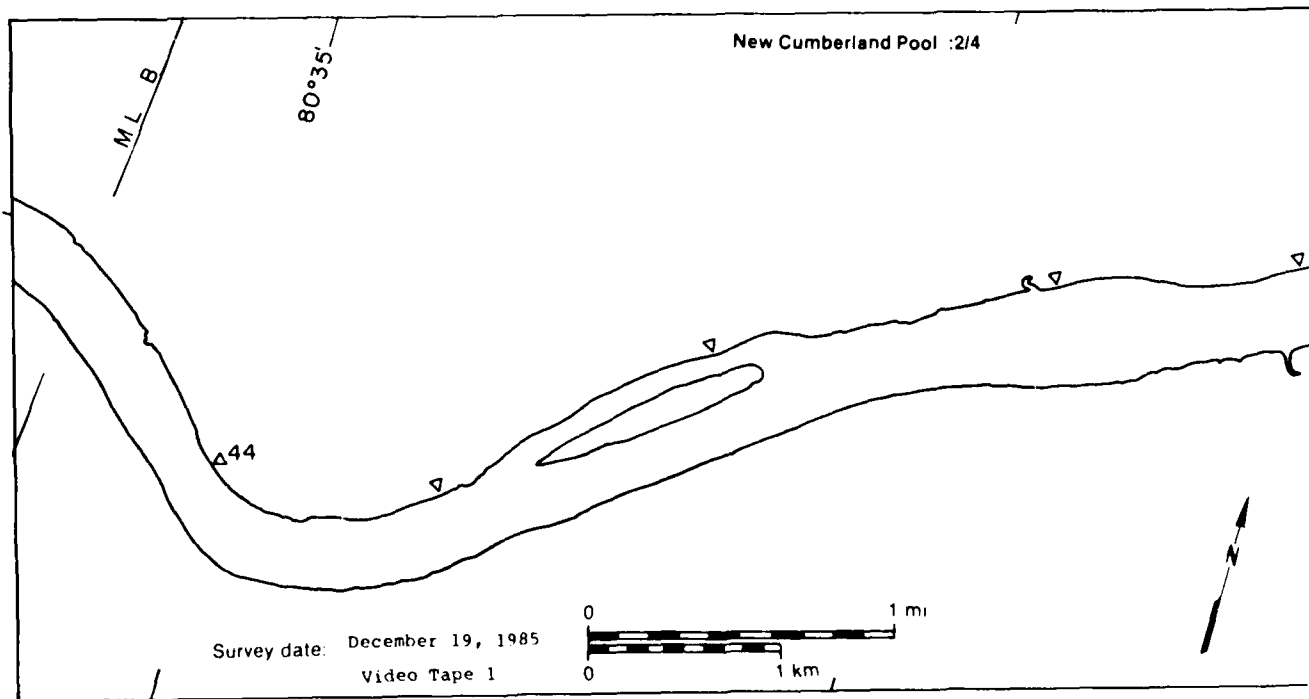
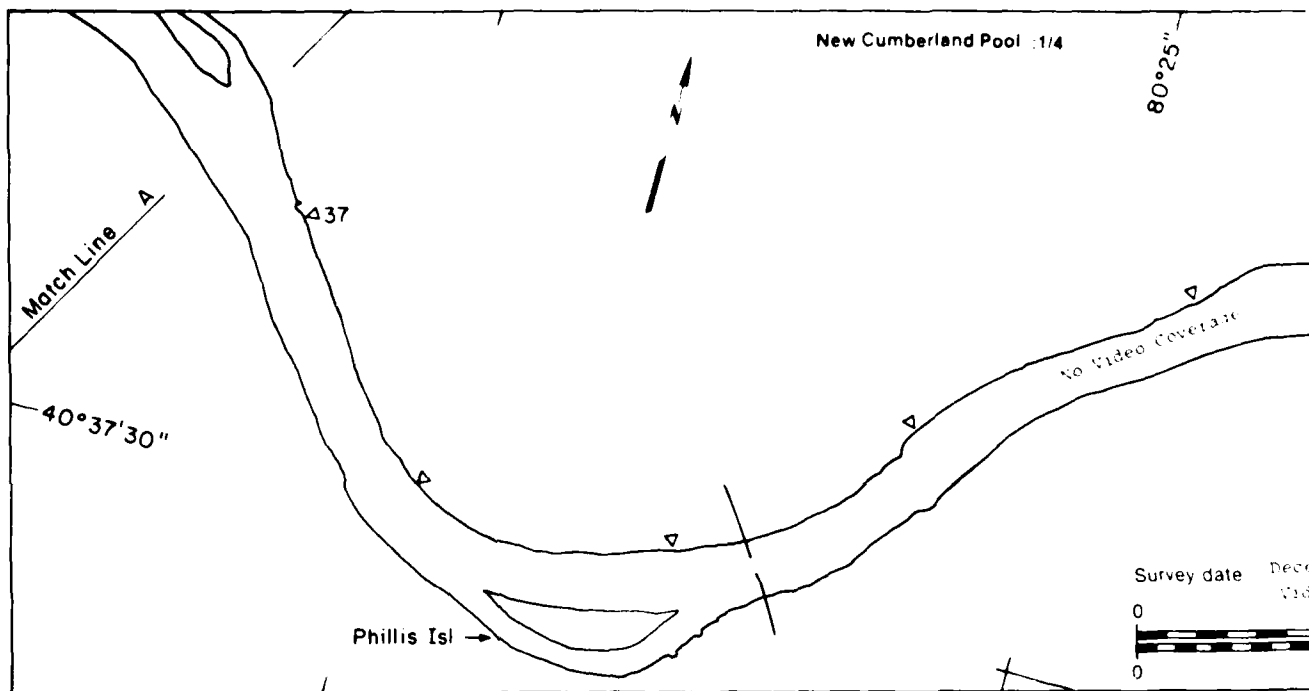
E

26

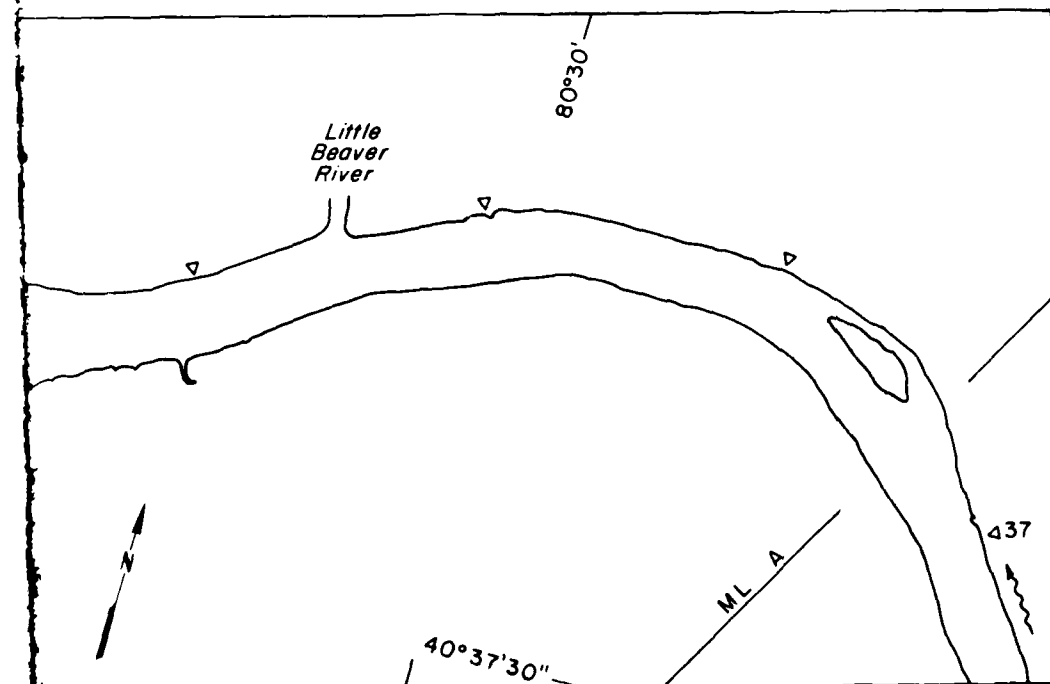
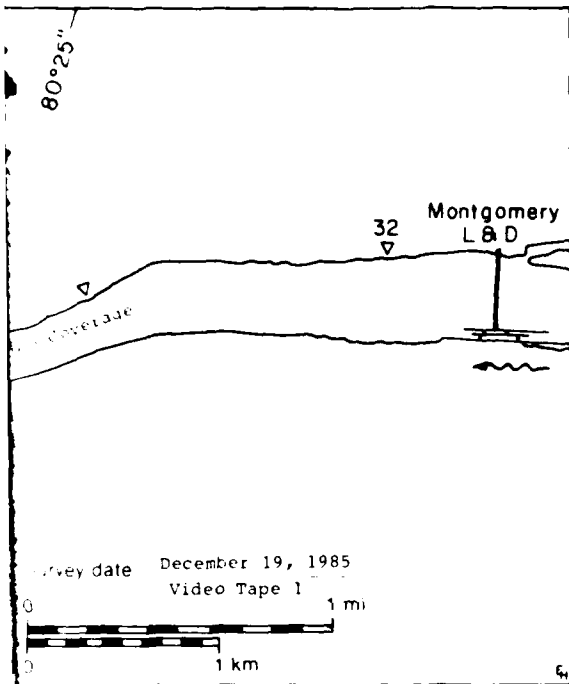
ML B

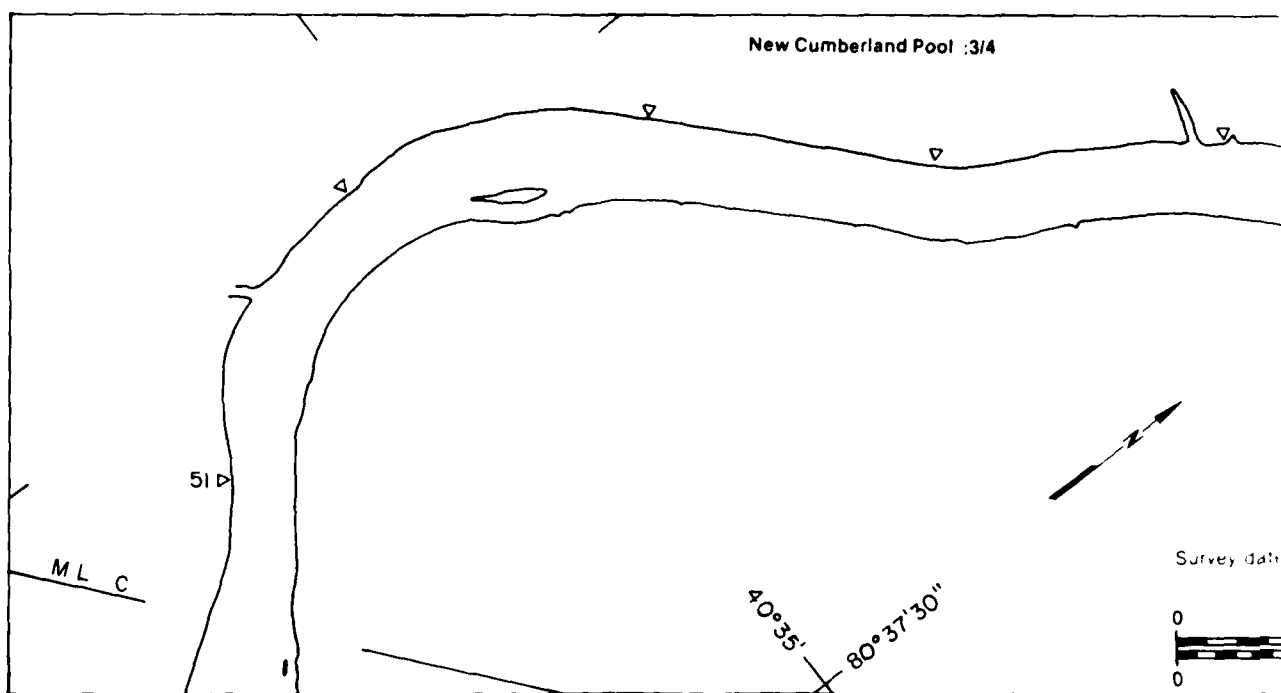
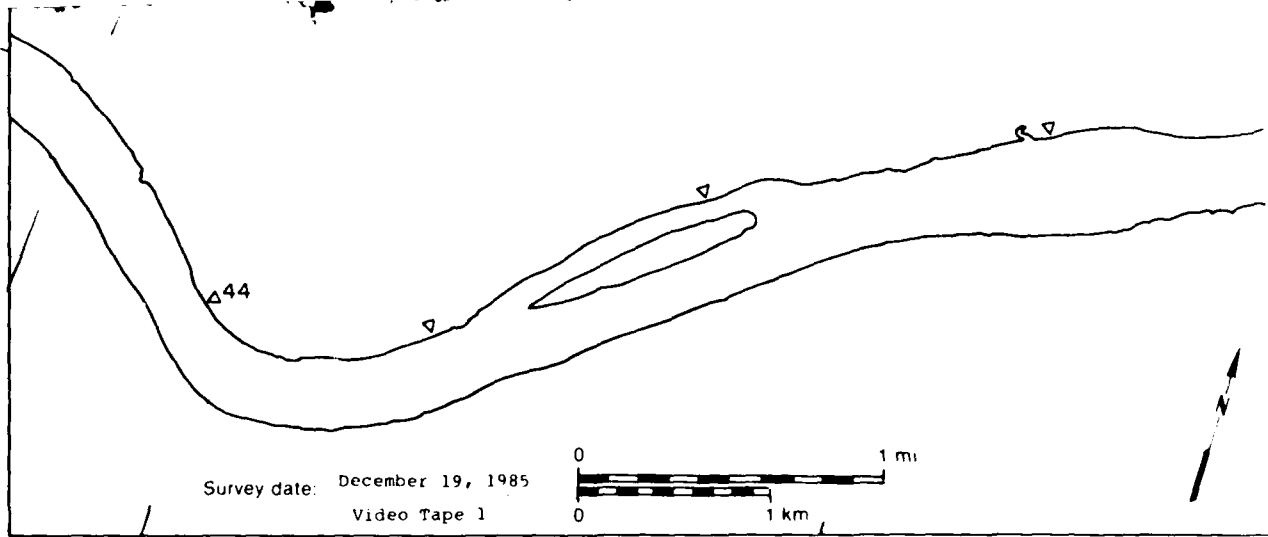
Survey date: December 19, 1985
Video Tape 1

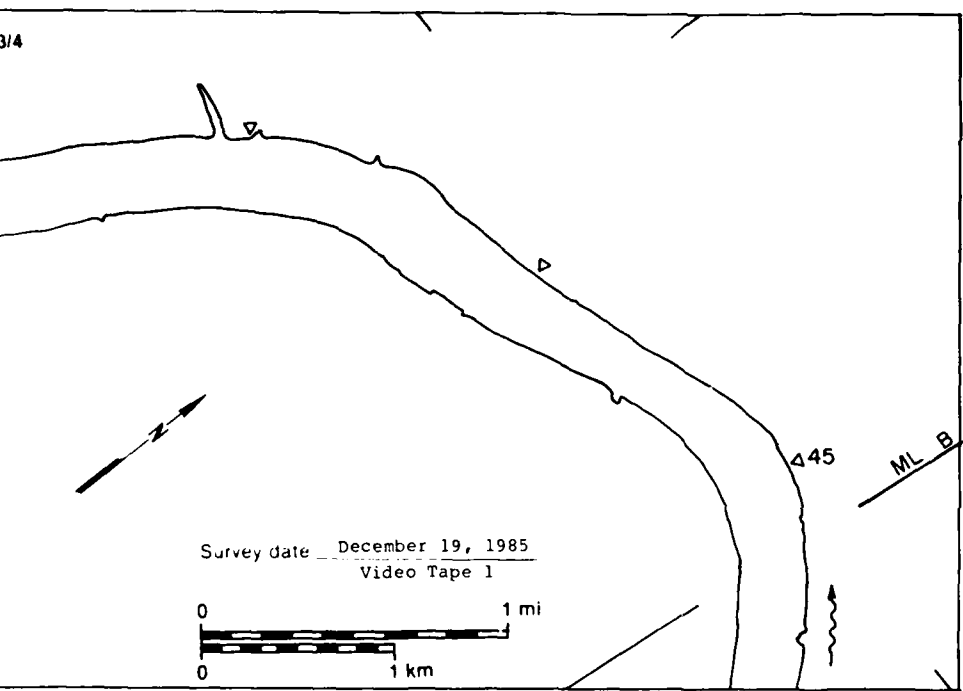
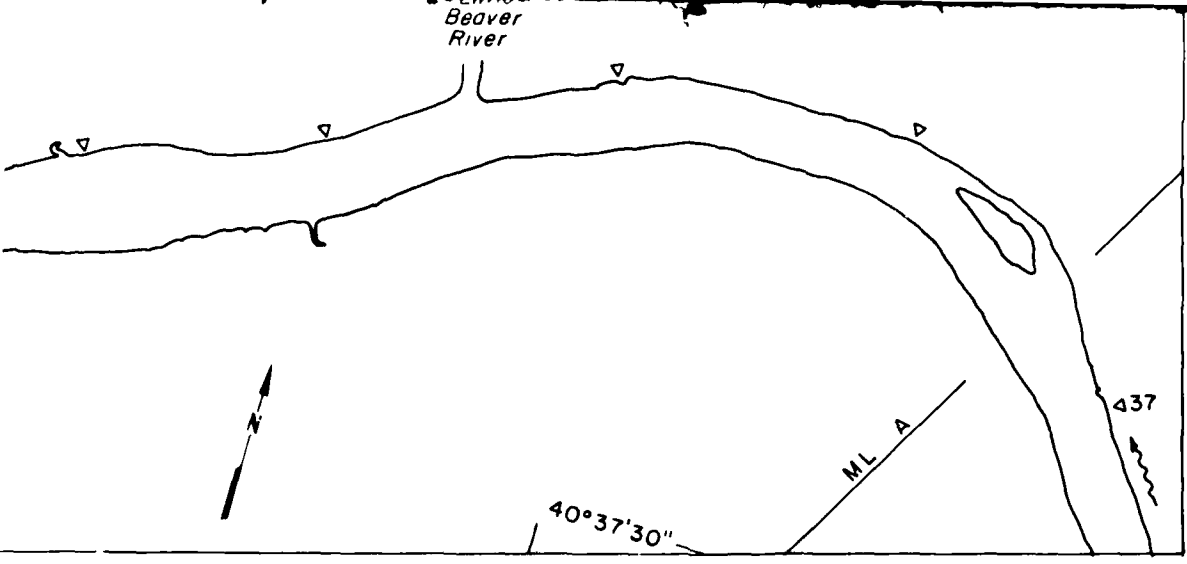
E_H



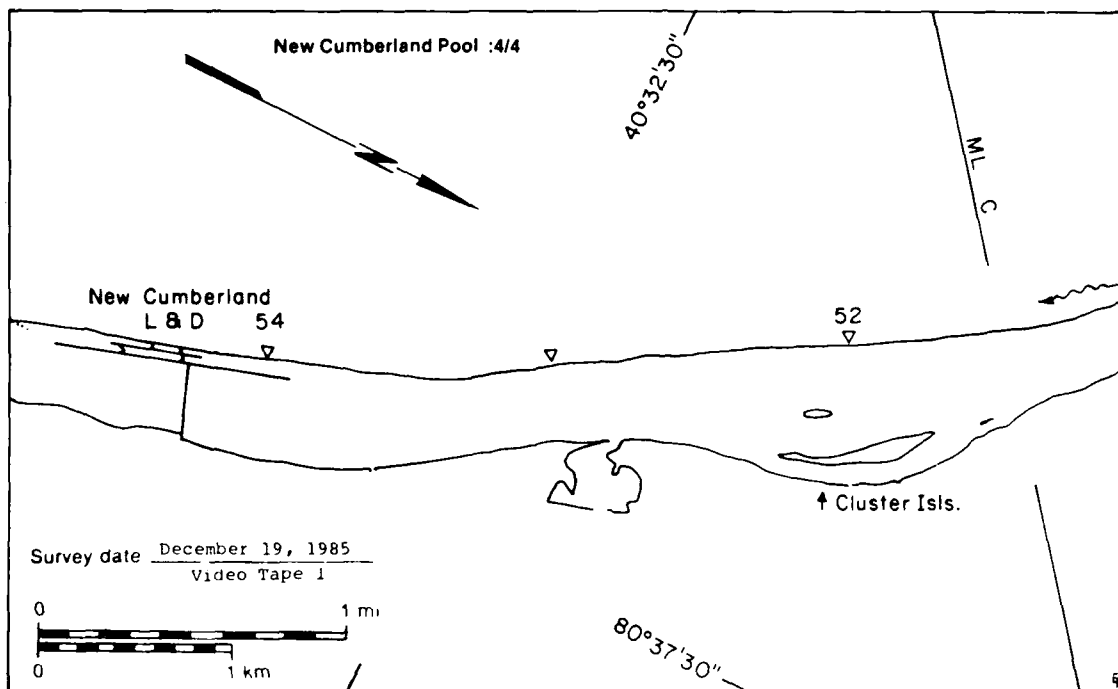
19 December 1985





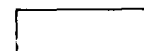


19 December 1985

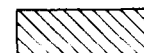


New Cumbe

MAP



Open



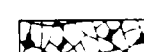
Solid



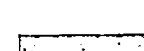
Solid open



Fragn

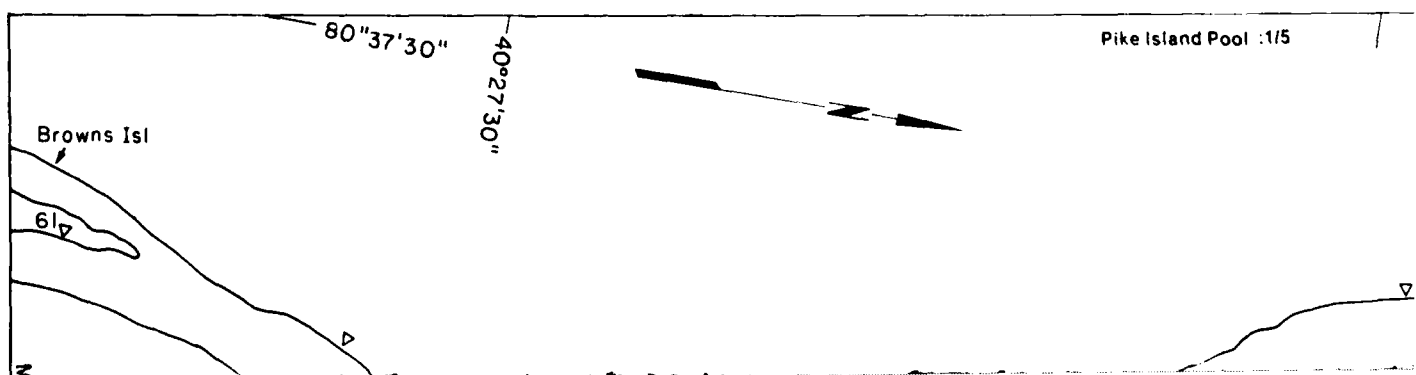


Fragn with



Ice
and

Total

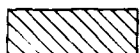


New Cumberland Pool

MAP UNITS



Open water



Solid ice cover



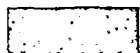
Solid ice cover with open-water areas



Fragmented ice cover



Fragmented ice cover with open-water areas



Ice floes or frazil slush and pans

Area
($m^2 \times 10^6$)

Surface
concentration
(%)

13.16	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
0.00	—

Total area ($m^2 \times 10^6$)

14.87*

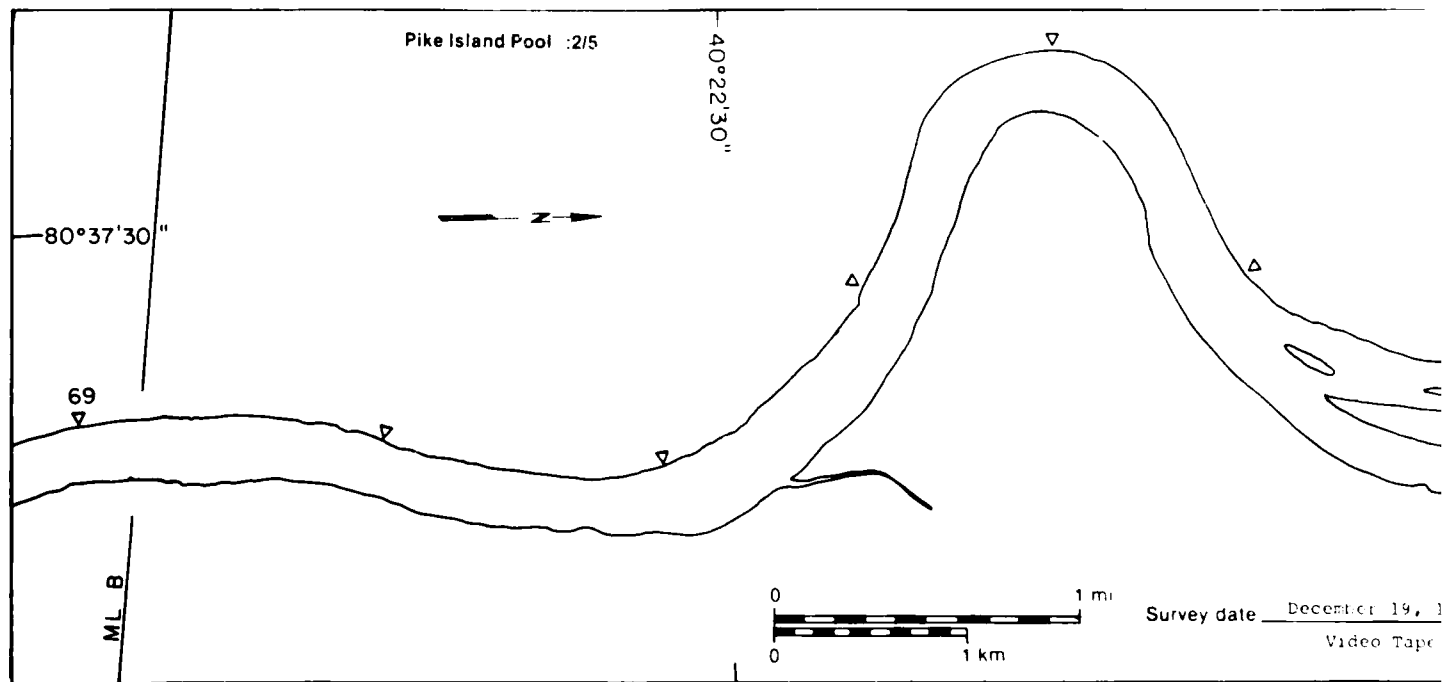
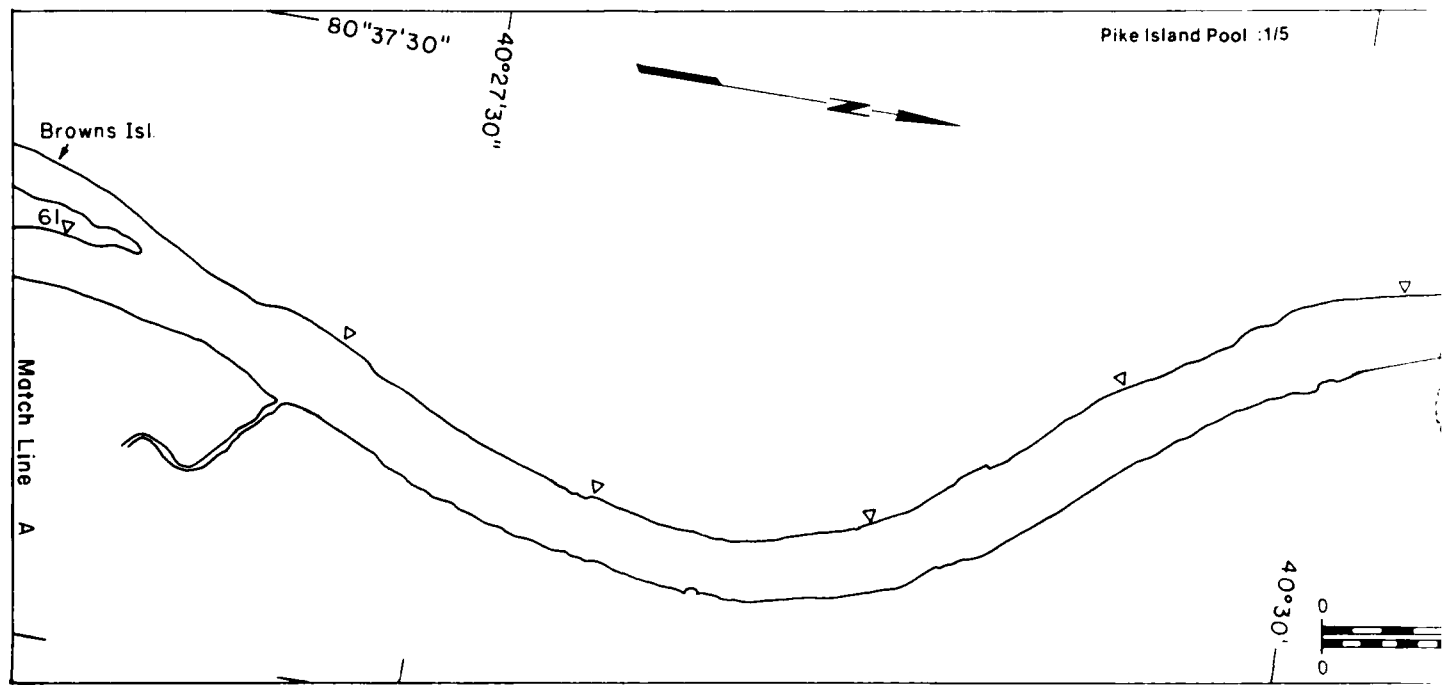
* Includes $1.71 \times 10^6 m^2$
of no video coverage

Island Pool :1/5

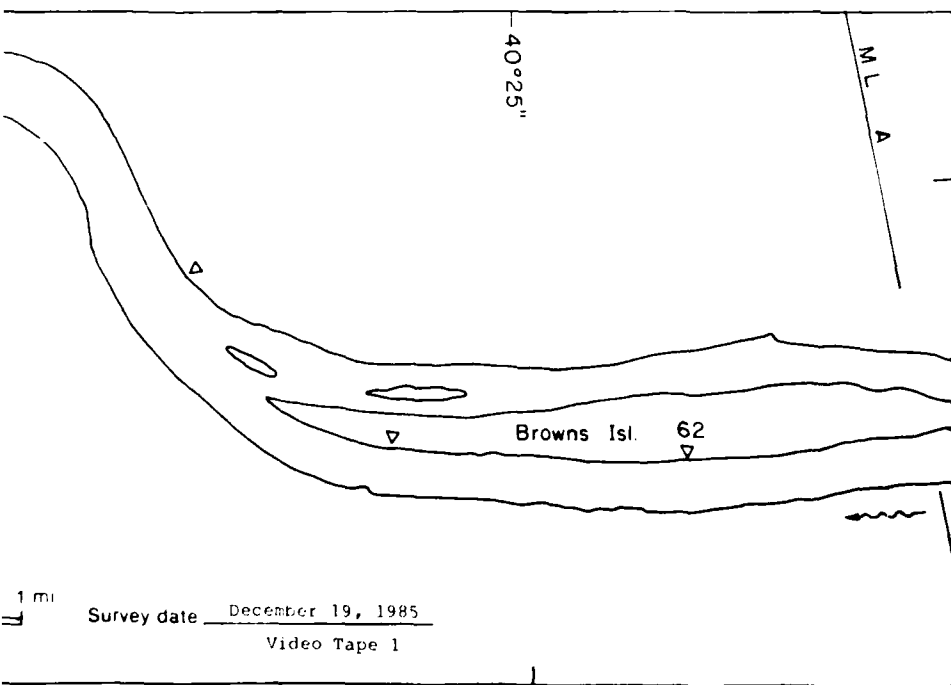
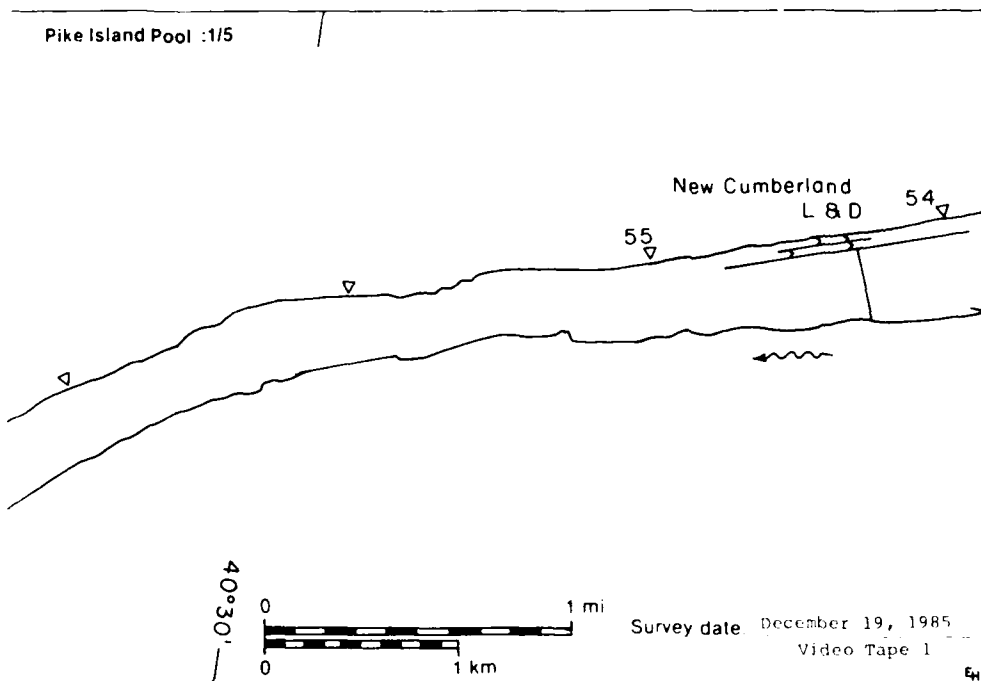
New Cumberland
L & D

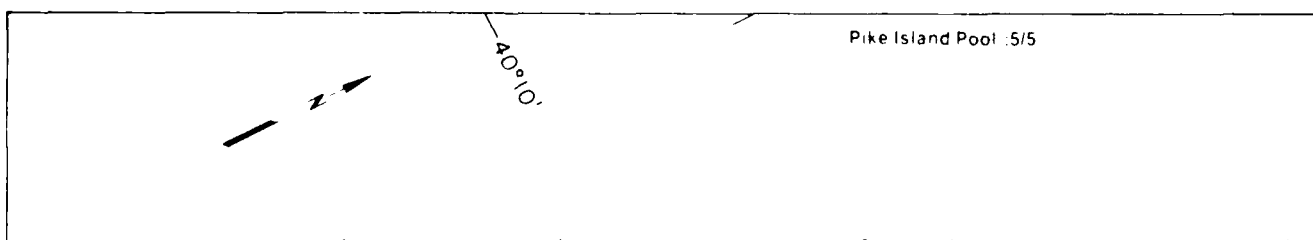
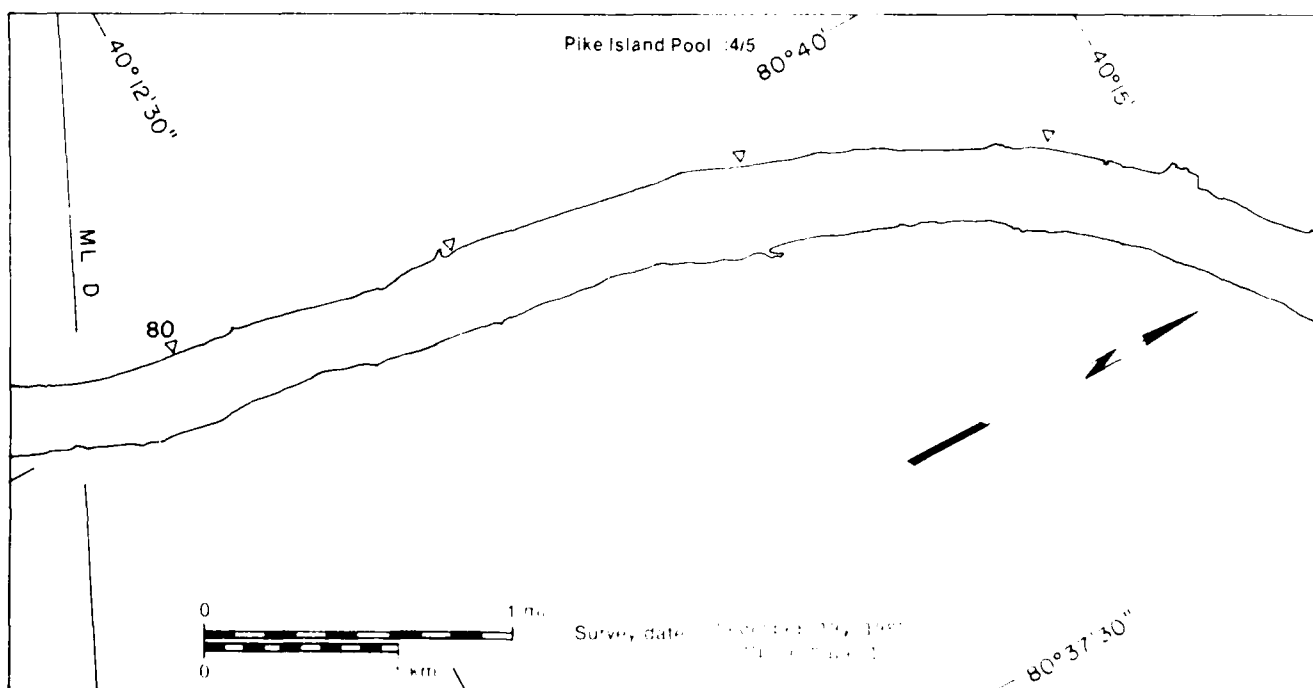
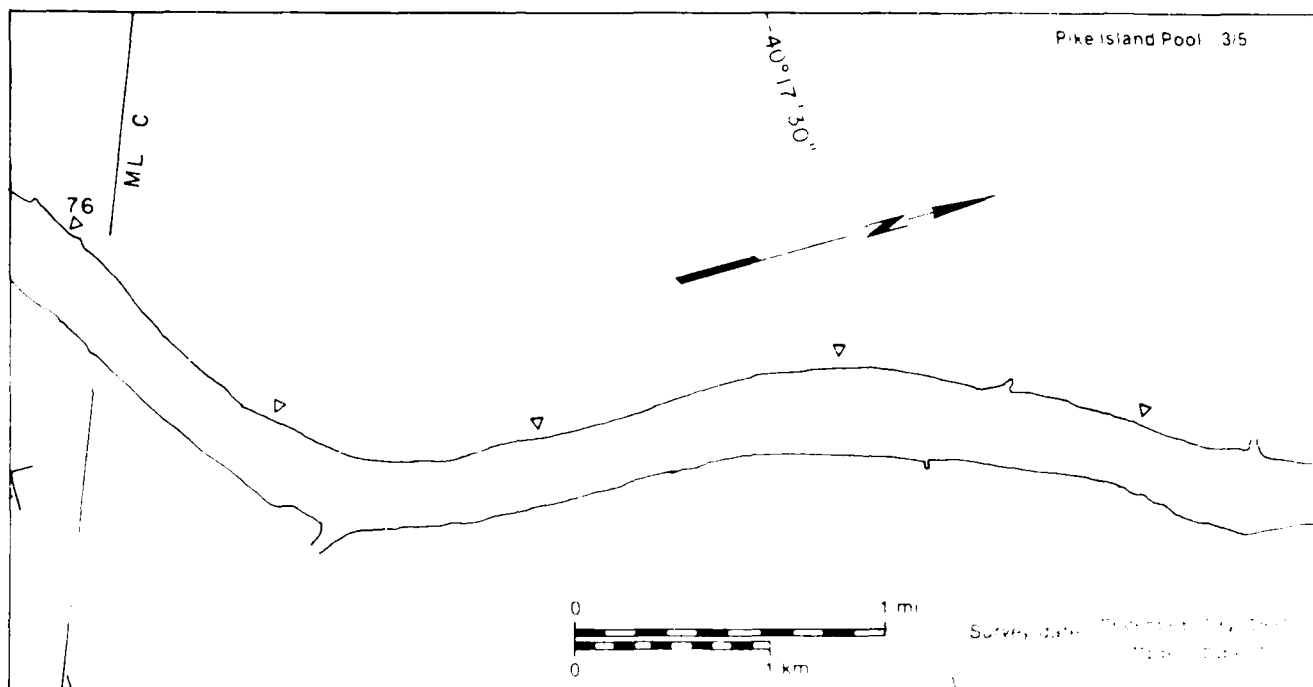
55

54



Pike Island Pool :1/5





December 1985

Pike Island Pool 3/5

80°37'30"

40°20'

69

ML B

Surveyed by: [illegible]
Date: [illegible]

40°5'

ML C

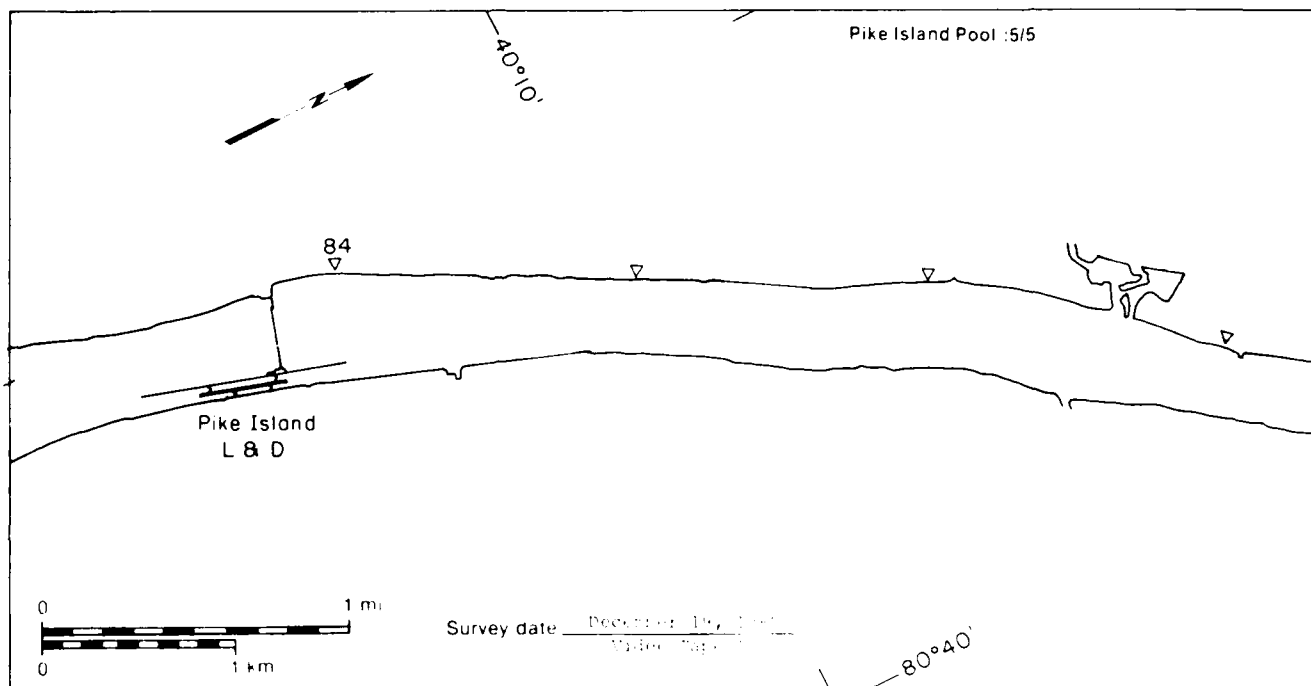
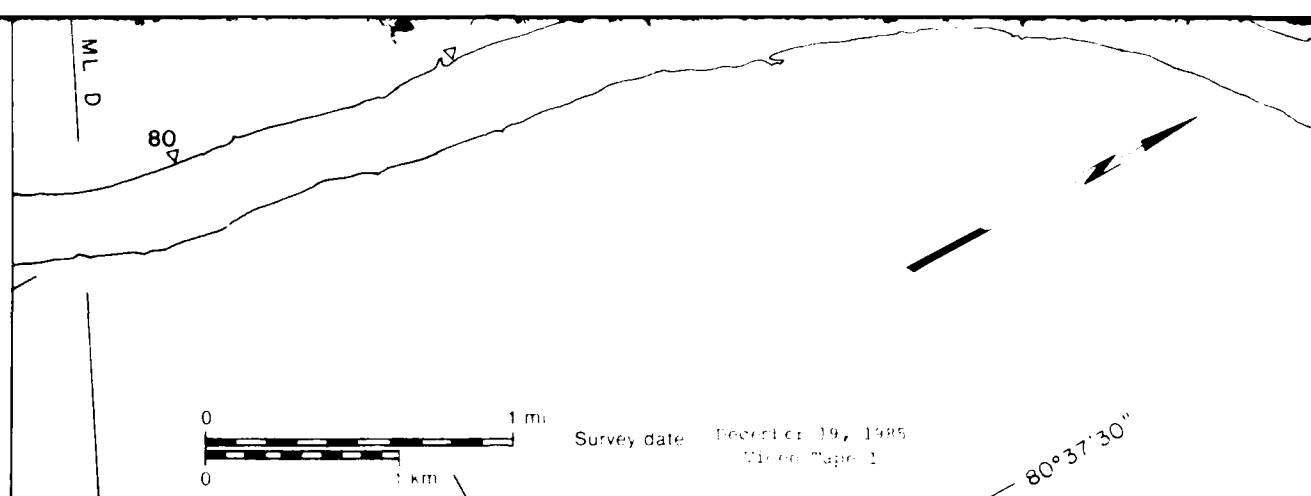
76

80°37'30"

Pool 5/5

40°12'30"

ML D

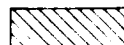


Pike Island Pool

MAP UNITS



Open water



Solid ice cover



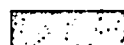
Solid ice cover with open water areas



Fragmented ice cover



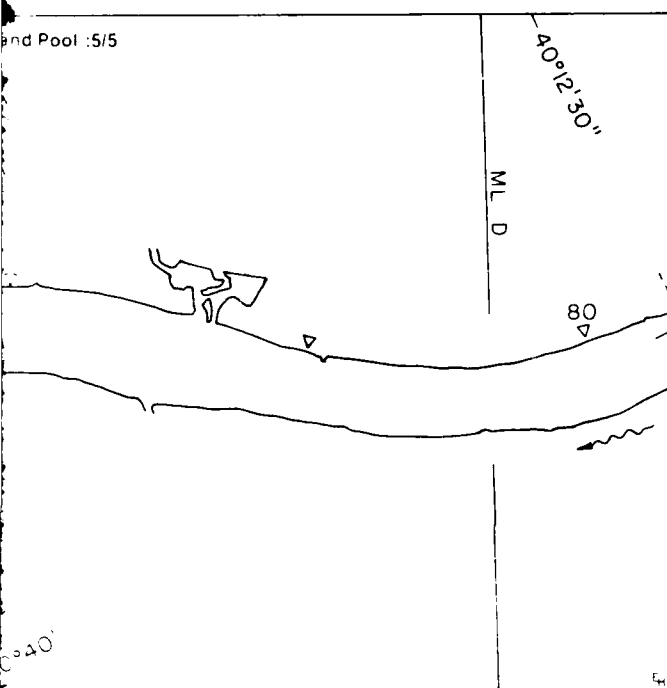
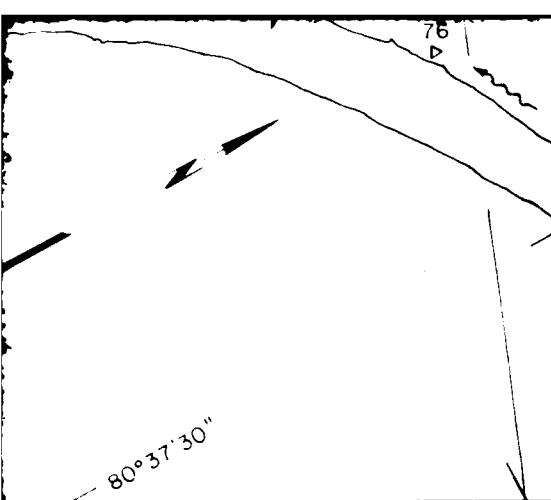
Fragmented ice cover with open water areas



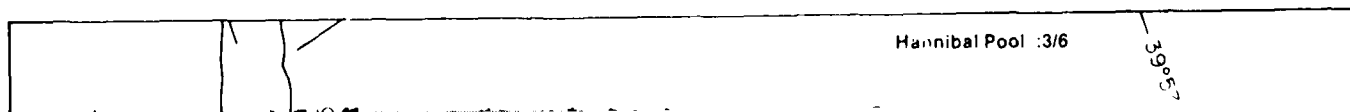
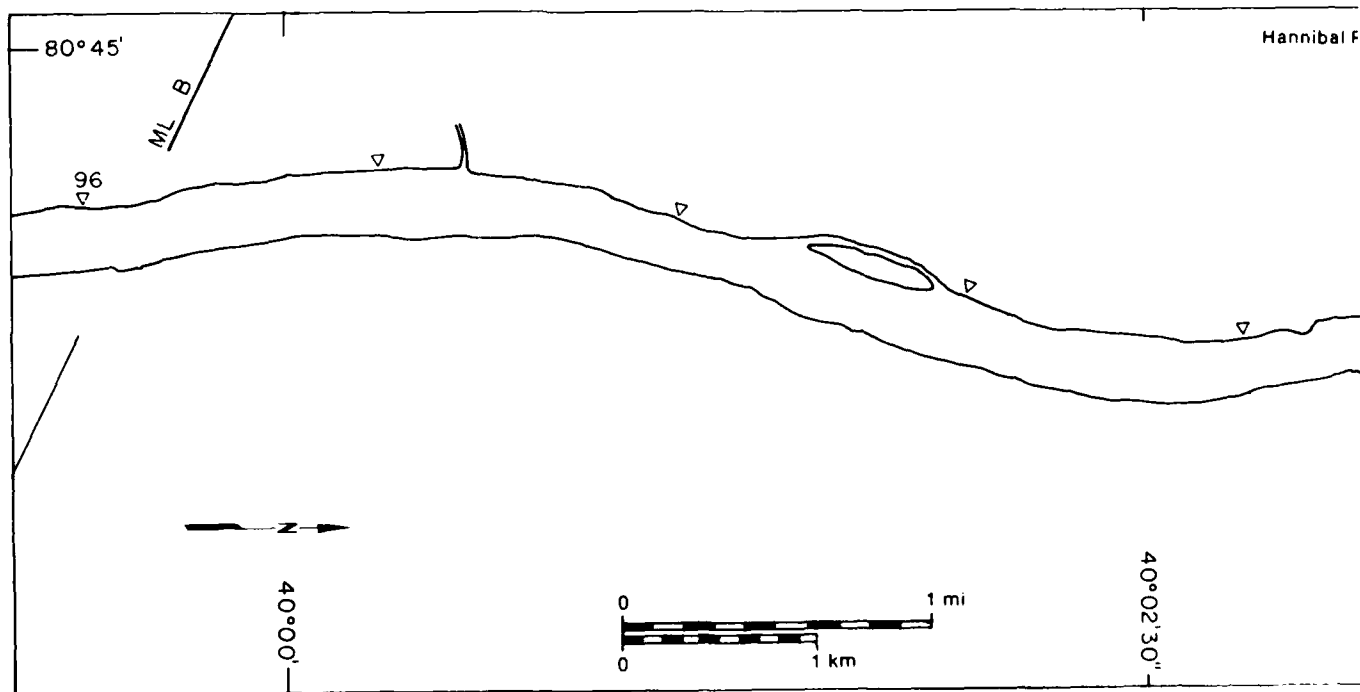
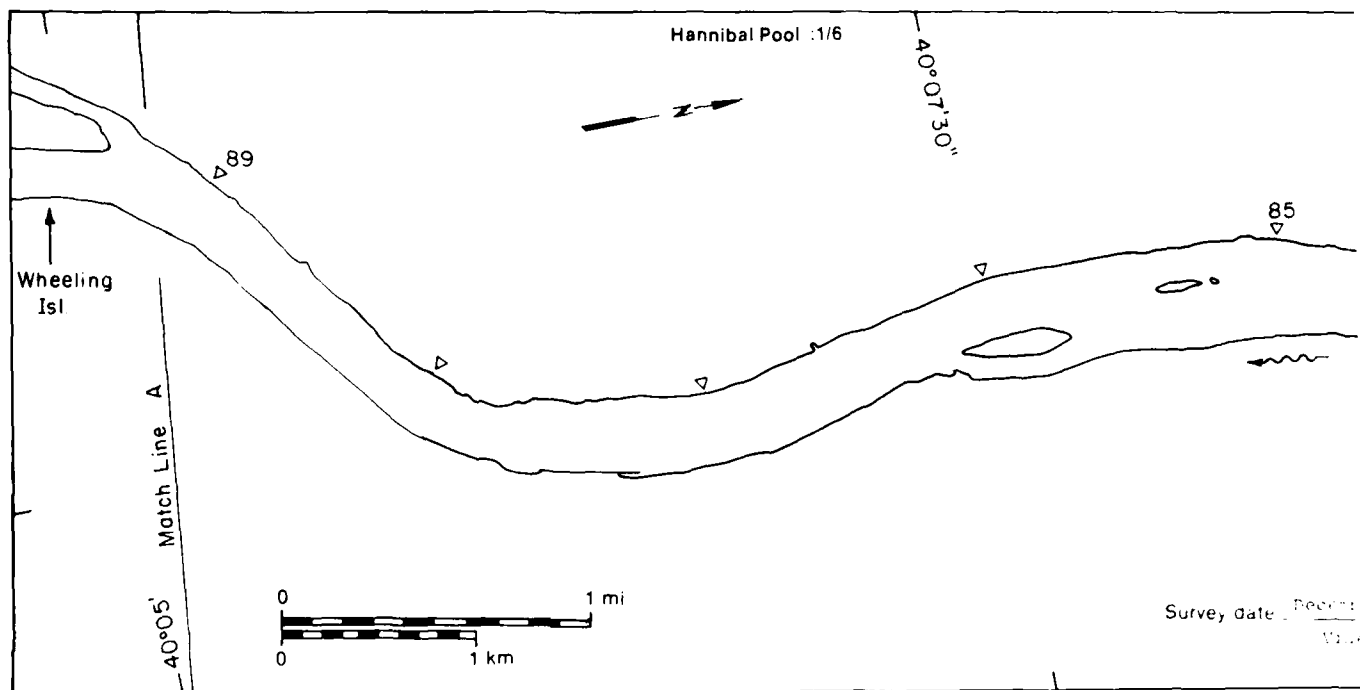
Ice floes or frazil slush and pans

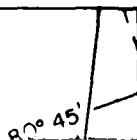
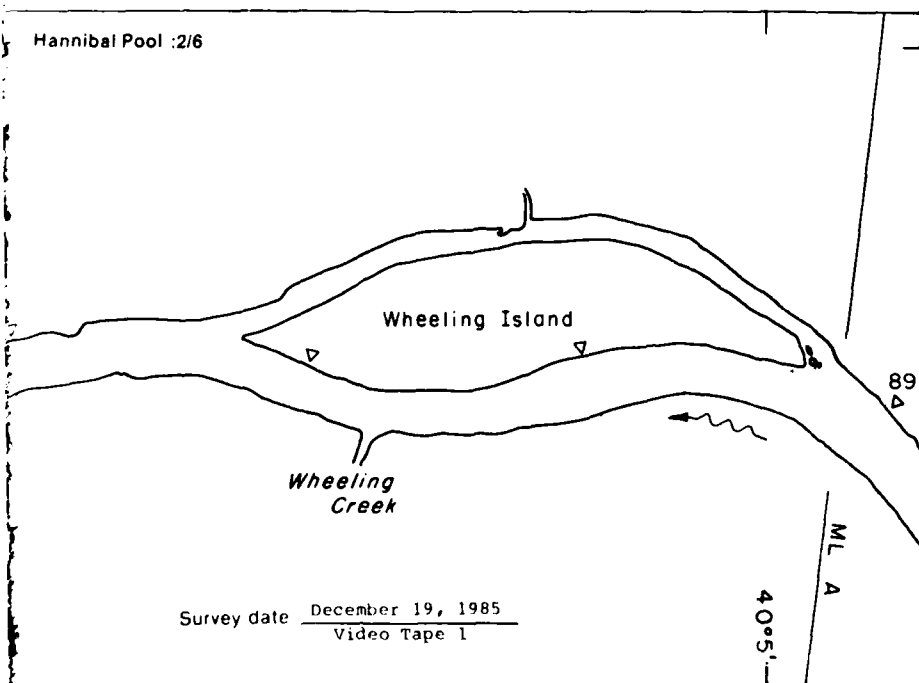
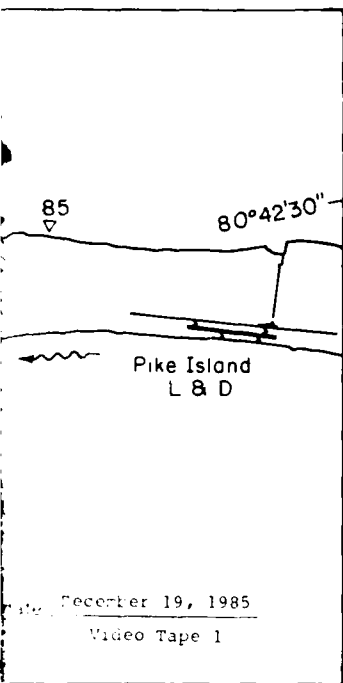
Total area ($m^2 \times 10^6$)

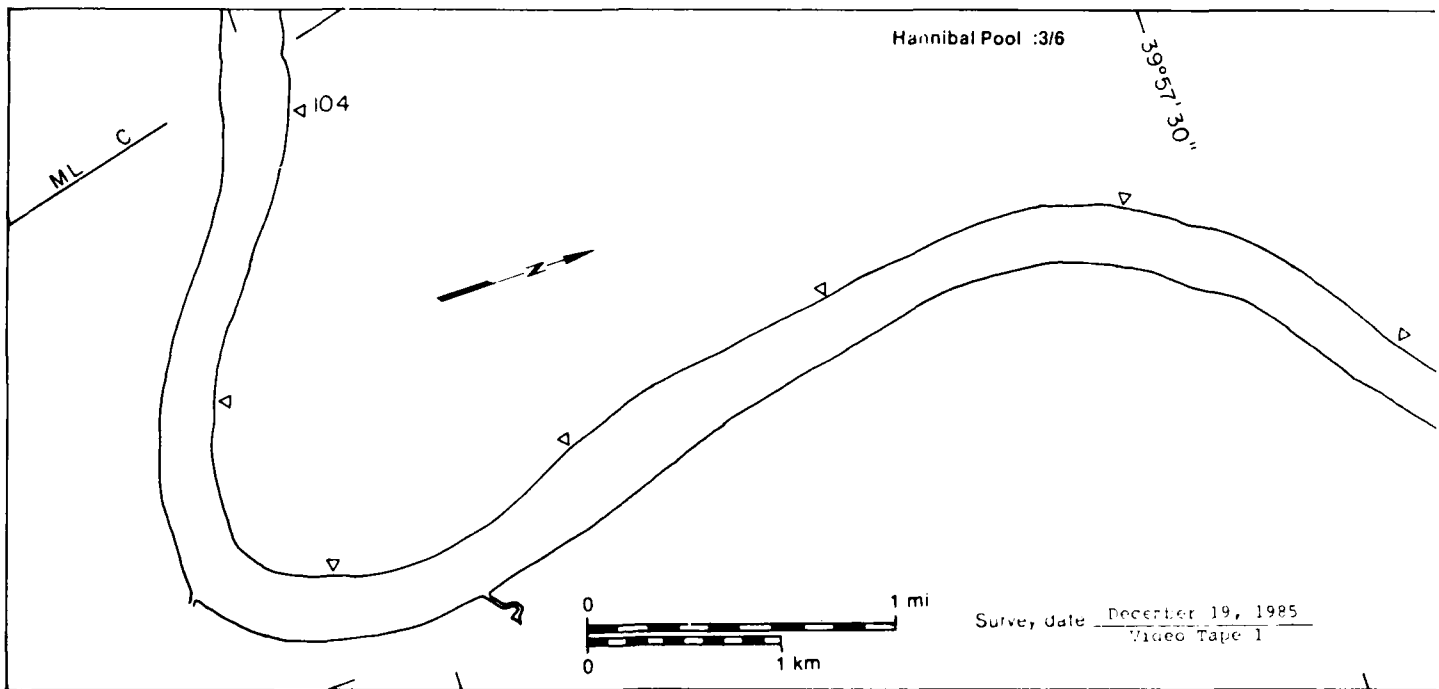
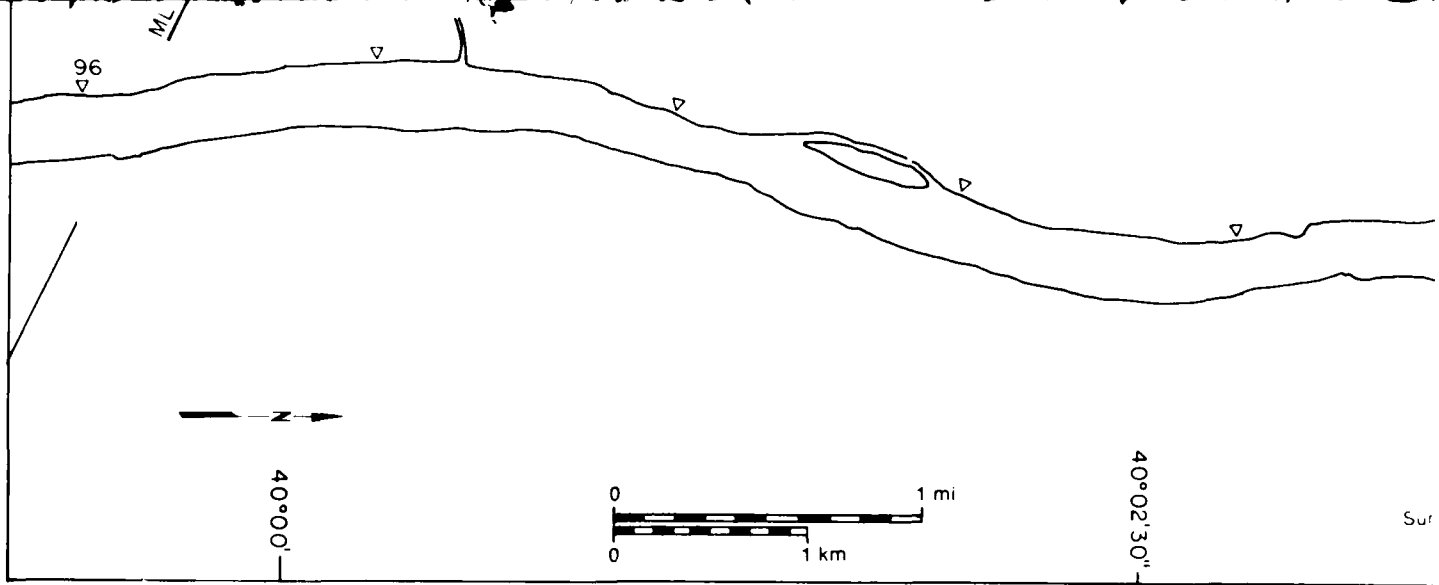
Area ($m^2 \times 10^6$)	Surface concentration (%)
18.92	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
0.00	—
18.92	

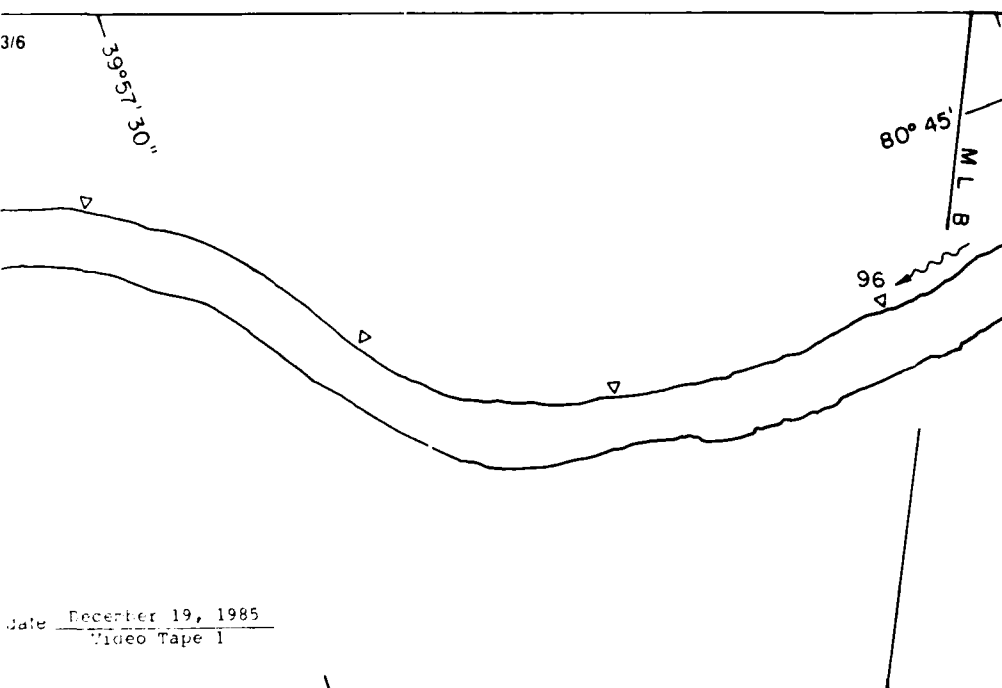
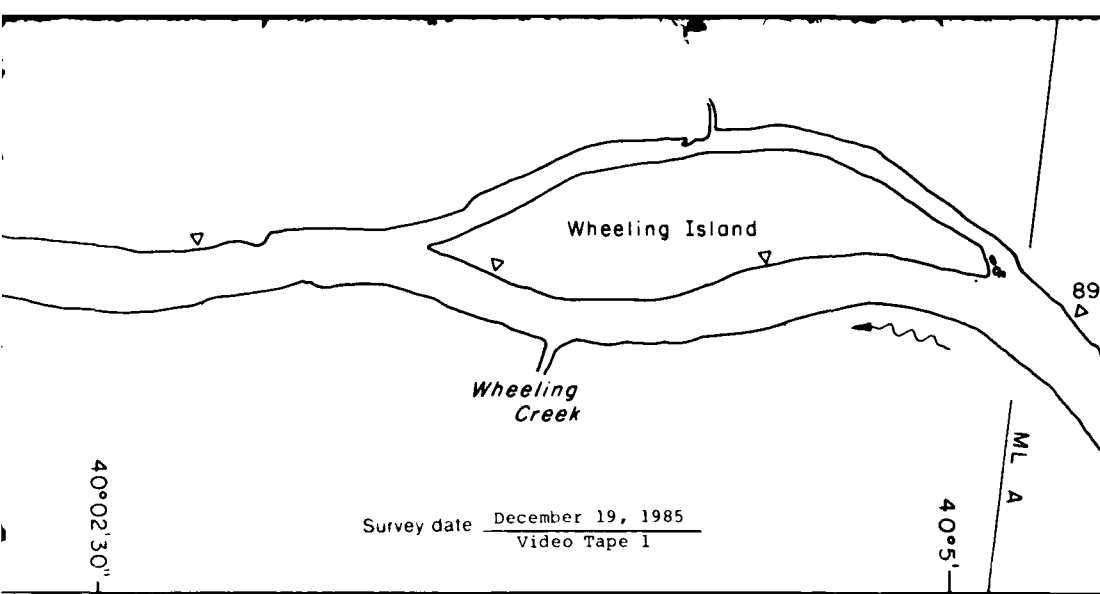


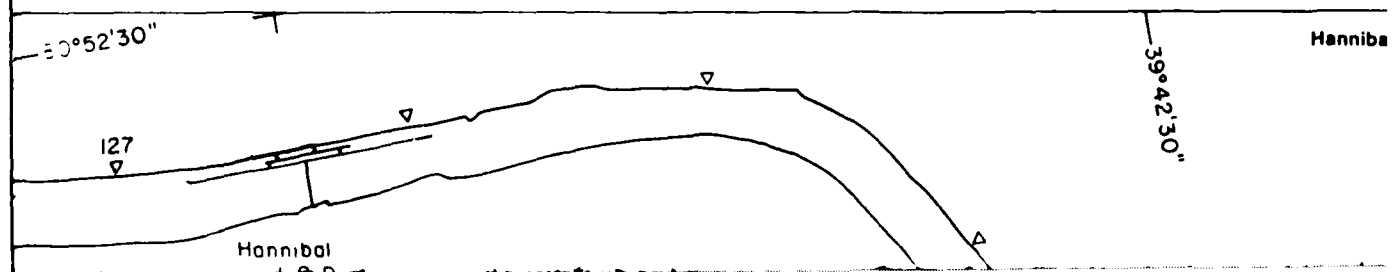
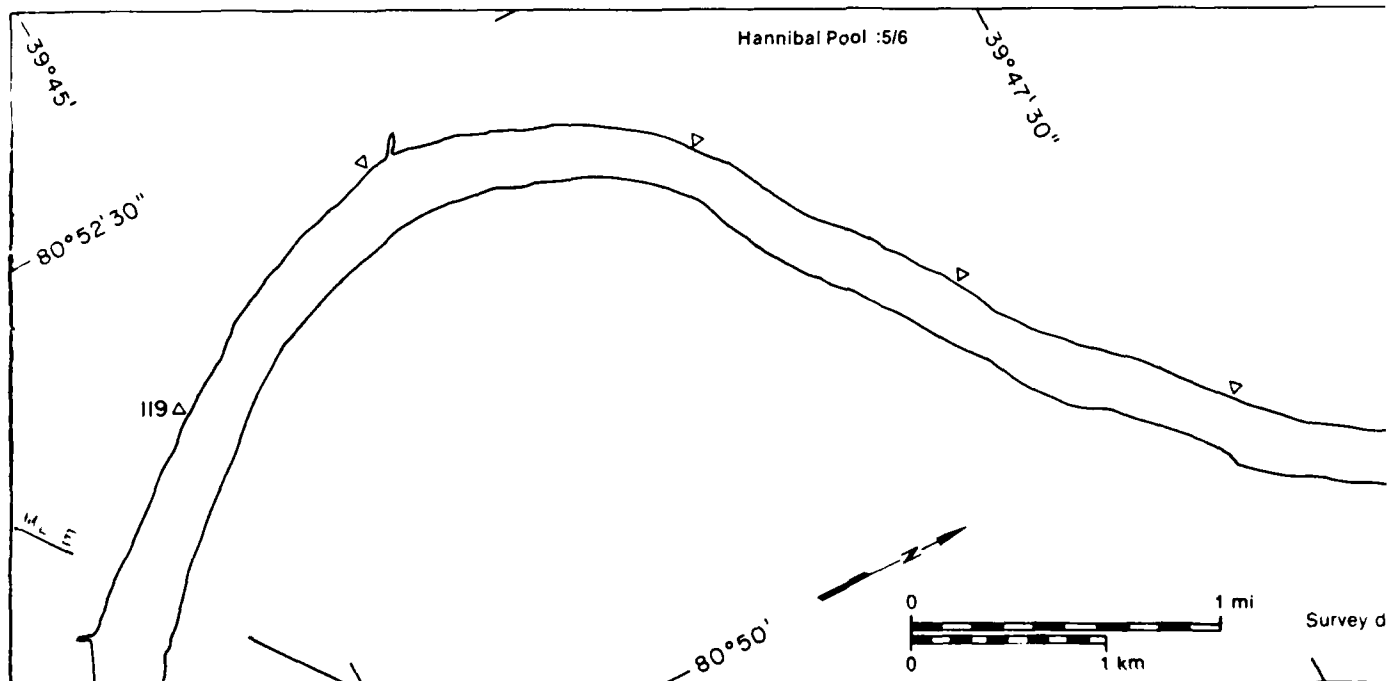
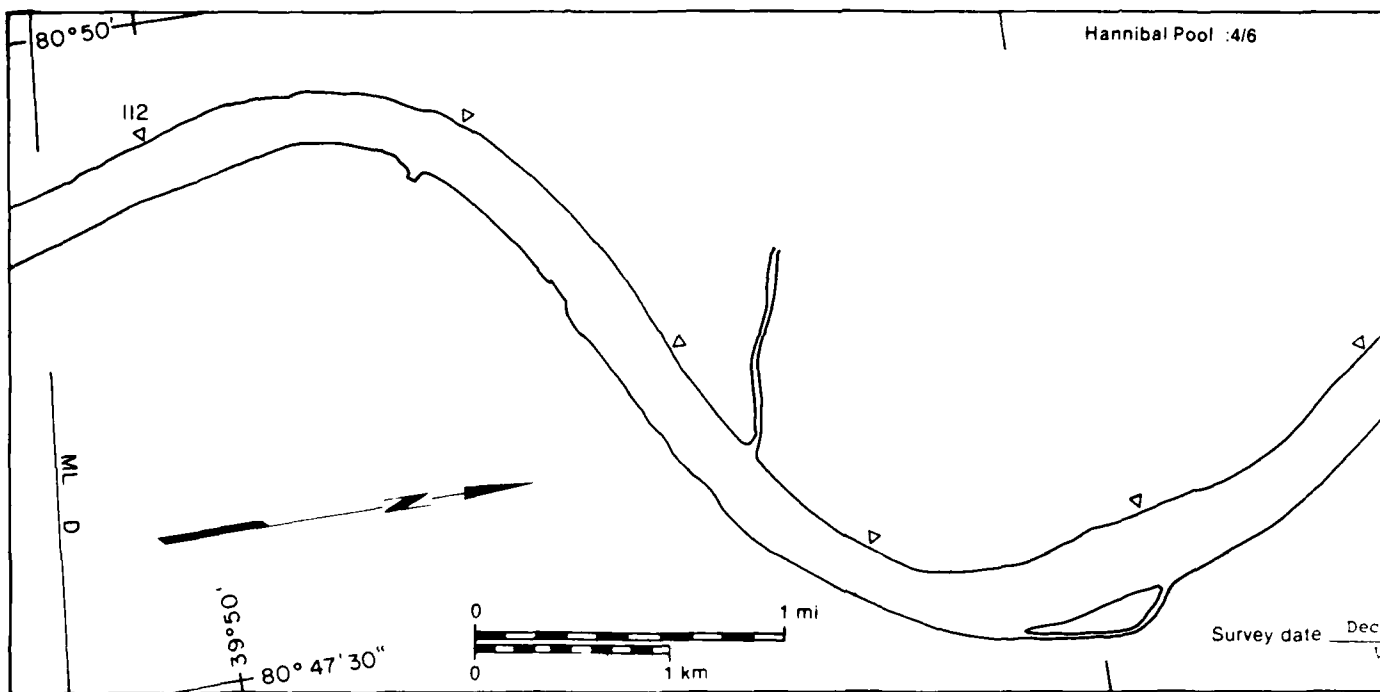
19 December 1985



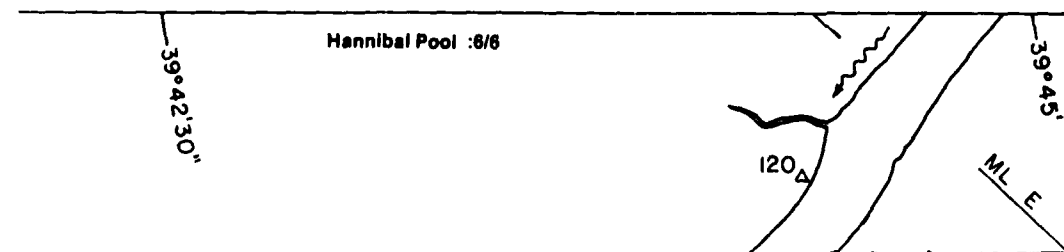
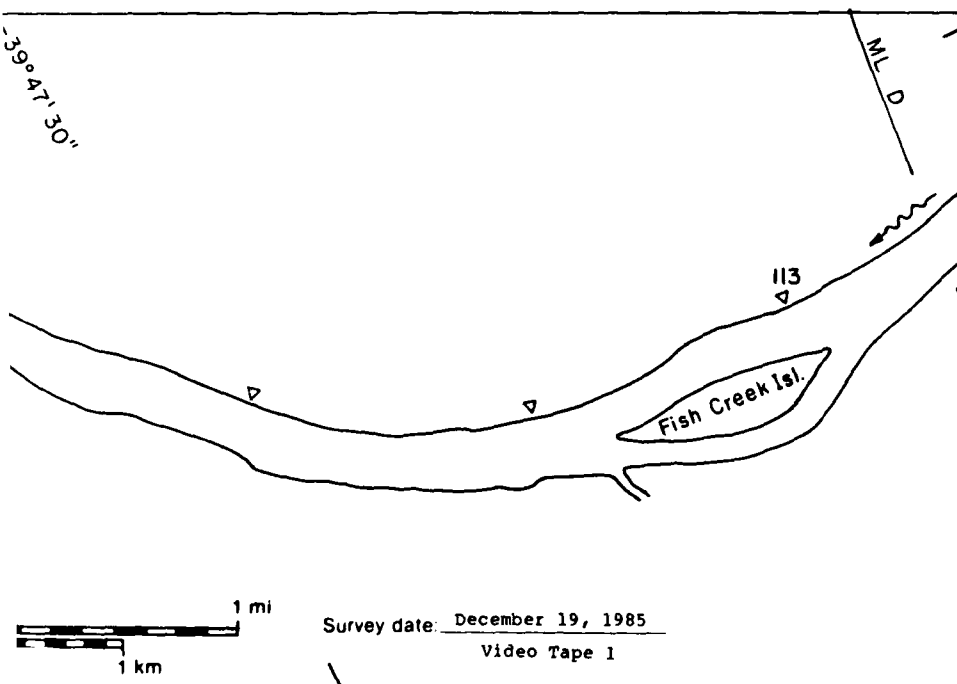
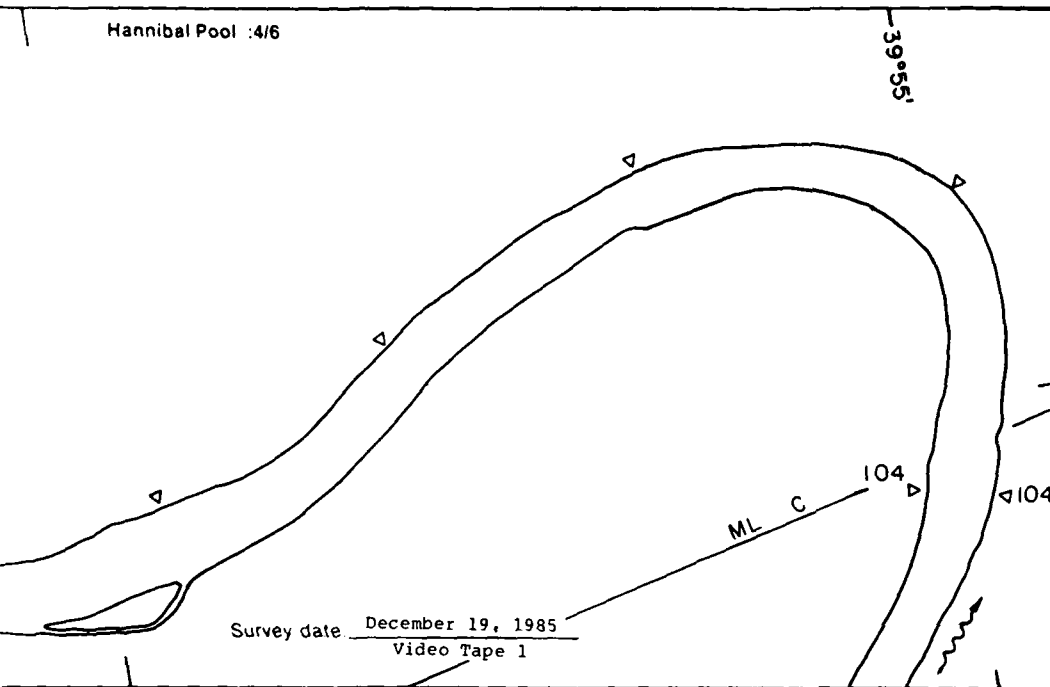


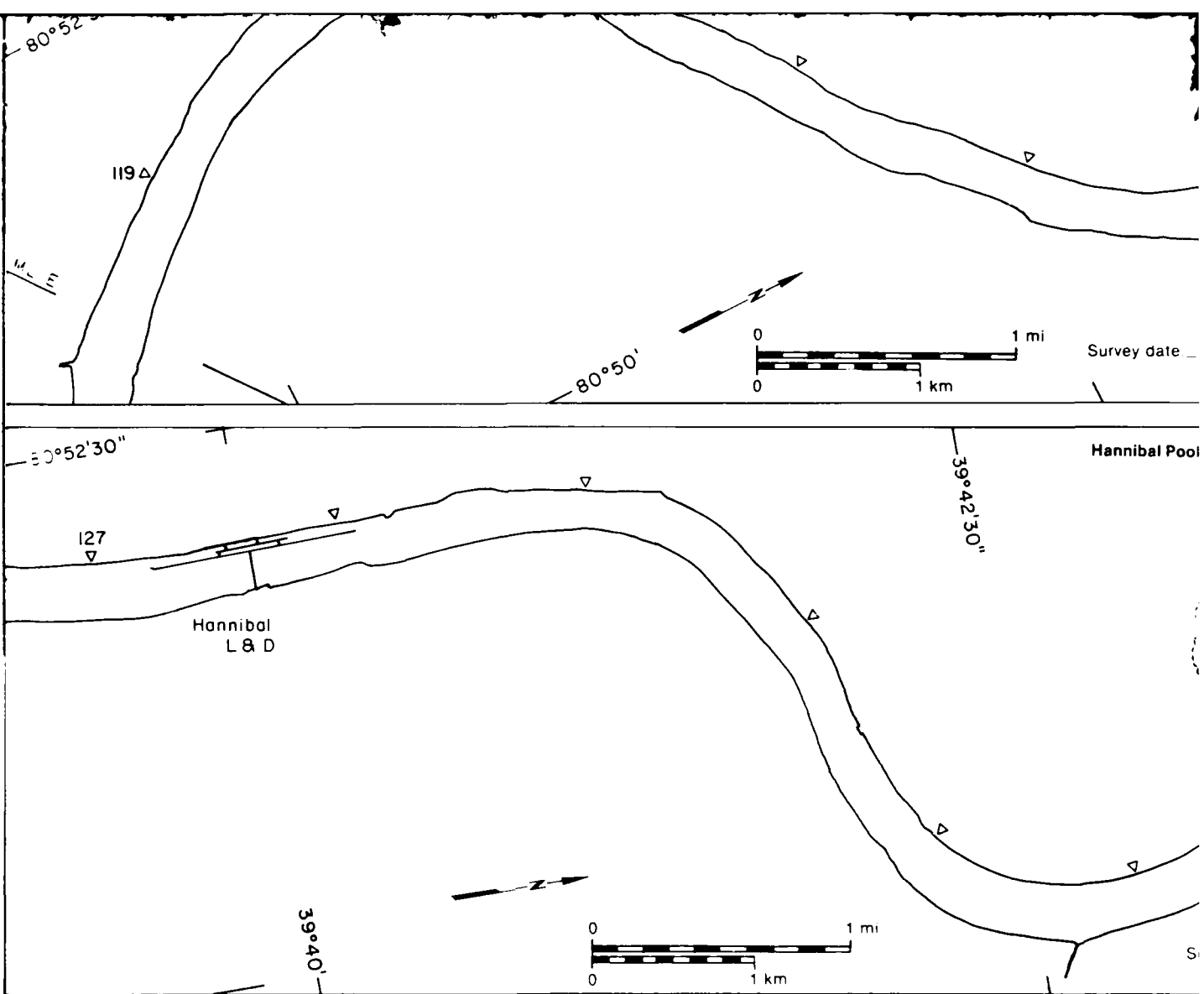





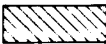

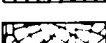
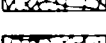



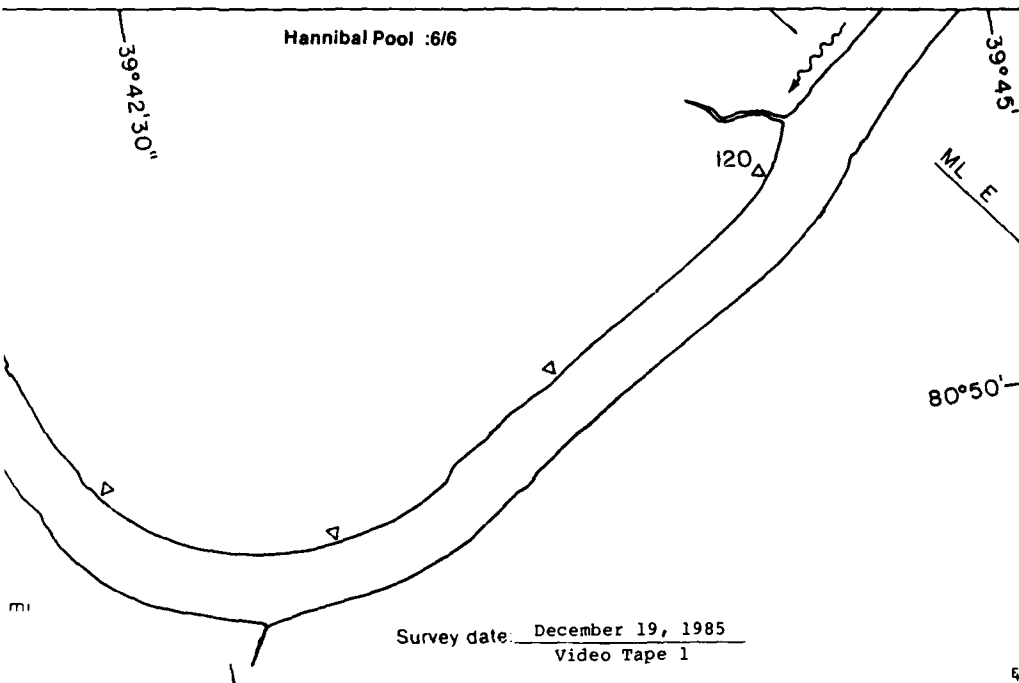
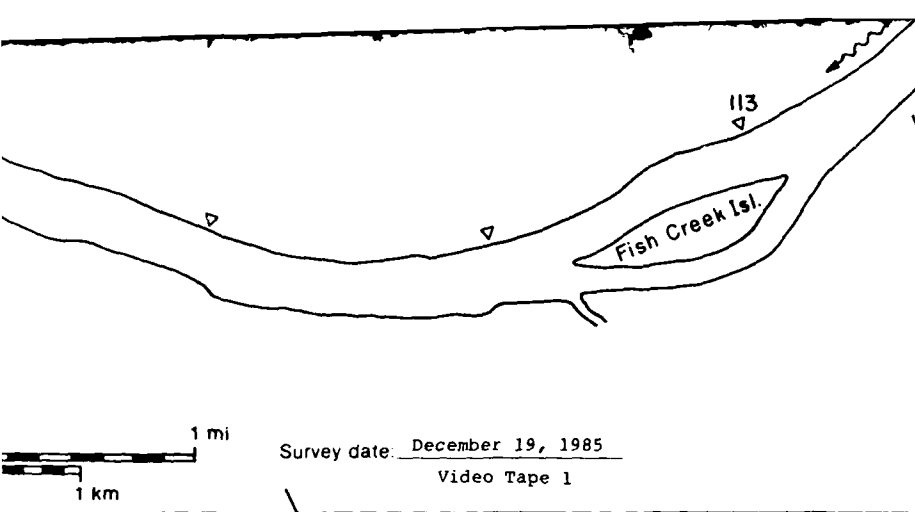
19 December 1985



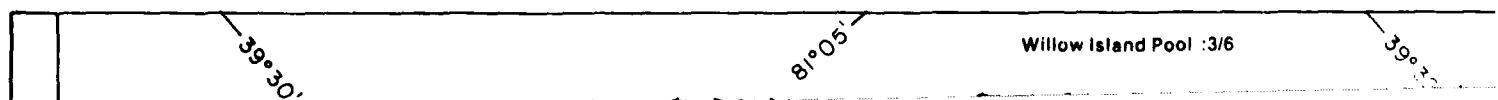
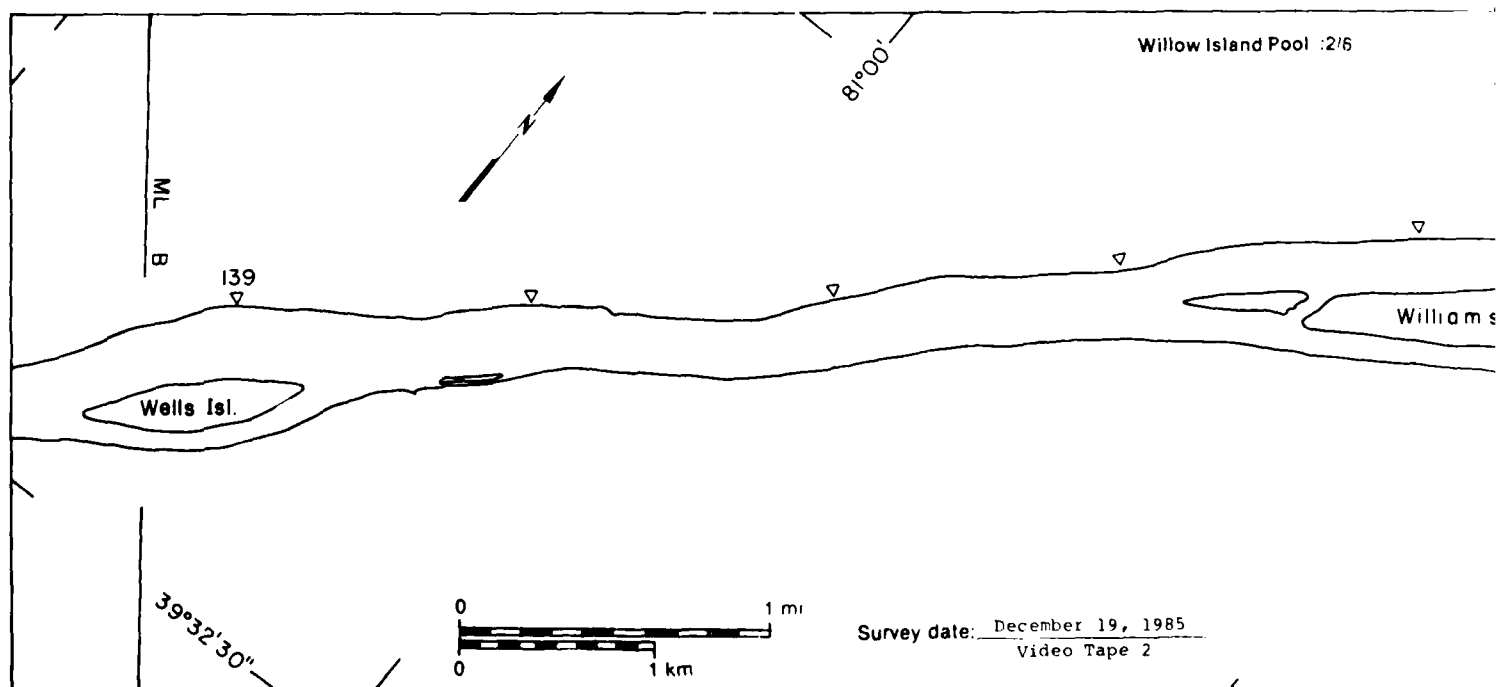
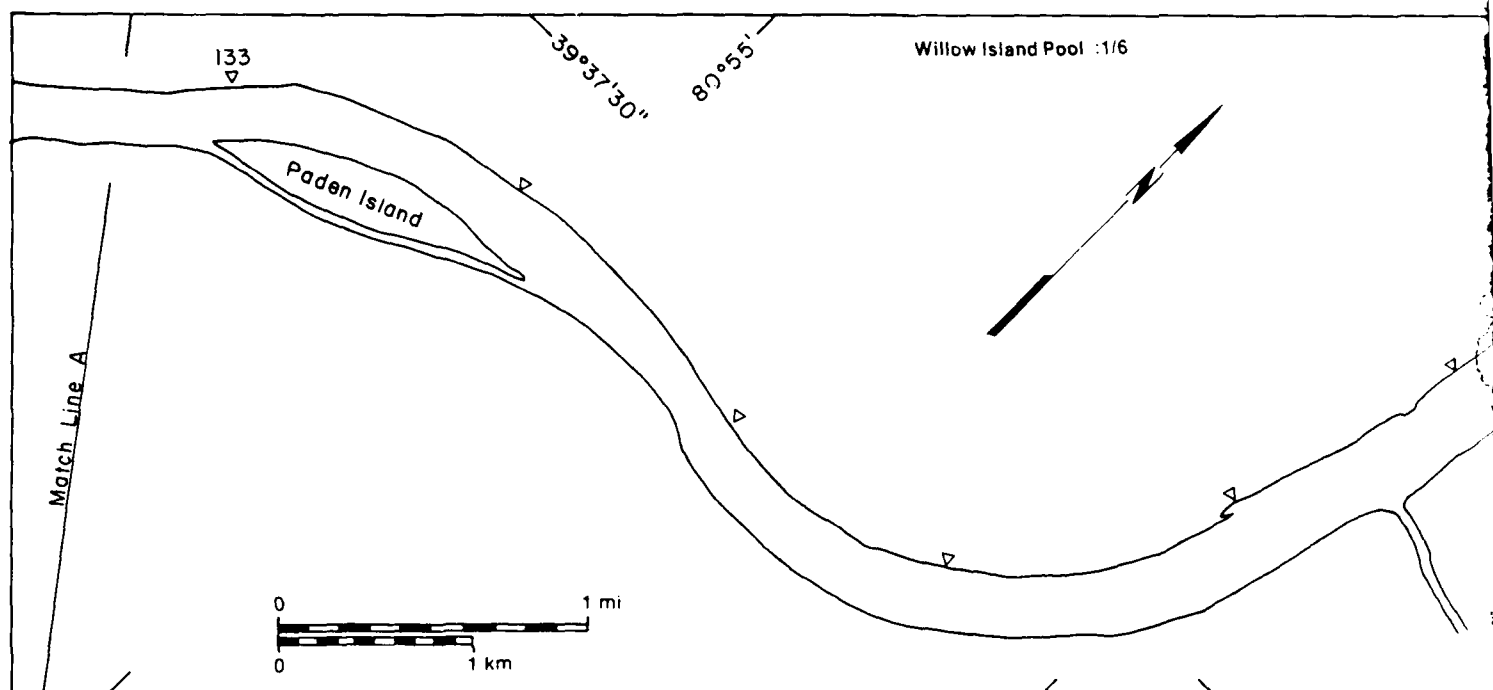


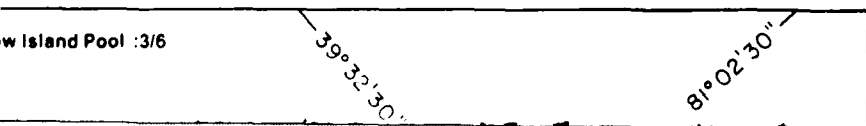
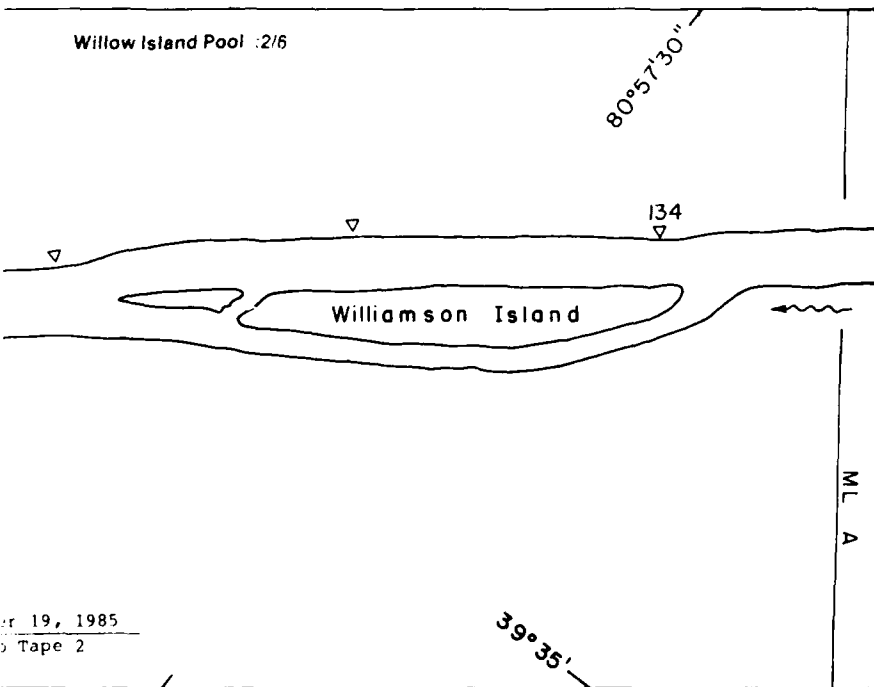
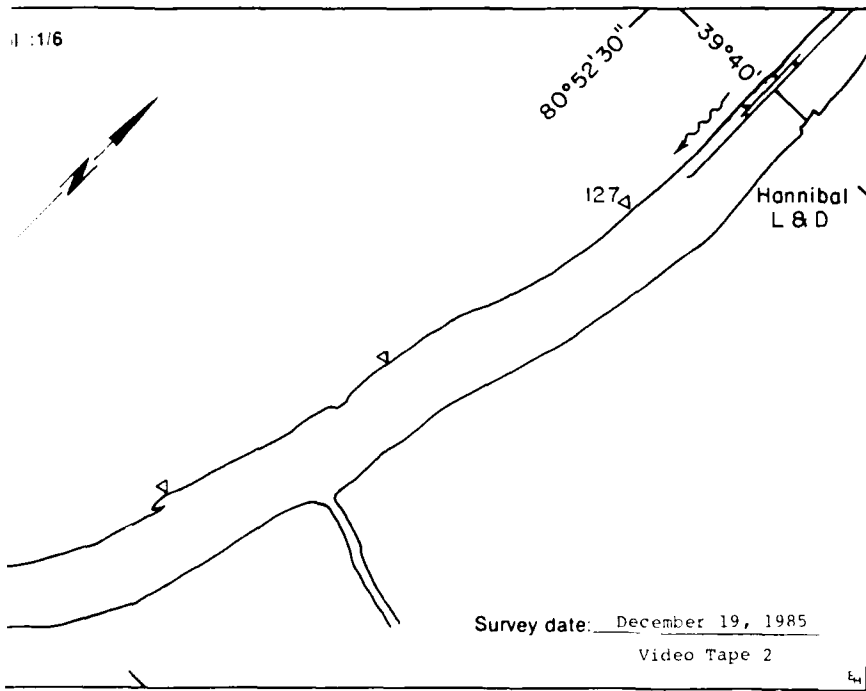
Hannibal Pool

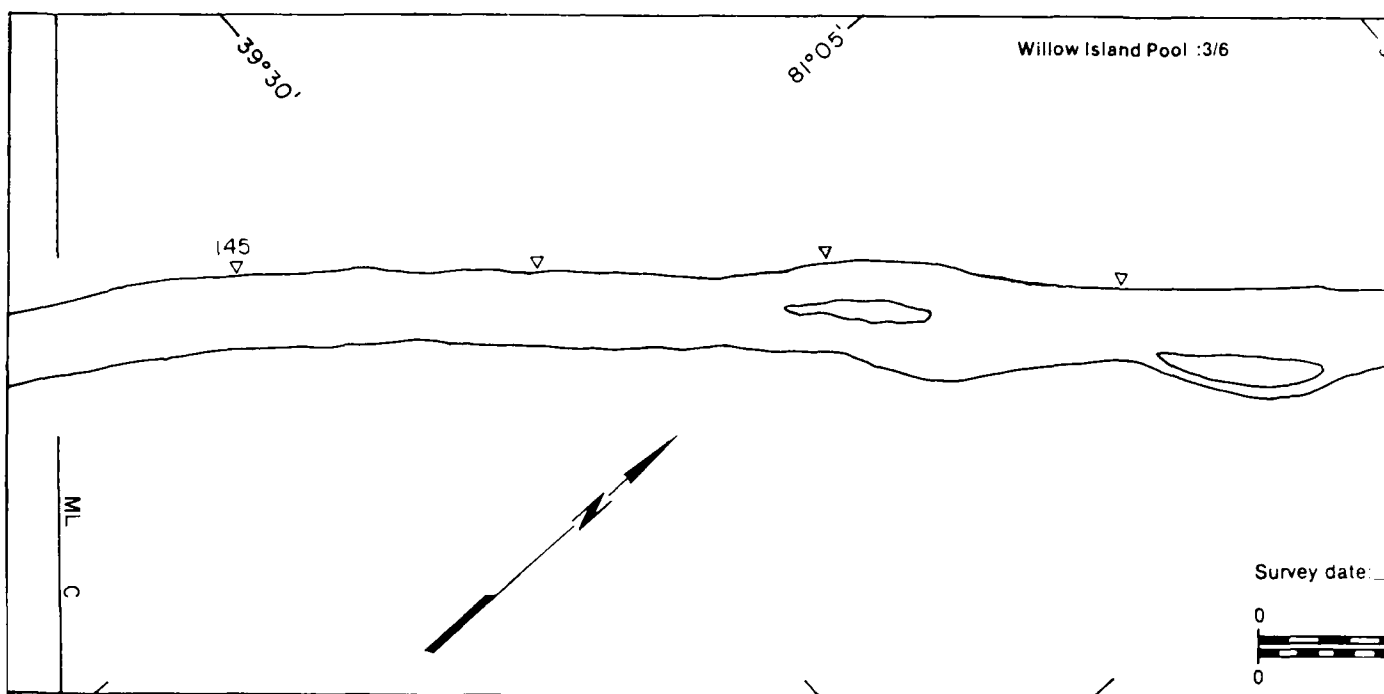
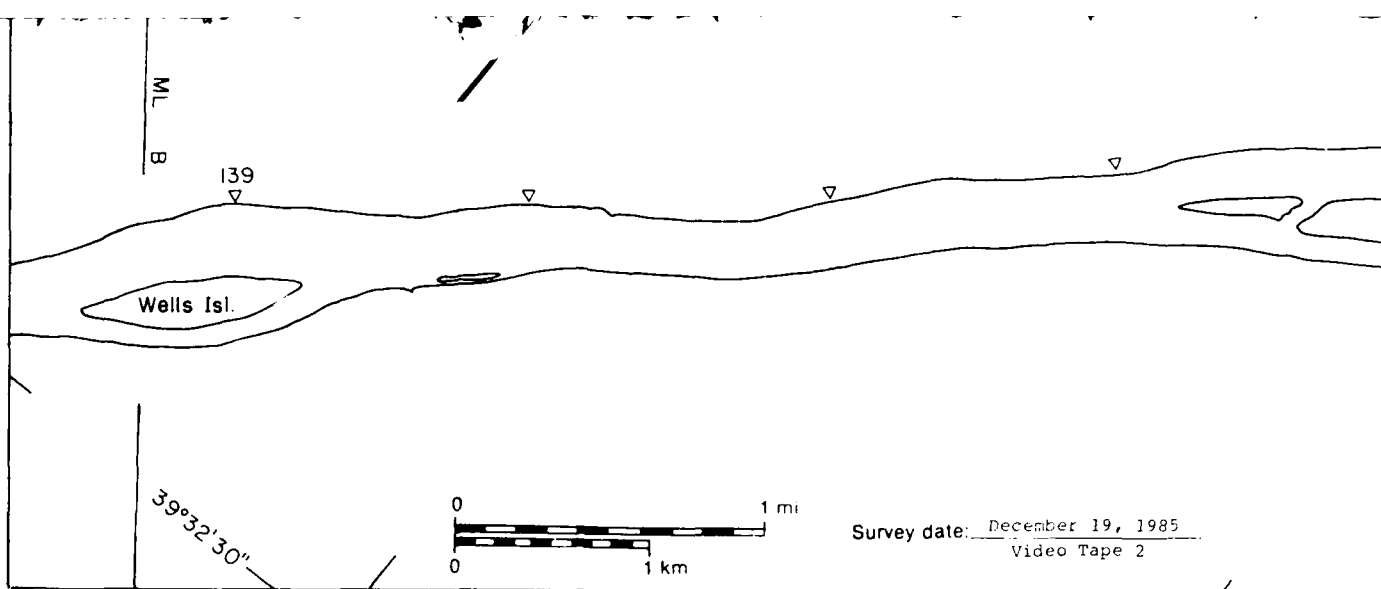
MAP UNITS	Area (m ² x 10 ⁶)	Surface concentration
	22.46	NA
	0.00	NA
	0.00	—
	0.00	NA
	0.00	—
	0.00	—
Total area (m² x 10⁶)	22.46	

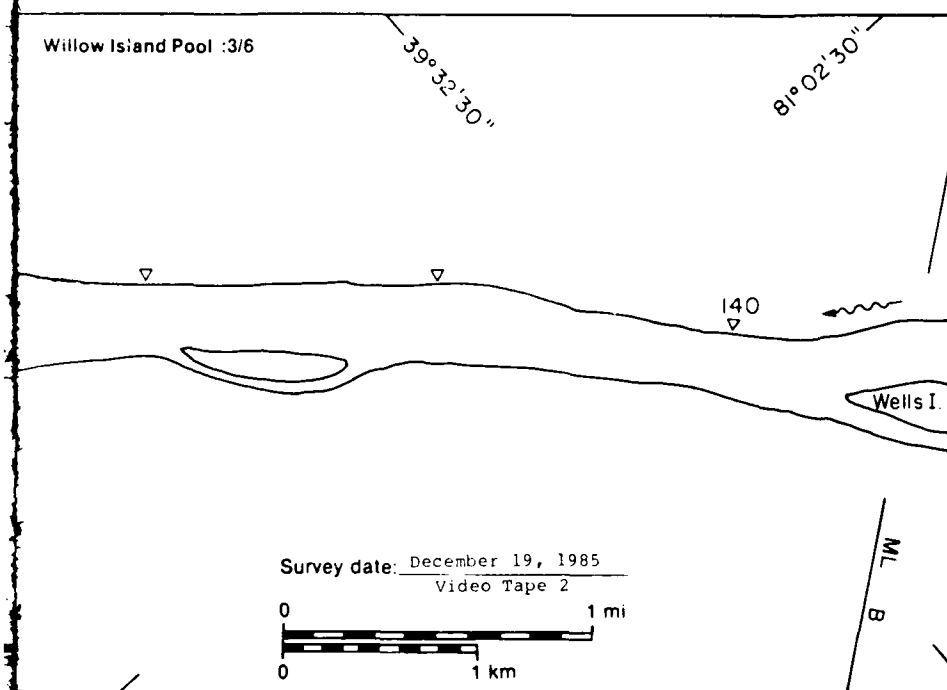
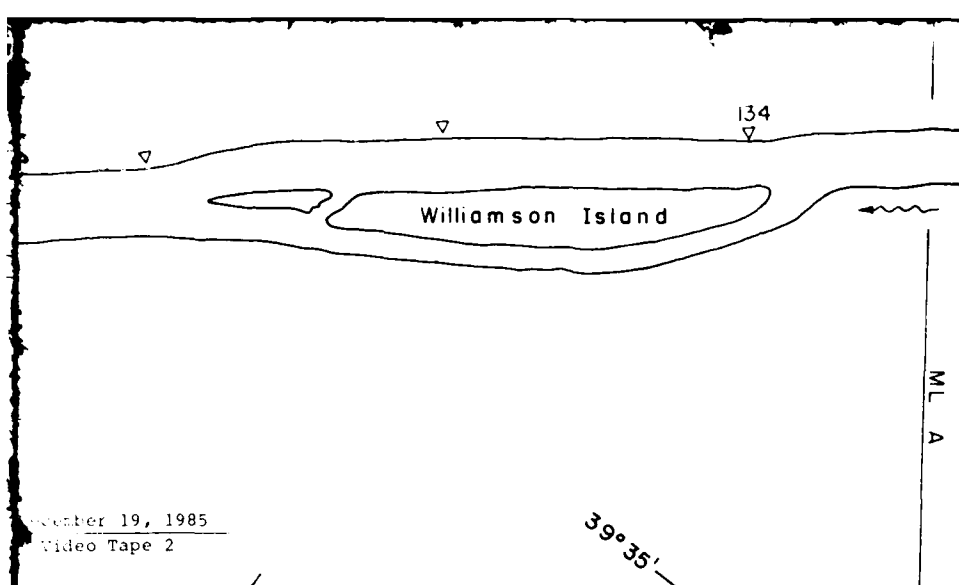


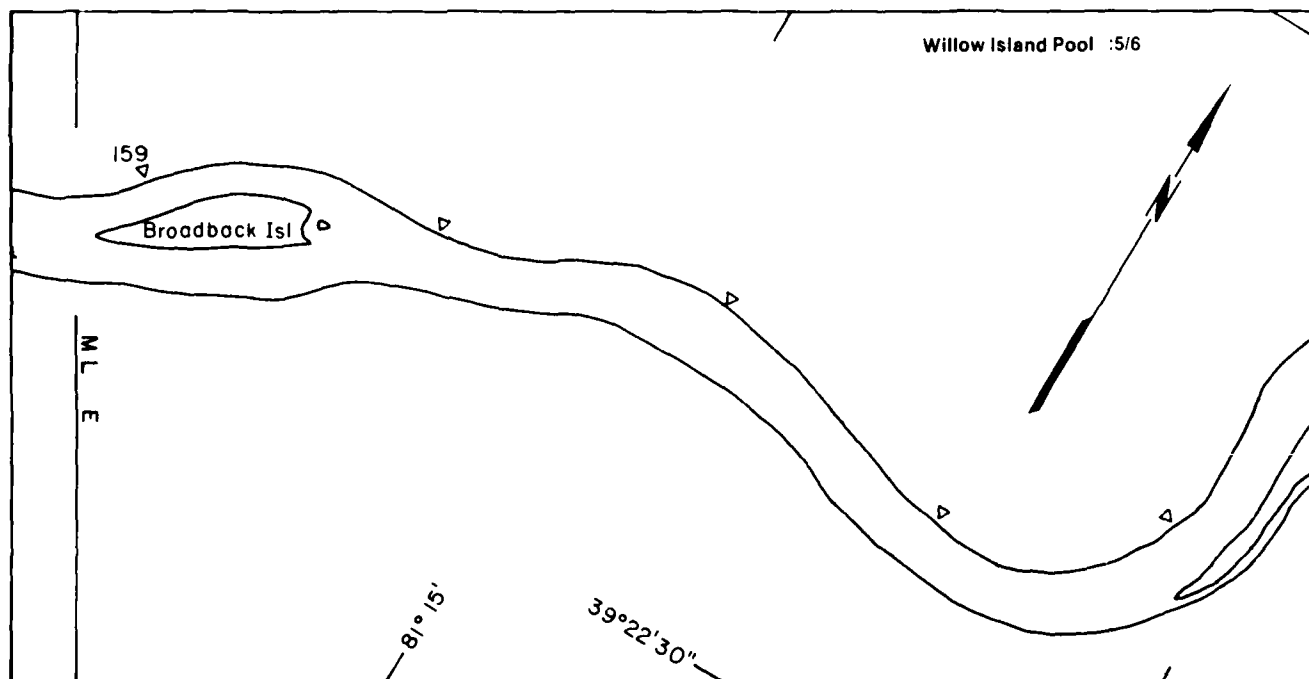
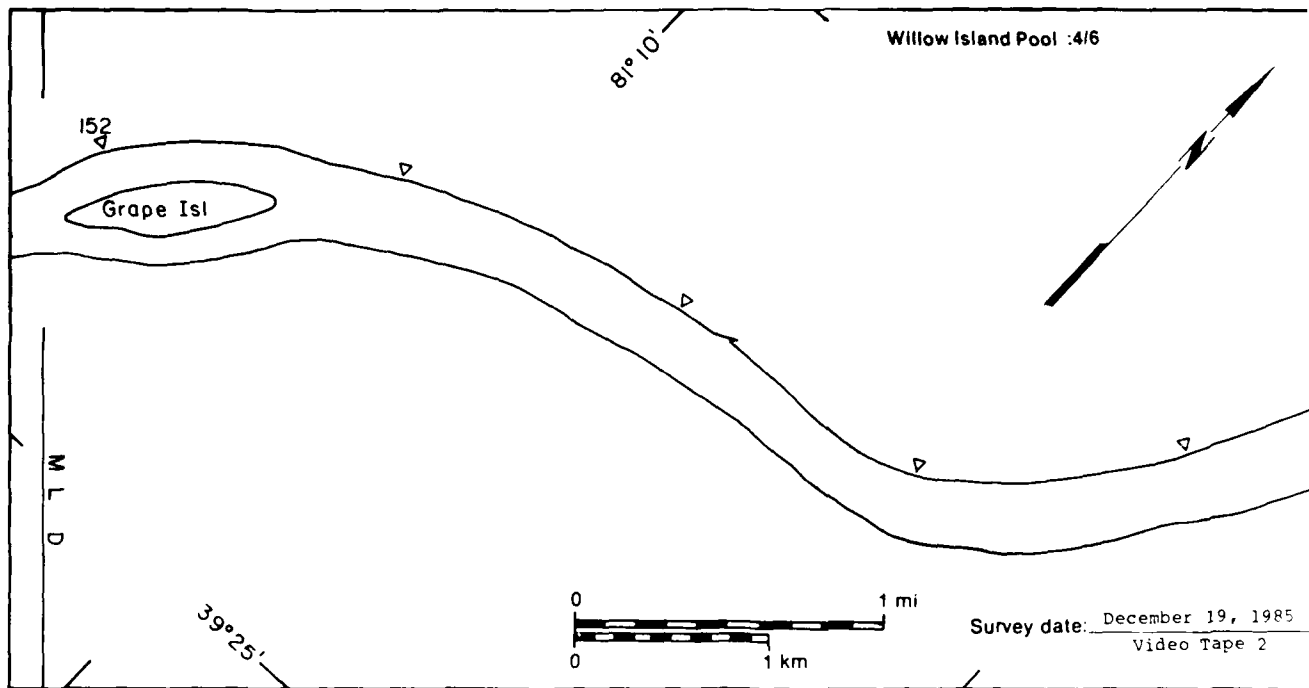
19 December 1985



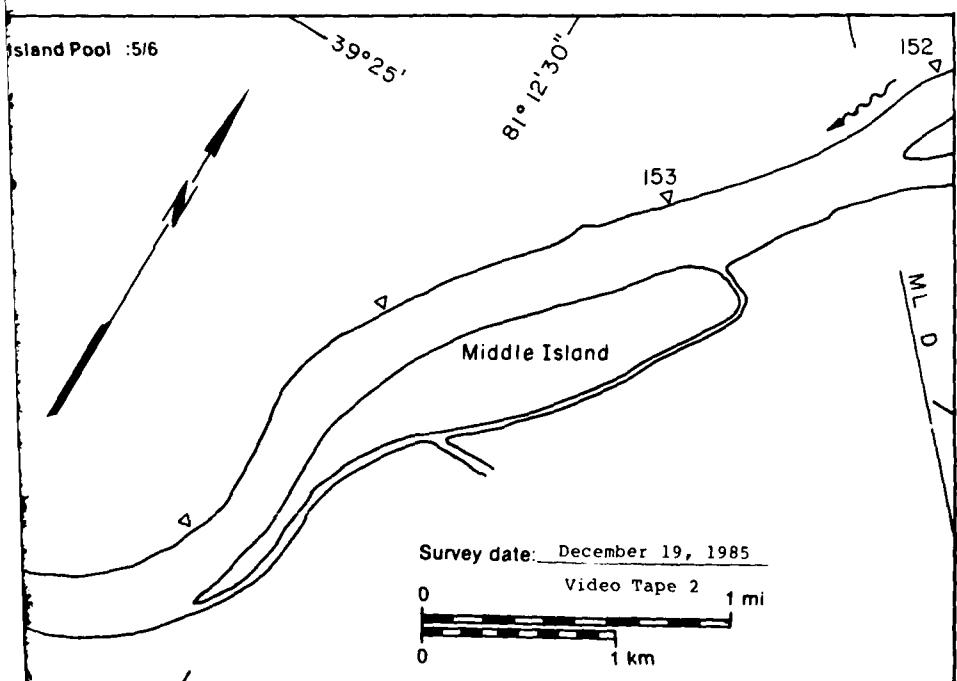
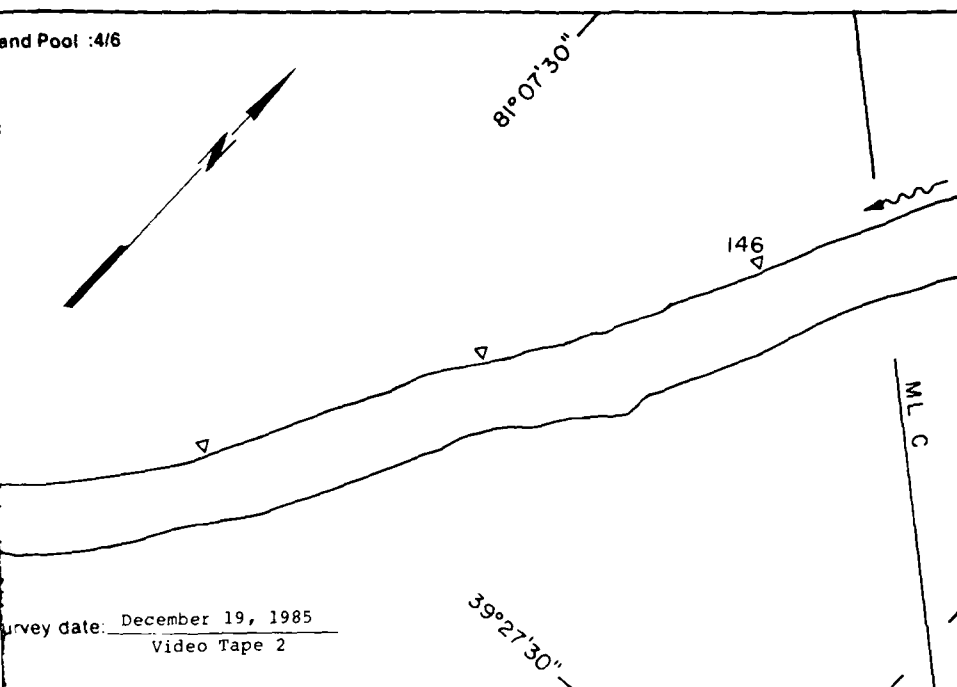








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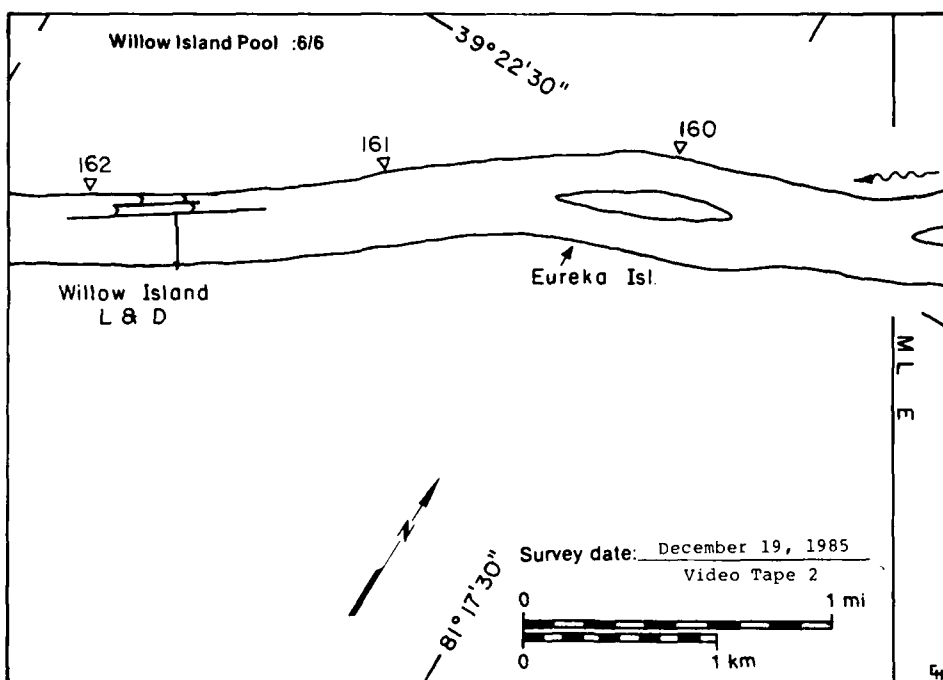
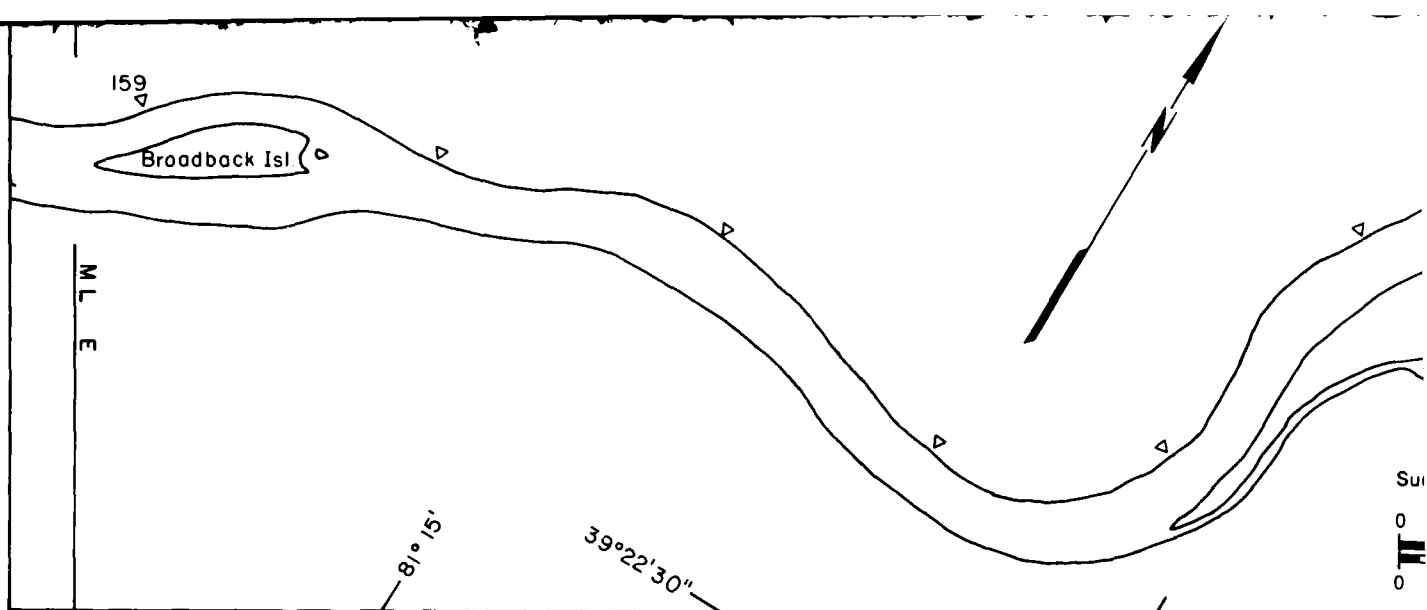


Willow Island Pool

MAP UNITS

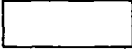
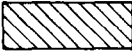


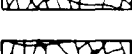

Area
($\pi^2 \times 10^6$)

Surface
concentration
(%)

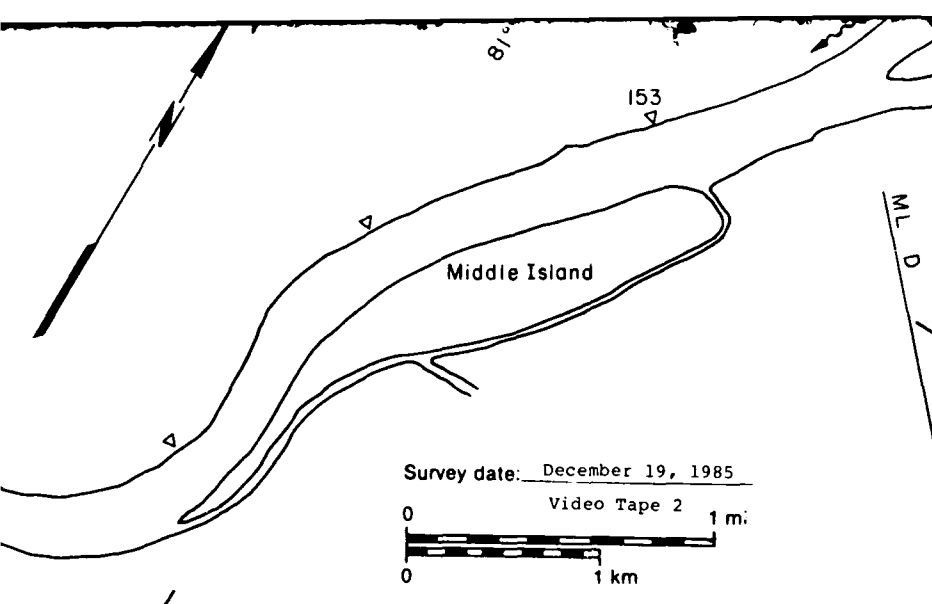


Willow Island Pool

MAP UNITS

-  Open water
-  Solid ice cover
-  Solid ice cover with open-water areas
-  Fragmented ice cover
-  Fragmented ice cover with open-water areas
-  Ice floes or frazil slush and pans

Total area ($m^2 \times 10^6$)



Willow Island Pool

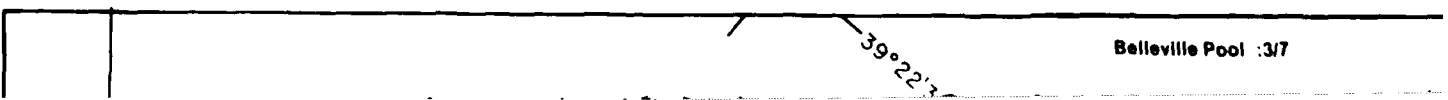
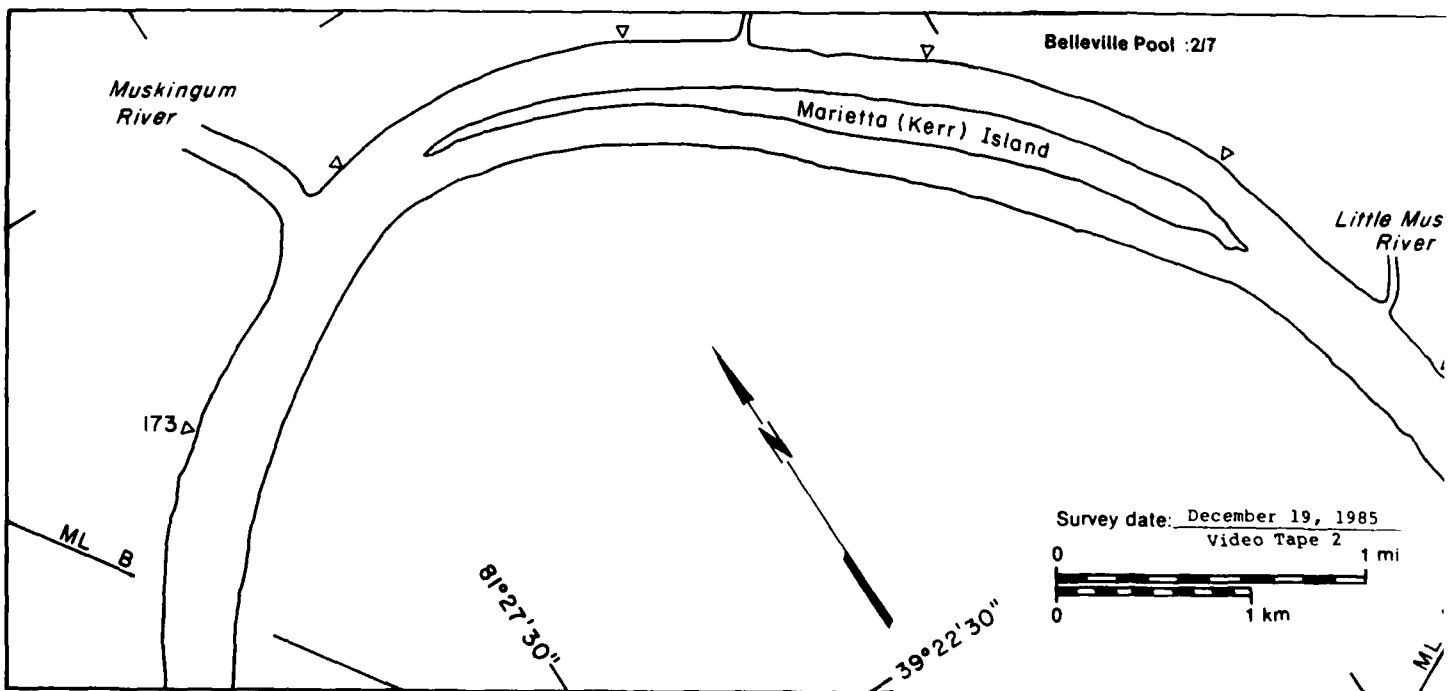
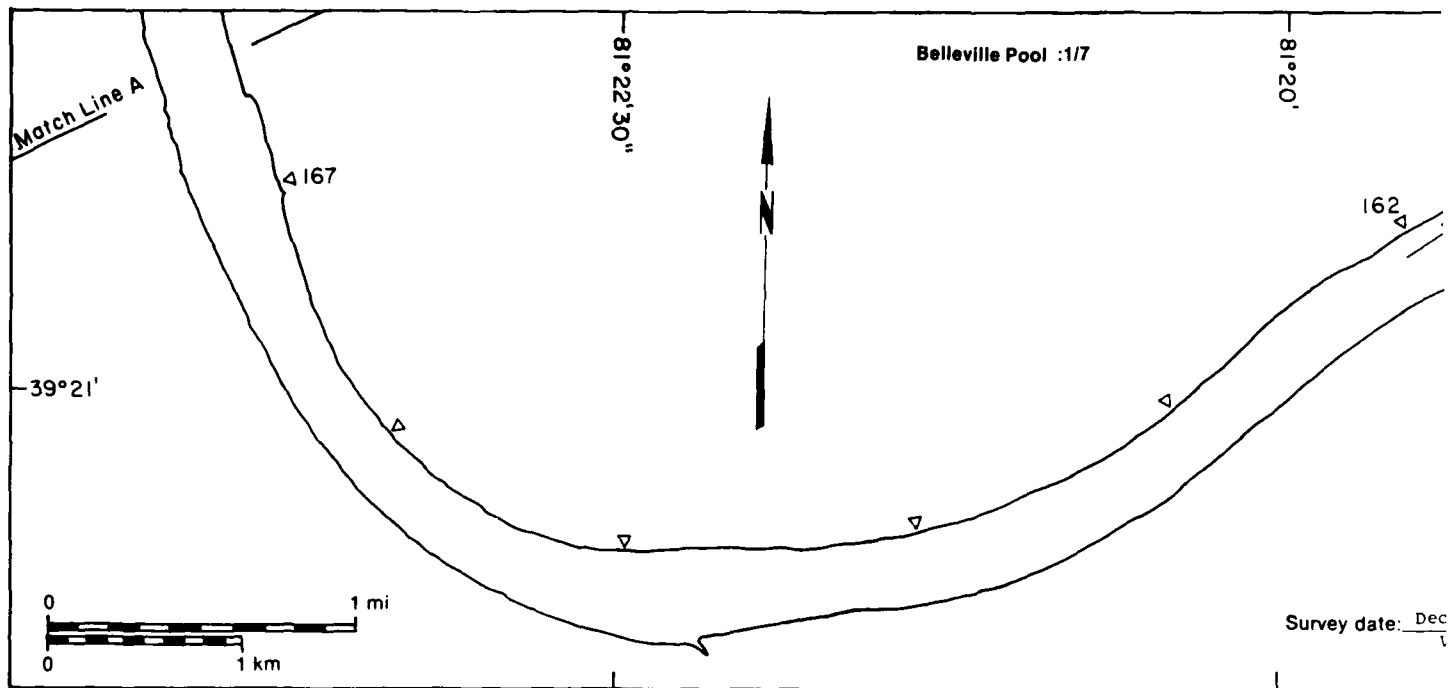
MAP UNITS

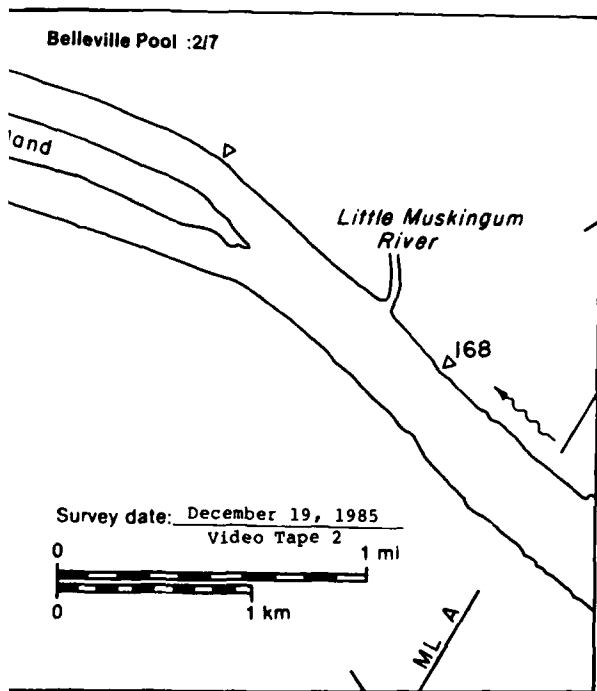
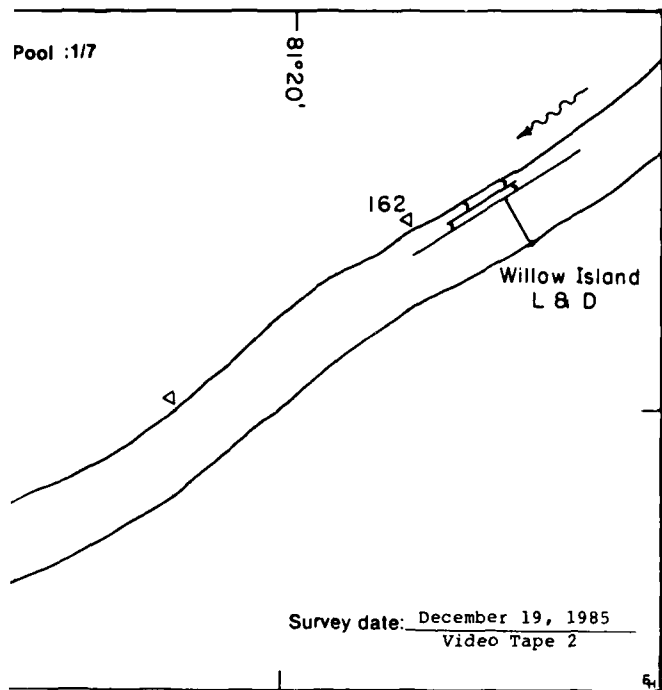
	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

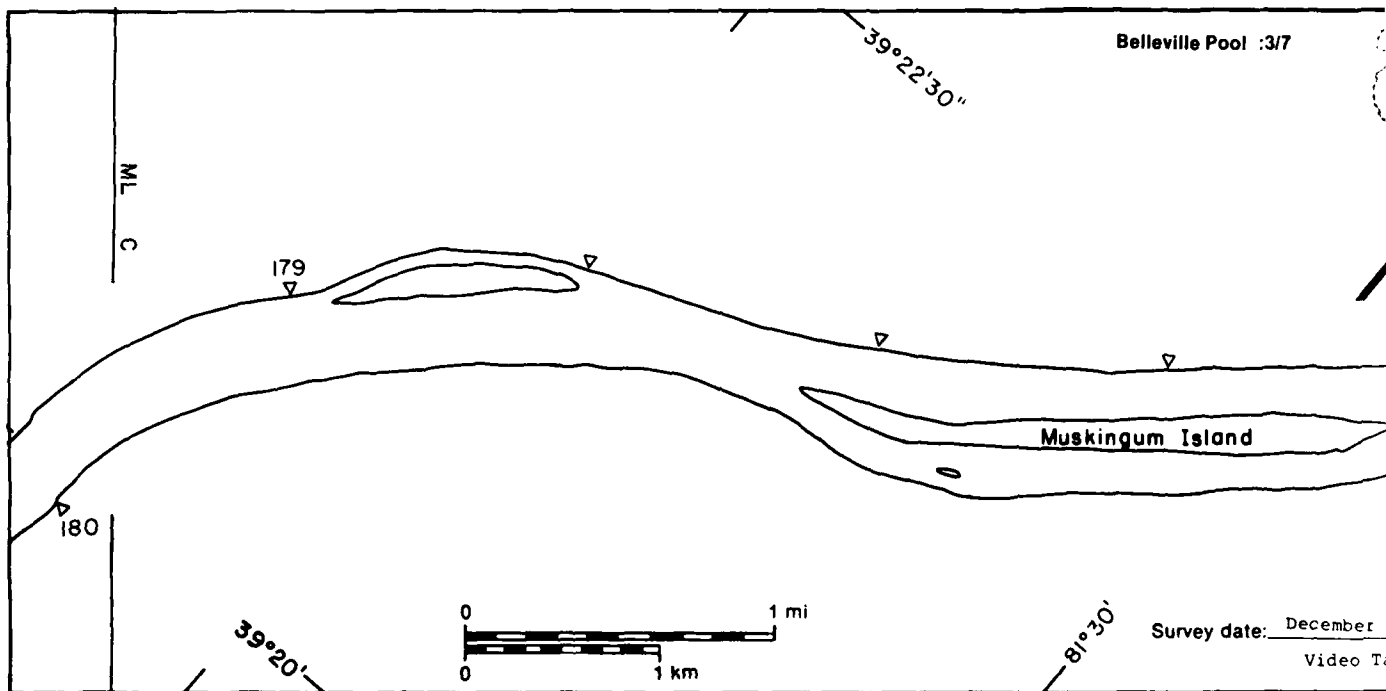
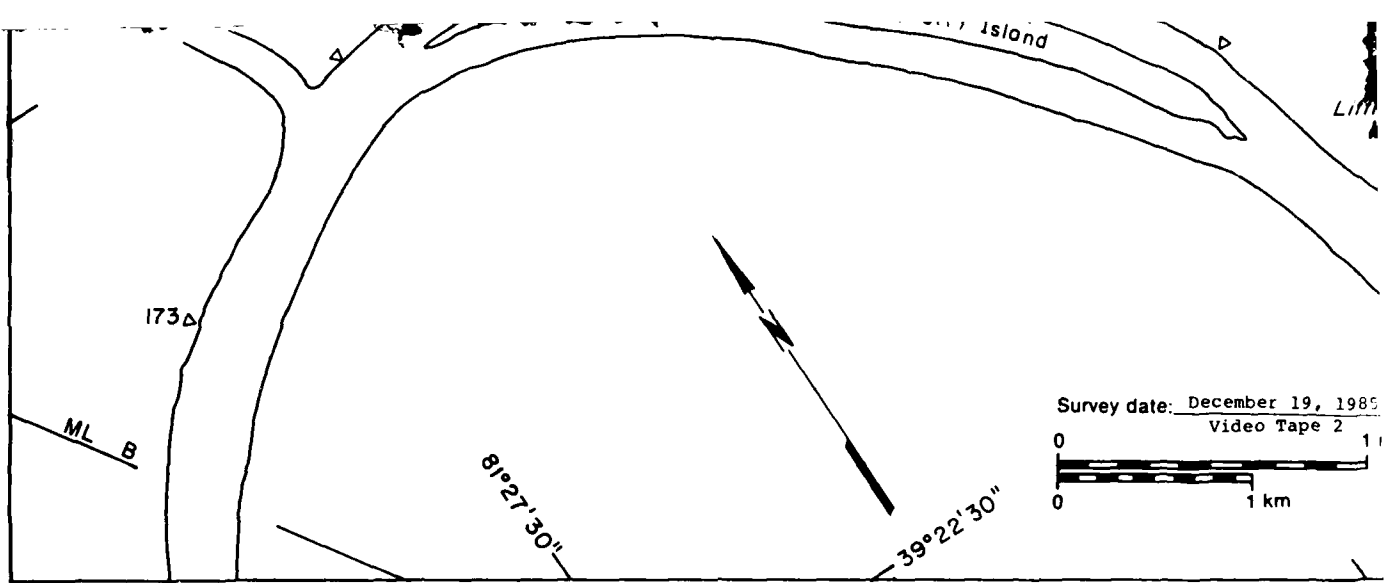
Total area ($m^2 \times 10^6$)

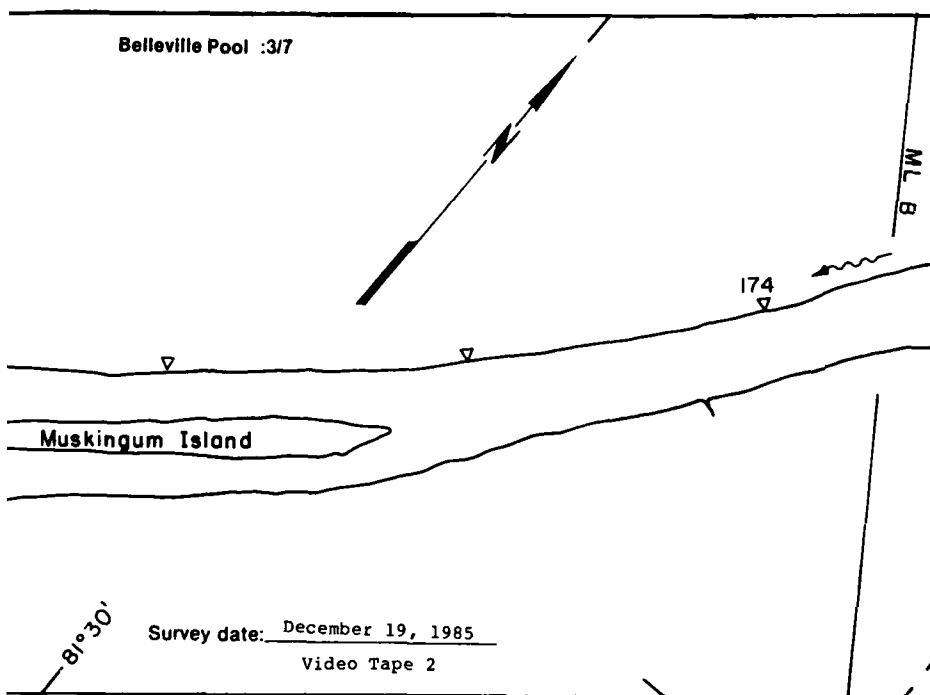
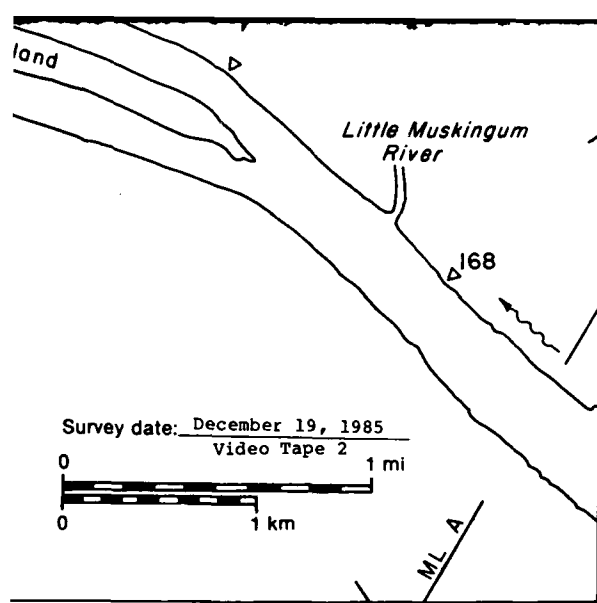
Area ($m^2 \times 10^6$)	Surface concentration (%)
21.24	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
0.00	—
21.24	

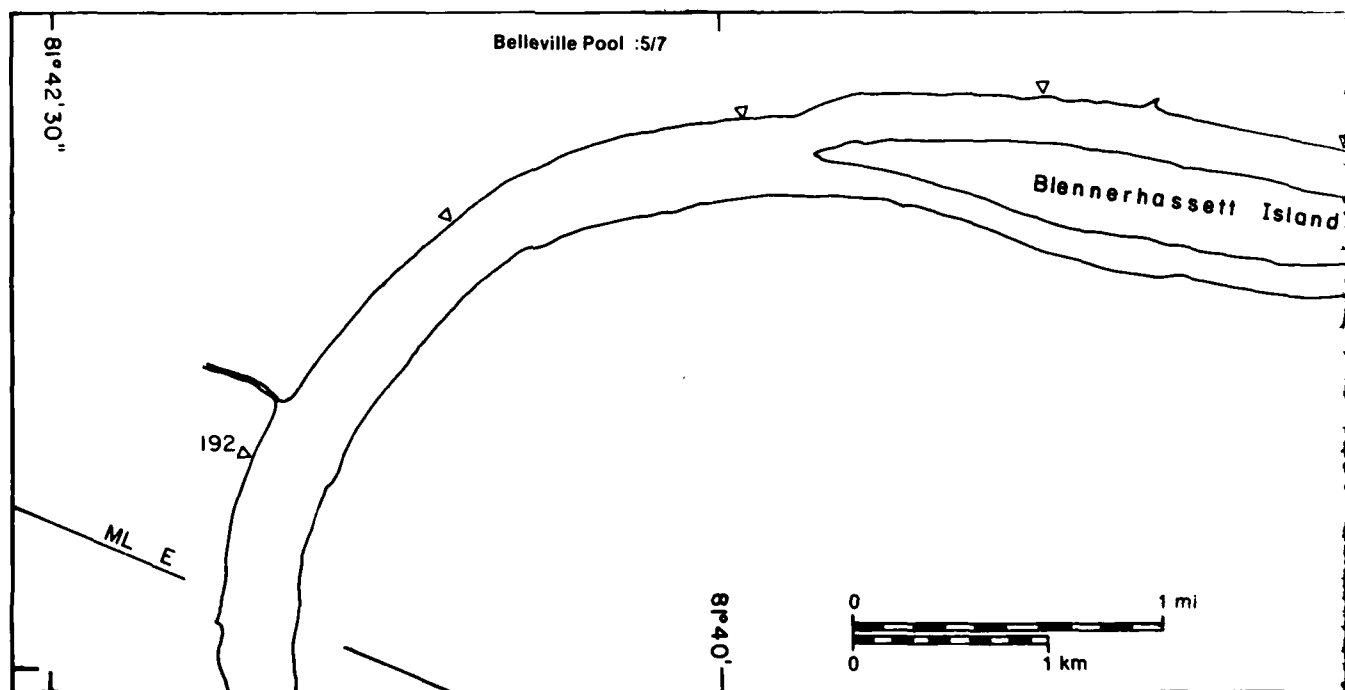
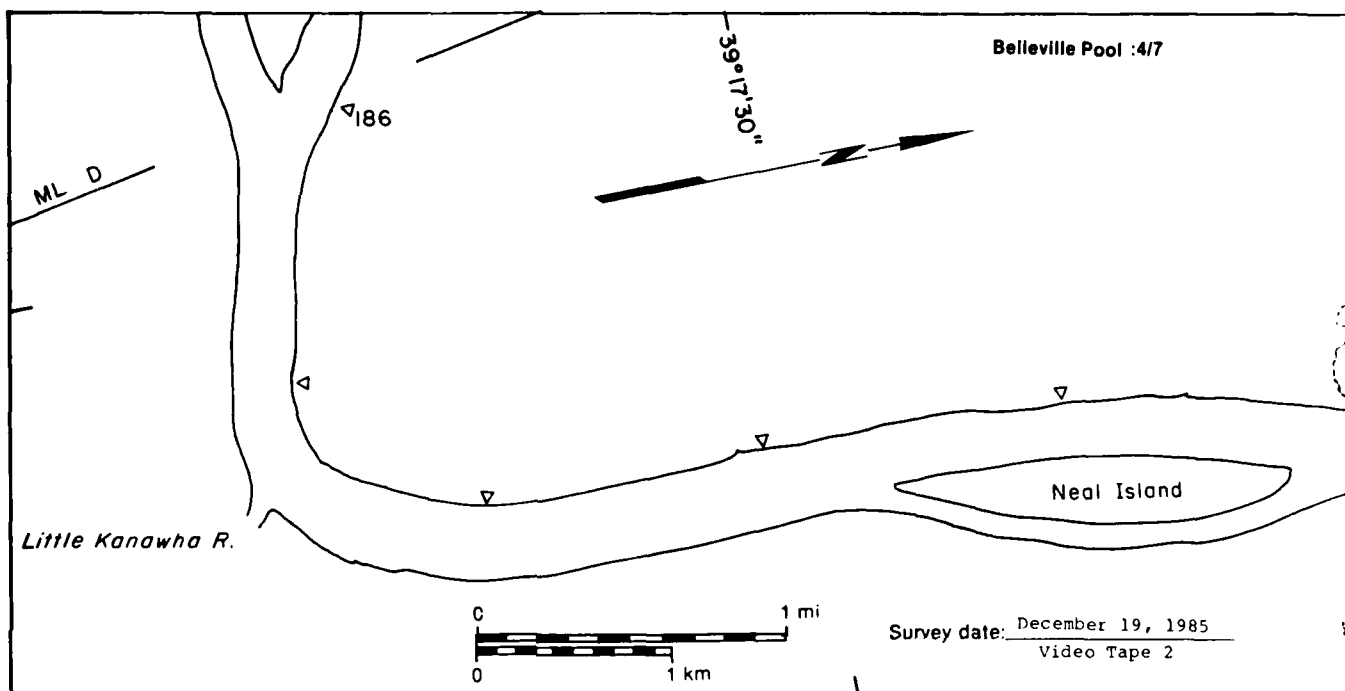
19 December 1985



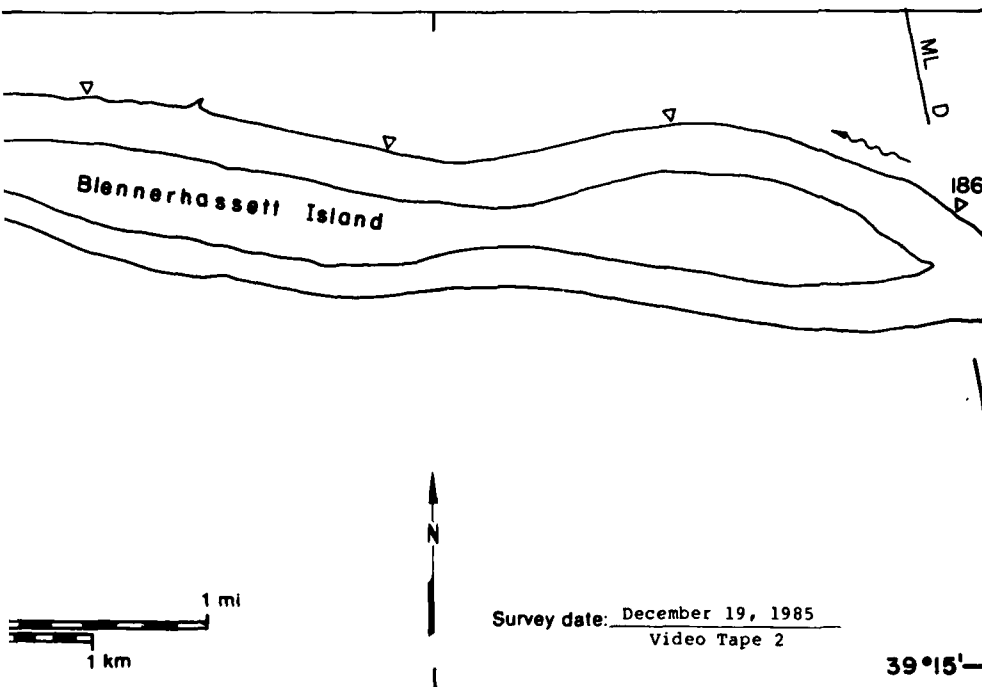
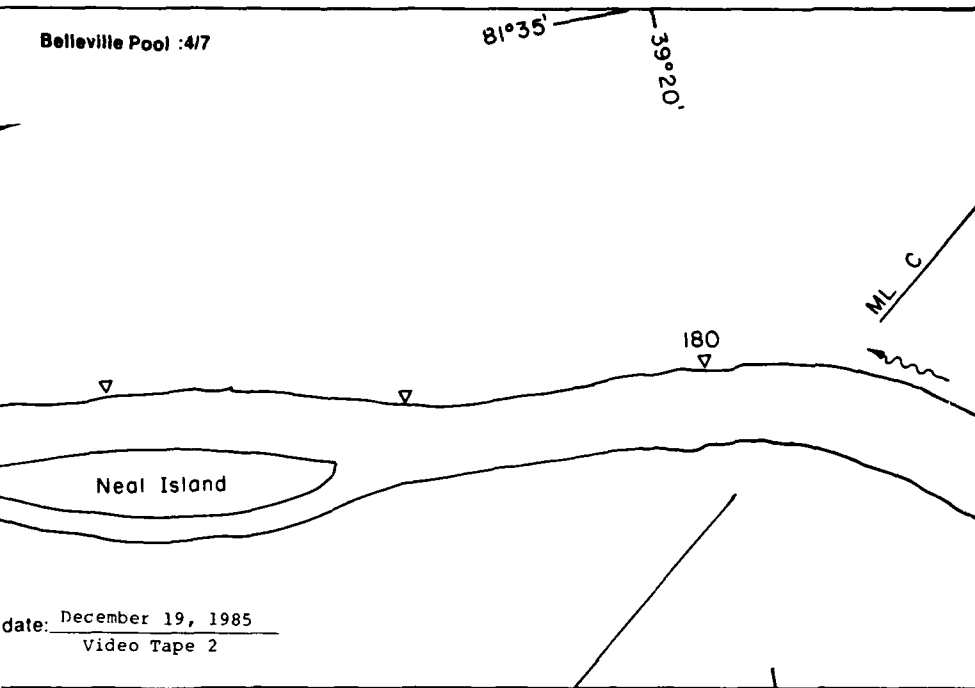








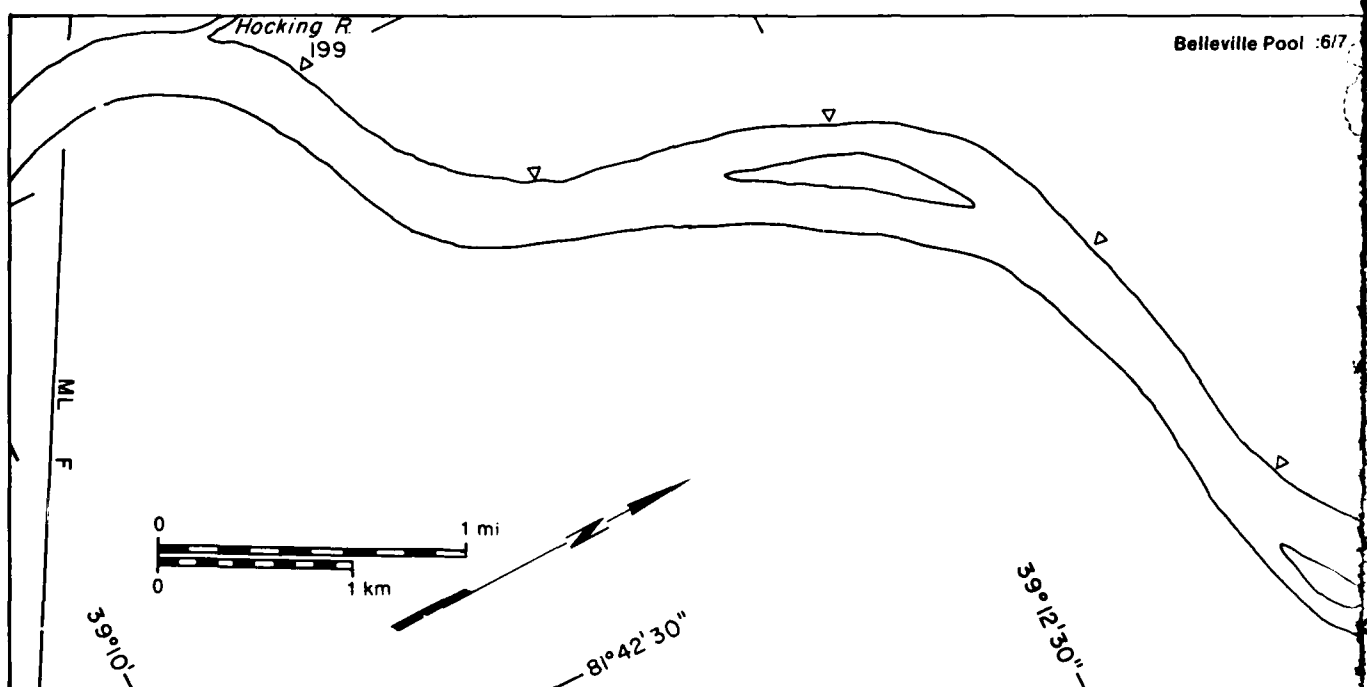
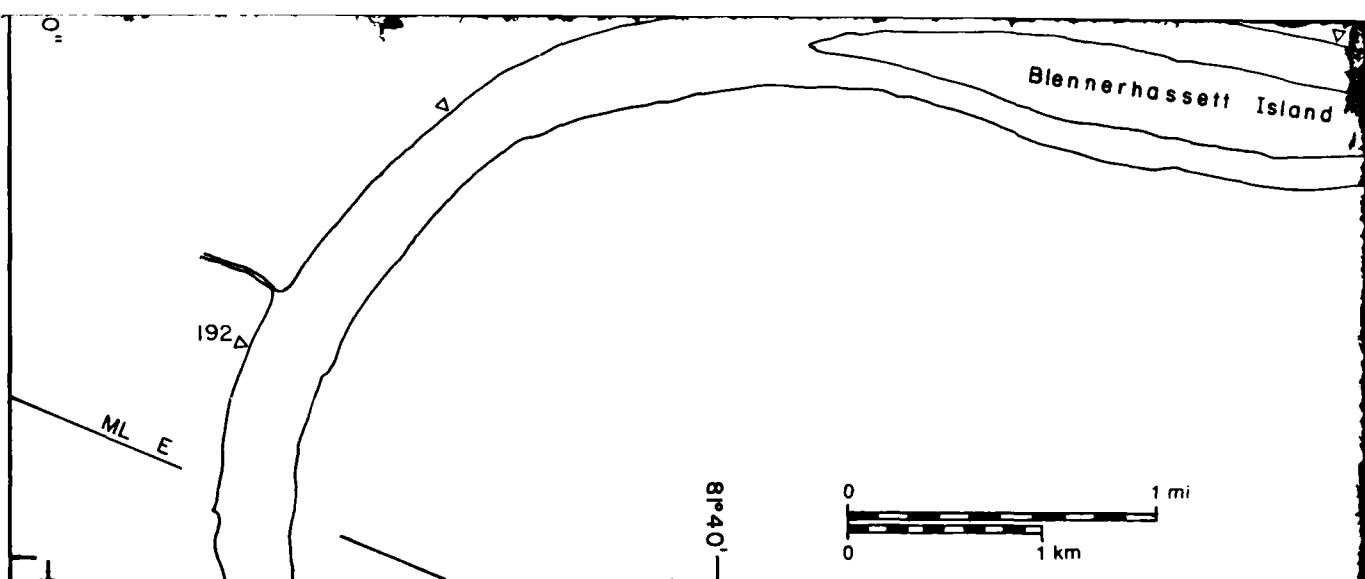
19 December 1985

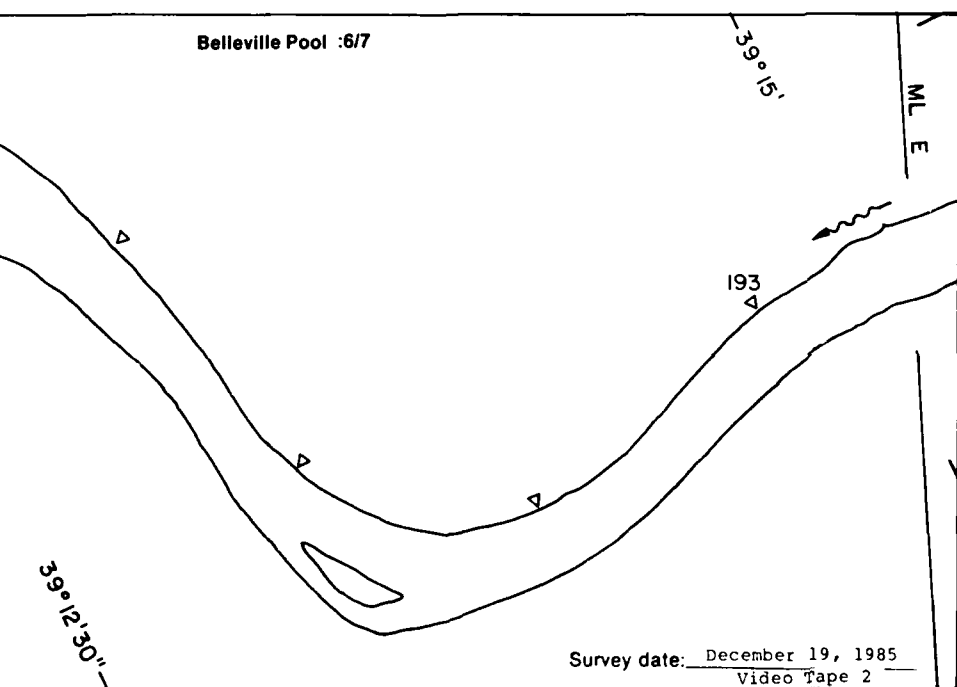
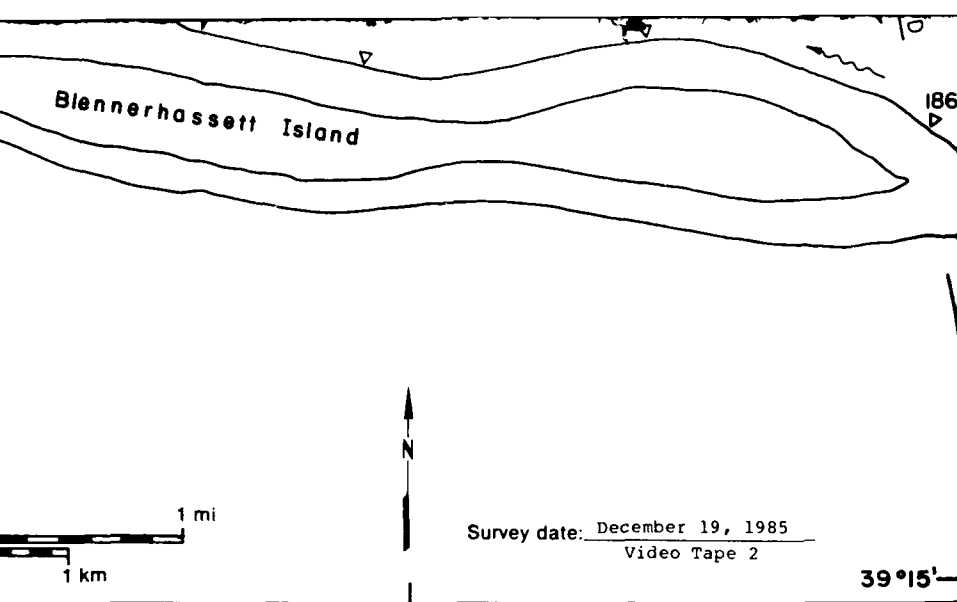


Belleville Pool :6/7

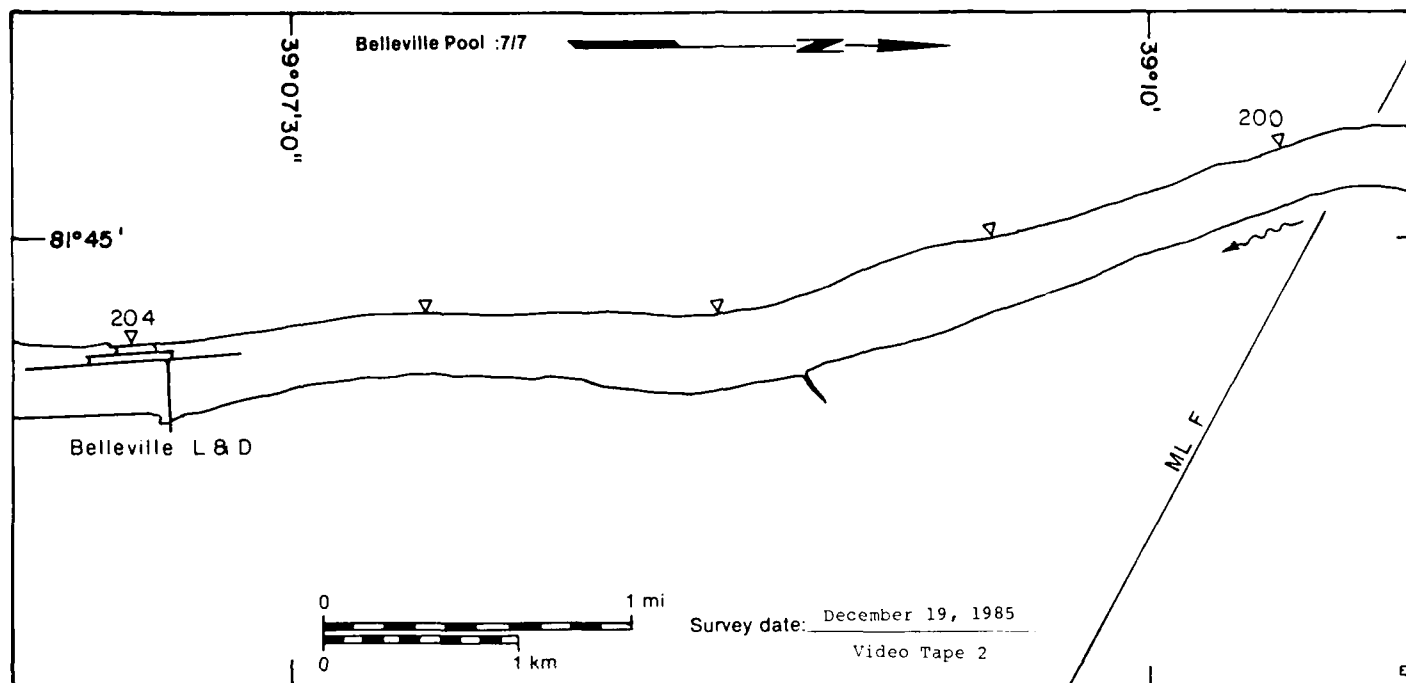
39°15'

ML



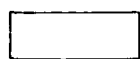


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Belleville Pool

MAP UNITS



Open water



Solid ice cover



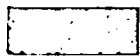
Solid ice cover with open-water areas



Fragmented ice cover



Fragmented ice cover with open-water areas



Ice floes or frazil slush and pans

Area
(m² x 10⁶)

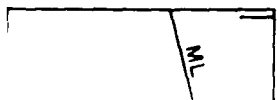
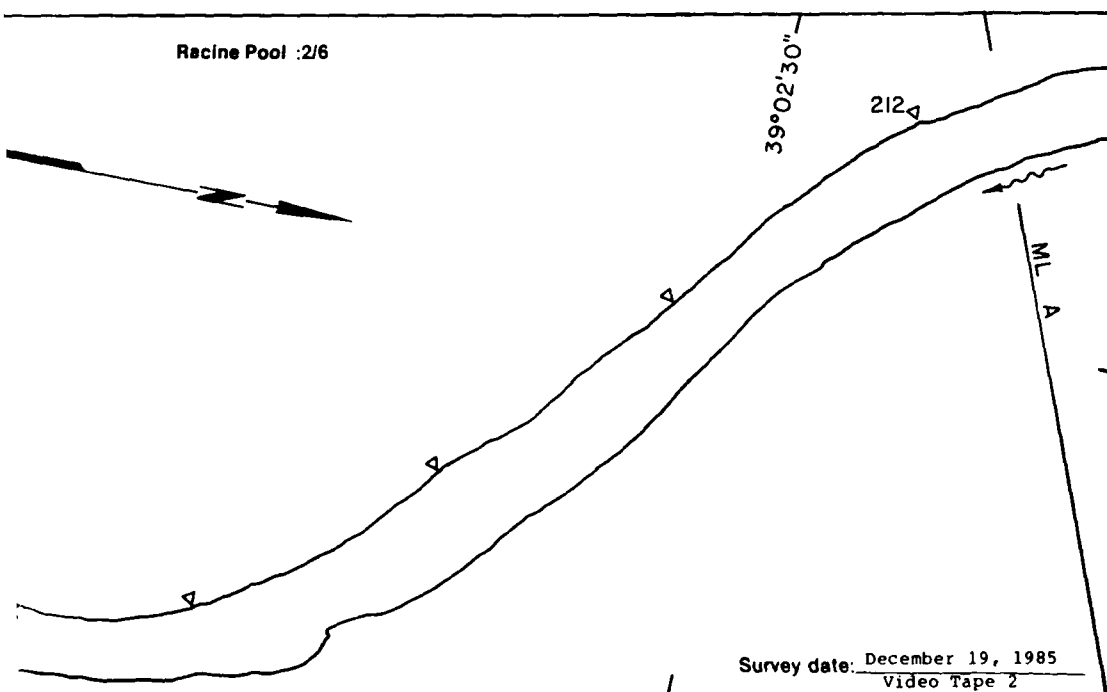
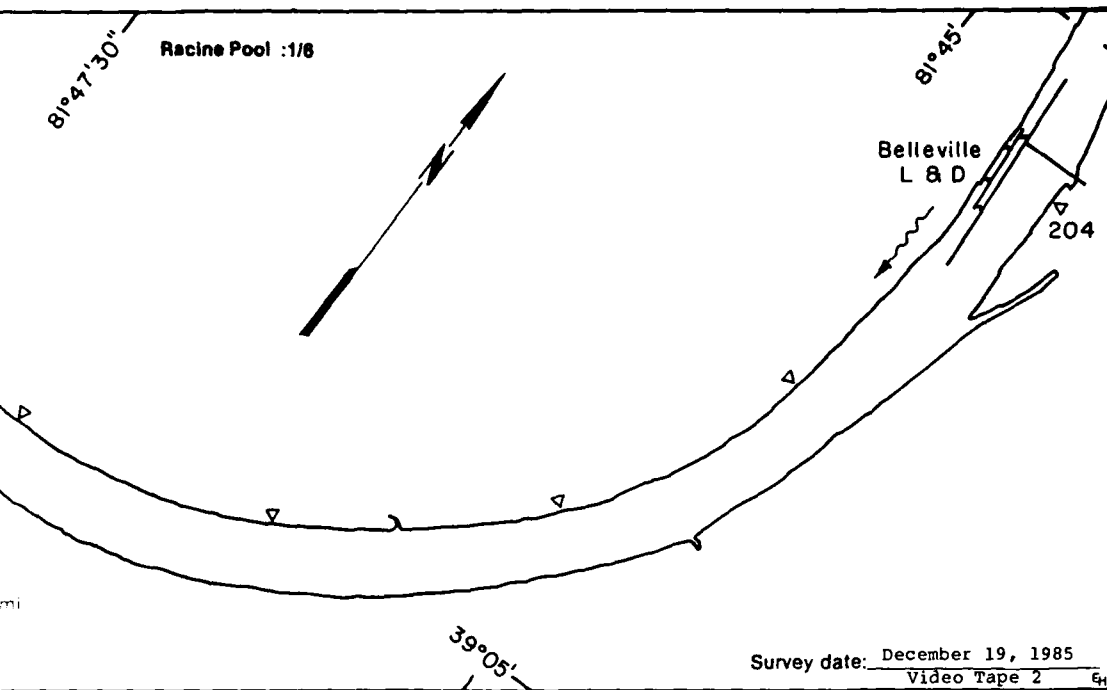
Surface
concentration
(%)

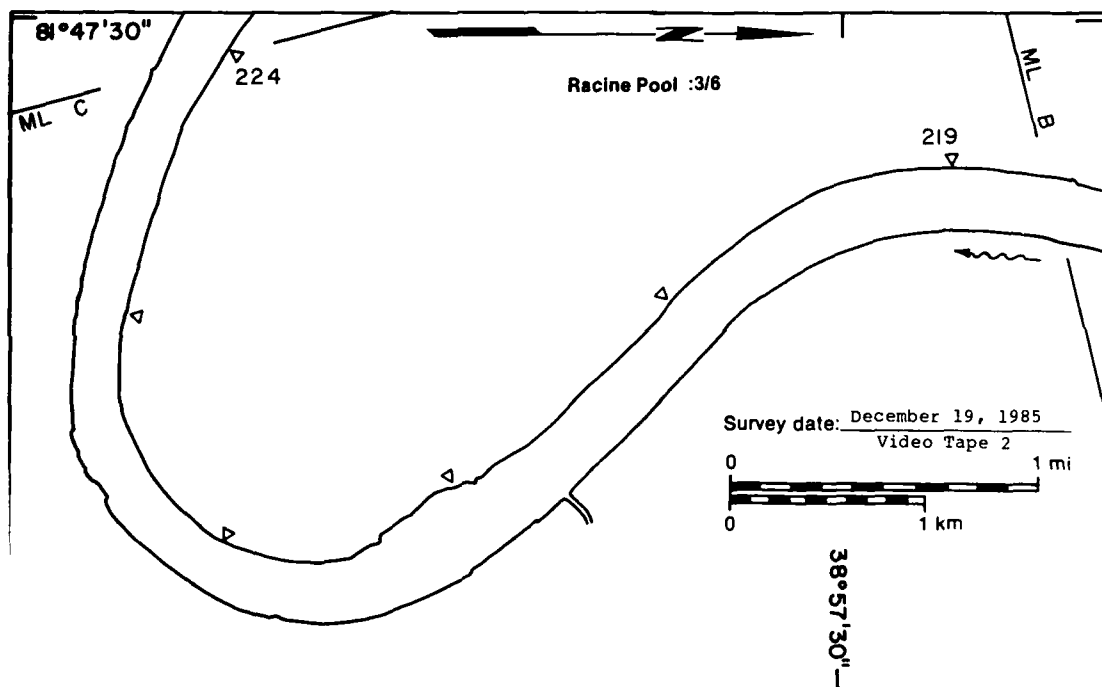
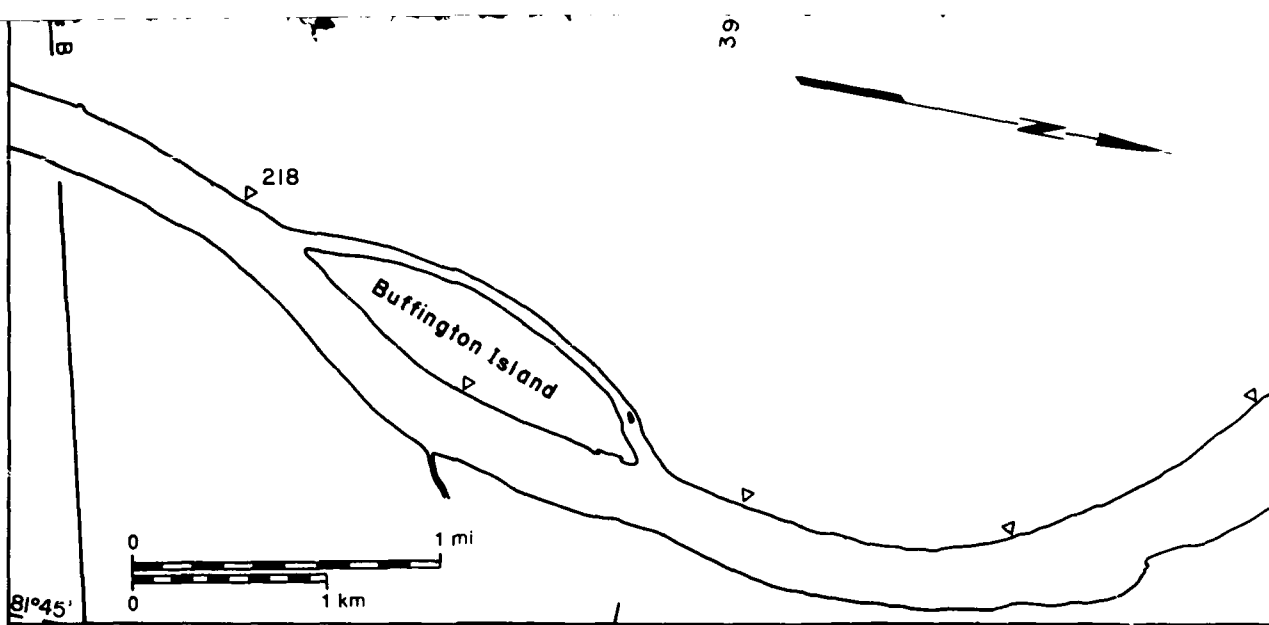
27.28	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
0.00	—

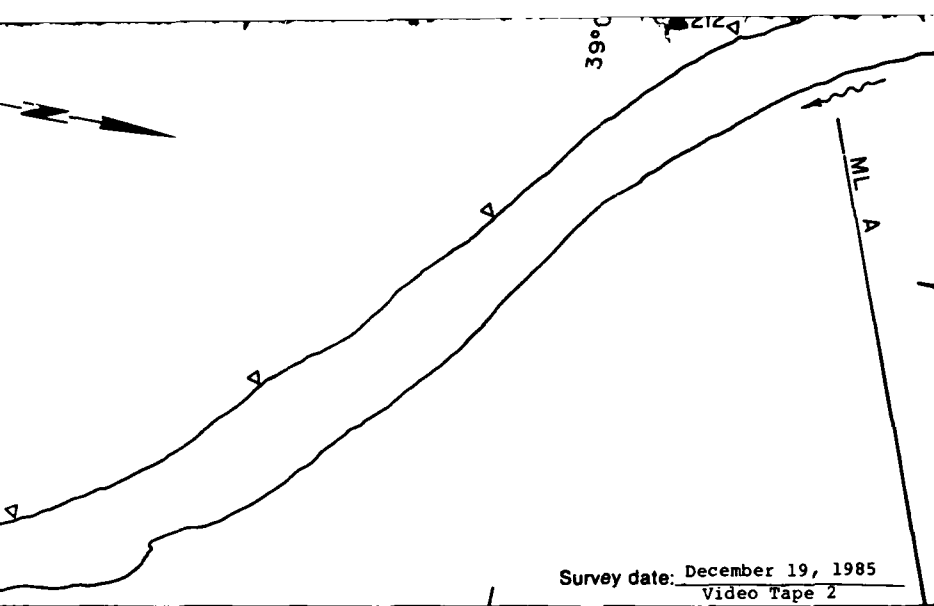
Total area (m² x 10⁶)

27.28

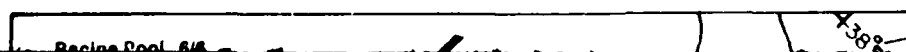
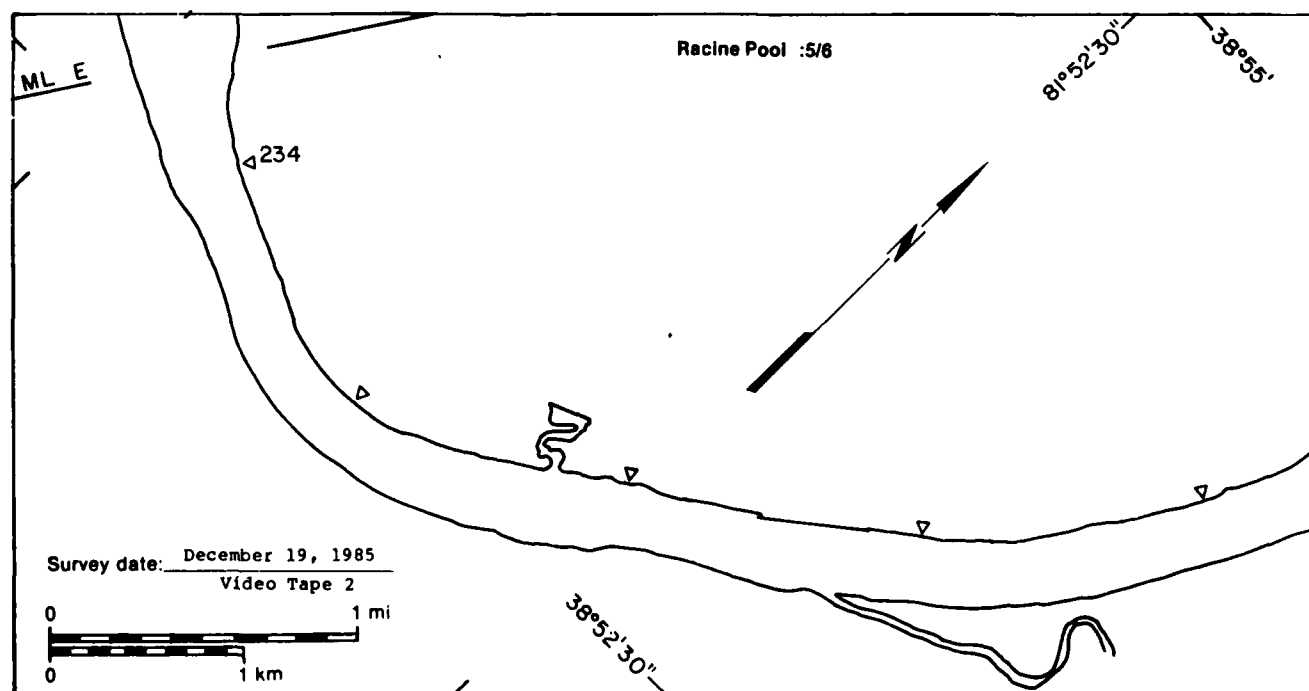
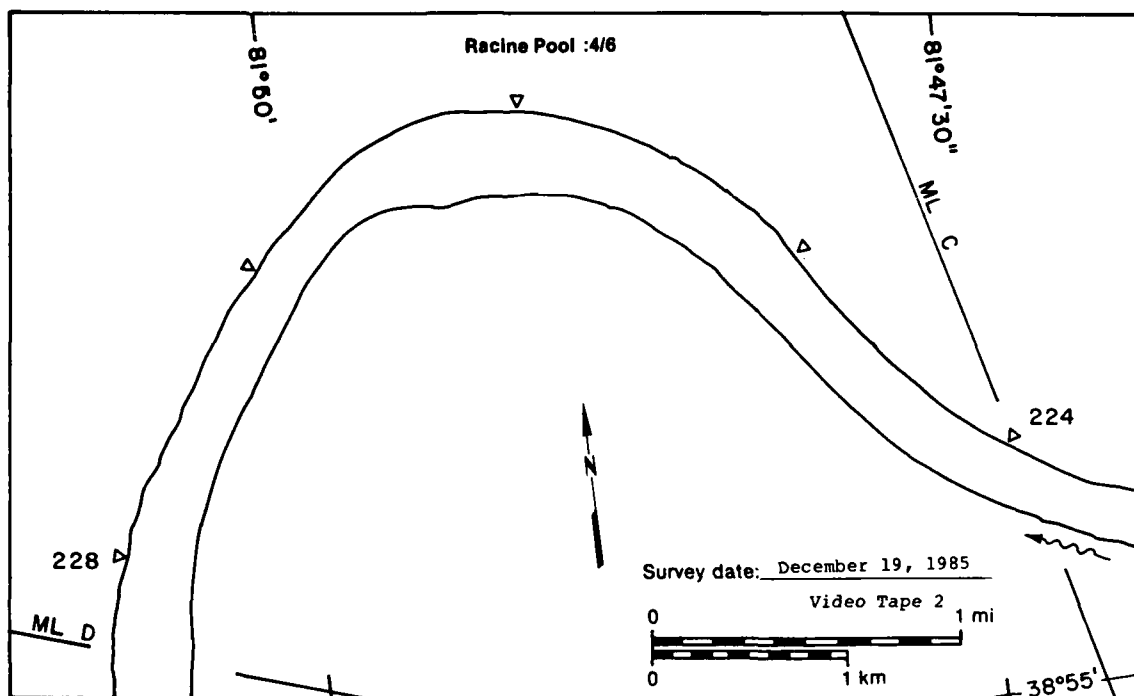
19 December 1985

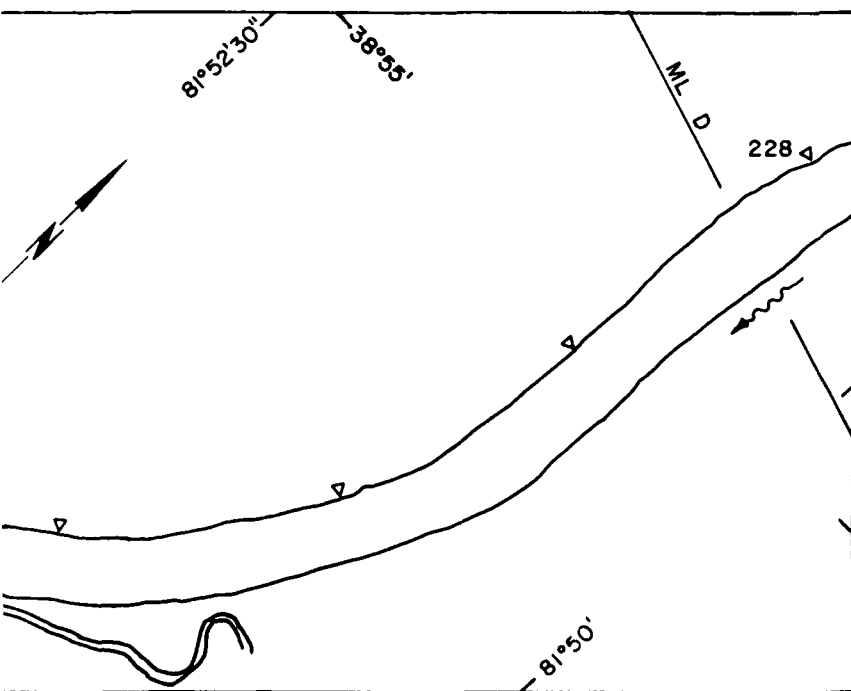
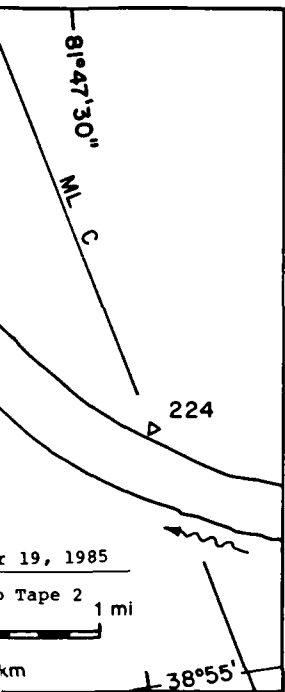






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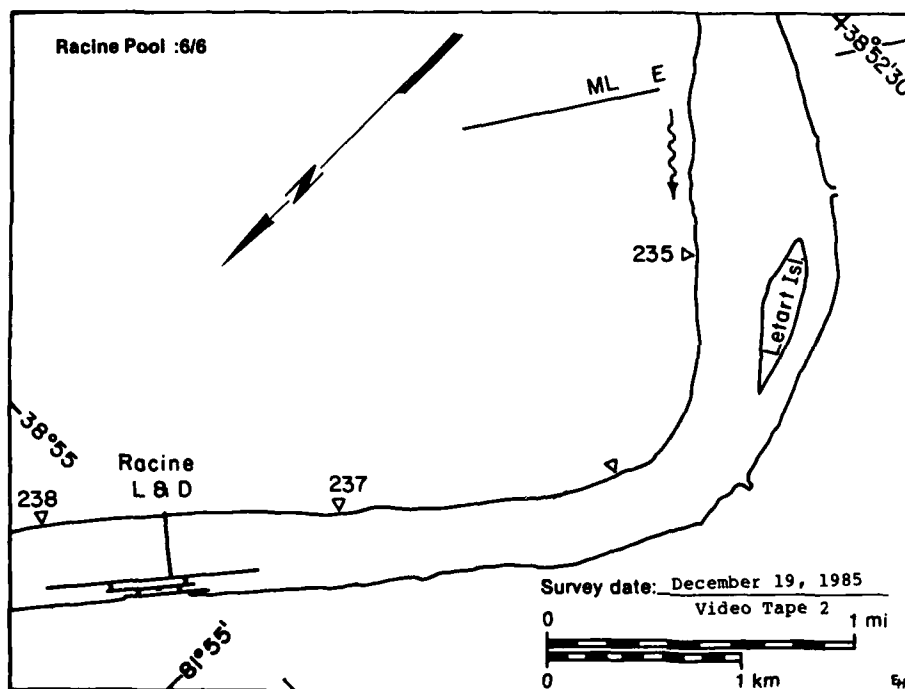
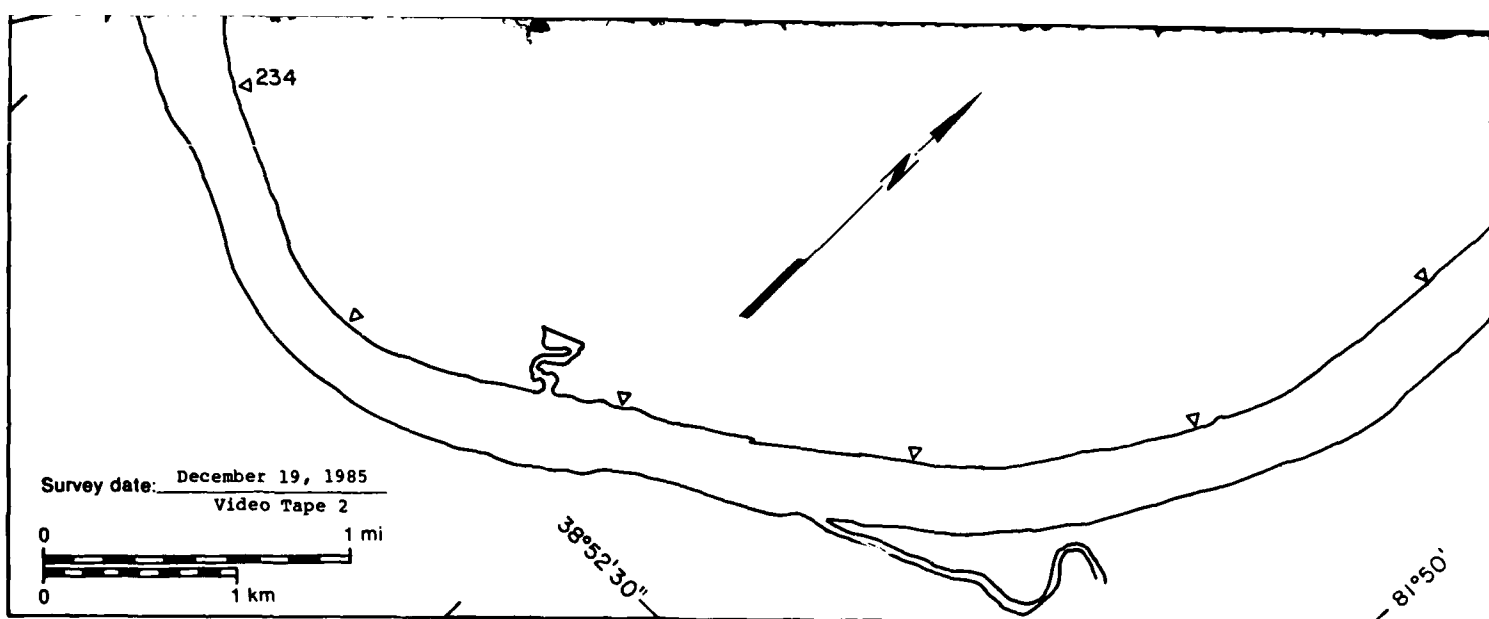
81°52'30"

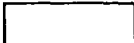


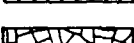
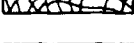

Racine Pool

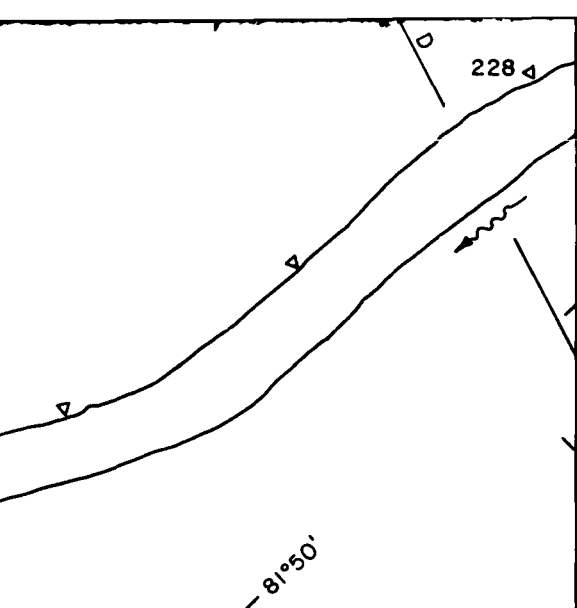
Area

Surface
concentration

2 106



Racine Pool		Area
MAP UNITS		(m ² x 10 ⁶)
	Open water	19.89
	Solid ice cover	0.00
	Solid ice cover with open-water areas	0.00
	Fragmented ice cover	0.00
	Fragmented ice cover with open-water areas	0.00
	Ice floes or frazil slush and pans	0.00
Total area (m ² x 10 ⁶)		19.89



Racine Pool

MAP UNITS

Open water

Solid ice cover

Solid ice cover with
open-water areas

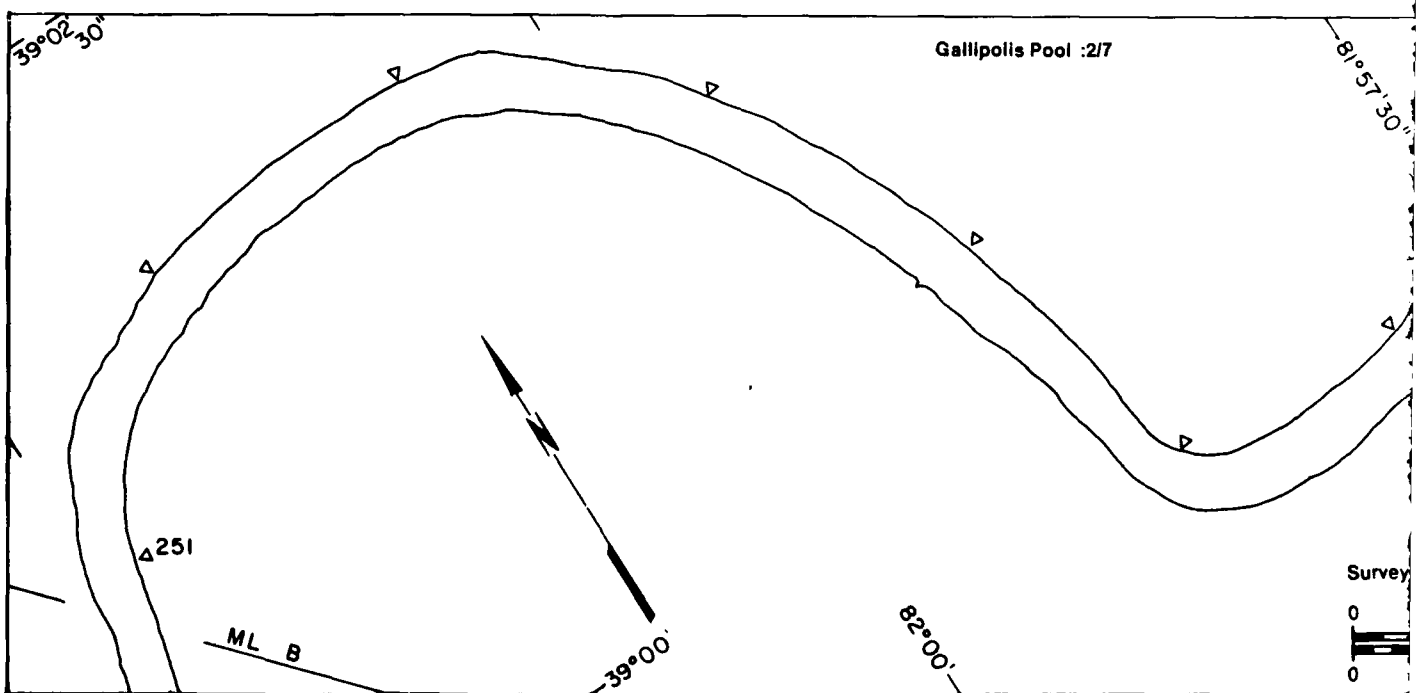
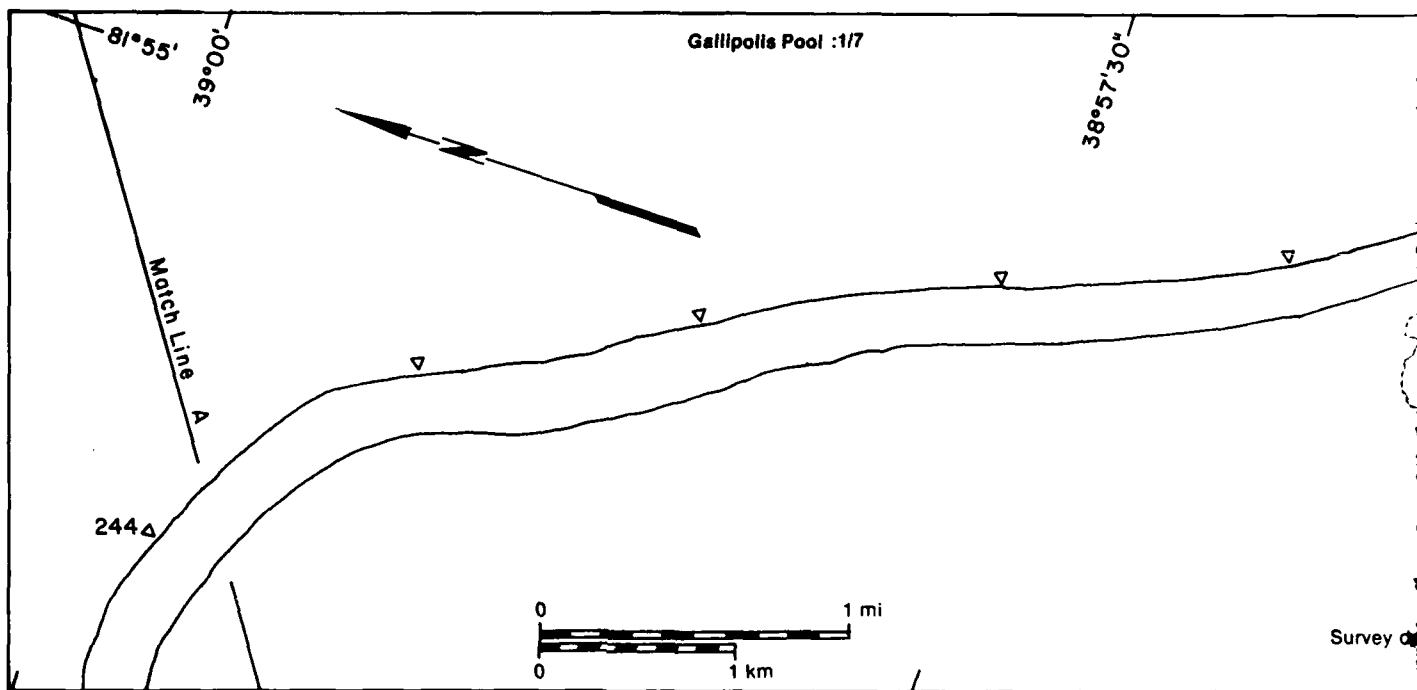
Fragmented ice cover

Fragmented ice cover
with open-water areas

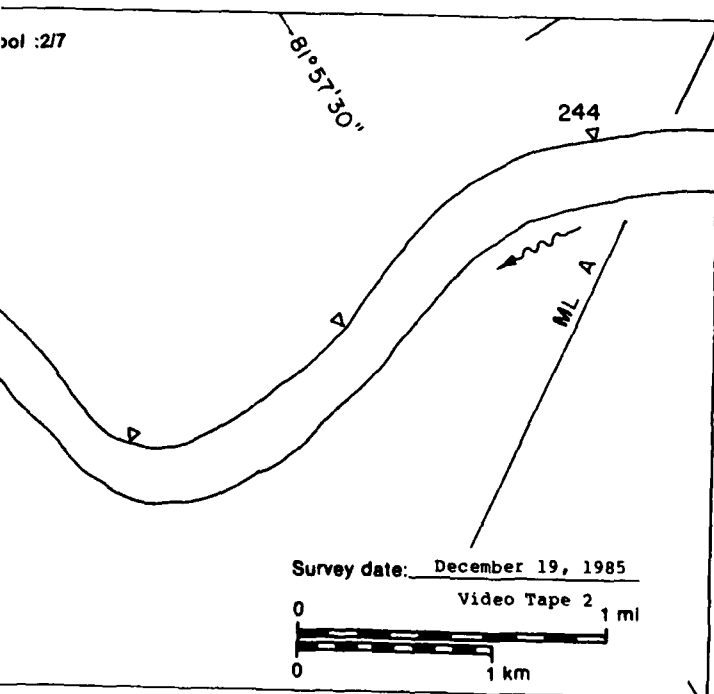
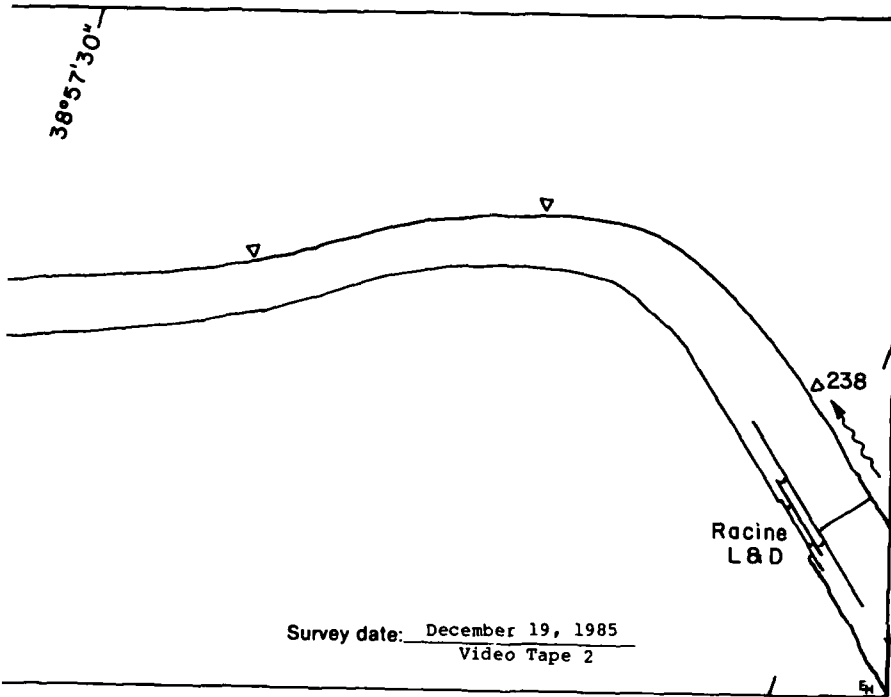
Ice floes or frazil slush
and pans

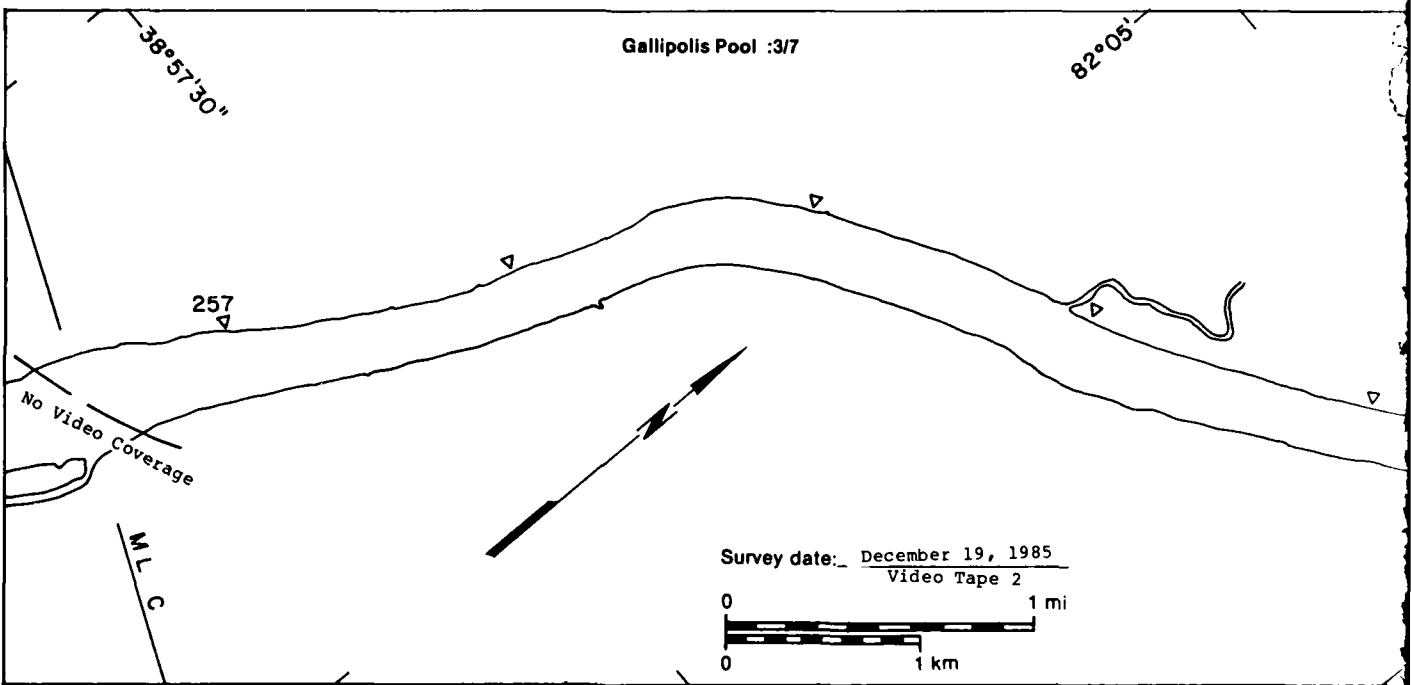
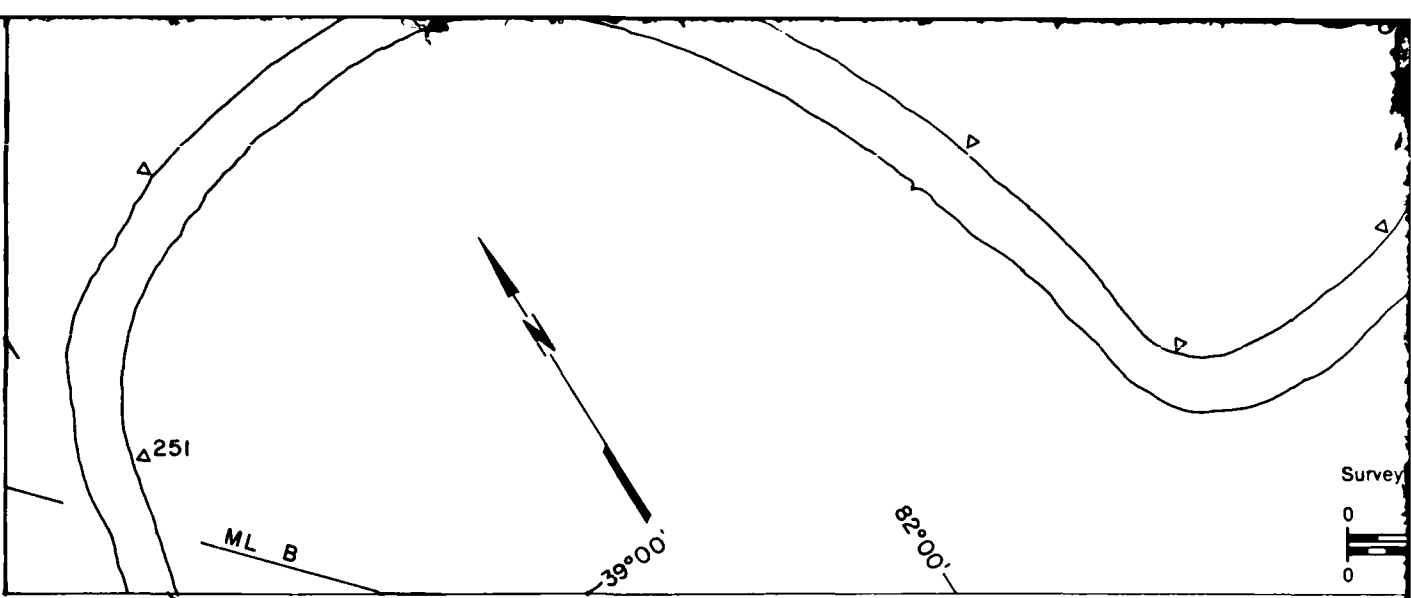
Total area ($m^2 \times 10^6$)

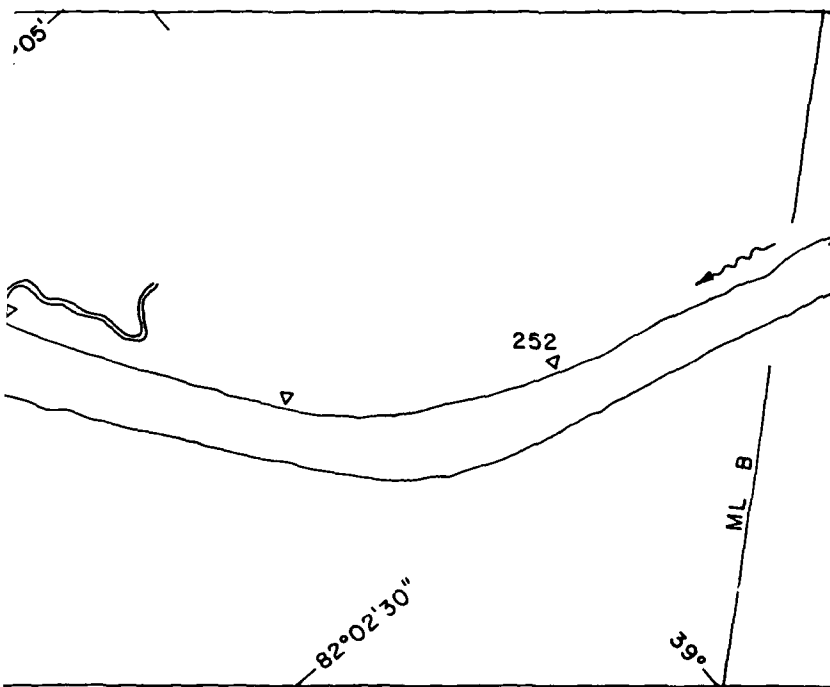
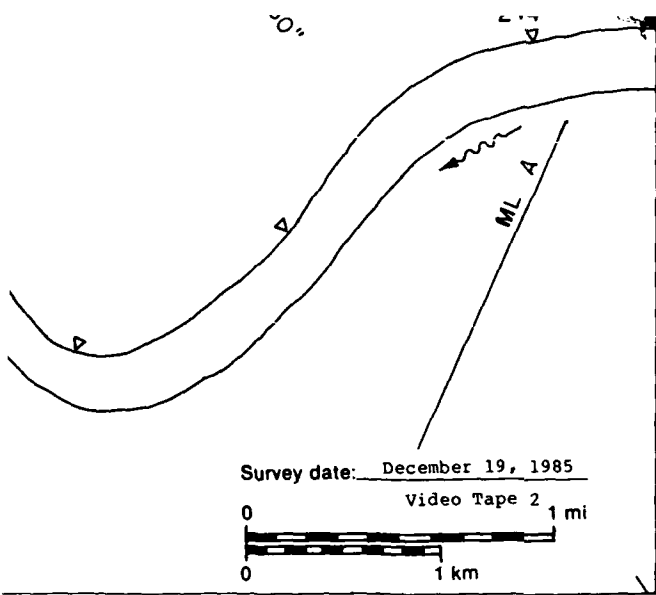
	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	19.89	NA
Solid ice cover	0.00	NA
Solid ice cover with open-water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open-water areas	0.00	—
Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)	19.89	



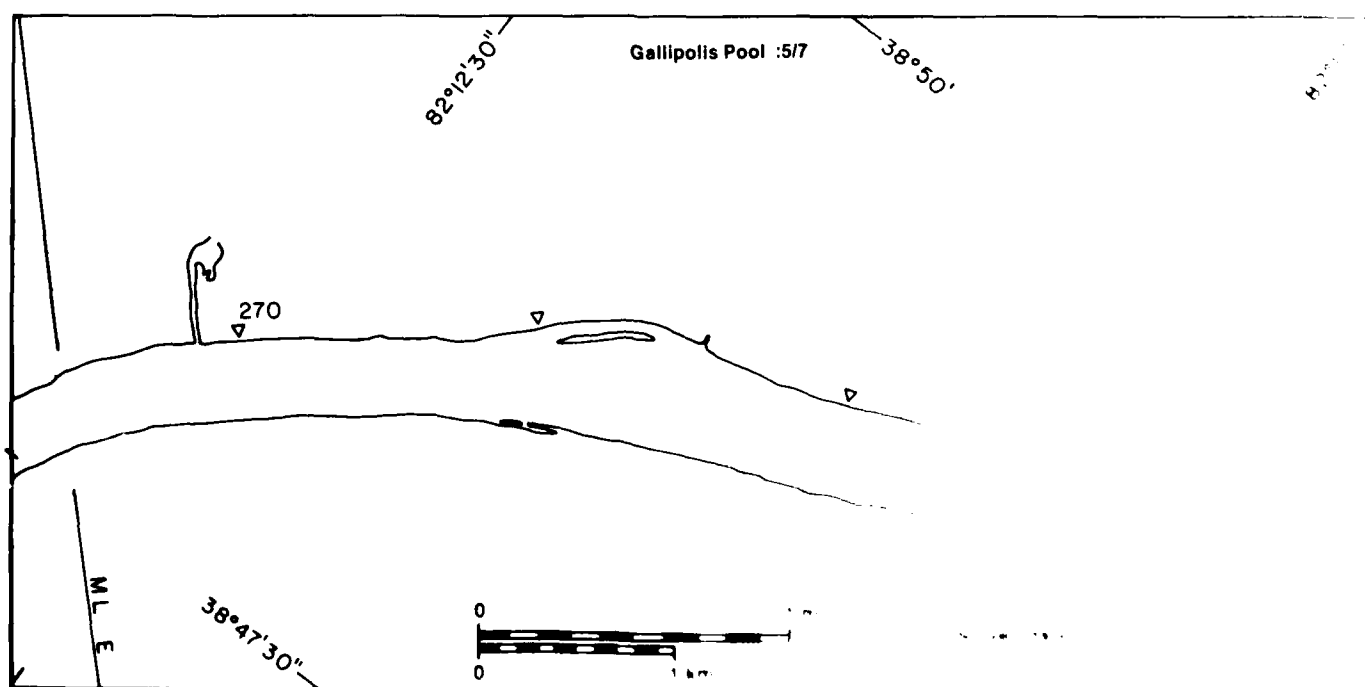
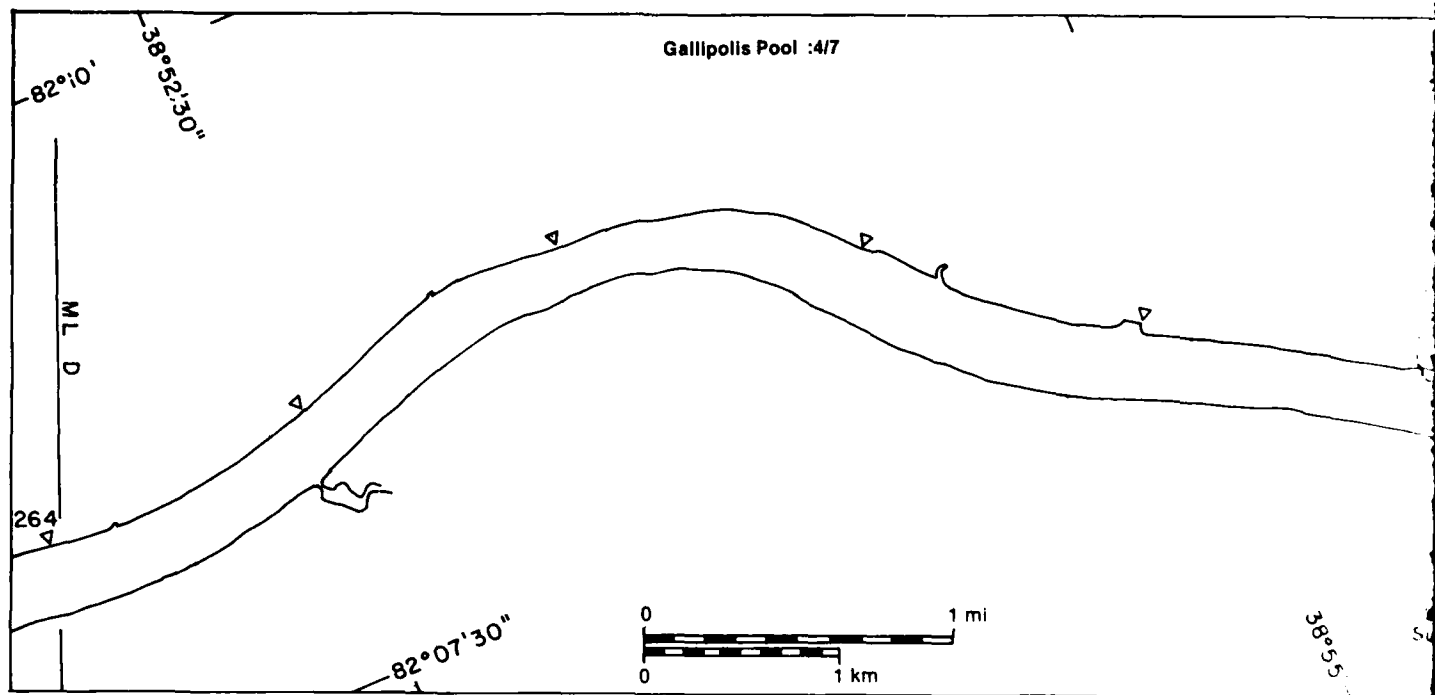
19 December 1985







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ICE ATLAS 1985 - 1986 MONONGAHELA RIVER ALLEGHENY RIVER 2/14

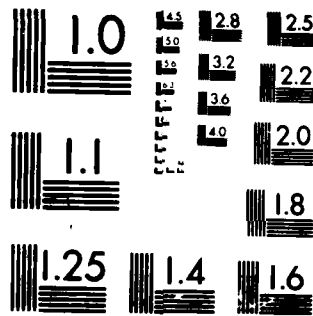
OHIO RIVER ILLINO. (U) COLD REGIONS RESEARCH AND

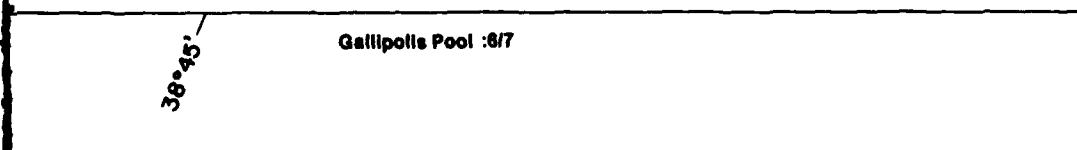
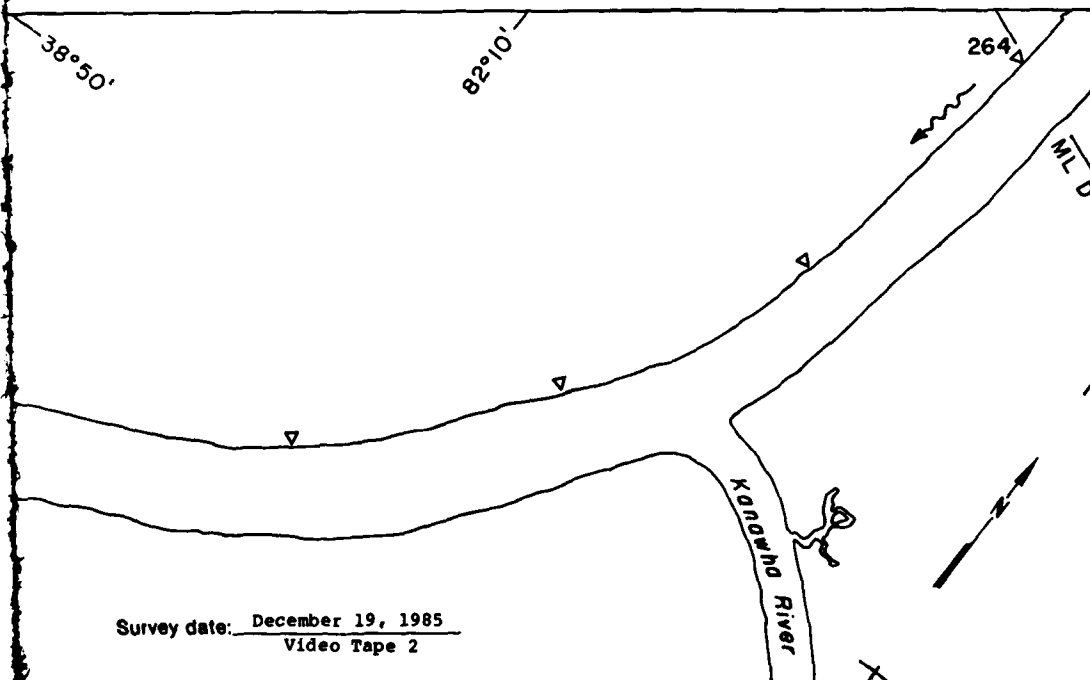
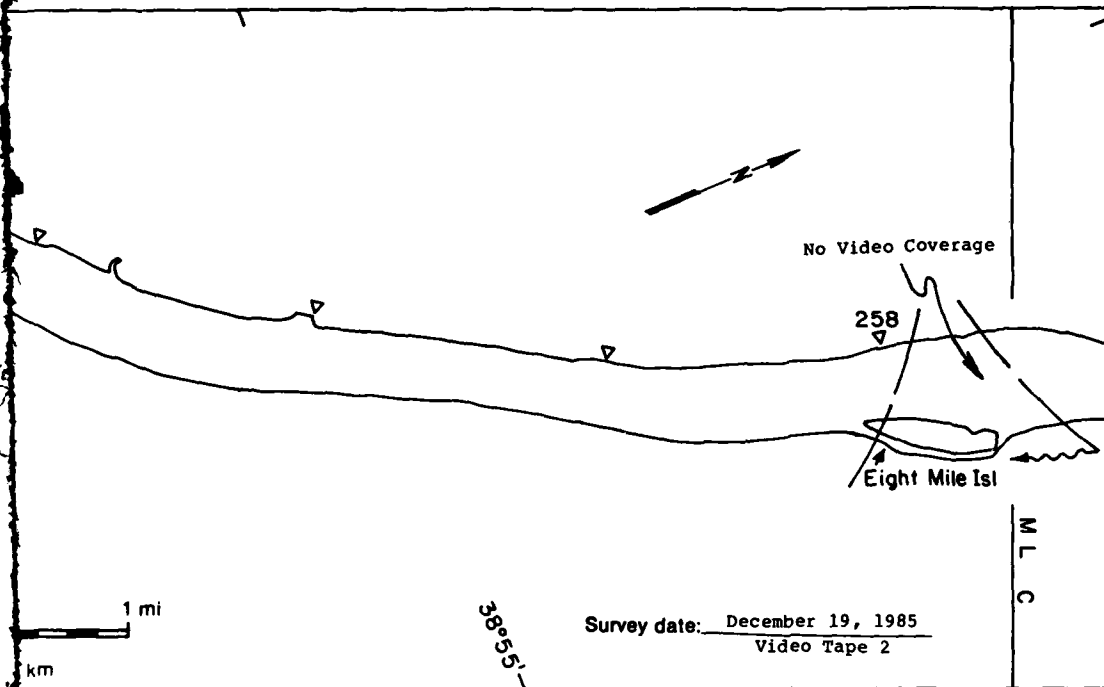
ENGINEERING LAB HANOVER NH L W CATTO ET AL. NOV 87

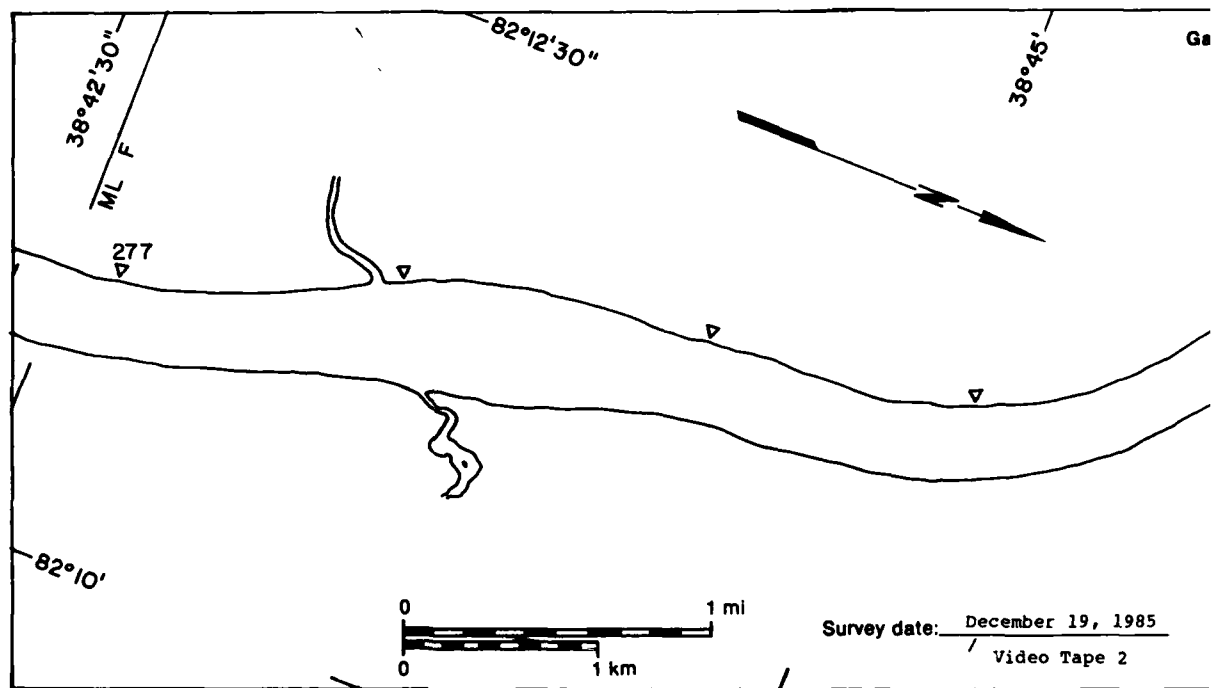
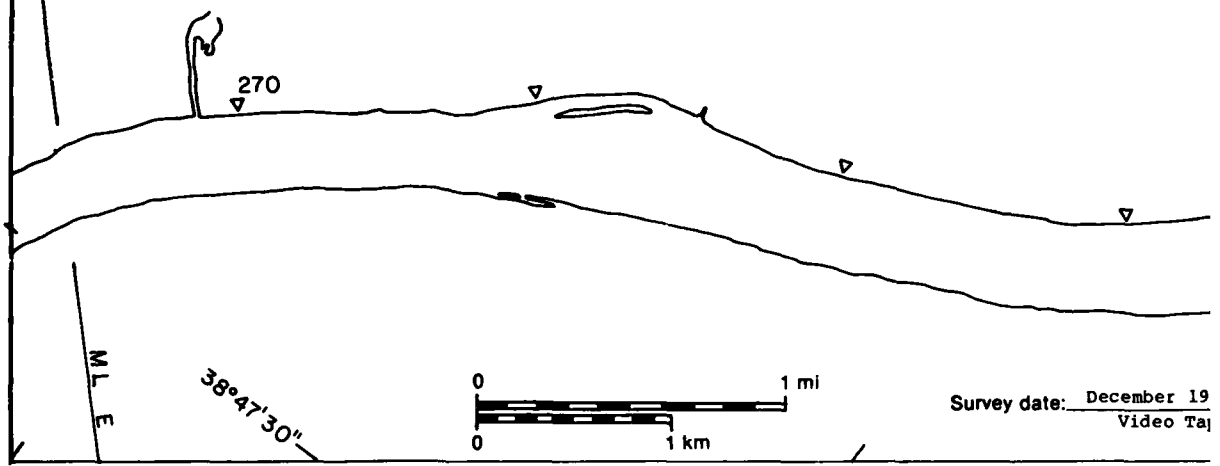
UNCLASSIFIED CRREL-SP-87-20

F/G 8/12

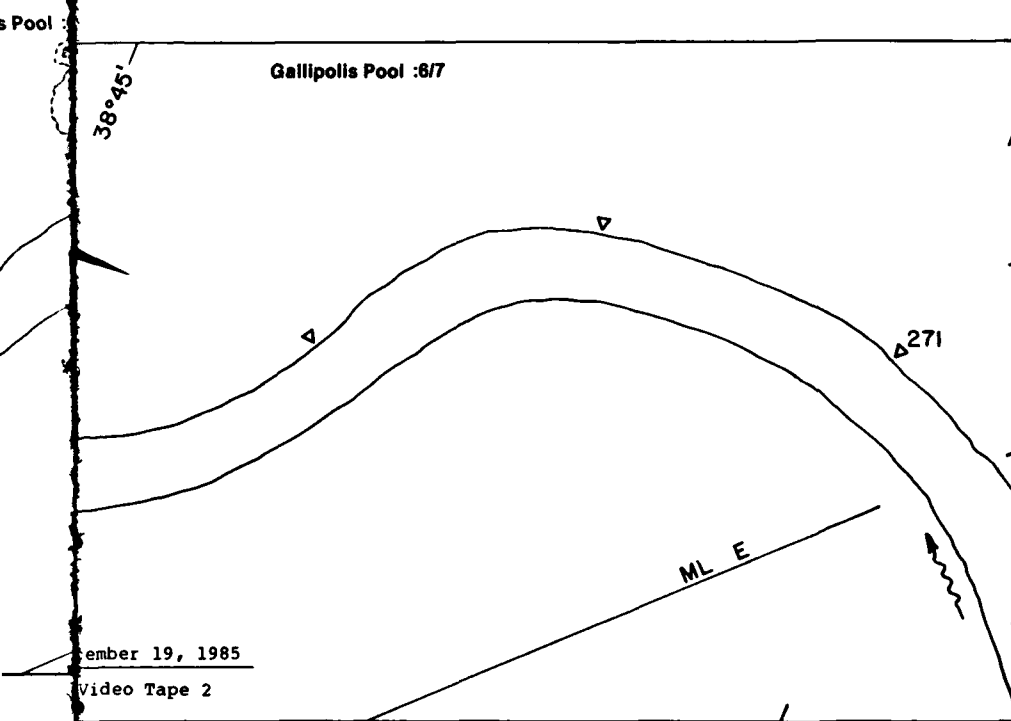
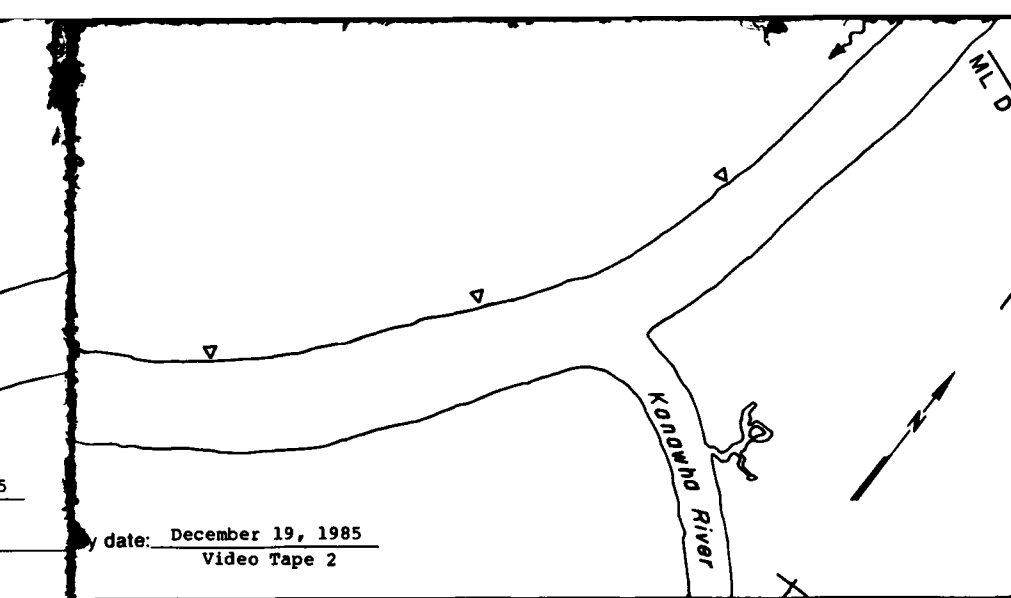
NL

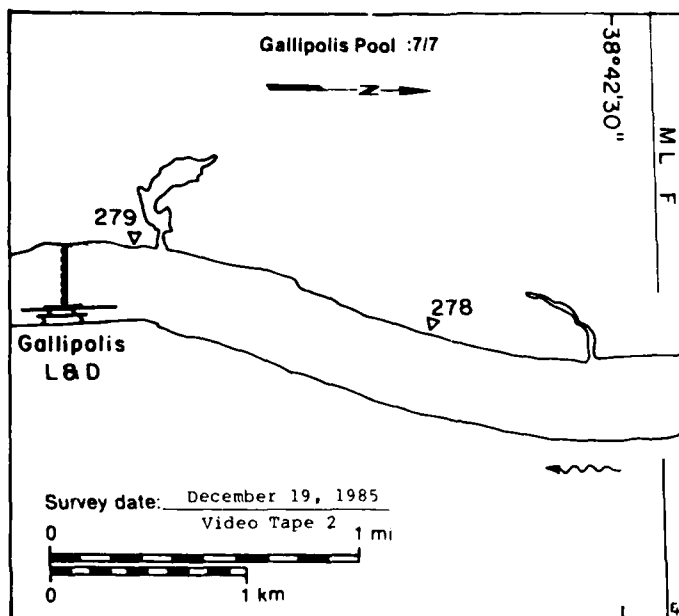









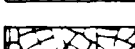
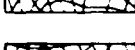

C





Gallipolis Pool

MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Area
($\pi^2 \times 10^6$)

24.26

0.00

0.00

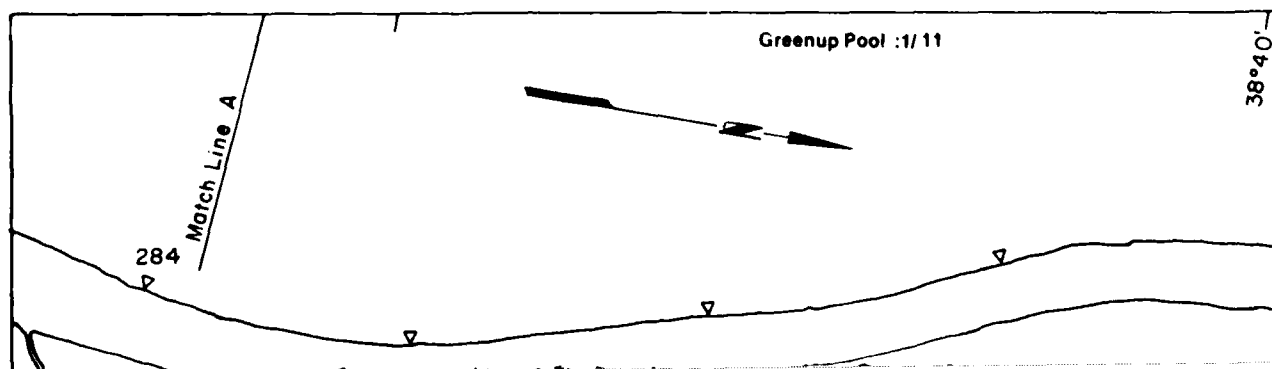
0.00

0.00

0.00

Total area ($\pi^2 \times 10^6$)

24.65*

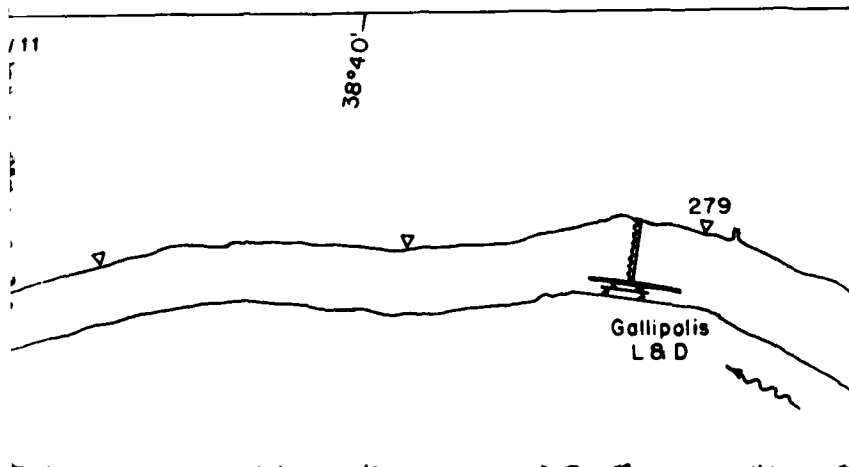


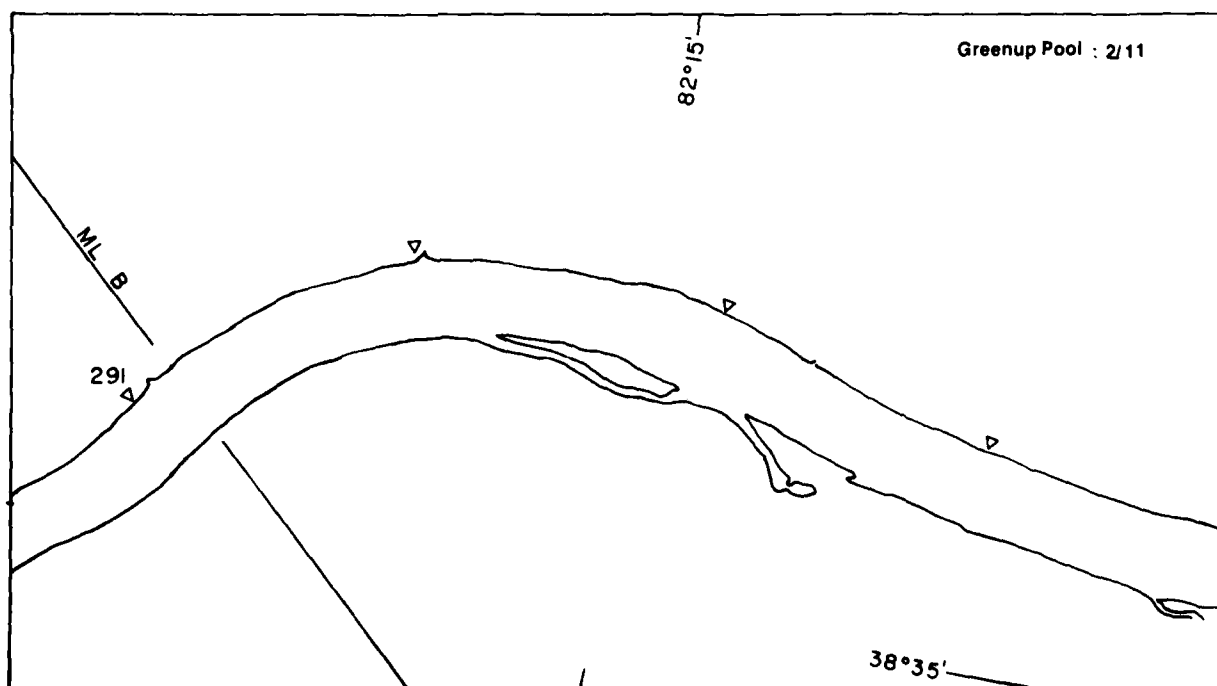
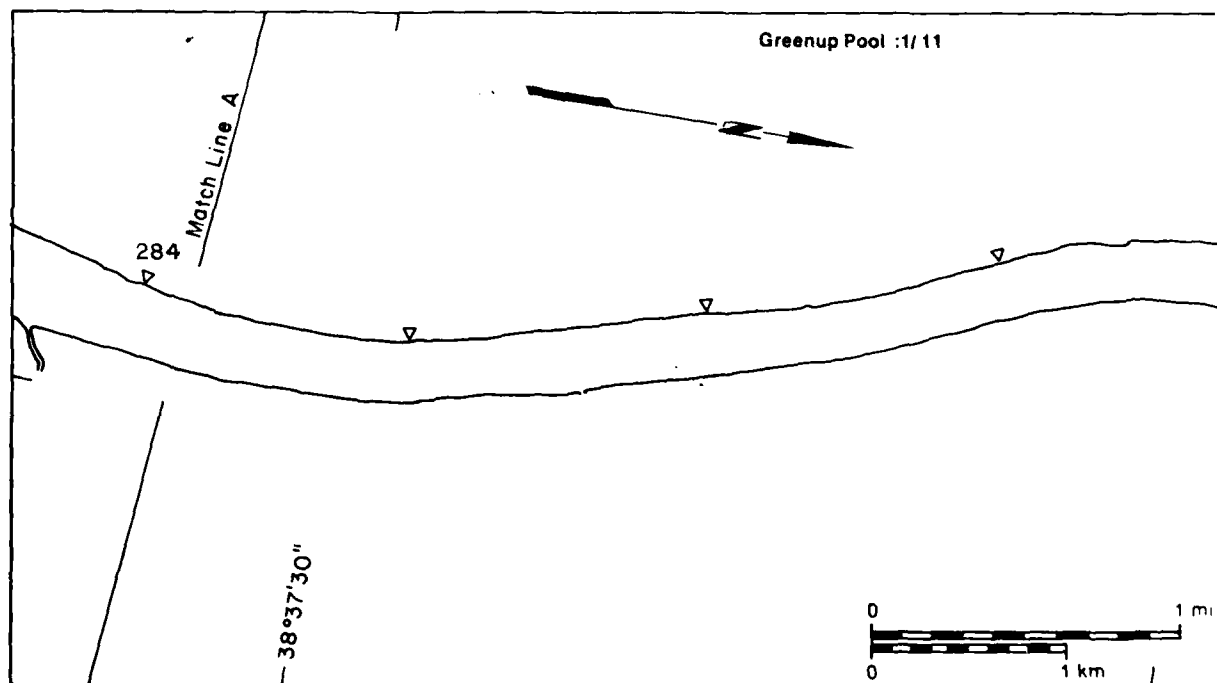
19 December 1985

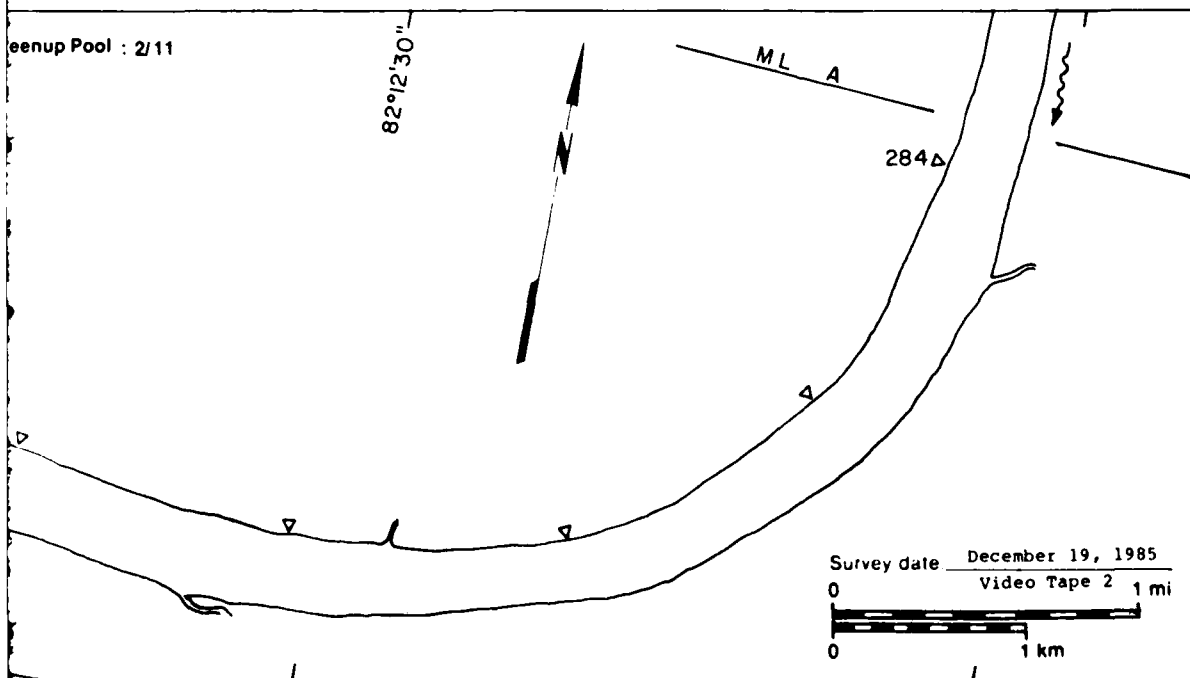
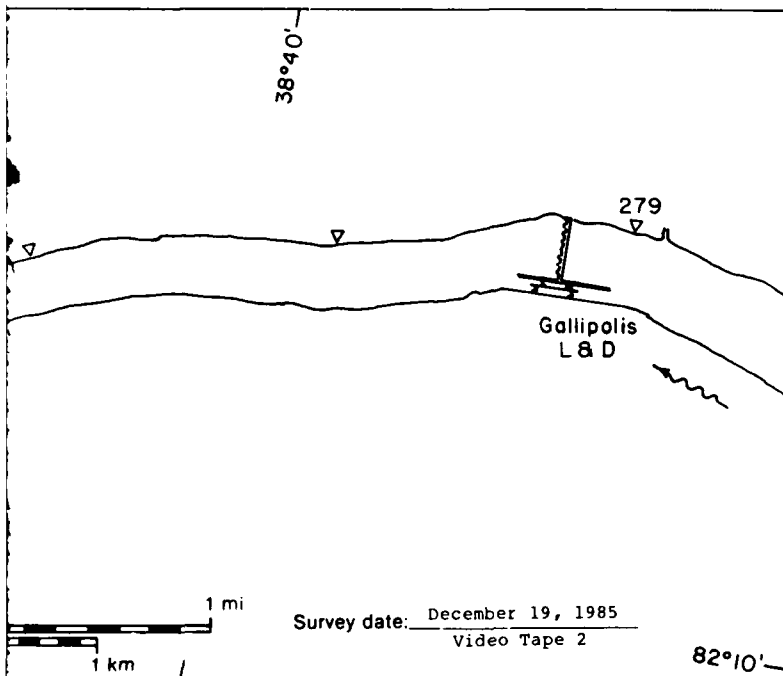
Gallipolis Pool

MAP UNITS

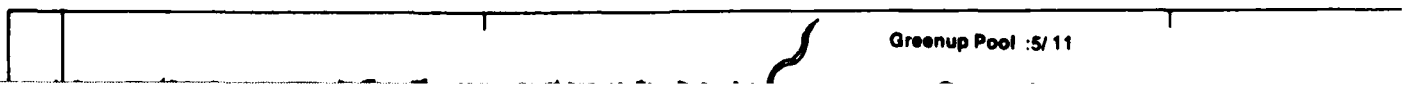
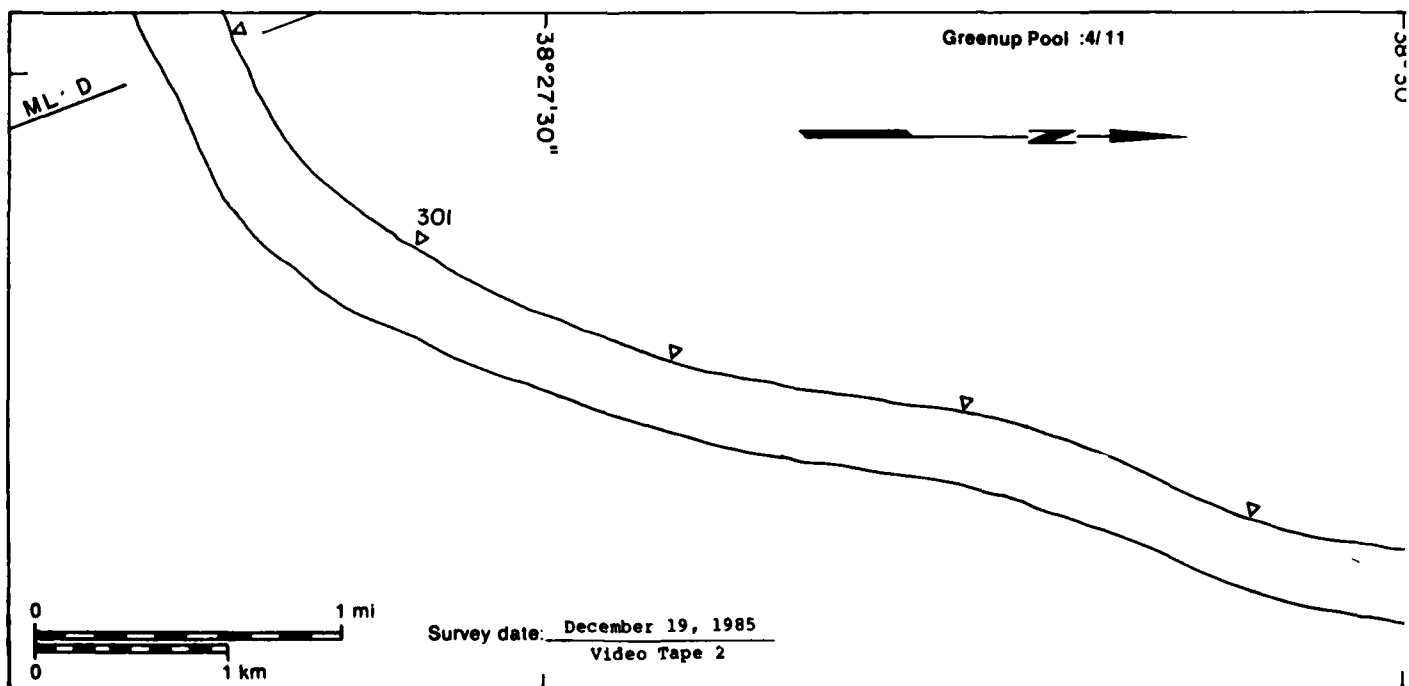
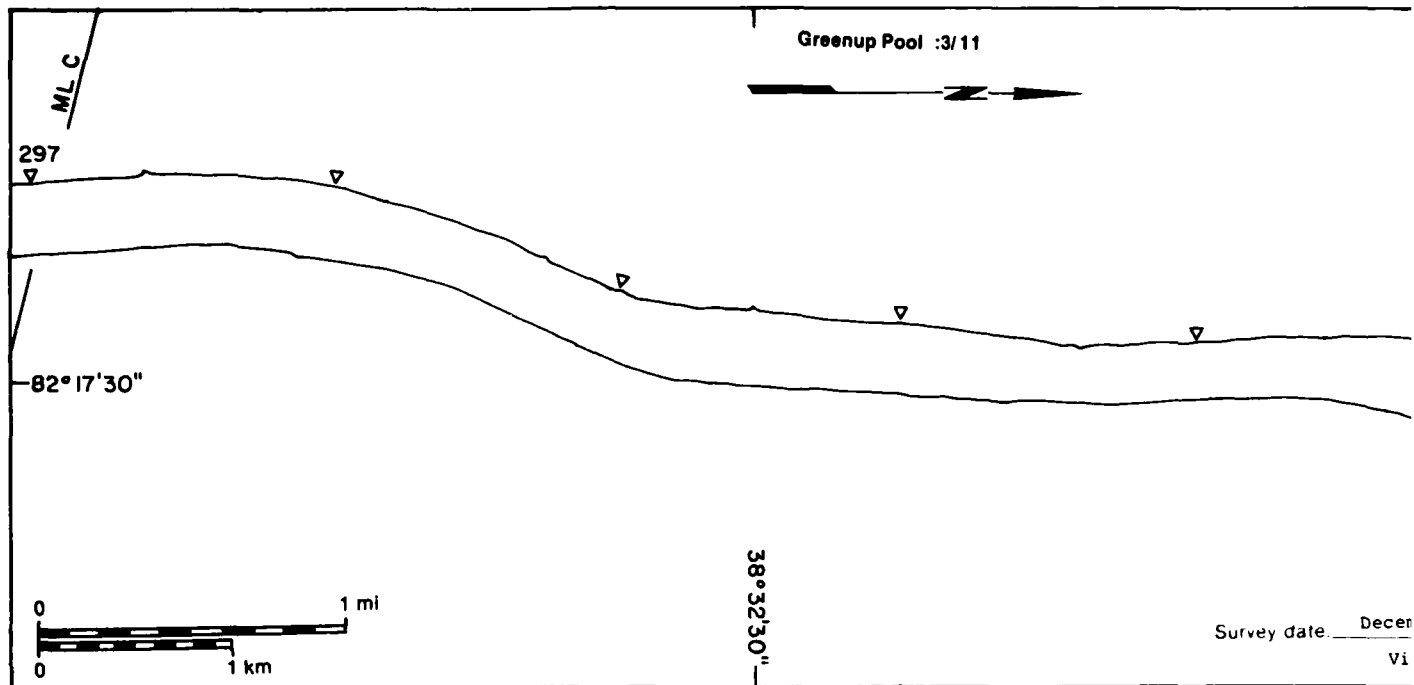
	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	24.26	NA
Solid ice cover	0.00	NA
Solid ice cover with open-water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open-water areas	0.00	—
Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)	24.65*	* Includes $0.39 \times 10^6 m^2$ of no video coverage

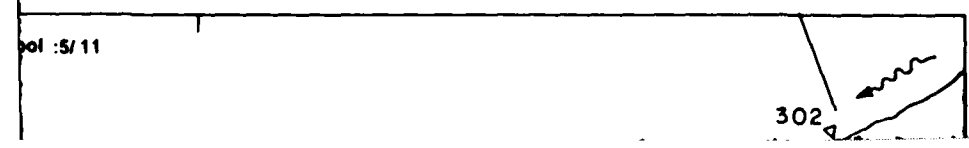
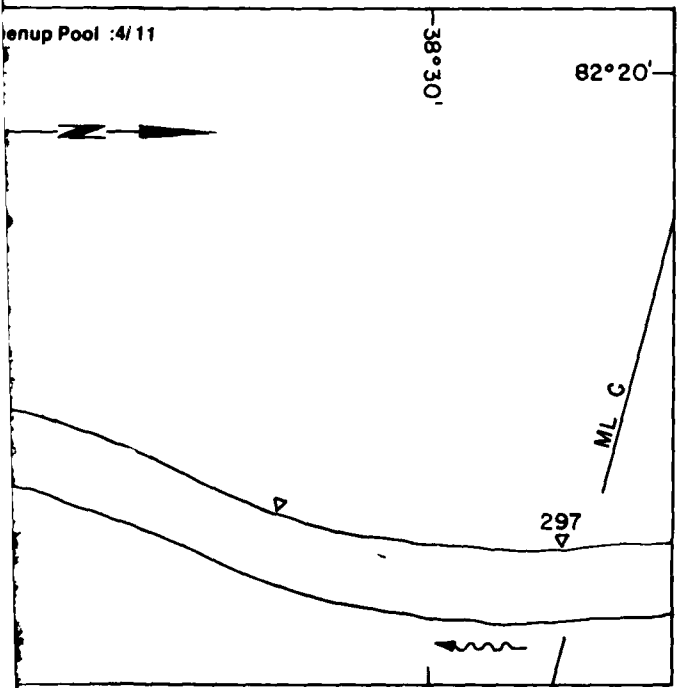
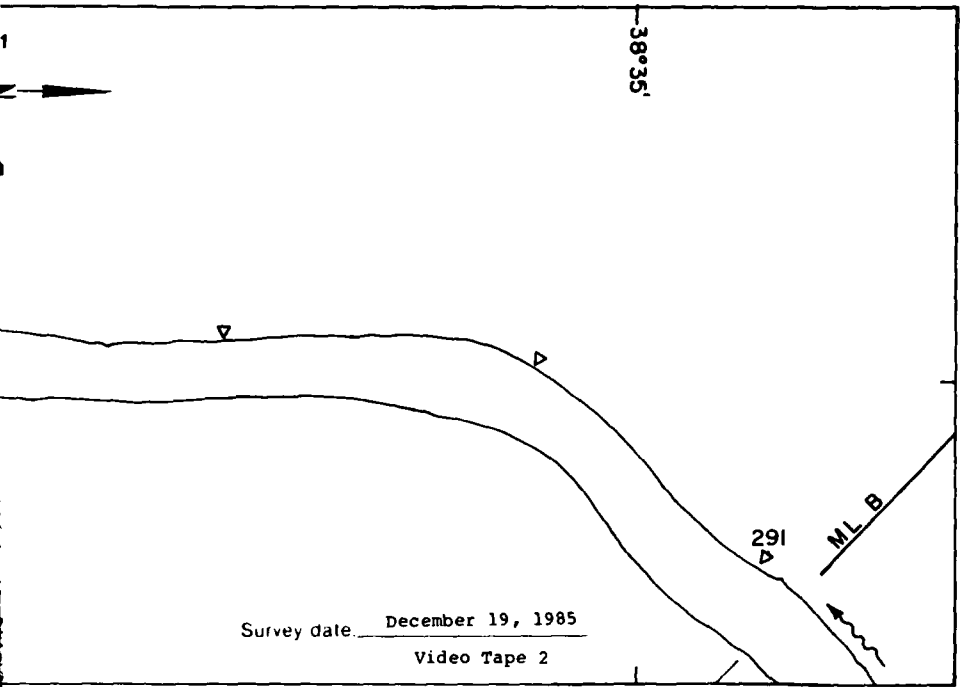


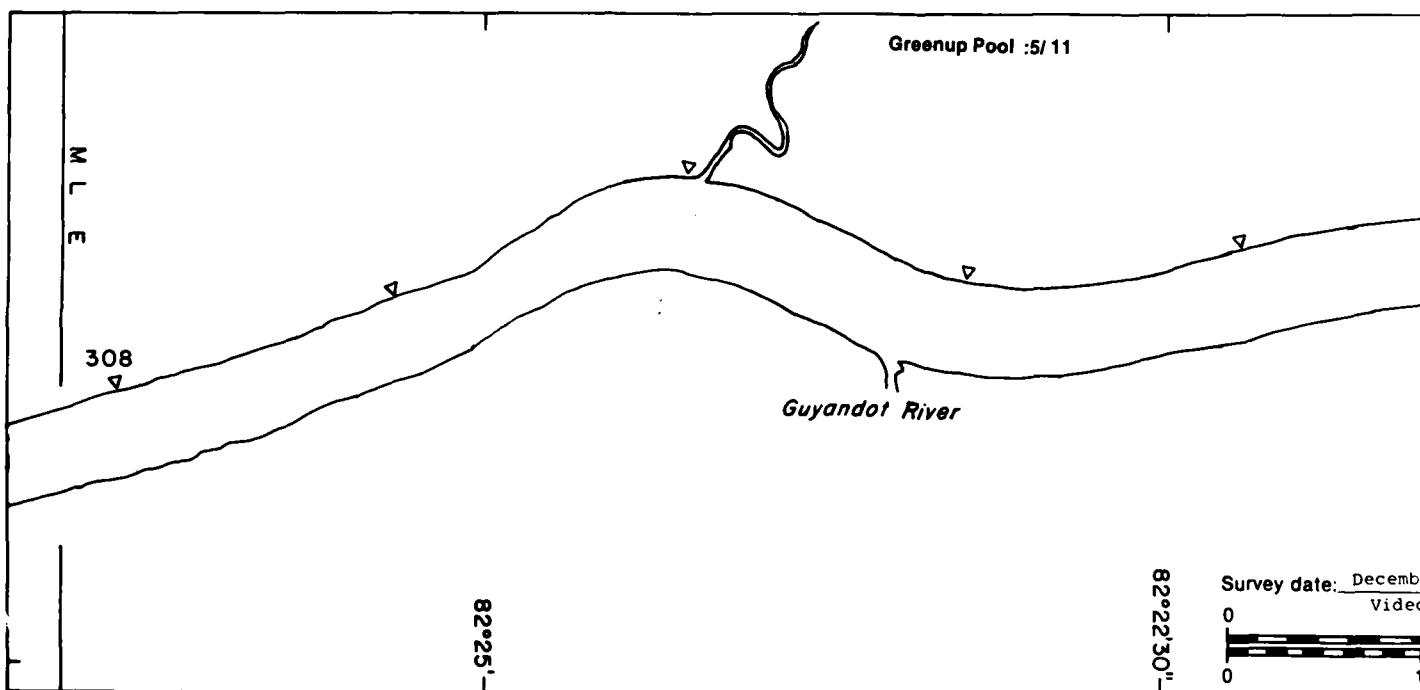
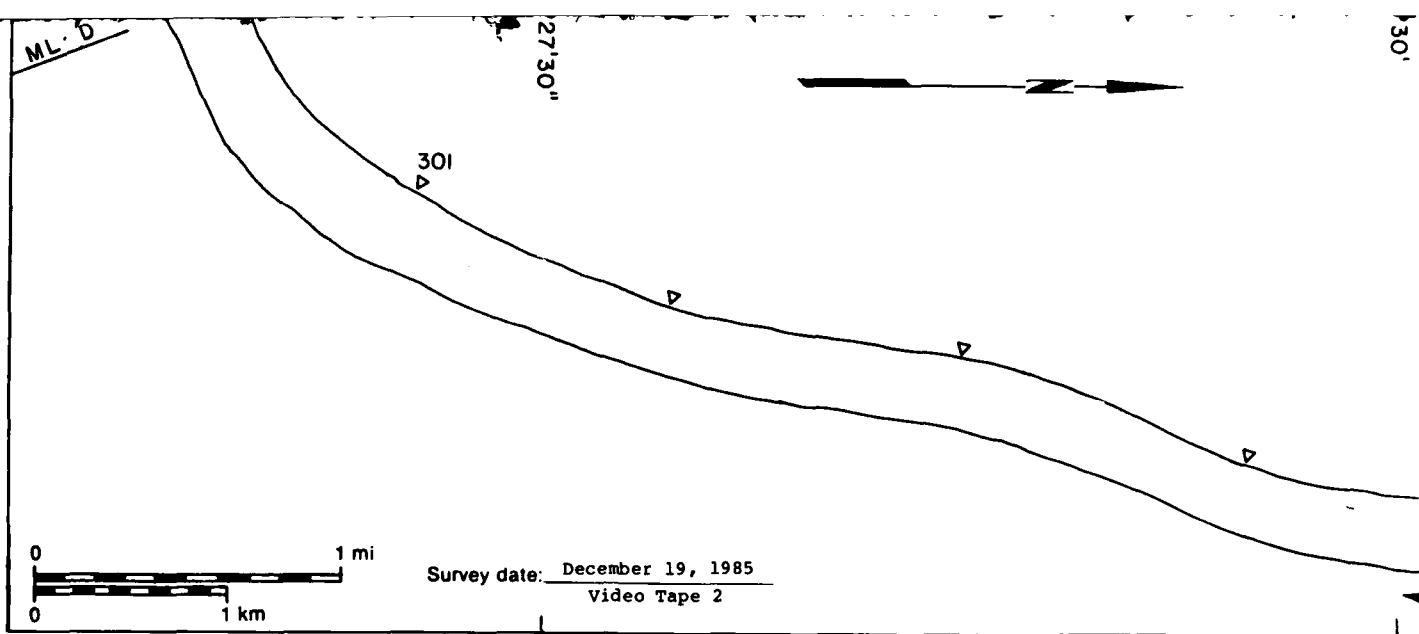


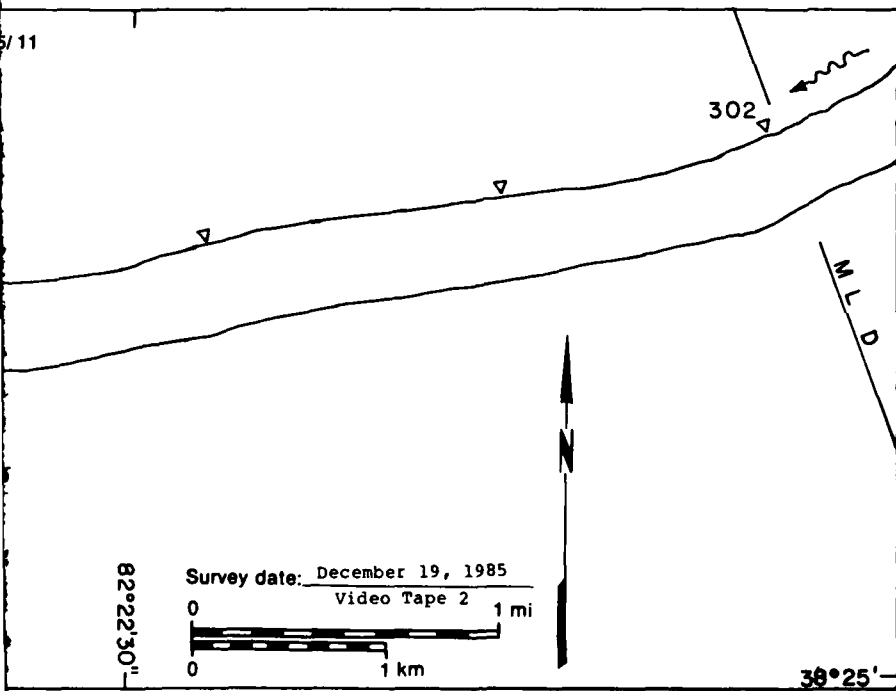
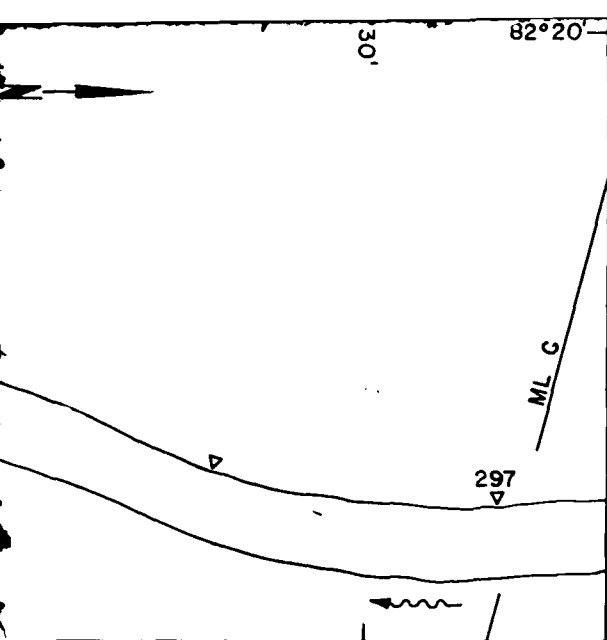


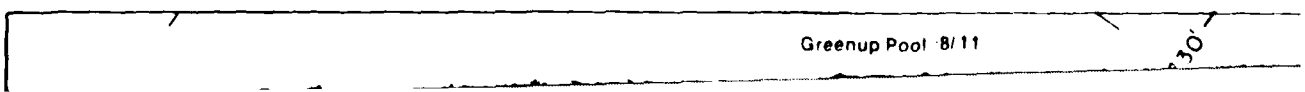
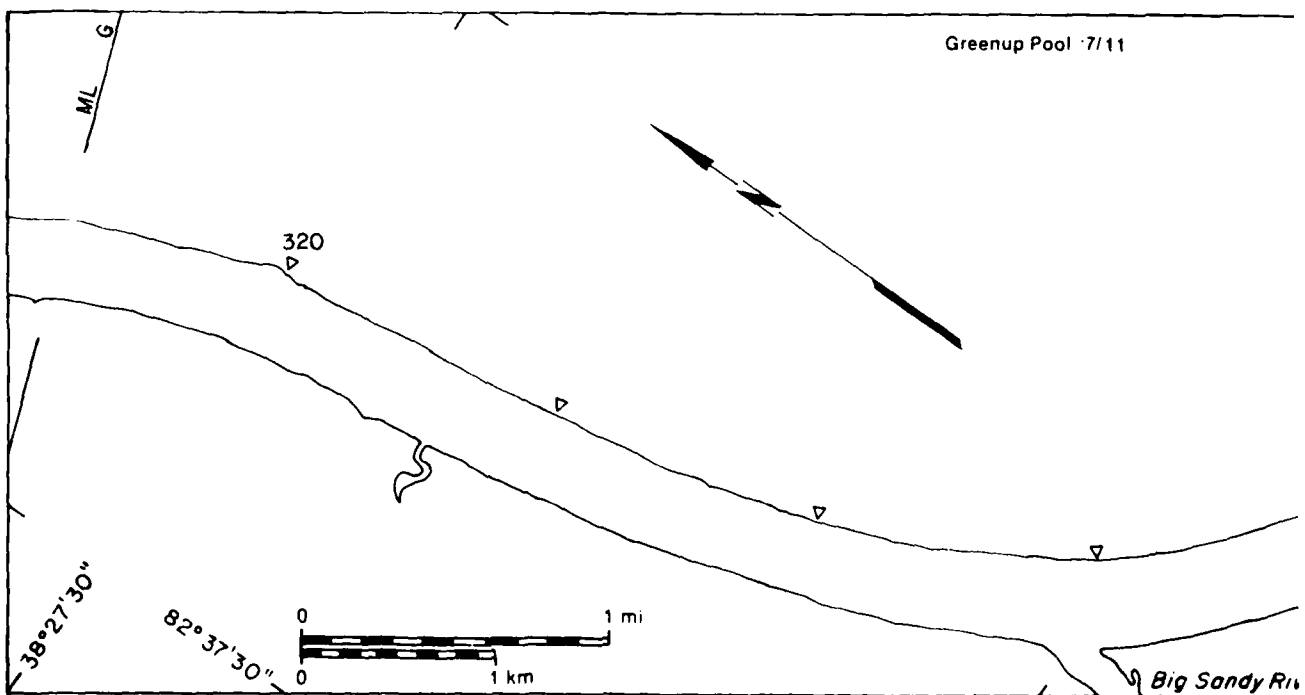
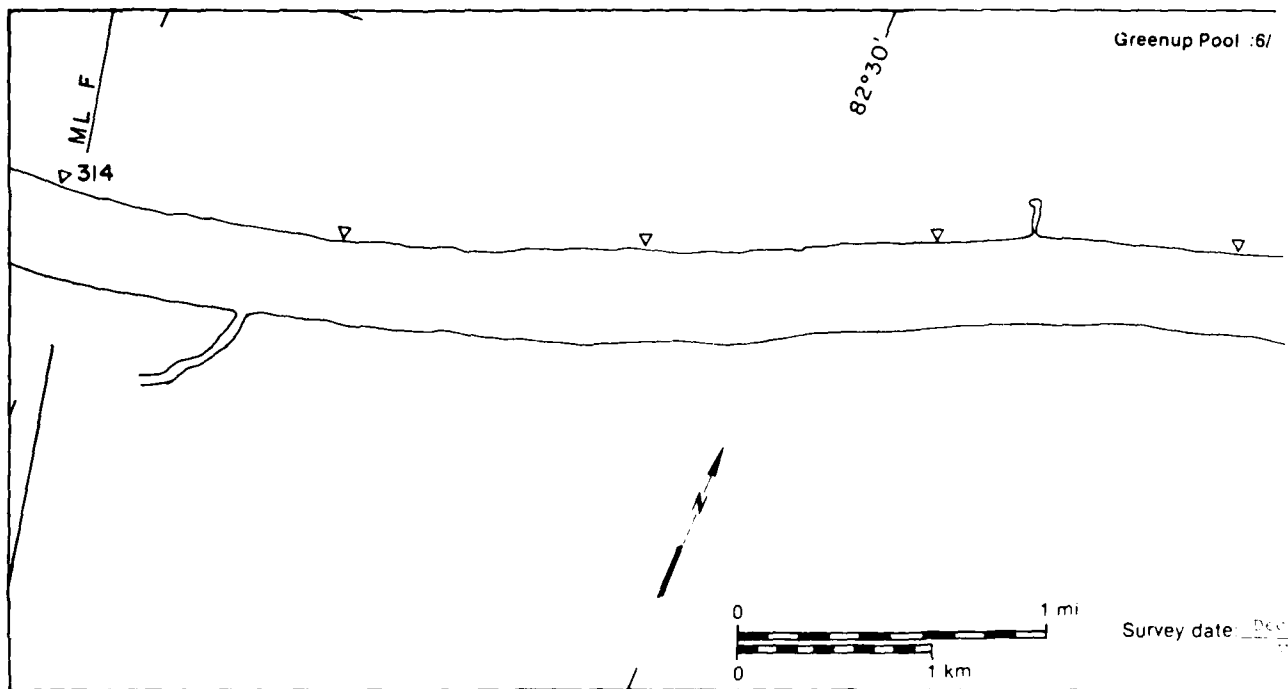
19 December 1985



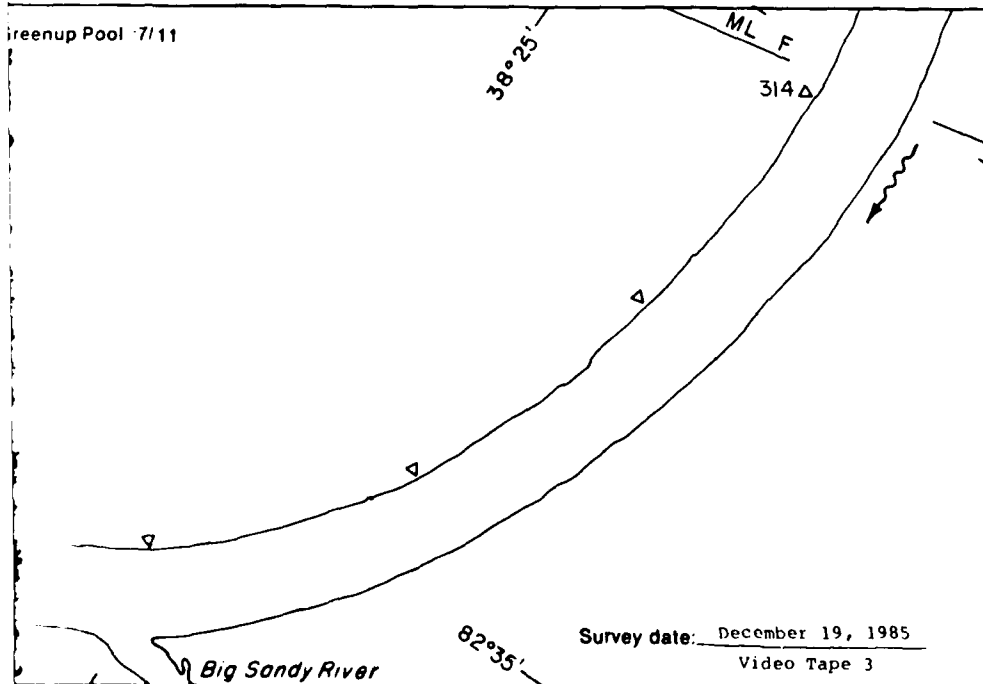
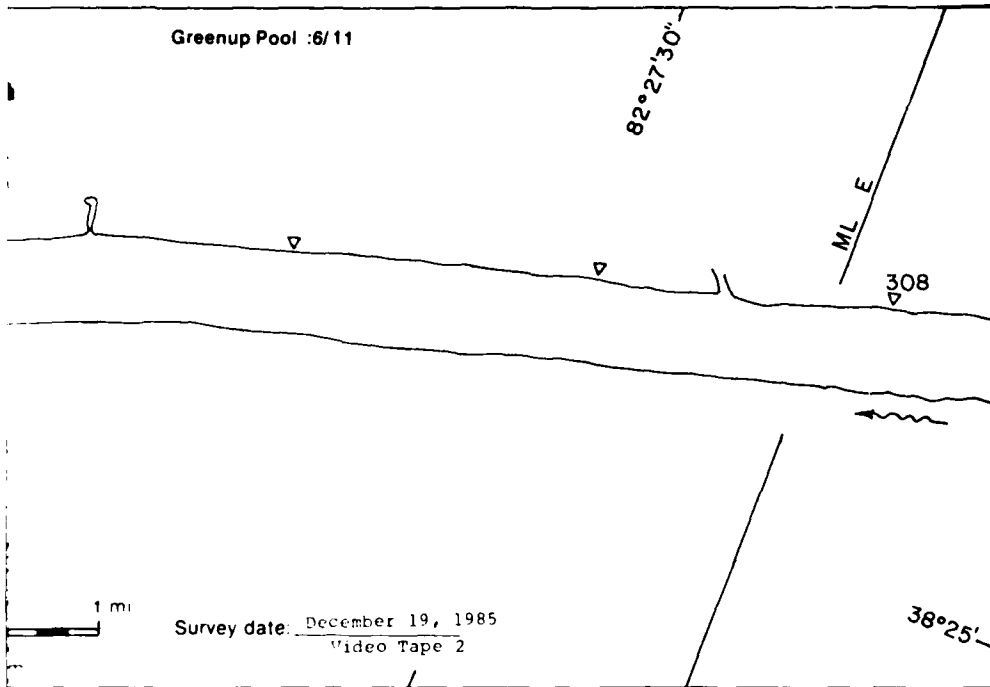




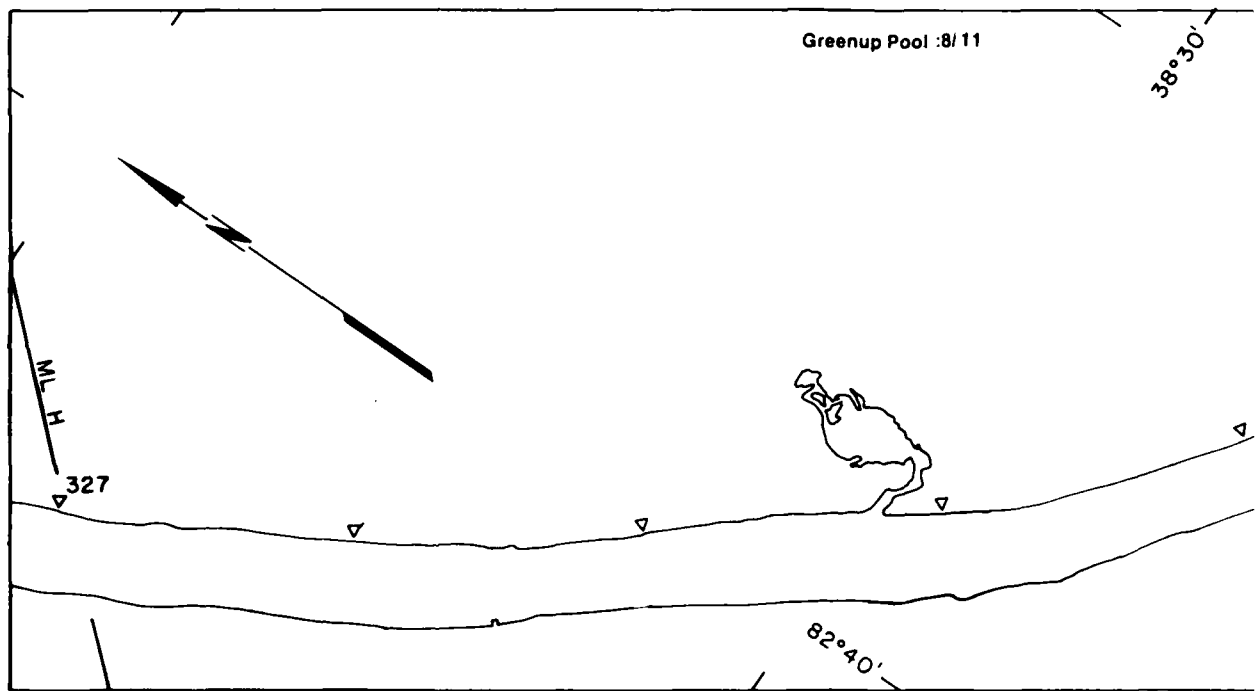
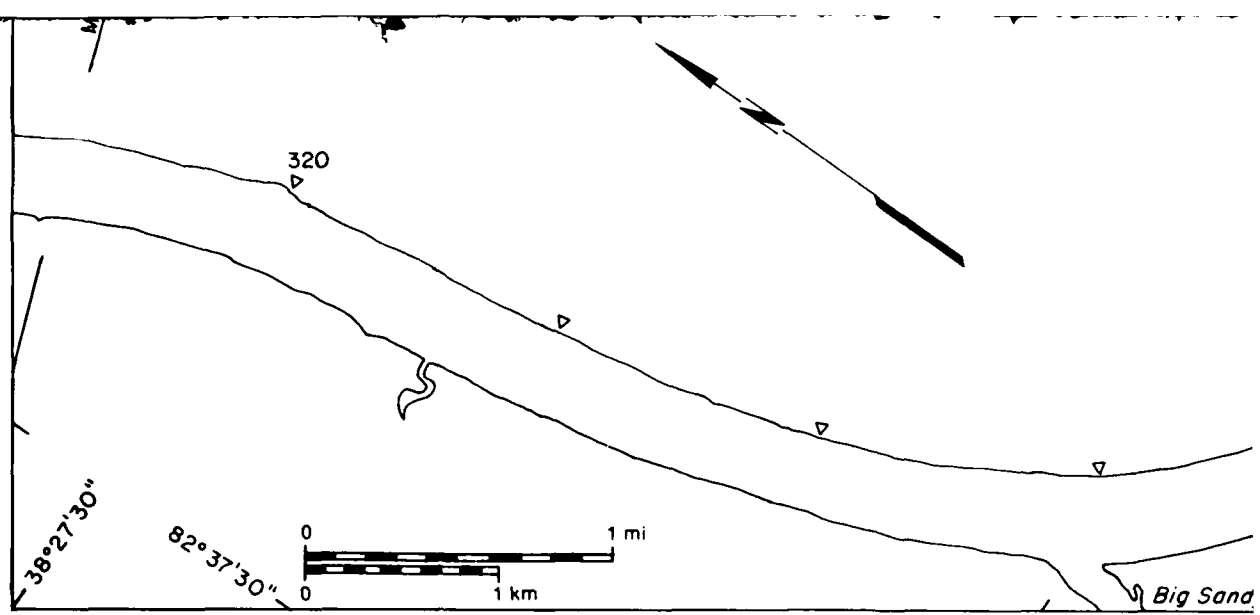


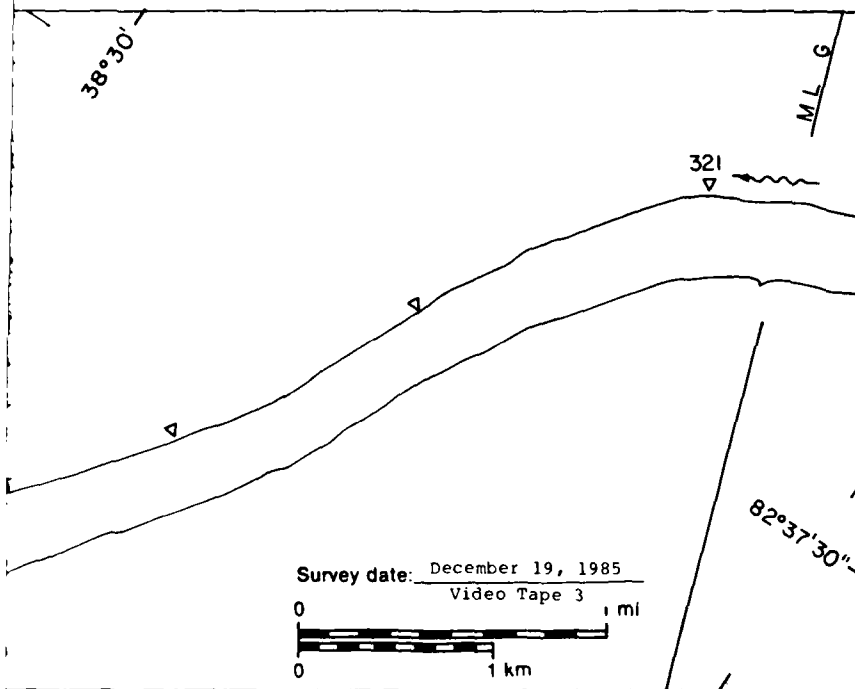
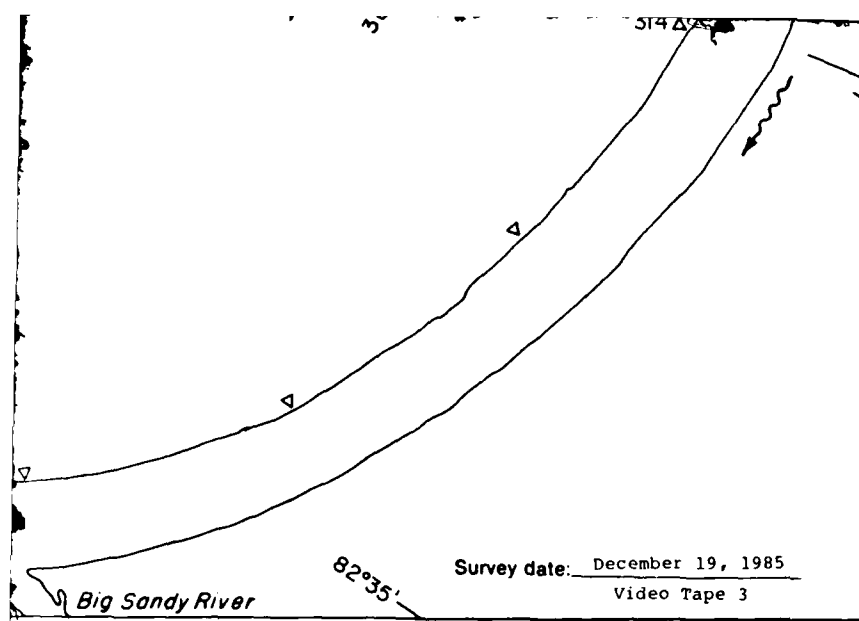


19 December 1985

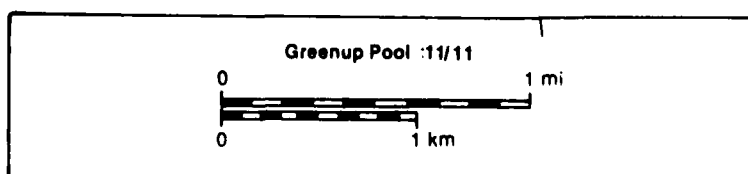
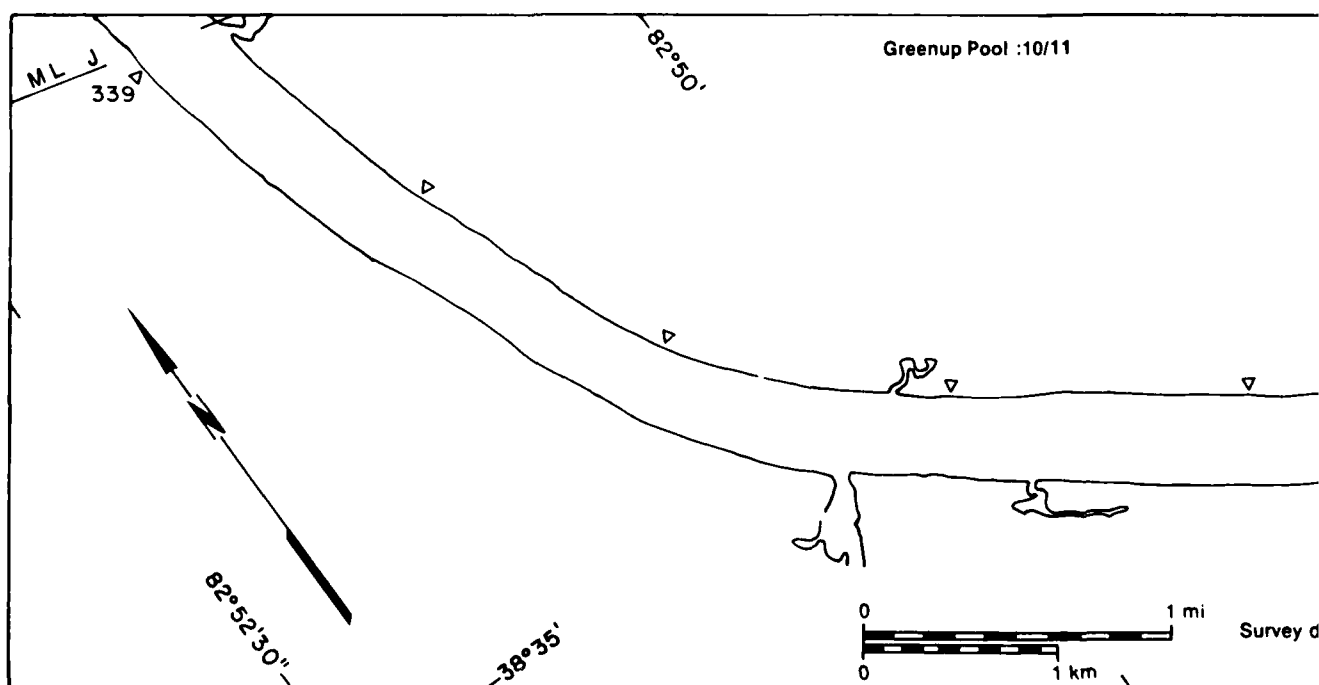
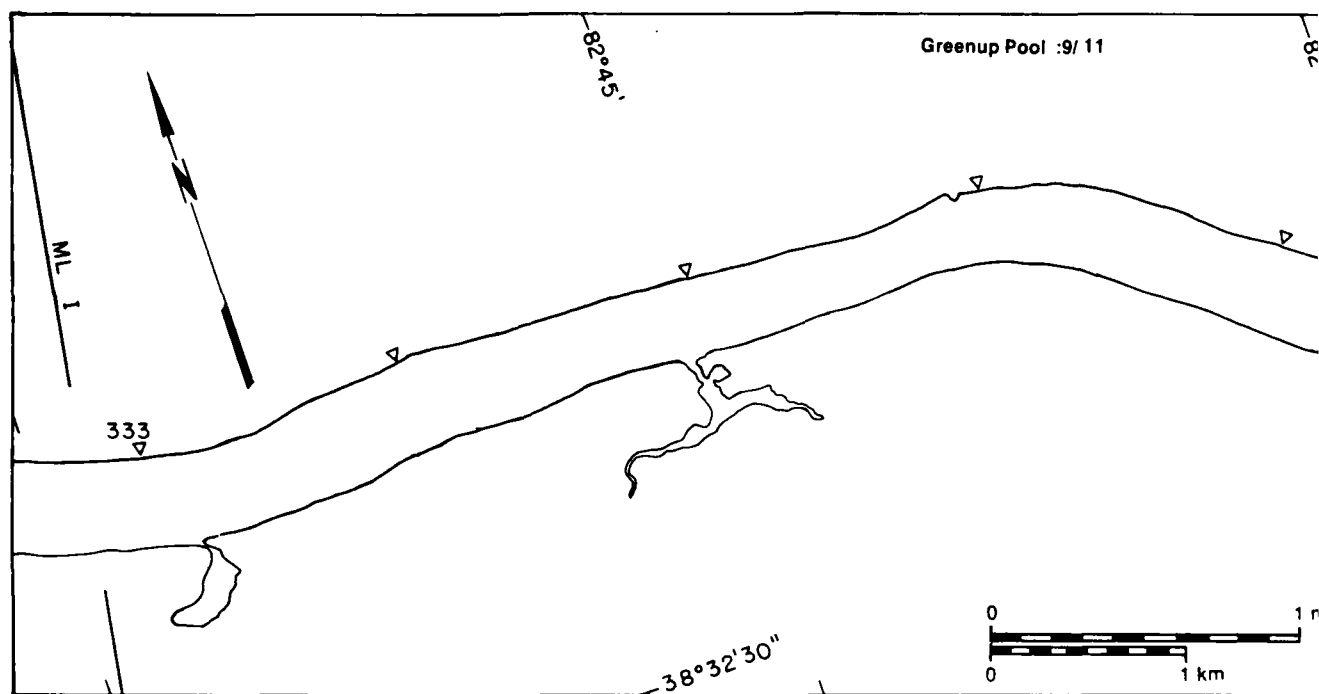


30'



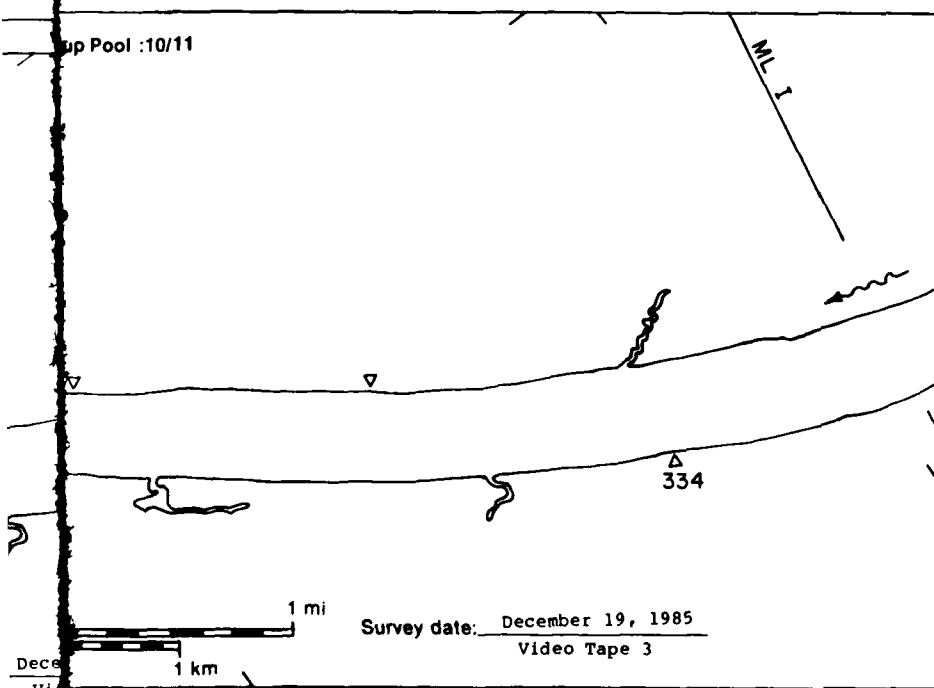
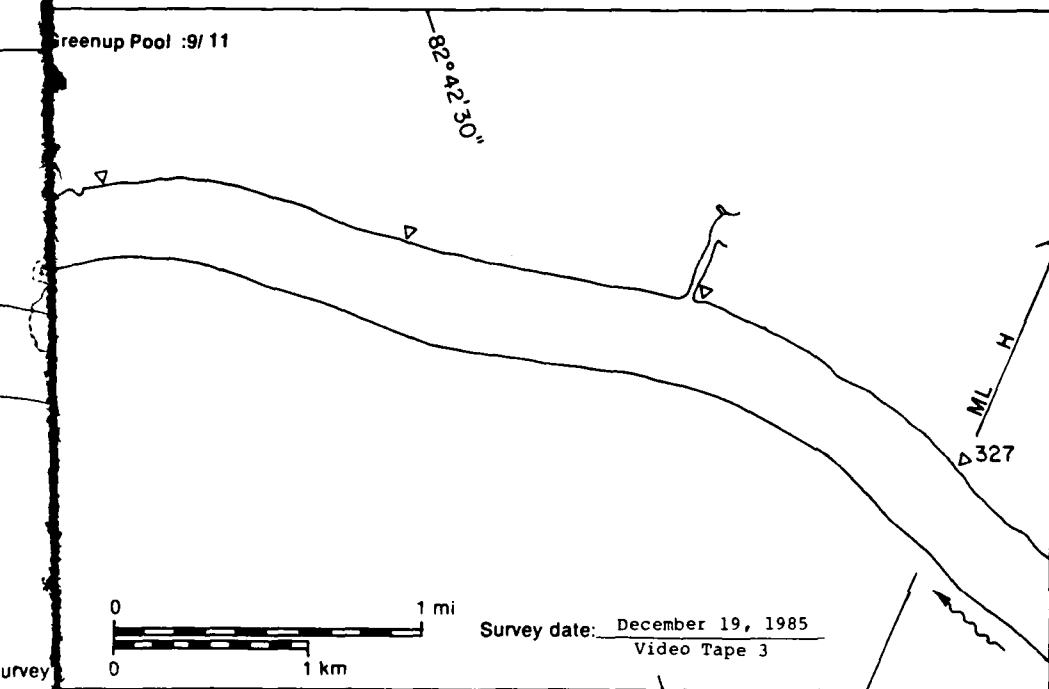


19 December 1985



Greenup Pool
MAP UNITS

Ar
(m² x

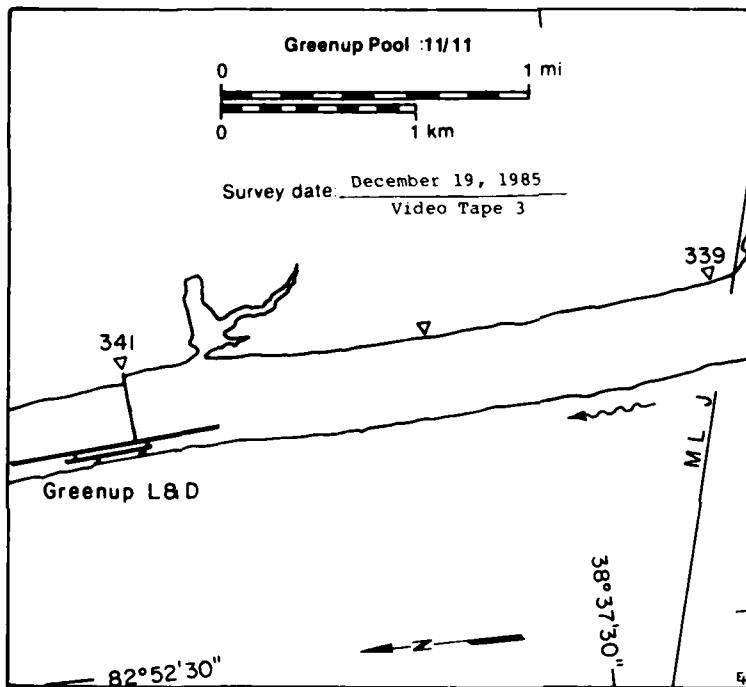
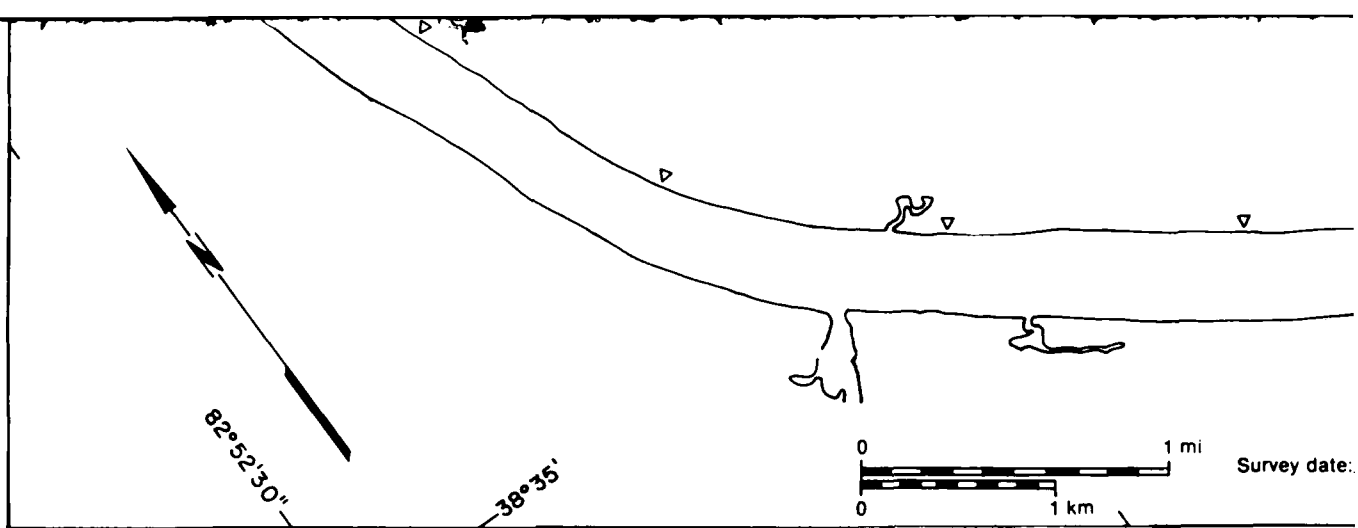


Greenup Pool

MAP UNITS





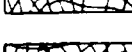

Area (m ² x 10 ⁶)	Surface concentration (%)
41.19	NA

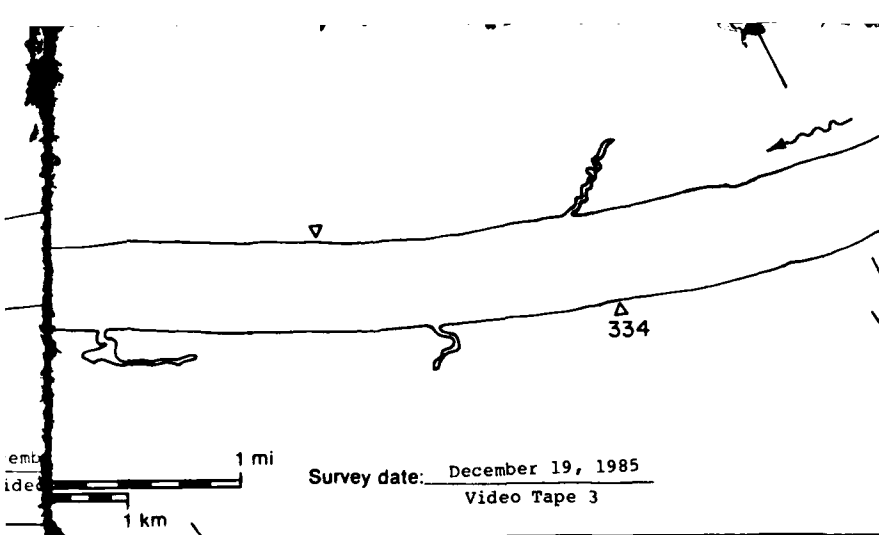
Open water



Greenup Pool

MAP UNITS

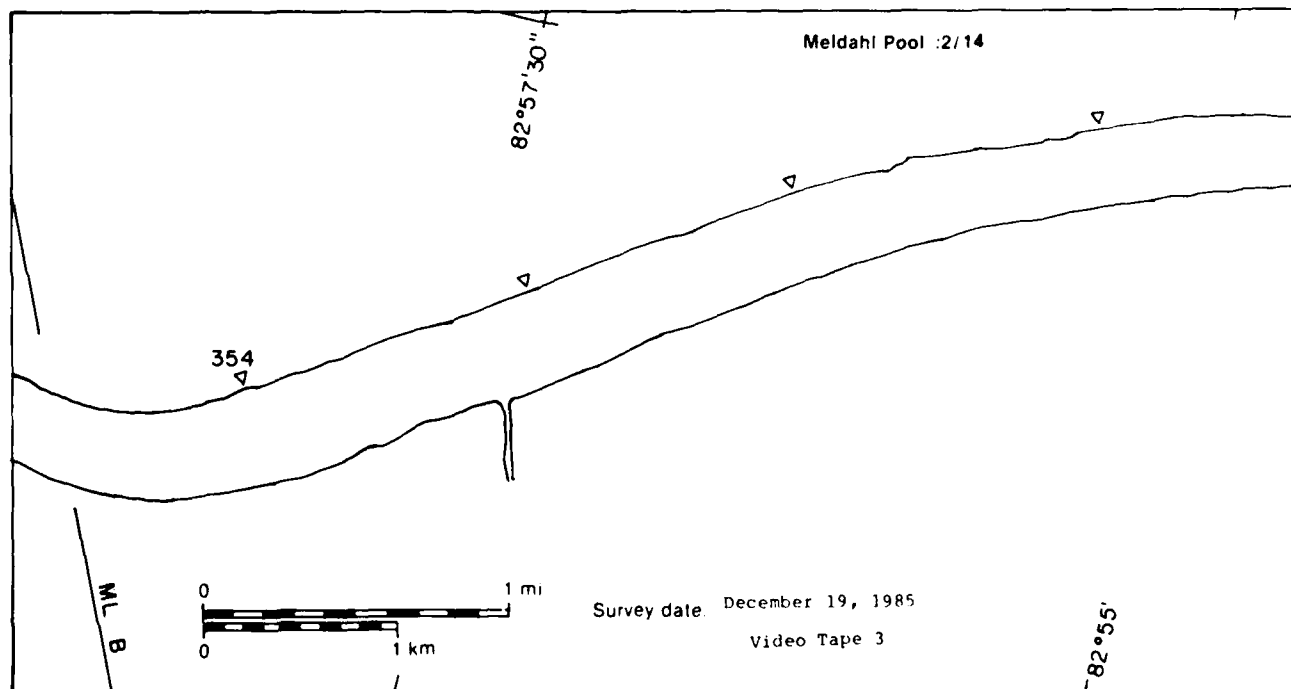
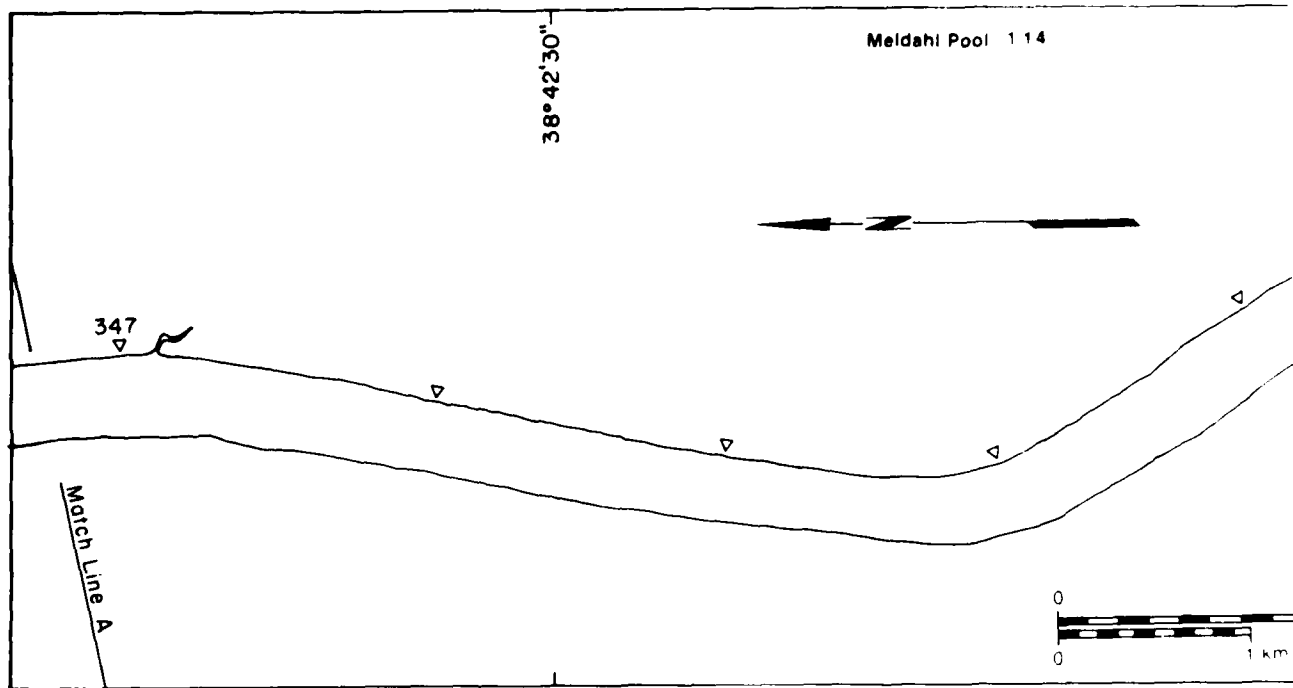
		Area (m ² x 10 ⁶)
	Open water	41.19
	Solid ice cover	0.00
	Solid ice cover with open-water areas	0.00
	Fragmented ice cover	0.00
	Fragmented ice cover with open-water areas	0.00
	Ice floes or frazil slush and pans	0.00
Total area (m ² x 10 ⁶)		41.19



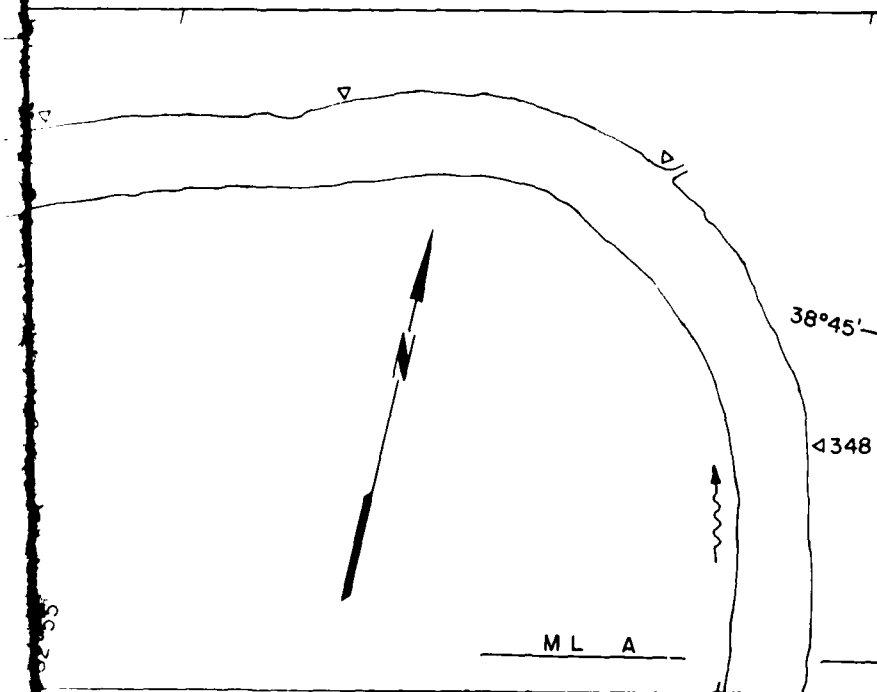
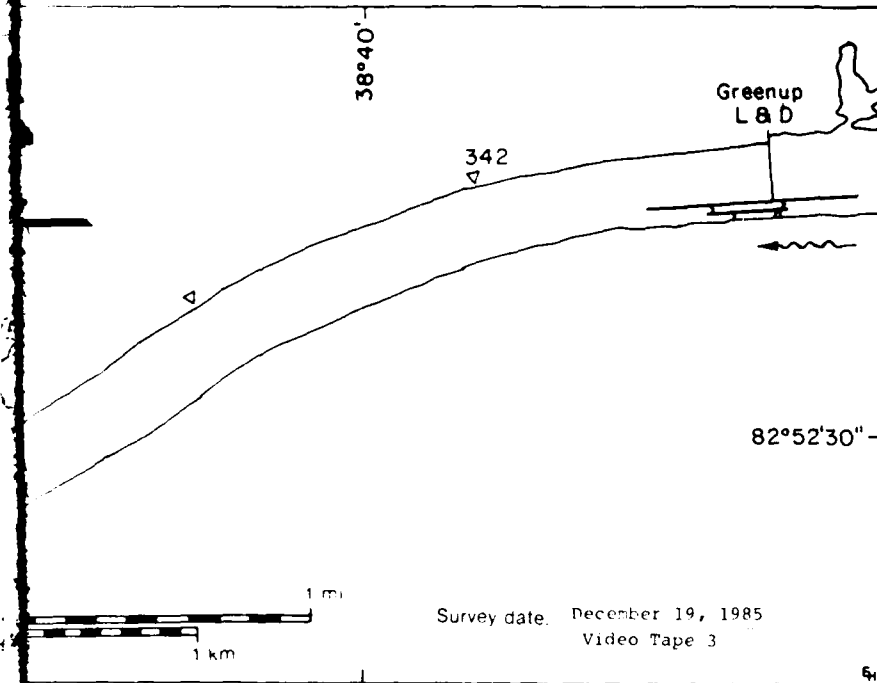
Surface
ance
Greenup Pool

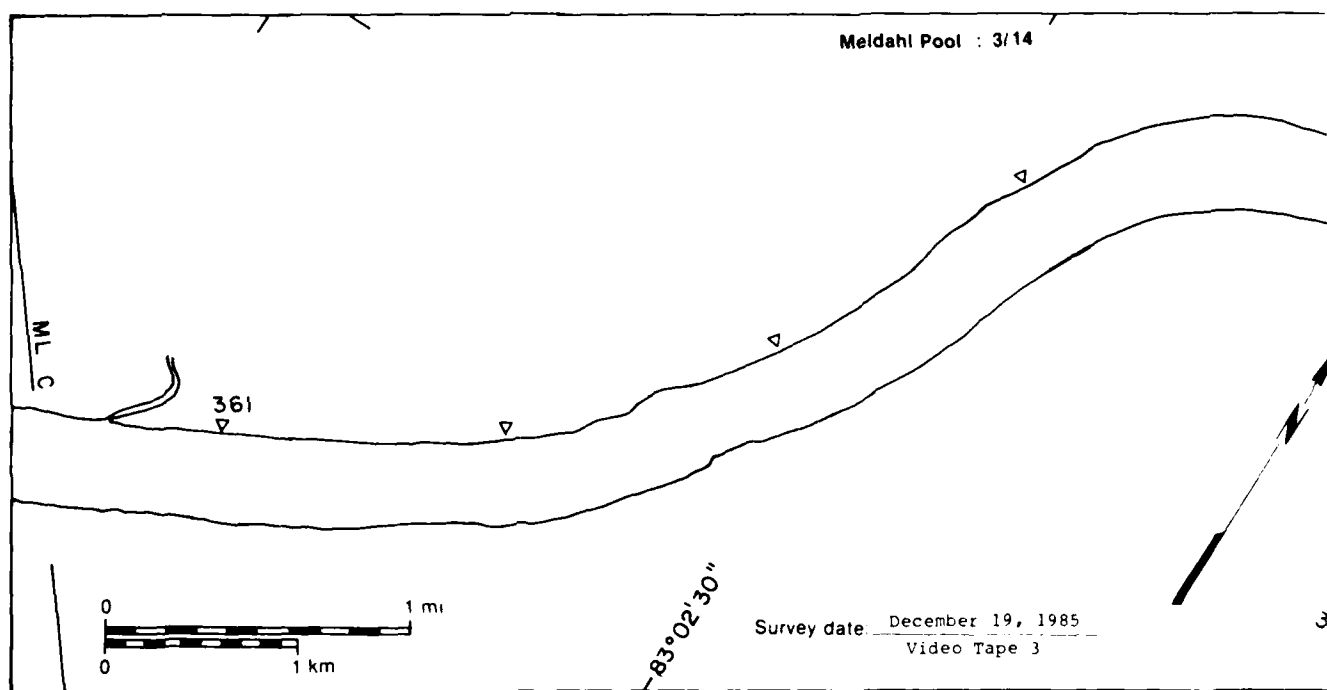
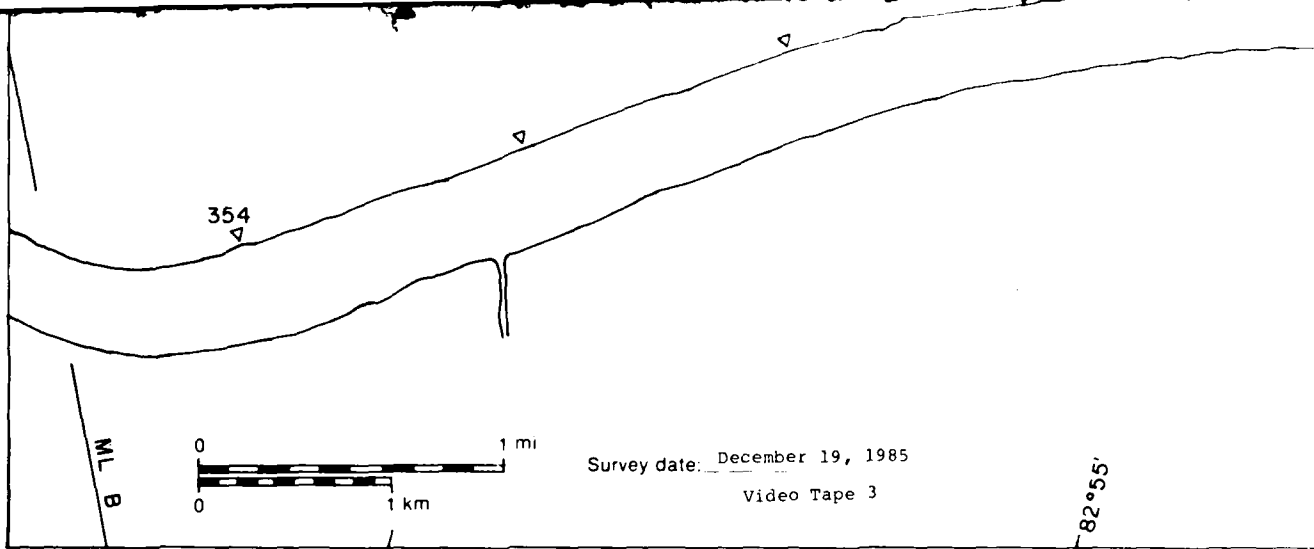
MAP UNITS

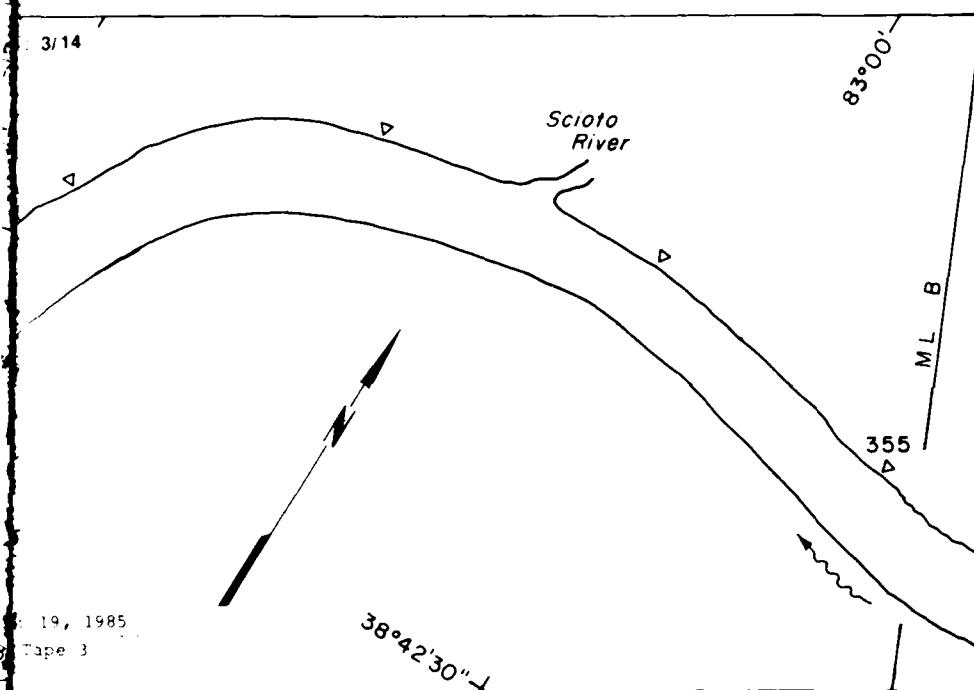
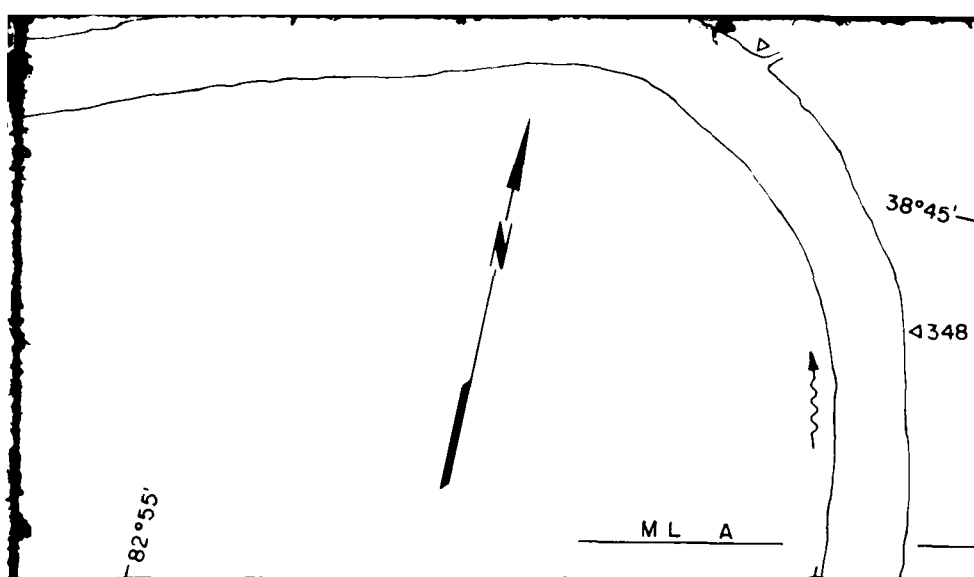
	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	41.19	NA
Solid ice cover	0.00	NA
Solid ice cover with open-water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open-water areas	0.00	—
Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)	41.19	



19 December 1985

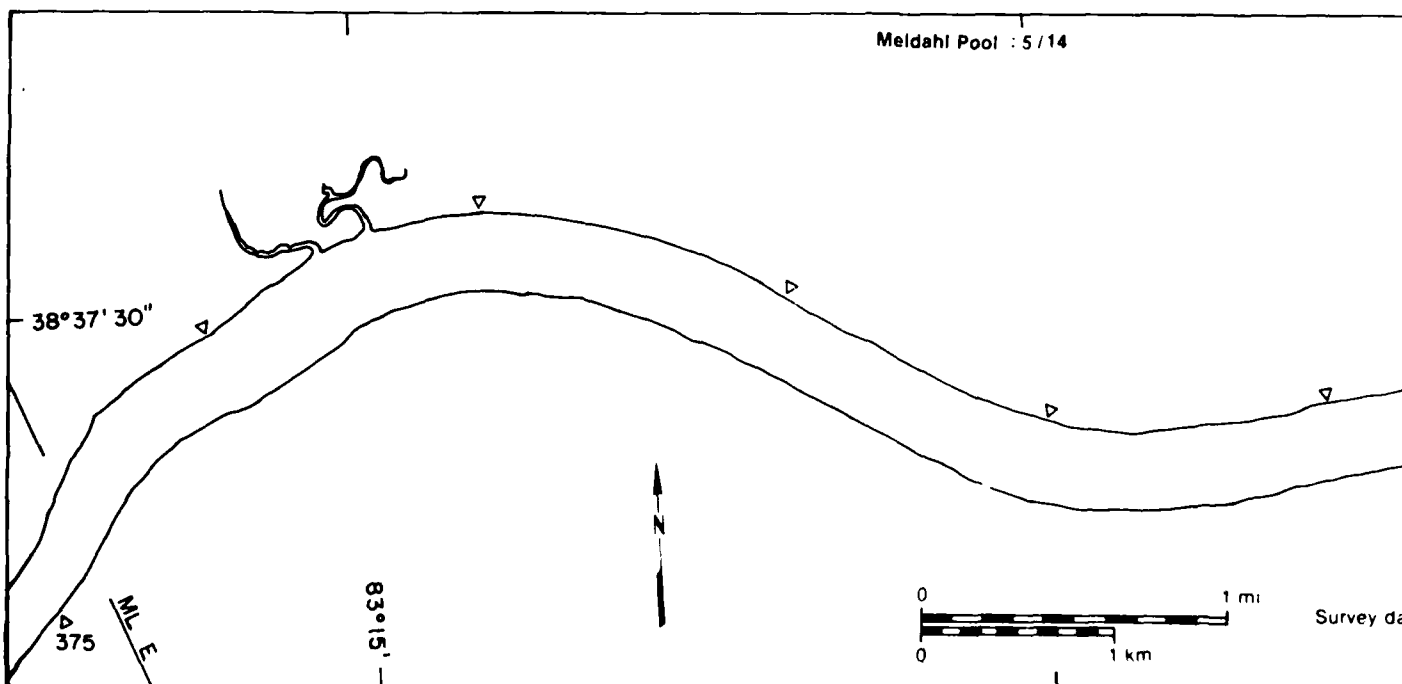
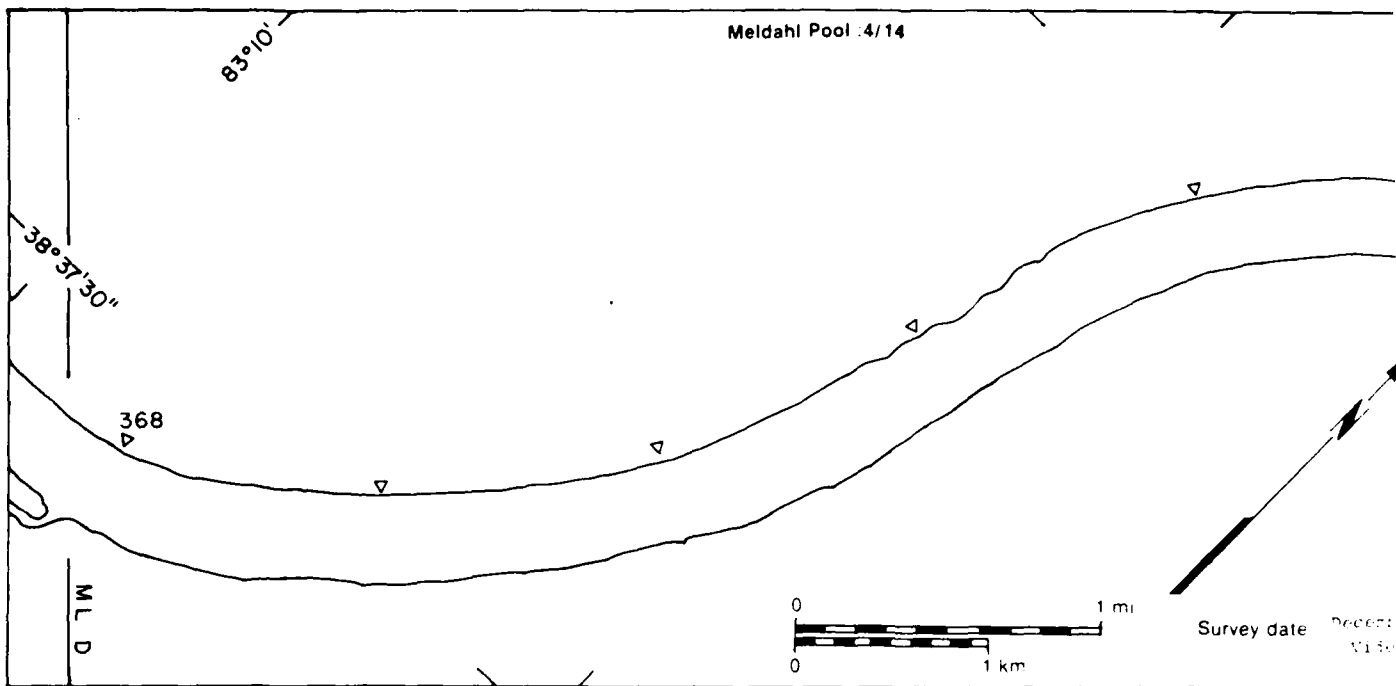


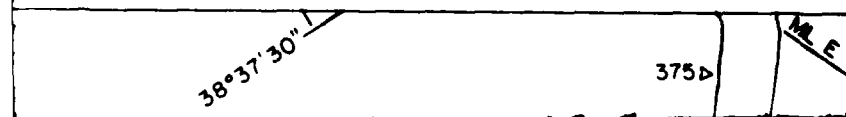
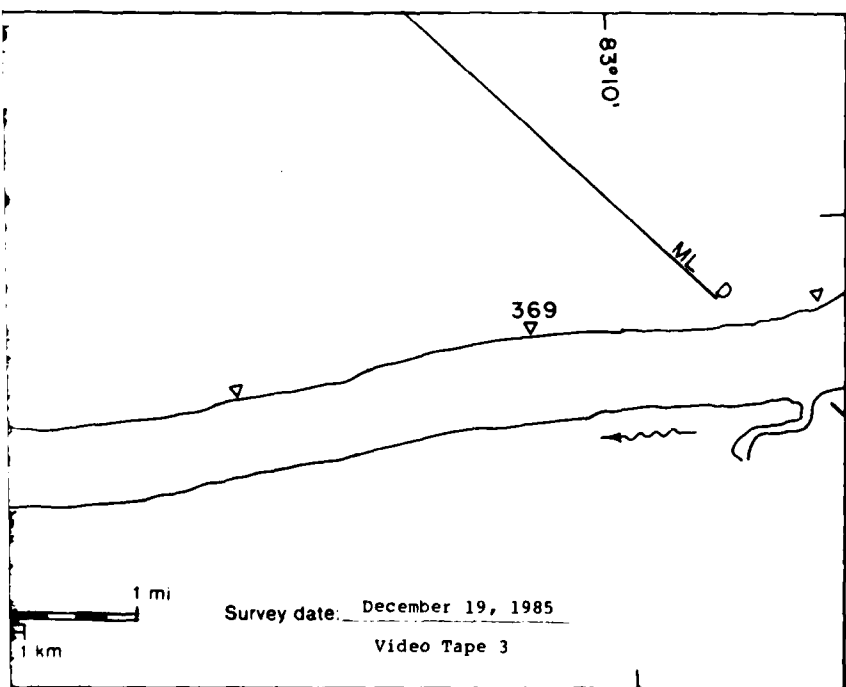
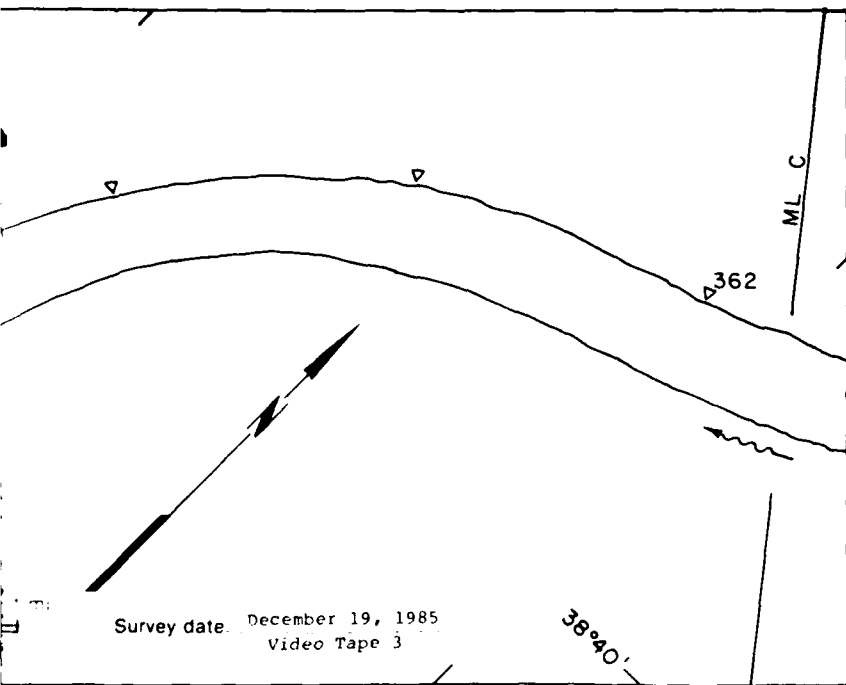


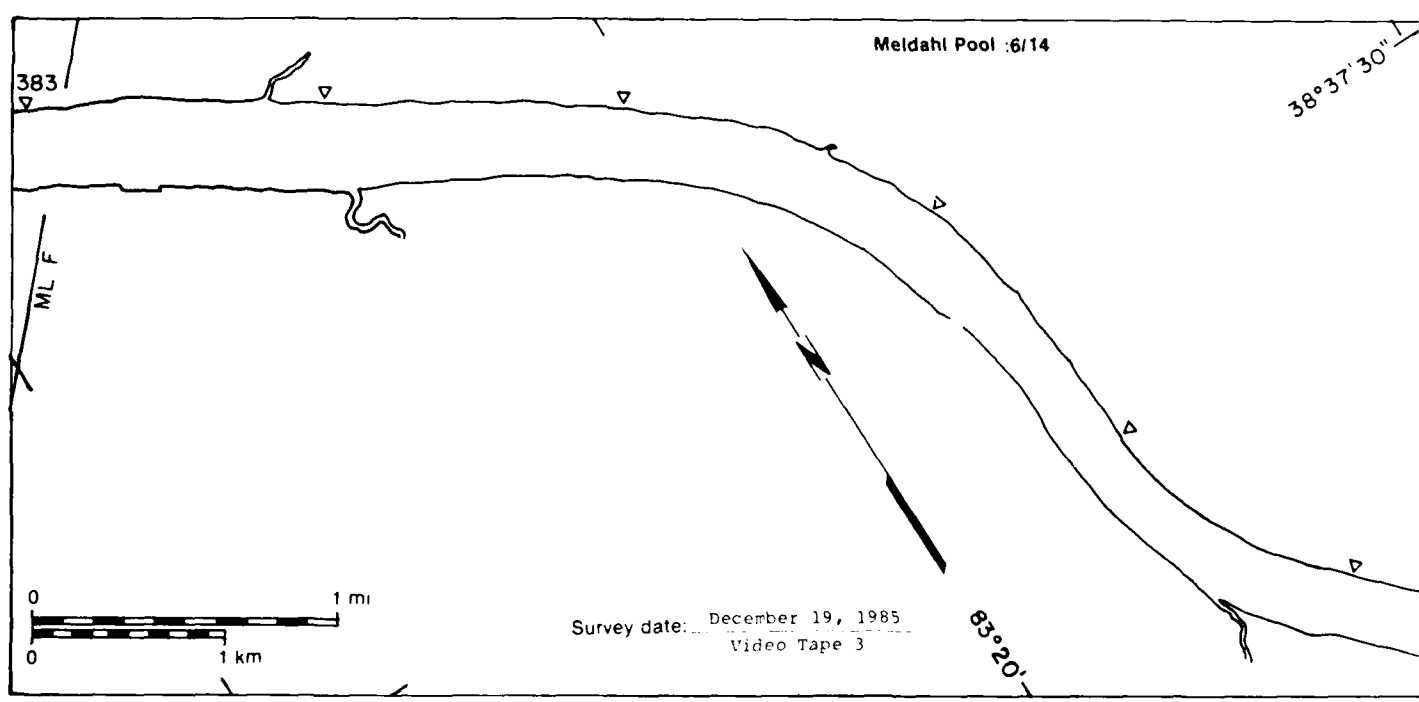
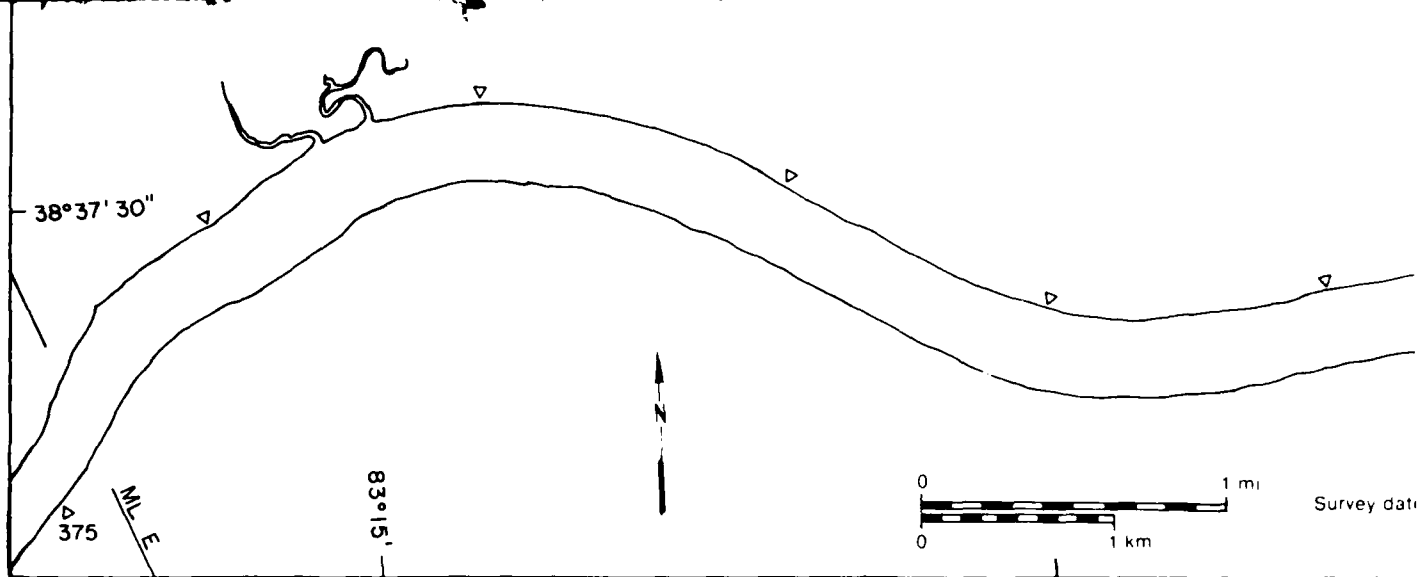


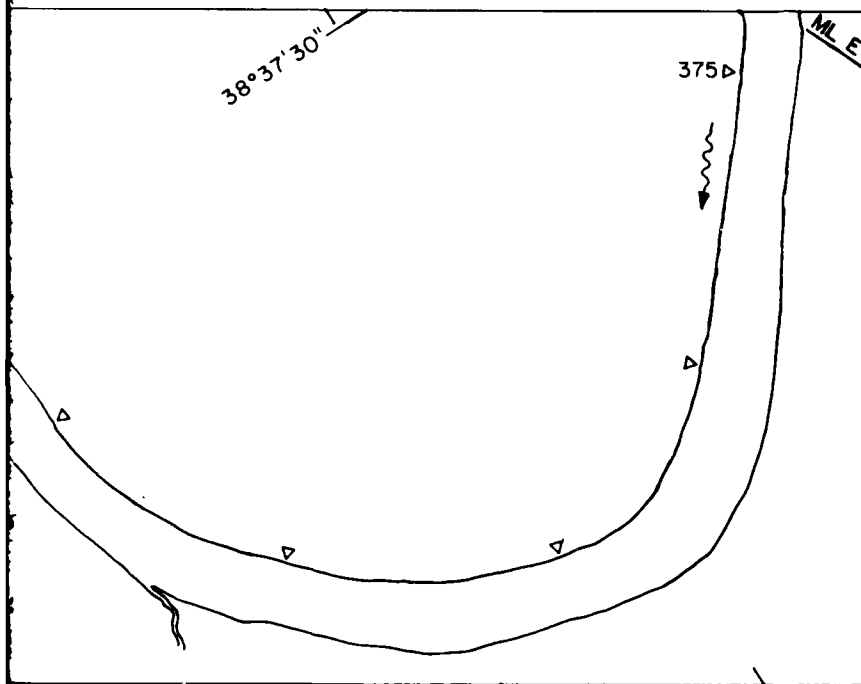
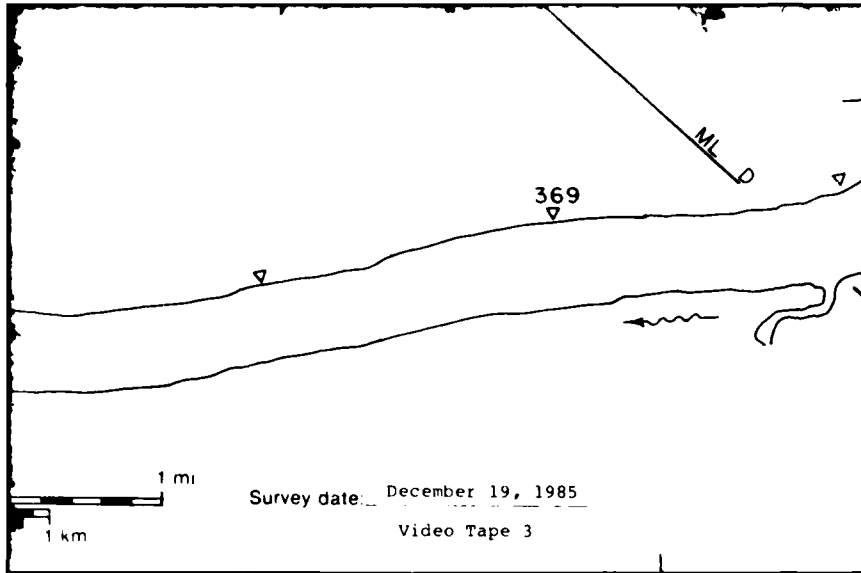
19, 1985
Tape 3

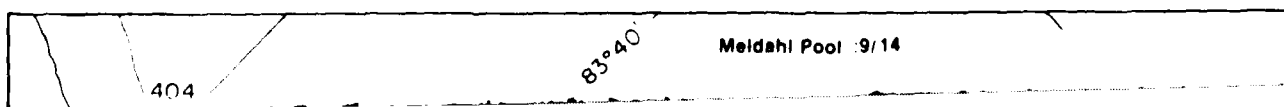
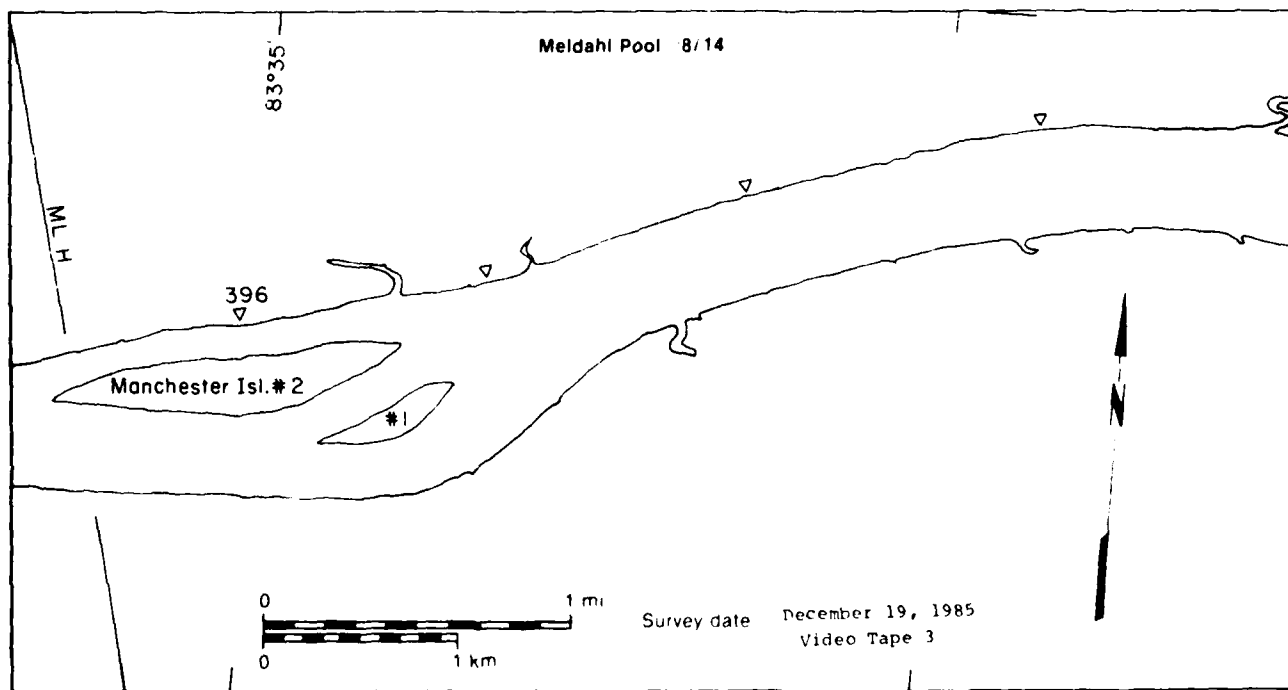
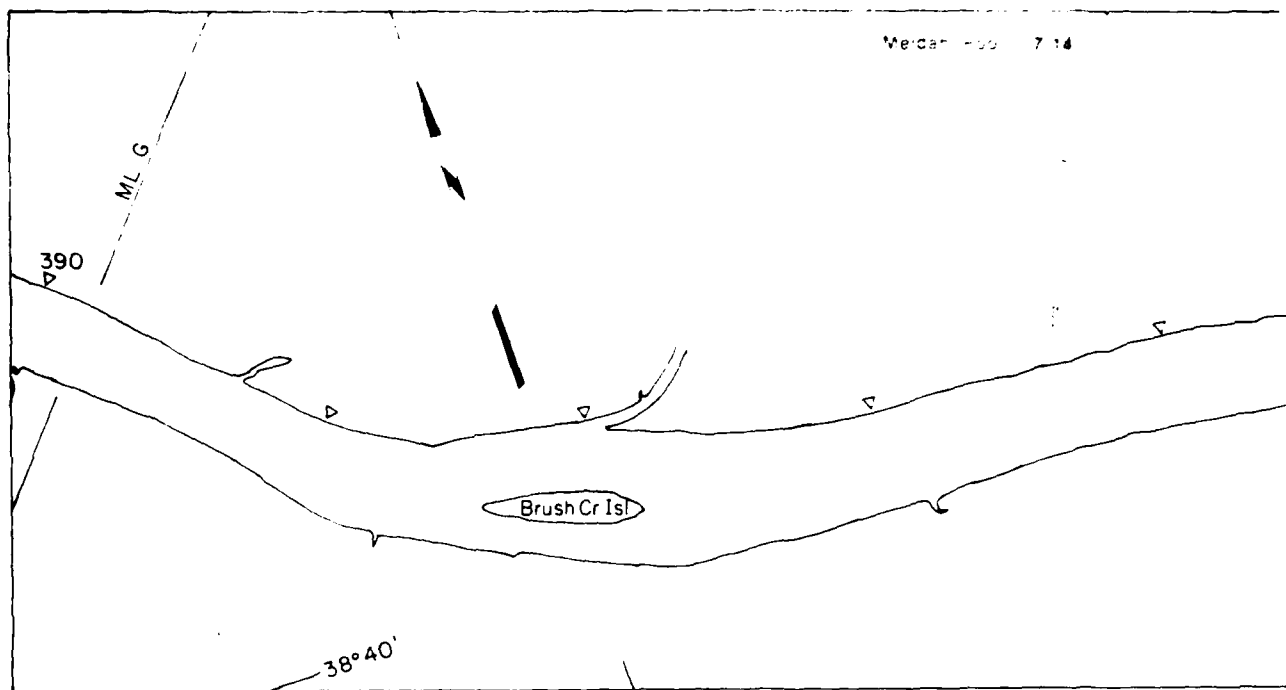
19 December 1985



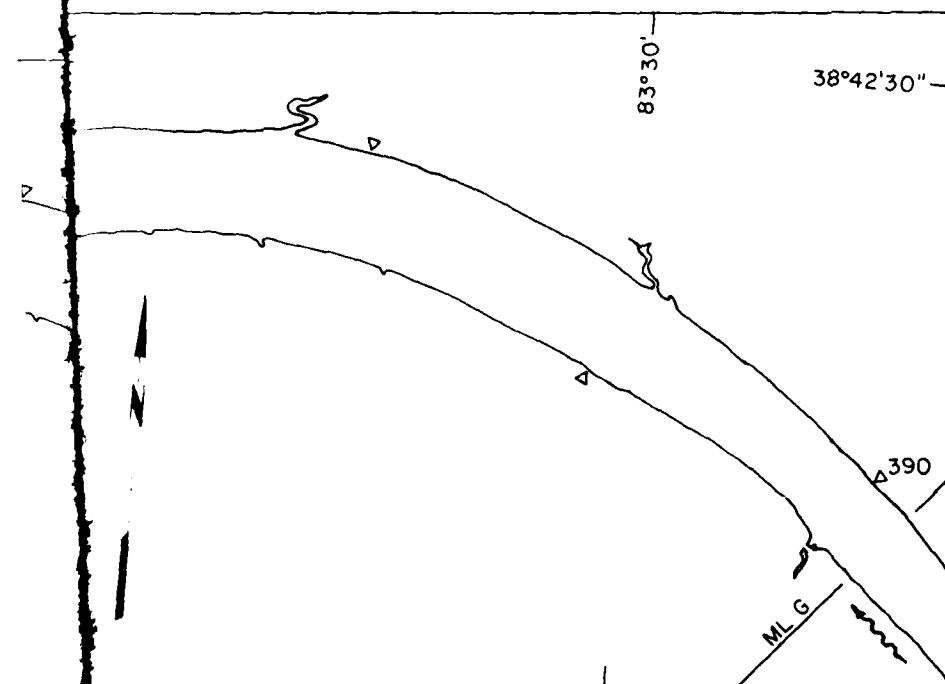
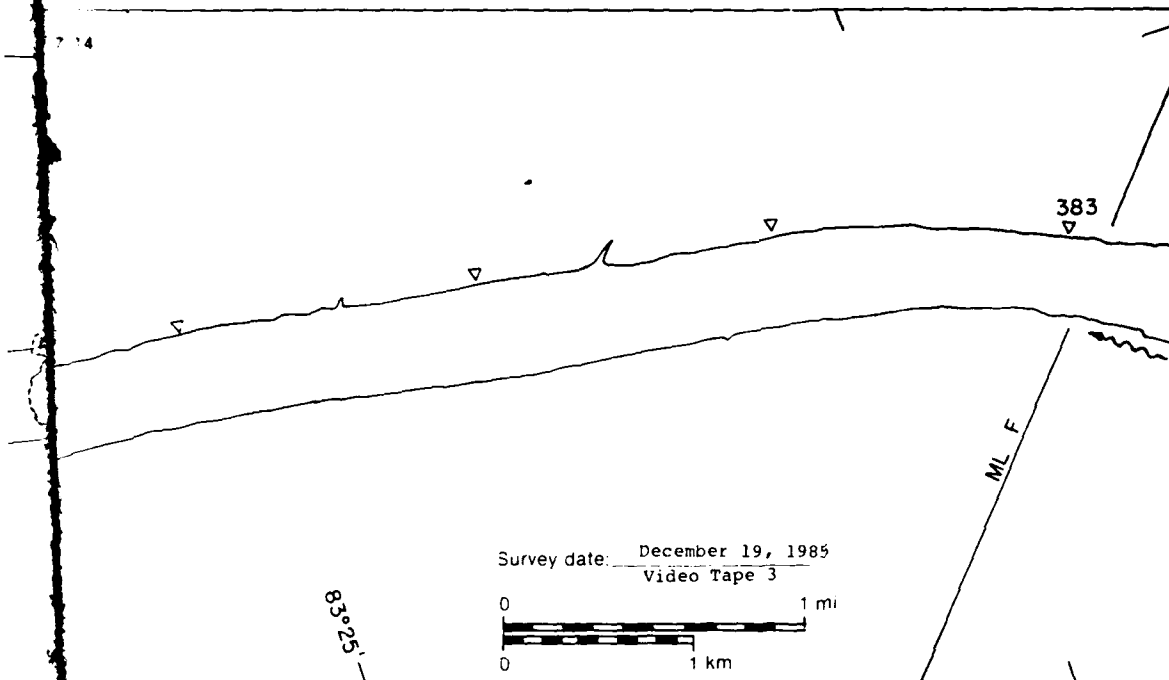


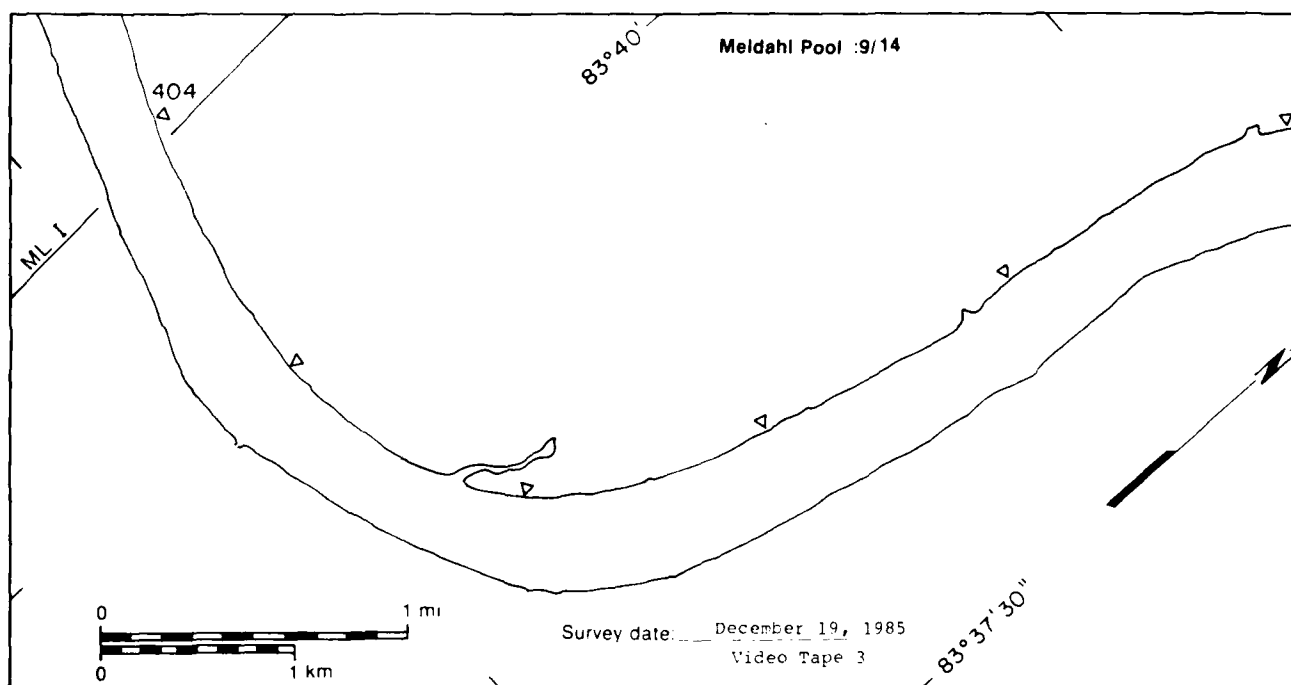
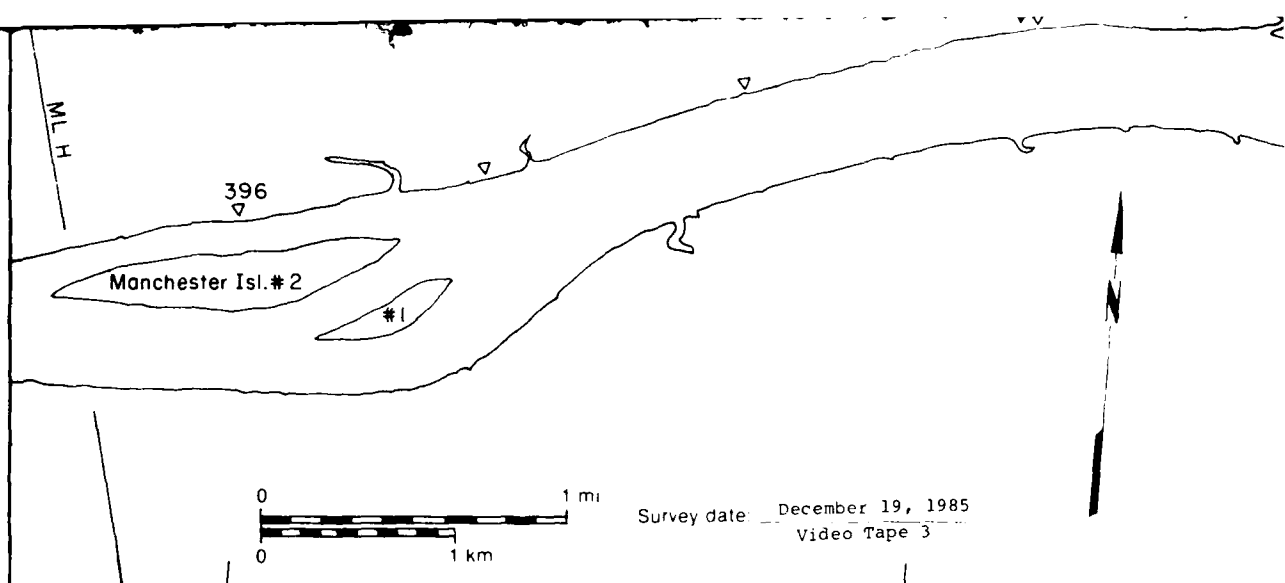


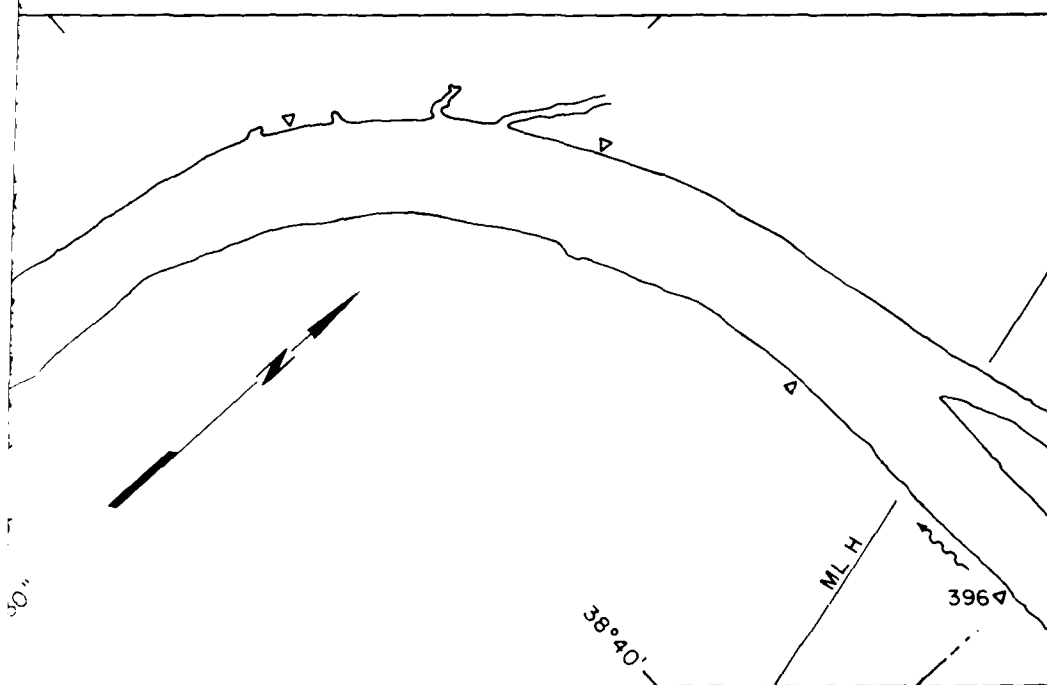
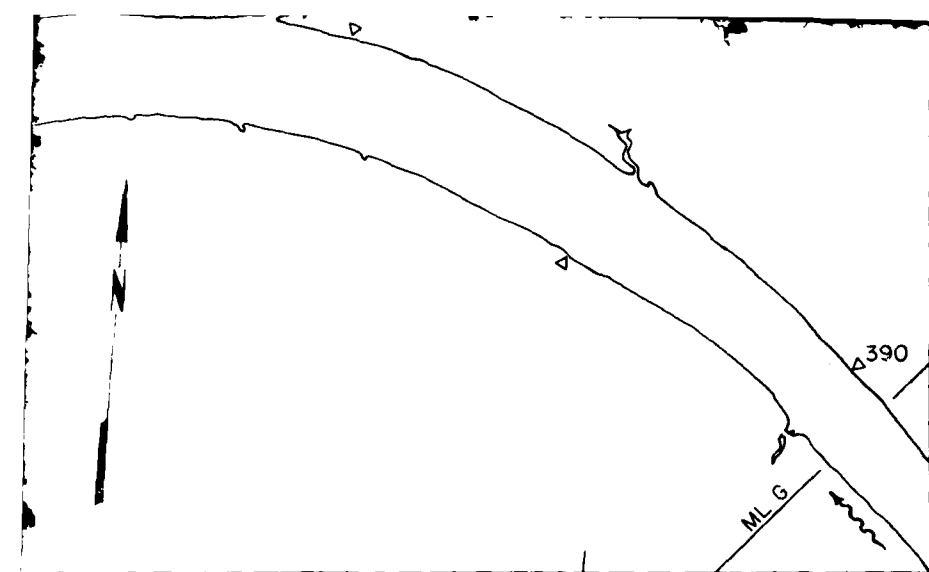




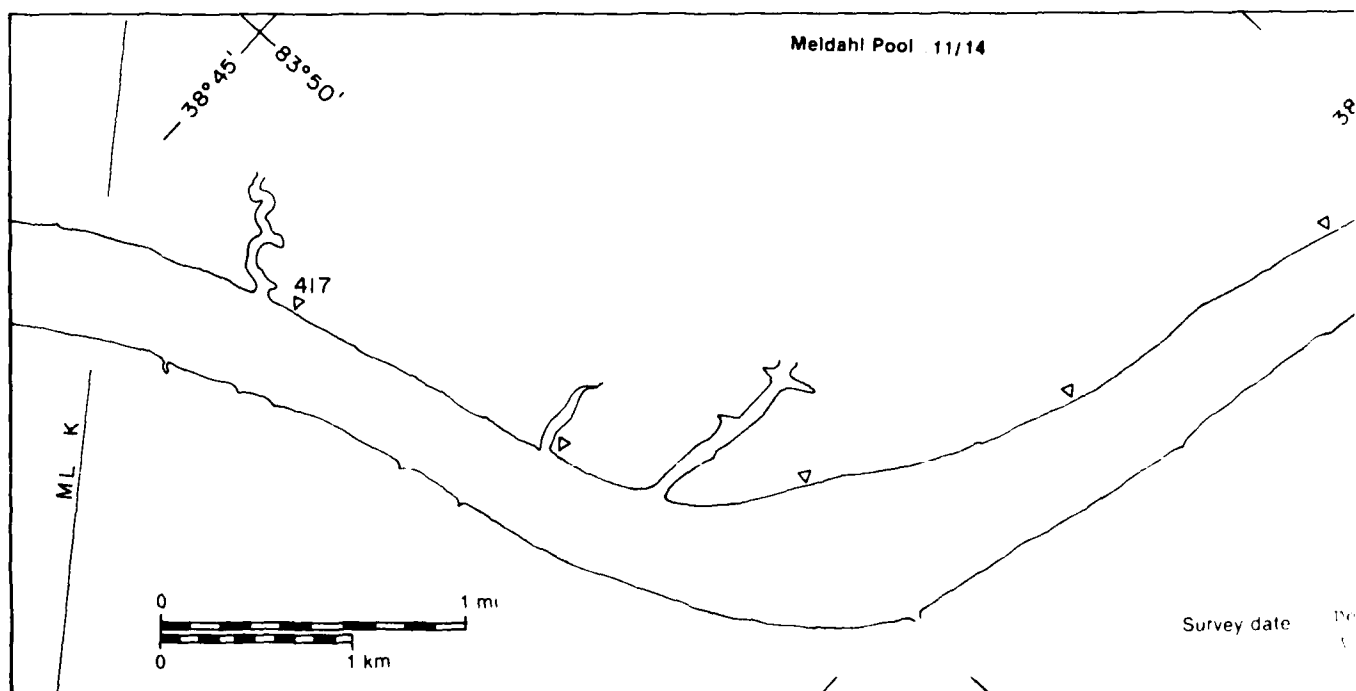
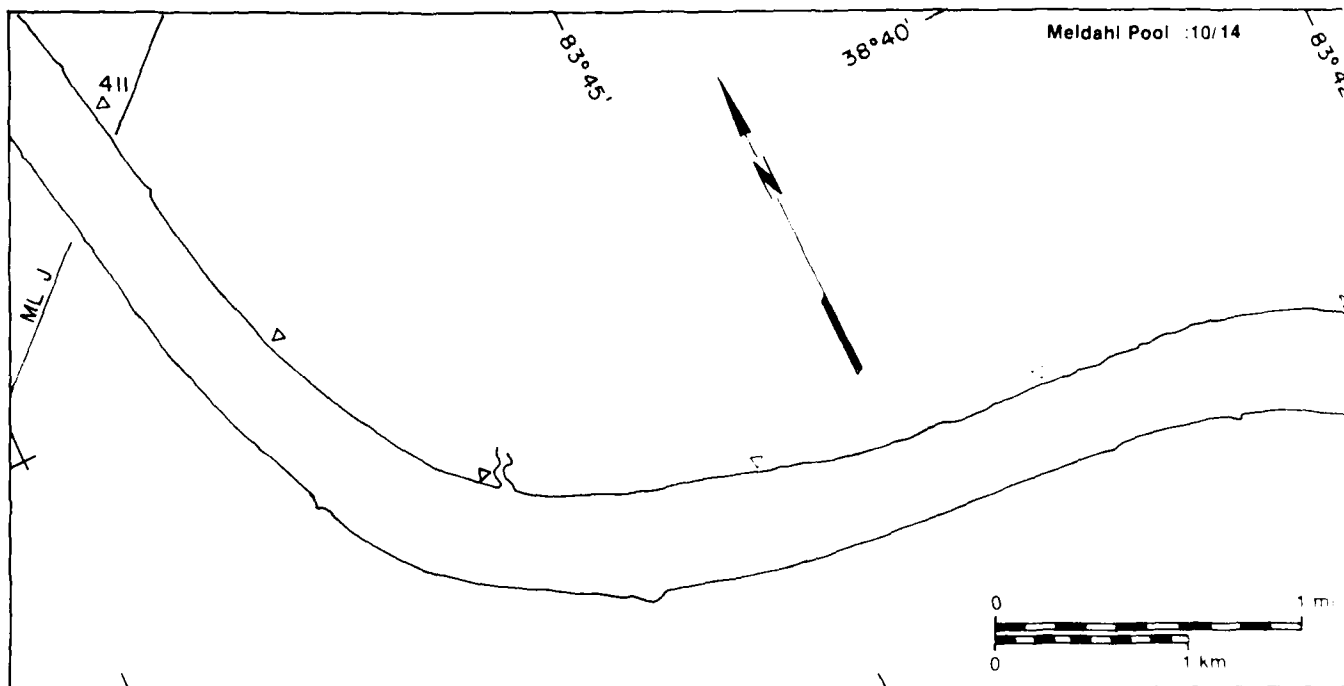
19 December 1985







19 December 1985



hi Pool :10/14

83°42'30"

ML I

404

1 mi

Survey date December 19, 1985
Video Tape 3

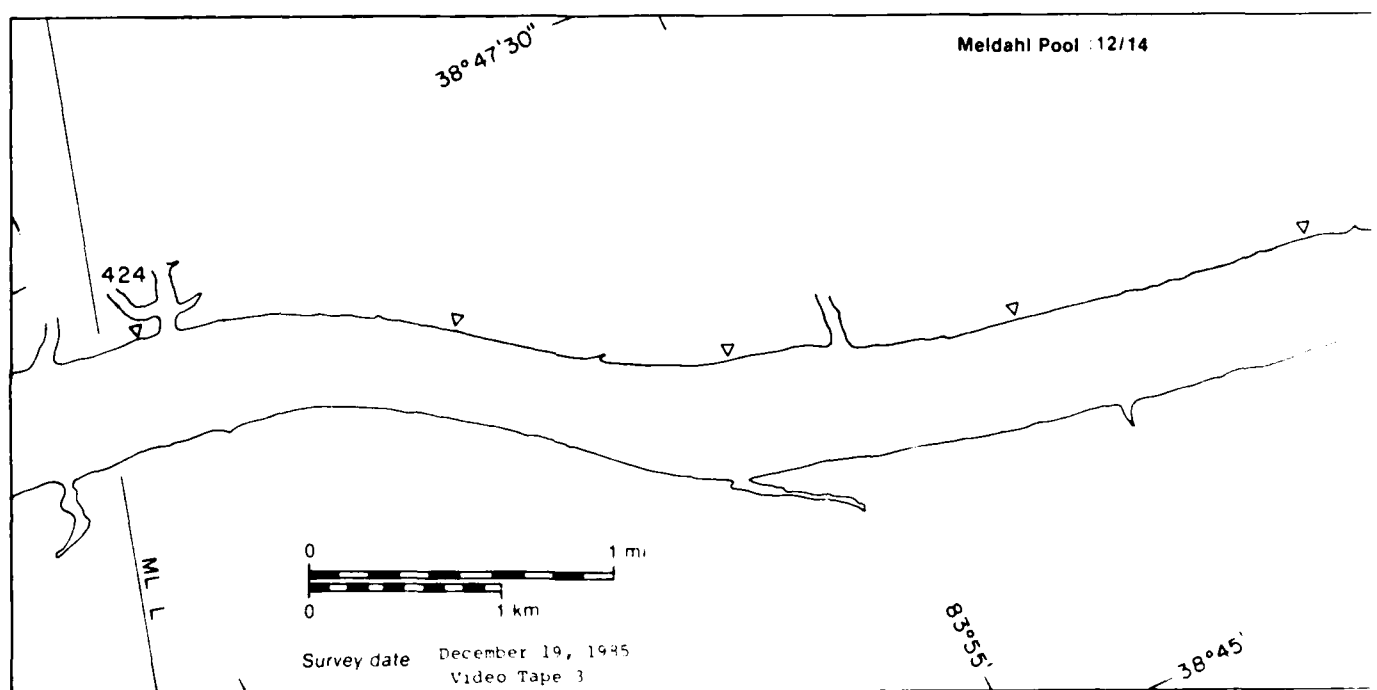
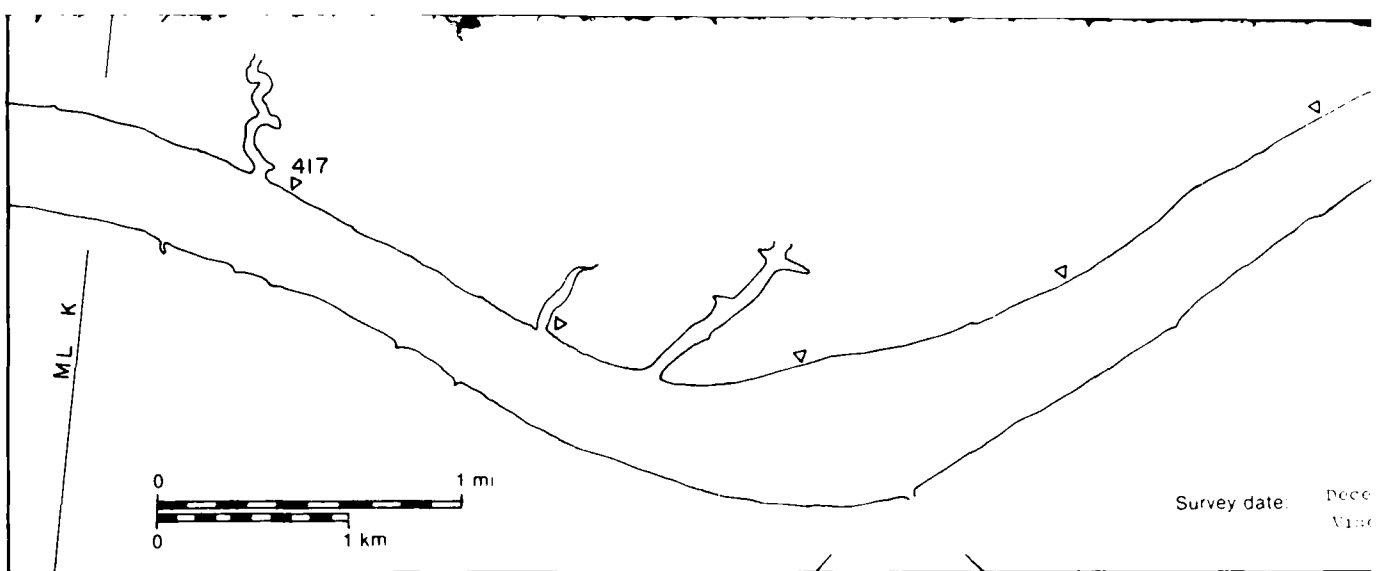
1 km

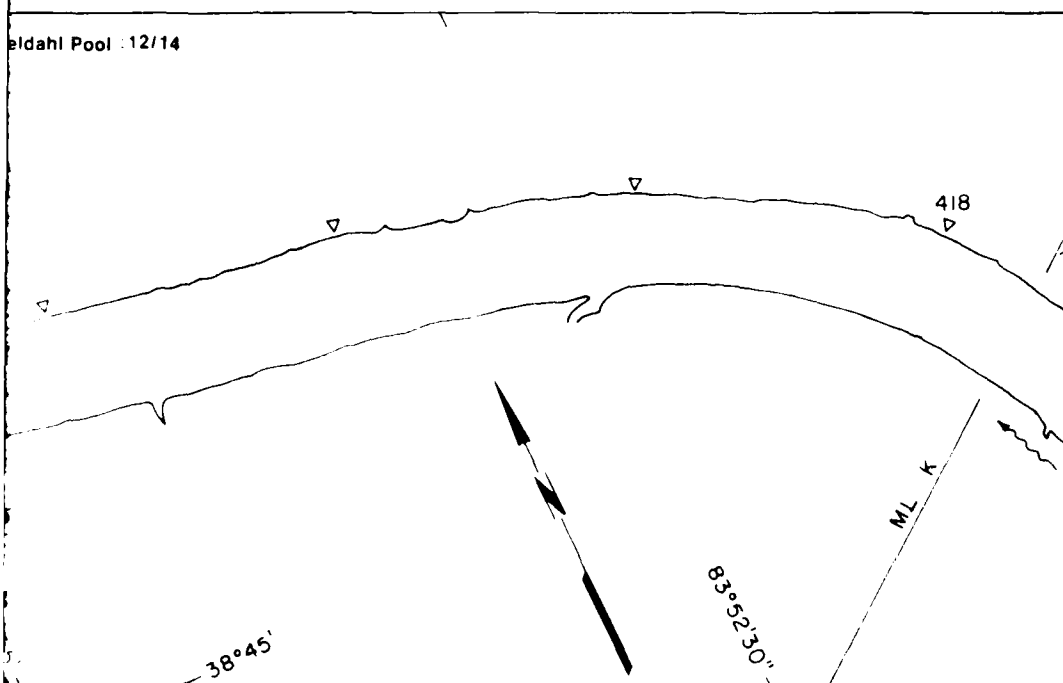
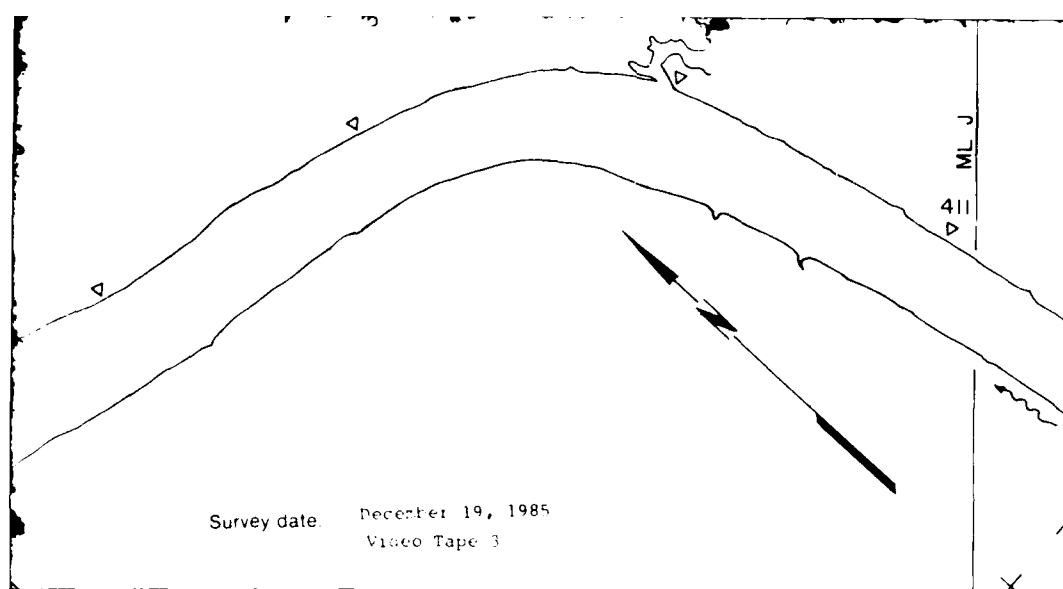
38°42'30"

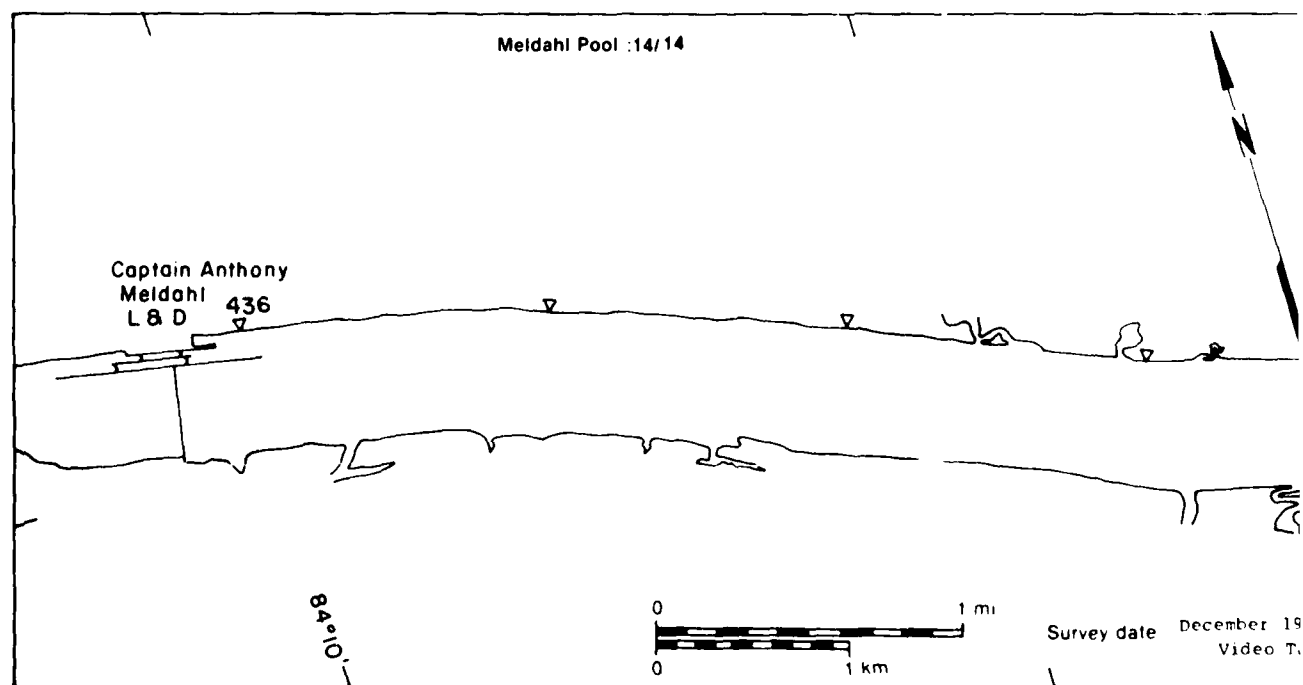
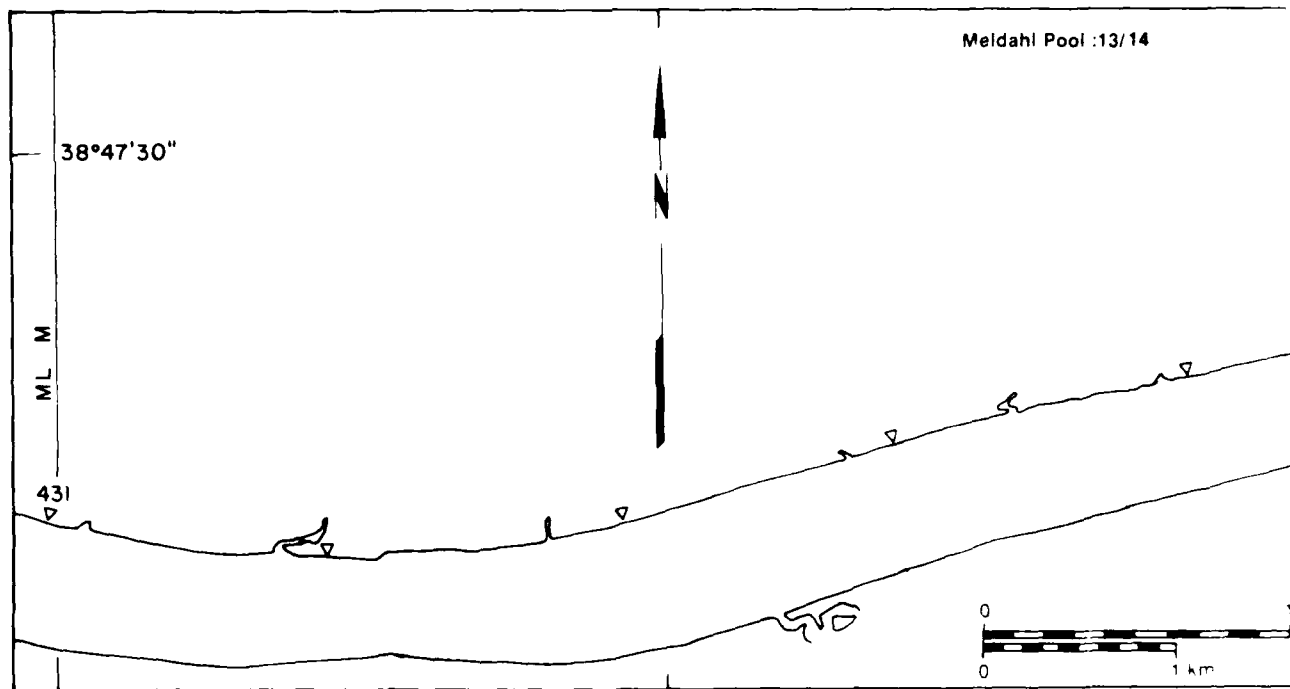
ML J

411

Survey date December 19, 1985
Video Tape 3







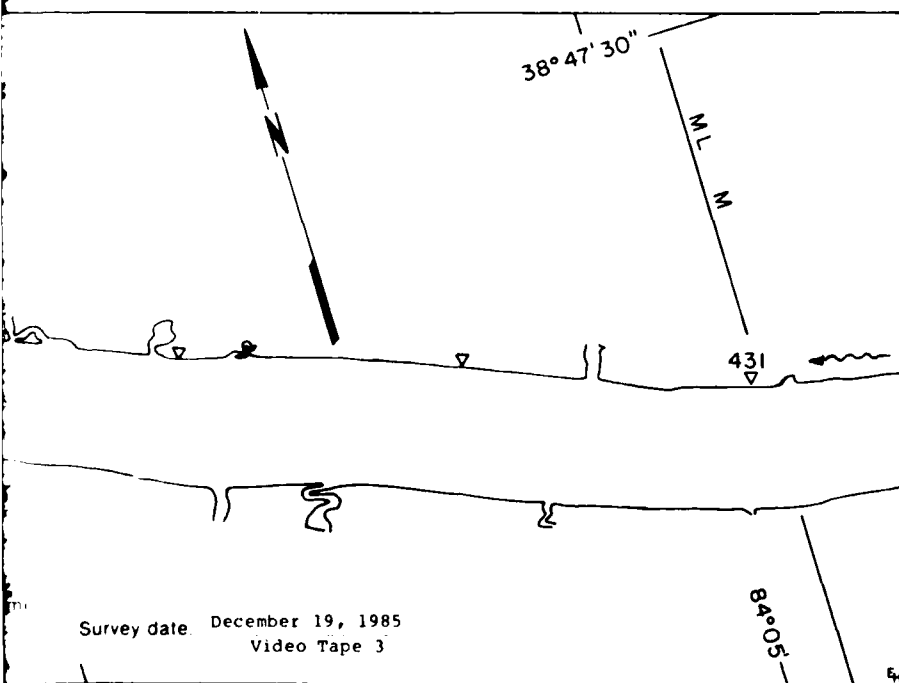
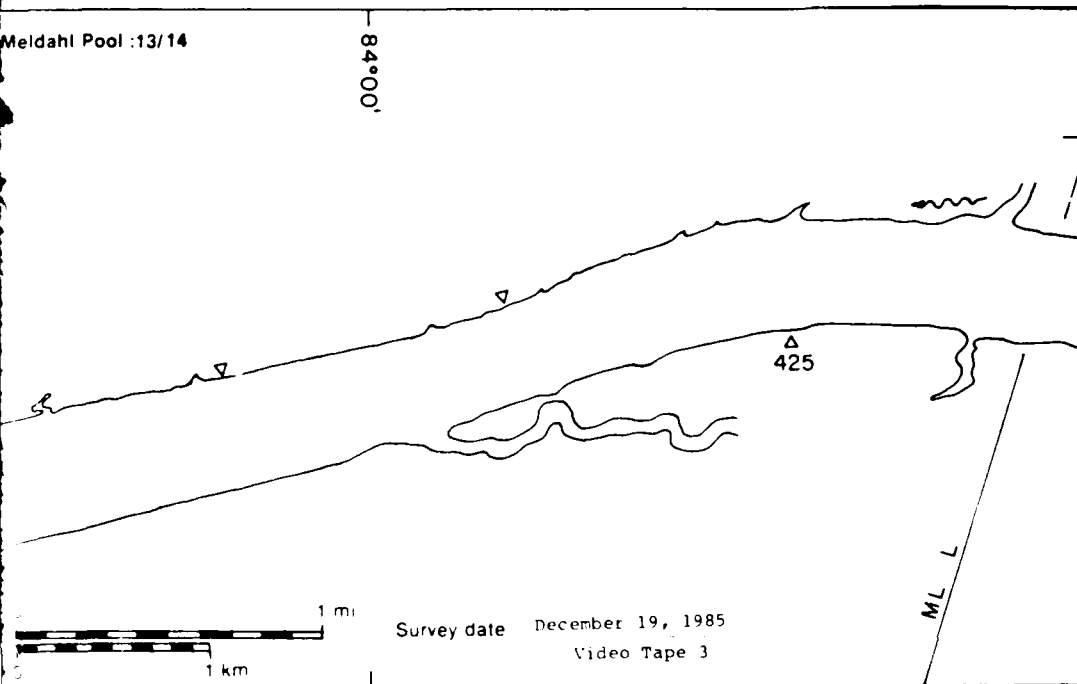
Meldahl Pool

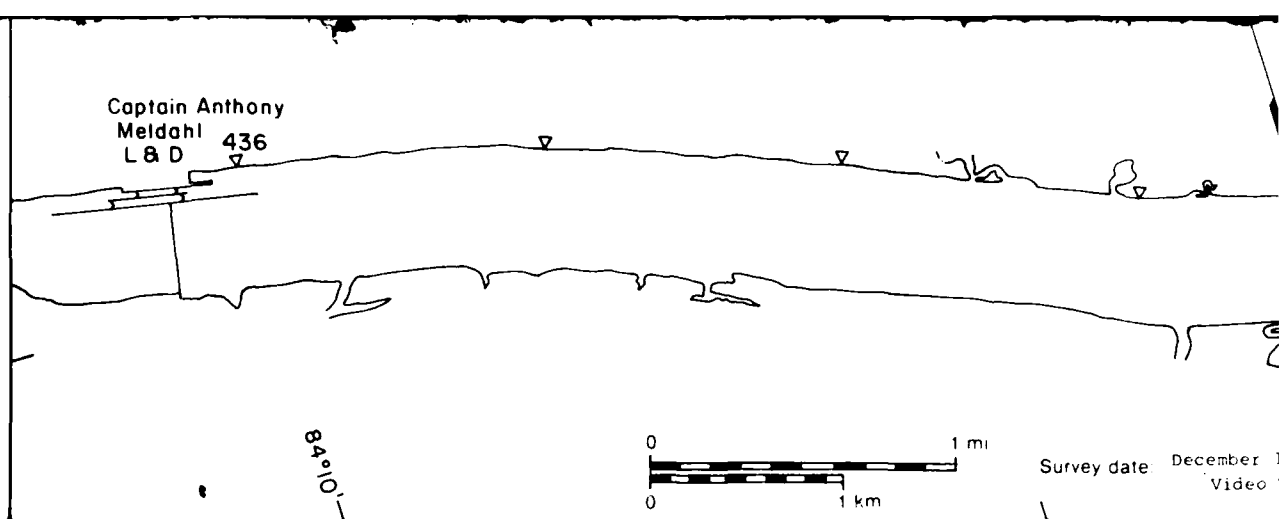
MAP UNITS

Open water

Area (m ² x 10 ⁶)	Surface concentration (%)
73.77	NA

19 December 1985



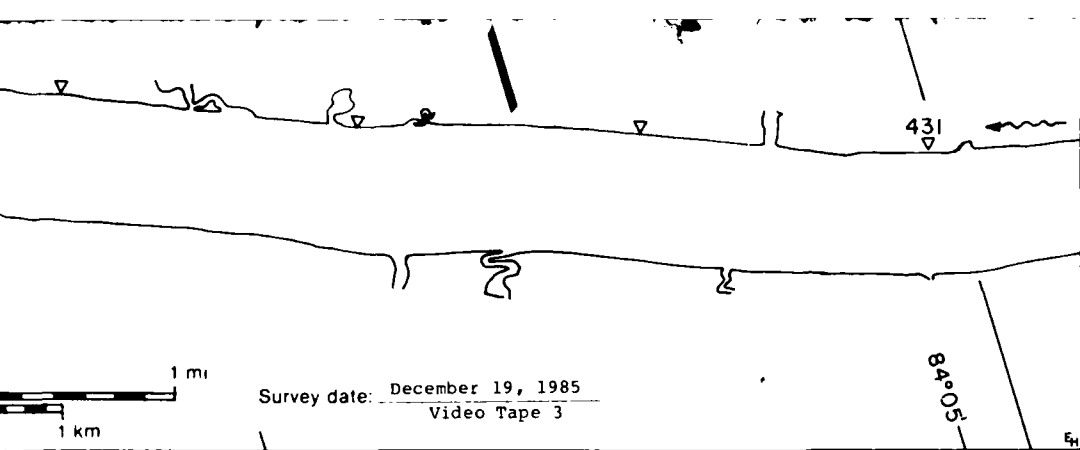


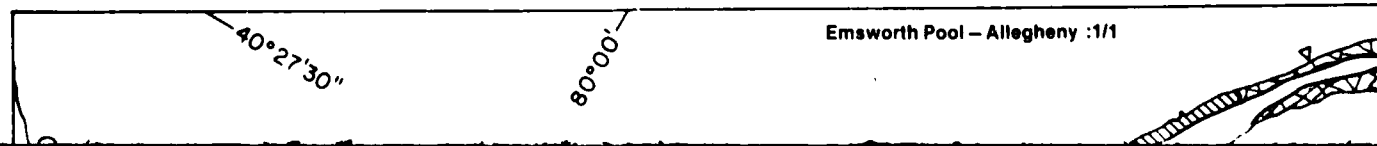
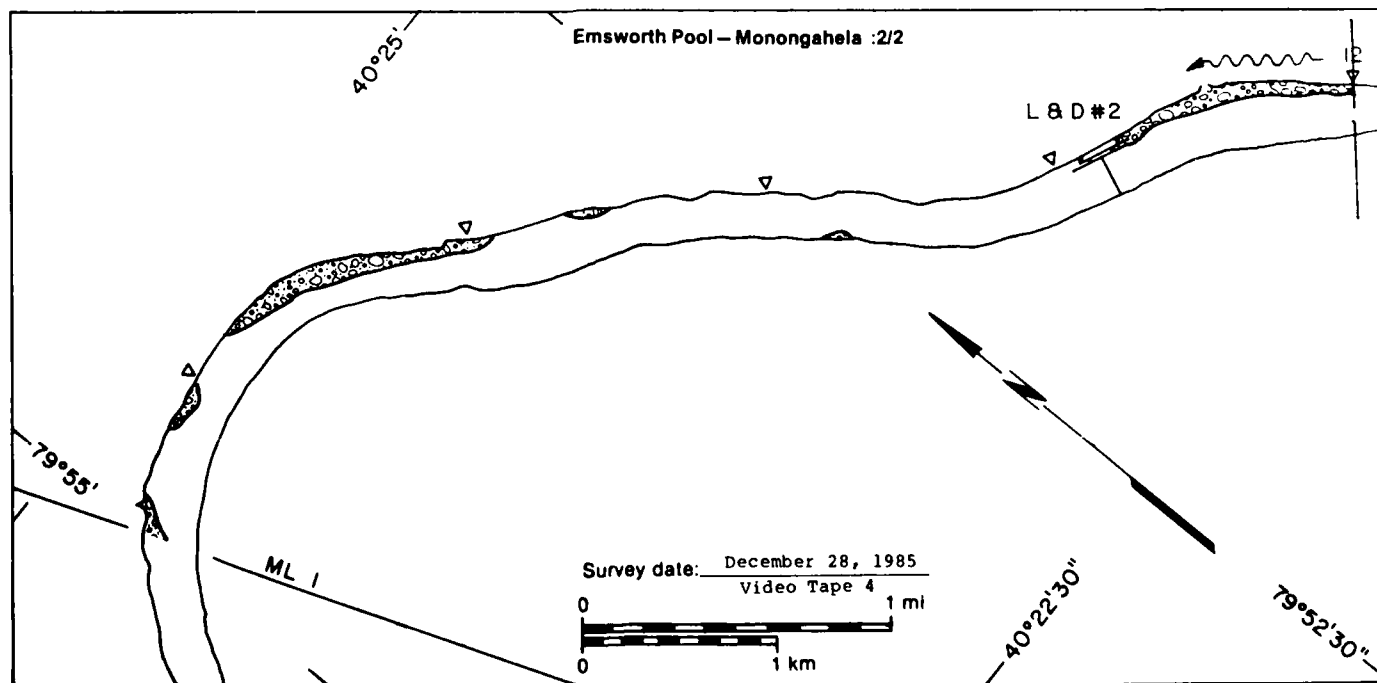
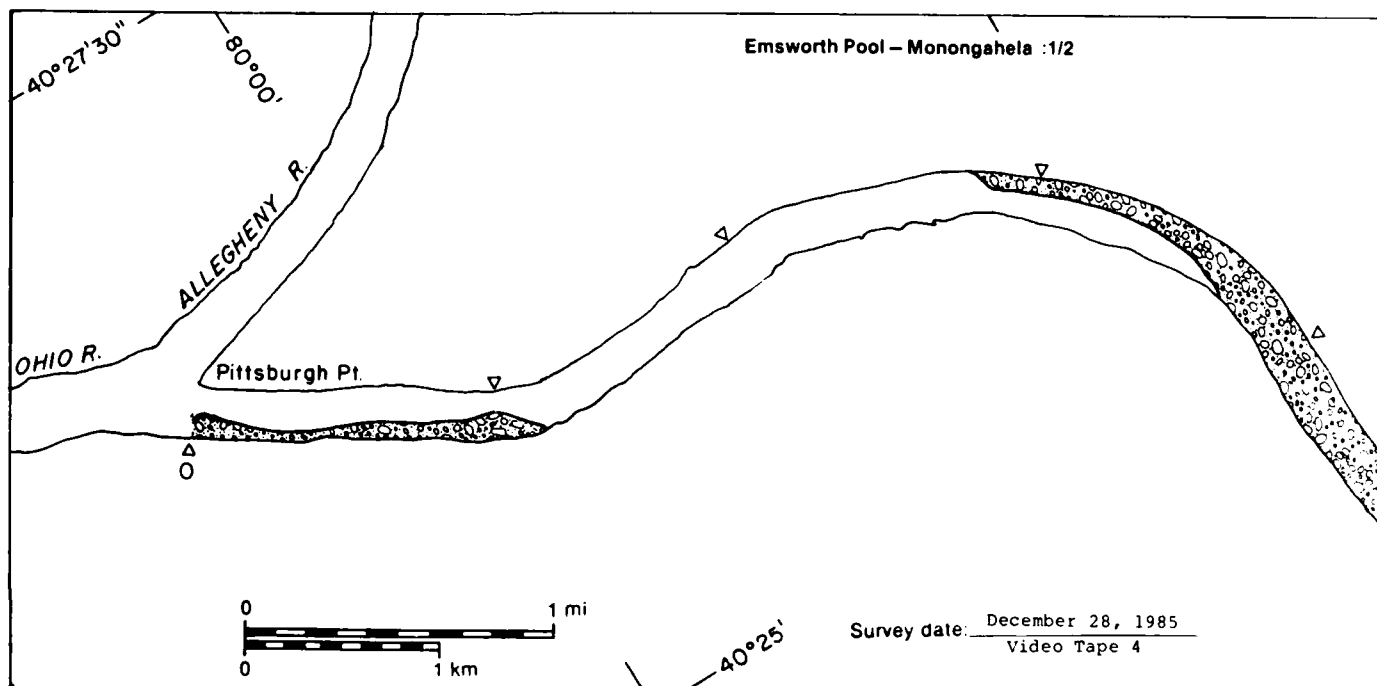
Meldahl Pool

MAP UNITS

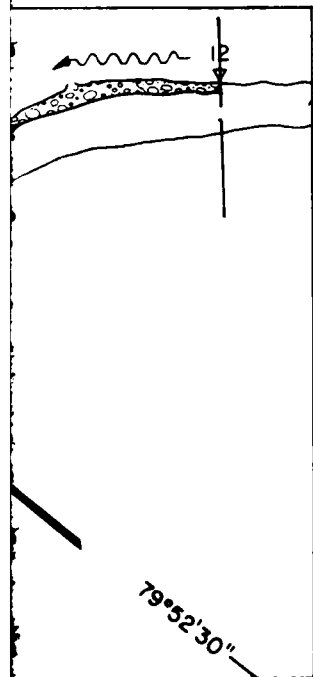
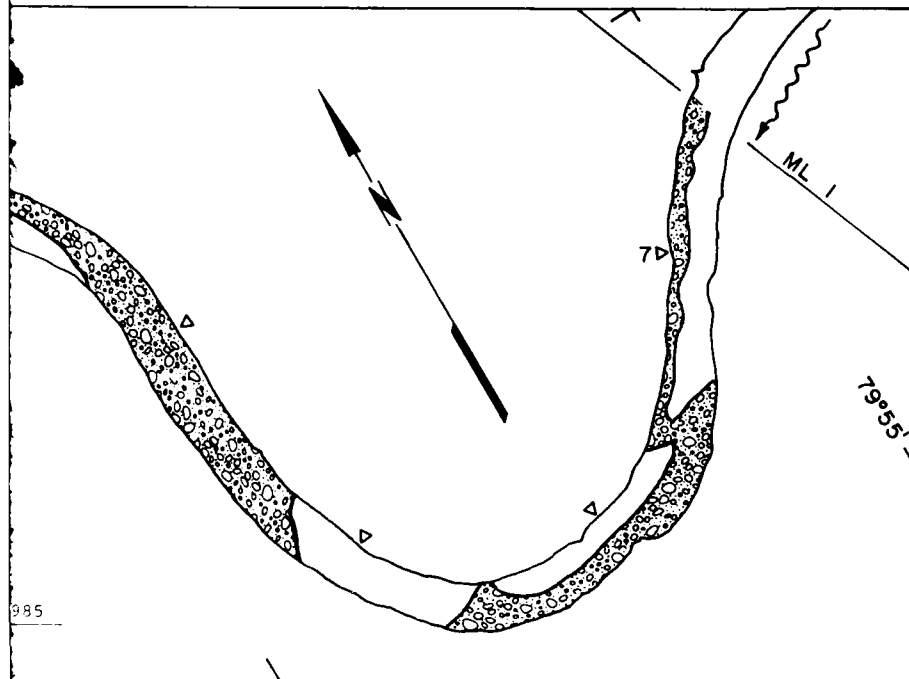
	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Area ($m^2 \times 10^6$)	Surface concentration (%)
73.77	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
0.00	—
Total area ($m^2 \times 10^6$)	73.77



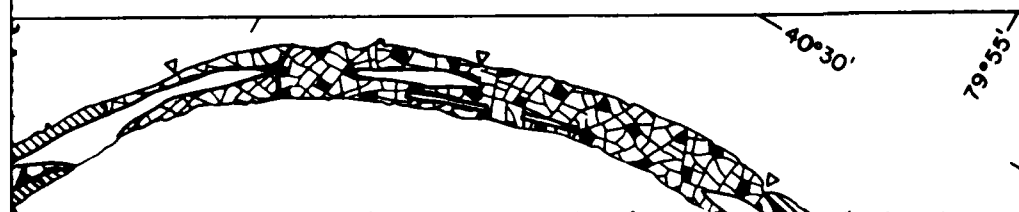


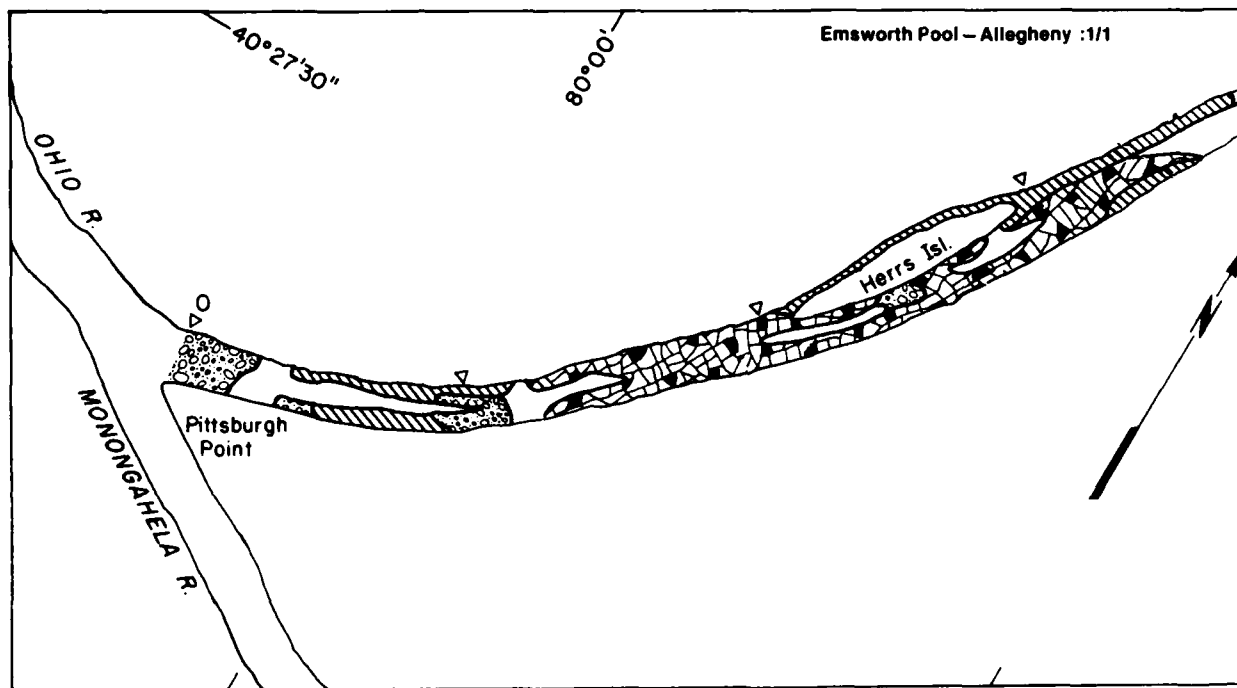
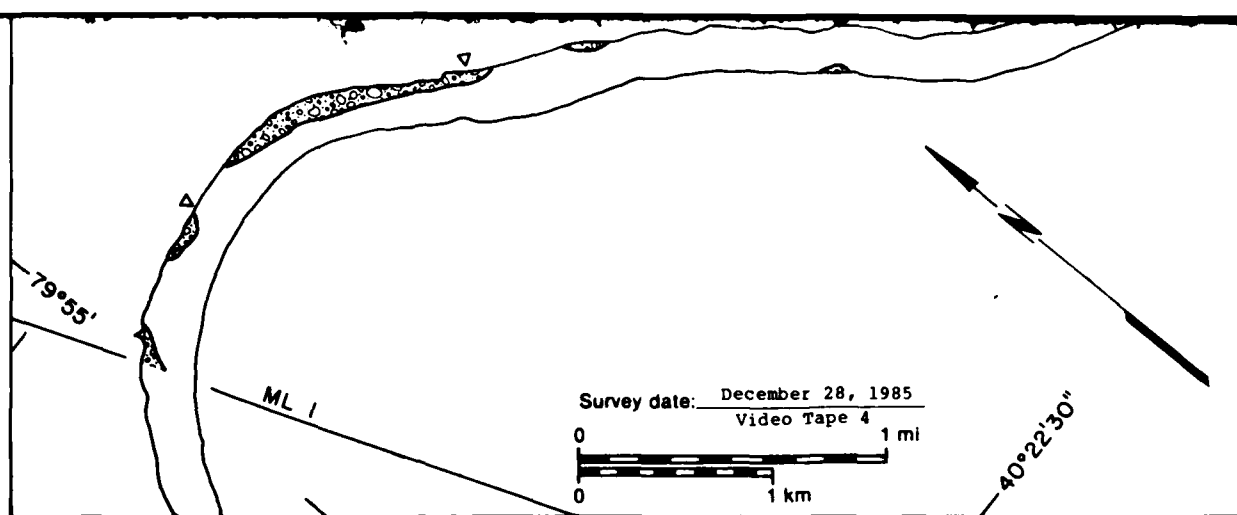
28 December 1985



Emsworth Pool - Monongahela

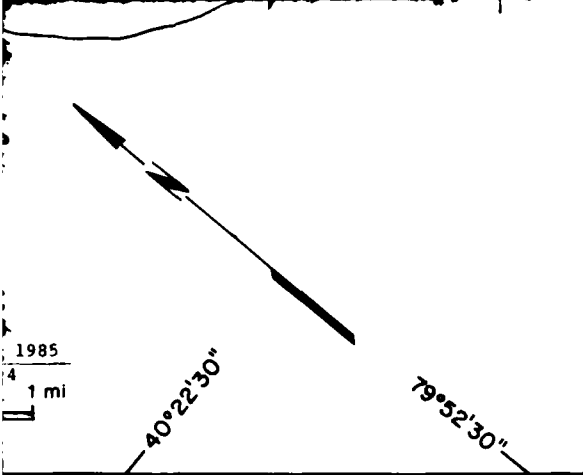
MAP UNITS	Area ($m^2 \times 10^6$)	Surface Concentration (%)
Open water	3.15	NA
Solid ice cover	0.00	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open water areas	0.00	—
Ice floes or frazil slush and pans	2.01	40
Total area ($m^2 \times 10^6$)	5.16	





△ Emsworth Pool - Allegheny

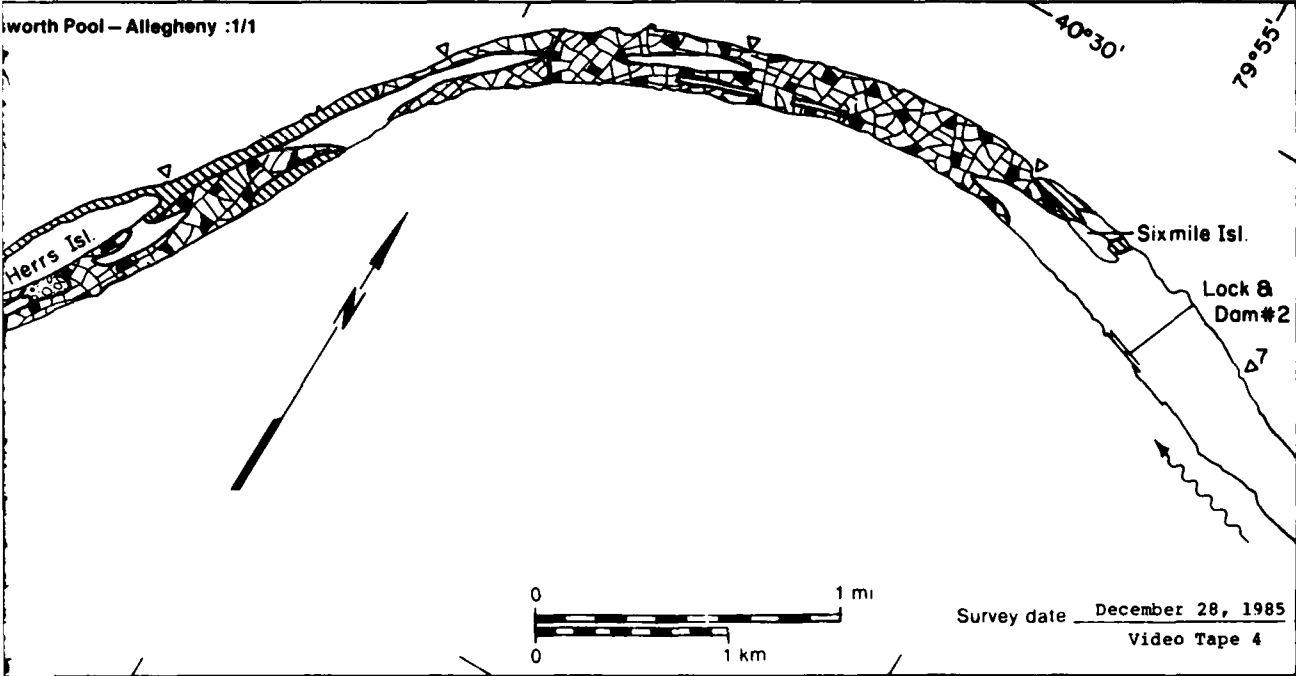
MAP UNITS	Area (m ² x 10 ⁶)	Surface concentration
Open water	0.91	NA
Solid ice cover	0.41	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.16	NA
Fragmented ice cover with open water areas	1.45	80
Ice floes or frazil slush and pans	0.14	20
Total area (m ² x 10 ⁶)	3.07	



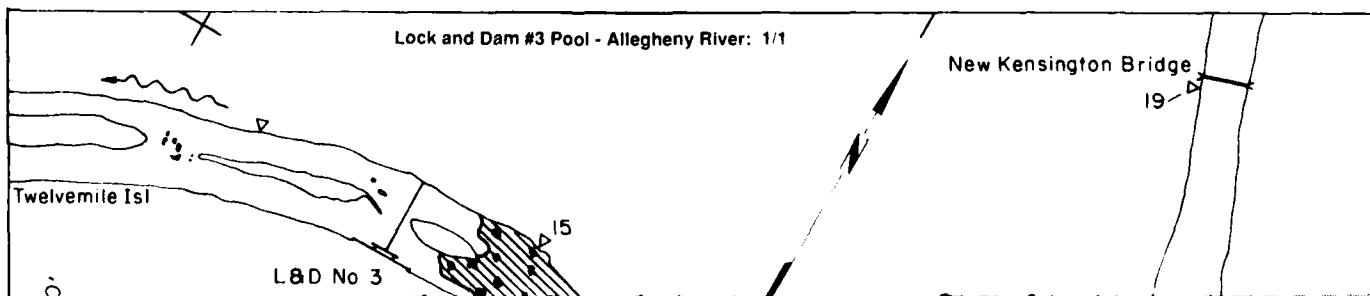
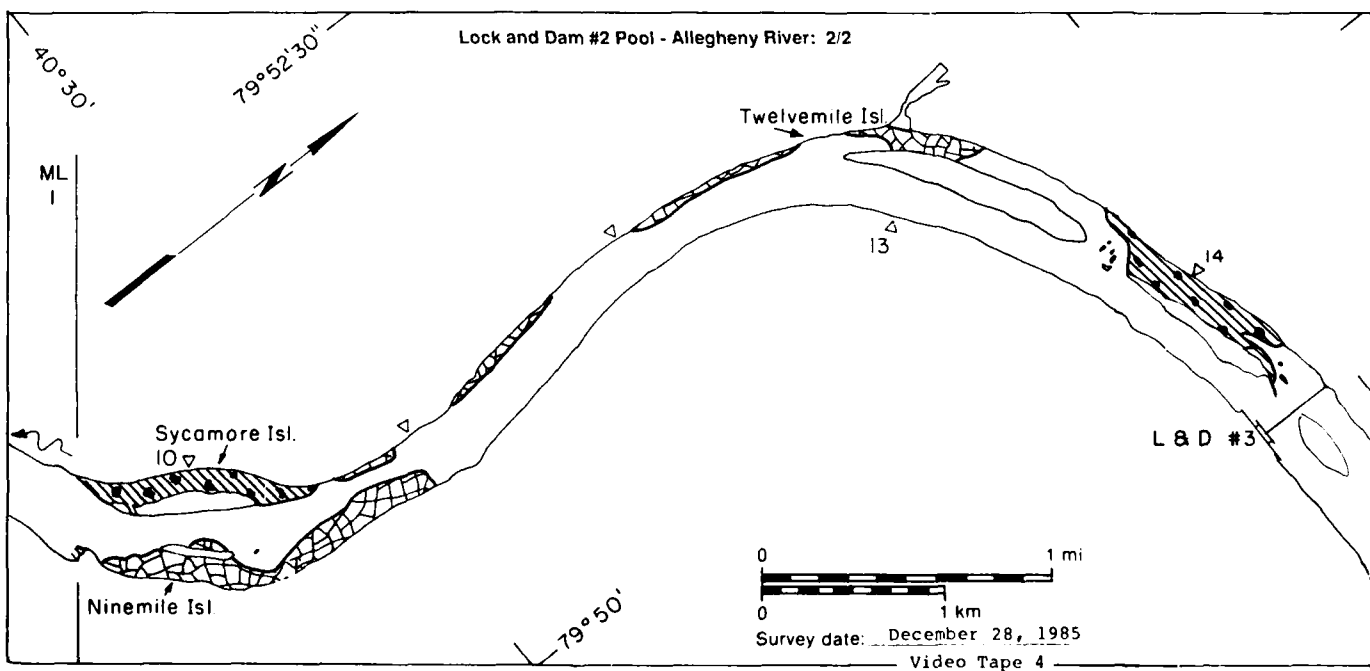
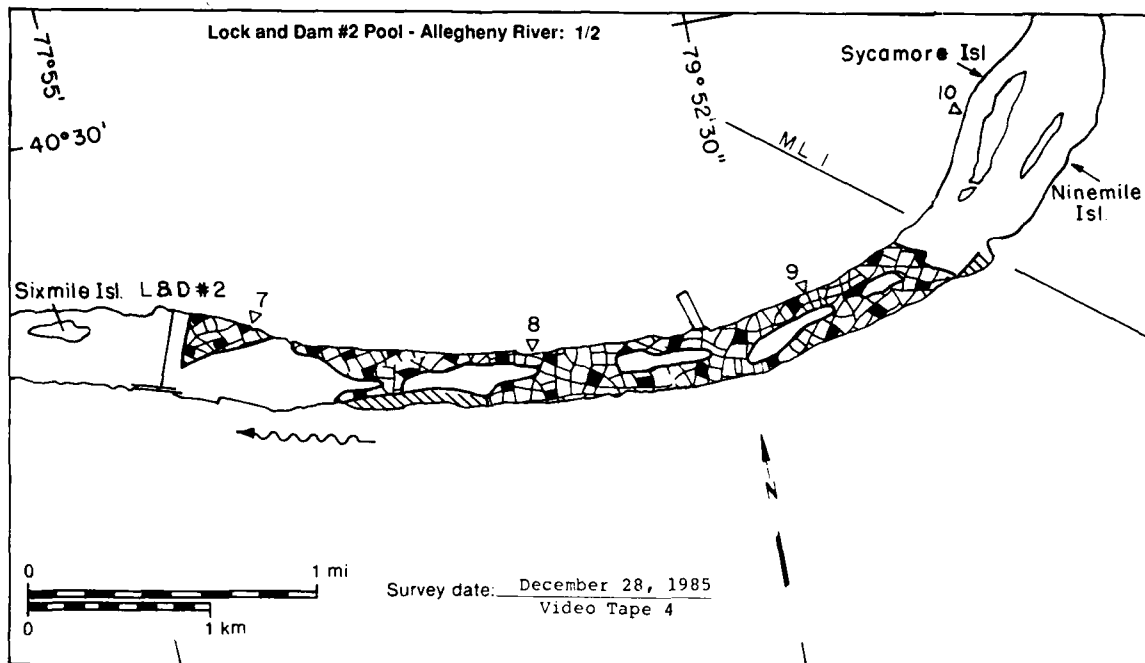
Emsworth Pool - Monongahela

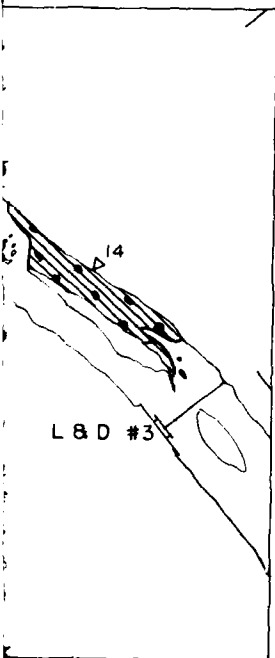
MAP UNITS		Area (m ² x 10 ⁶)	Surface concentration (%)
	Open water	3.15	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open water areas	0.00	—
	Ice floes or frazil slush and pans	2.01	40
Total area (m ² x 10 ⁶)		5.16	

Emsworth Pool - Allegheny :1/1



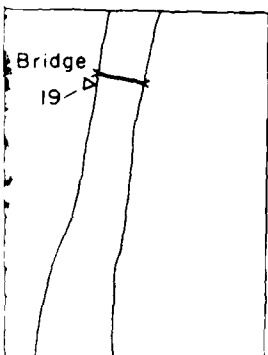
28 December 1985





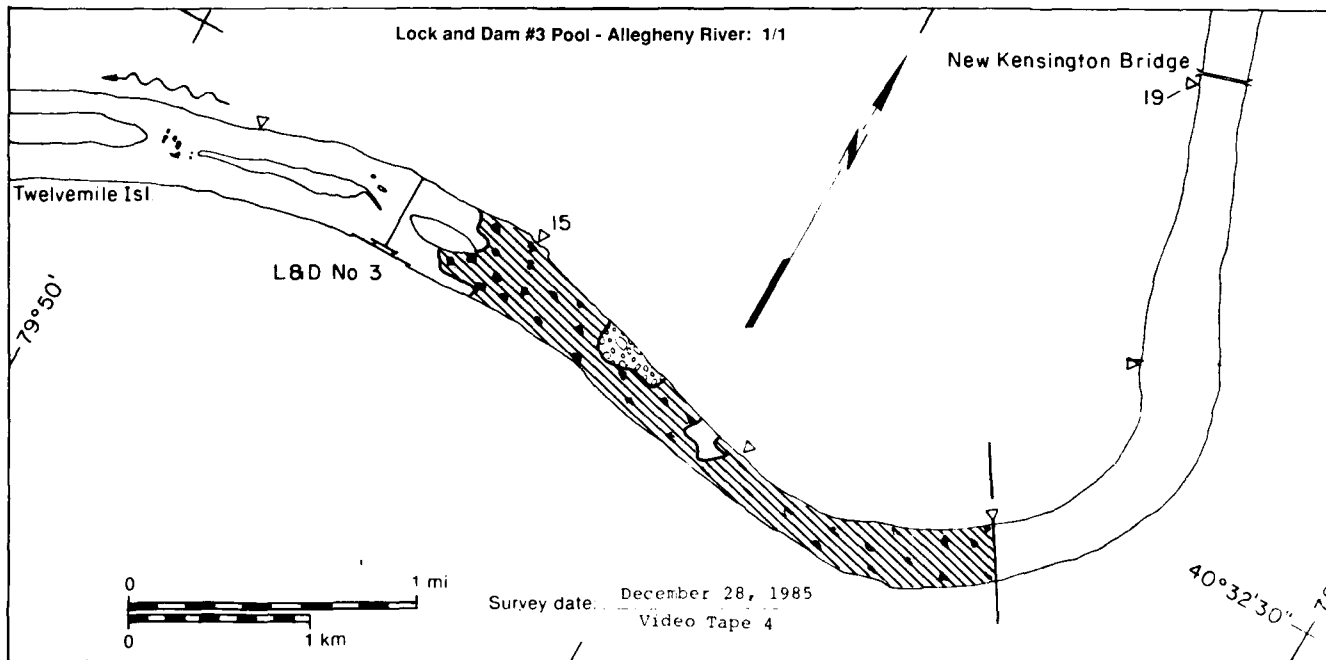
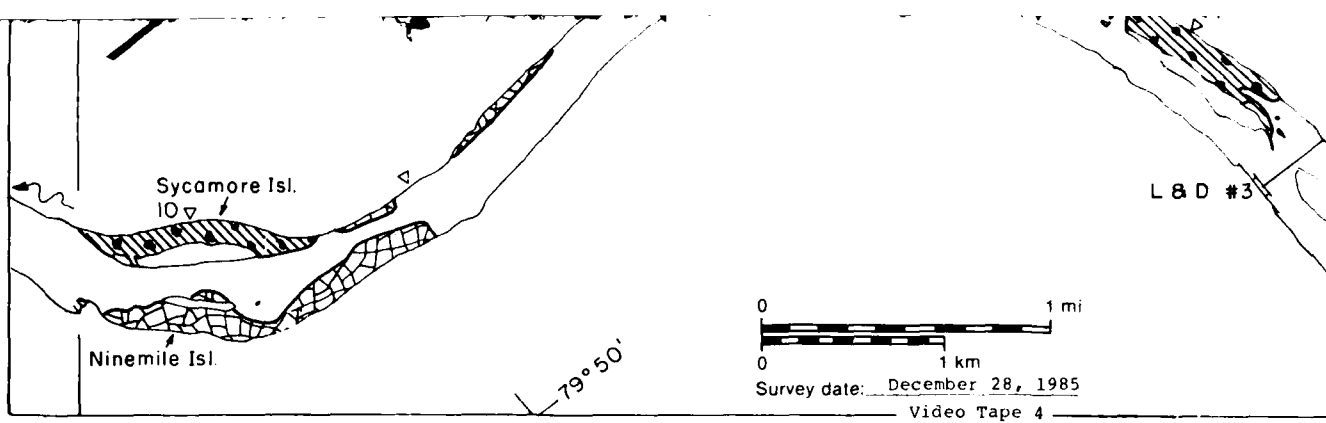
Lock and Dam #2 Pool

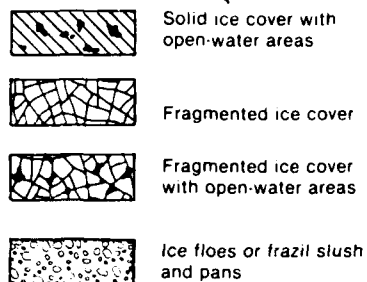
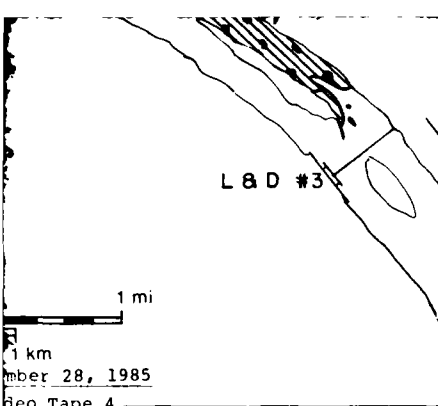
MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	2.47	NA
	Solid ice cover	0.09	NA
	Solid ice cover with open-water areas	0.28	90
	Fragmented ice cover	0.44	NA
	Fragmented ice cover with open-water areas	0.74	80
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		4.02	



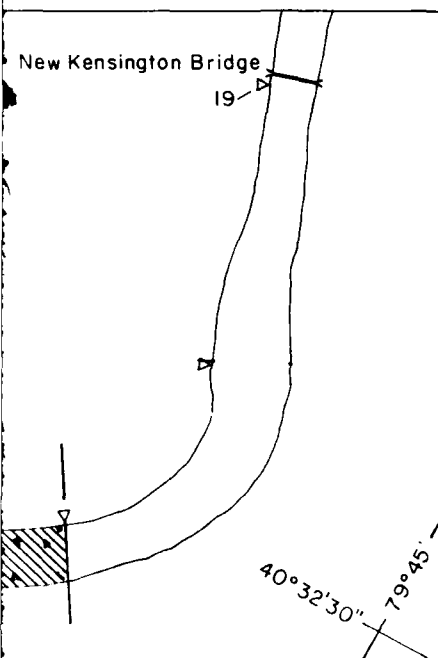
Lock and Dam #3 Pool

MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	0.17	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.93	80



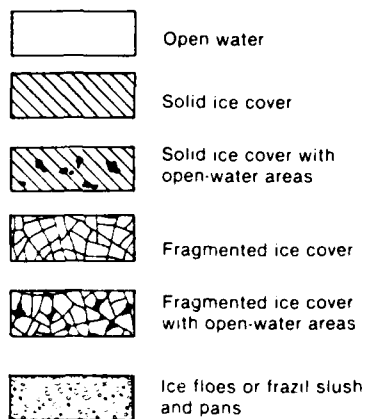


0.28	90
0.44	NA
0.74	80
0.00	—
Total area ($m^2 \times 10^6$)	
4.02	

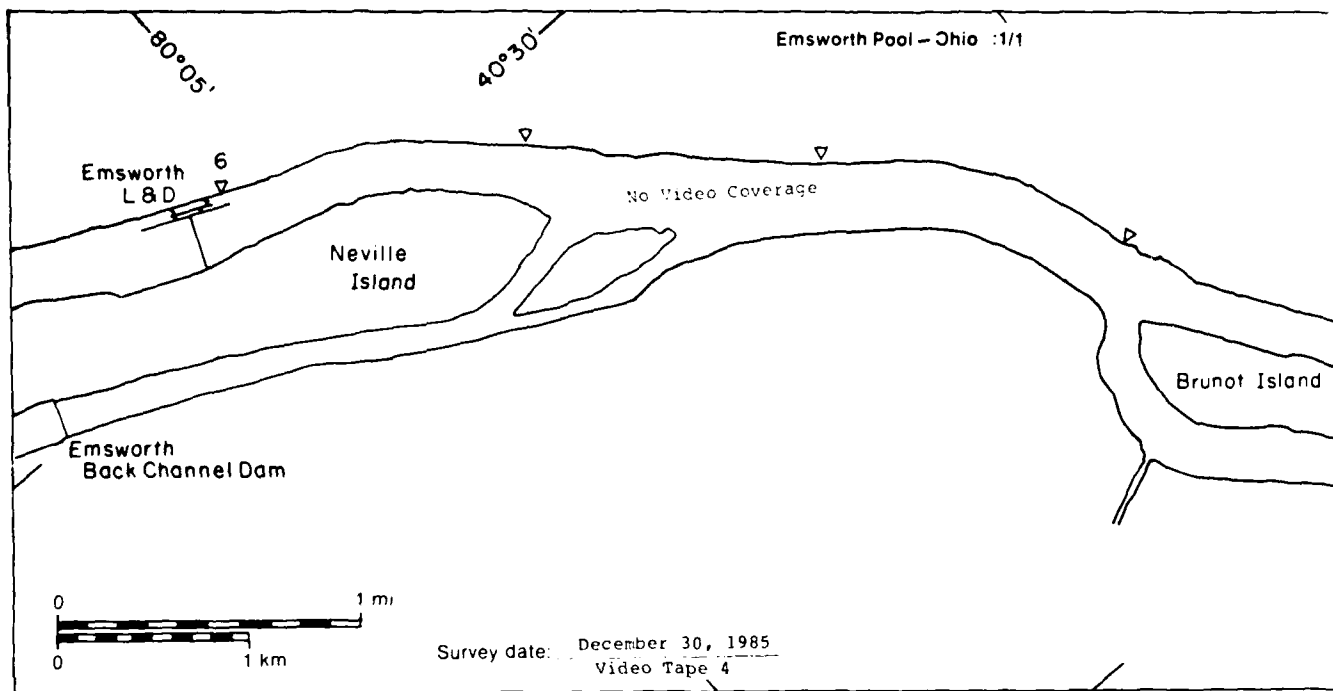


Lock and Dam #3 Pool

MAP UNITS

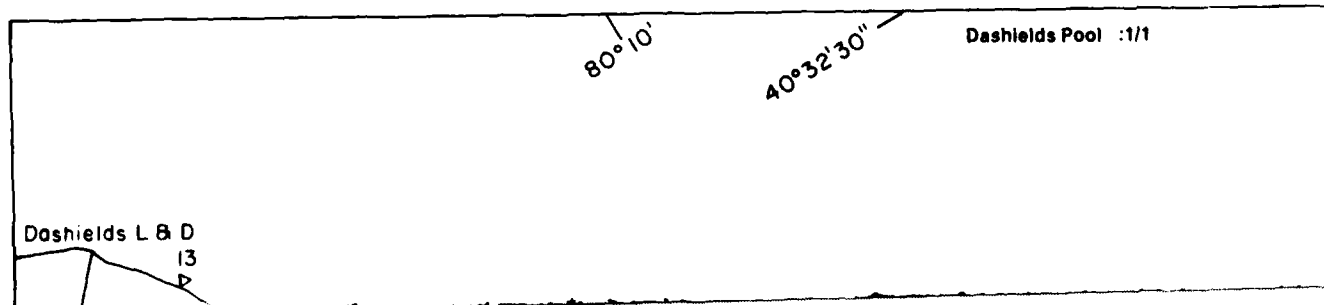


Area ($m^2 \times 10^6$)	Surface concentration (%)
0.17	NA
0.00	NA
0.93	80
0.00	NA
0.00	—
0.04	10
Total area ($m^2 \times 10^6$)	
1.14	



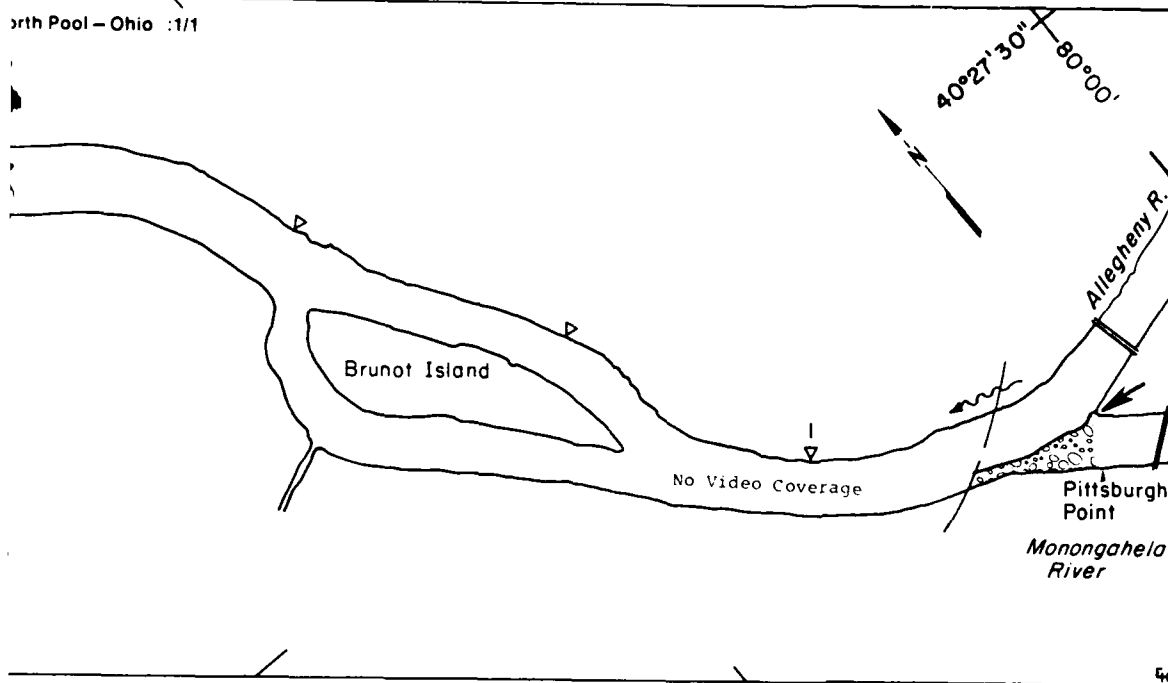
Emsworth Pool - Ohio

MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	0.16	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.10	1
Total area ($m^2 \times 10^6$)		4.49*	* Includes $4.23 \times 10^6 m^2$ of no video coverage

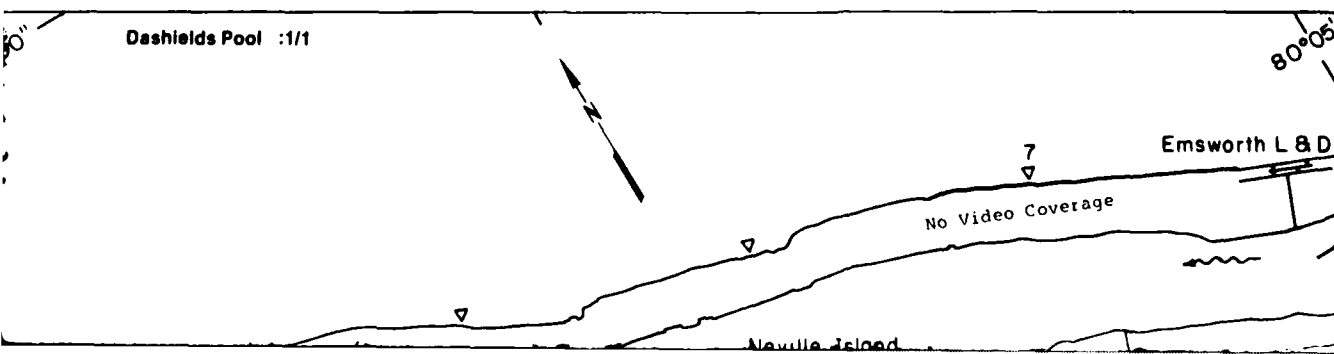






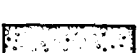
30 December 1985

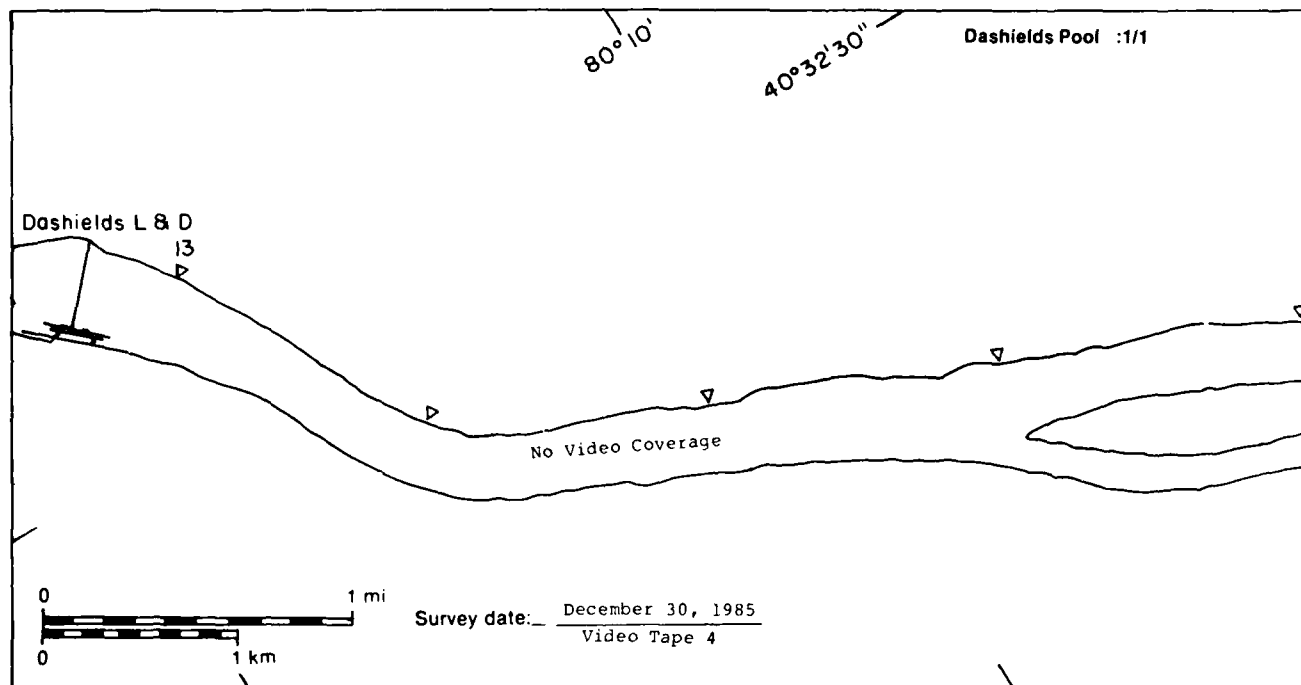
North Pool - Ohio :1/1


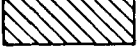



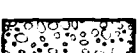


Dashields Pool :1/1

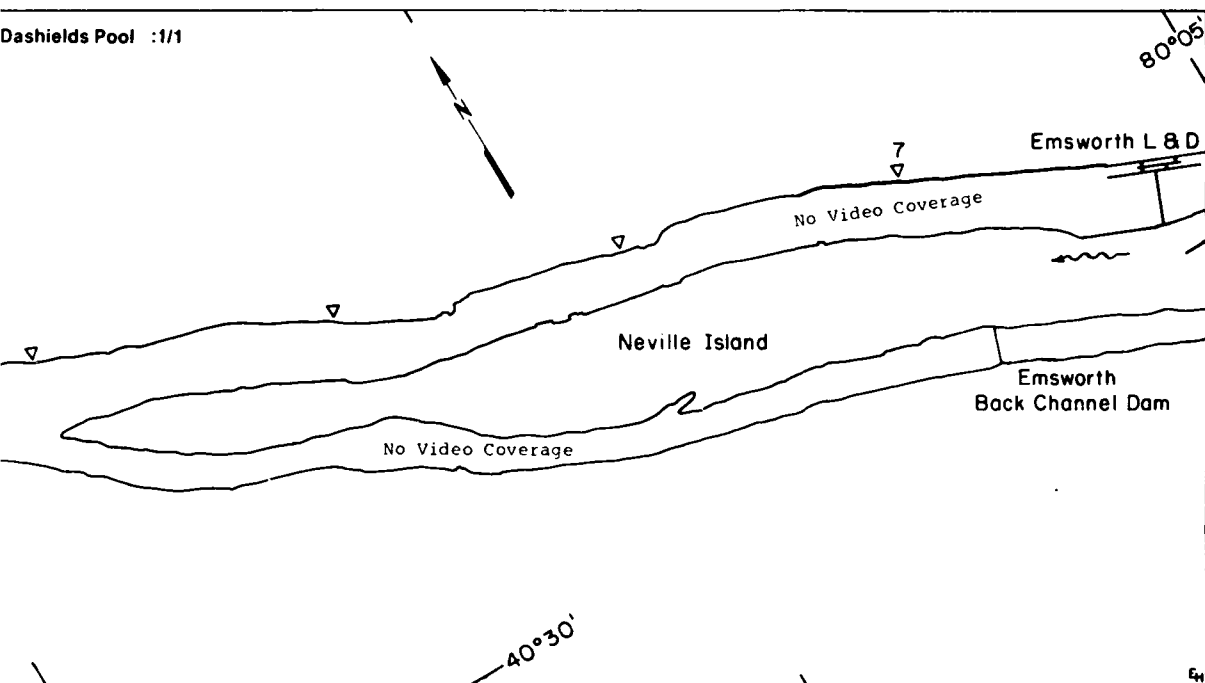


	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.10	1
Total area ($m^2 \times 10^6$)		4.49*	* Includes $4.23 \times 10^6 m^2$ of no video coverage

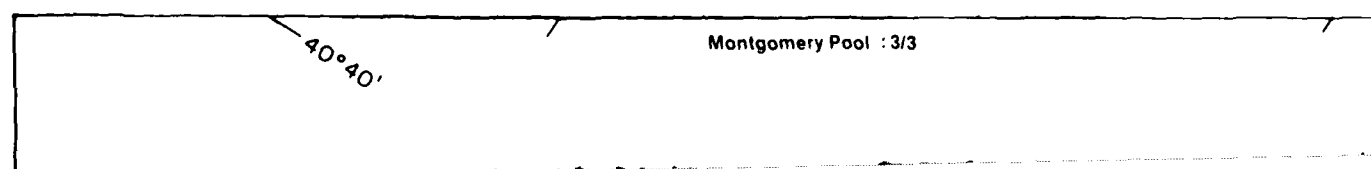
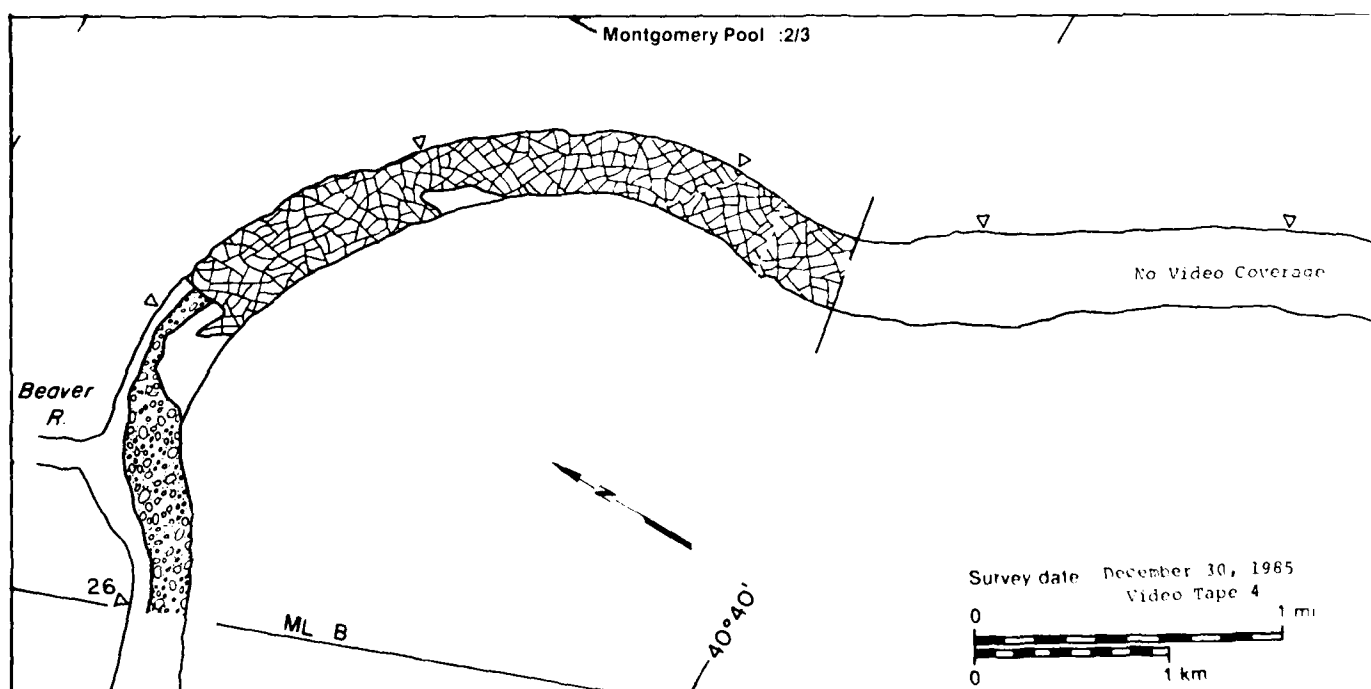
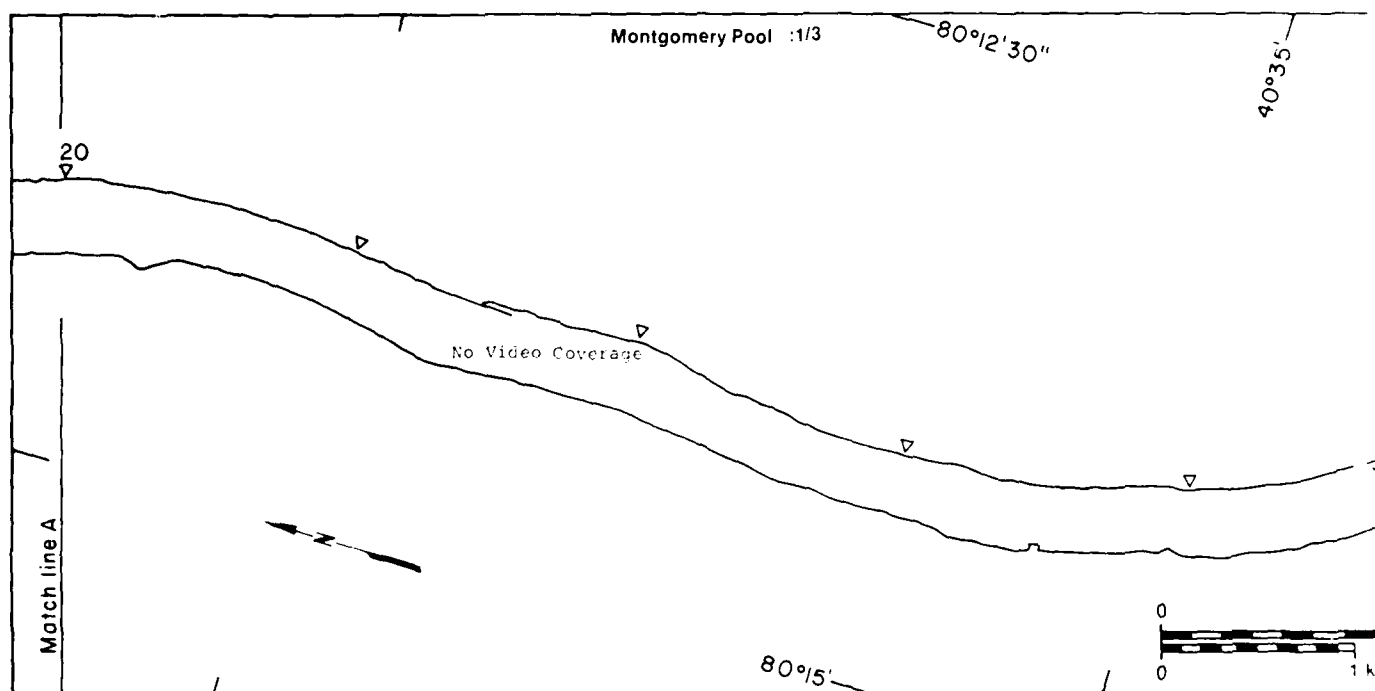


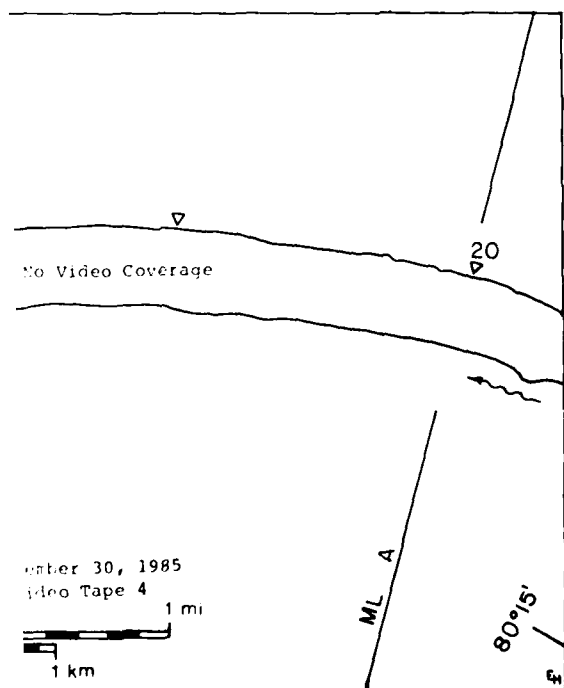
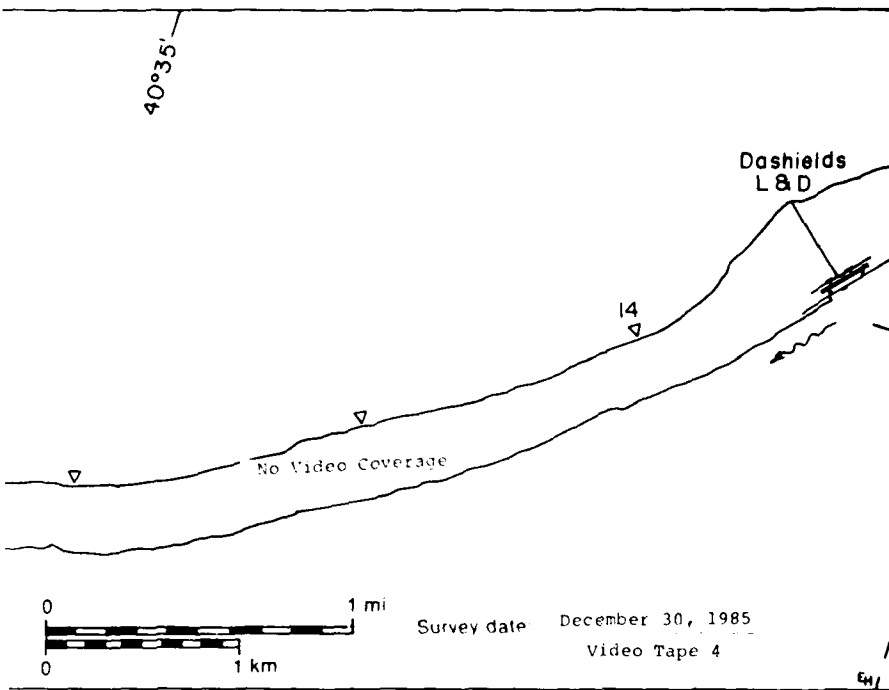
Dashiels Pool		Area ($m^2 \times 10^6$)	Surface concentration (%)
MAP UNITS			
	Open water	0.00	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		5.00*	* Includes $5.00 \times 10^6 m^2$ of no video coverage

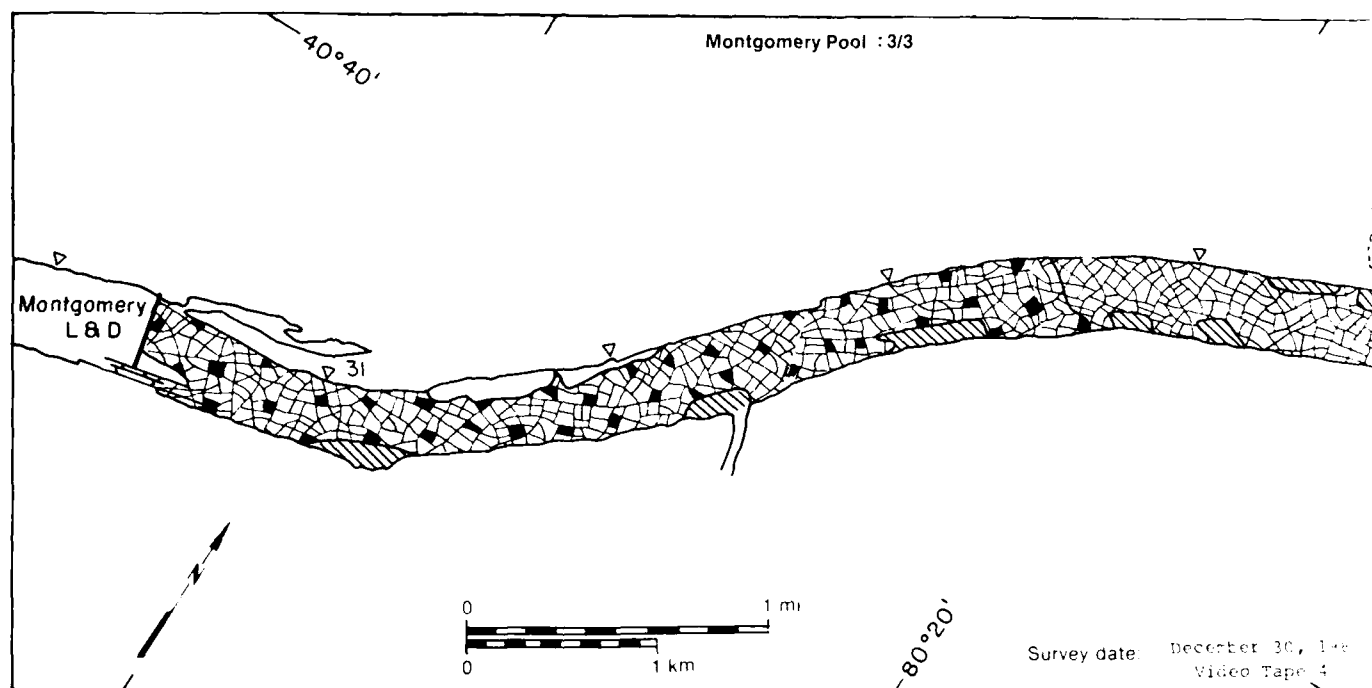
Dashields Pool :1/1



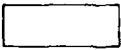





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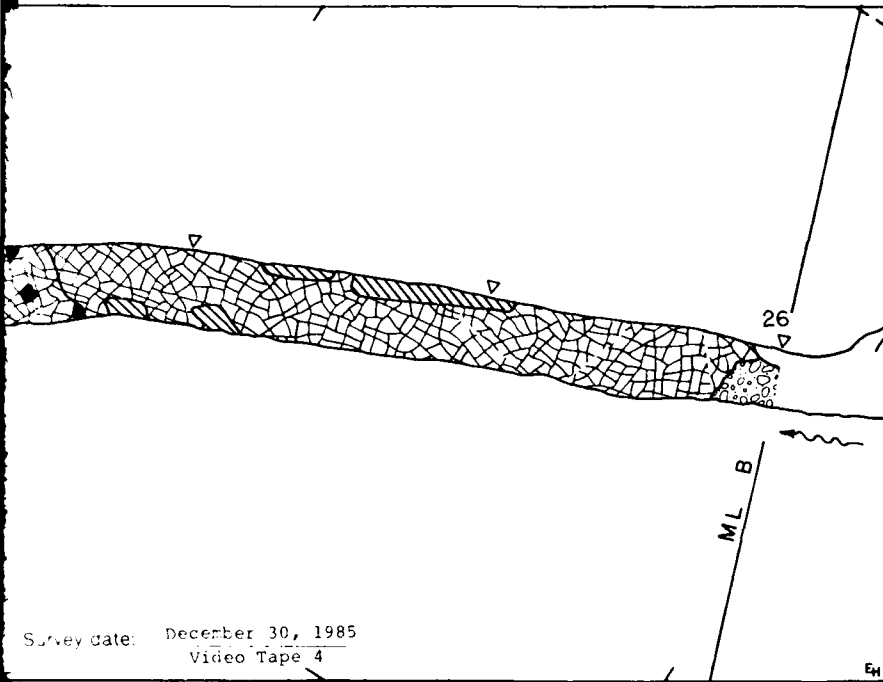
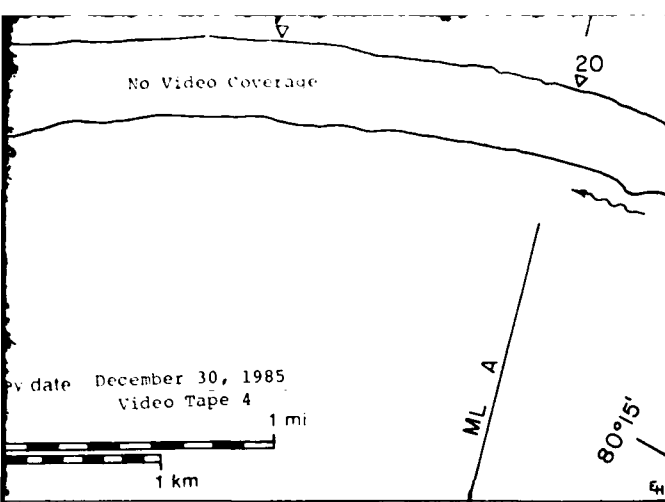


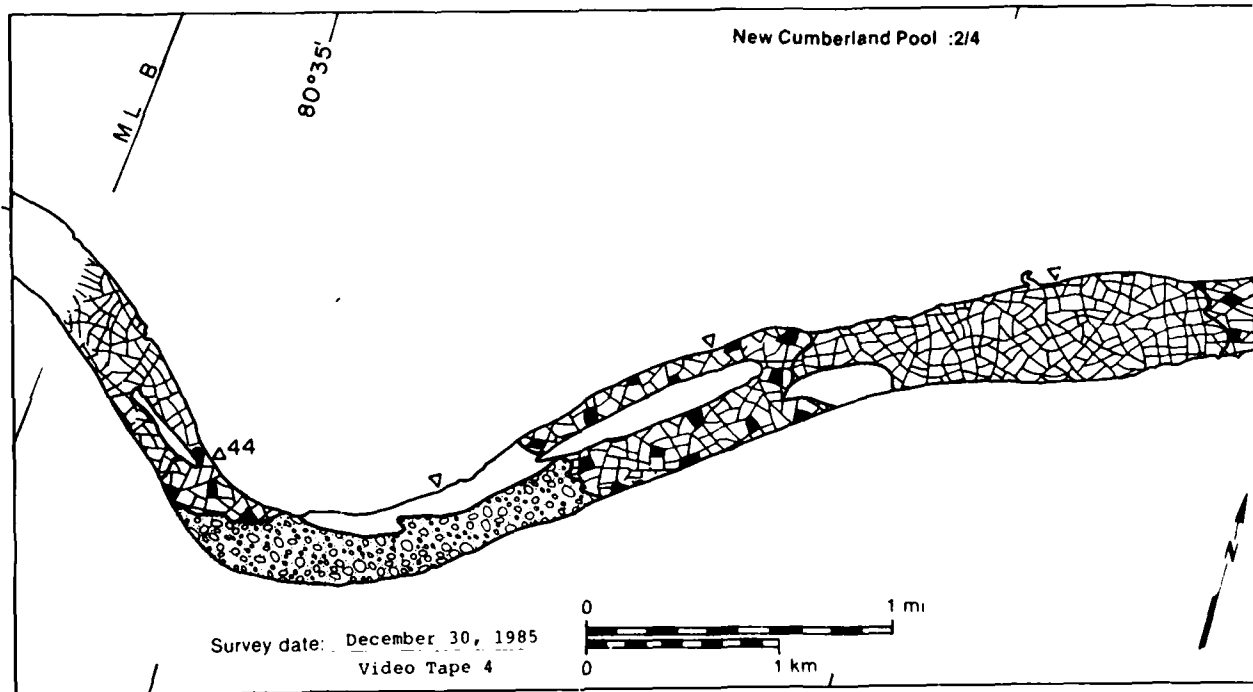
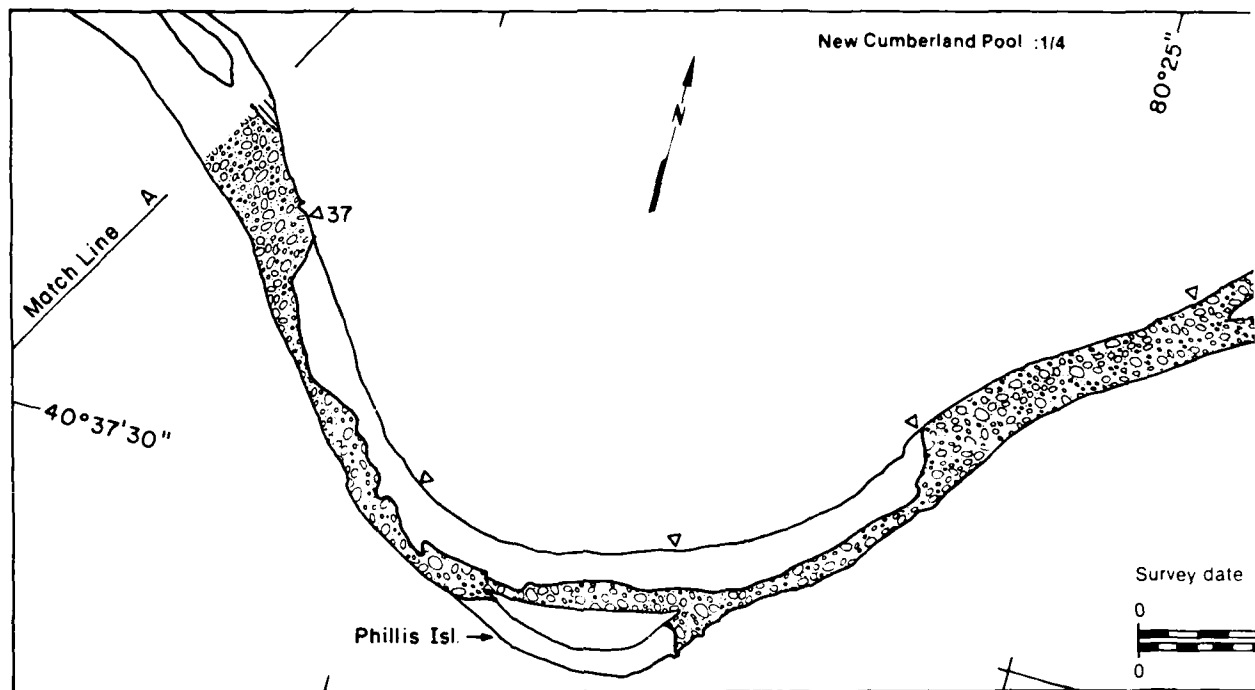




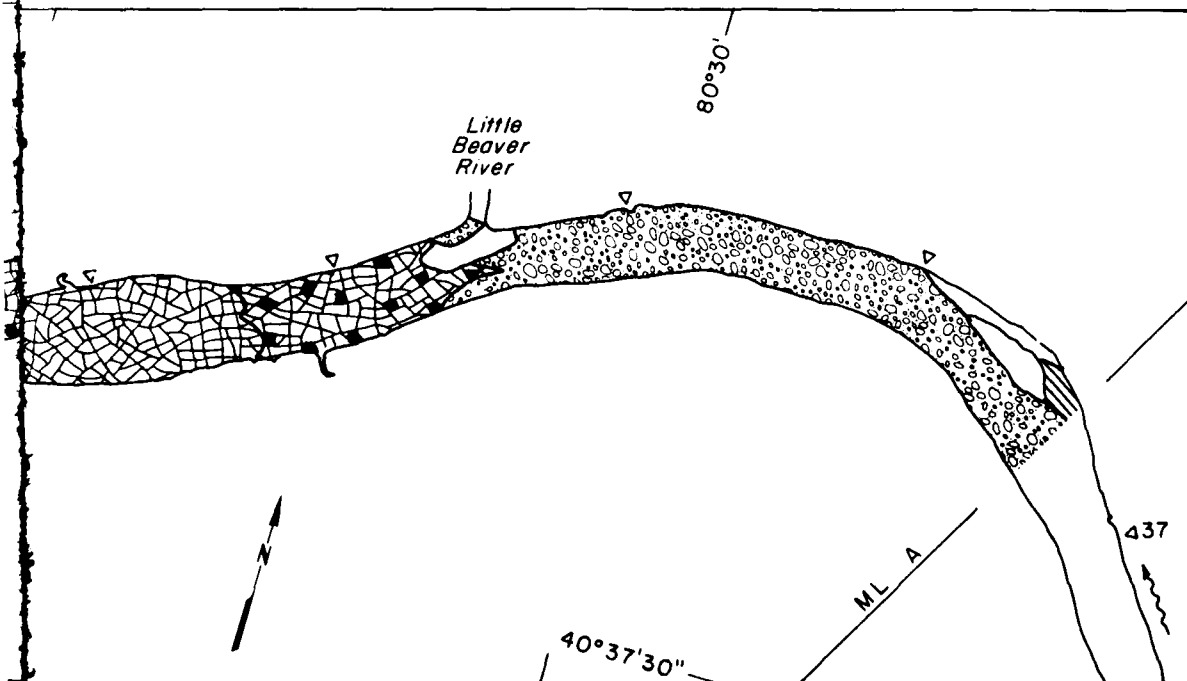
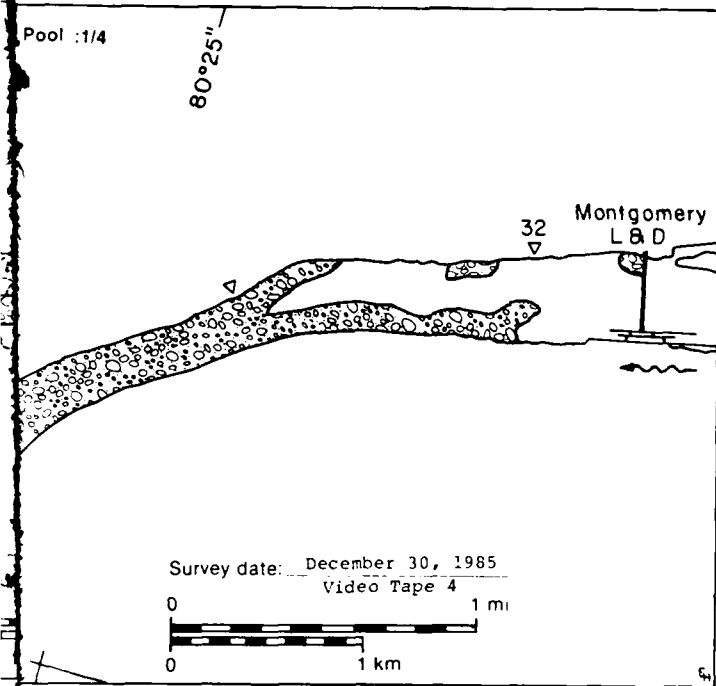
Montgomery Pool

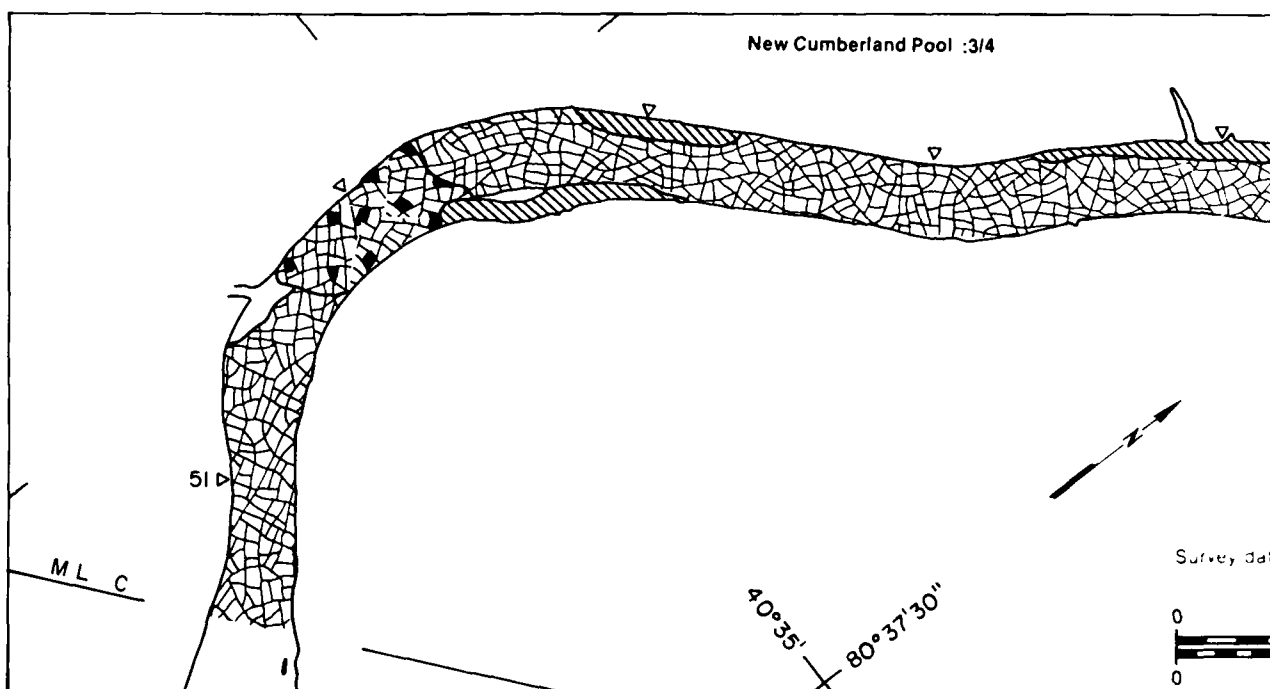
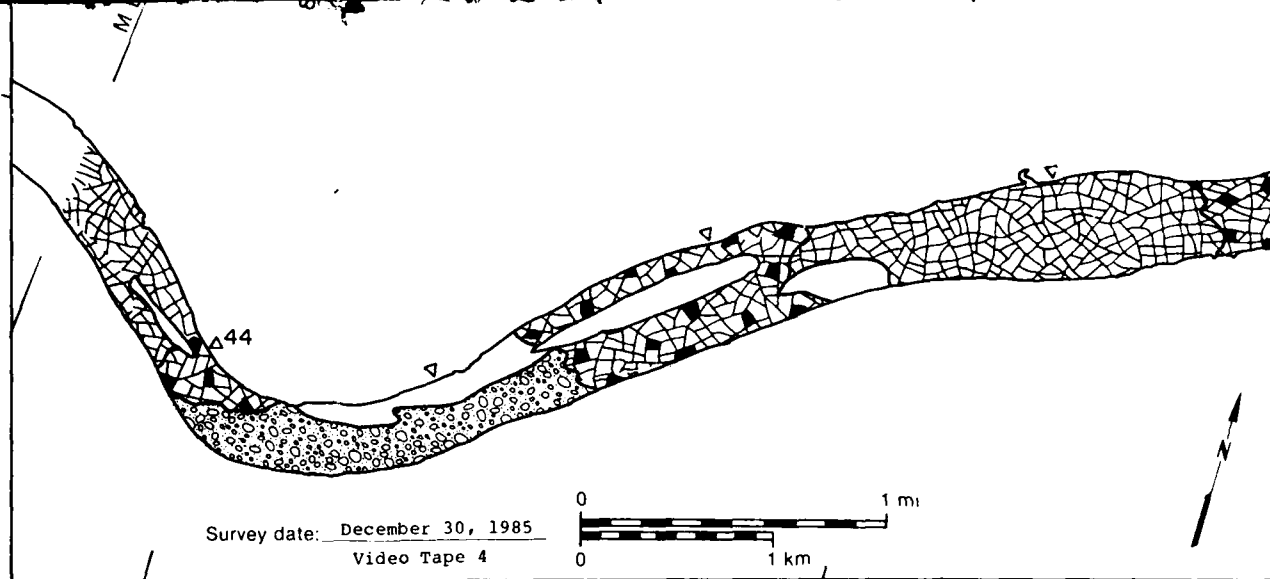
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
 Open water	0.53	NA
 Solid ice cover	0.28	NA
 Solid ice cover with open water areas	0.00	—
 Fragmented ice cover	2.74	NA
 Fragmented ice cover with open-water areas	1.73	80
 Ice floes or frazil slush and pans	0.43	40
Total area ($m^2 \times 10^6$)	11.27*	* Includes $5.56 \times 10^6 m^2$ of no video coverage

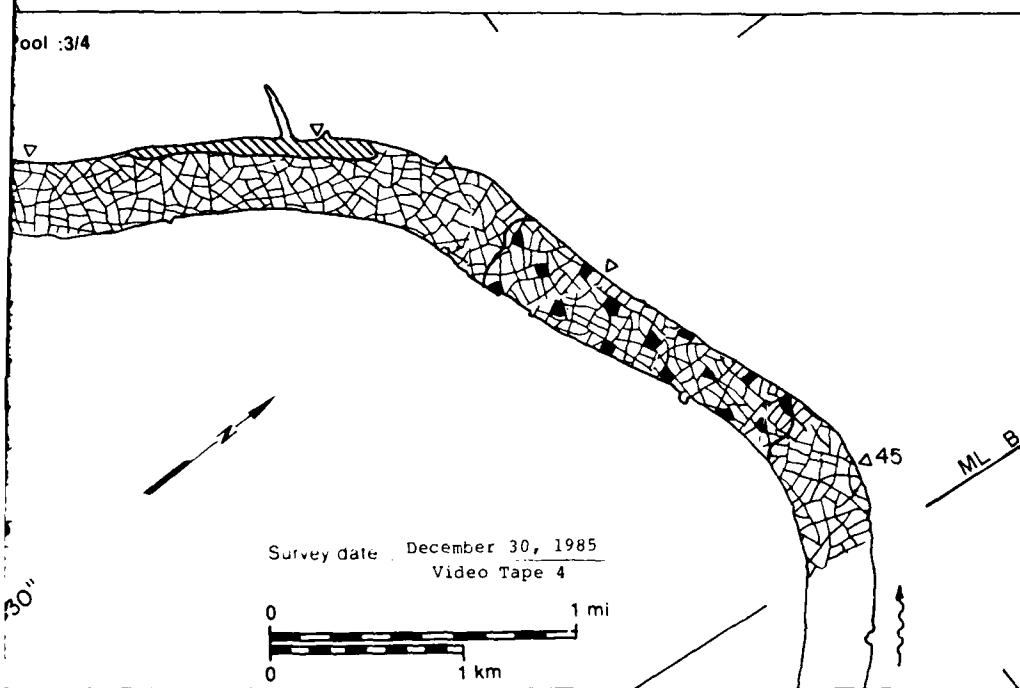
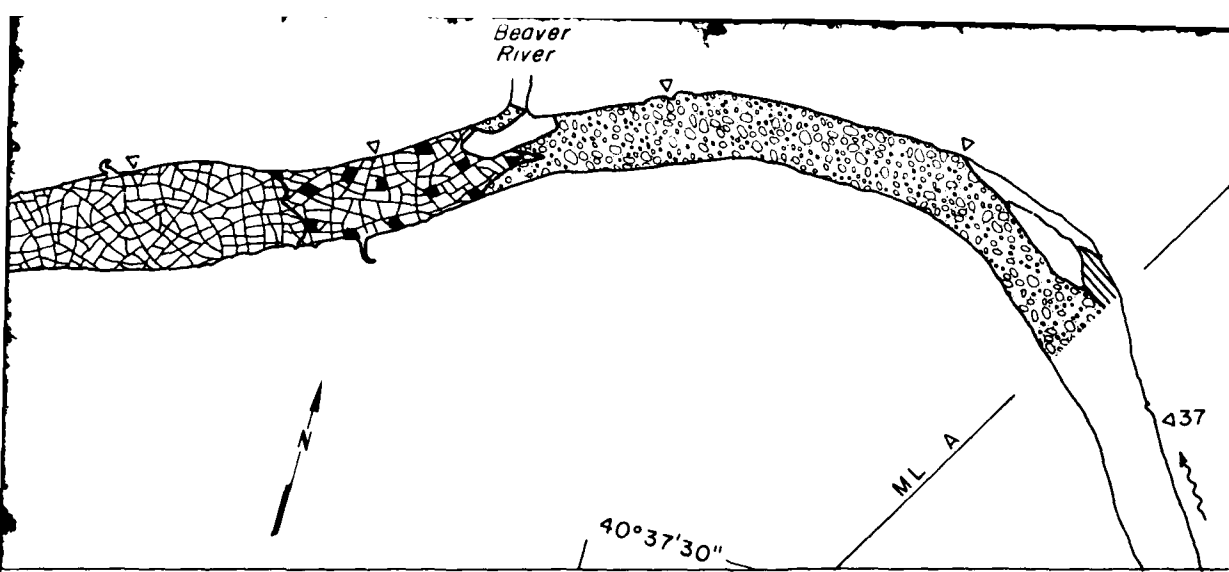




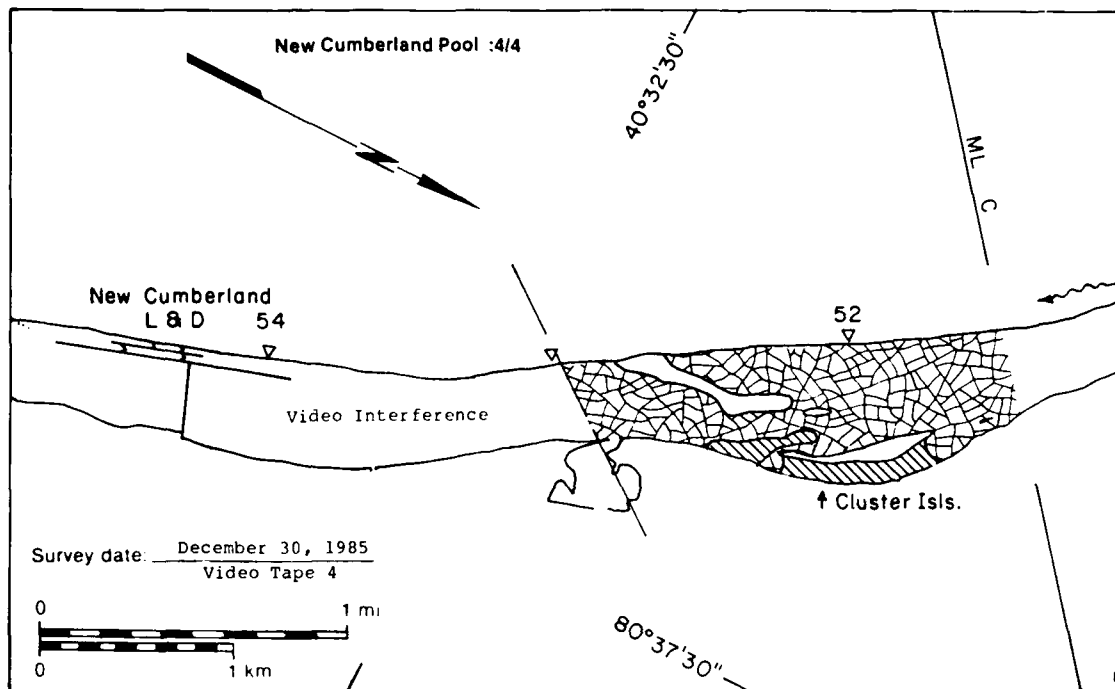
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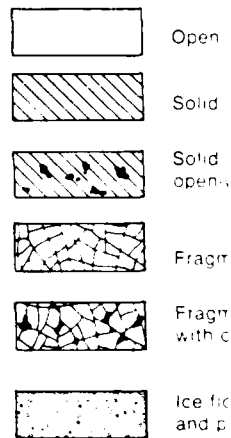


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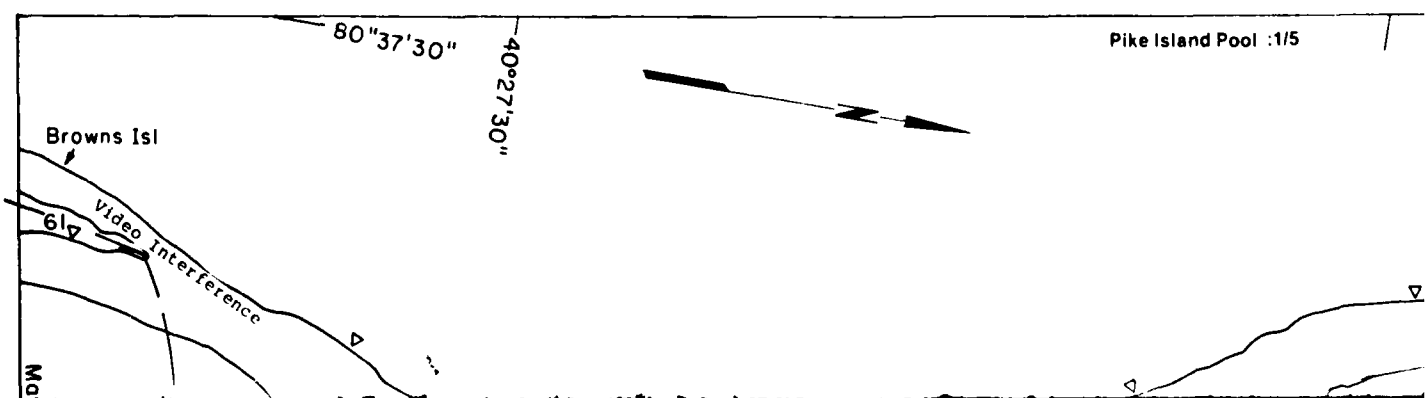


New Cumbe






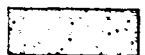
MAP L

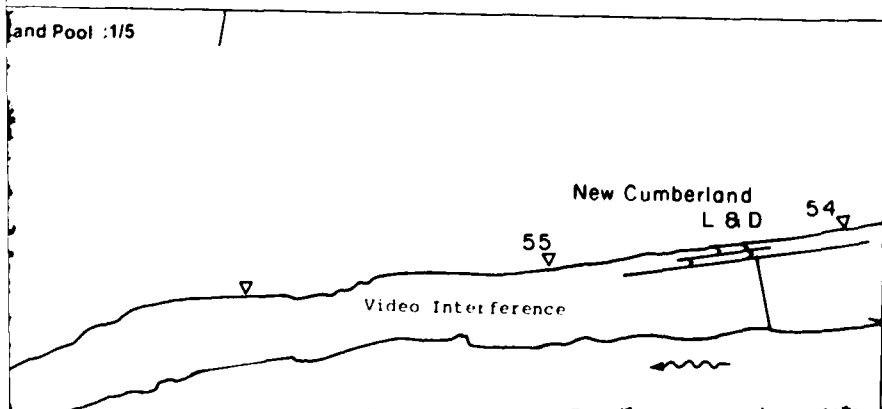


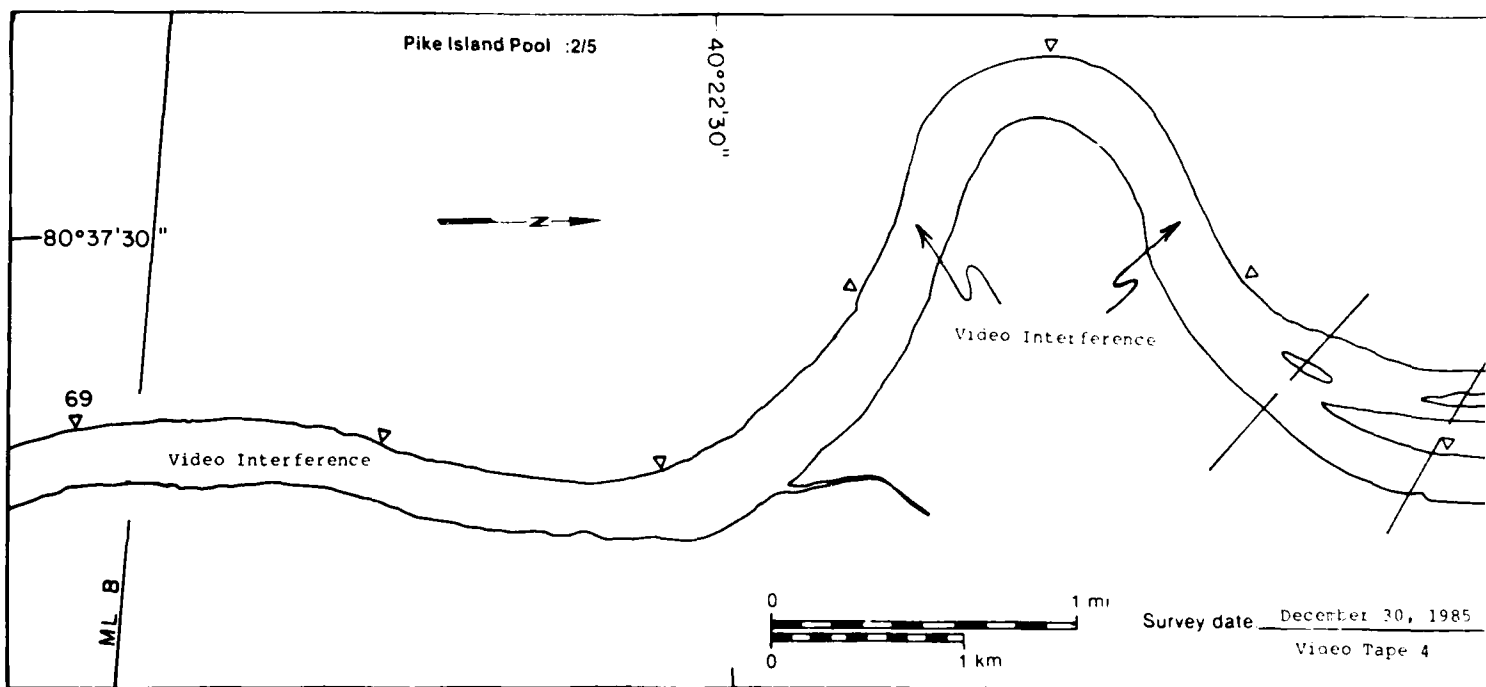
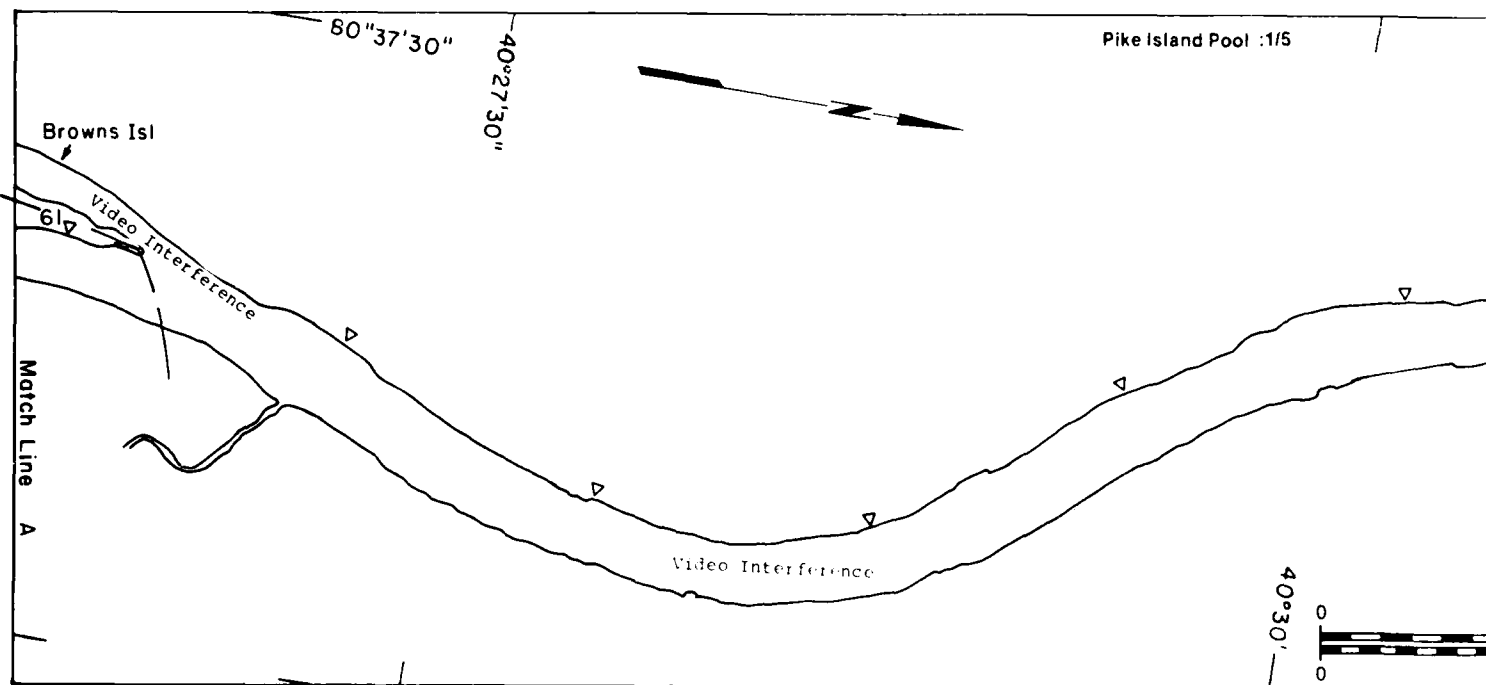
Total



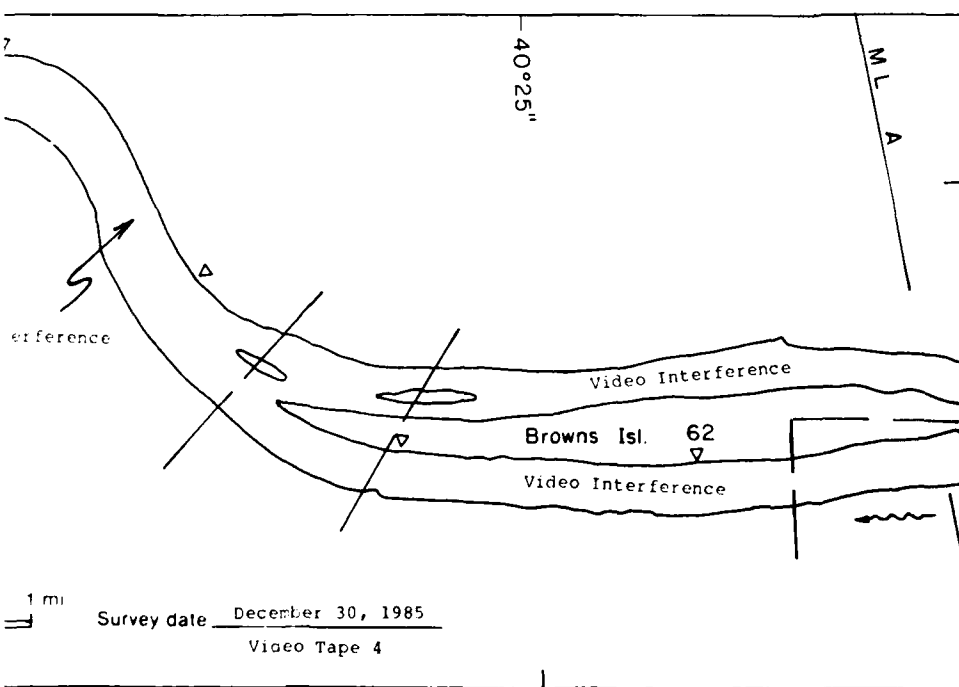
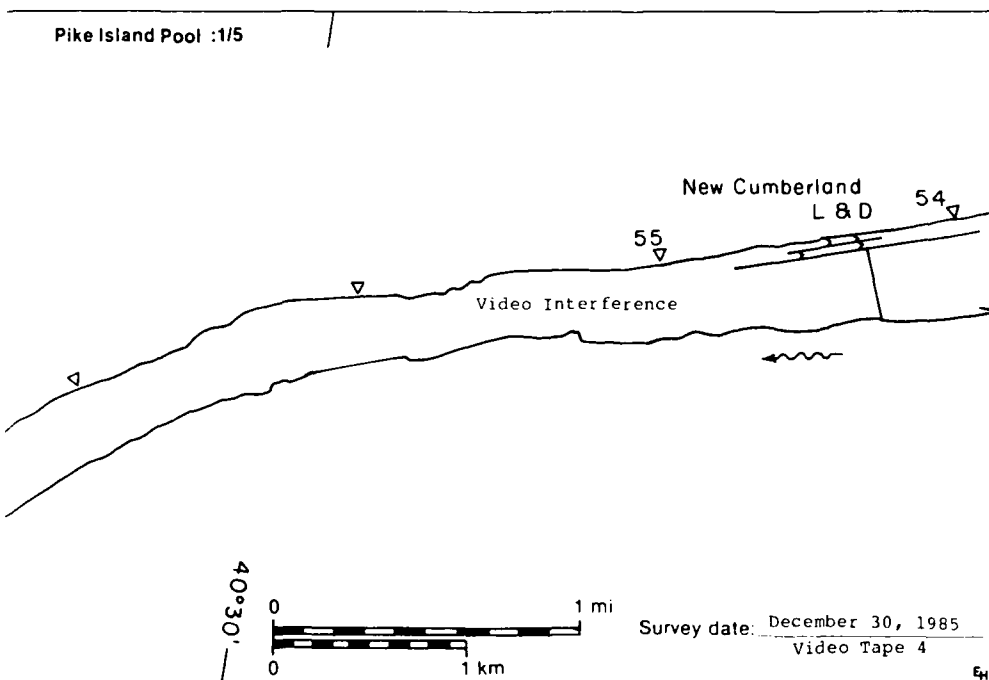
New Cumberland Pool

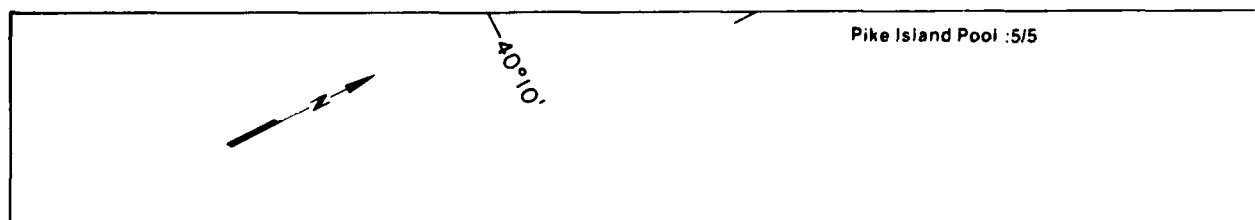
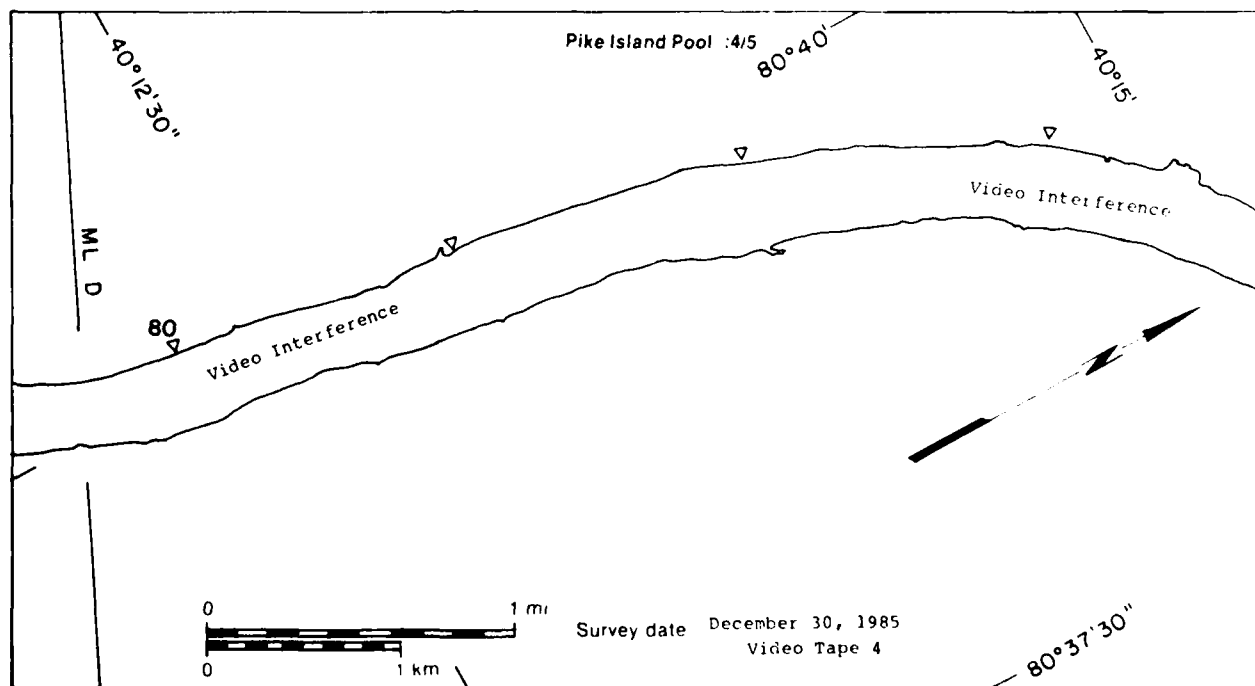
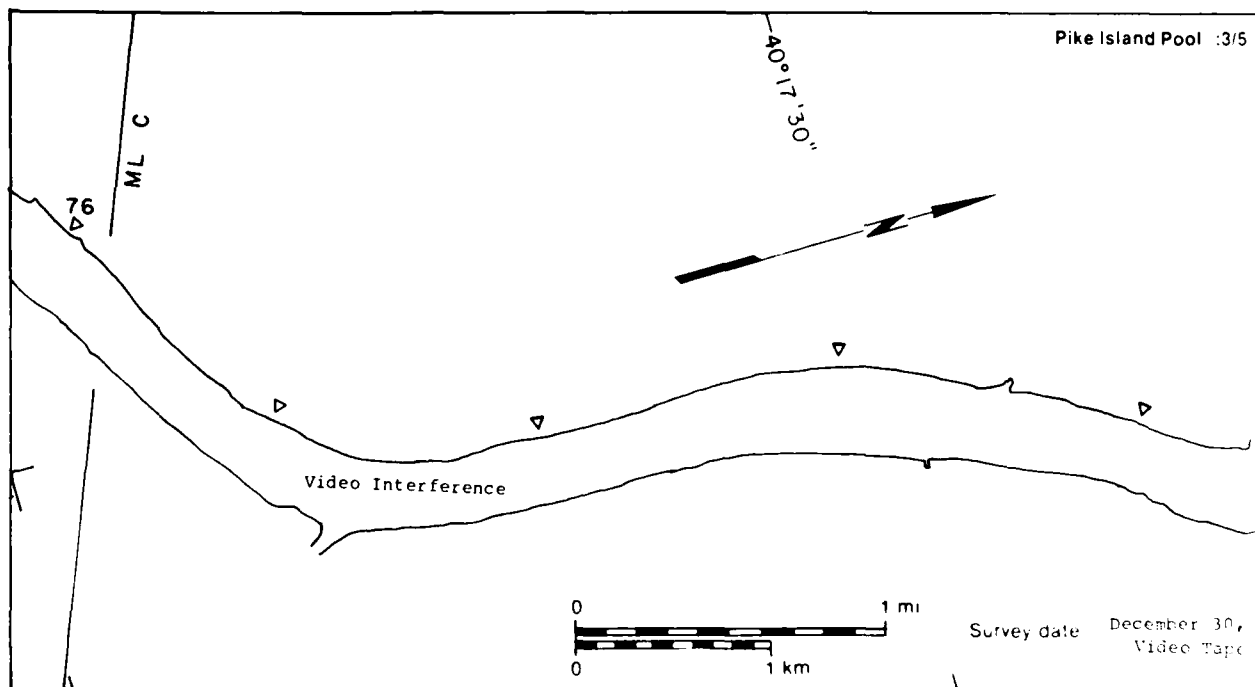
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
 Open water	2.19	NA
 Solid ice cover	0.46	NA
 Solid ice cover with open-water areas	0.00	—
 Fragmented ice cover	5.83	NA
 Fragmented ice cover with open-water areas	2.17	90
 Ice floes or frazil slush and pans	3.18	30
Total area ($m^2 \times 10^6$)	14.87*	* Includes $1.04 \times 10^6 m^2$ of Video Interference



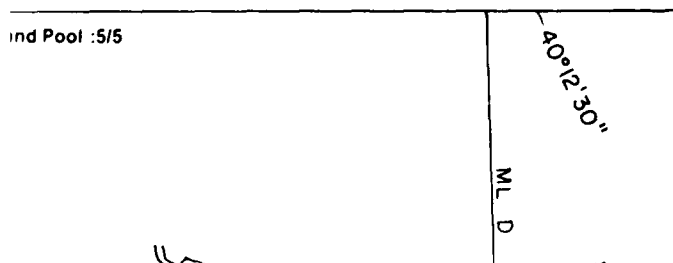
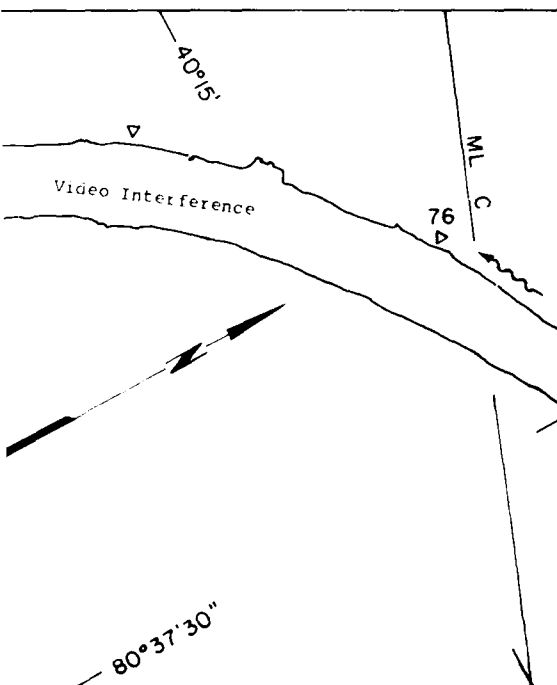
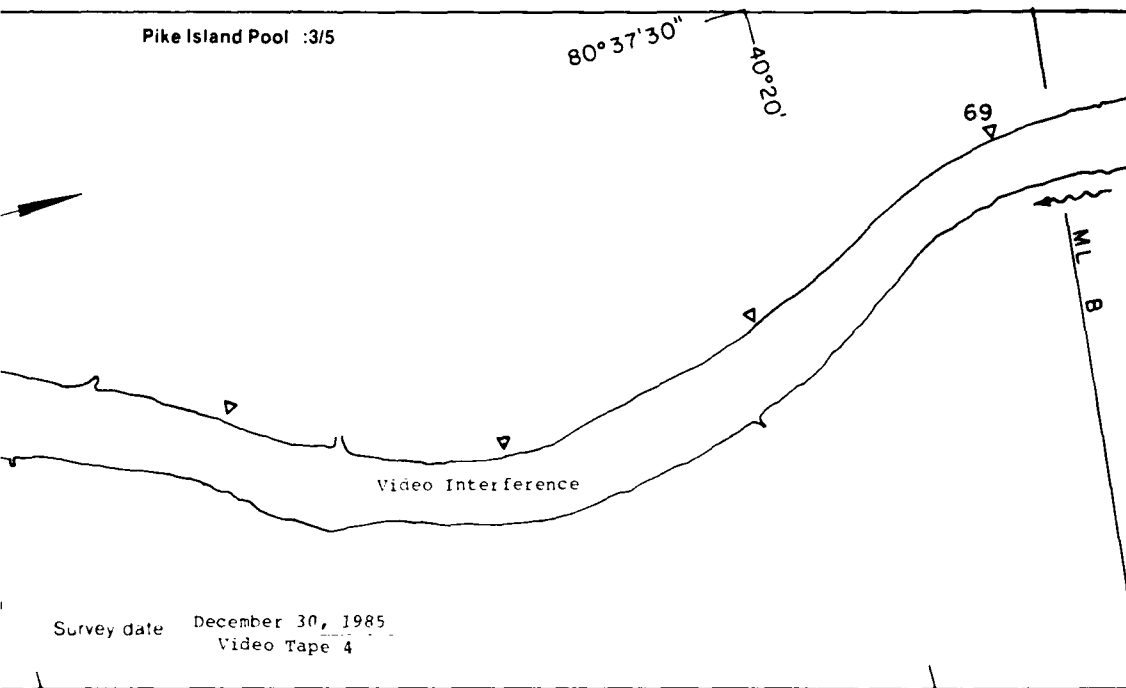


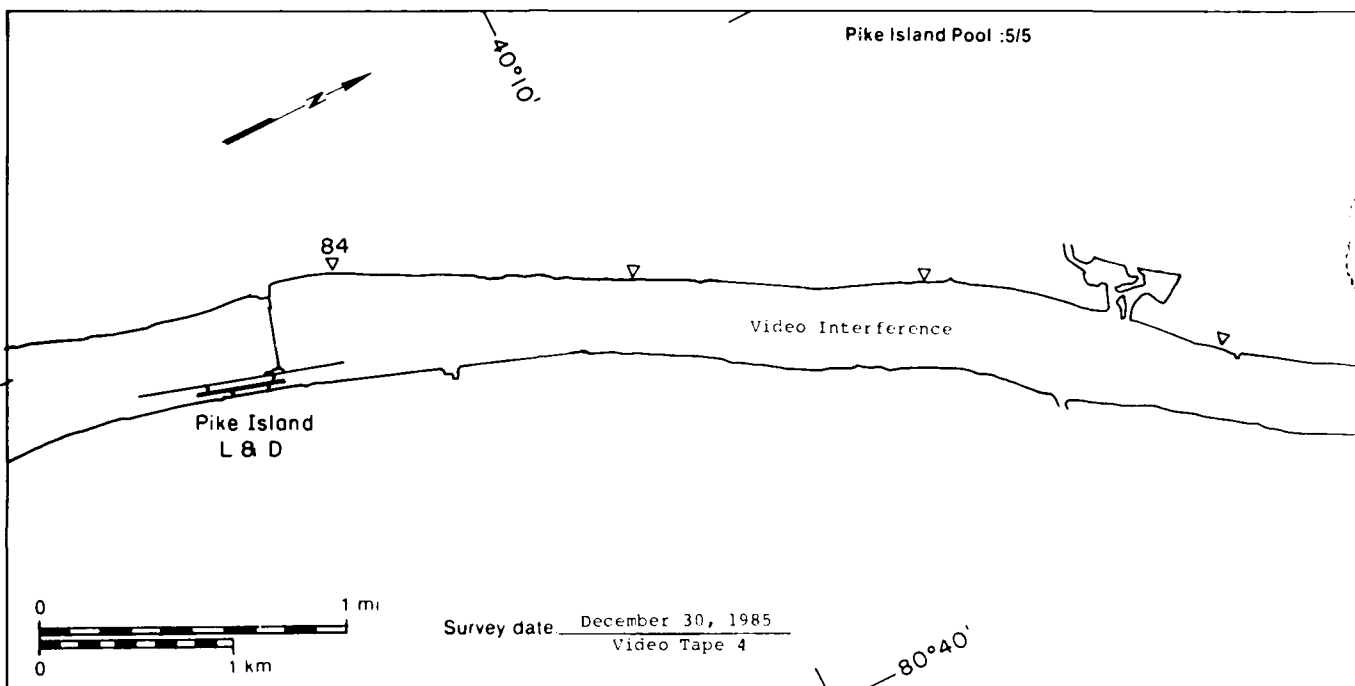
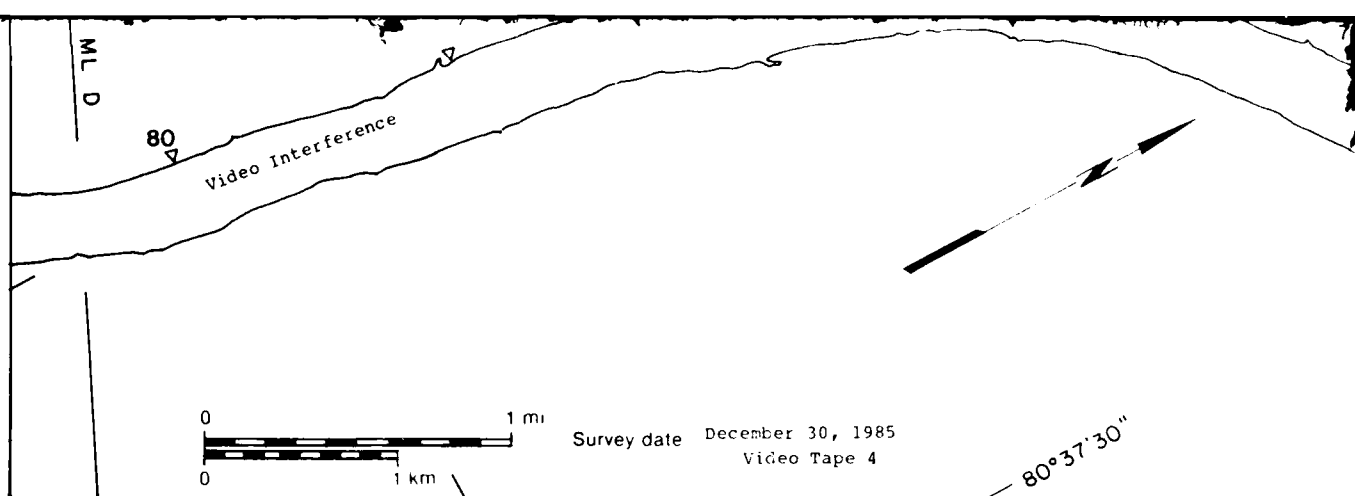
Pike Island Pool :1/5



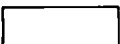
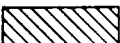
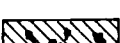
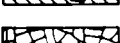
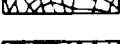



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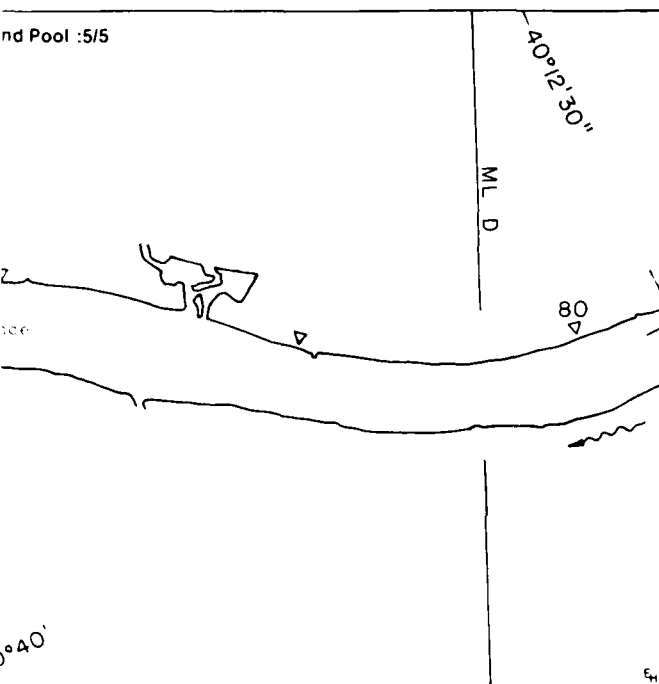
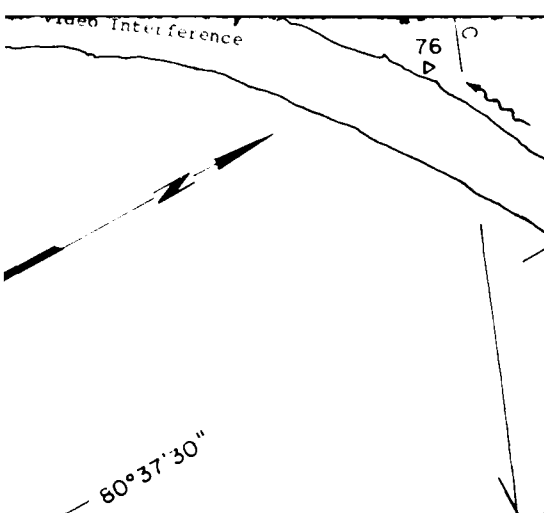
Pike Island Pool

MAP UNITS		Area (m ² x 10 ⁶)	Surface concentration (%)
	Open water	0.90	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—

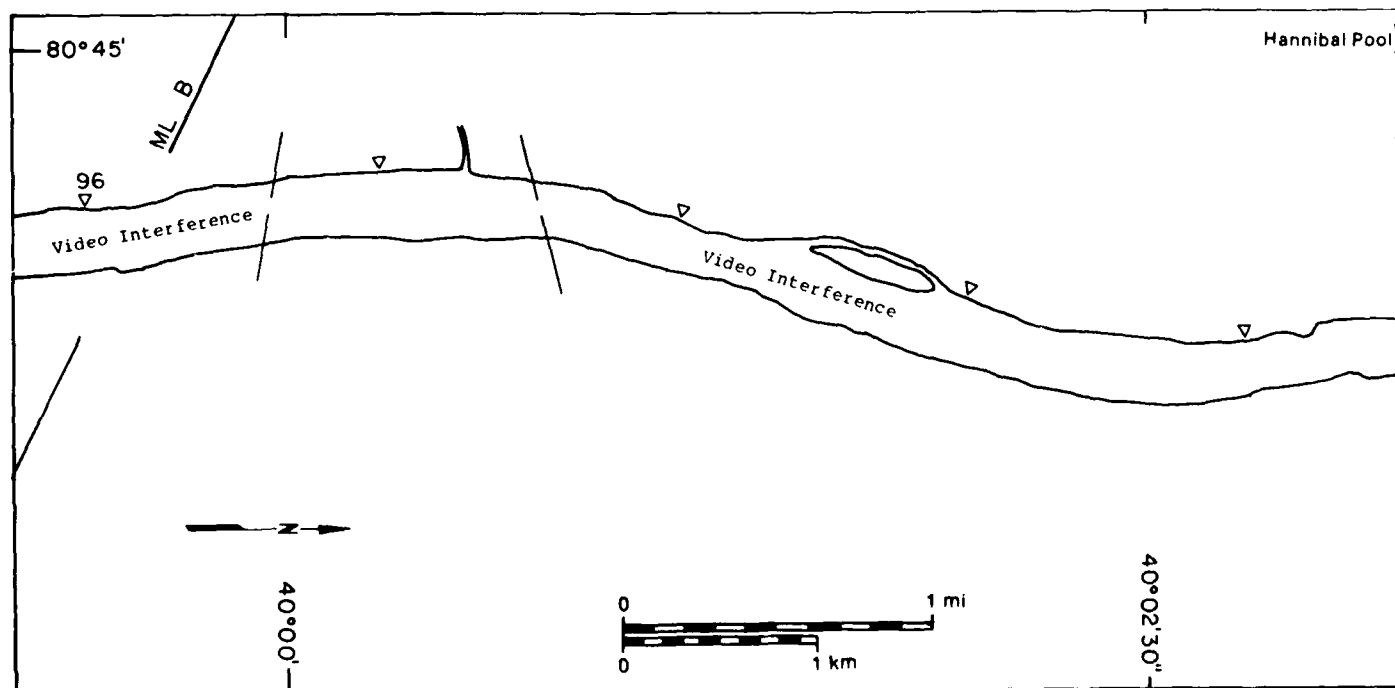
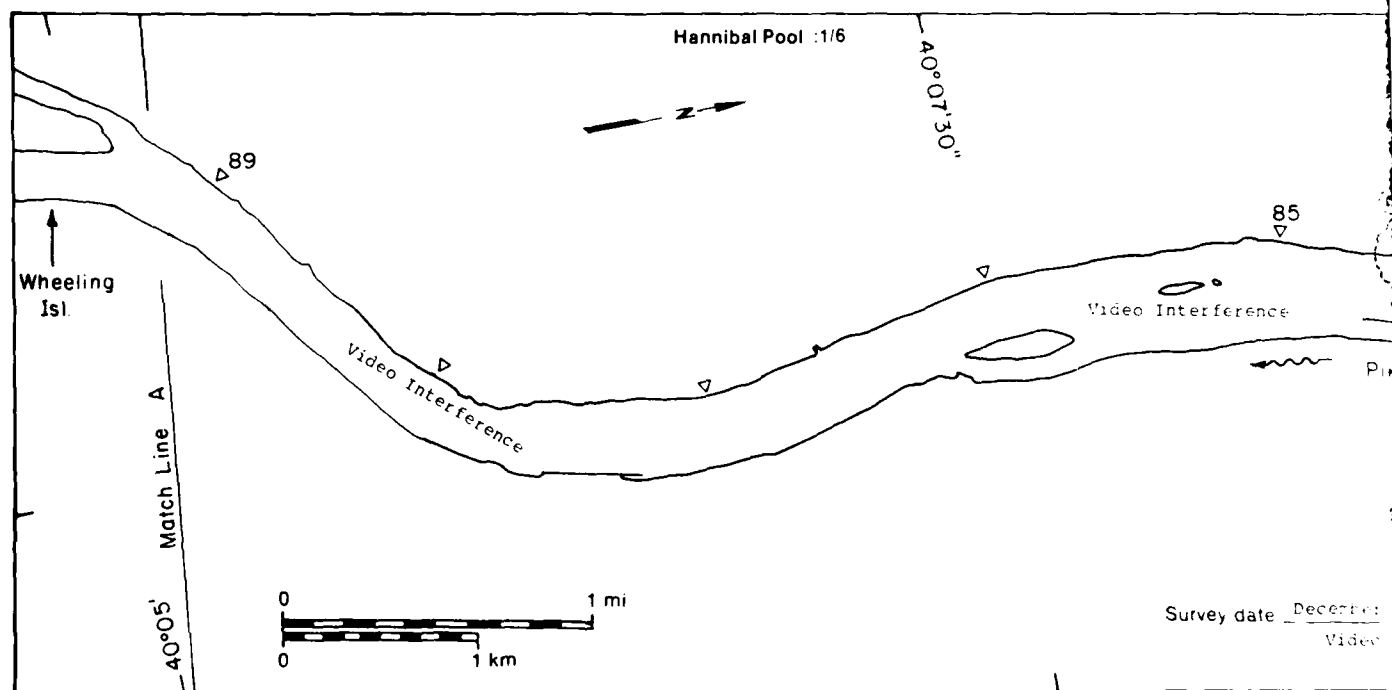
Total area (m² x 10⁶)

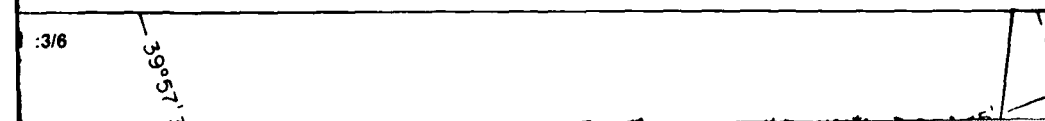
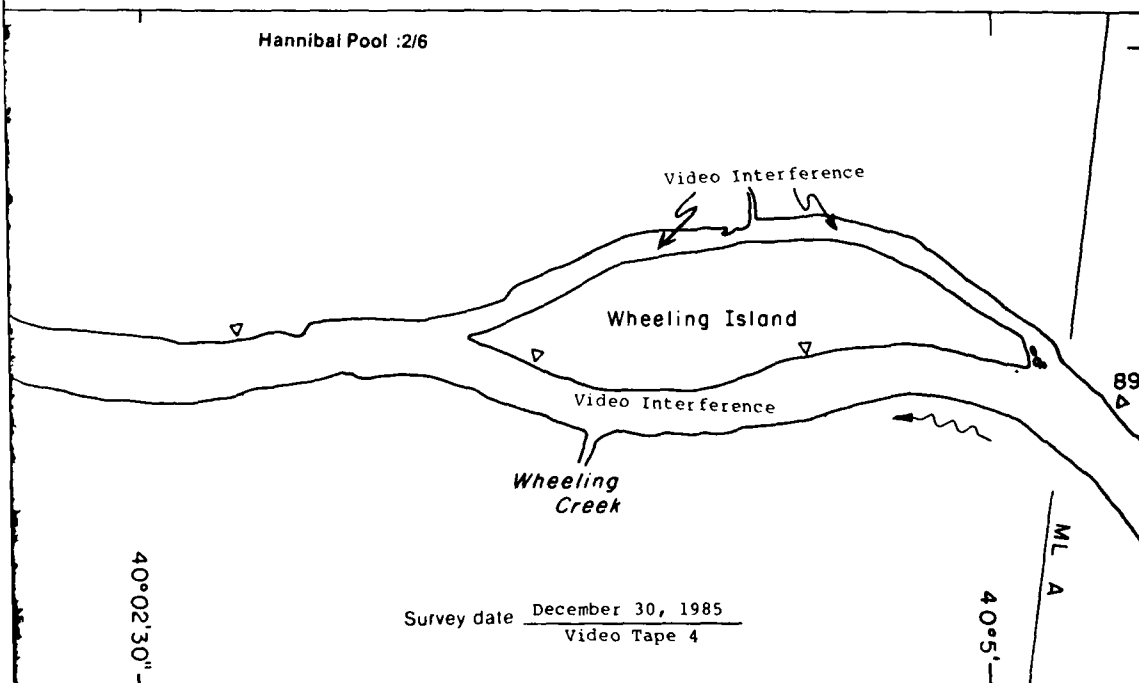
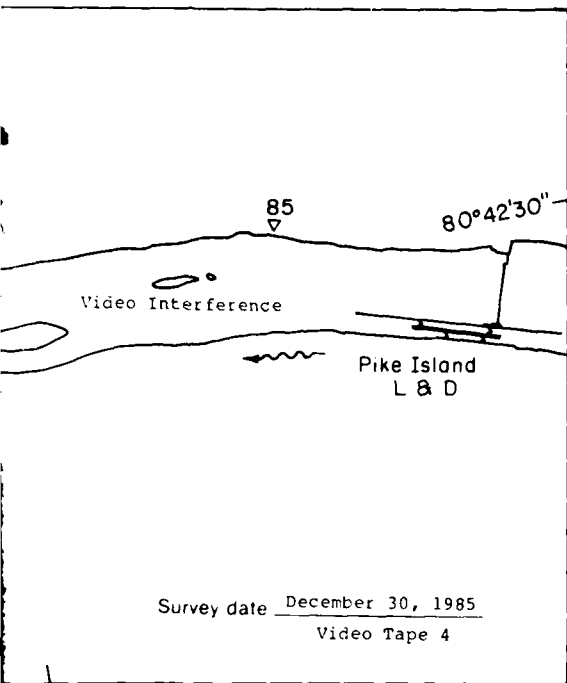
18.92*

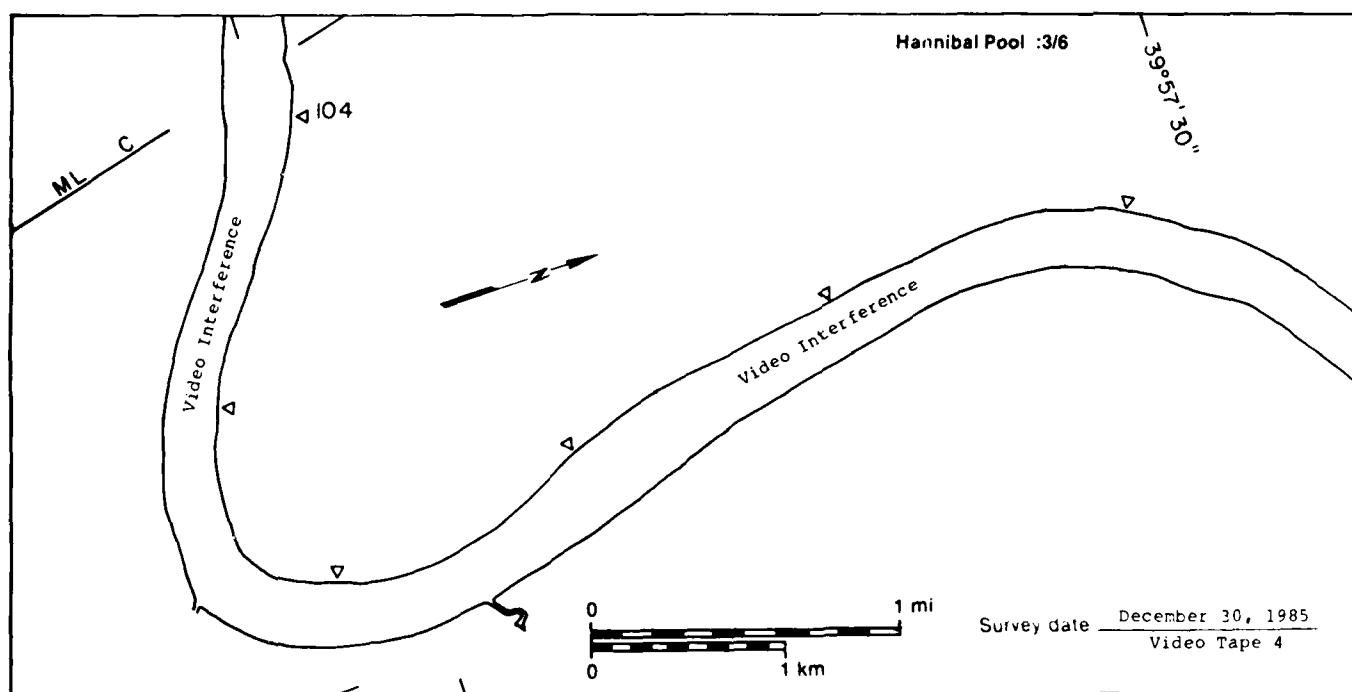
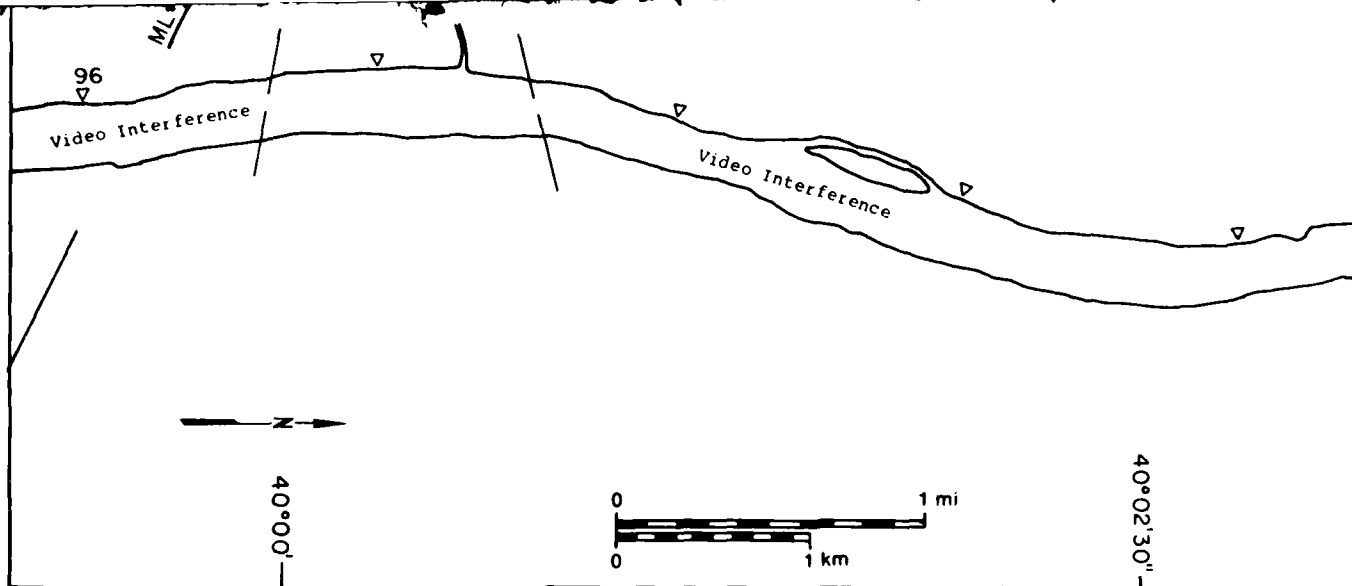
* Includes 18.02 x 10⁶ m² of Video Interference

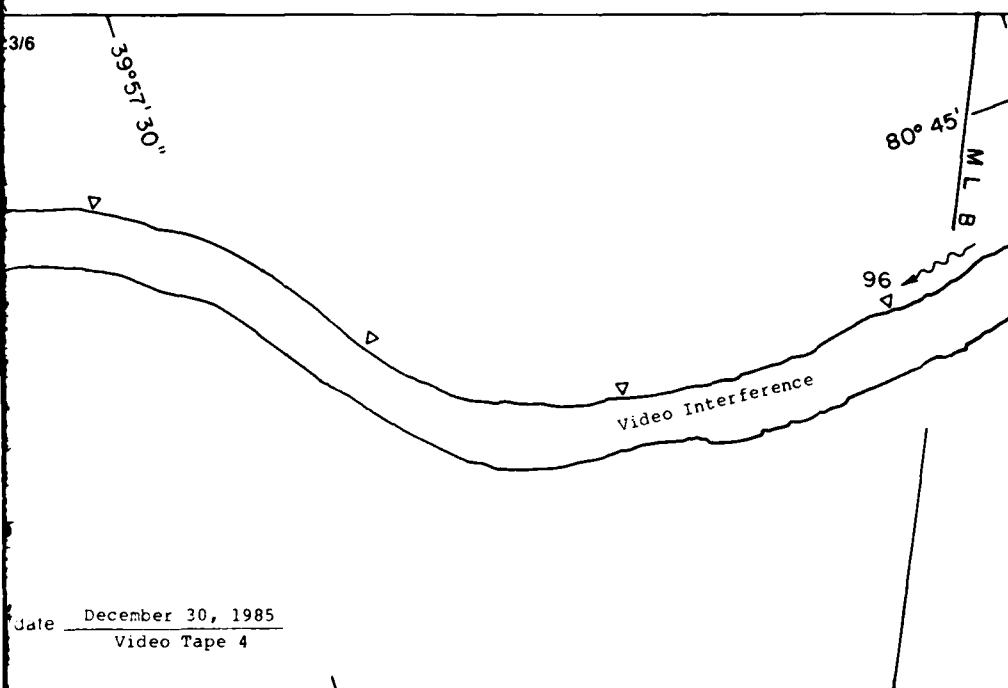
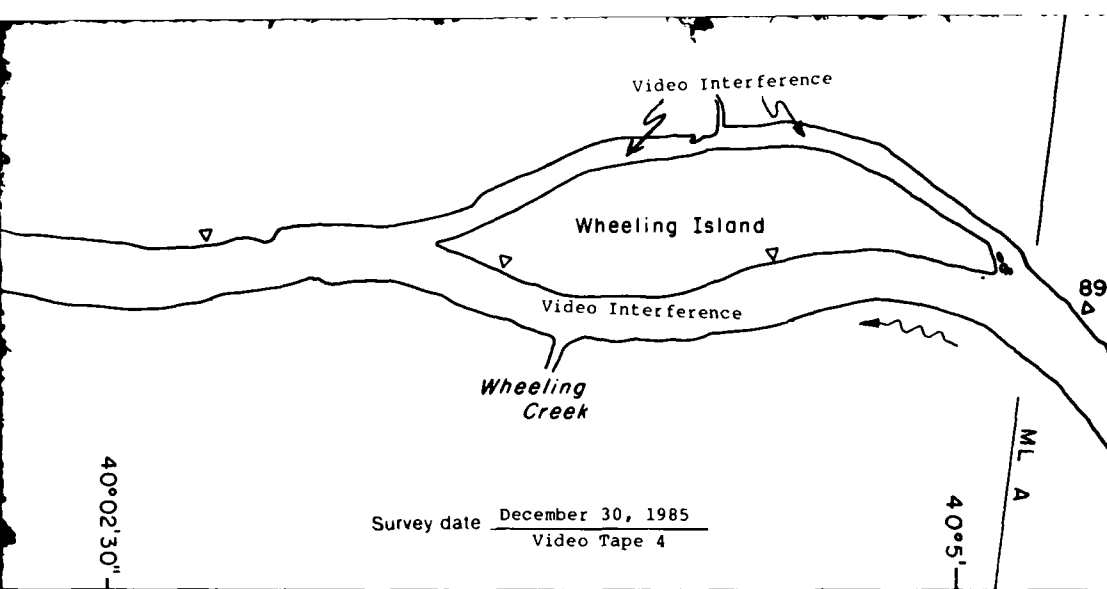


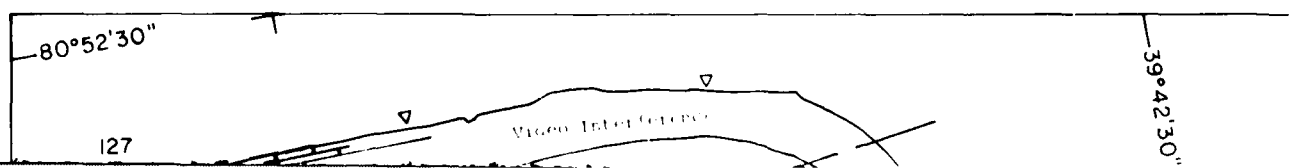
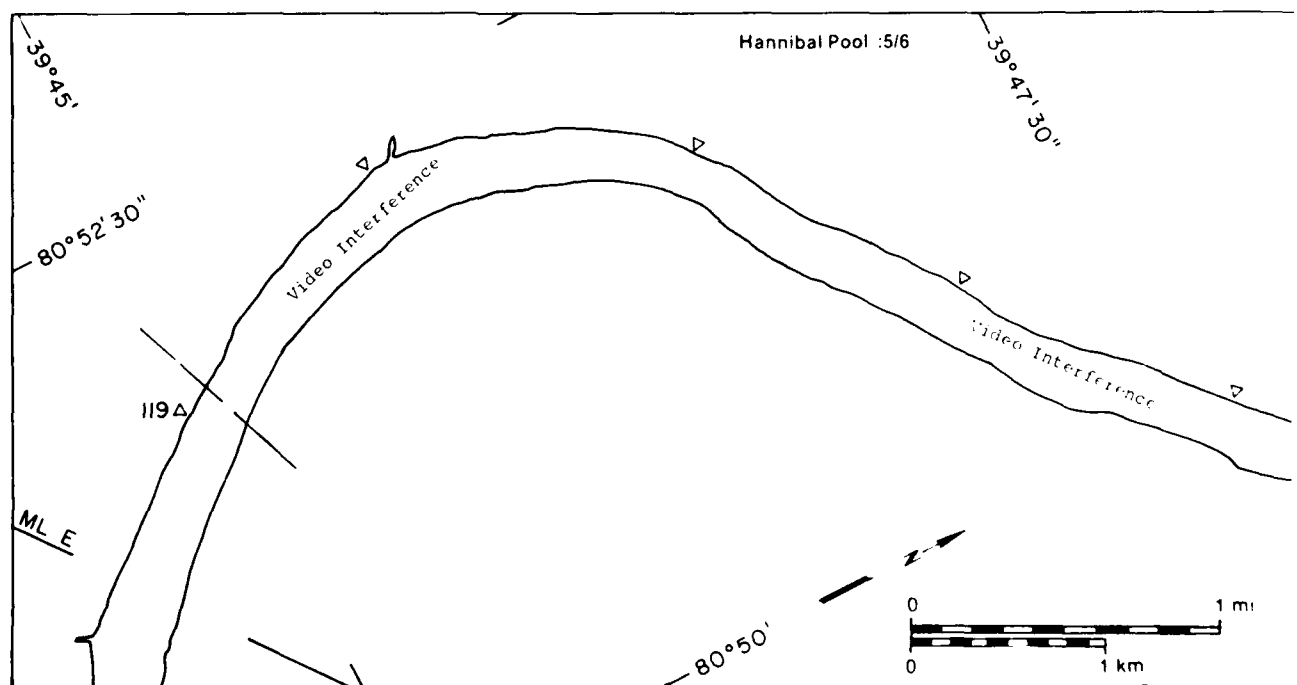
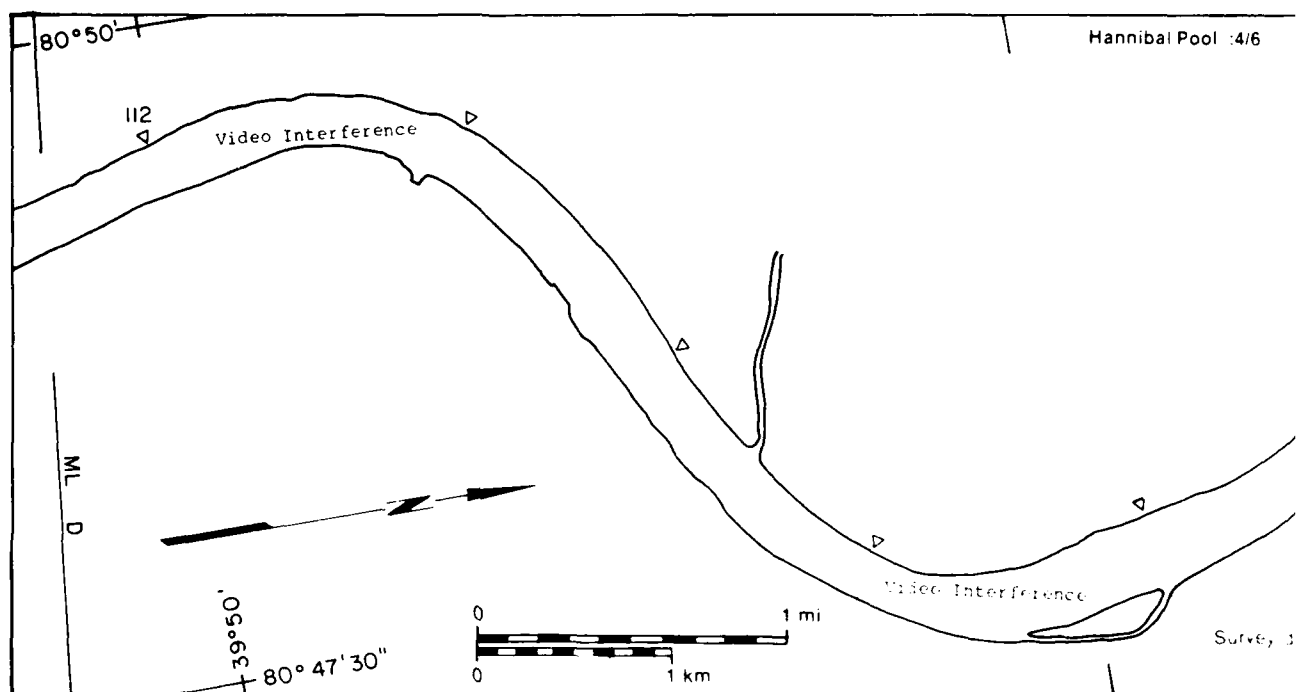
30 December 1985



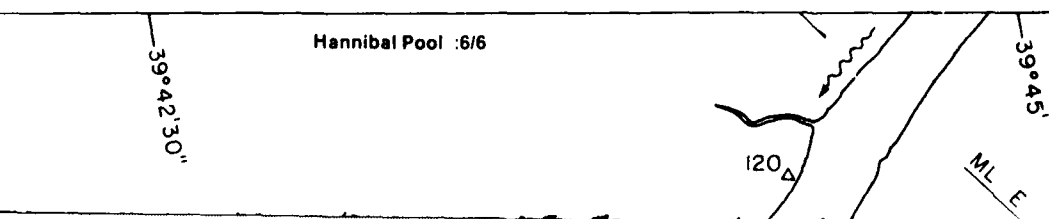
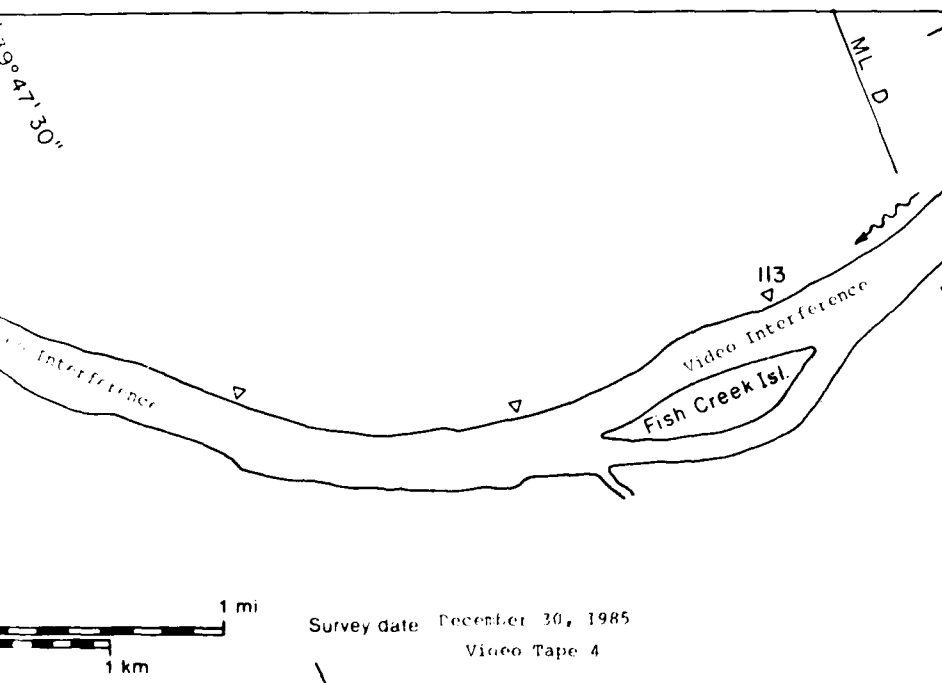
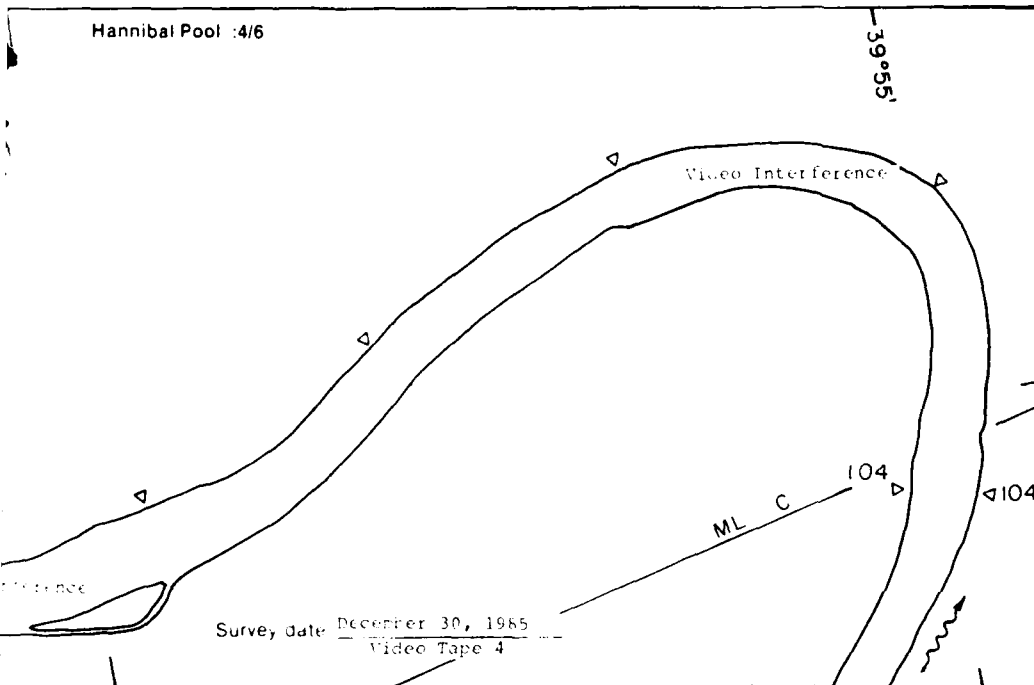


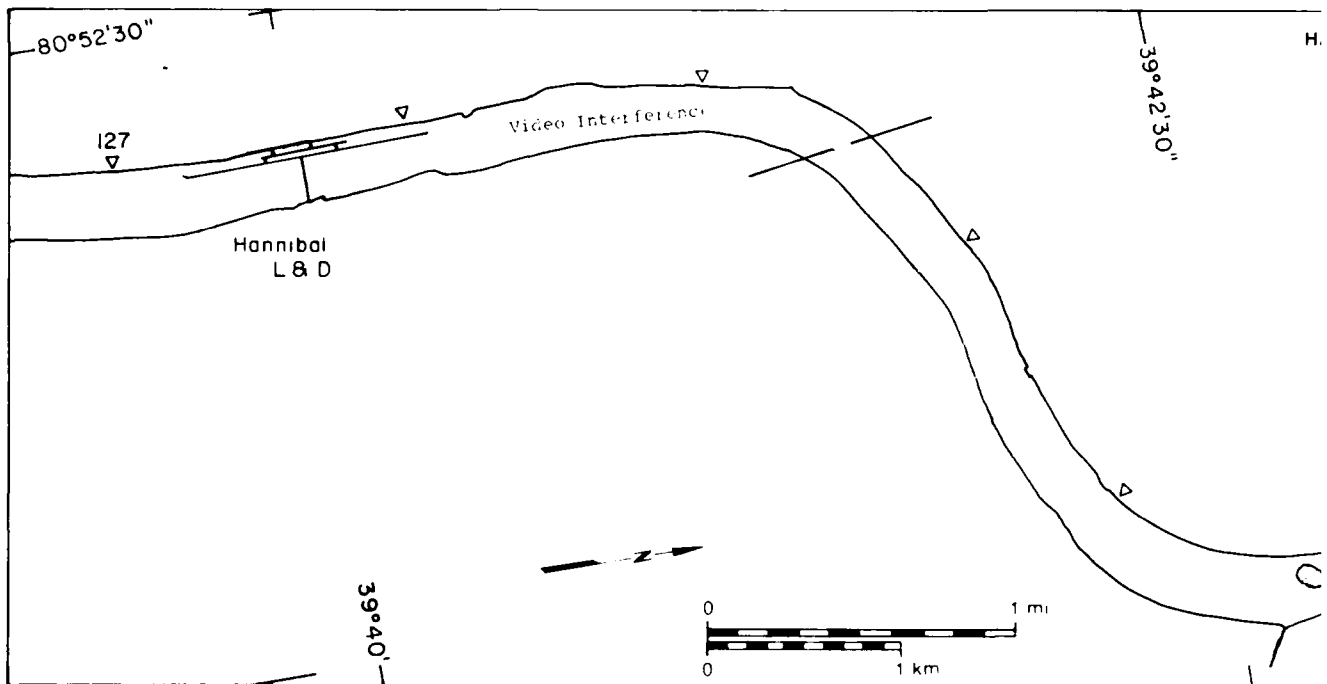
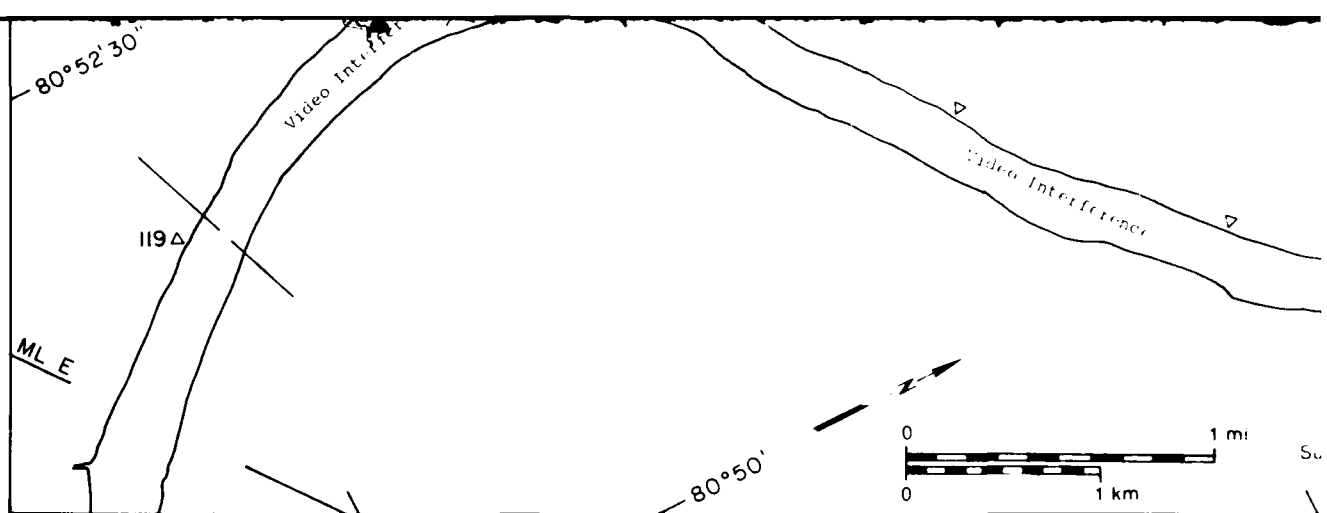






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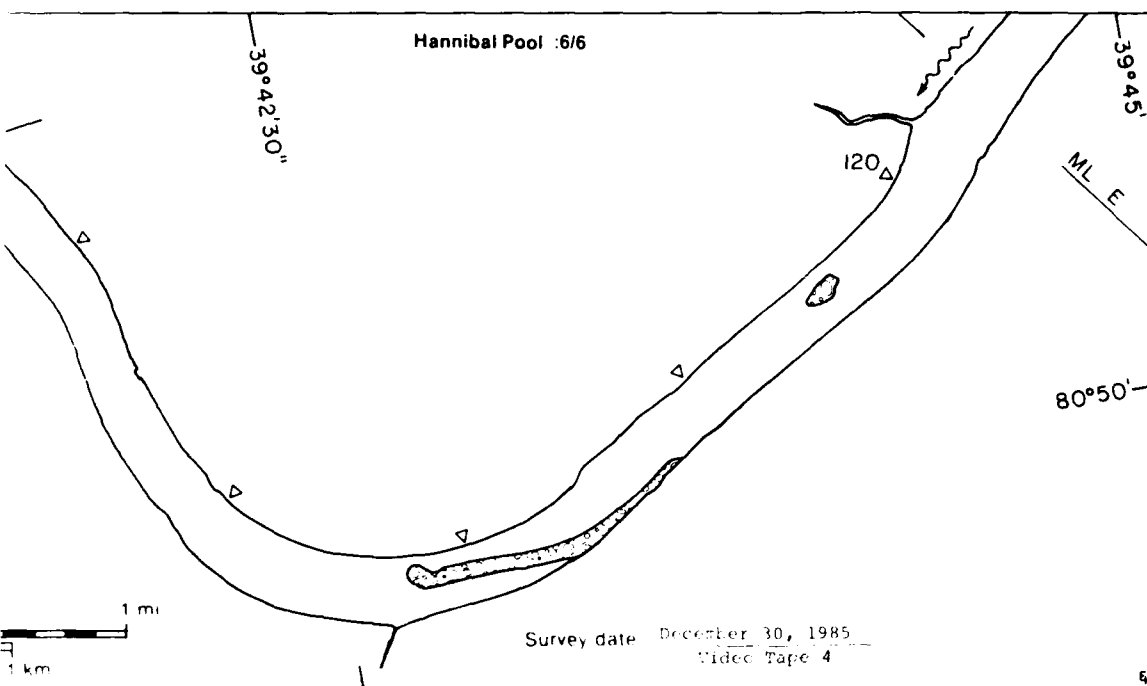
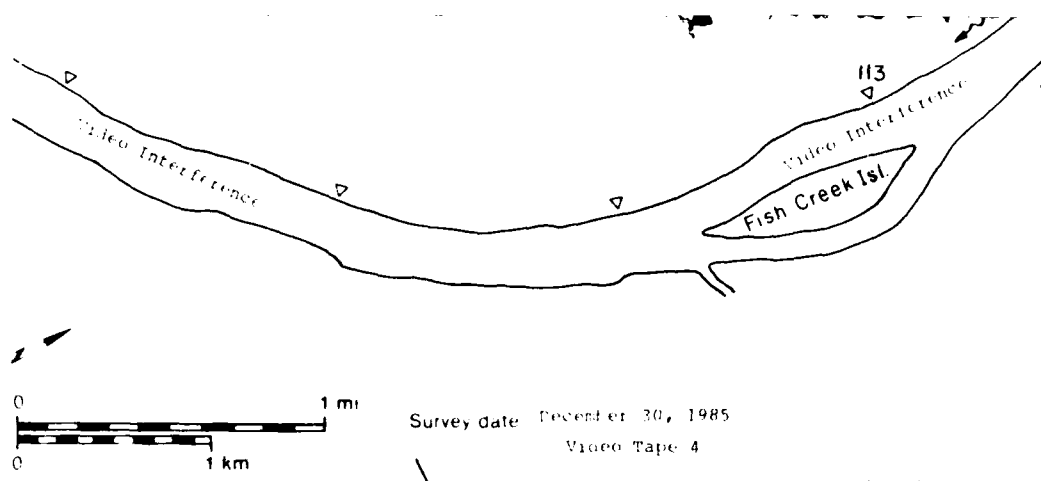
Hannibal Pool

MAP UNITS	Area ($m^2 \times 10^6$)	Surface temperature
Open water	3.34	NA
Solid ice cover	0.00	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open water areas	0.00	—
Ice floes or frazil slush and pans	0.12	20

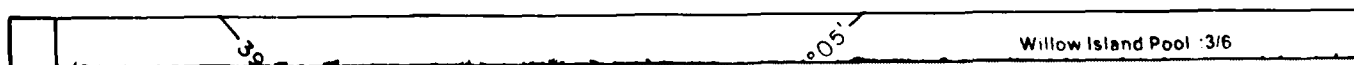
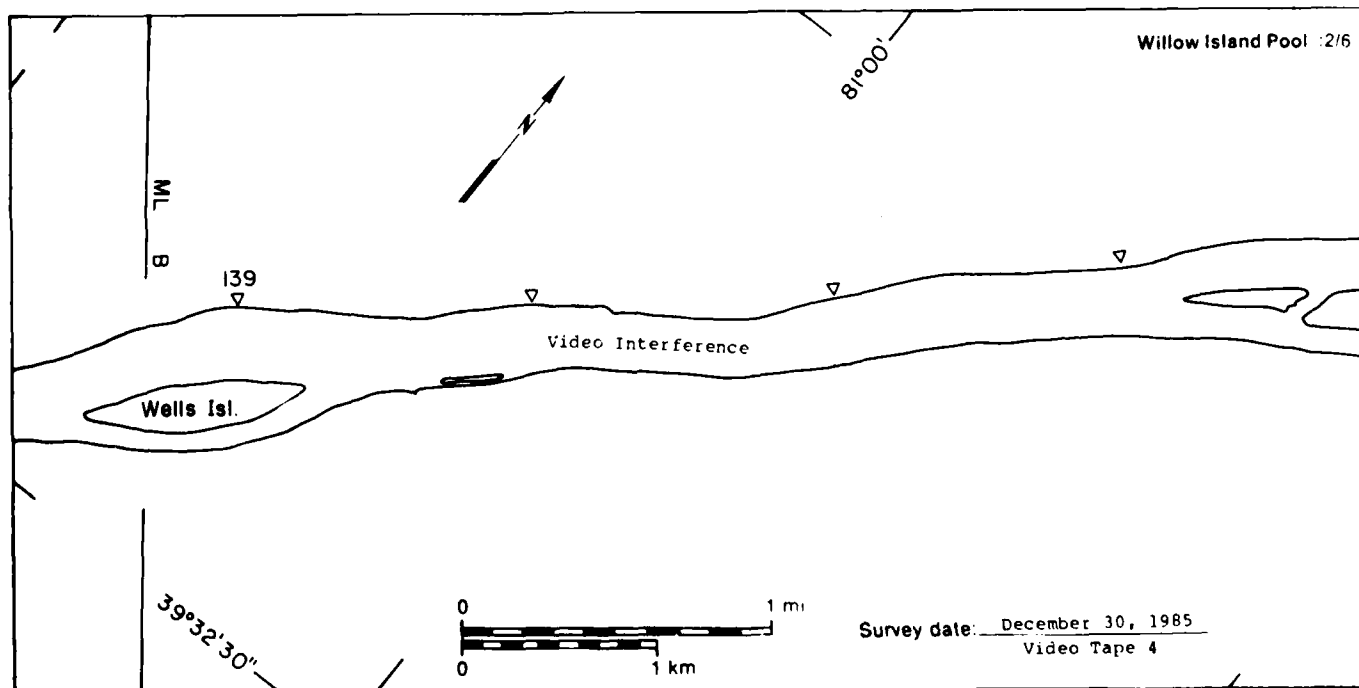
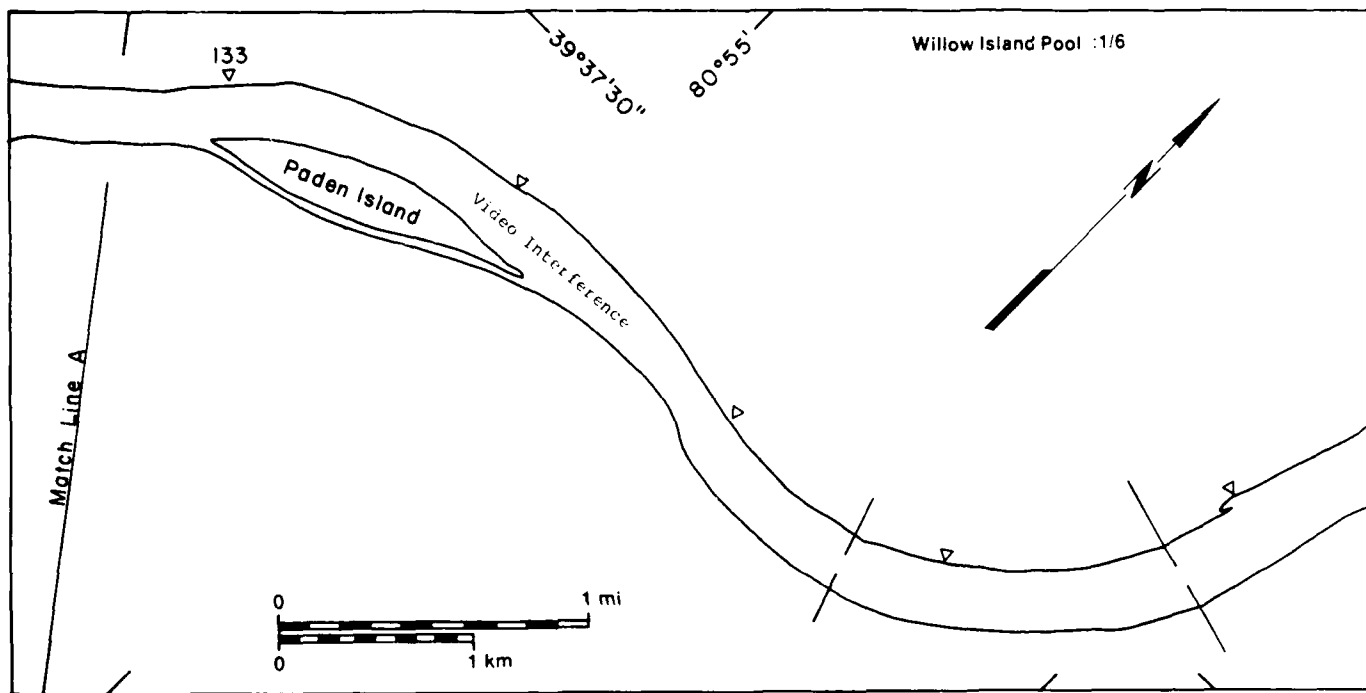
Total area ($m^2 \times 10^6$)

22.46*

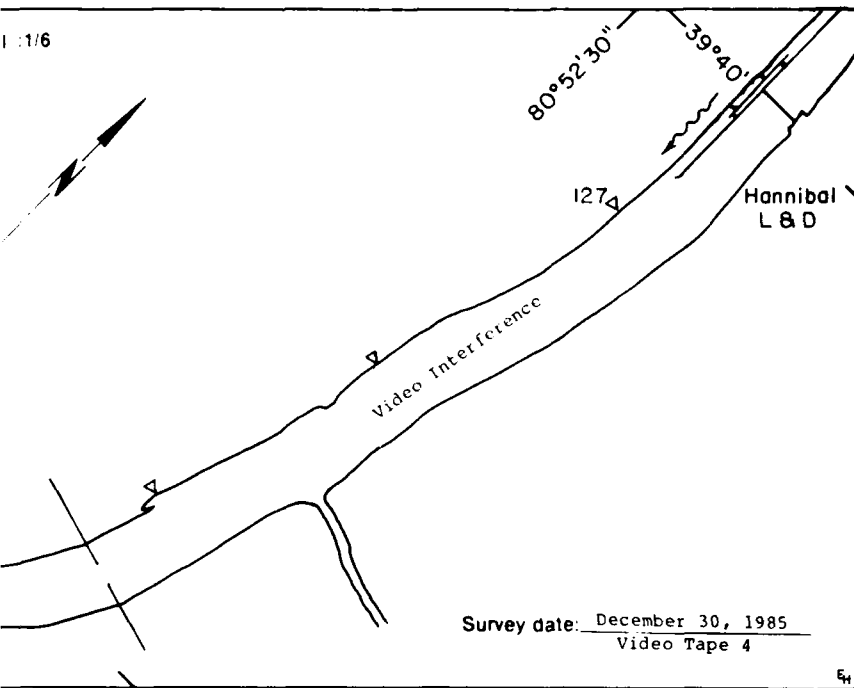
* Includes $19.00 \times 10^6 m^2$
of Video Interference



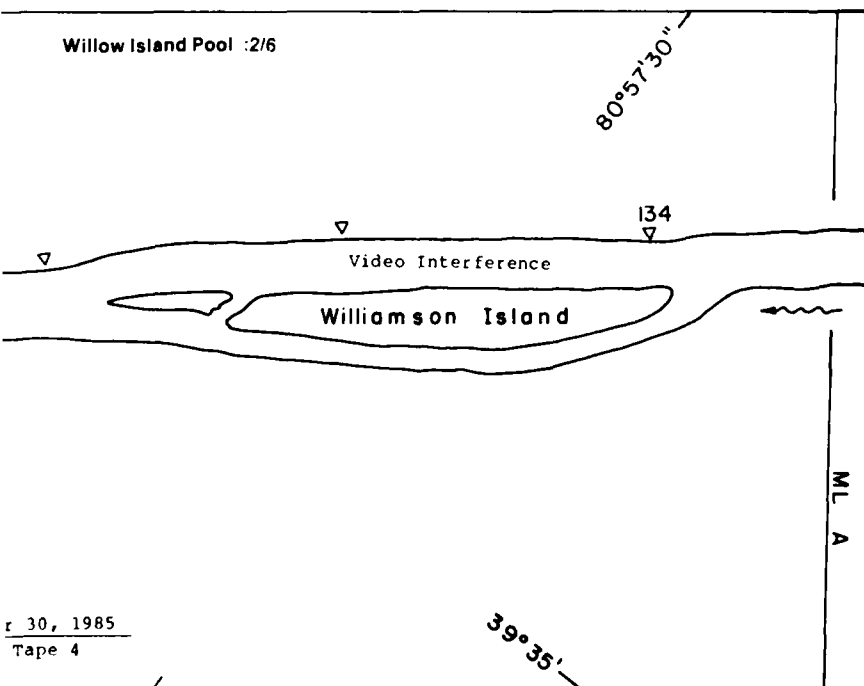
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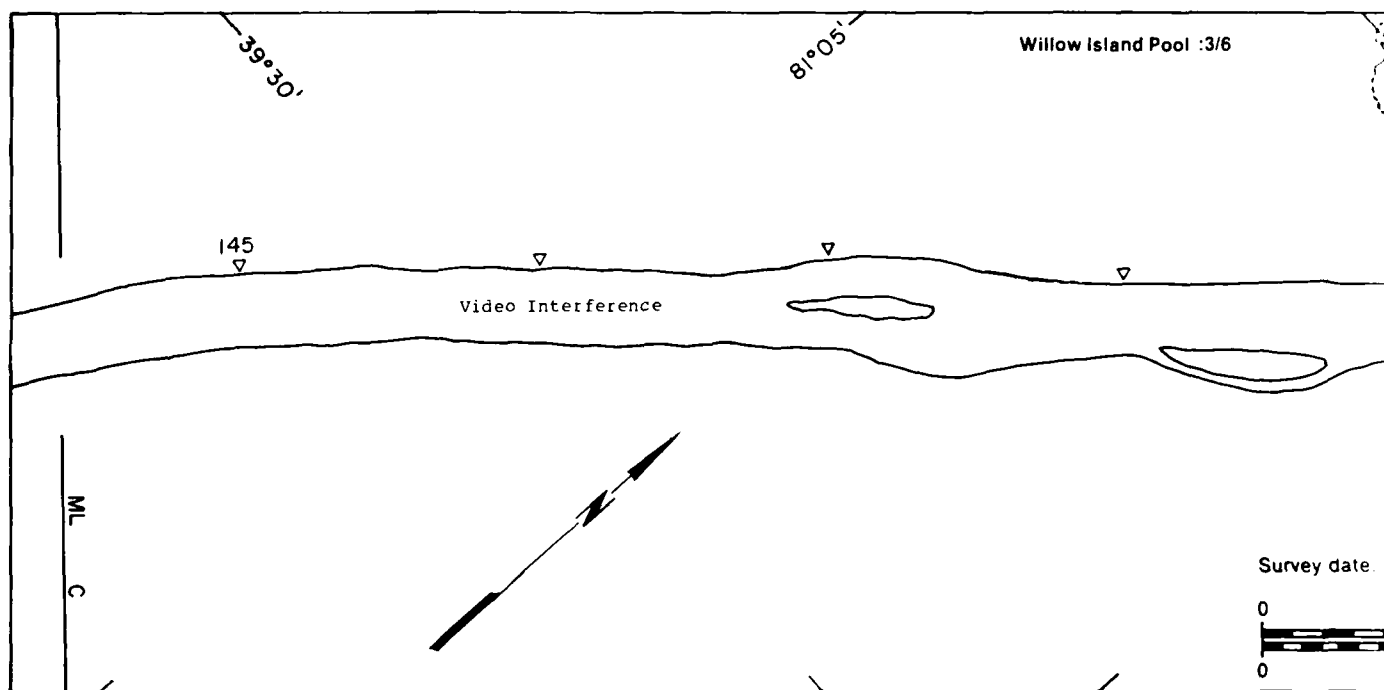
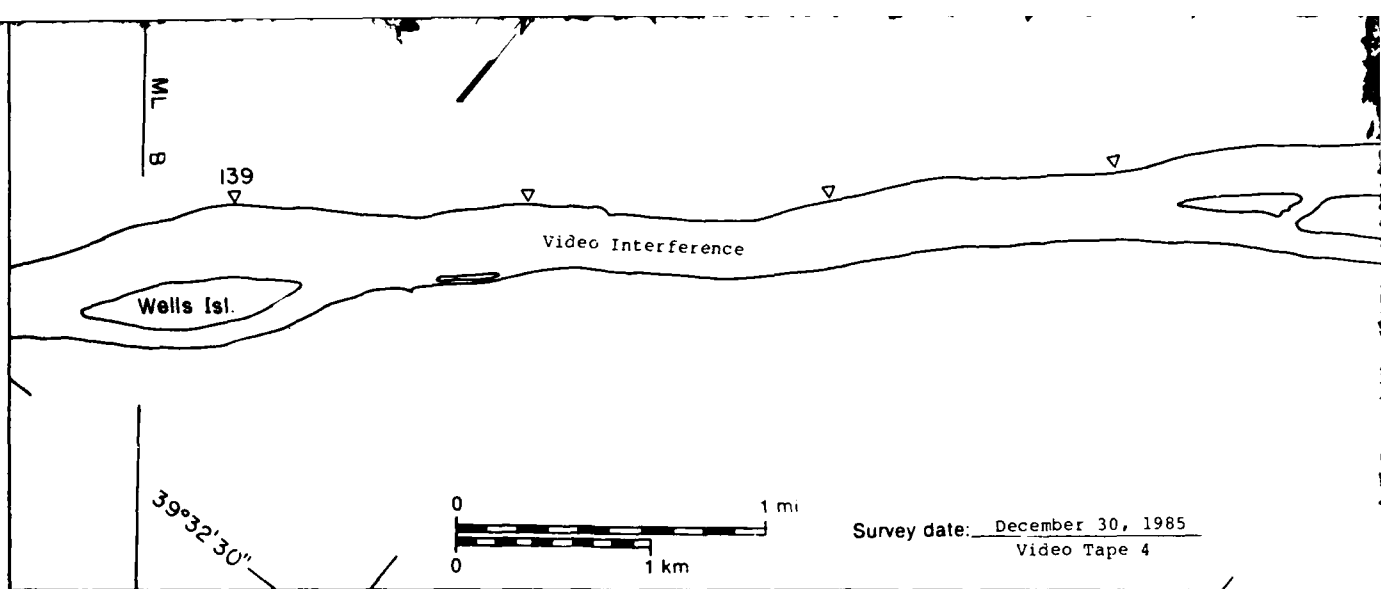


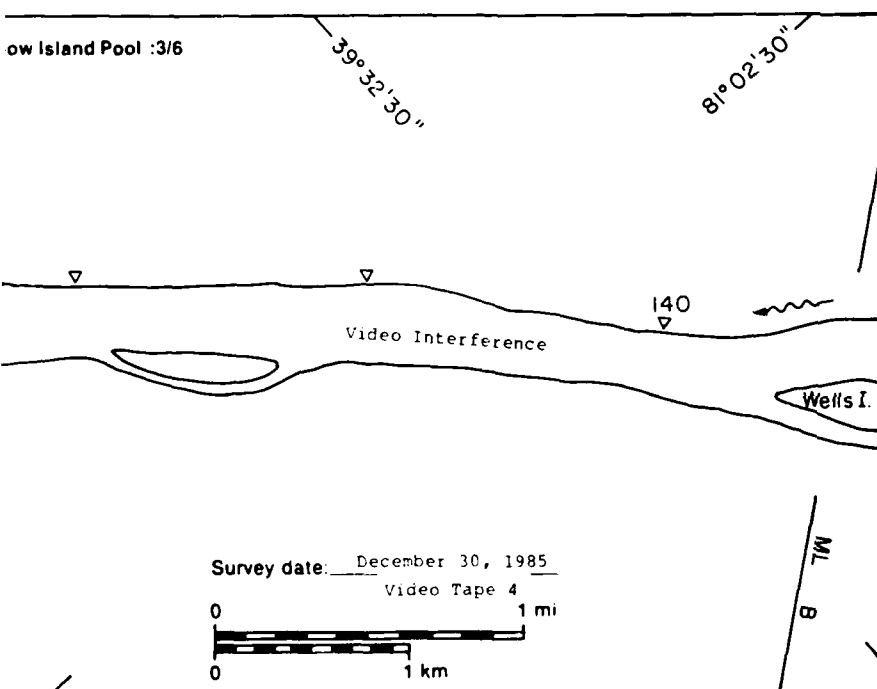
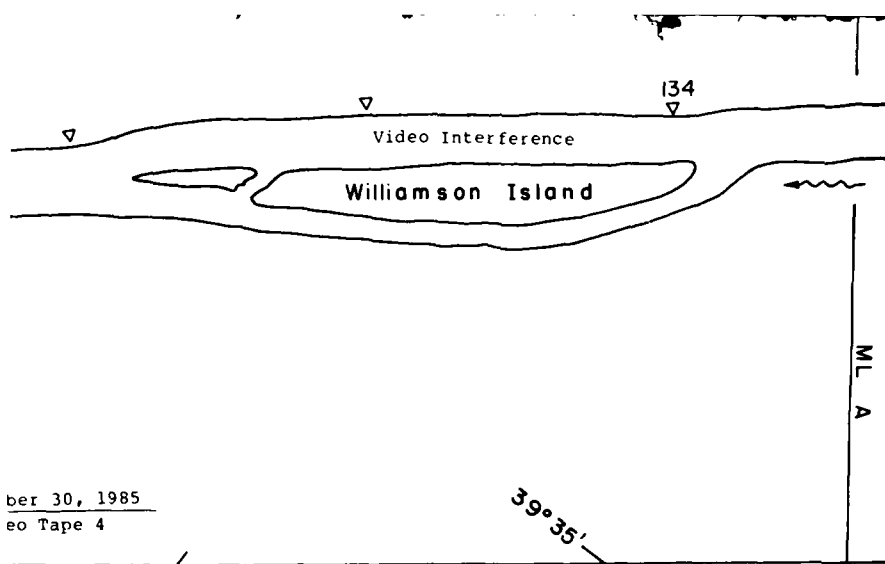
Willow Island Pool :2/6

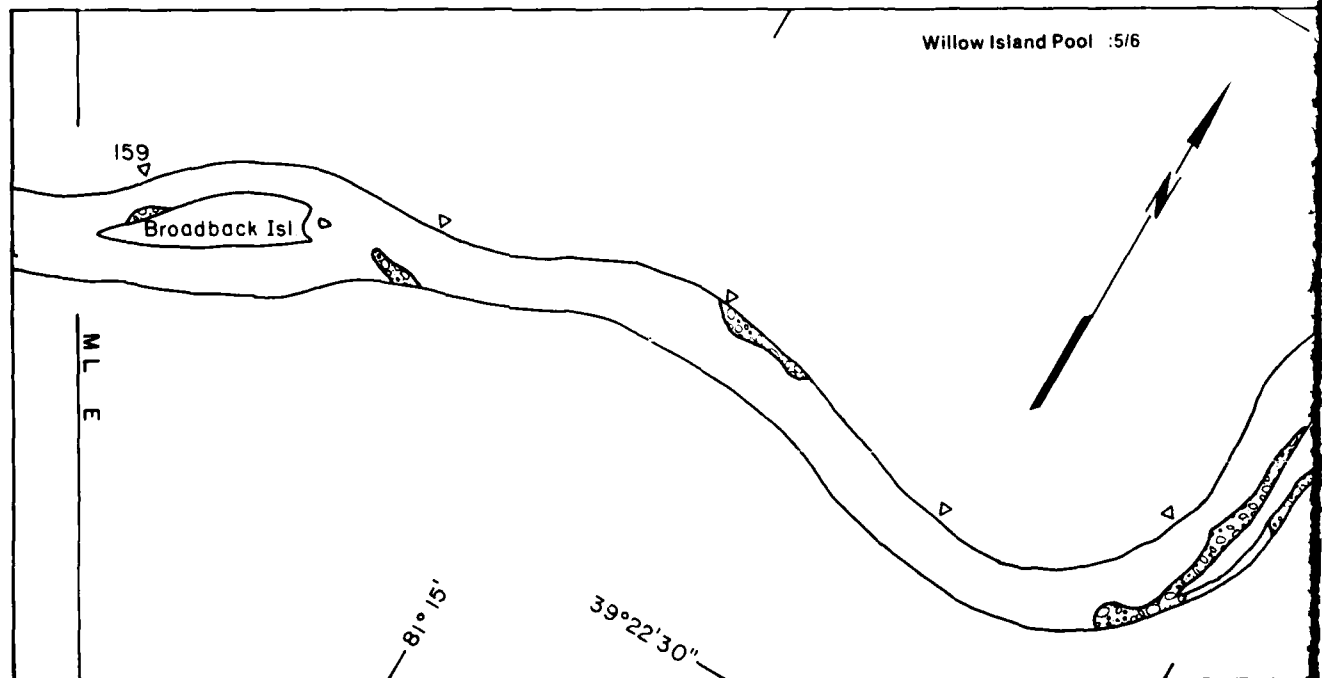
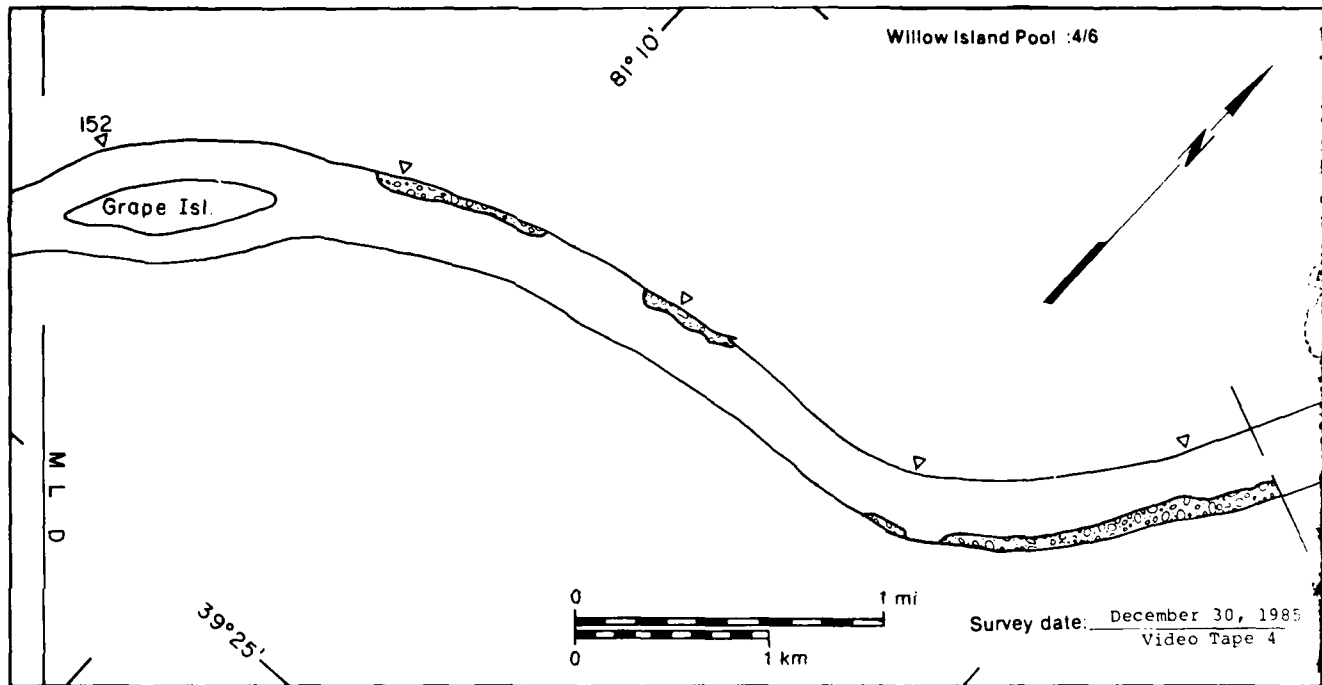


Island Pool :3/6

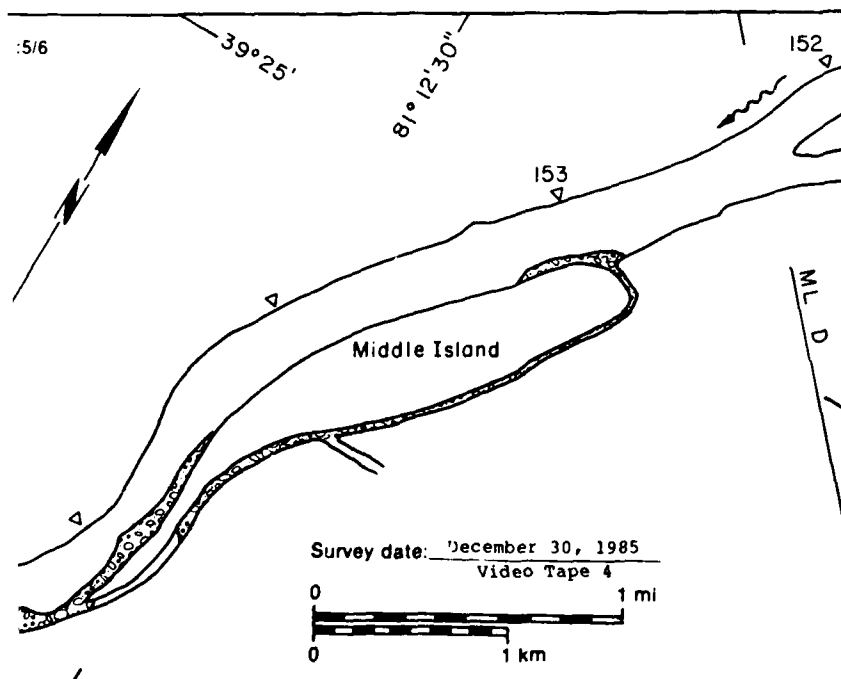
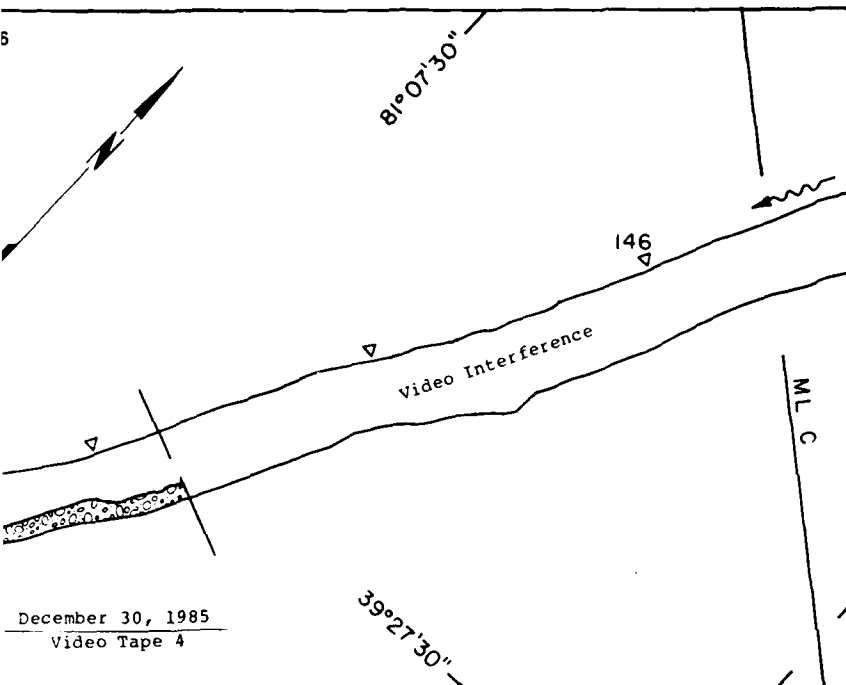








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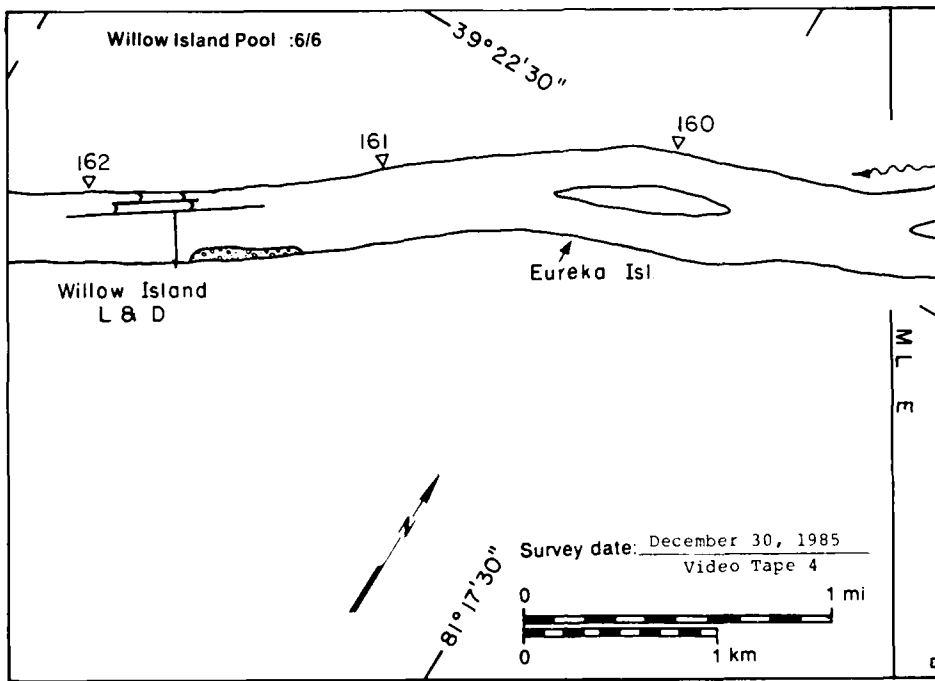
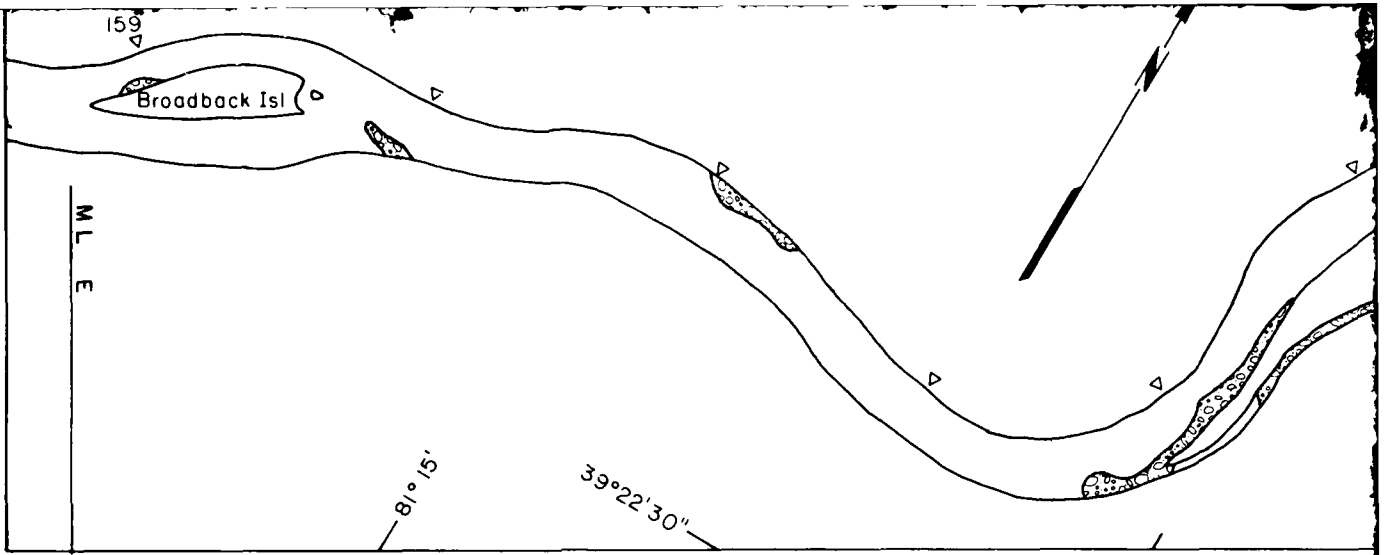


Willow Island Pool

MAP UNITS

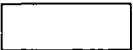



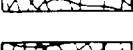

Area
($m^2 \times 10^6$)

Surface
concentration
(%)

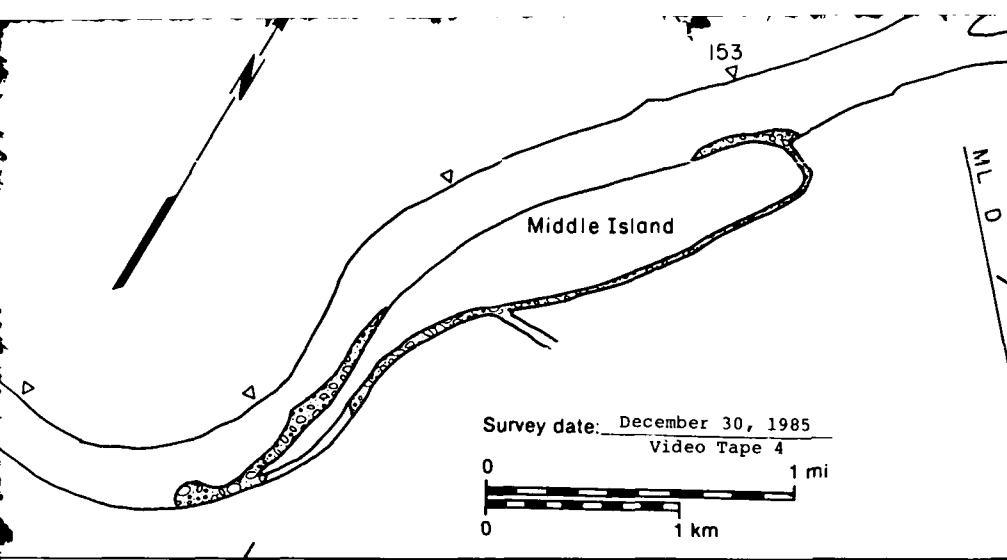


Willow Island Pool

MAP UNITS

-  Open water
-  Solid ice cover
-  Solid ice cover with open-water areas
-  Fragmented ice cover
-  Fragmented ice cover with open-water areas
-  Ice floes or frazil slus and pans

Total area (m² x)



Willow Island Pool

MAP UNITS



Open water



Solid ice cover



Solid ice cover with open-water areas



Fragmented ice cover



Fragmented ice cover with open-water areas



Ice floes or frazil slush and pans

Area
($m^2 \times 10^6$)

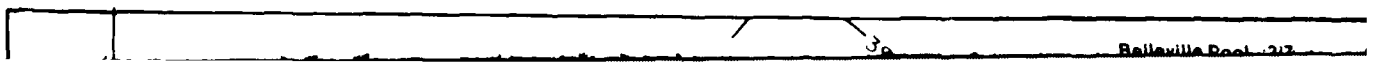
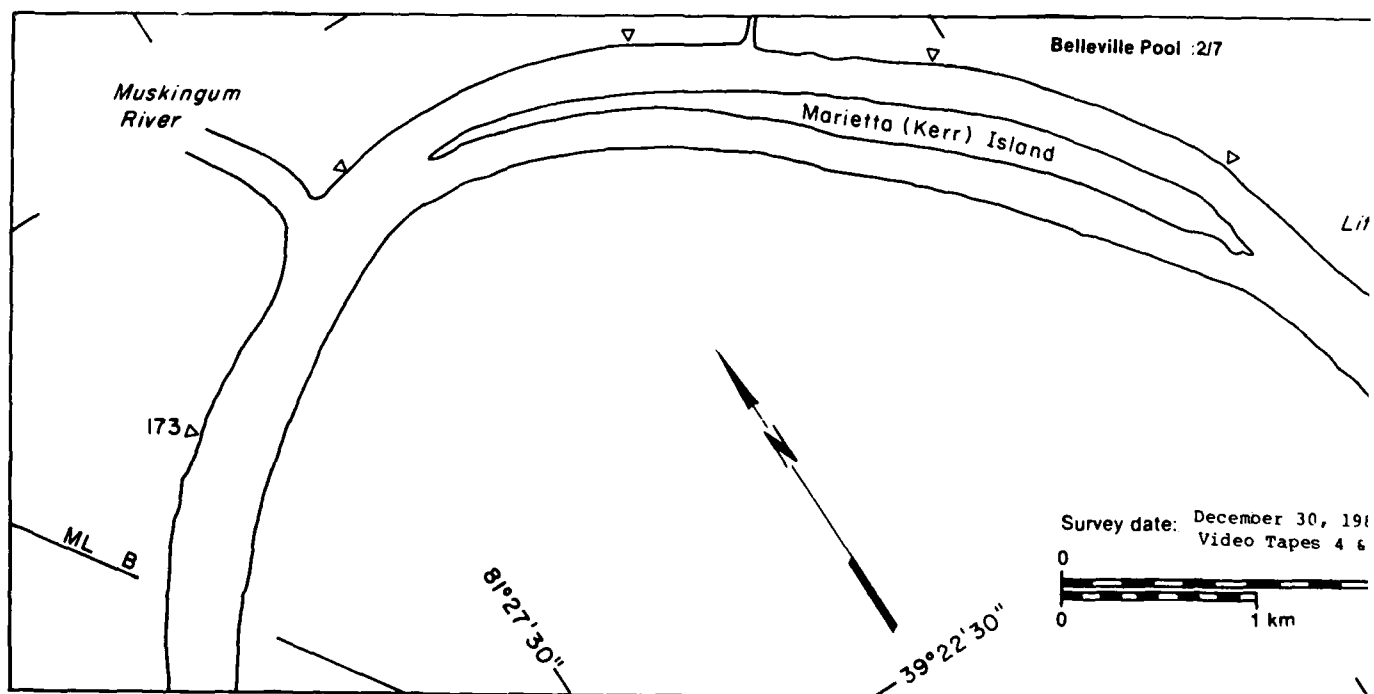
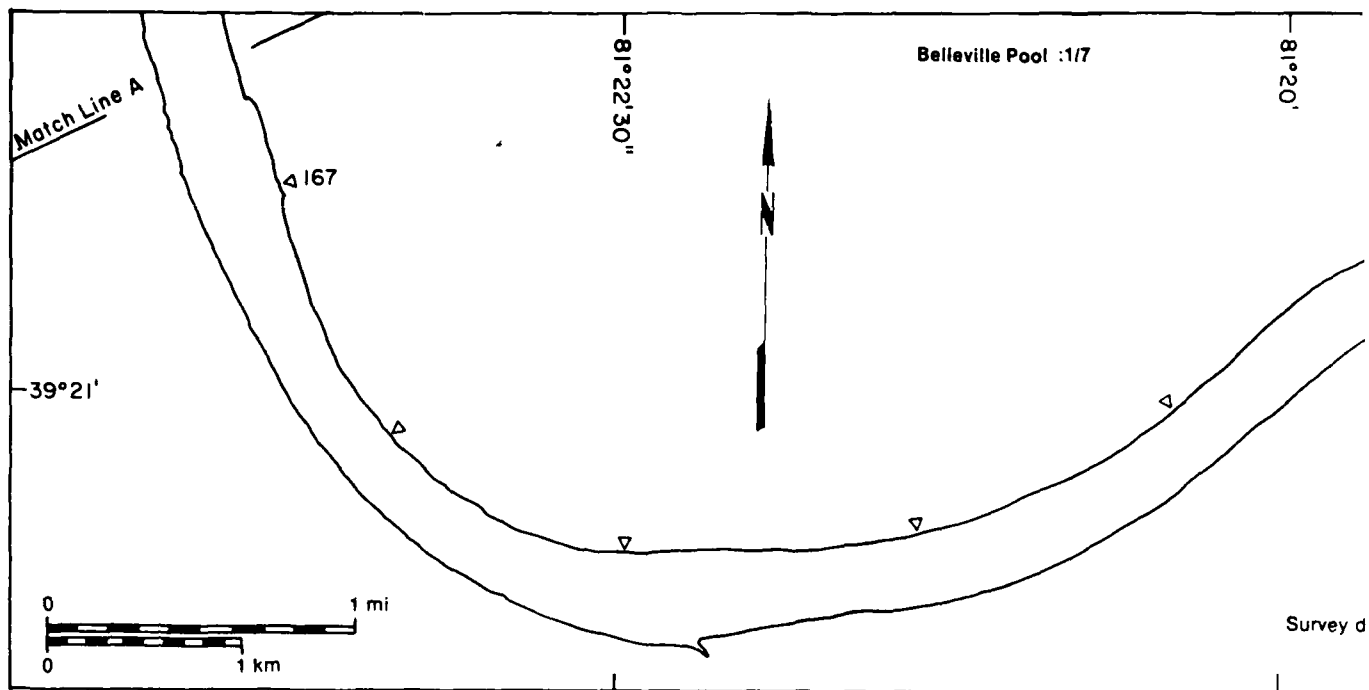
8.08	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
0.66	10

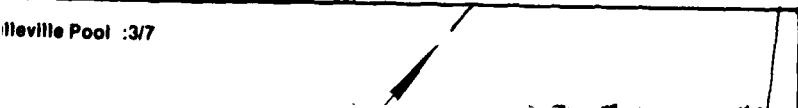
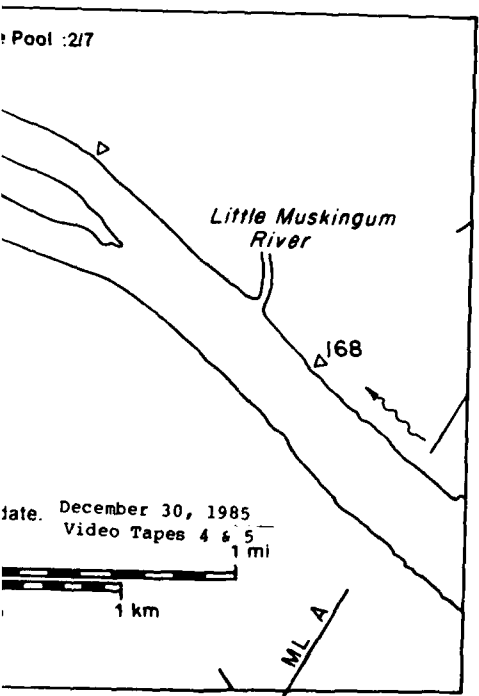
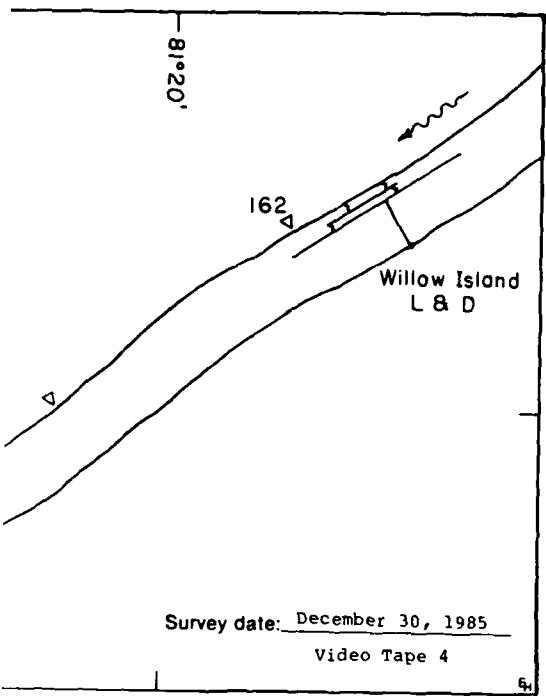
Total area ($m^2 \times 10^6$)

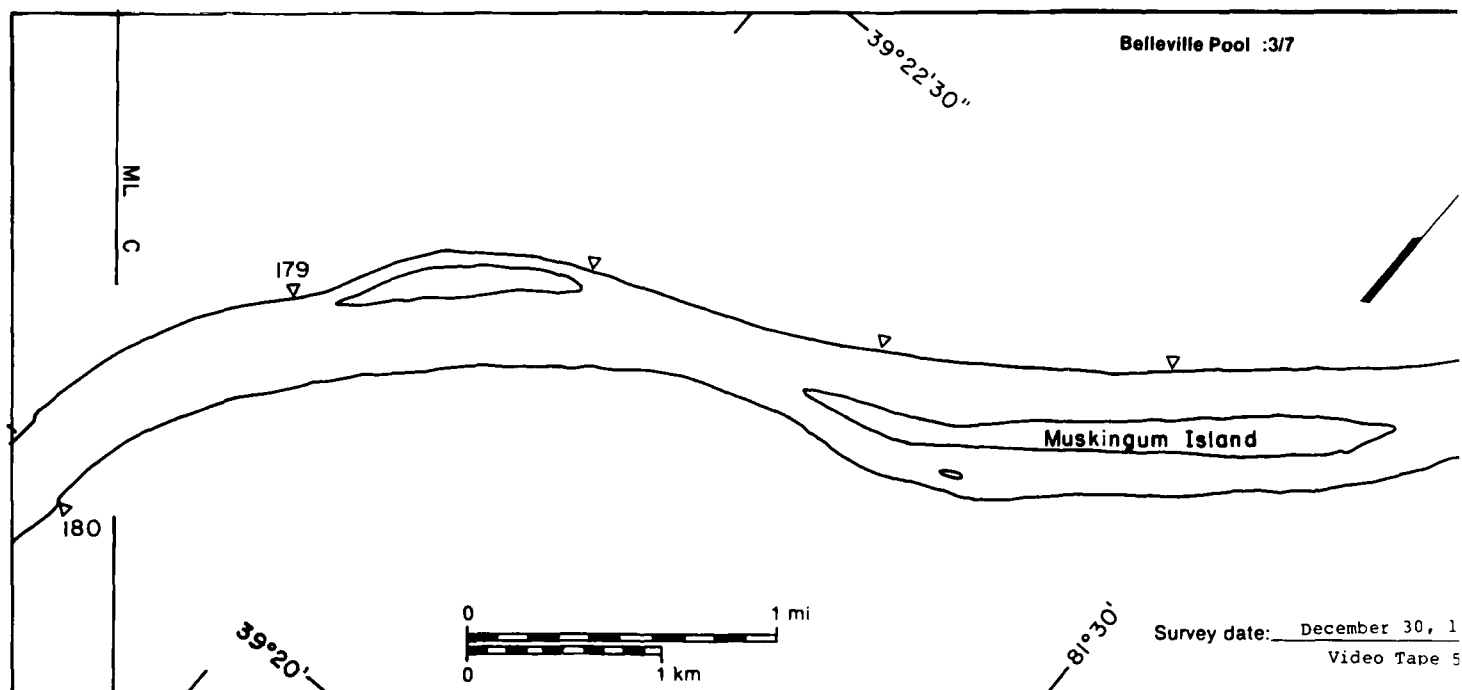
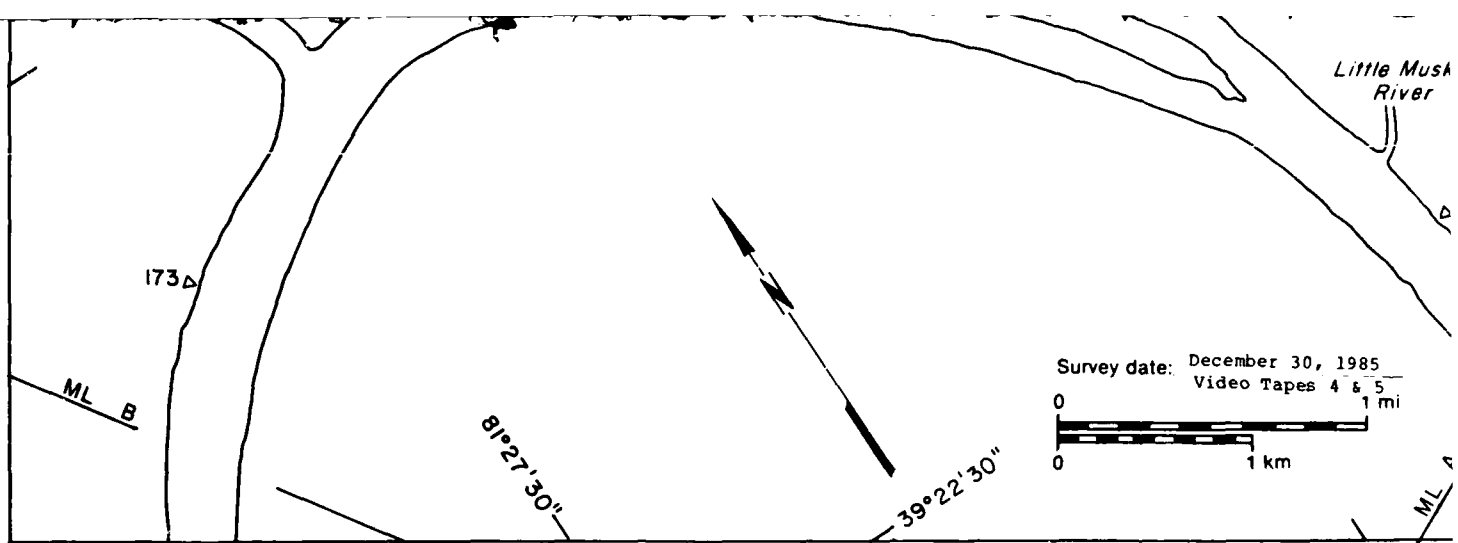
21.24*

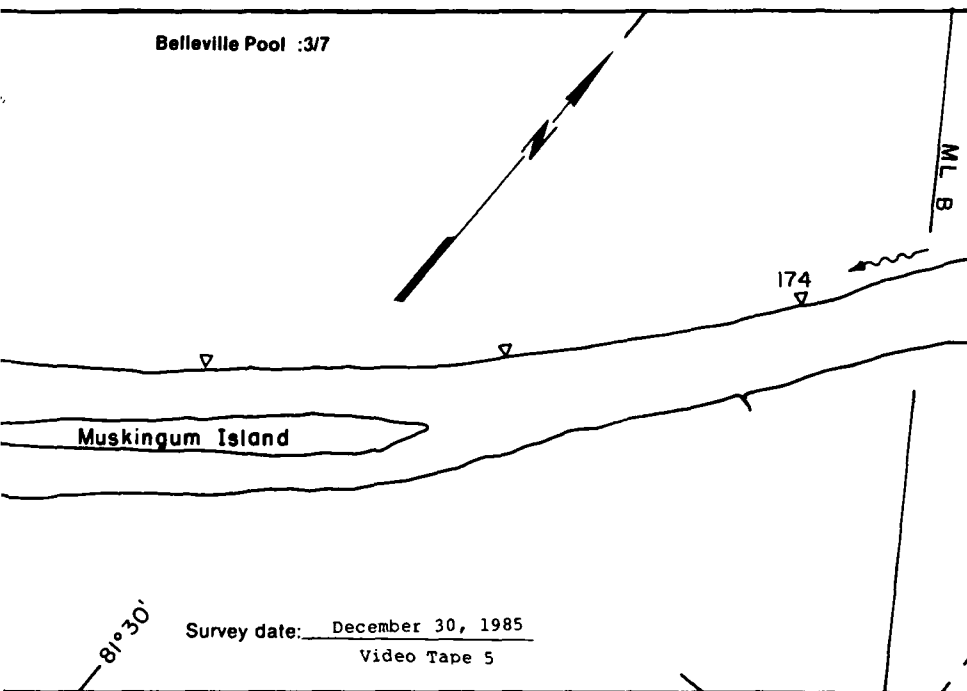
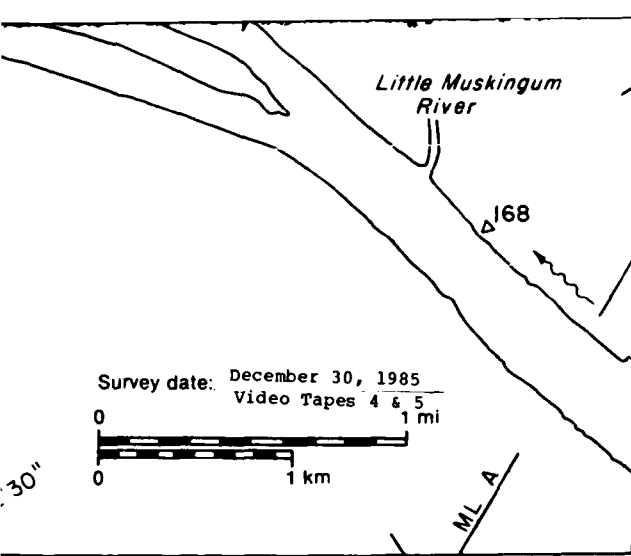
* Includes $12.50 \times 10^6 m^2$ of Video Interference

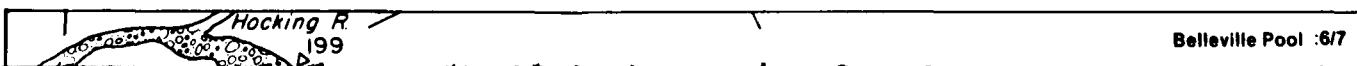
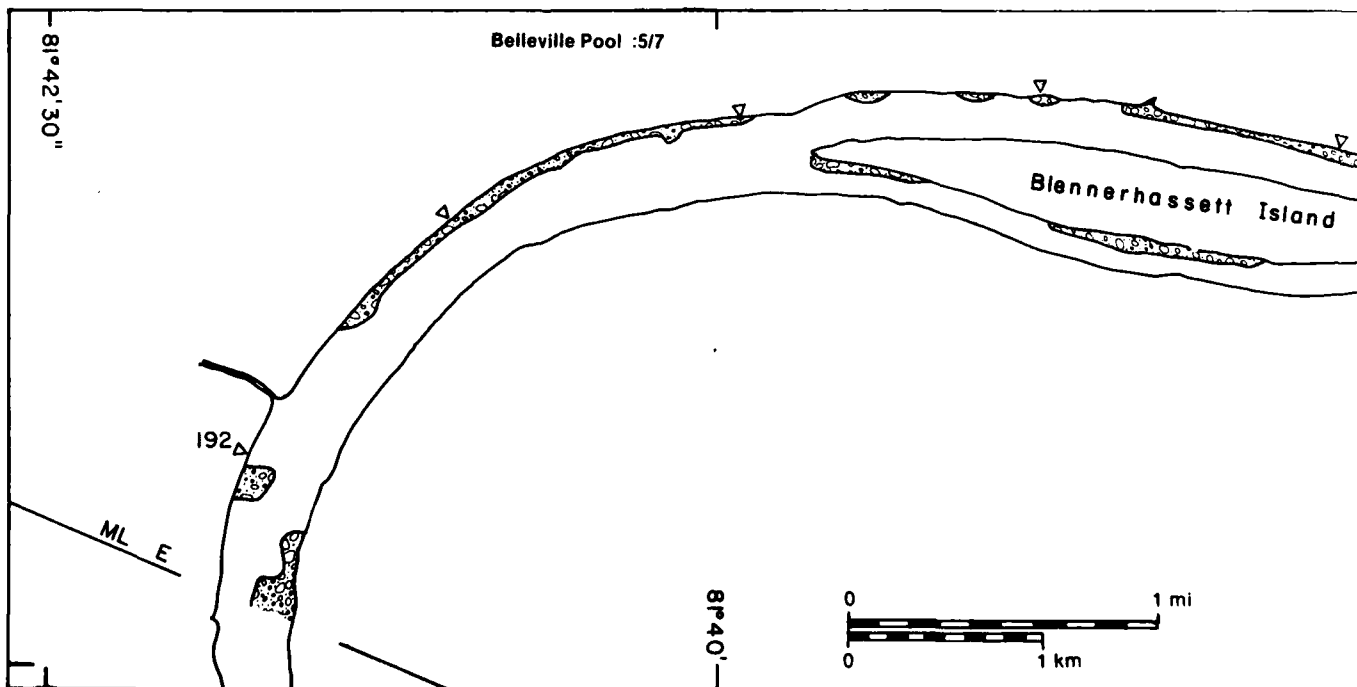
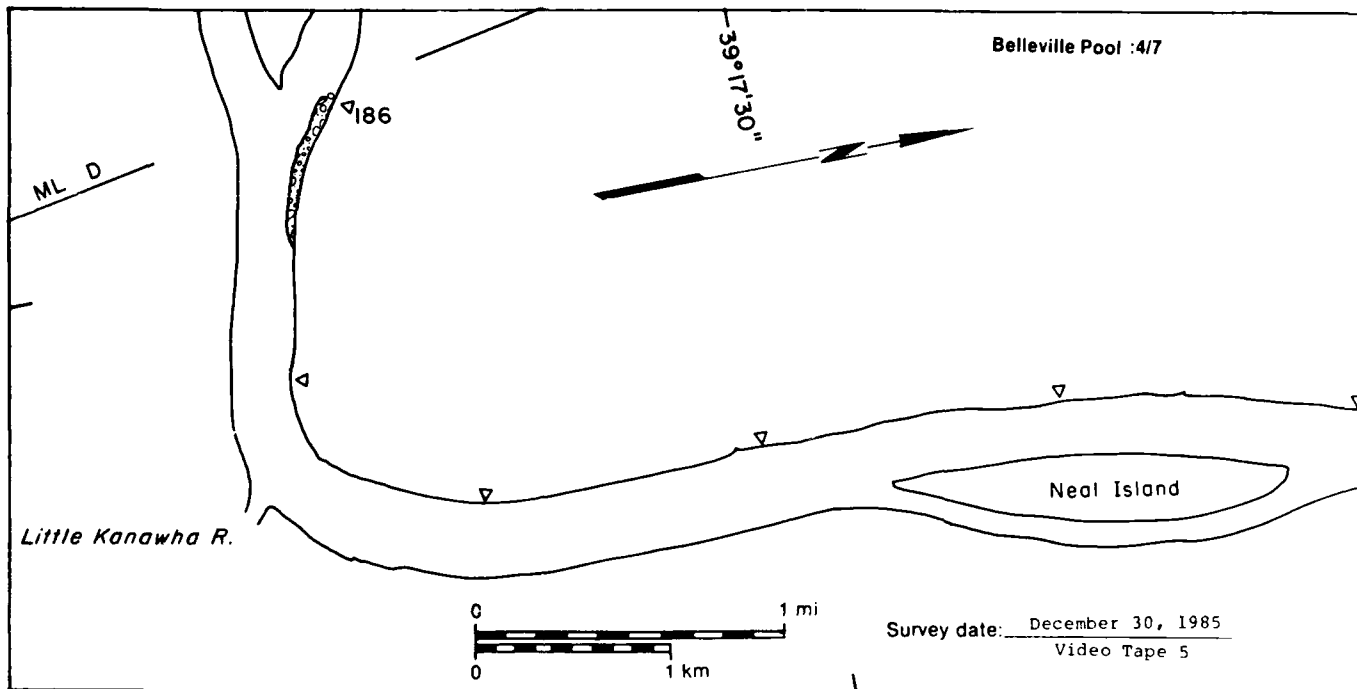
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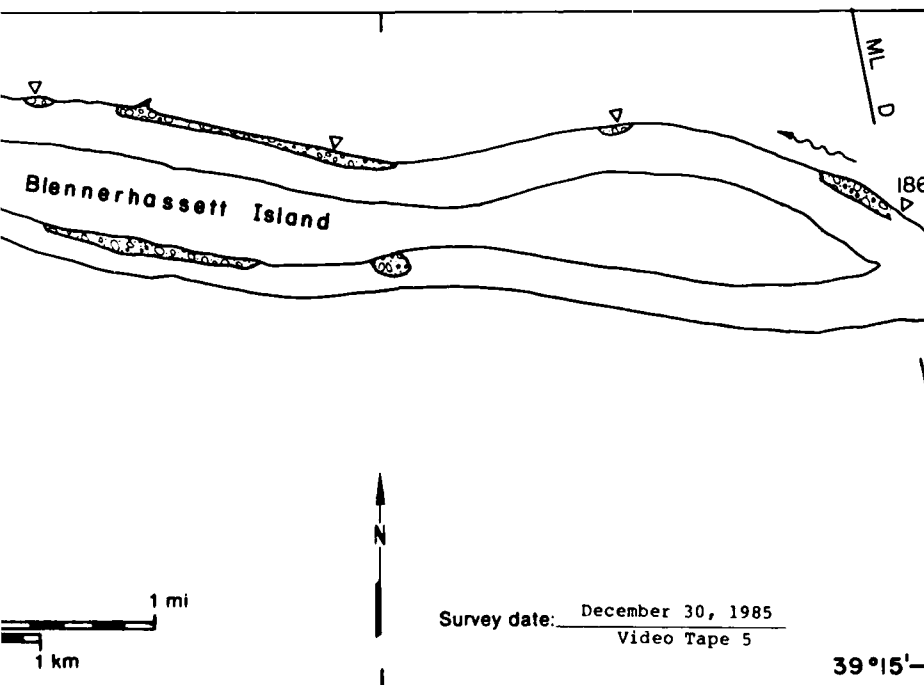
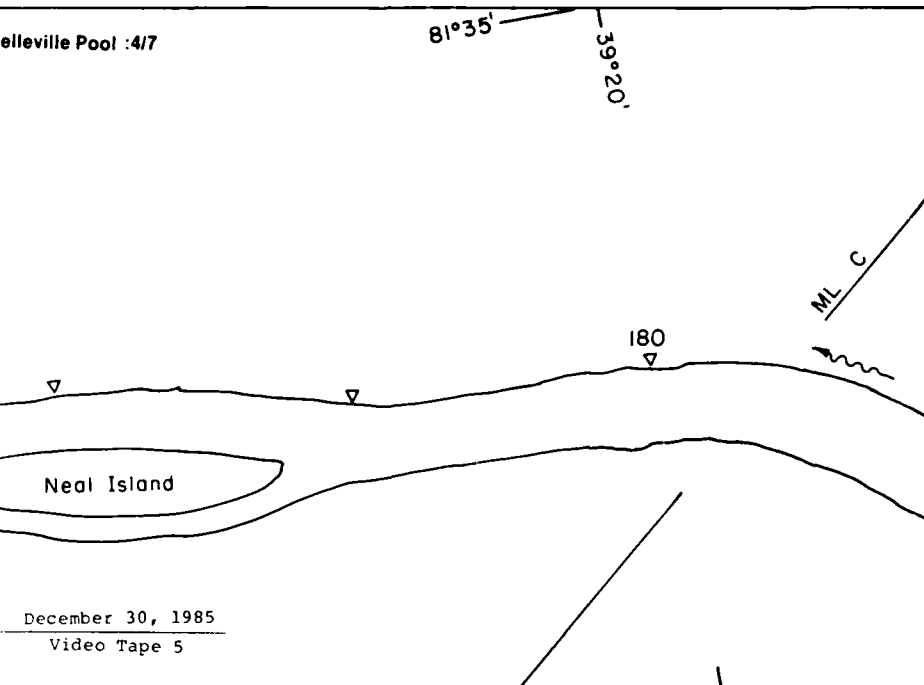






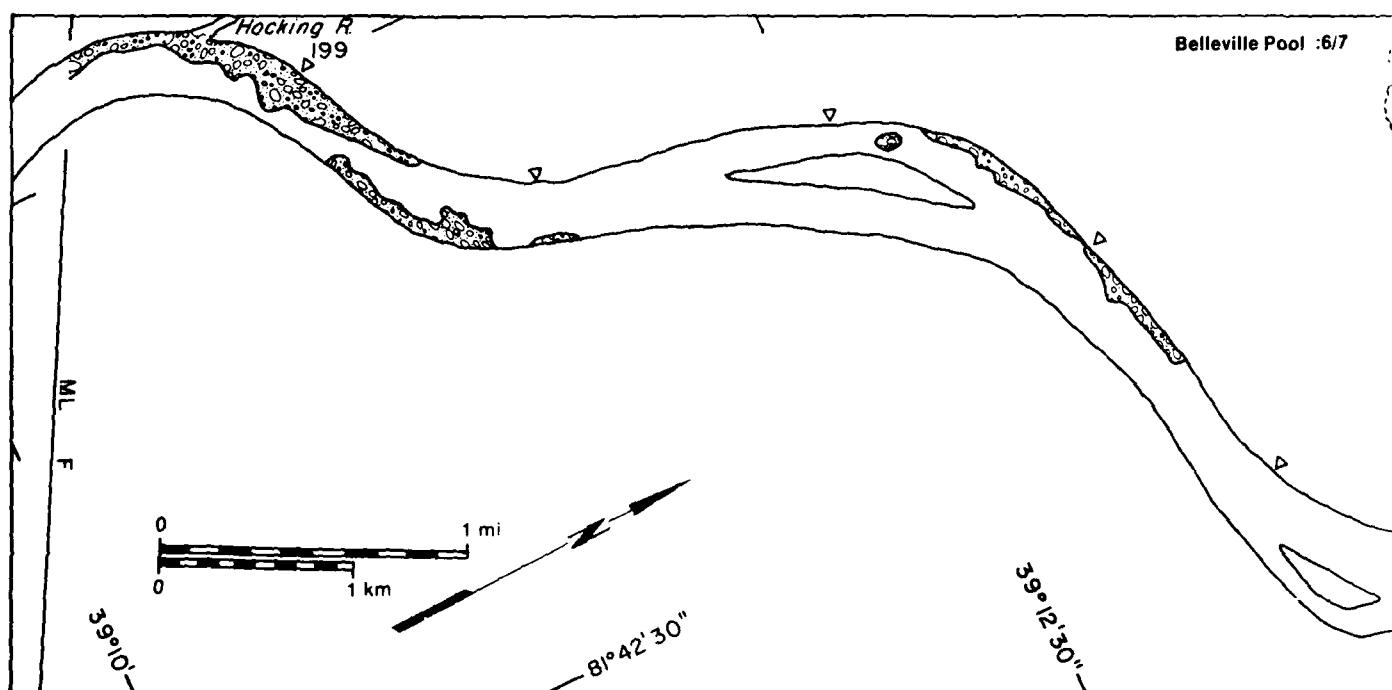
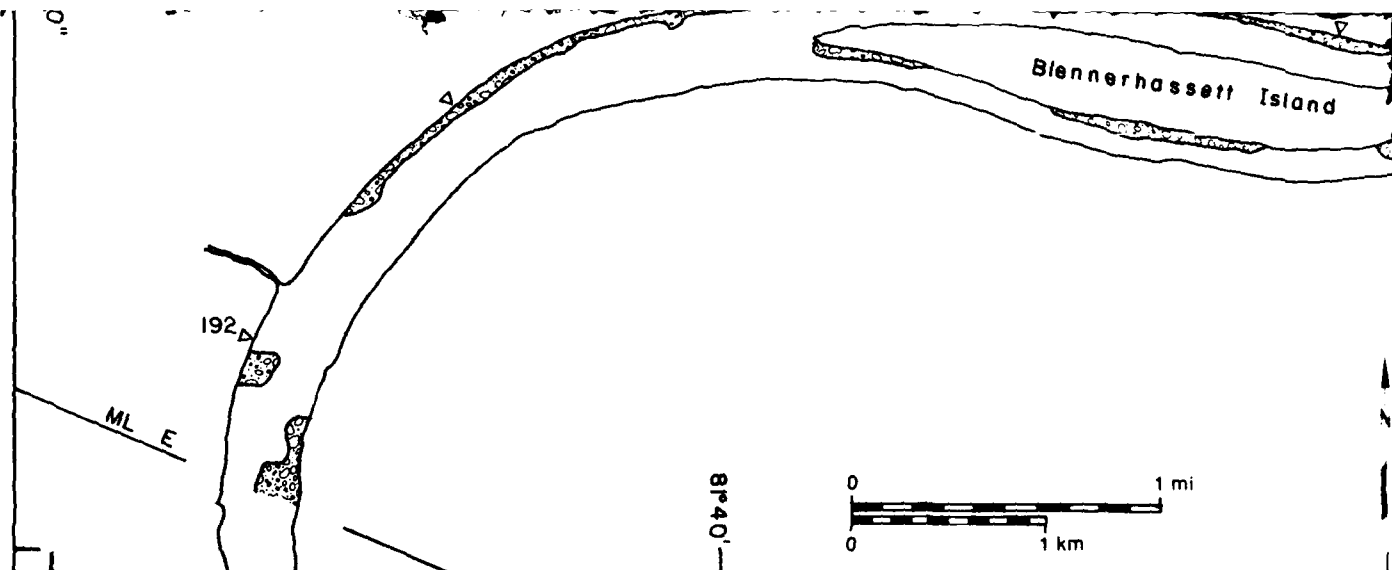


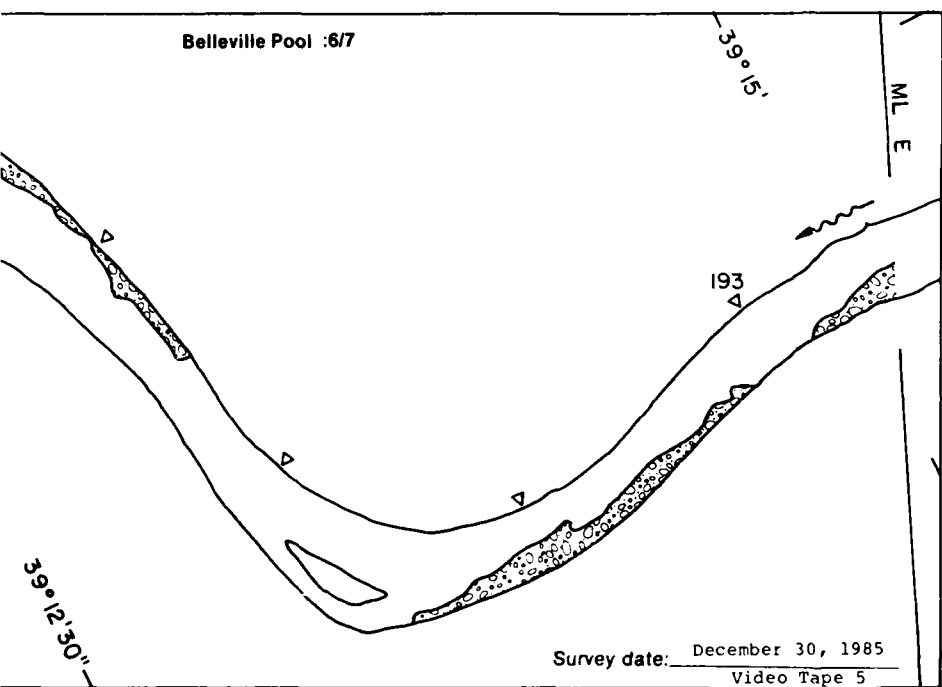
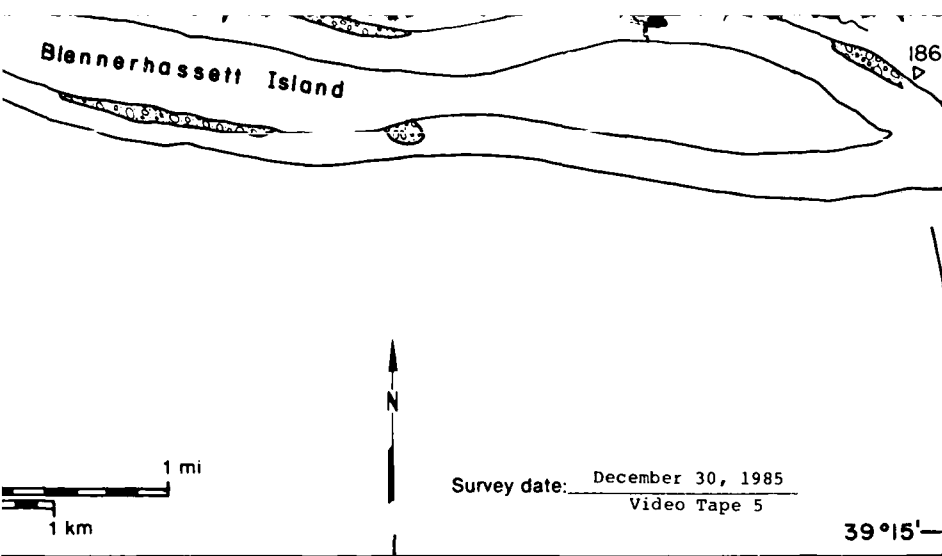
30 December 1985



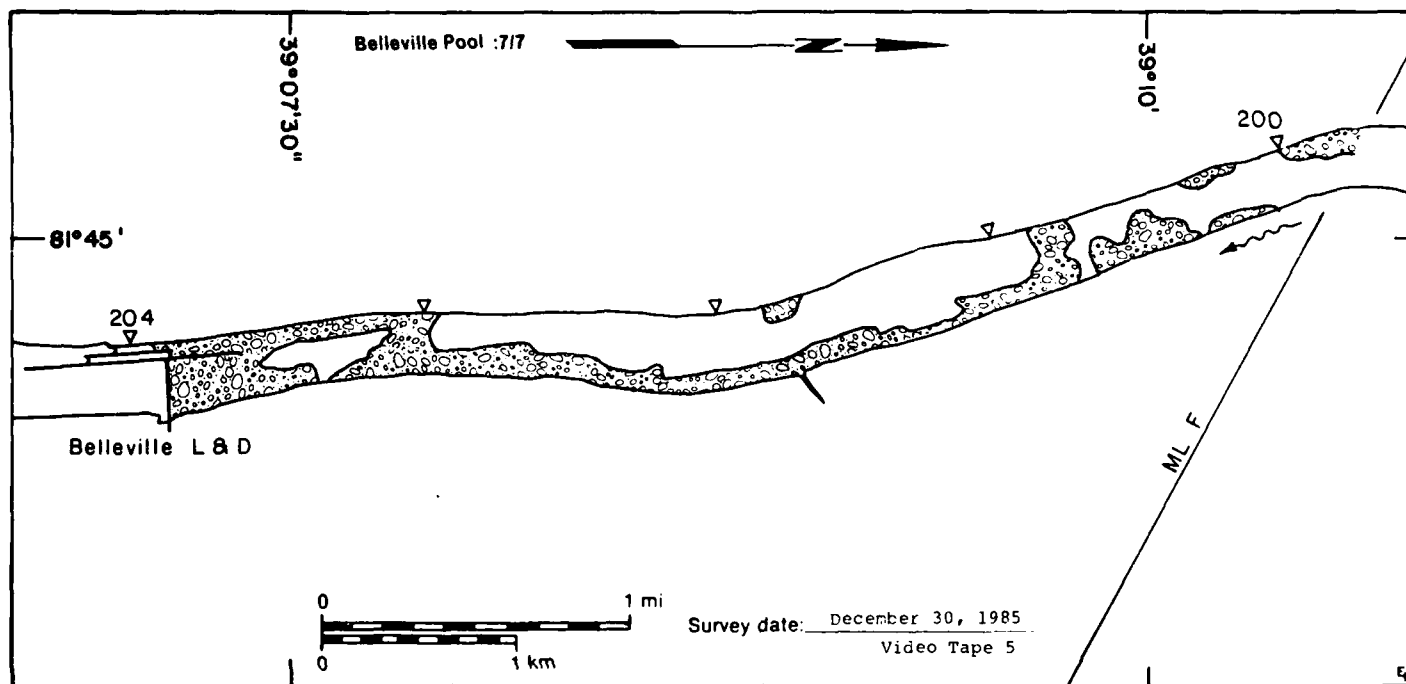
Belleville Pool :6/7

39°15'



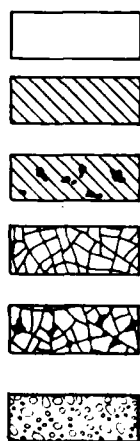


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Belleville Pool

MAP UNITS



Open water

Solid ice cover

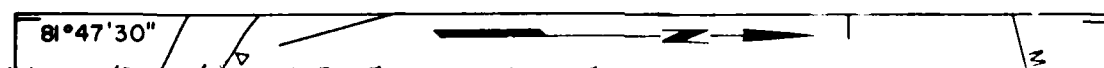
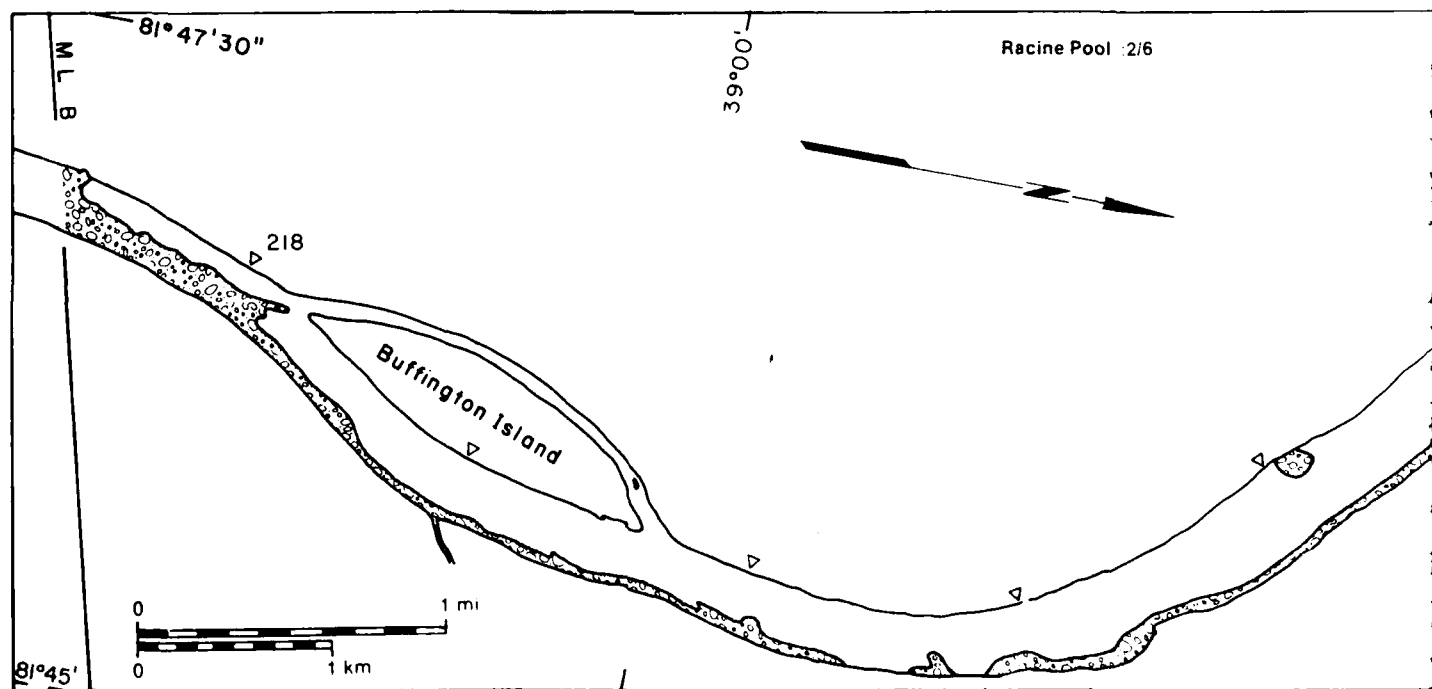
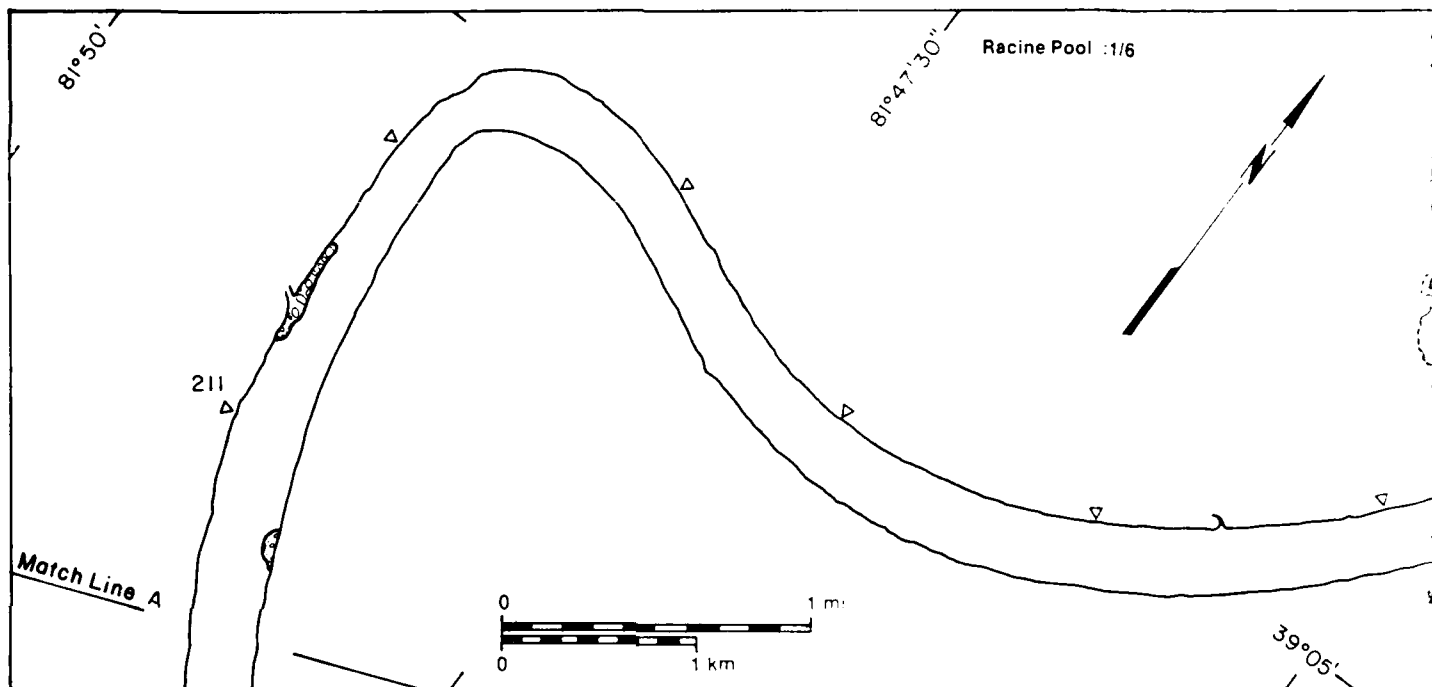
Solid ice cover with open-water areas

Fragmented ice cover

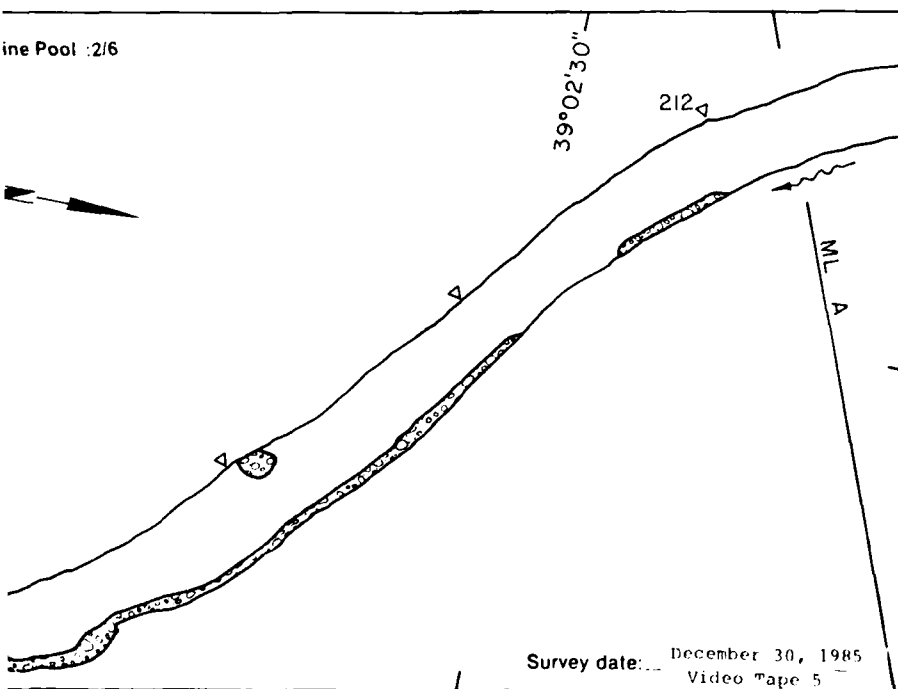
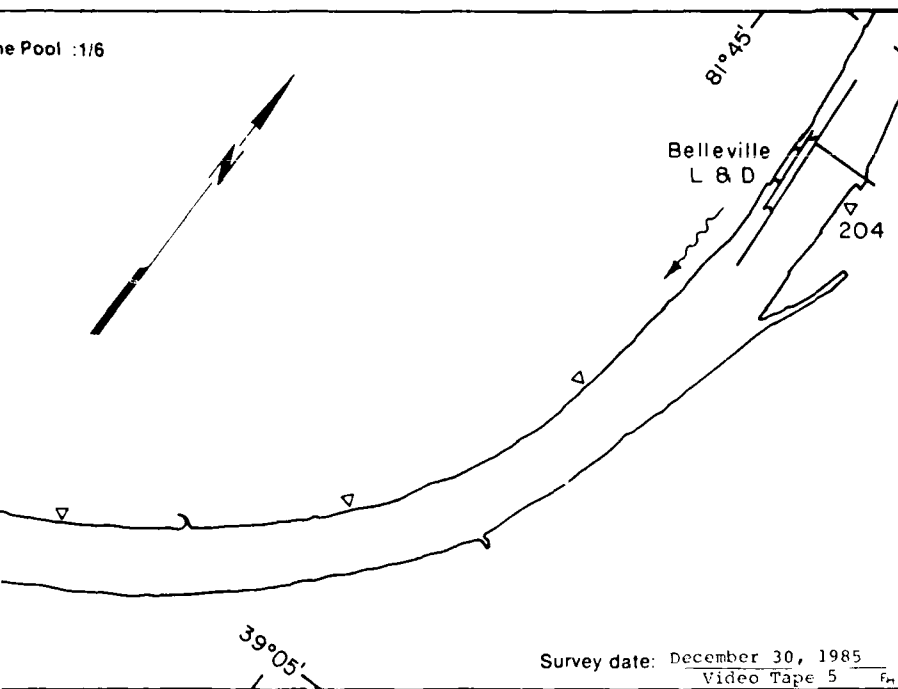
Fragmented ice cover with open-water areas

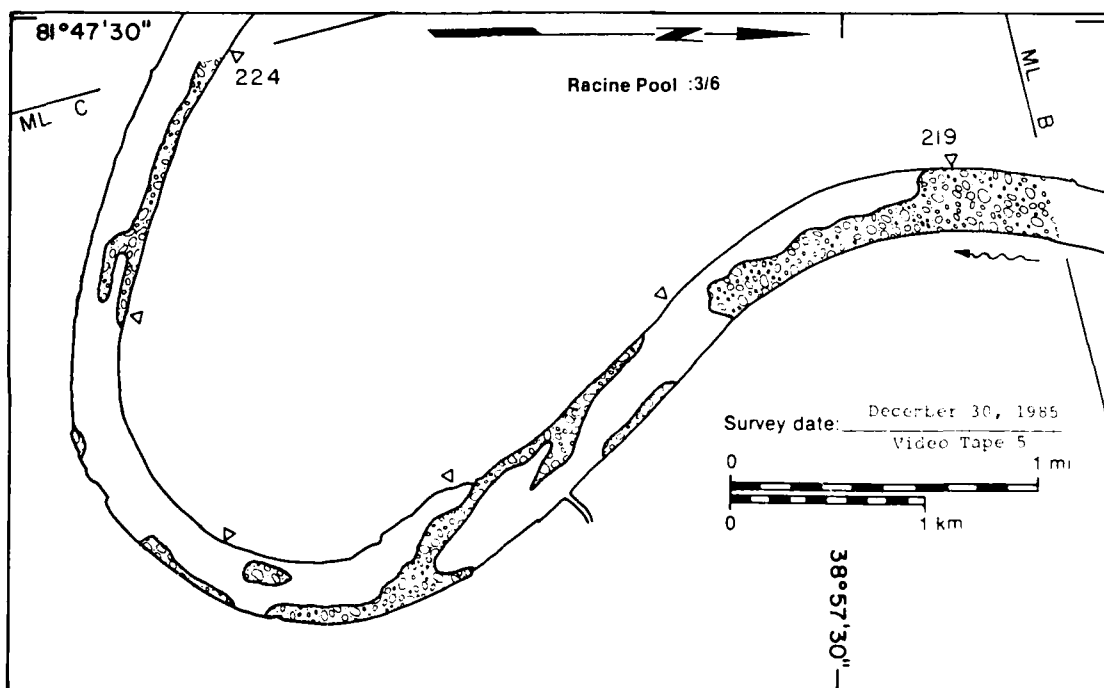
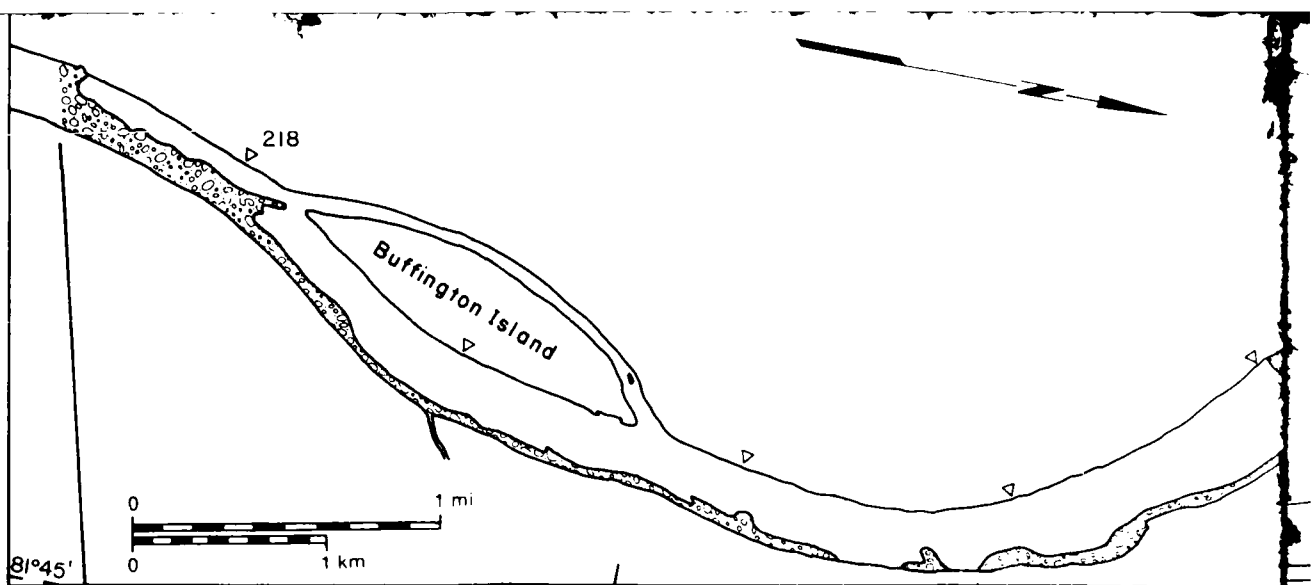
Ice floes or frazil slush and pans

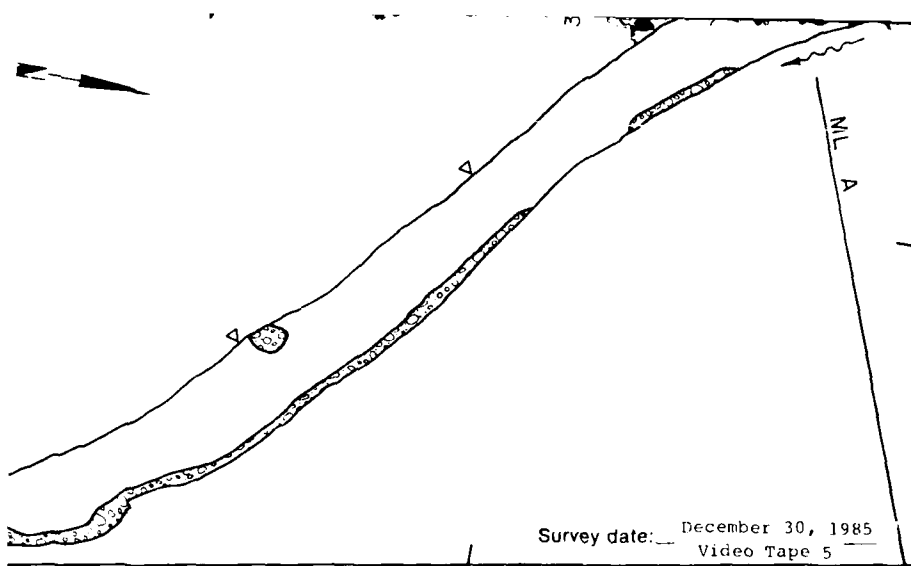
Area ($m^2 \times 10^6$)	Surface concentration (%)
25.01	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
2.27	10
Total area ($m^2 \times 10^6$)	27.28



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ICE ATLAS 1985 - 1986 MONONGAHELA RIVER ALLEGHENY RIVER 3/14

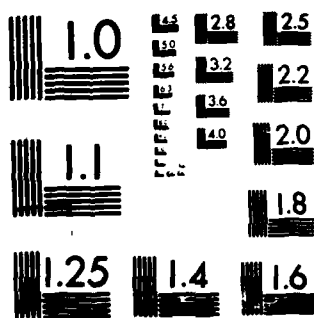
OHIO RIVER ILLINO. (U) COLD REGIONS RESEARCH AND

ENGINEERING LAB HANOVER NH L W GATTO ET AL. NOV 87

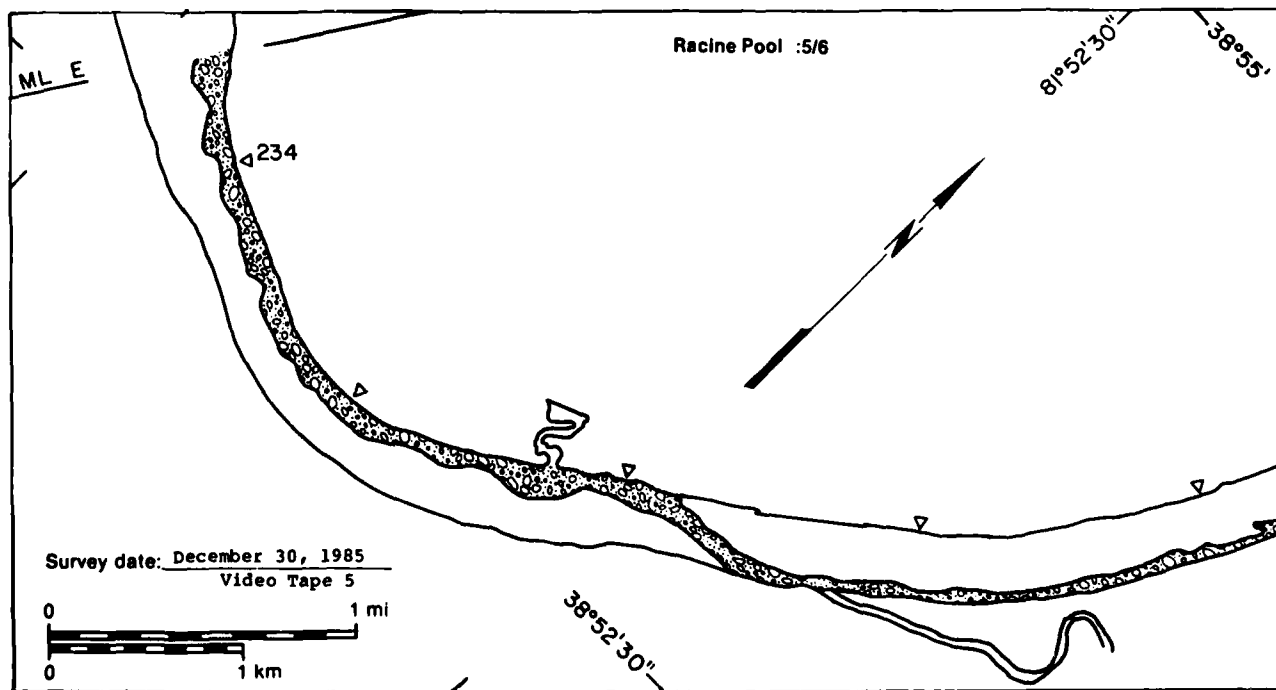
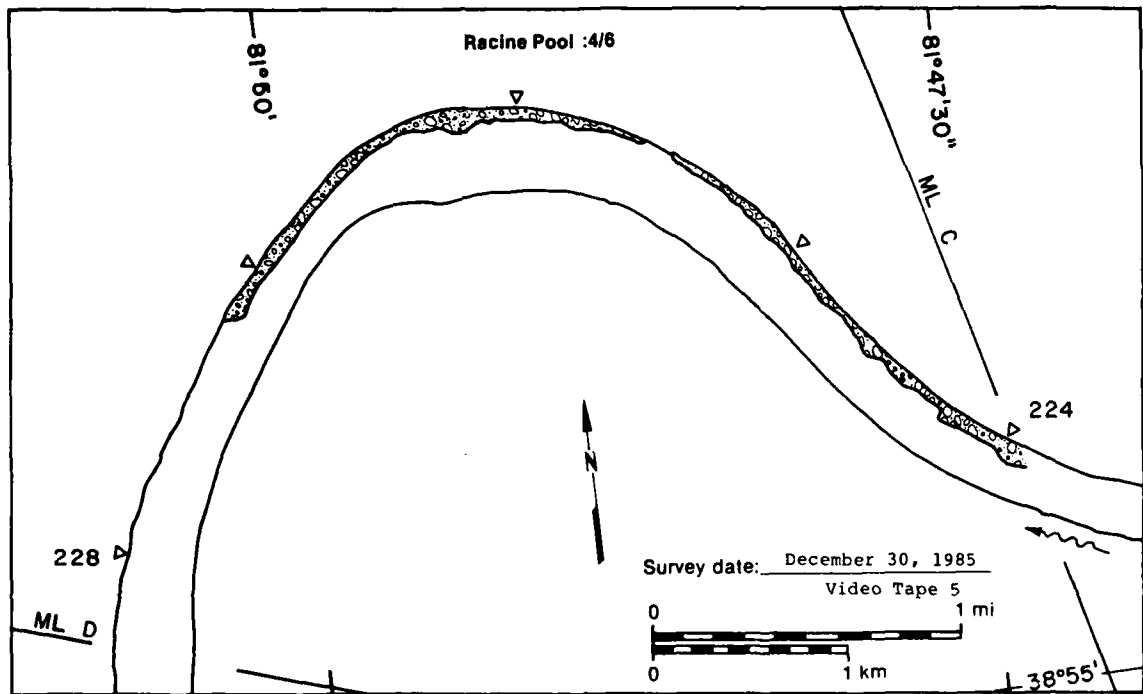
UNCLASSIFIED CRREL-SP-87-28

F/G 8/12

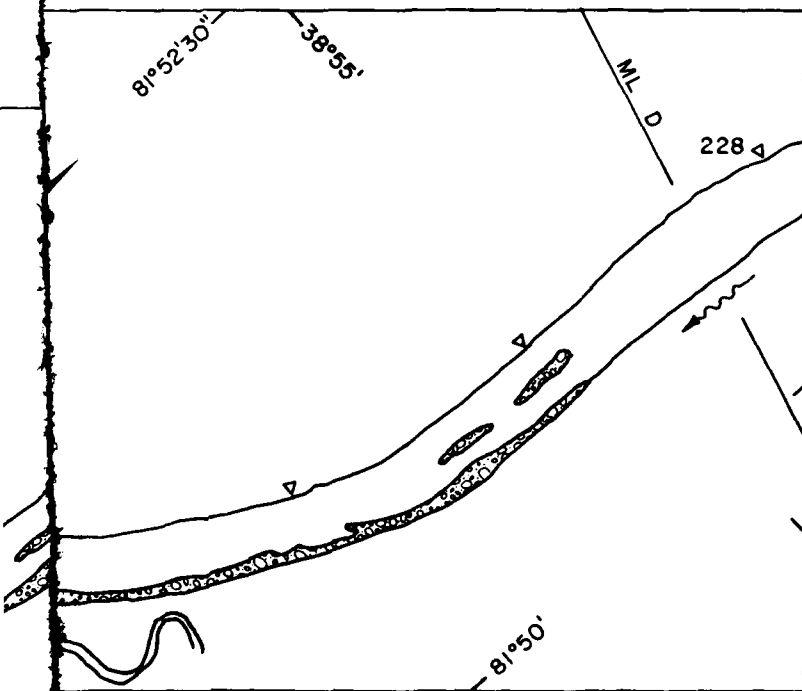
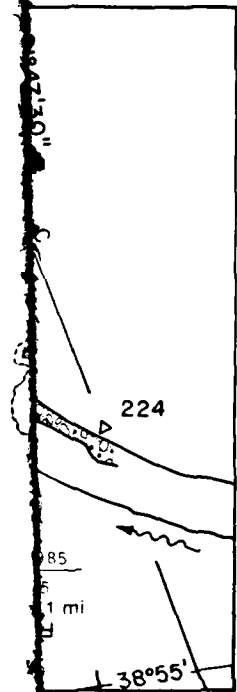
ML



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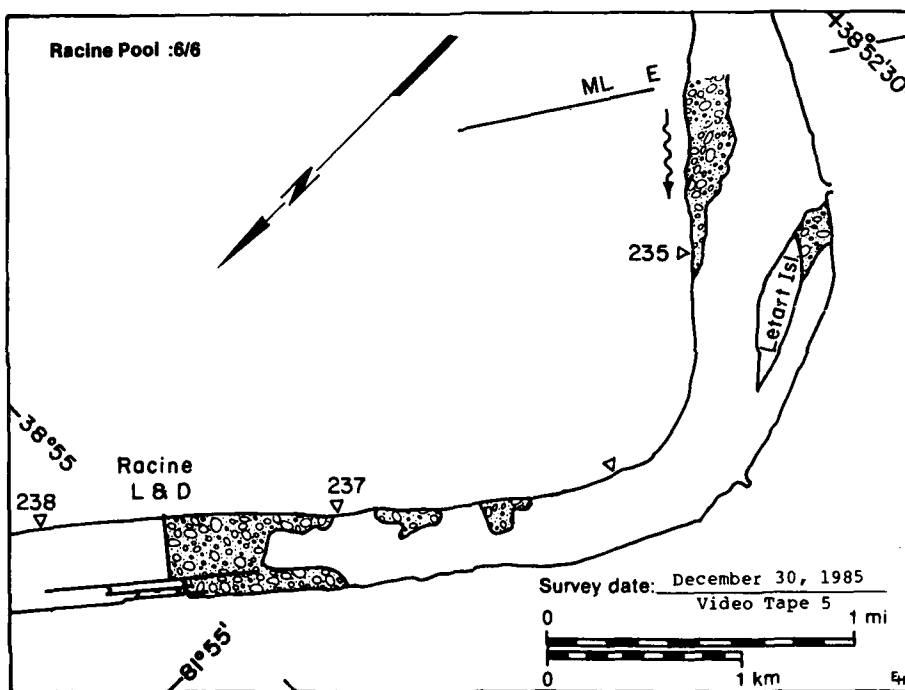
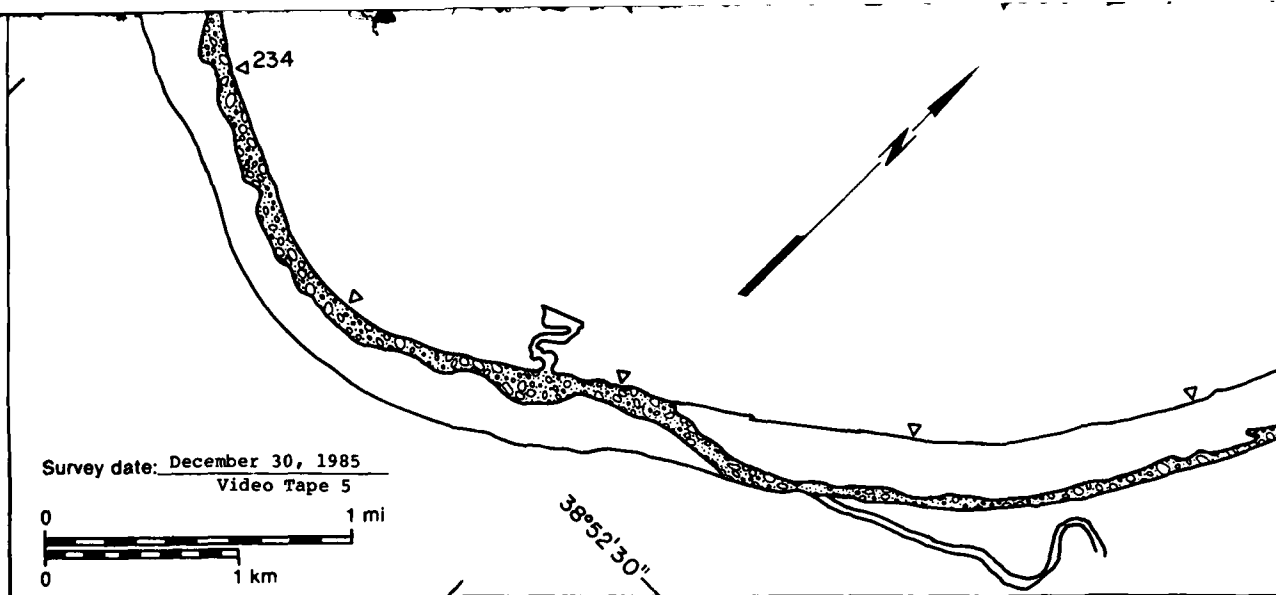
Racine Pool :6/6







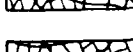

Racine Pool
MAP UNITS

Area
(m² x 10⁶)

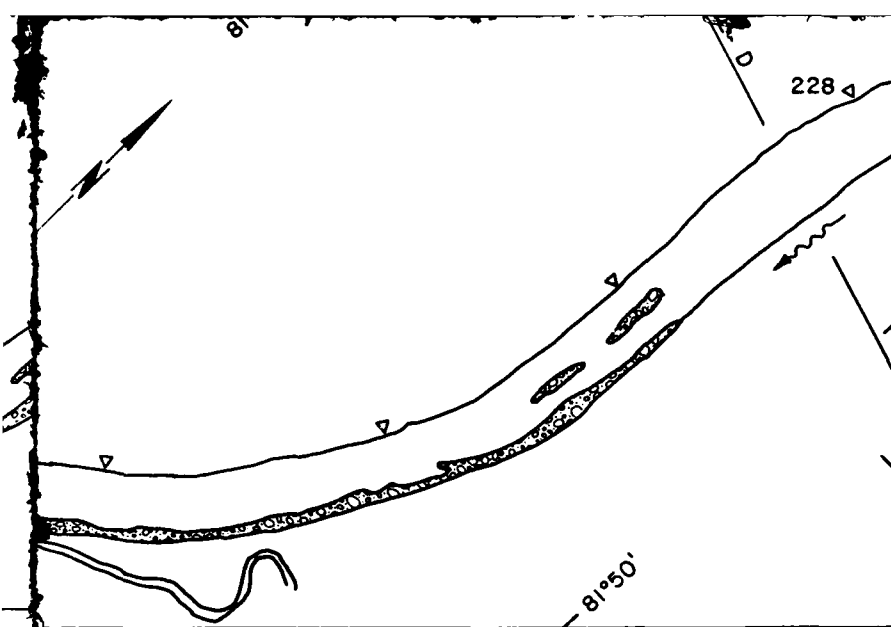
Surface
concentration
(%)



Racine Pool
MAP UNITS

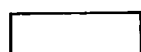
-  Open water
-  Solid ice cover
-  Solid ice cover w open-water area
-  Fragmented ice
-  Fragmented ice with open-water
-  Ice floes or frazil and pans

Total area (1



Racine Pool

MAP UNITS



Open water



Solid ice cover



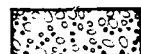
Solid ice cover with open-water areas



Fragmented ice cover

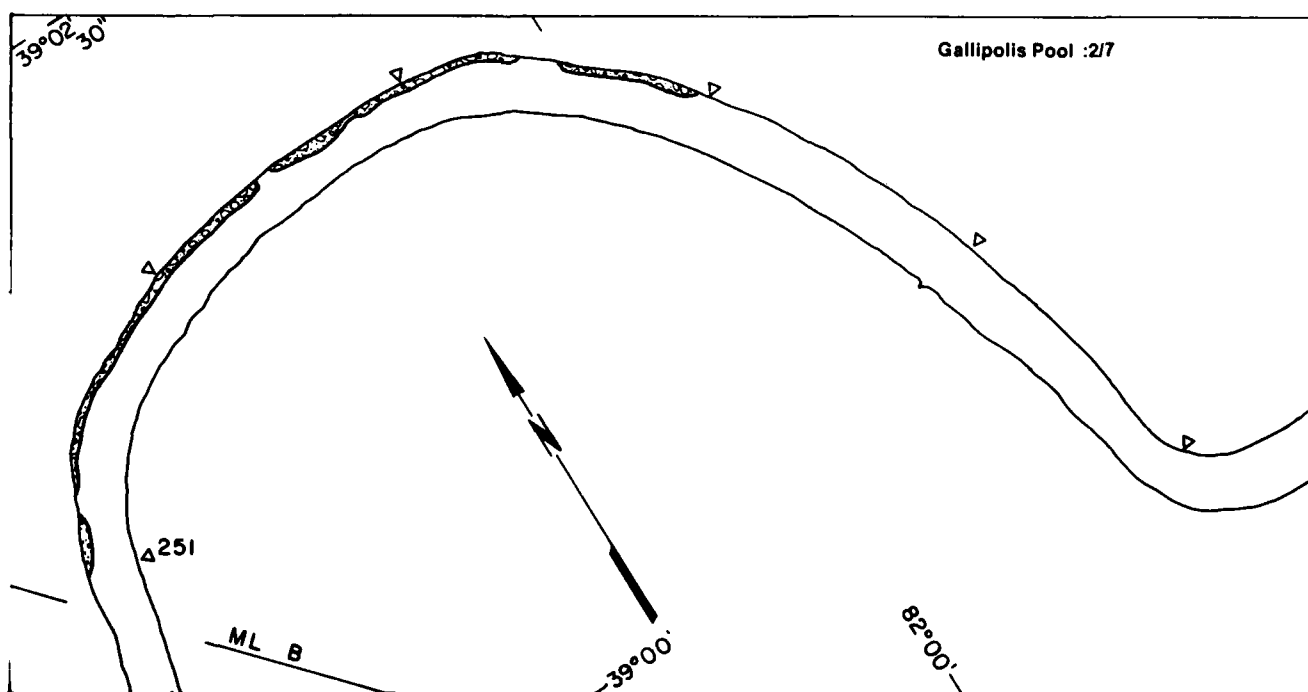
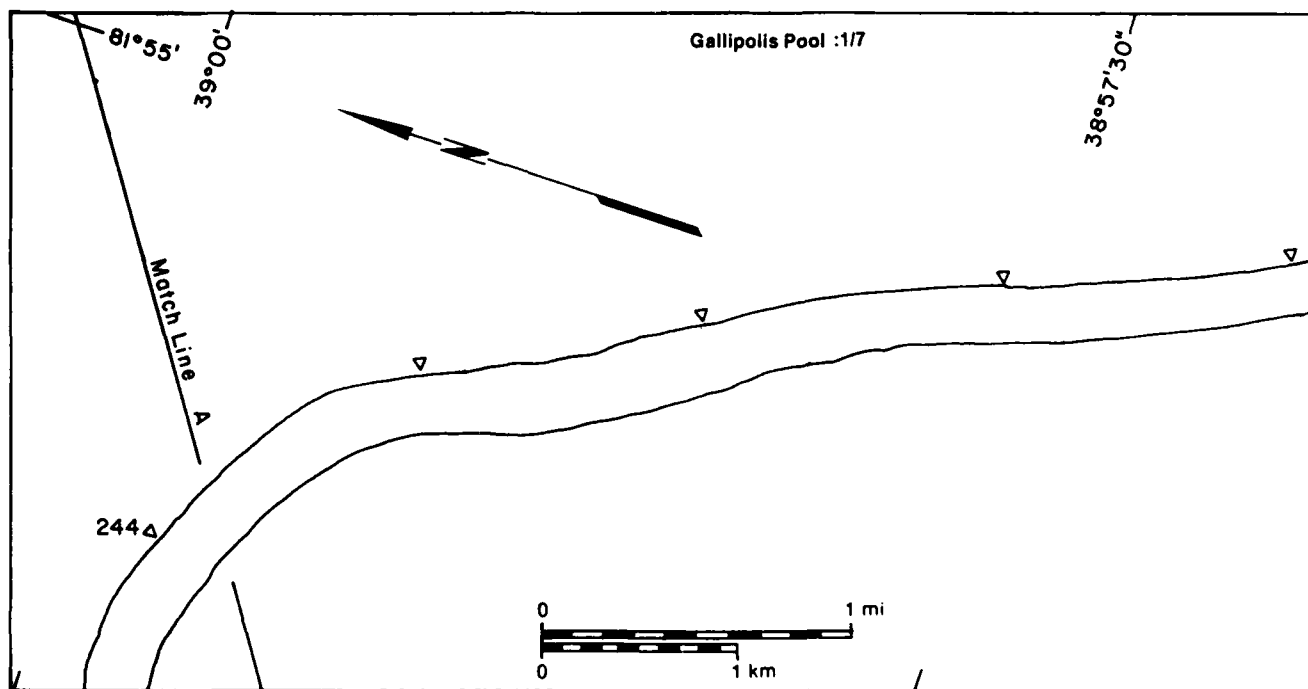


Fragmented ice cover with open-water areas

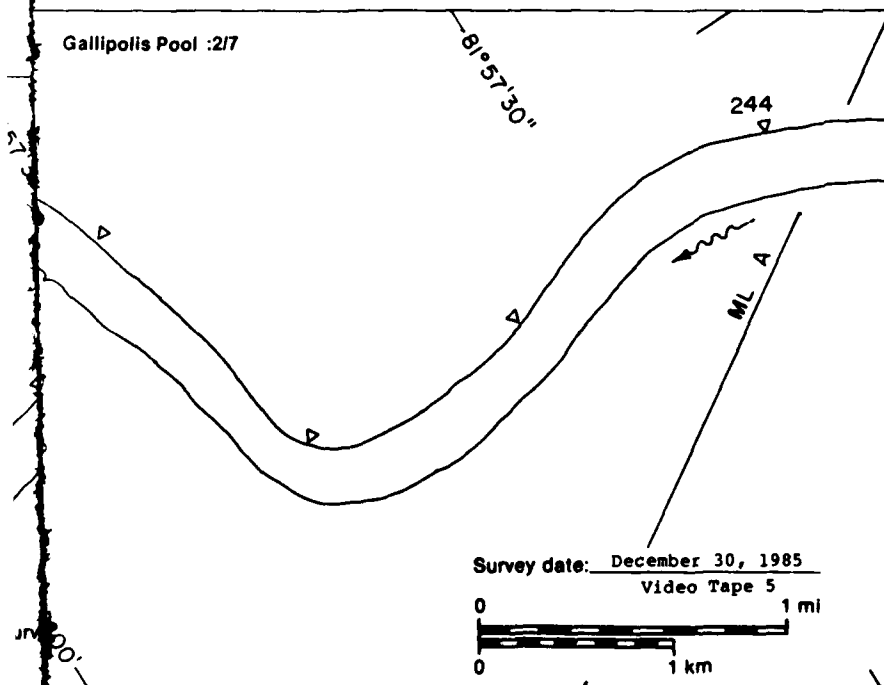
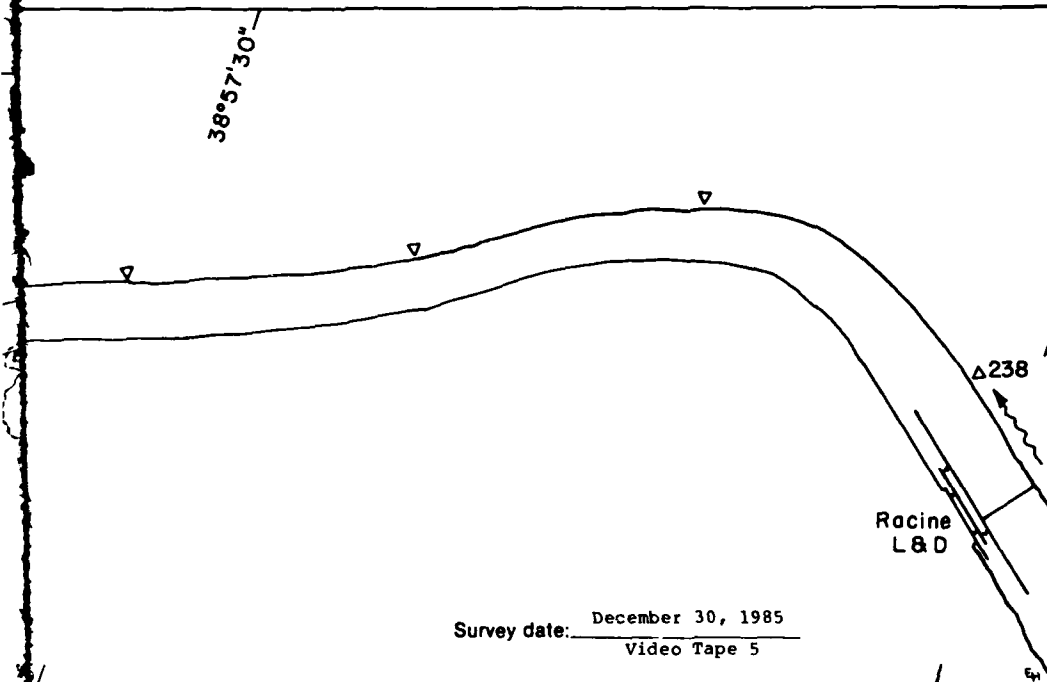


Ice floes or frazil slush and pans

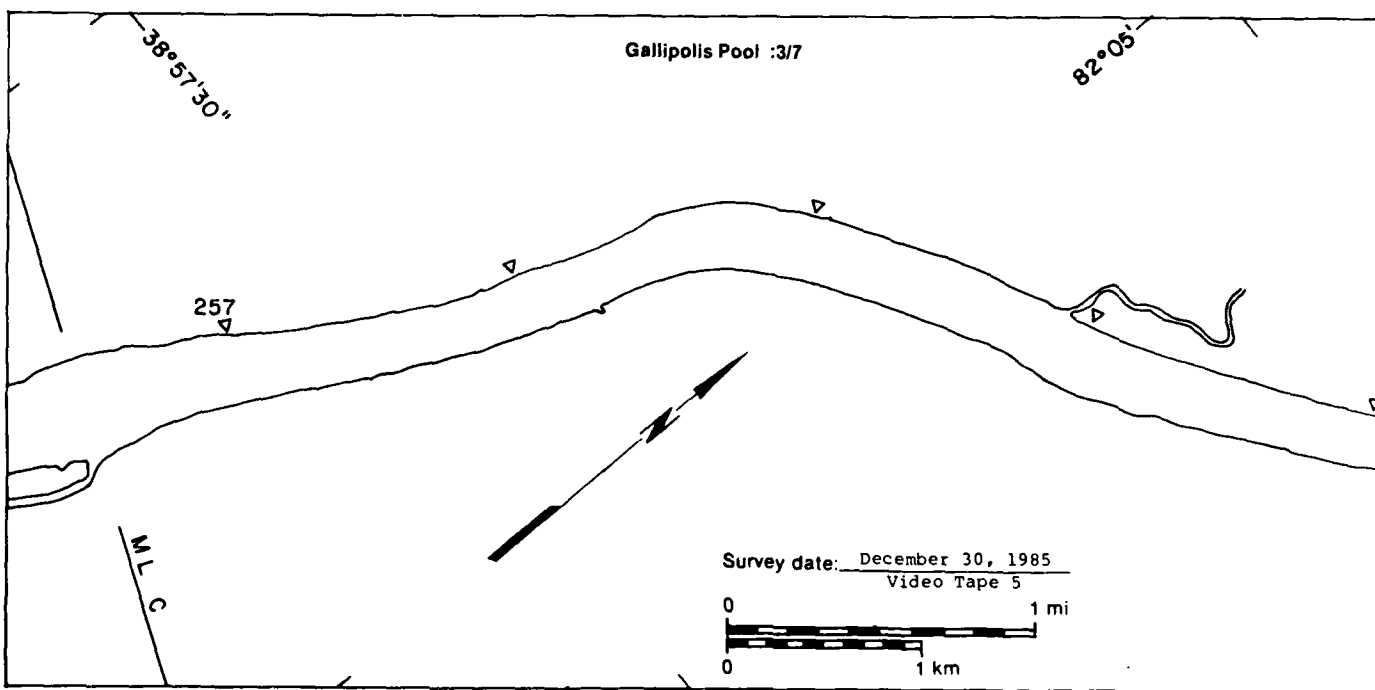
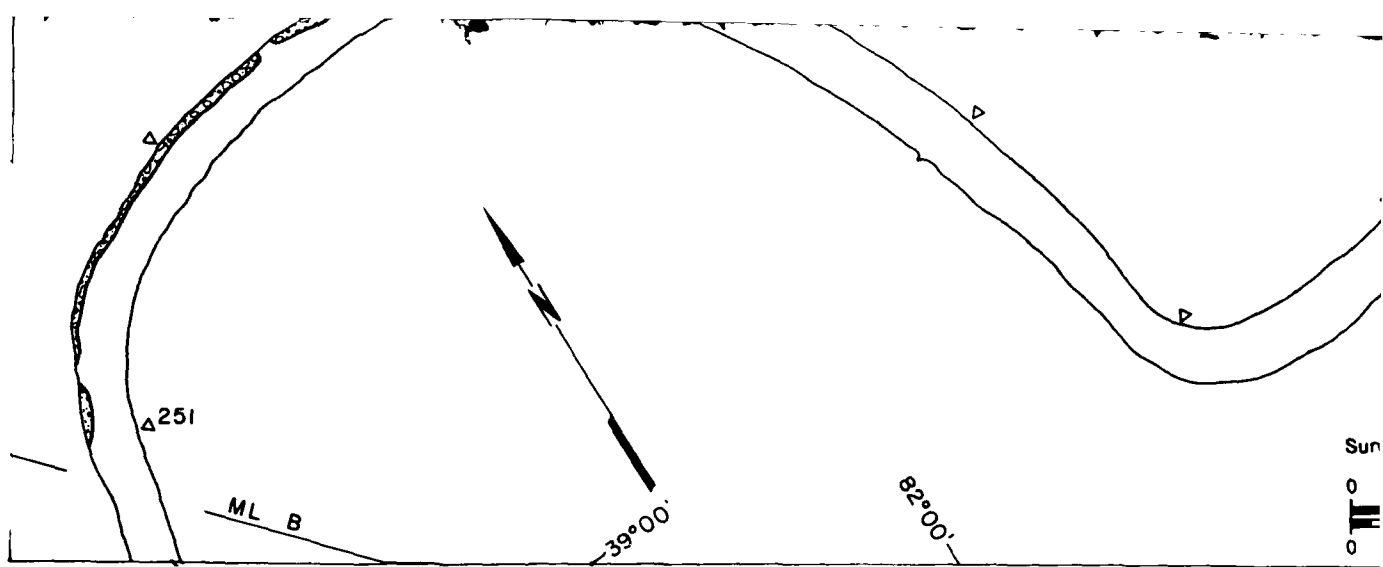
Area ($m^2 \times 10^6$)	Surface concentration (%)
16.18	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
3.71	20
Total area ($m^2 \times 10^6$)	19.89

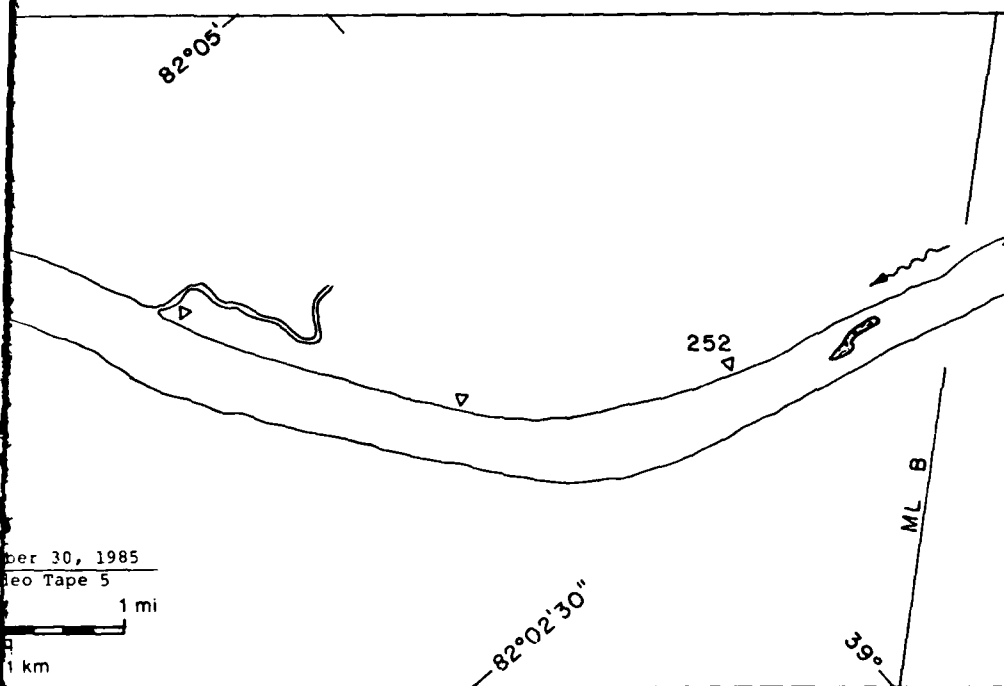
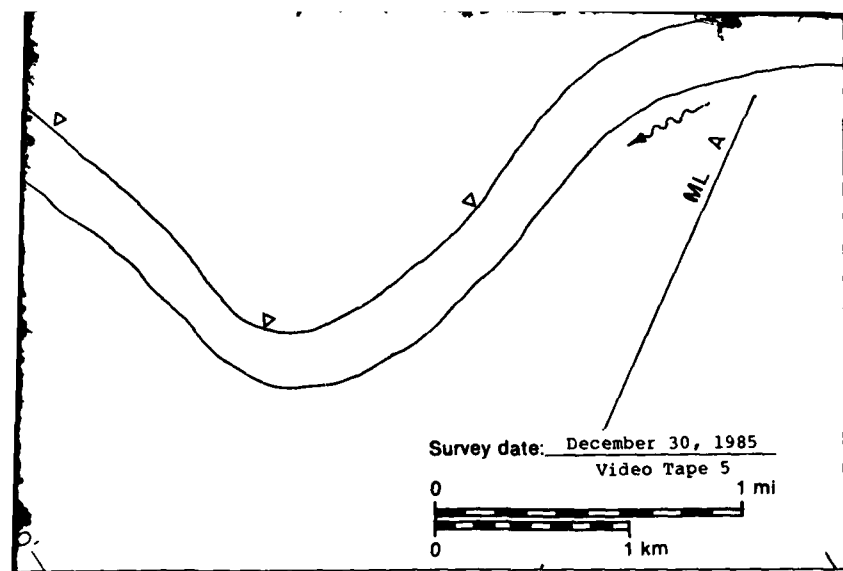


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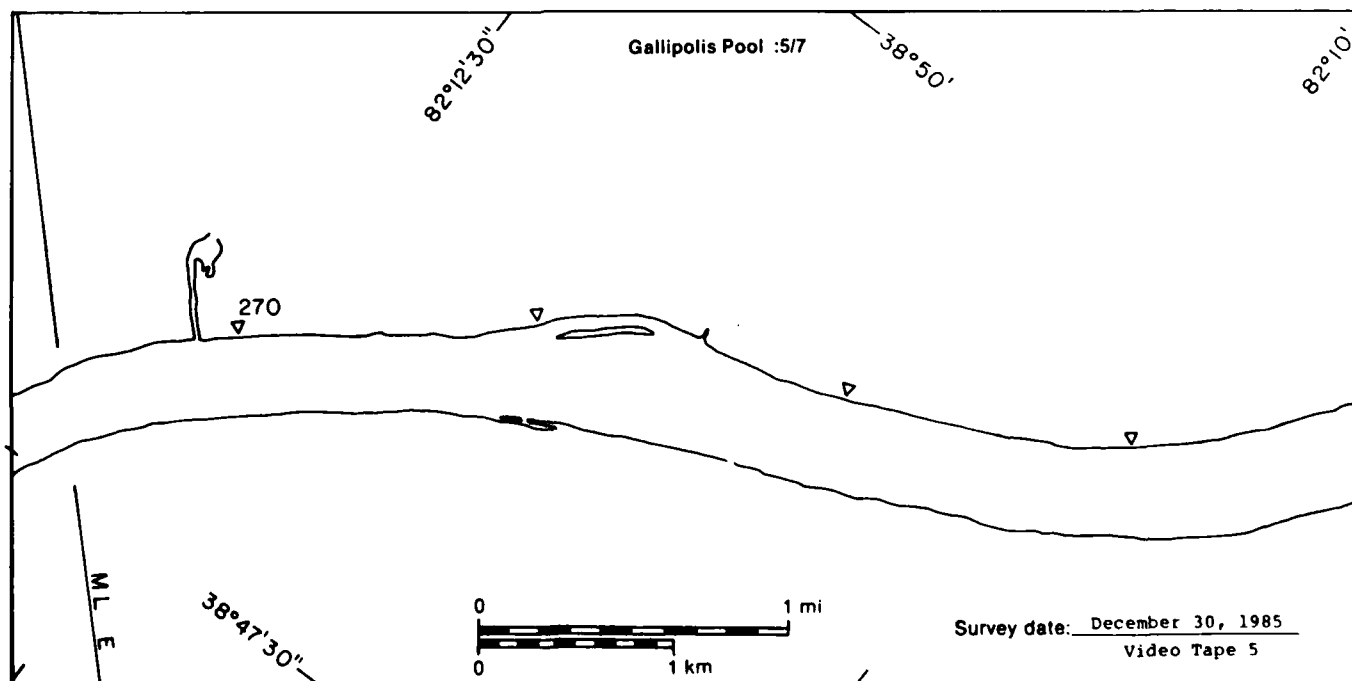
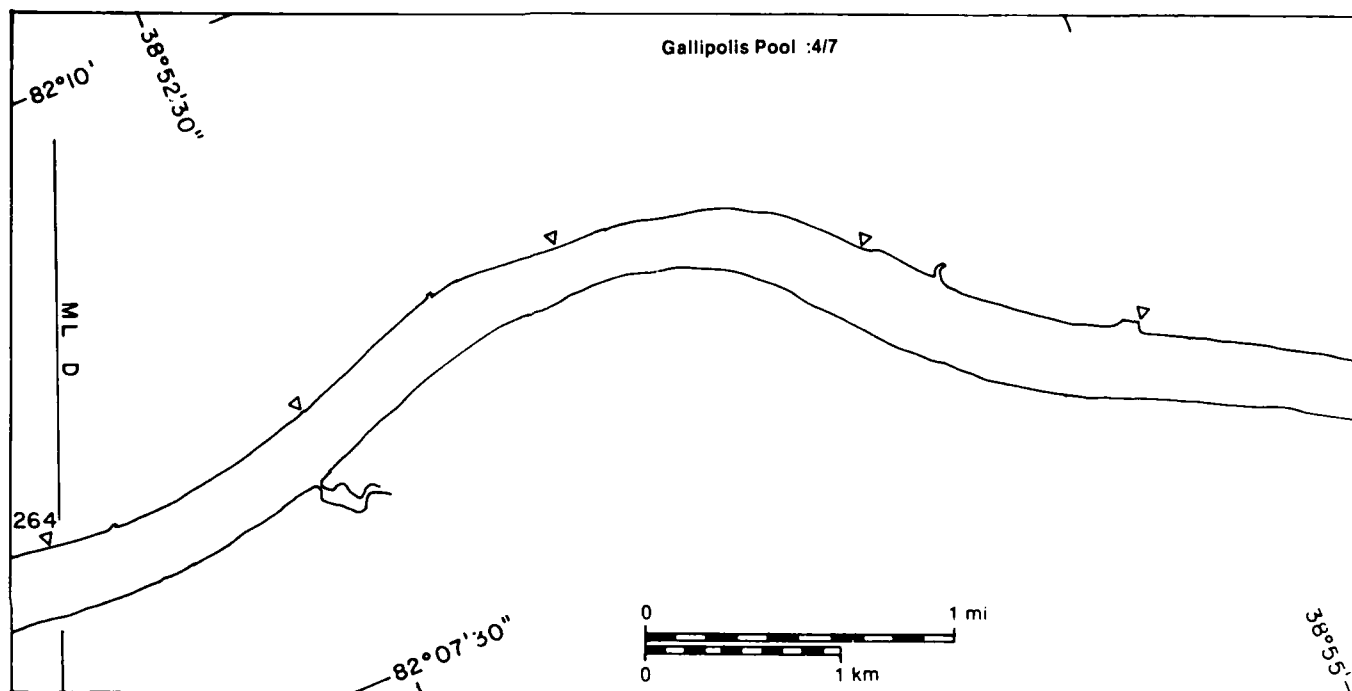


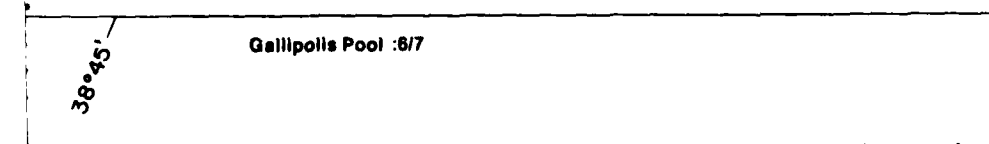
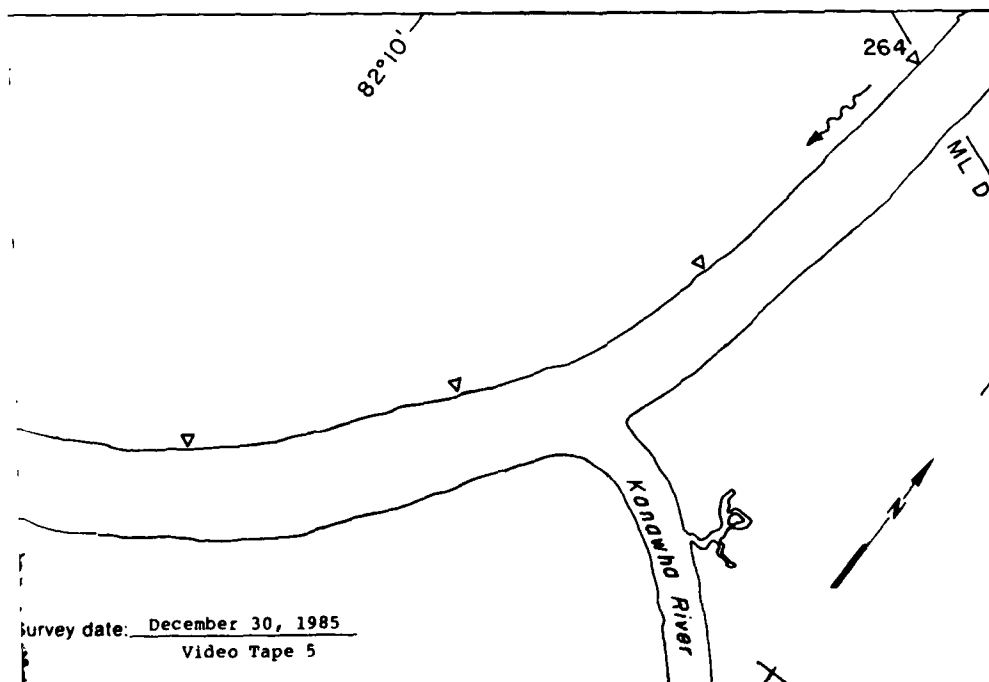
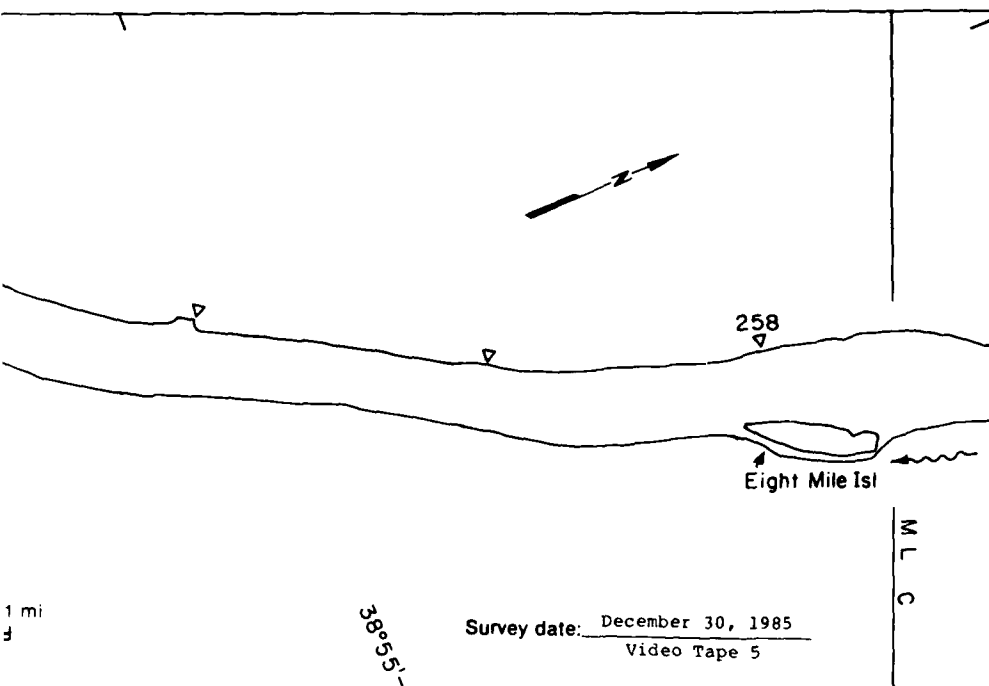
$82^{\circ}03'$

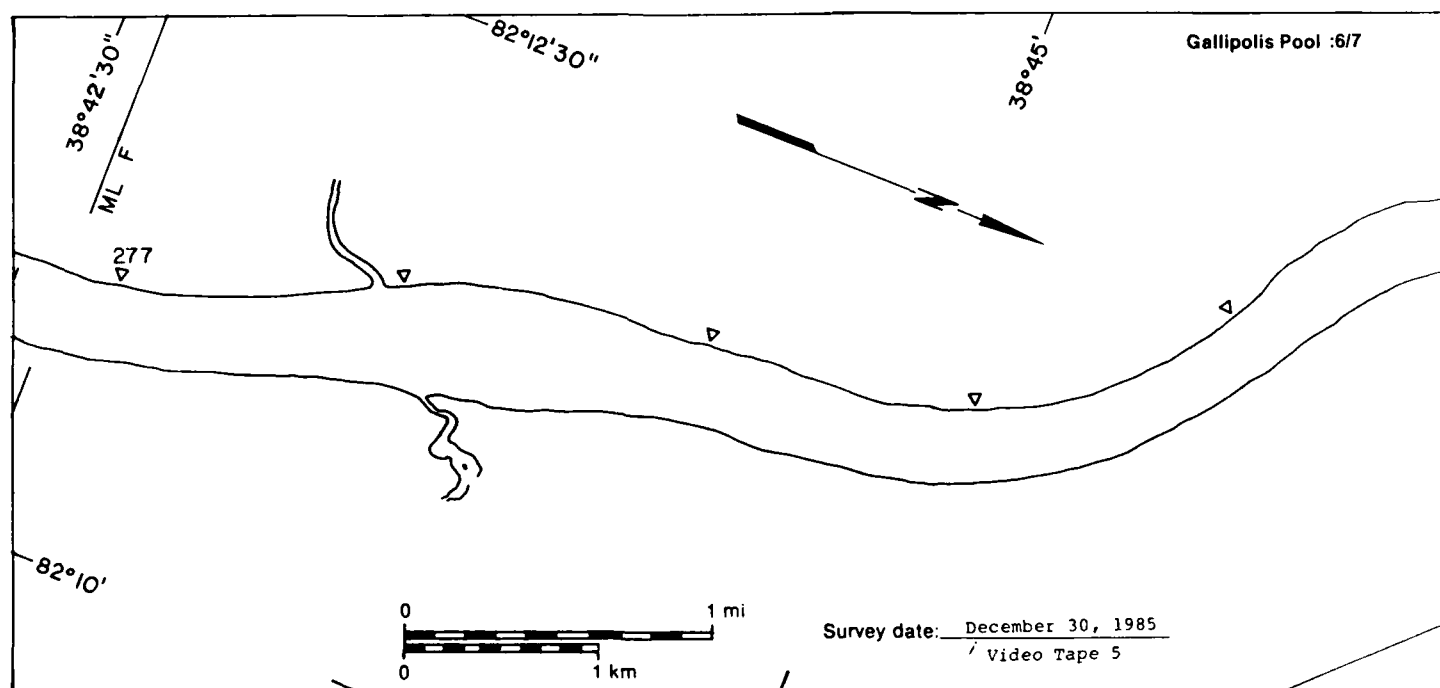
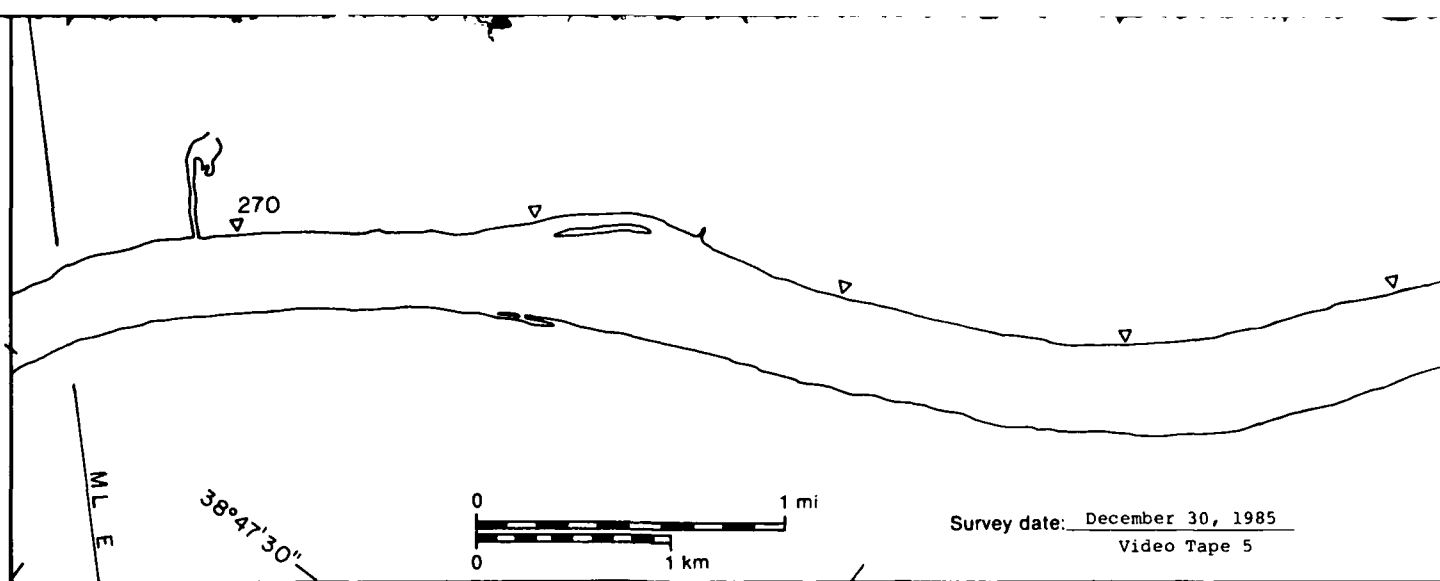


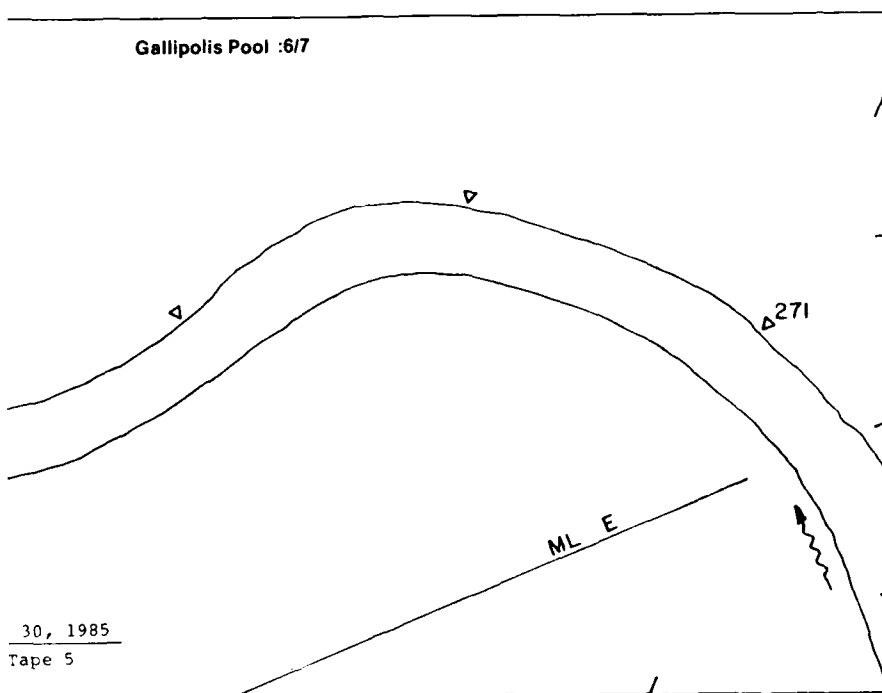
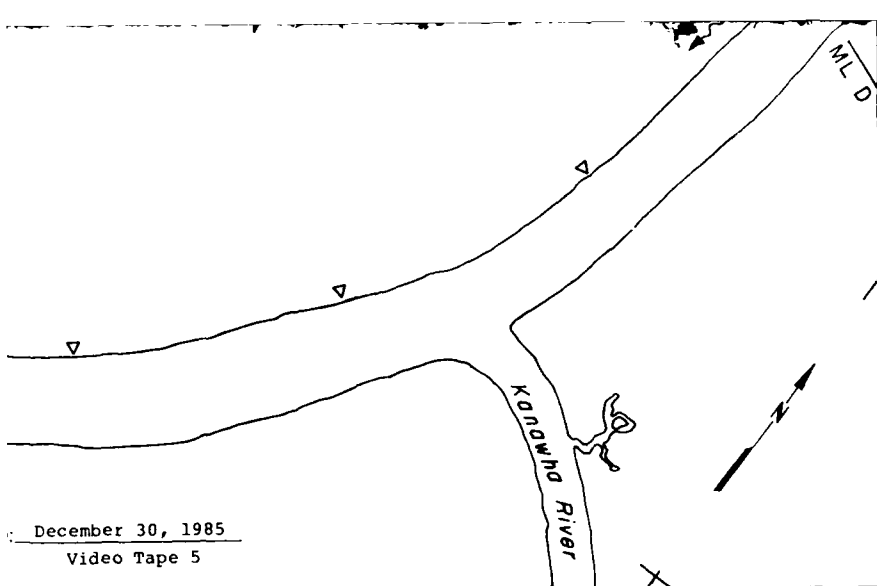


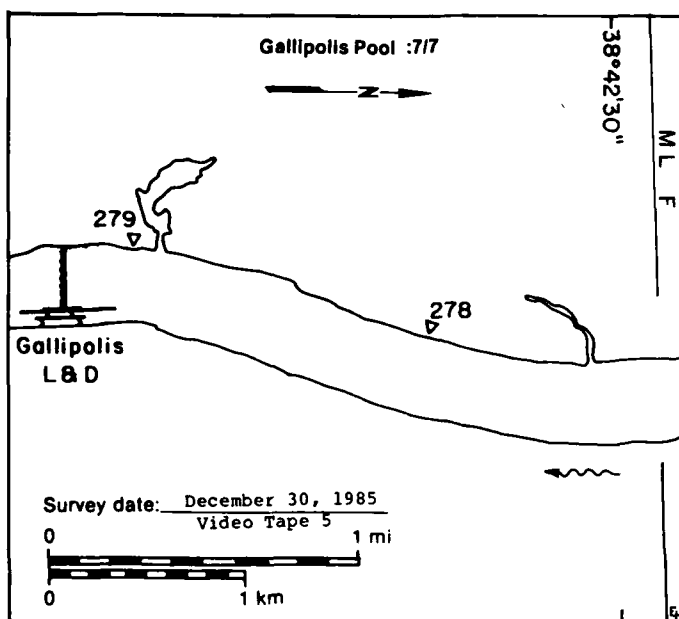
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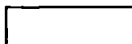
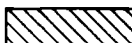

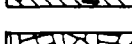
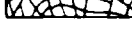



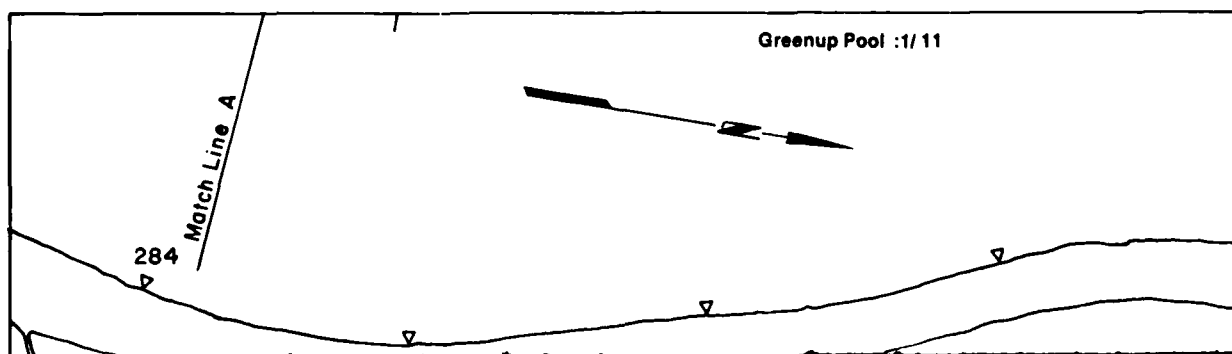




Gallipolis Pool

MAP UNITS

	Area (m ² x 10 ⁶)
 Open water	24.
 Solid ice cover	0.
 Solid ice cover with open-water areas	0.
 Fragmented ice cover	0.
 Fragmented ice cover with open-water areas	0.
 Ice floes or frazil slush and pans	0.
Total area (m ² x 10 ⁶)	24.

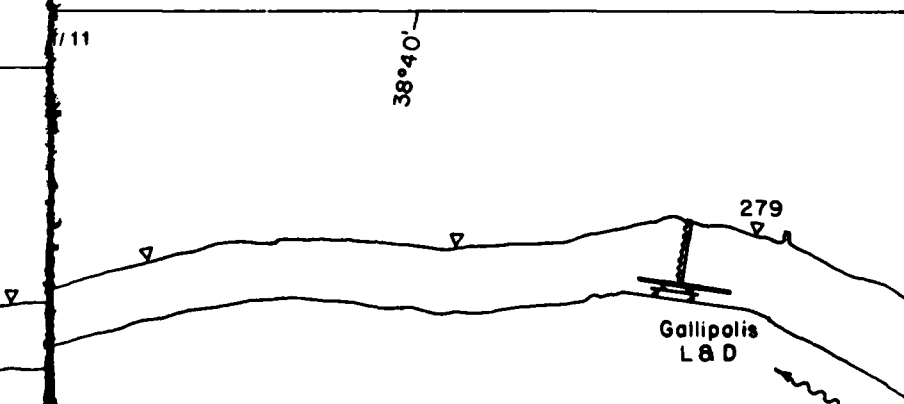


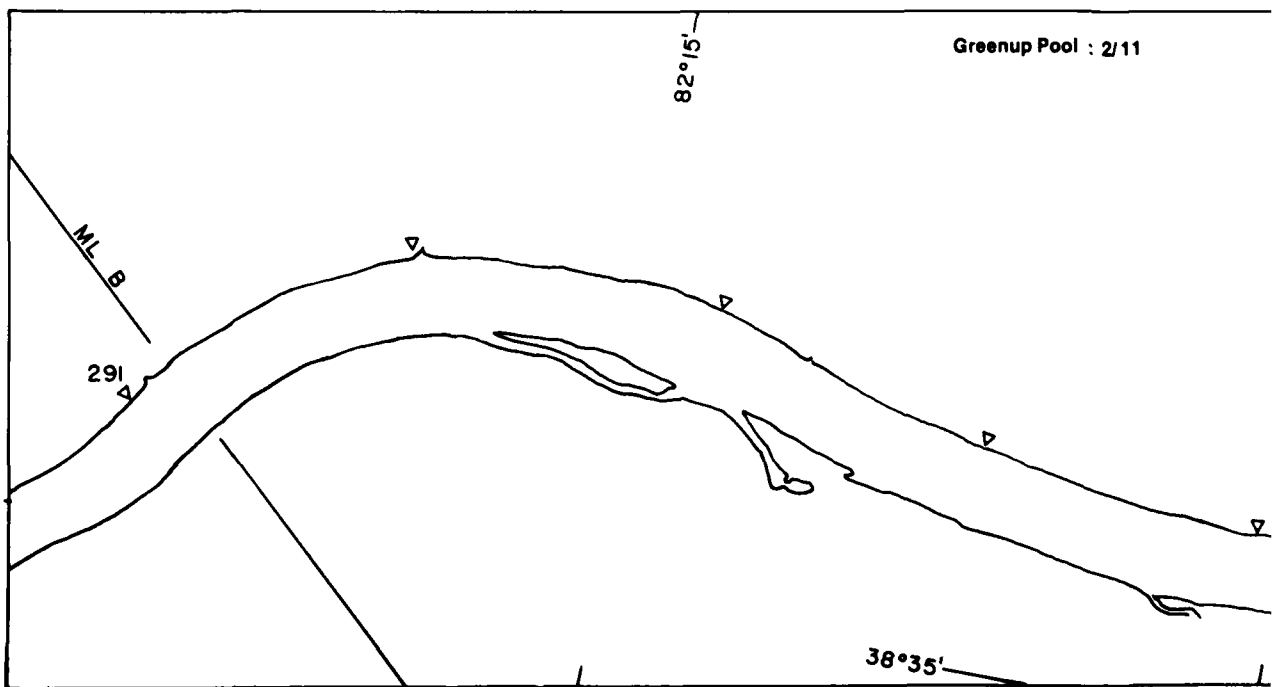
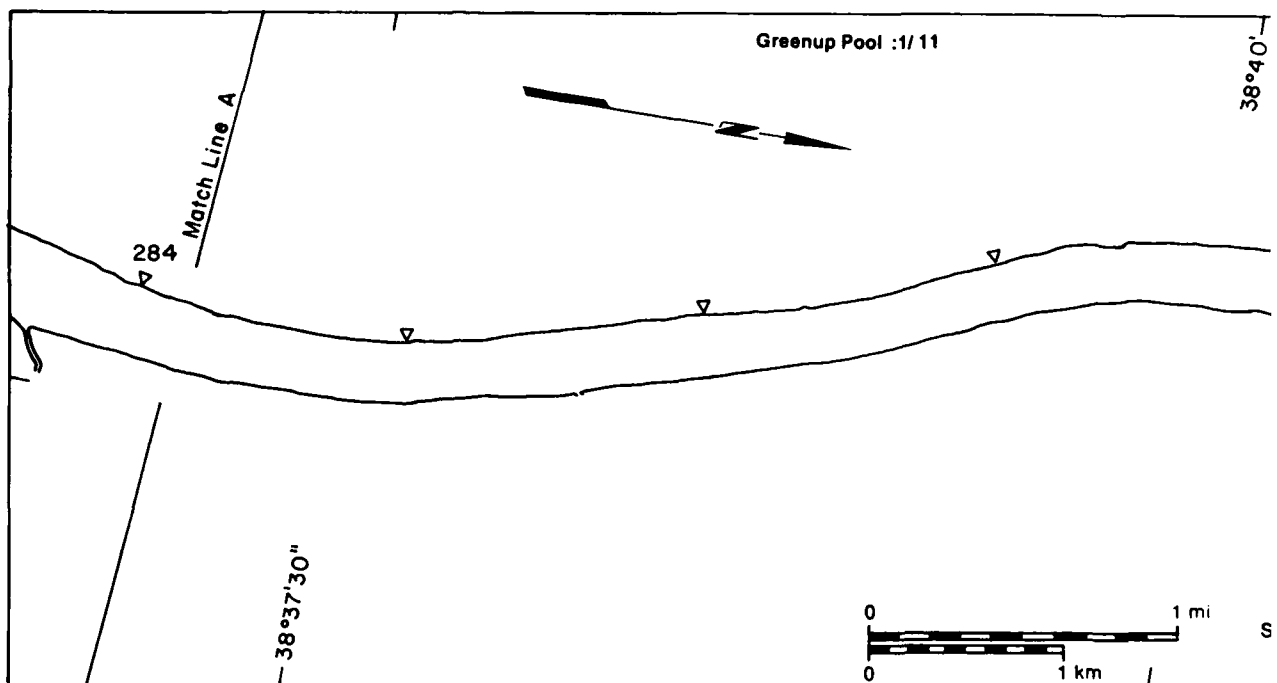
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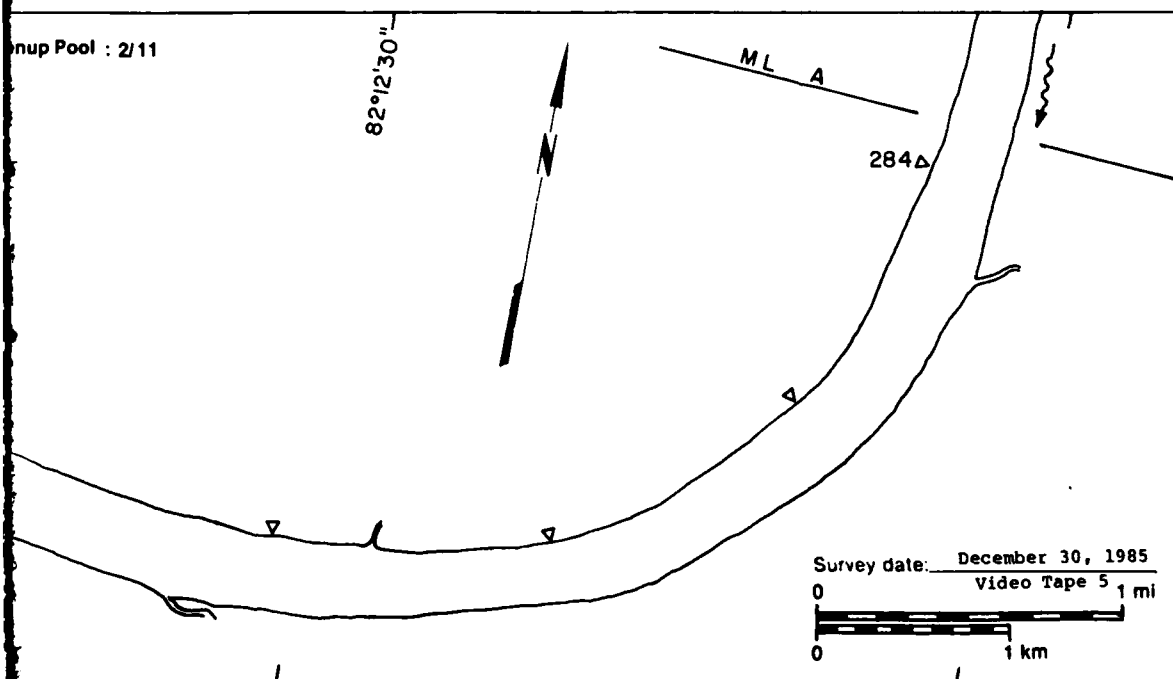
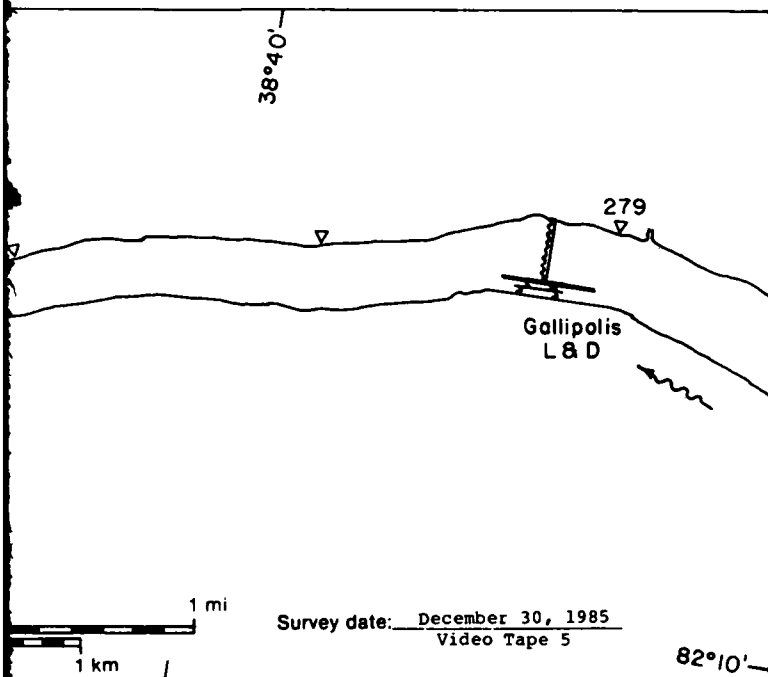
Gallipolis Pool

MAP UNITS

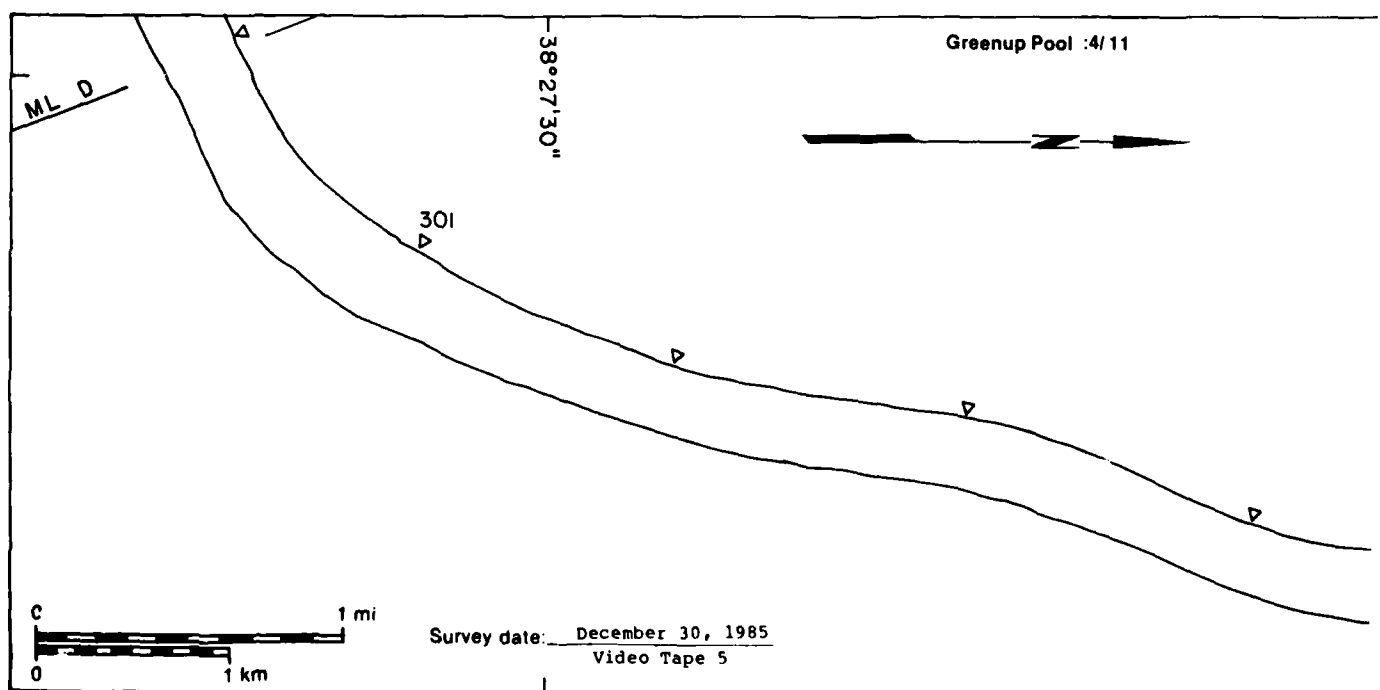
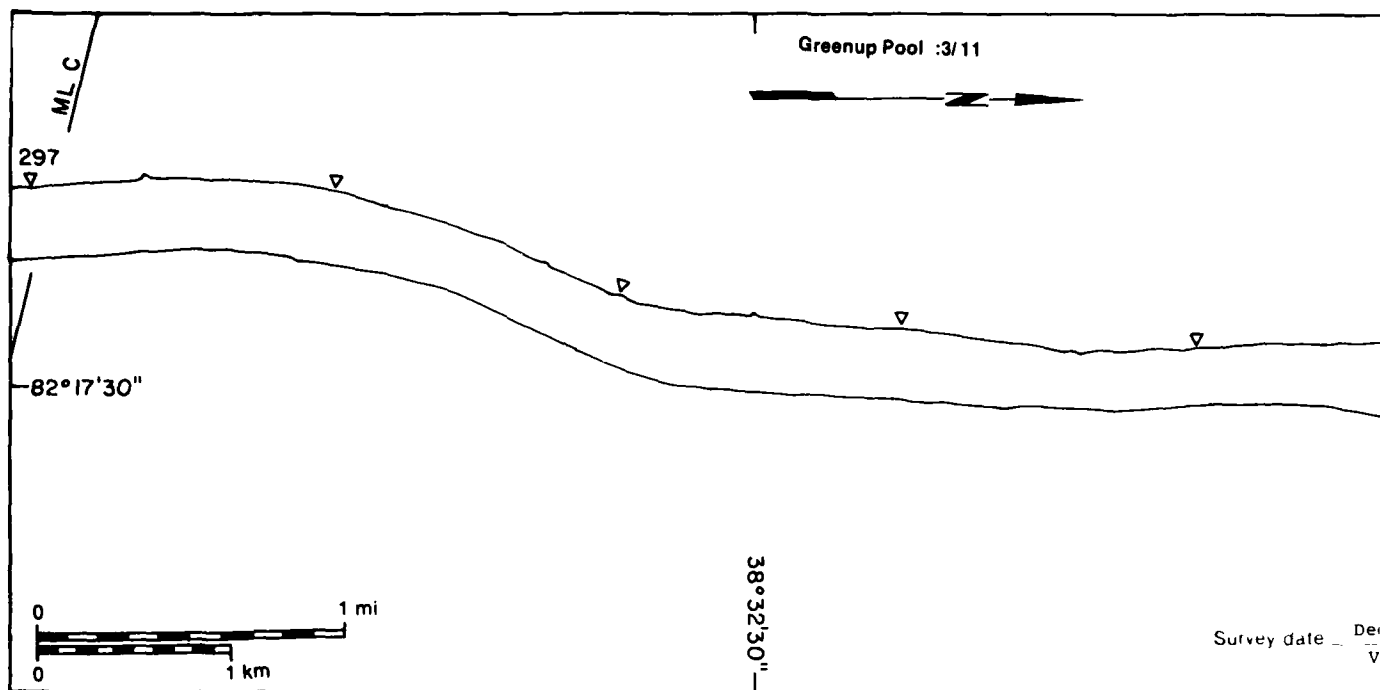
	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	24.36	NA
Solid ice cover	0.00	NA
Solid ice cover with open-water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open-water areas	0.00	—
Ice floes or frazil slush and pans	0.29	10
Total area ($m^2 \times 10^6$)	24.65	

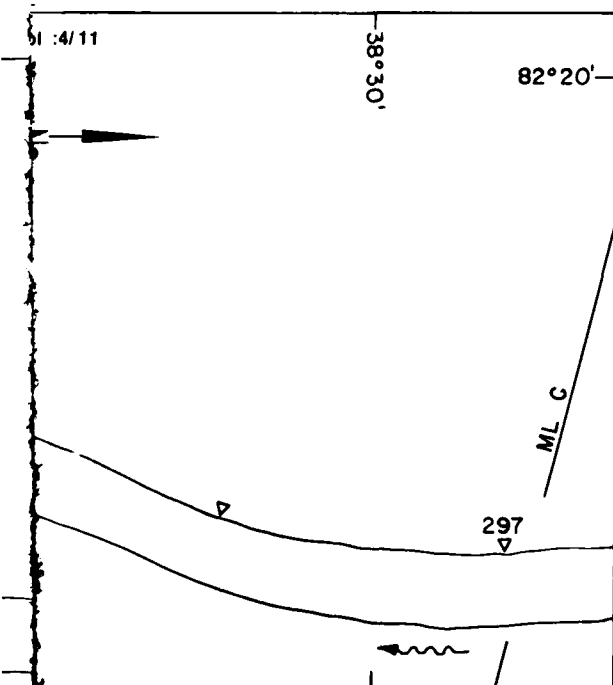
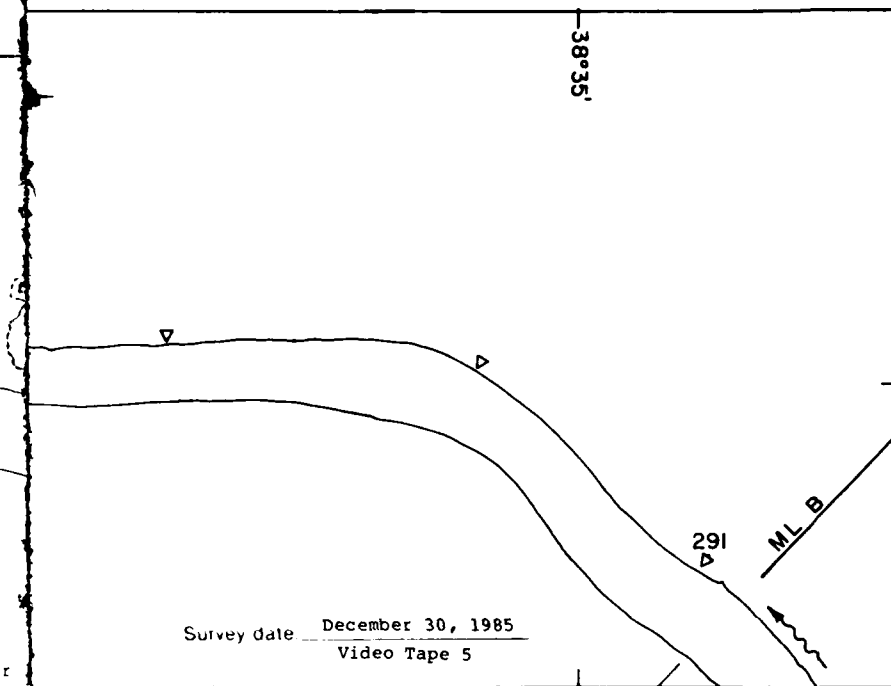


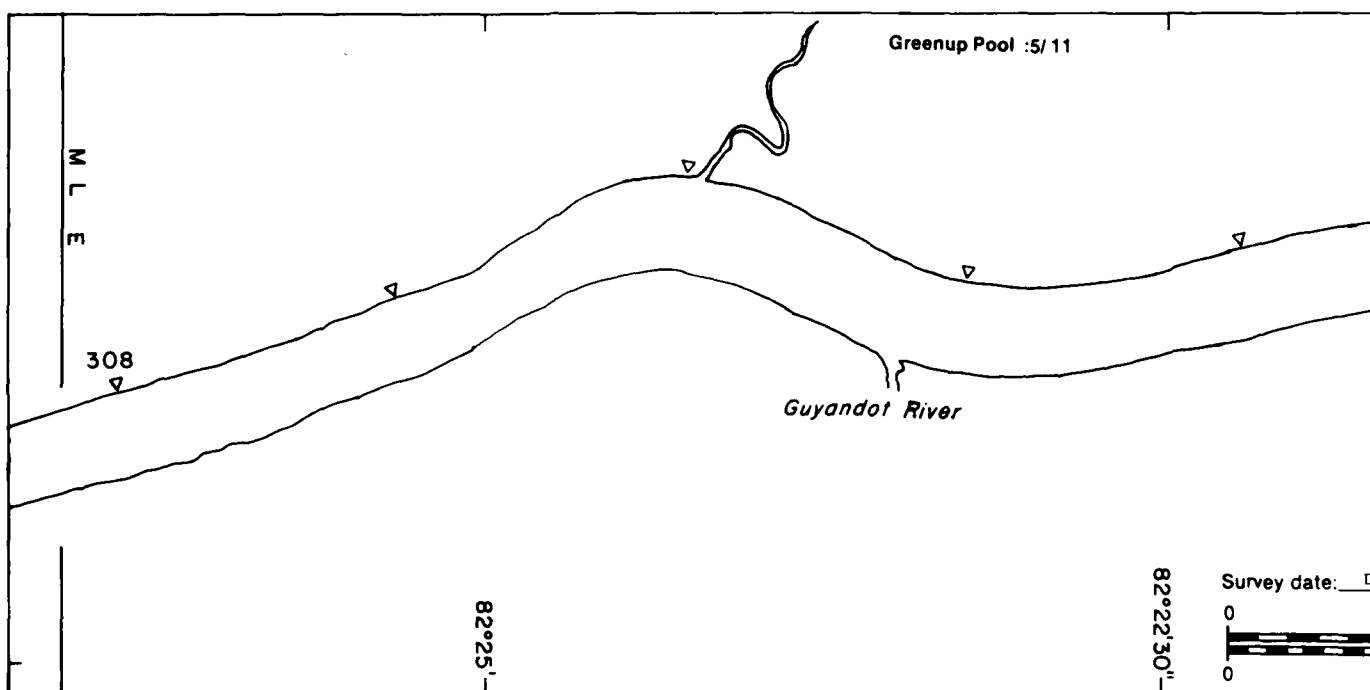
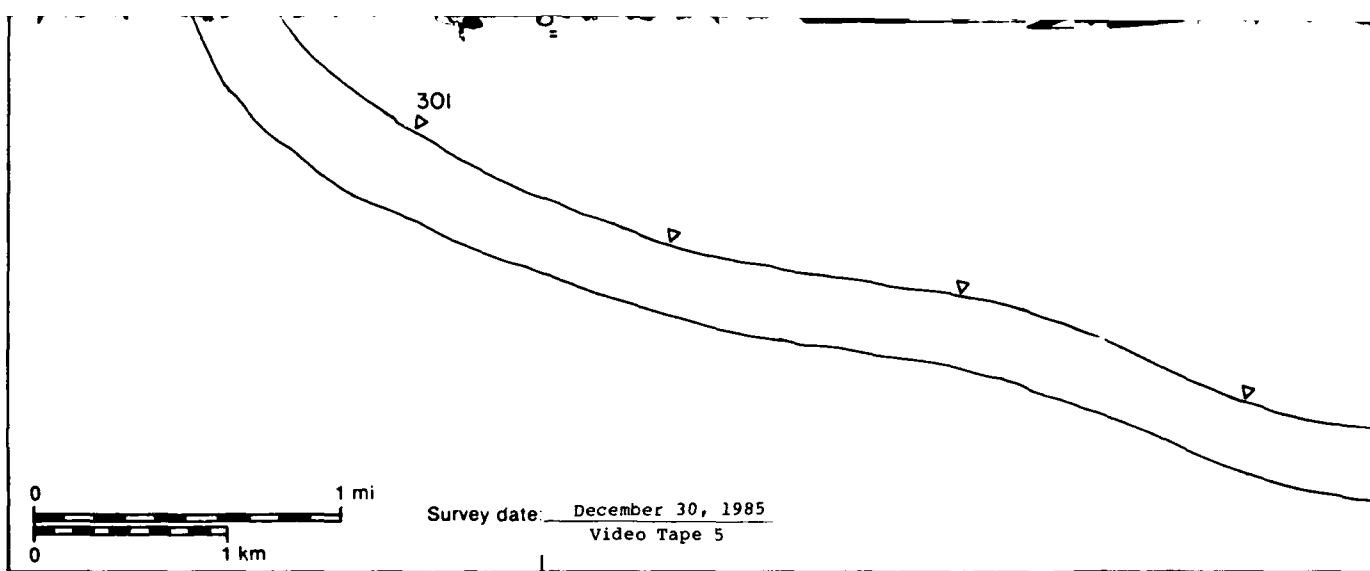


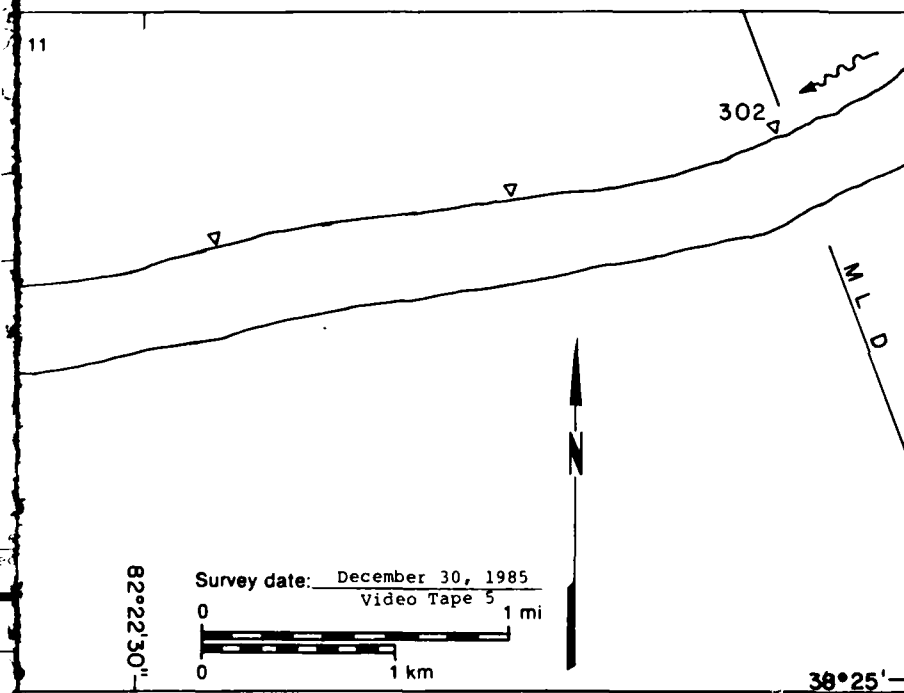
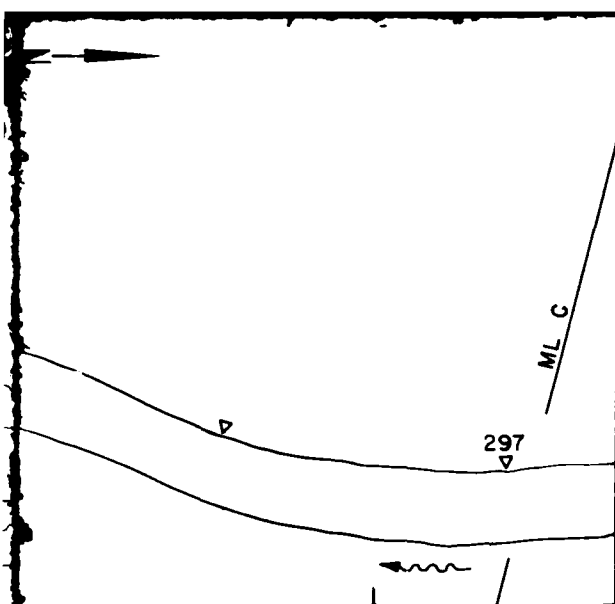


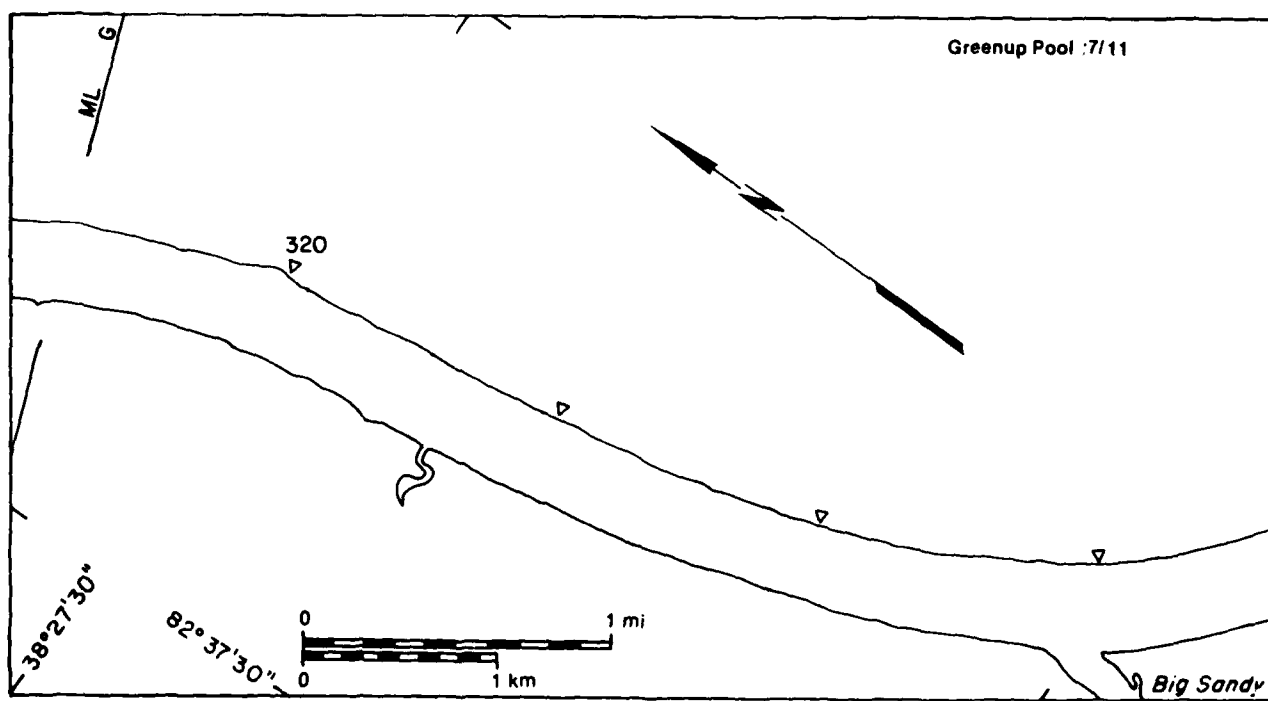
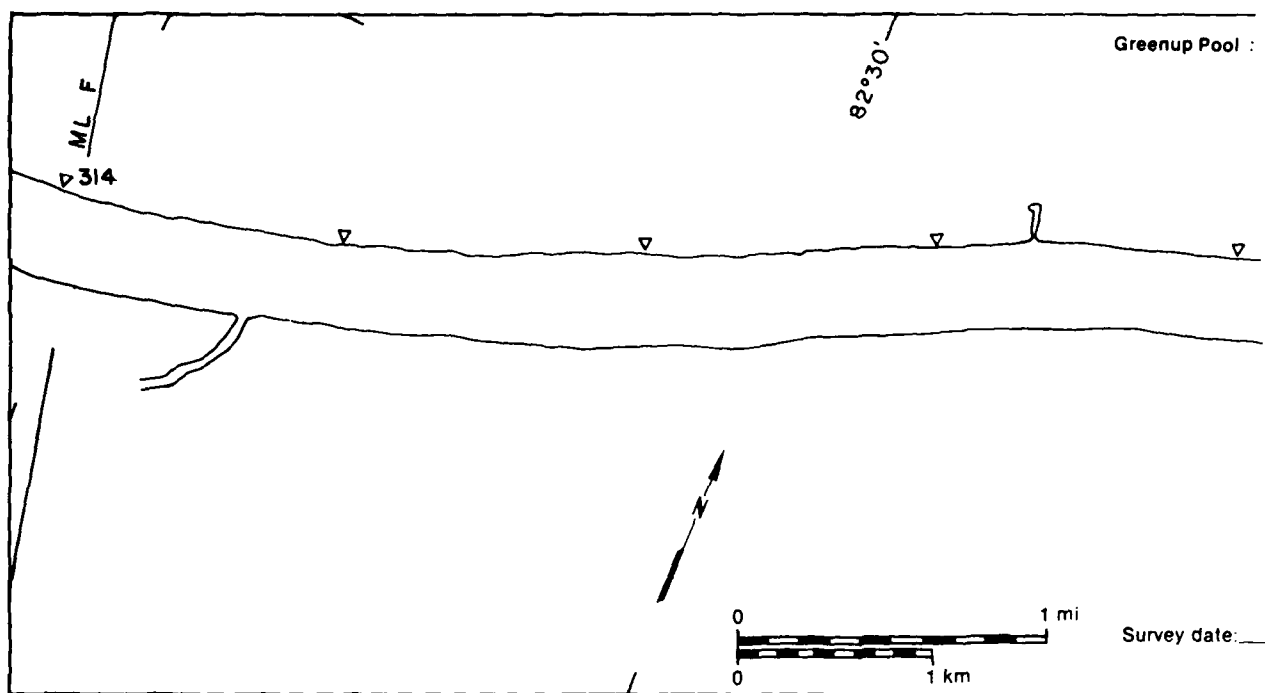
30 December 1985



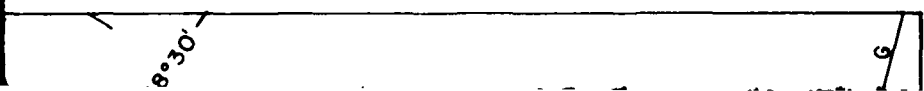
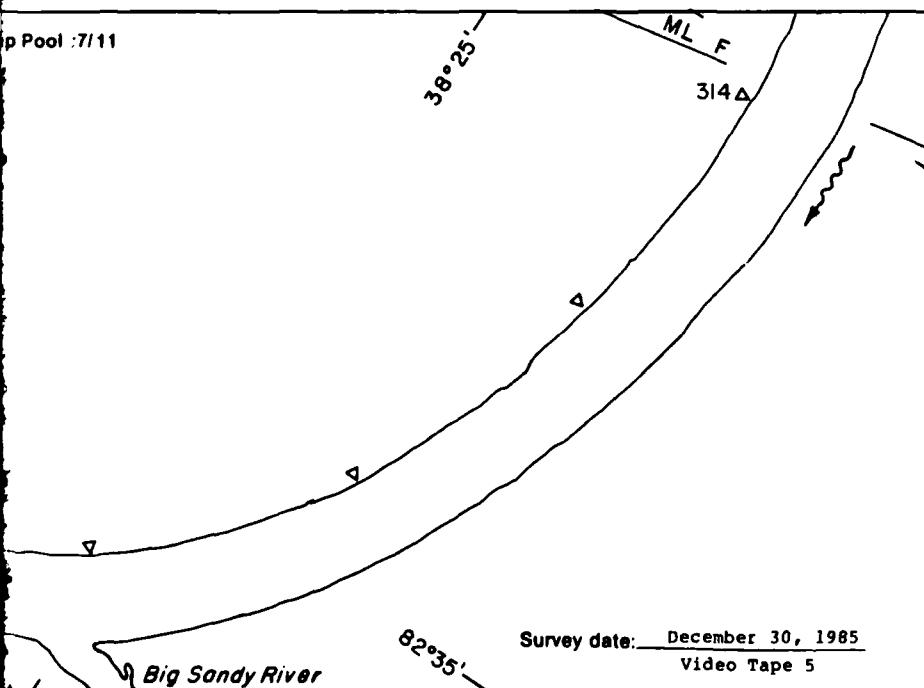
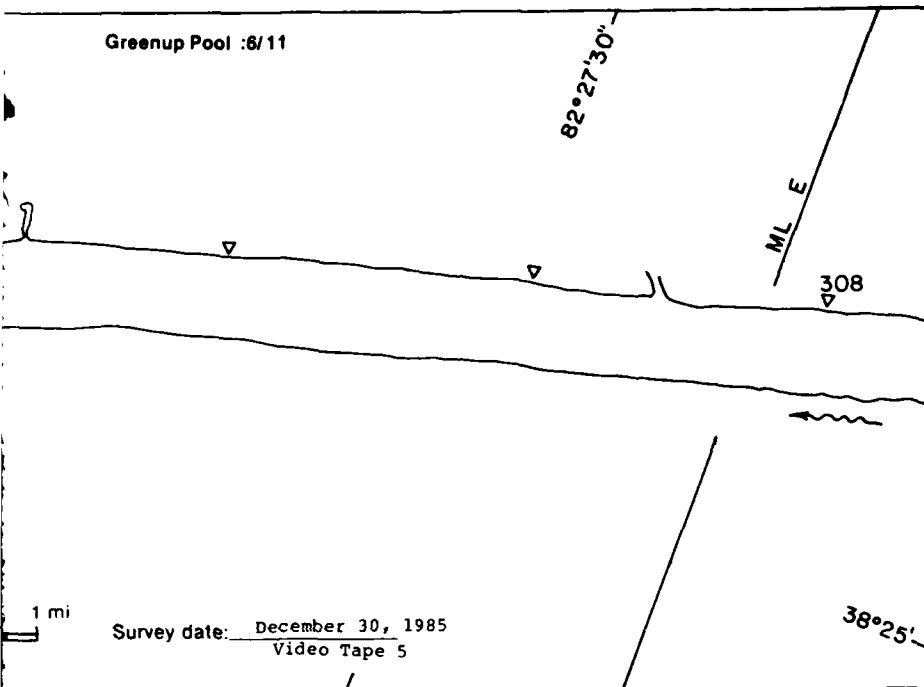


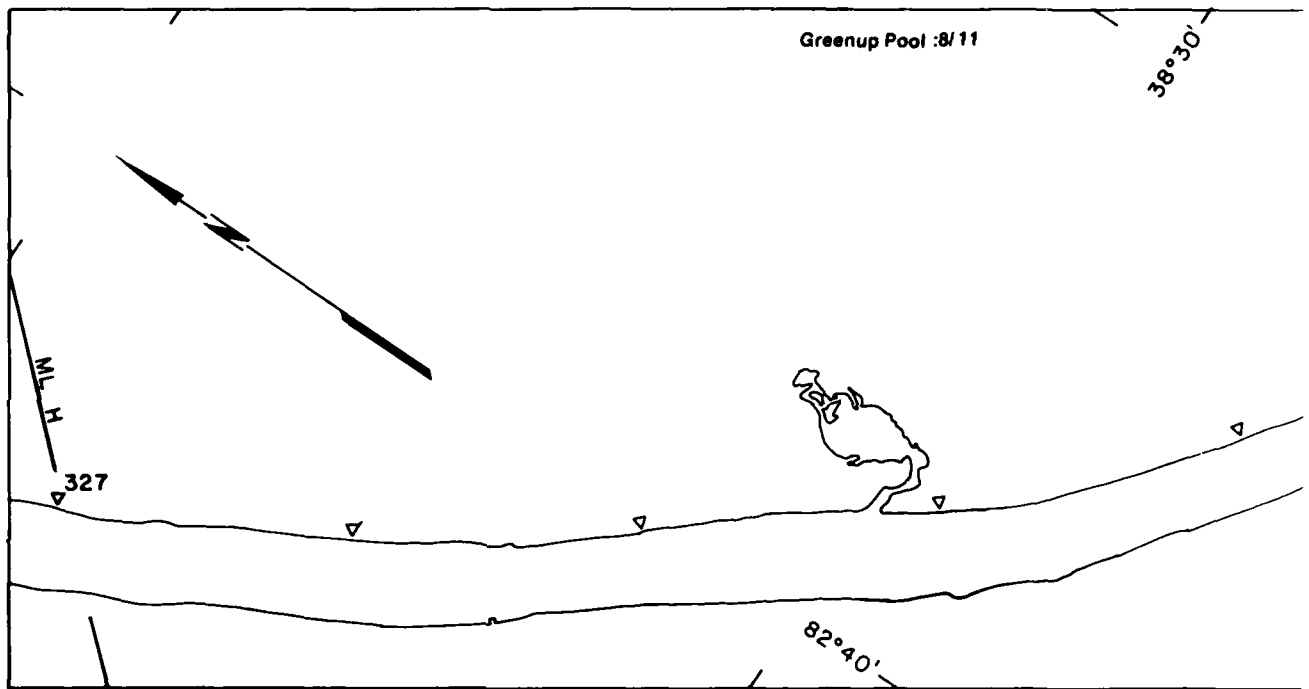
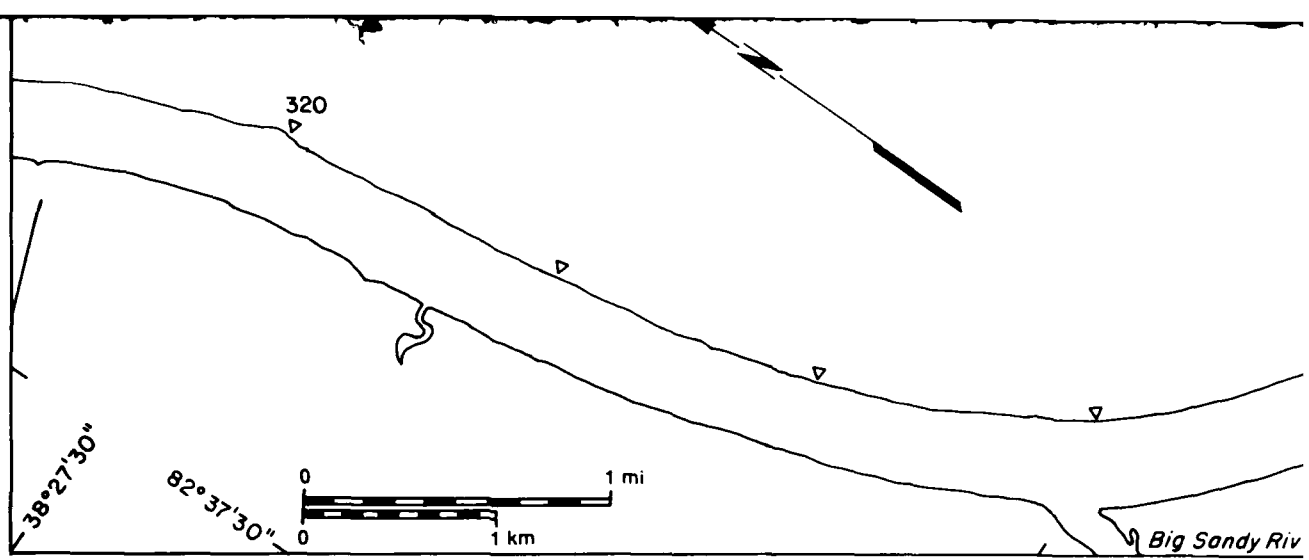


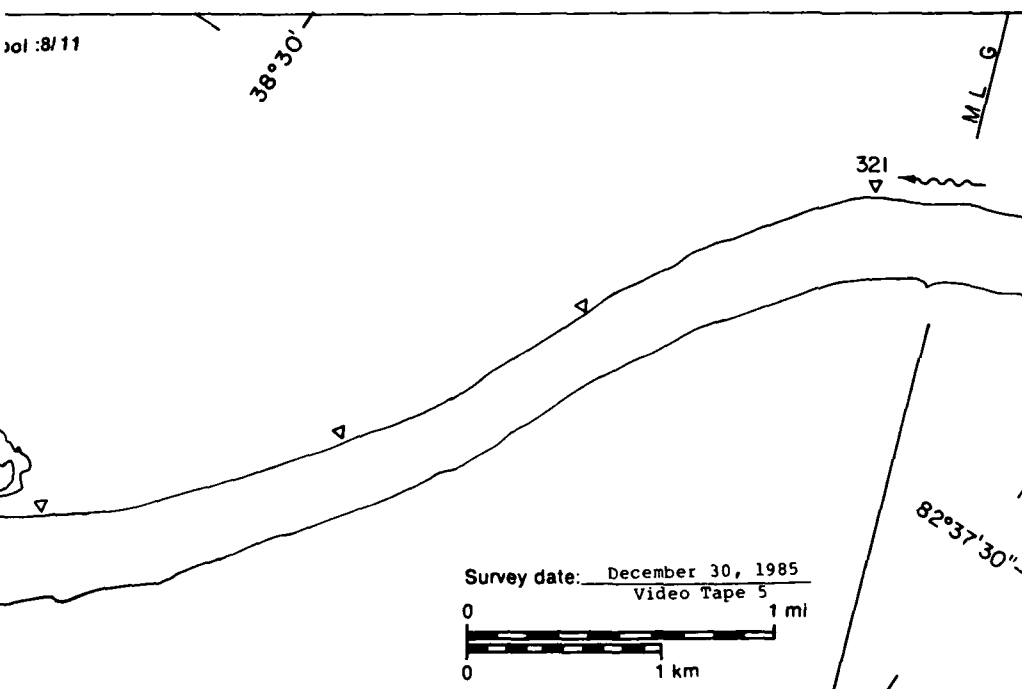
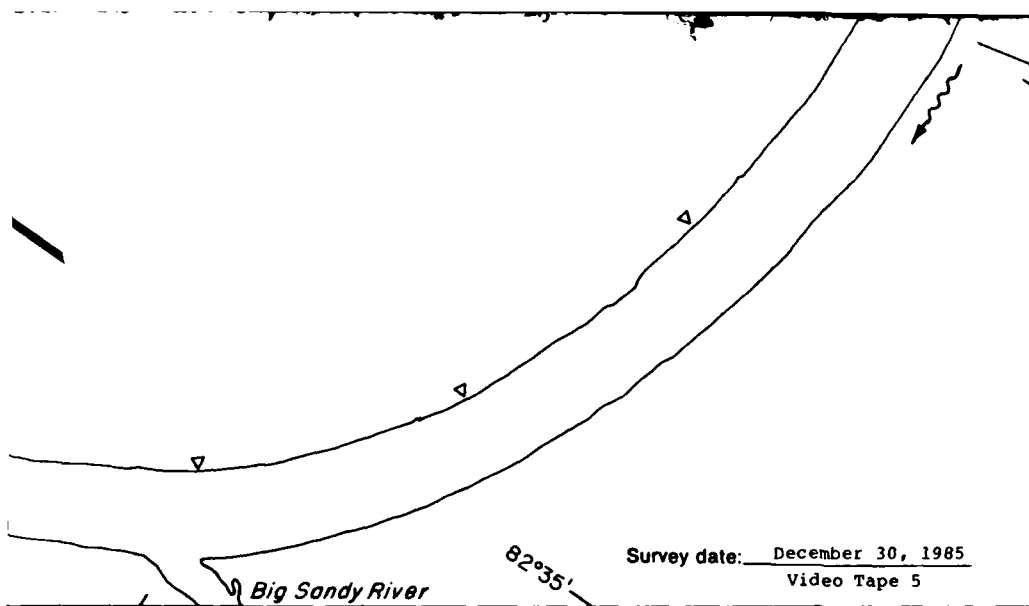




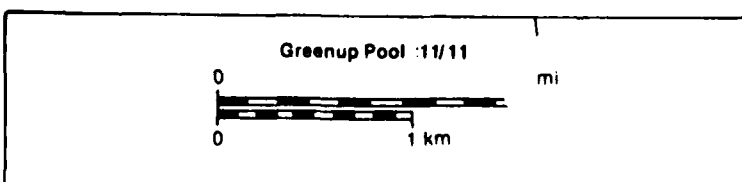
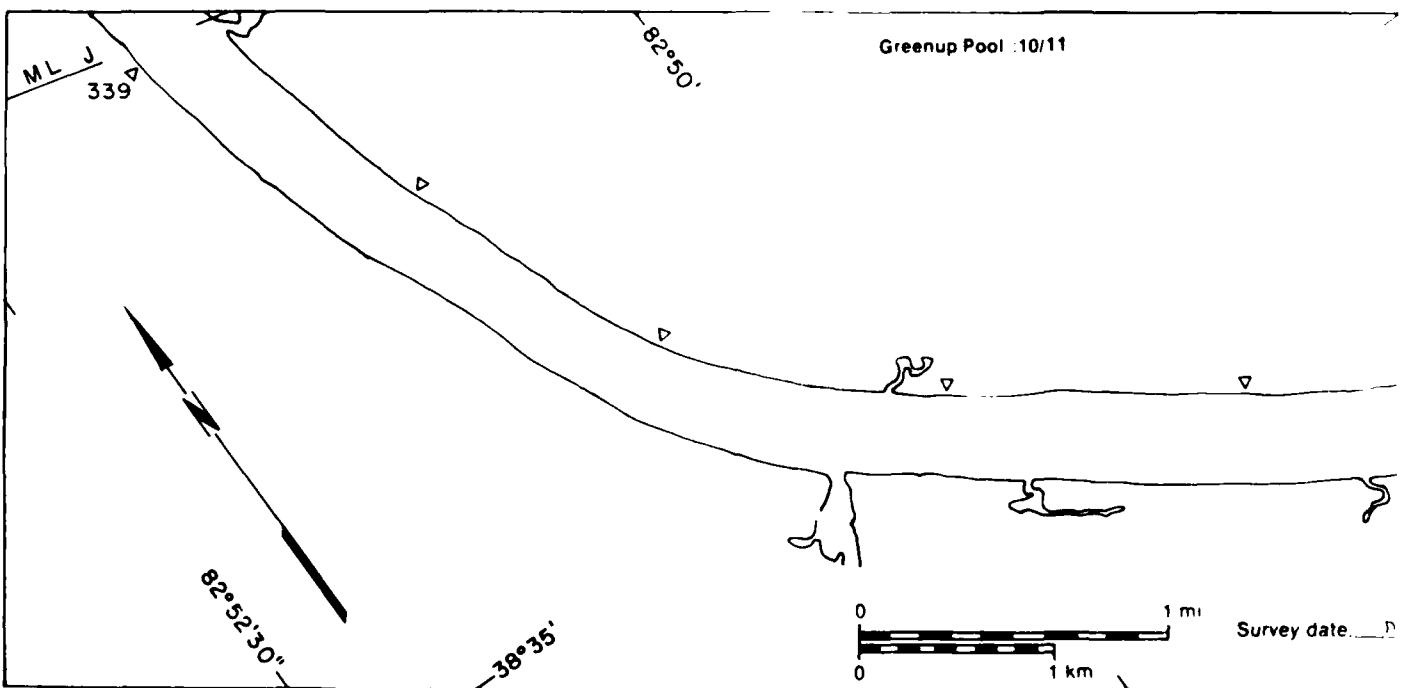
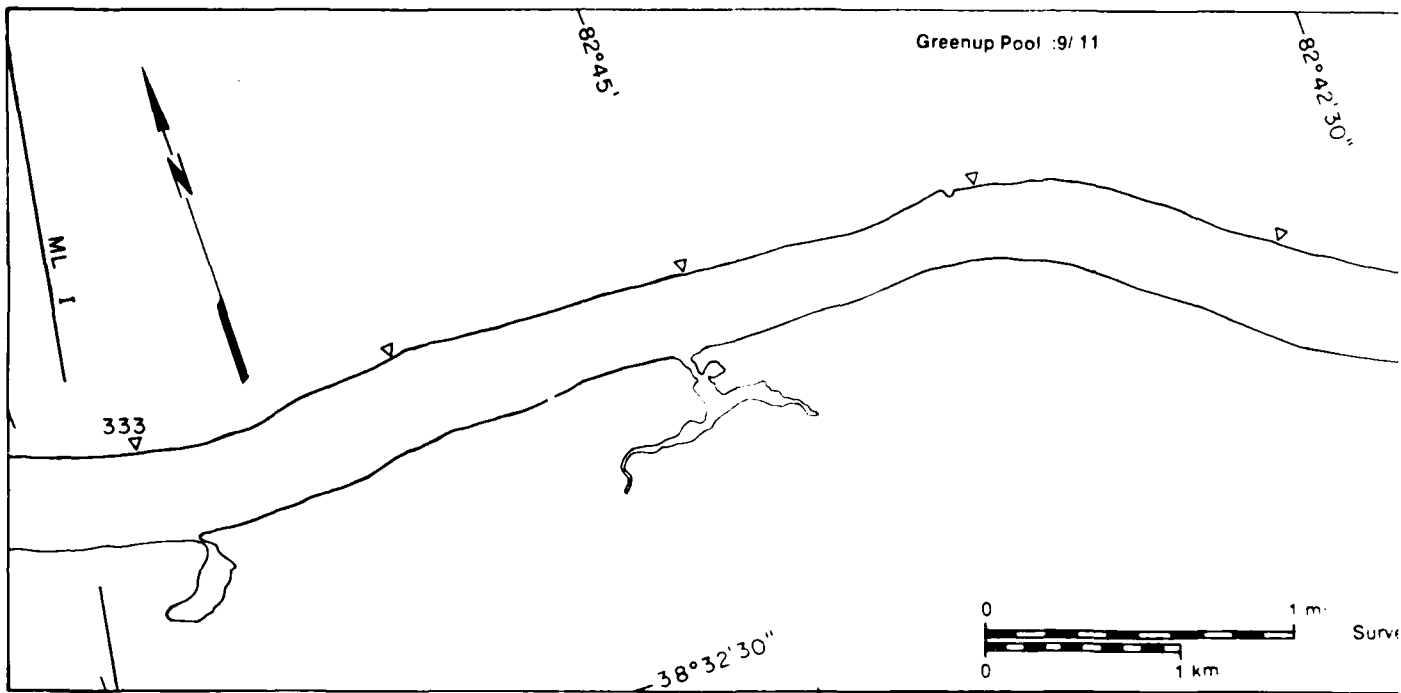
30 December 1985







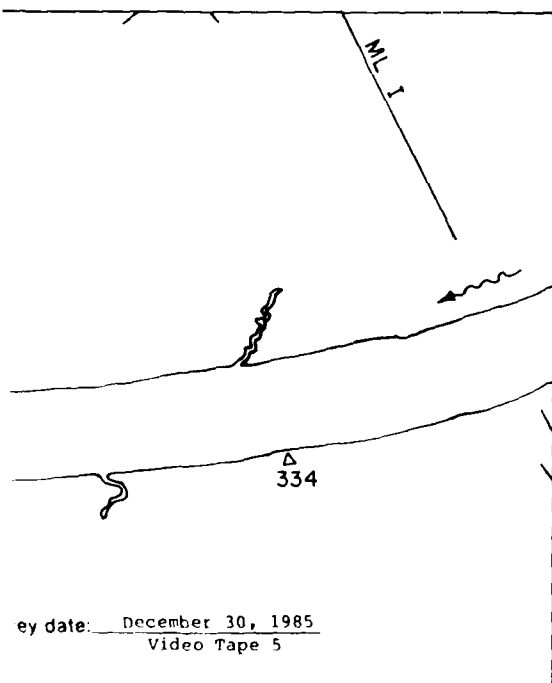
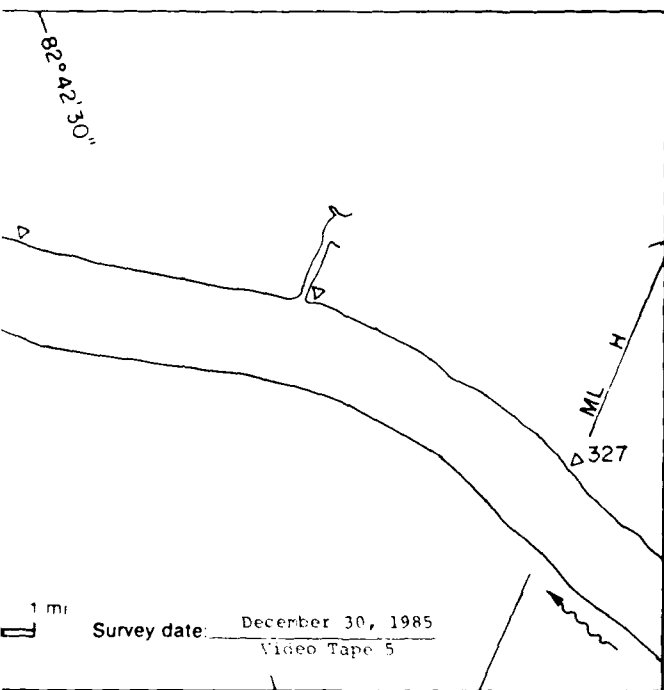
30 December 1985



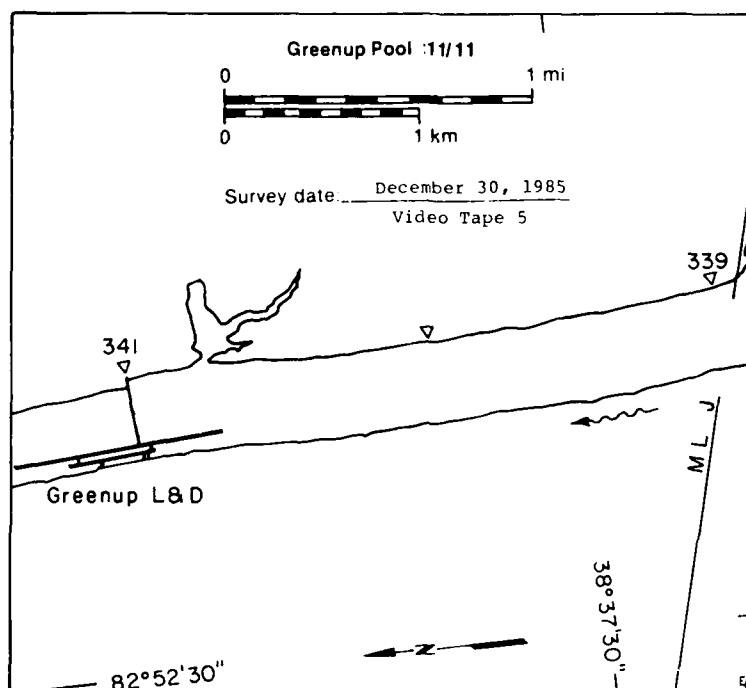
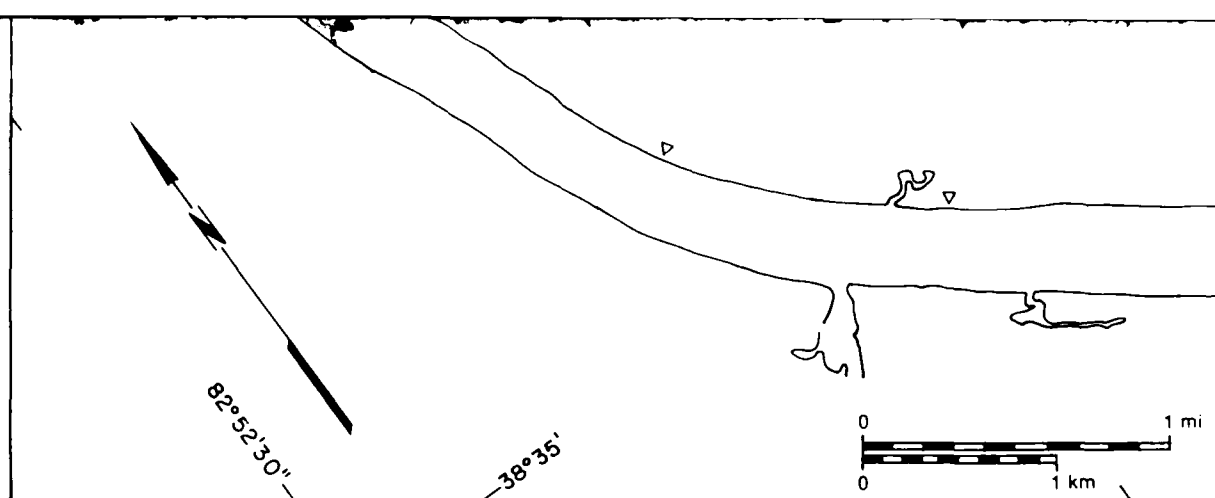
Greenup Pool

MAP UNITS

Area
($\pi^2 \times 10^6$)

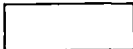
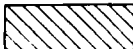






Area ($\times 10^6$)	Surface concentration (%)
41.19	NA

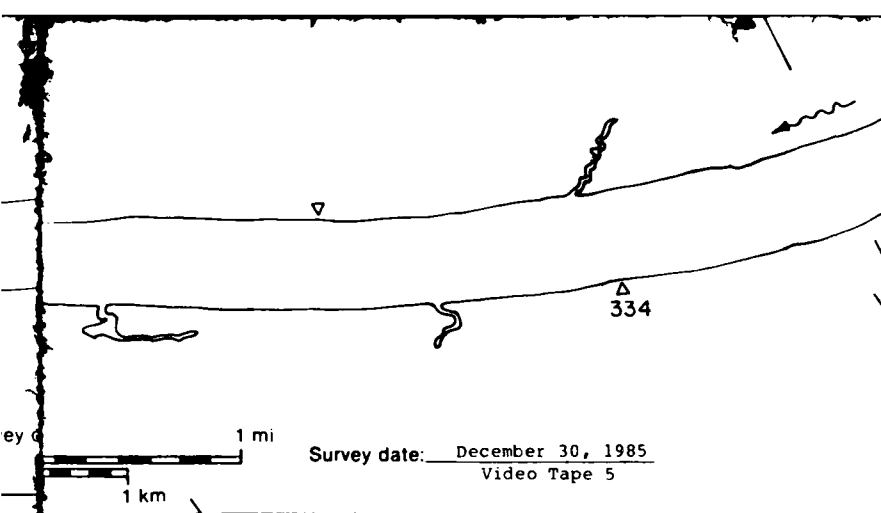


Greenup Pool

MAP UNITS

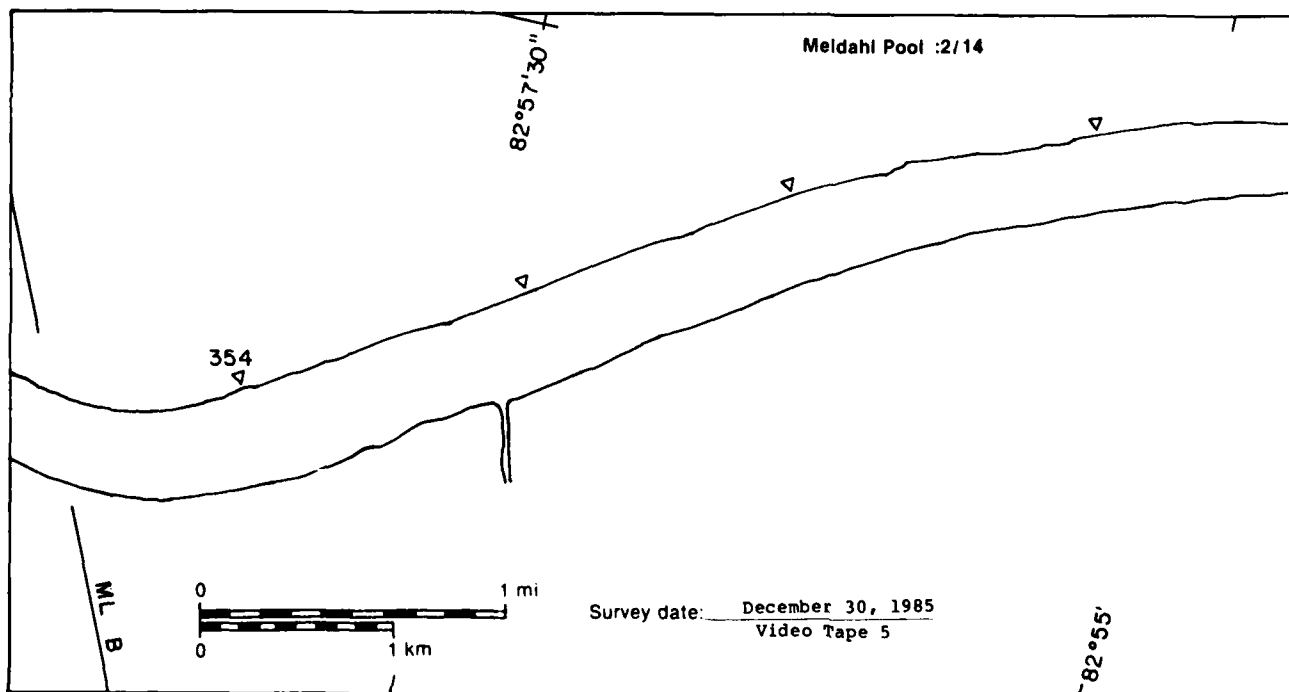
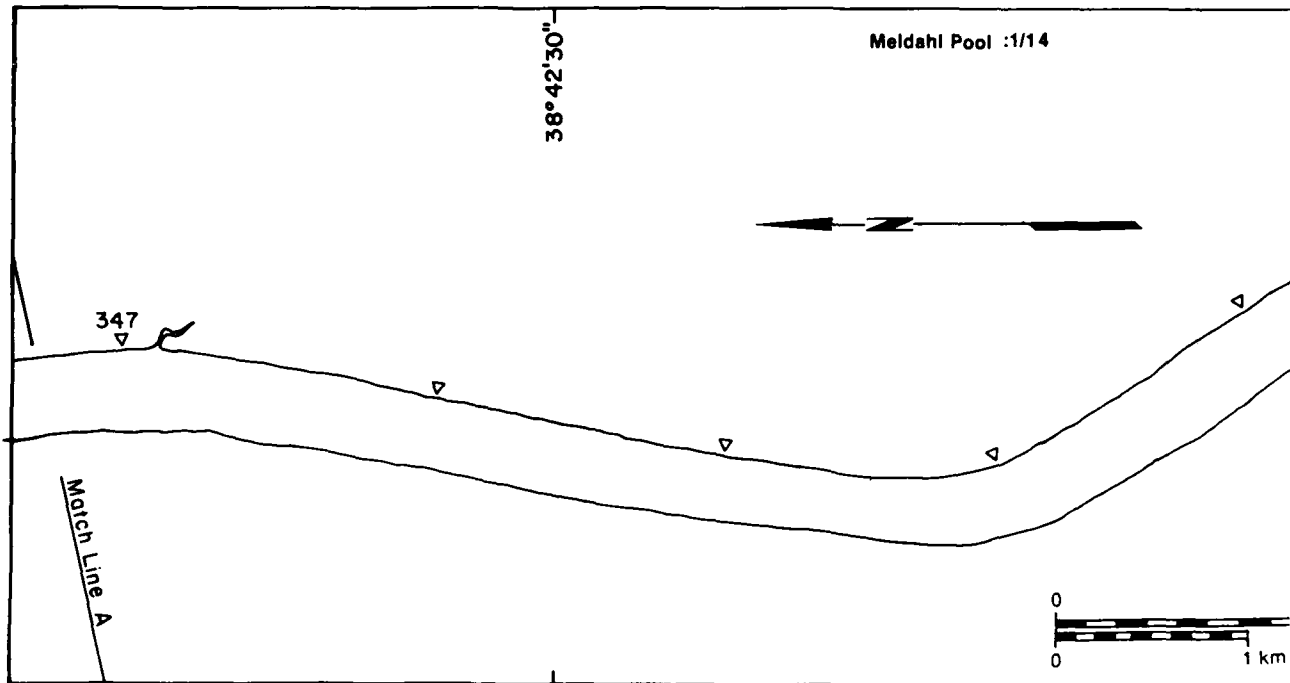
-  Open water
-  Solid ice cover
-  Solid ice cover with open-water areas
-  Fragmented ice cover
-  Fragmented ice cover with open-water areas
-  Ice floes or frazil slush and pans

Total area (m² x :

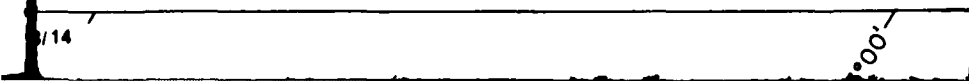
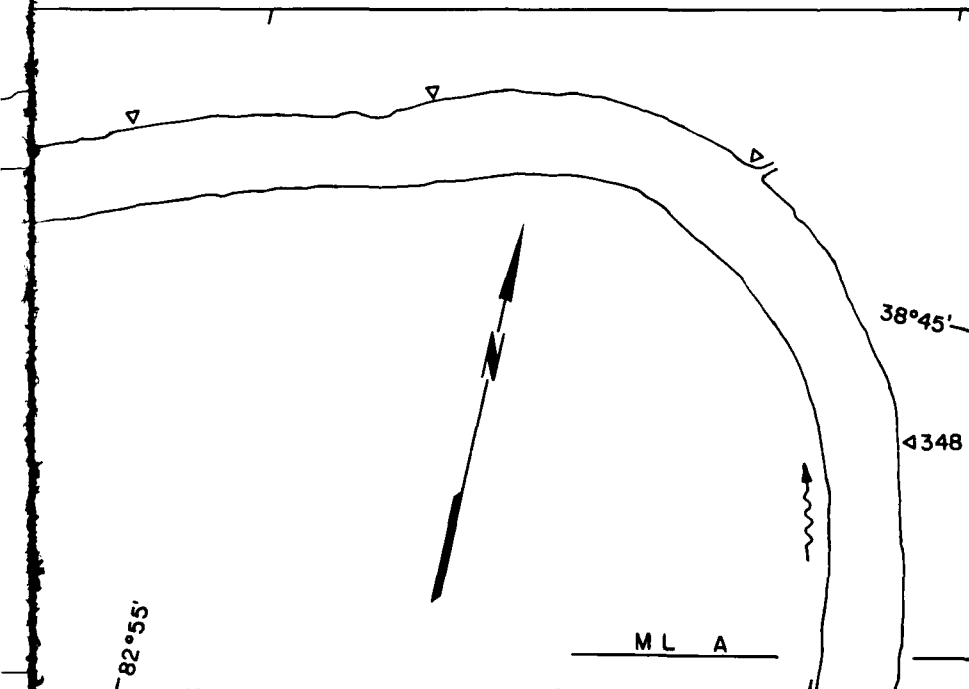
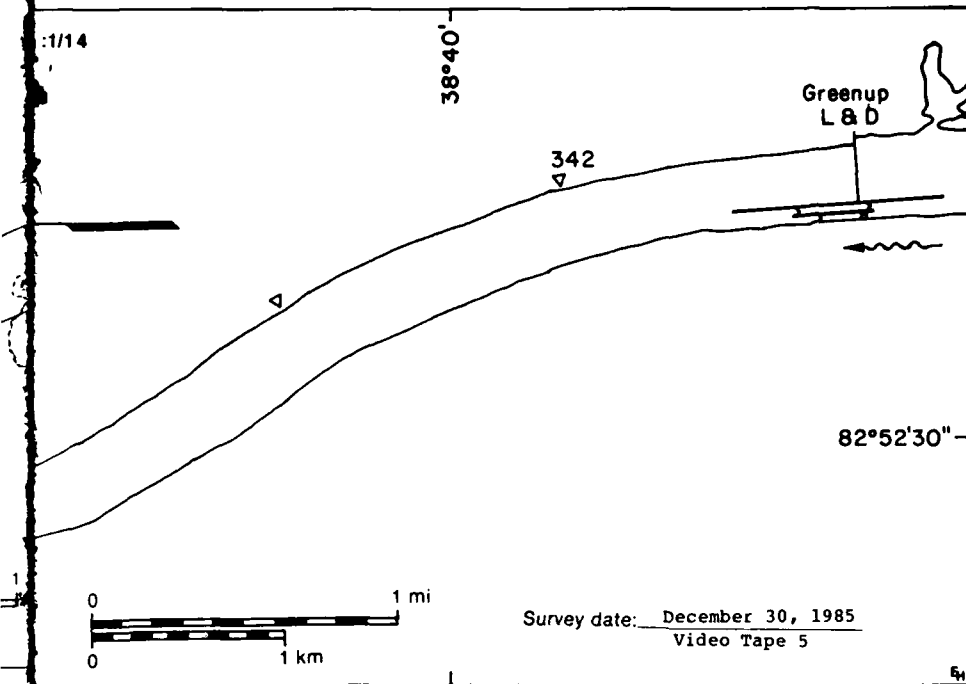


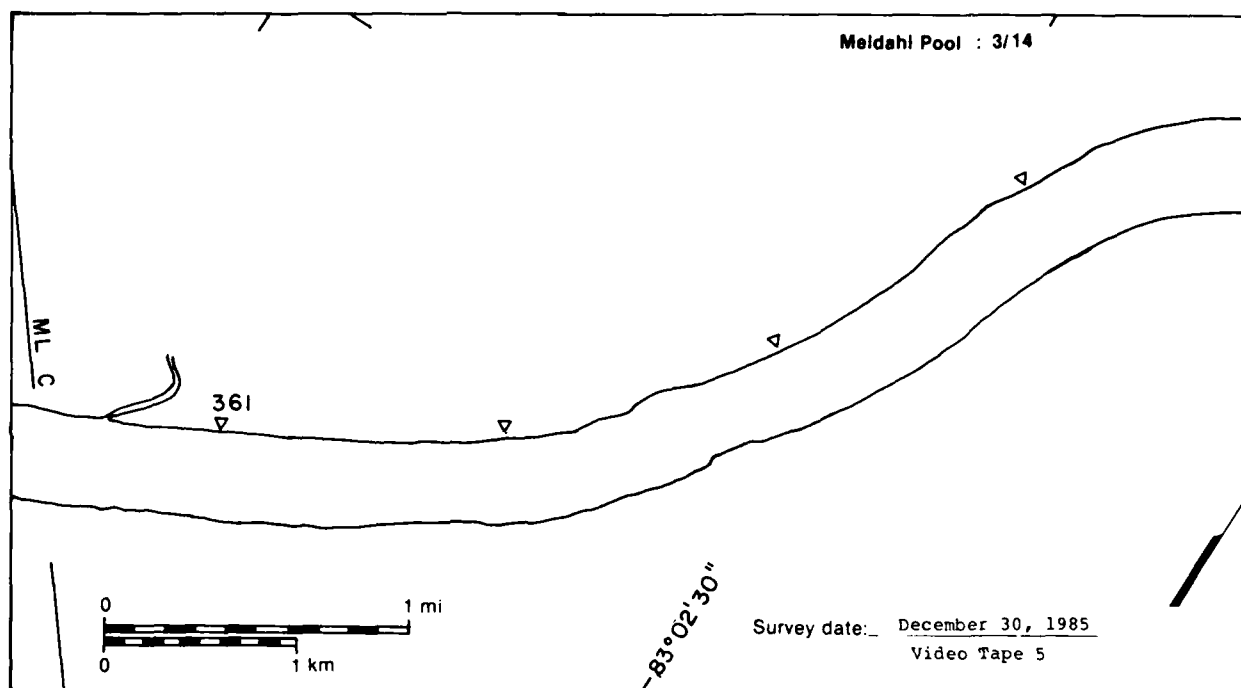
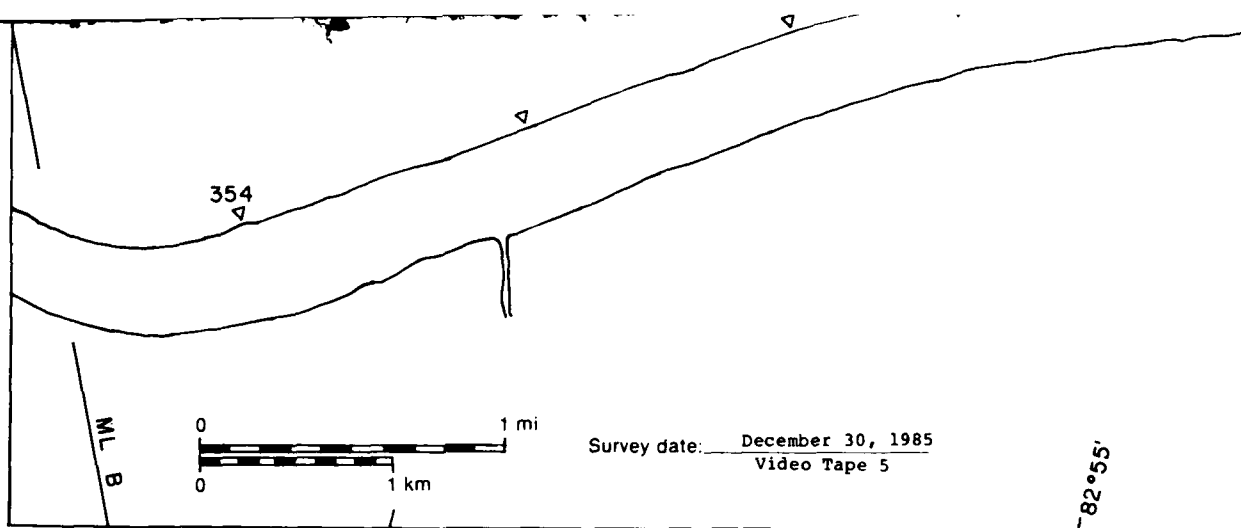
Greenup Pool

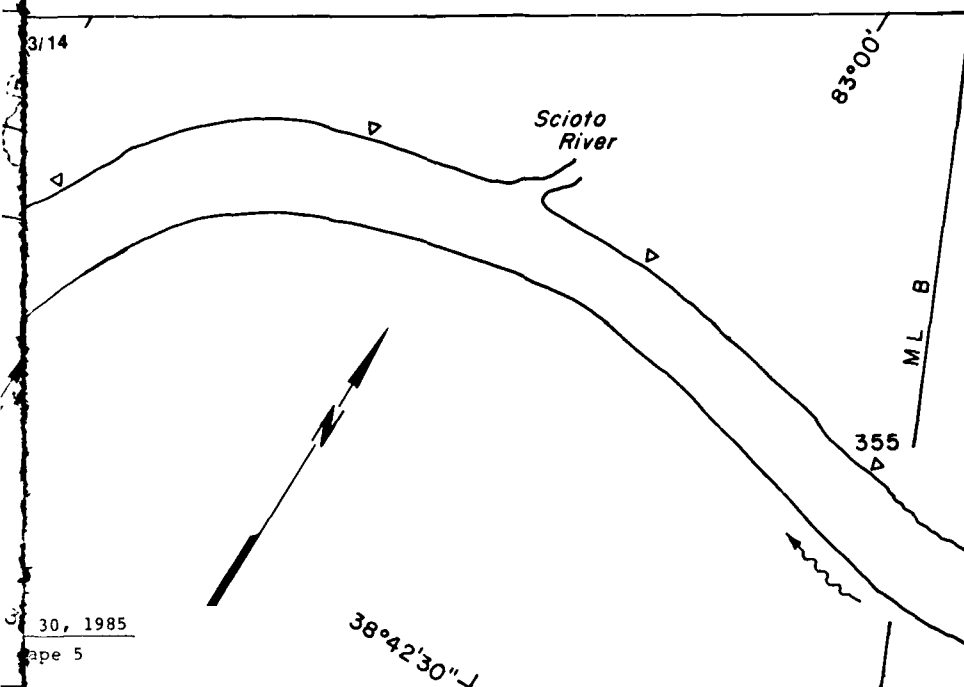
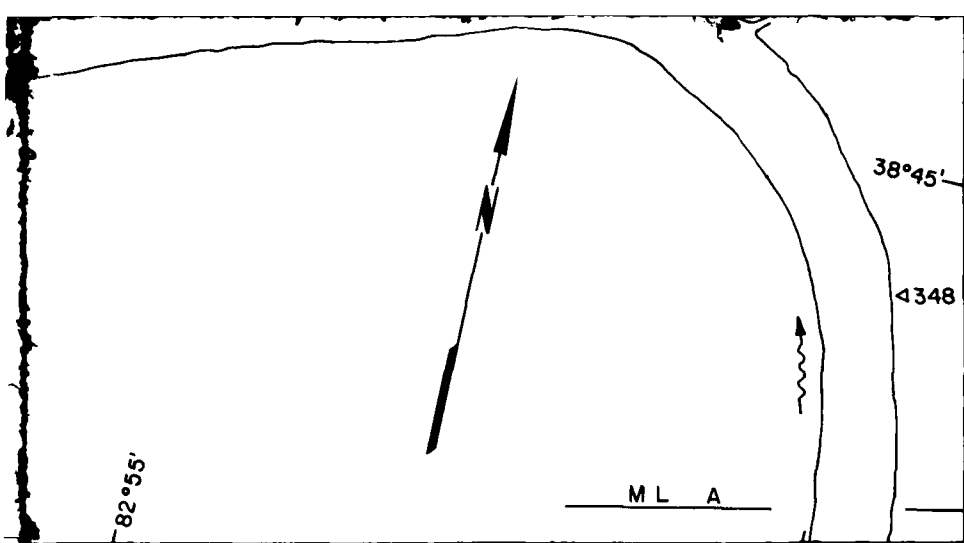
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	41.19	NA
Solid ice cover	0.00	NA
Solid ice cover with open-water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open-water areas	0.00	—
Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)	41.19	



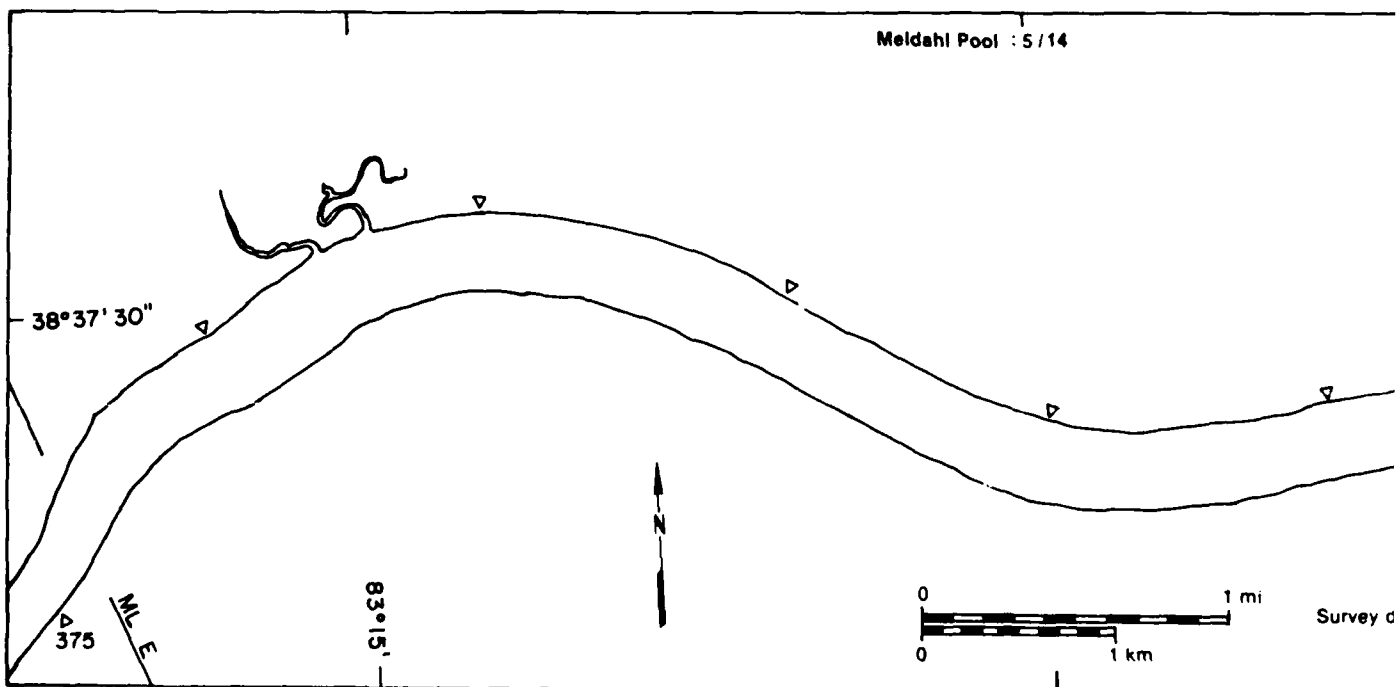
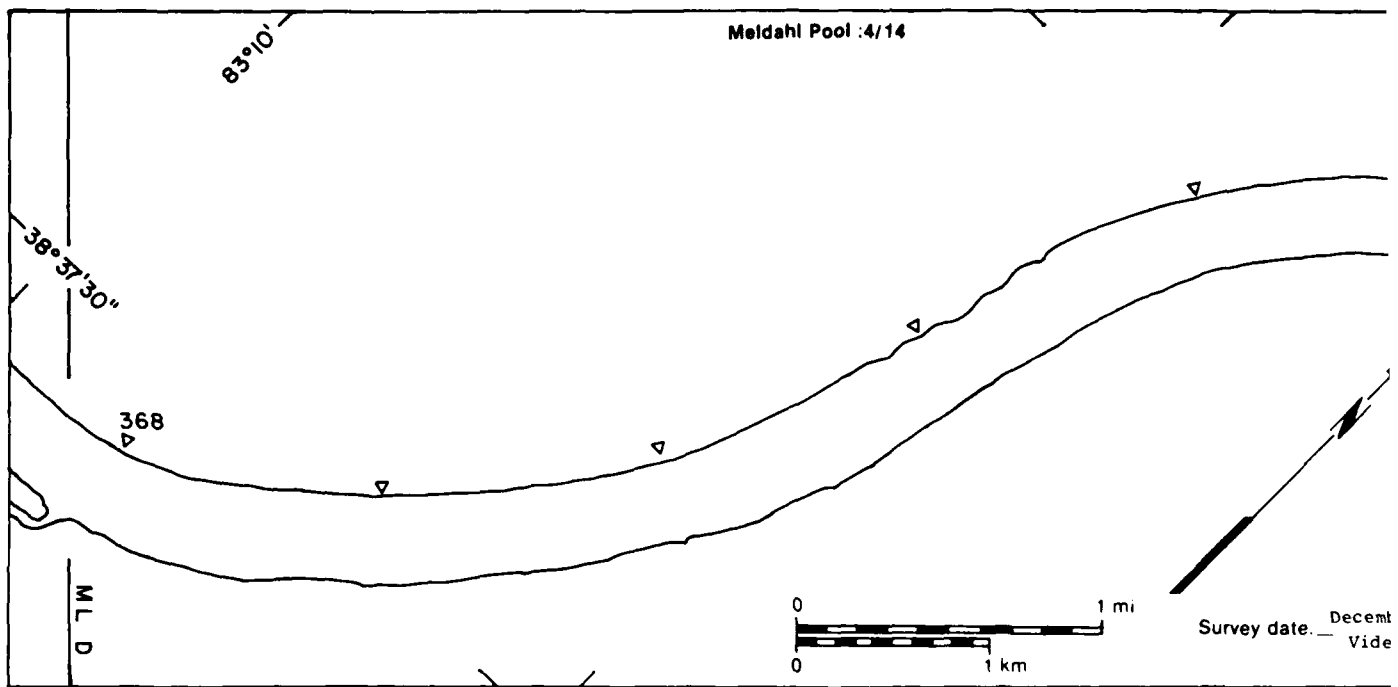
30 December 1985

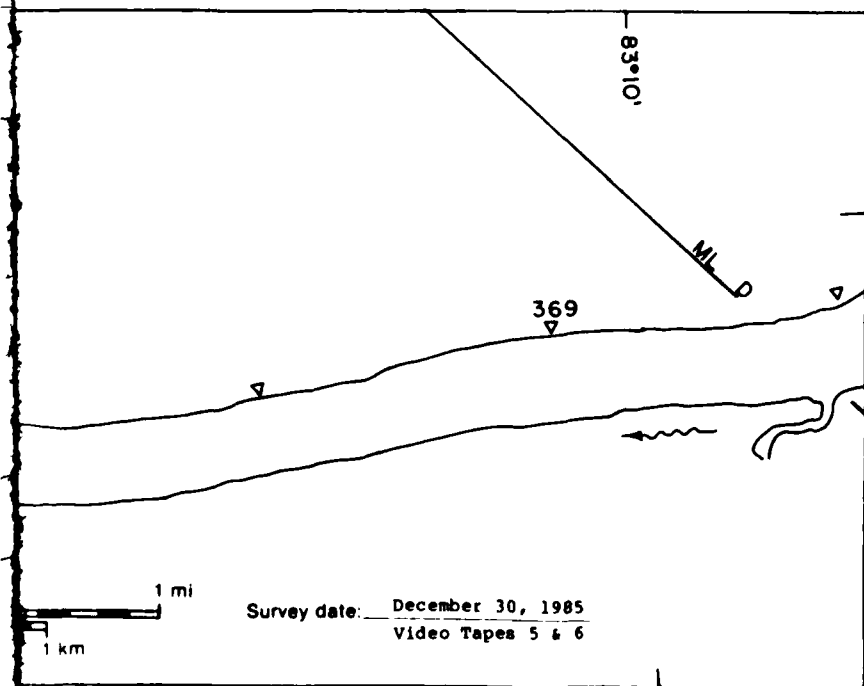
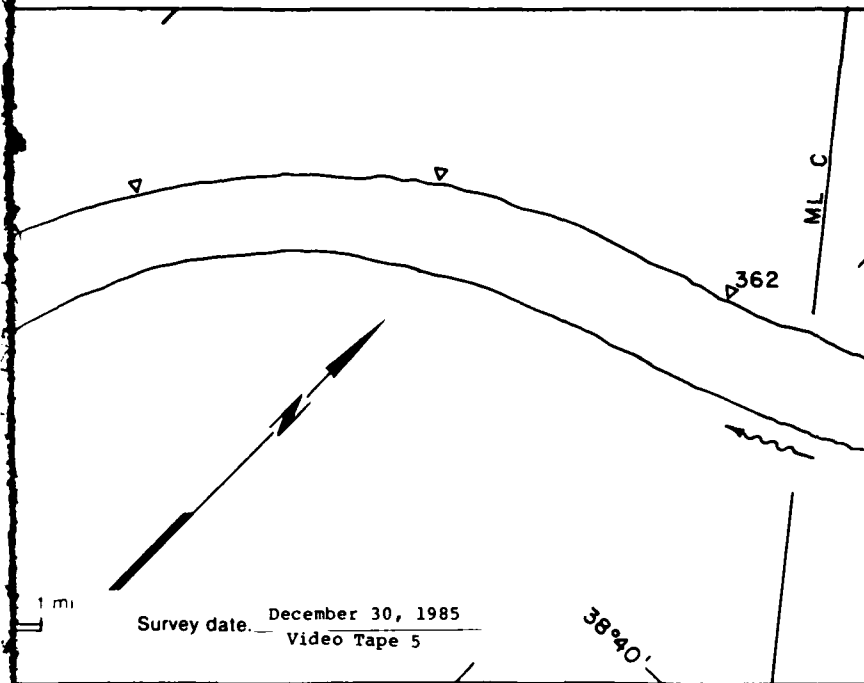


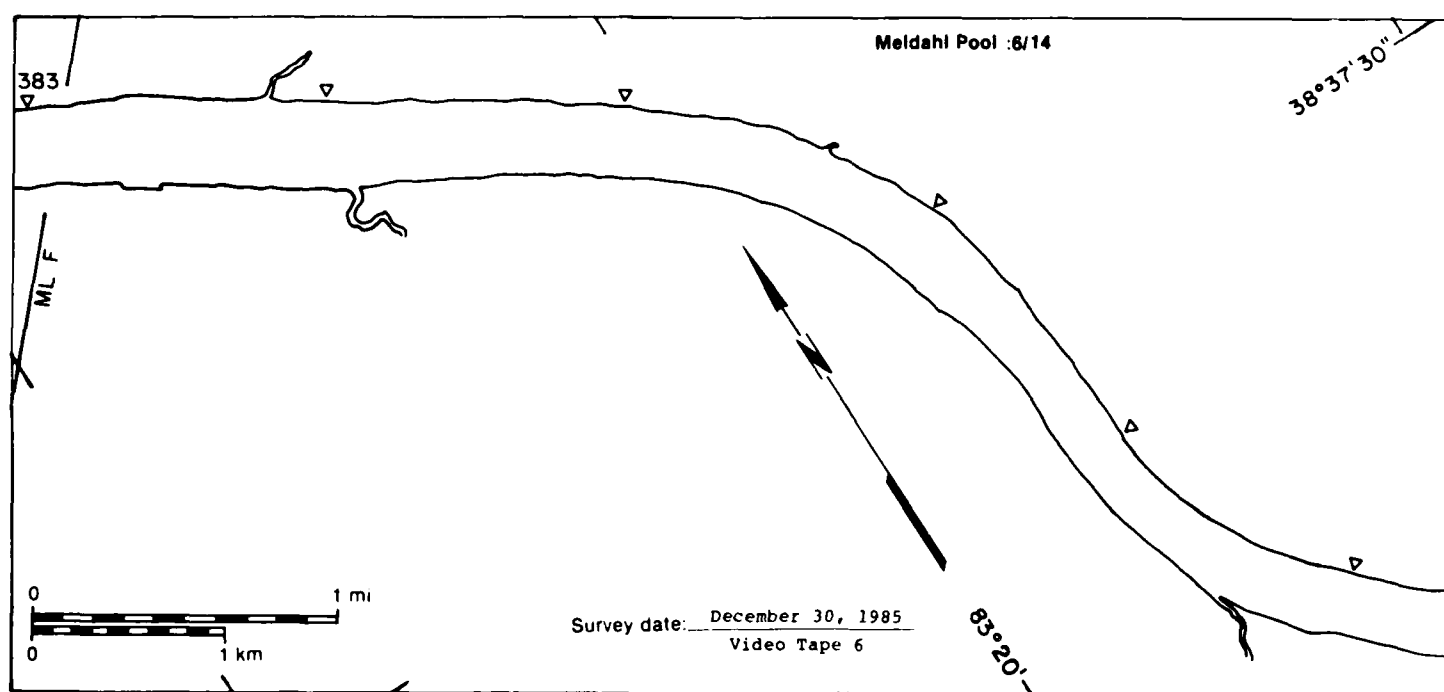
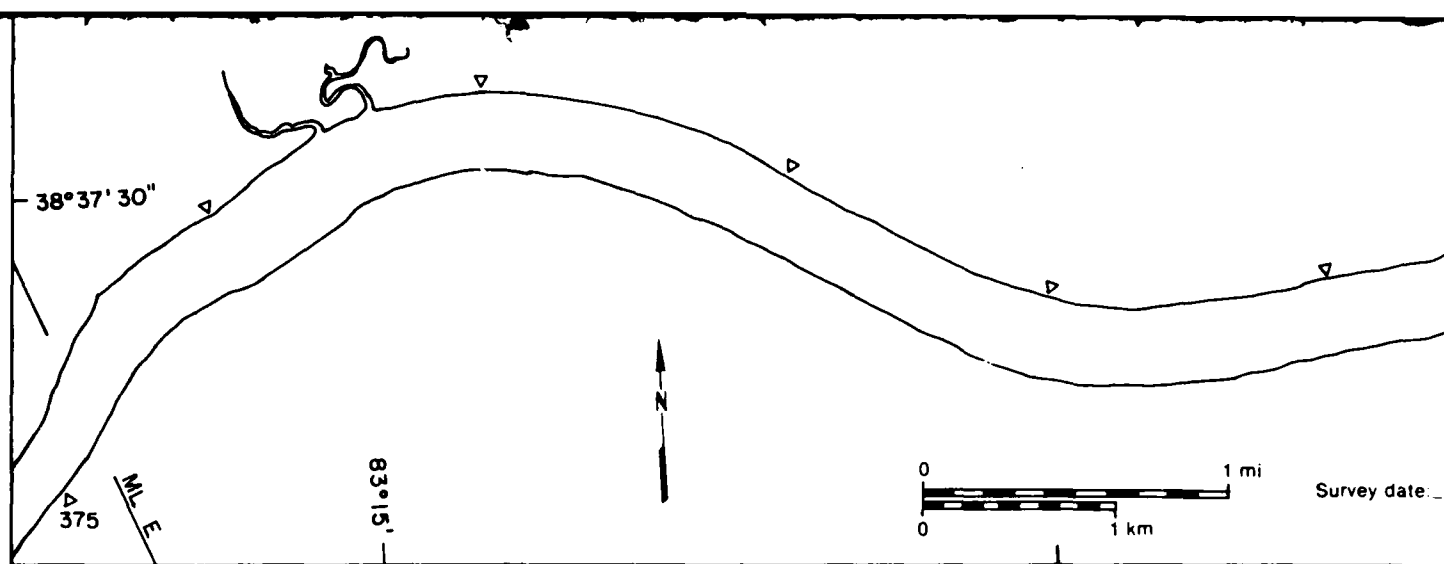


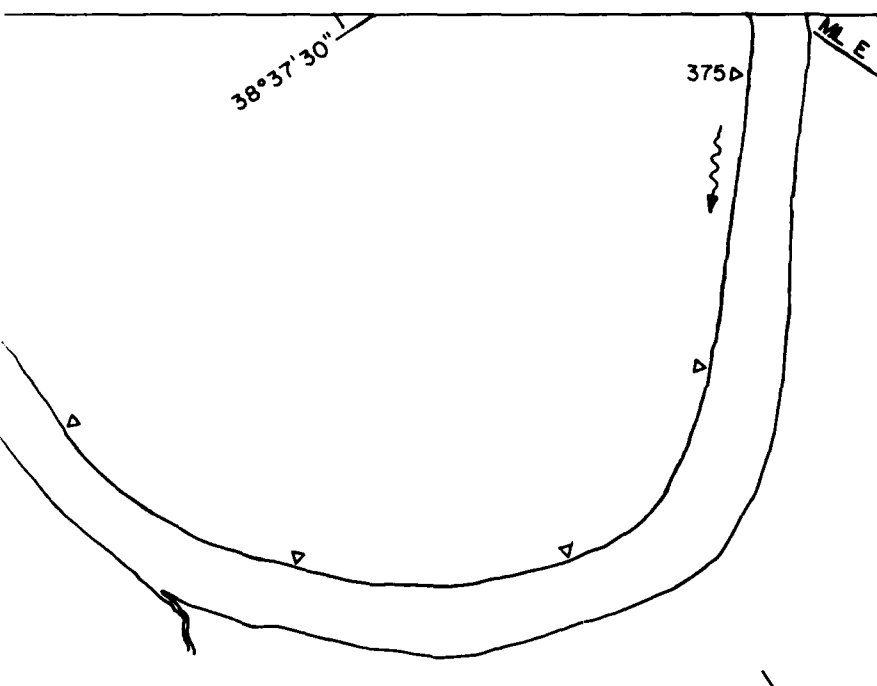
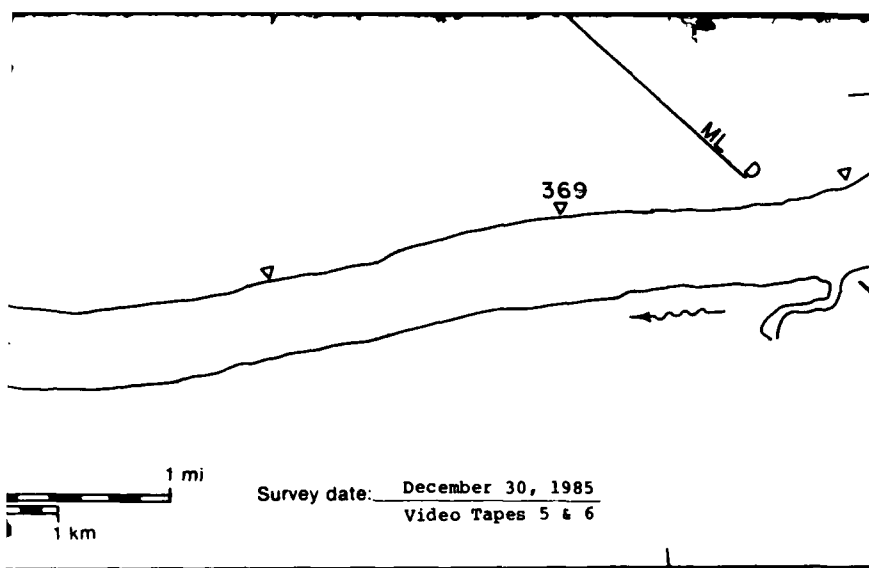


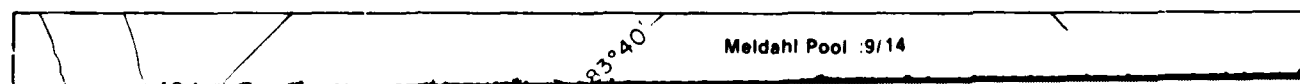
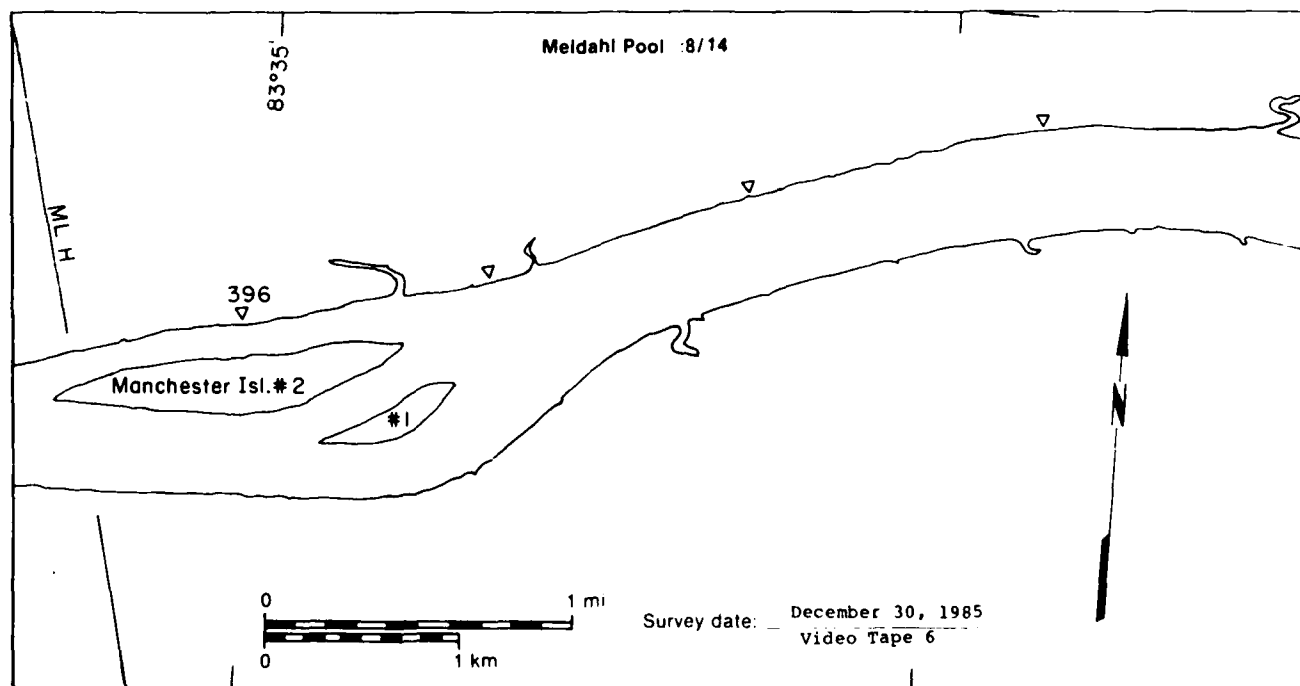
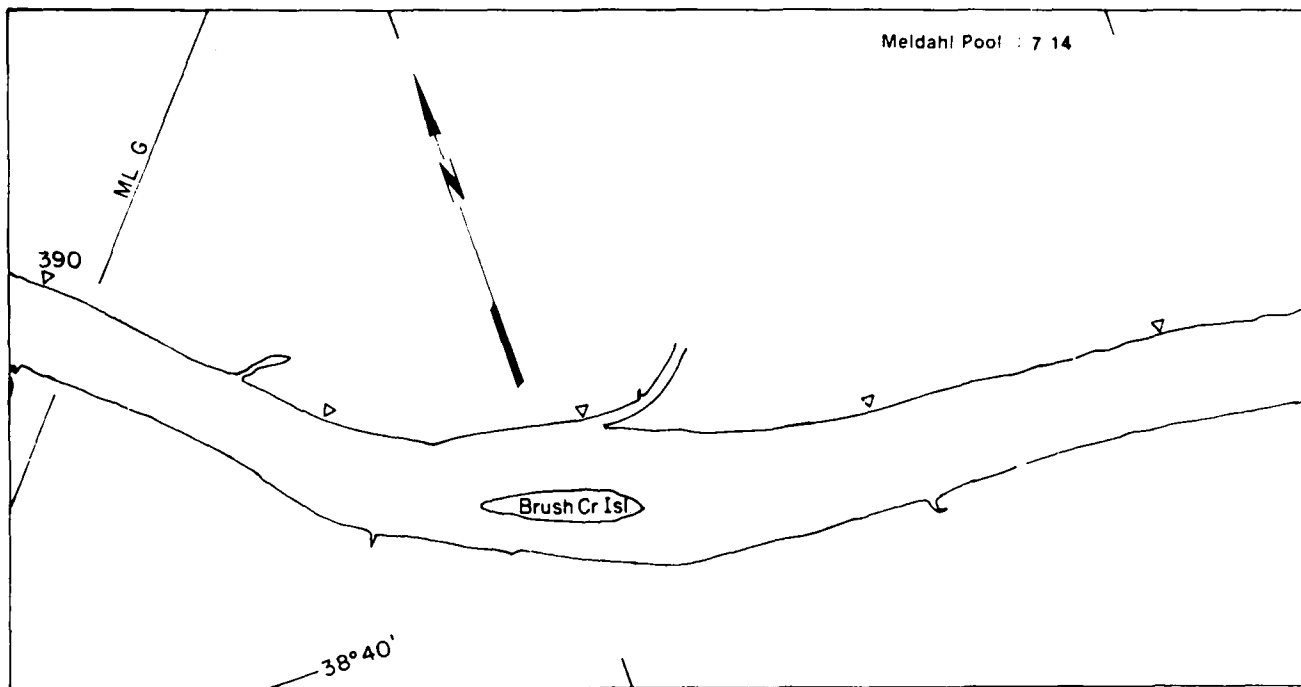
30 December 1985





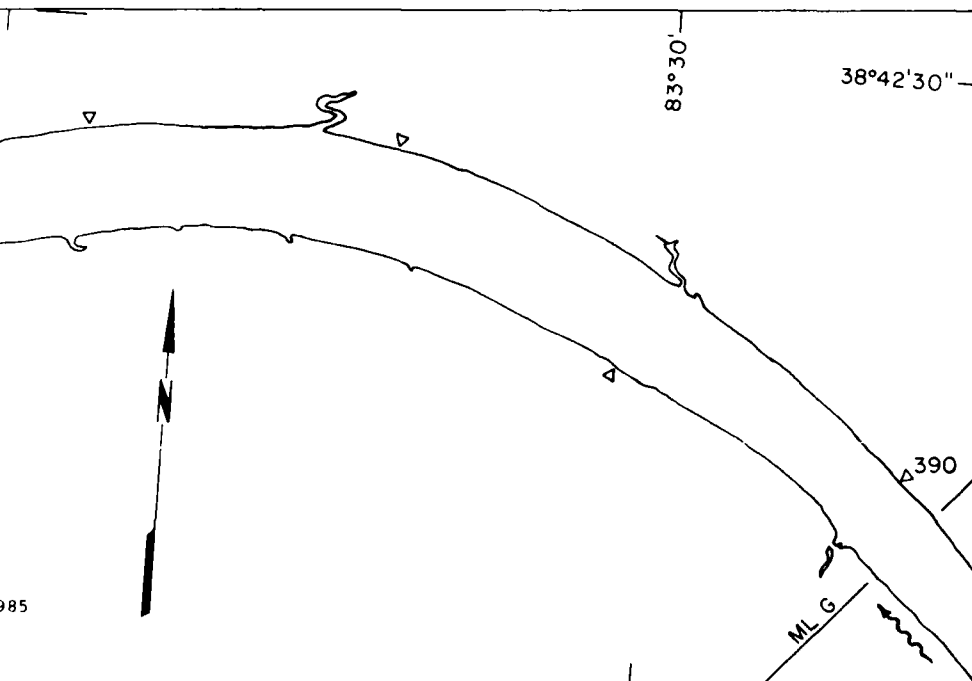
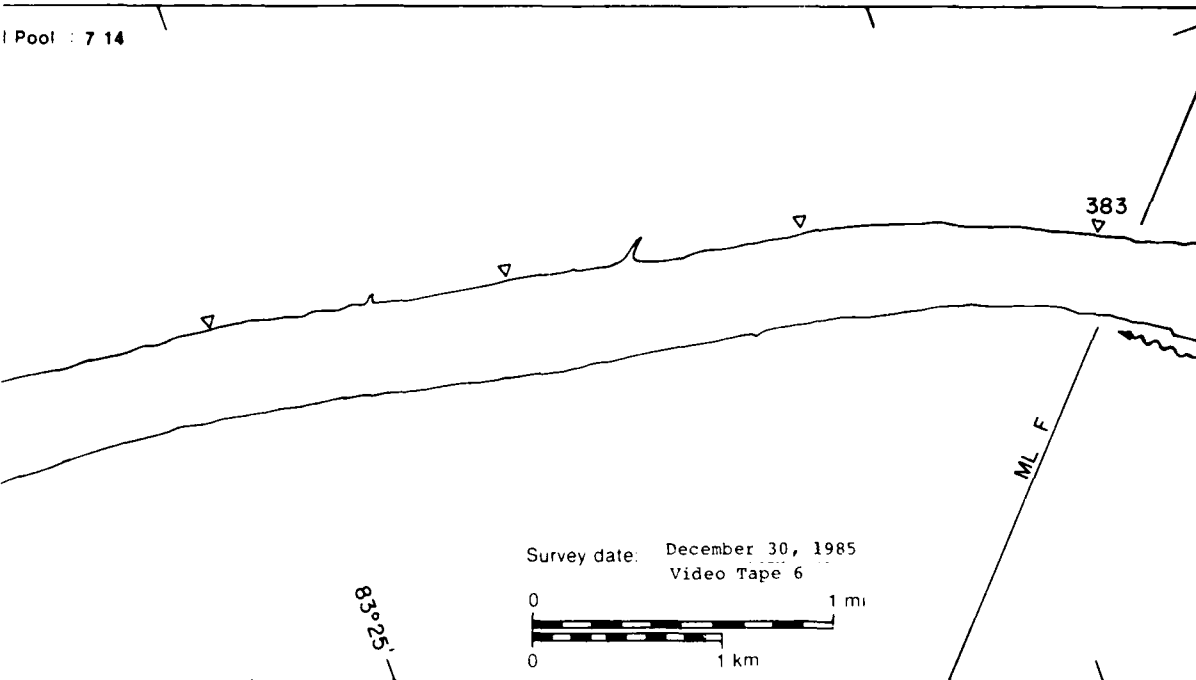


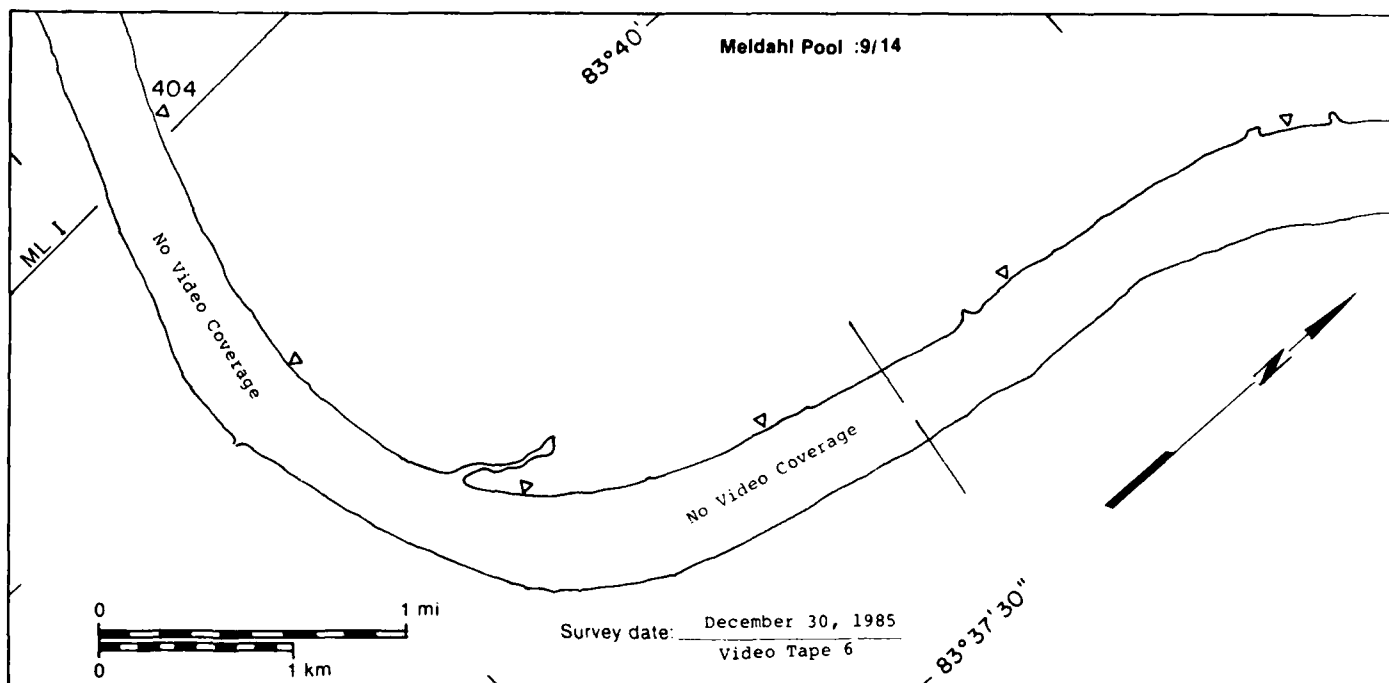
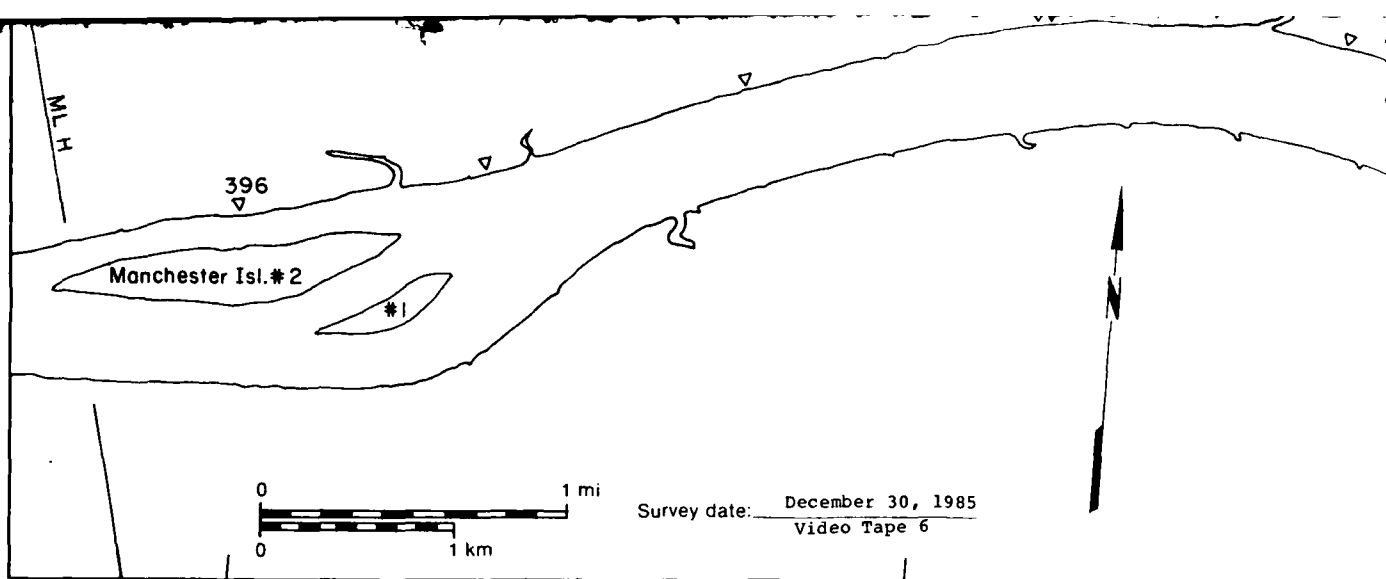


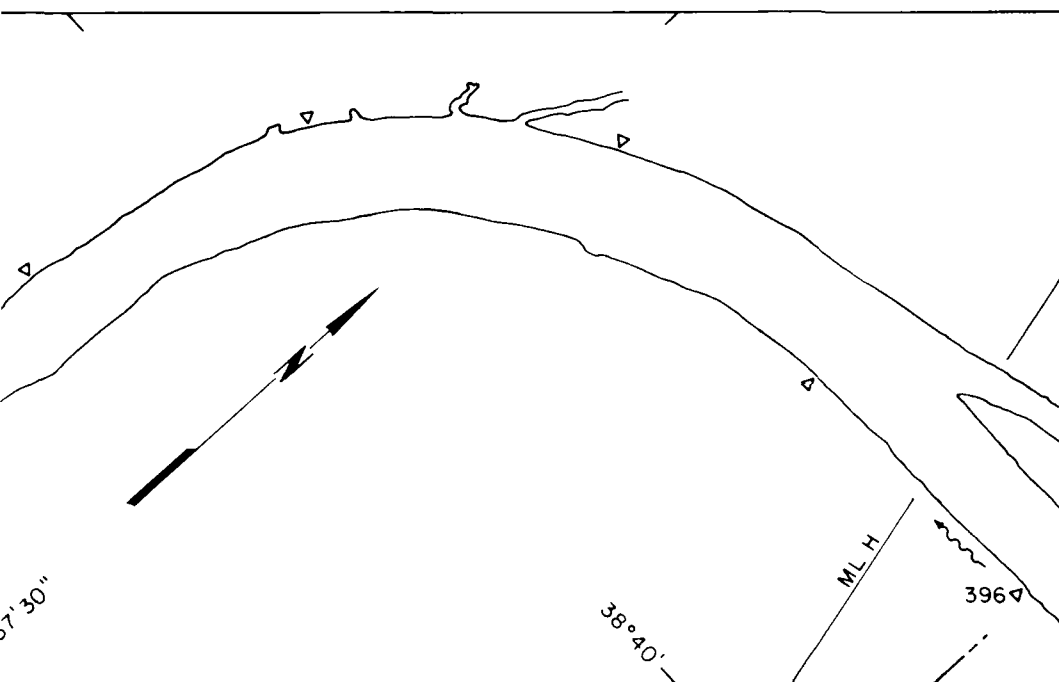
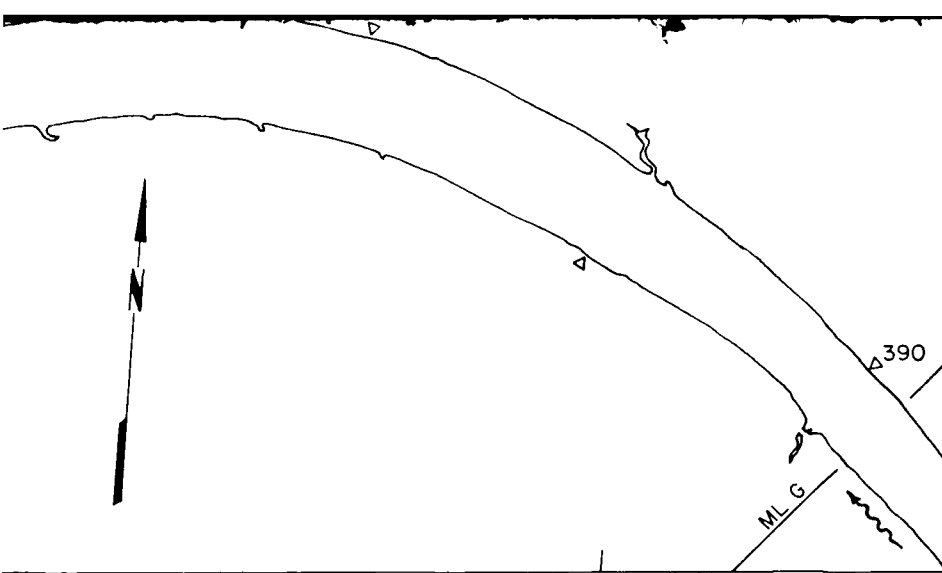


30 December 1985

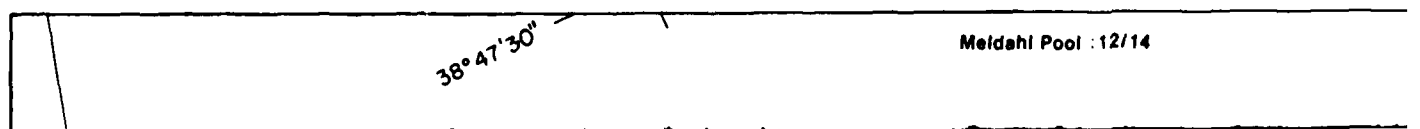
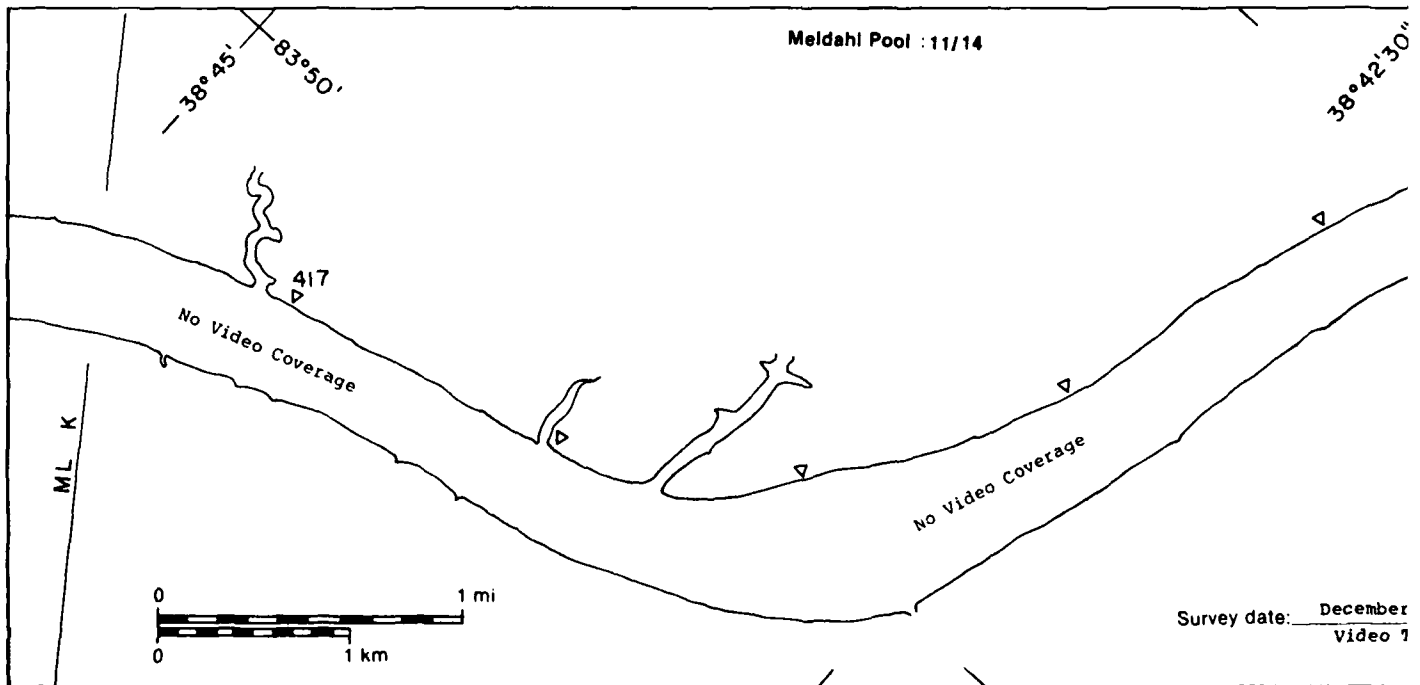
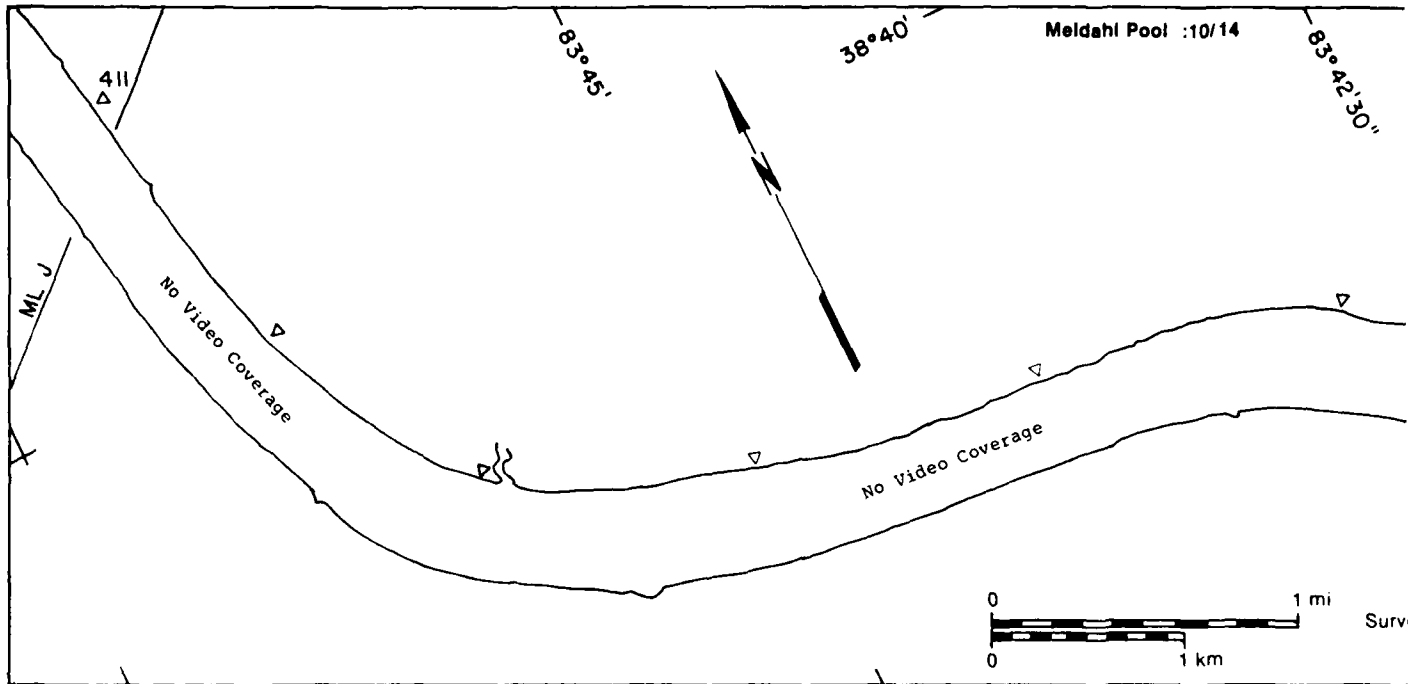
Pool : 7 14

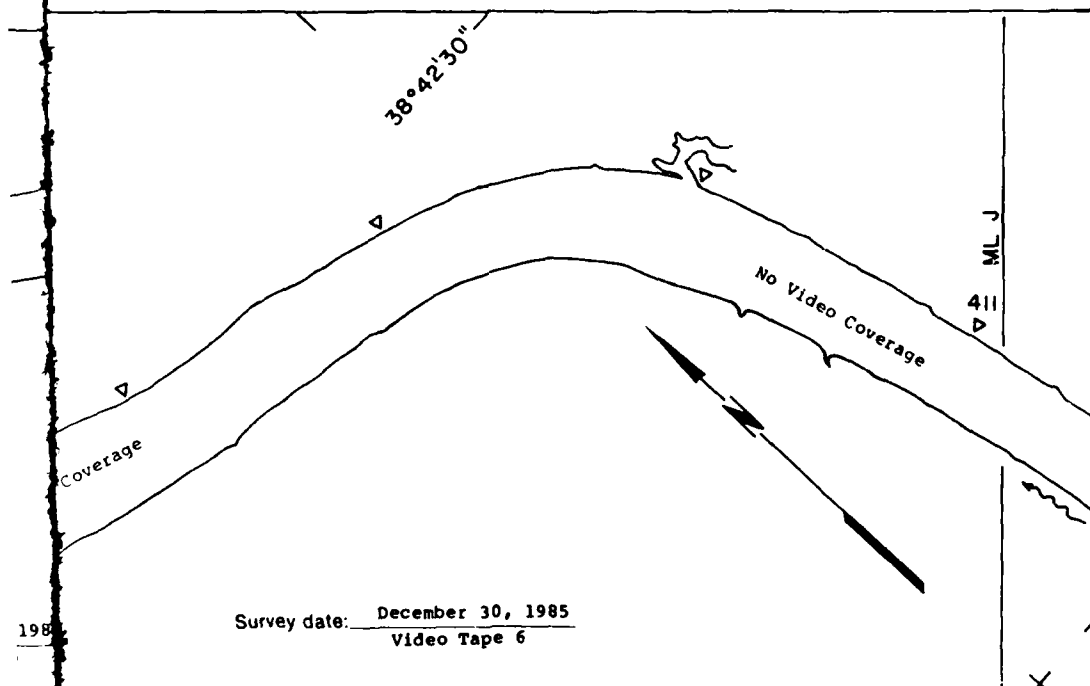
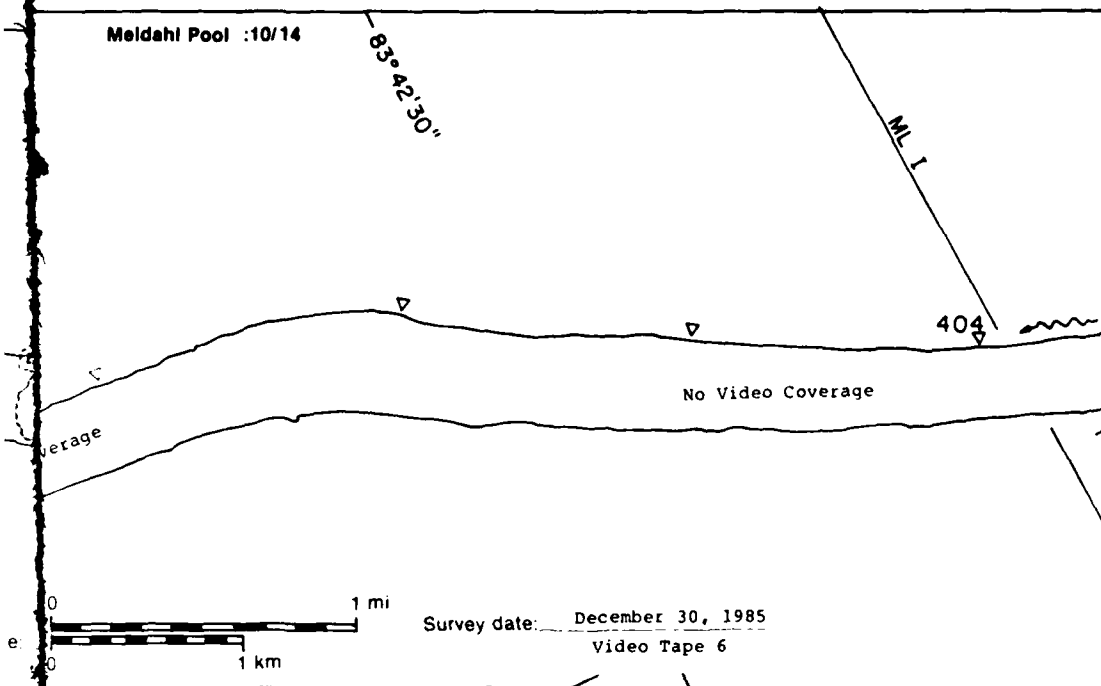




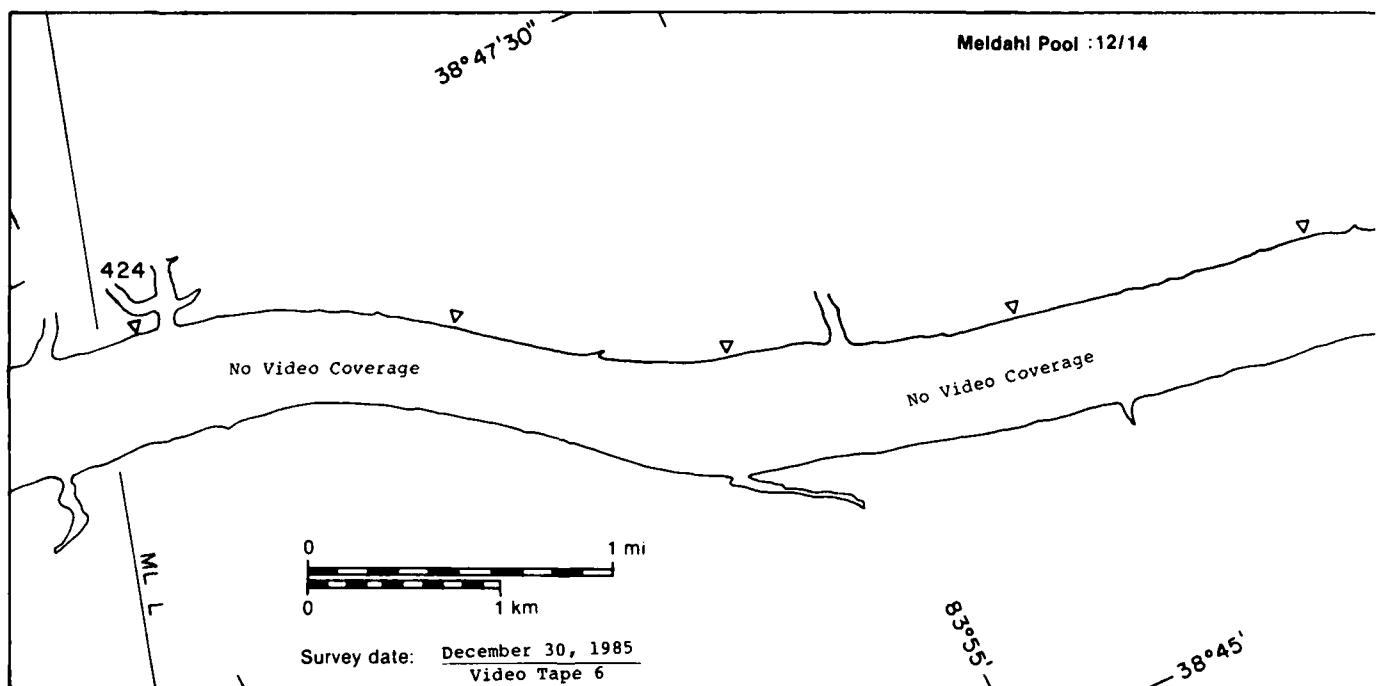
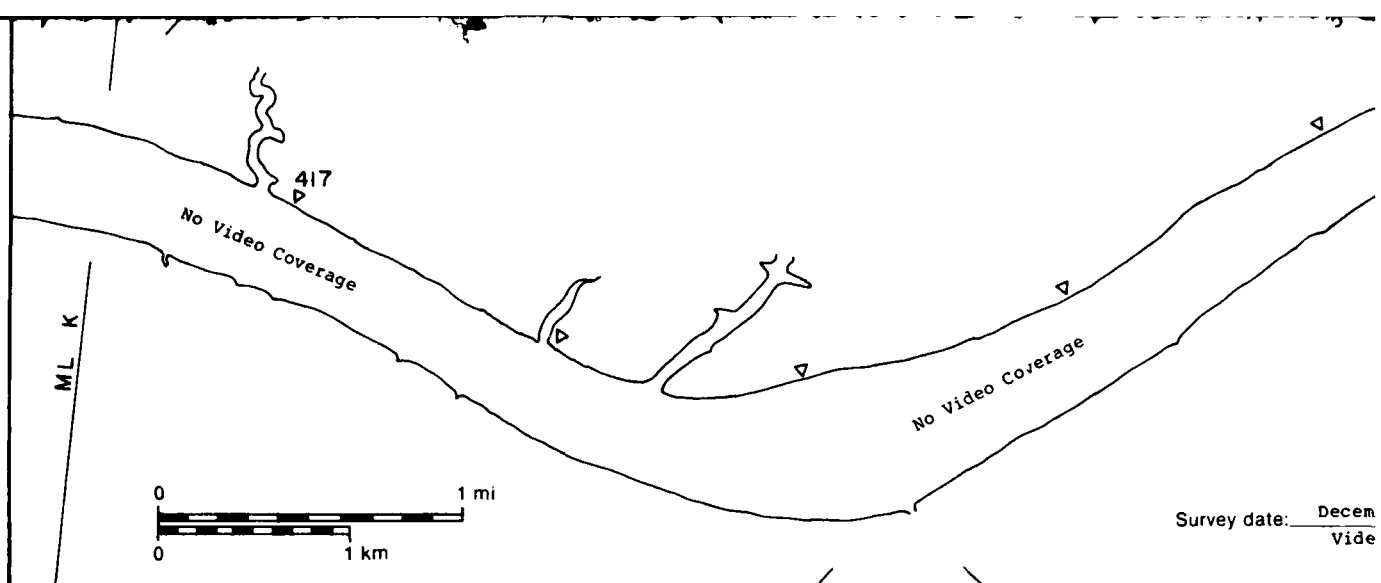


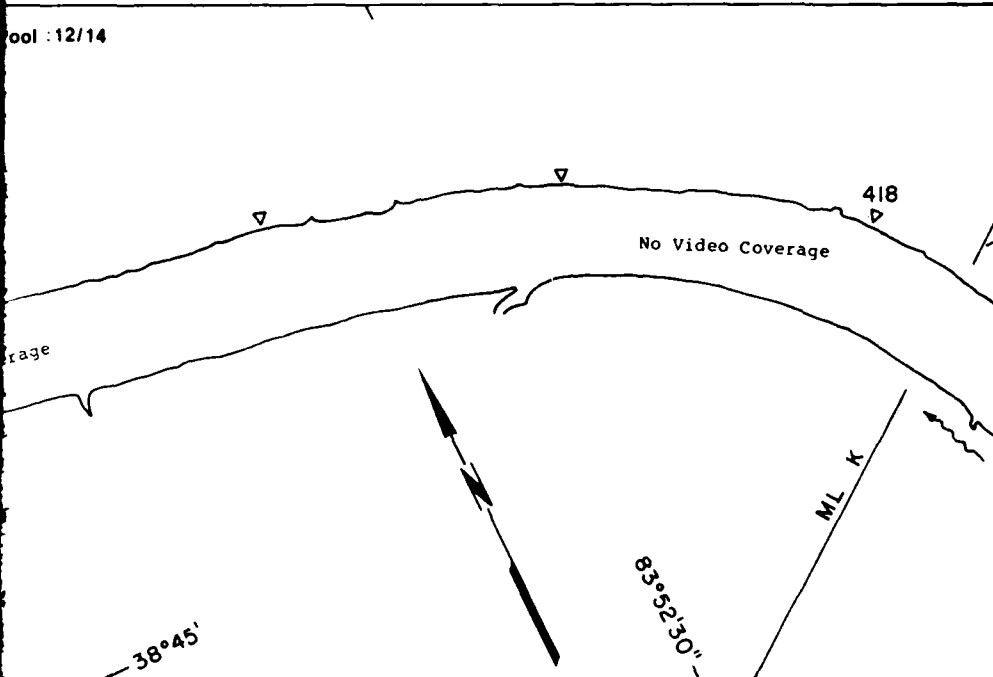
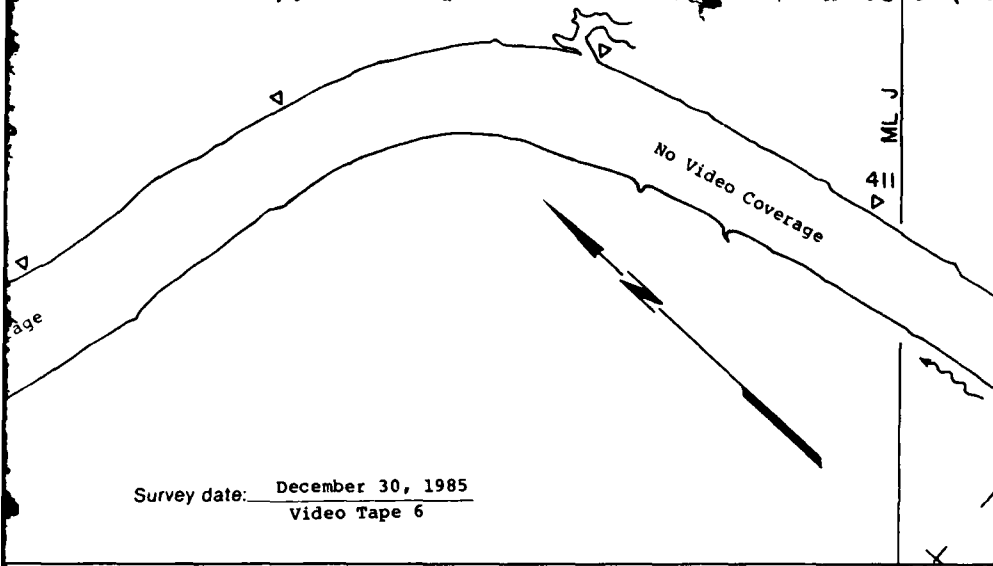
30 December 1985

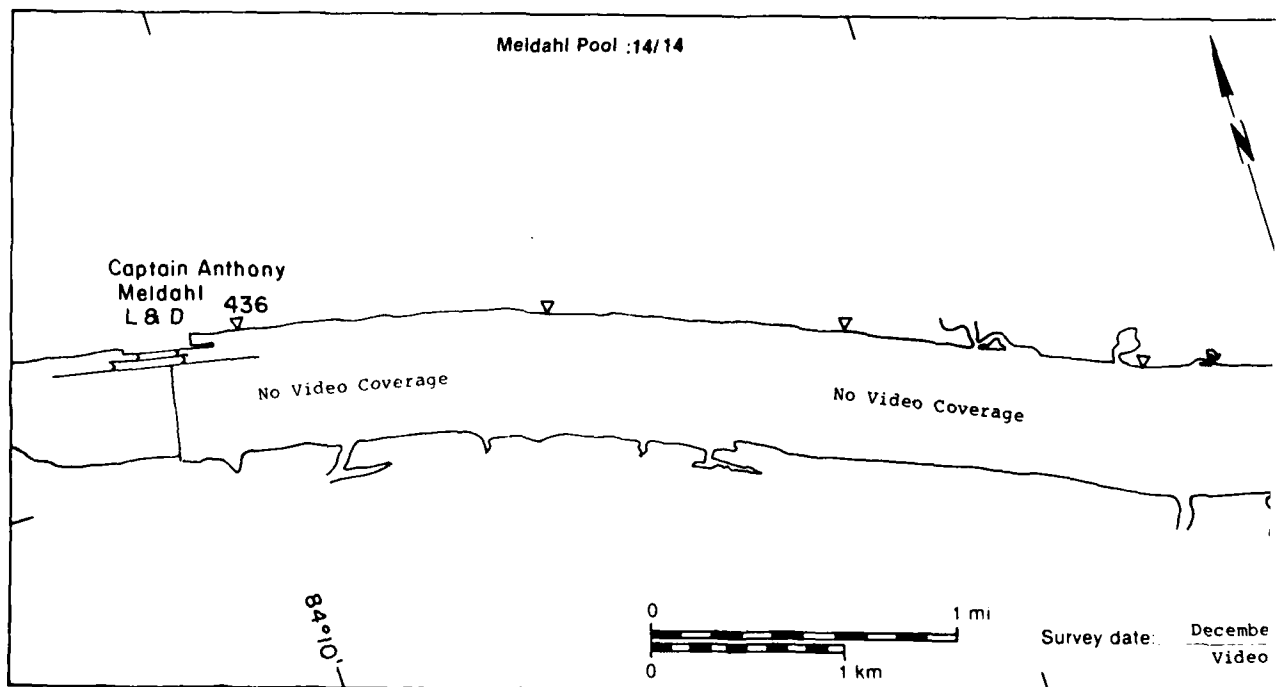
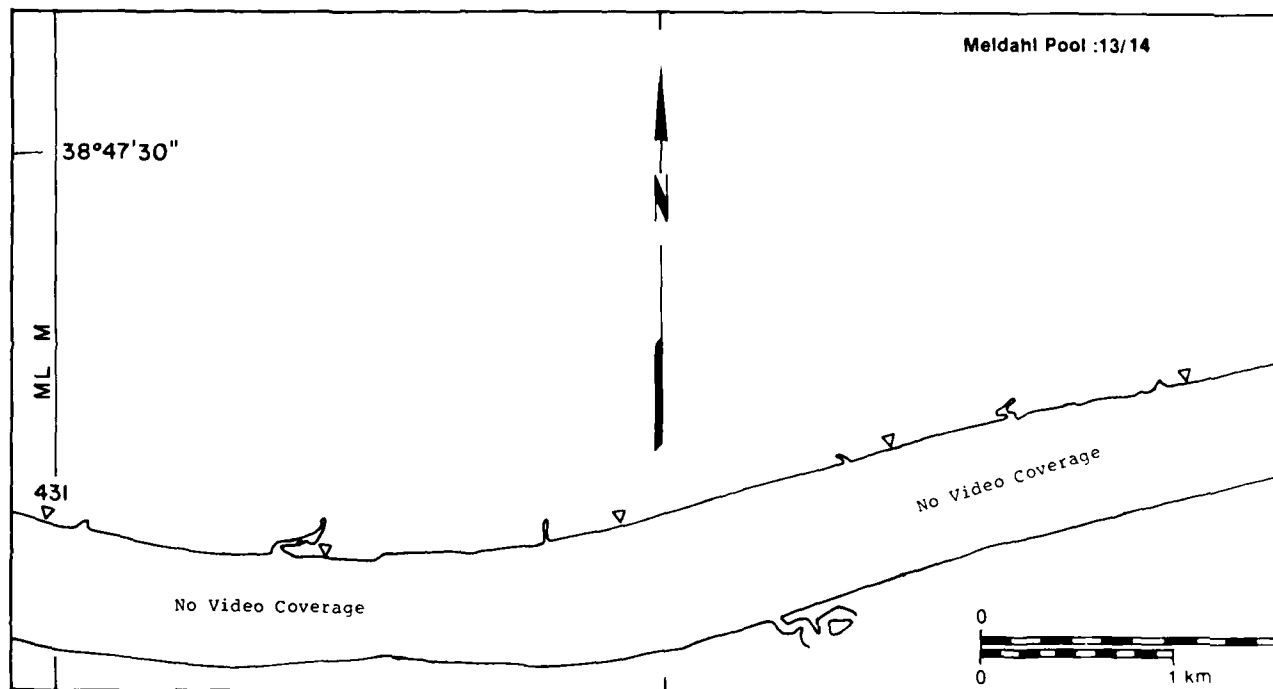




Meldahl Pool :12/14

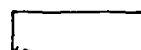






Meldahl Pool

MAP UNITS



Open water

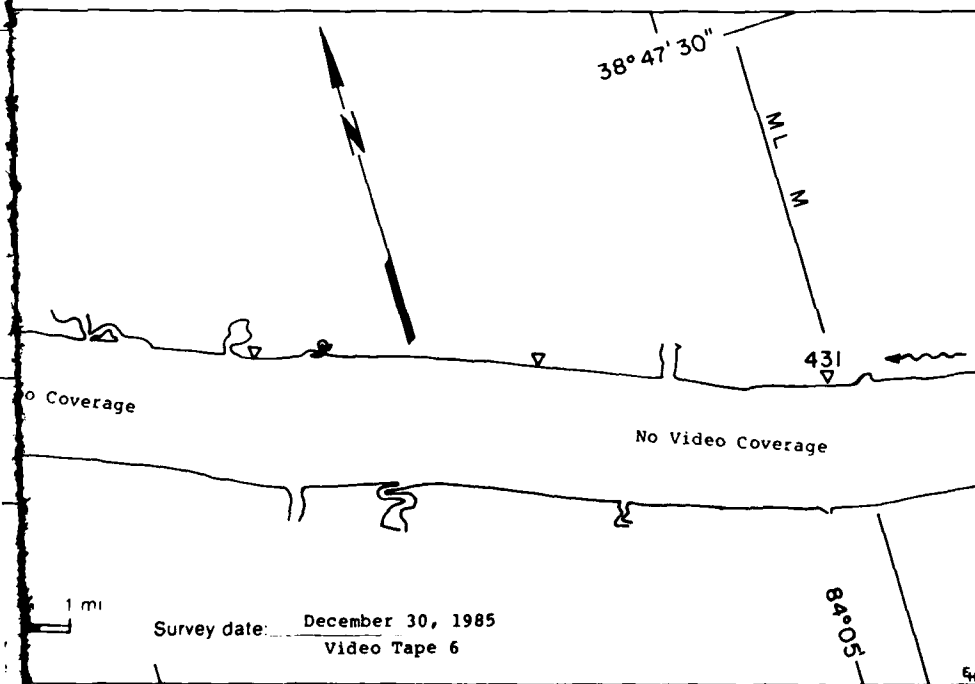
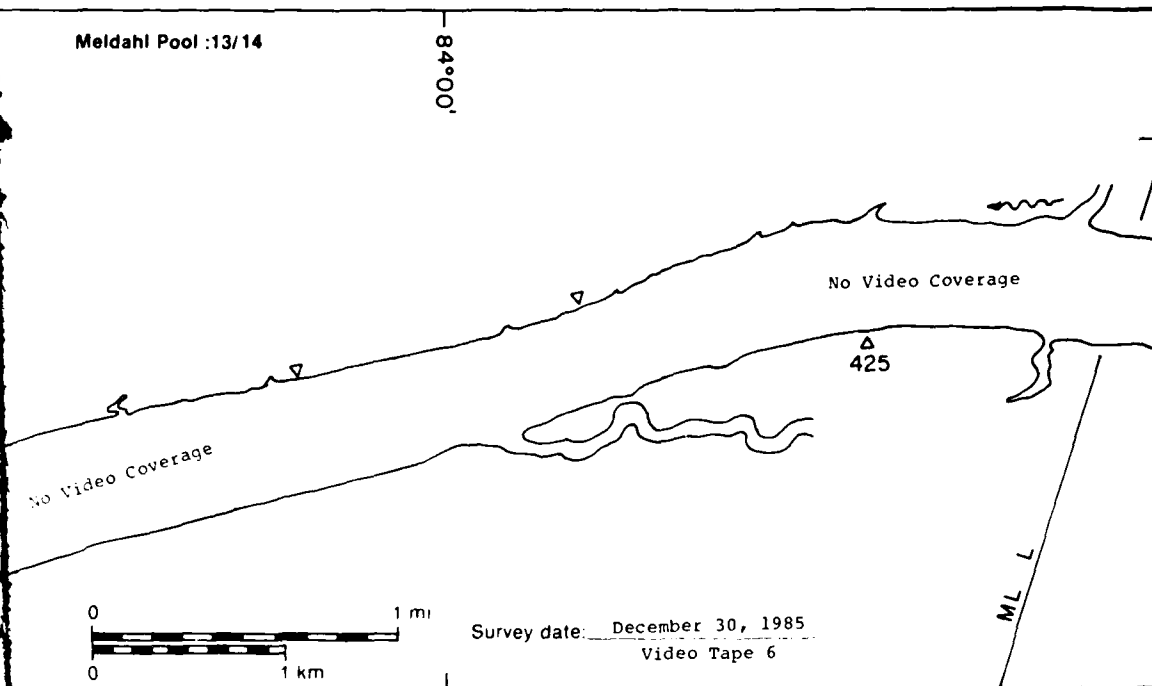
Area
(m² x 10⁶)

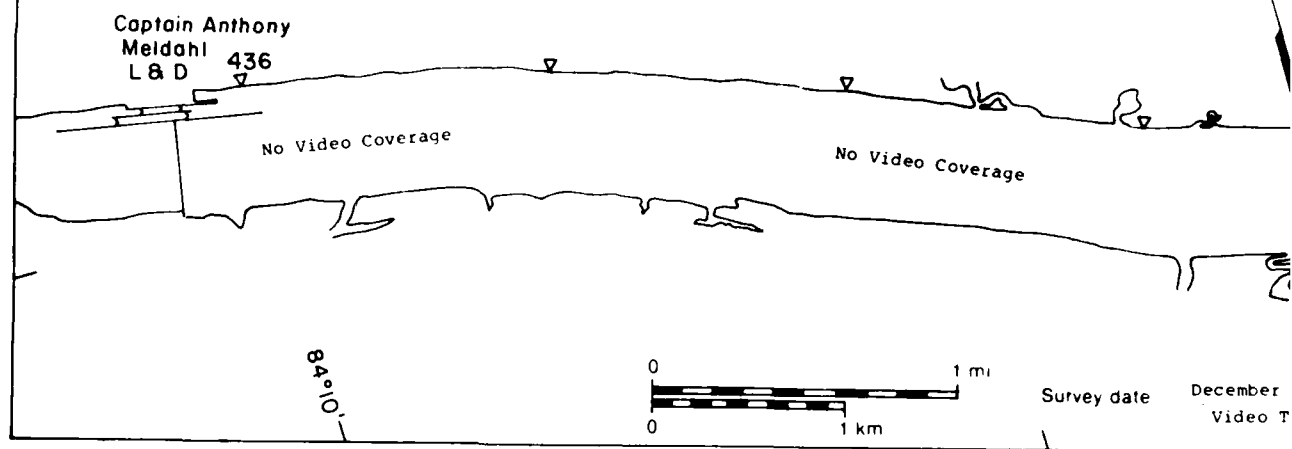
43.44

Surface
concentration
(%)

NA






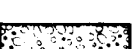
30 December 1985





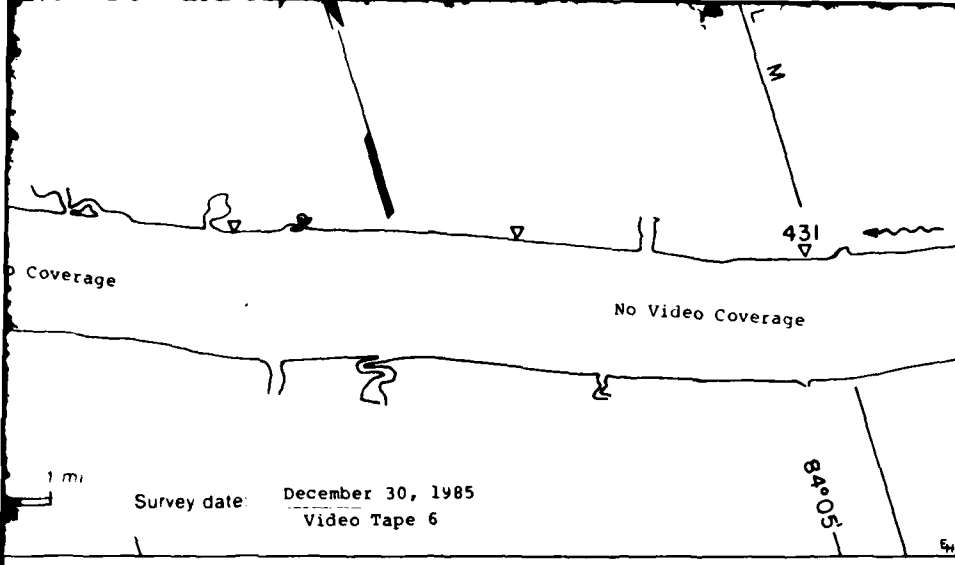
Meldahl Pool

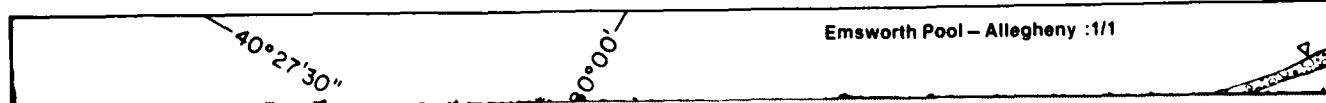
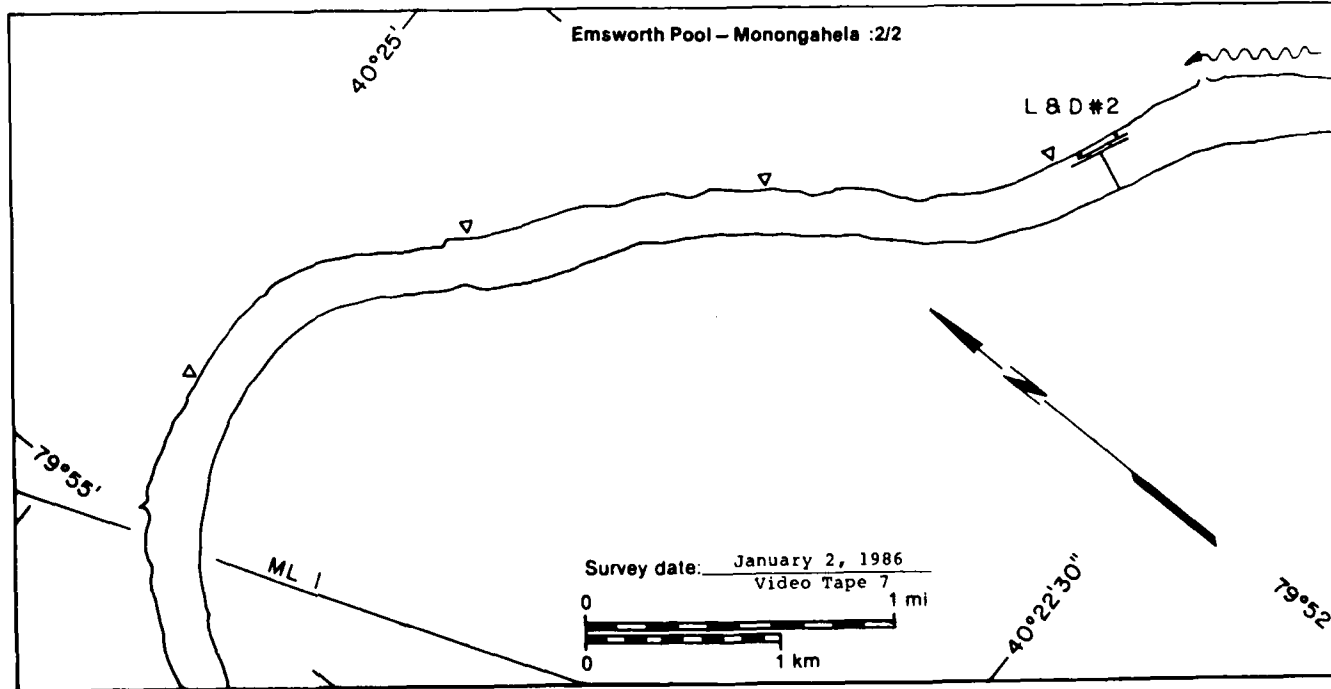
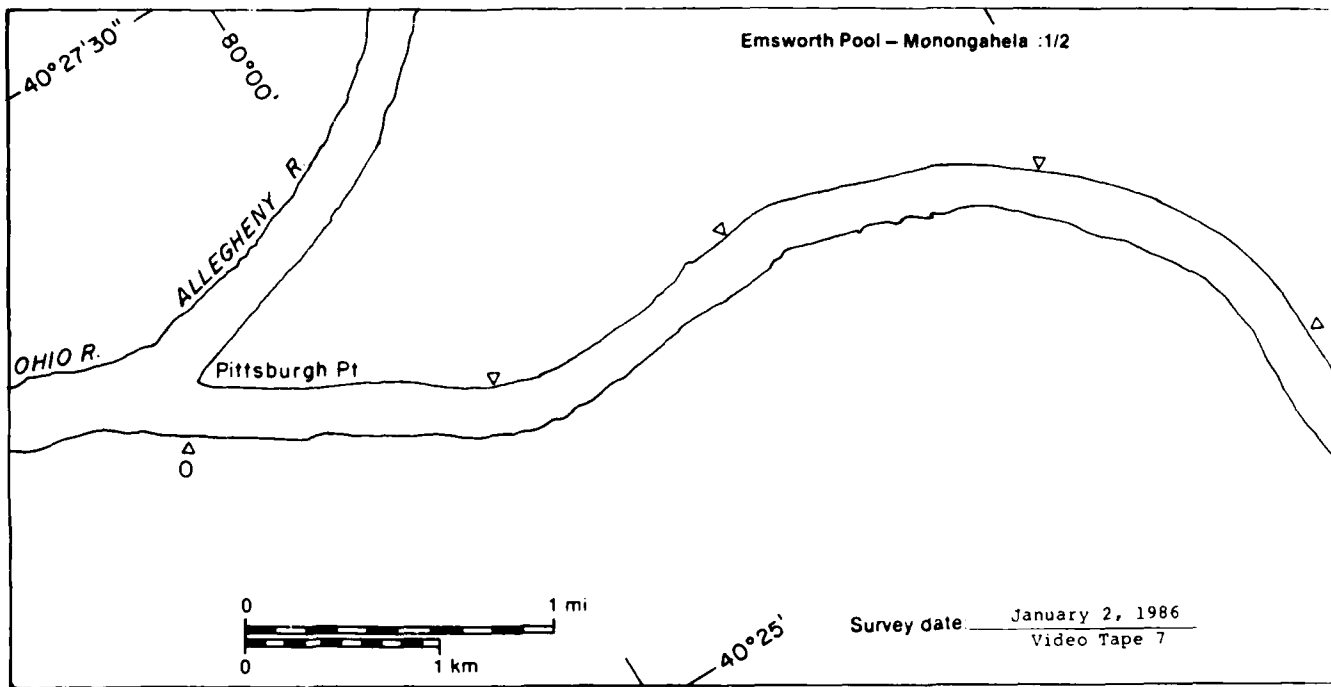
MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

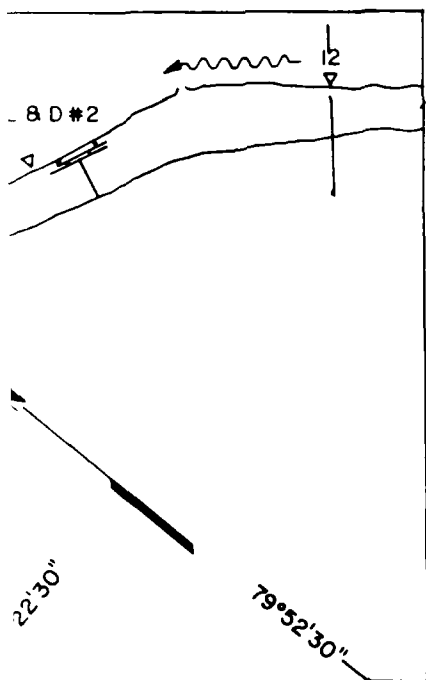
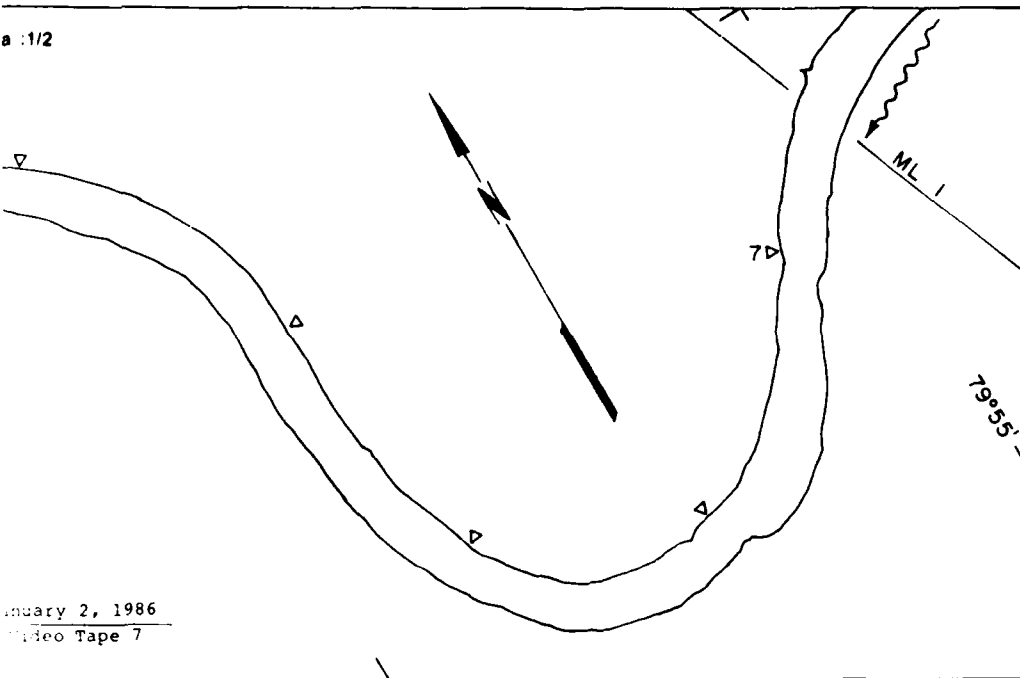
Area ($m^2 \times 10^6$)	Surface concentration (%)
43.44	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
0.00	—
73.77*	

* Includes $30.33 \times 10^6 m^2$
of no video coverage



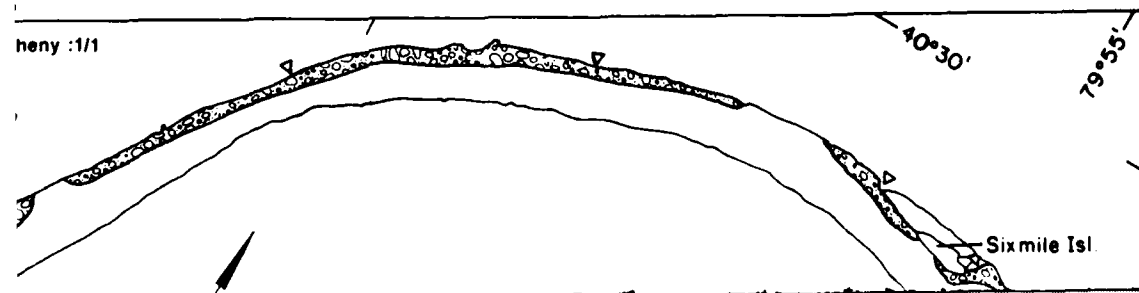


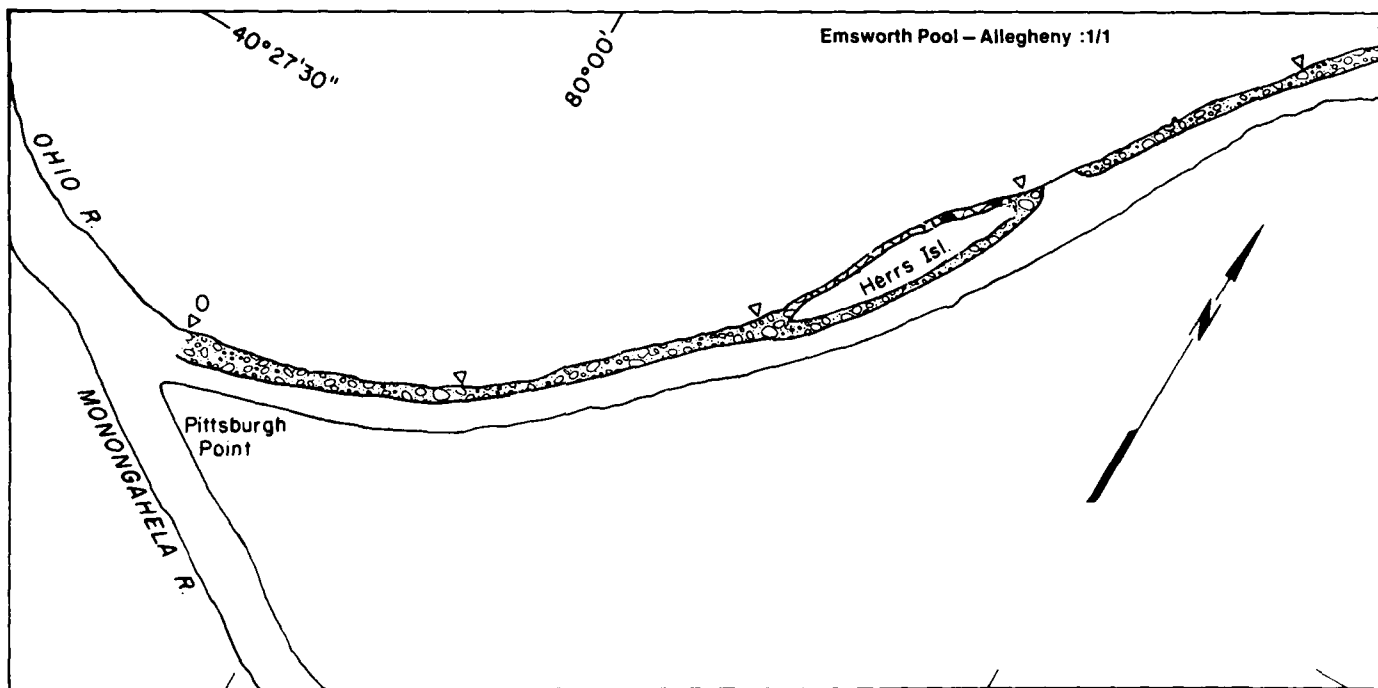
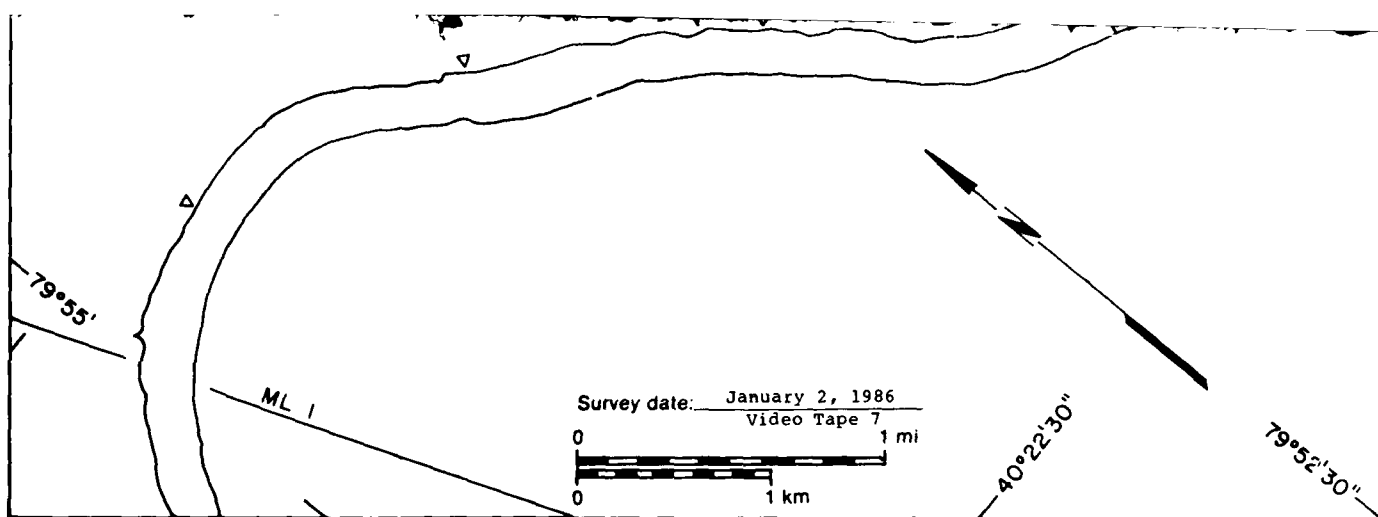
2 January 1986



Emsworth Pool - Monongahela

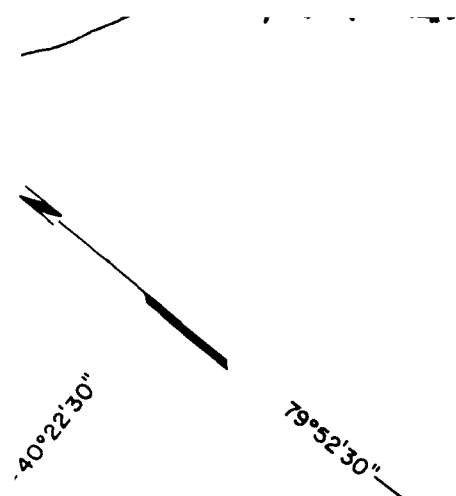
MAP UNITS	Area (m ² x 10 ⁶)	Surface concentration (%)
Open water	5.16	NA
Solid ice cover	0.00	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open water areas	0.00	—
Ice floes or frazil slush and pans	0.00	—
Total area (m ² x 10 ⁶)	5.16	





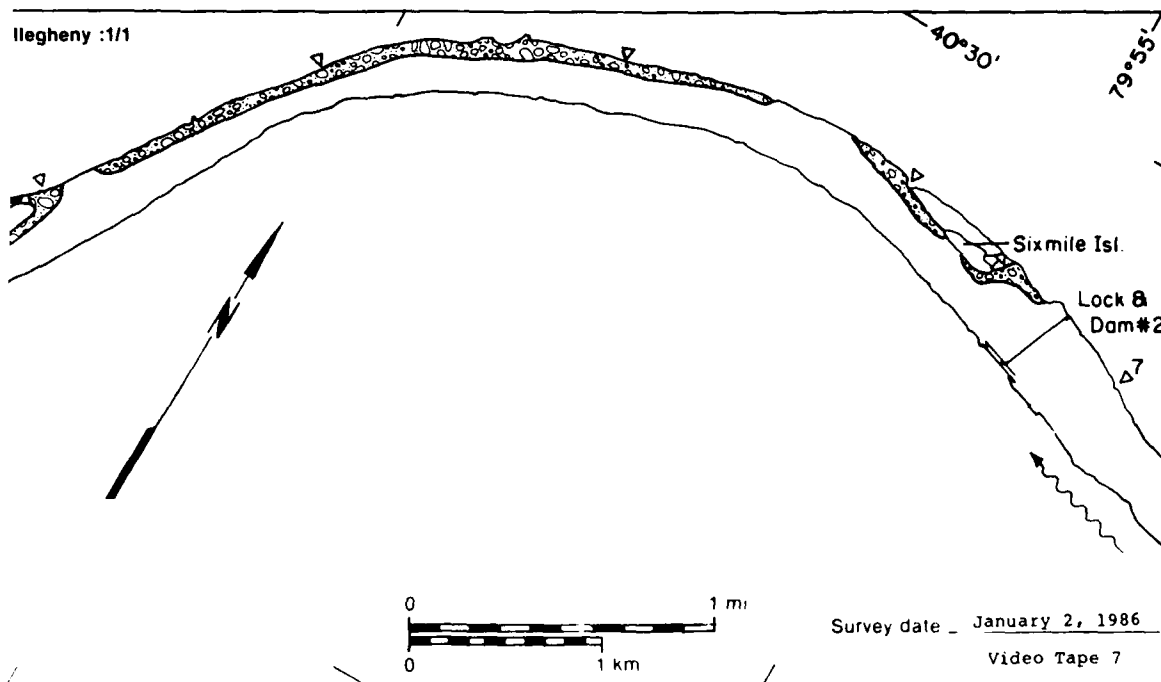
△ Emsworth Pool - Allegheny

MAP UNITS	Area (m ² x 10 ⁶)	Surface concentration
Open water	2.23	NA
Solid ice cover	0.00	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.04	NA
Fragmented ice cover with open water areas	0.03	50
Ice floes of trash brush and pans	0.77	10
Total area (m ² x 10 ⁶)	3.07	

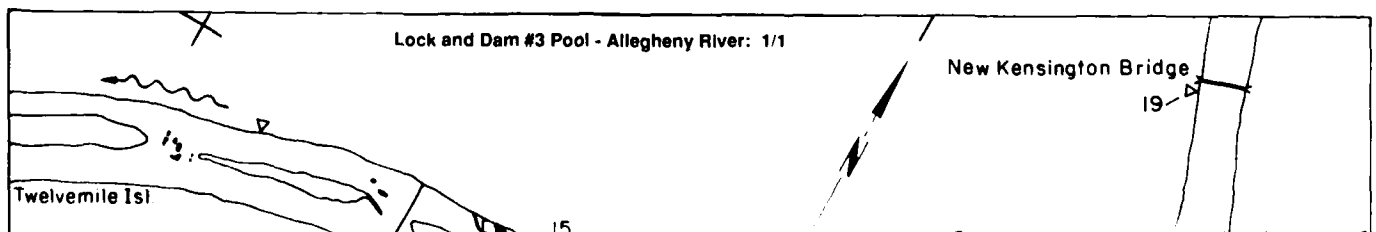
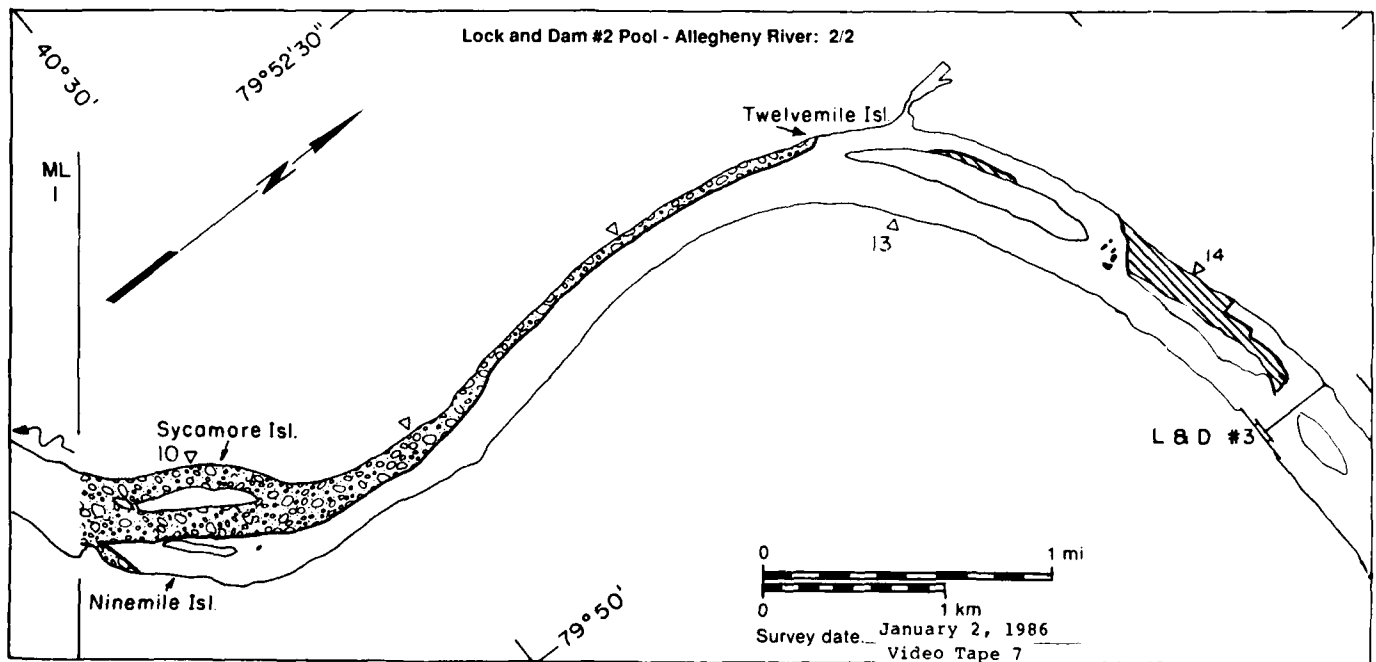
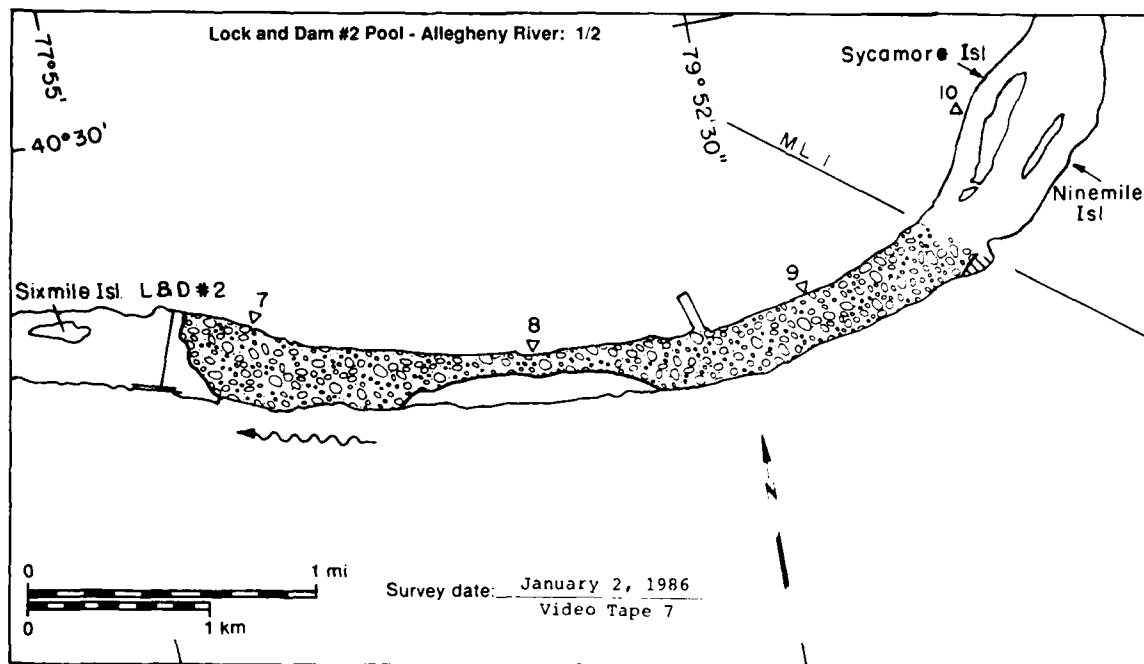


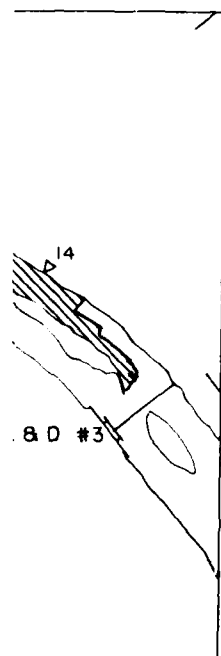
Emsworth Pool - Monongahela

MAP units	Area (m ² x 10 ⁶)	Surface water area (m ² x 10 ⁶)
Open water	5.16	NA
Solid ice cover	0.00	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open water areas	0.00	—
Ice flows or frazil slush and pans	0.00	—
Total area (m ² x 10 ⁶)		5.16



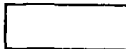

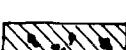
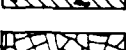


2 January 1986



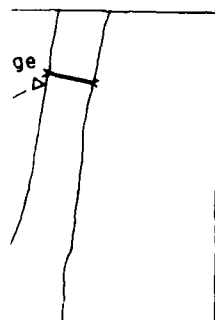


Lock and Dam #2 Pool

MAP UNITS



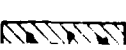
	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Area ($m^2 \times 10^6$)	Surface concentration (%)
2.02	NA
0.16	NA
0.00	—
0.00	NA
0.00	—
1.84	40
Total area ($m^2 \times 10^6$)	4.02

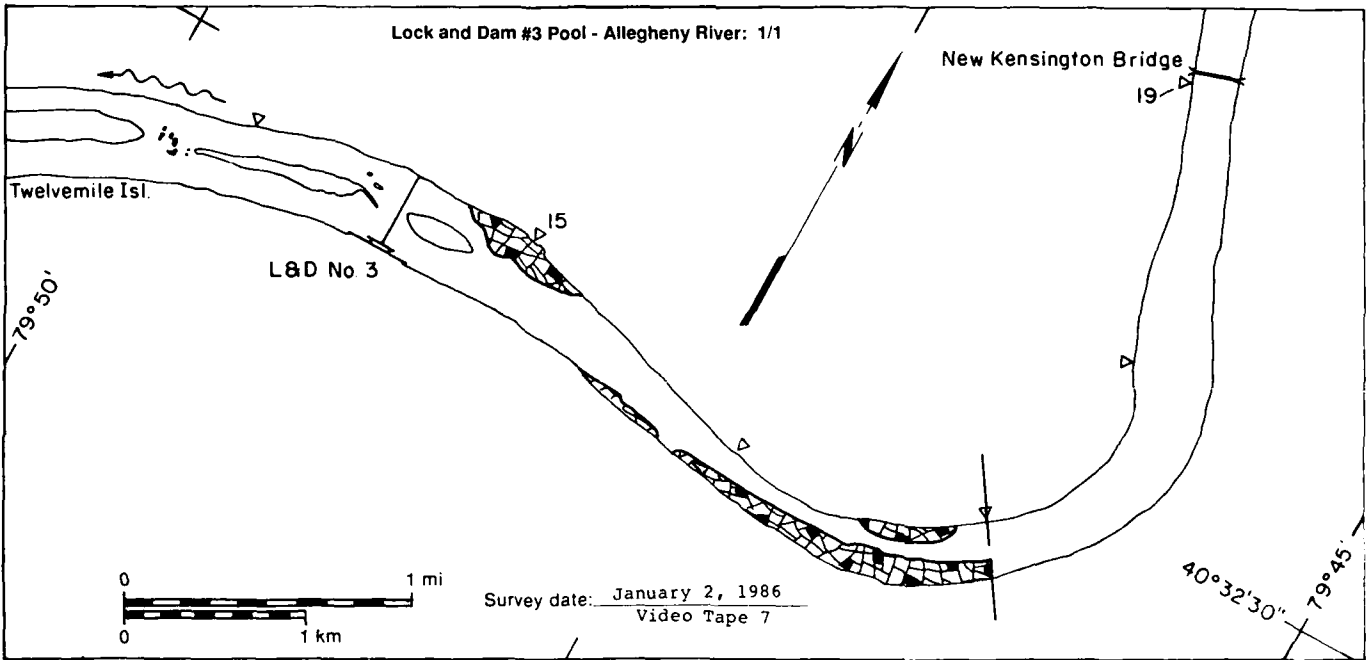
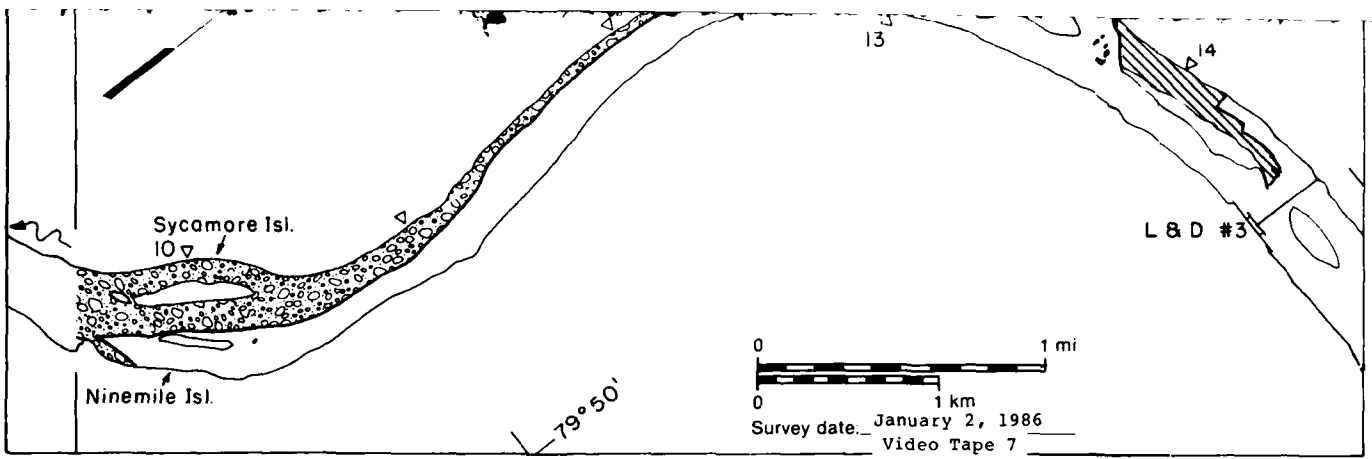


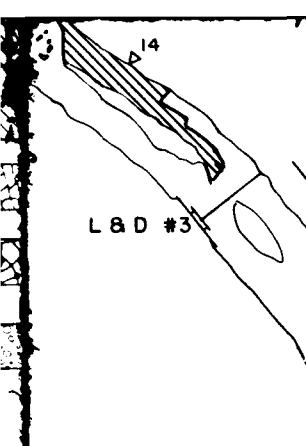
Lock and Dam #3 Pool





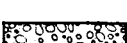
MAP UNITS

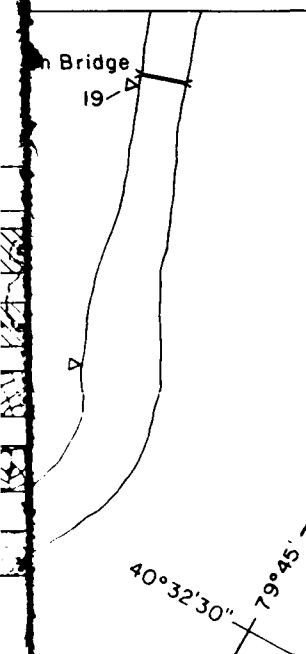
	Open water
	Solid ice cover
	Solid ice cover with open-water areas

Area ($m^2 \times 10^6$)	Surface concentration (%)
0.75	NA
0.00	NA


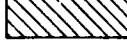



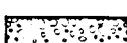


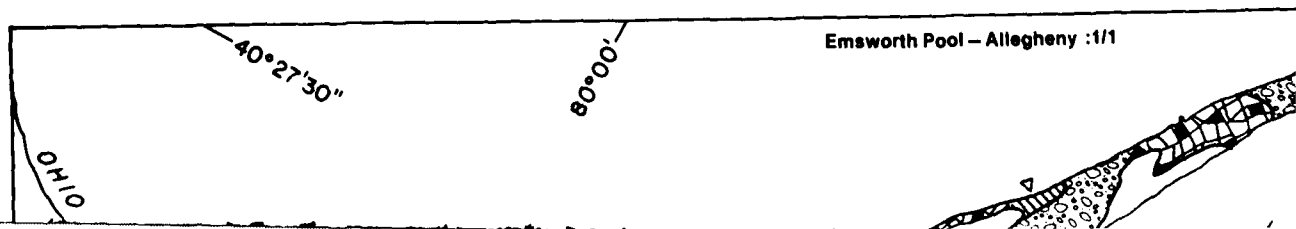
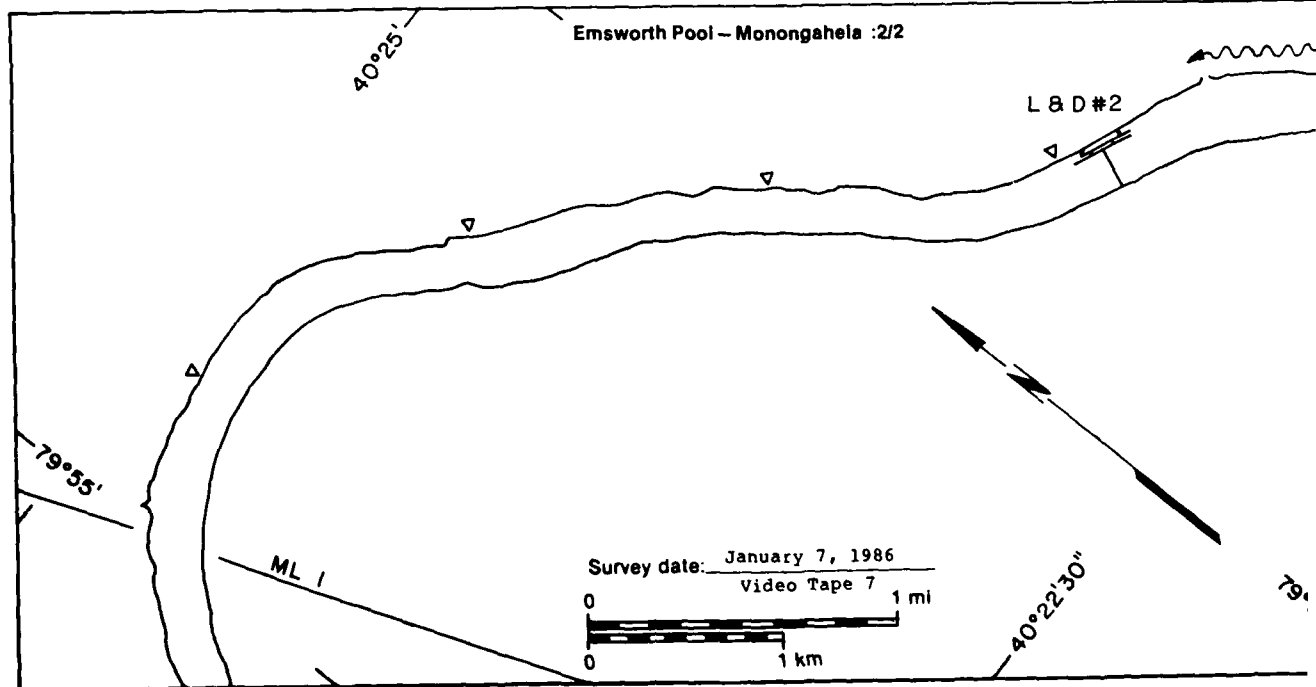
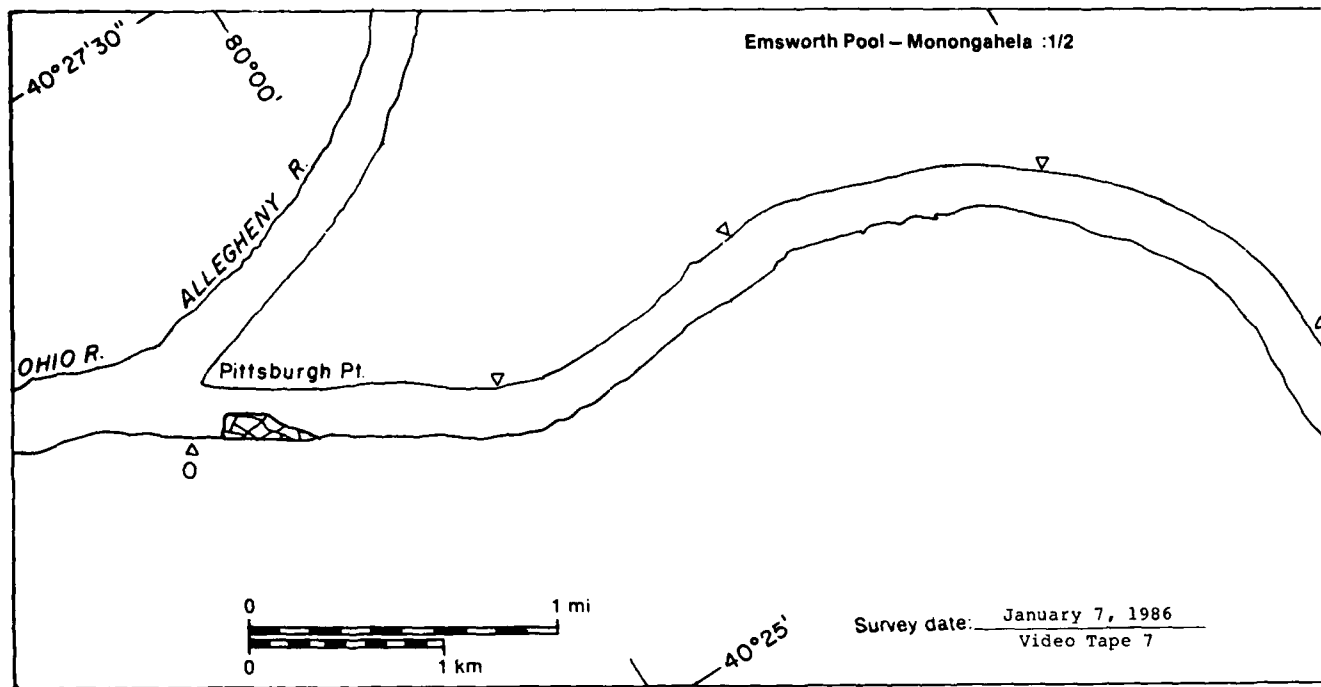


	Solid ice cover	0.16	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	1.84	40
Total area ($m^2 \times 10^6$)		4.02	

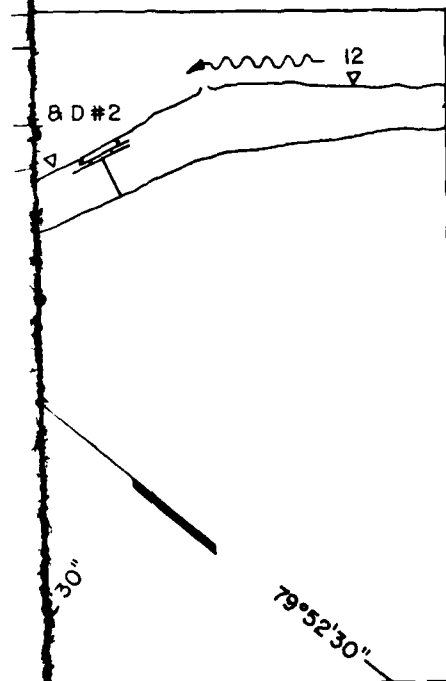
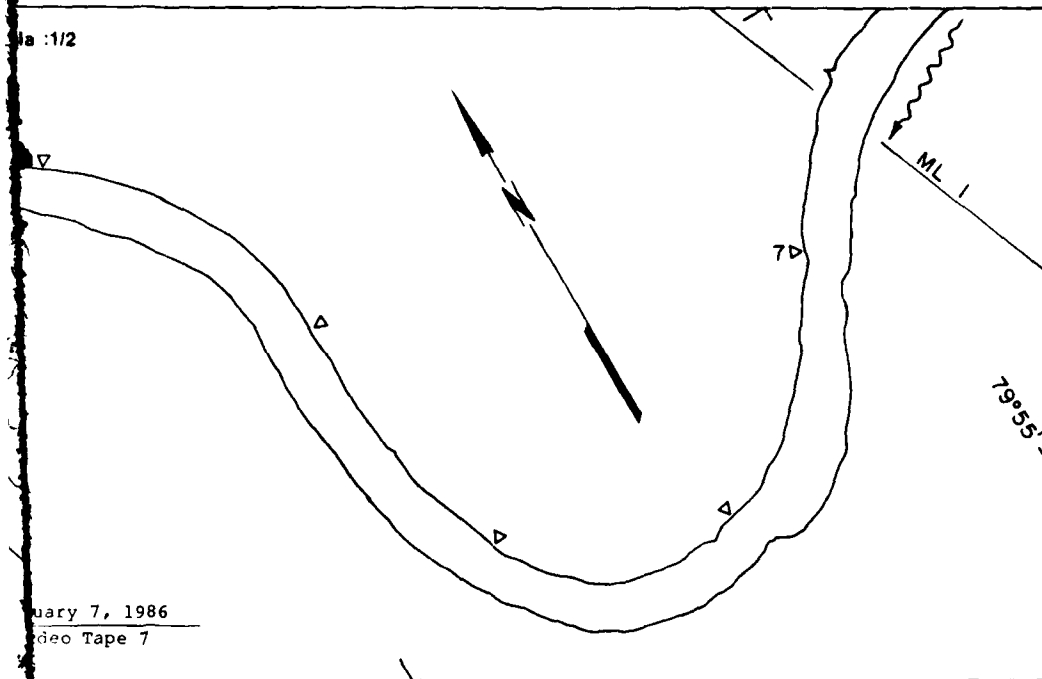


Lock and Dam #3 Pool

MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	0.75	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.03	NA
	Fragmented ice cover with open-water areas	0.36	60
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		1.14	



7 January 1986

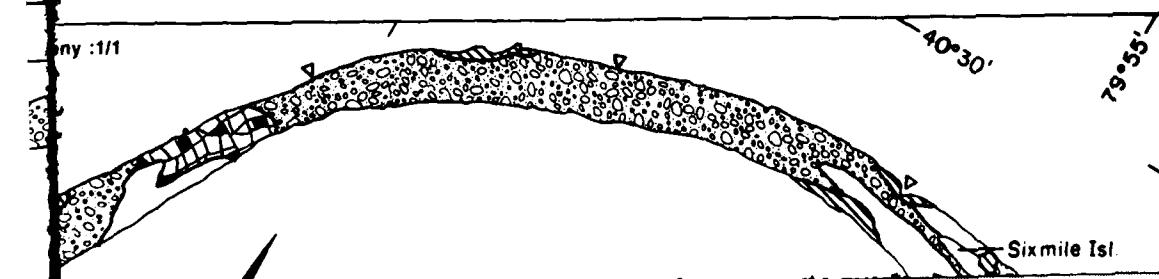


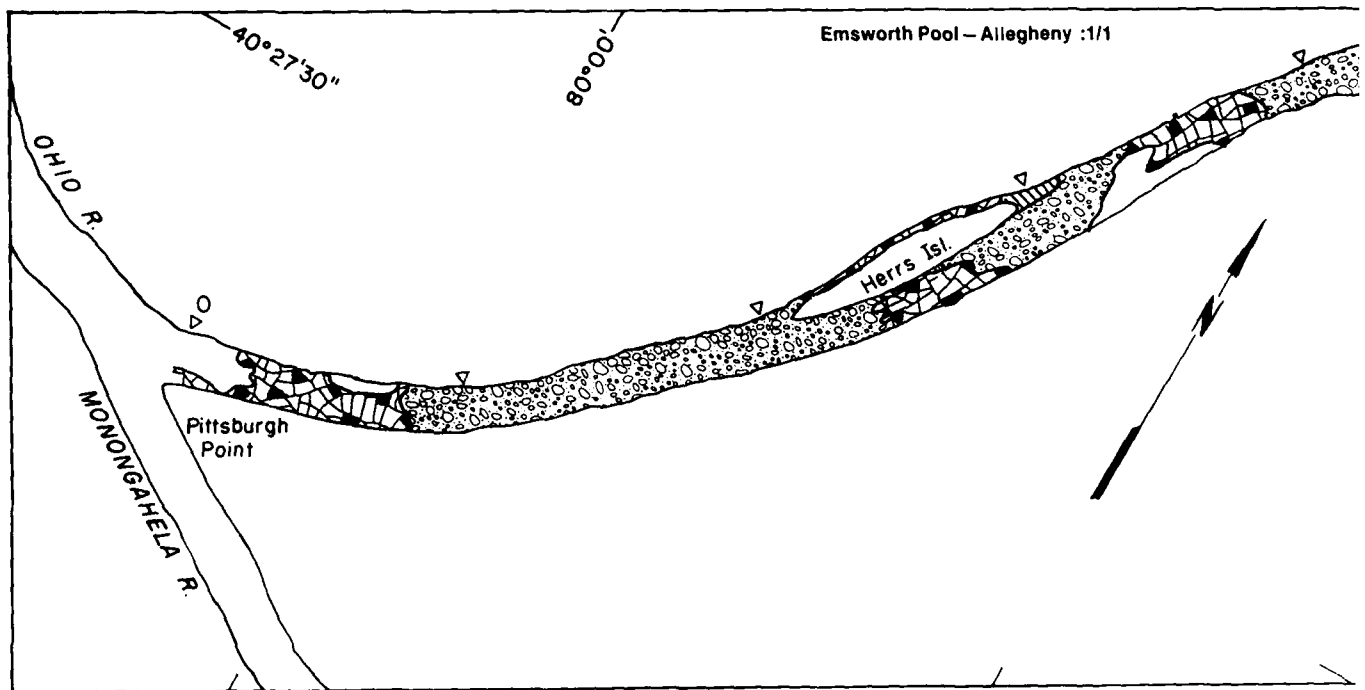
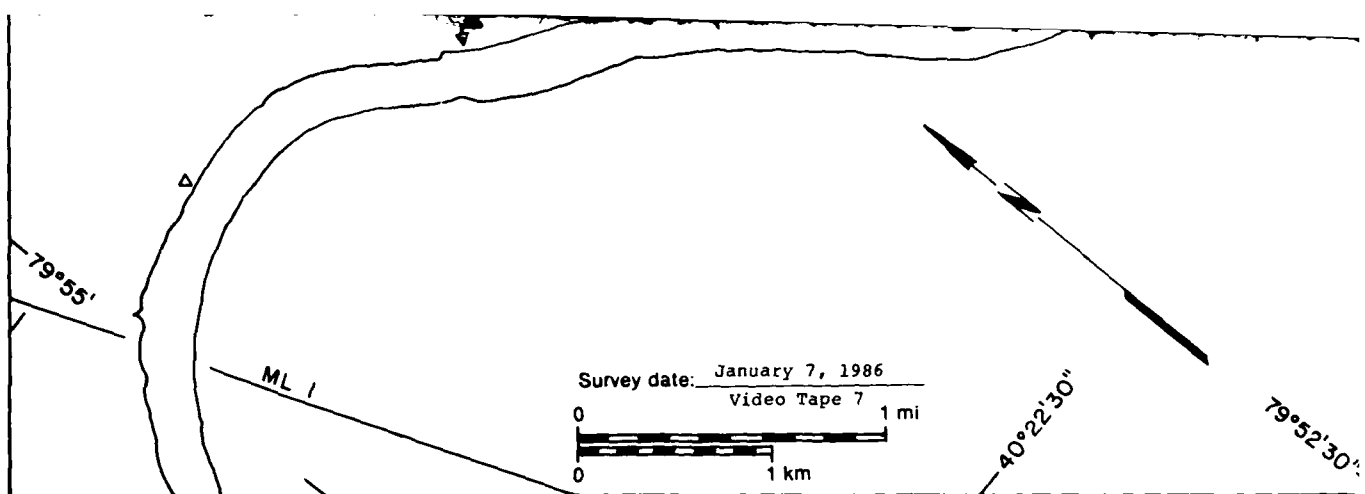
Emsworth Pool - Monongahela

MAP UNITS	Area (m ² x 10 ⁶)	Surface concentration (%)
Open water	5.11	NA
Solid ice cover	0.00	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.05	NA
Fragmented ice cover with open water areas	0.00	—
Ice floes or frazil slush and pans	0.00	—

Total area (m² x 10⁶)

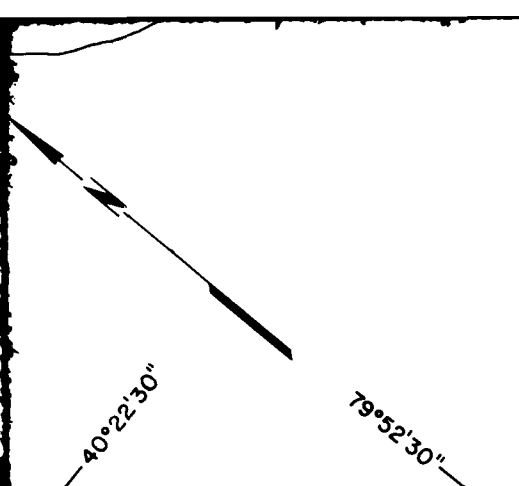
5.16





△ Emsworth Pool - Allegheny

MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	0.58	NA
Solid ice cover	0.06	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.02	NA
Fragmented ice cover with open water areas	0.47	70
Ice floes or frazil slush and pans	1.94	40
Total area ($m^2 \times 10^6$)	3.07	

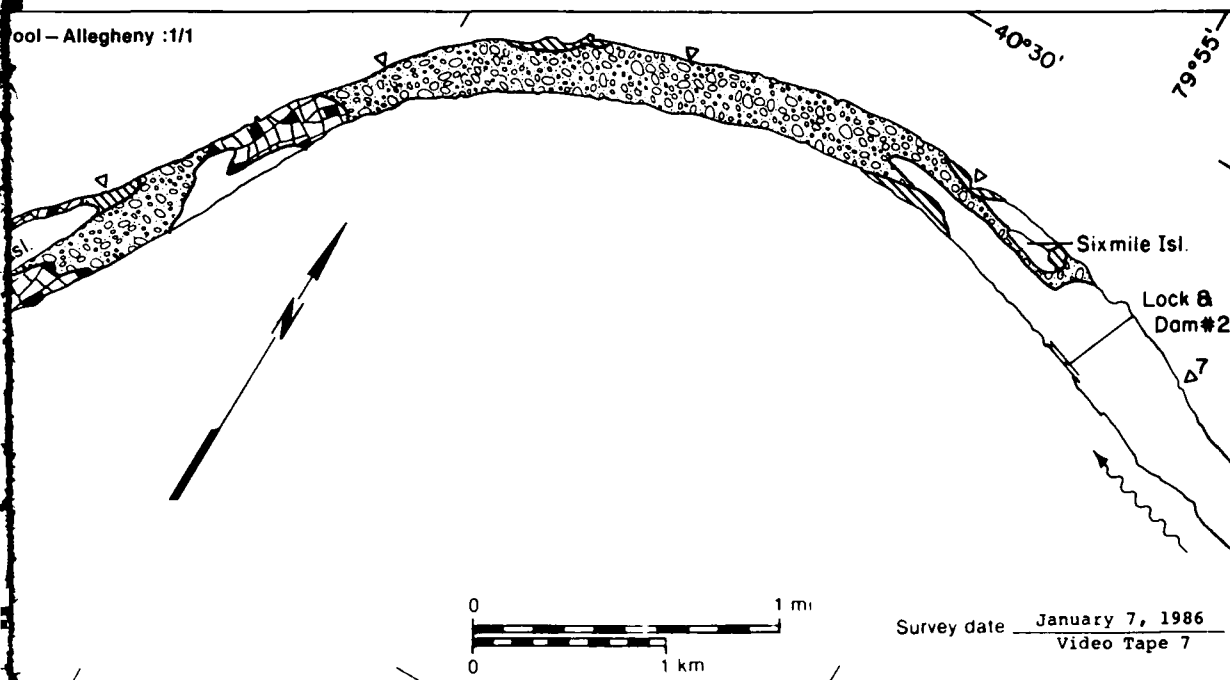


Emsworth Pool - Monongahela

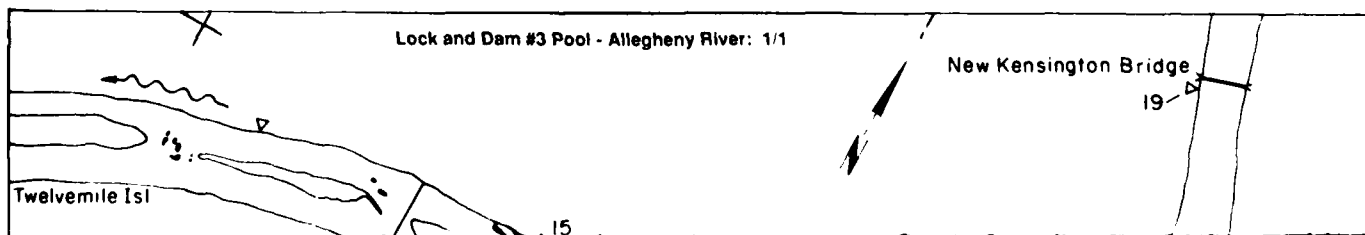
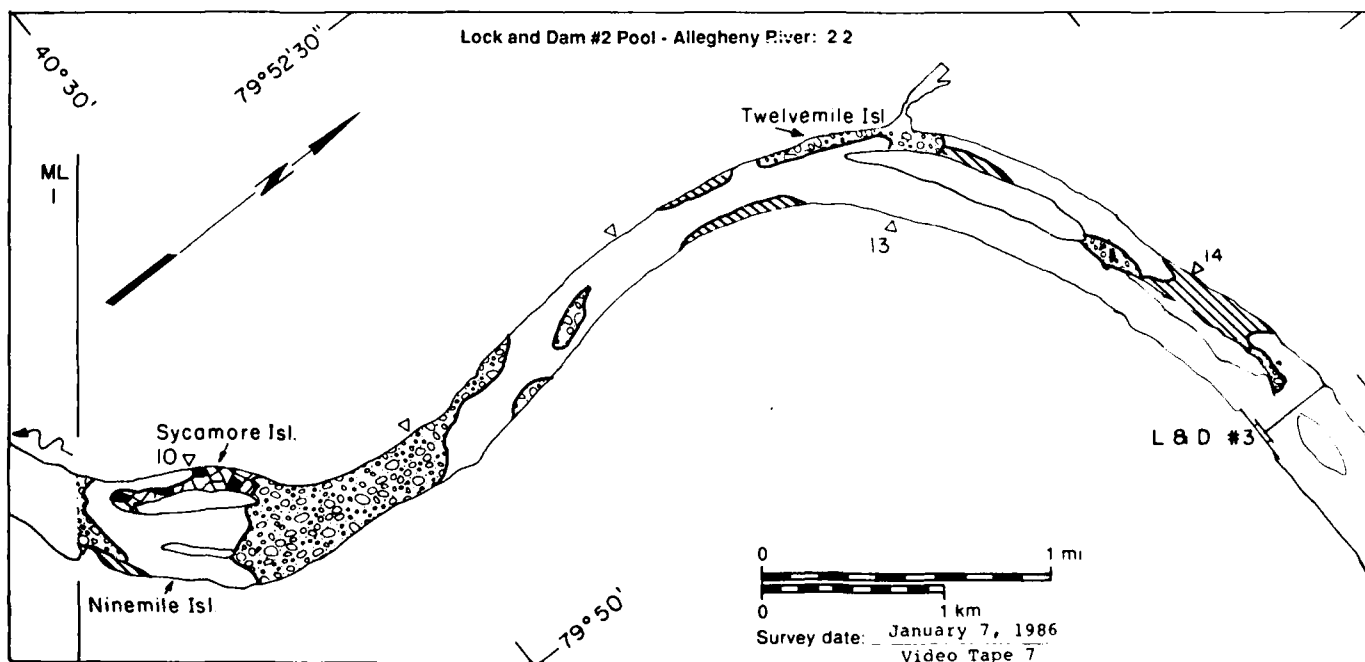
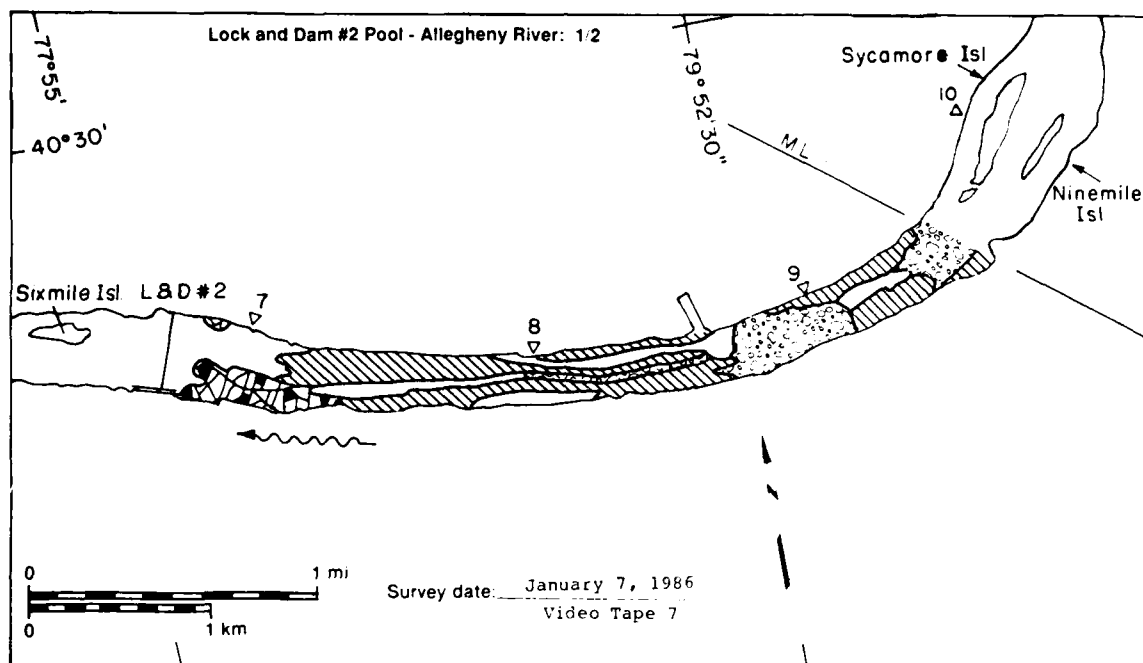
MAP UNIT	Area (m ² x 10 ⁶)	Surface concentration (g/m ²)
Open water	5.11	NA
Solid ice cover	0.00	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.05	NA
Fragmented ice cover with open water areas	0.00	—
Ice floes or frazil slush and pans	0.00	—

Total area (m² x 10⁶) 5.16

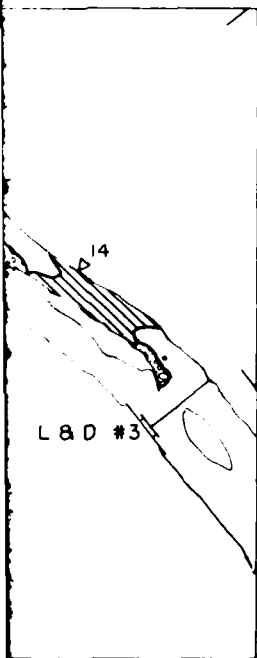
pool - Allegheny :1/1



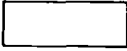




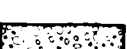
7 January 1986

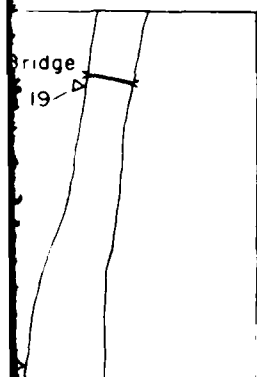


ile






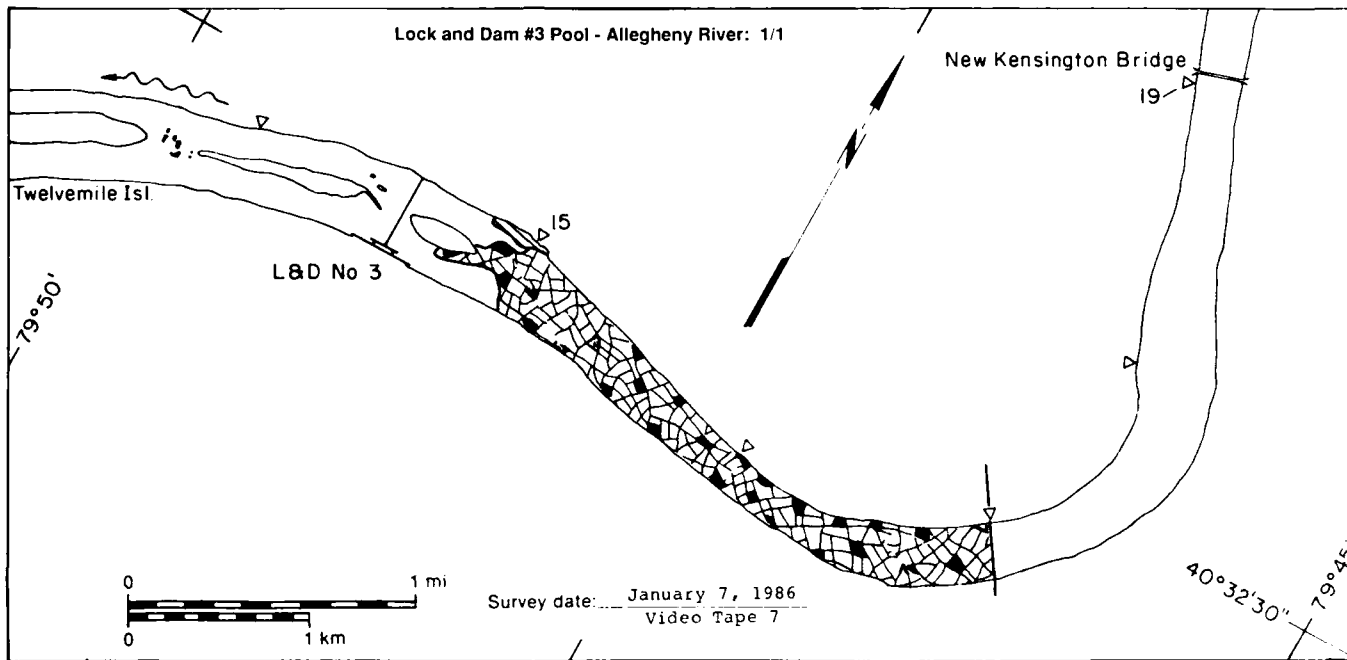
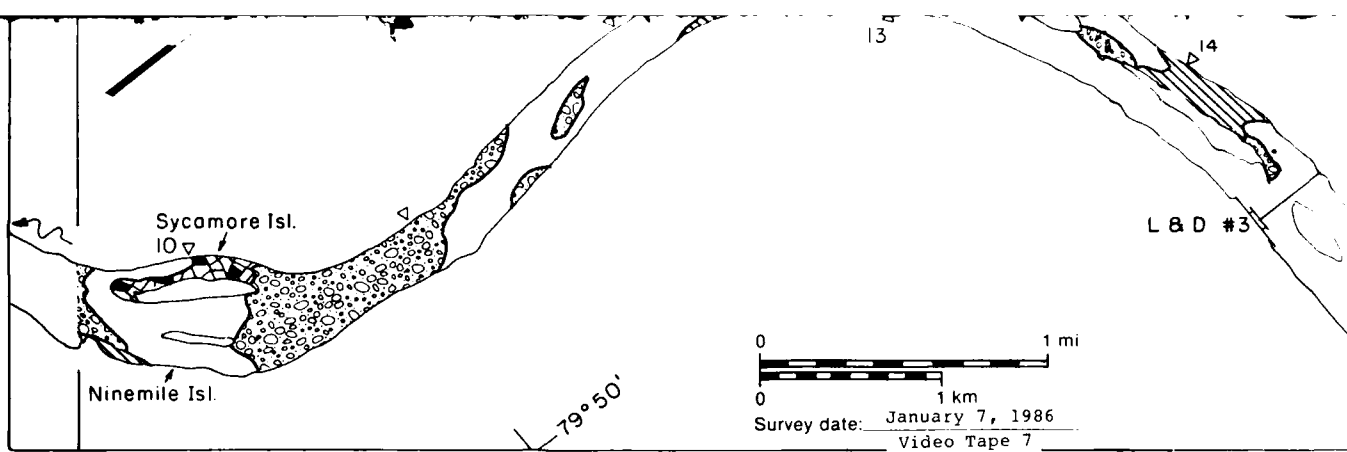
Lock and Dam #2 Pool

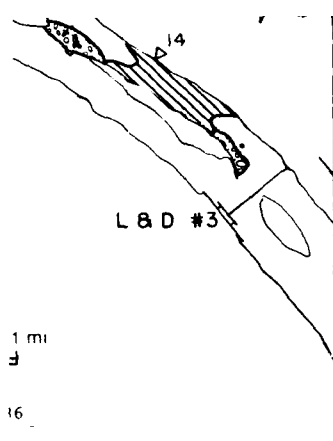
MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	2.02	NA
	Solid ice cover	0.82	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.03	NA
	Fragmented ice cover with open-water areas	0.20	70
	Ice floes or frazil slush and pans	0.95	40
Total area ($m^2 \times 10^6$)		4.02	



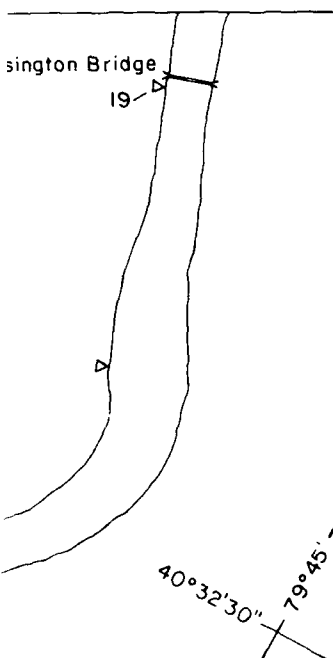
Lock and Dam #3 Pool

MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	0.20	NA
	Solid ice cover	0.04	NA
	Solid ice cover with open-water areas	0.00	—

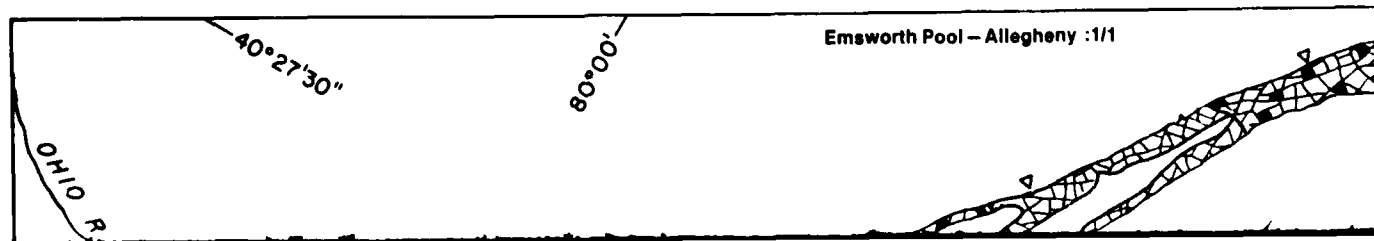
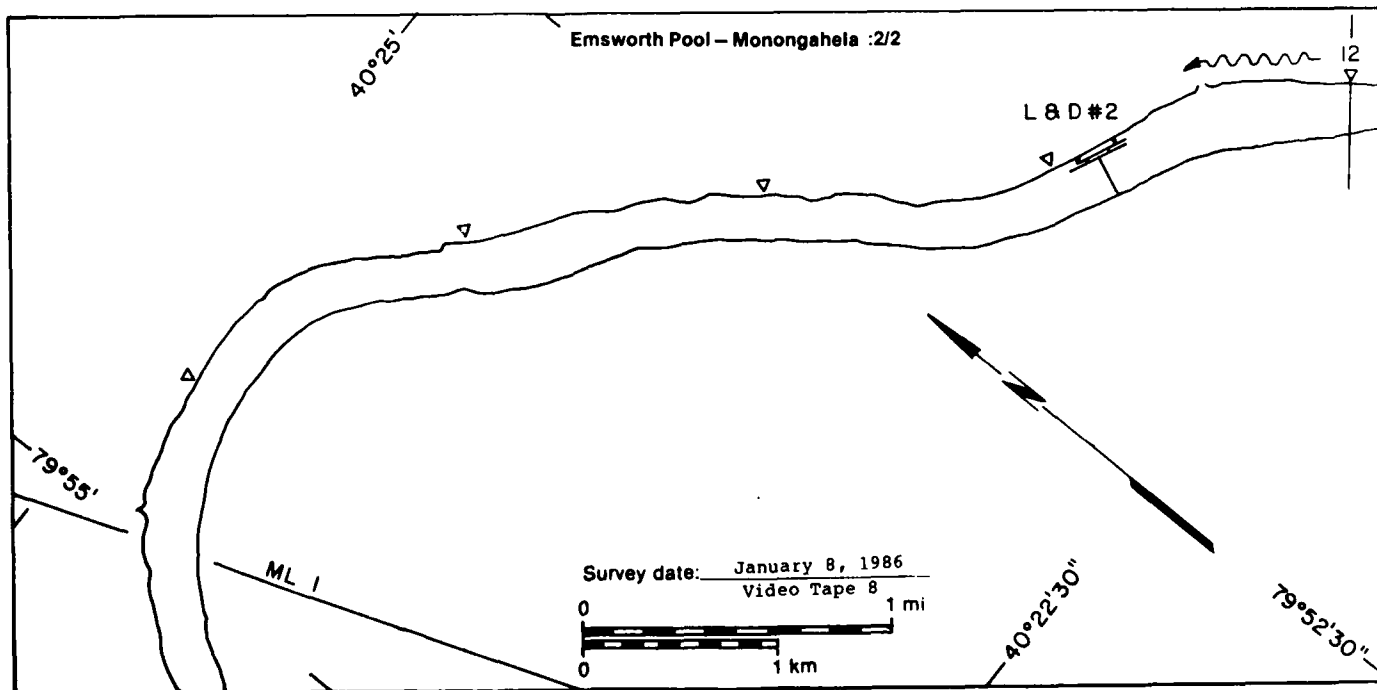
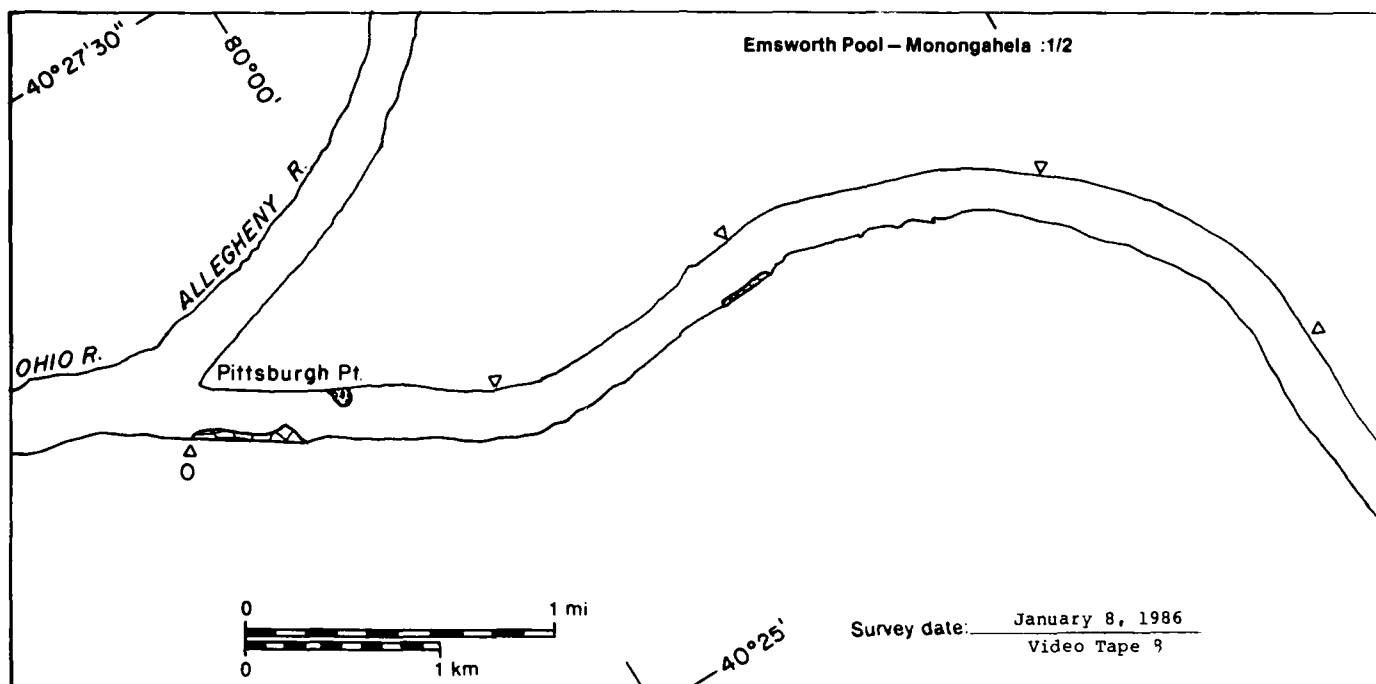




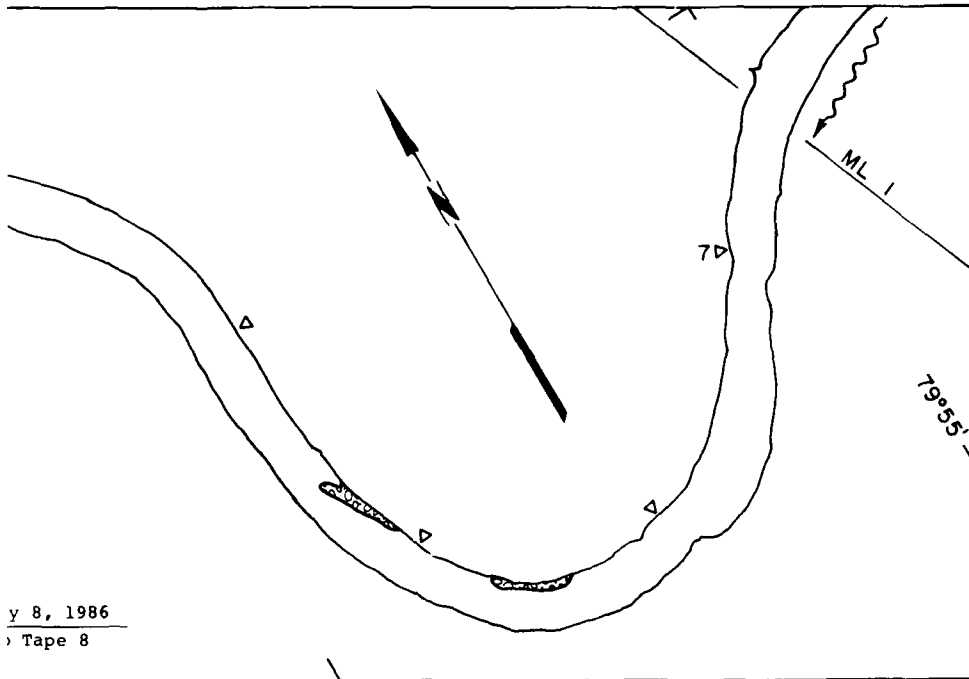
	Solid ice cover	0.82	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.03	NA
	Fragmented ice cover with open-water areas	0.20	70
	Ice floes or frazil slush and pans	0.95	40
Total area ($m^2 \times 10^6$)		4.02	



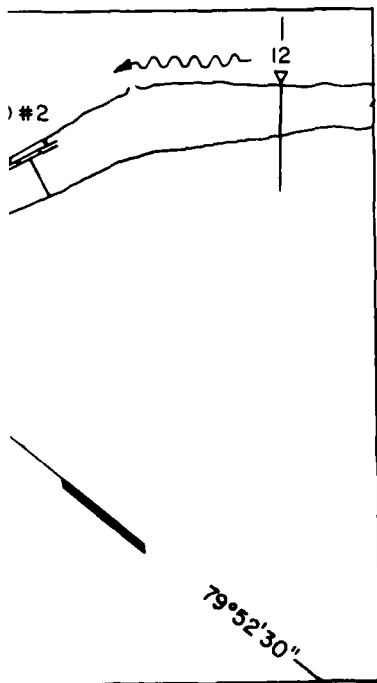
Lock and Dam #3 Pool		Area ($m^2 \times 10^6$)	Surface concentration (%)
MAP UNITS			
	Open water	0.20	NA
	Solid ice cover	0.04	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.90	90
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		1.14	



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







y 8, 1986
Tape 8



Emsworth Pool - Monongahela

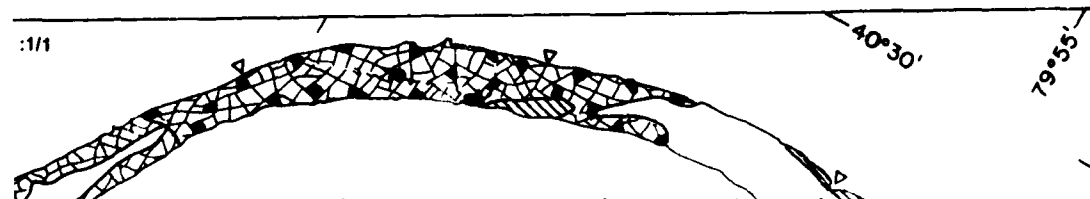
MAP UNITS

-  Open water
-  Solid ice cover
-  Solid ice cover with open water areas
-  Fragmented ice cover
-  Fragmented ice cover with open water areas
-  Ice flows or train slush and pans

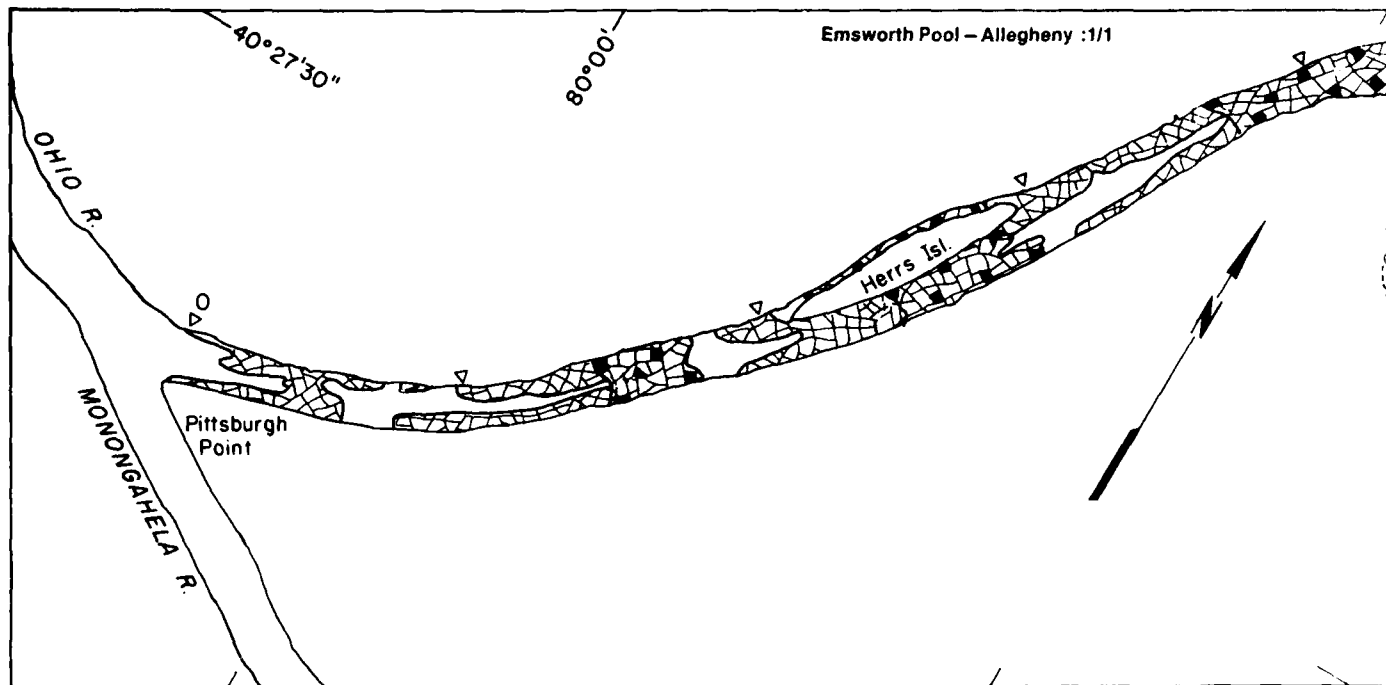
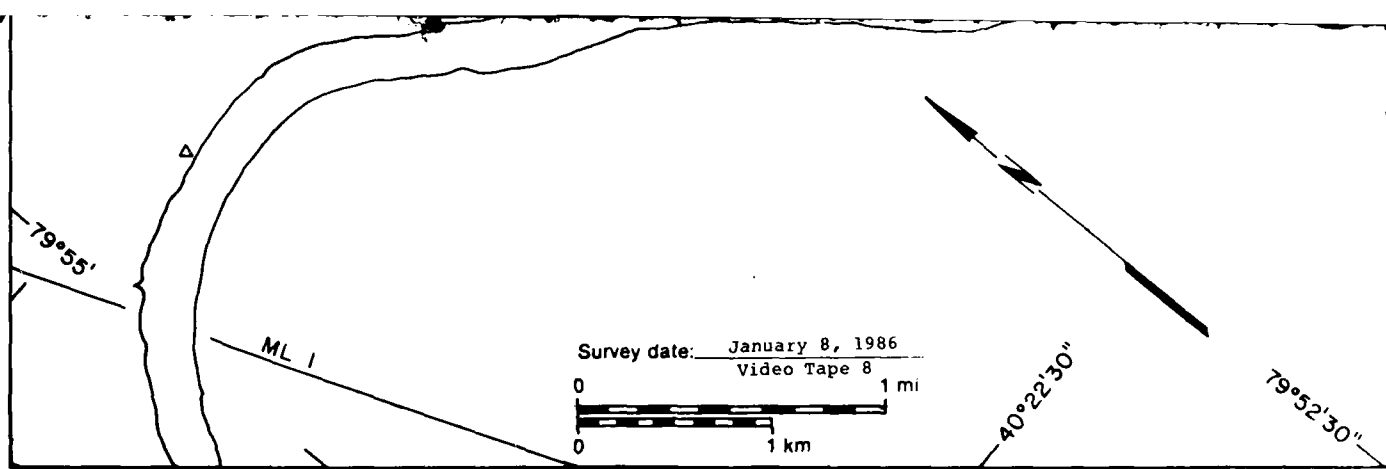
Area
($m^2 \times 10^6$)

Surface
Concentration
(%)

5.06	NA
0.00	NA
0.00	—
0.03	NA
0.00	—
0.07	5
Total area ($m^2 \times 10^6$)	5.16

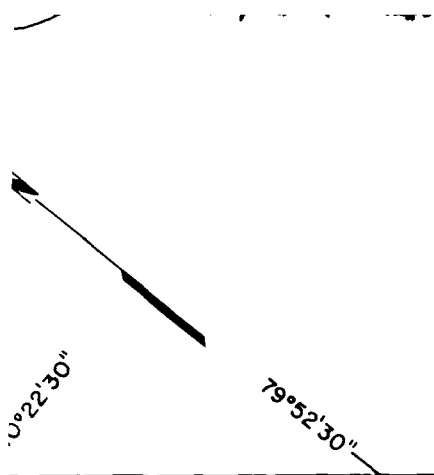


1/1



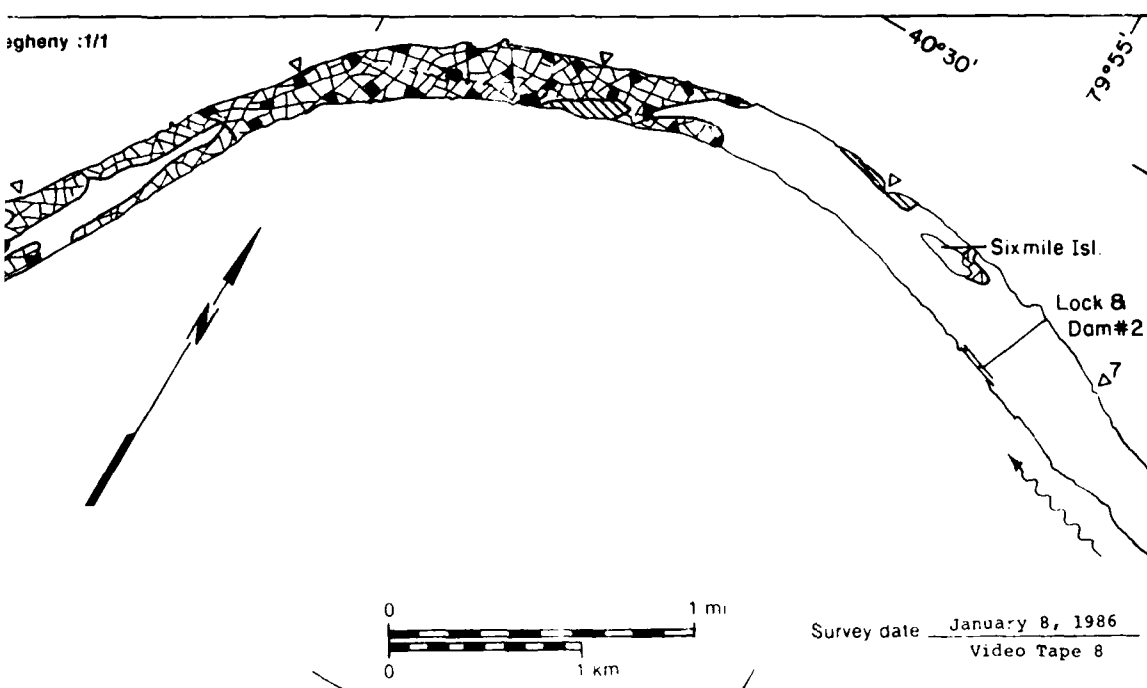
◊ Emsworth Pool - Allegheny

MAP UNITS	Area (m ² x 10 ⁶)	Surface concentration (g/m ²)
Open water	1.20	NA
Solid ice cover	0.08	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.78	NA
Fragmented ice cover with open water areas	1.01	90
Ice floes or frazil slush and pans	0.00	—
Total area (m² x 10⁶)	3.07	

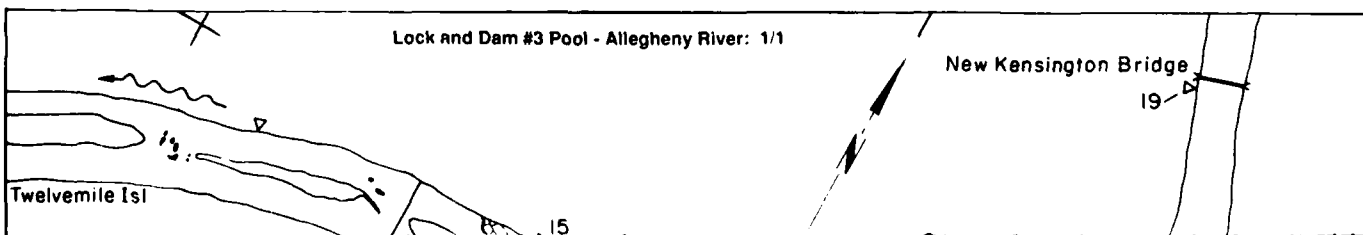
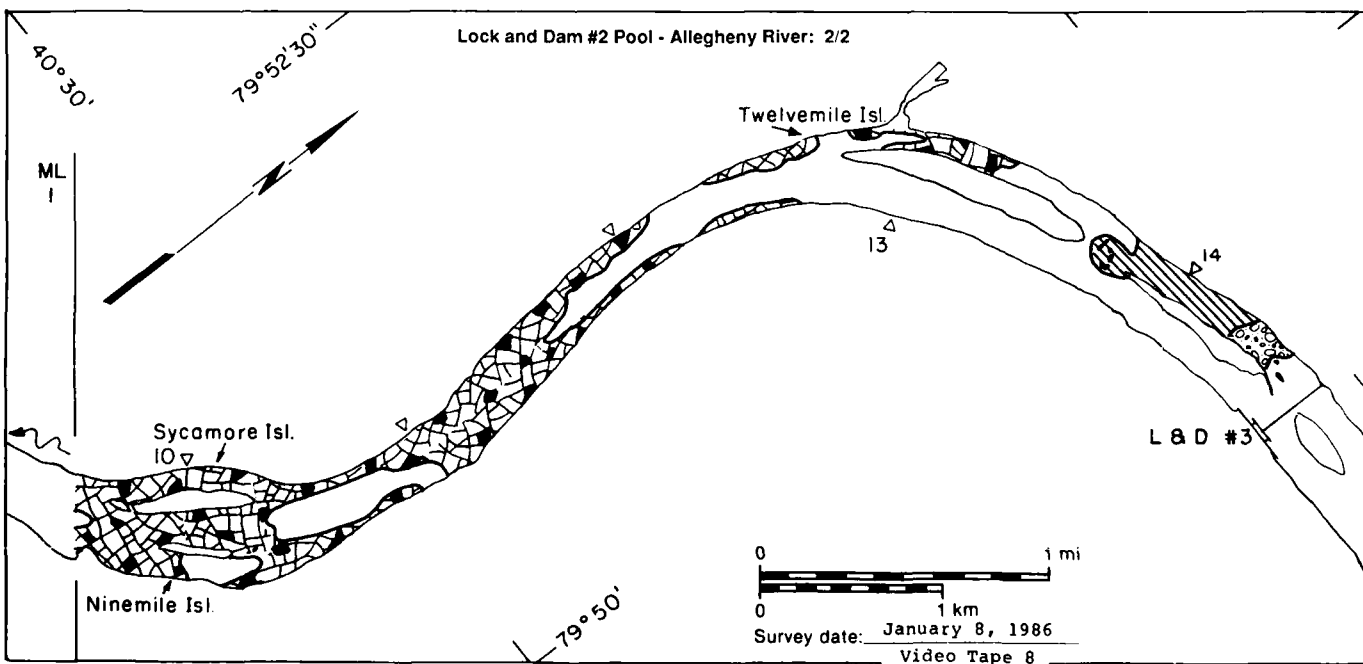
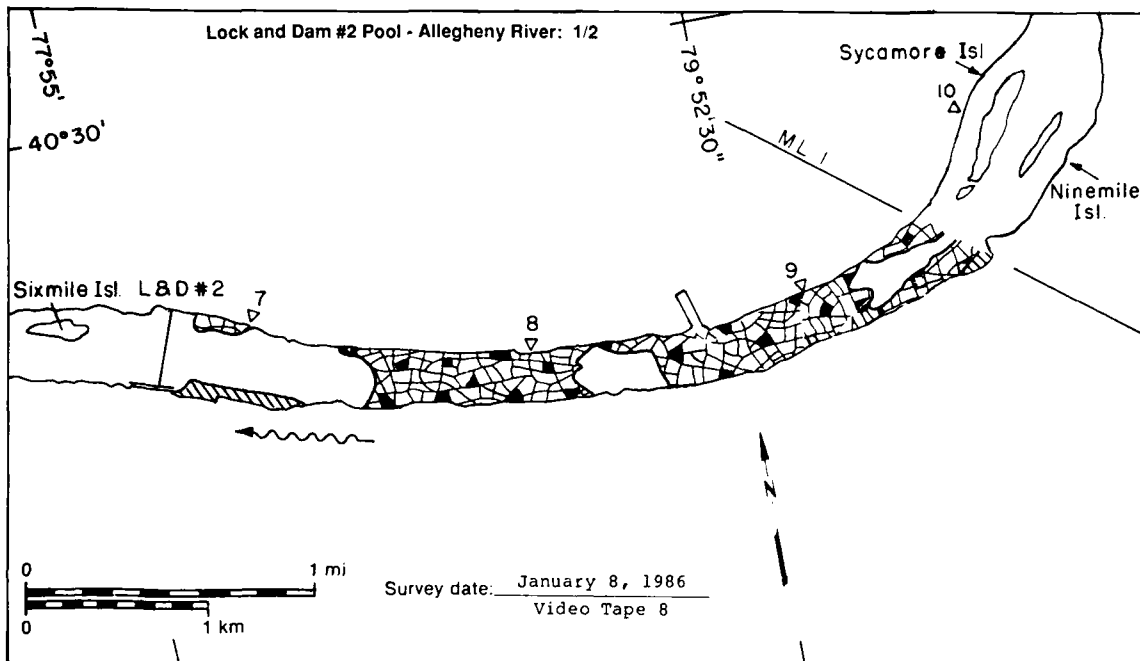


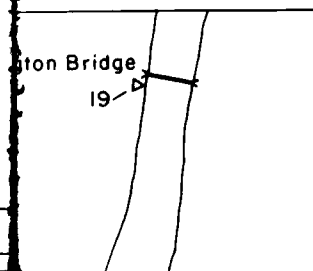
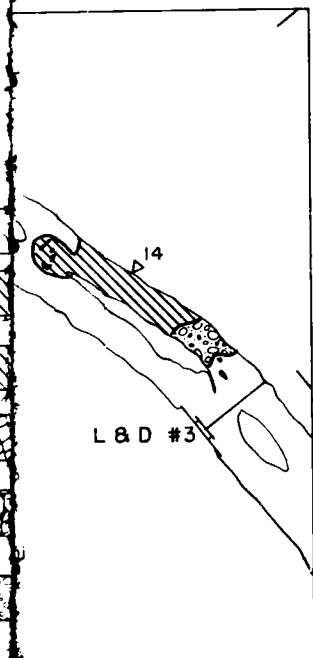
Emsworth Pool - Monongahela

Map Symbols		Area (m ² x 10 ⁶)	
	Open water	5.06	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open water areas	0.00	—
	Fragmented ice cover	0.03	NA
	Fragmented ice cover with open water areas	0.00	—
	Ice free areas, marsh and ponds	0.07	5
Total area (m ² x 10 ⁶)		5.16	



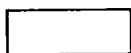



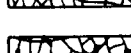

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Lock and Dam #2 Pool

MAP UNITS

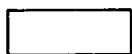
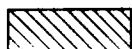
-  Open water
-  Solid ice cover
-  Solid ice cover with open-water areas
-  Fragmented ice cover
-  Fragmented ice cover with open-water areas
-  Ice floes or frazil slush and pans

Total area ($m^2 \times 10^6$)

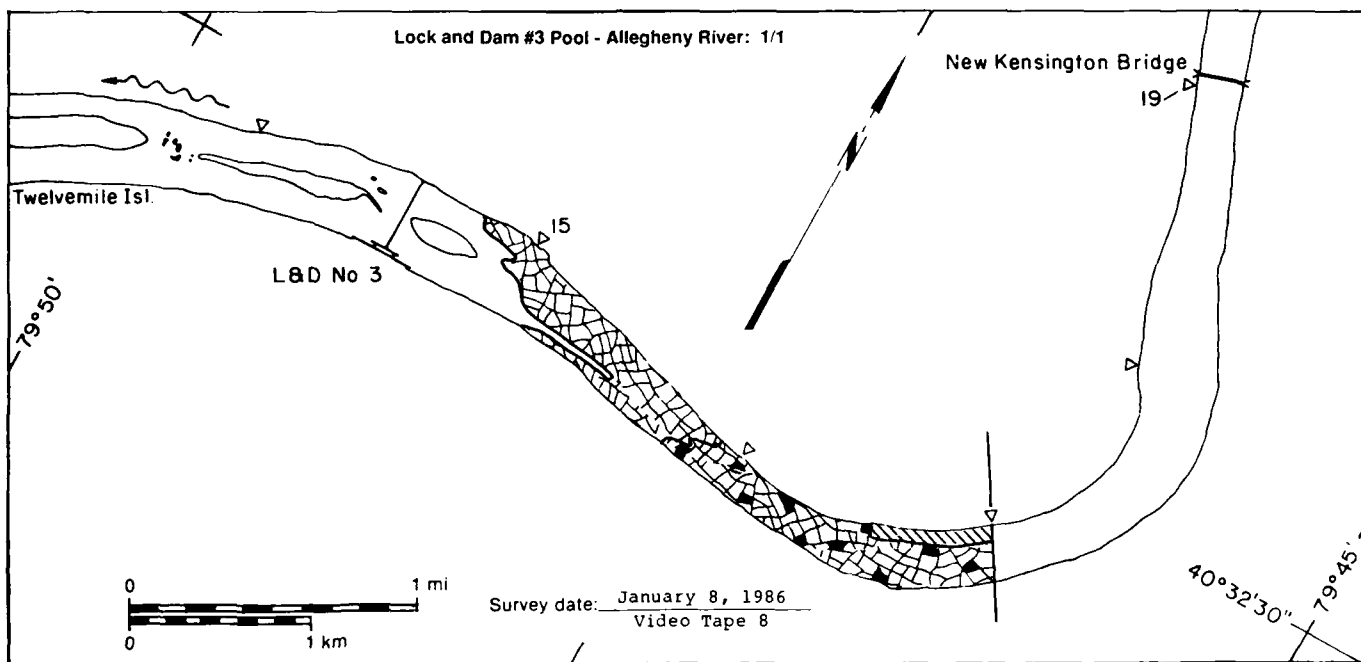
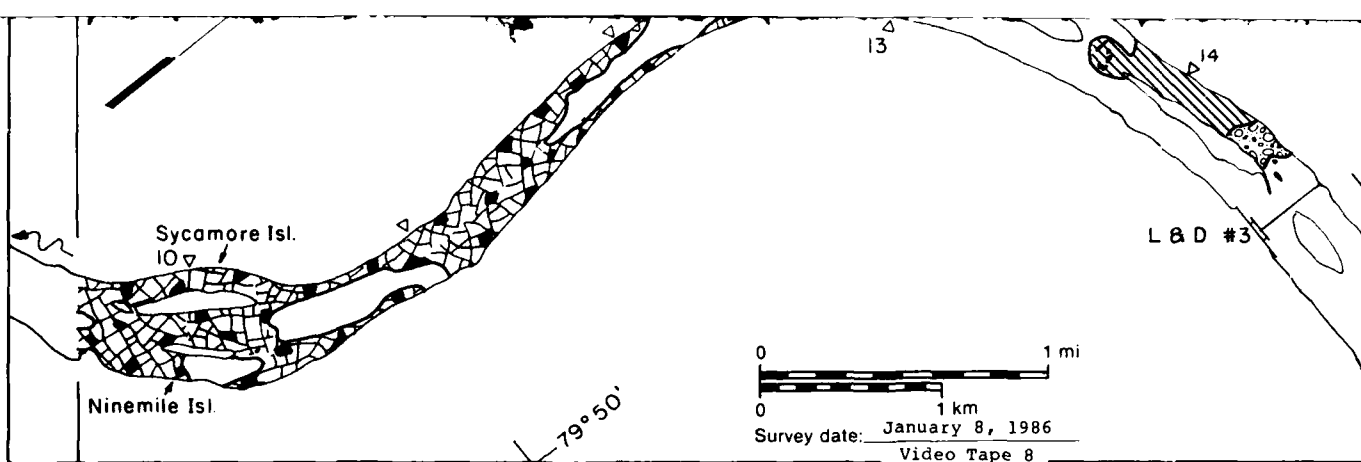
Area ($m^2 \times 10^6$)	Surface concentration (%)
1.83	NA
0.23	NA
0.00	—
0.09	NA
1.82	90
0.05	50
4.02	

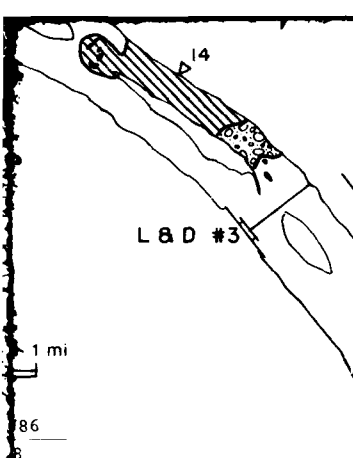
Lock and Dam #3 Pool





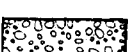
MAP UNITS

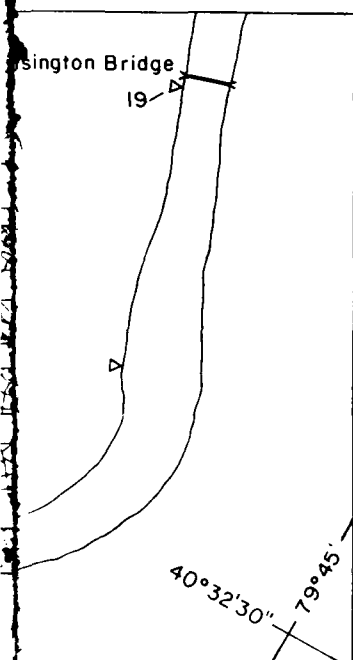
-  Open water
-  Solid ice cover


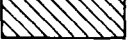



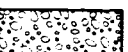
Area ($m^2 \times 10^6$)	Surface concentration (%)
0.30	NA
0.04	NA

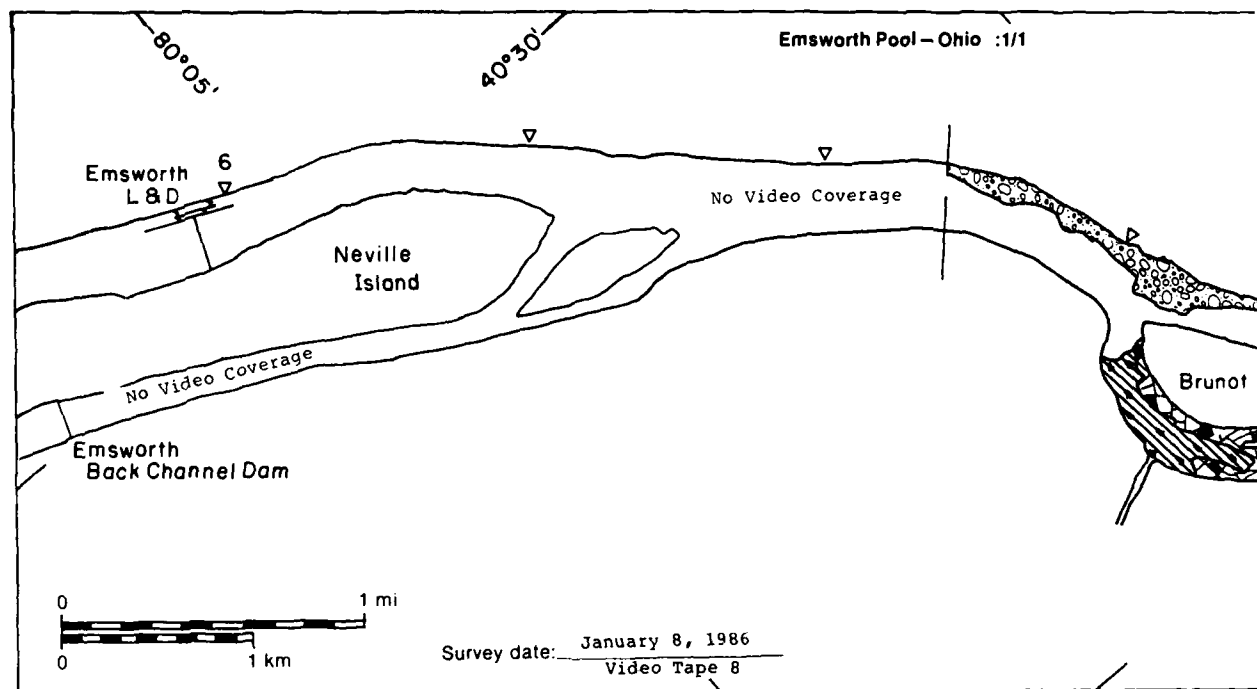




	Solid ice cover	0.23	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.09	NA
	Fragmented ice cover with open-water areas	1.82	90
	Ice floes or frazil slush and pans	0.05	50
Total area ($m^2 \times 10^6$)		4.02	

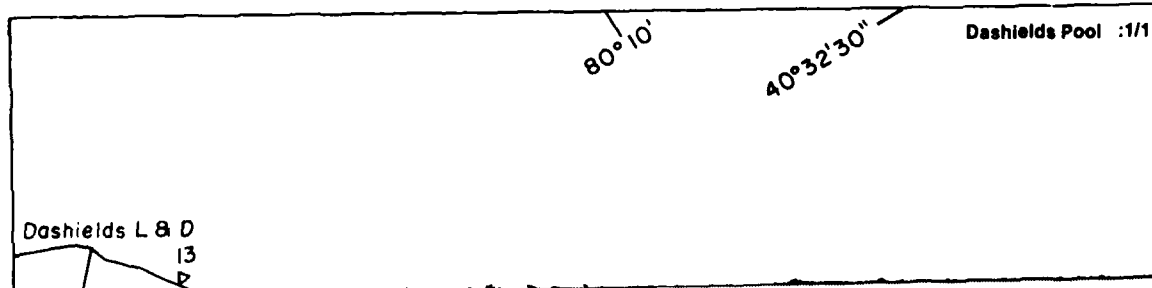


Lock and Dam #3 Pool		Area ($m^2 \times 10^6$)	Surface concentration (%)
MAP UNITS			
	Open water	0.30	NA
	Solid ice cover	0.04	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.38	NA
	Fragmented ice cover with open-water areas	0.42	95
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		1.14	

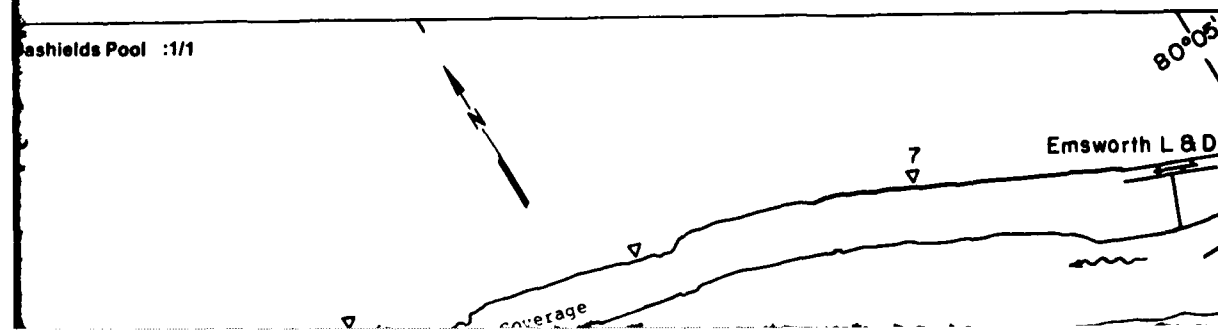
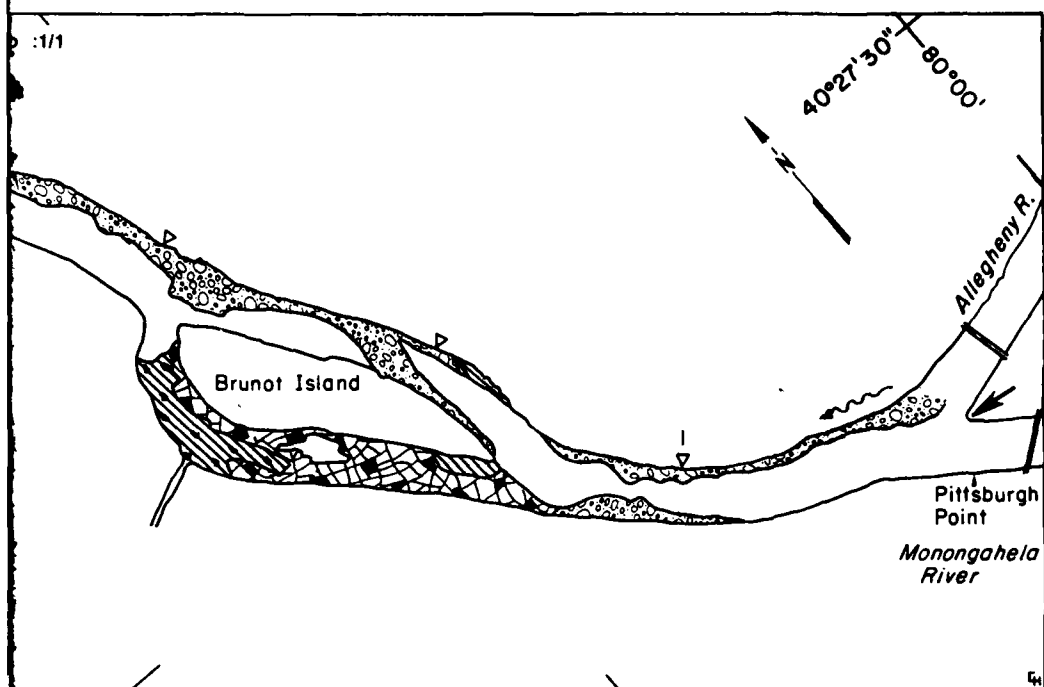






Emsworth Pool - Ohio

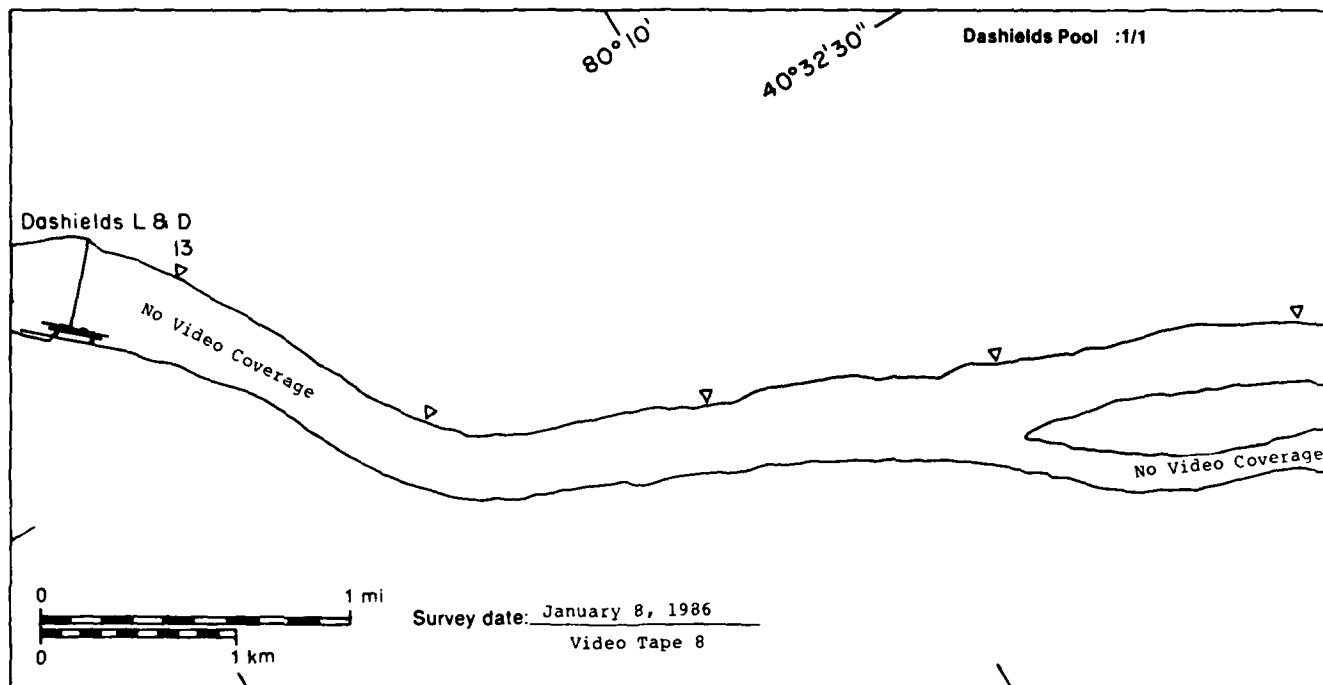
MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	1.20	NA
	Solid ice cover	0.07	NA
	Solid ice cover with open-water areas	0.15	90
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.39	80
	Ice floes or frazil slush and pans	0.65	40
Total area ($m^2 \times 10^6$)		4.49*	* Includes $2.03 \times 10^6 m^2$ of no video coverage

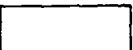




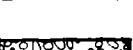


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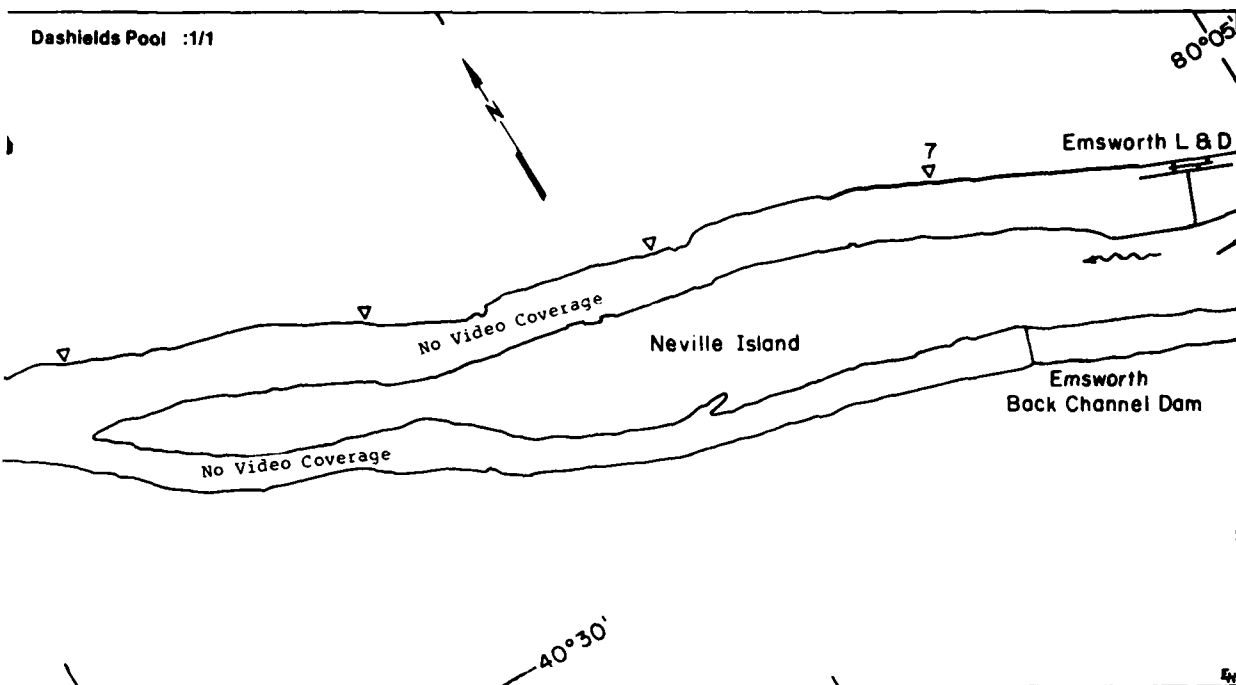


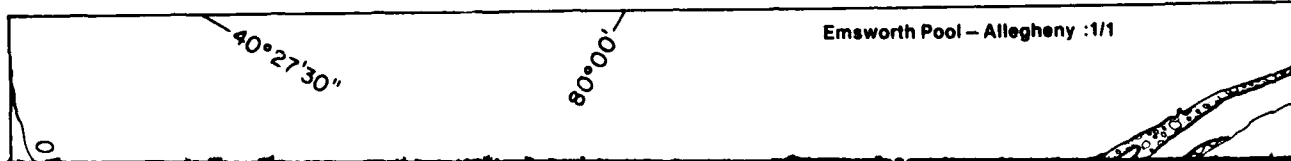
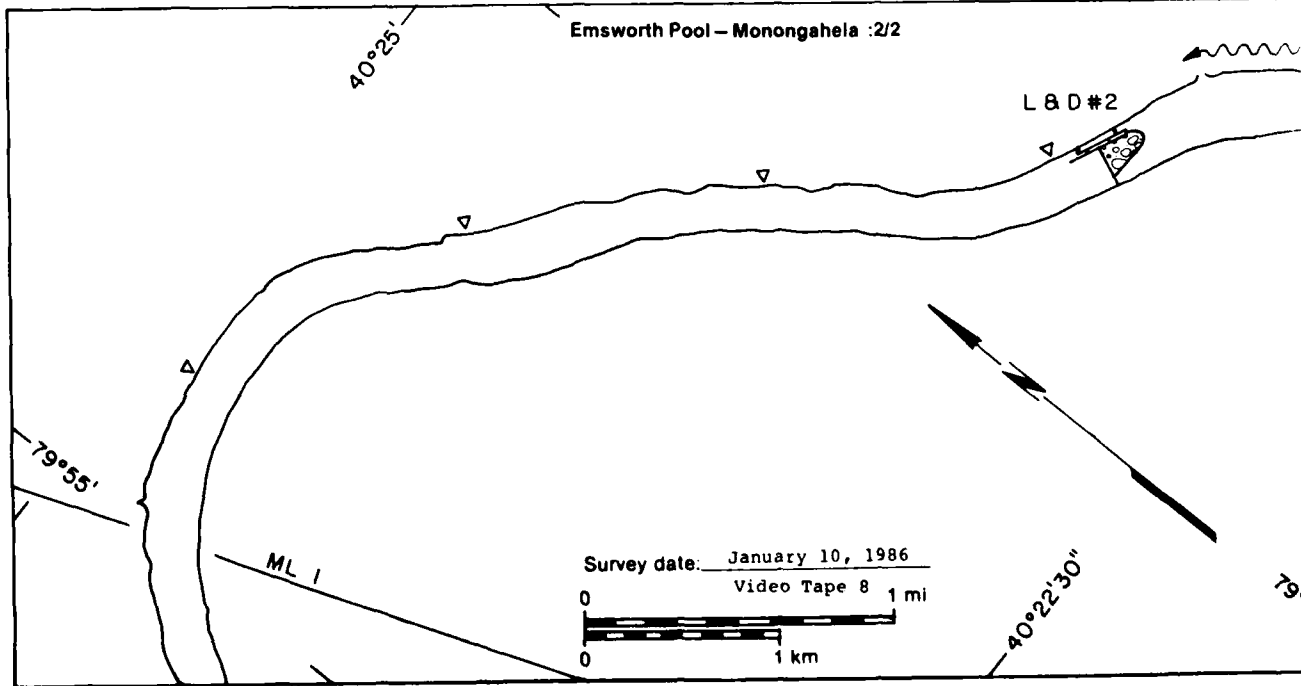
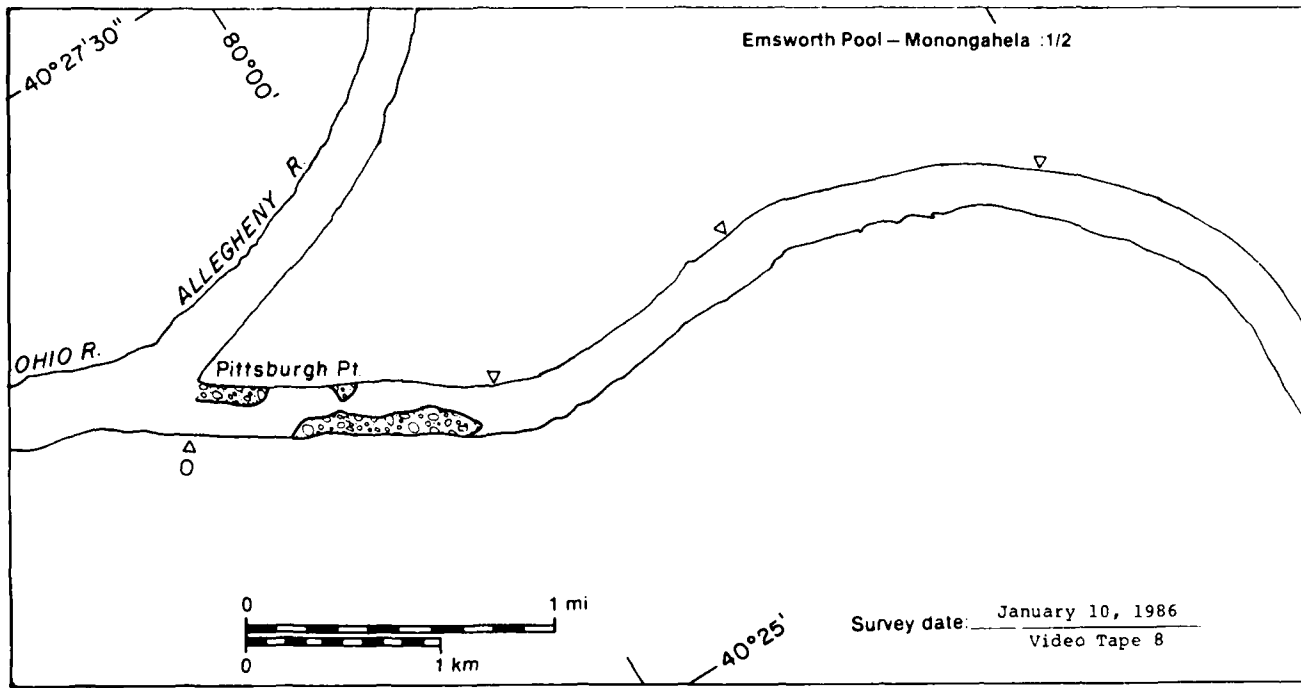
	Solid ice cover with open-water areas	0.15	90
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.39	80
	Ice floes or frazil slush and pans	0.65	40
Total area ($m^2 \times 10^6$)		4.49*	* Includes $2.03 \times 10^6 m^2$ of no video coverage



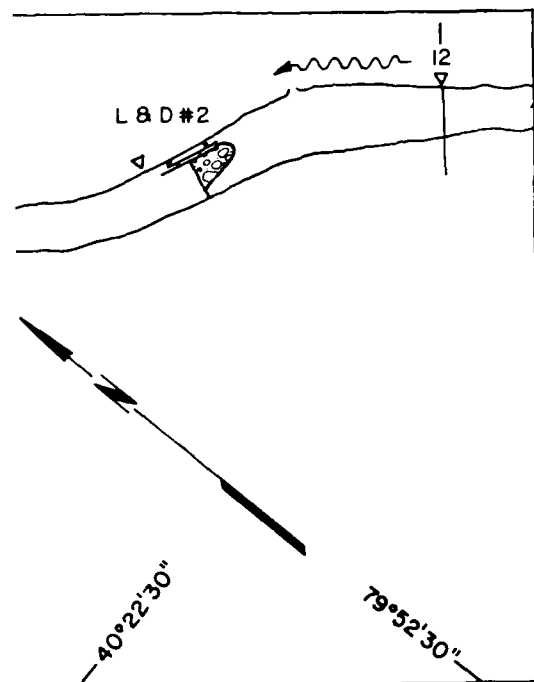
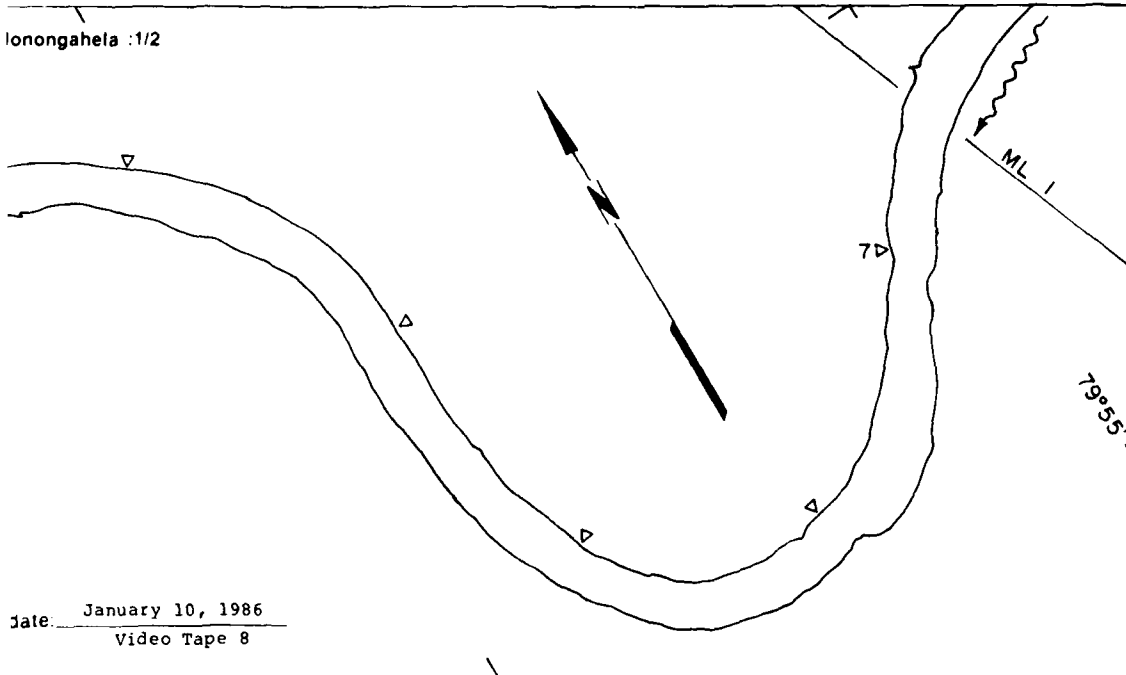
MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	0.00	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		5.00*	* Includes $5.00 \times 10^6 m^2$ of no video coverage

Dashields Pool :1/1



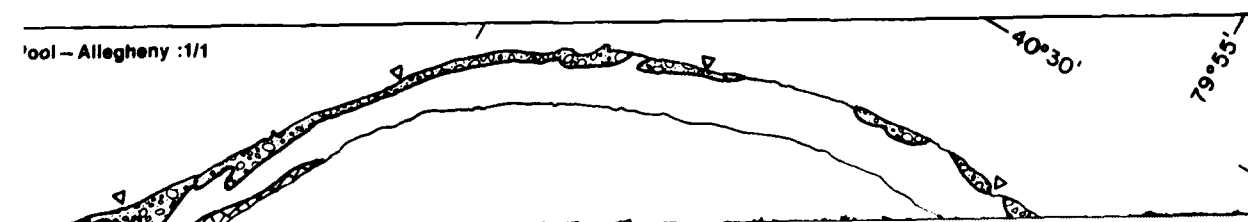


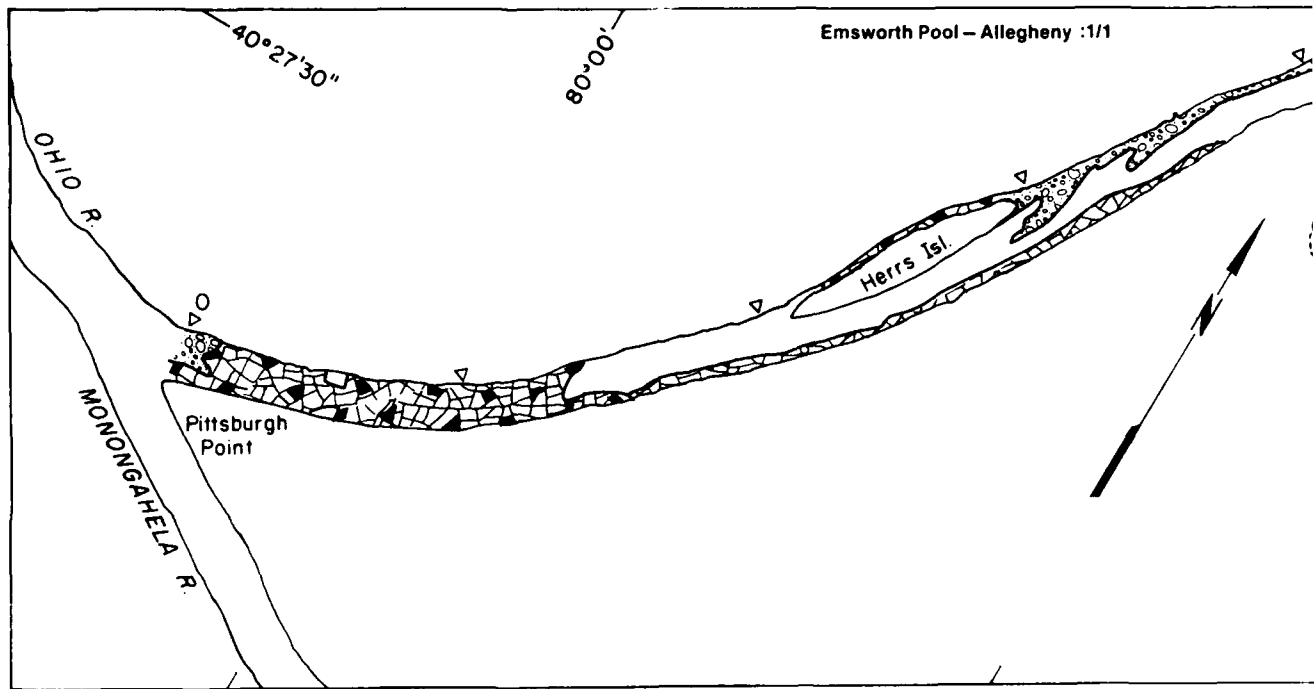
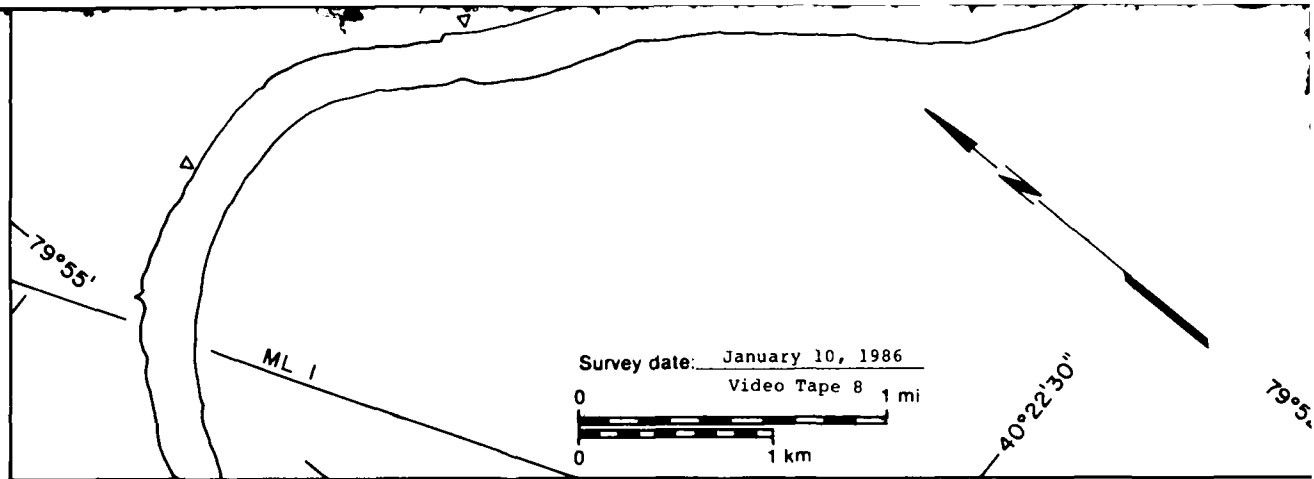
10 January 1986



Emsworth Pool - Monongahela

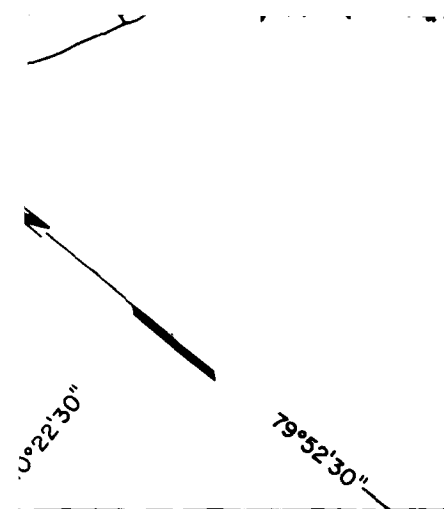
MAP UNITS		Area (m ² x 10 ⁶)	Surface concentration (%)
	Open water	4.95	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open water areas	0.00*	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open water areas	0.00	—
	Ice floes or frazil slush and pans	0.21	60
Total area (m ² x 10 ⁶)		5.16	











◊ Emsworth Pool - Allegheny

MAP SYMBOL	Area (m ² x 10 ⁶)	Surface ice concentration (%)
Open water	2.02	NA
Solid ice cover	0.00	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.16	NA
Fragmented ice cover with open water areas	0.48	90
Ice floes or frazil slush and pans	0.41	60
Total area (m ² x 10 ⁶)	3.07	



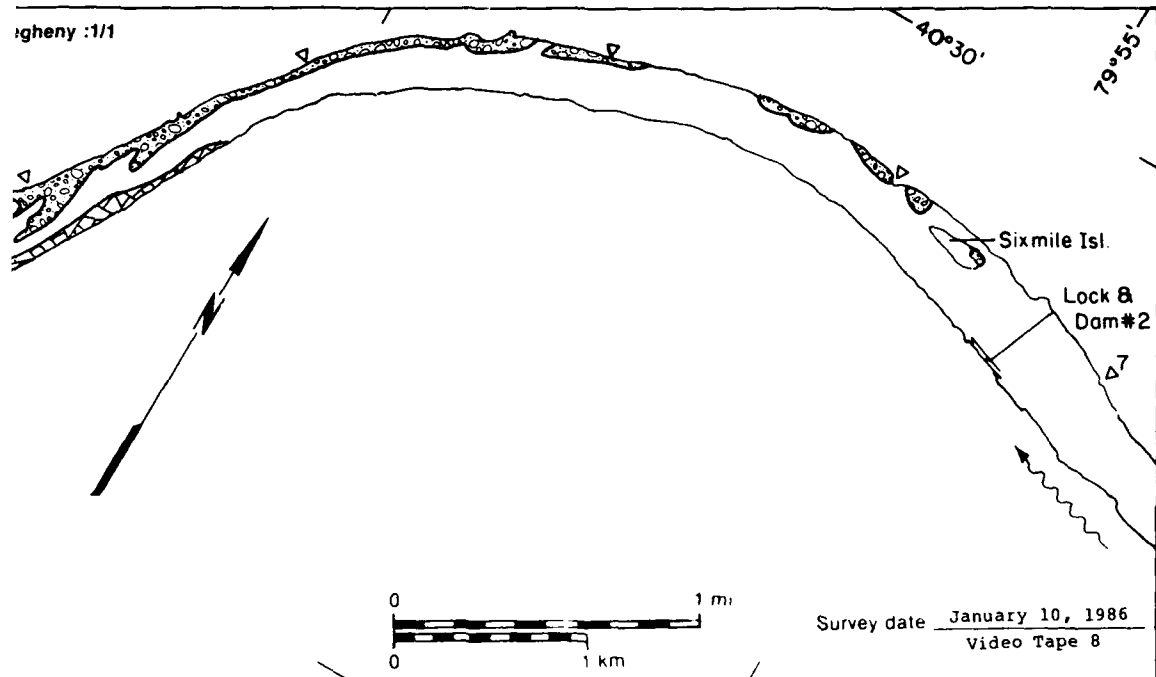
Emsworth Pool - Monongahela

MAP UNITS

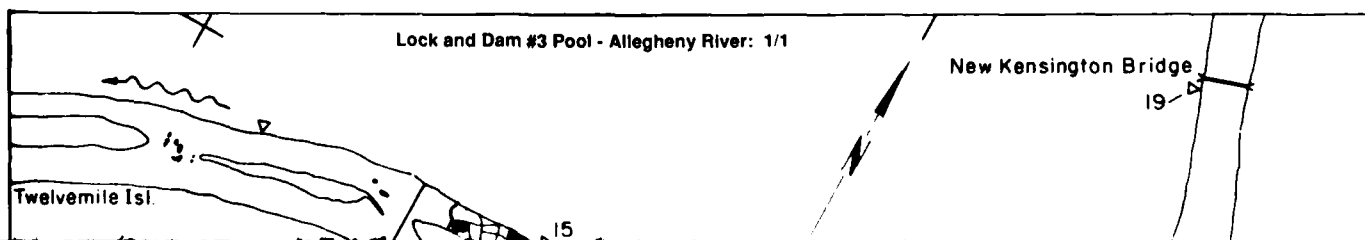
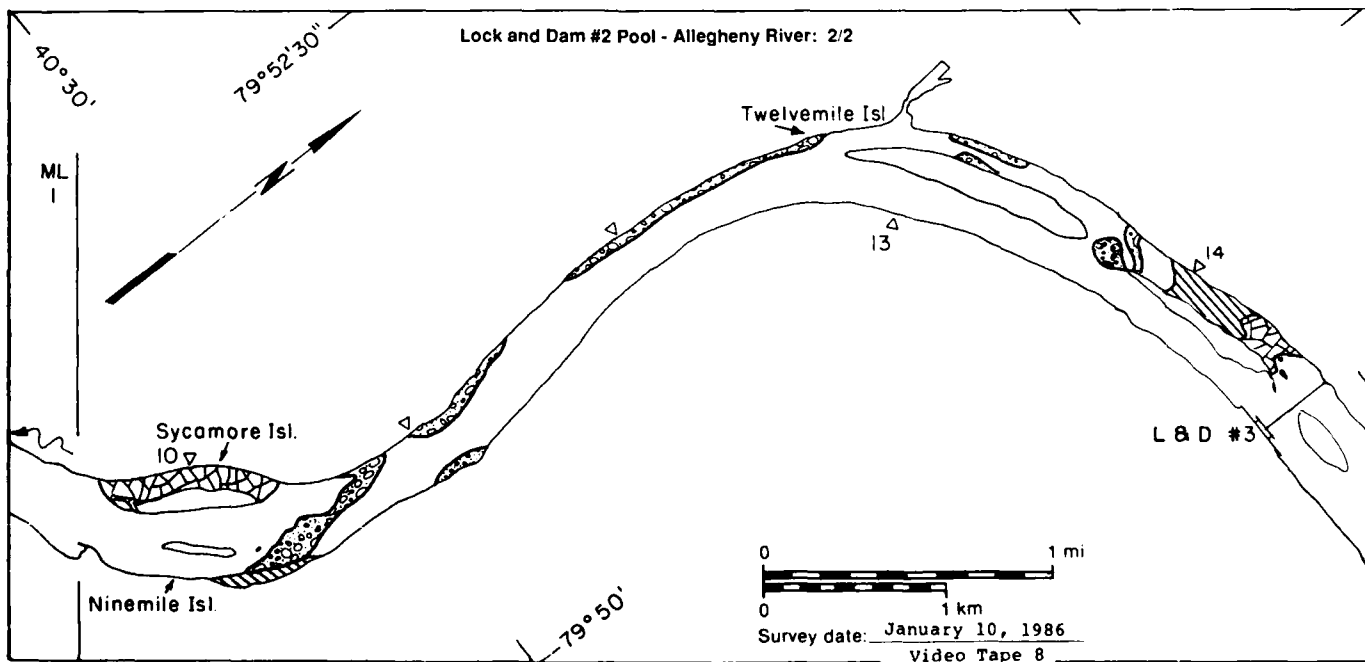
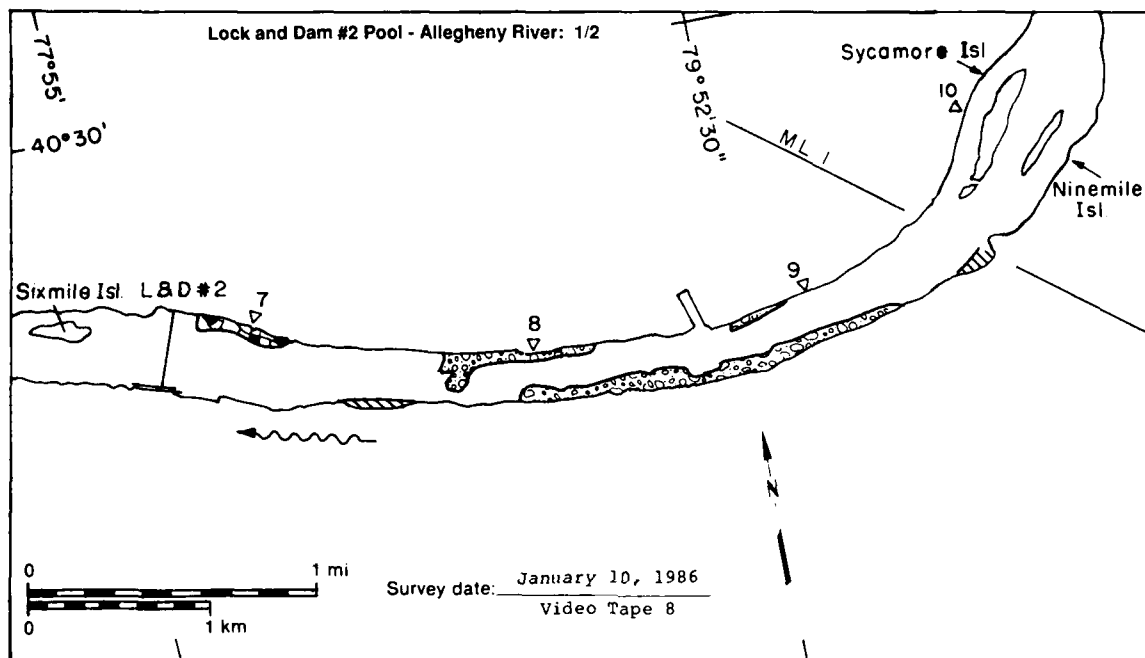
-  Open water
-  Solid ice cover
-  Solid ice cover with open water areas
-  Fragmented ice cover
-  Fragmented ice cover with open water areas
-  Ice floes or frazil slush and pans

Area (m ² x 10 ⁶)	Surface contamination level
4.95	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
0.21	60

Total area (m² x 10⁶) 5.16








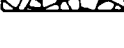
10 January 1986





New Kensington Bridge

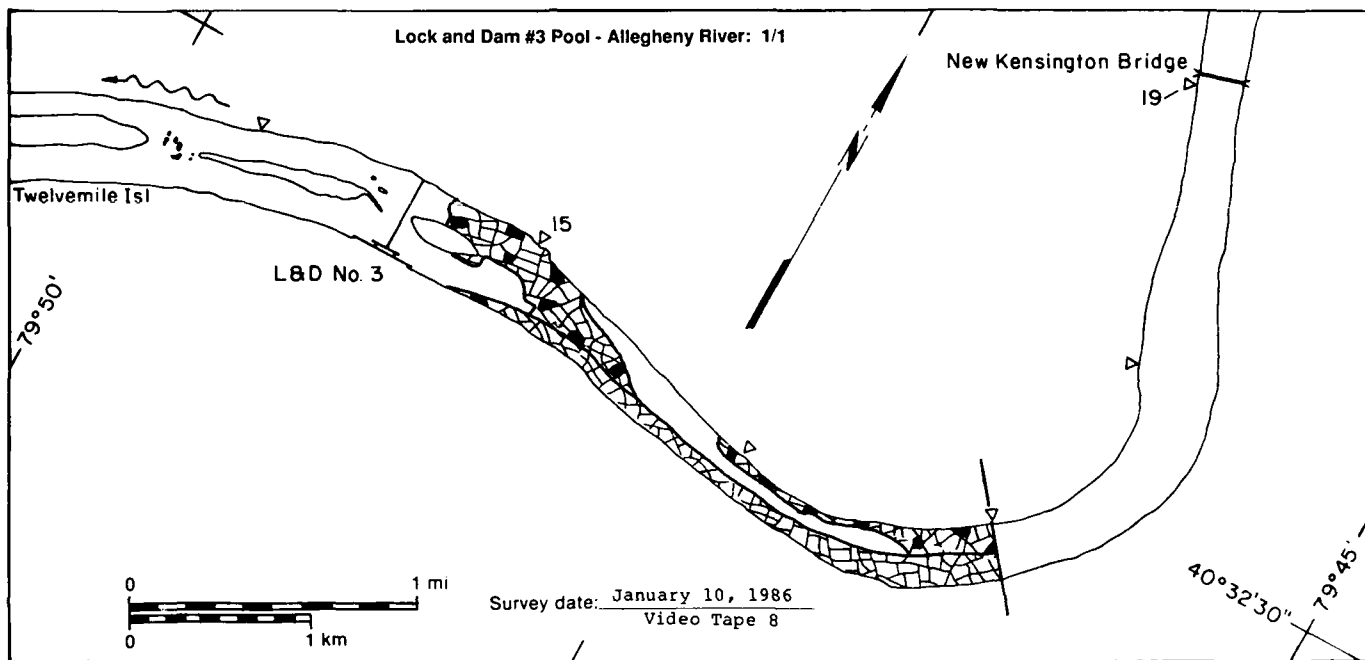
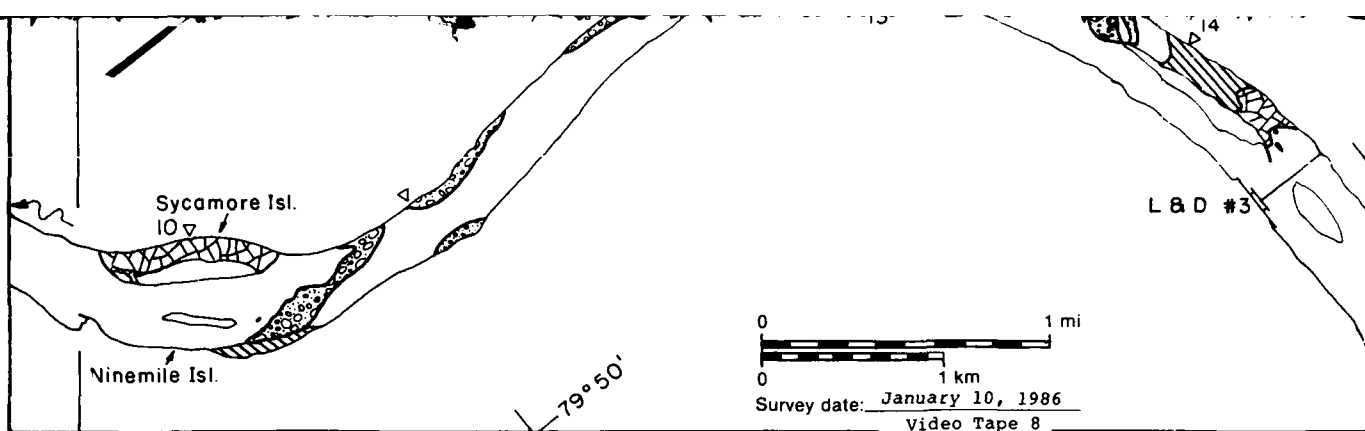
19

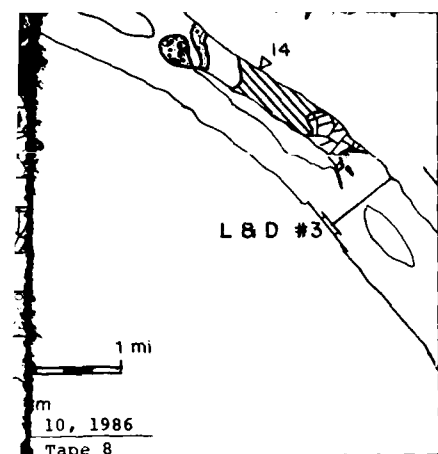
Lock and Dam #2 Pool

MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	3.07	NA
	Solid ice cover	0.14	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.15	NA
	Fragmented ice cover with open-water areas	0.05	90
	Ice floes or frazil slush and pans	0.61	40
Total area ($m^2 \times 10^6$)		4.02	

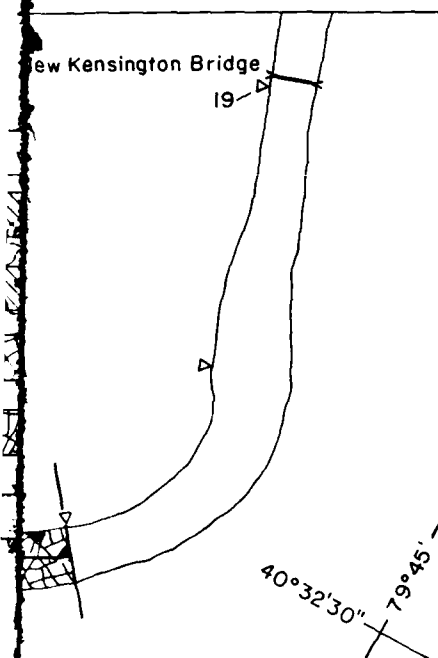
Lock and Dam #3 Pool

MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	0.39	NA
	Solid ice cover	0.00	NA





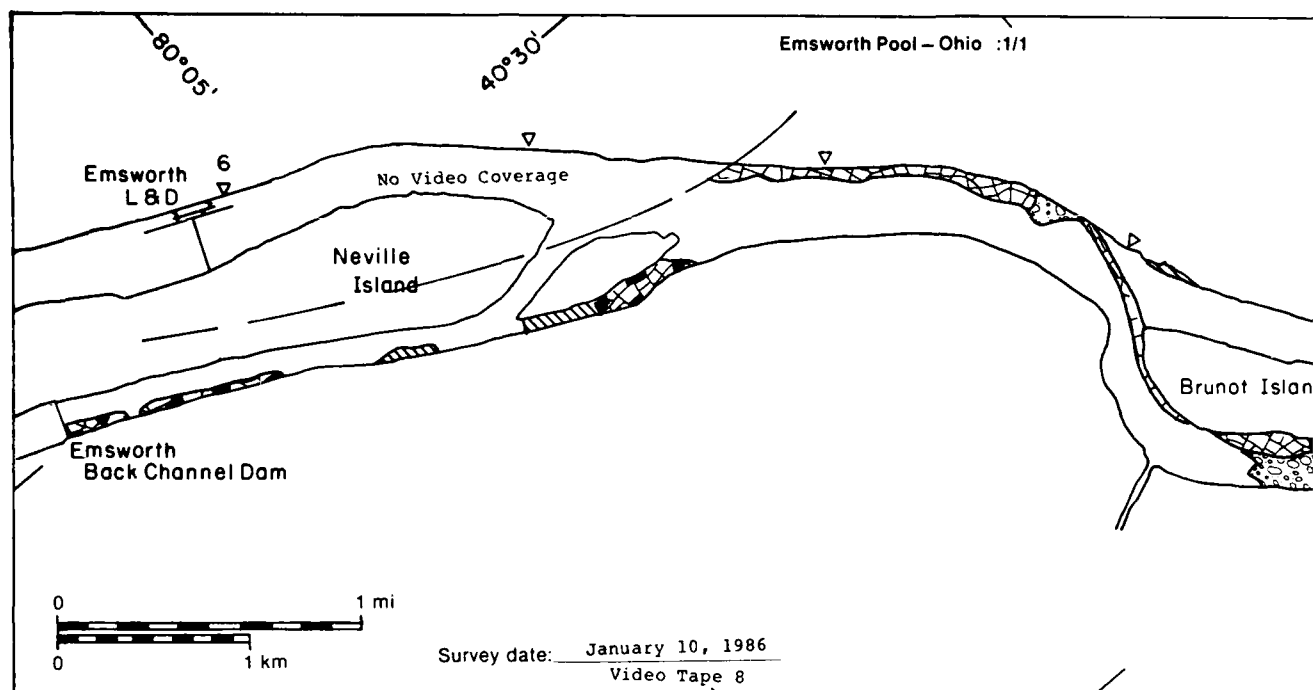
	Solid ice cover	0.14	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.15	NA
	Fragmented ice cover with open-water areas	0.05	90
	Ice floes or frazil slush and pans	0.61	40
Total area ($m^2 \times 10^6$)		4.02	



Lock and Dam #3 Pool

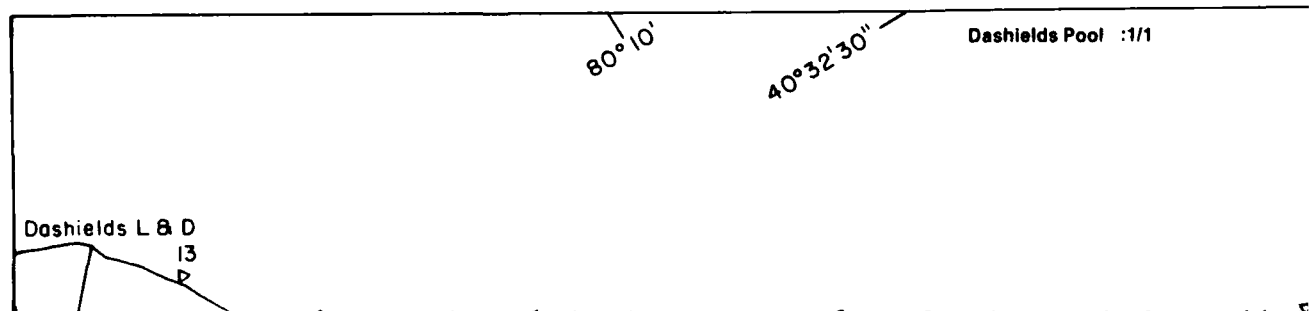
MAP UNITS

		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	0.39	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.40	NA
	Fragmented ice cover with open-water areas	0.35	90
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		1.14	

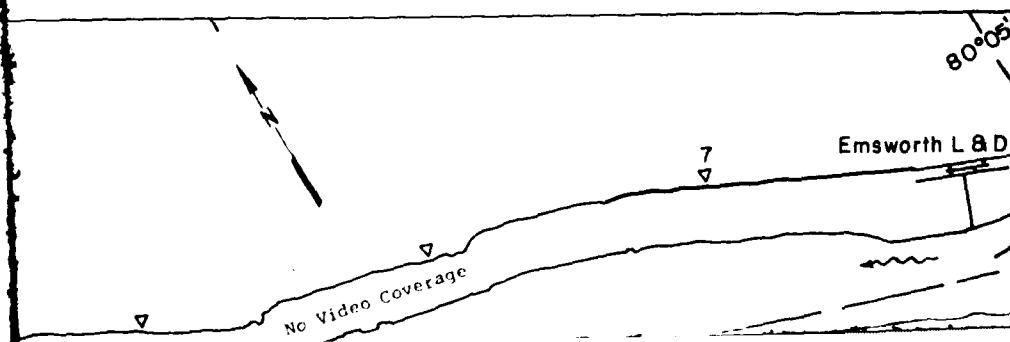
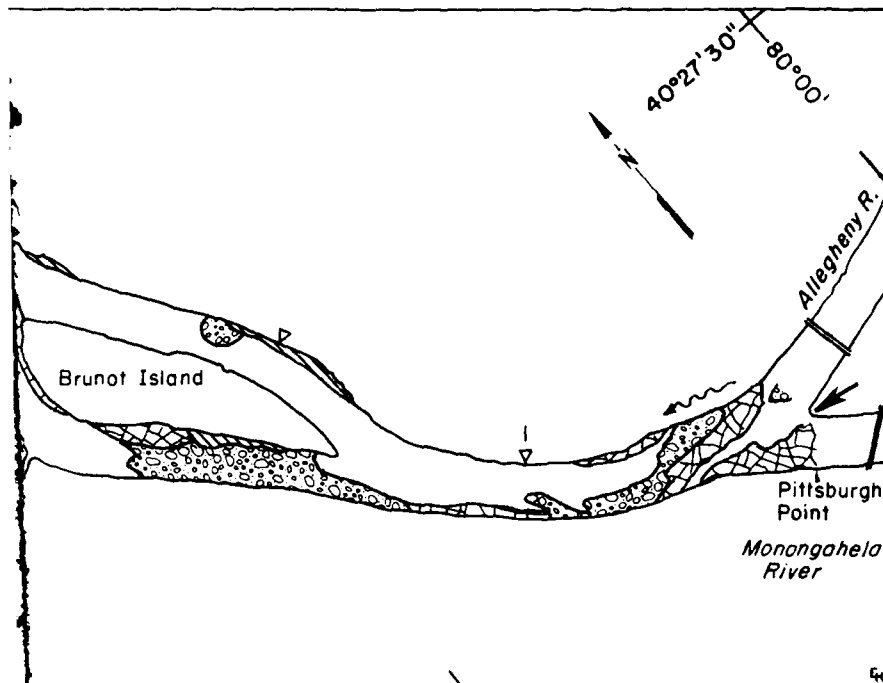






Emsworth Pool - Ohio

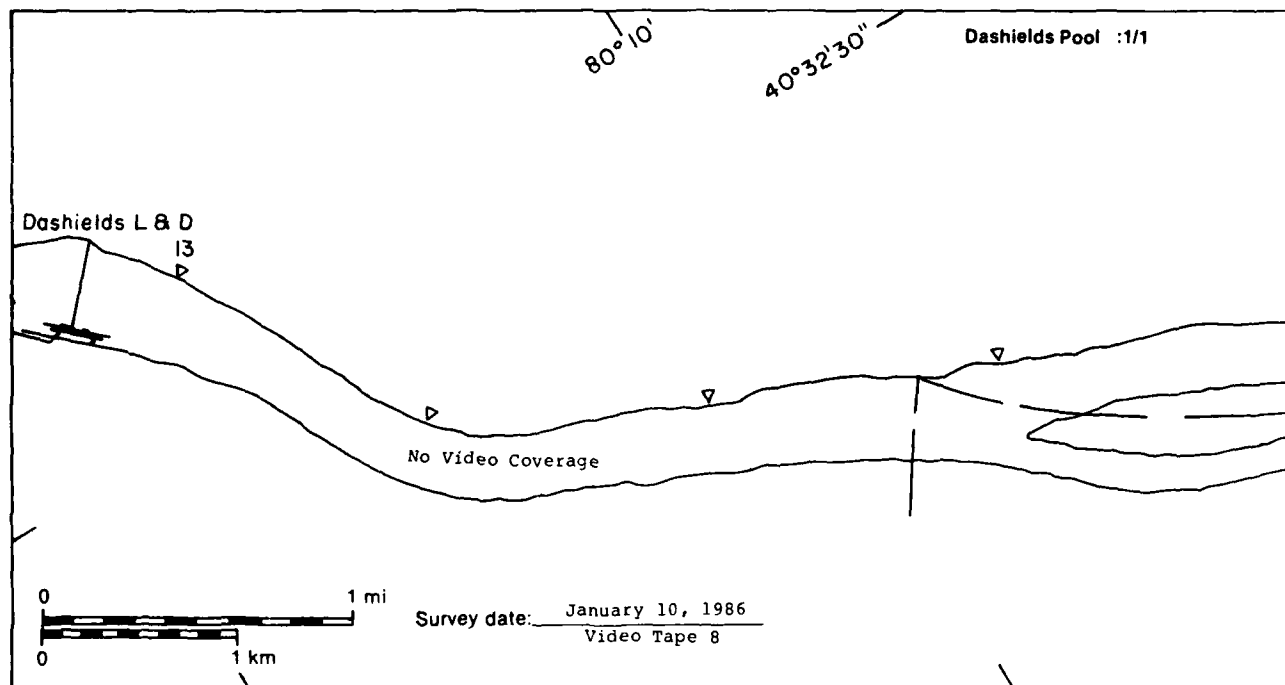
MAP UNITS		Area (m ²)	Surface concentration (%)
	Open water	2.53	NA
	Solid ice cover	0.14	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.53	NA
	Fragmented ice cover with open-water areas	0.06	80
	Ice floes or frazil slush and pans	0.38	10
Total area (m ²)		4.49*	* Includes 0.85×10^6 m ² of no video coverage









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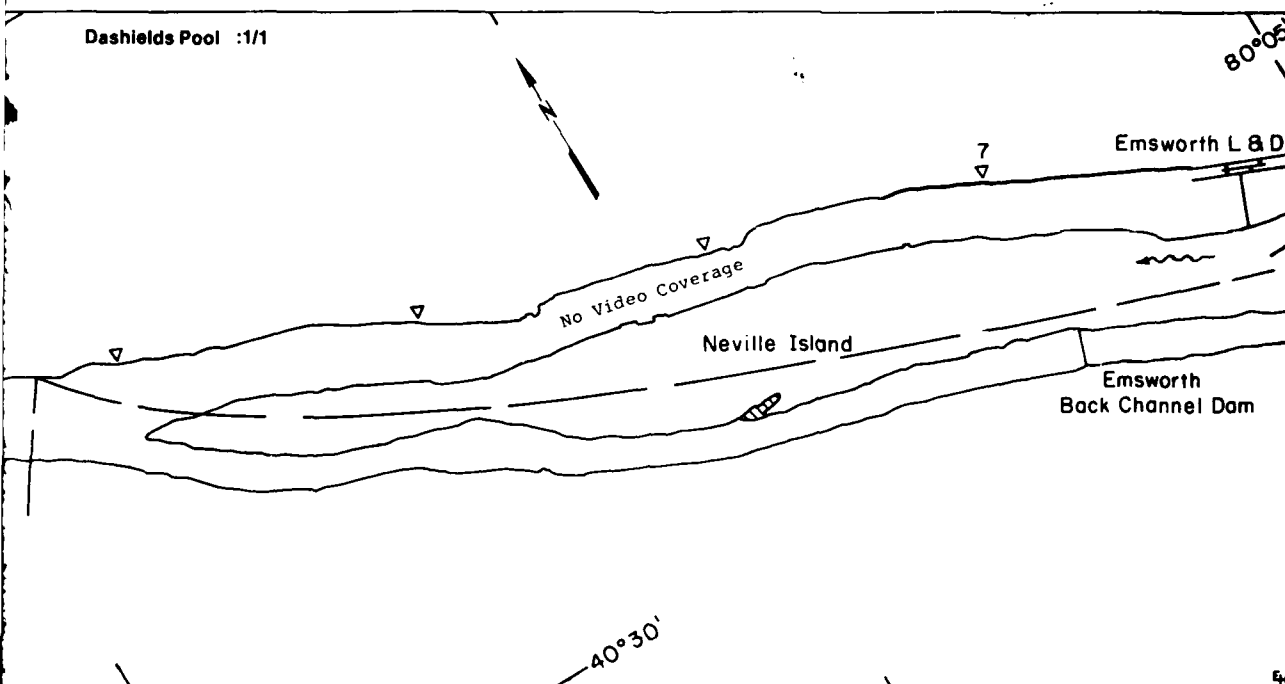


	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.53	NA
	Fragmented ice cover with open-water areas	0.06	80
	Ice floes or frazil slush and pans	0.38	10
Total area (m ²)		4.49*	* Includes 0.85×10^6 m ² of no video coverage

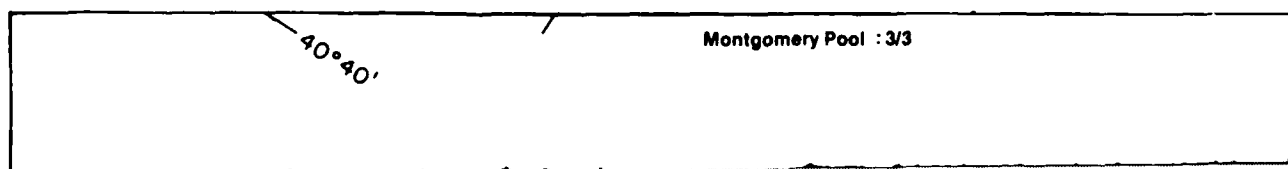
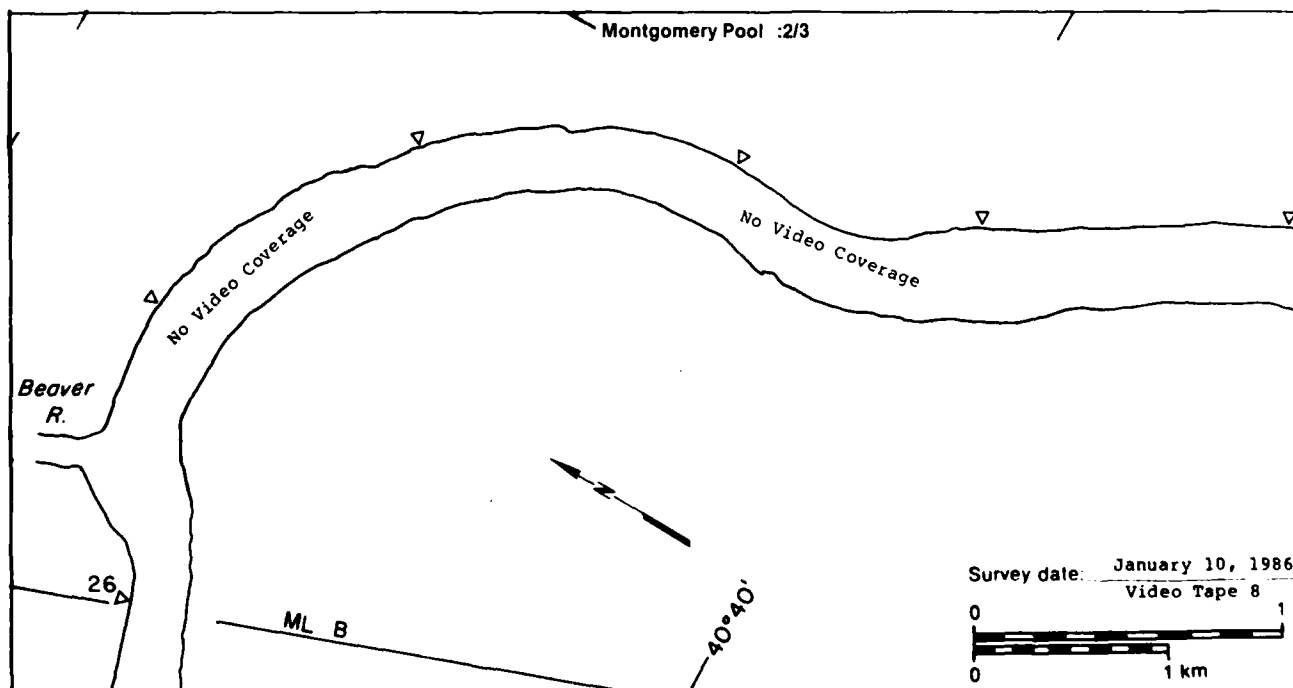
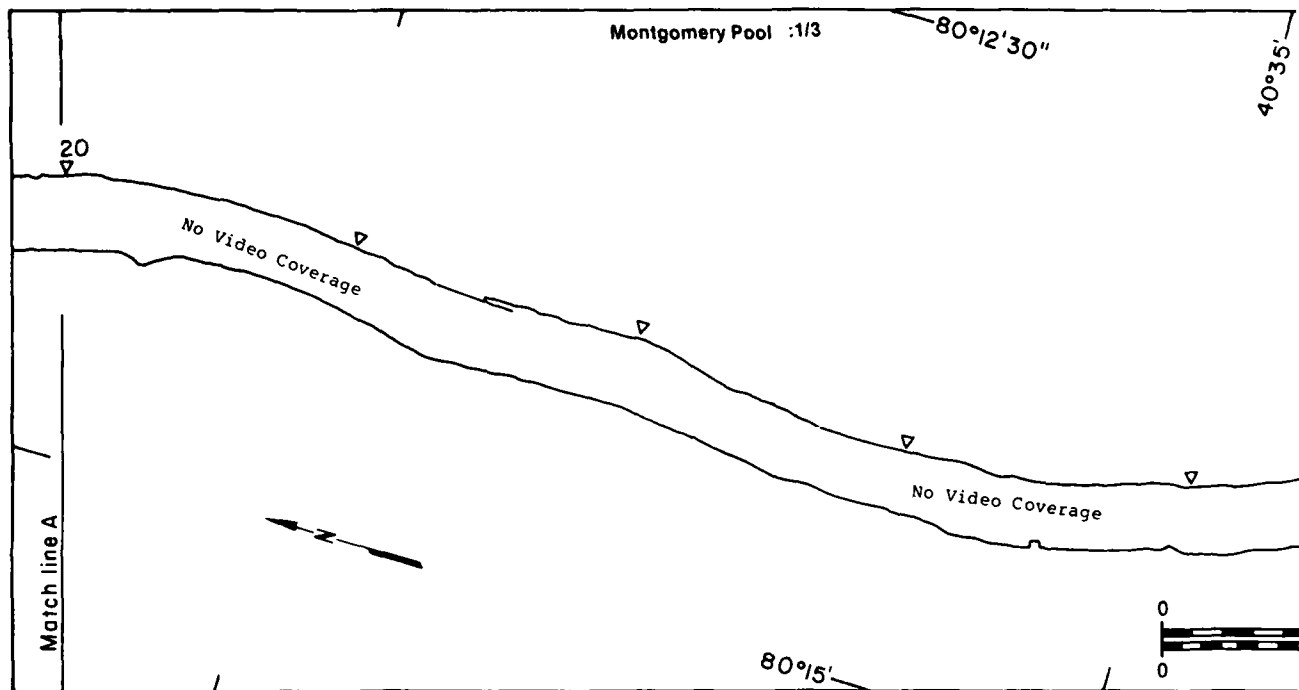


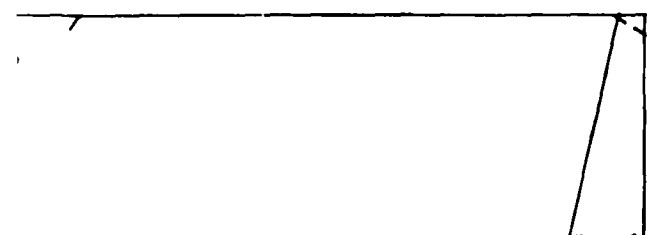
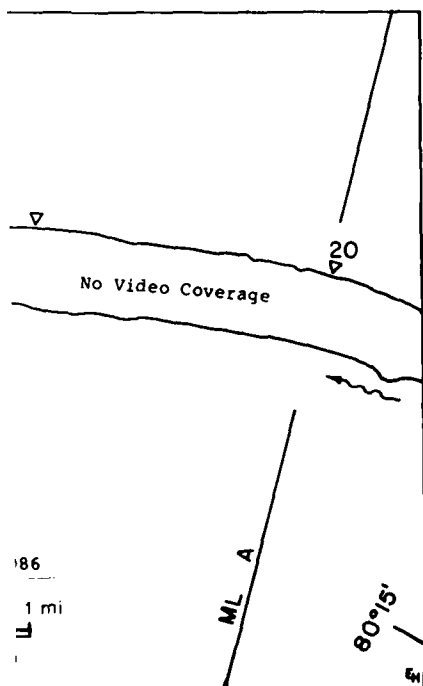
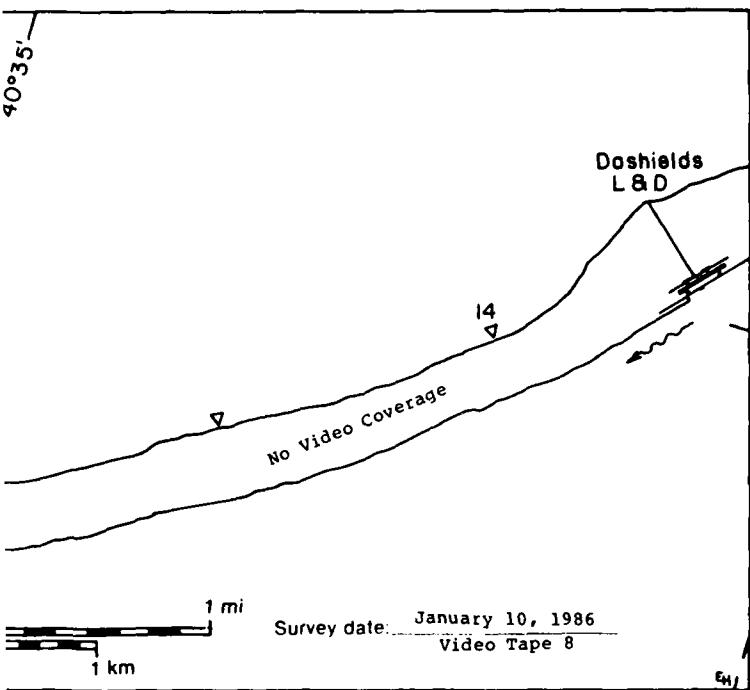
Dashields Pool		Area (m ² × 10 ⁶)	Surface concentration (%)
MAP UNITS			
	Open water	1.24	NA
	Solid ice cover	0.02	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area (m ² × 10 ⁶)		5.00*	* Includes 3.74 × 10 ⁶ m ² of no video coverage

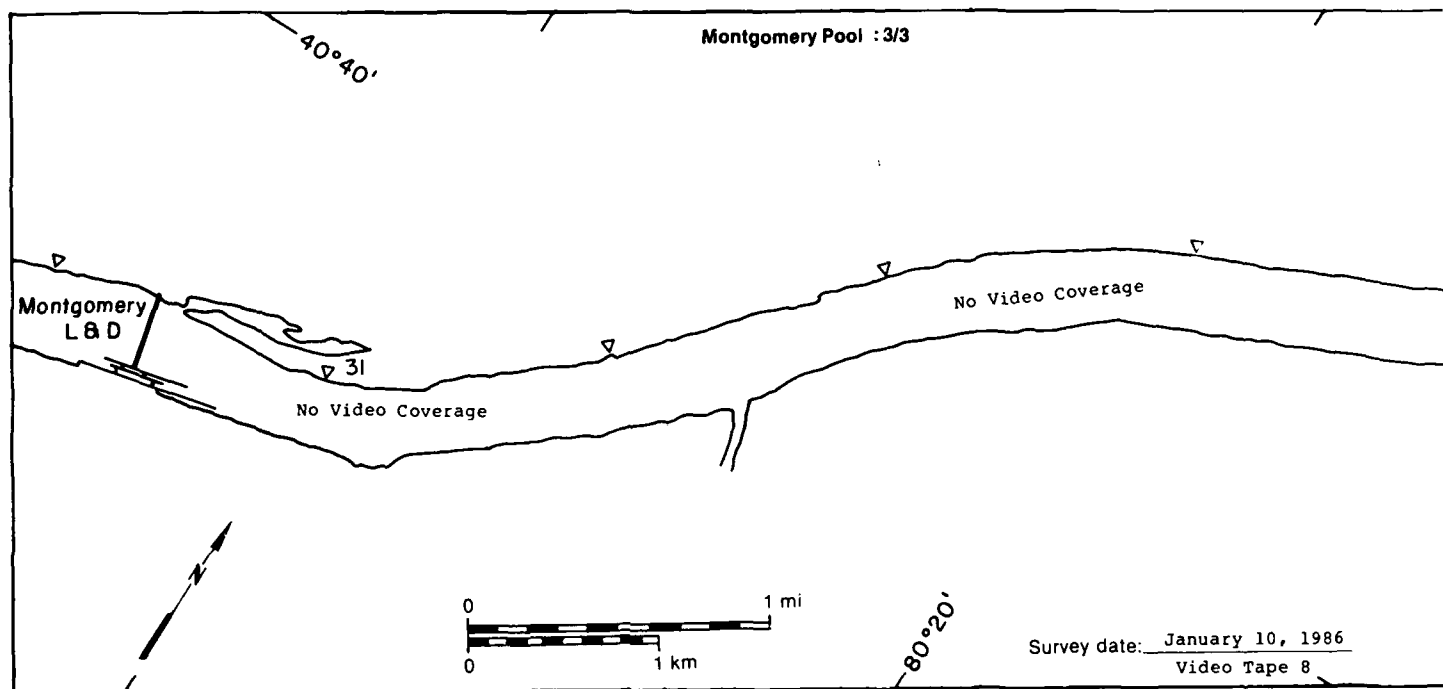
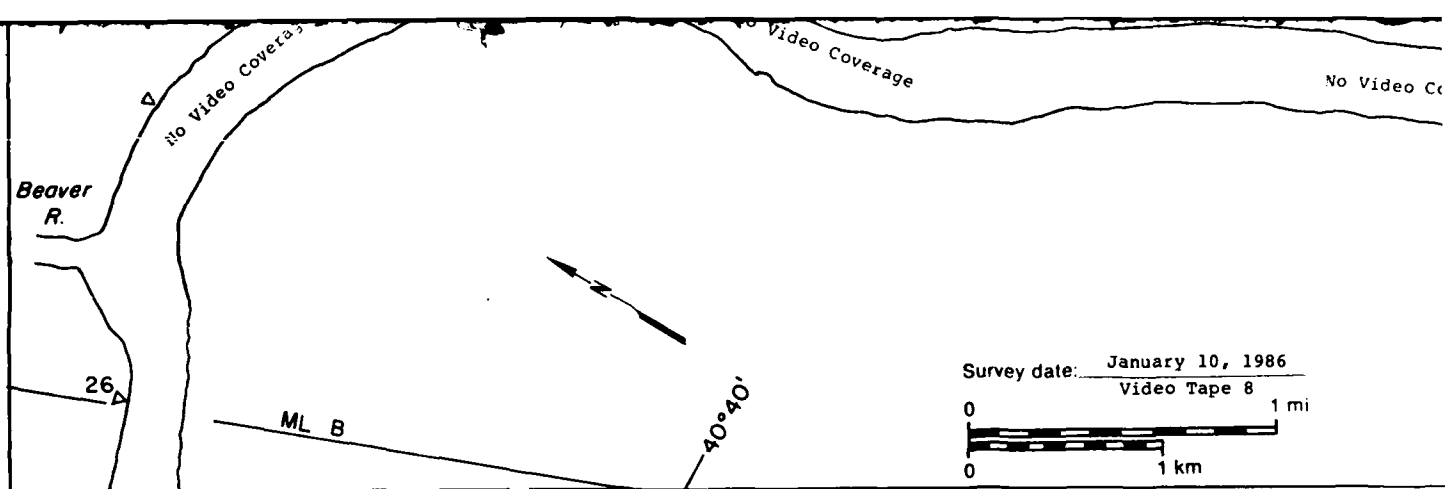
Dashields Pool :1/1



10 January 1986



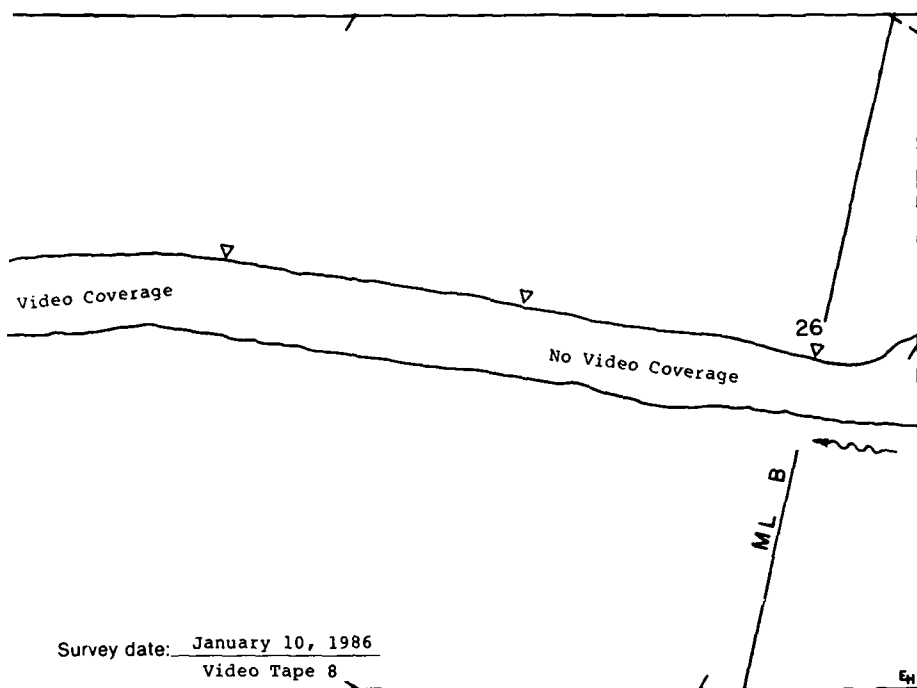
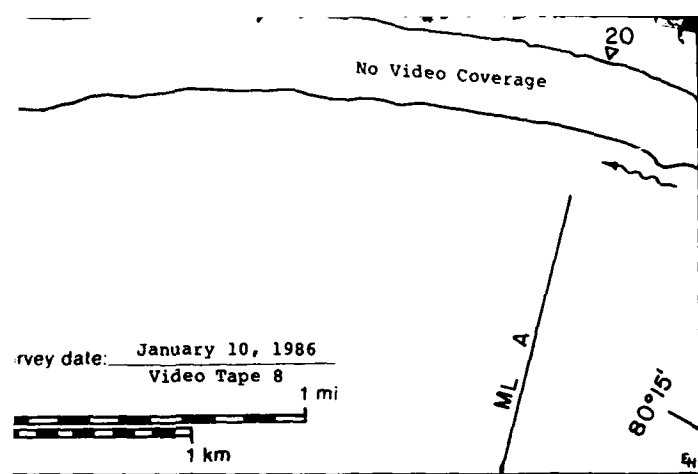


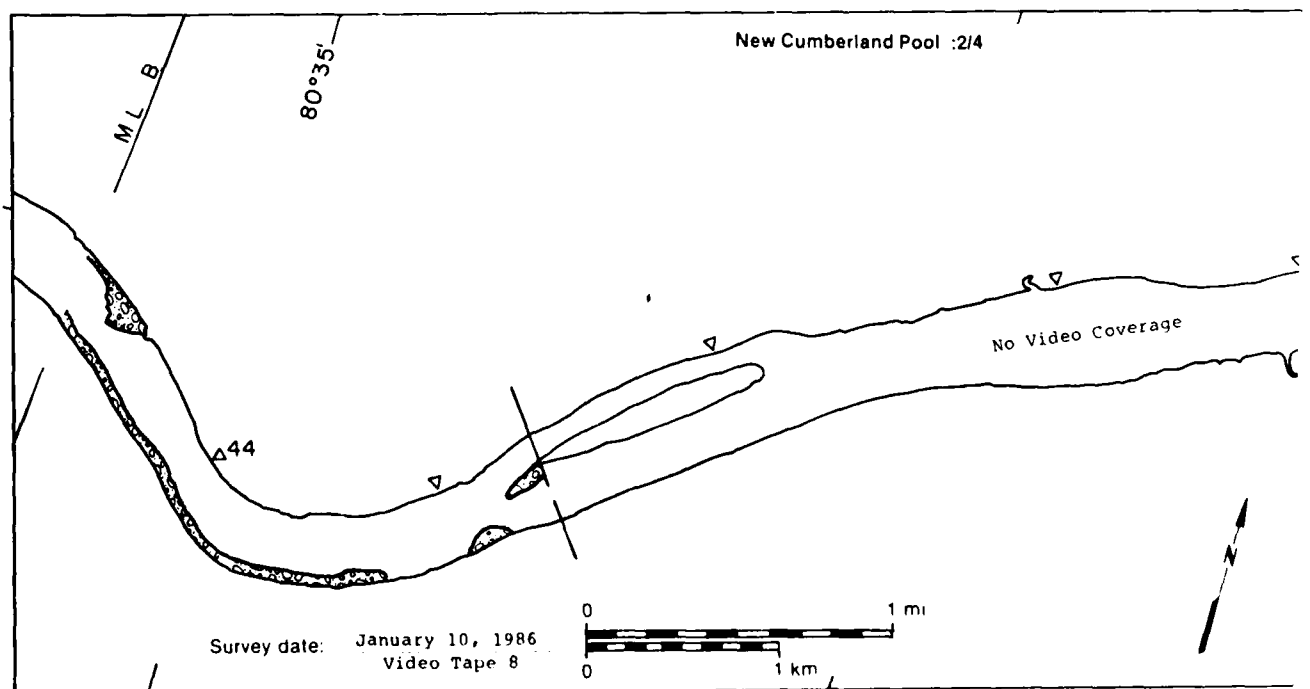
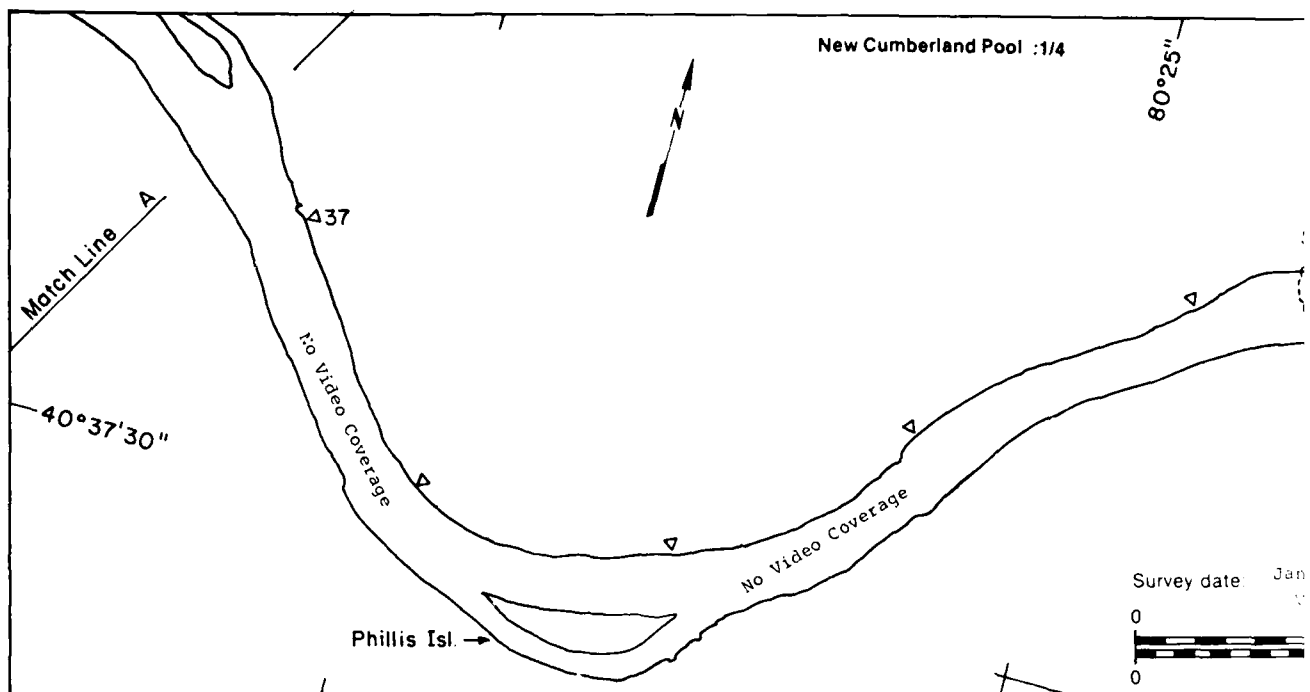


Montgomery Pool

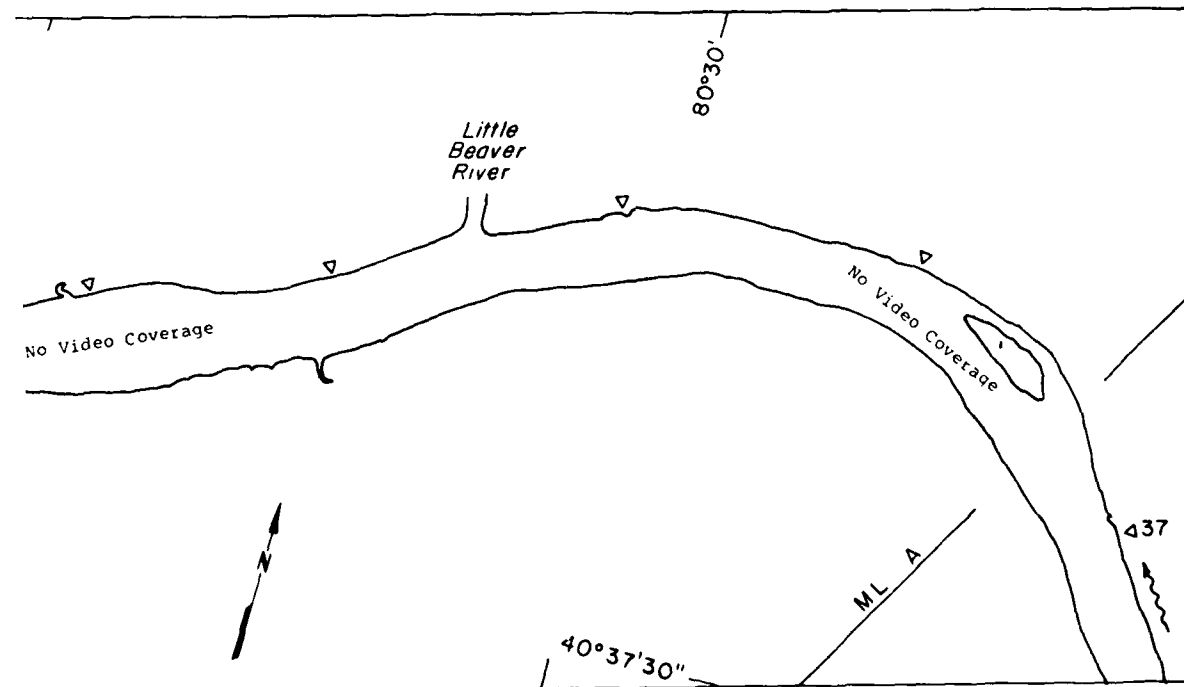
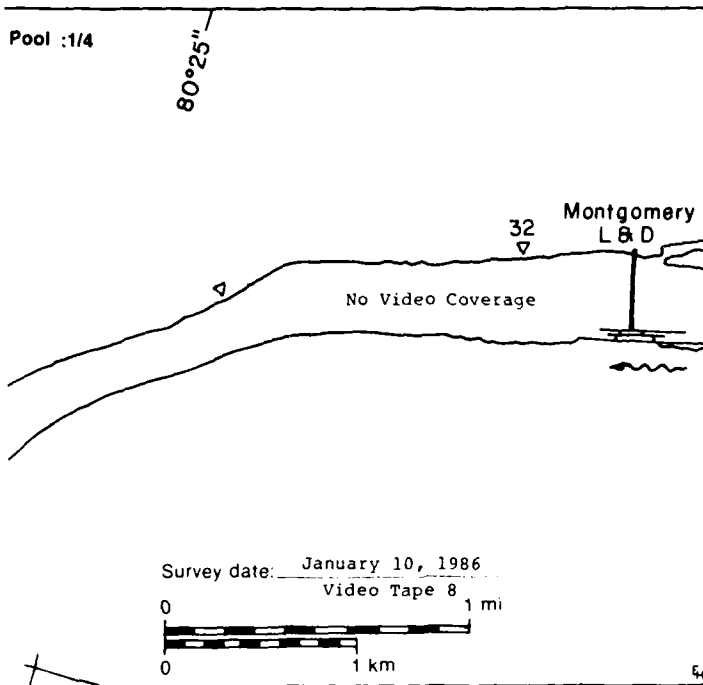
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	0.00	NA
Solid ice cover	0.00	NA
Solid ice cover with open-water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open-water areas	0.00	—
Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)	11.27*	

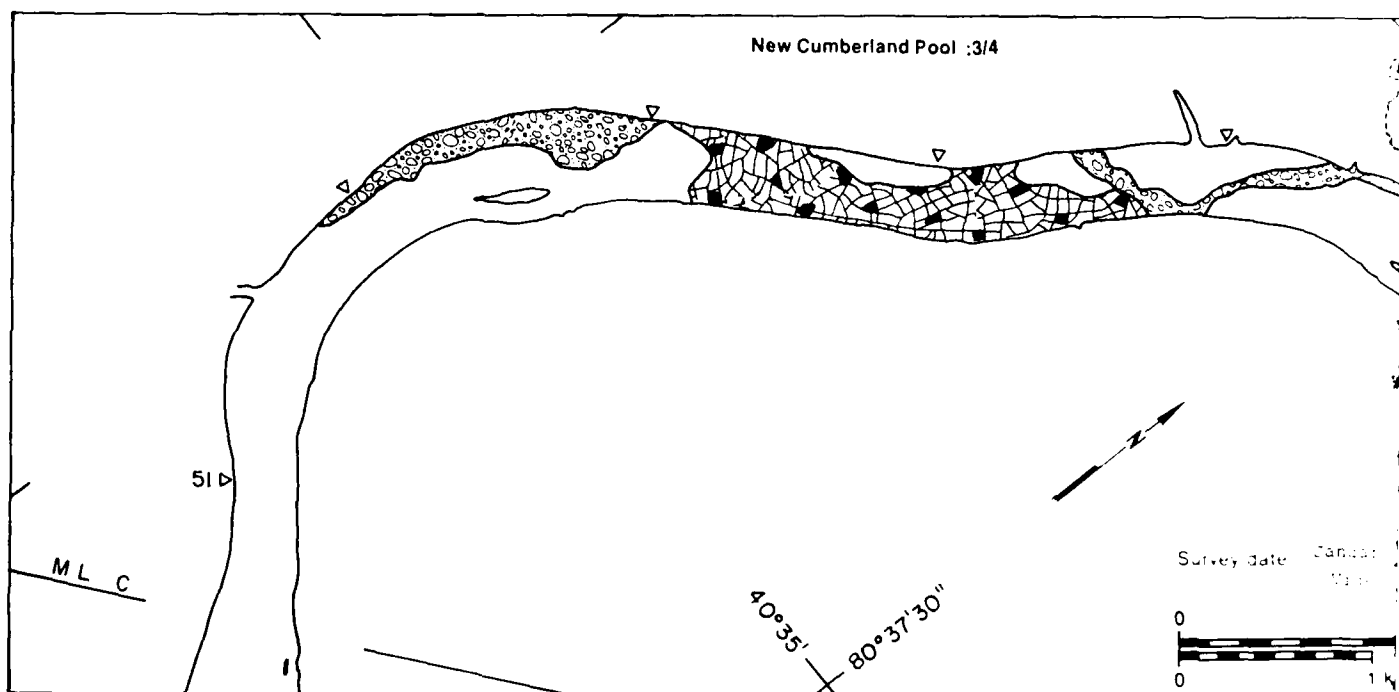
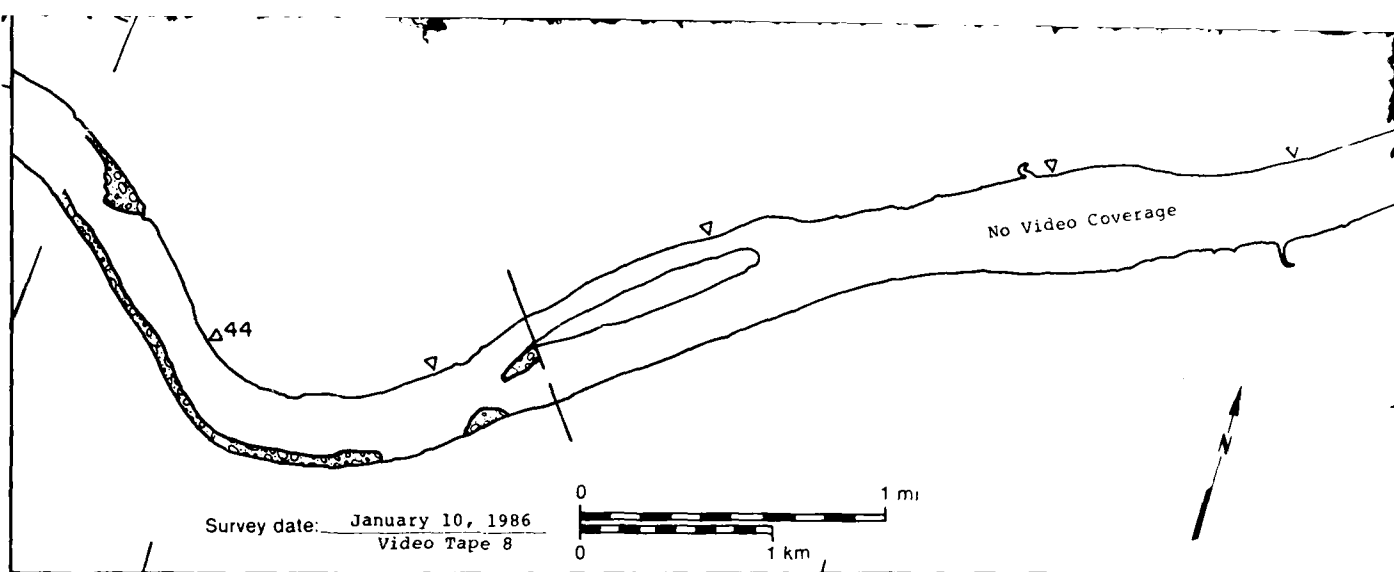
* Includes $11.27 \times 10^6 m^2$
of no video coverage

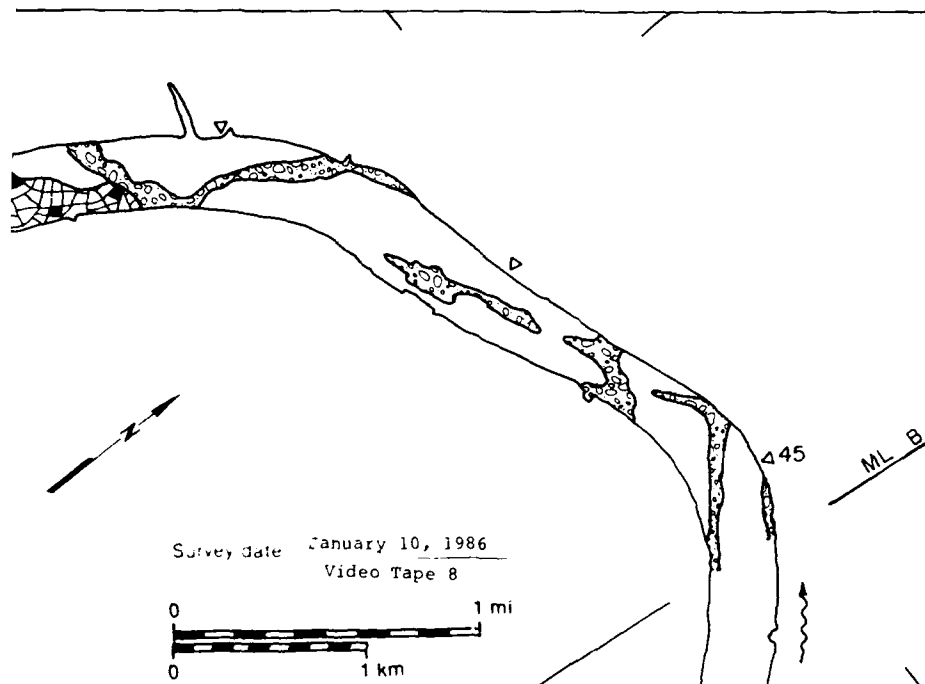
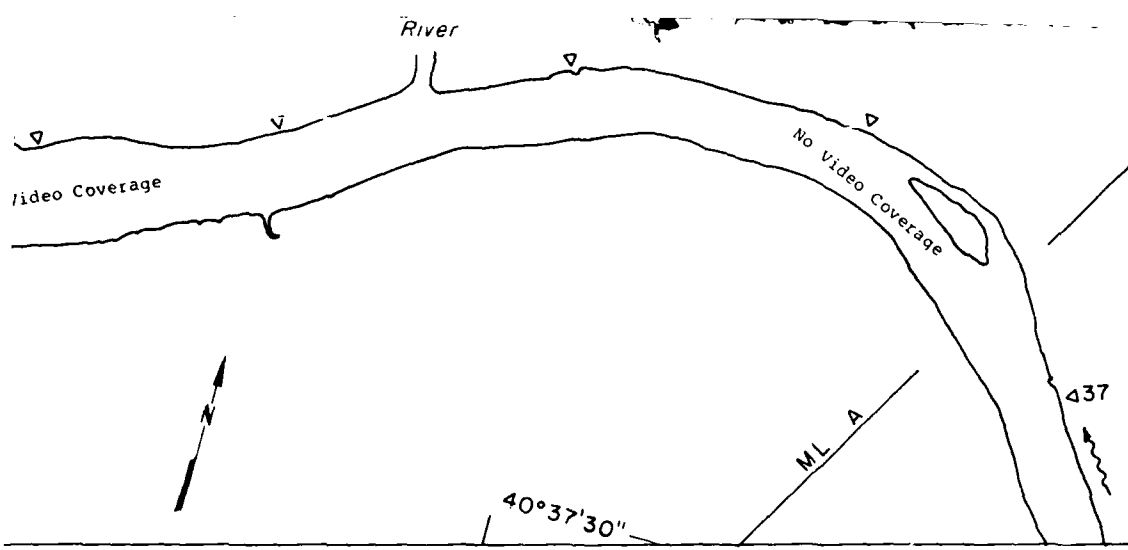




10 January 1986







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ICE ATLAS 1985 - 1986 MONONGAHELA RIVER ALLEGHENY RIVER

4/14

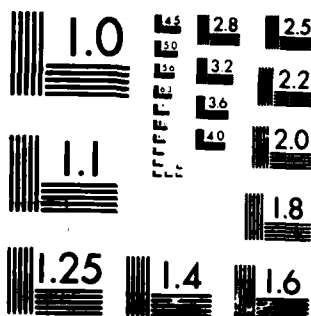
OHIO RIVER ILLINO. (U) COLD REGIONS RESEARCH AND

ENGINEERING LAB HANOVER NH L H CATTO ET AL. NOV 87

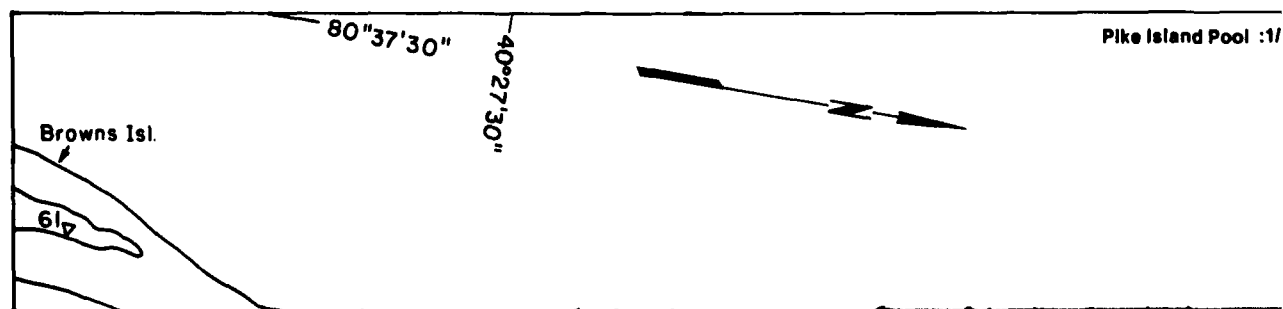
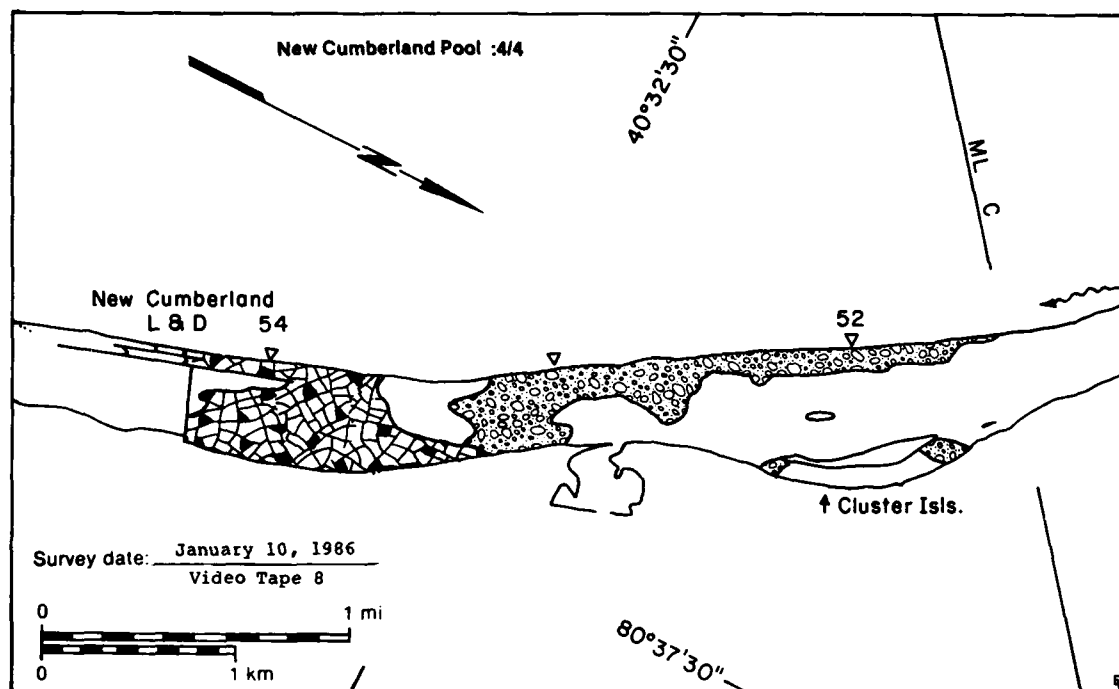
UNCLASSIFIED CRREL-SP-87-28

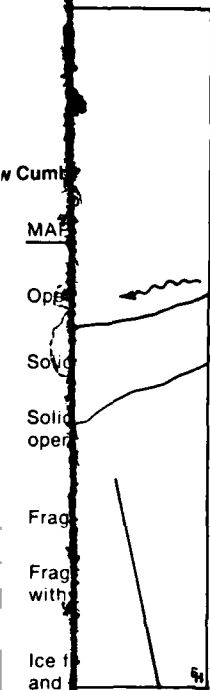
F/G 8/12

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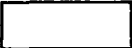


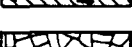
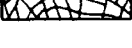

10 January 1986





New Cumberland Pool

MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Area
(m² x 10⁶)

Surface
concentration
(%)

5.37	NA
0.00	NA
0.00	—
0.00	NA
1.32	90
1.43	20

Total area (m² x 10⁶)

14.87*

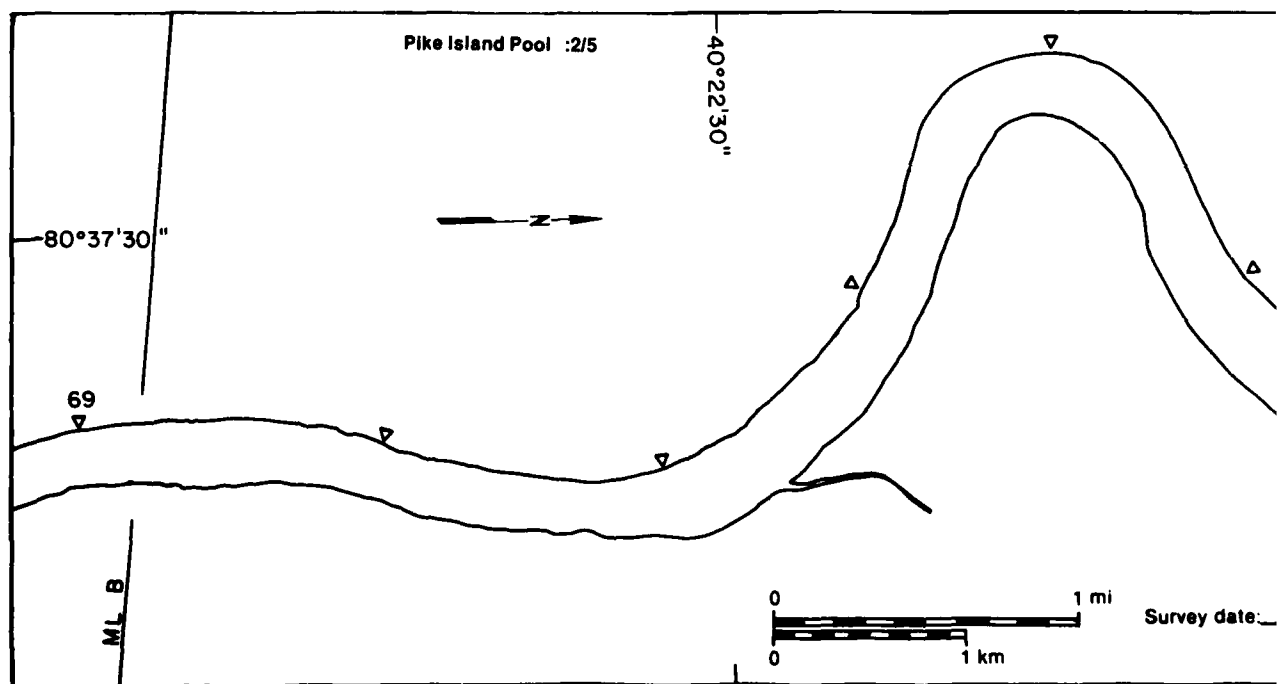
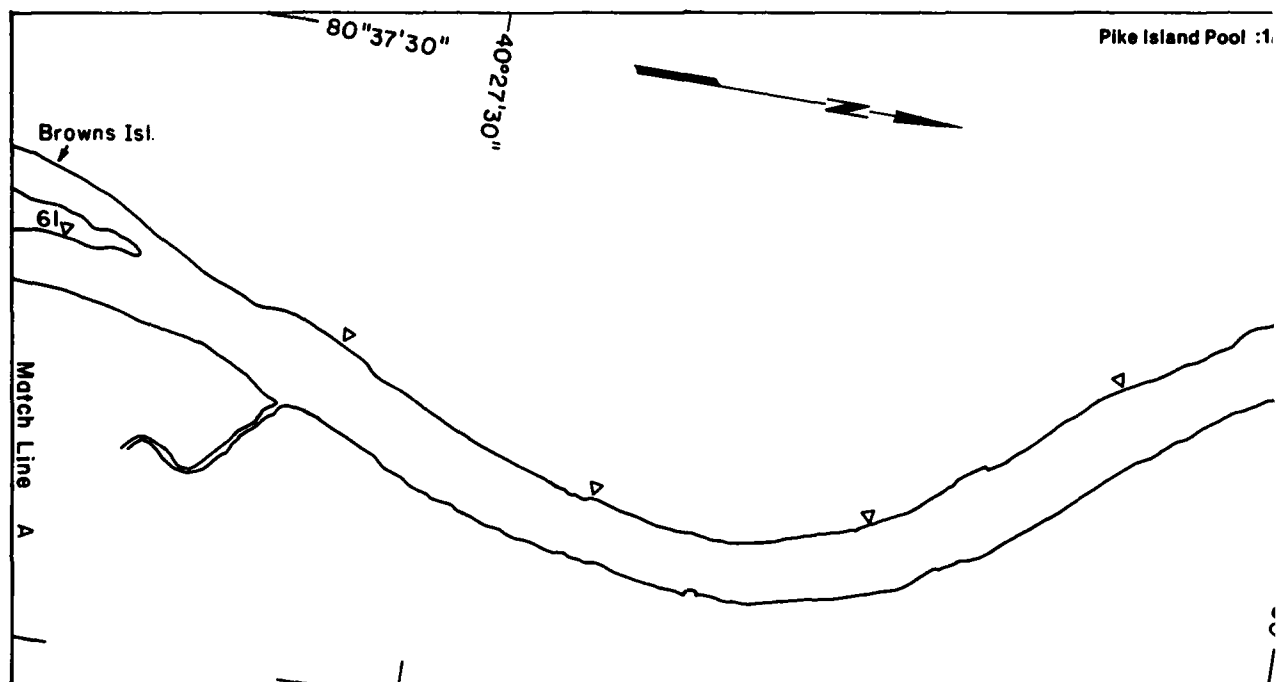
* Includes 6.75 x 10⁶ m² of no video coverage

Pike Island Pool :1/5

New Cumberland
L & D

54

55



Pike Island Pool :1/5

New Cumberland
L & D

54

55

40°30'

0

1 mi

Survey date: January 10, 1986

Video Tape 8

0

1 km

40°25'

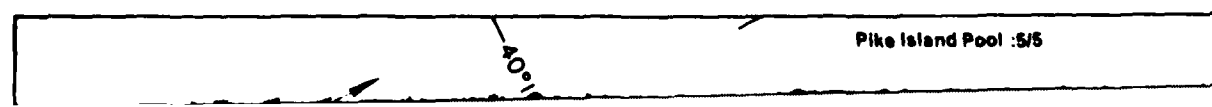
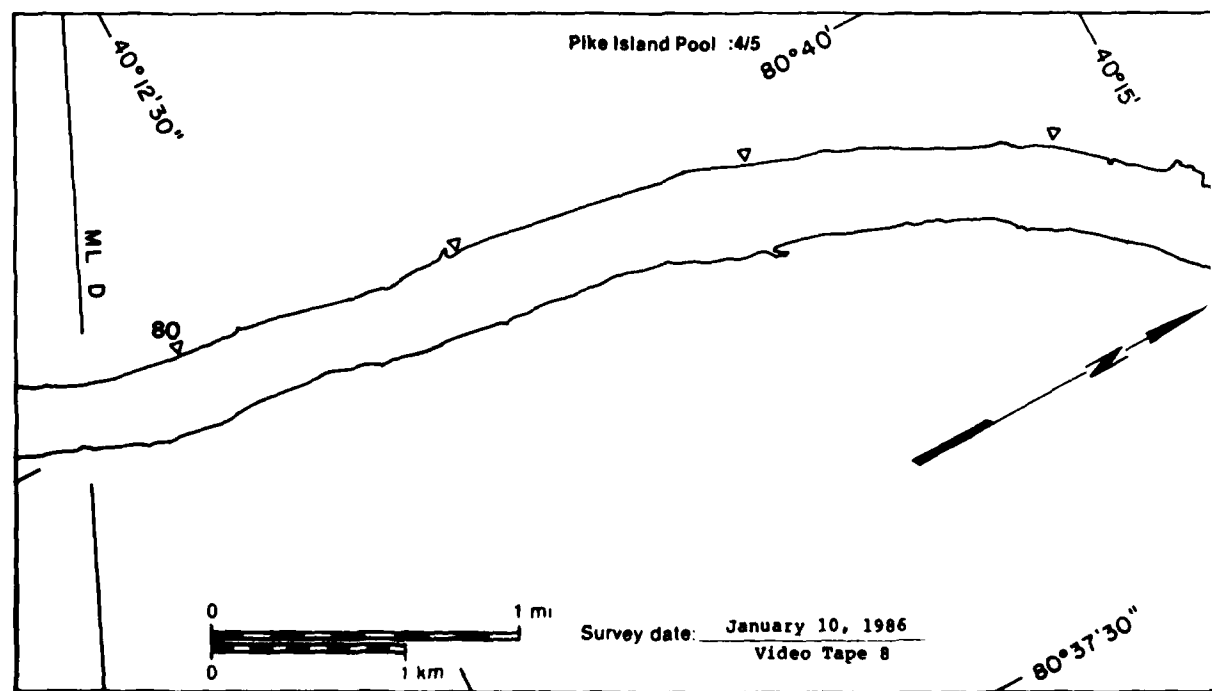
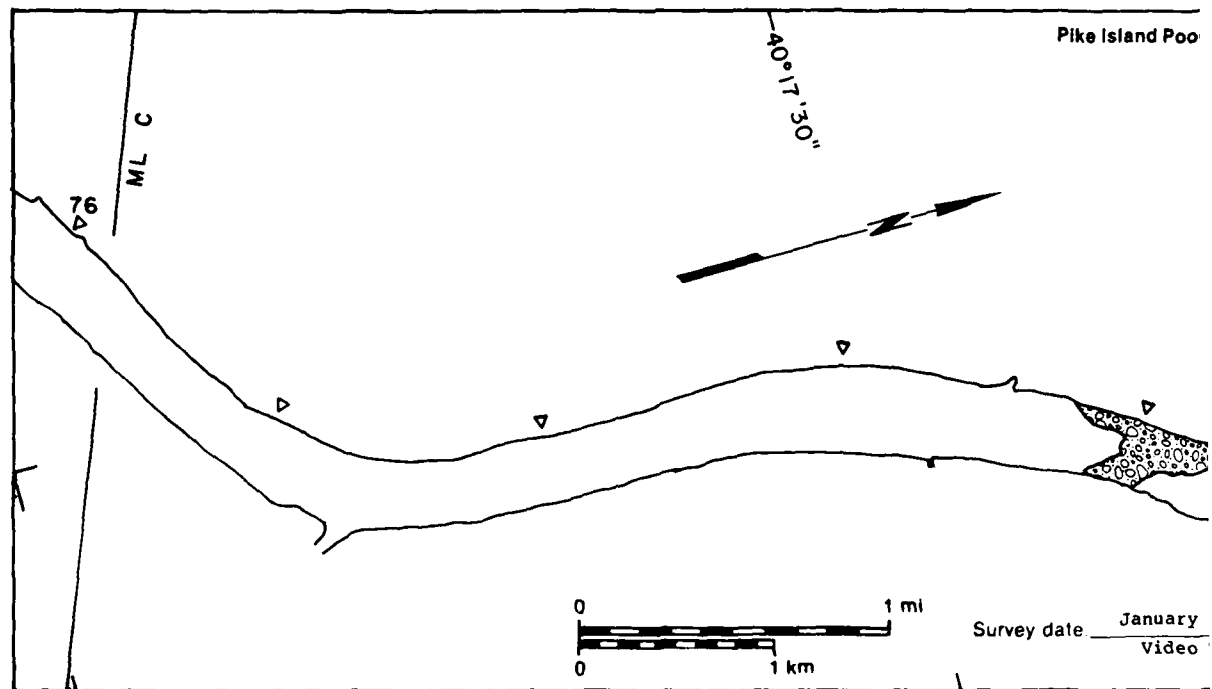
M L A

Browns Isl.

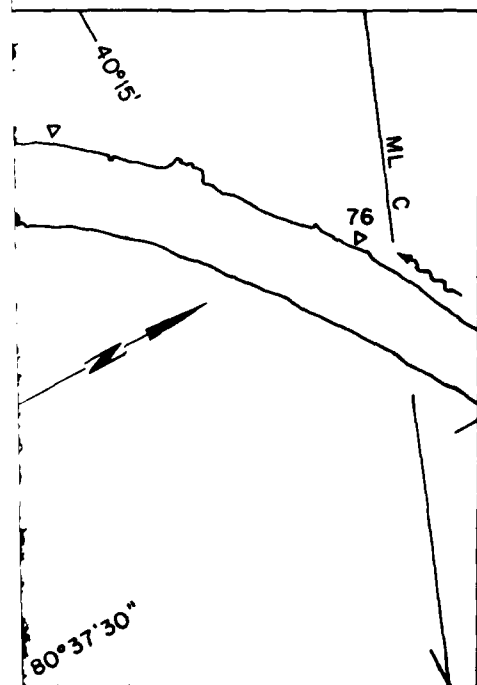
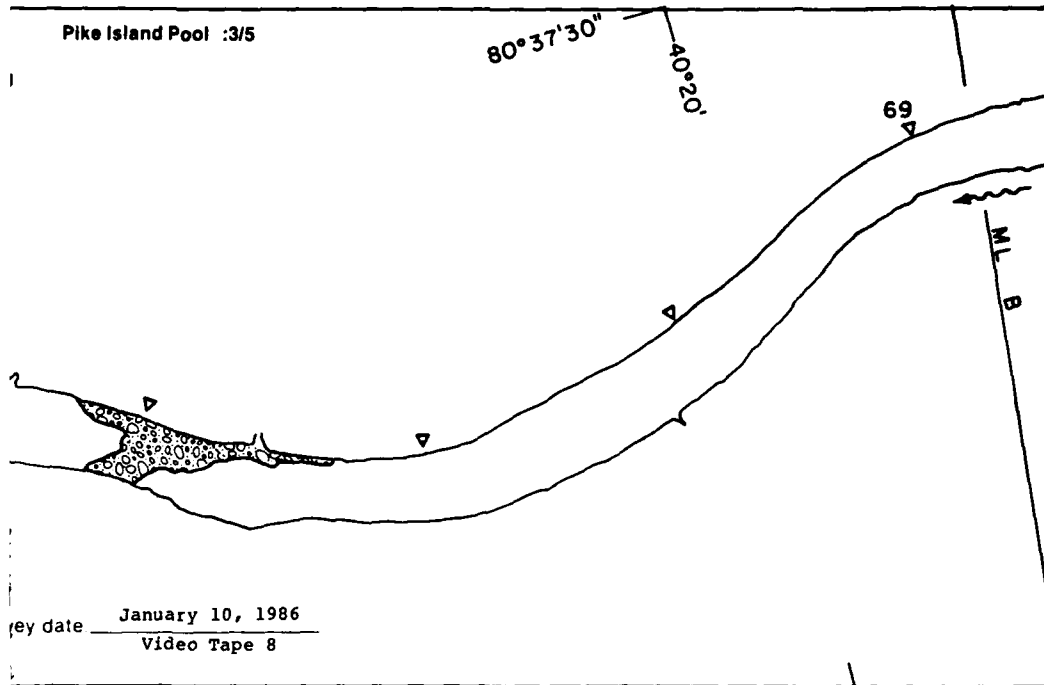
62

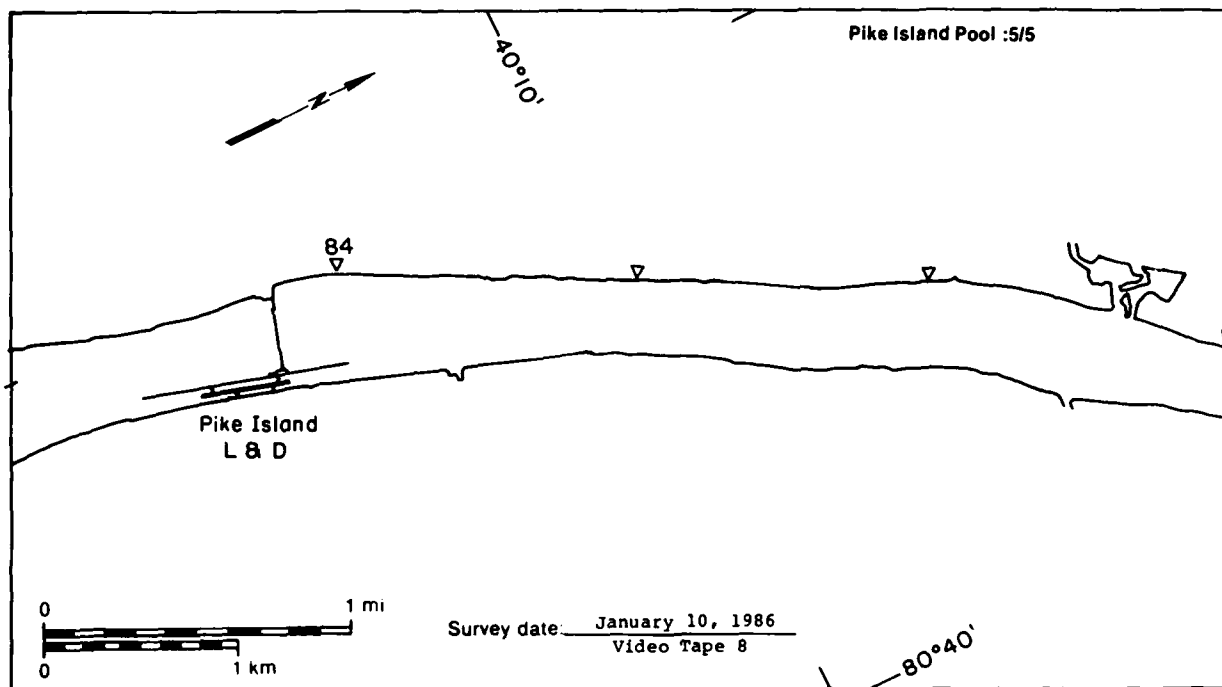
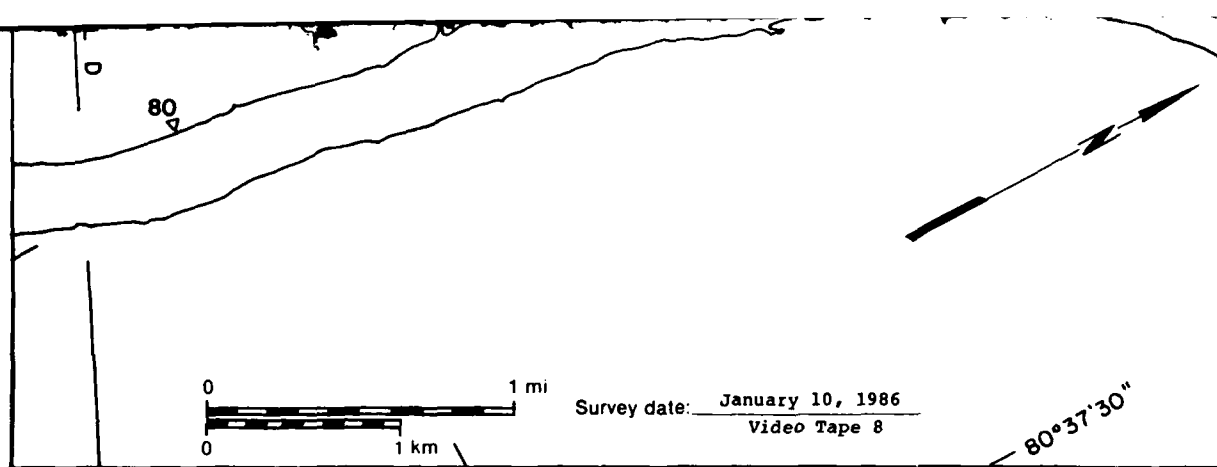
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leo T

Survey date: January 10, 1986
Video Tape 8



10 January 1986



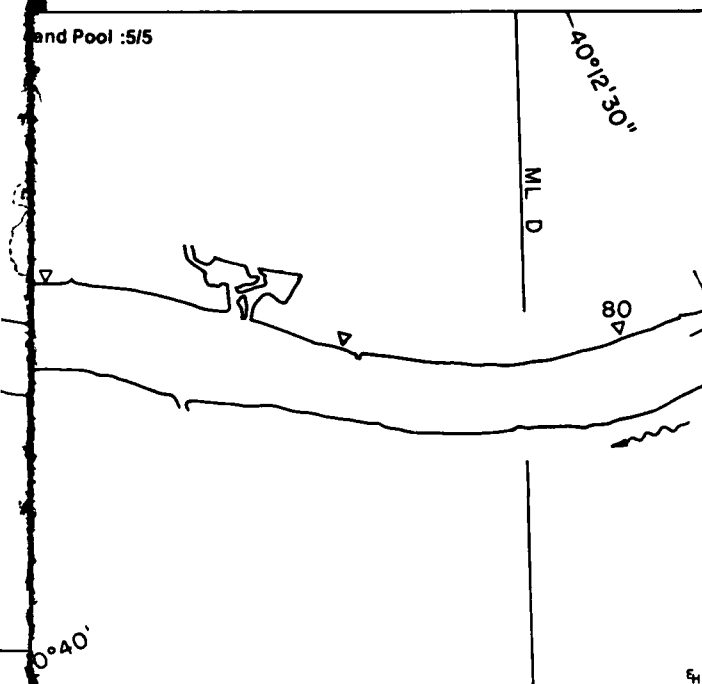
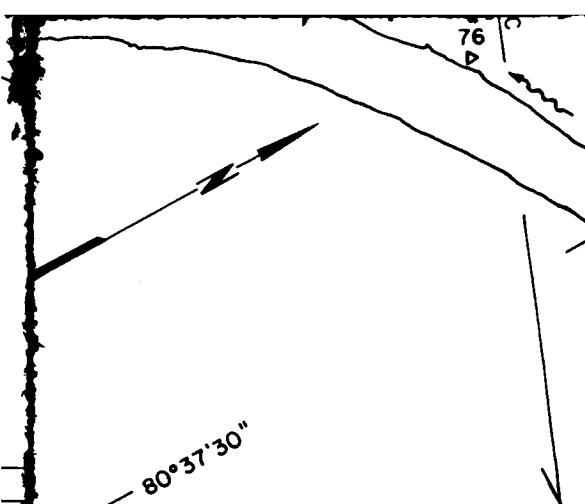


Pike Island Pool

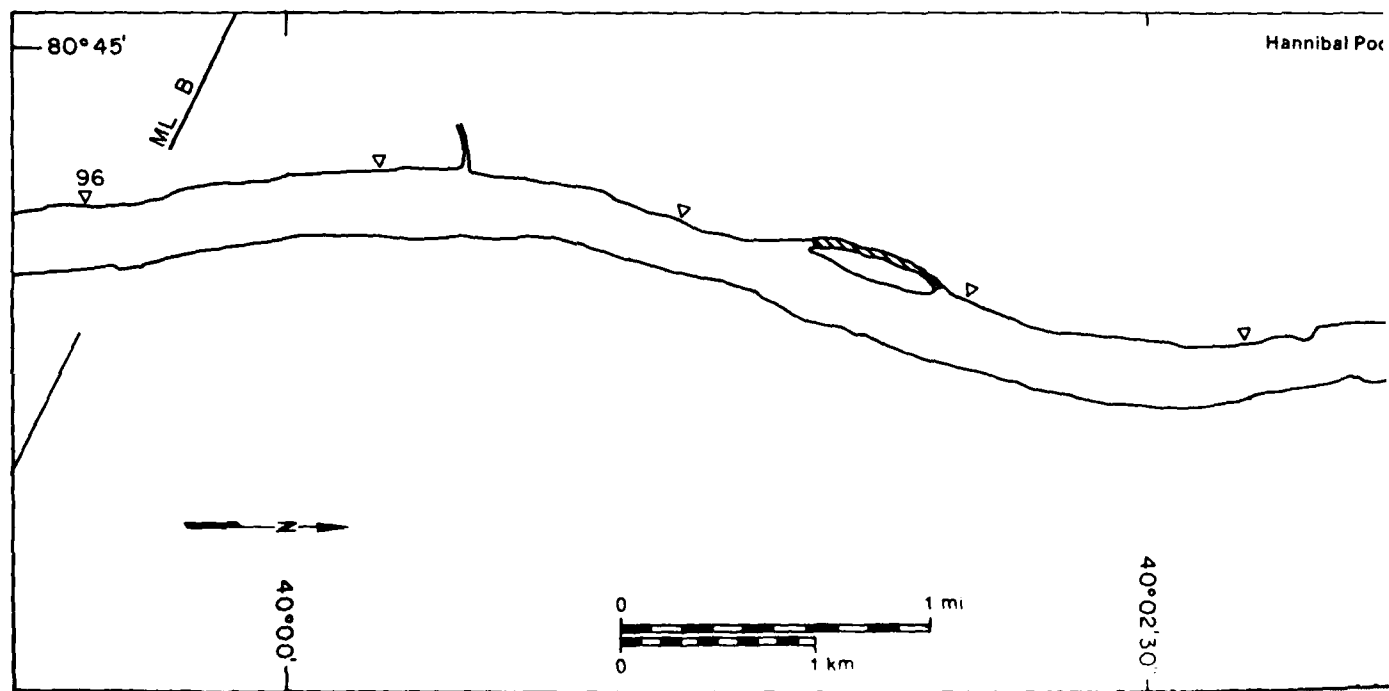
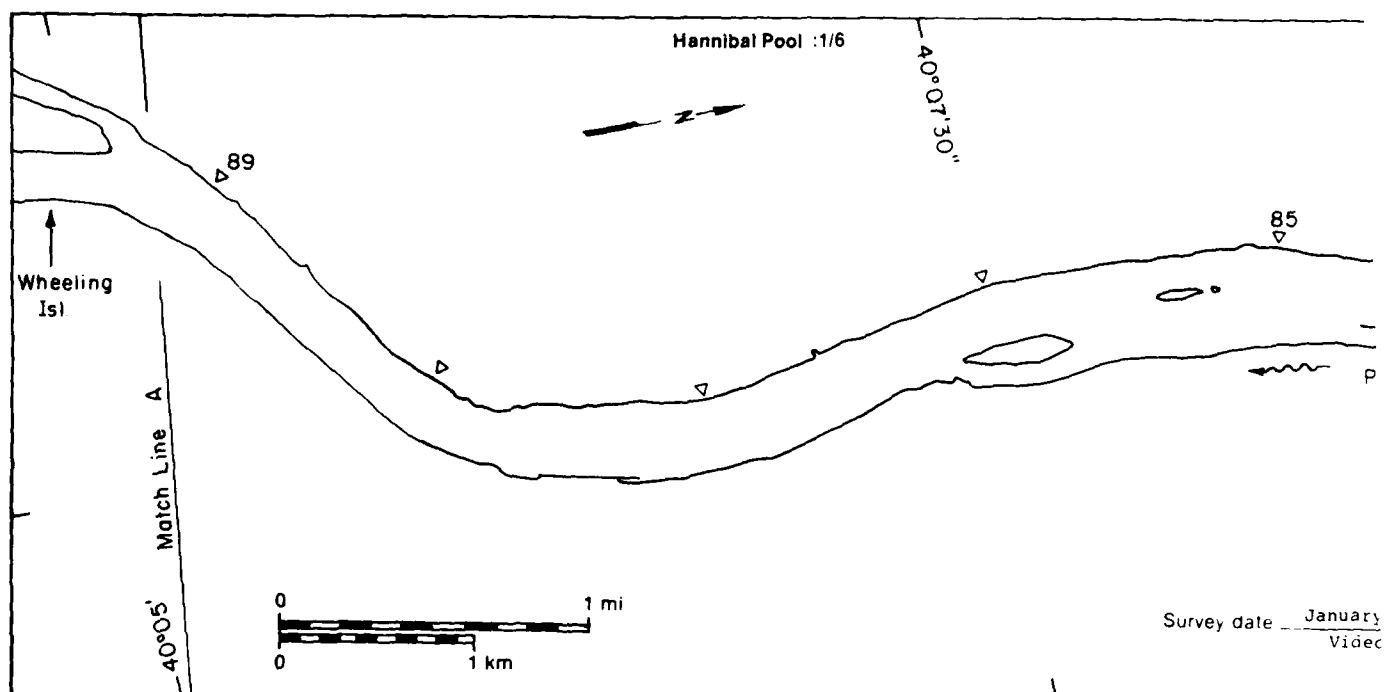
MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Area ($m^2 \times 10^6$)	Surface concentration (%)
18.74	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
0.18	10
Total area ($m^2 \times 10^6$)	18.92



10 January 1986



80°42'30"

Pike Island
L & D

January 10, 1986
Video Tape 8

Sheet 2/6

Wheeling Island

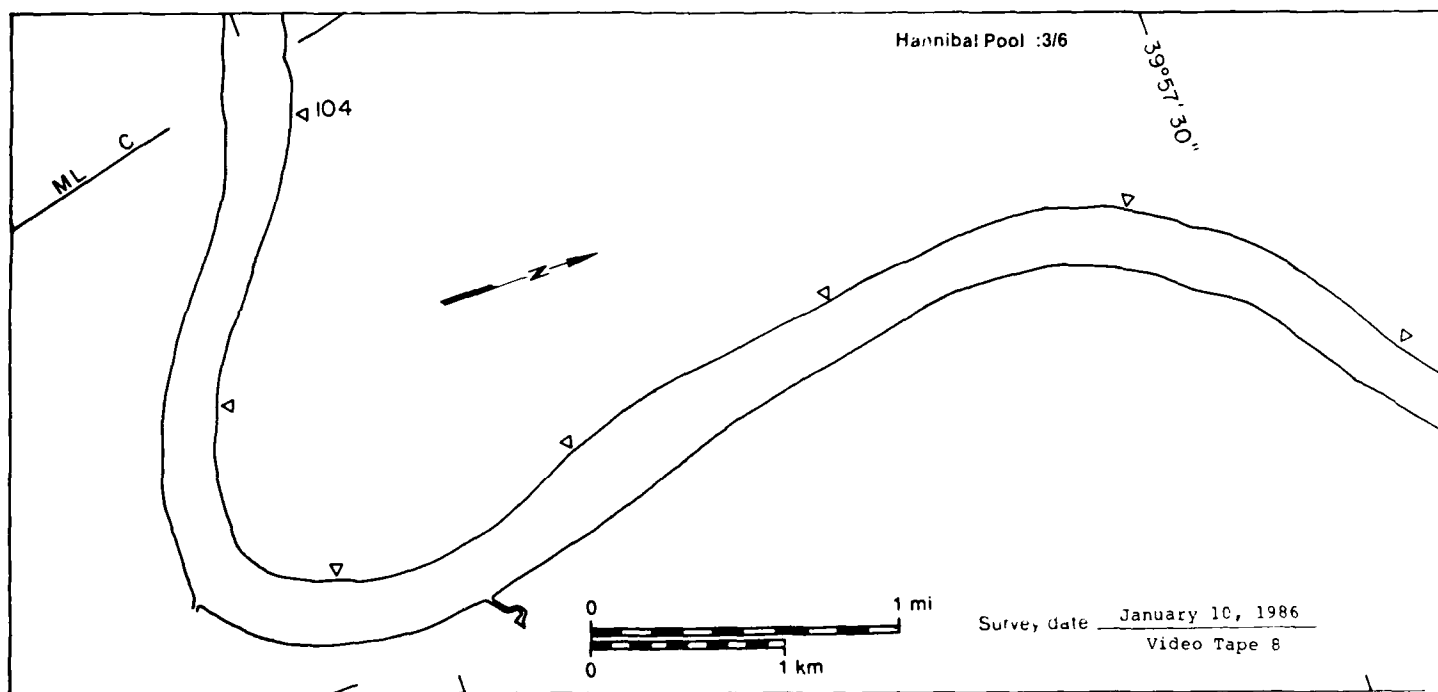
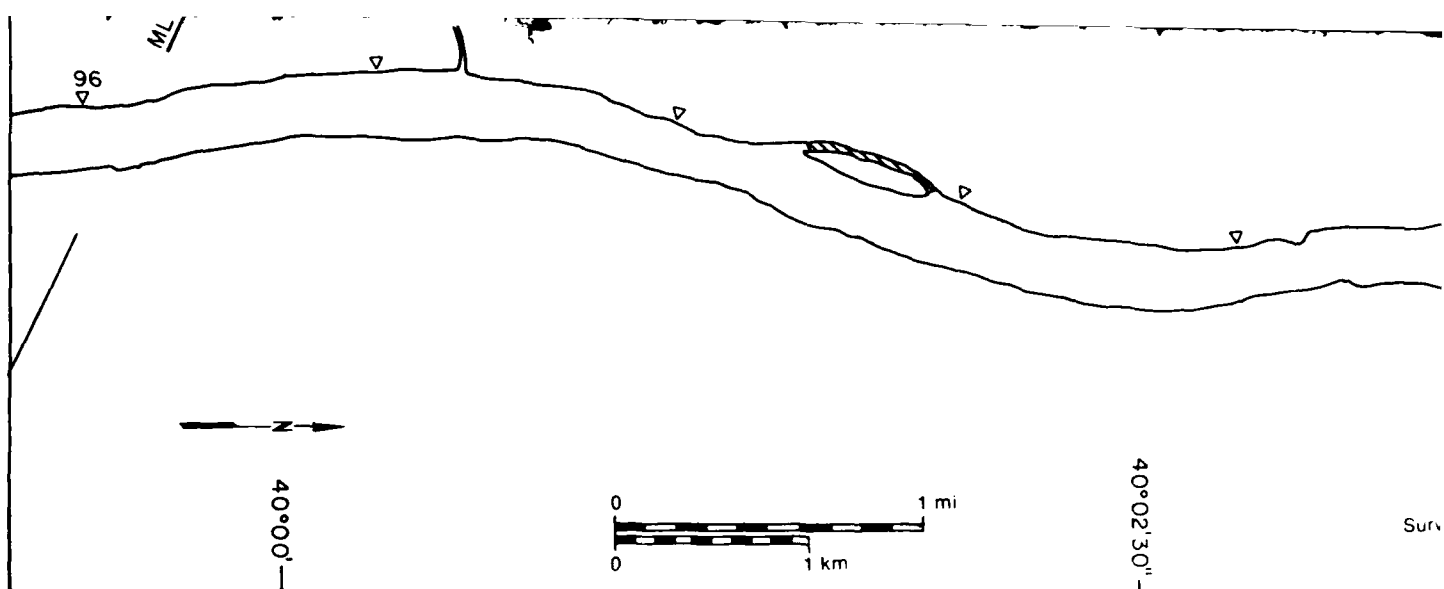
Wheeling
Creek

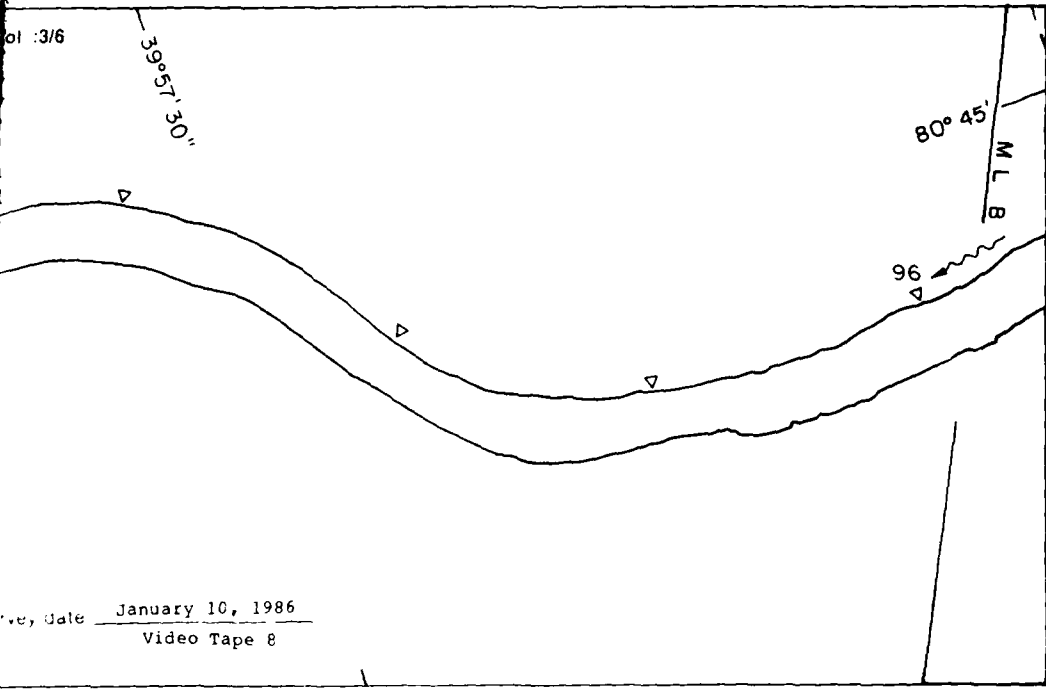
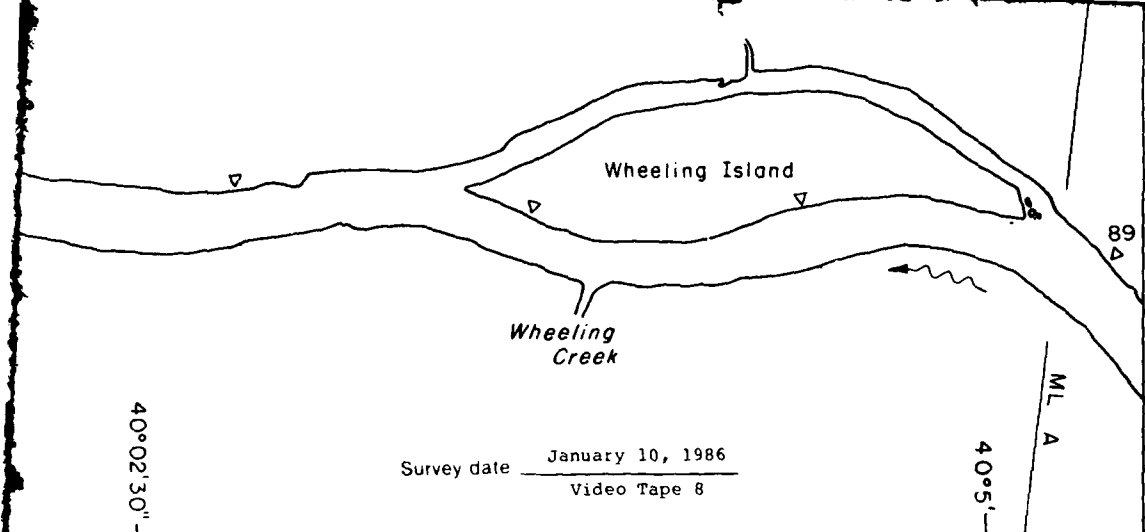
Survey date January 10, 1986
Video Tape 8

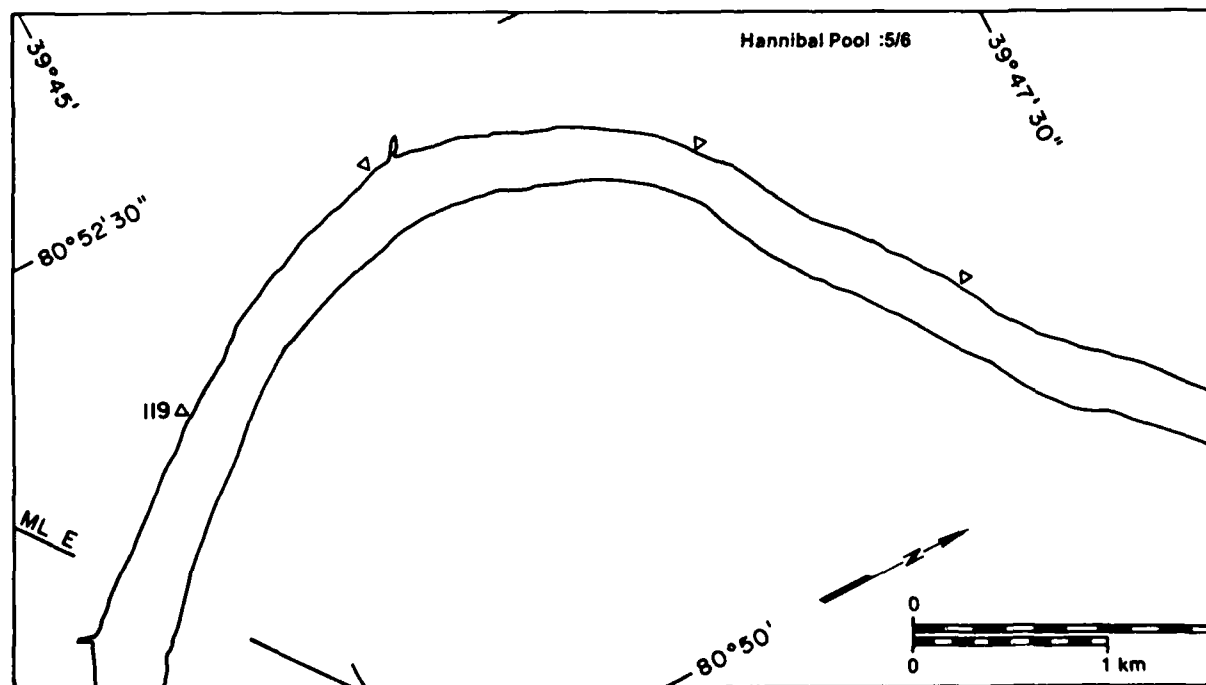
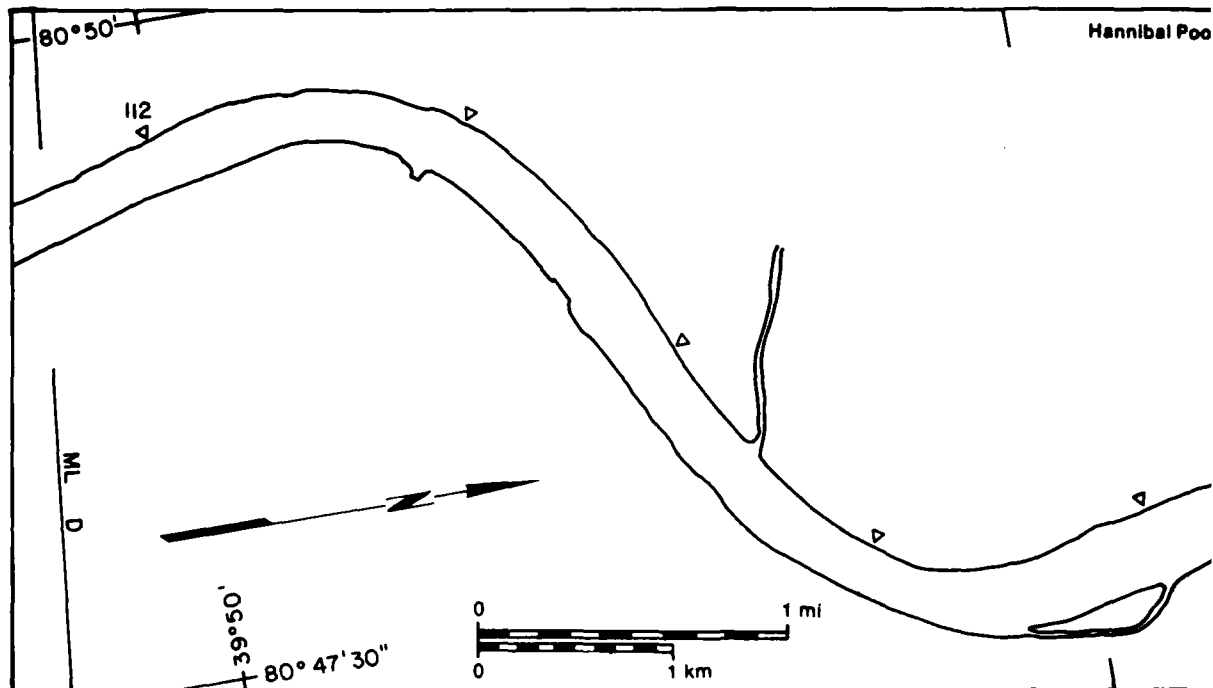
40°5'

M.L.A.

89







10 January 1986

Hannibal Pool :4/6

39°55'

ML C 104

104

Survey date: January 10, 1986
Video Tape 8

ML D

113

Fish Creek Isl.

1 mi

1 km

Survey date: January 10, 1986
Video Tape 8

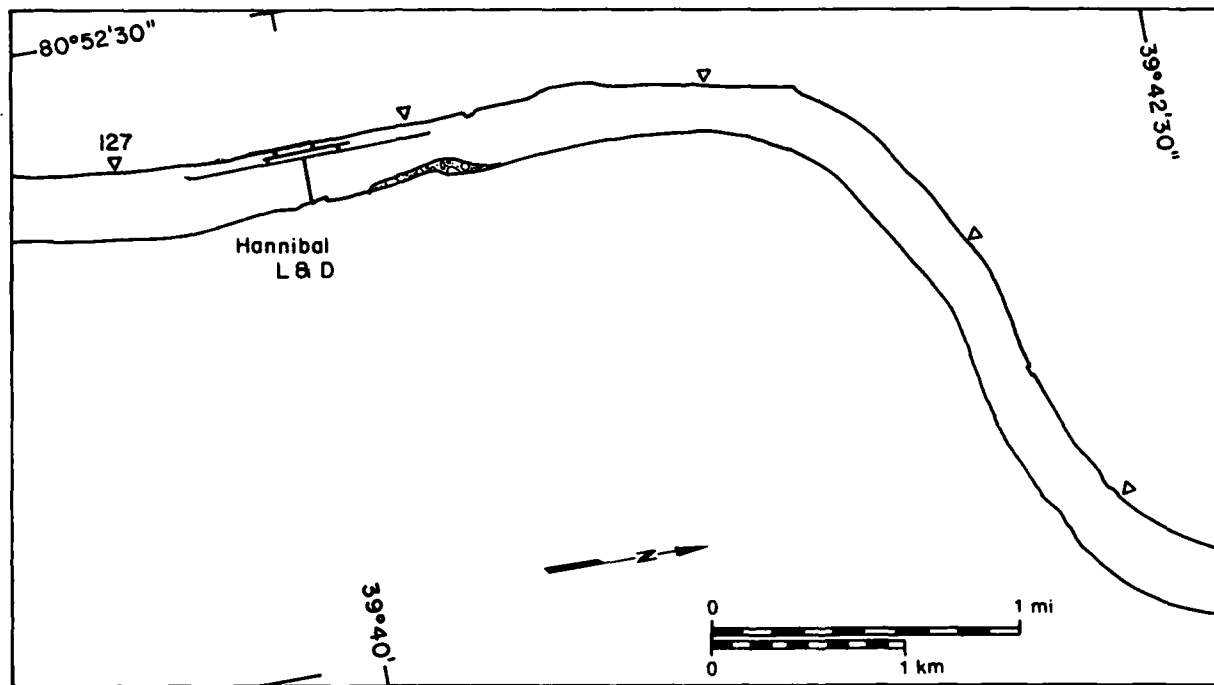
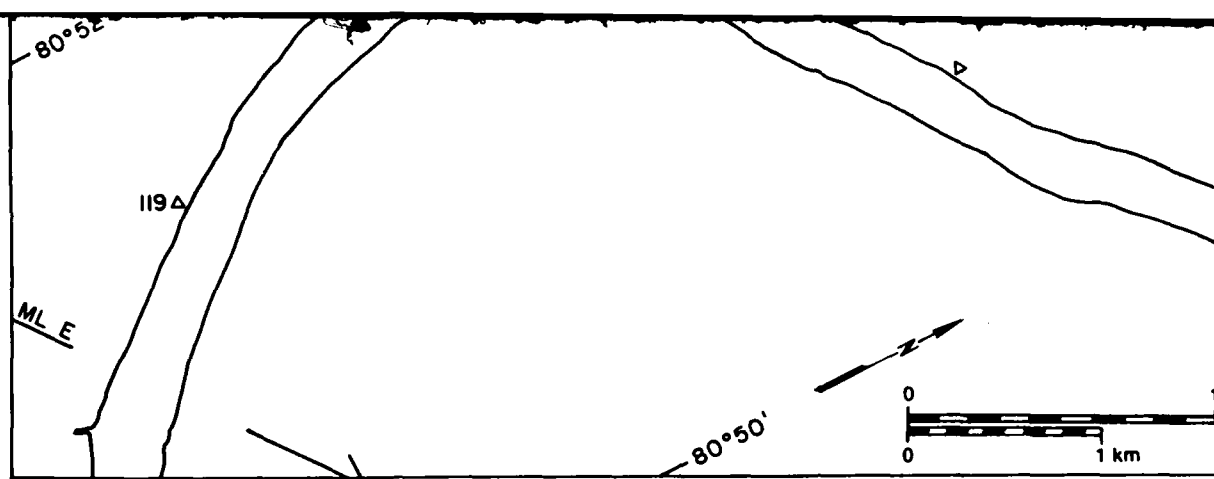
Hannibal Pool :6/6

39°42'30"





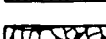
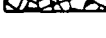
39°45'

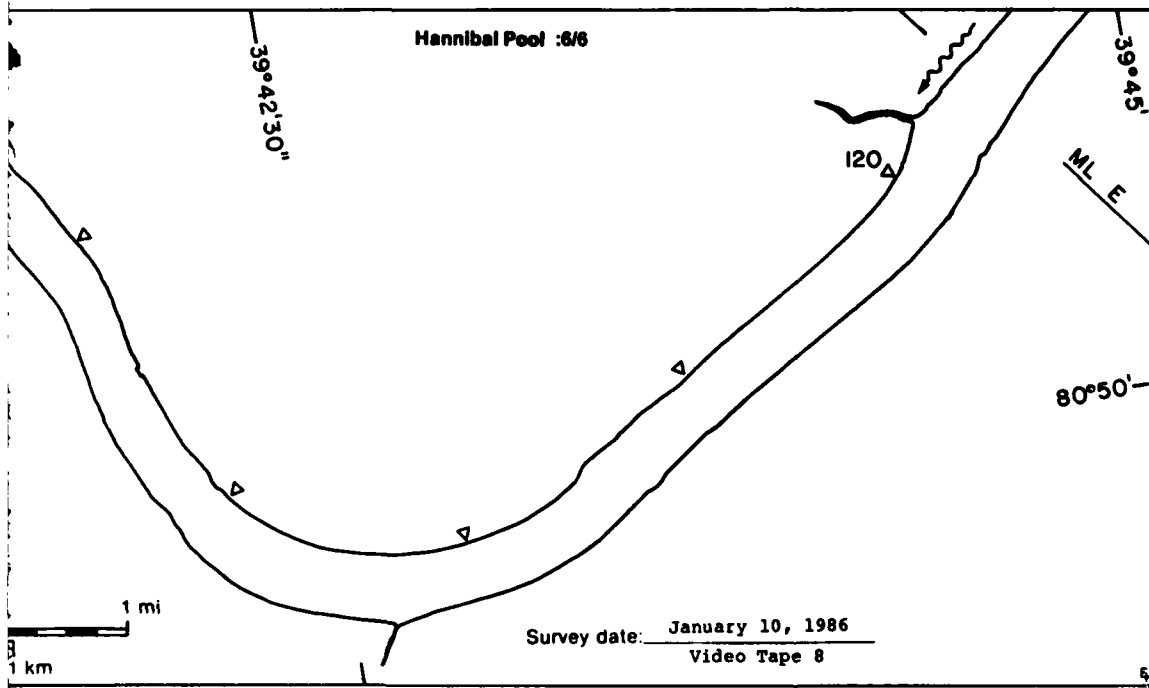
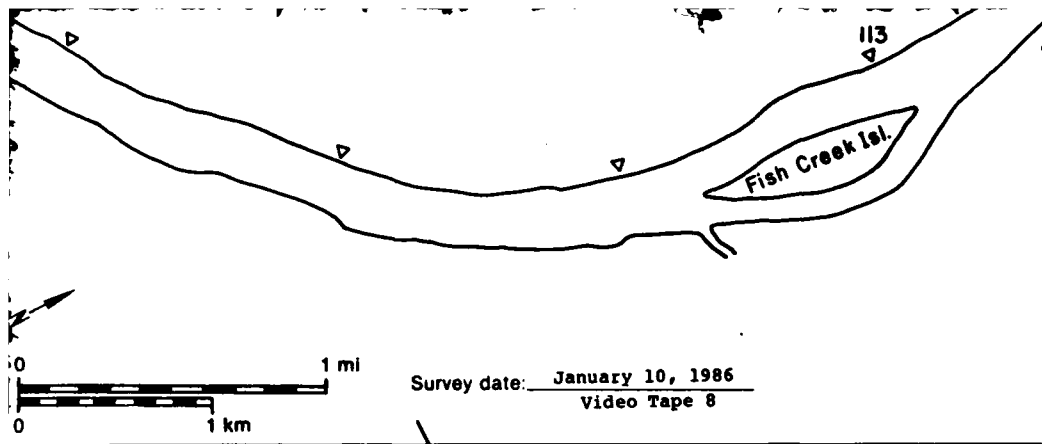
120

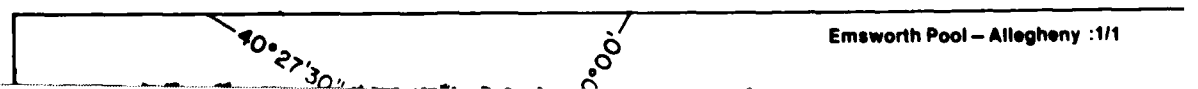
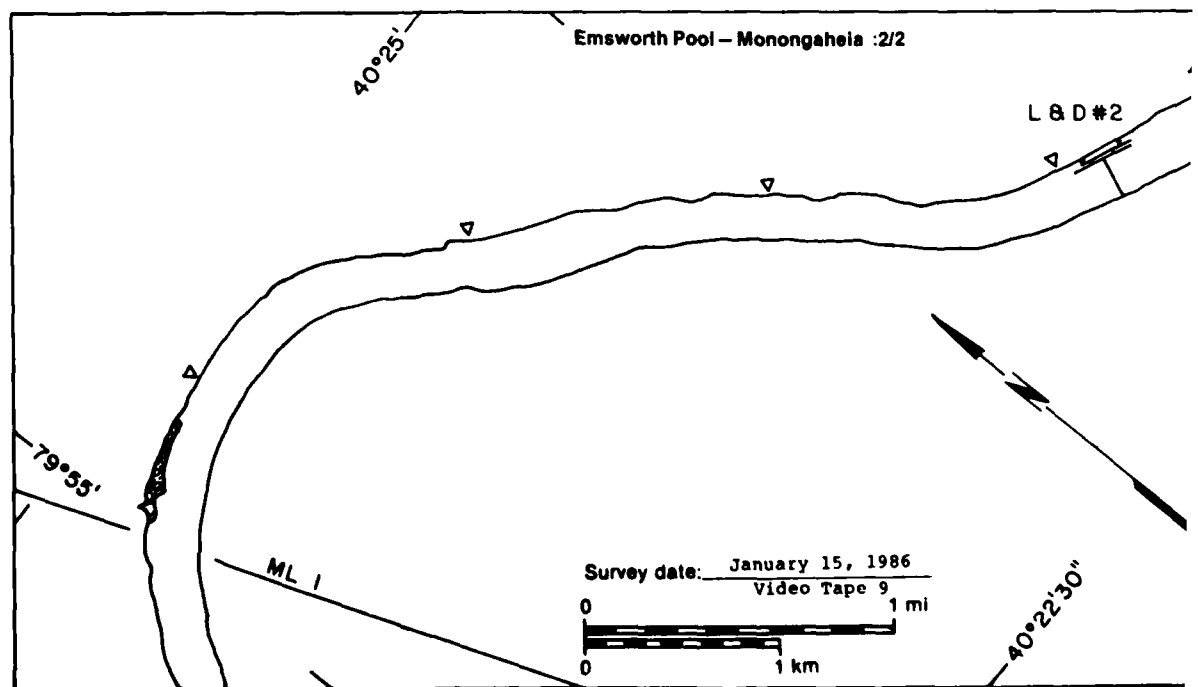
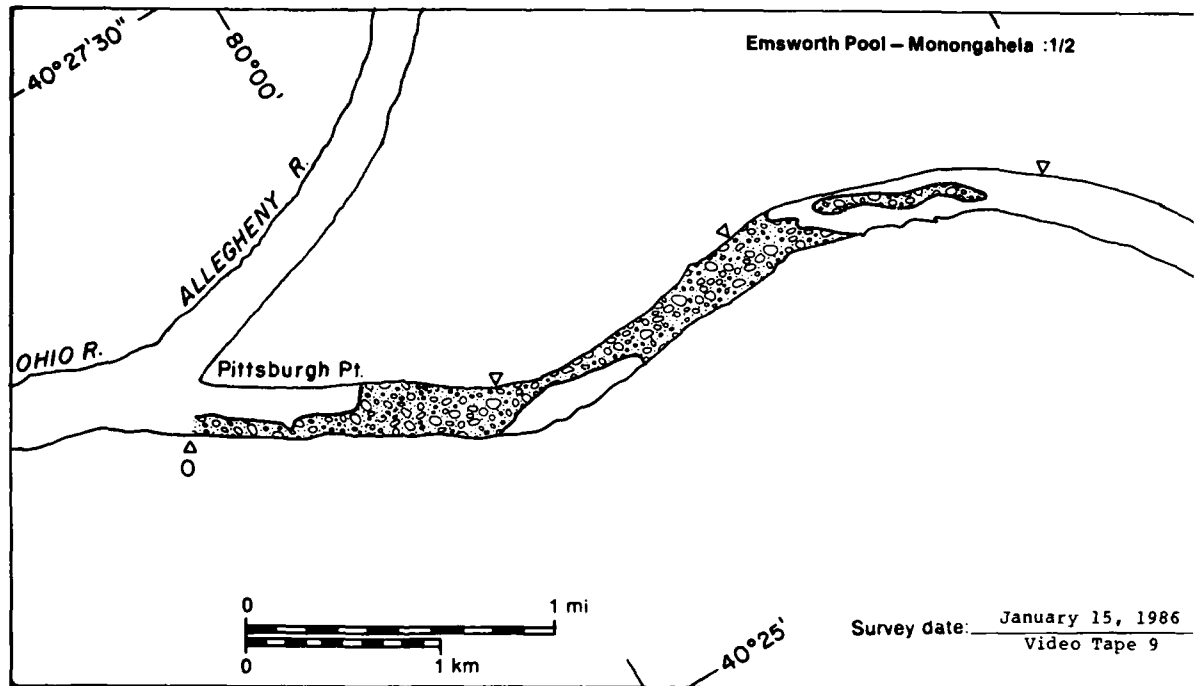
ML



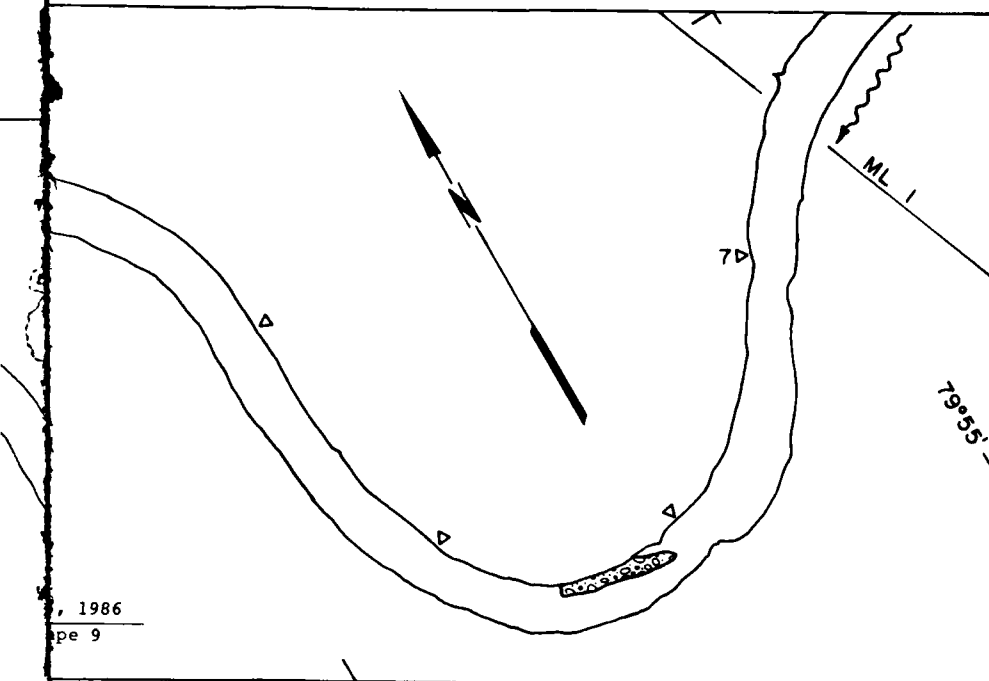
Hannibal Pool

MAP UNITS	Area (m ² x 10 ⁶)	Surface concentration (%)
 Open water	22.38	NA
 Solid ice cover	0.04	NA
 Solid ice cover with open-water areas	0.00	—
 Fragmented ice cover	0.00	NA
 Fragmented ice cover with open-water areas	0.00	—
 Ice floes or frazil slush and pans	0.04	40
Total area (m² x 10⁶)	22.46	

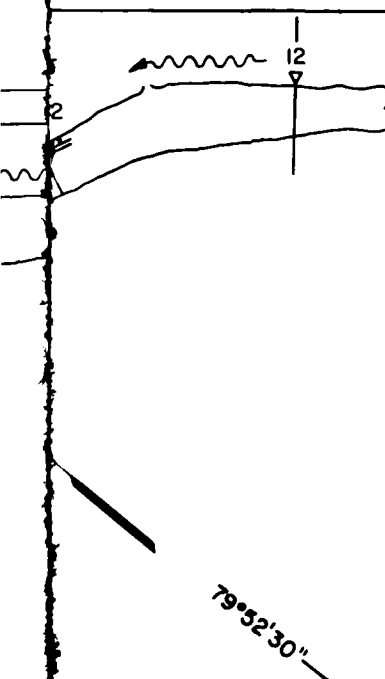




15 January 1986

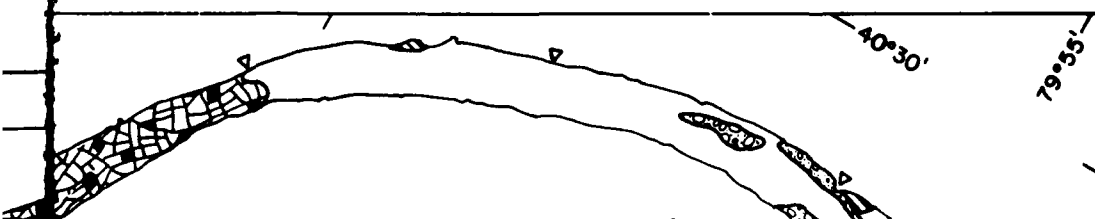


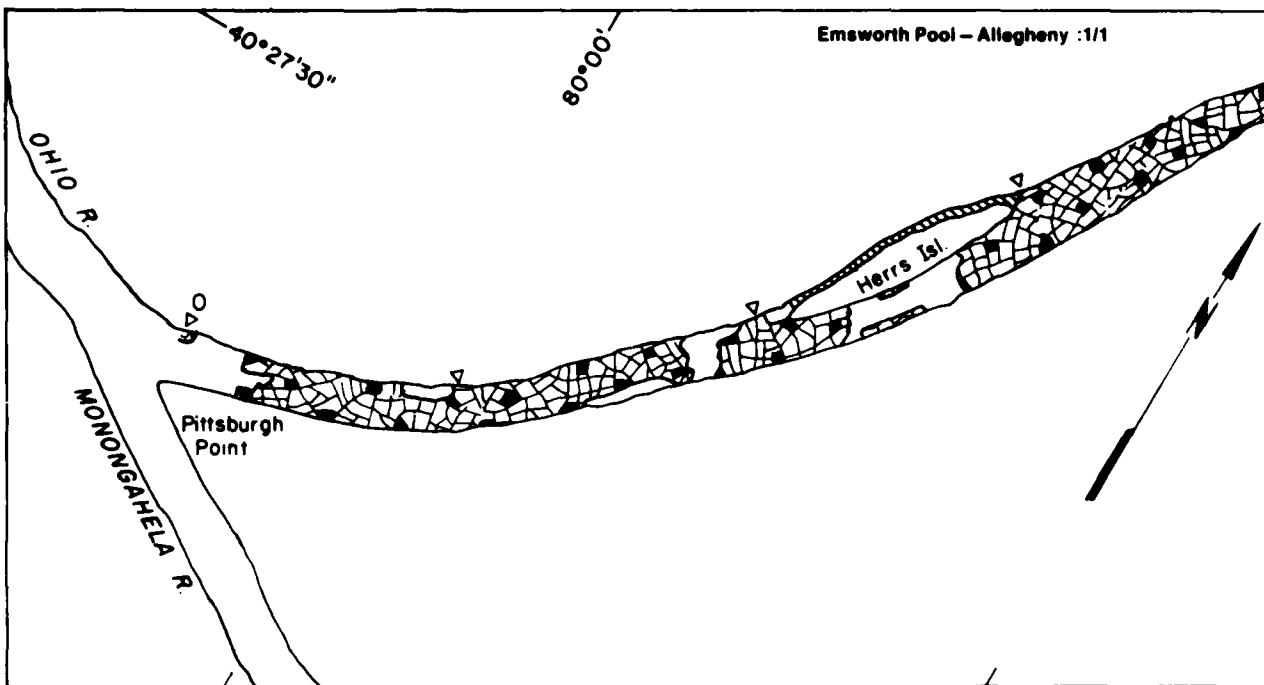
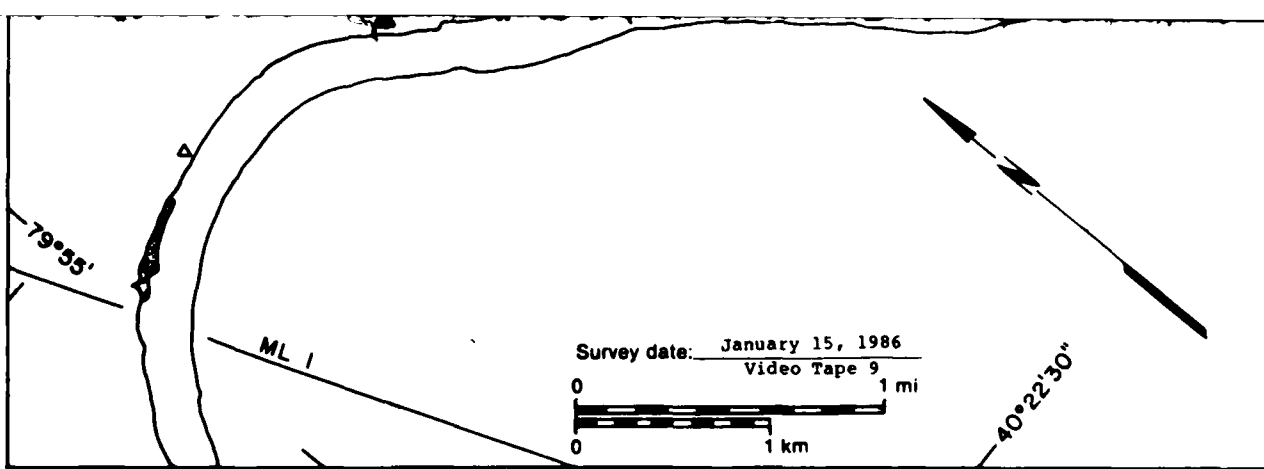
, 1986
pe 9



Emsworth Pool - Monongahela

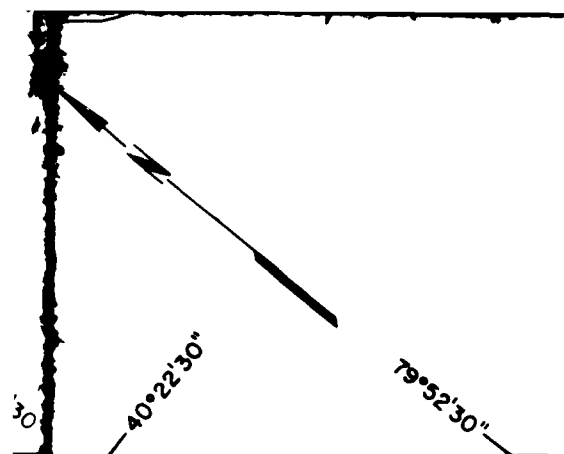
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	4.34	NA
Solid ice cover	0.00	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open water areas	0.00	—
Ice floes or frazil slush and pans	0.82	40
Total area ($m^2 \times 10^6$)	5.16	





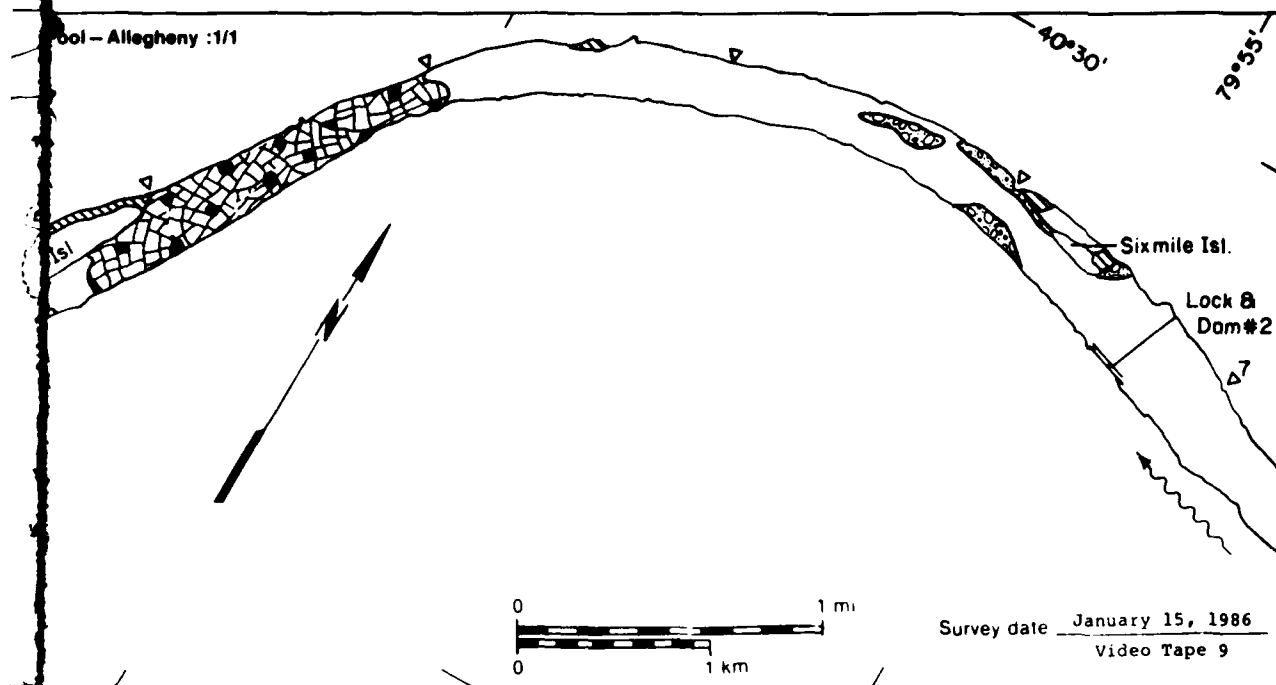
△ Emsworth Pool - Allegheny

MAP UNITS	Area (m ² x 10 ⁶)	Surface concentration (%)
Open water	1.39	NA
Solid ice cover	0.10	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.02	NA
Fragmented ice cover with open water areas	1.42	80
Ice floes or frazil slush and pans	0.14	10
Total area (m ² x 10 ⁶)	3.07	

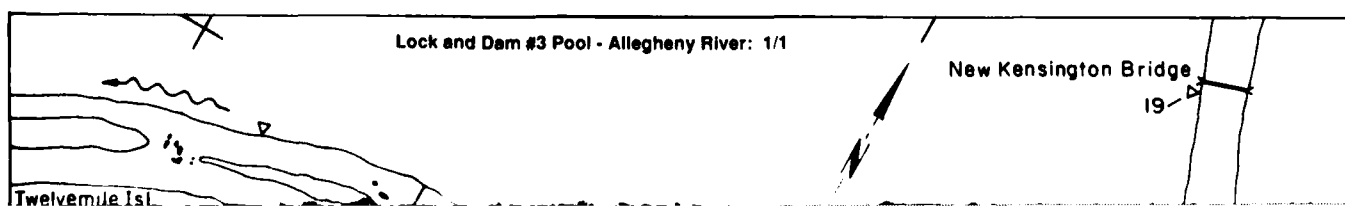
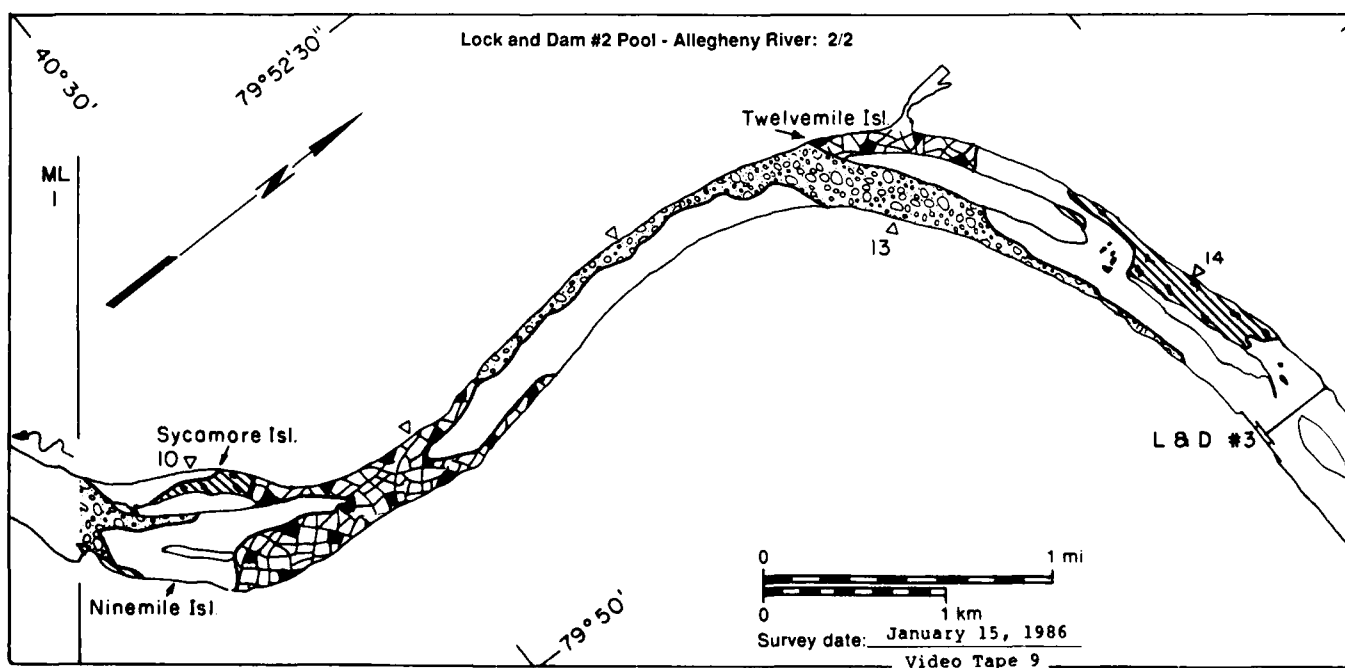
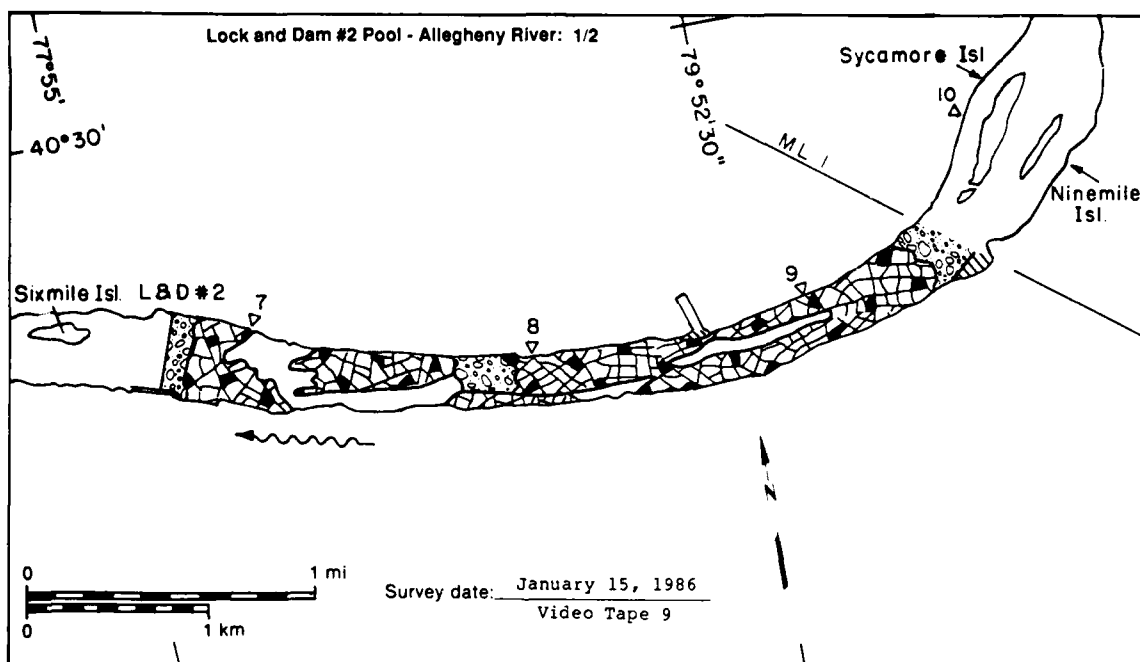


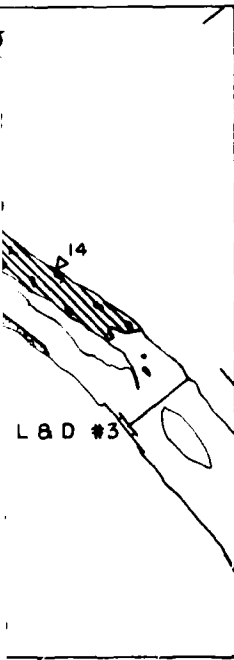
MAP Units	Area (m ² x 10 ⁶)	Percentage
Open water	4.34	NA
Solid ice cover	0.00	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open water areas	0.00	—
Ice floes or frazil slush and pans	0.82	40

Total area (m² x 10⁶) 5.16








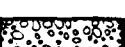
15 January 1986



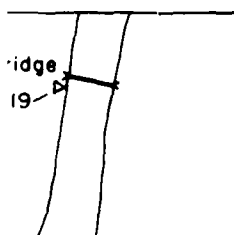


Lock and Dam #2 Pool

MAP UNITS



	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Area ($m^2 \times 10^6$)	Surface concentration (%)
1.51	NA
0.03	NA
0.23	80
0.05	NA
1.42	70
0.78	30
Total area ($m^2 \times 10^6$)	4.02

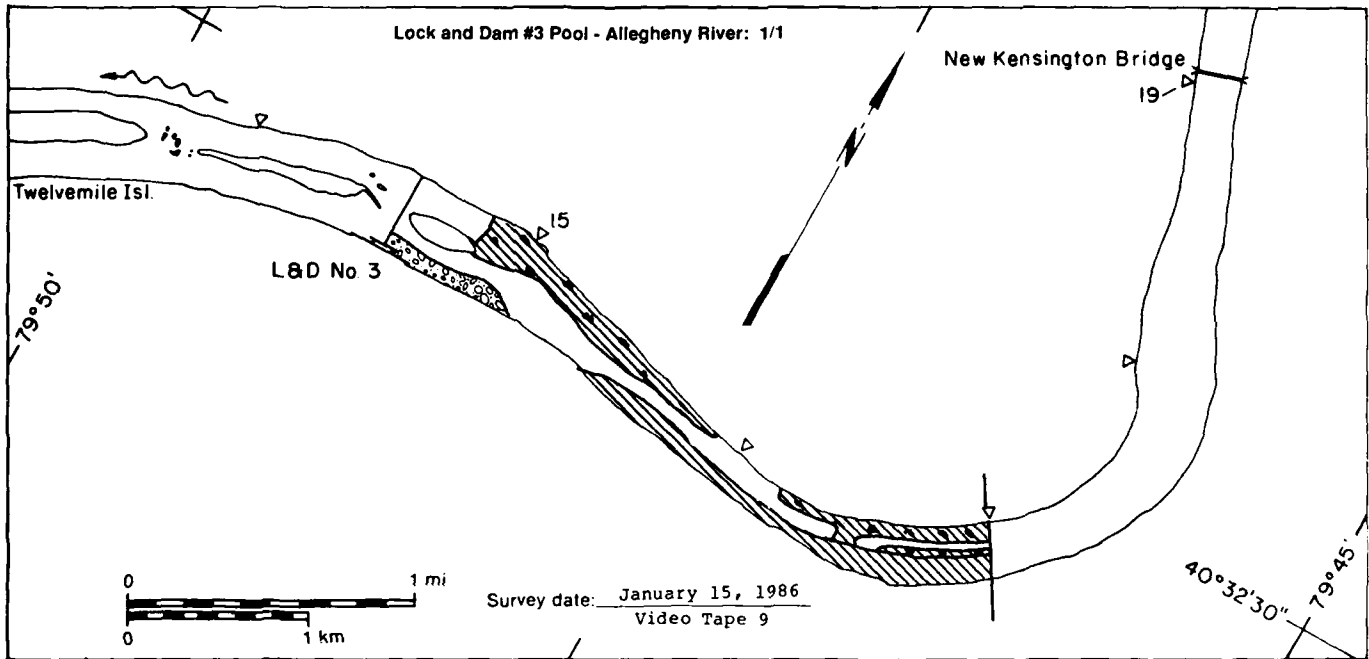
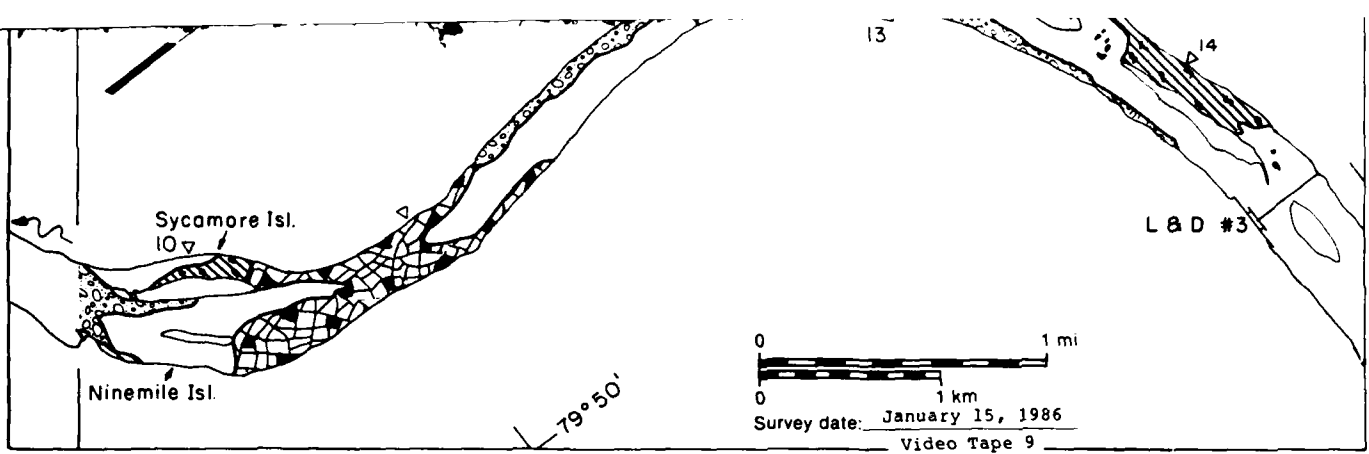


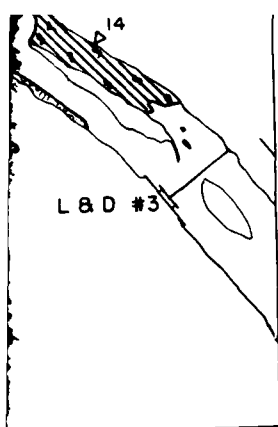
Lock and Dam #3 Pool

MAP UNITS

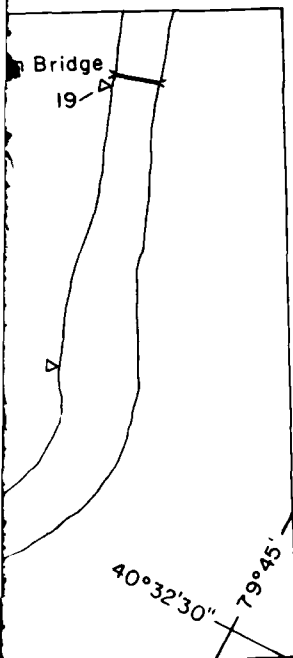
	Open water
	

Area ($m^2 \times 10^6$)	Surface concentration (%)
0.49	NA



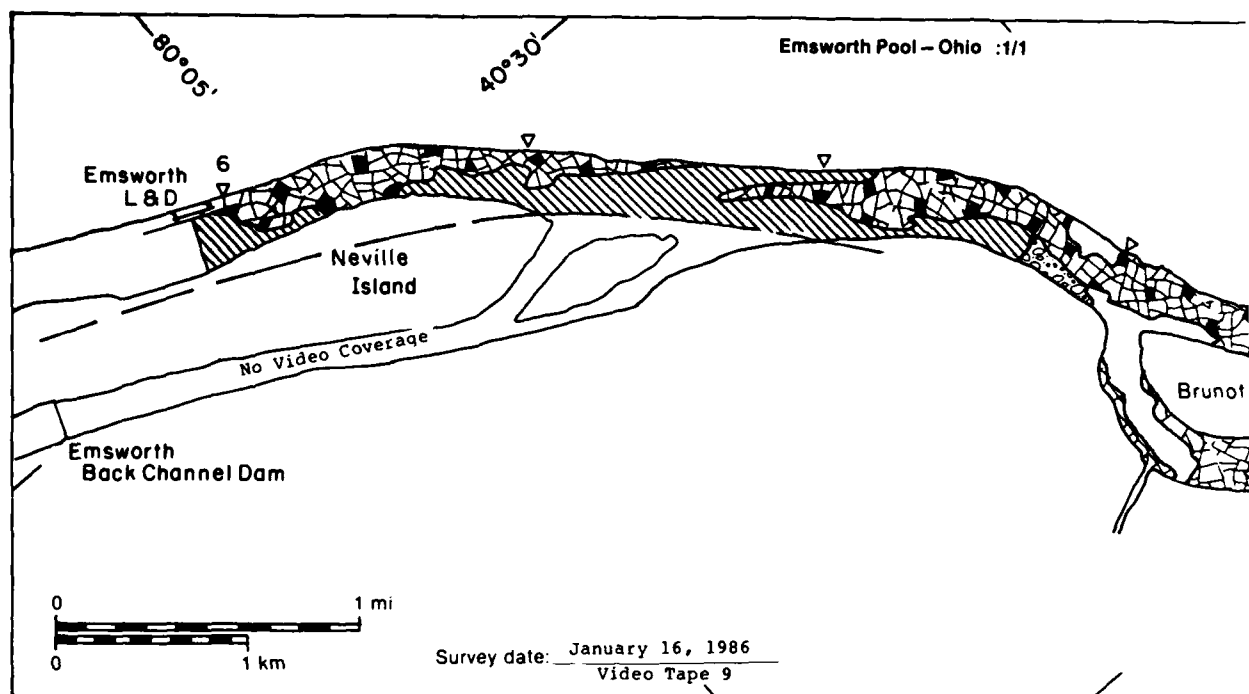


	Solid ice cover	0.03	NA
	Solid ice cover with open-water areas	0.23	80
	Fragmented ice cover	0.05	NA
	Fragmented ice cover with open-water areas	1.42	70
	Ice floes or frazil slush and pans	0.78	30
Total area ($m^2 \times 10^6$)		4.02	



Lock and Dam #3 Pool

MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	0.49	NA
	Solid ice cover	0.28	NA
	Solid ice cover with open-water areas	0.30	80
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.07	50
Total area ($m^2 \times 10^6$)		1.14	



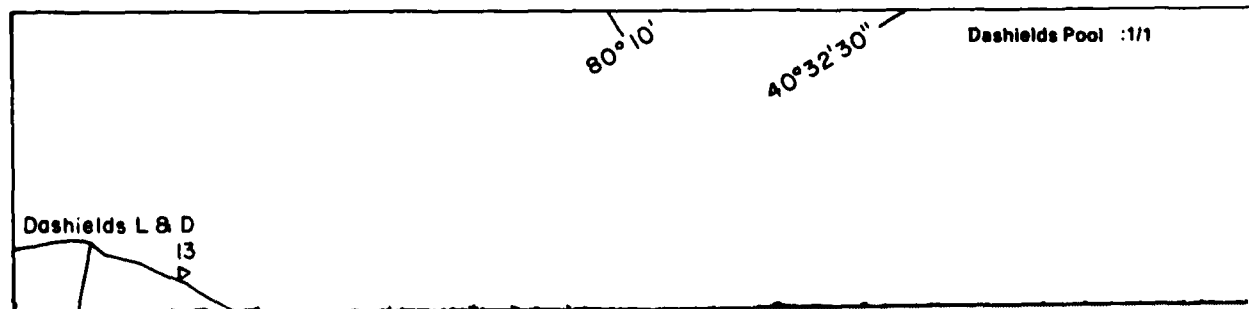
Emsworth Pool - Ohio

MAP UNITS

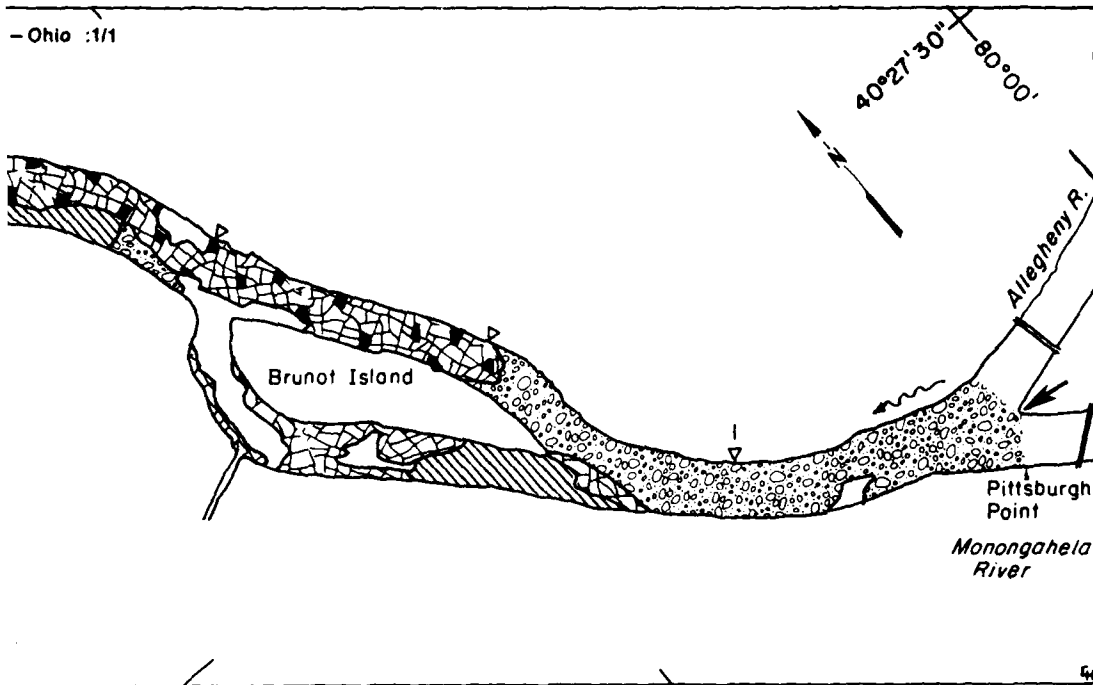
	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Area ($m^2 \times 10^6$)	Surface concentration (%)
0.30	NA
0.99	NA
0.00	—
0.30	NA
1.20	90
0.86	55
4.49*	* Includes $0.84 \times 10^6 m^2$ of no video coverage

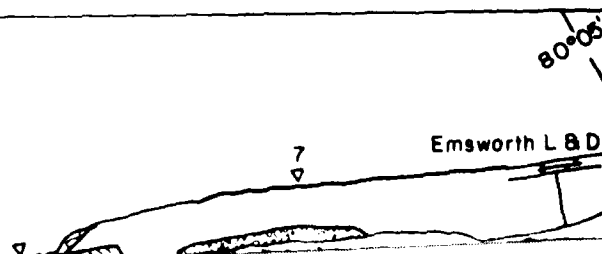
Total area ($m^2 \times 10^6$)




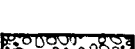


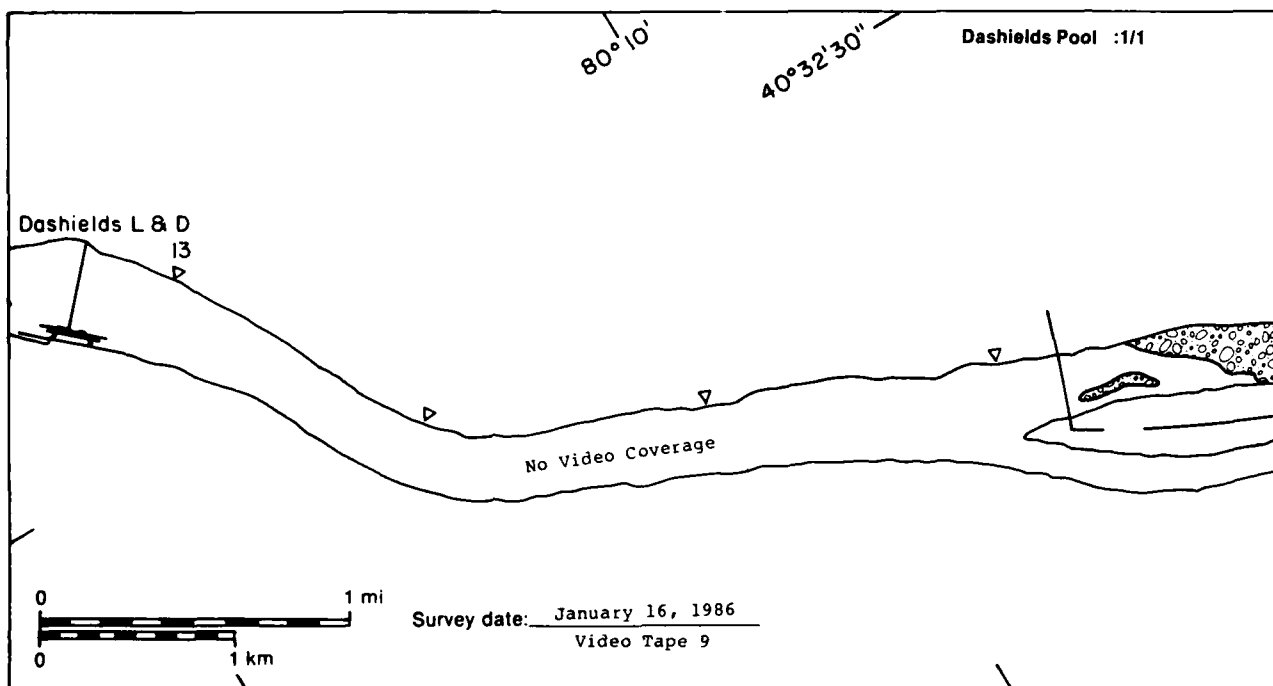
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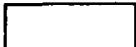




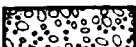


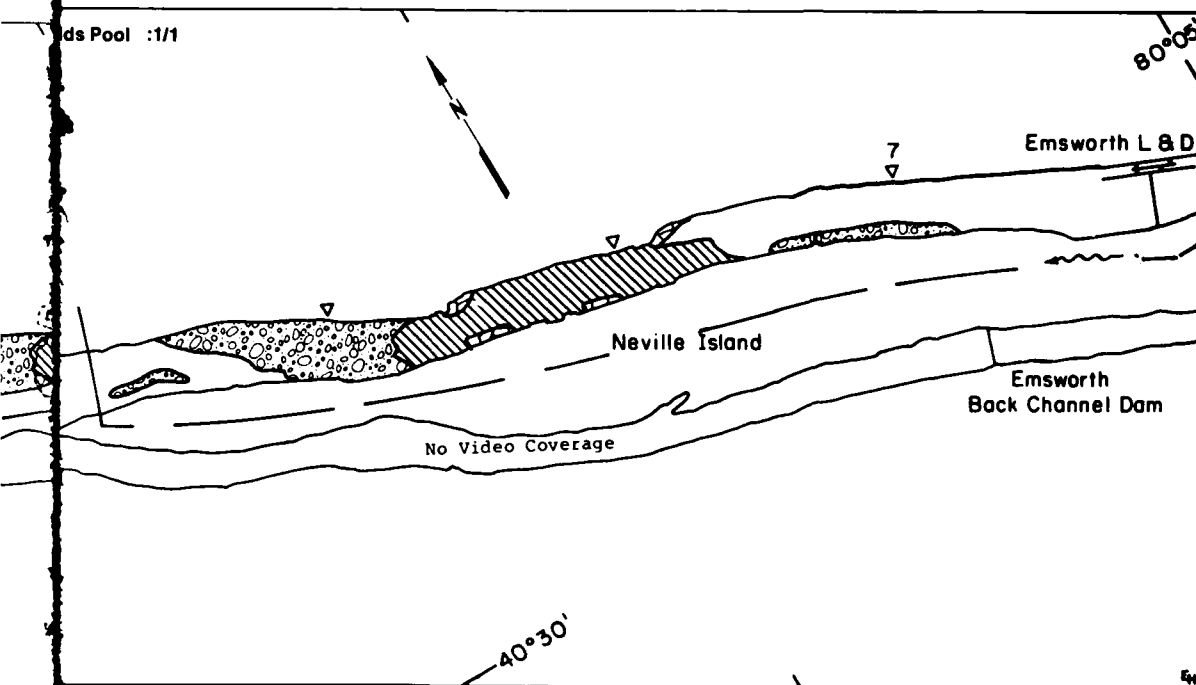
Dashields Pool :1/1



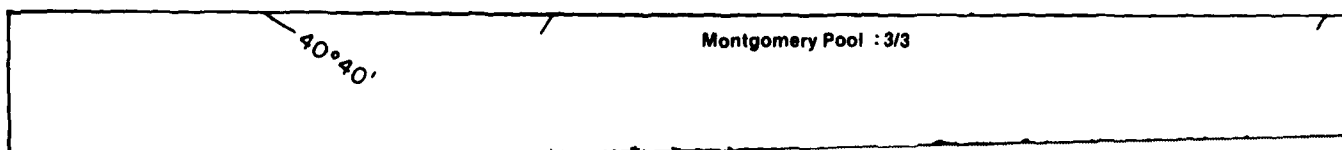
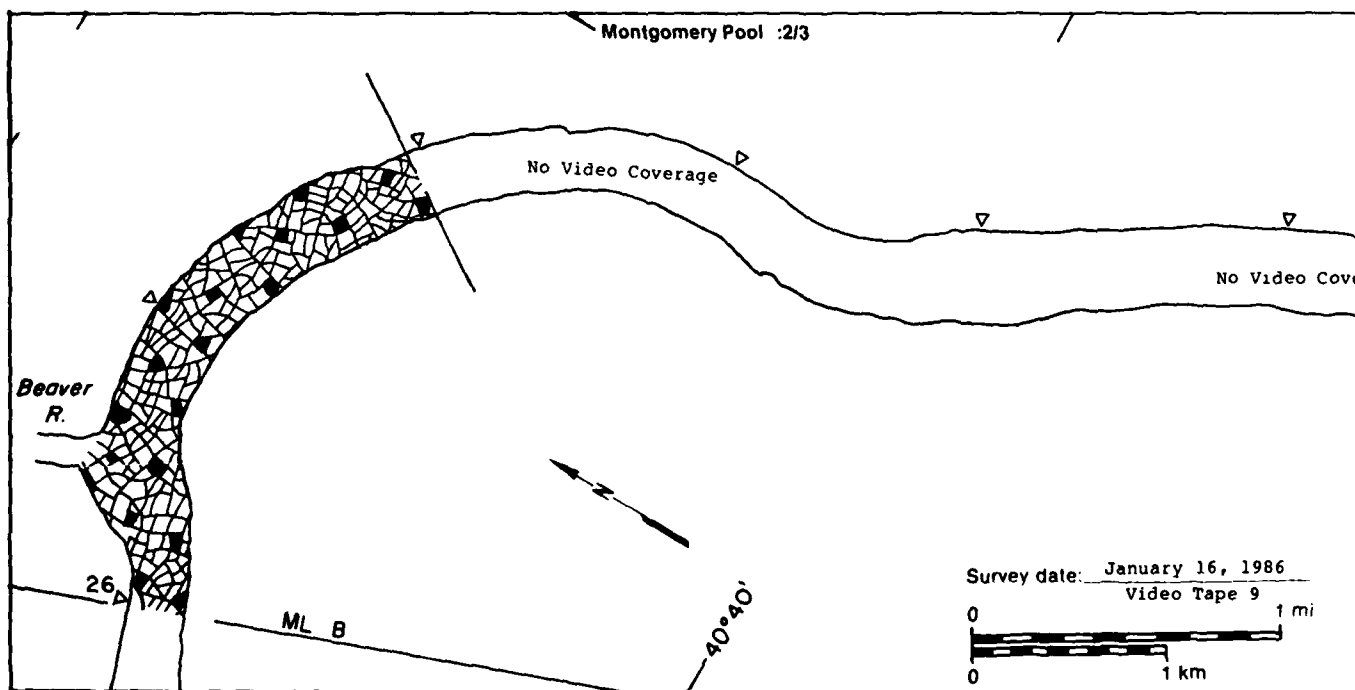
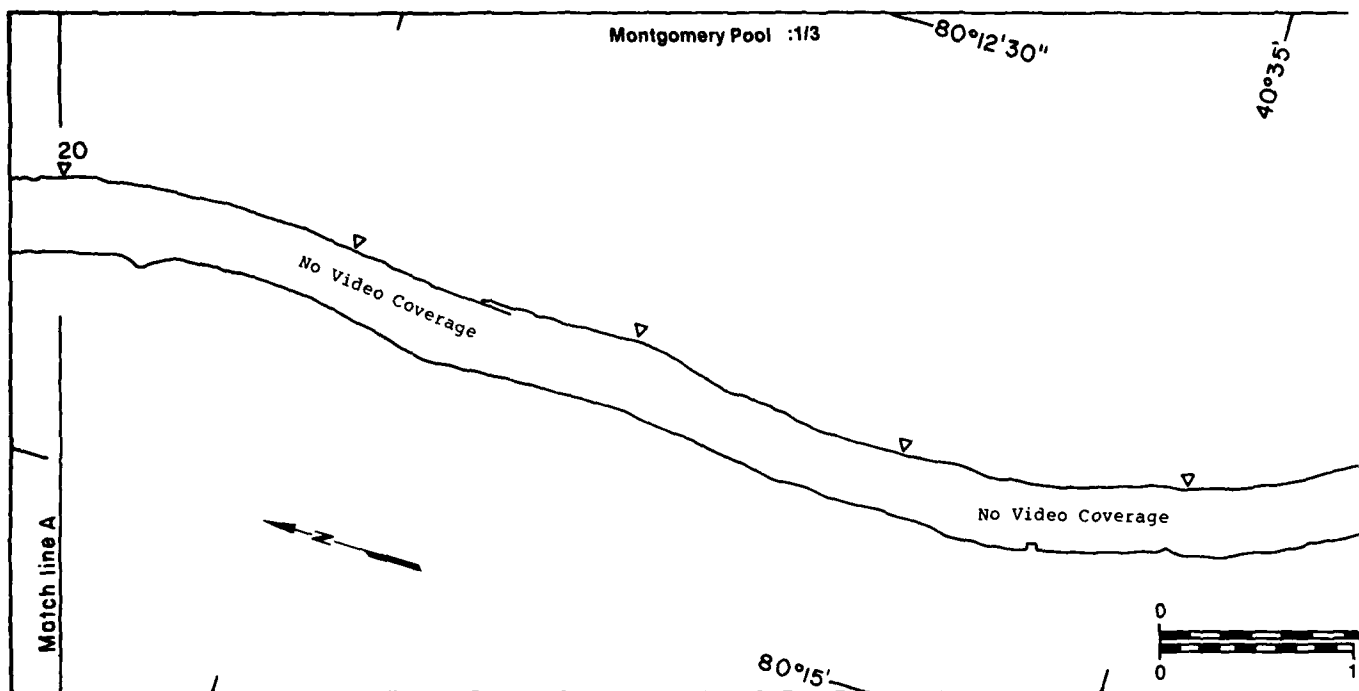
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.30	NA
	Fragmented ice cover with open-water areas	1.20	90
	Ice floes or frazil slush and pans	0.86	55
Total area ($m^2 \times 10^6$)		4.49*	* Includes $0.84 \times 10^6 m^2$ of no video coverage

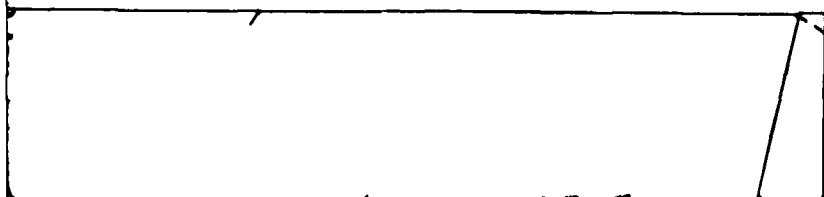
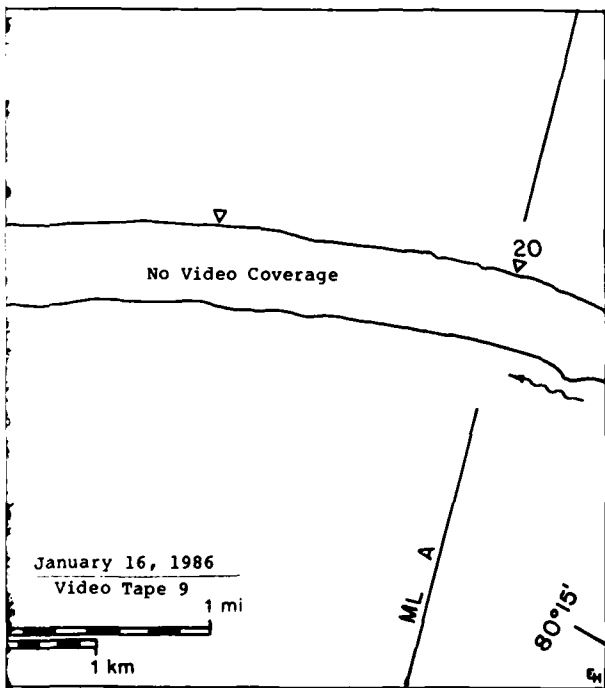
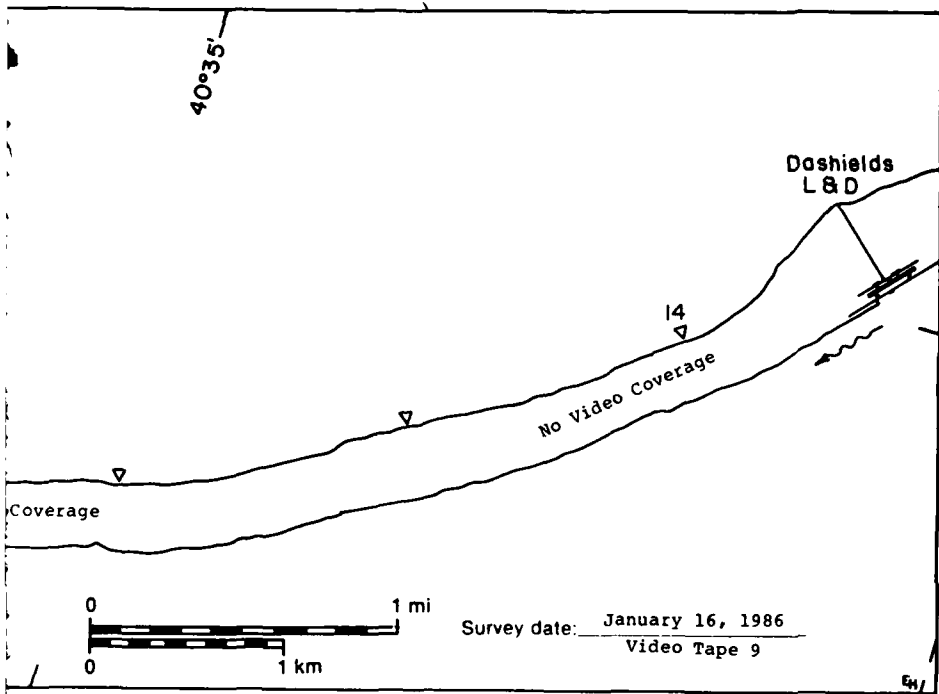


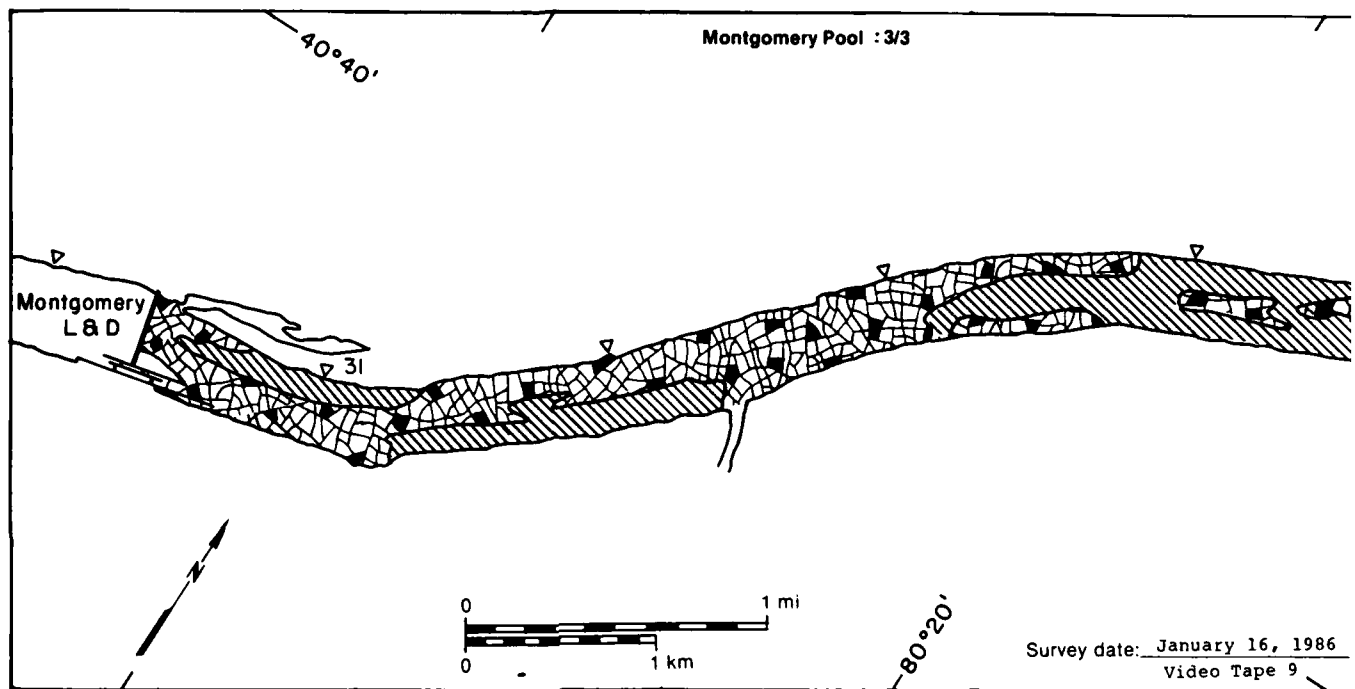
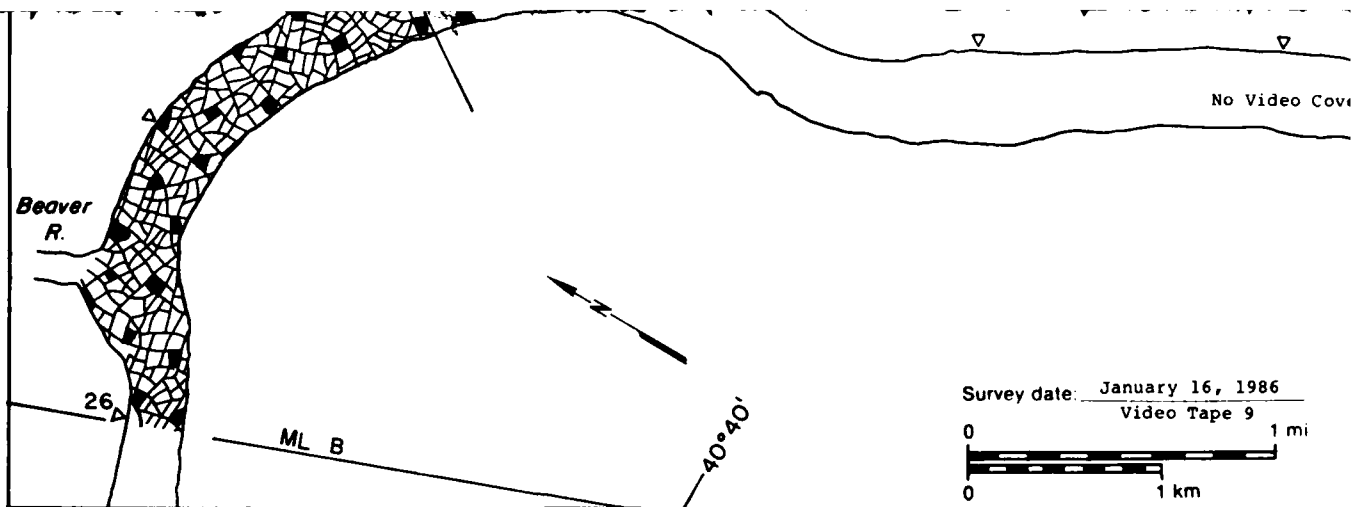
Dashields Pool		Surface concentration (%)	
MAP UNITS		Area ($m^2 \times 10^6$)	
	Open water	0.93	NA
	Solid ice cover	0.43	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.05	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.41	50
Total area ($m^2 \times 10^6$)		5.00*	* Includes $3.18 \times 10^6 m^2$ of no video coverage



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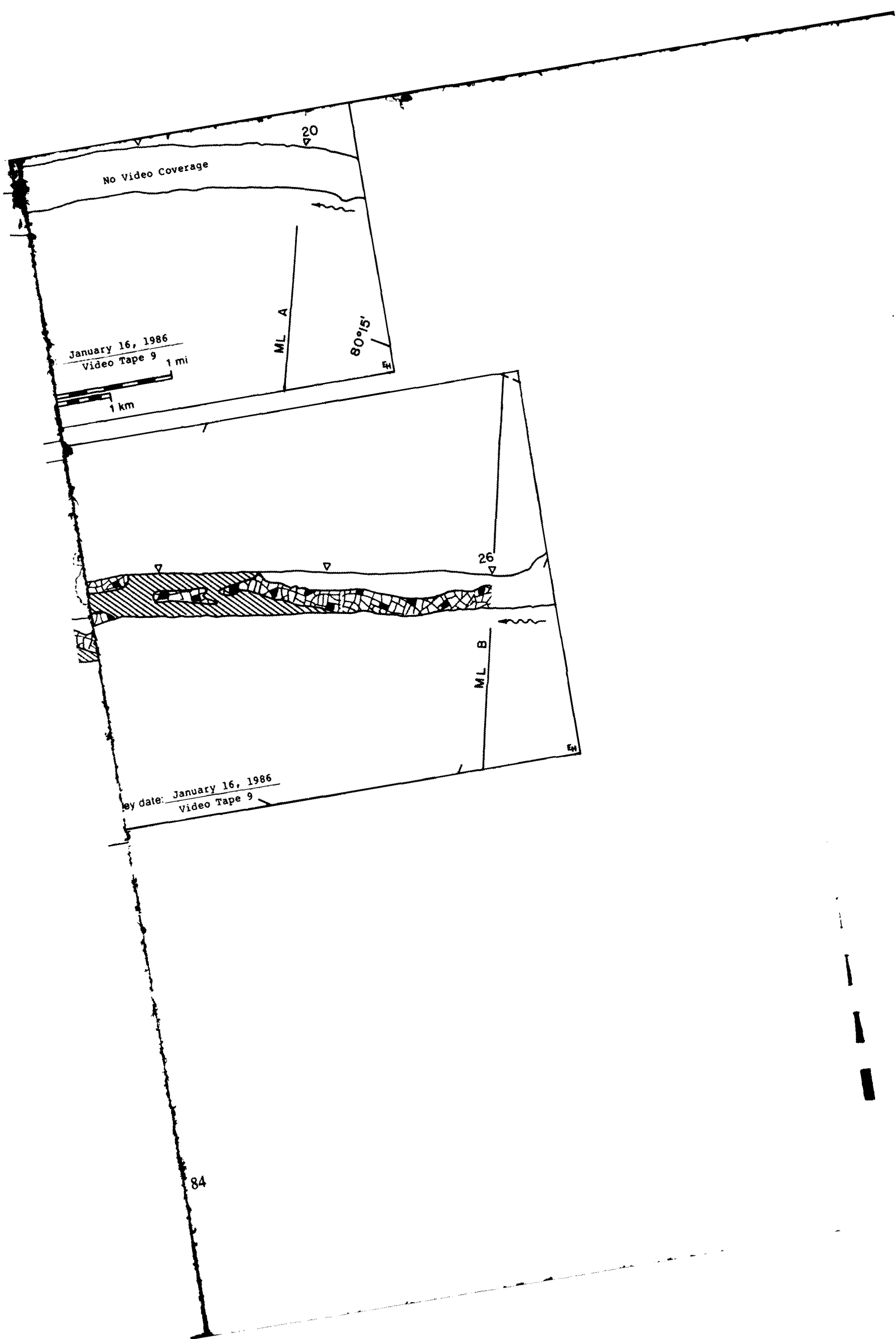


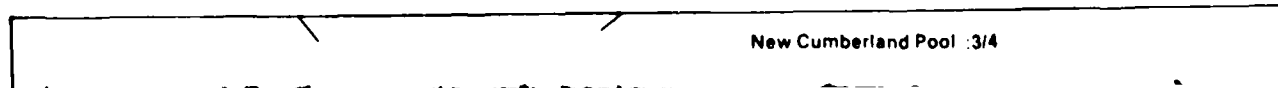
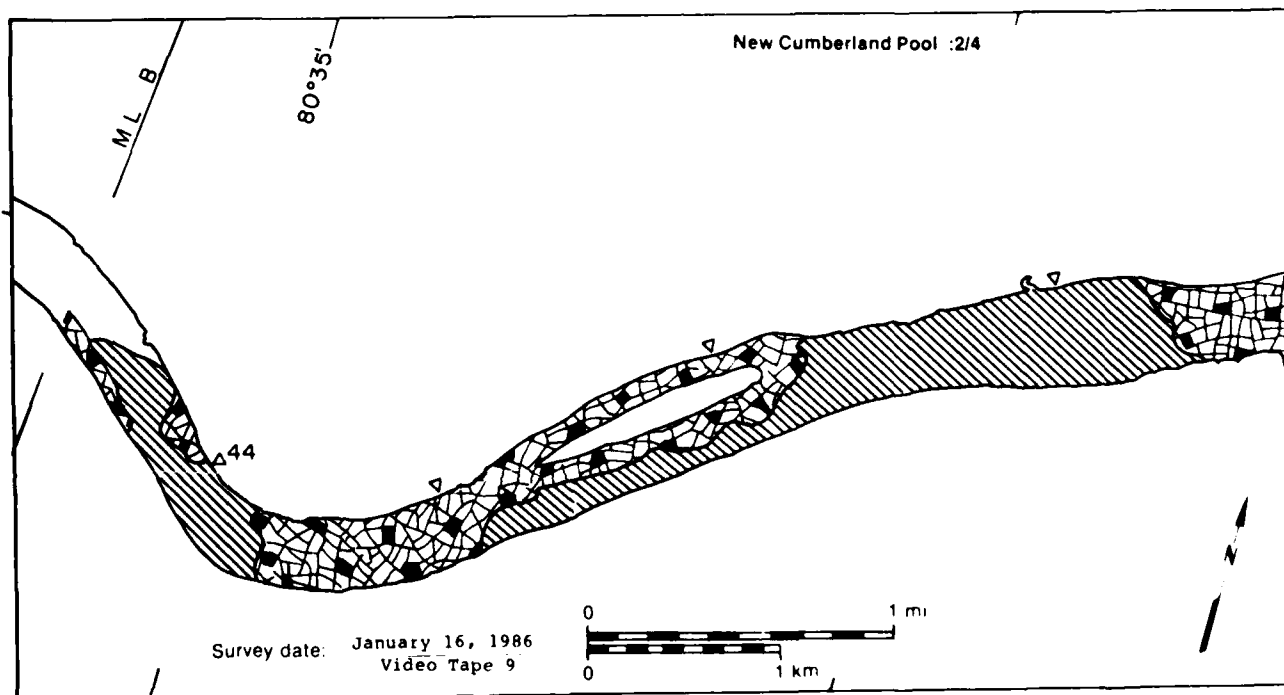
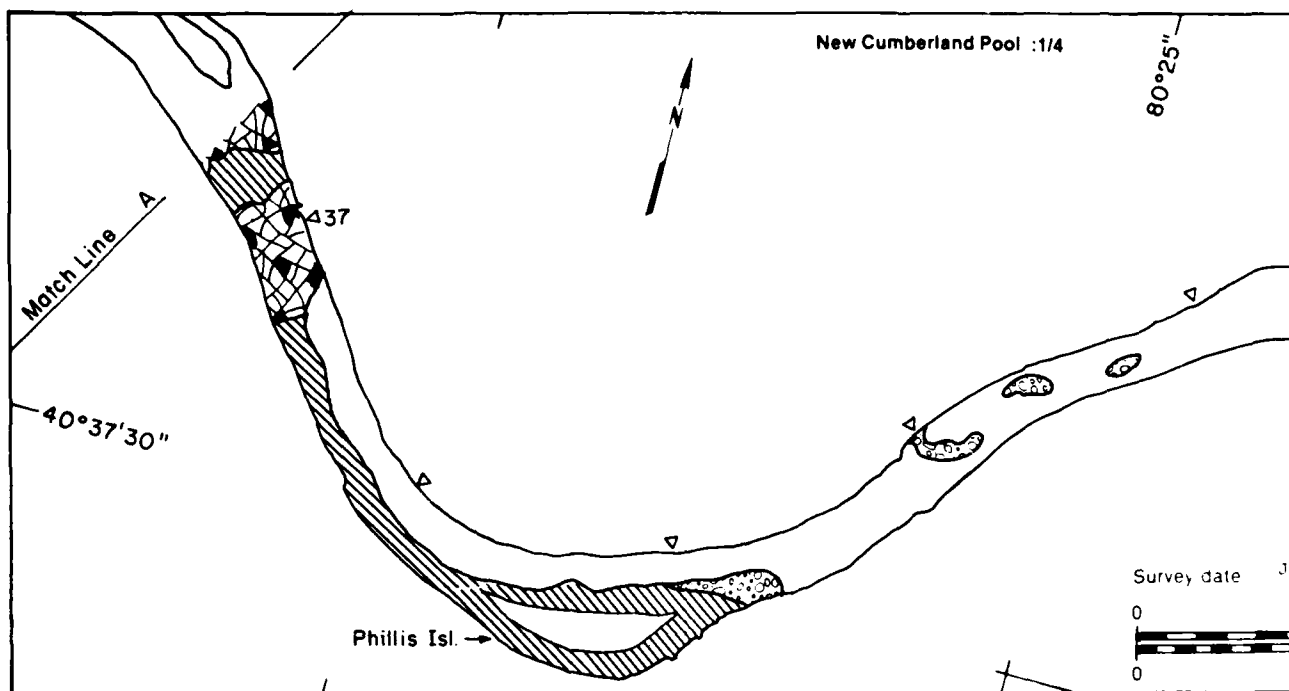


Montgomery Pool

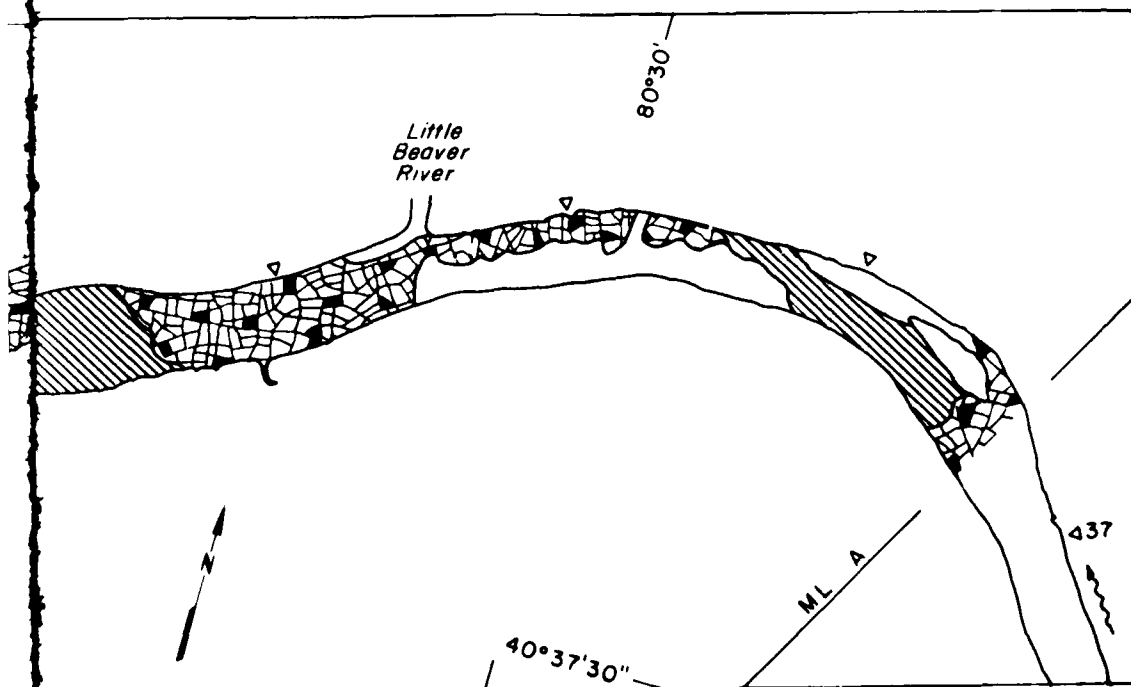
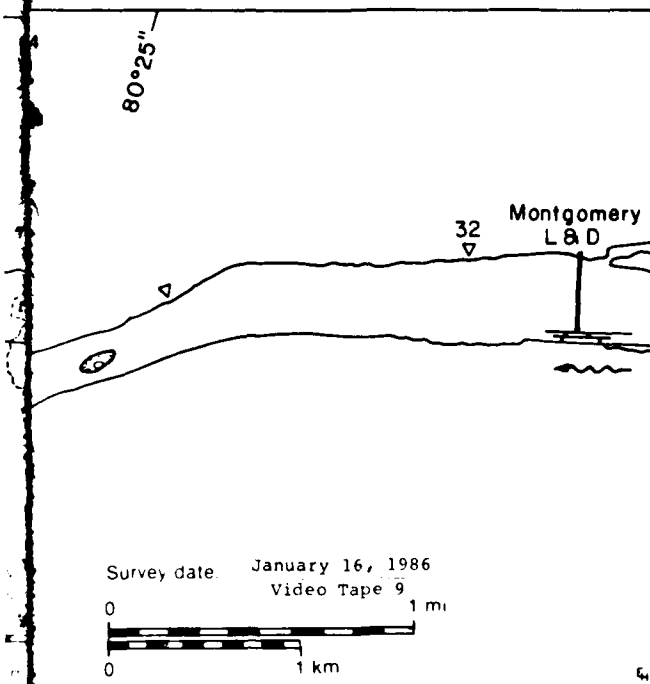
MAP UNITS		Area (m ² x 10 ⁶)	Surface concentration (%)
	Open water	0.38	NA
	Solid ice cover	1.14	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	3.20	70
	Ice floes or frazil slush and pans	0.00	—
Total area (m ² x 10 ⁶)		11.27*	

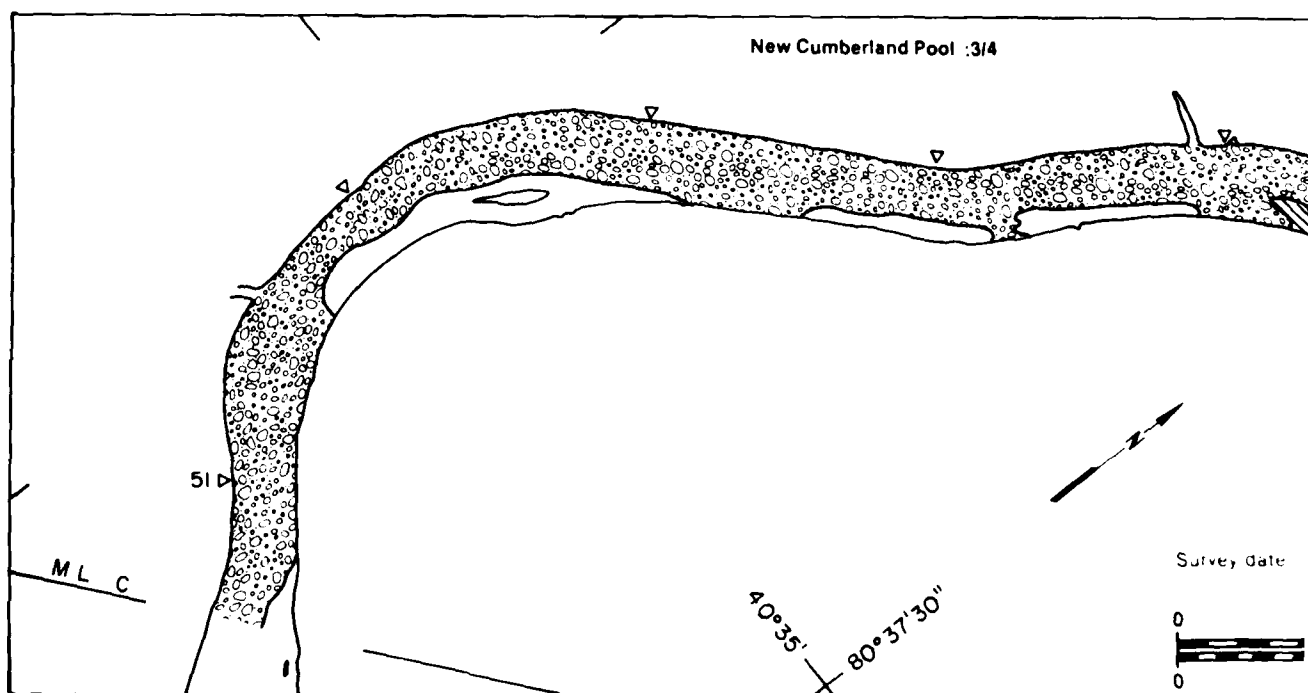
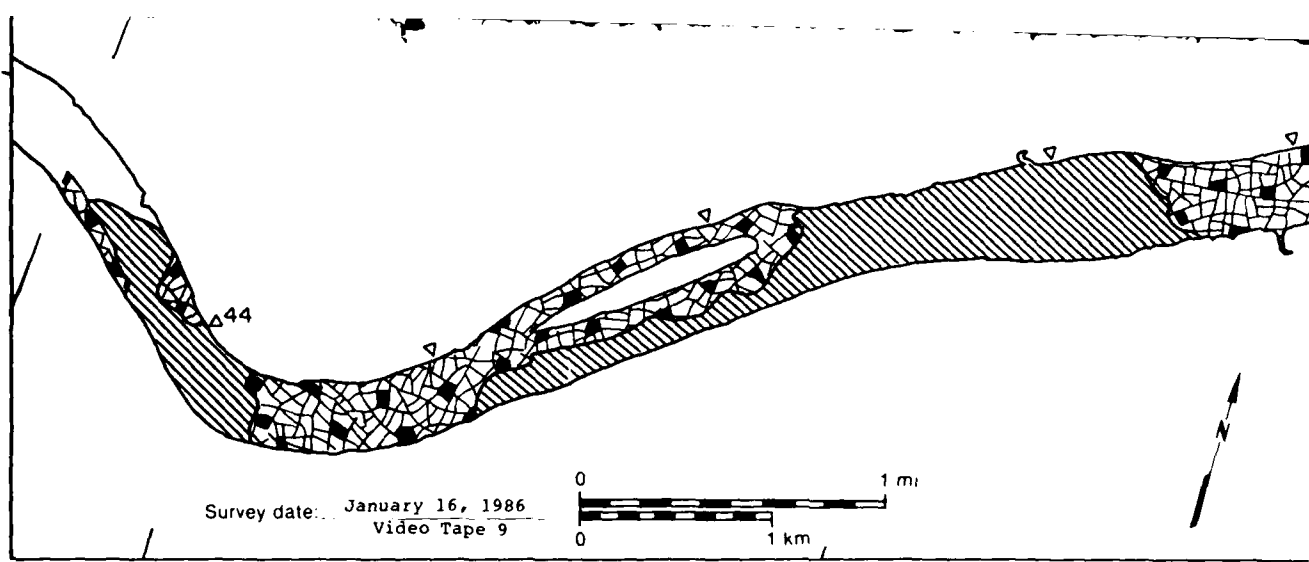
* Includes 6.55 x 10⁶ m² of no video coverage

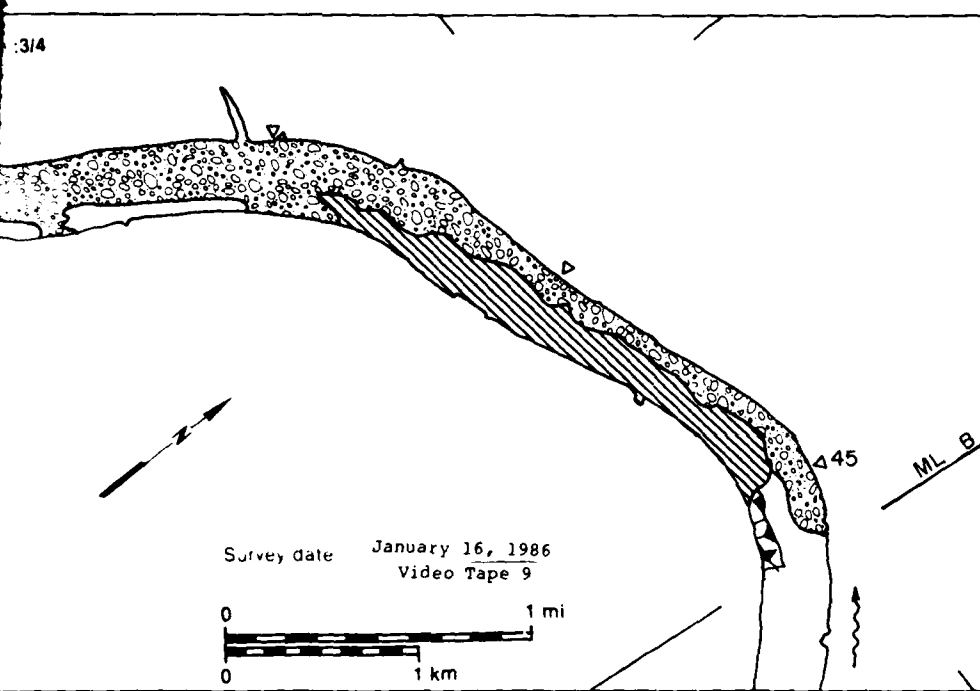
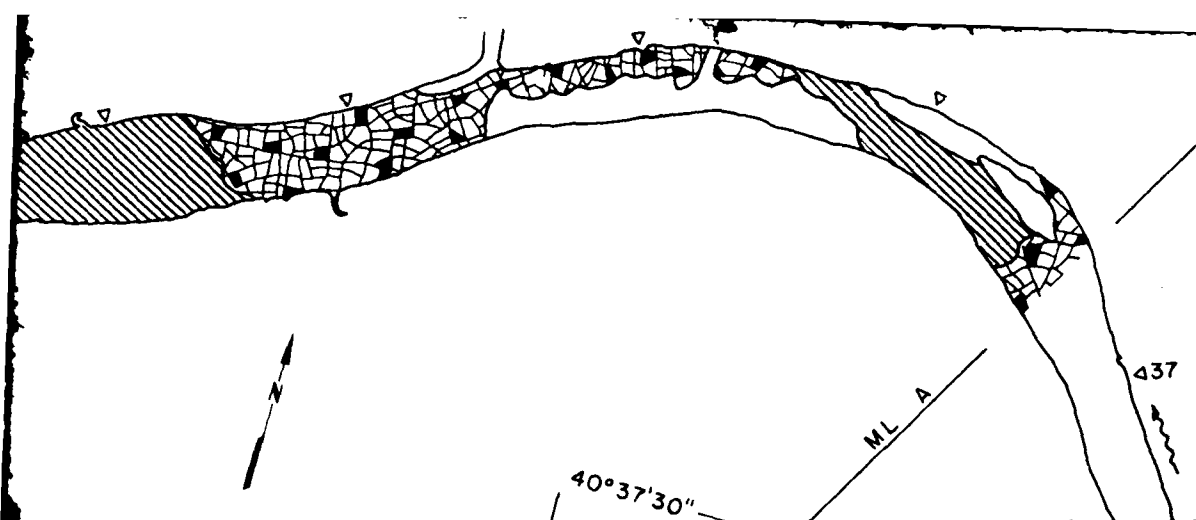




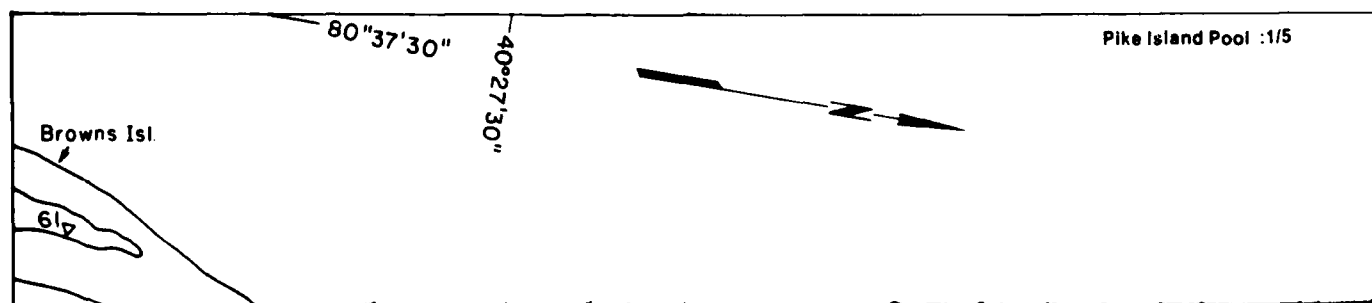
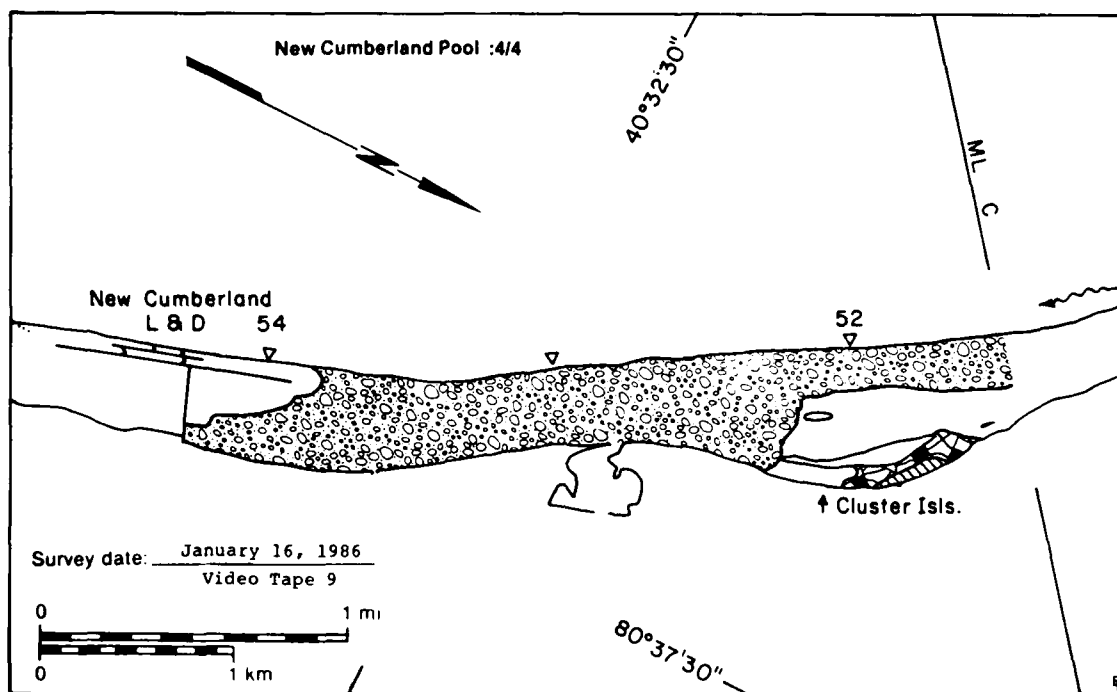
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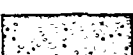




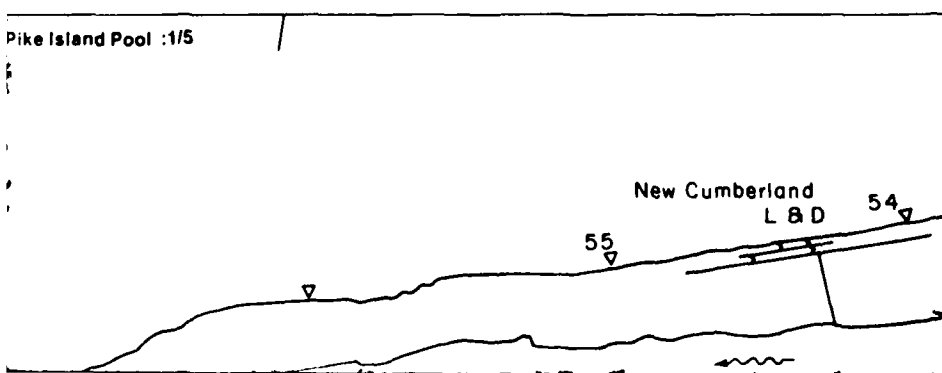
16 January 1986

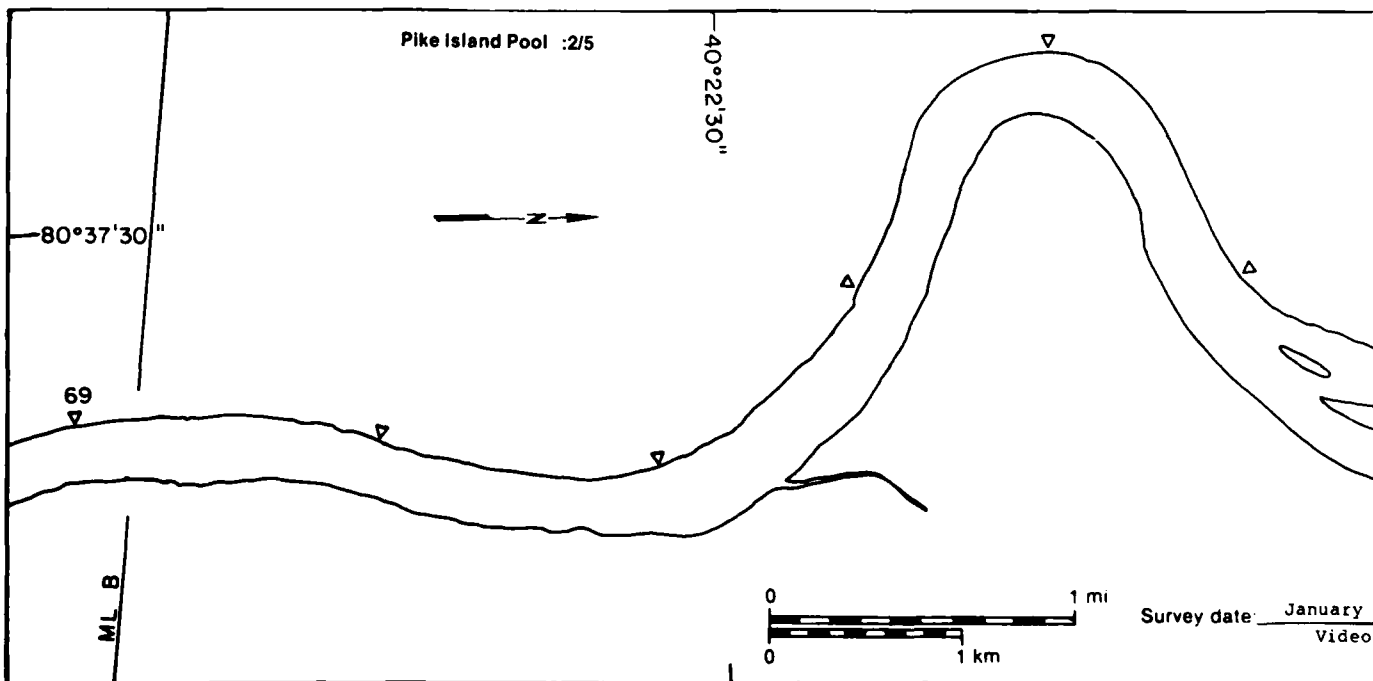
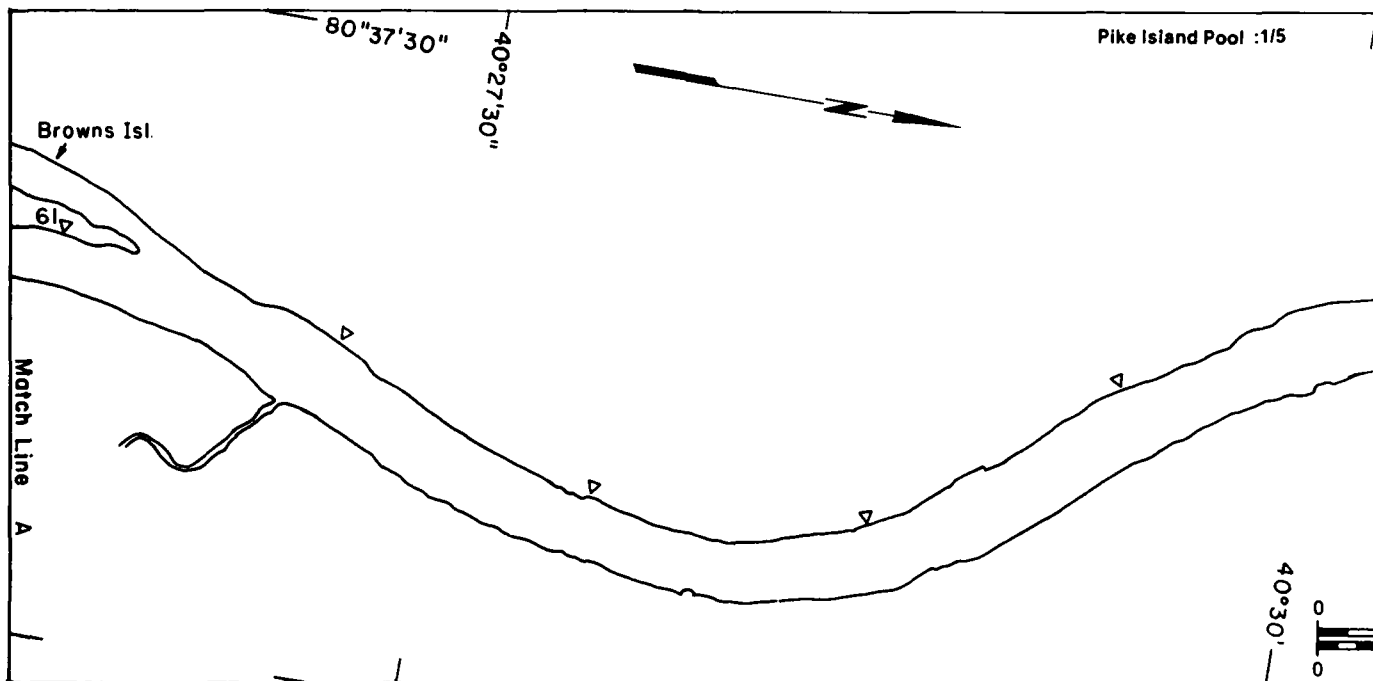


New Cumberland Pool

MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
 Open water	4.61	NA
 Solid ice cover	2.86	NA
 Solid ice cover with open-water areas	0.00	—
 Fragmented ice cover	0.00	NA
 Fragmented ice cover with open-water areas	2.42	90
 Ice floes or frazil slush and pans	4.98	50
Total area ($m^2 \times 10^6$)	14.87	

Pike Island Pool :1/5





Pike Island Pool :1/5

New Cumberland
L & D

54

55

40°30'

0

1 mi

Survey date: January 16, 1986
Video Tape 9

0

1 km

54

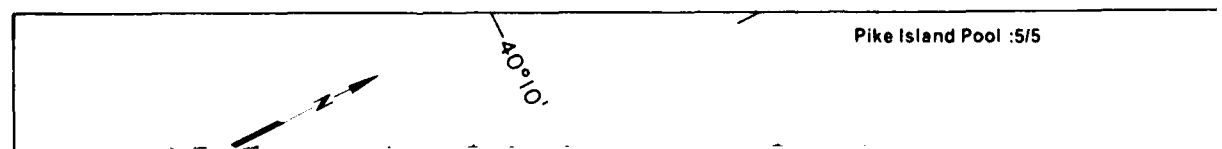
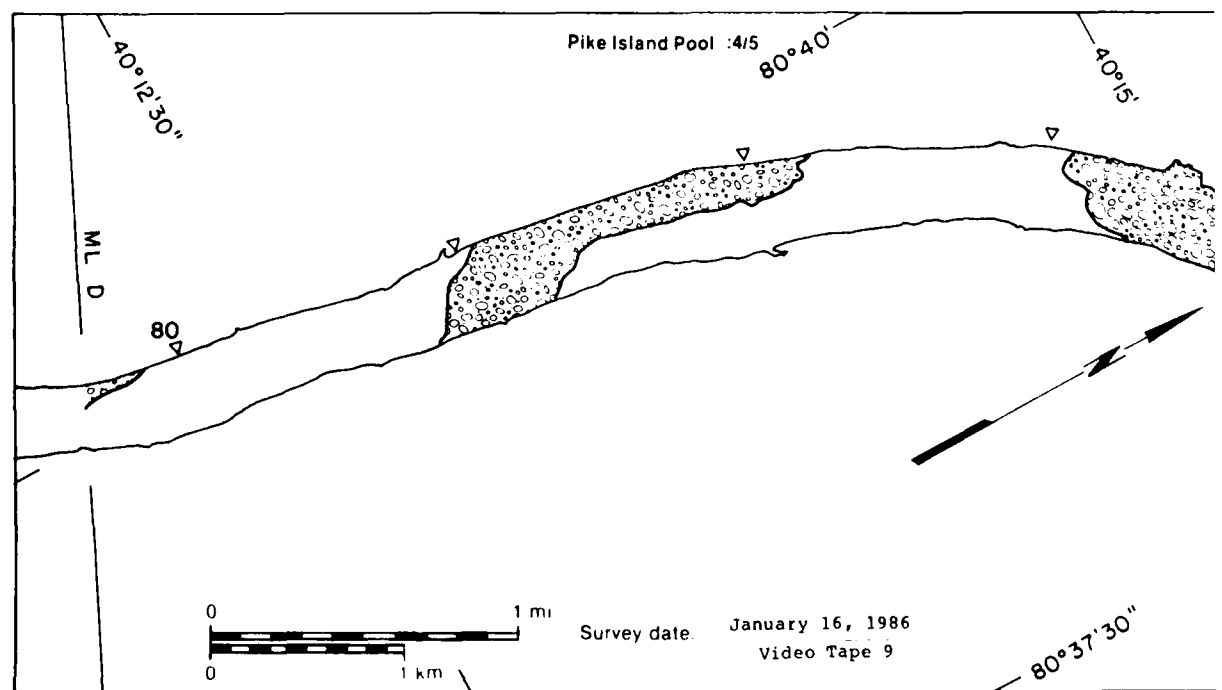
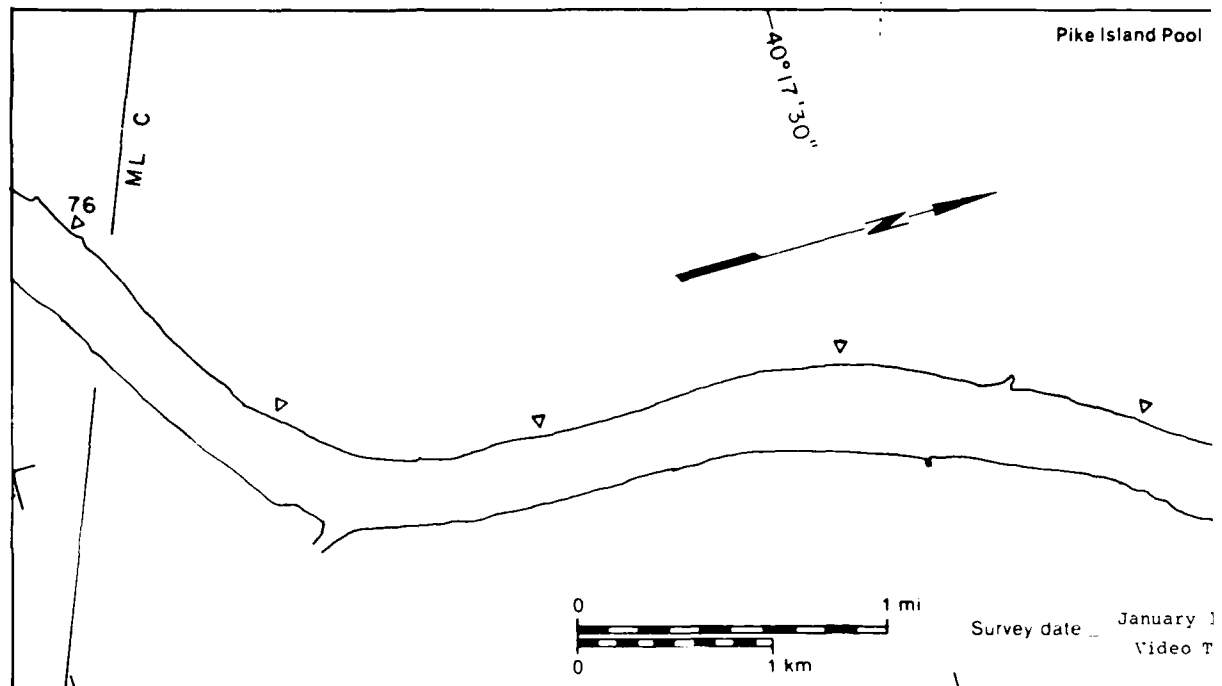
40°25''

M L A

Browns Isl. 62

1 mi

Survey date: January 16, 1986
Video Tape 9



16 January 1986

Pike Island Pool :3/5

80°37'30"
40°20'

69

ML B

Key date January 16, 1986
Video Tape 9

40°15'

ML C

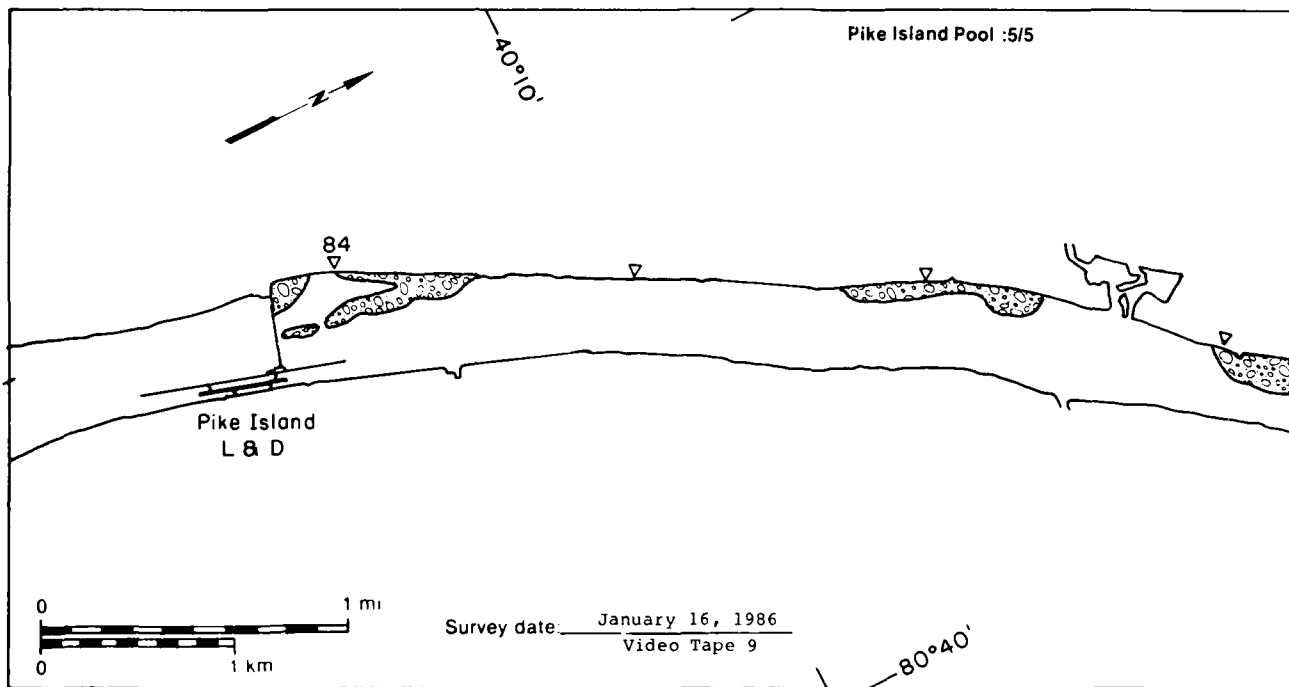
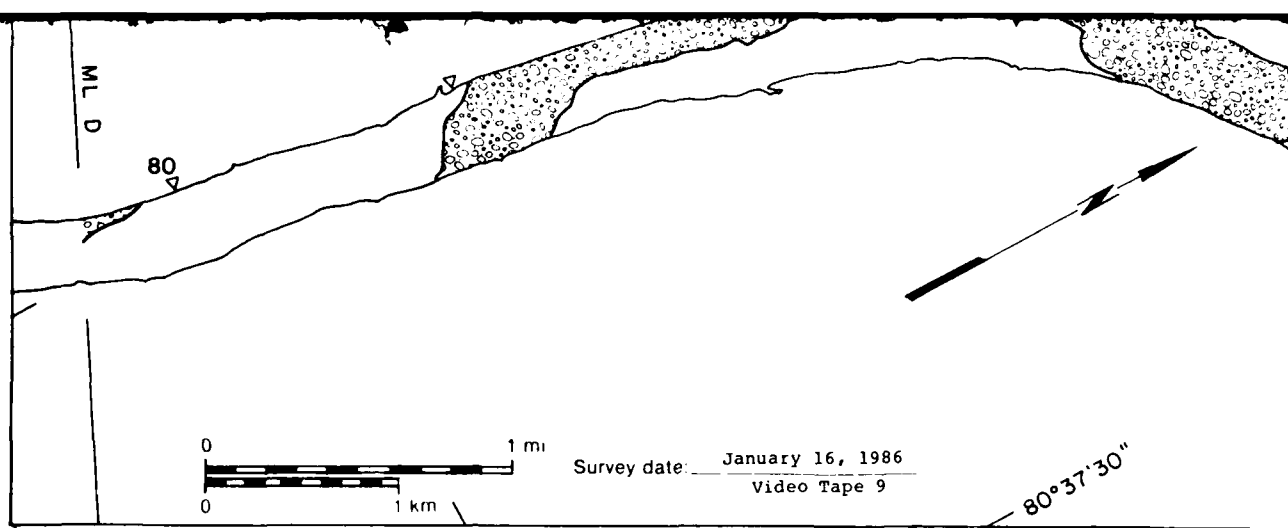
76

80°37'30"






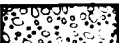
:5/5

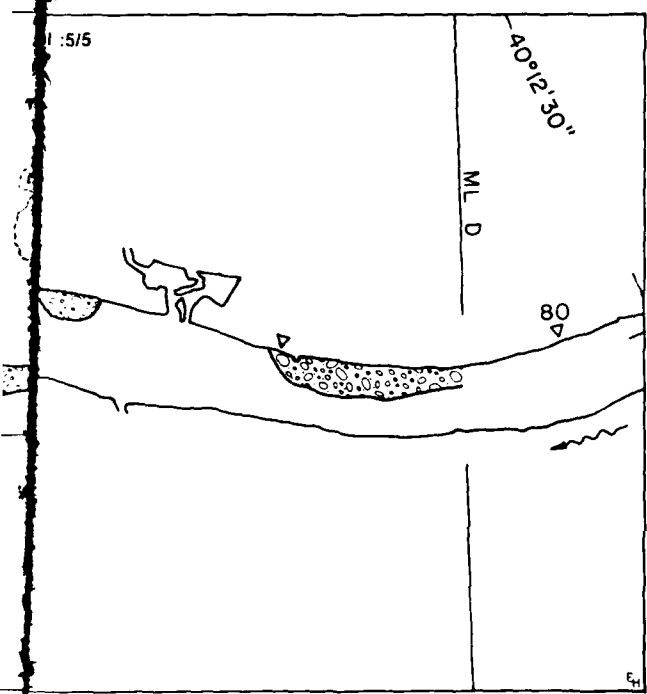
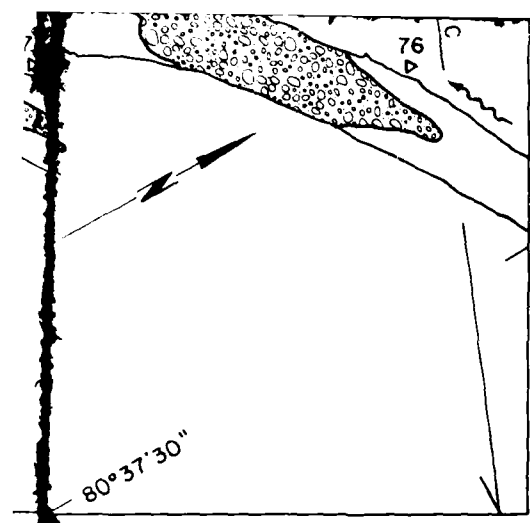
40°12'30"

ML

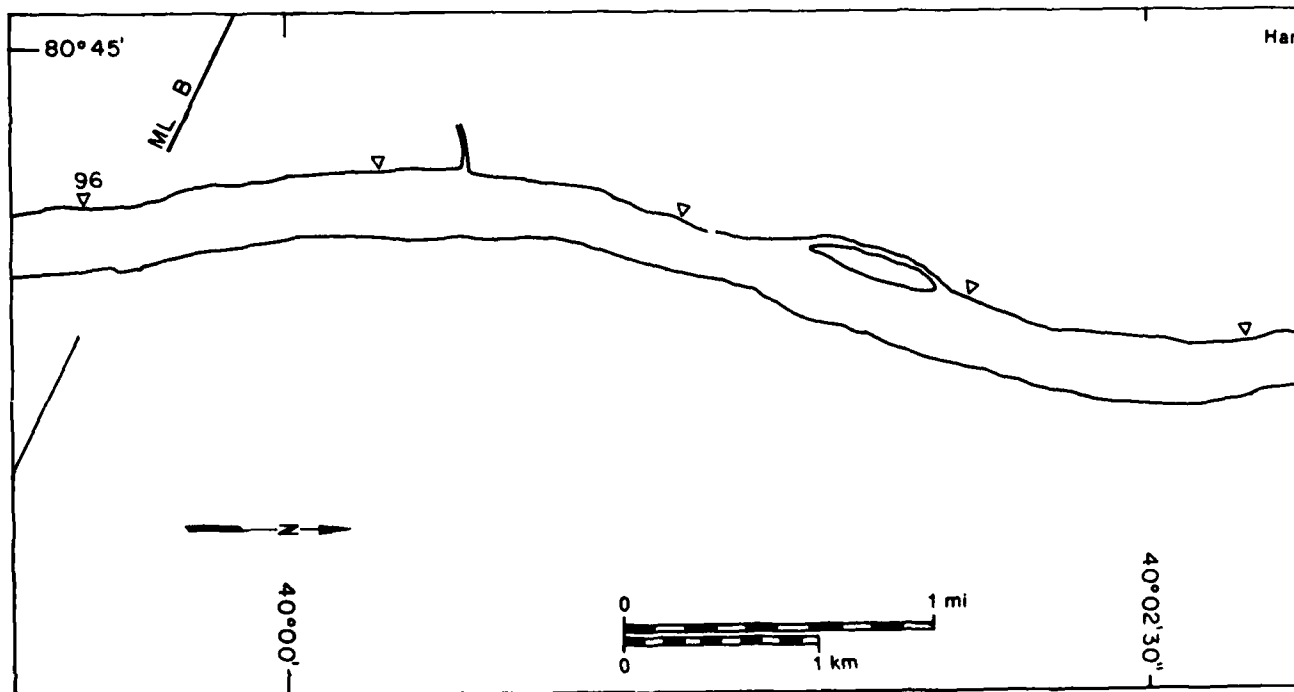
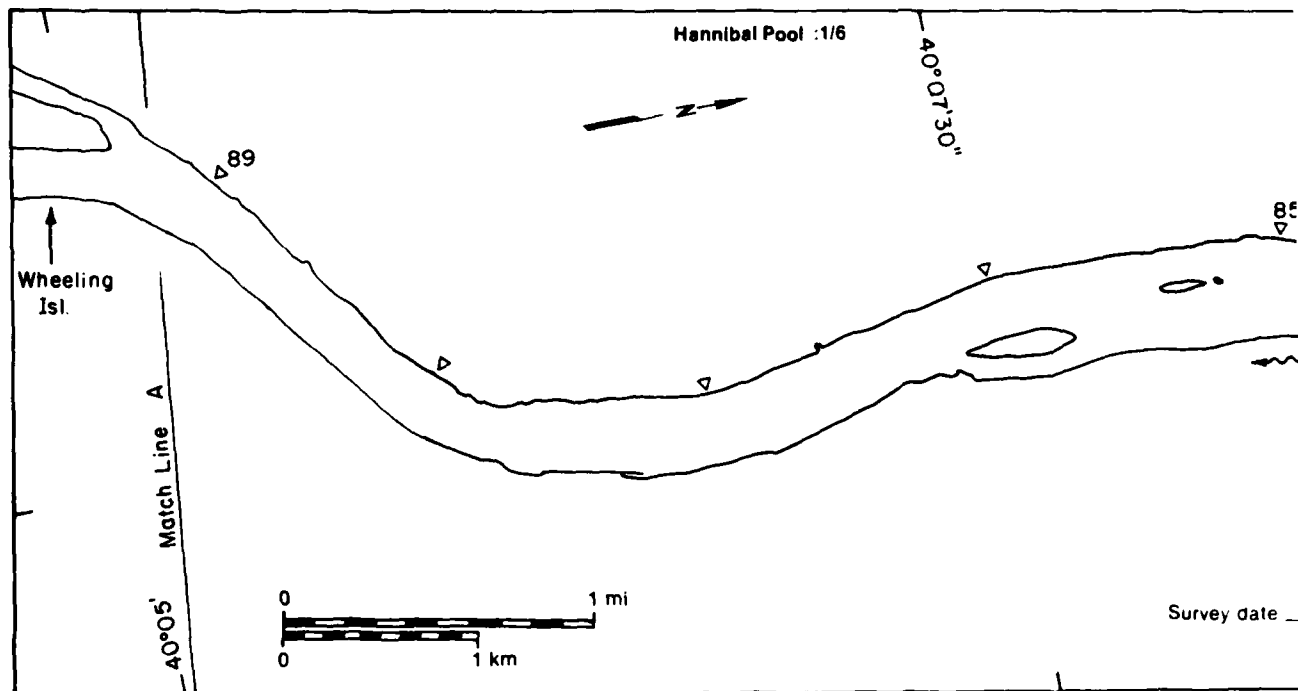


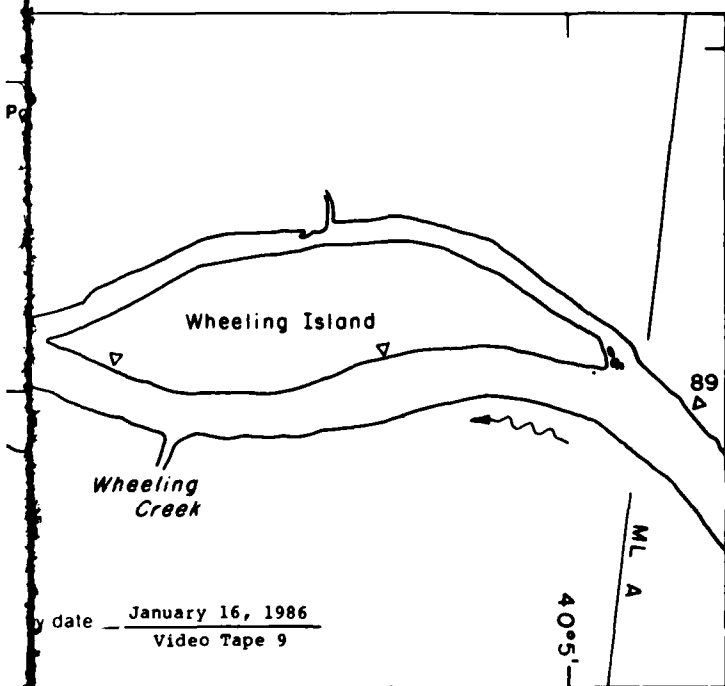
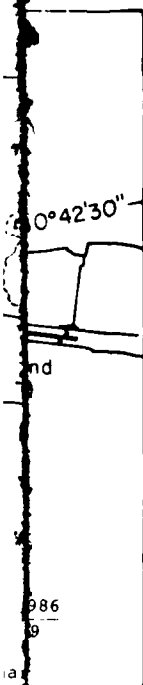
Pike Island Pool

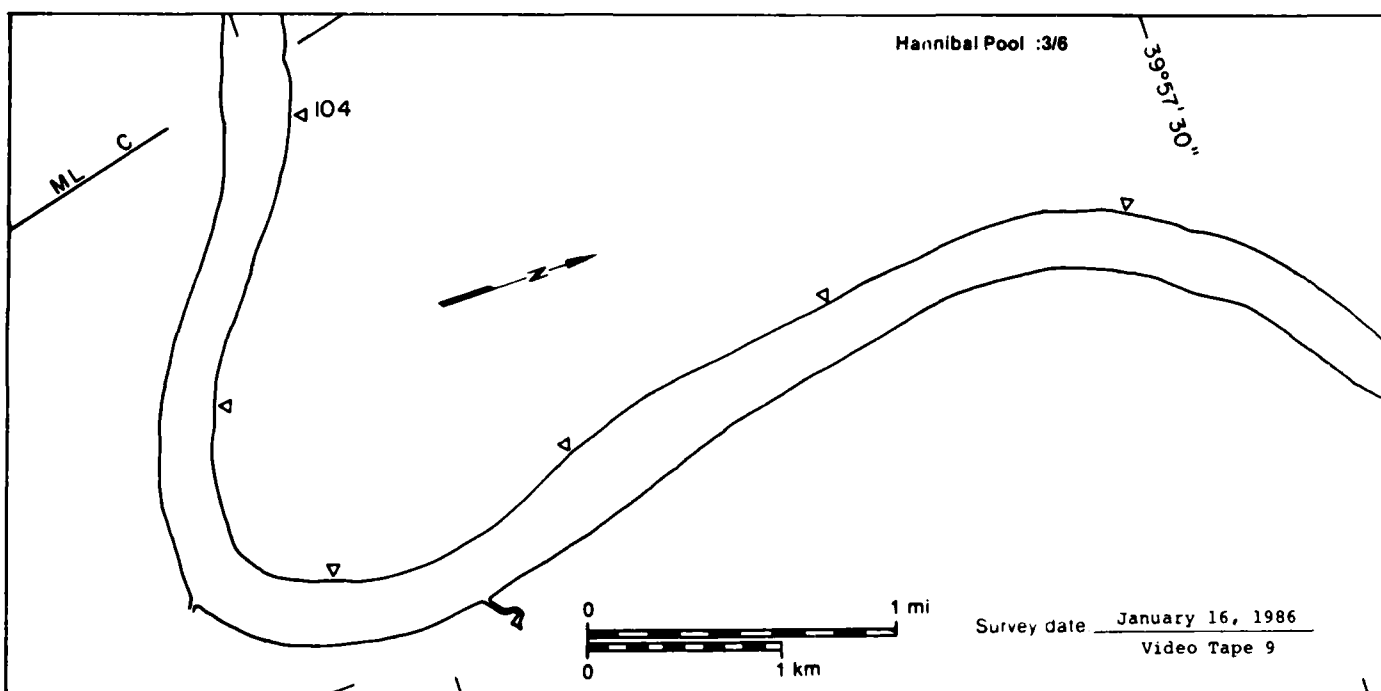
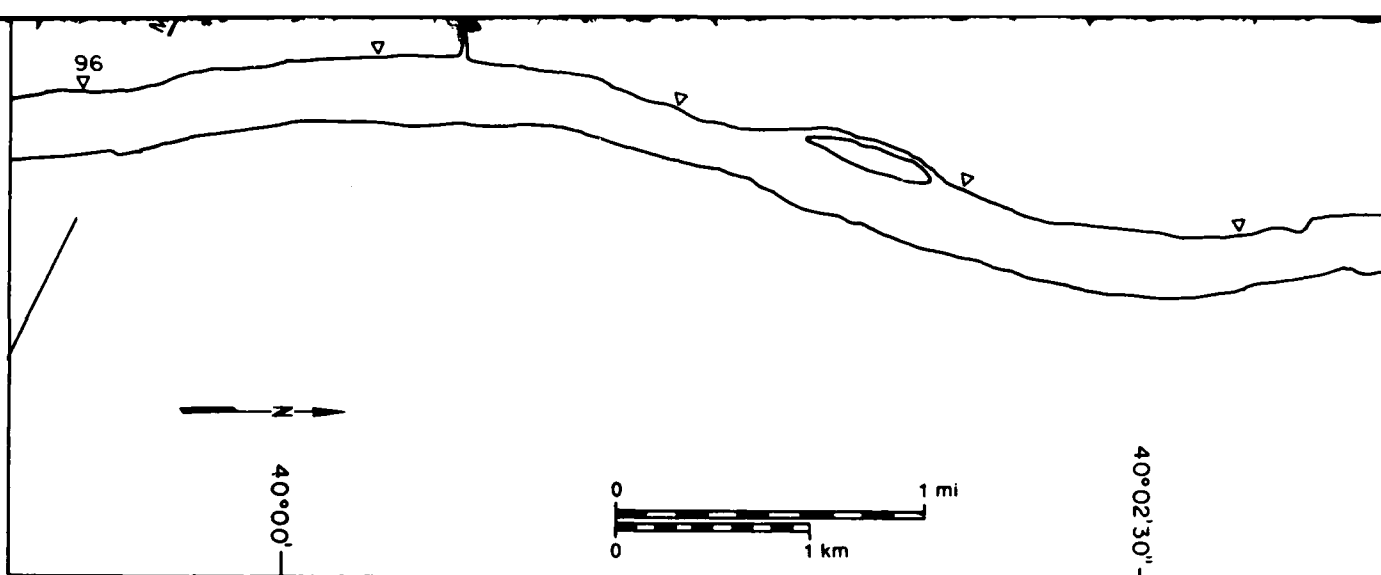
MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	17.34	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	1.58	10
Total area ($m^2 \times 10^6$)		18.92	

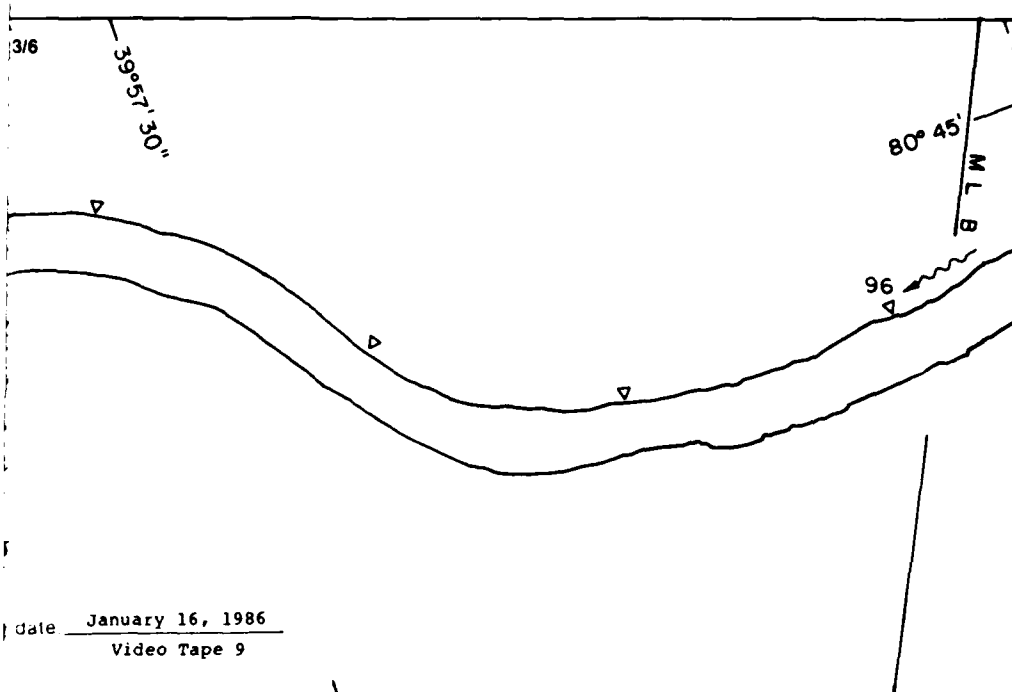
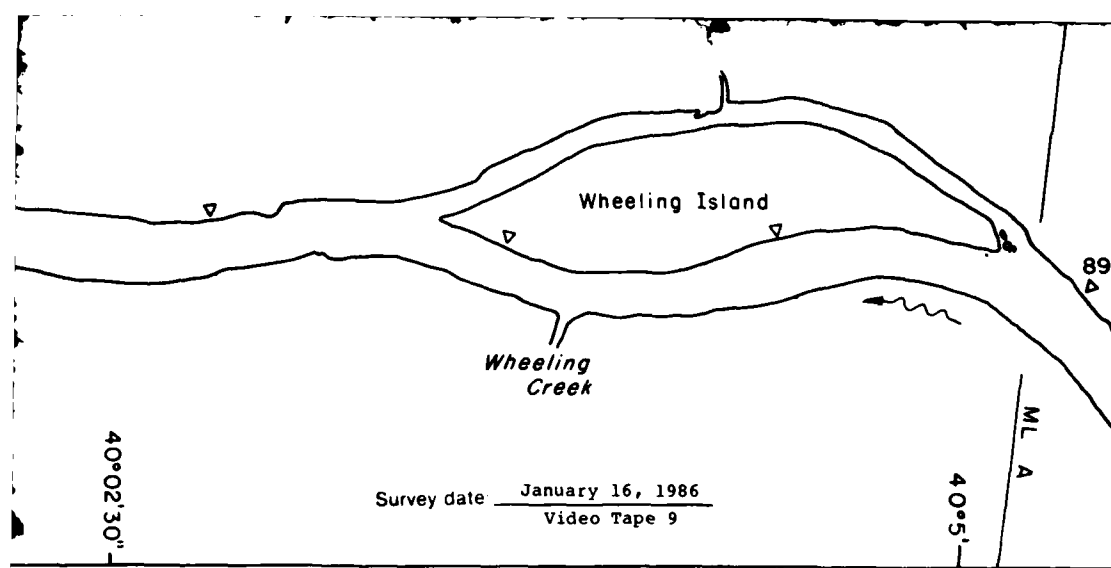


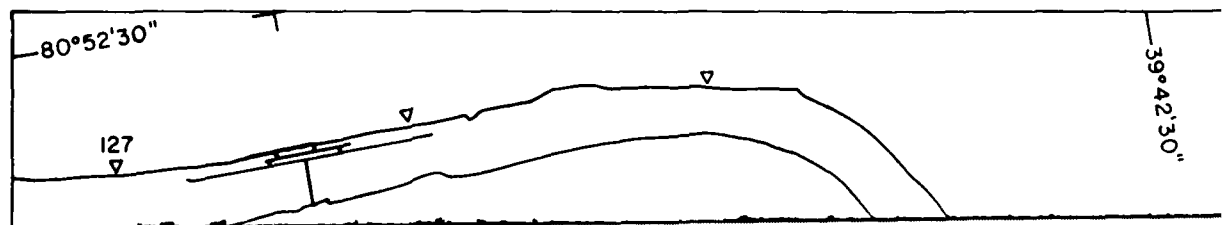
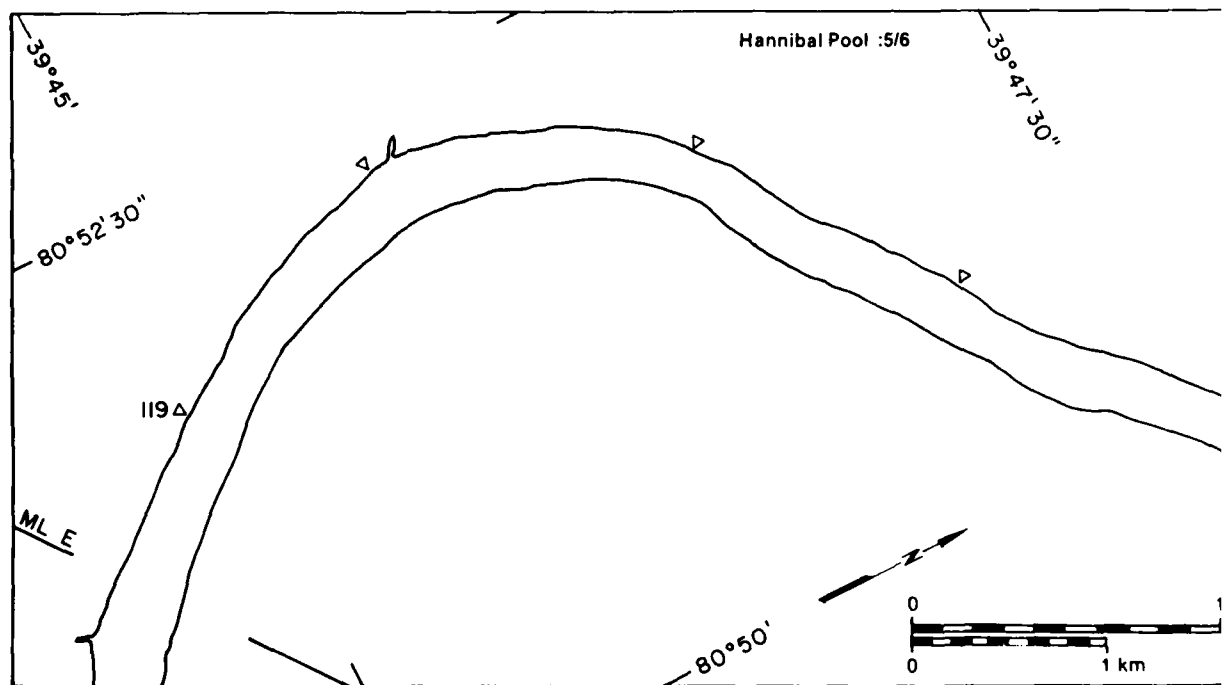
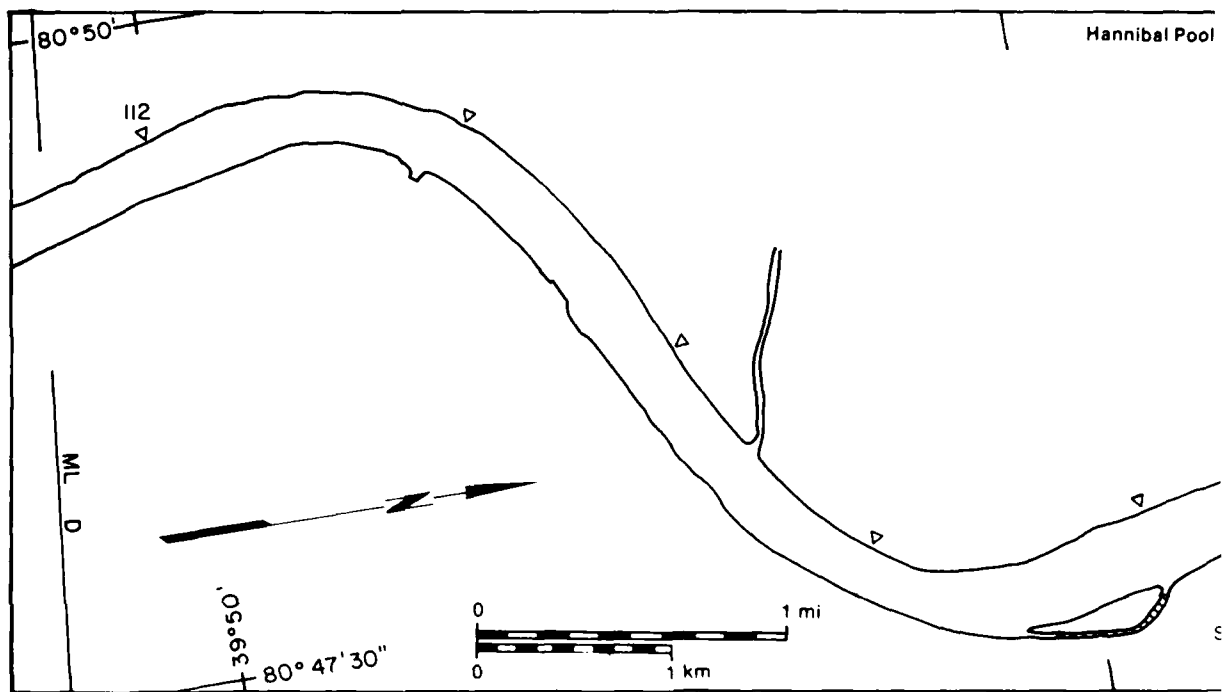
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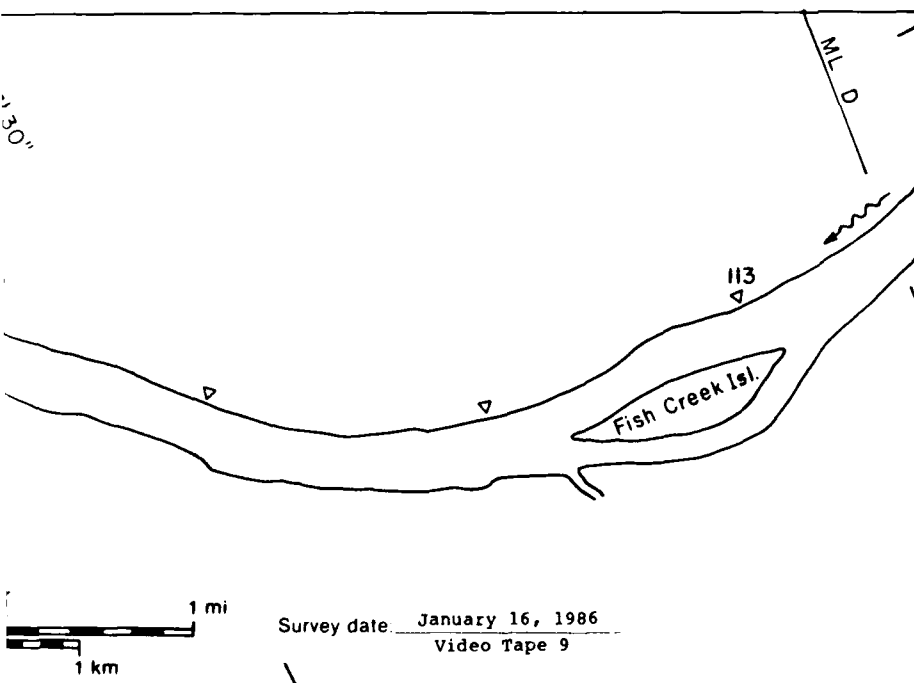
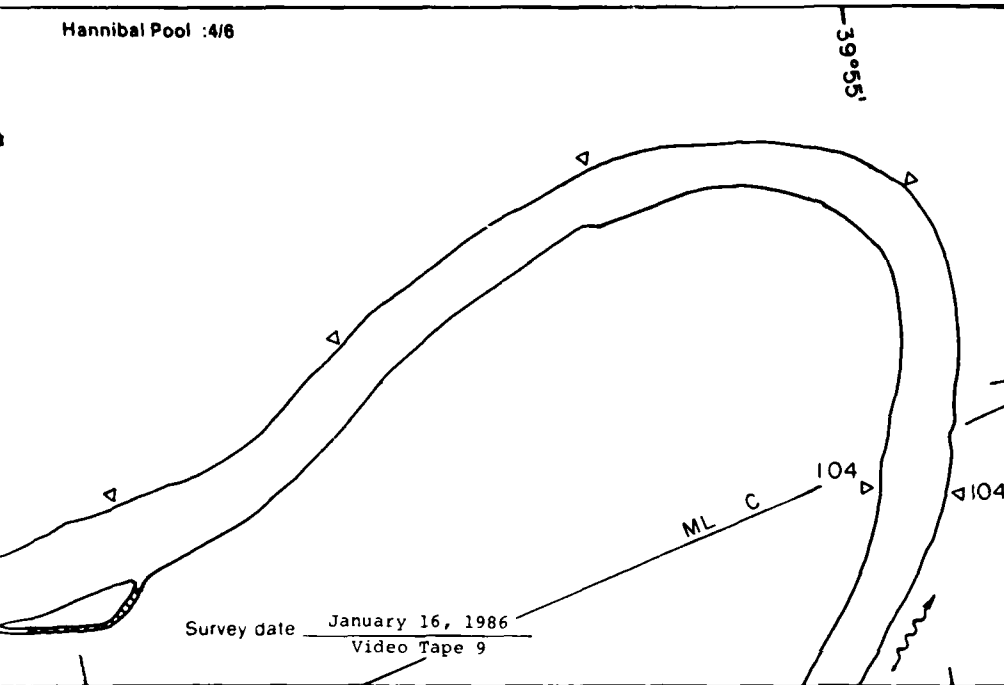




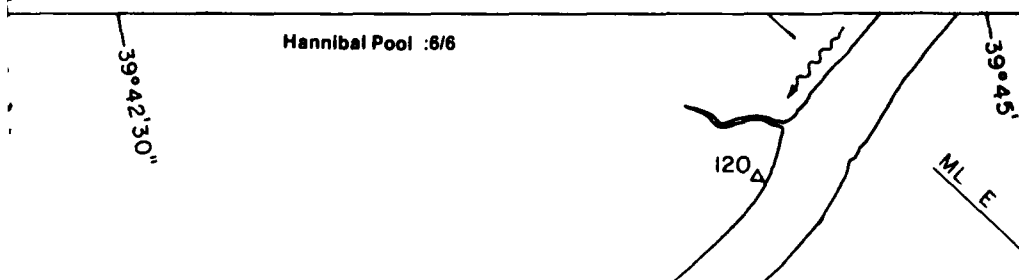


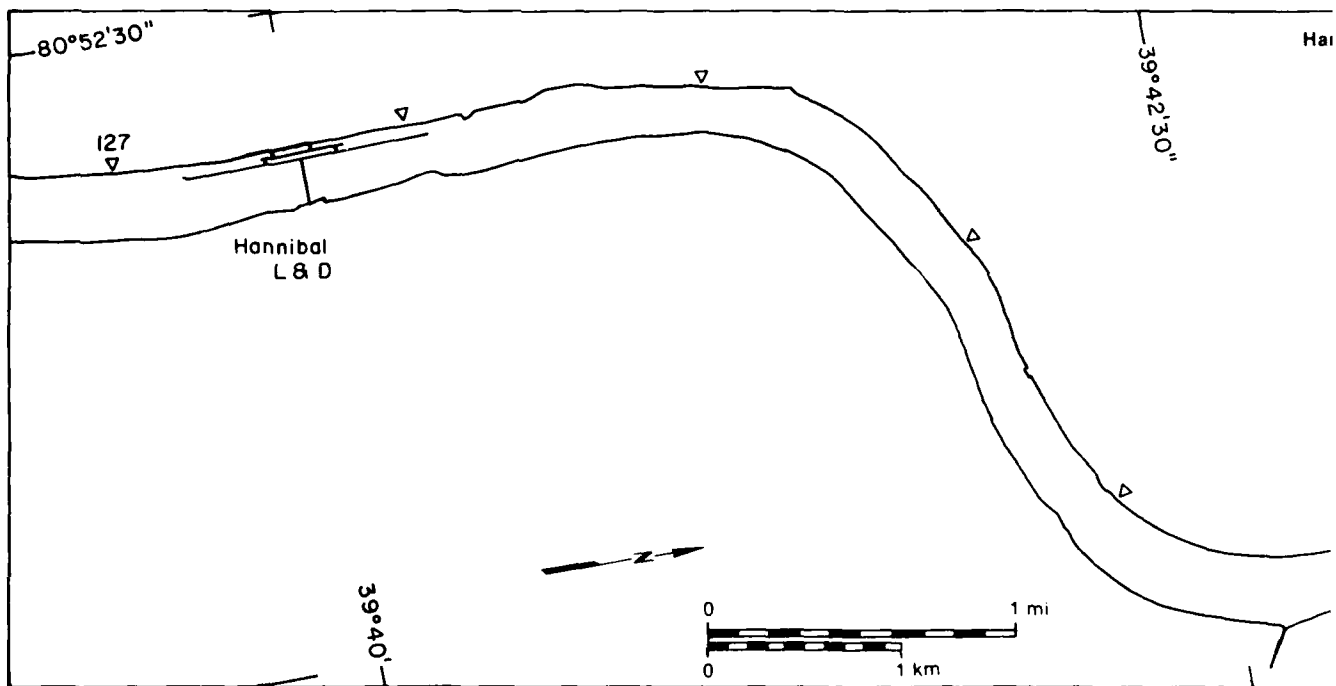
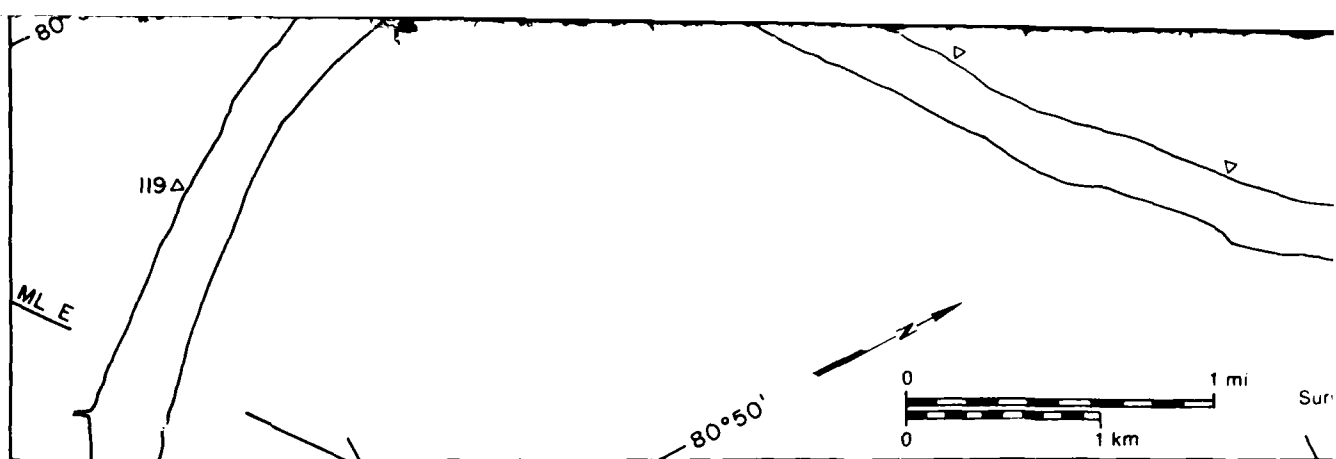
16 January 1986

Hannibal Pool :4/6



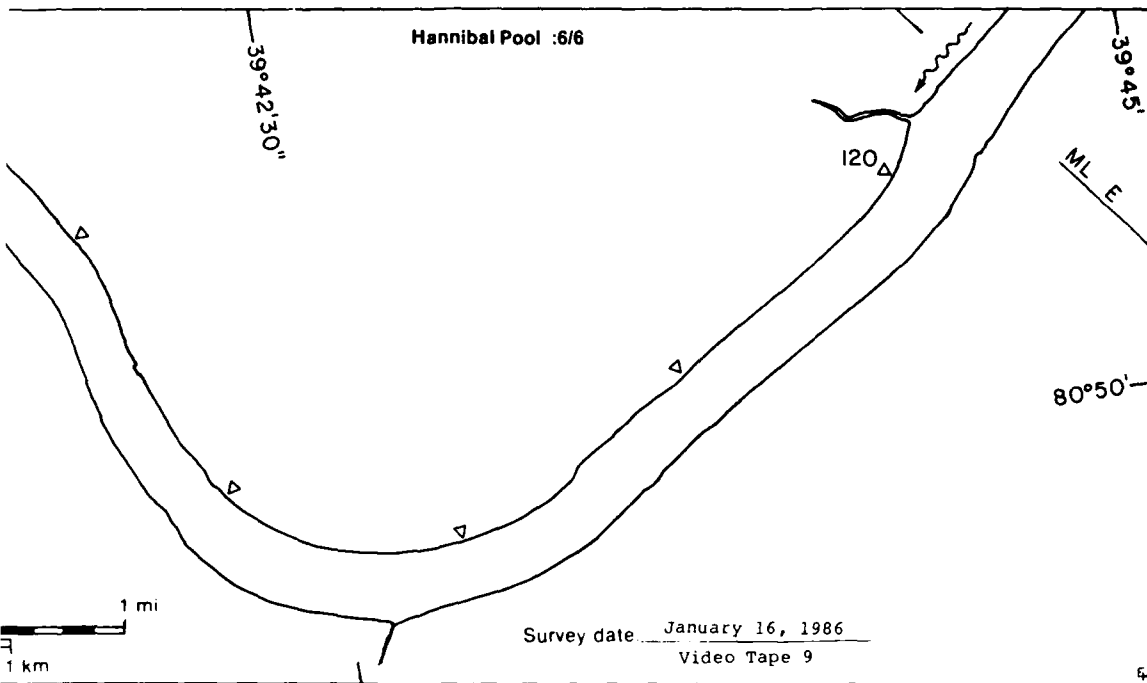
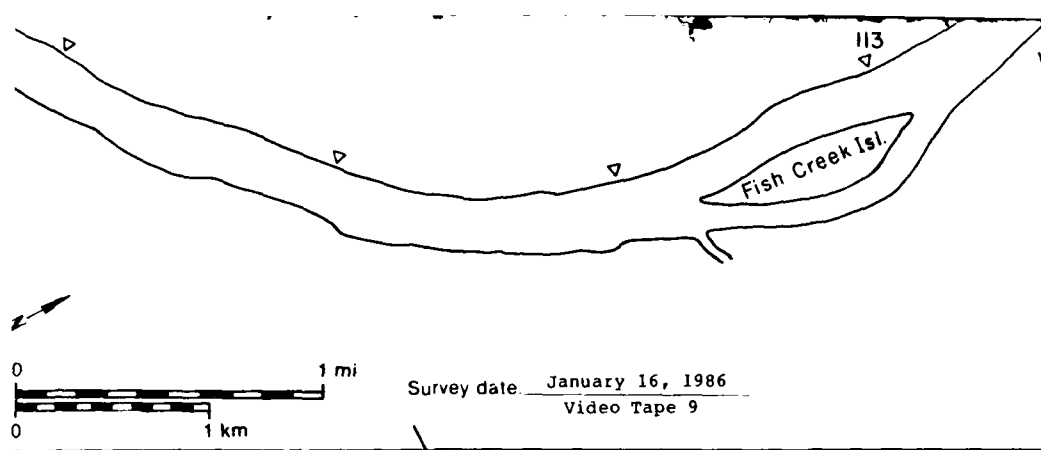
Hannibal Pool :8/6



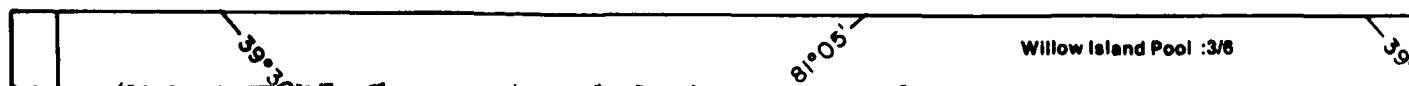
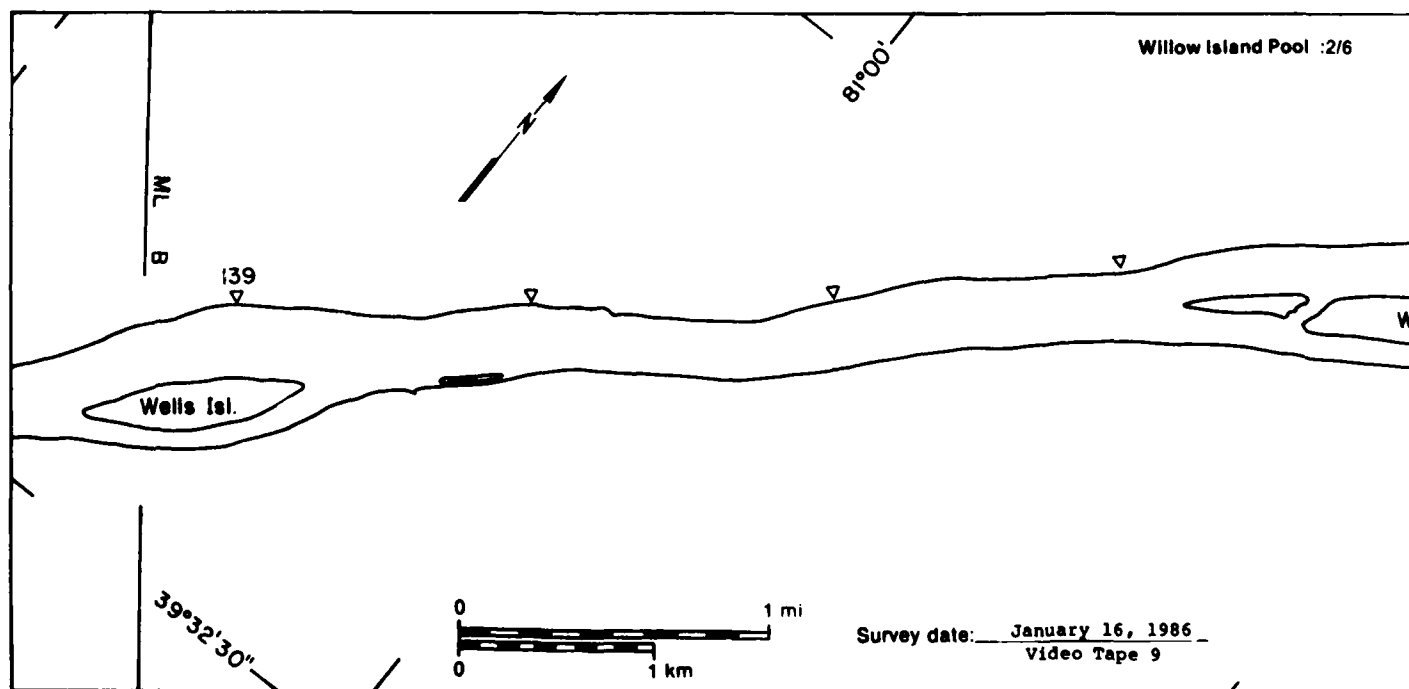
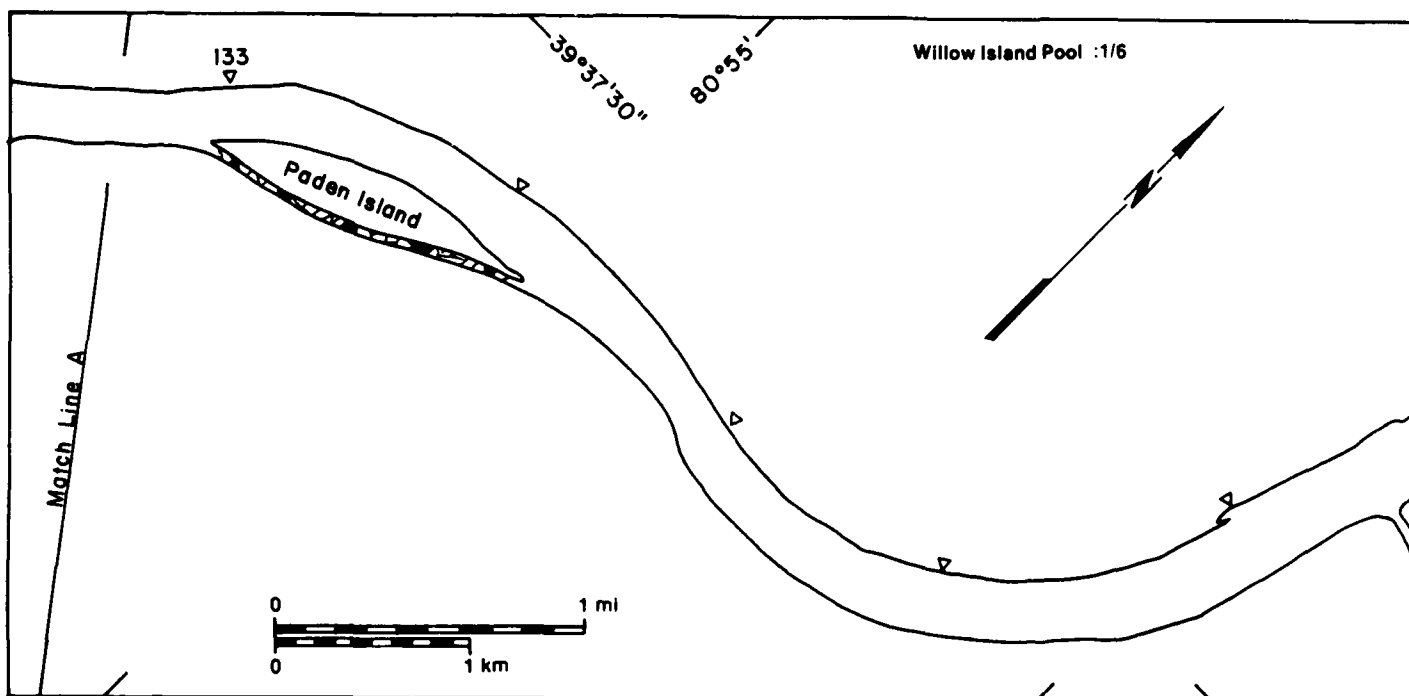


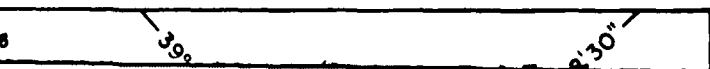
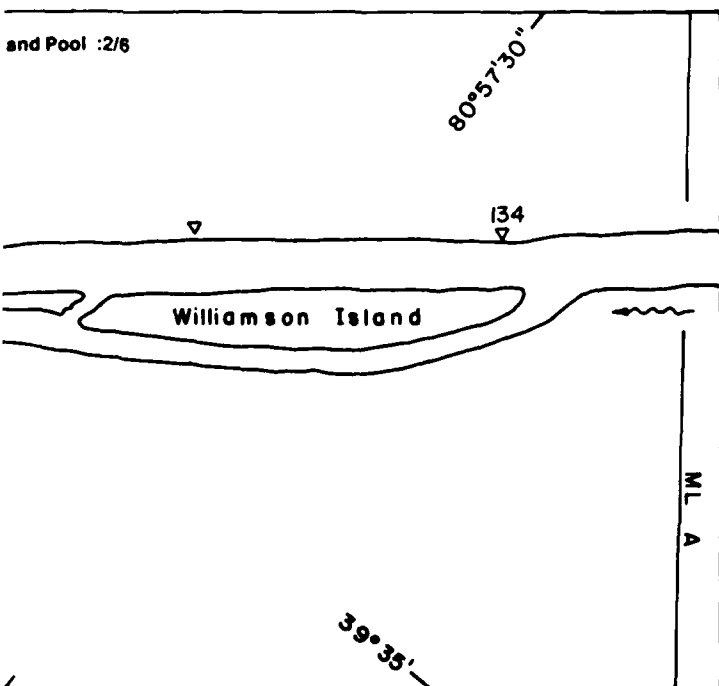
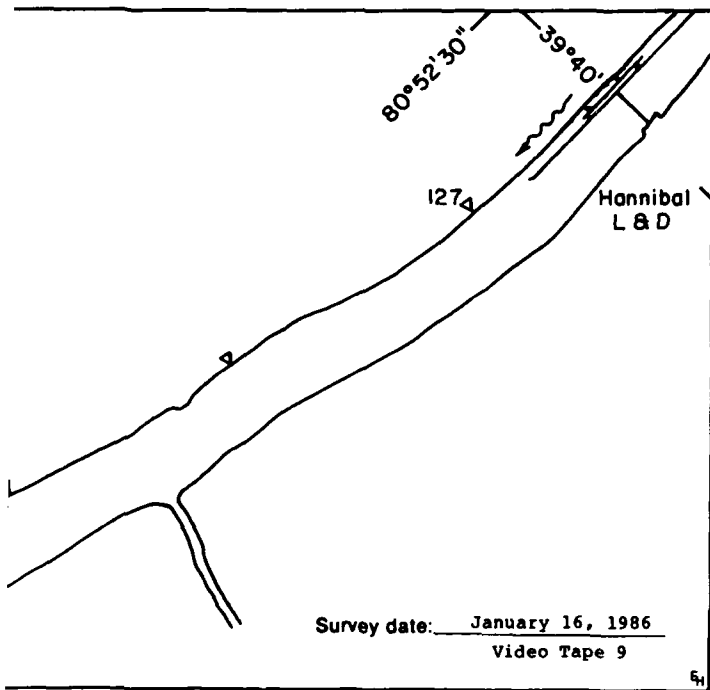
Hannibal Pool

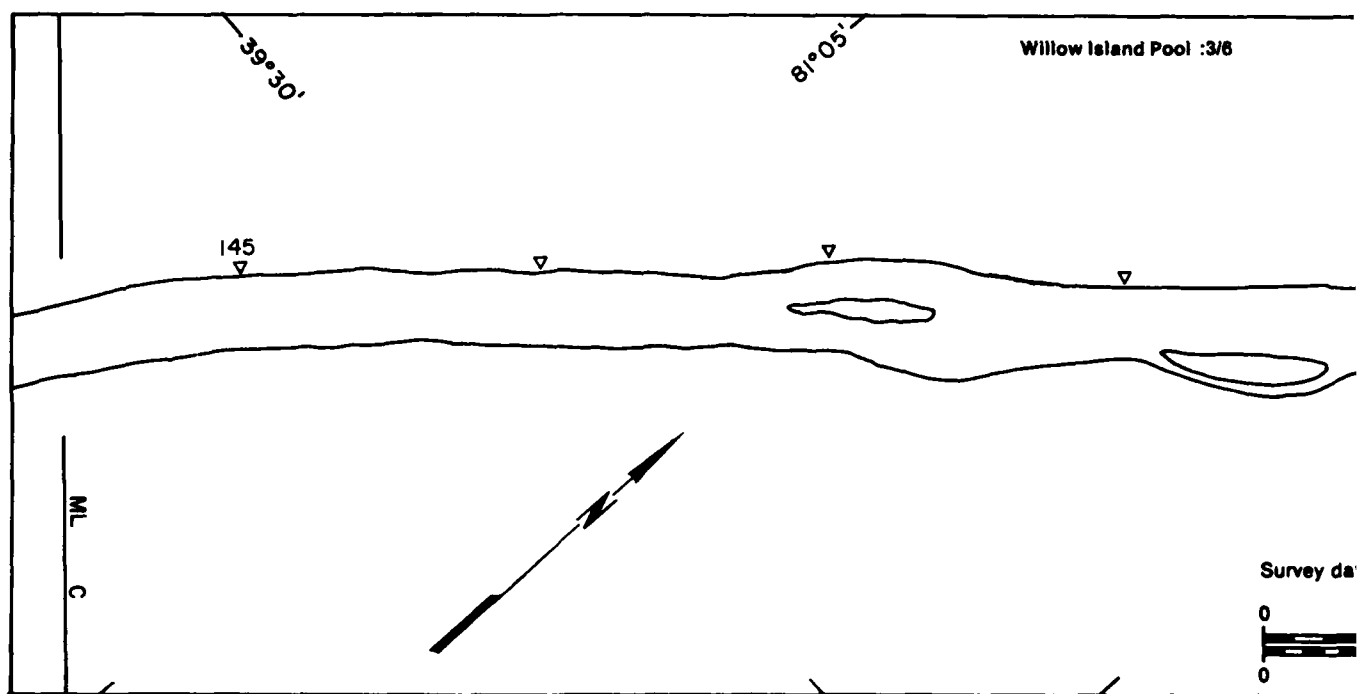
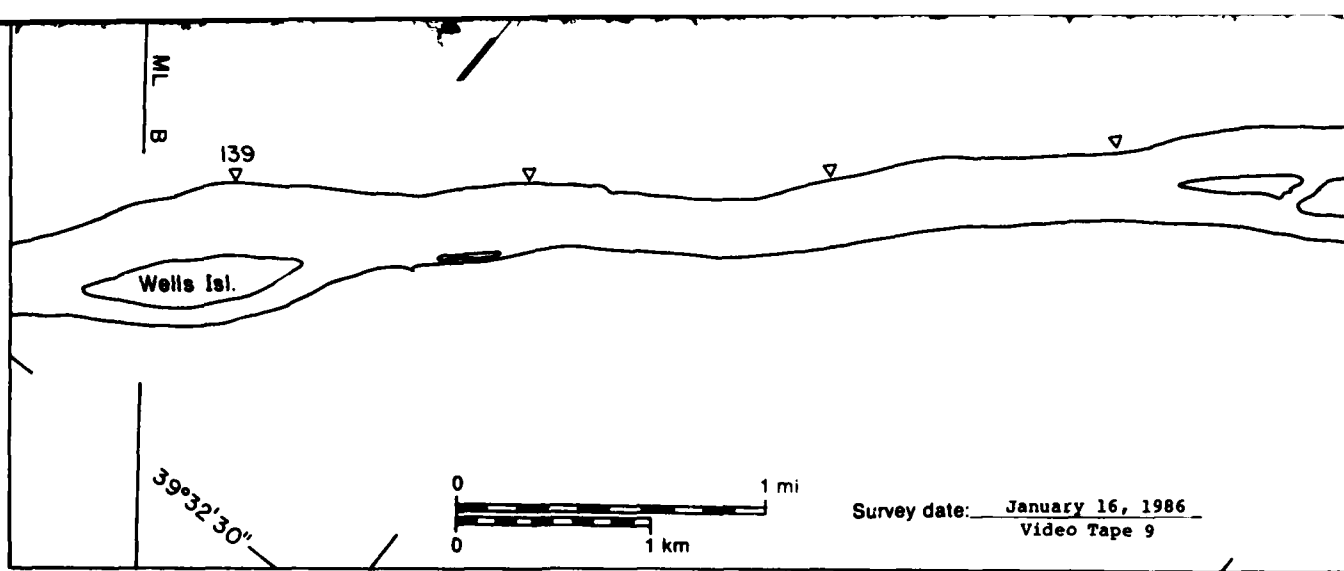
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	22.44	NA
Solid ice cover	0.02	NA
Solid ice cover with open-water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open-water areas	0.00	—
Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)	22.46	

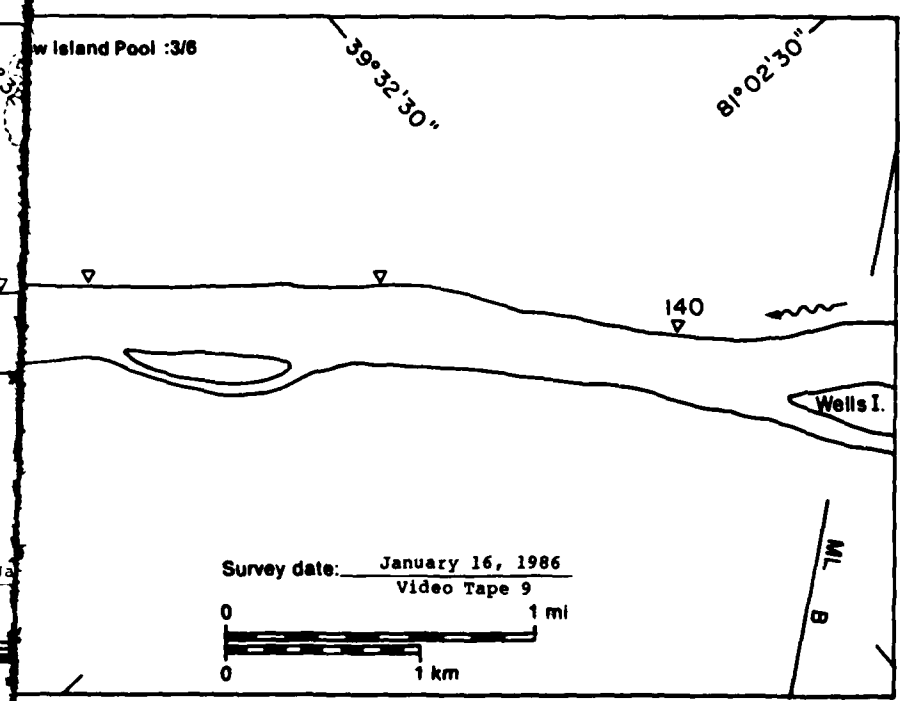
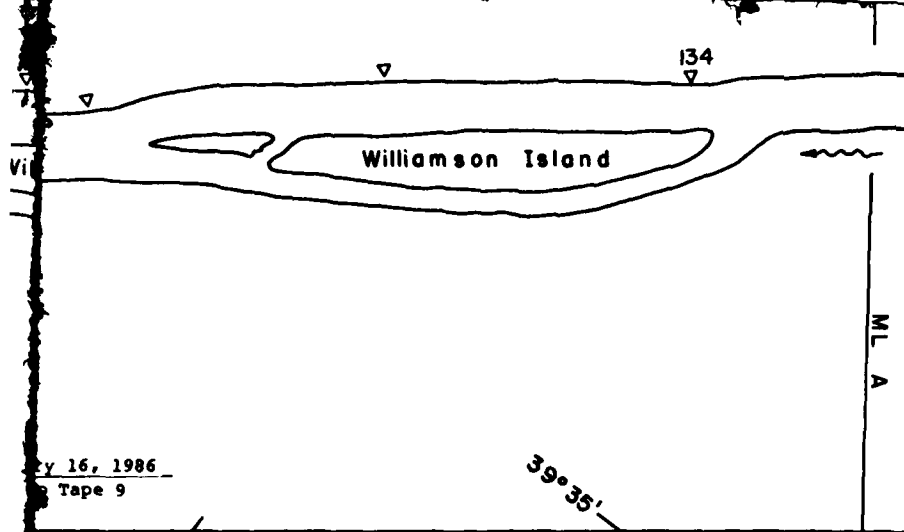


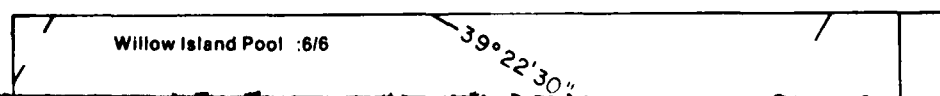
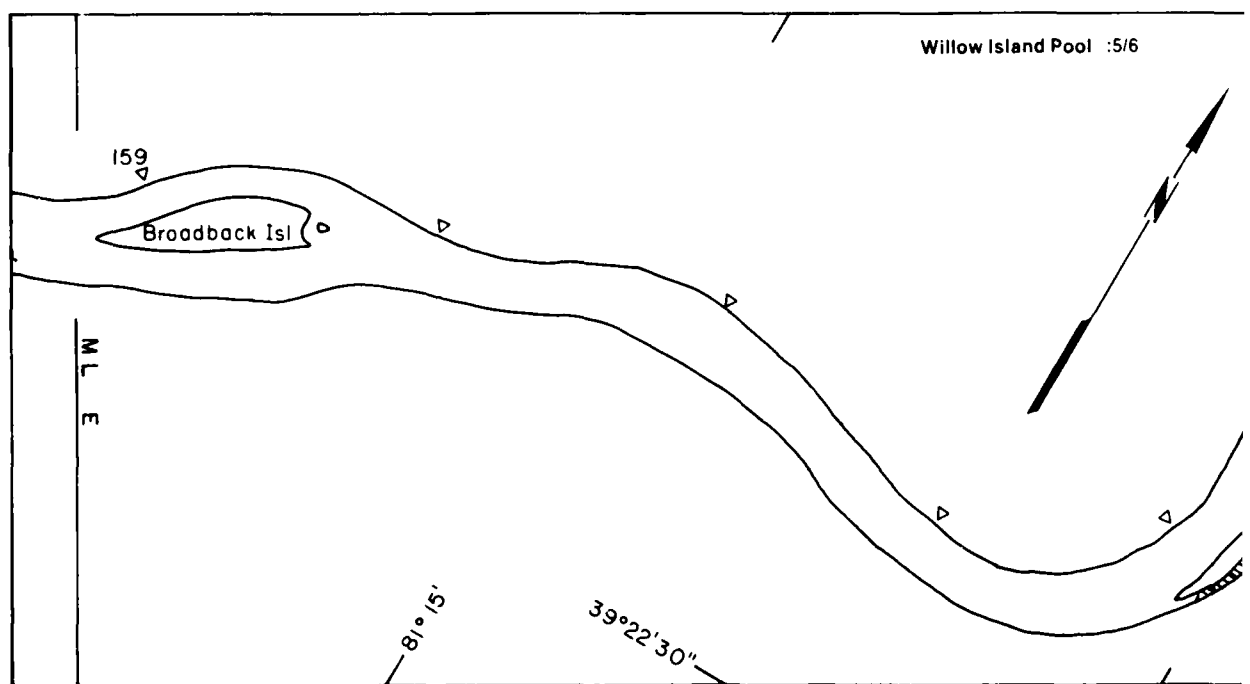
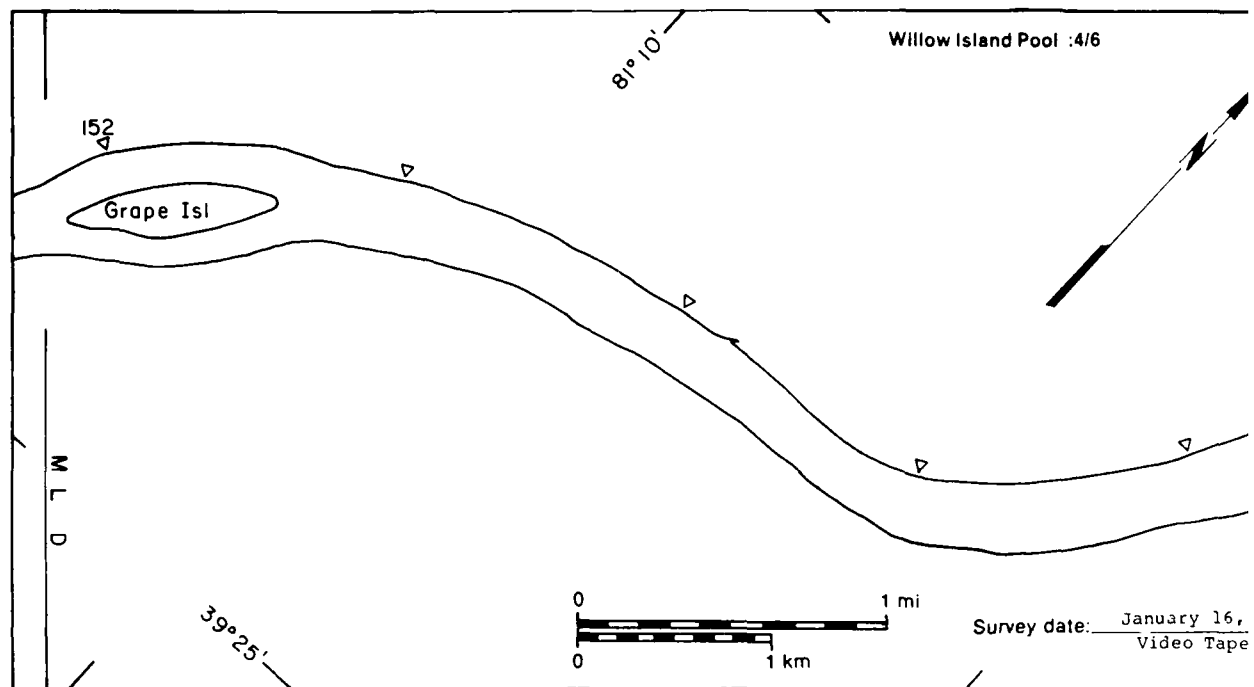
16 January 1986



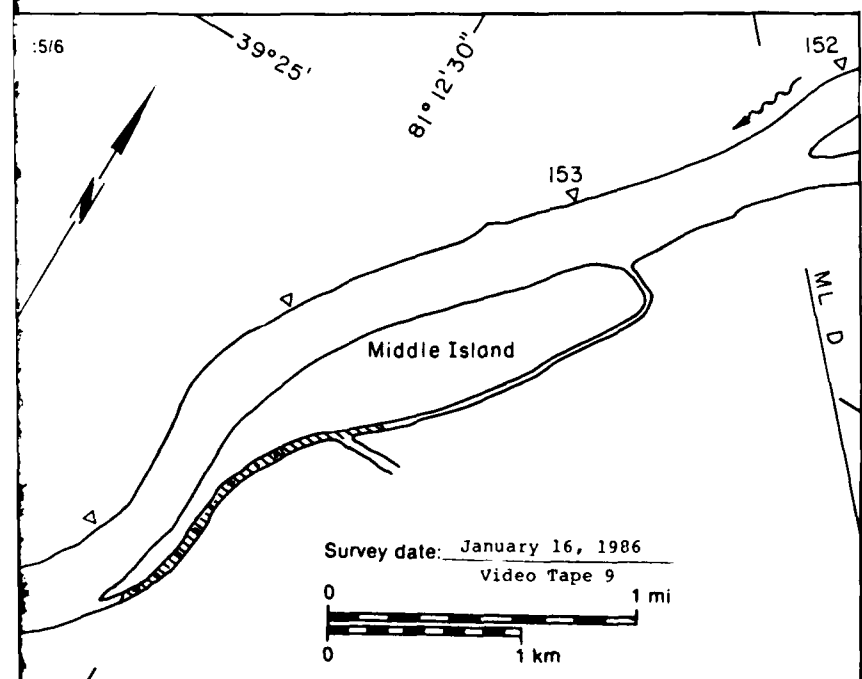
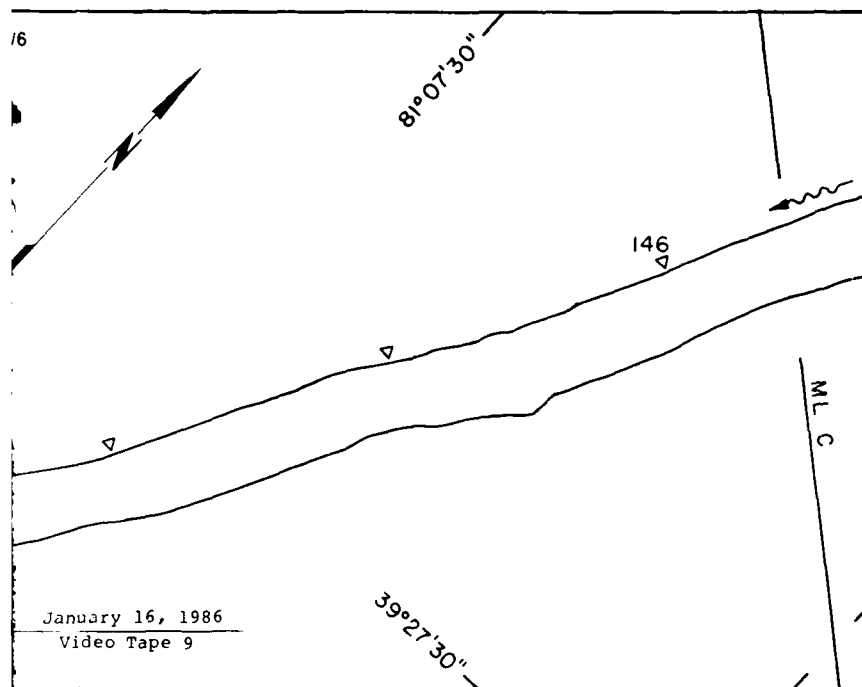








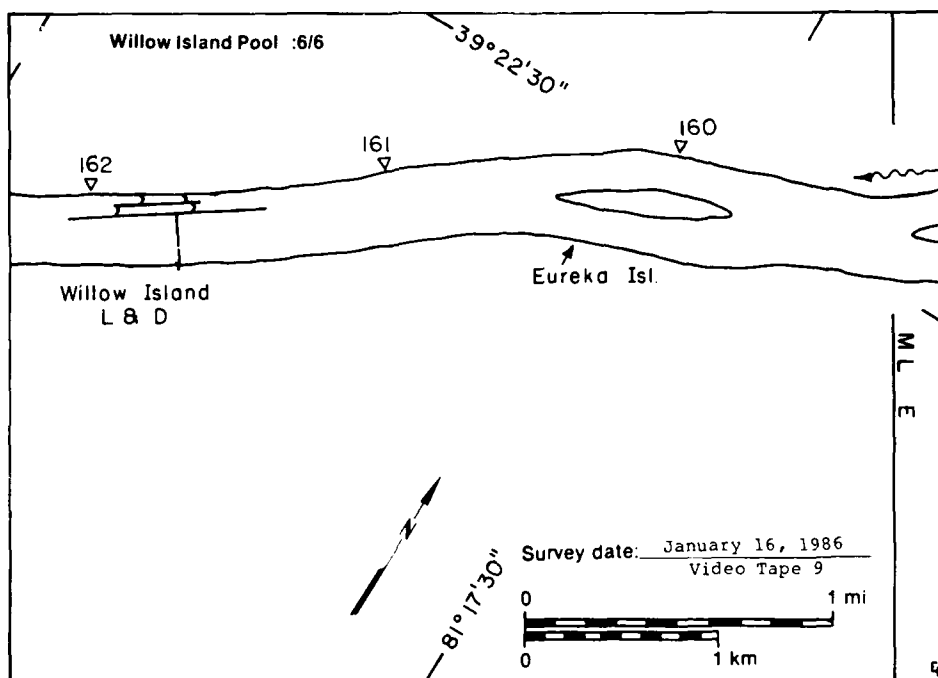
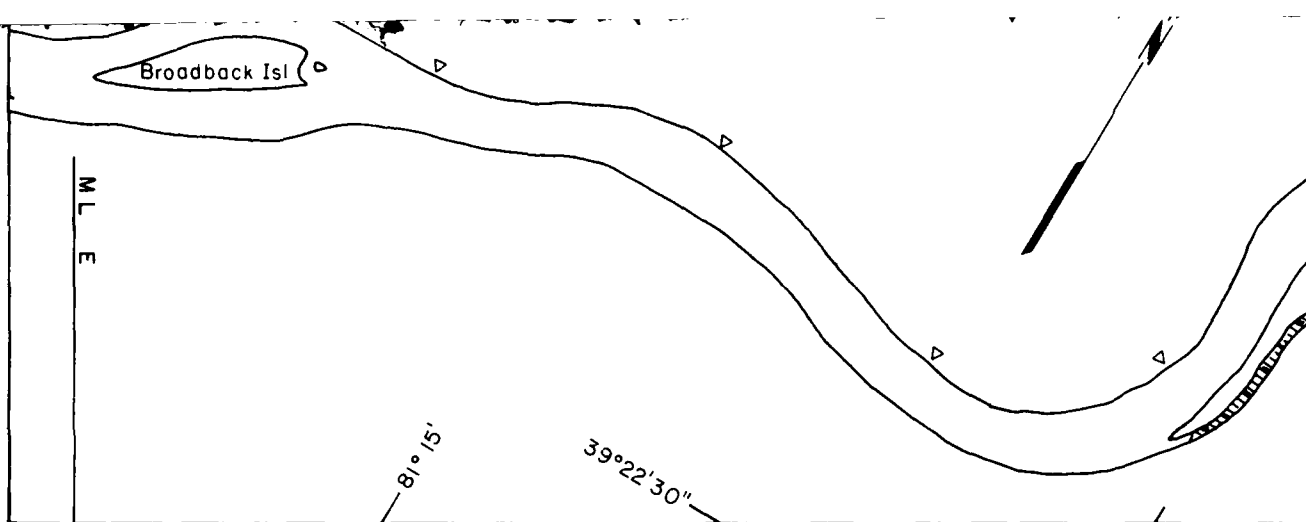
16 January 1986



Willow Island Pool

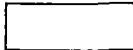
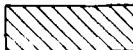




MAP_UNITS

Area ($\text{m}^2 \times 10^6$)	Surface concentration (m^{-2})
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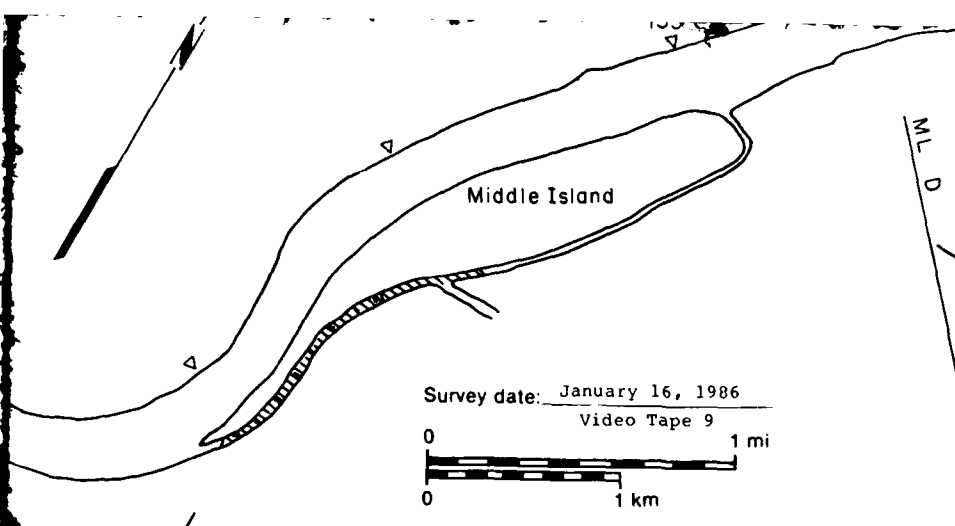


Willow Island Pool

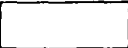
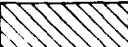

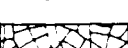
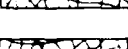

MAP UNITS

-  Open water
-  Solid ice cover
-  Solid ice cover open-water area
-  Fragmented ice
-  Fragmented ice with open-water
-  Ice floes or fra and pans

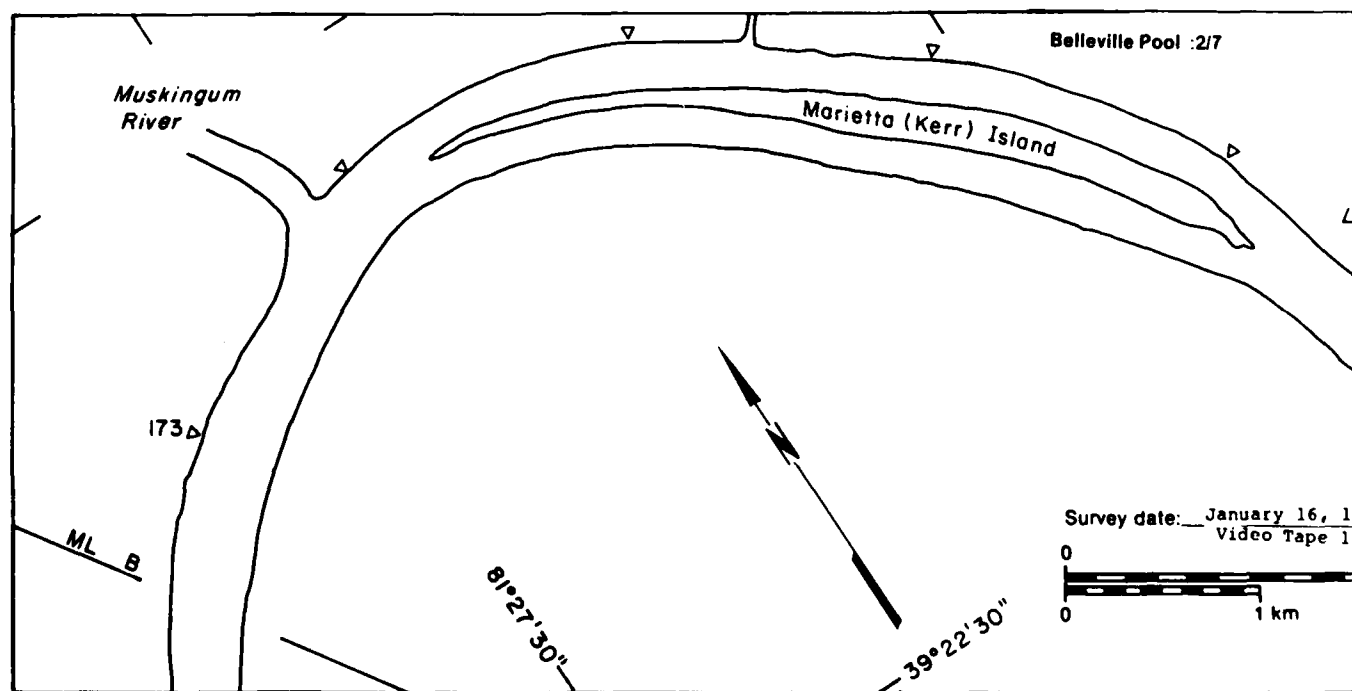
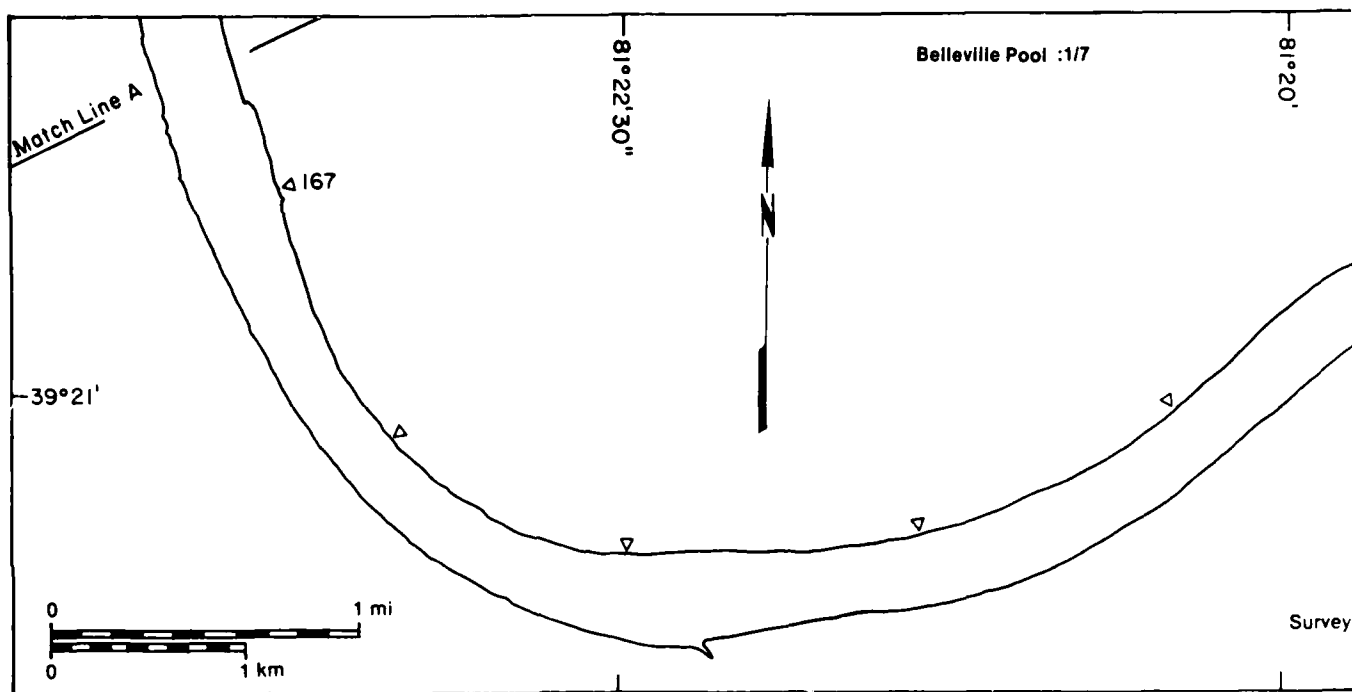
Total area

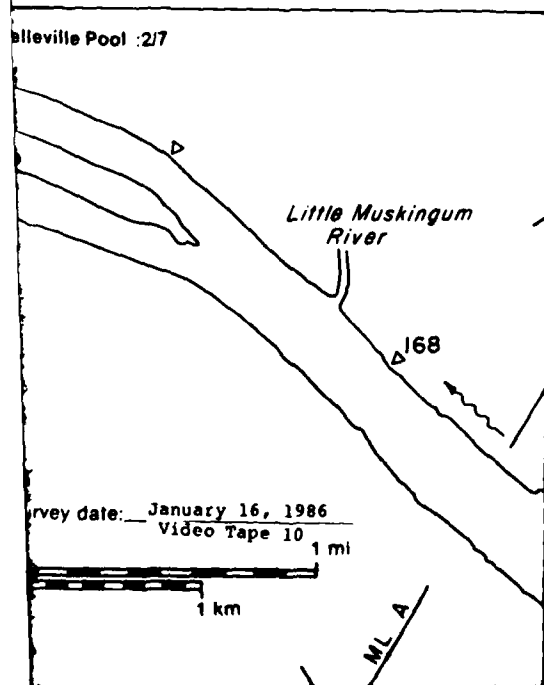
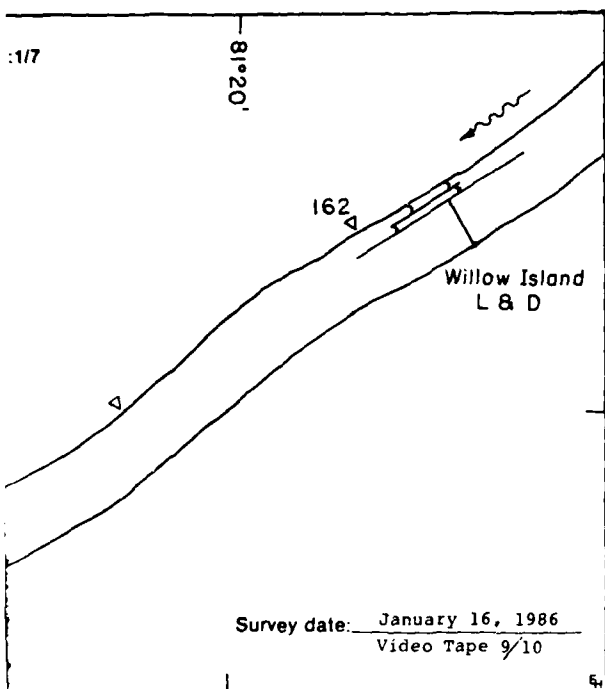


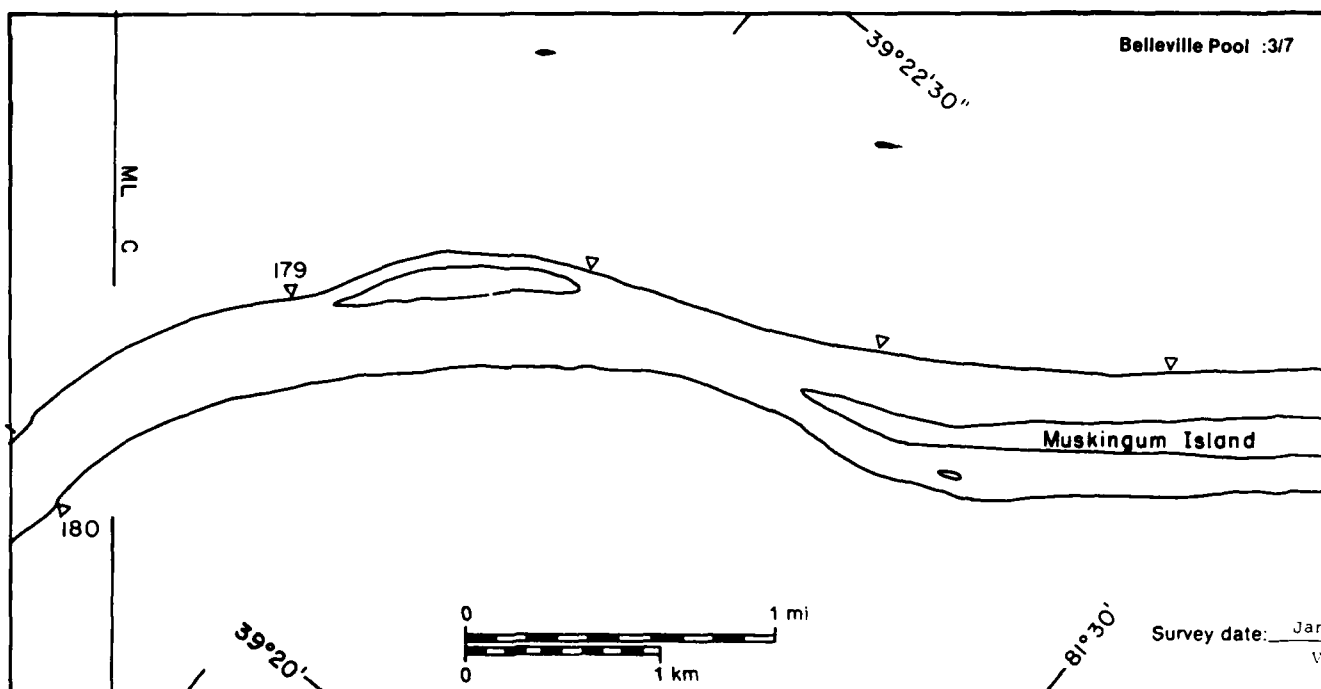
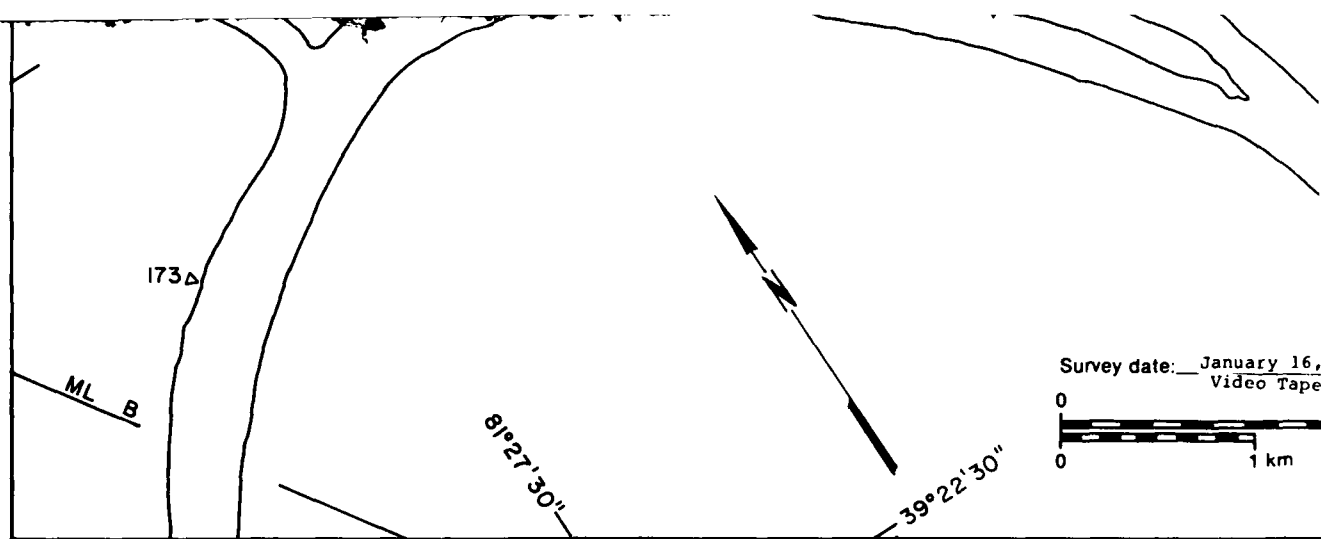
Willow Island Pool

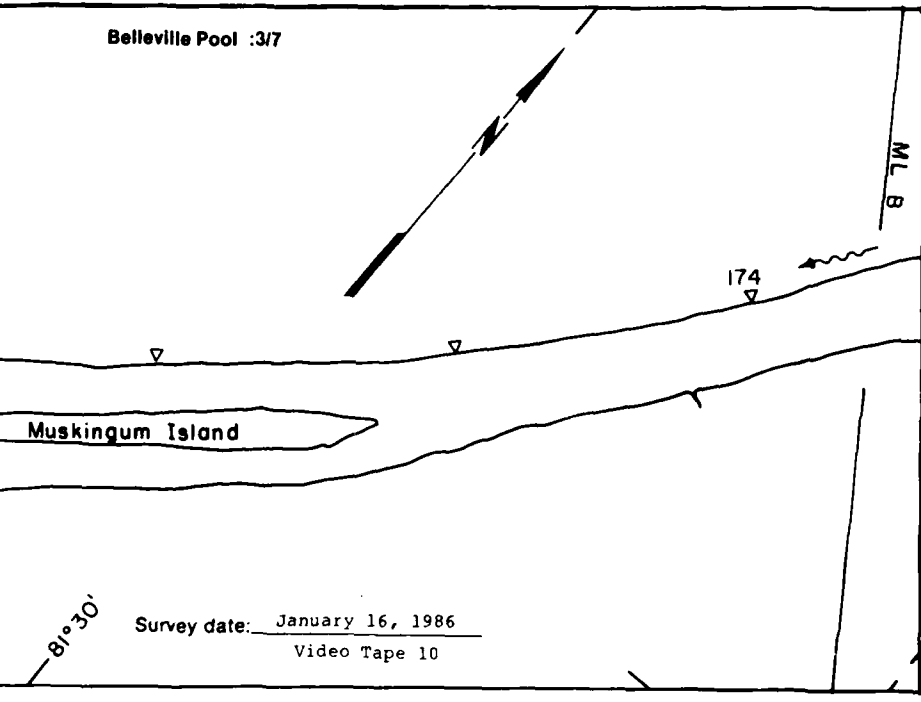
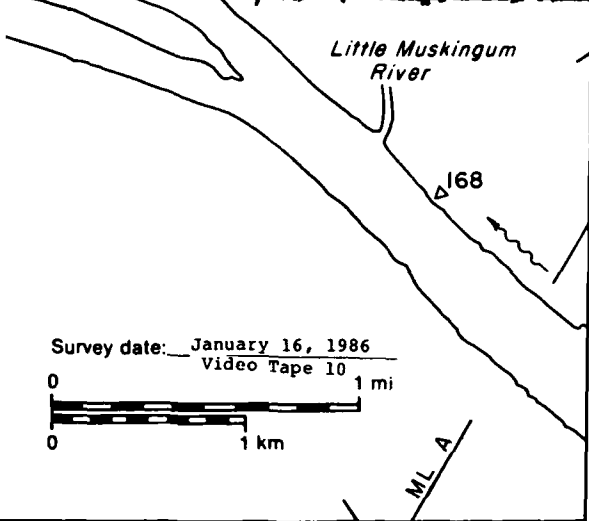
MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	21.02	NA
	Solid ice cover	0.03	NA
	Solid ice cover with open-water areas	0.09	70
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.10	50
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		21.24	

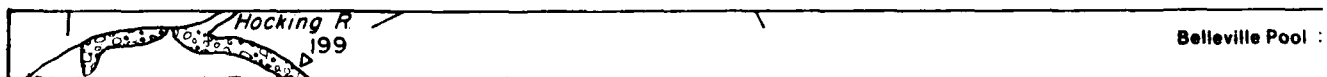
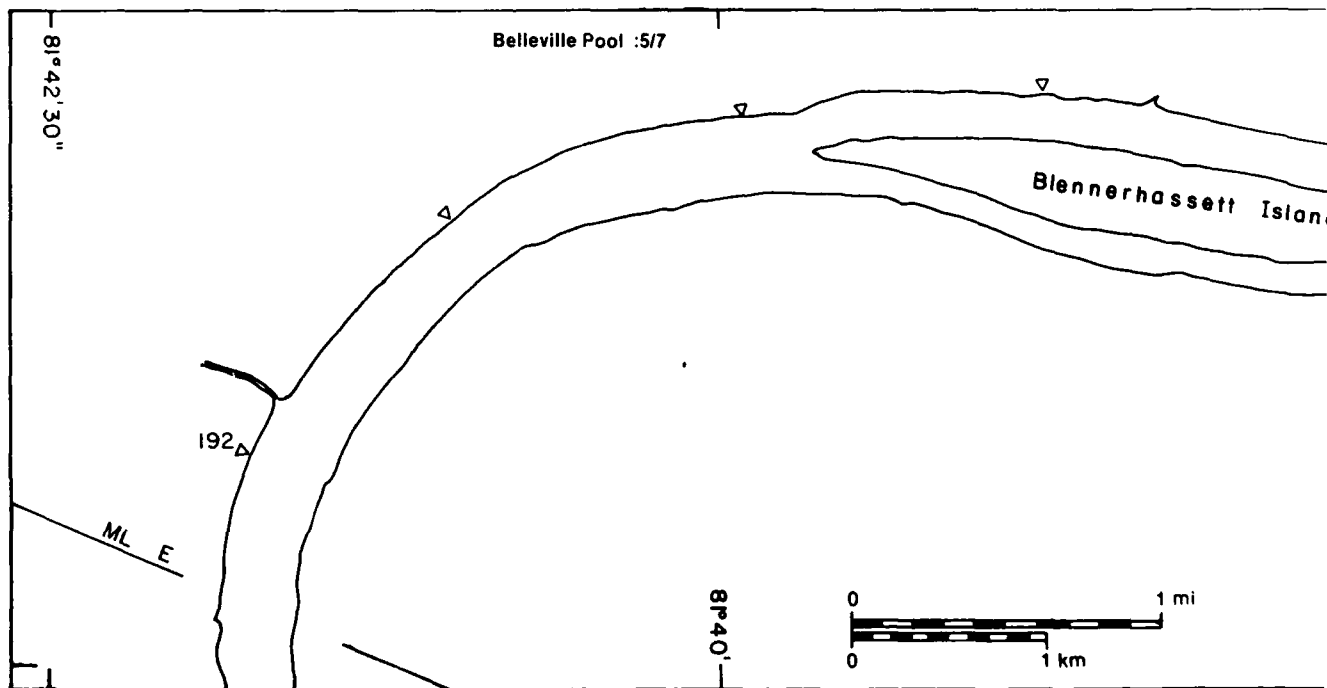
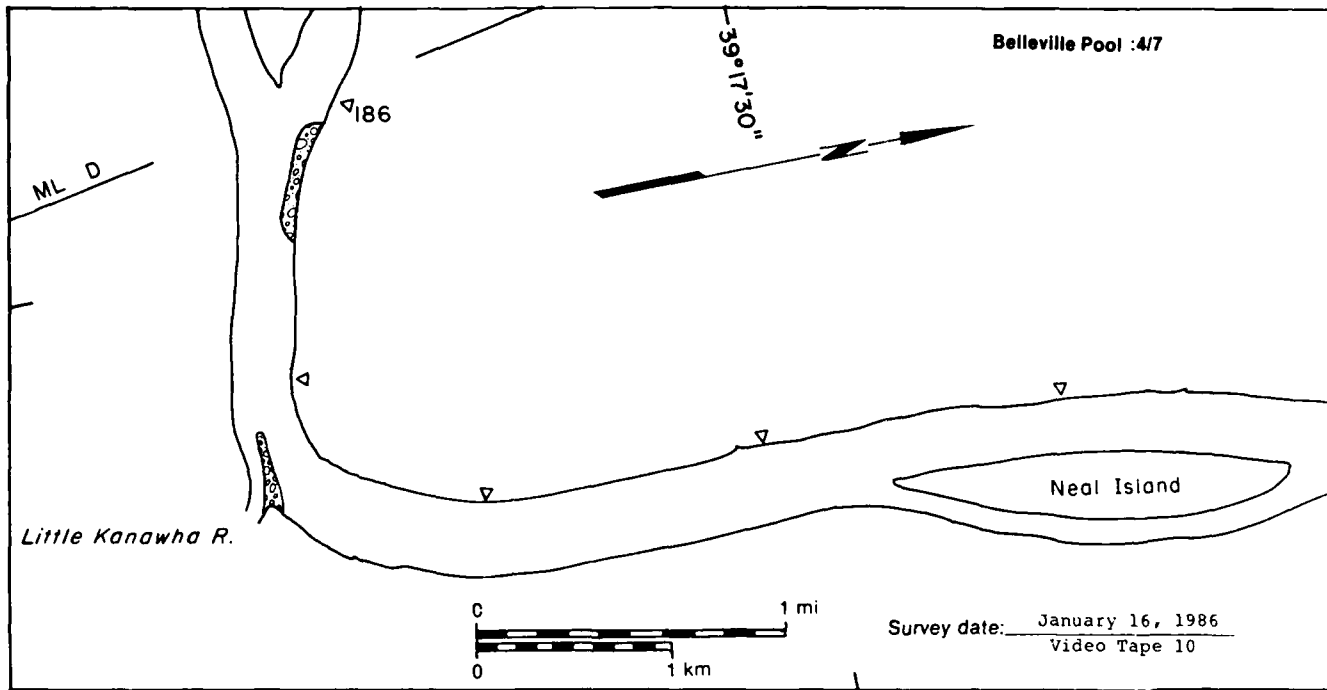
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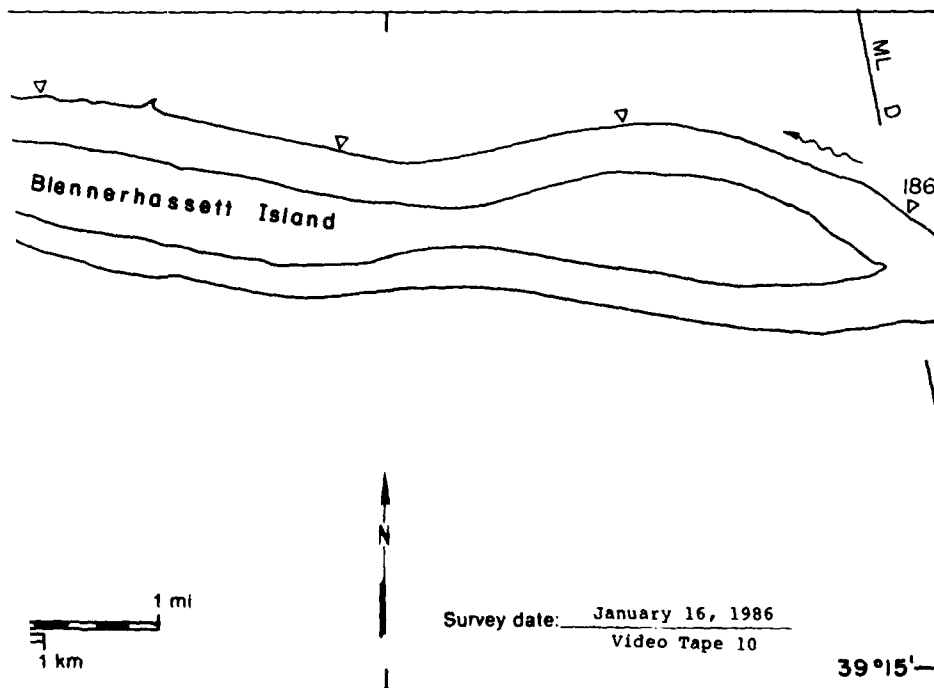
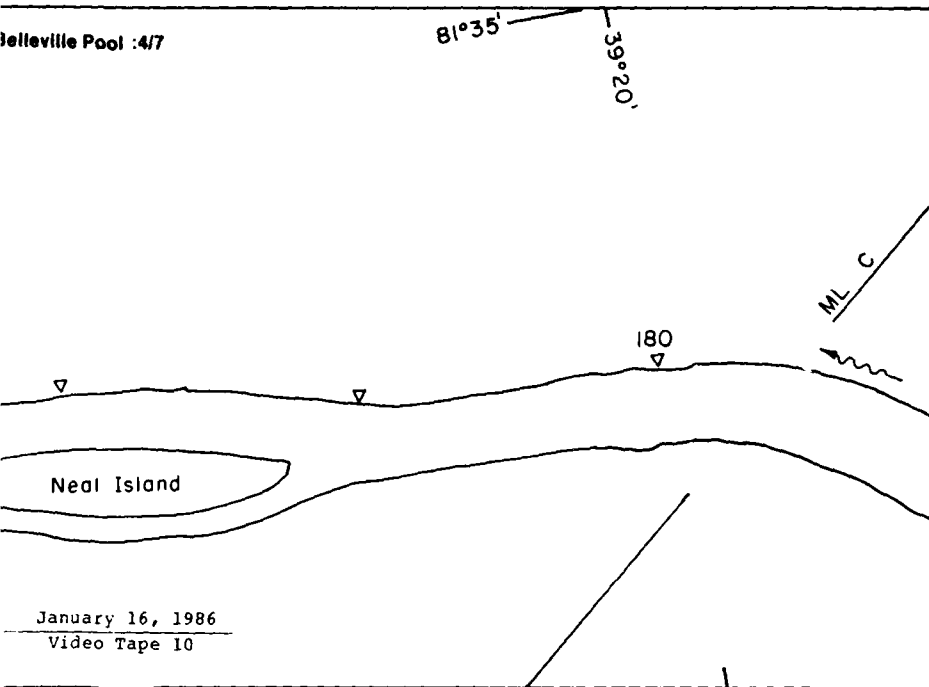


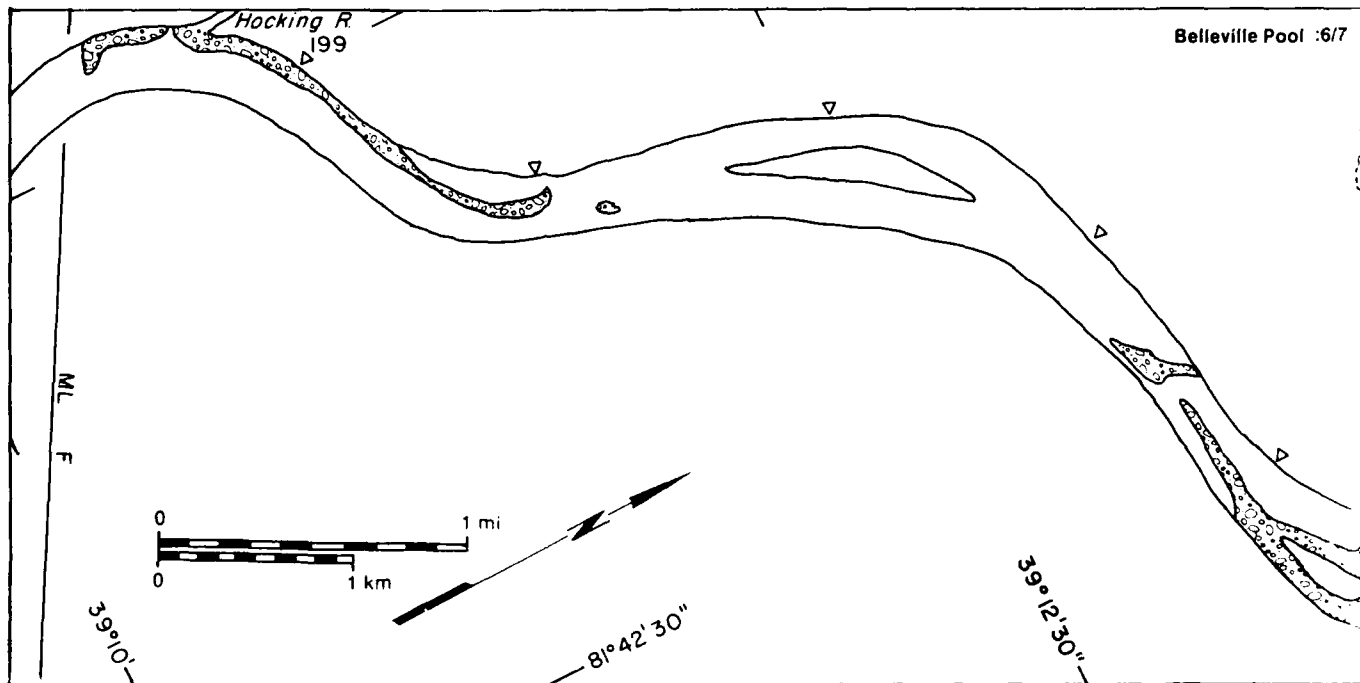
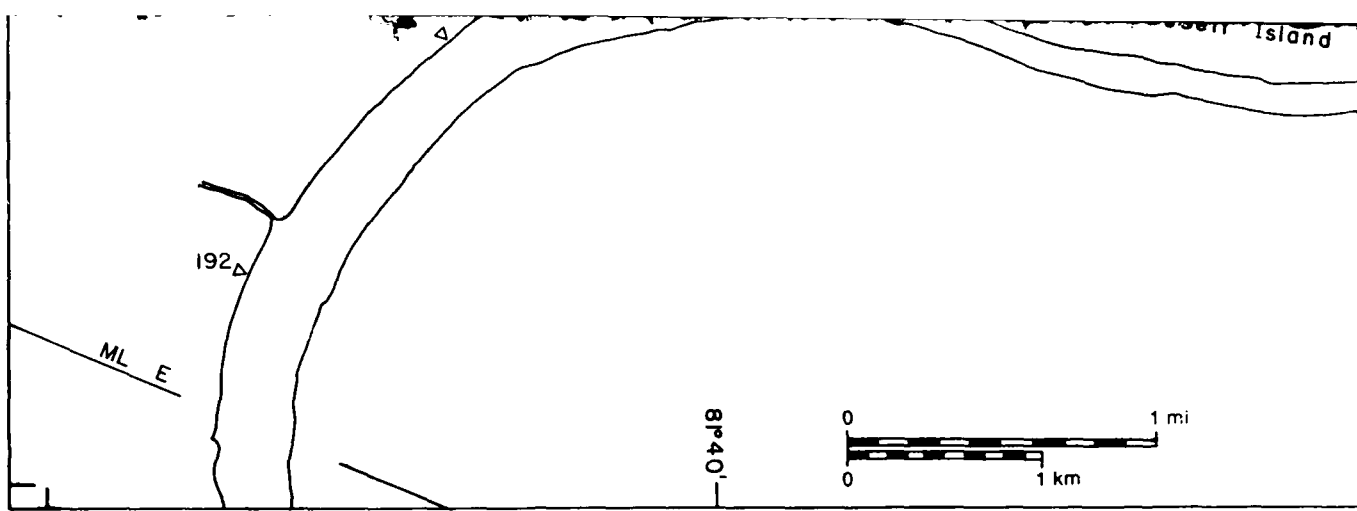


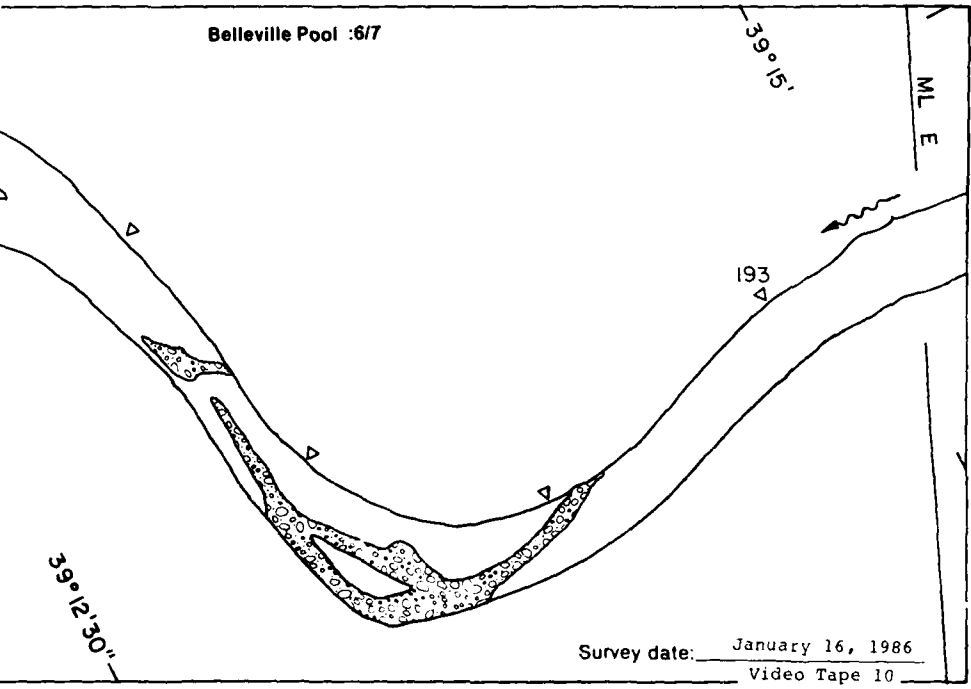
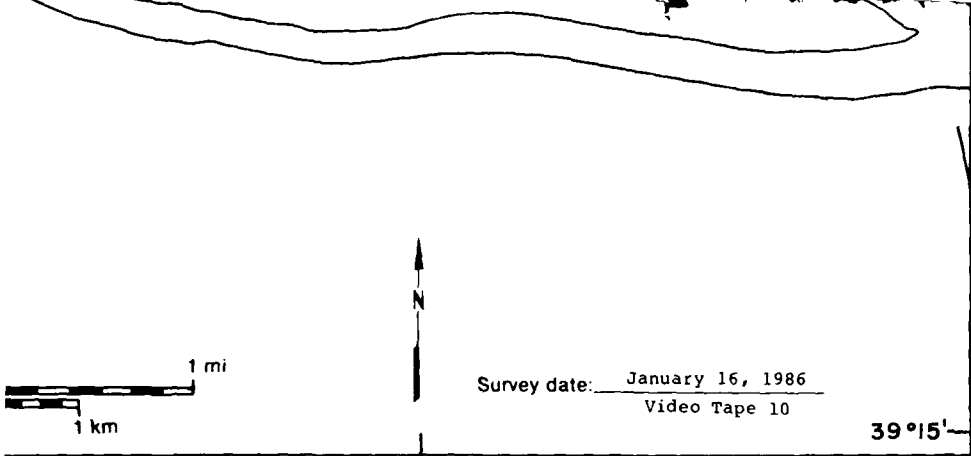




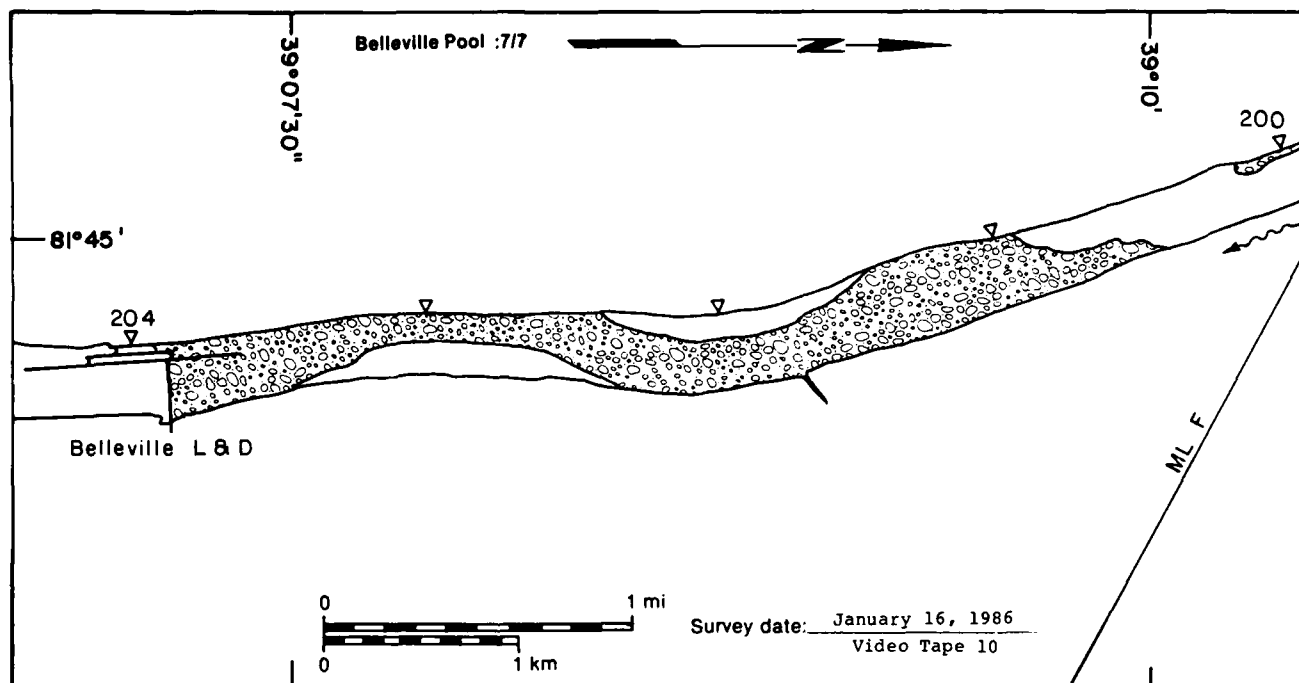
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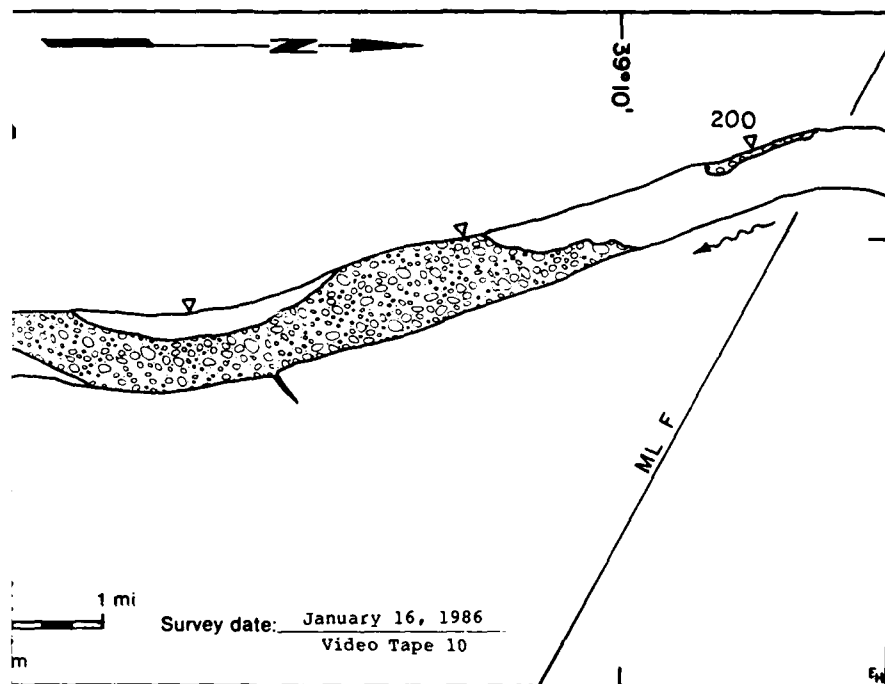


Belleville Pool

MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Area ($m^2 \times 10^6$)	Surface concentration (%)
24.97	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
2.31	5
Total area ($m^2 \times 10^6$)	27.28



Surface
concentration
(%)

NA

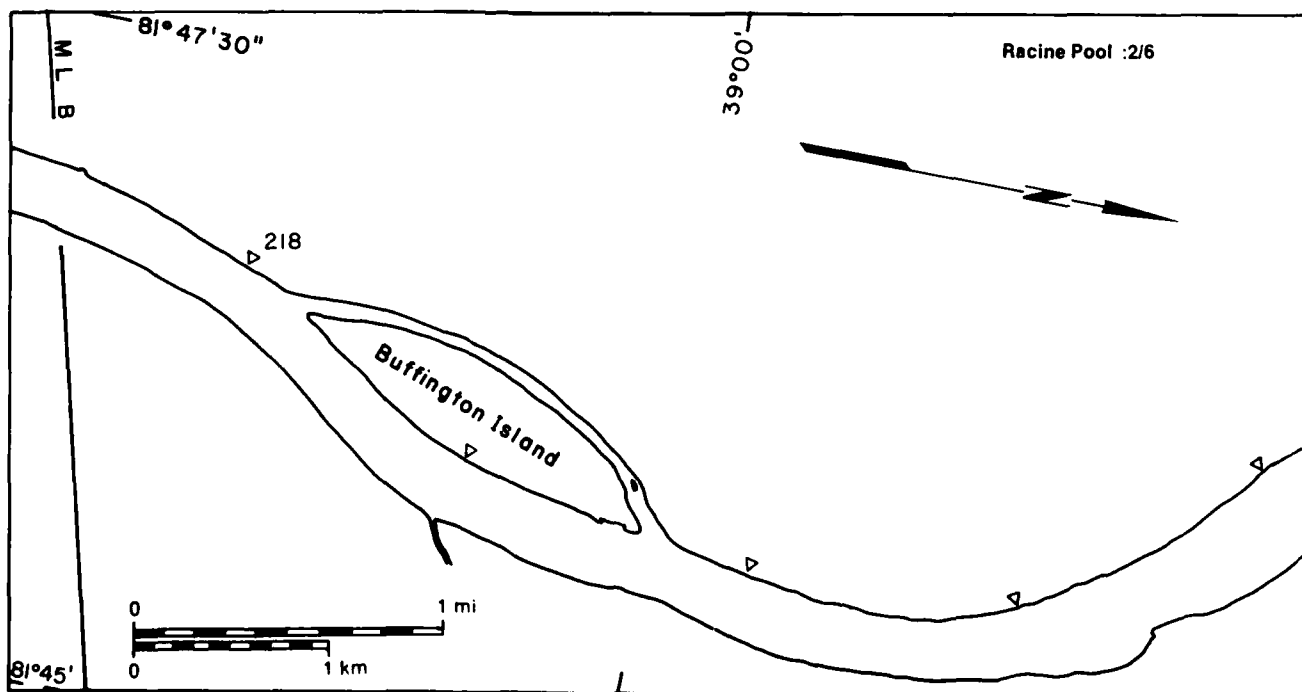
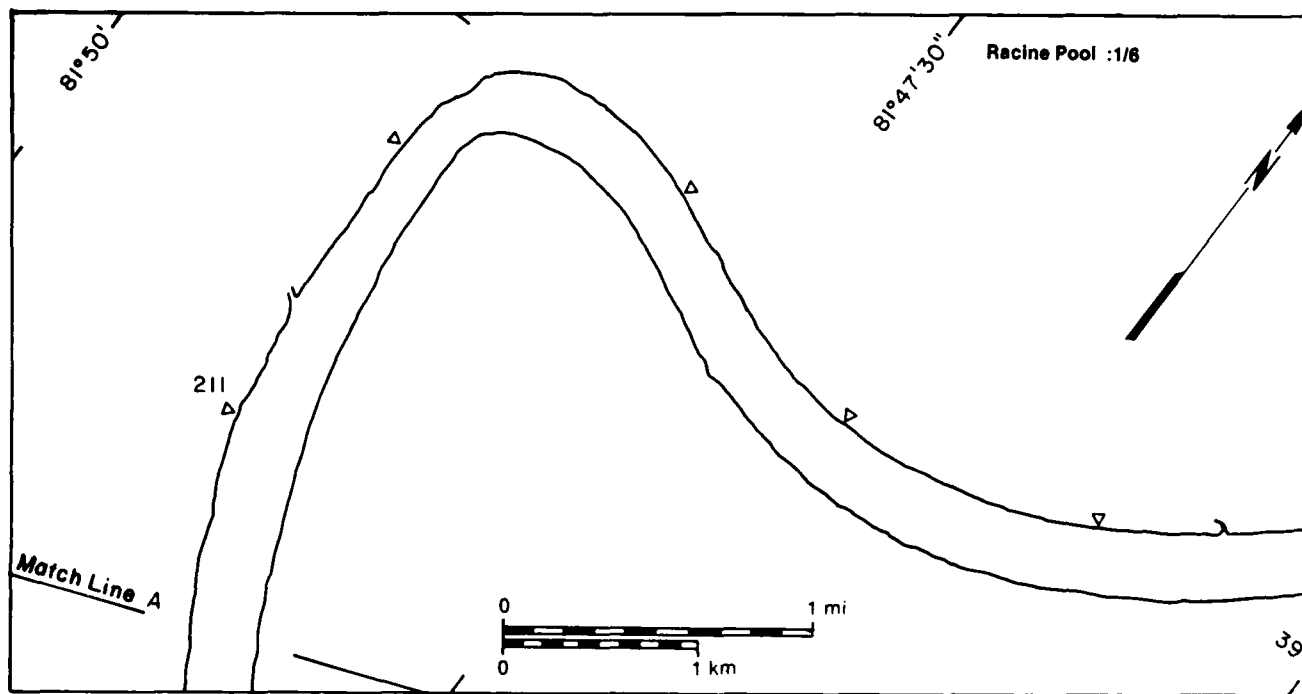
NA

—

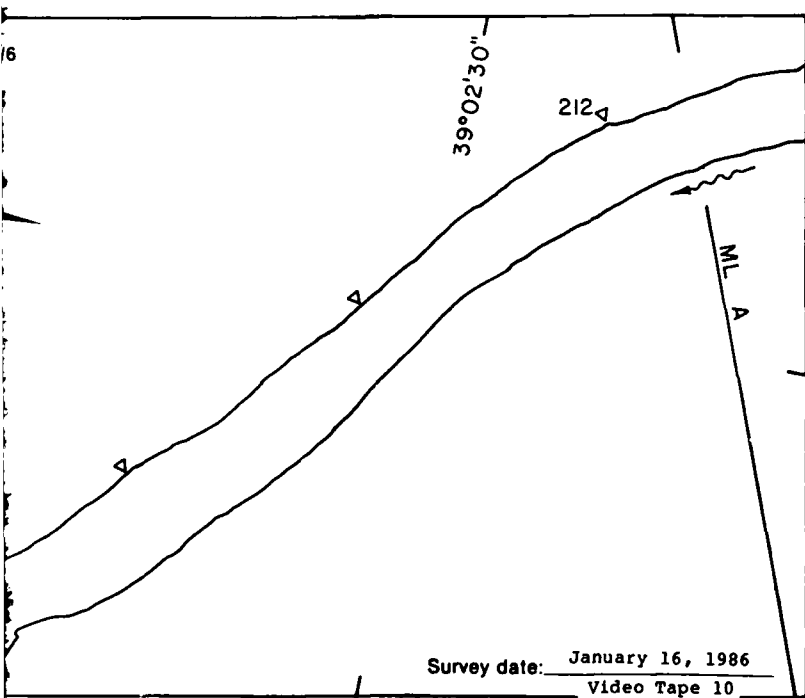
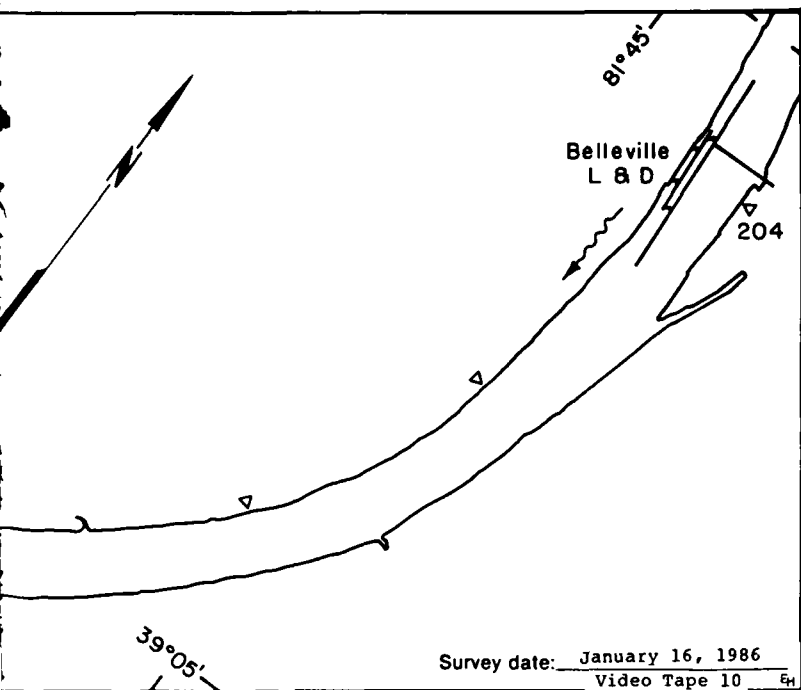
NA

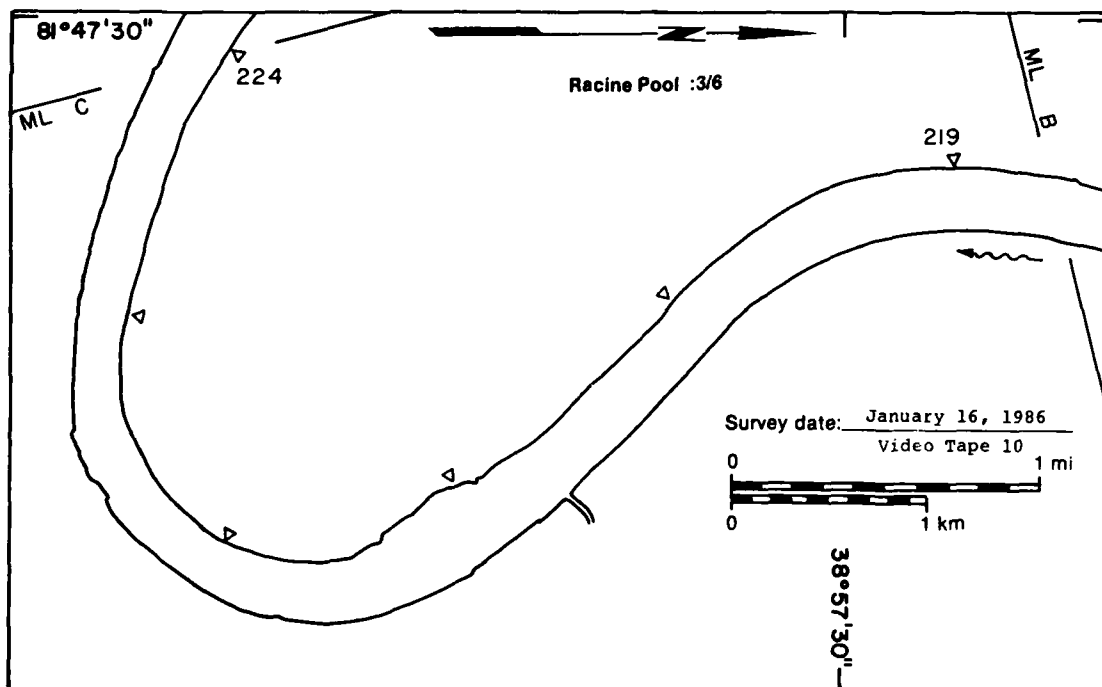
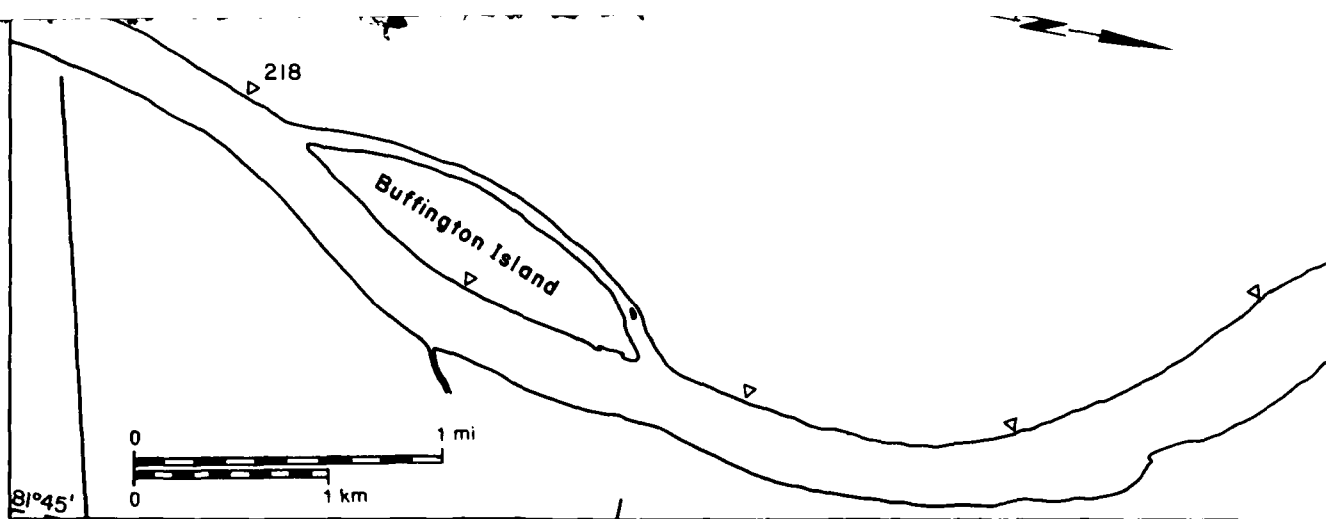
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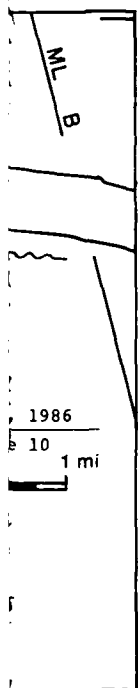
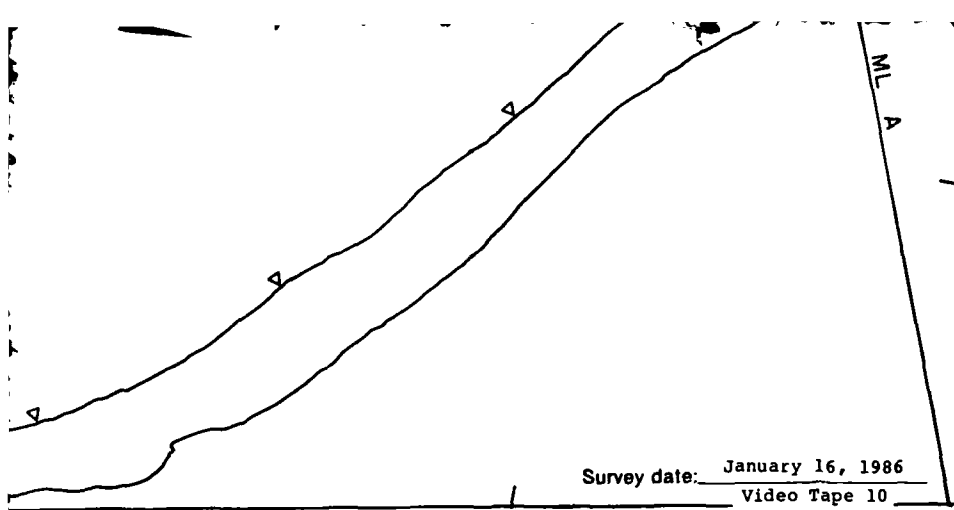
5



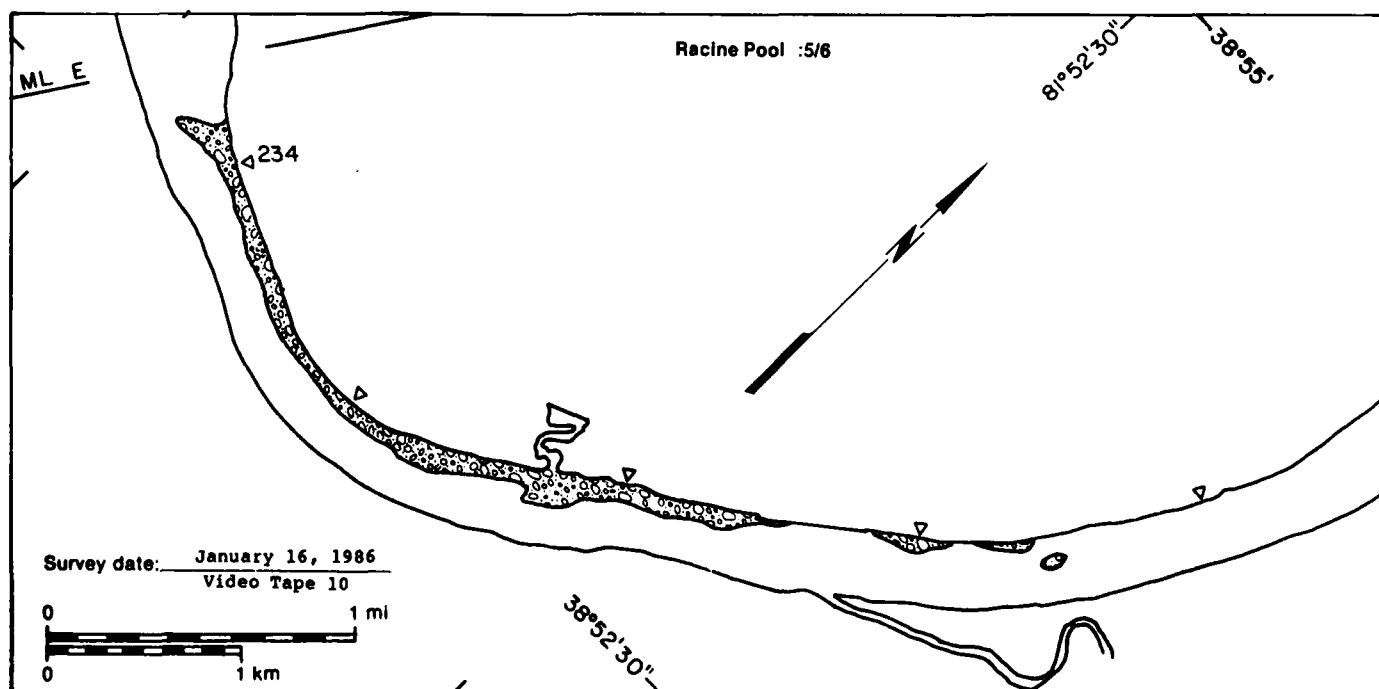
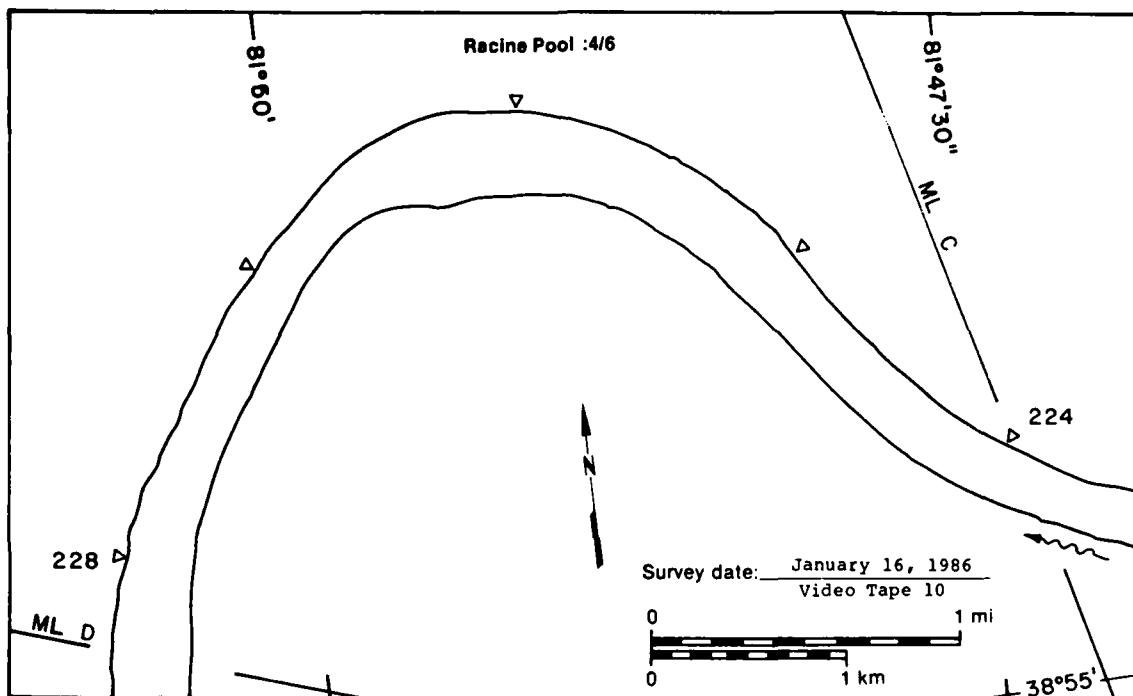
16 January 1986

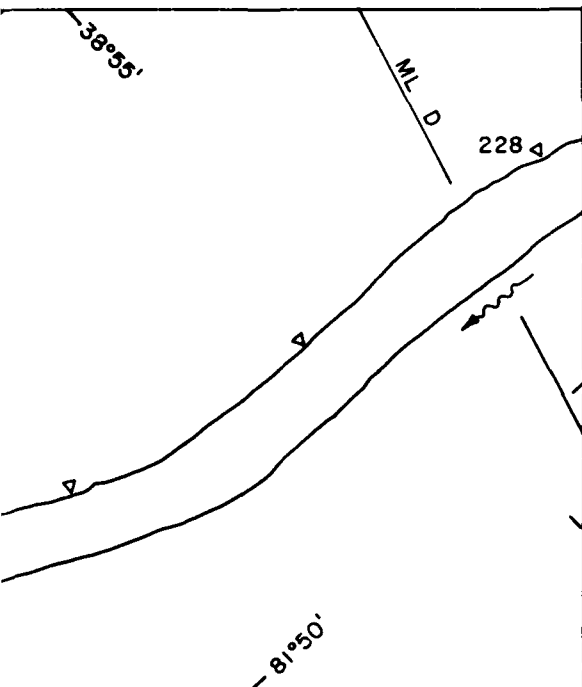


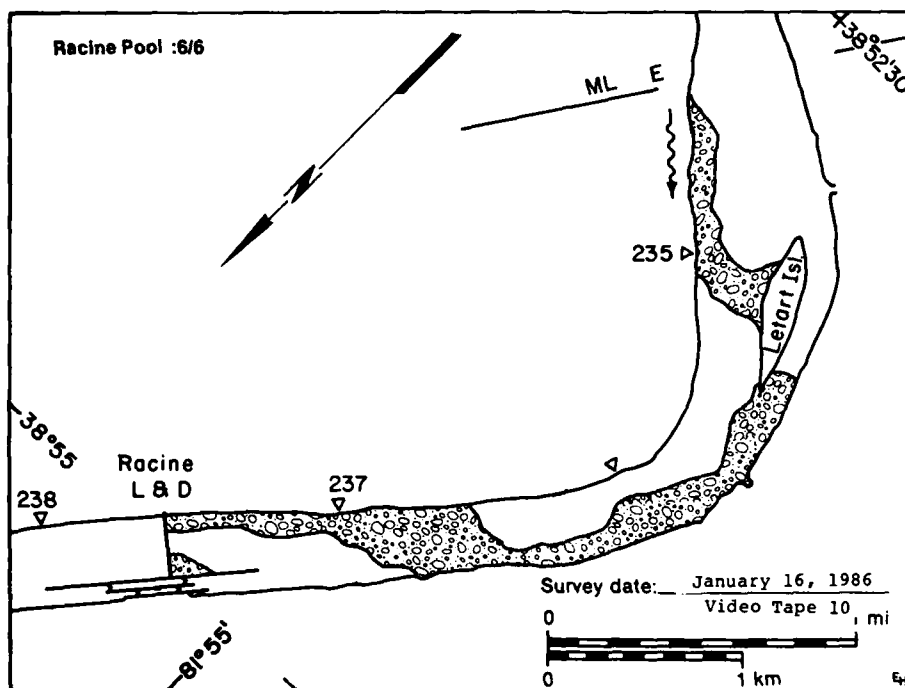
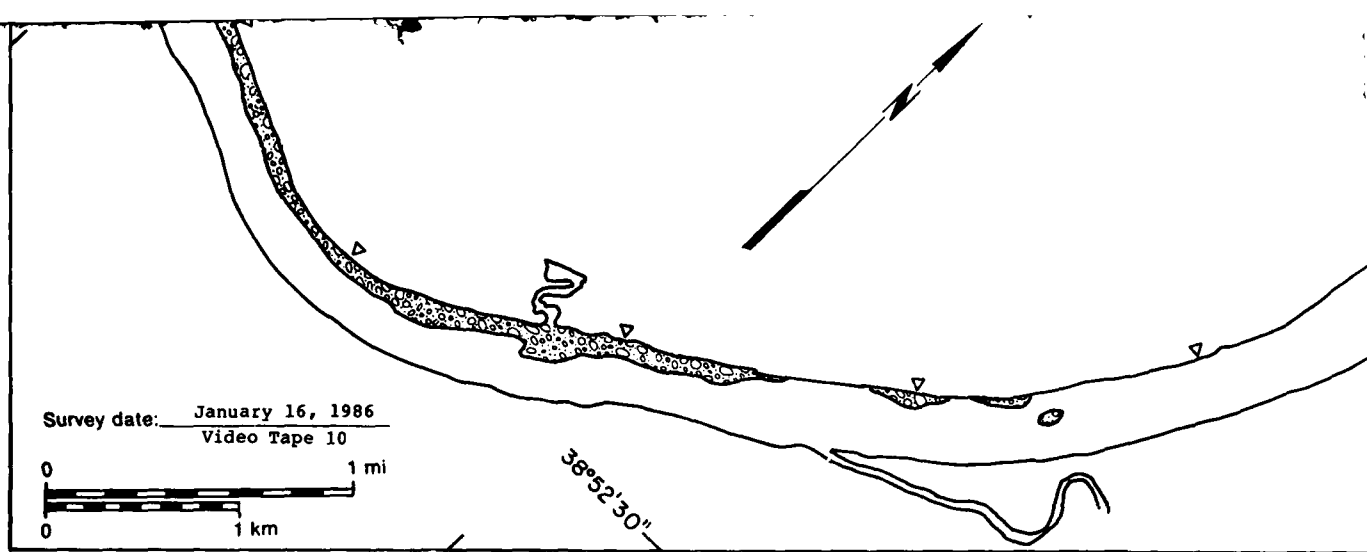




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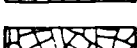
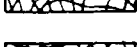





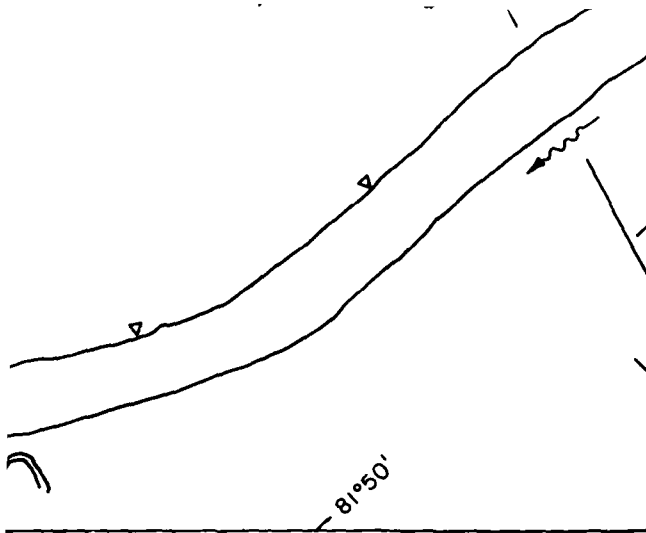


Racine Pool

MAP UNITS







-  Open water
-  Solid ice cover
-  Solid ice cover with open-water areas
-  Fragmented ice cover
-  Fragmented ice cover with open-water areas
-  Ice floes or frazil slush and pans

Total area ($m^2 \times 10^6$)

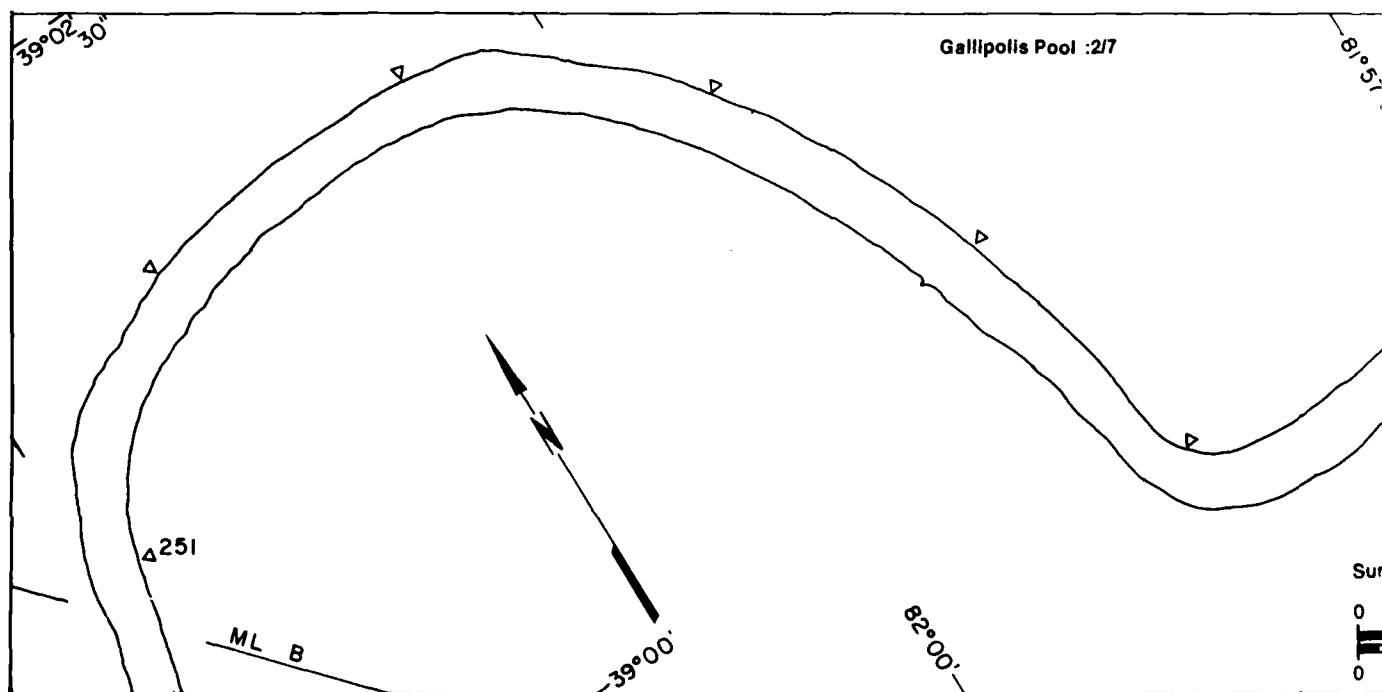
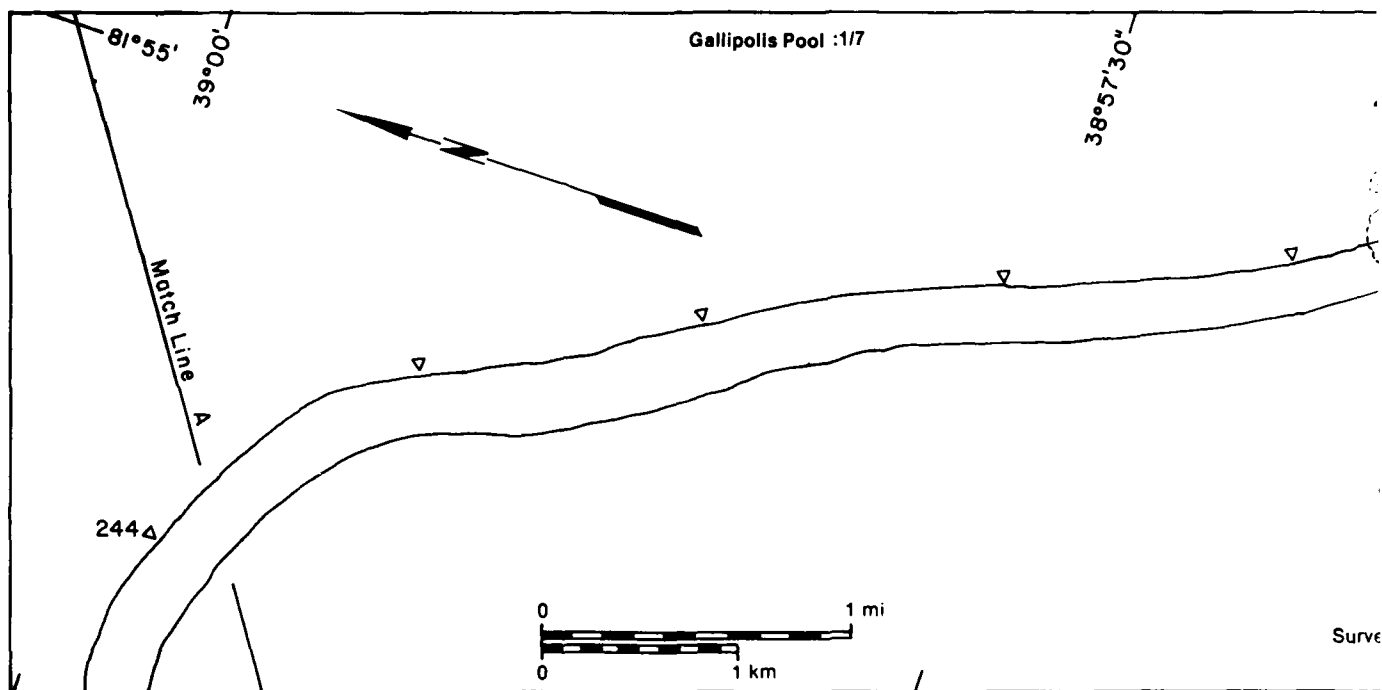


Racine Pool

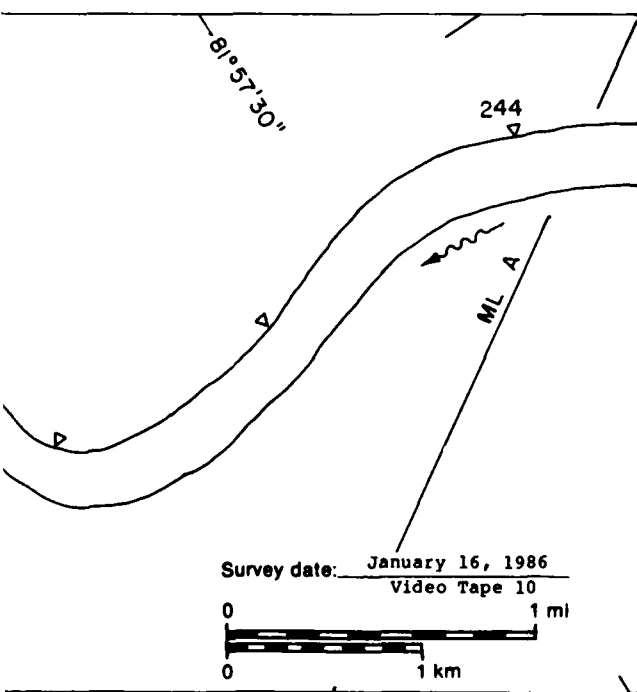
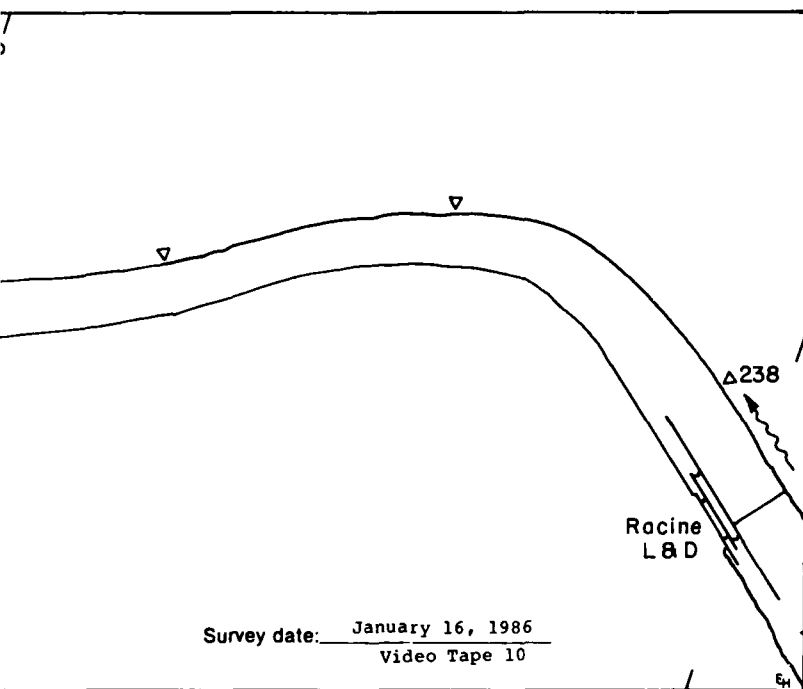
MAP UNITS

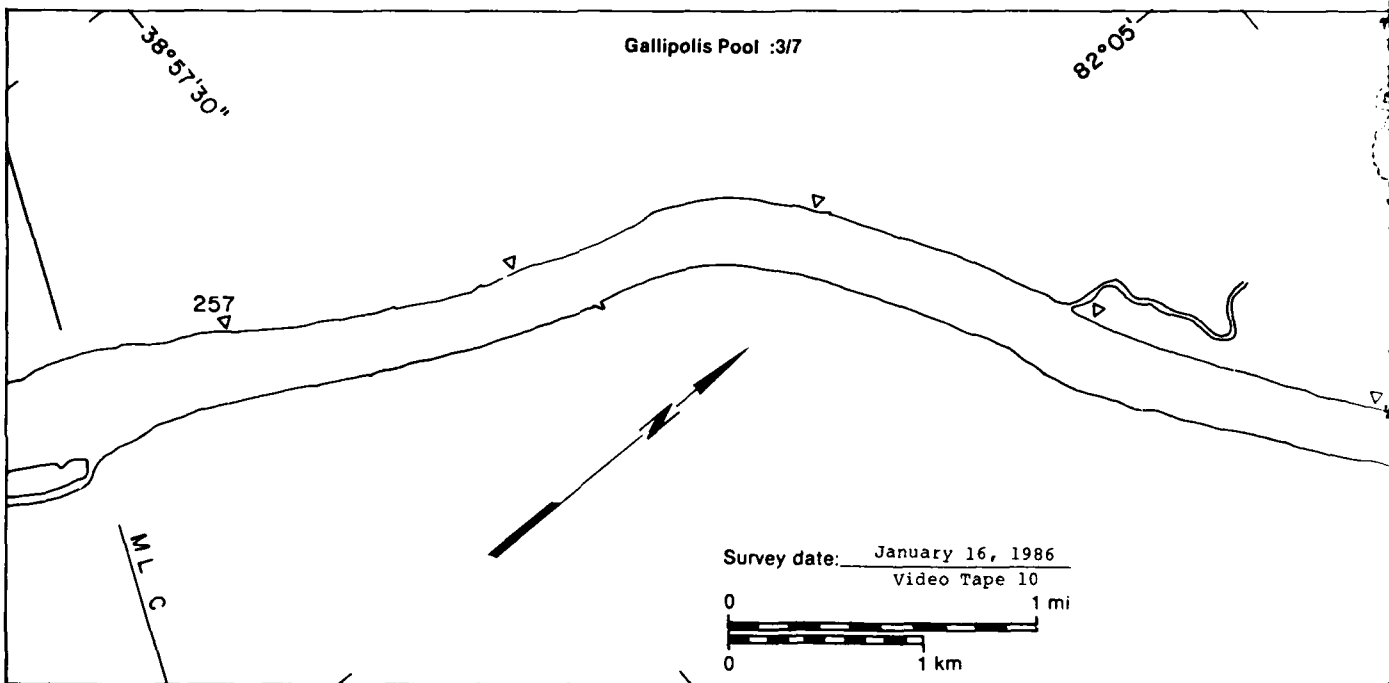
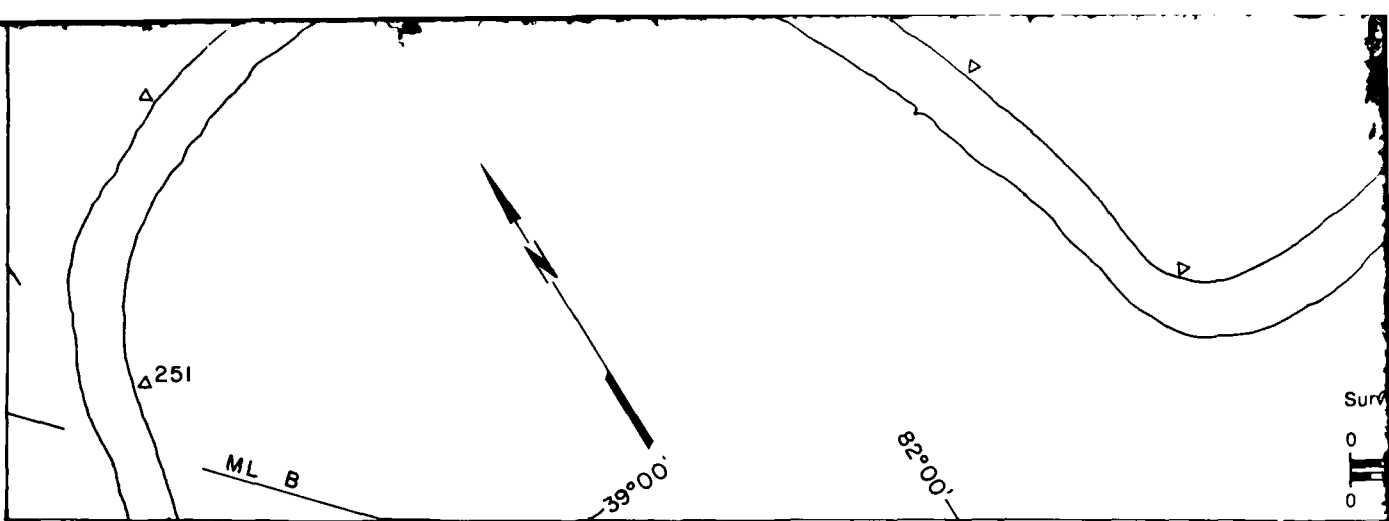
-  Open water
-  Solid ice cover
-  Solid ice cover with open-water areas
-  Fragmented ice cover
-  Fragmented ice cover with open-water areas
-  Ice floes or frazil slush and pans

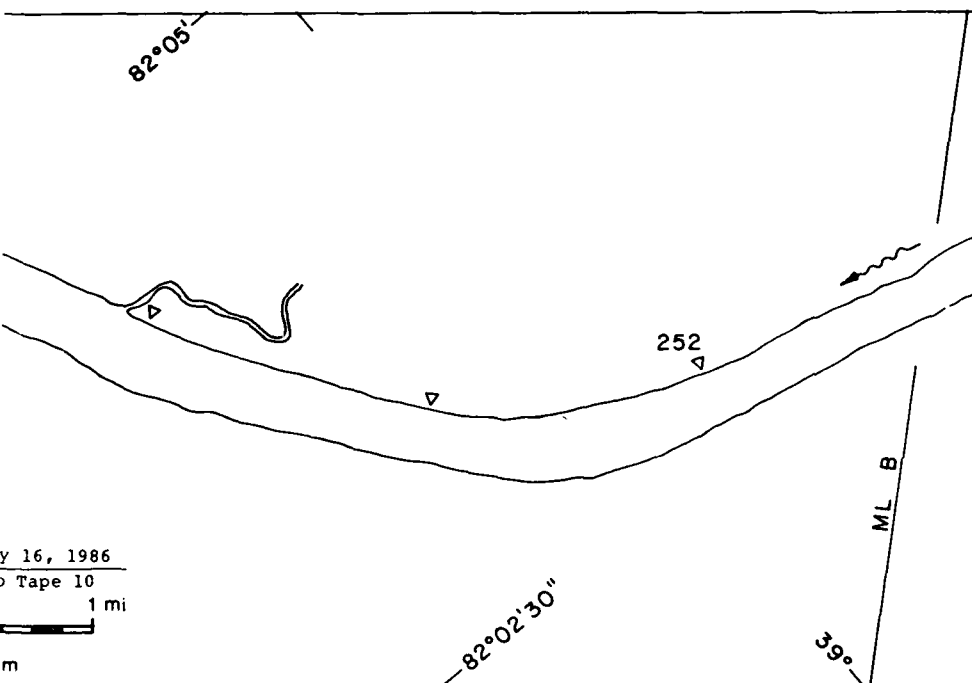
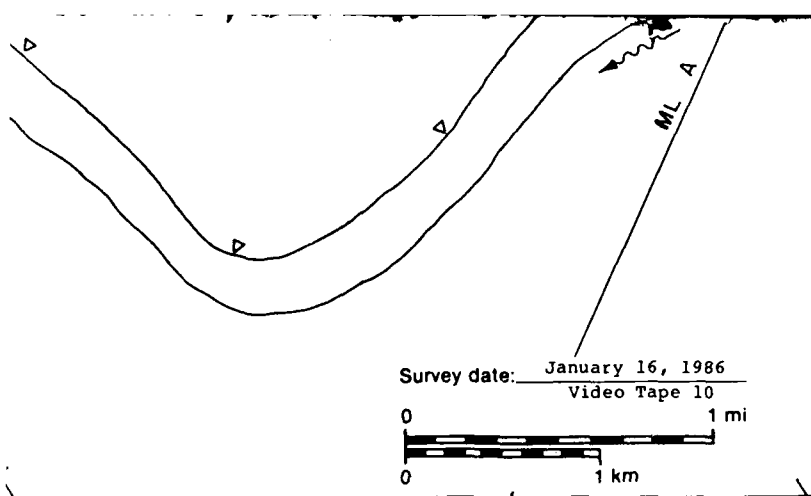
Area (m ² x 10 ⁶)	Surface concentration (%)
18.52	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
1.37	10
Total area (m ² x 10 ⁶)	19.89



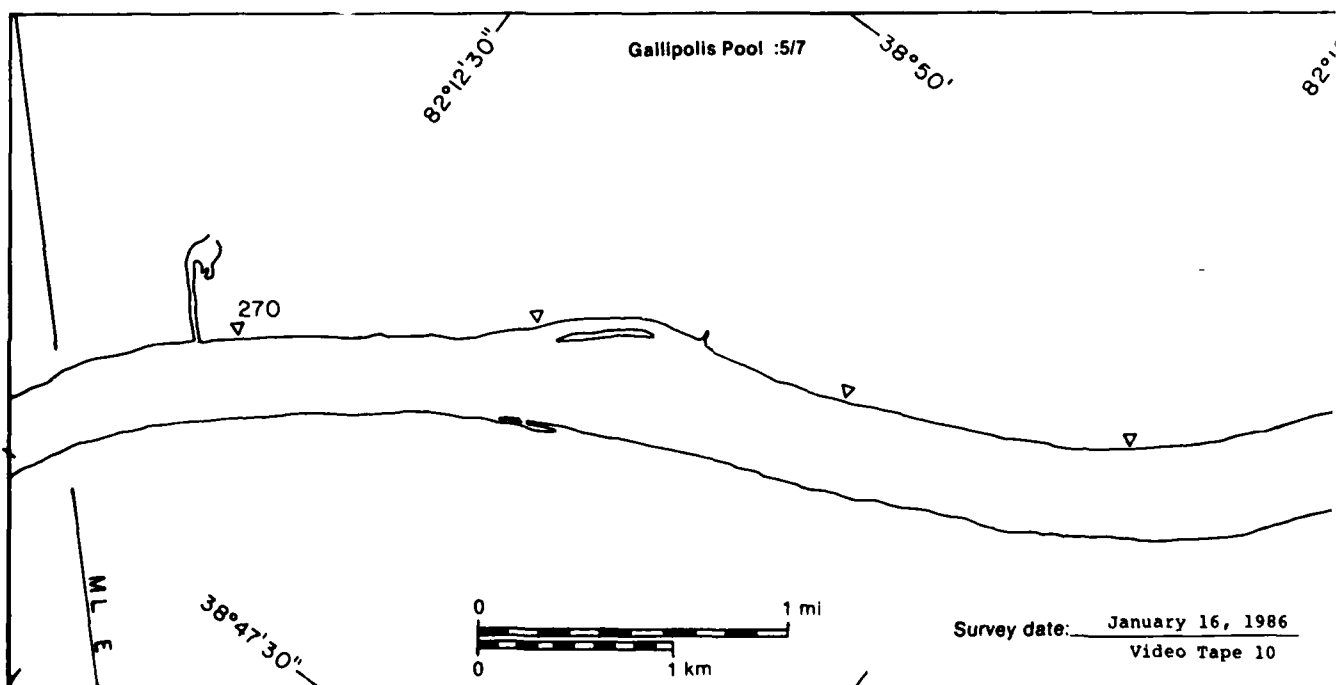
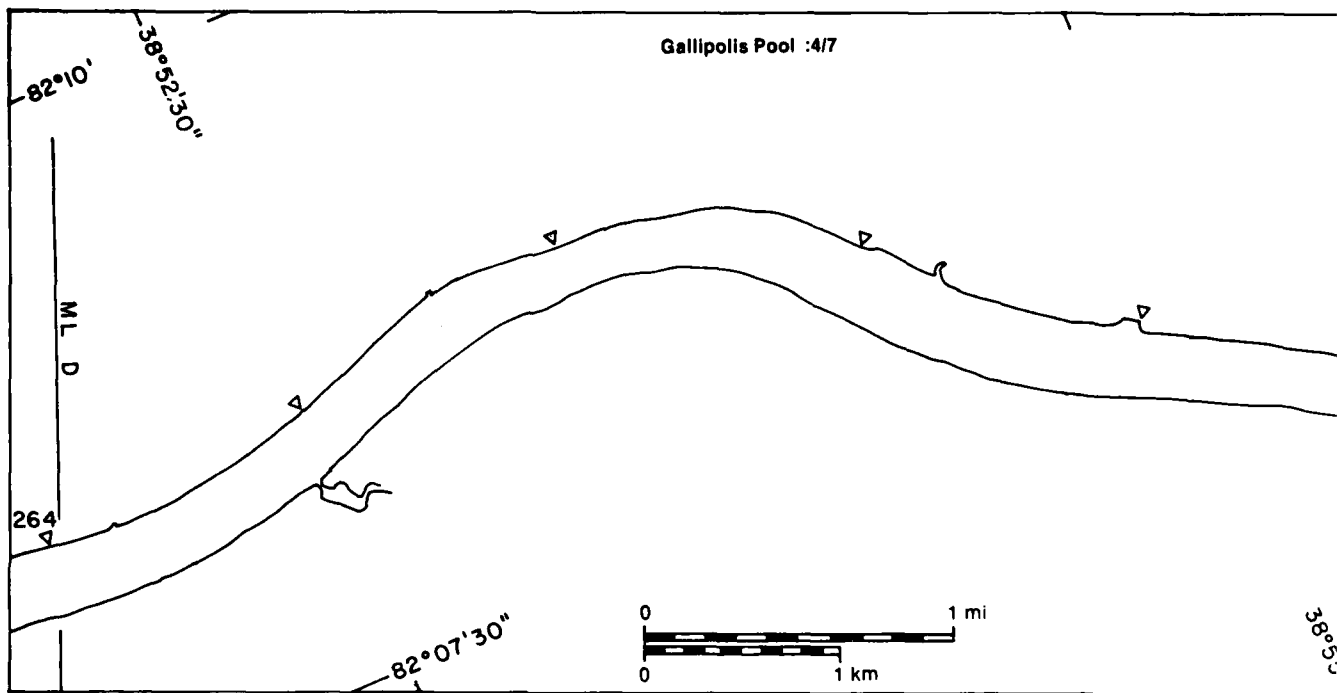
16 January 1986

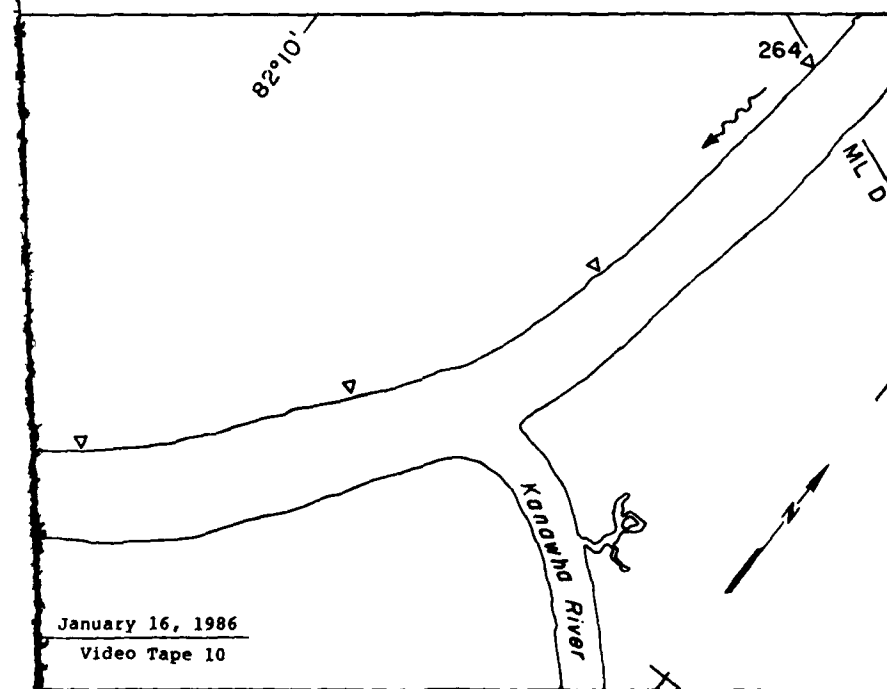
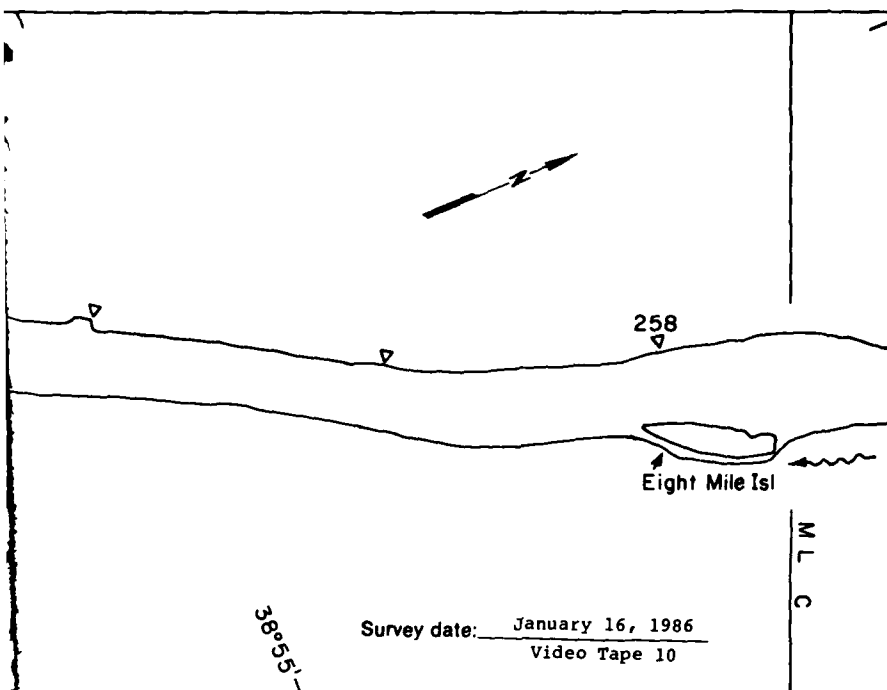


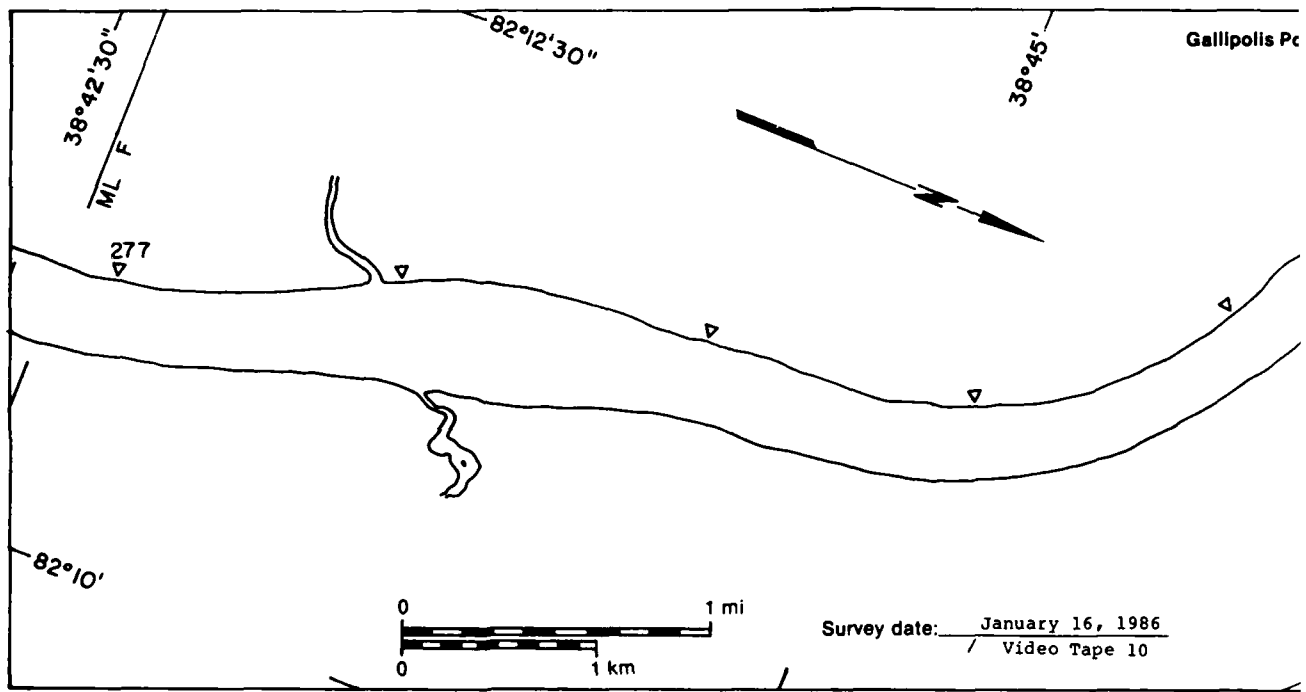
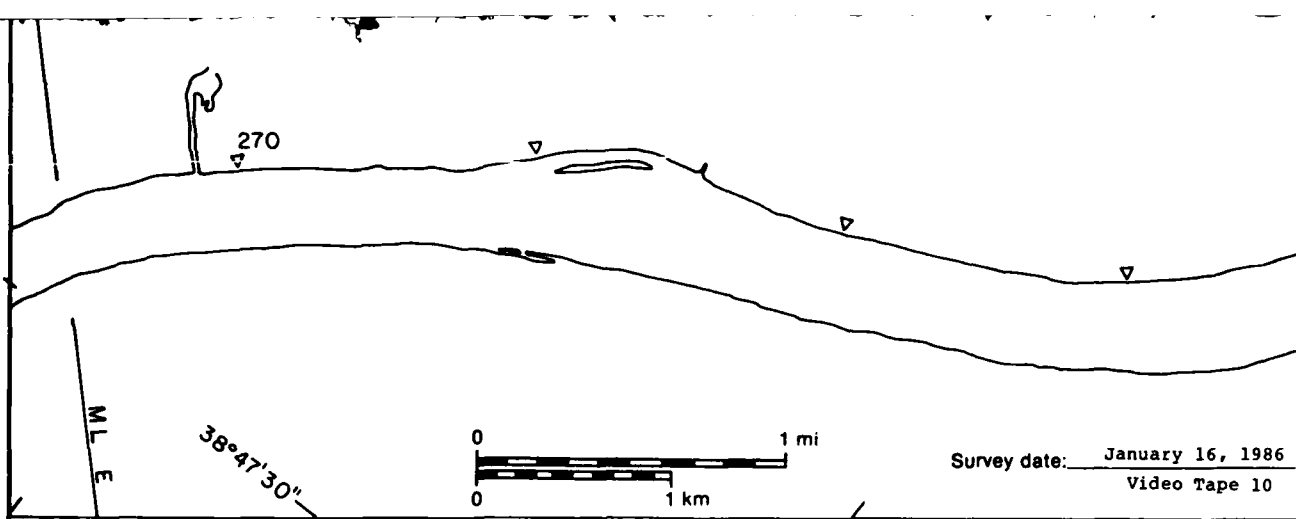


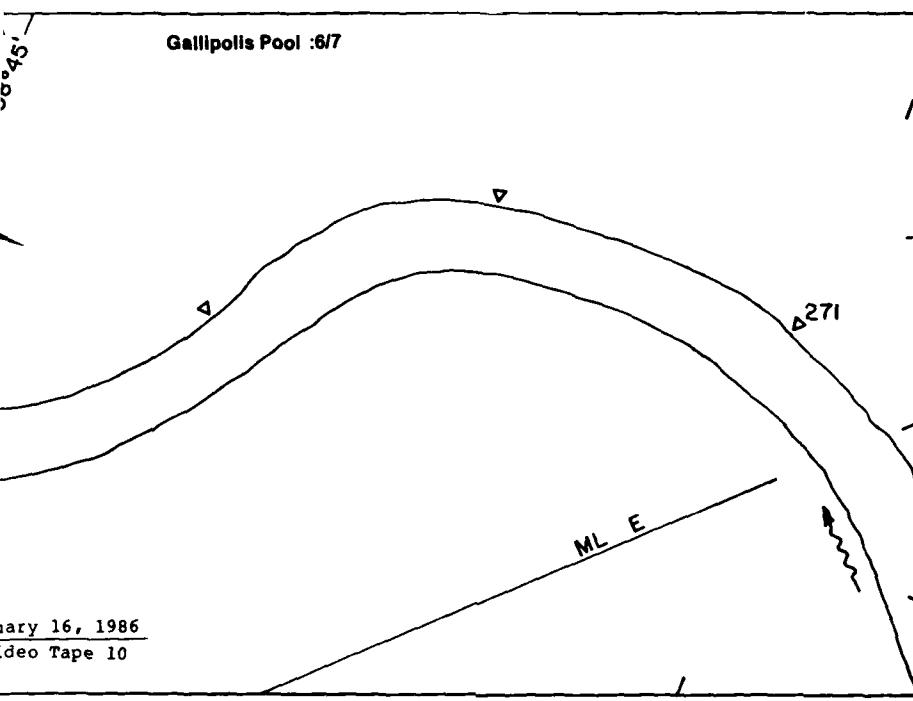
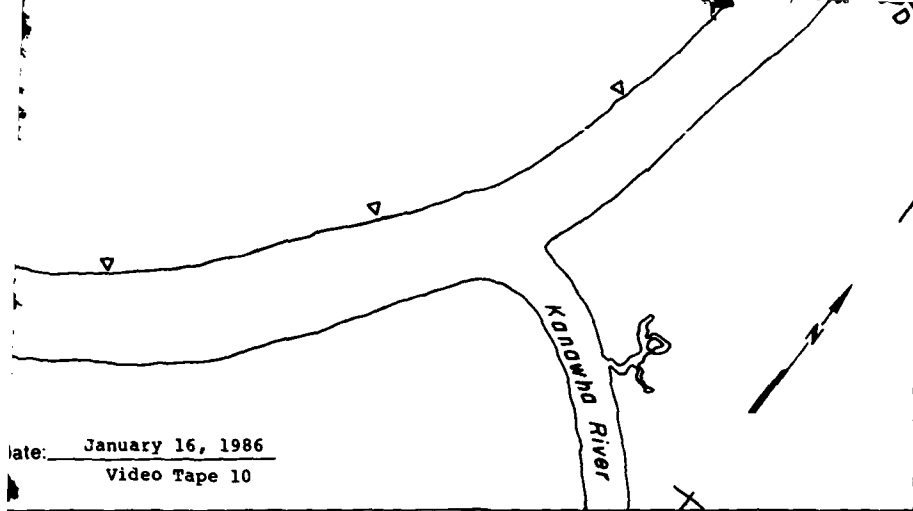


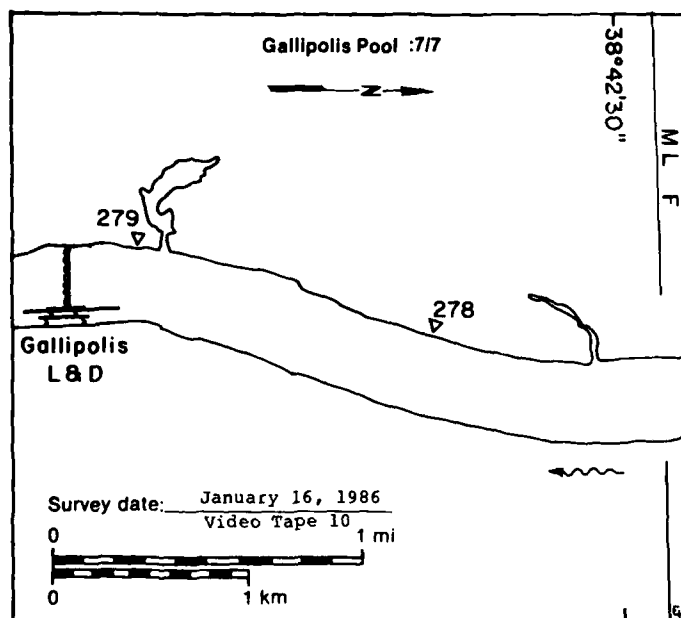
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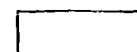






Gallipolis Pool

MAP UNITS



Open water

(m² × 10⁶)

24.



Solid ice cover

0.



Solid ice cover with open-water areas

0.



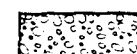
Fragmented ice cover

0.



Fragmented ice cover with open-water areas

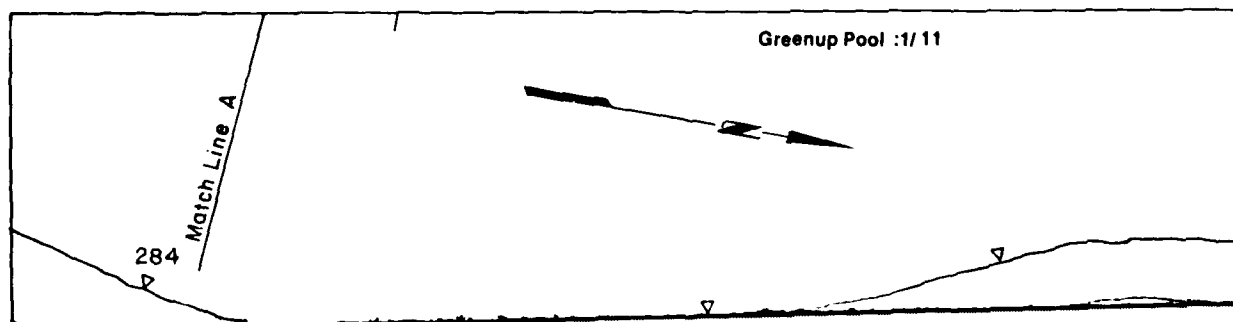
0.



Ice floes or frazil slush and pans

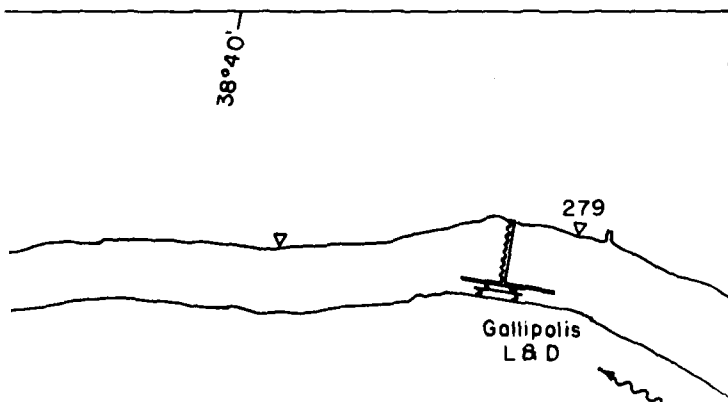
0.

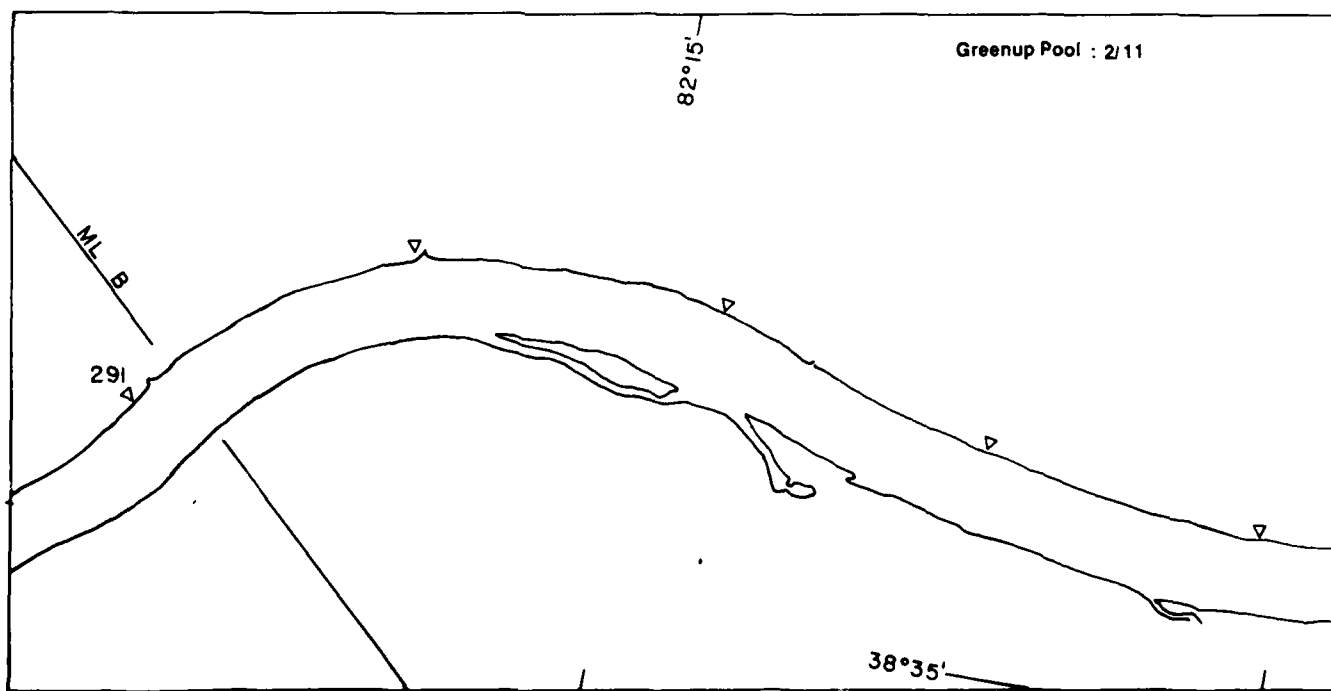
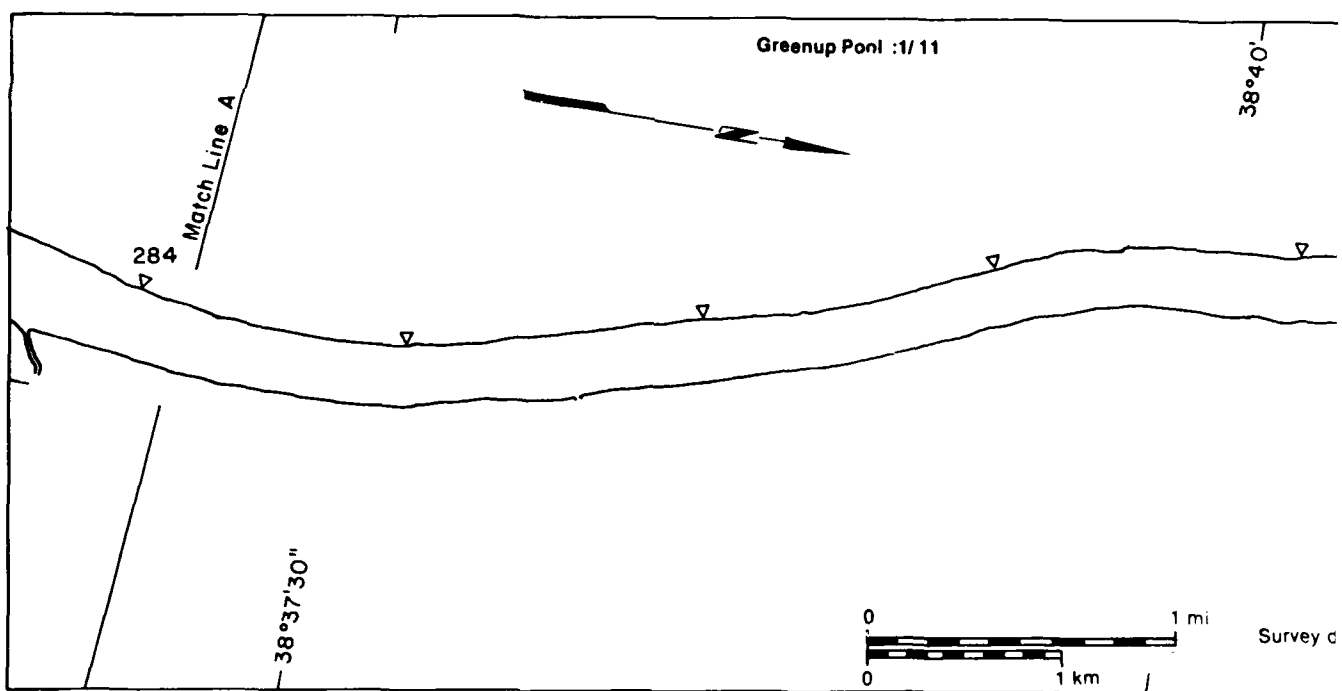
Total area (m² × 10⁶) 24.6

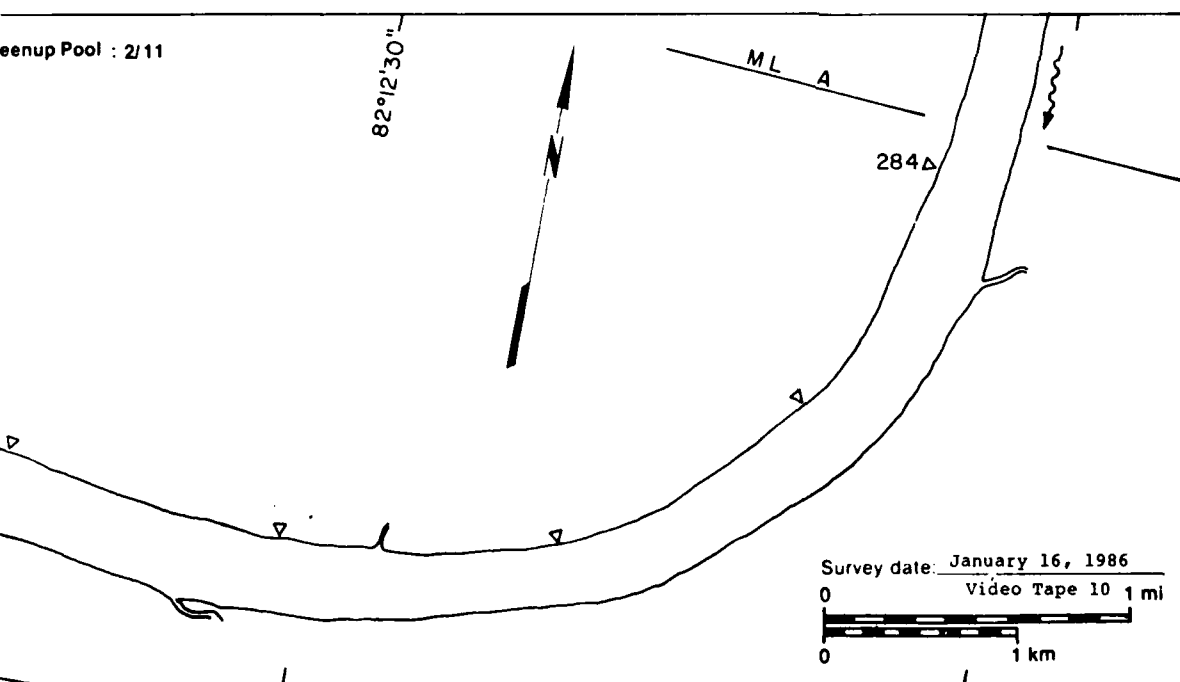
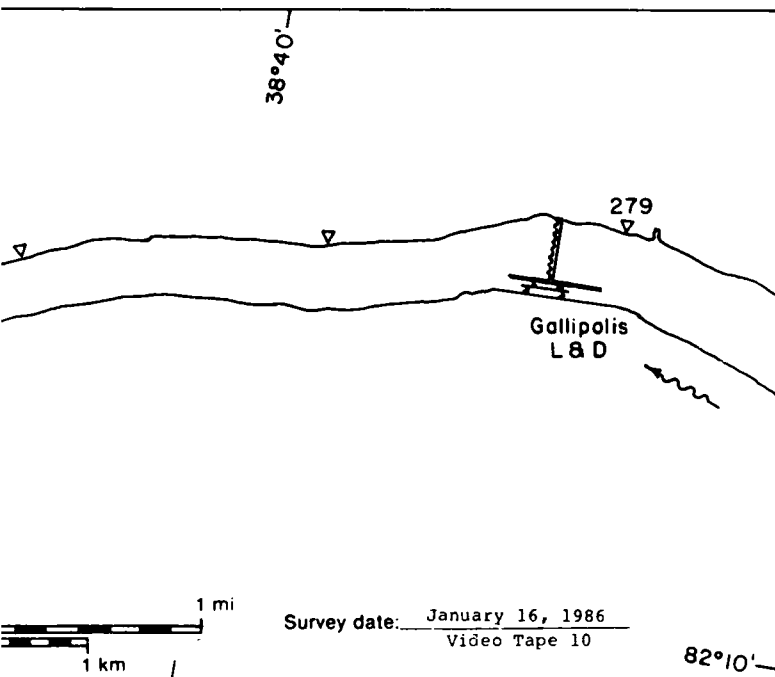


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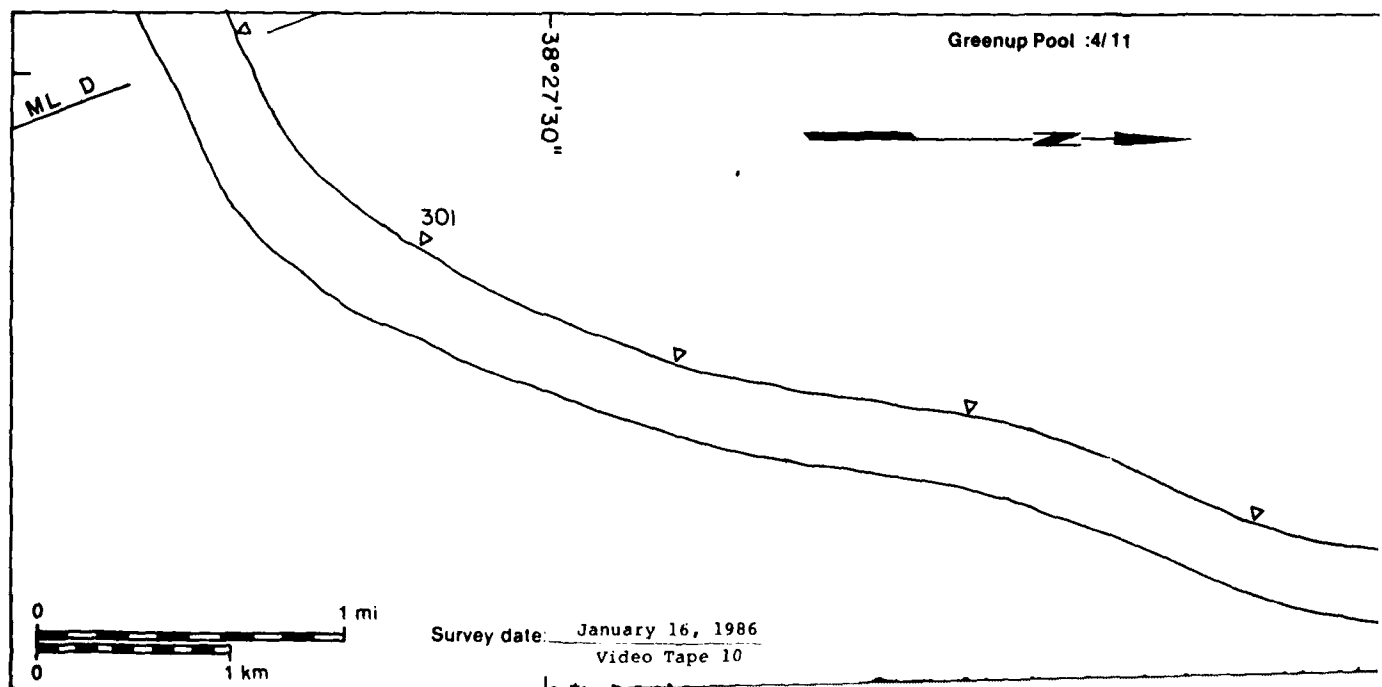
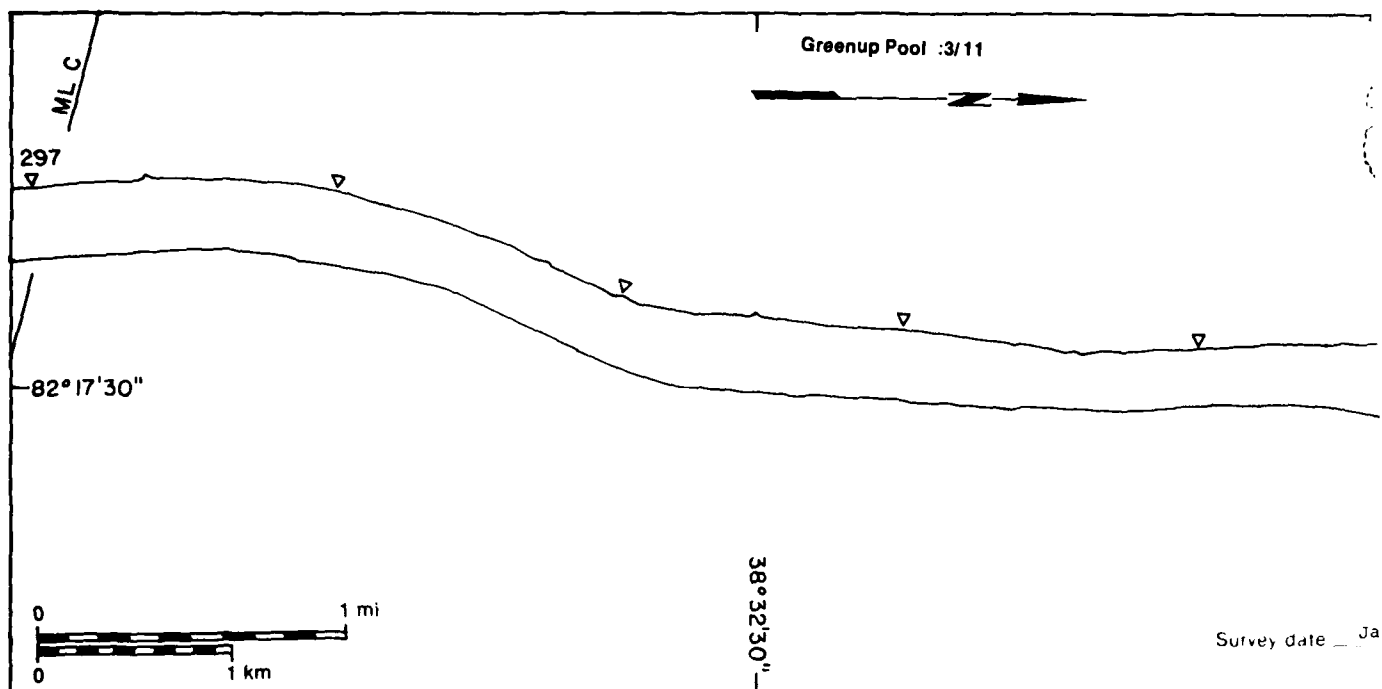
Description	Area	Surface
	(m ² x 10 ⁶)	concentration (%)
er	24.65	NA
cover	0.00	NA
cover with if areas	0.00	—
ed ice cover	0.00	NA
ed ice cover water areas	0.00	—
or frazil slush	0.00	—
Area (m ² x 10 ⁶)	24.65	

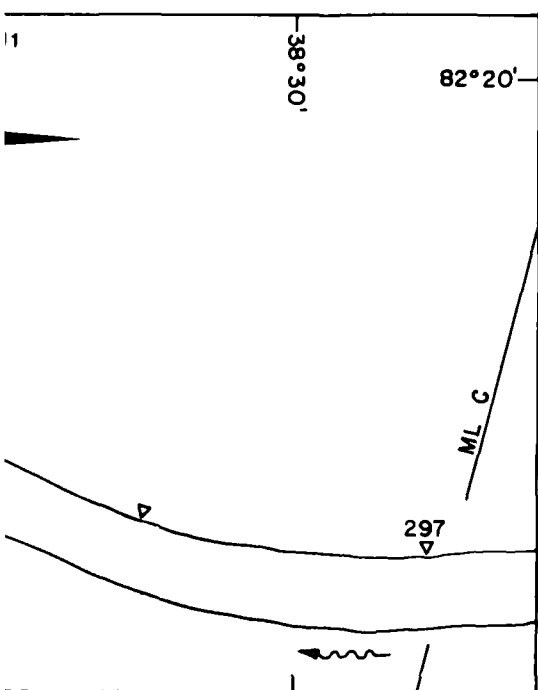
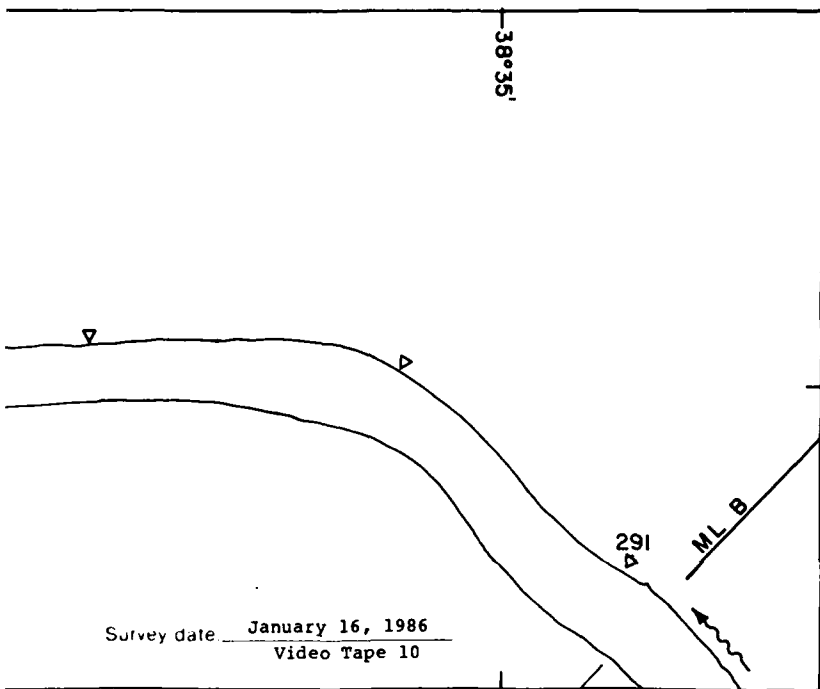


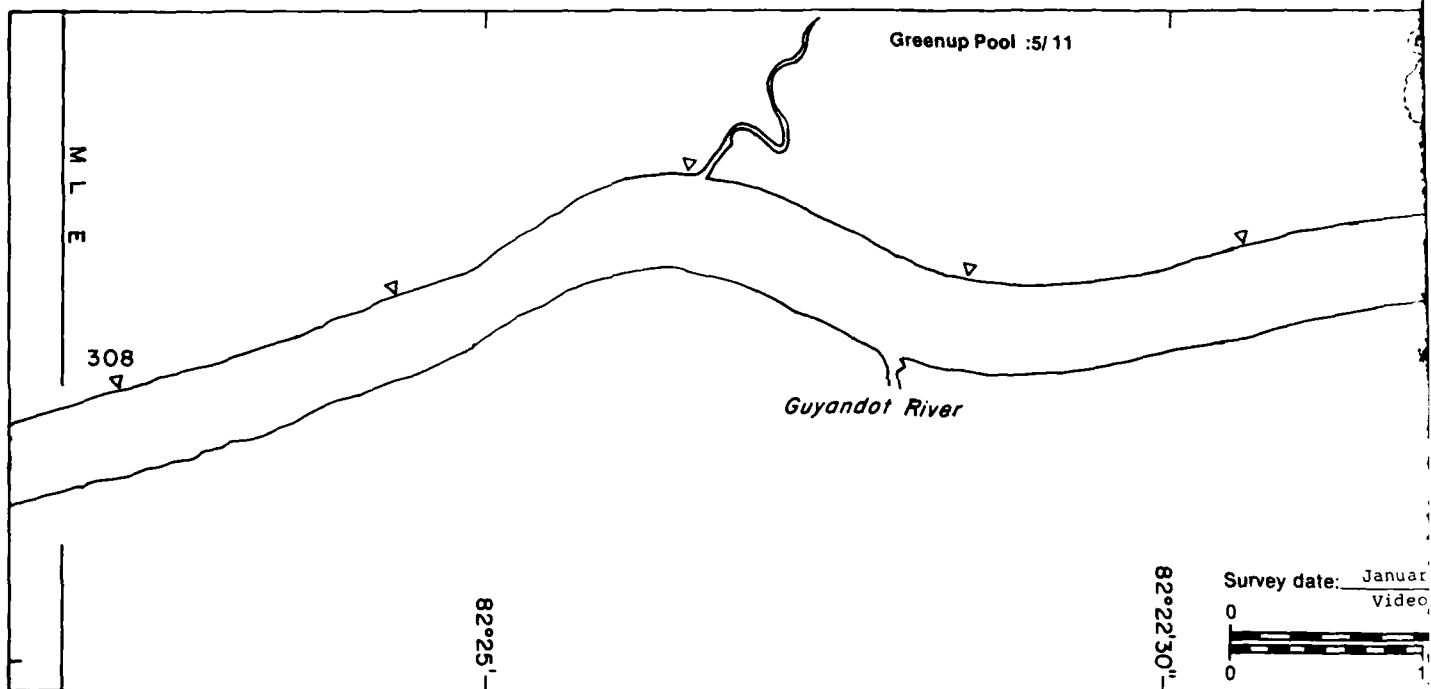
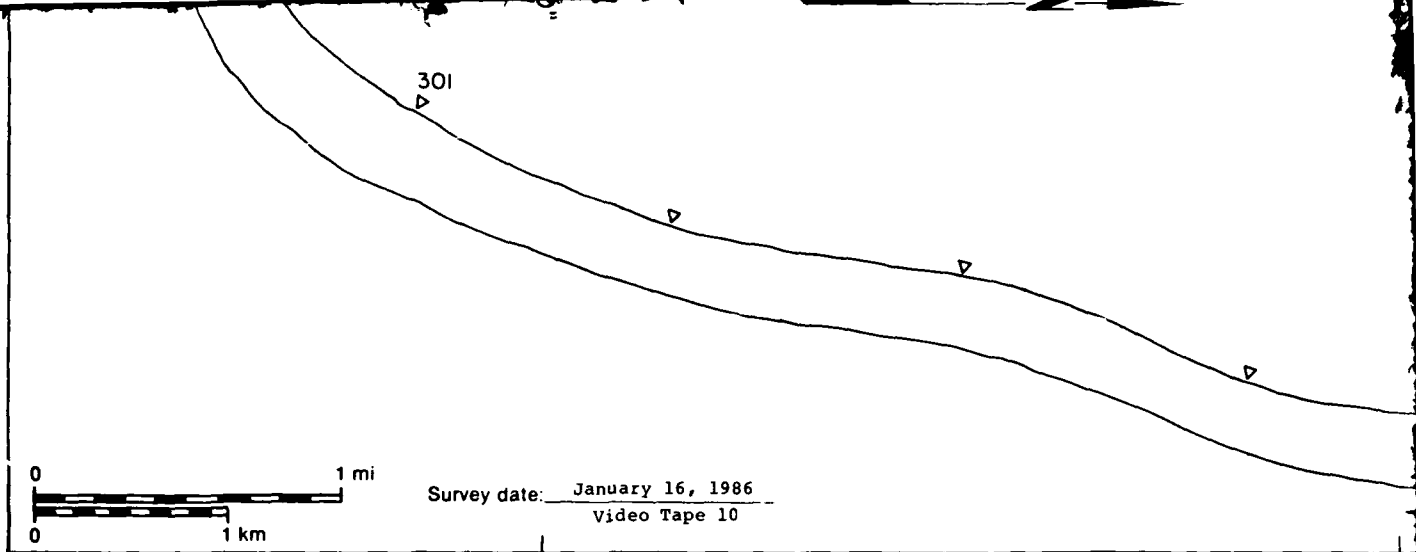


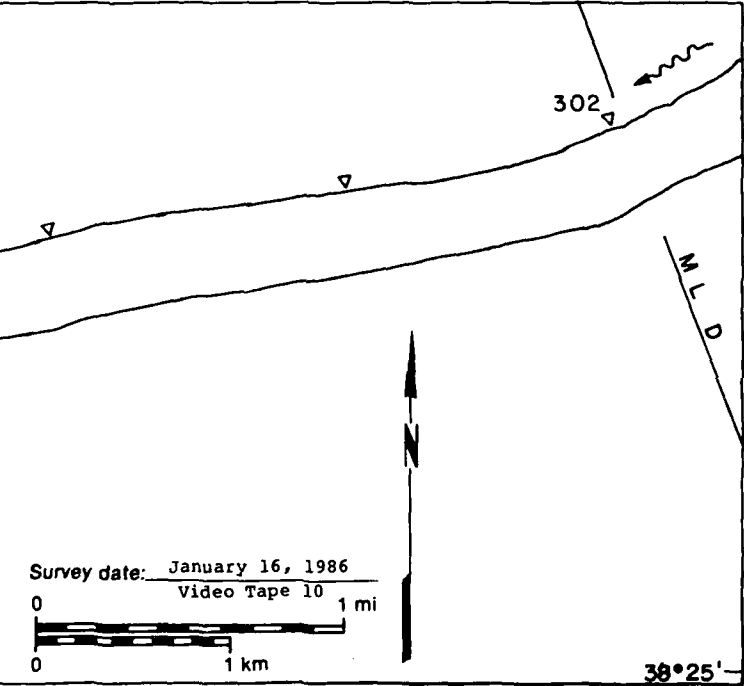
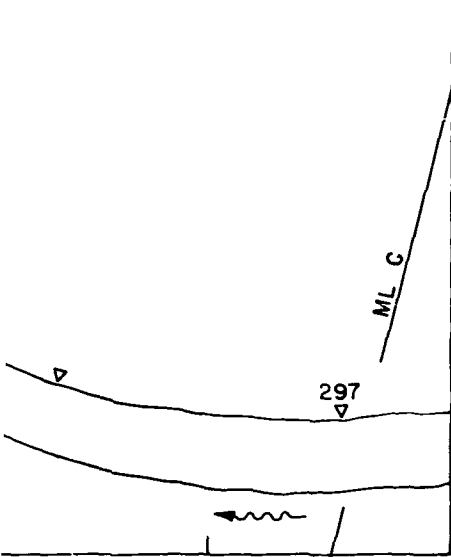


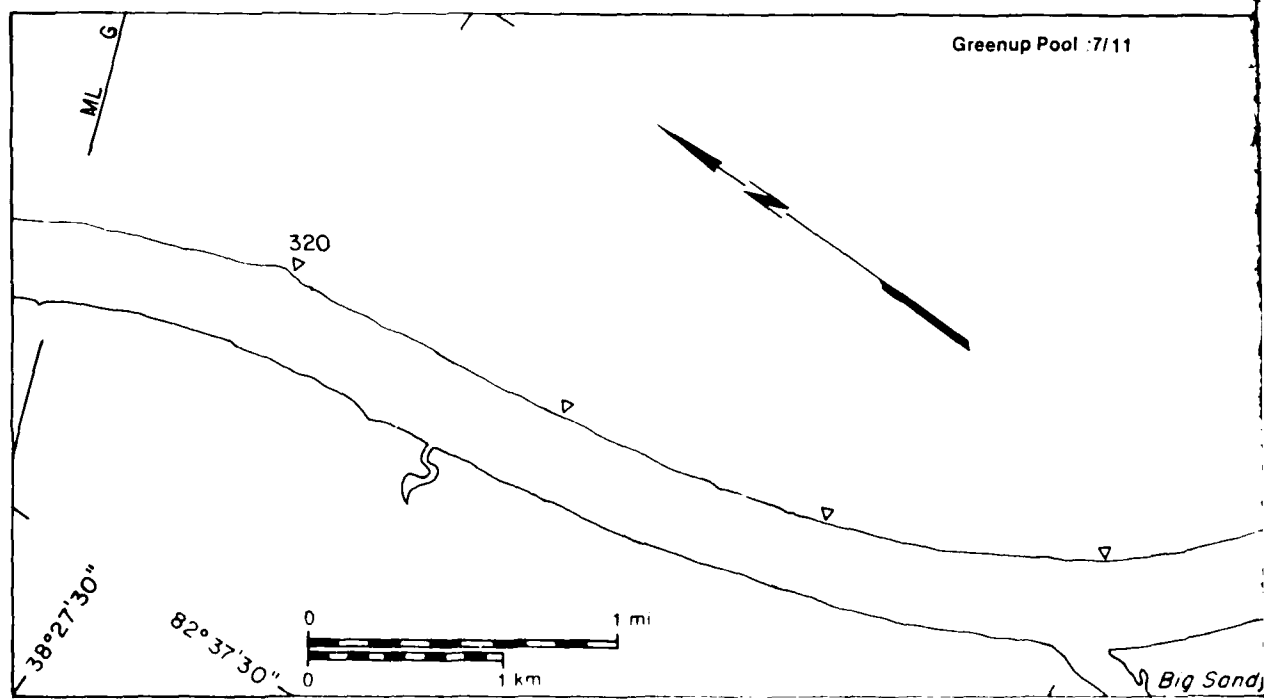
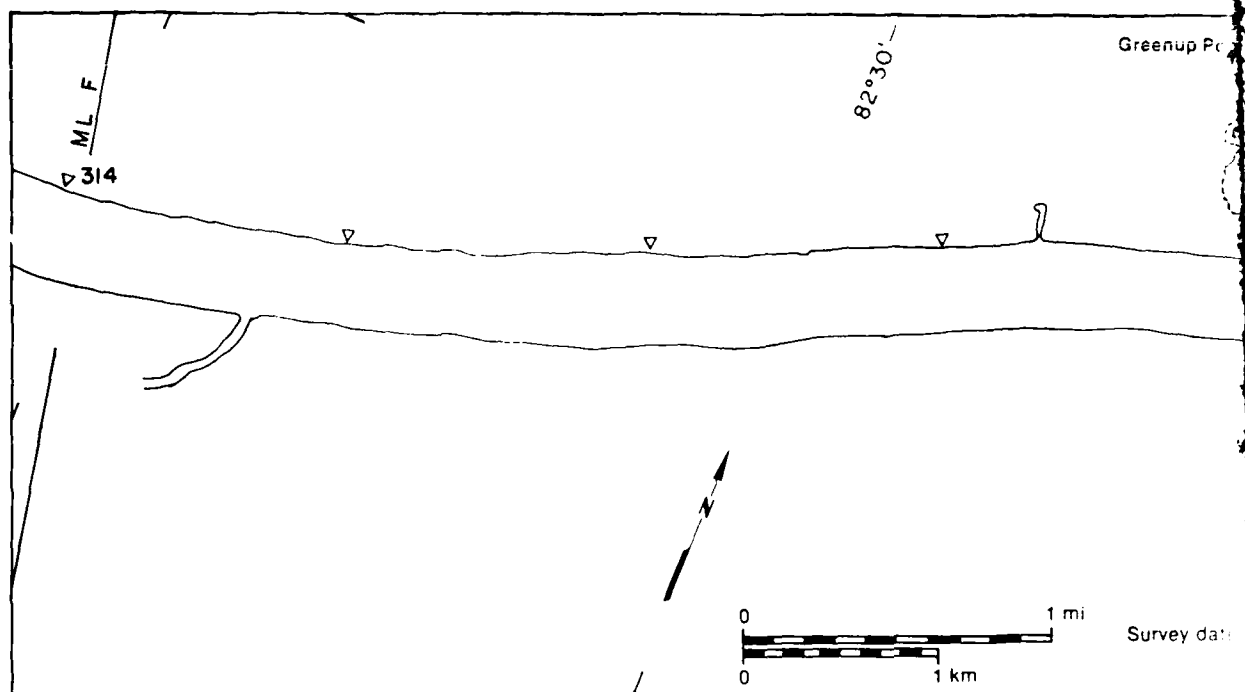
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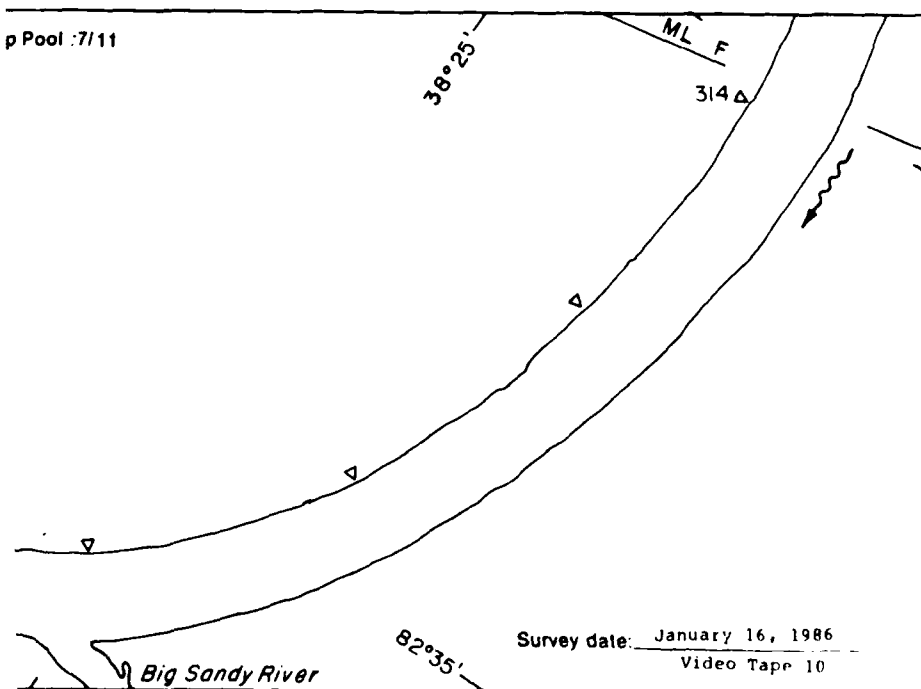
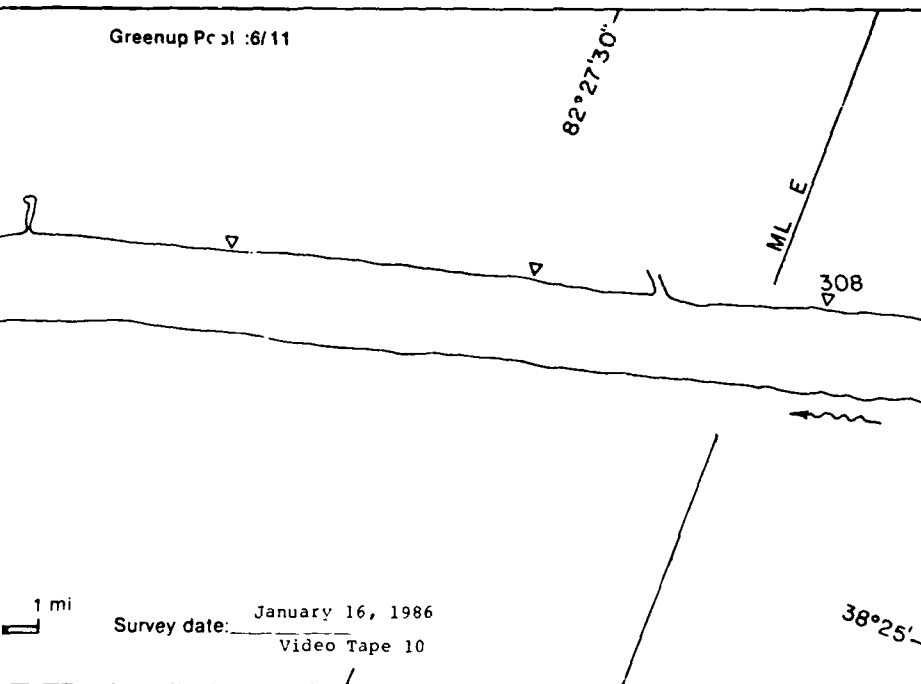








16 January 1986



AD-A191 863

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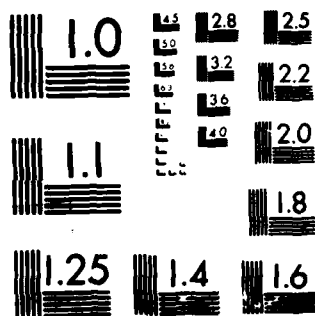
OHIO RIVER ILLINO. (U) COLD REGIONS RESEARCH AND

ENGINEERING LAB HANOVER NH L W GATTO ET AL. NOV 87

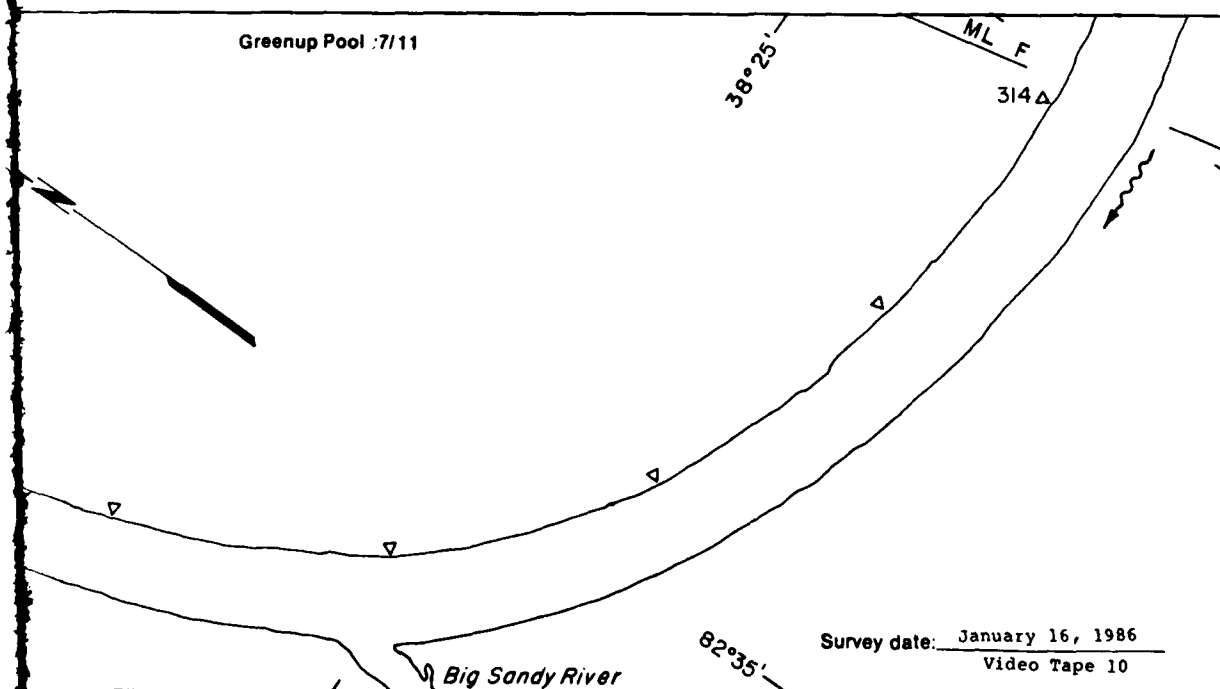
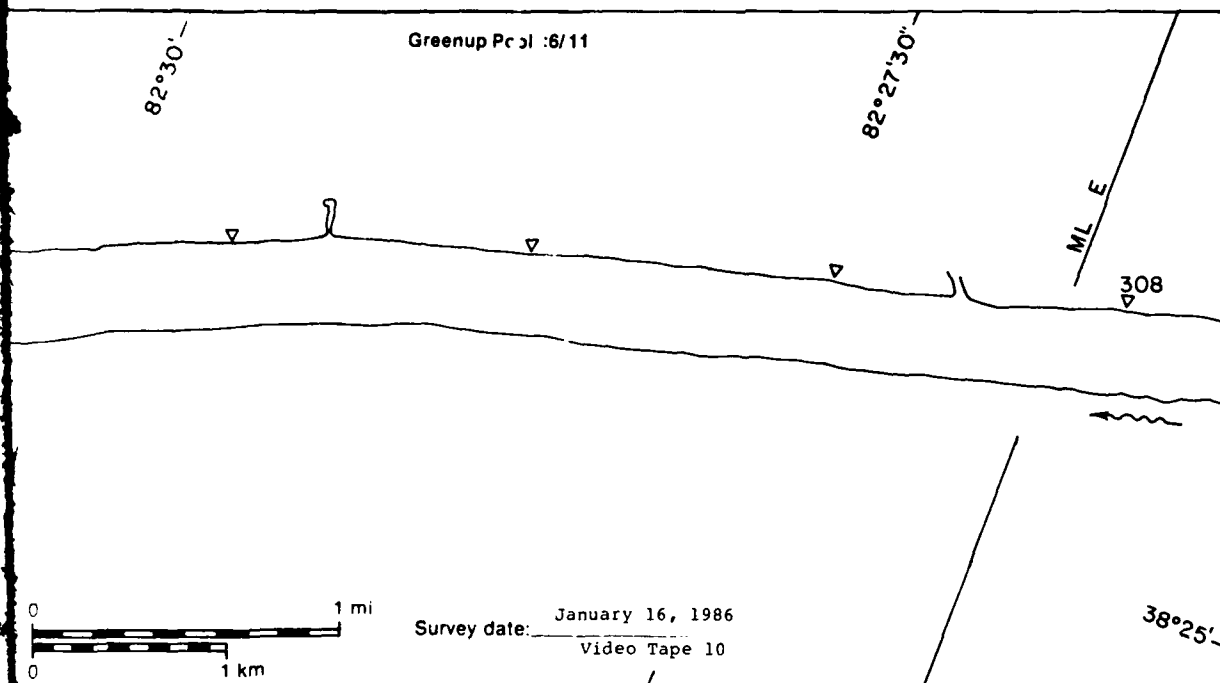
UNCLASSIFIED CRREL-SP-87-20

F/G 8/12

NL

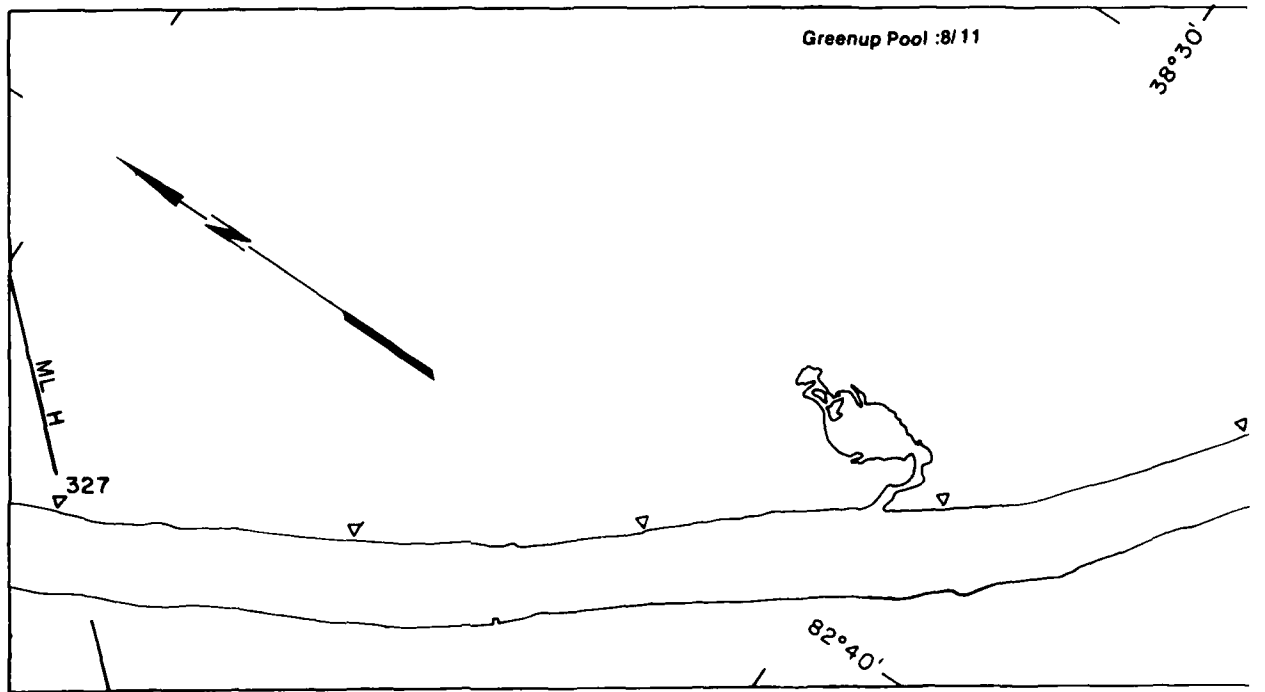
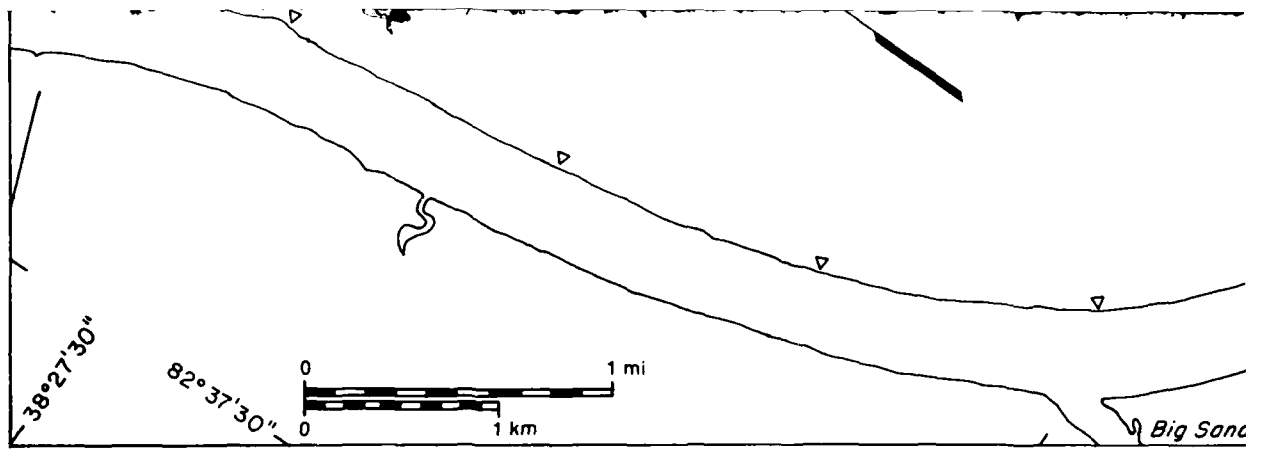


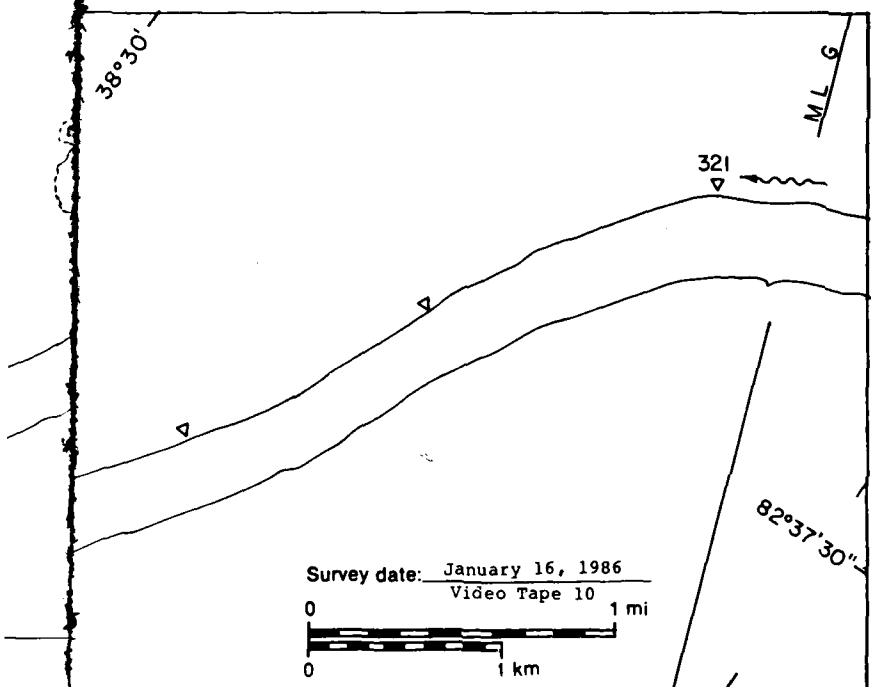
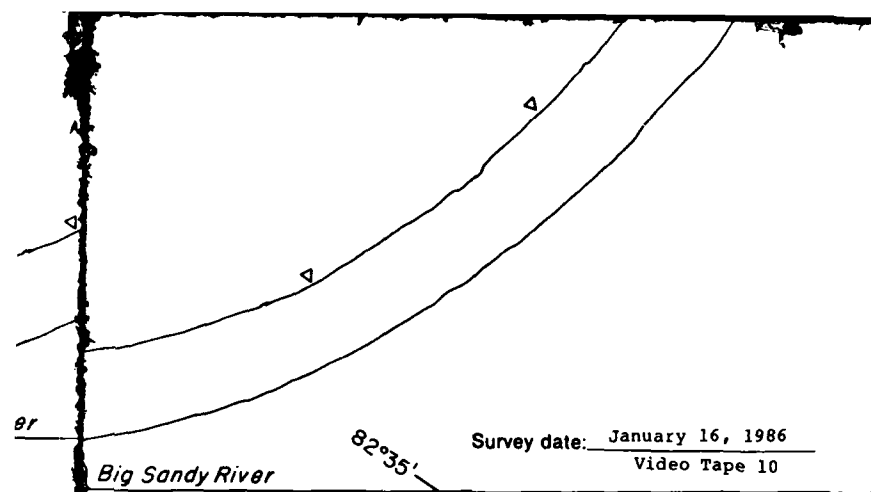
16 January 1986



Greenup Pool :8/11

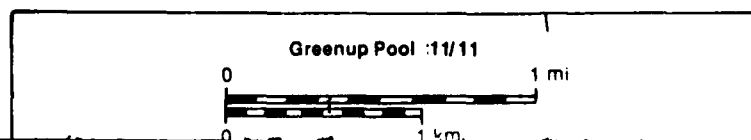
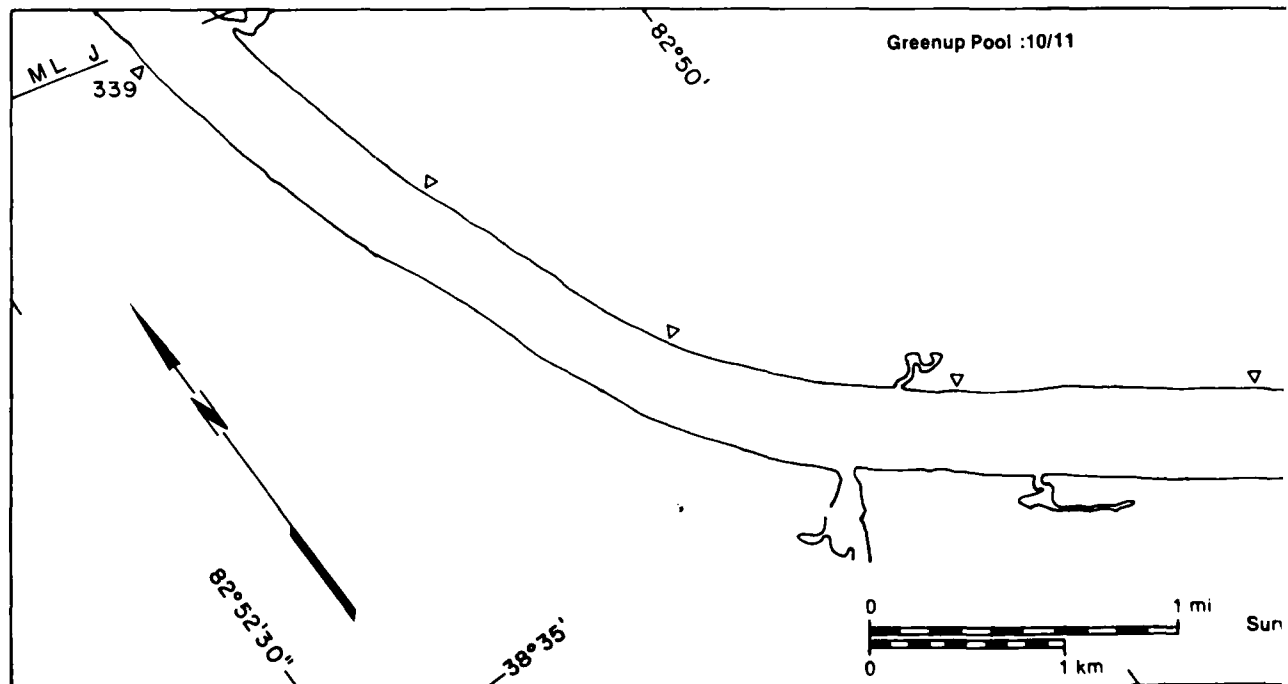
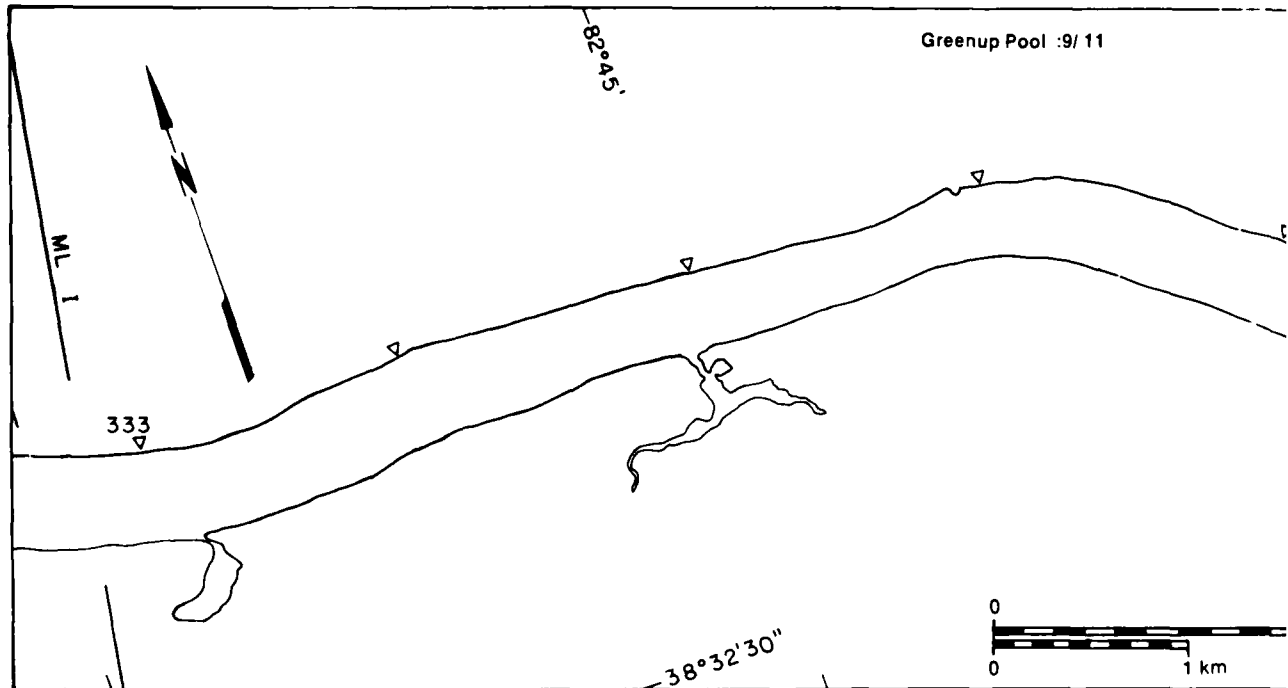
38°30'





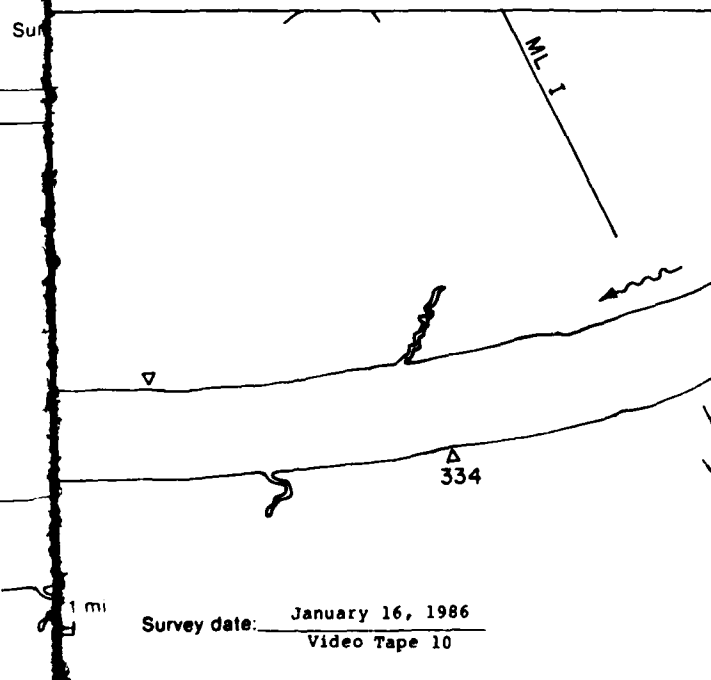
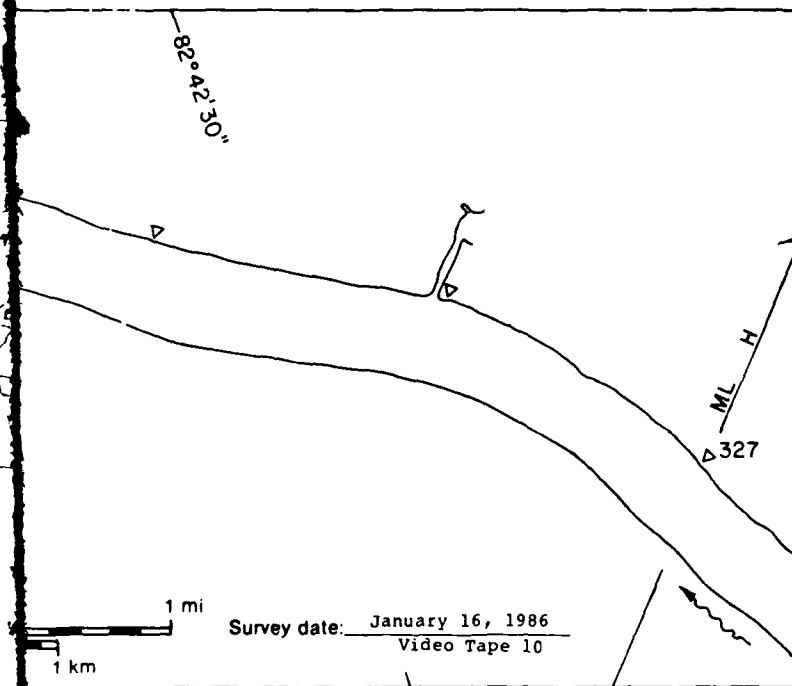
7

16 January 1986

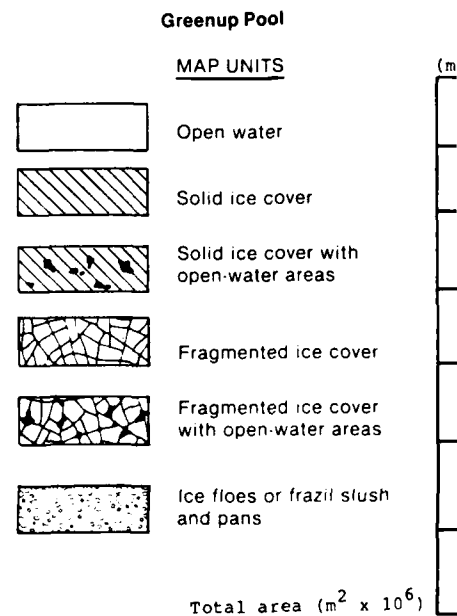
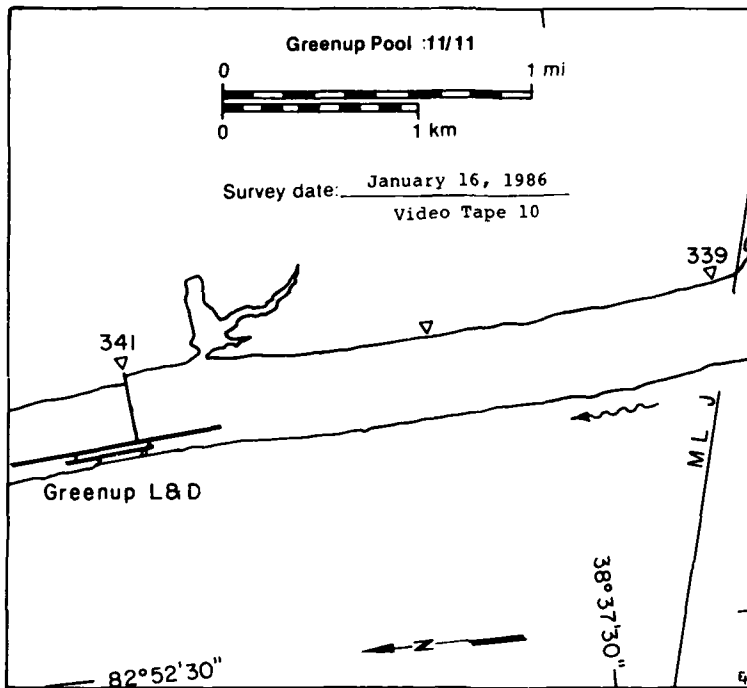
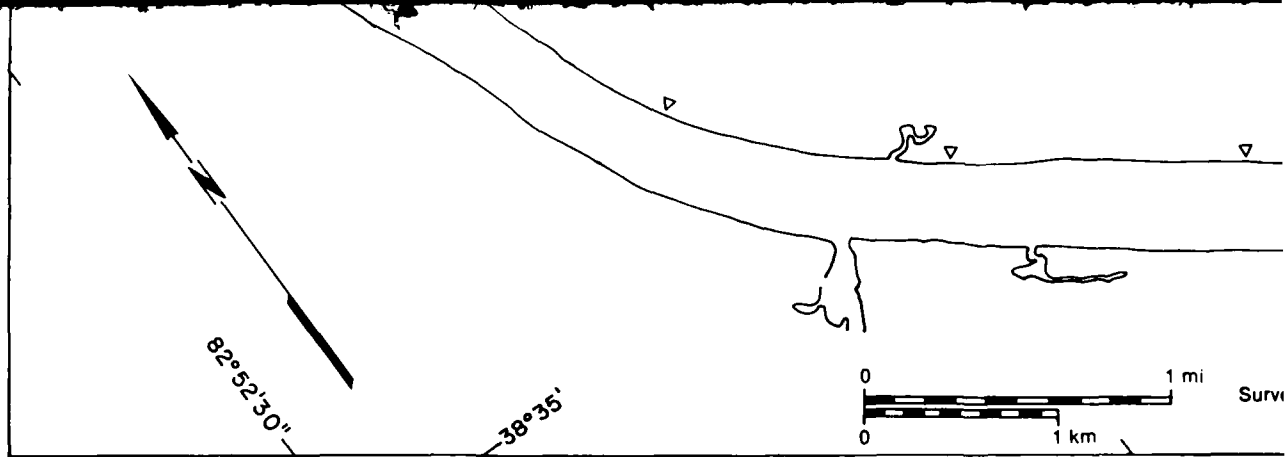


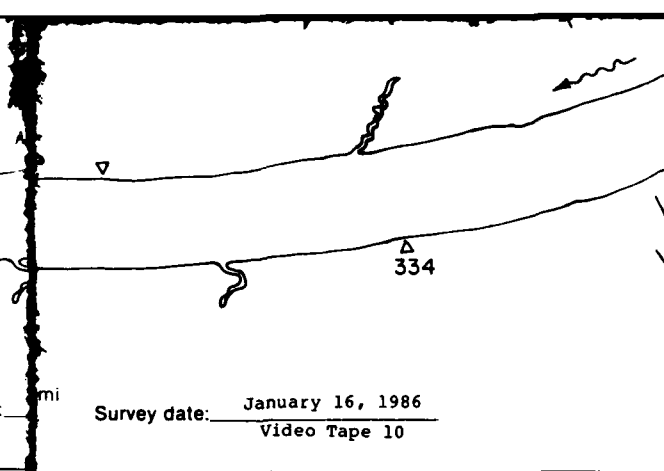
Greenup Pool

MAP UNITS



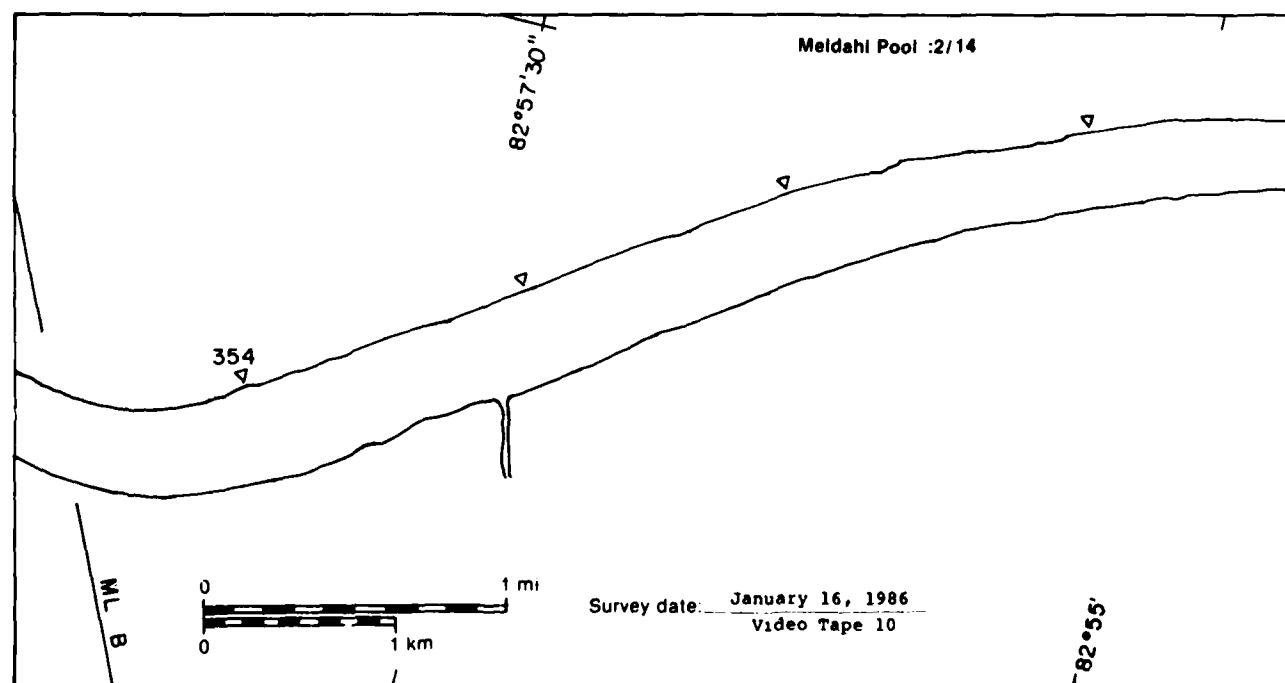
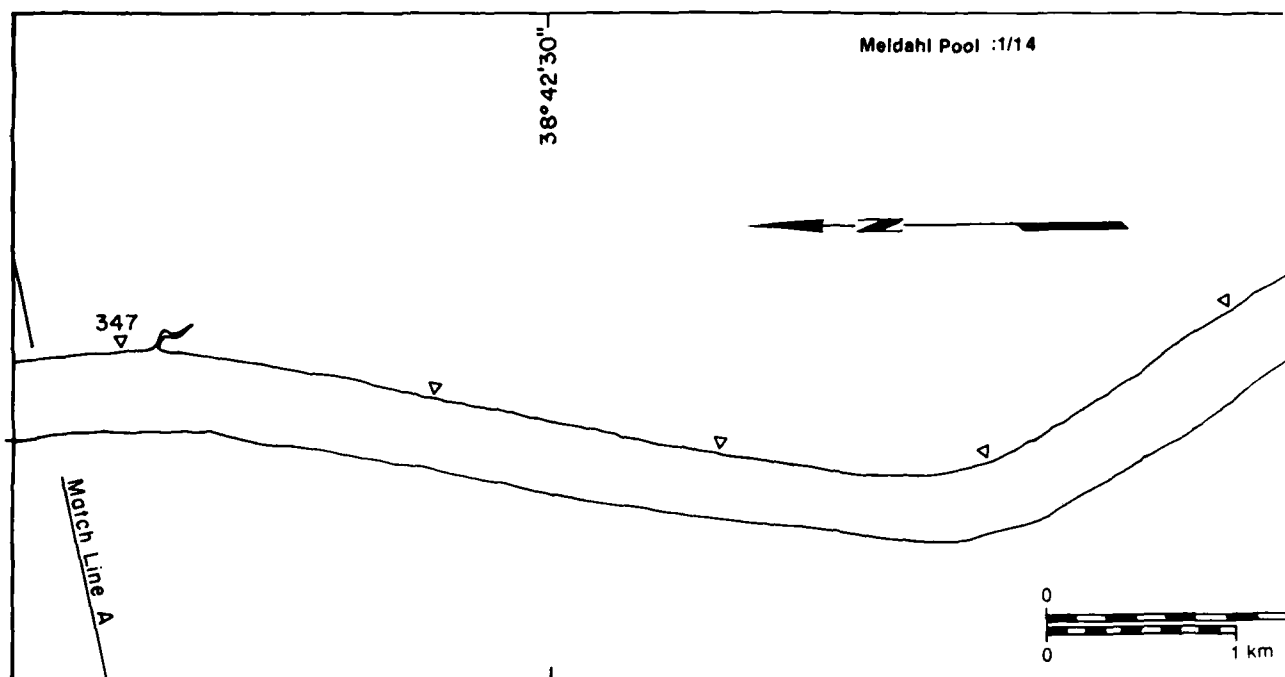
Area (m ² x 10 ⁶)	Surface concentration (%)
41.19	NA





mi
Survey date: January 16, 1986
Video Tape 10

	Area (m ² x 10 ⁶)	Surface concentration (%)
6)	41.19	NA
	0.00	NA
	0.00	—
er	0.00	NA
er as	0.00	—
ush	0.00	—
x 10 ⁶)	41.19	



16 January 1986

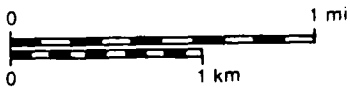
Pool :1/14

38°40'

Greenup
L & D

342

82°52'30"



Survey date: January 16, 1986
Video Tape 10

14

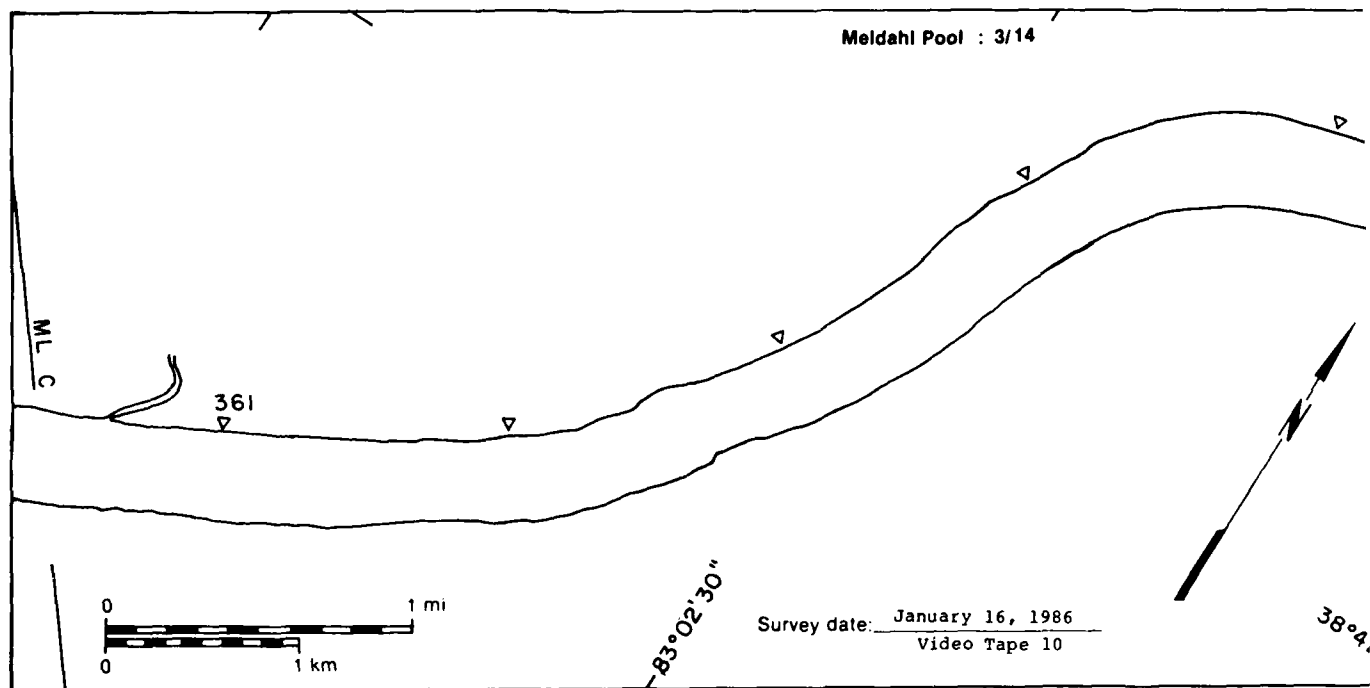
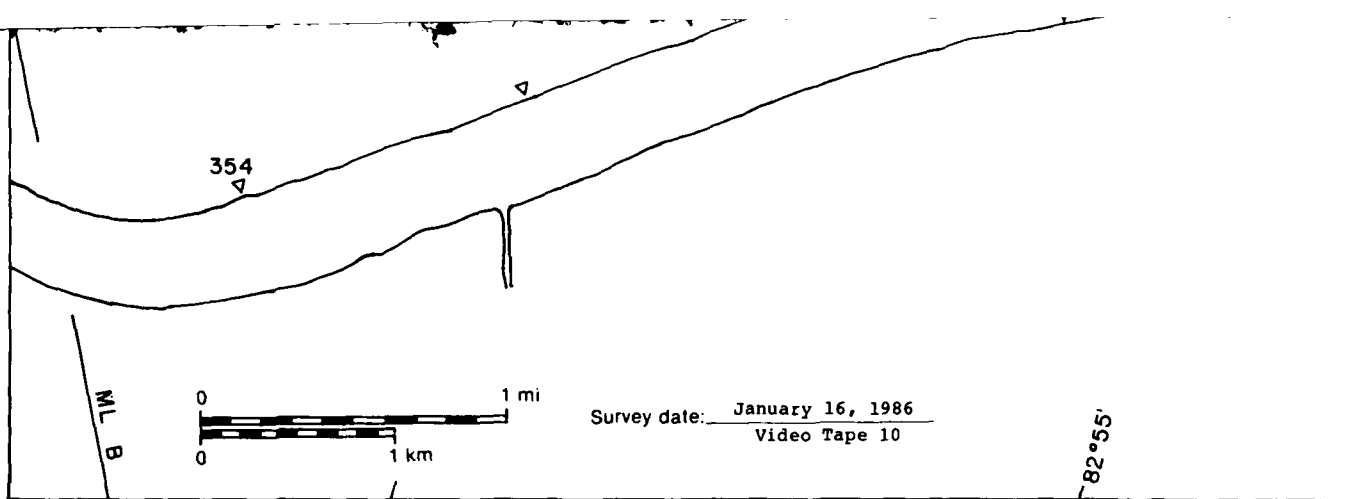
38°45'

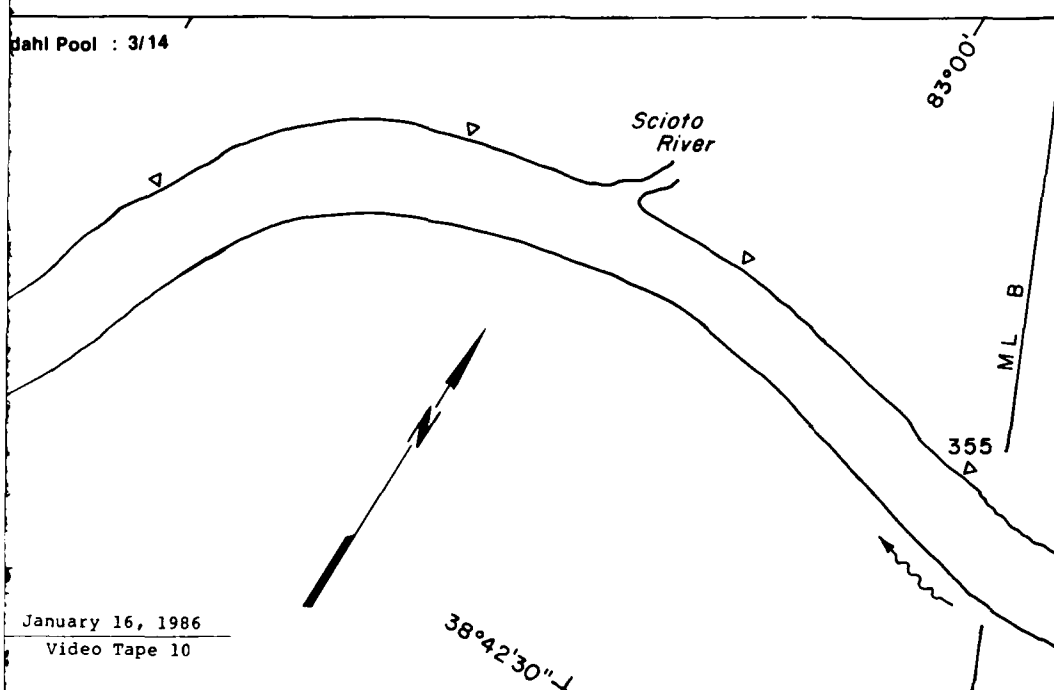
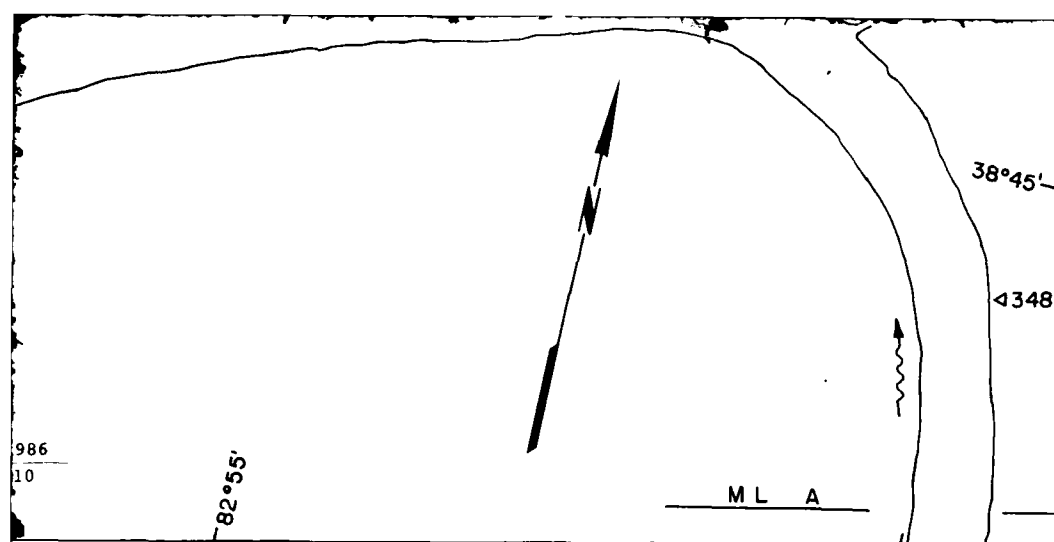
4348

82°55'

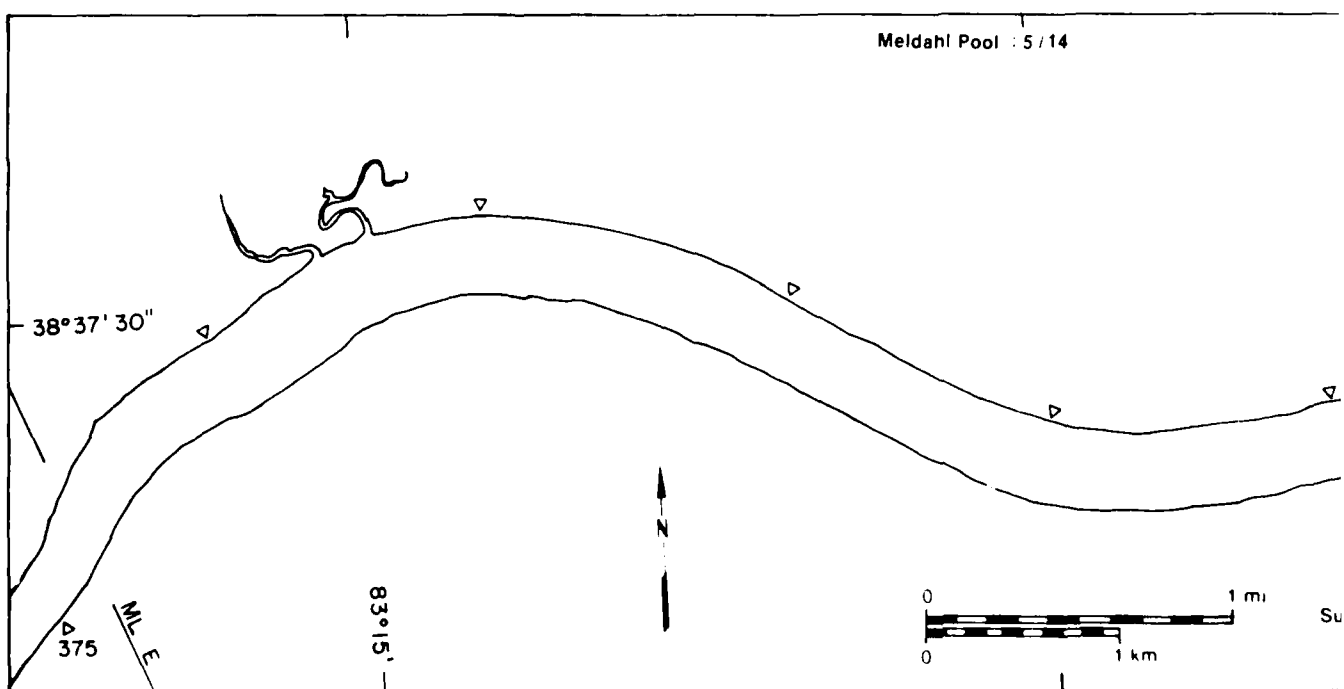
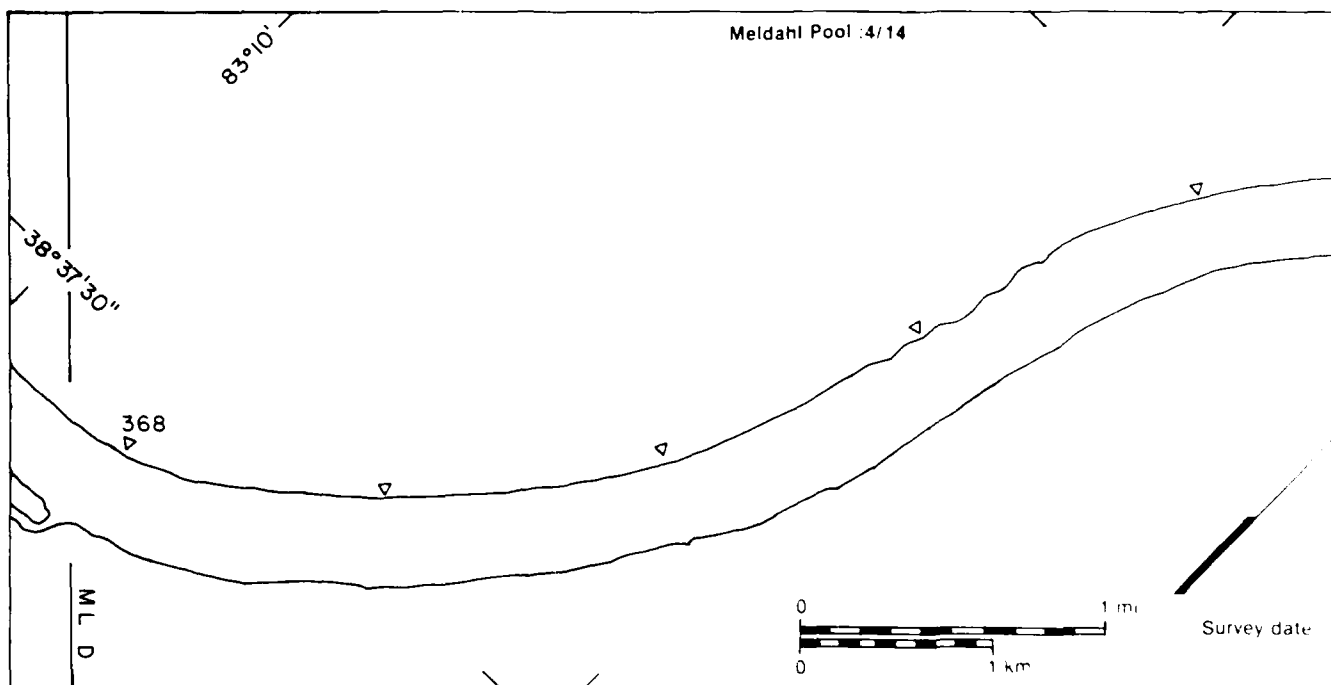
M L A

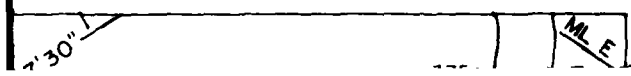
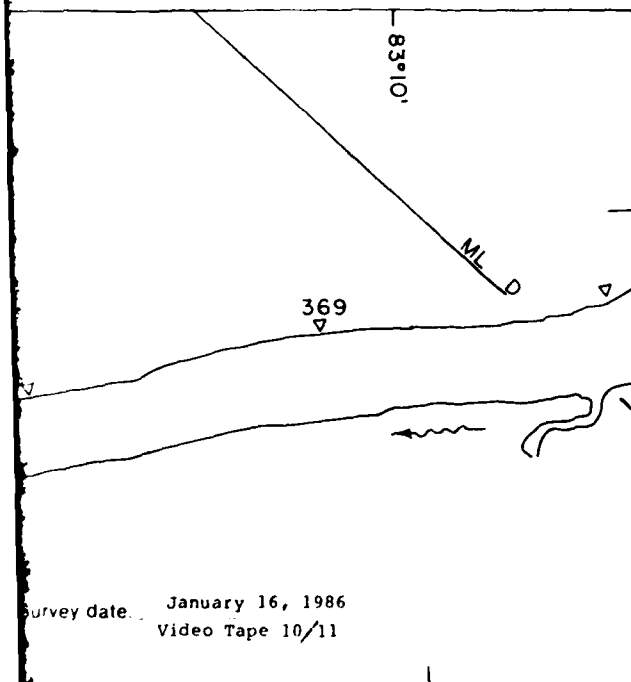
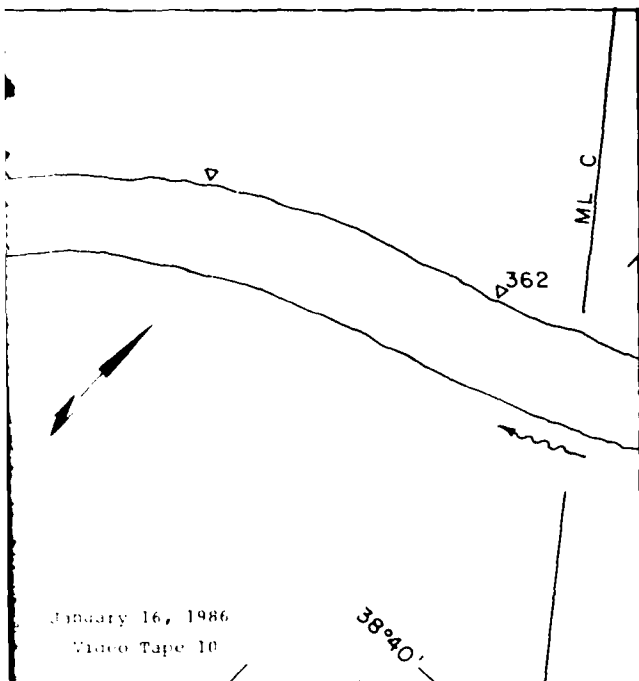
3/14

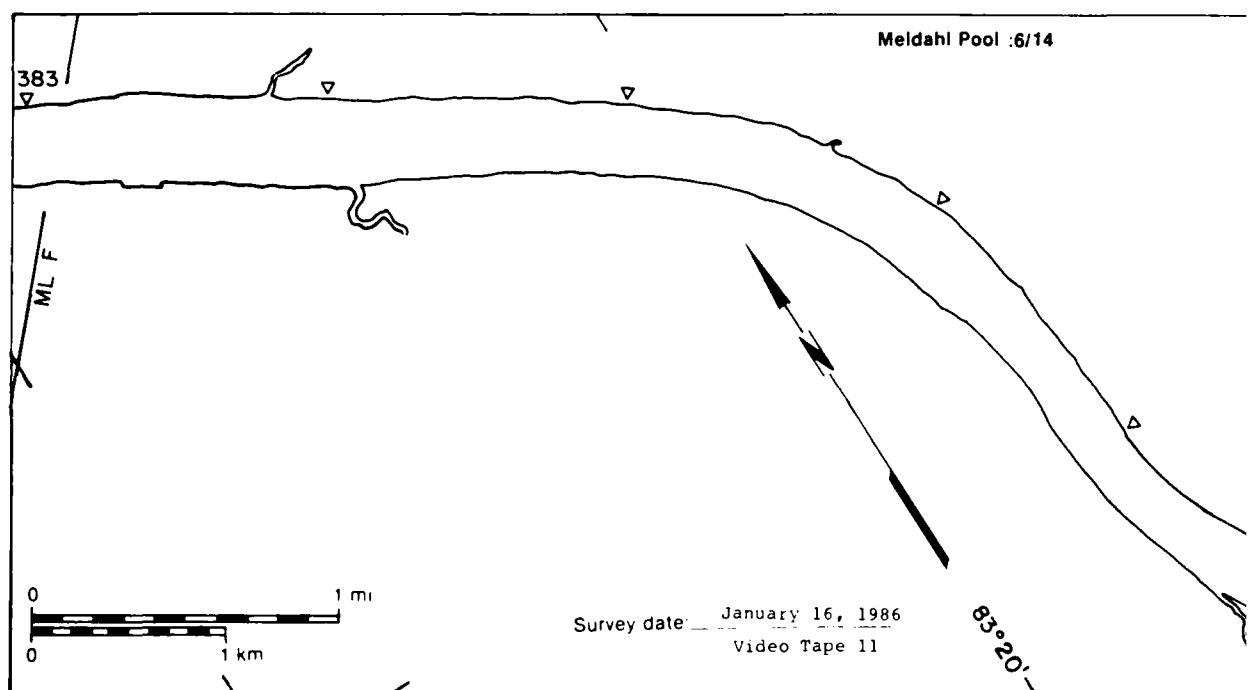
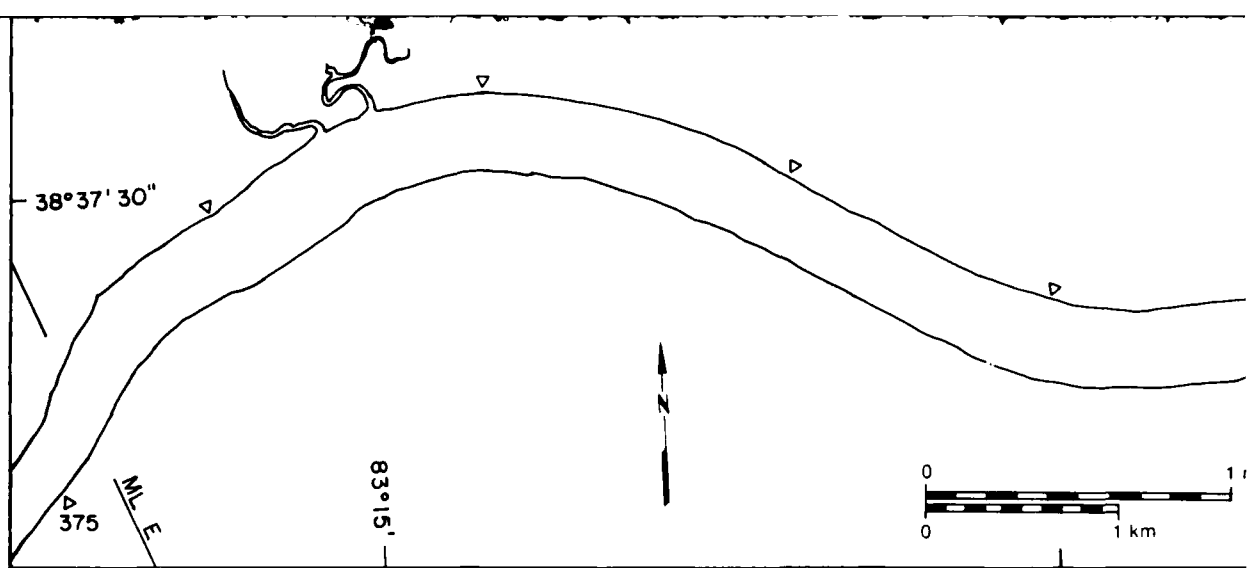


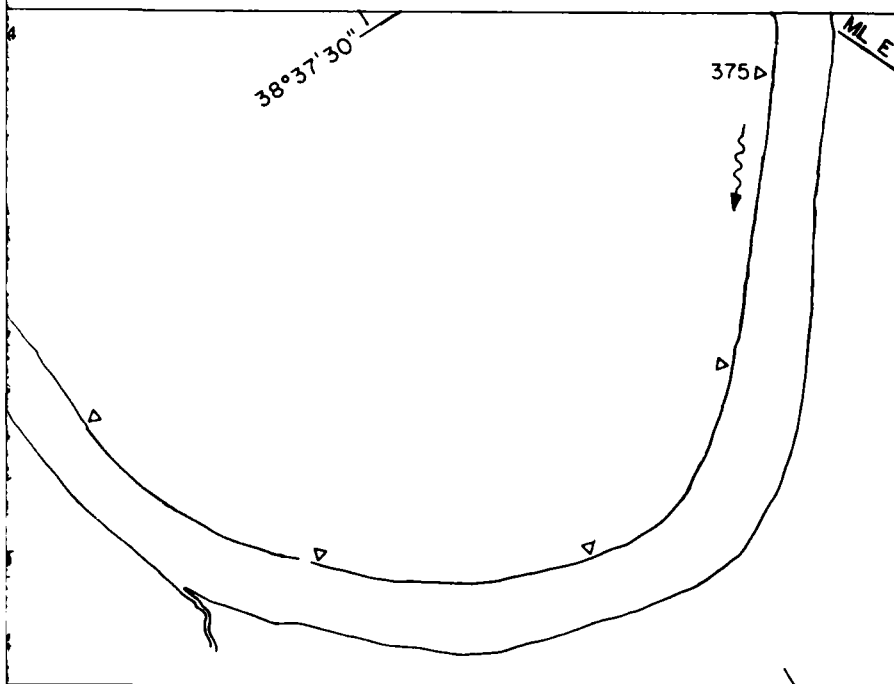
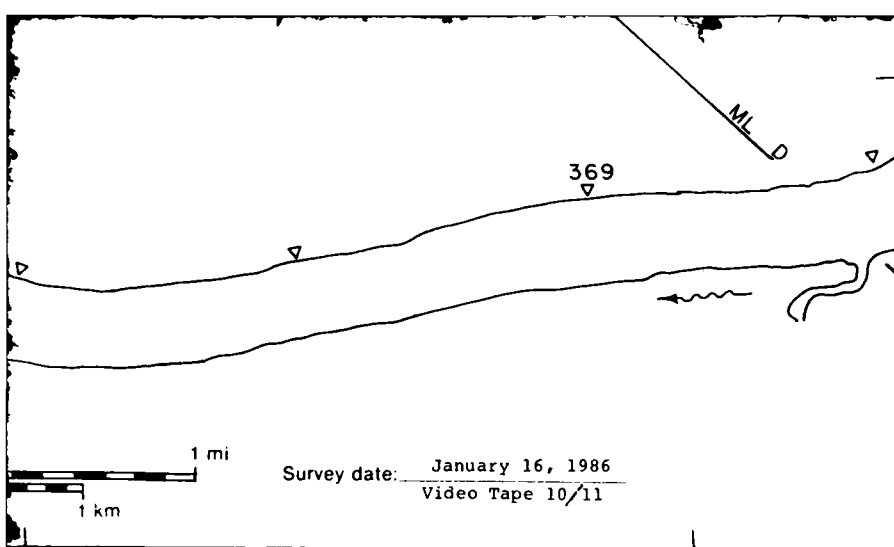


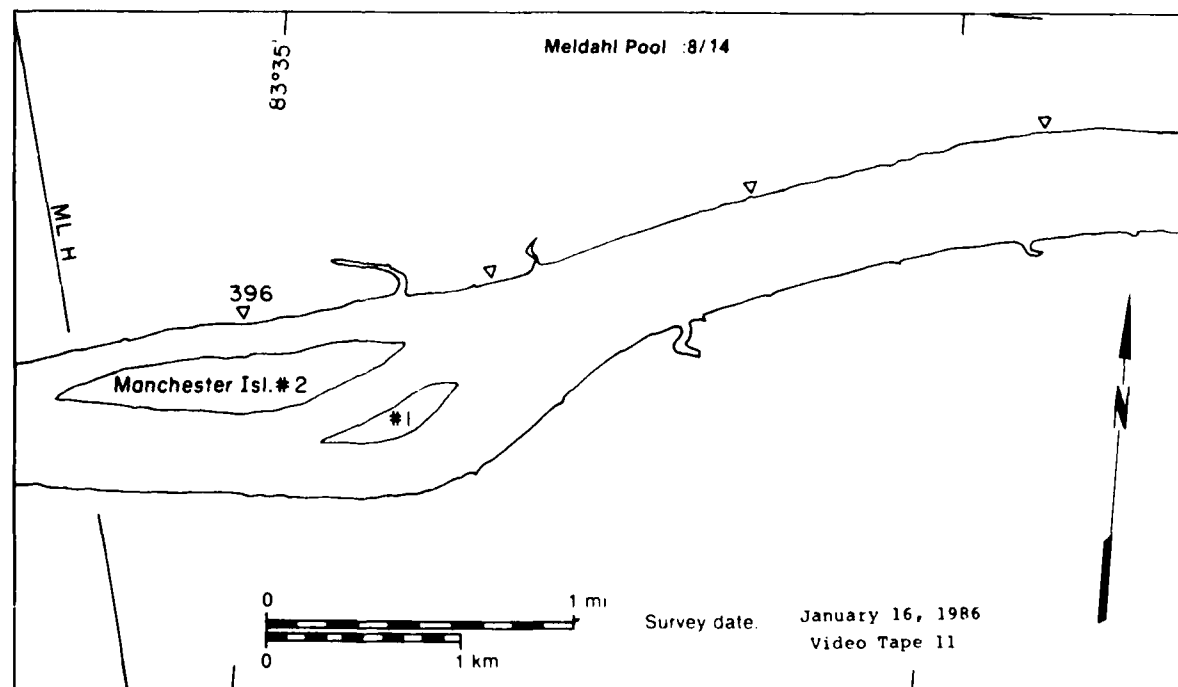
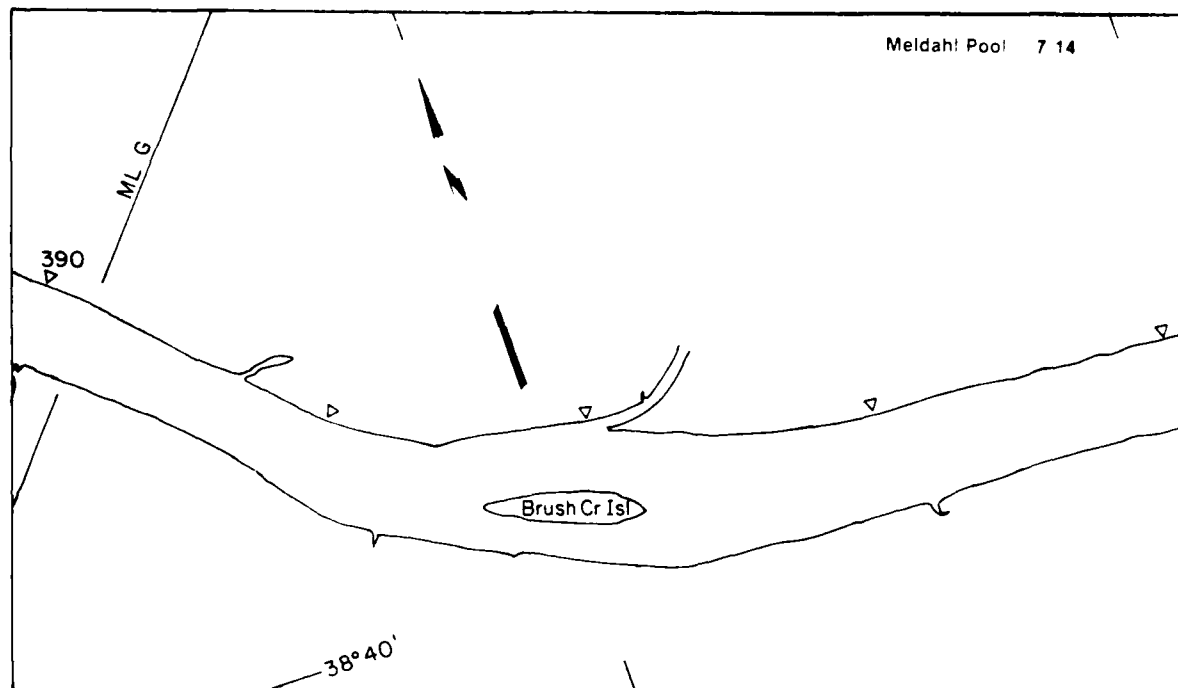
16 January 1986



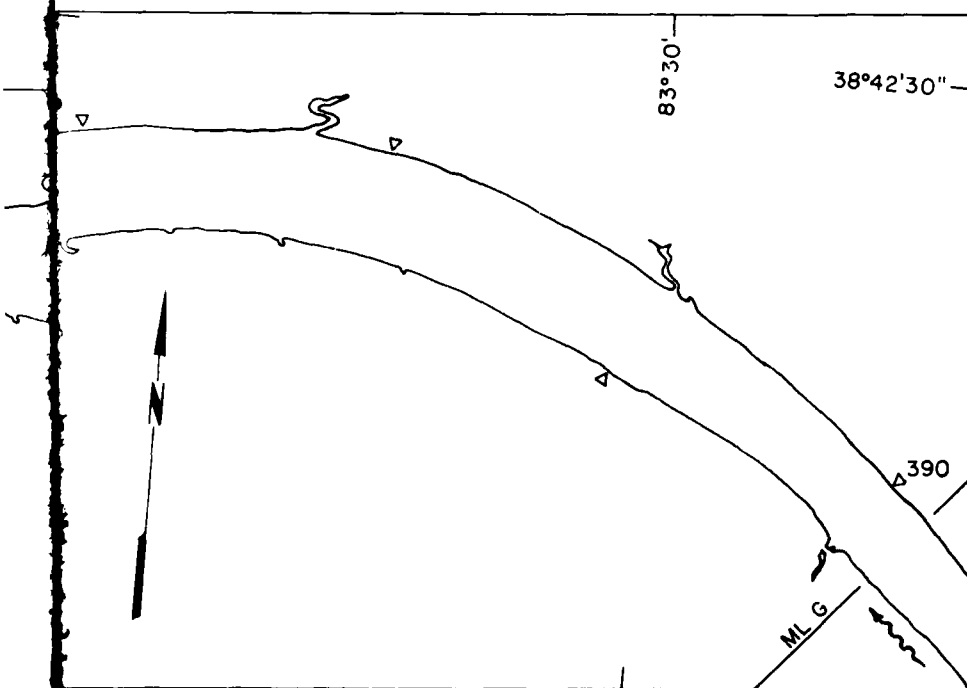
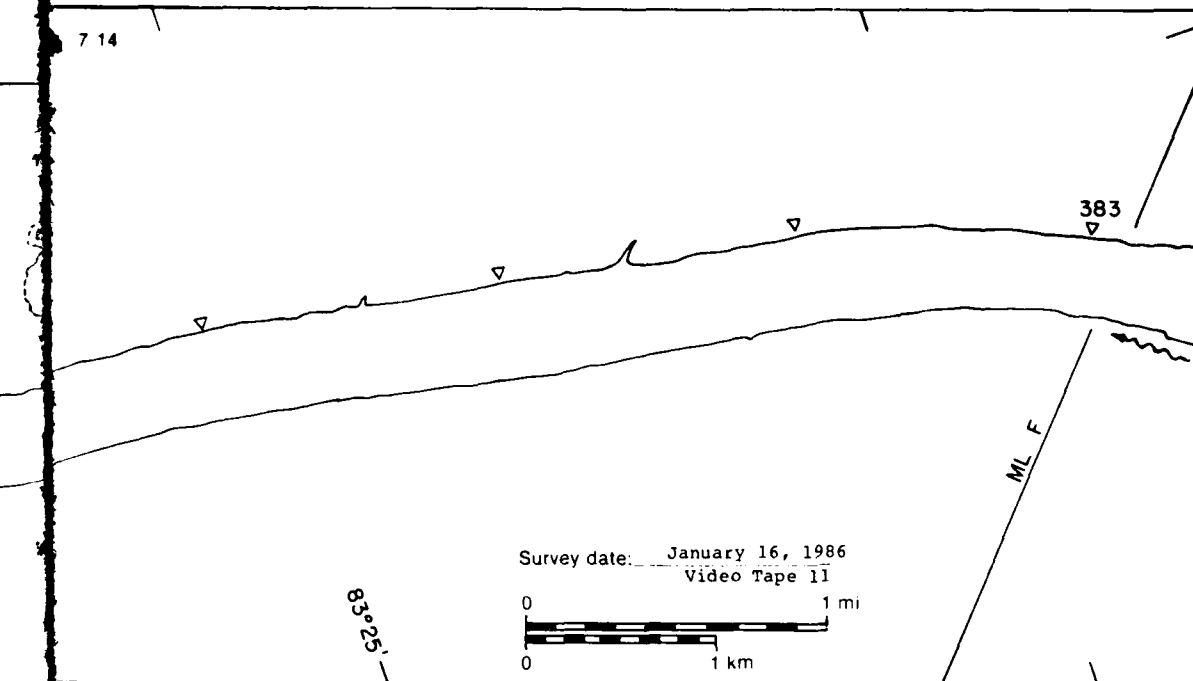


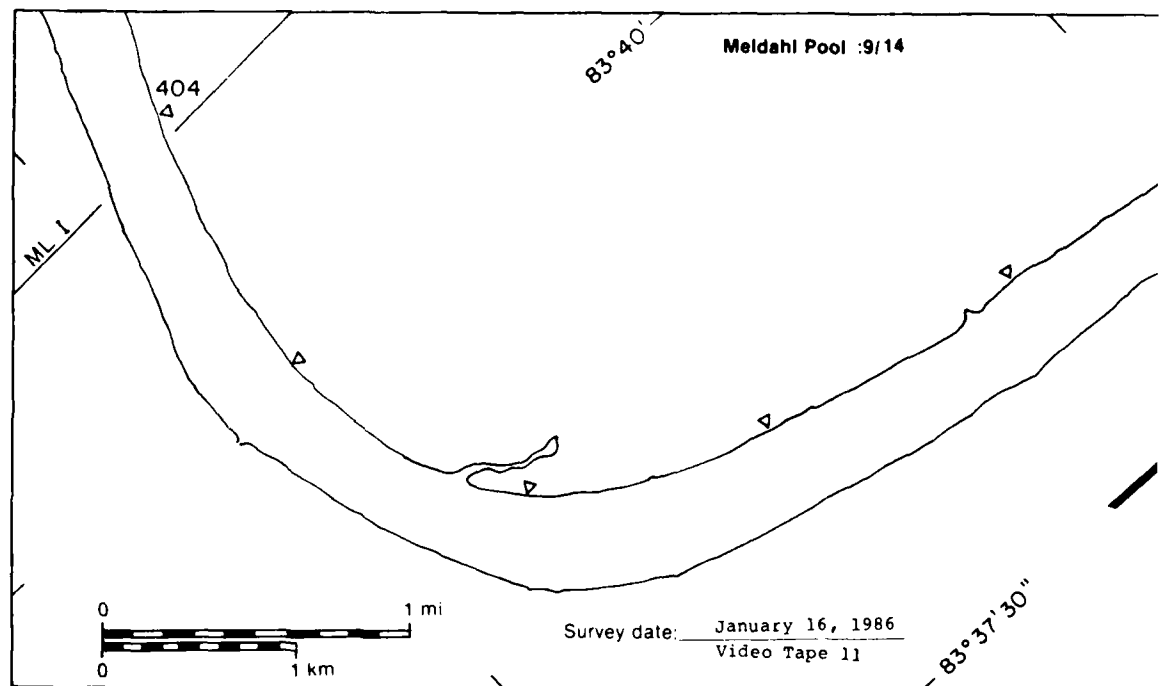
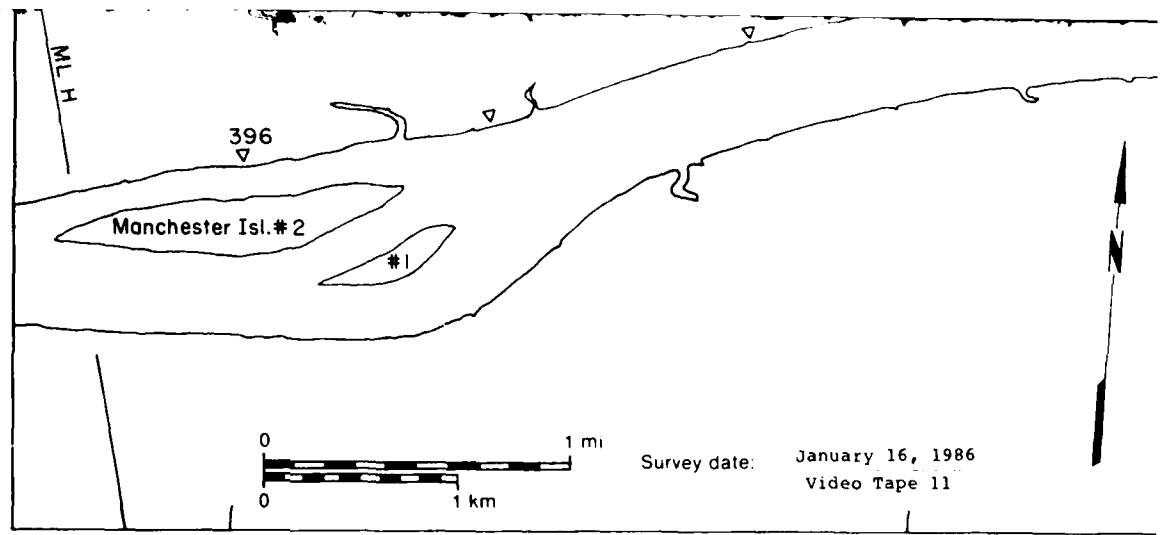


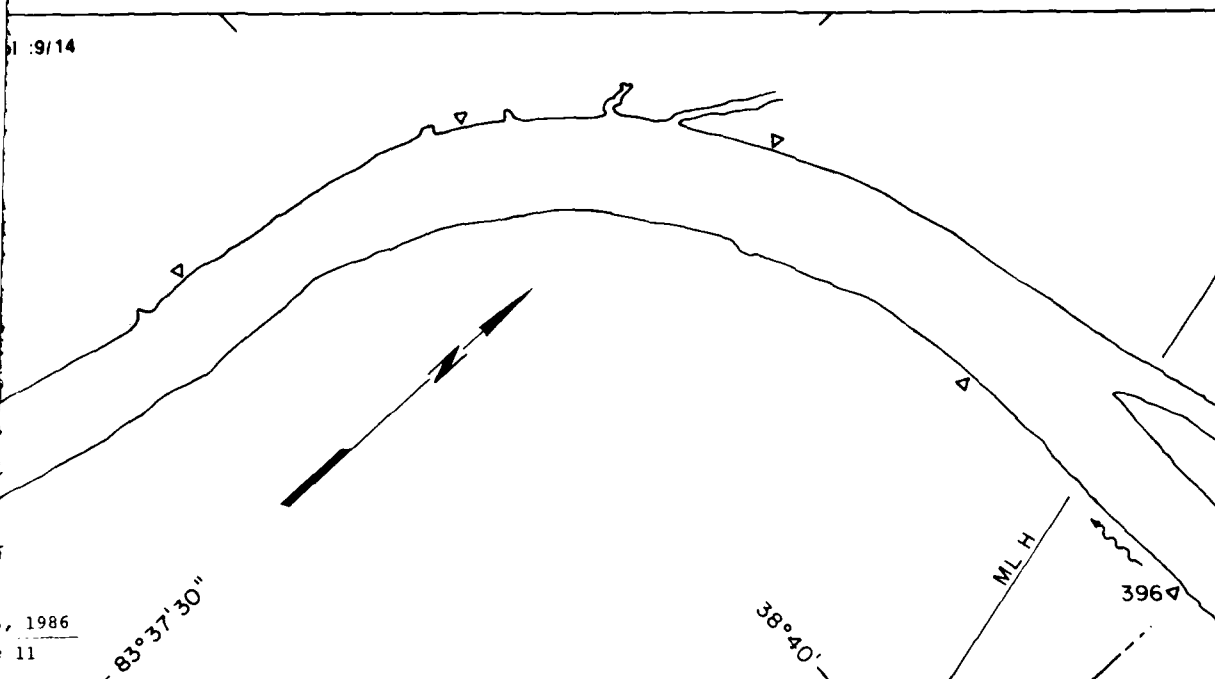
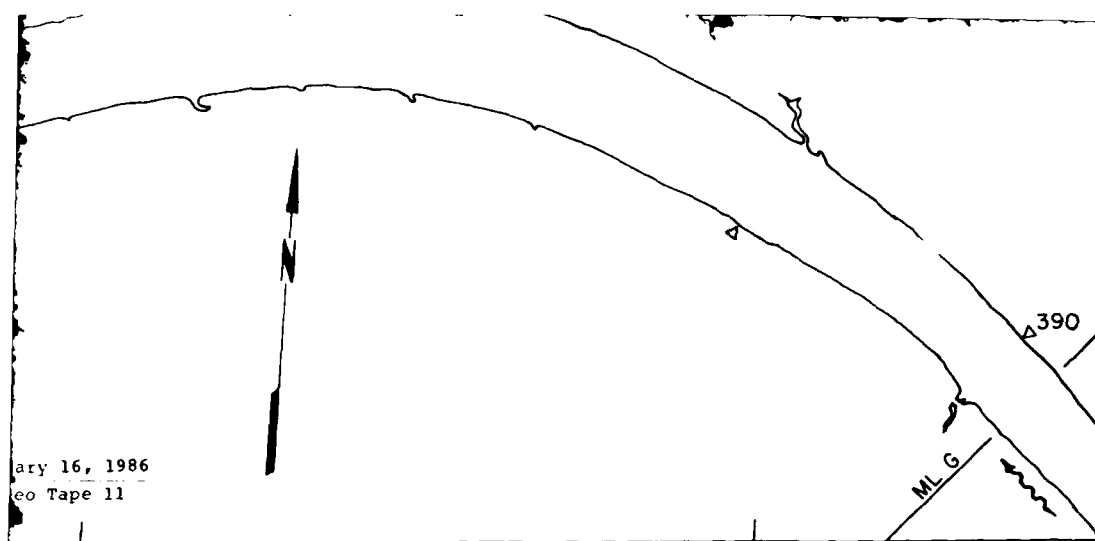




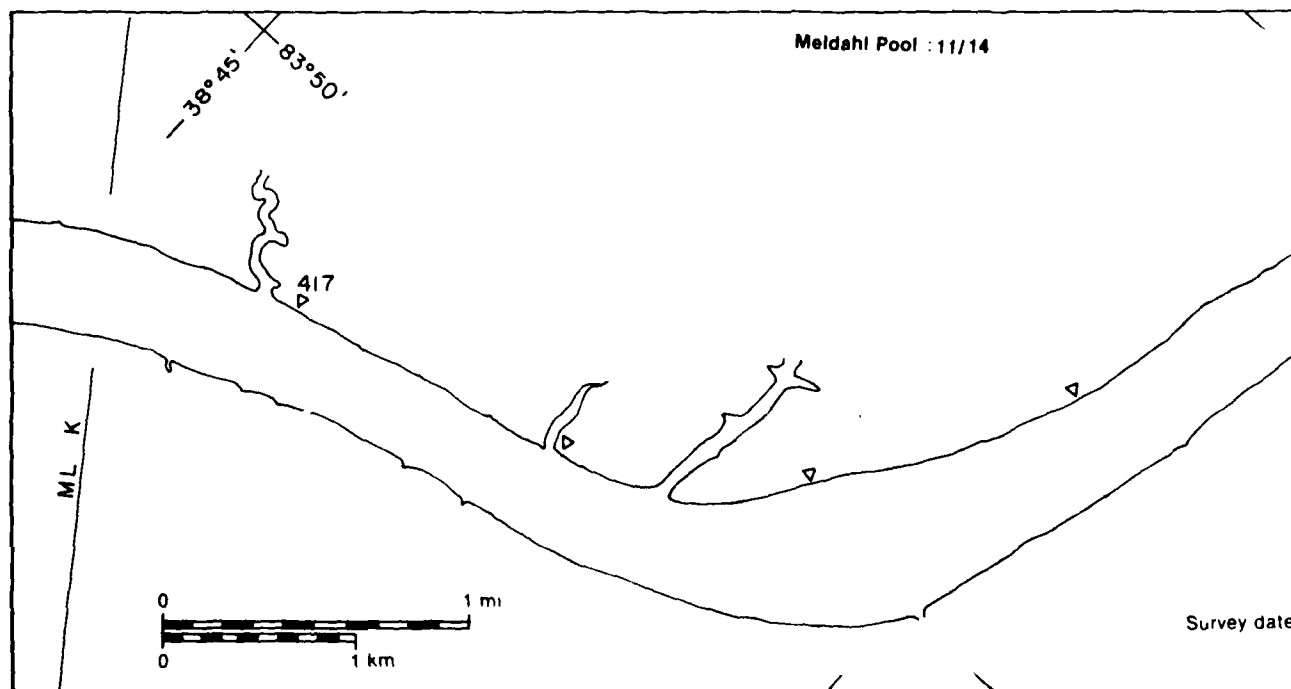
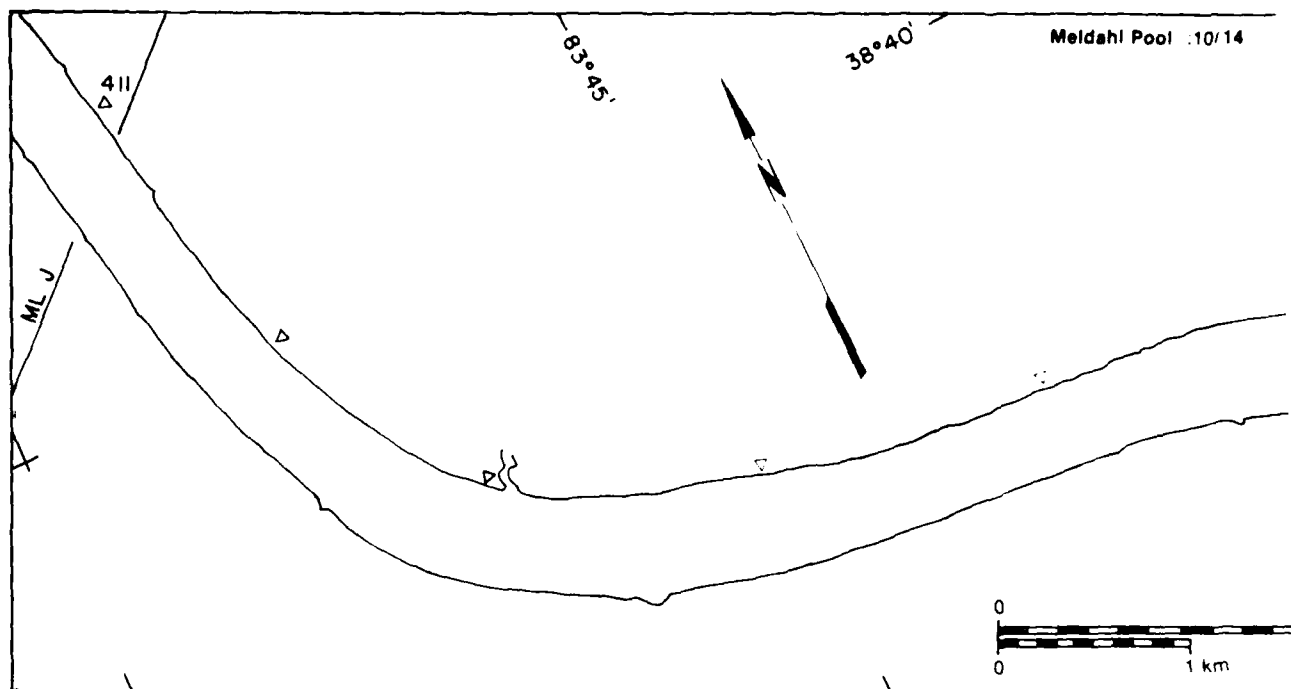
16 January 1986







16 January 1986



eldahl Pool :10/14

83°42'30"

ML I

404

1 mi

1 km

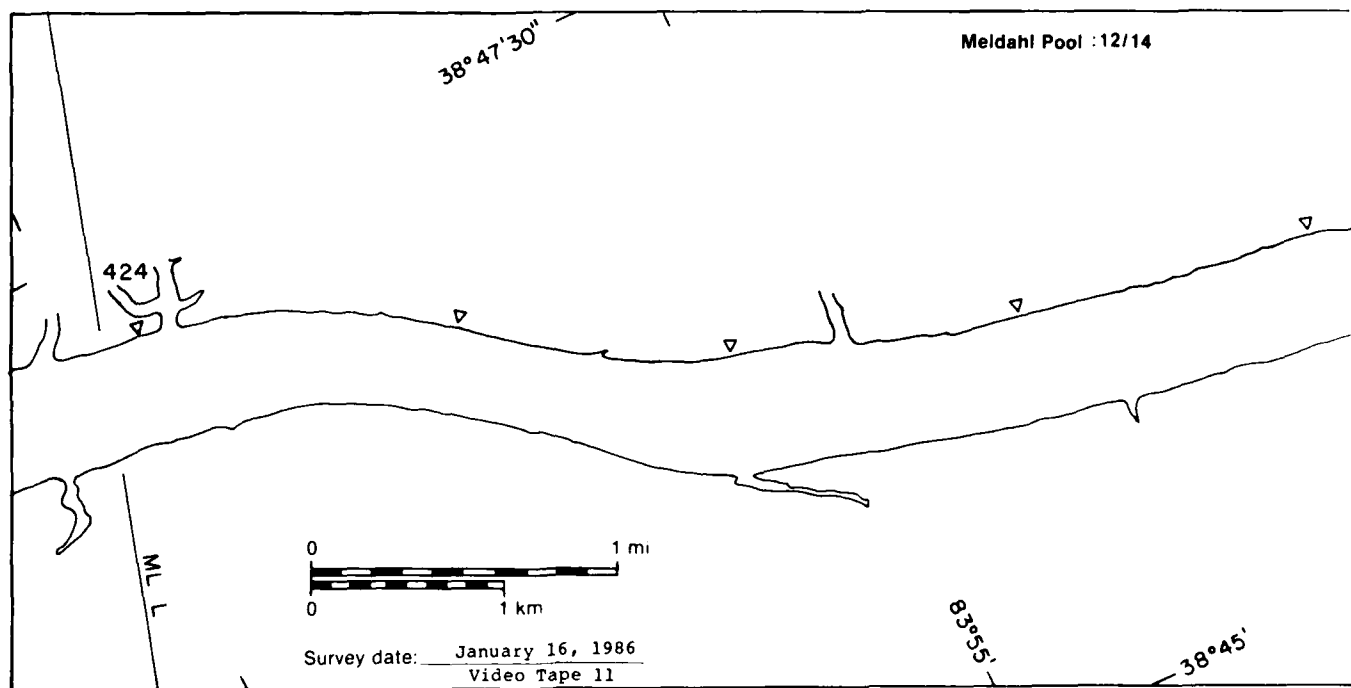
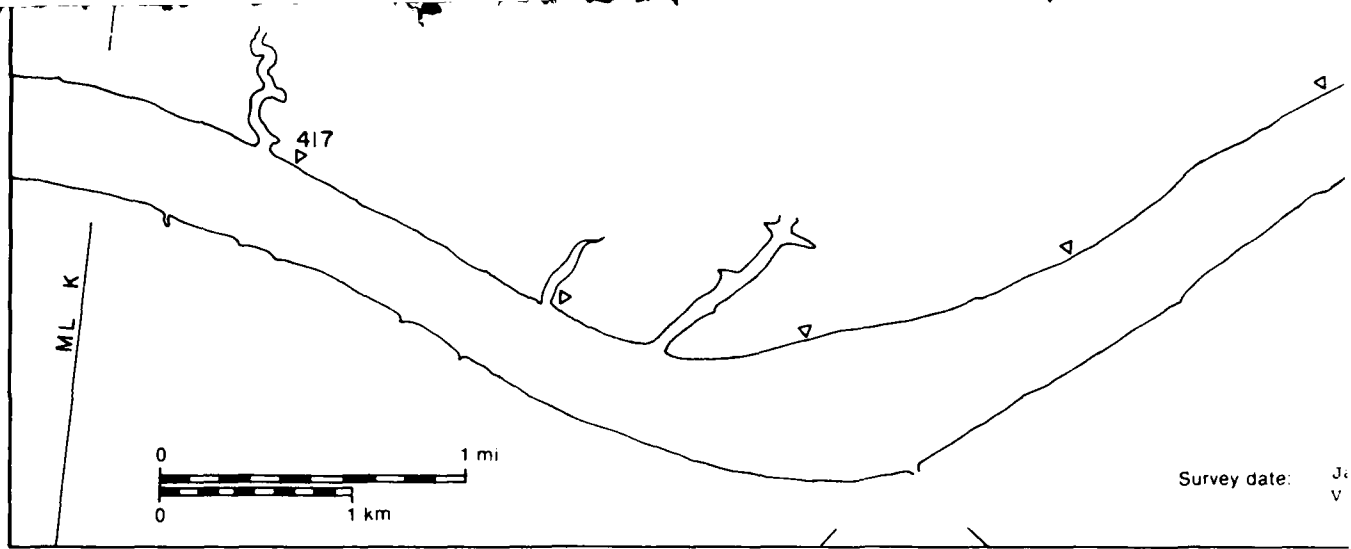
Survey date: January 16, 1986
Video Tape 11

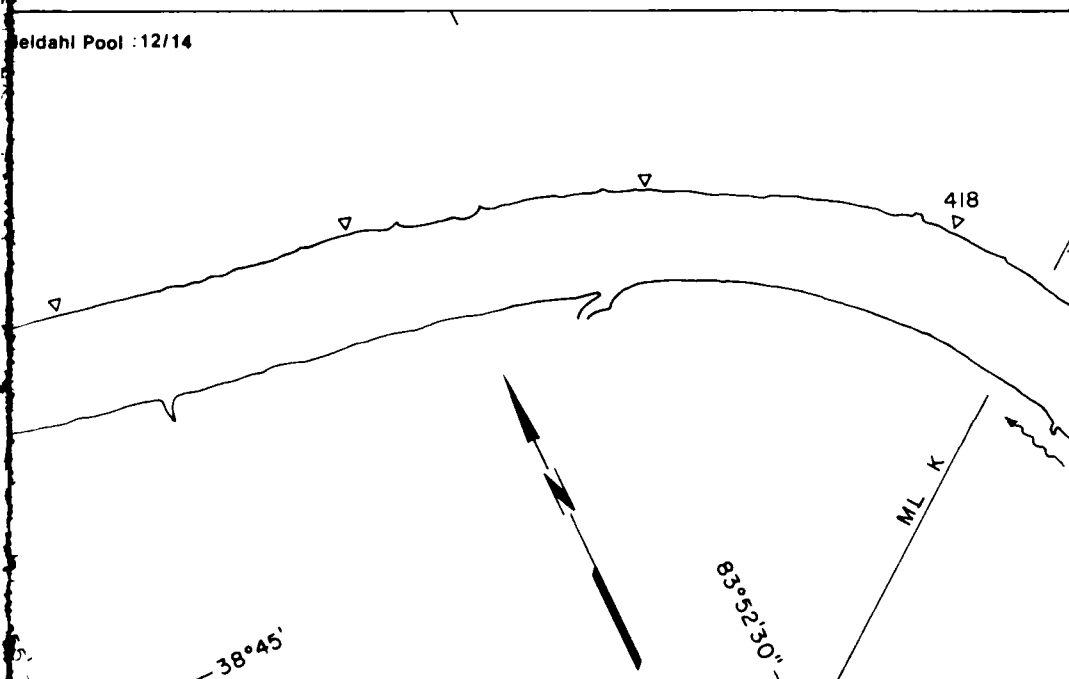
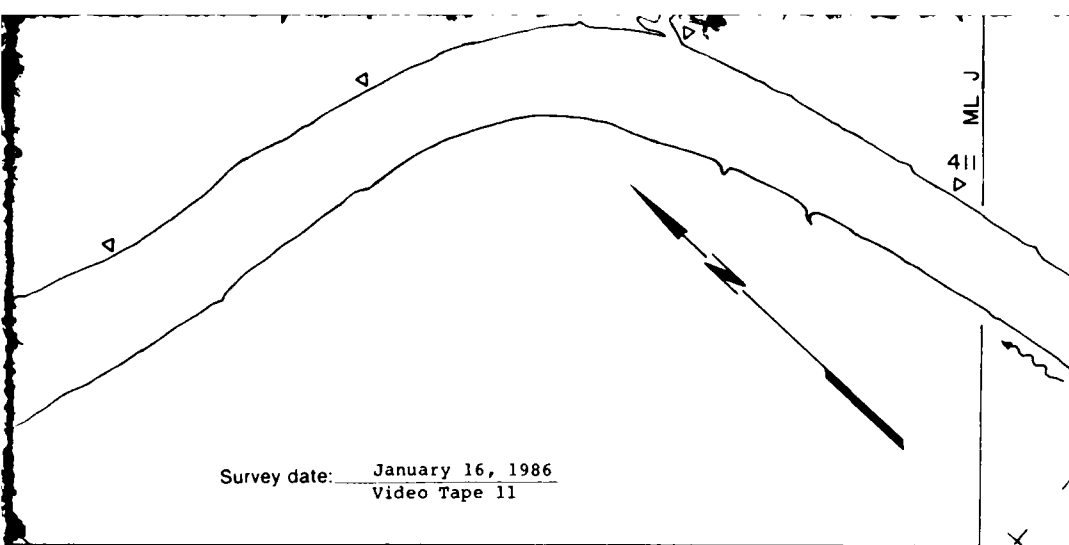
38°42'30"

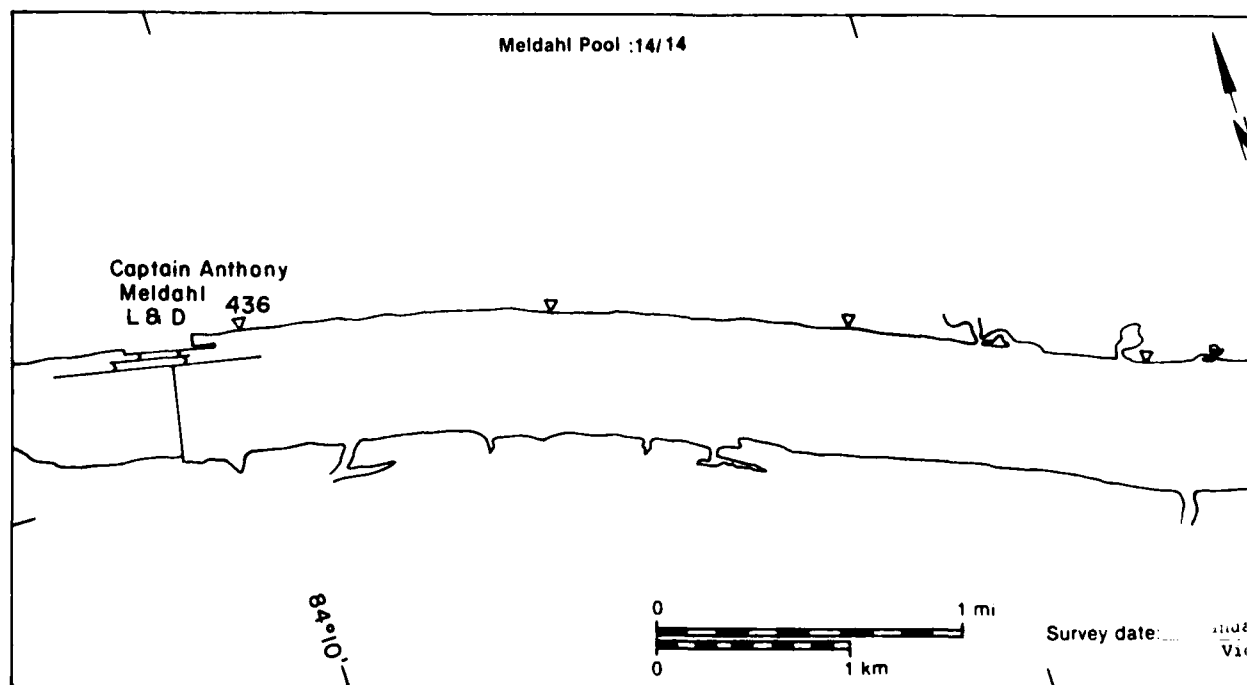
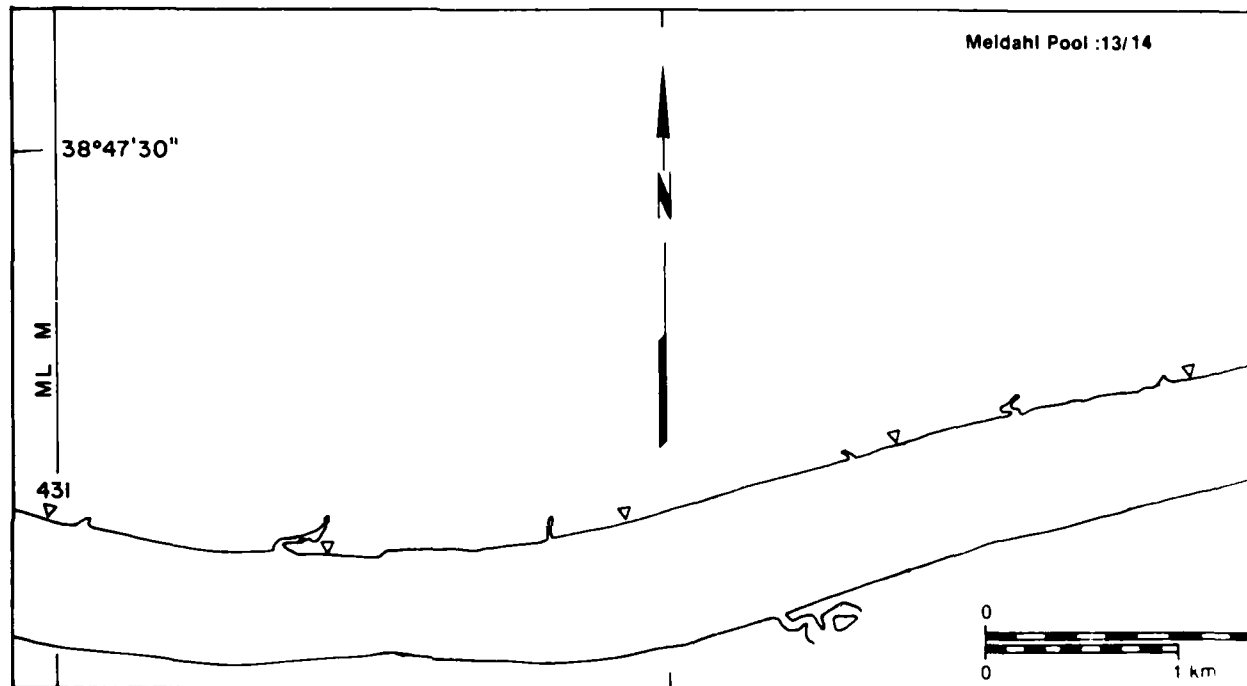
ML J

411

Survey date: January 16, 1986
Video Tape 11





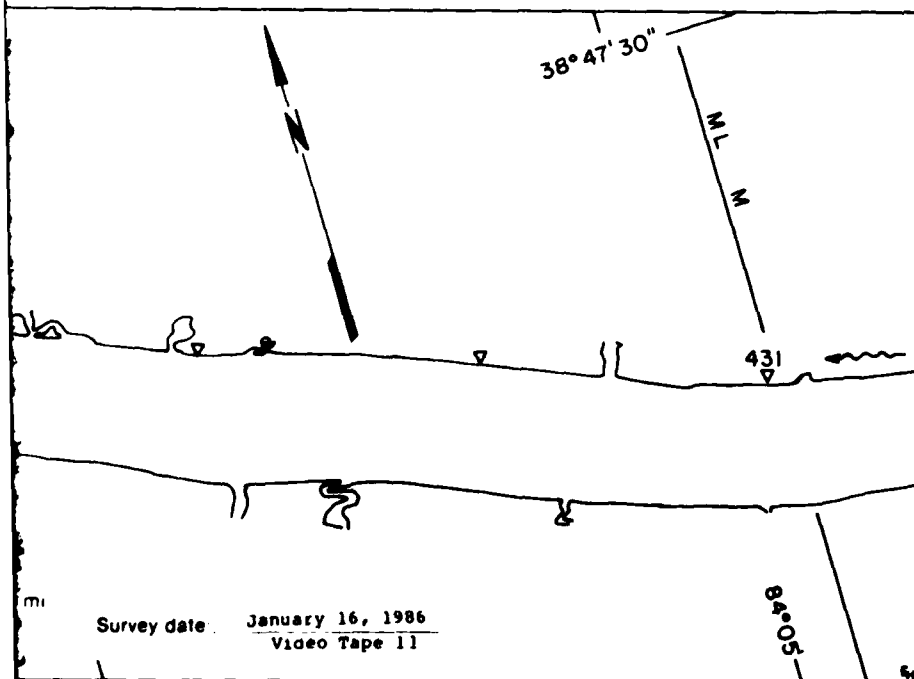
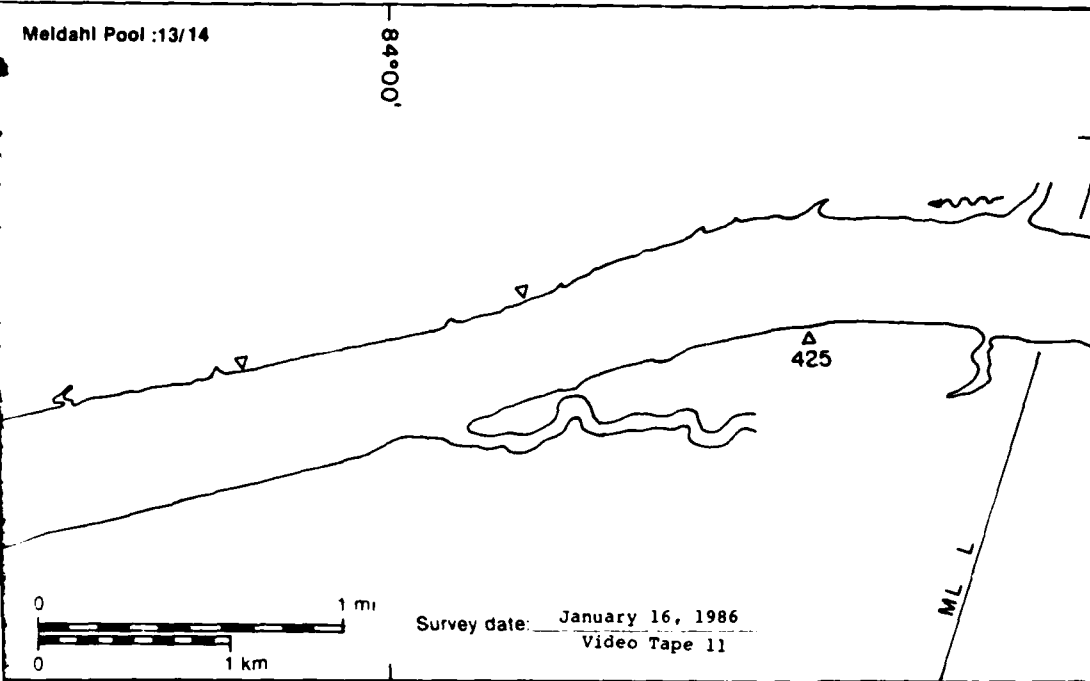


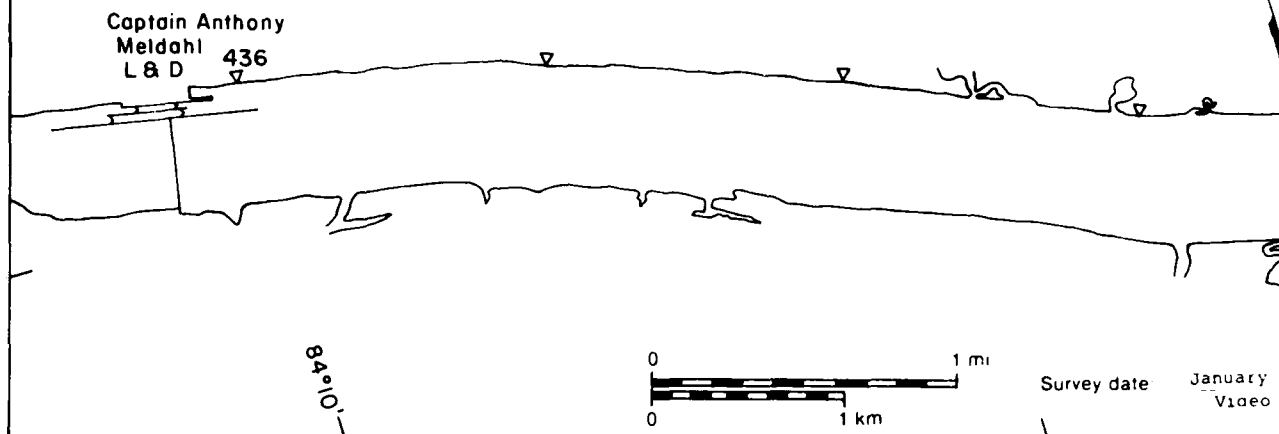
Meldahl Pool

Surface

Area concentration





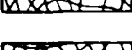

16 January 1986



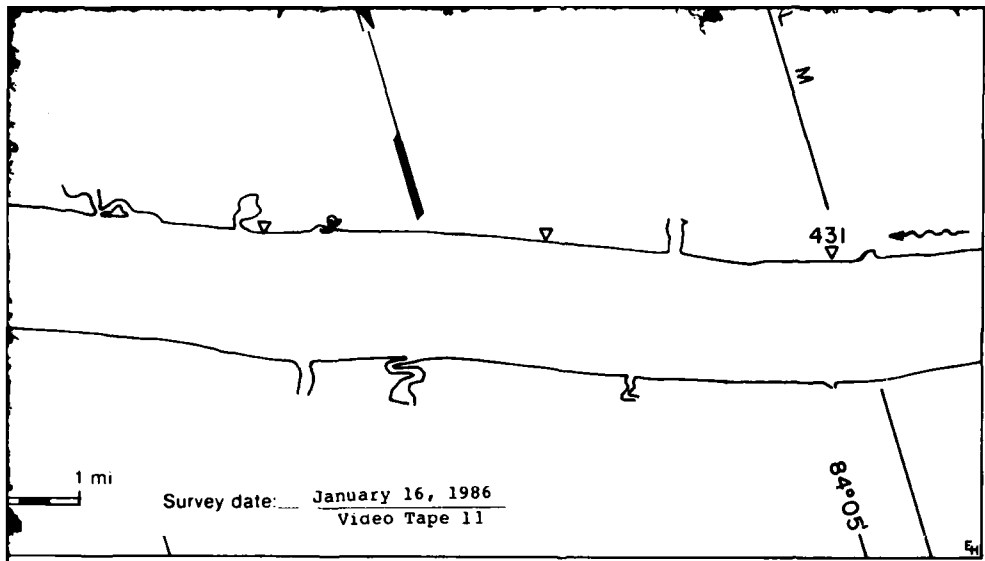


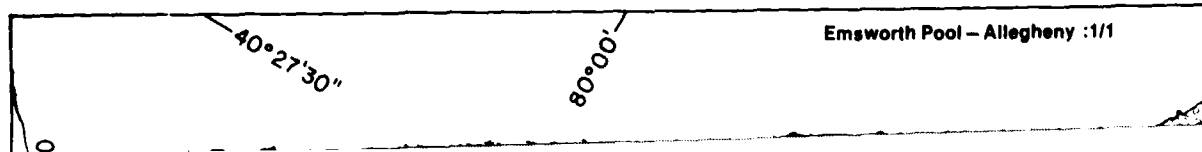
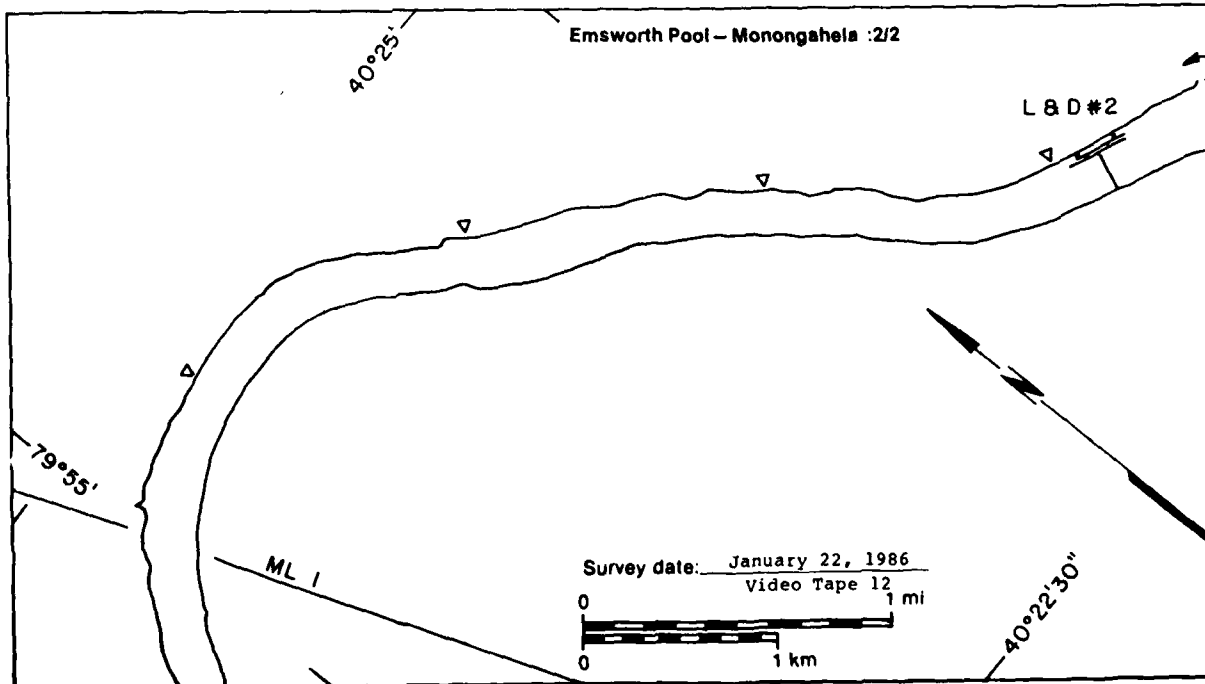
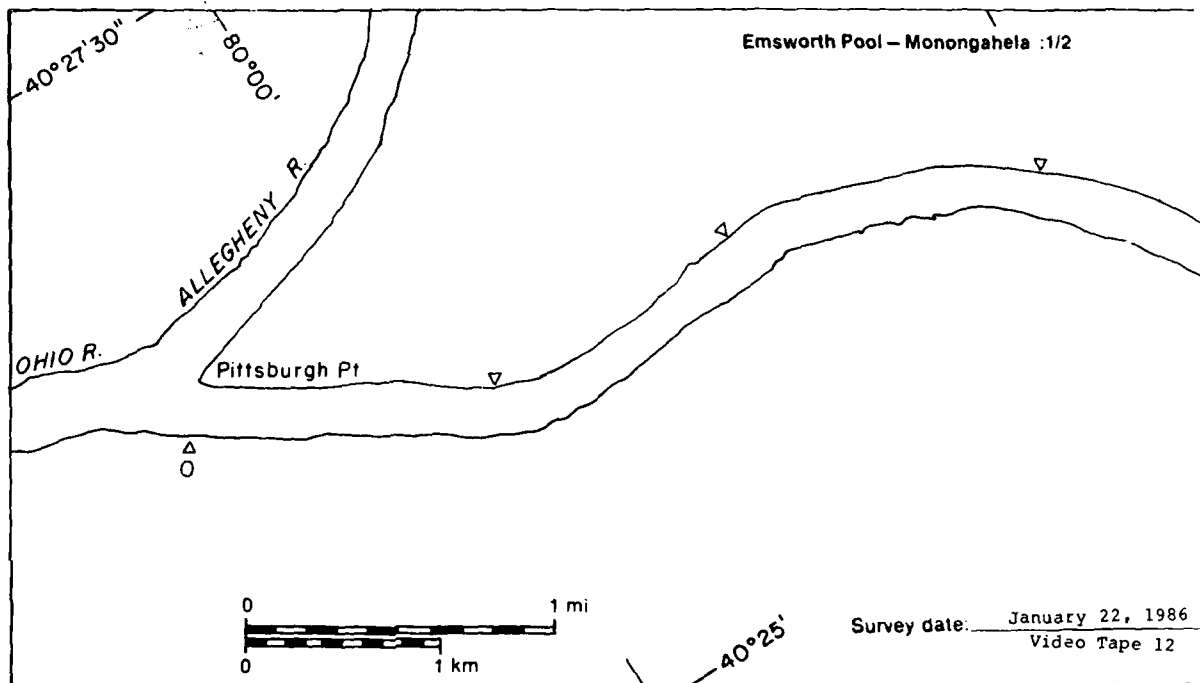
Meldahl Pool

MAP UNITS

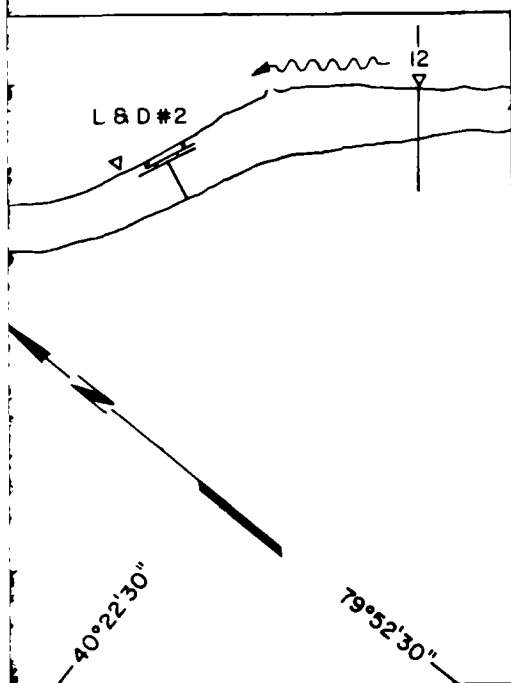
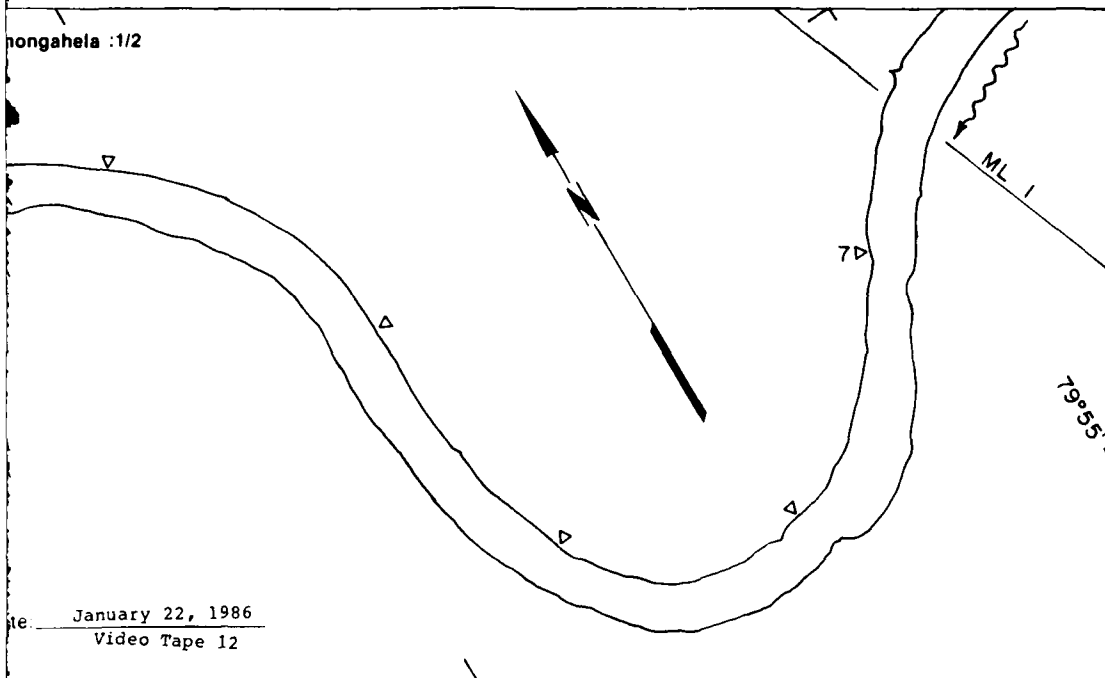
	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Area ($m^2 \times 10^6$)	Surface concentration (%)
73.77	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
0.00	—
Total area ($m^2 \times 10^6$)	73.77



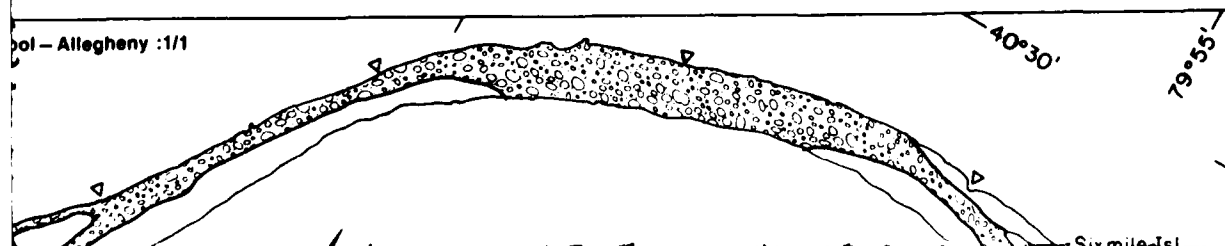


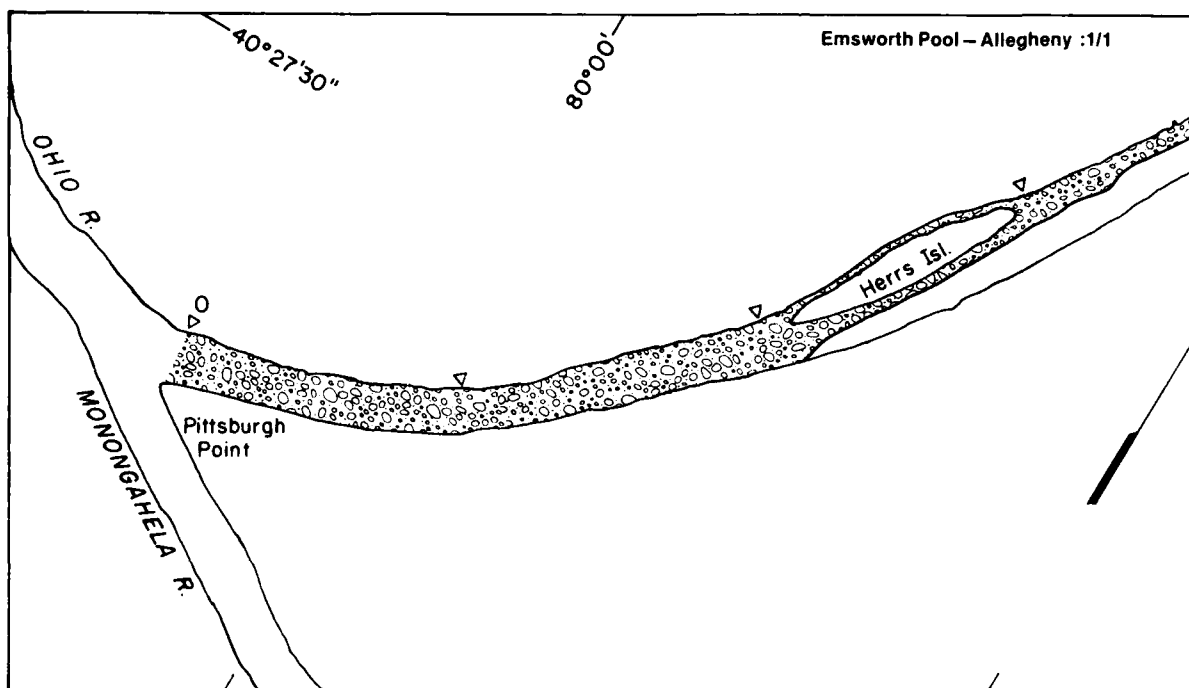
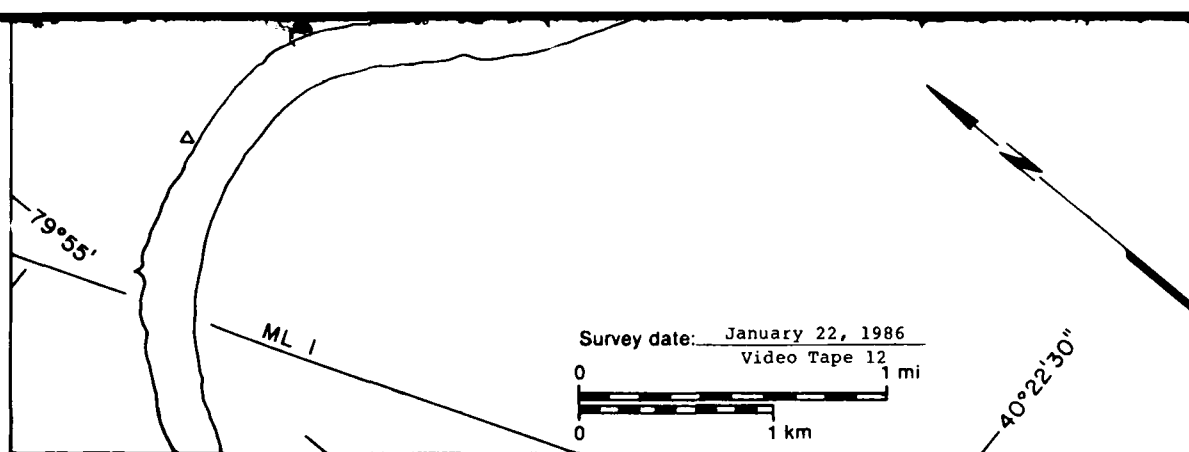
22 January 1986



Emsworth Pool - Monongahela

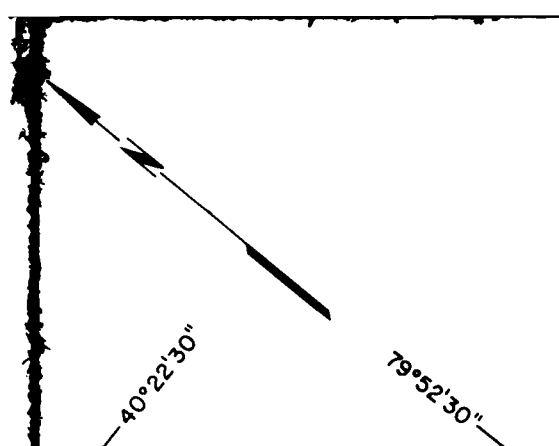
MAP units	Area (m ² x 10 ⁶)	Surface concentration (g/m ²)
Open water	5.16	NA
Solid ice cover	0.00	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open water areas	0.00	—
Ice floes or frazil flush and pans	0.00	—
Total area (m ² x 10 ⁶)	5.16	



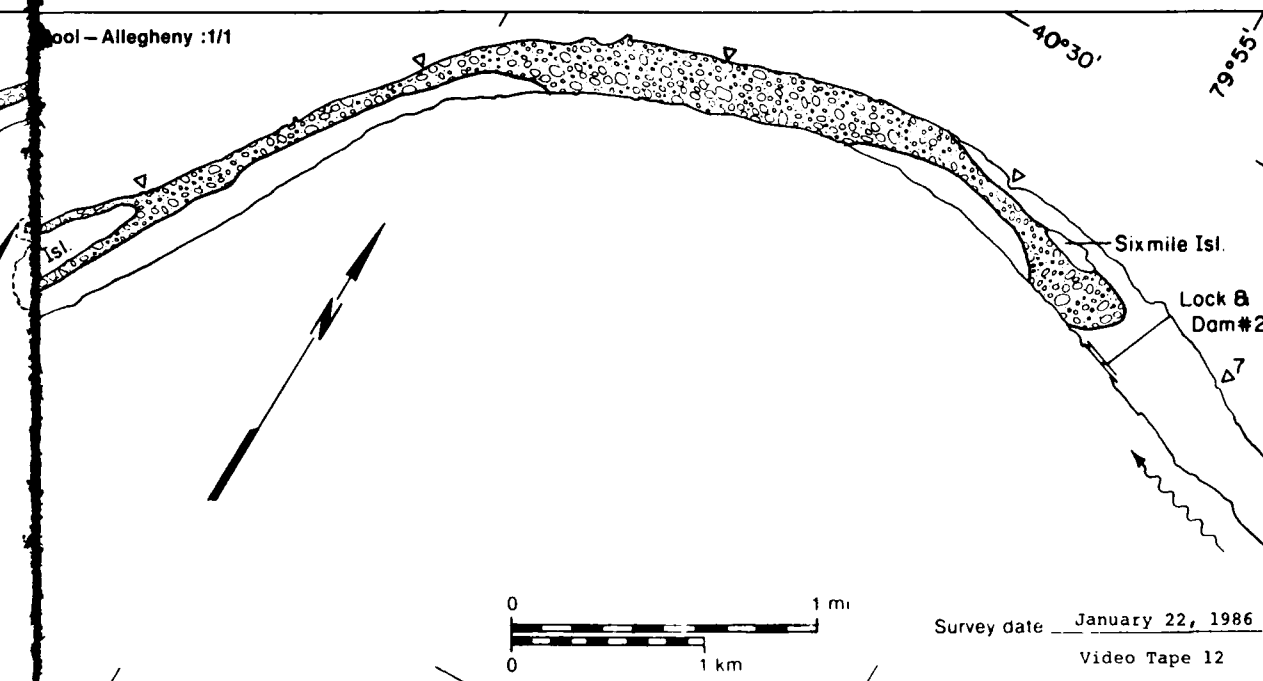


△ Emsworth Pool - Allegheny

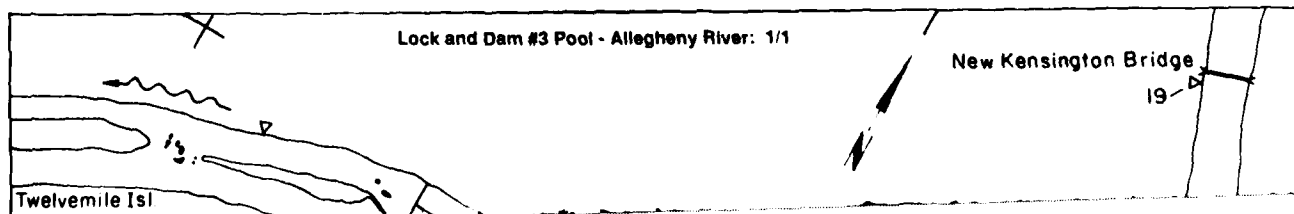
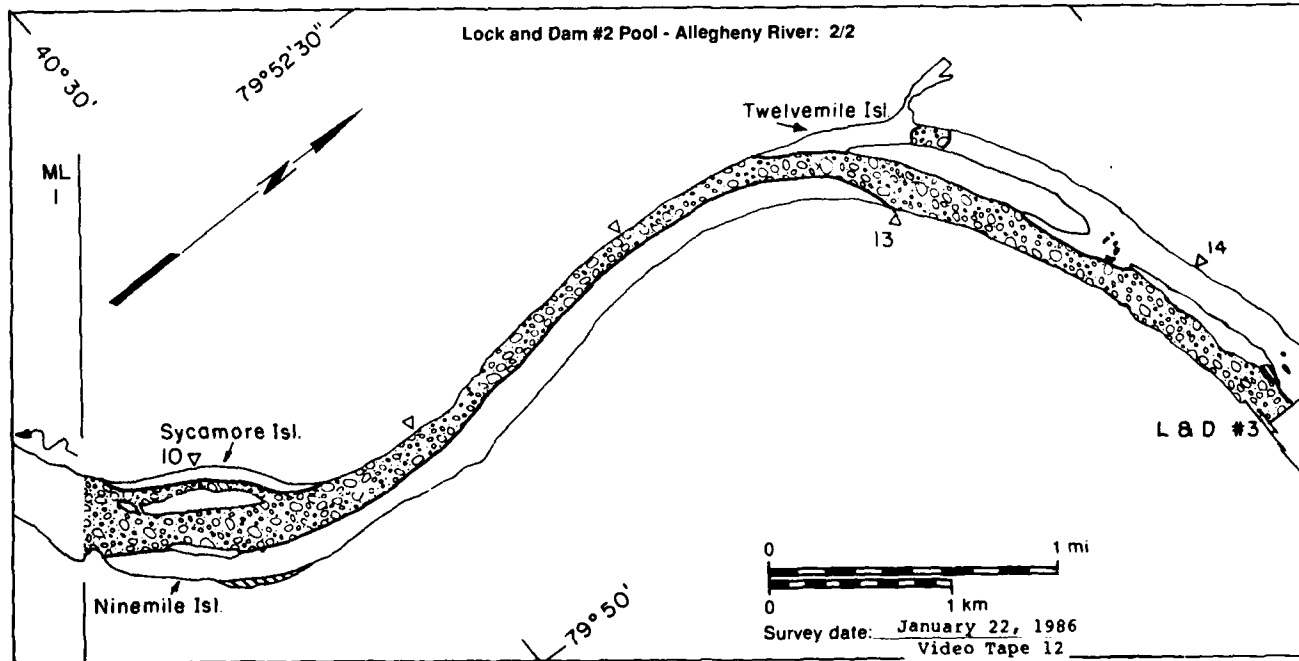
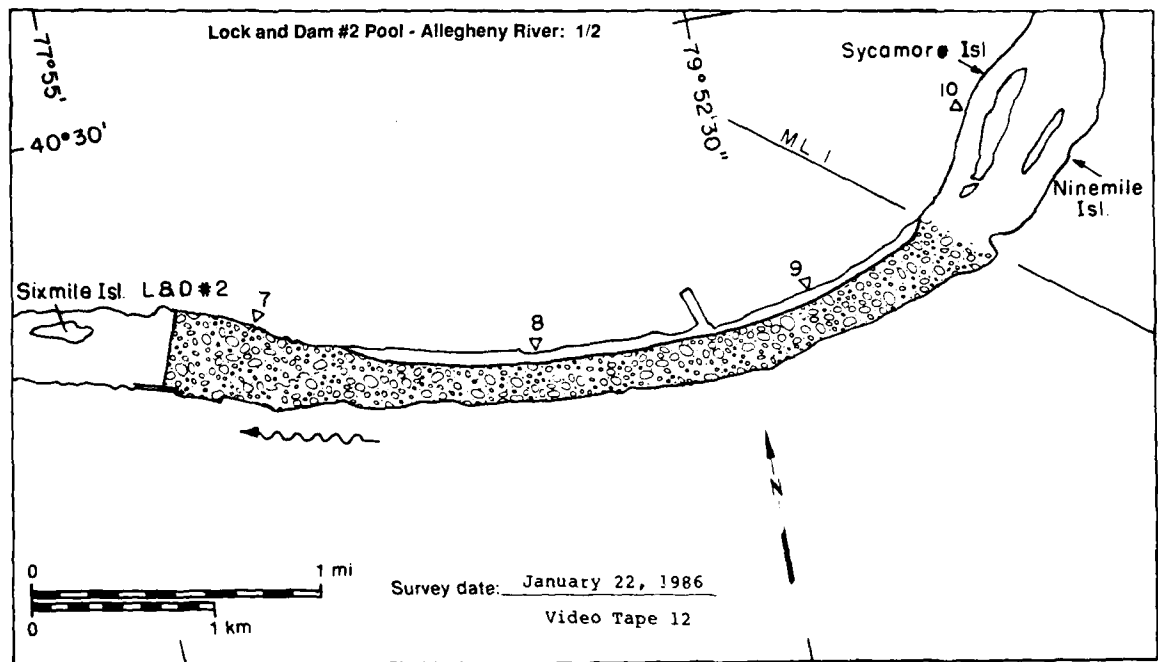
MAP UNITS		Area (m ² x 10 ⁶)	Surface concentration (g/m ²)
	Open water	0.80	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open water areas	0.00	—
	Ice floes or frazil slush and pans	2.27	10
Total area (m ² x 10 ⁶)		3.07	



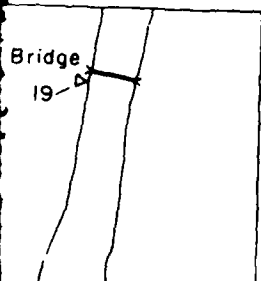
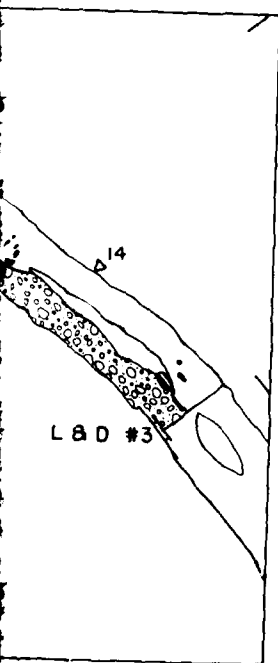
Map Symbols		Area (m ² x 10 ⁶)	
	Open water	5.16	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area (m ² x 10 ⁶)		5.16	



22 January 1986



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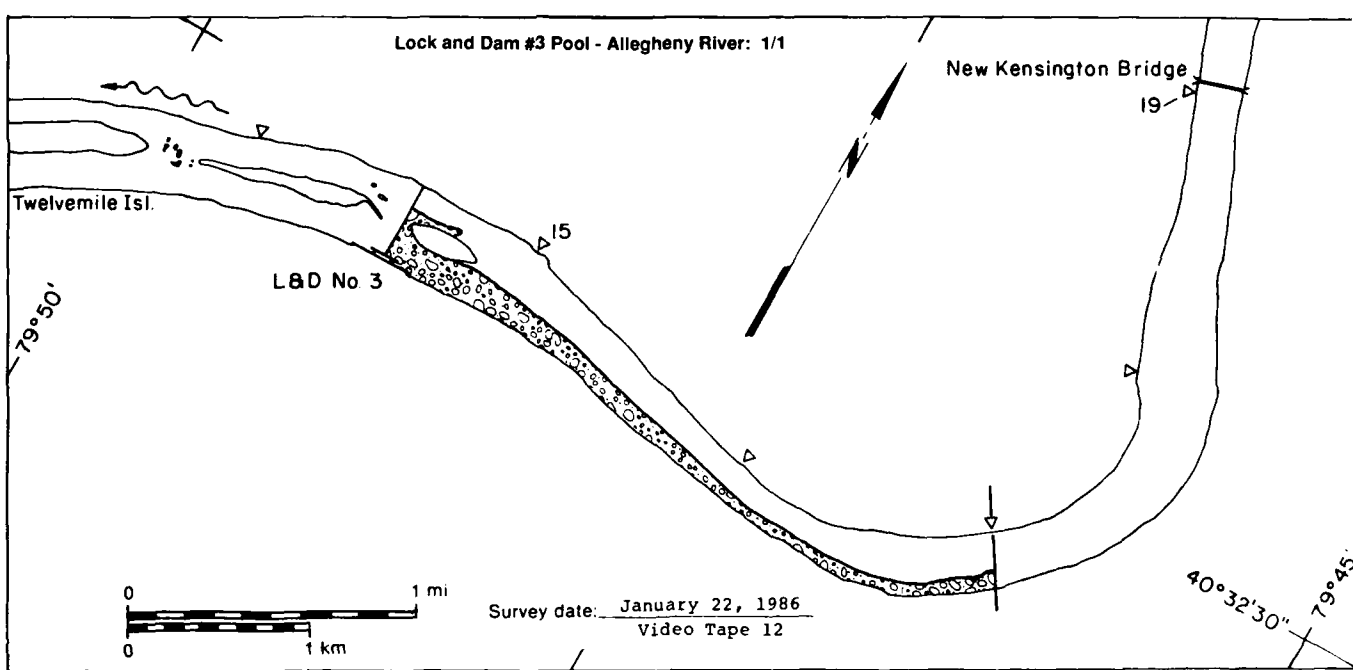
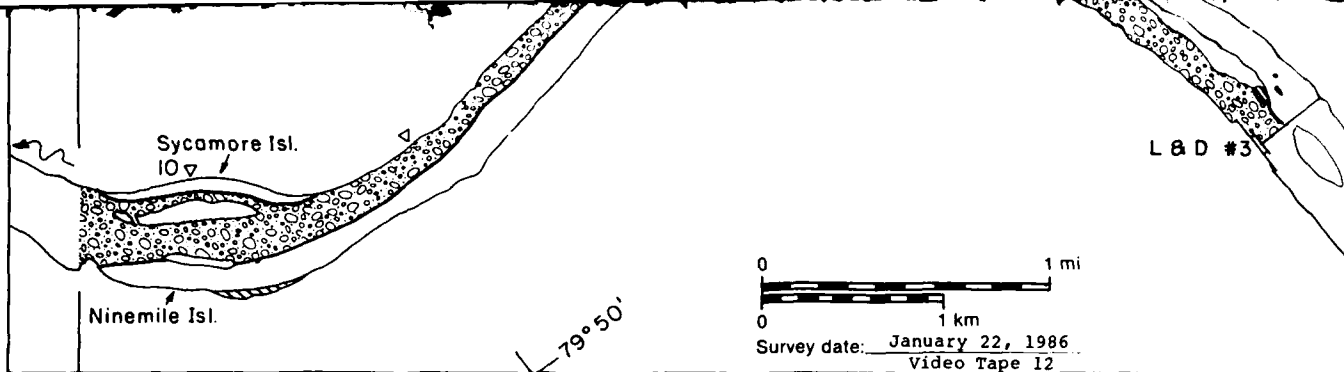


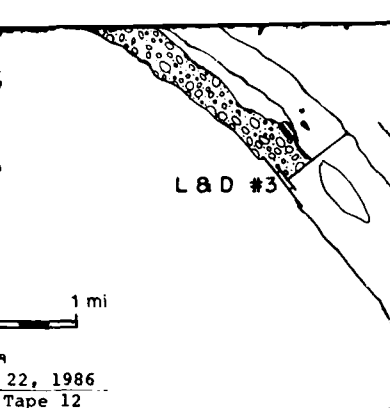
Lock and Dam #2 Pool

MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	1.50	NA
Solid ice cover	0.03	NA
Solid ice cover with open-water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open-water areas	0.00	—
Ice floes or frazil slush and pans	2.49	5
Total area ($m^2 \times 10^6$)	4.02	

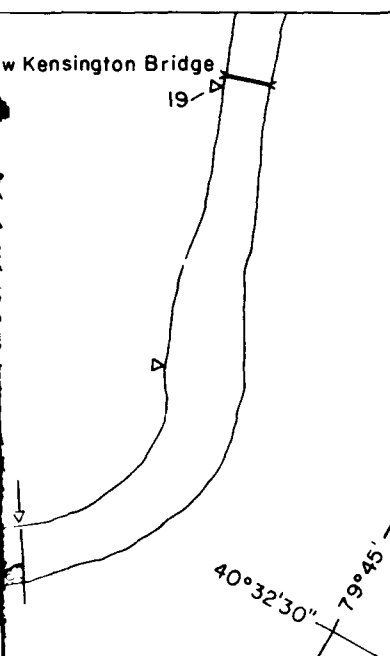
Lock and Dam #3 Pool

MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	0.69	NA
Solid ice cover	0.00	NA

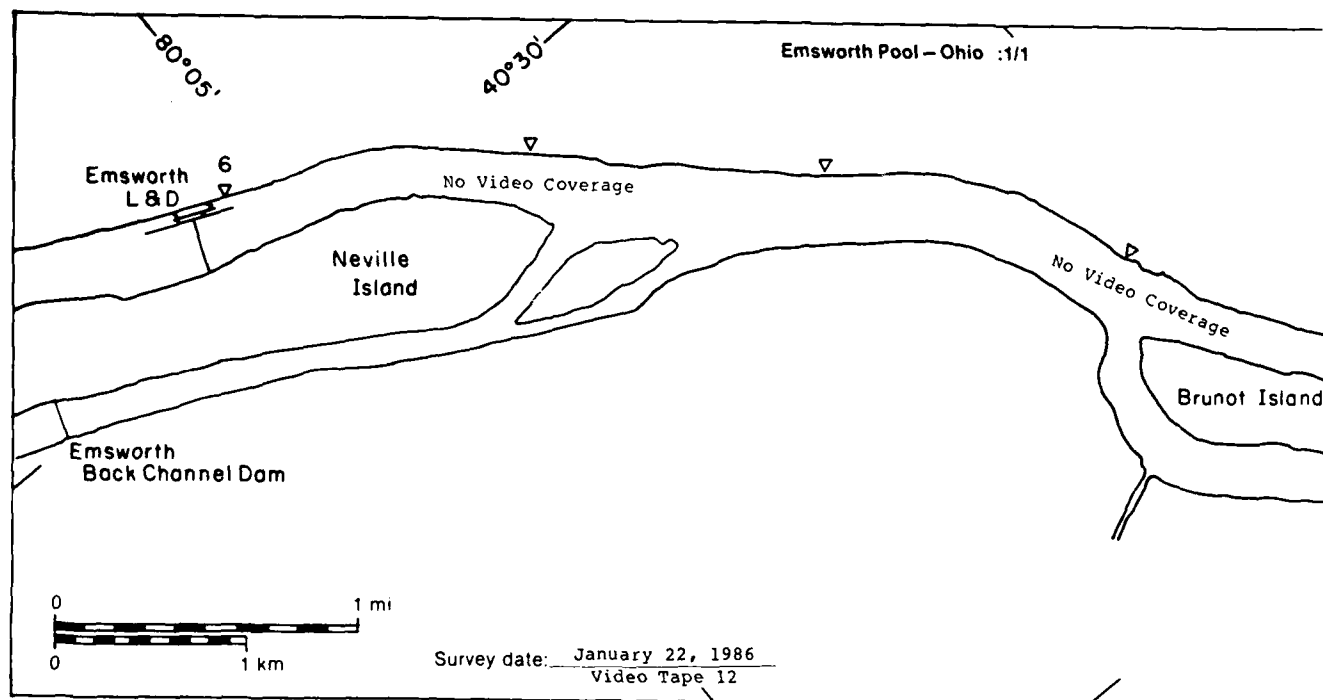




	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	2.49	5
Total area ($m^2 \times 10^6$)		4.02	

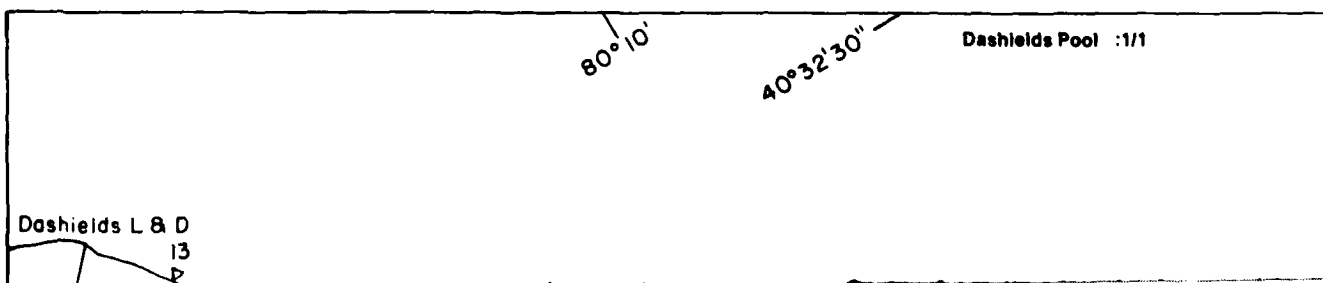


Lock and Dam #3 Pool		Surface concentration (%)	
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)	
	Open water	0.69	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.45	10
Total area ($m^2 \times 10^6$)		1.14	

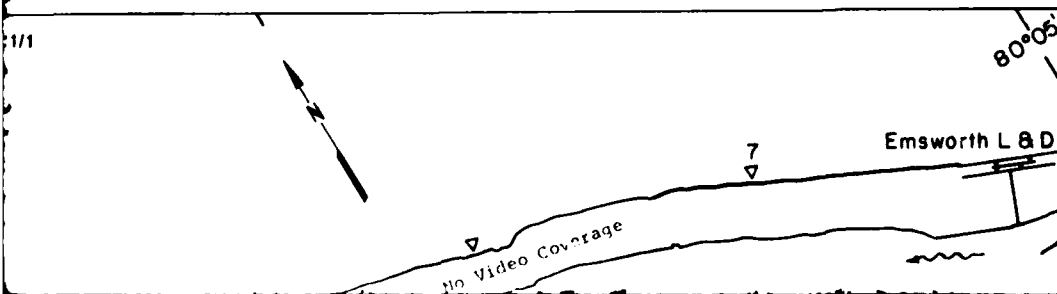
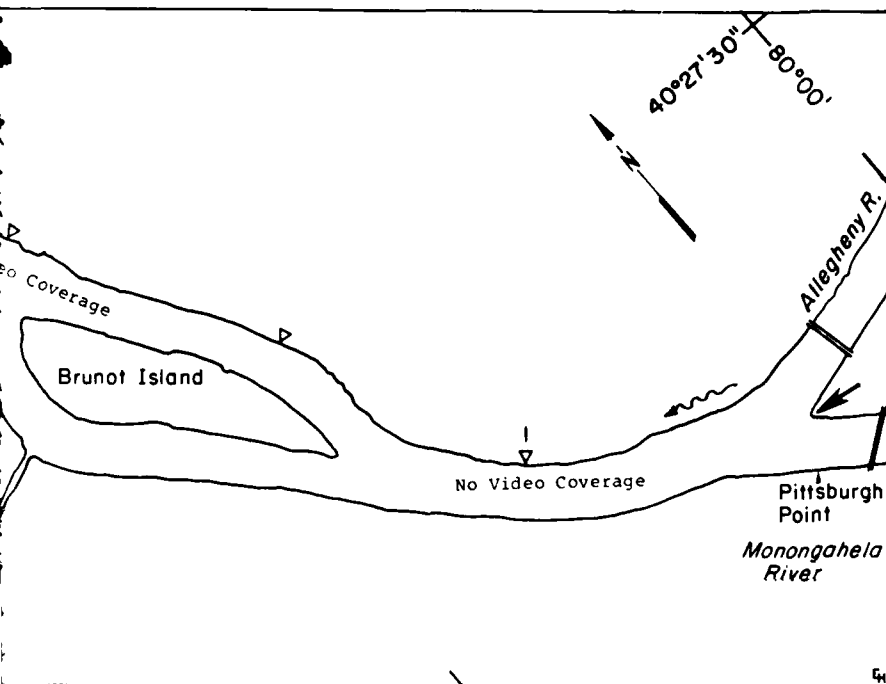





Emsworth Pool - Ohio

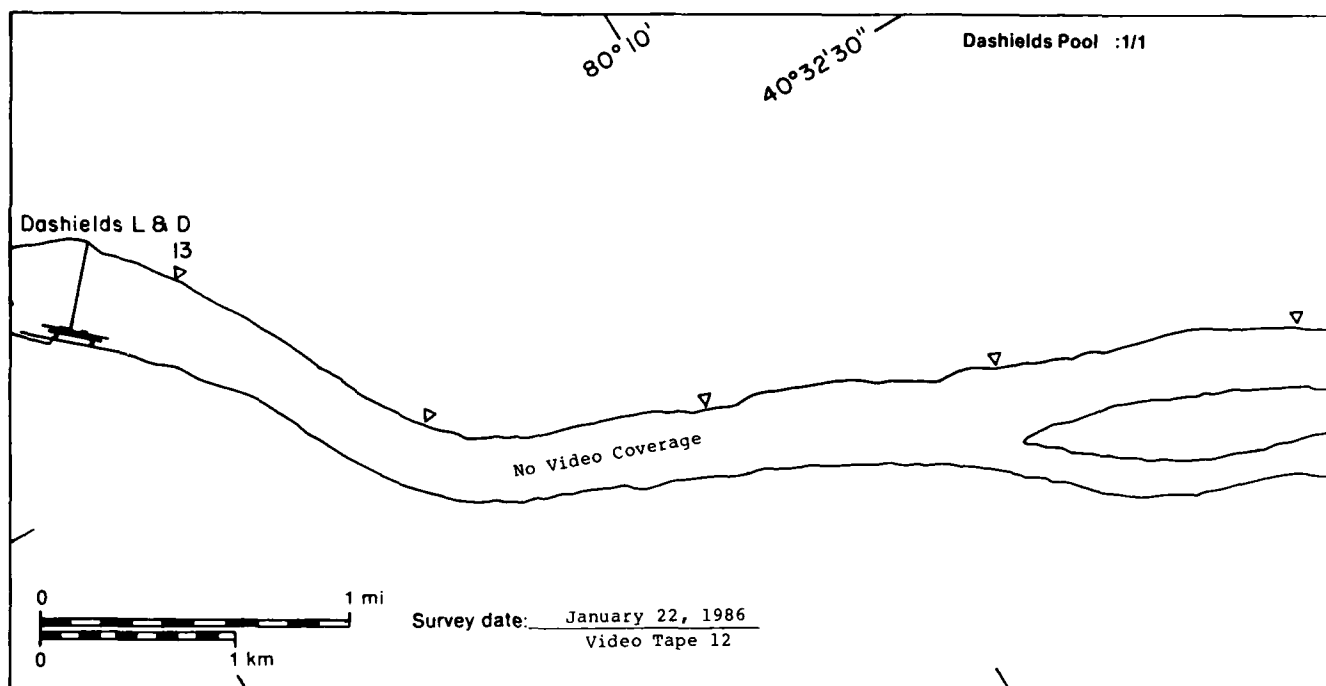
MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	0.00	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		4.49*	* Includes $4.49 \times 10^6 m^2$ of no video coverage

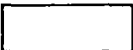




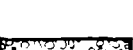


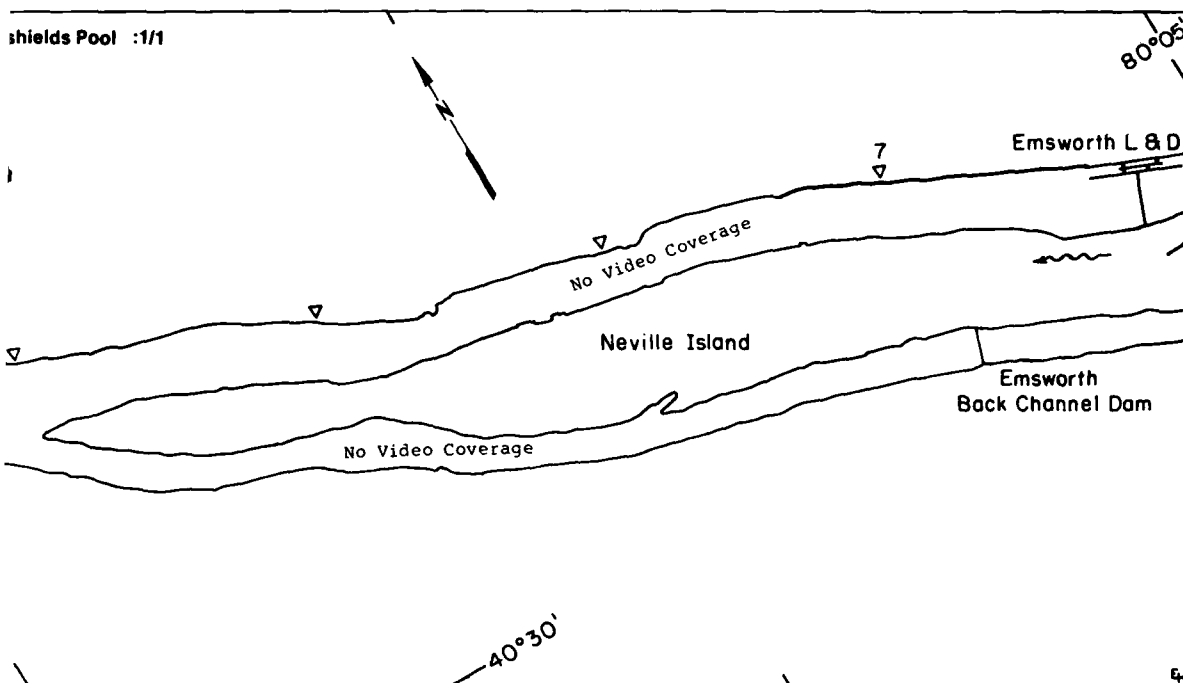
22 January 1986



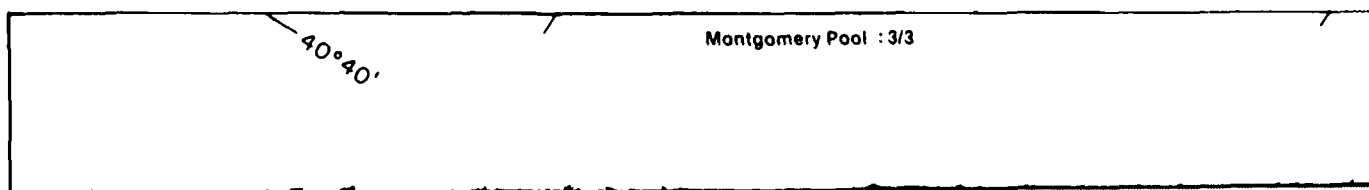
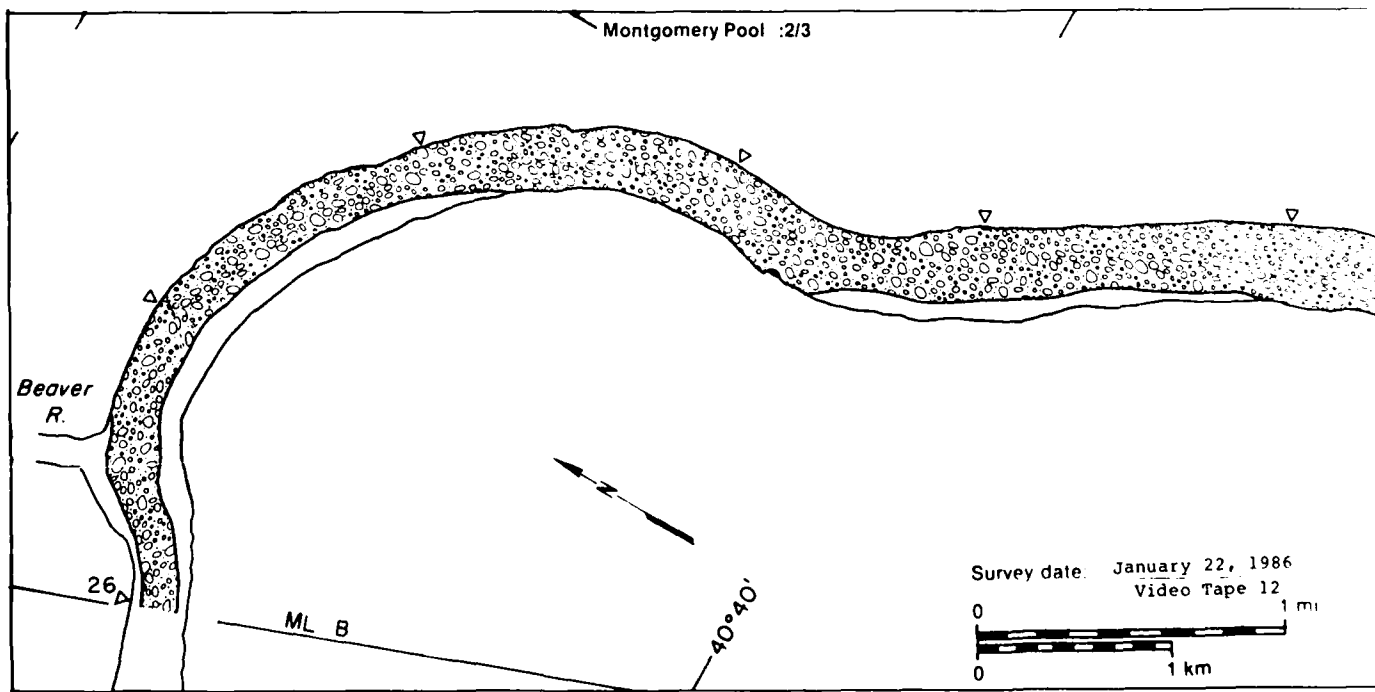
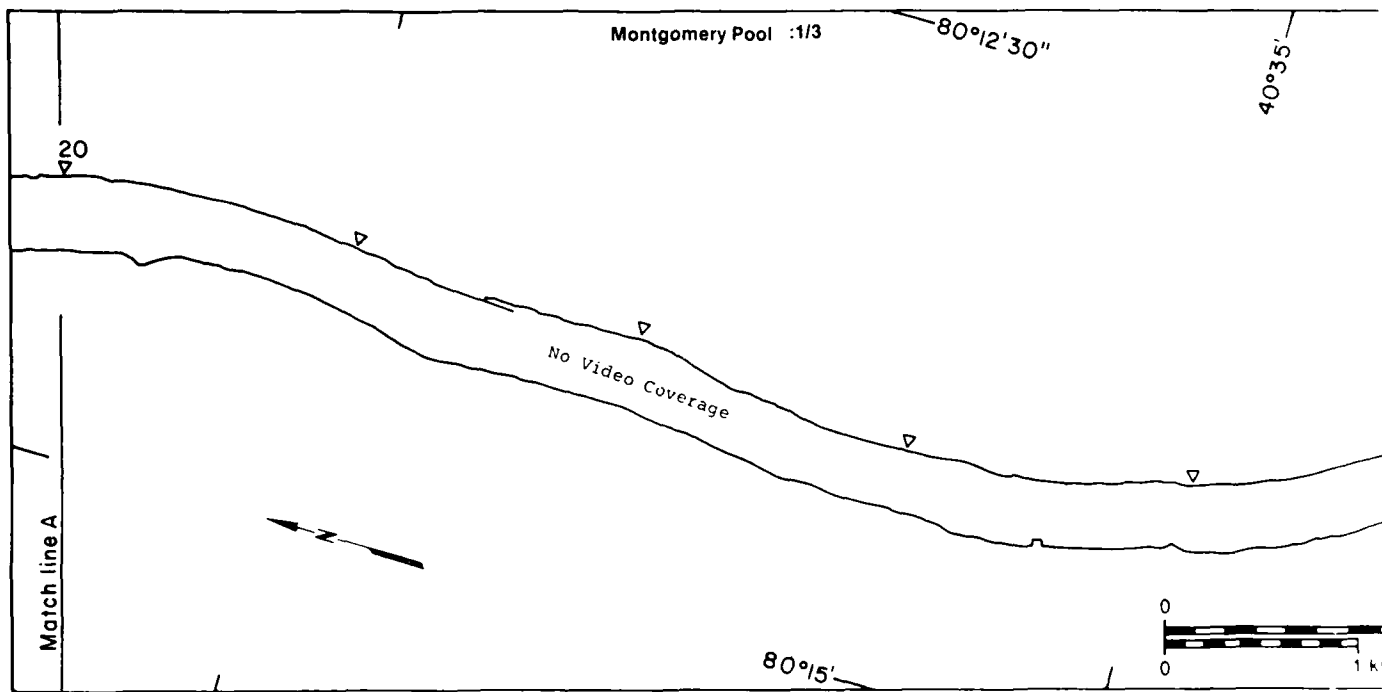
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		4.49*	* Includes $4.49 \times 10^6 m^2$ of no video coverage

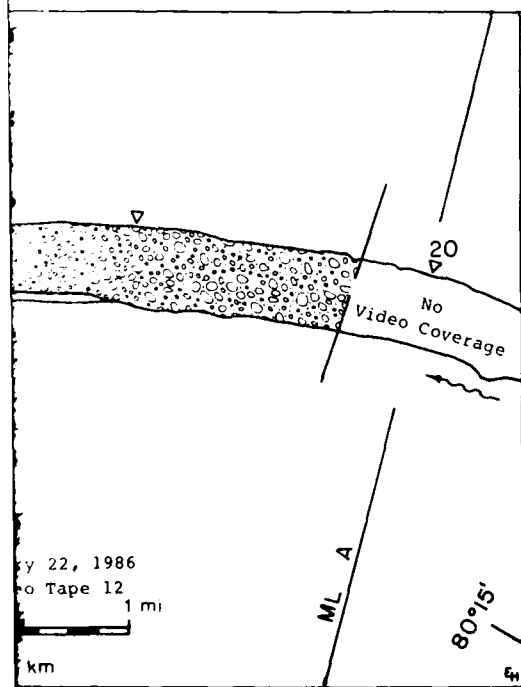
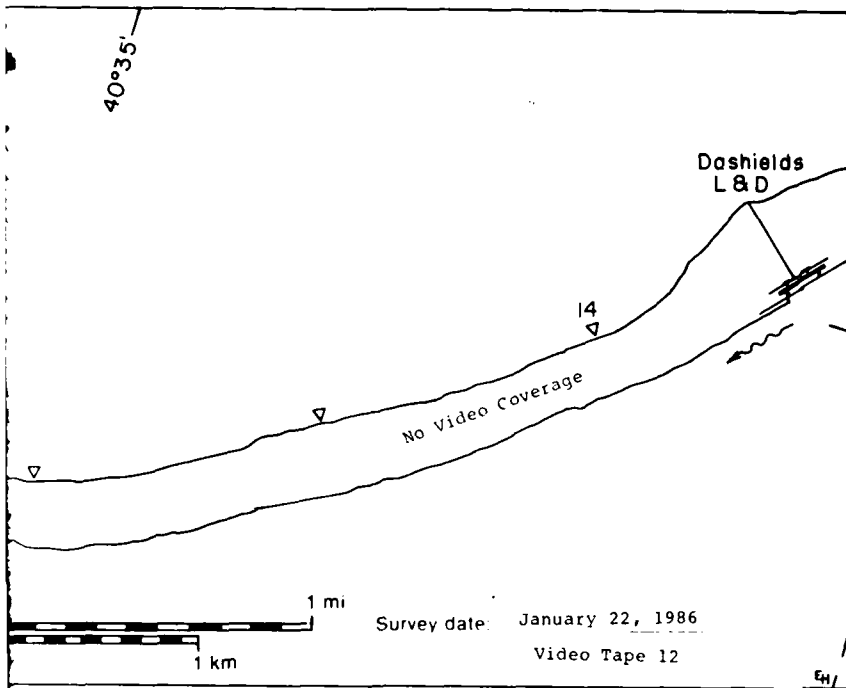


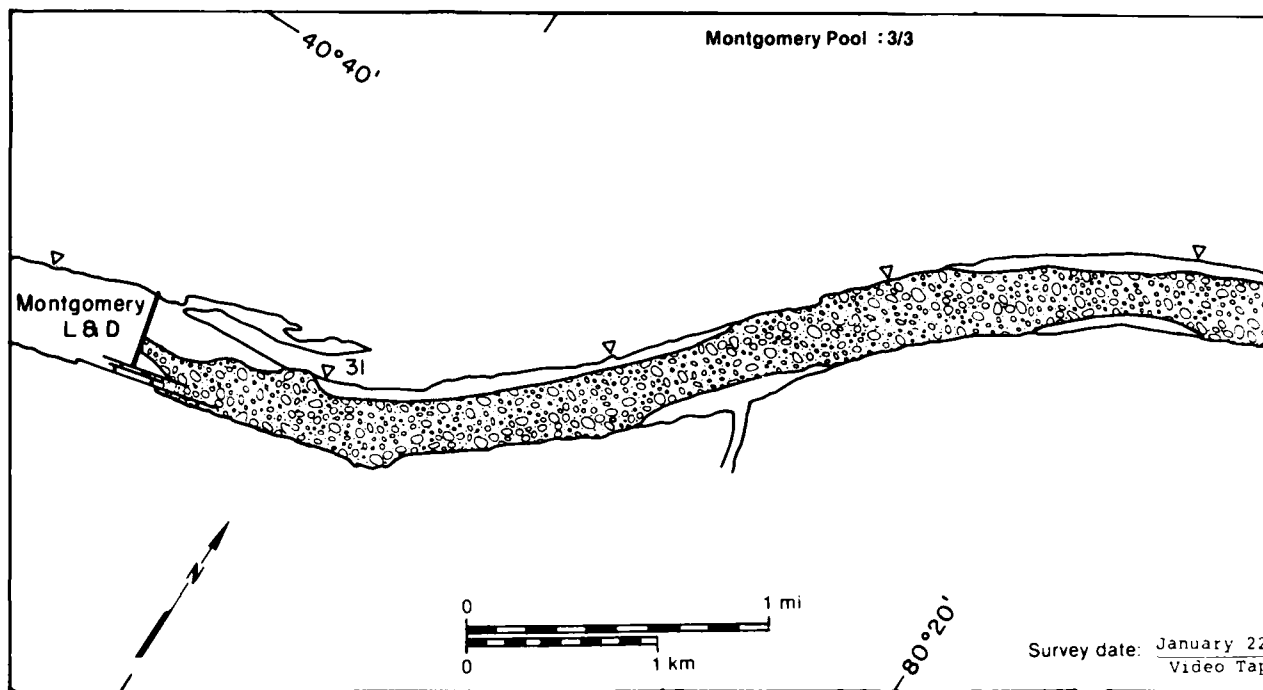
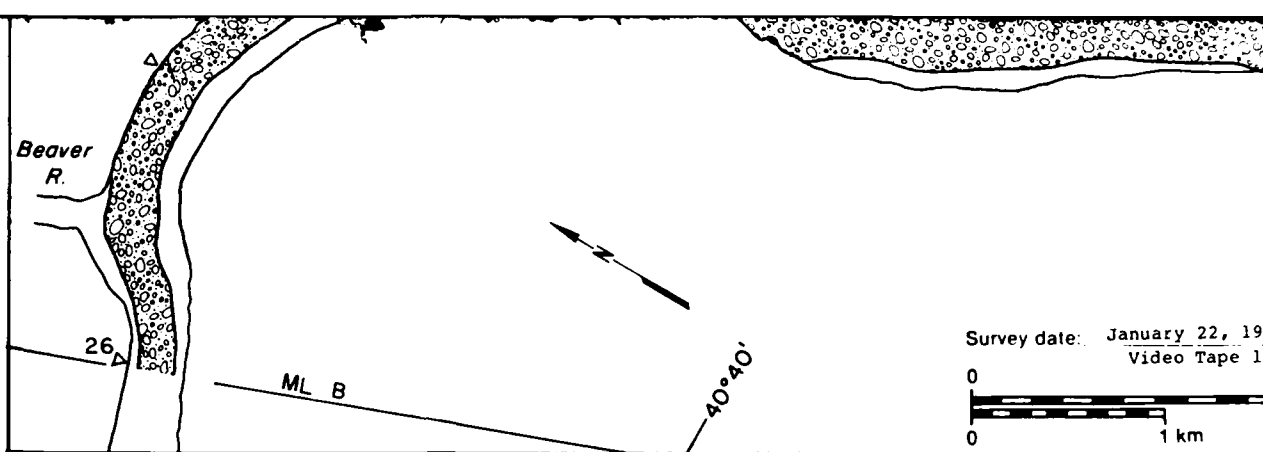
Dashields Pool		Surface concentration (%)	
MAP UNITS		Area ($m^2 \times 10^6$)	
	Open water	0.00	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		5.00*	* Includes $5.00 \times 10^6 m^2$ of no video coverage



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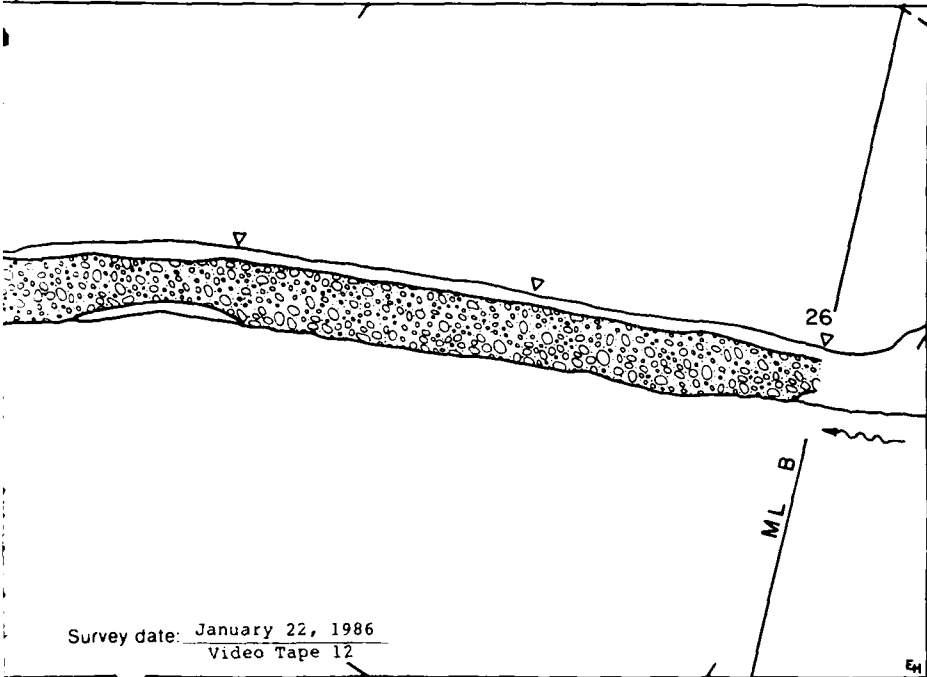
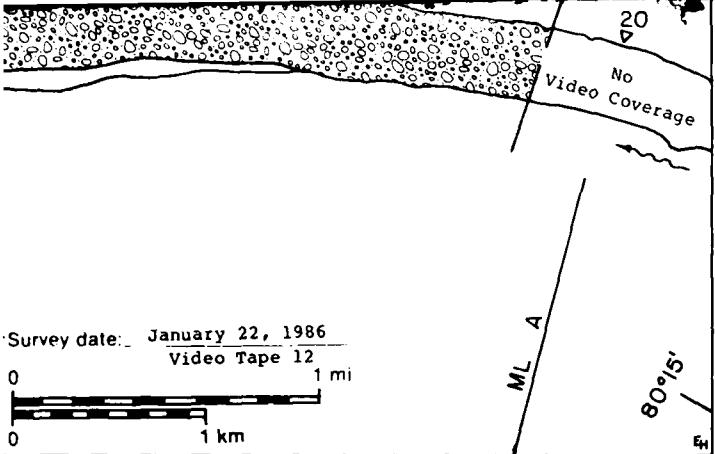
Montgomery Pool

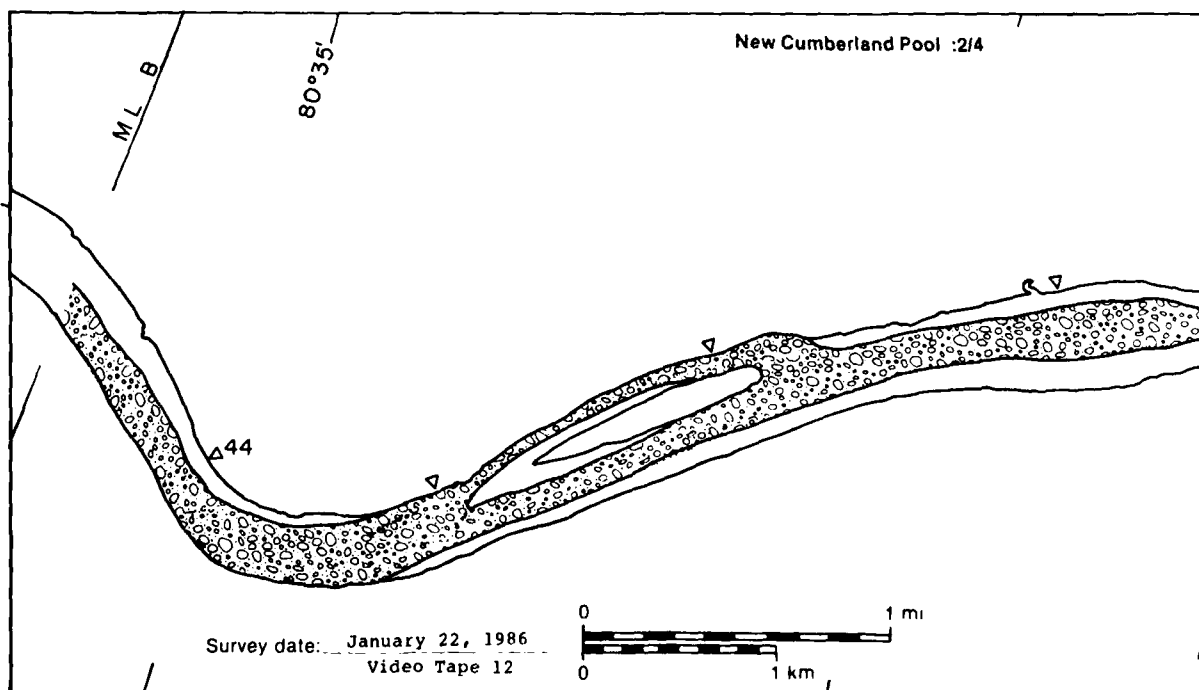
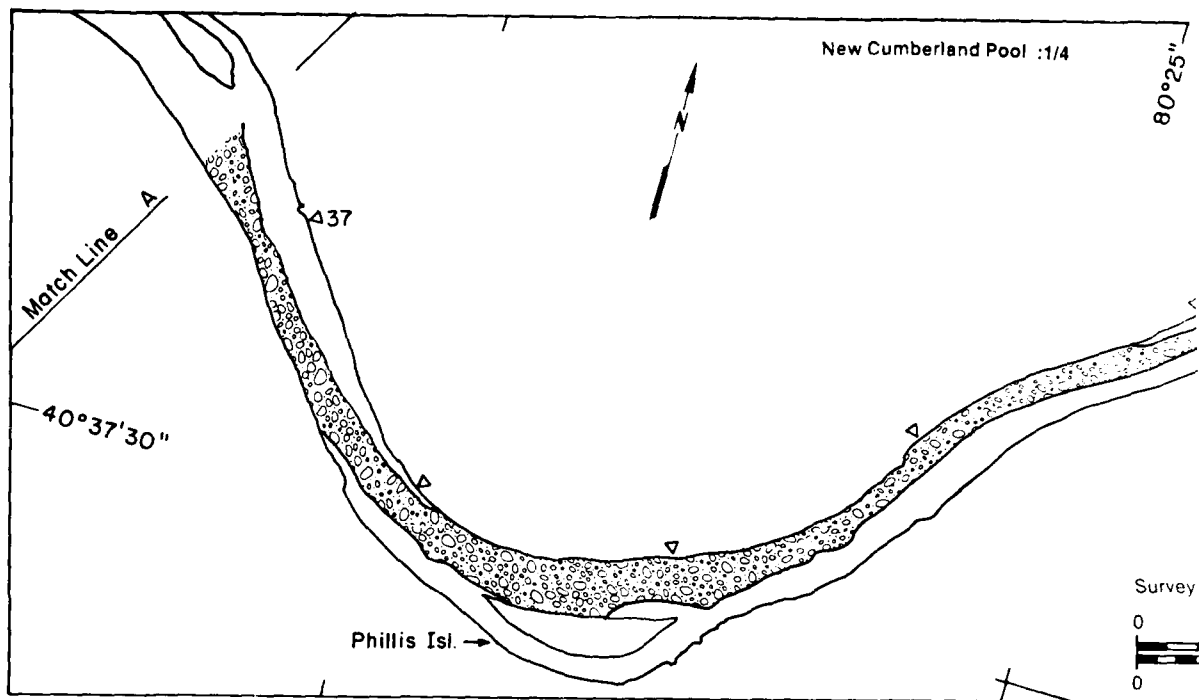
MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

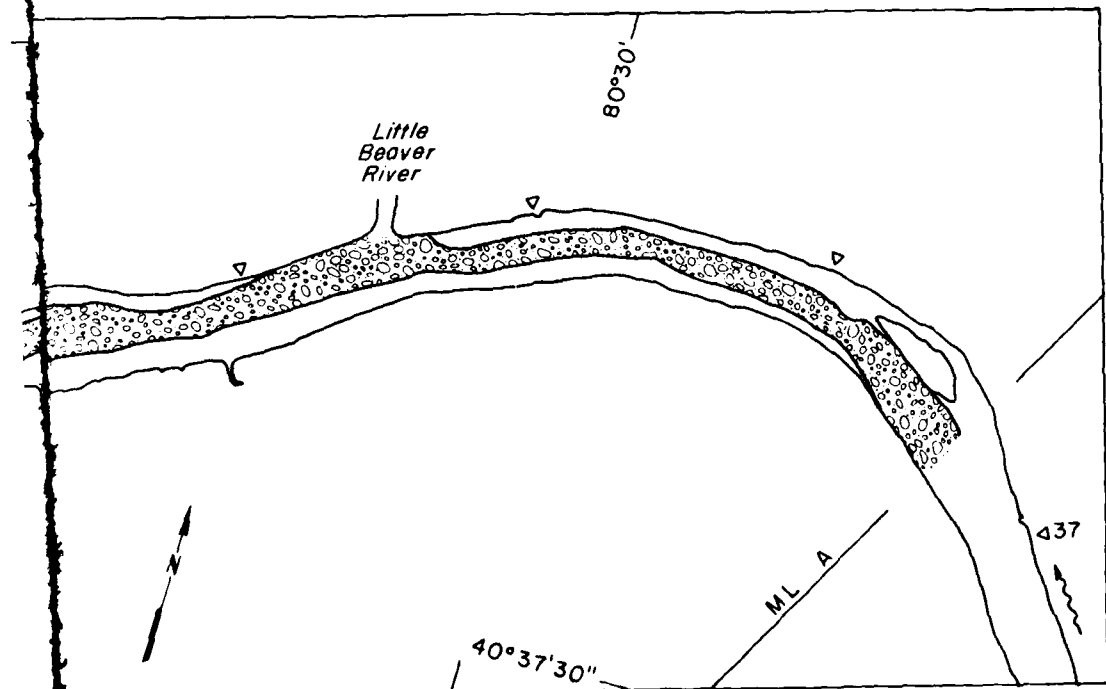
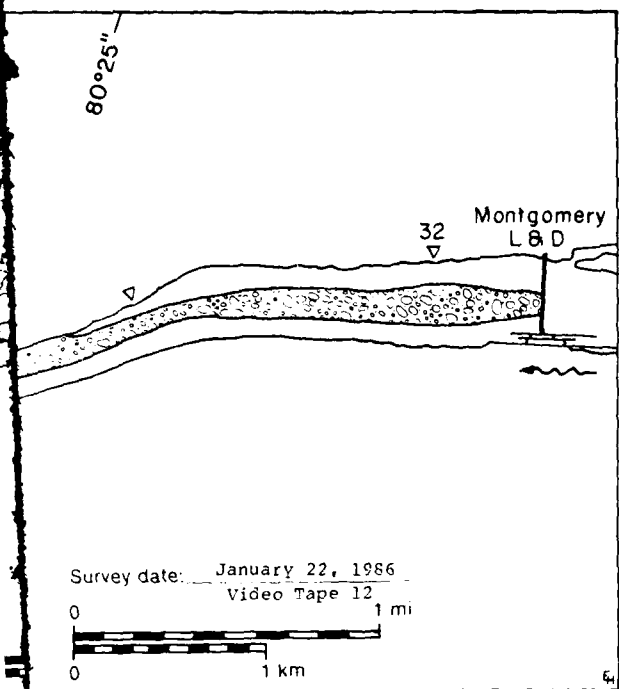
Area (m ² x 10 ⁶)	Surface concentration (%)
1.43	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
5.82	80
Total area (m ² x 10 ⁶)	11.27*

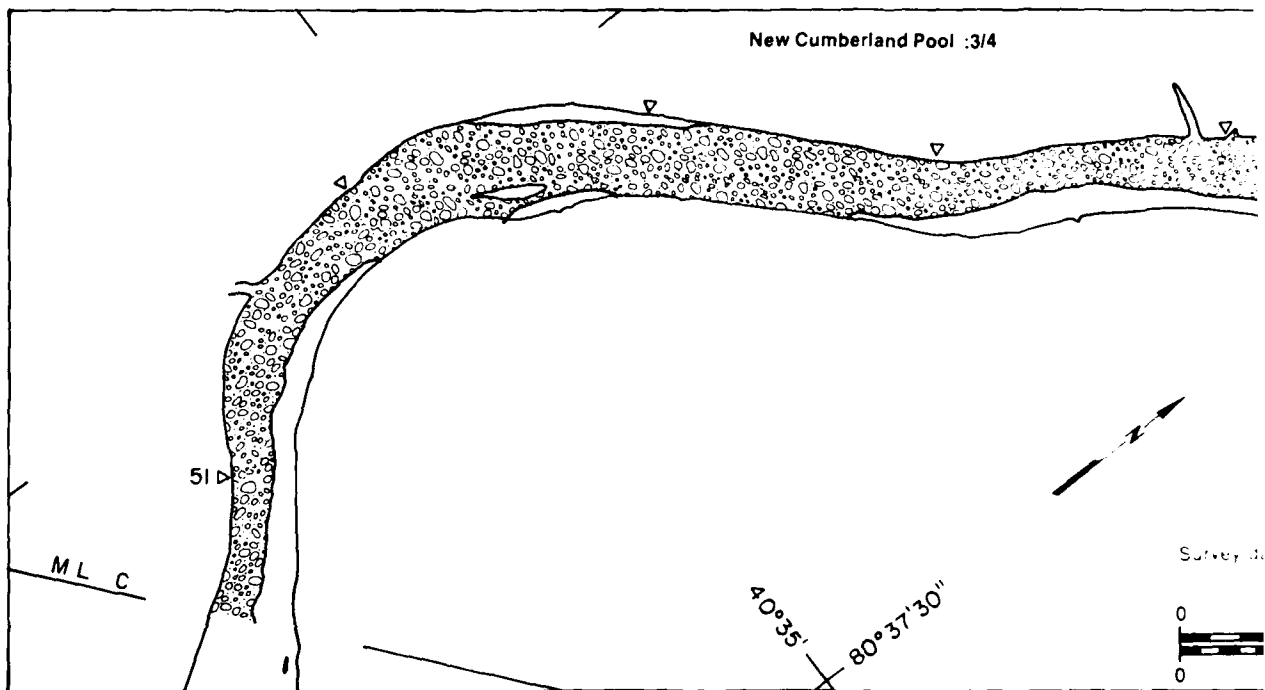
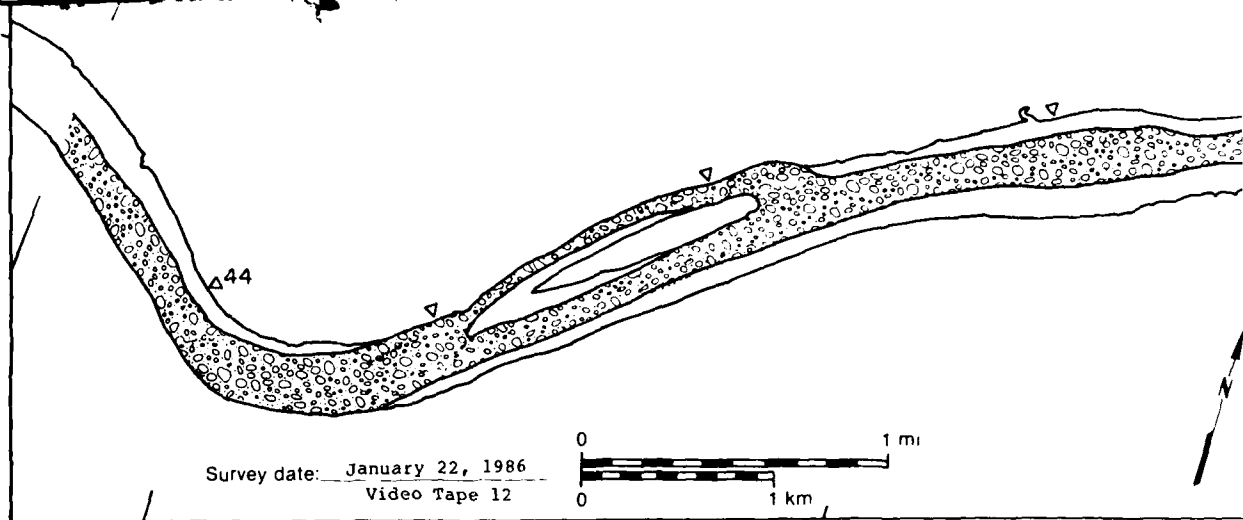
* Includes 4.02 x 10⁶ m² of no video coverage

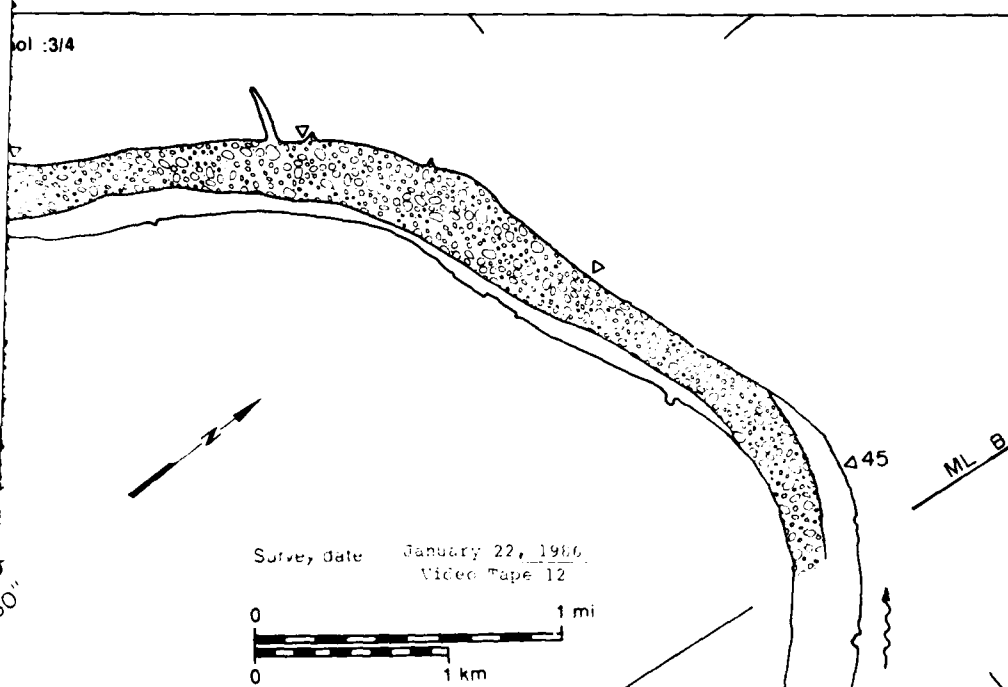
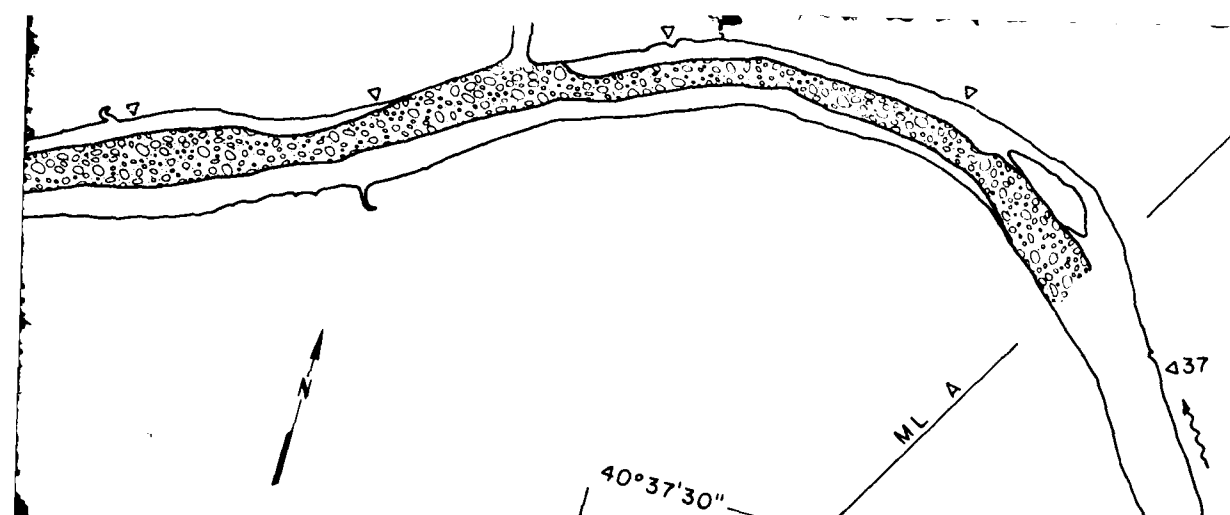




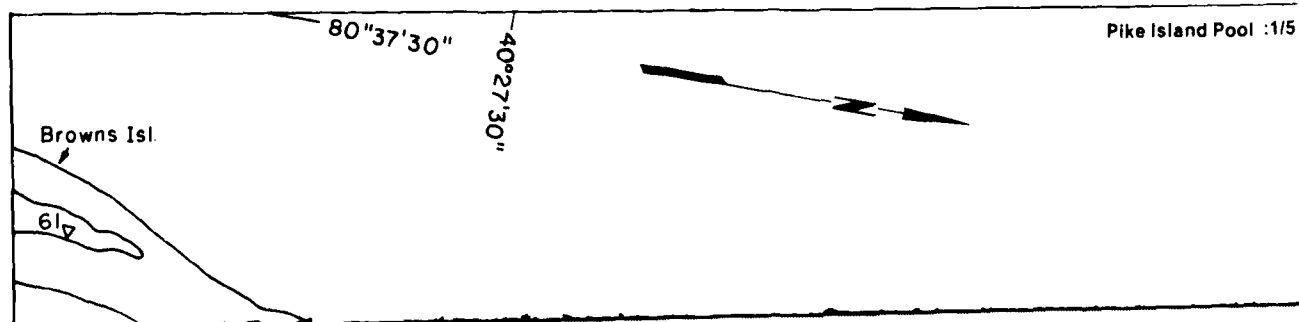
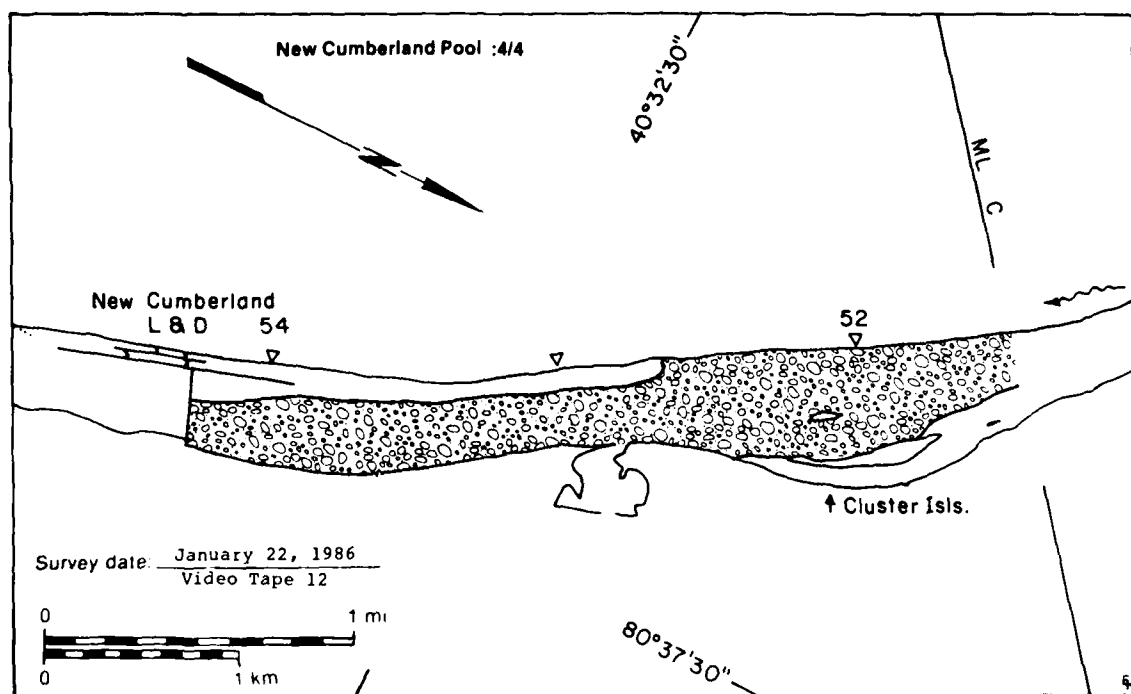
22 January 1986



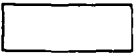









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New Cumberland Pool

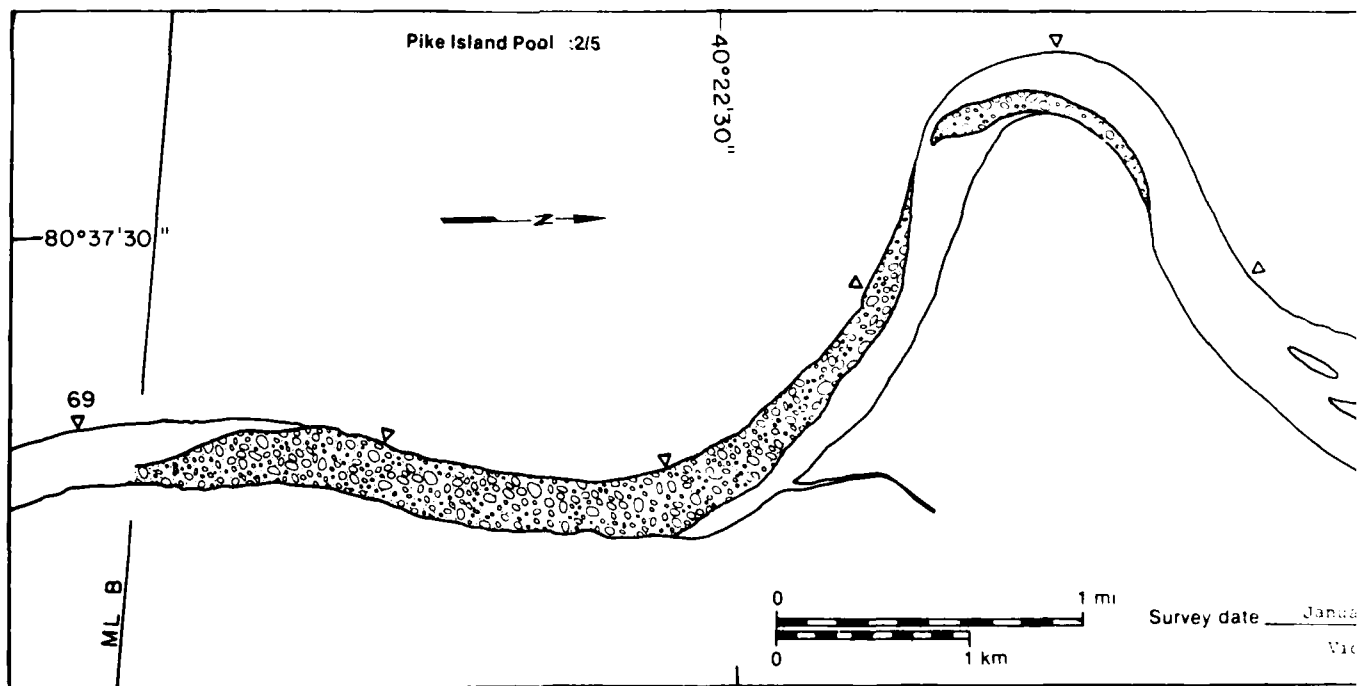
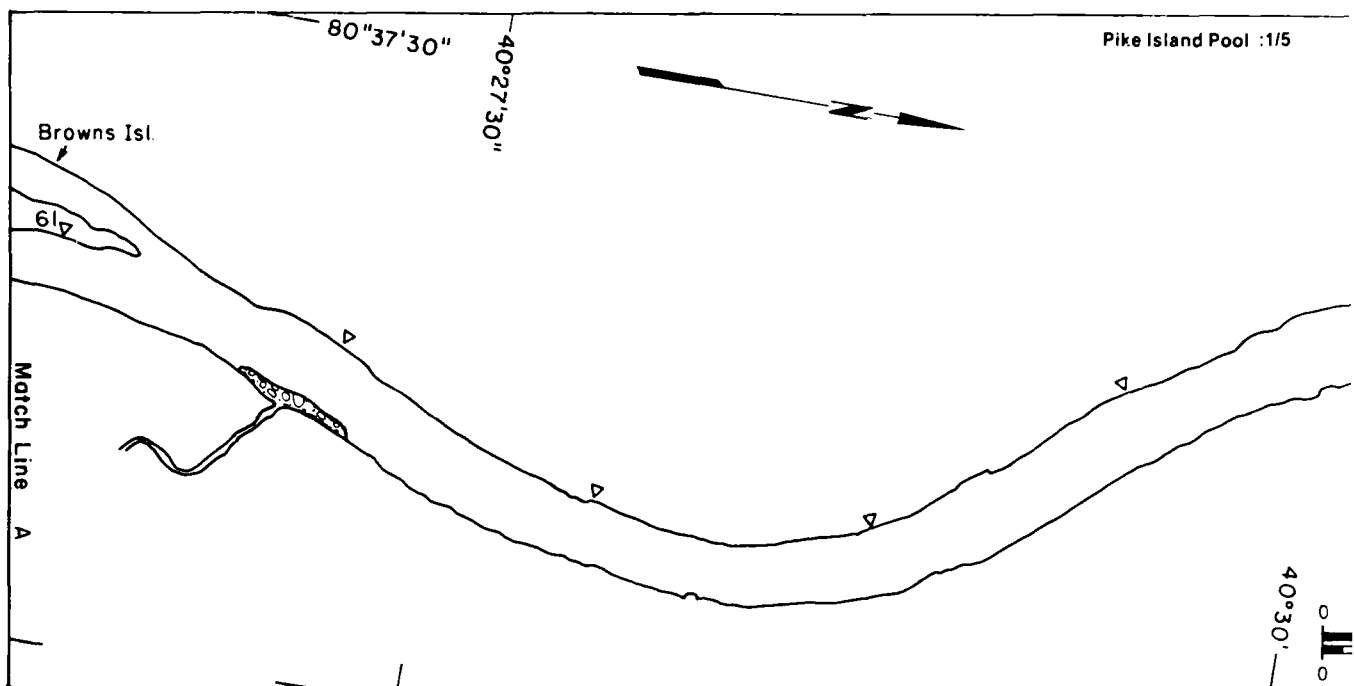
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
 Open water	5.13	NA
 Solid ice cover	0.00	NA
 Solid ice cover with open-water areas	0.00	—
 Fragmented ice cover	0.00	NA
 Fragmented ice cover with open-water areas	0.00	—
 Ice floes or frazil slush and pans	9.74	20
Total area ($m^2 \times 10^6$)	14.87	

Pike Island Pool :1/5

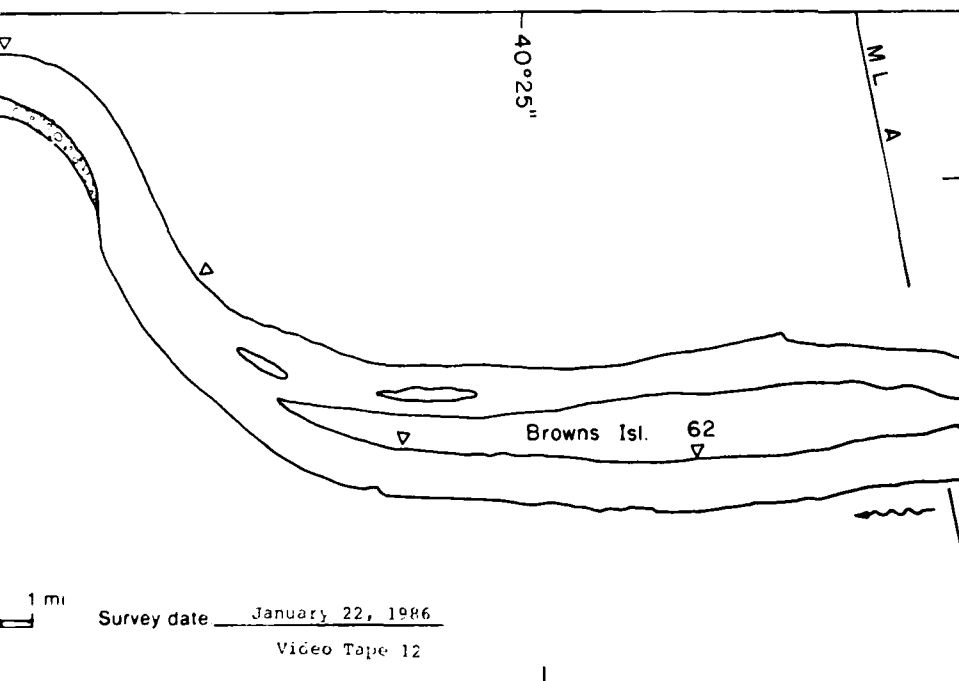
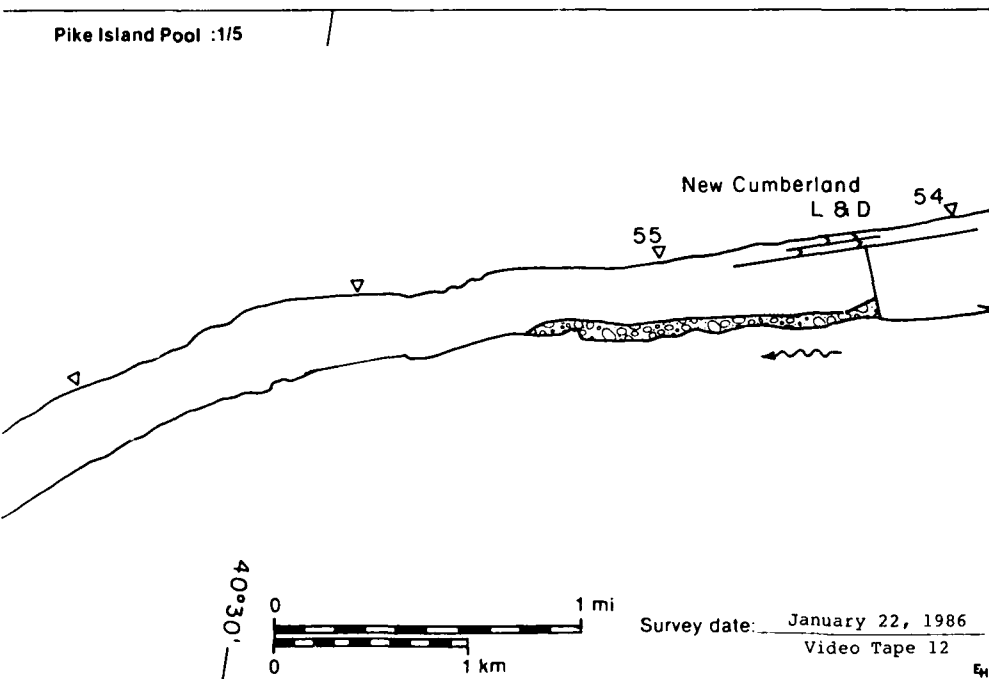
New Cumberland
L & D

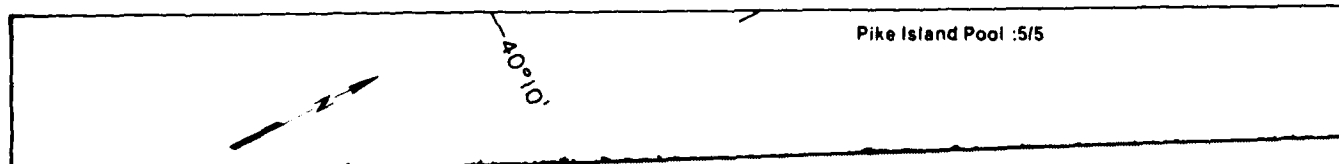
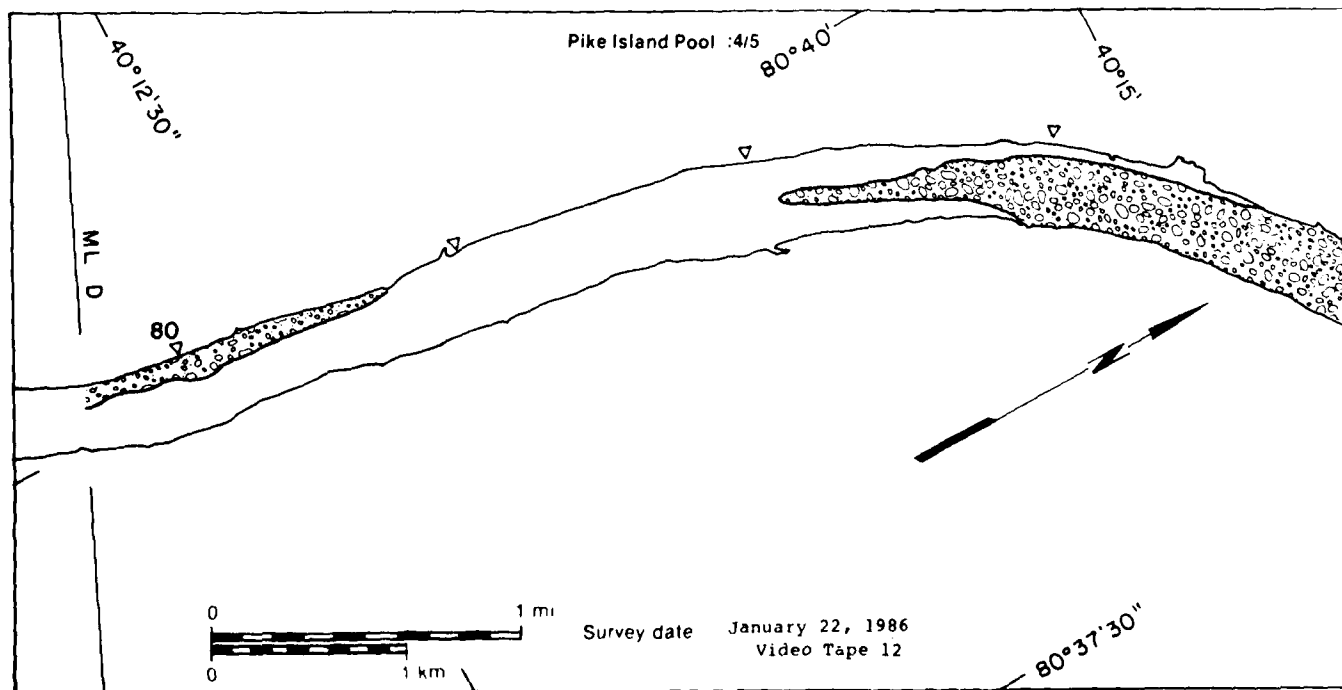
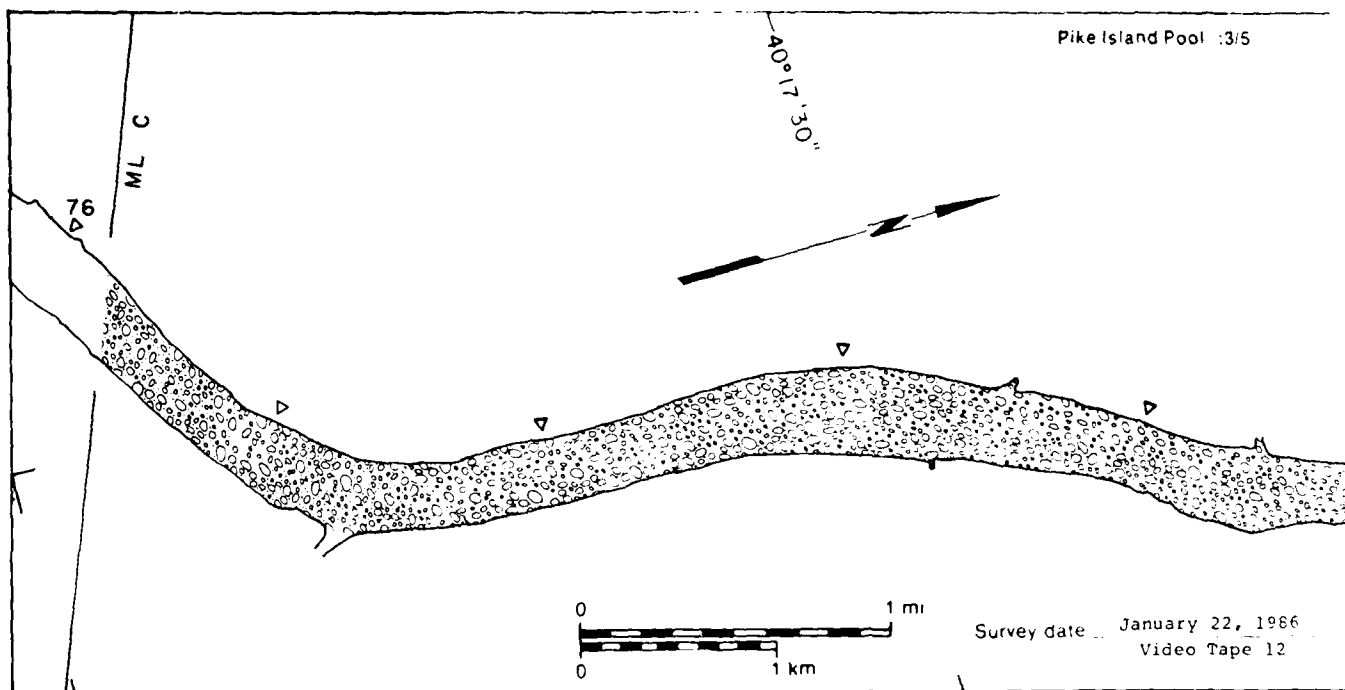
54

55

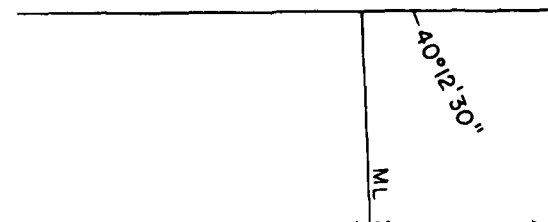
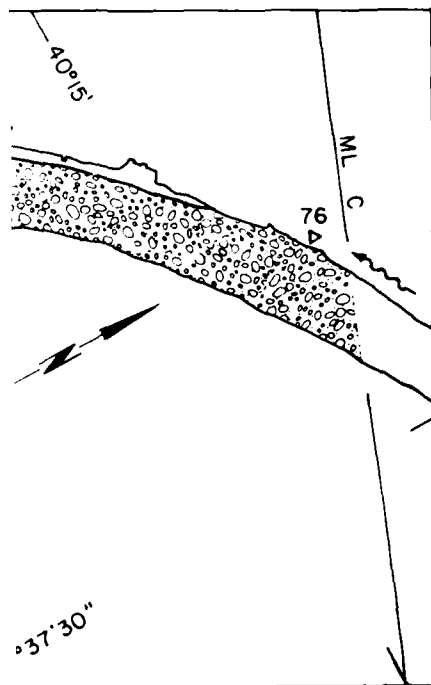
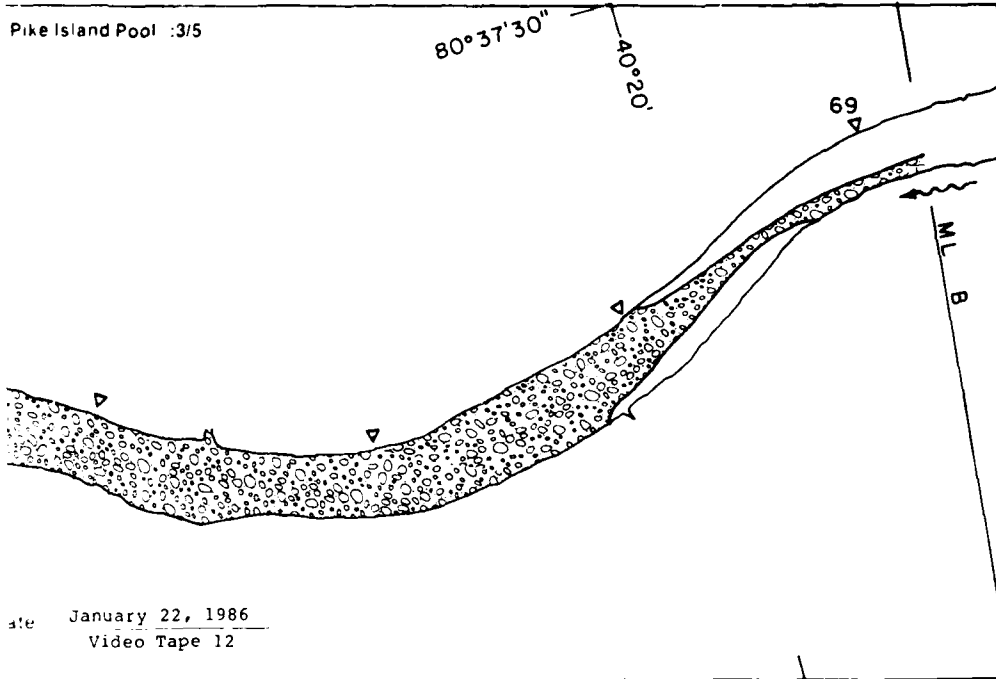


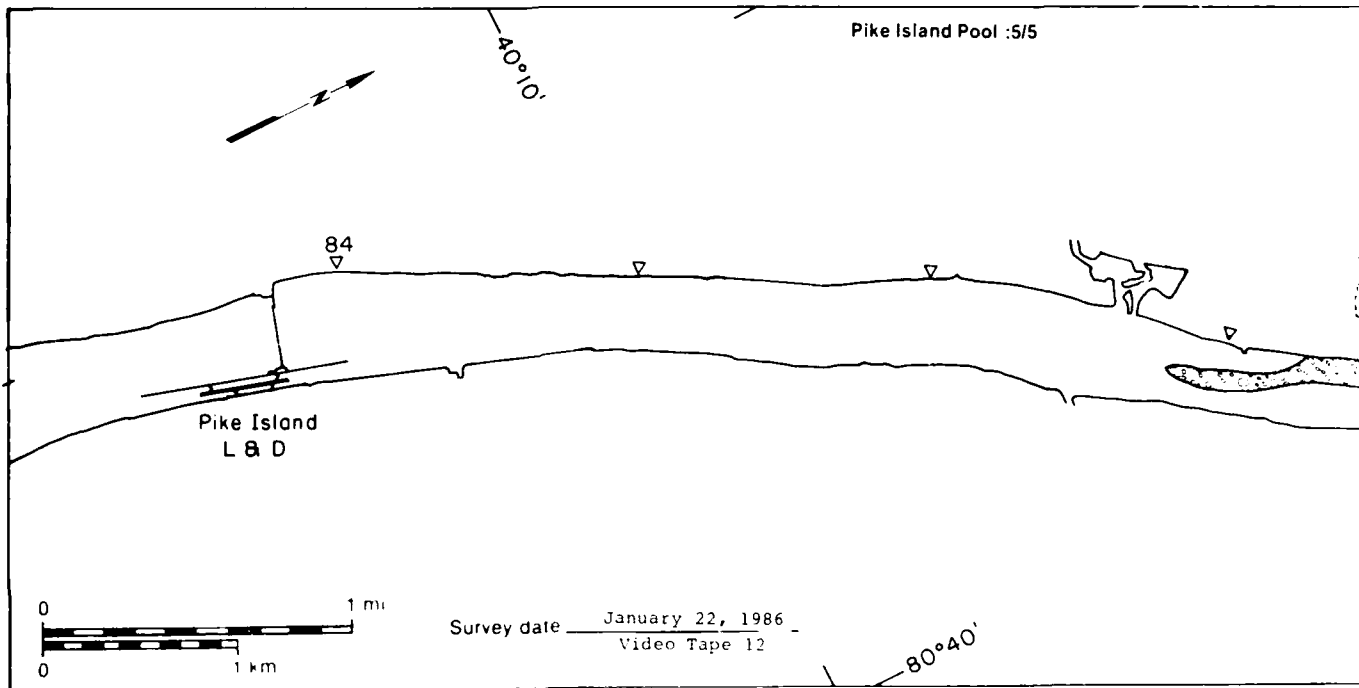
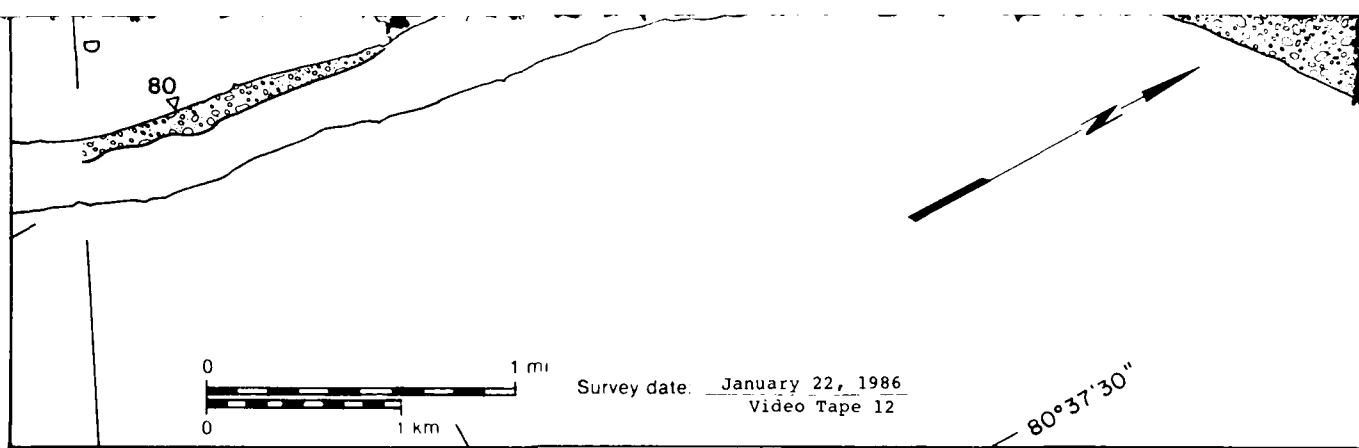
Pike Island Pool :1/5









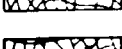

22 January 1986



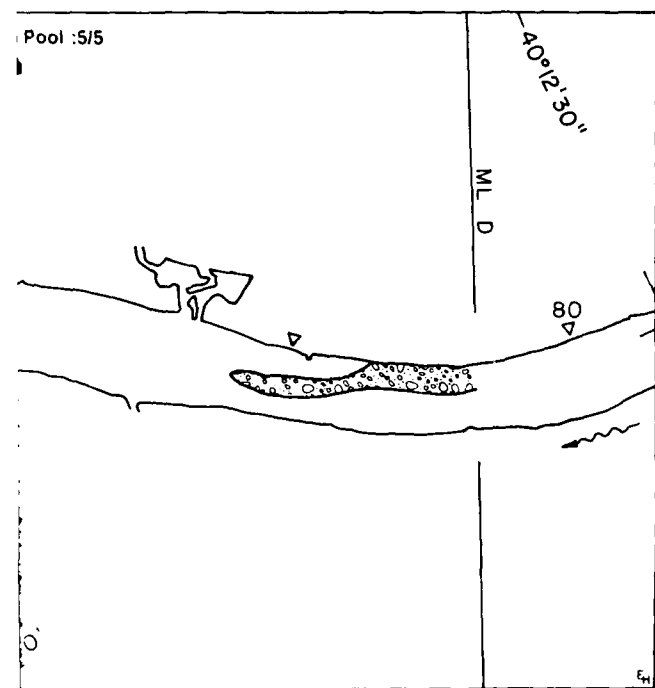
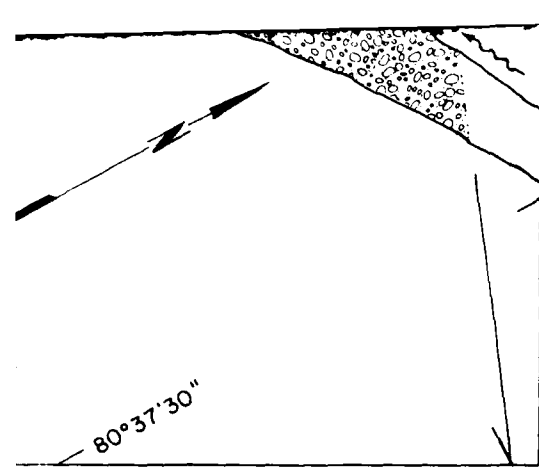


Pike Island Pool

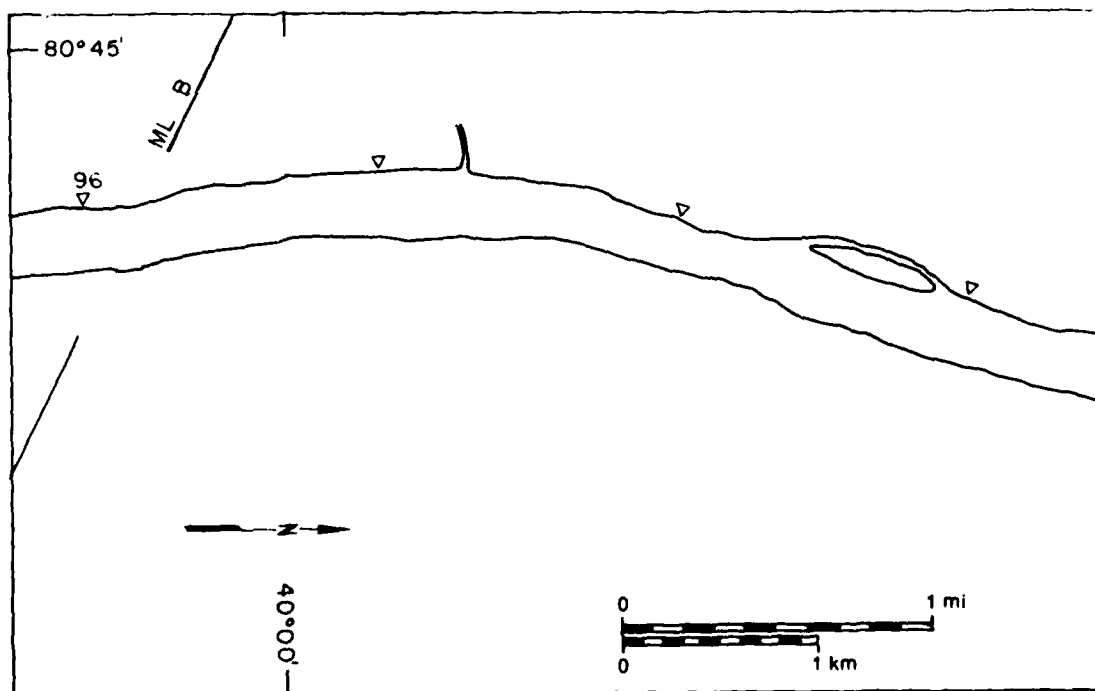
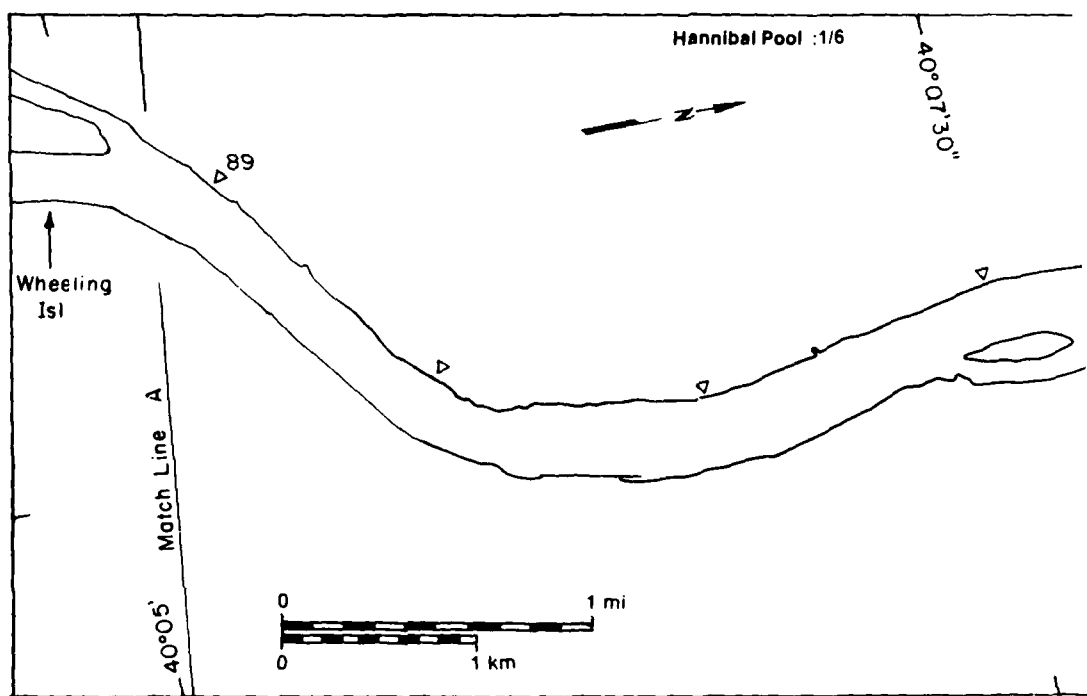
MAP UNITS

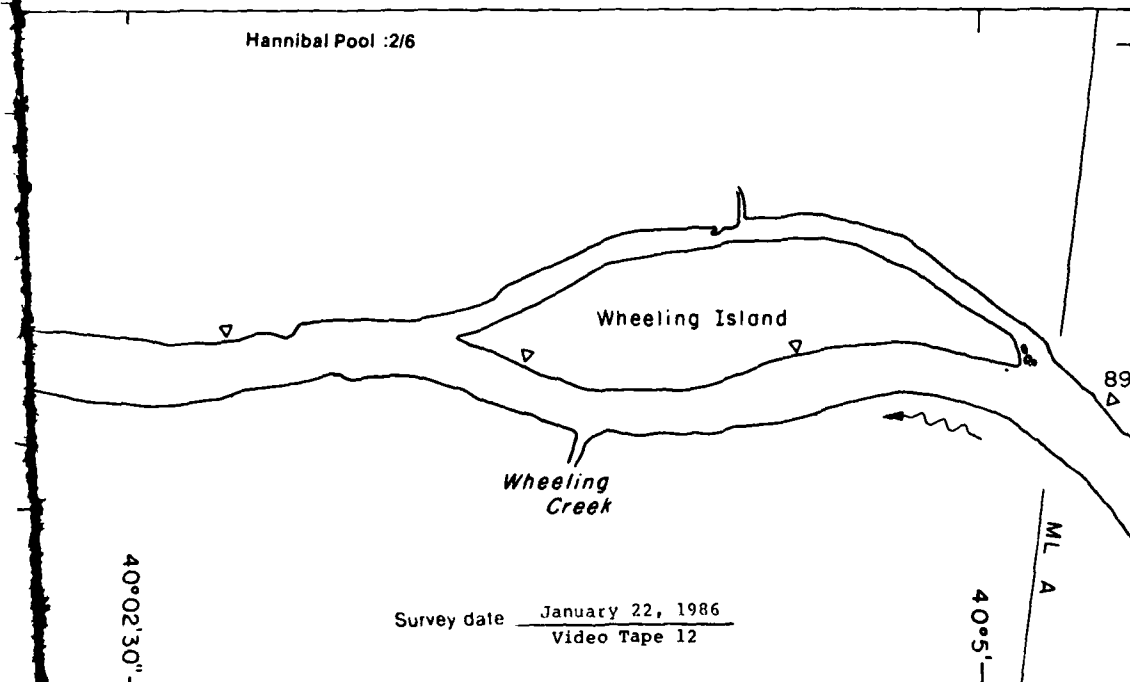
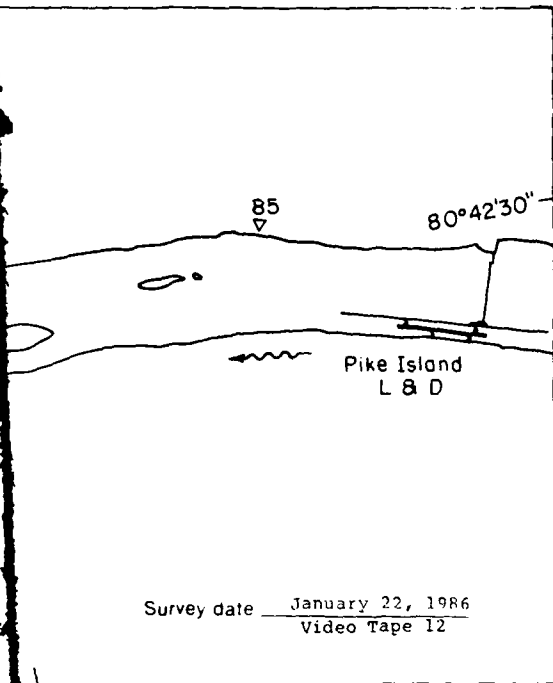
-  Open water
-  Solid ice cover
-  Solid ice cover with open-water areas
-  Fragmented ice cover
-  Fragmented ice cover with open-water areas
-  Ice floes or frazil slush and pans

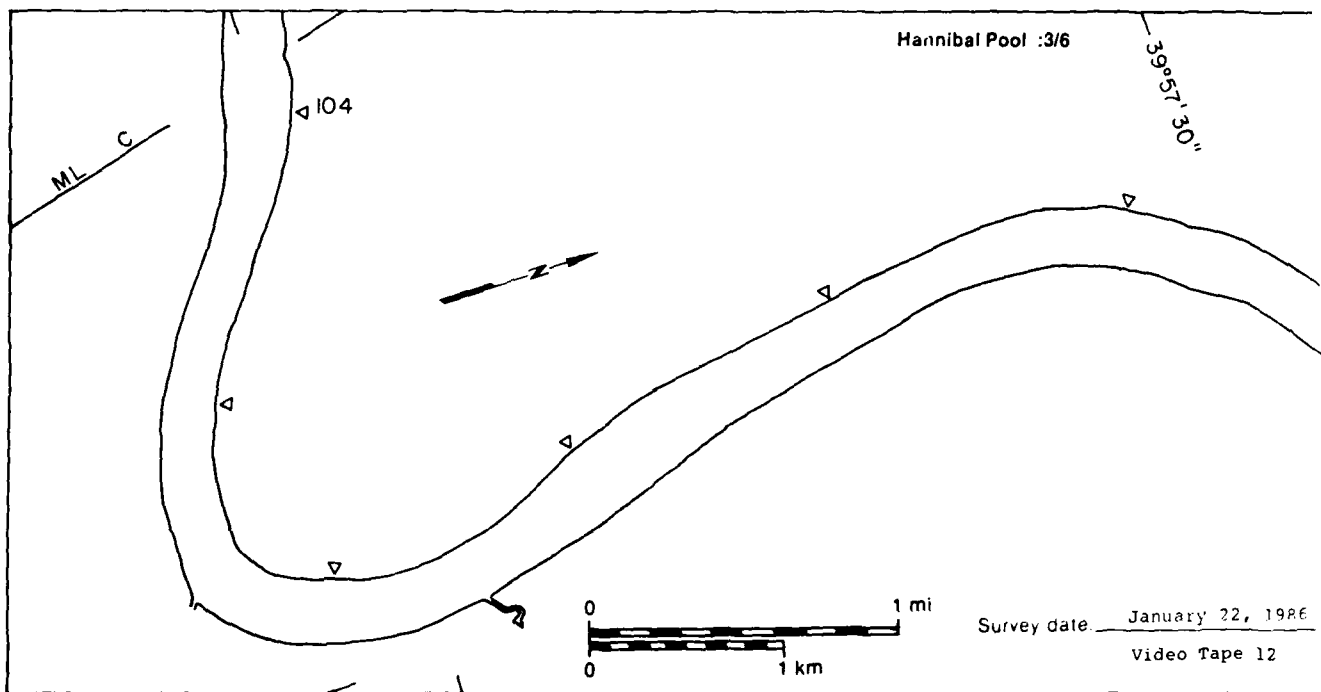
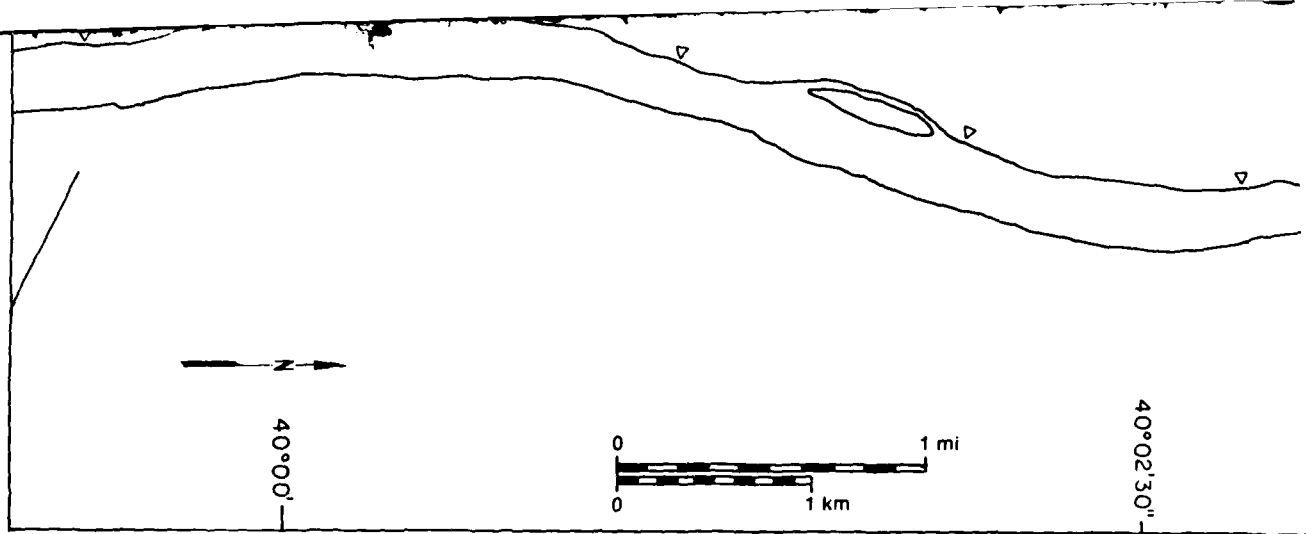
Area ($m^2 \times 10^6$)	Surface concentration (%)
12.21	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
6.71	10
Total area ($m^2 \times 10^6$)	18.92

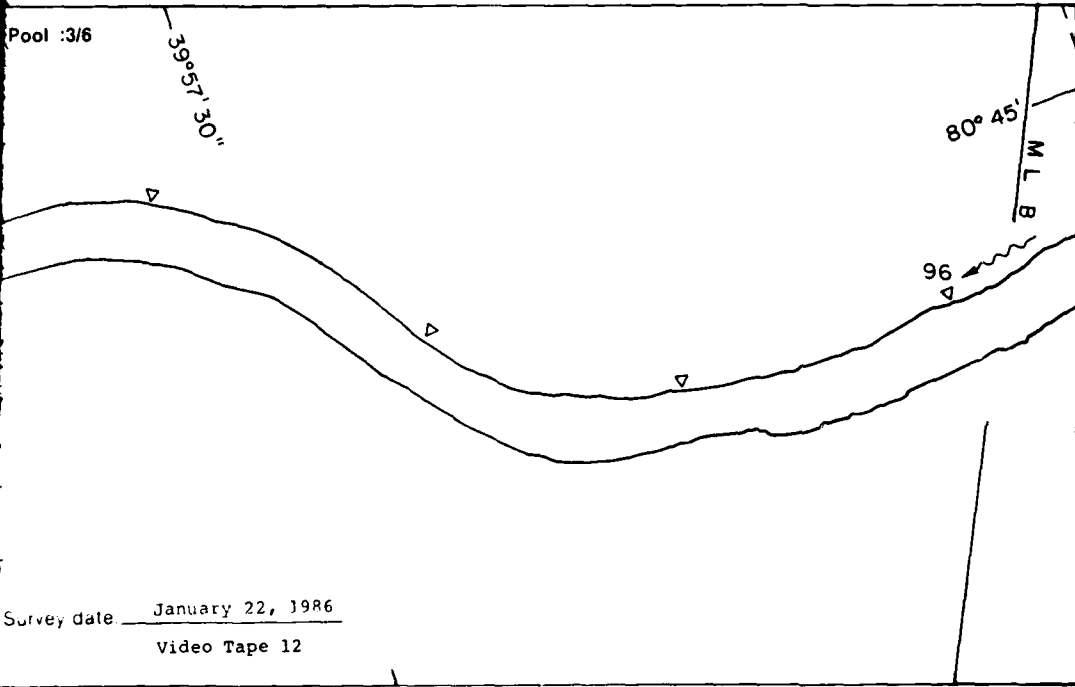
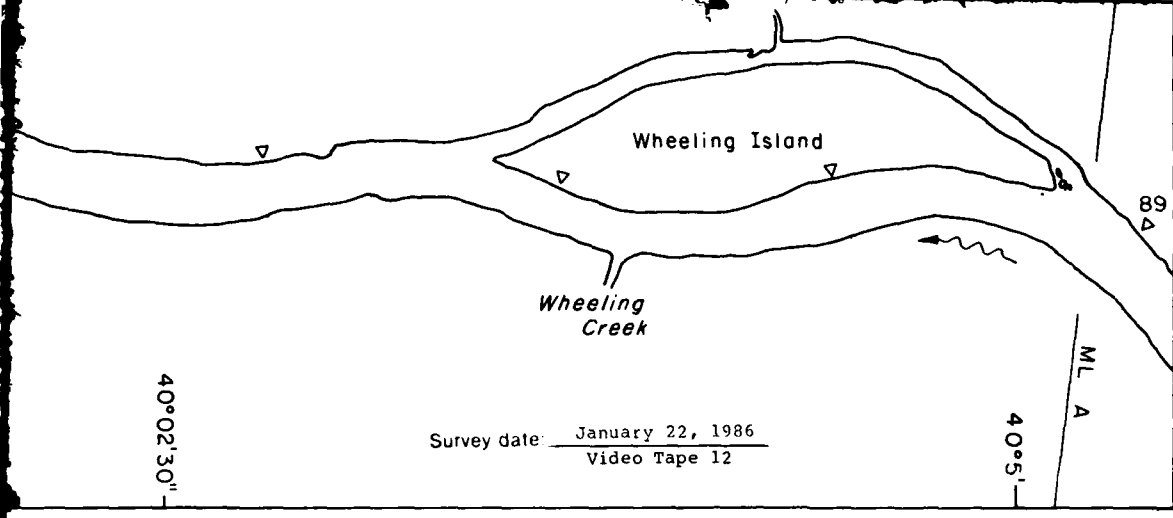


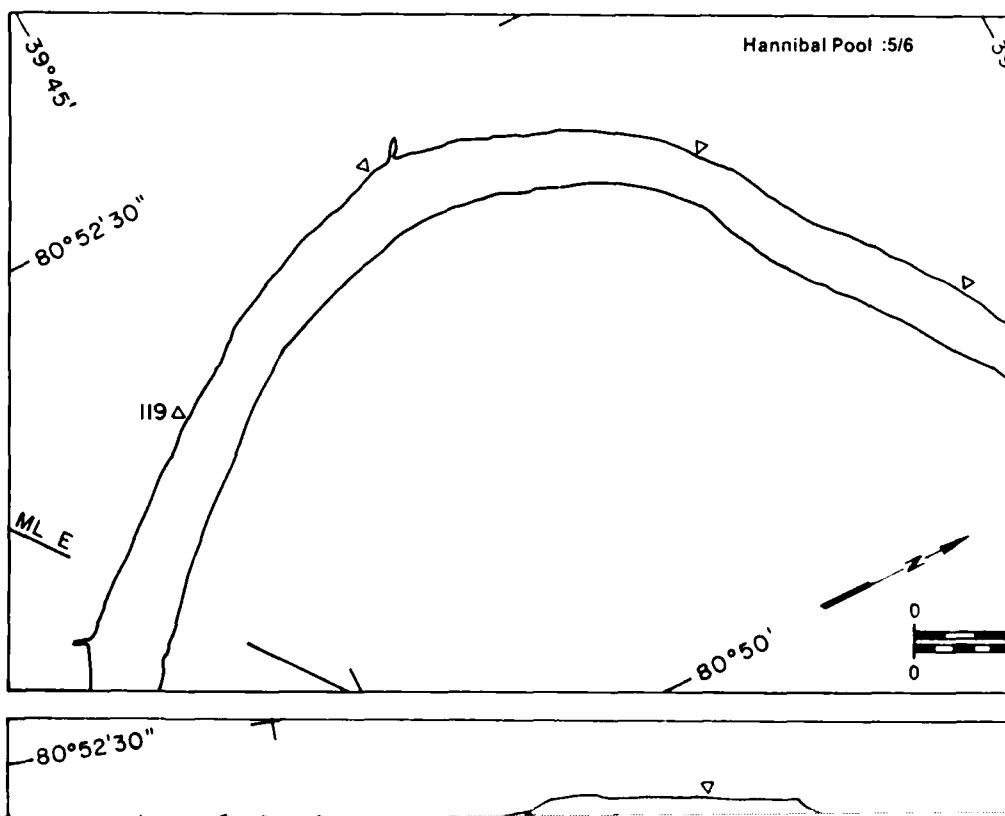
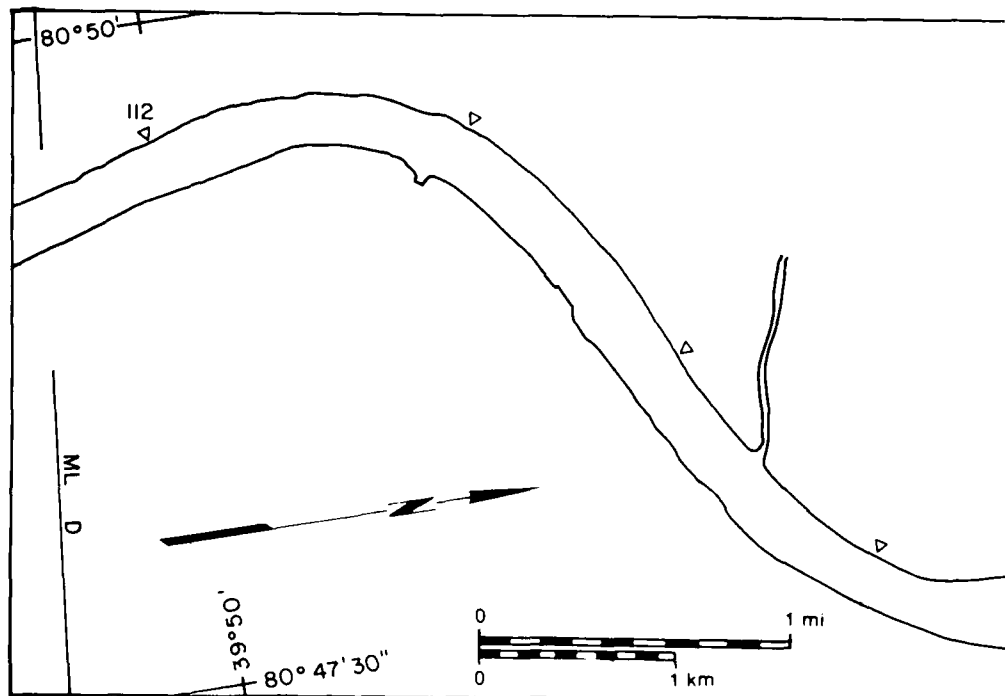
22 January 1986



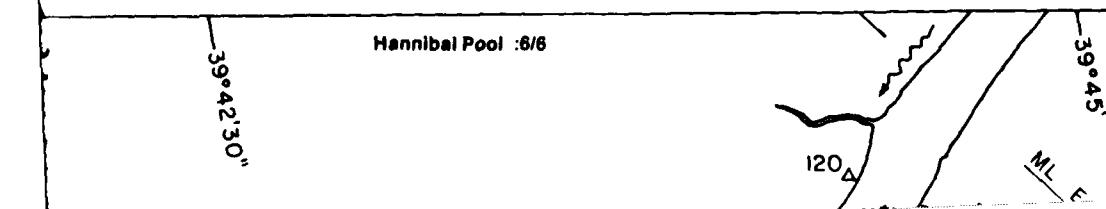
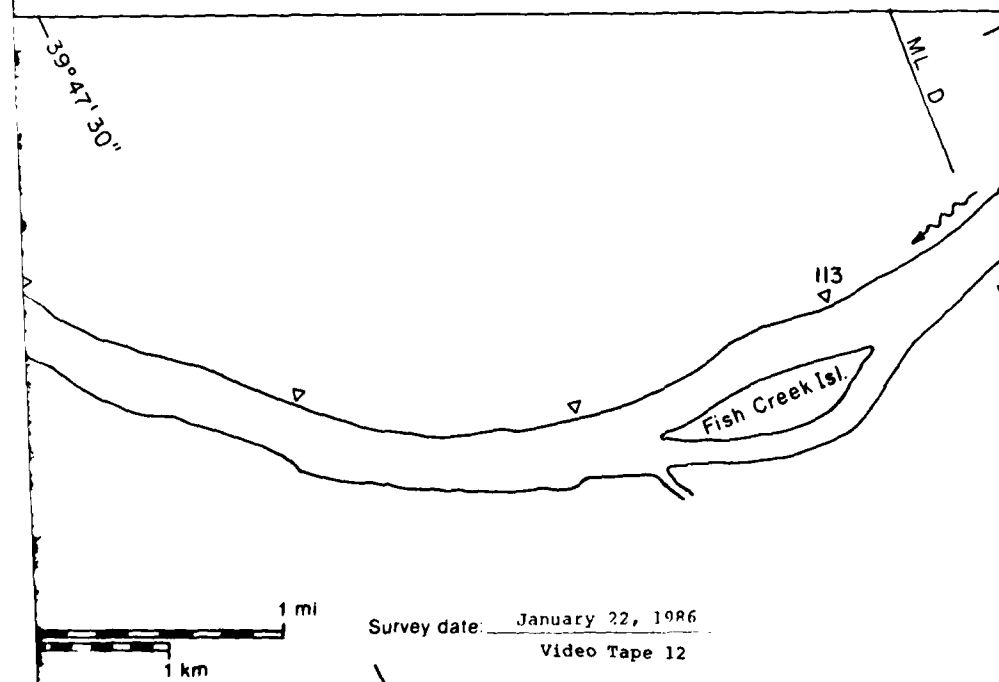
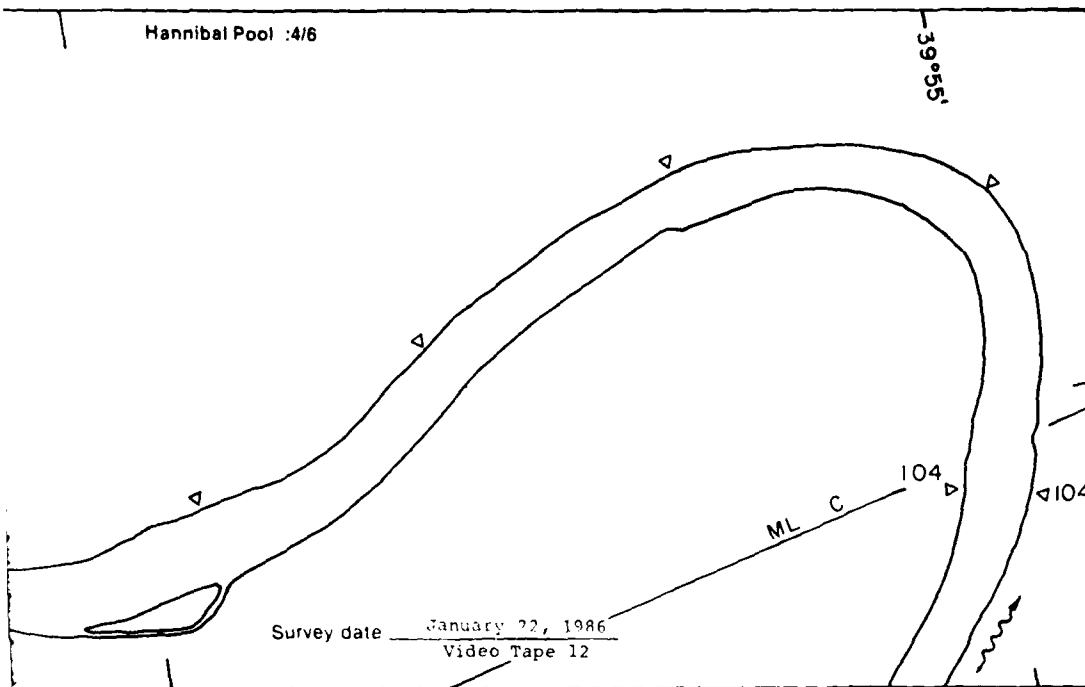


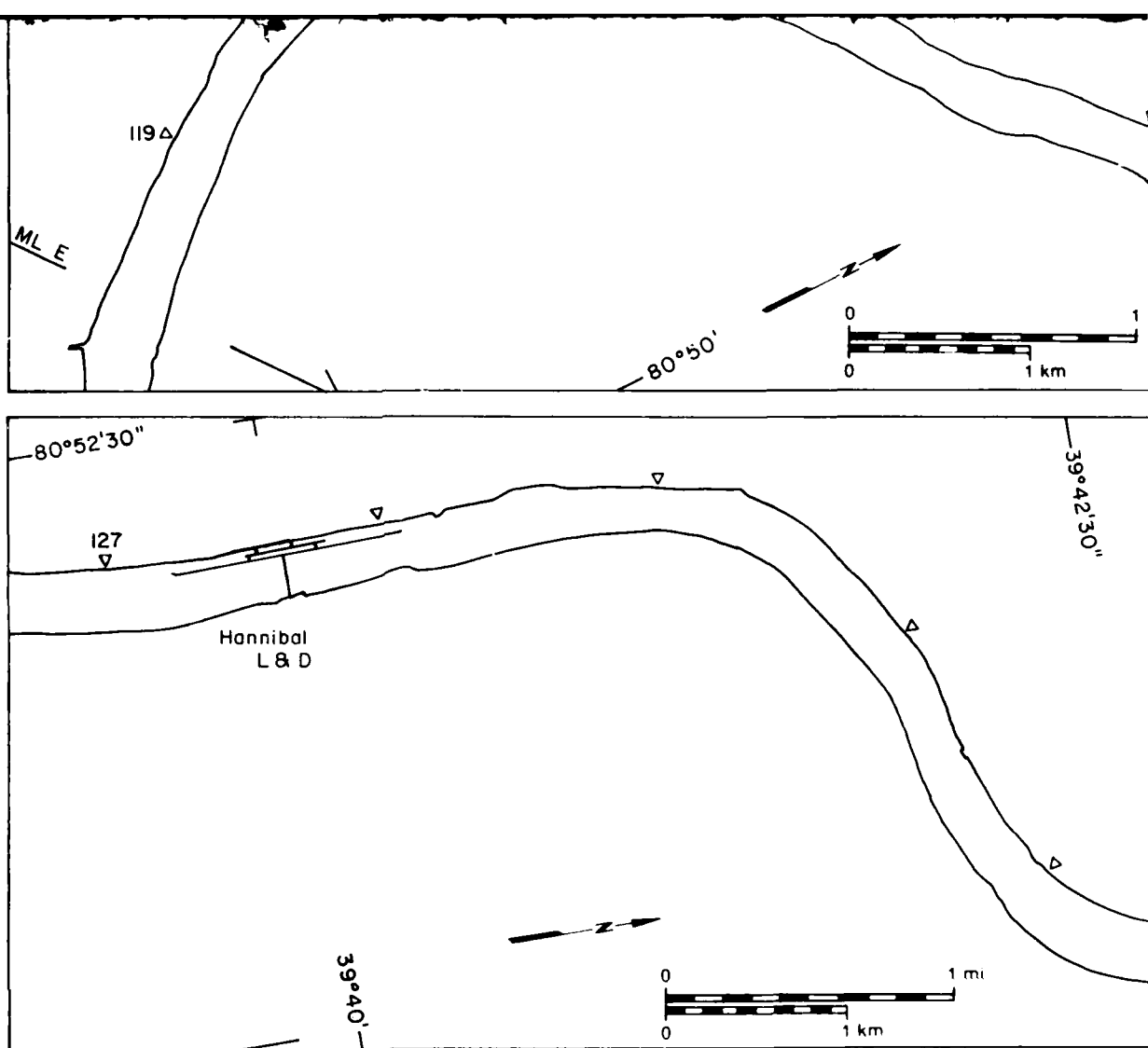




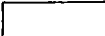
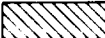

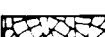
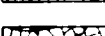



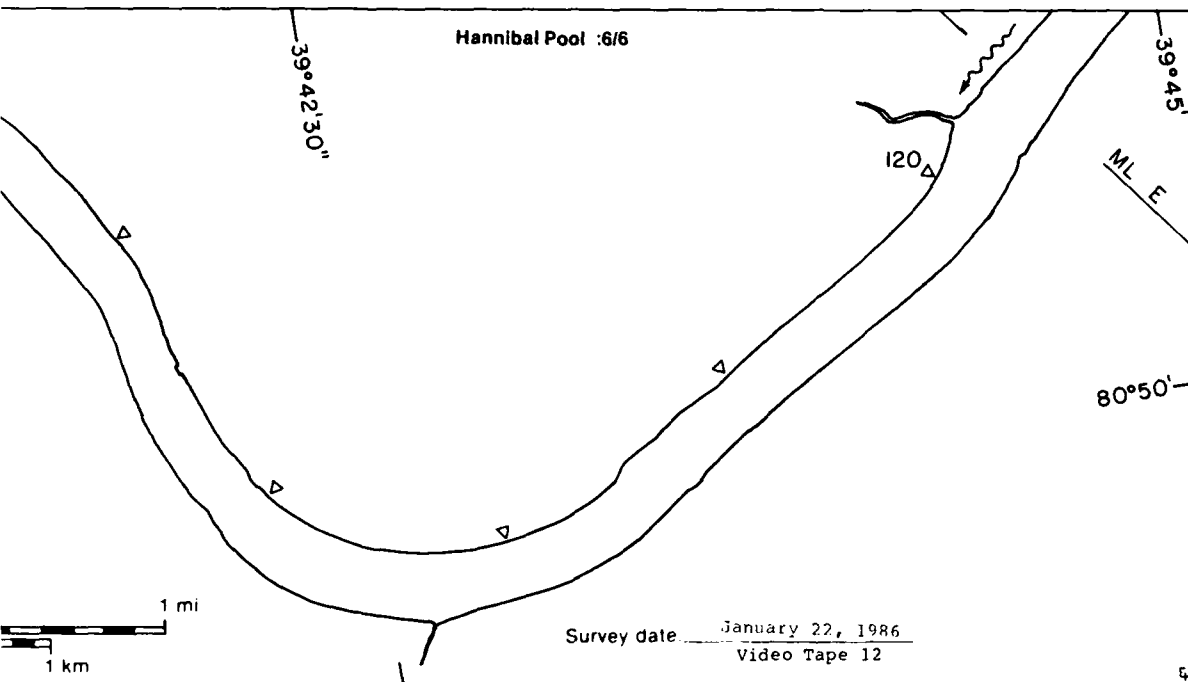
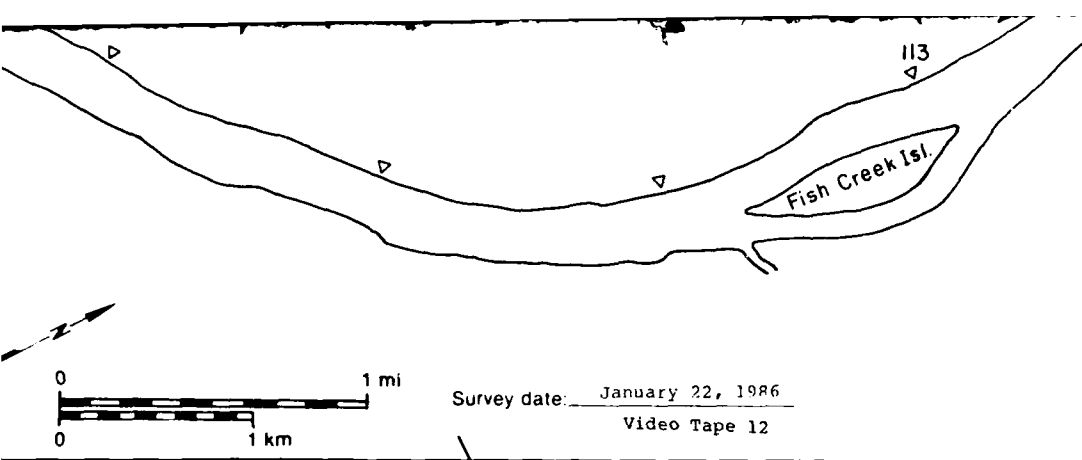
22 January 1986

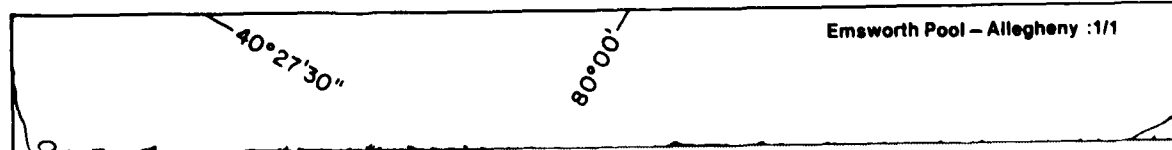
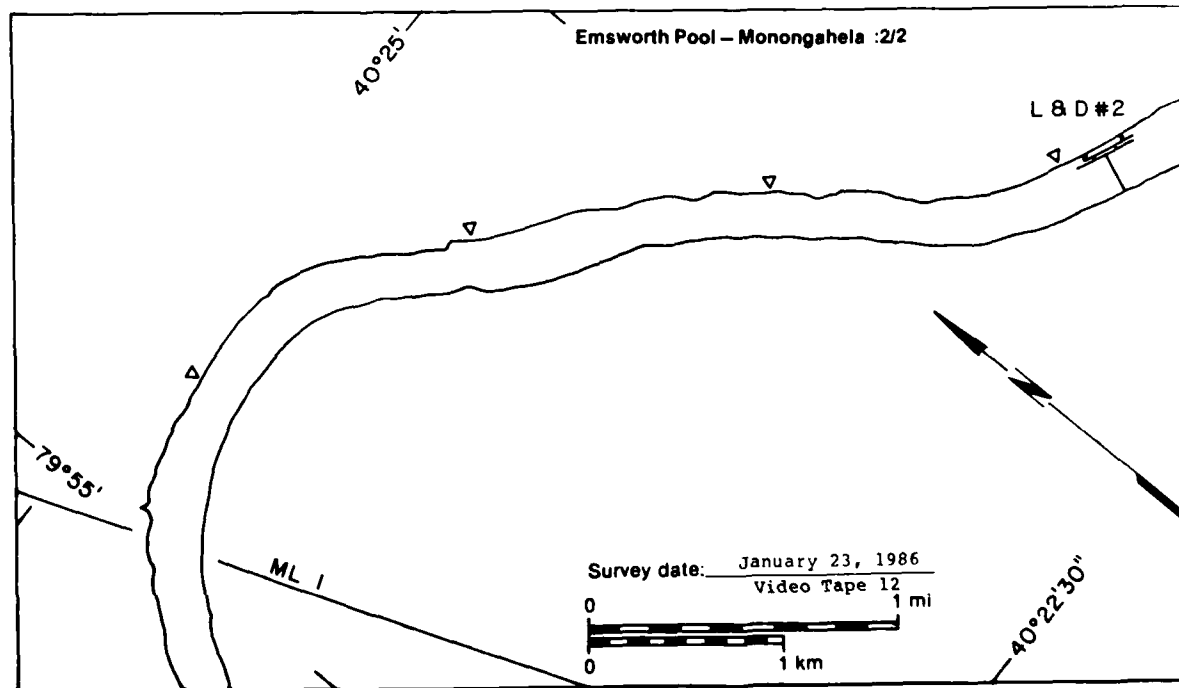
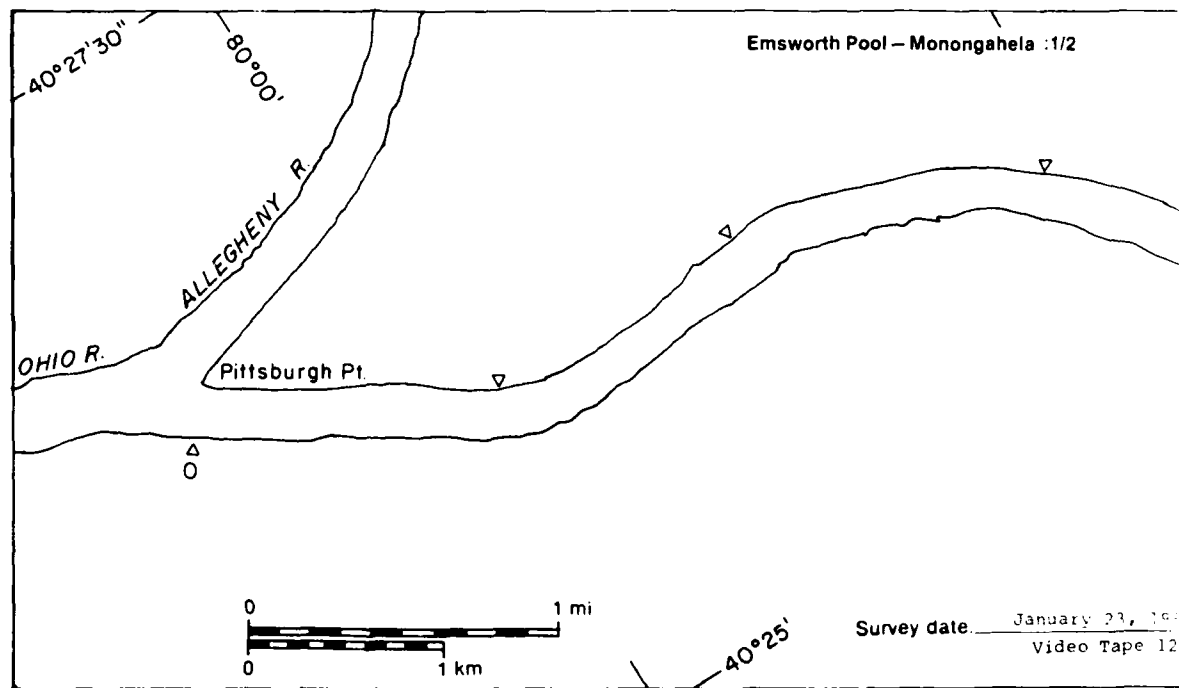




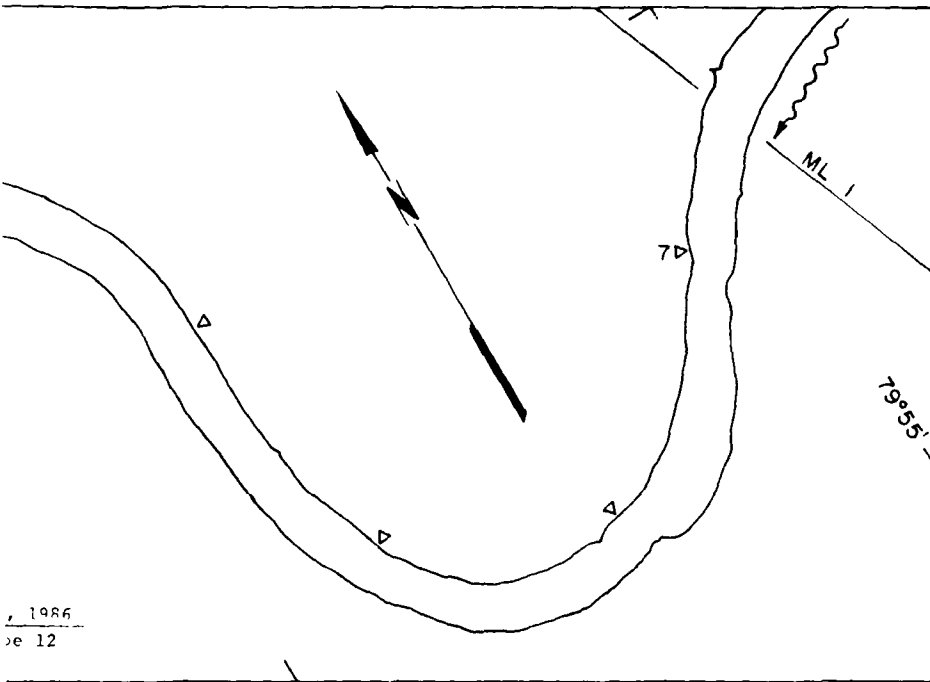
Hannibal Pool

MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
 Open water	22.46	NA
 Solid ice cover	0.00	NA
 Solid ice cover with open-water areas	0.00	—
 Fragmented ice cover	0.00	NA
 Fragmented ice cover with open-water areas	0.00	—
 Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)	22.46	

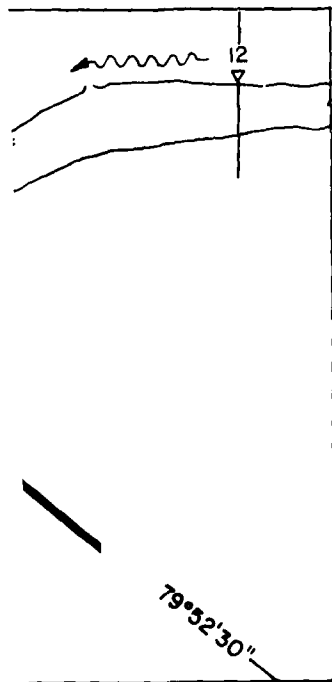




23 January 1986

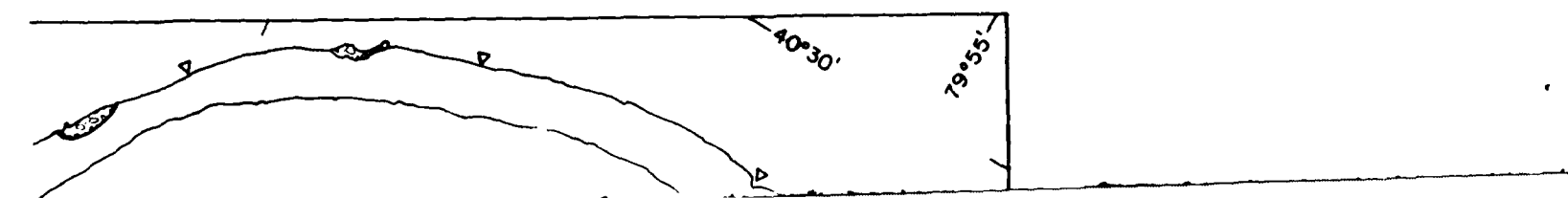


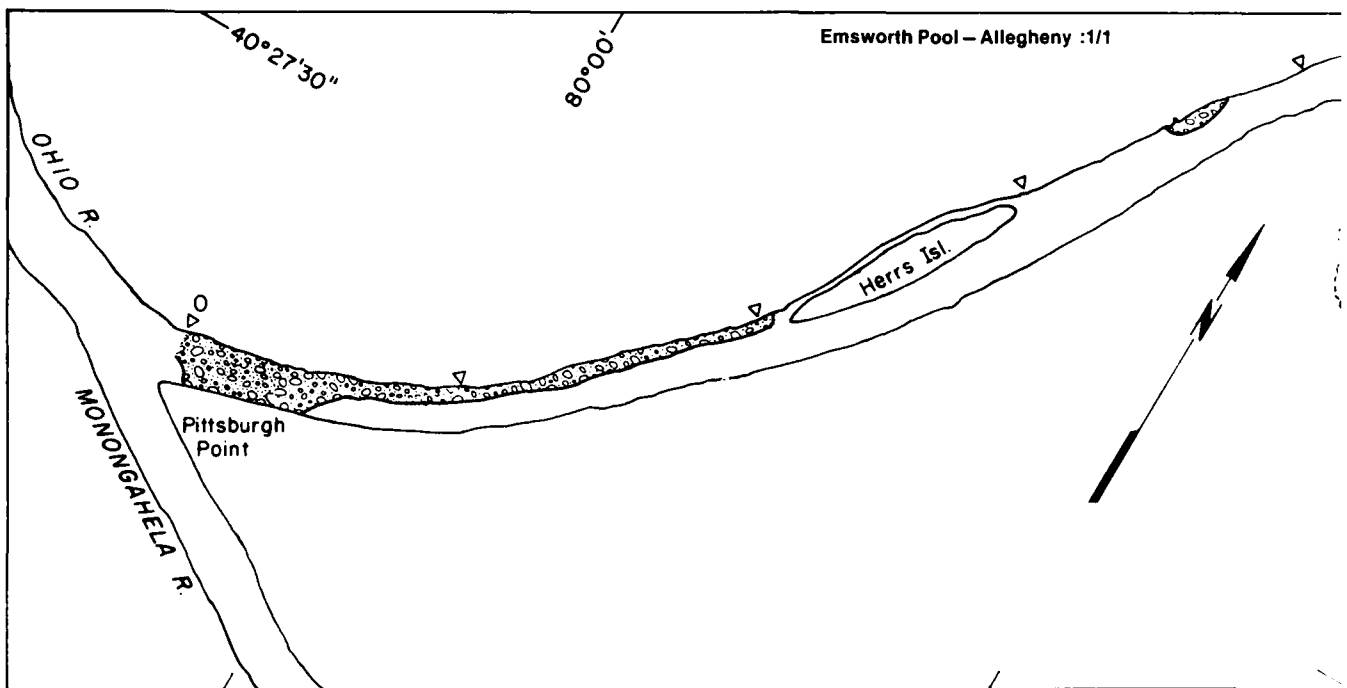
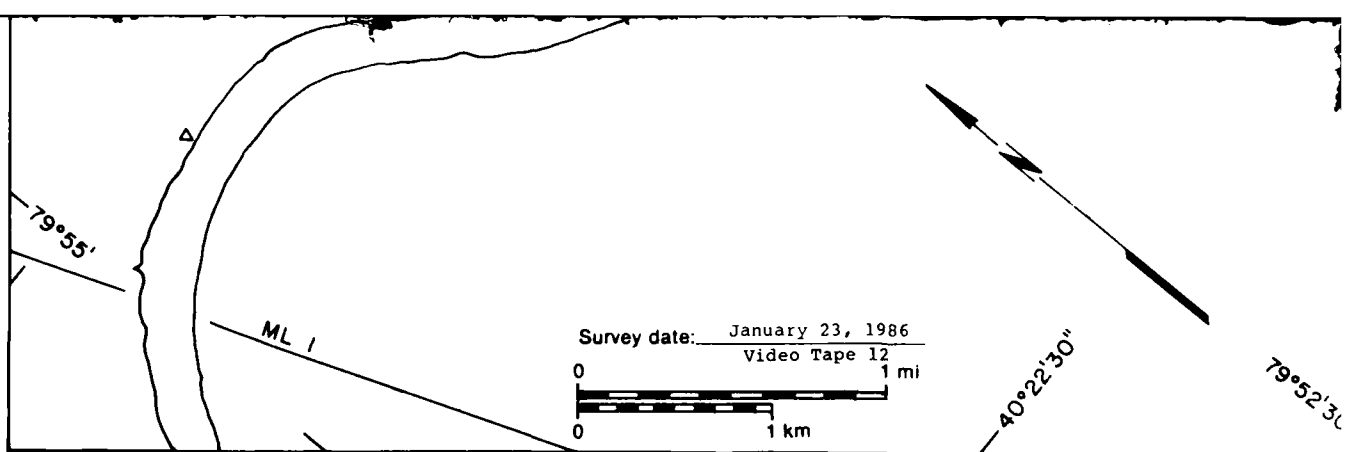
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Emsworth Pool - Monongahela

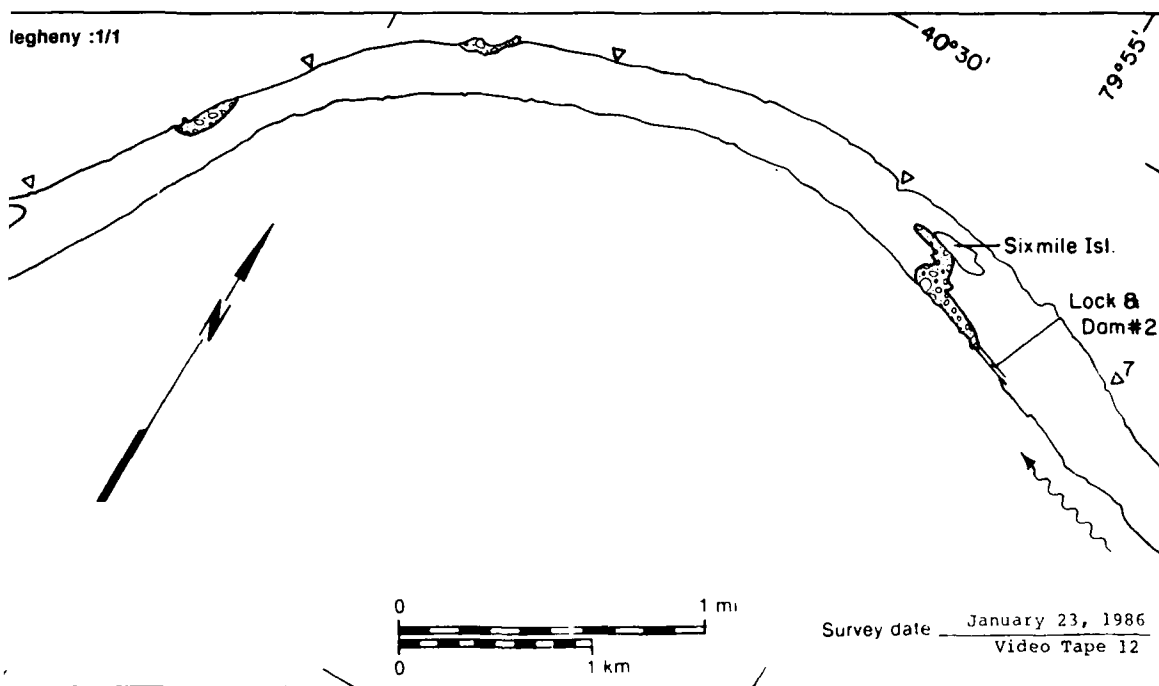
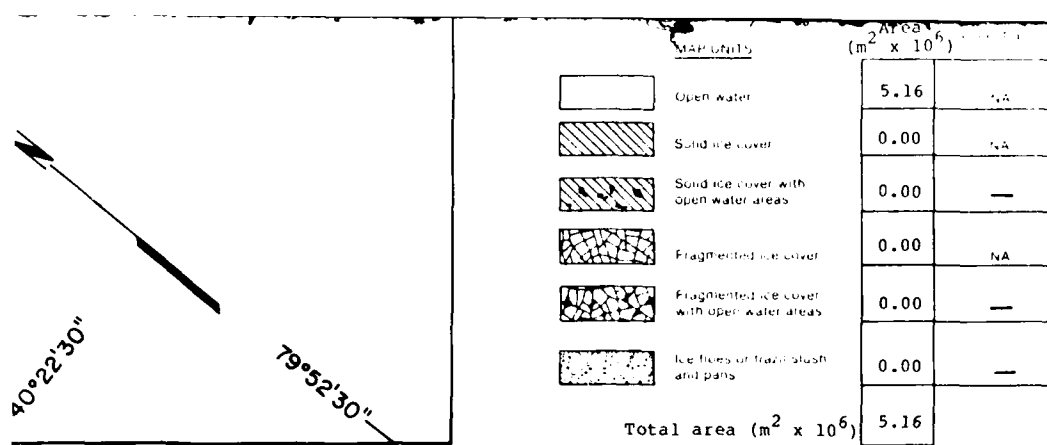
MAP SYMBOL	Area (m ² x 10 ⁶)	Surface concentration (g/m ³)
Open water	5.16	NA
Solid ice cover	0.00	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open water areas	0.00	—
Ice lines or frazil slush and pans	0.00	—
Total area (m ² x 10 ⁶)	5.16	



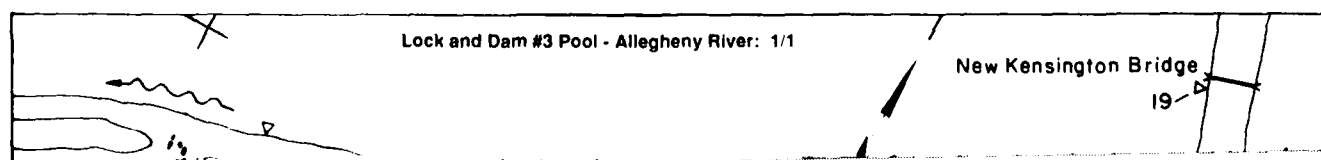
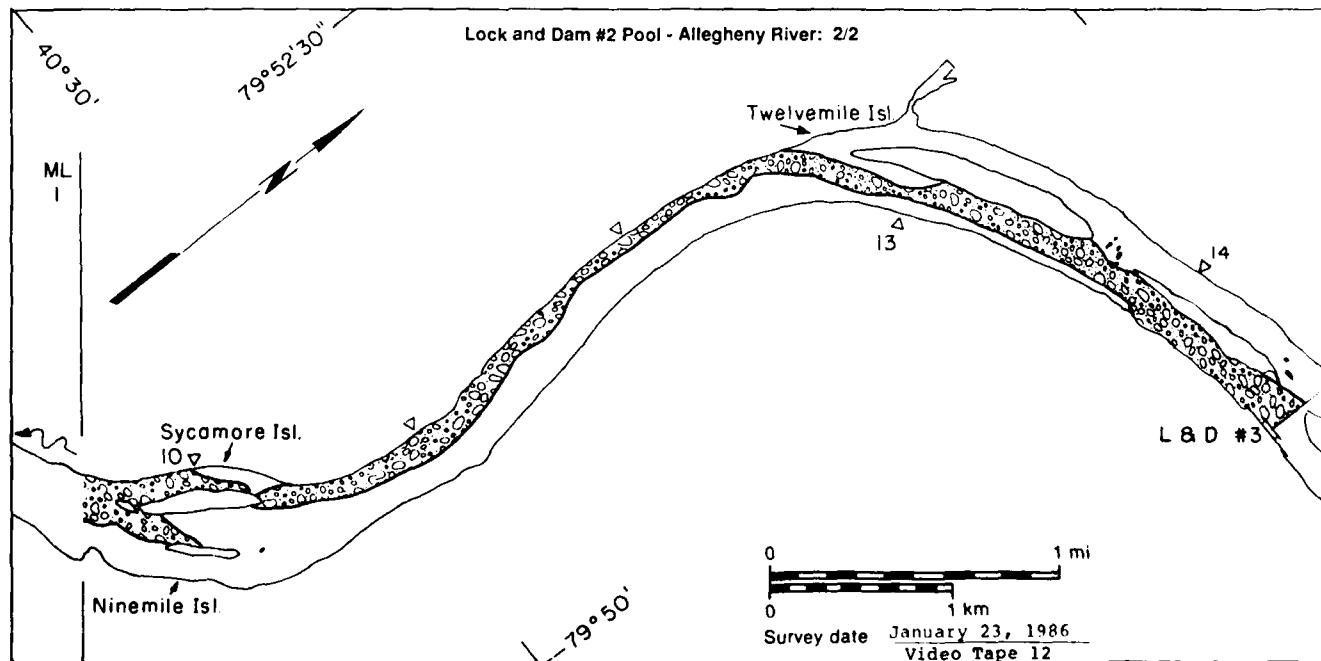
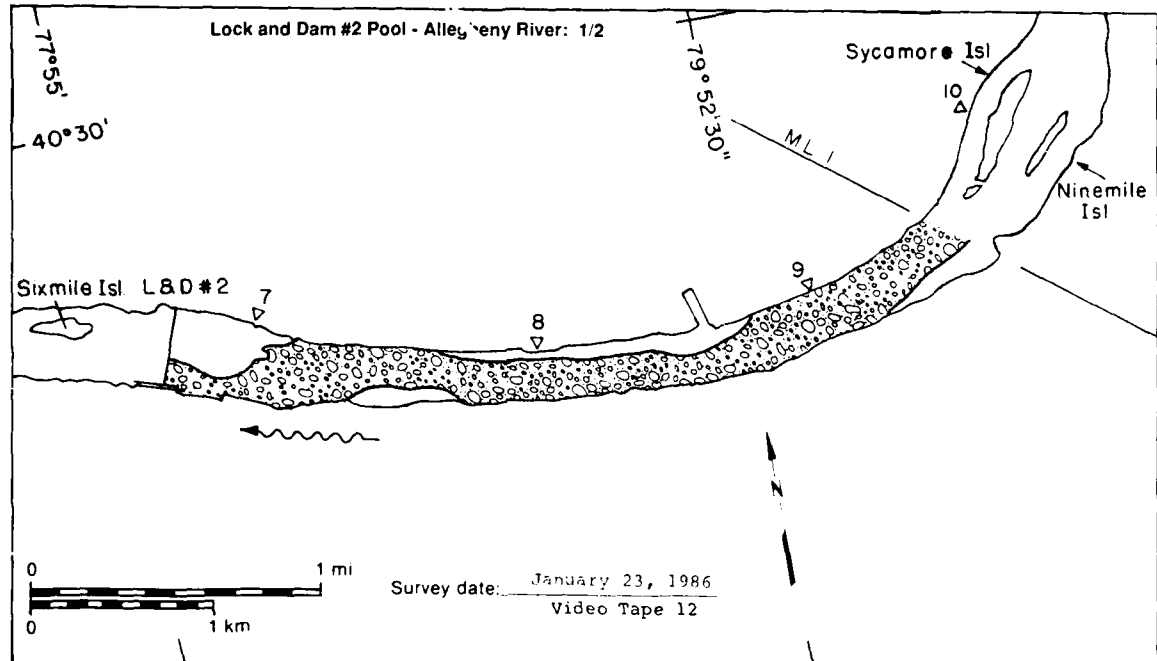


◇ Emsworth Pool - Allegheny

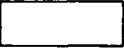





MAP UNITS	Area (m ² x 10 ⁶)	Surface concentration (%)
Open water	2.54	NA
Solid ice cover	0.00	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open water areas	0.00	—
Ice floes or frazil slush and pans	0.53	5
Total area (m ² x 10 ⁶)	3.07	




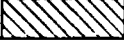
23 January 1986

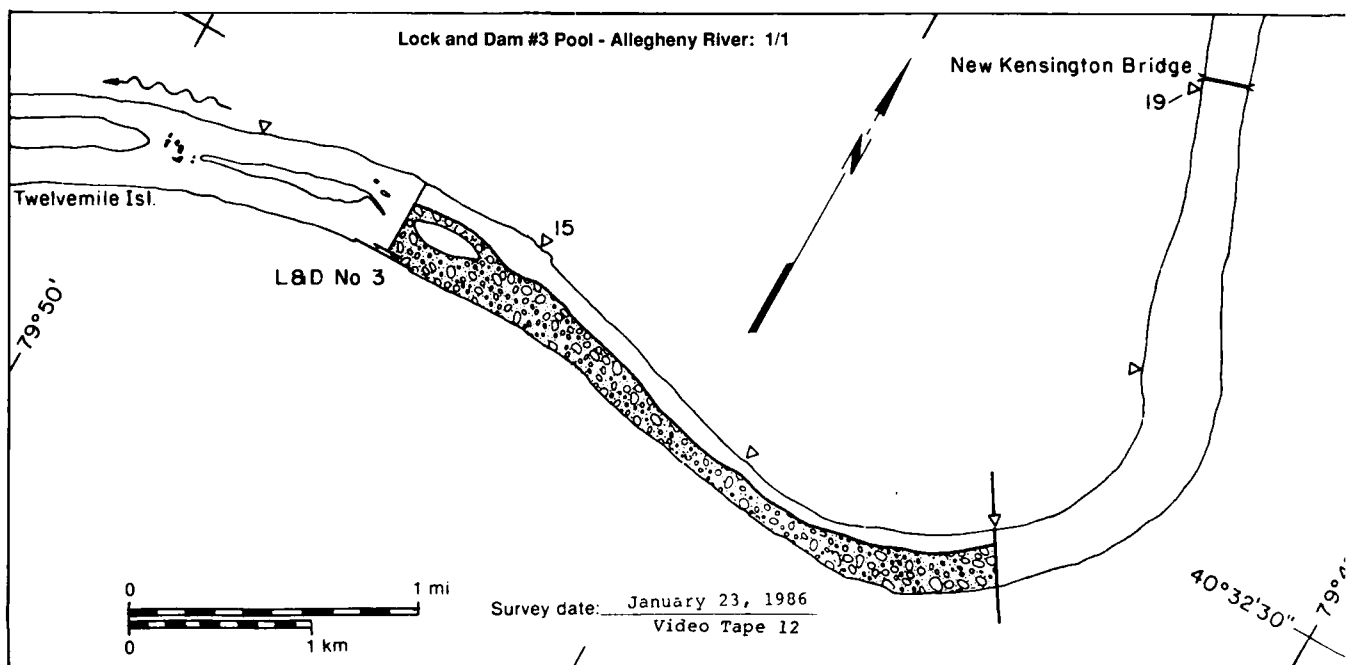
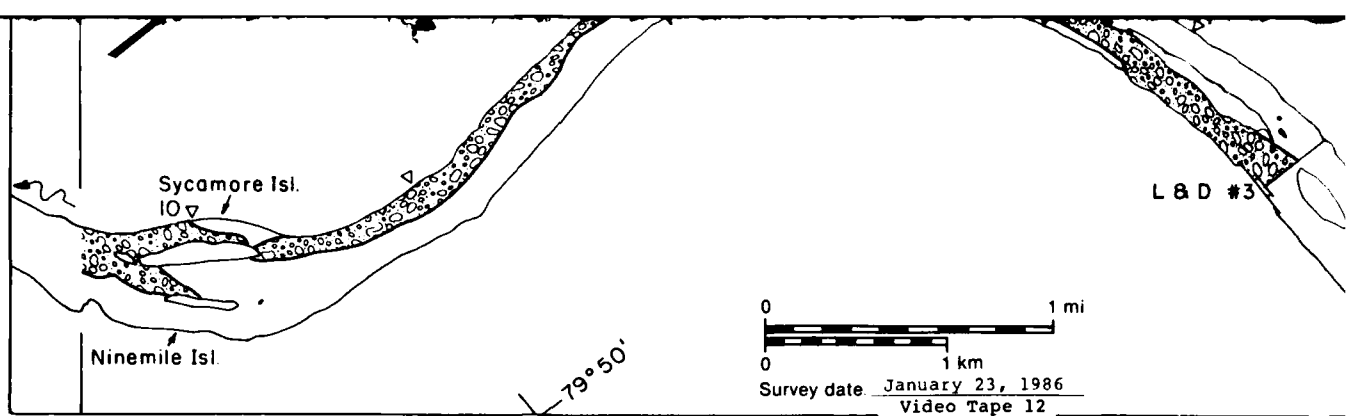


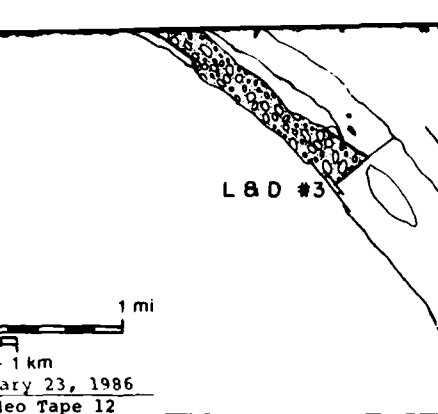
Lock and Dam #2 Pool

MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	1.99	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	2.03	5
Total area ($m^2 \times 10^6$)		4.02	

Lock and Dam #3 Pool

MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	0.41	NA
	Solid ice cover	0.00	NA

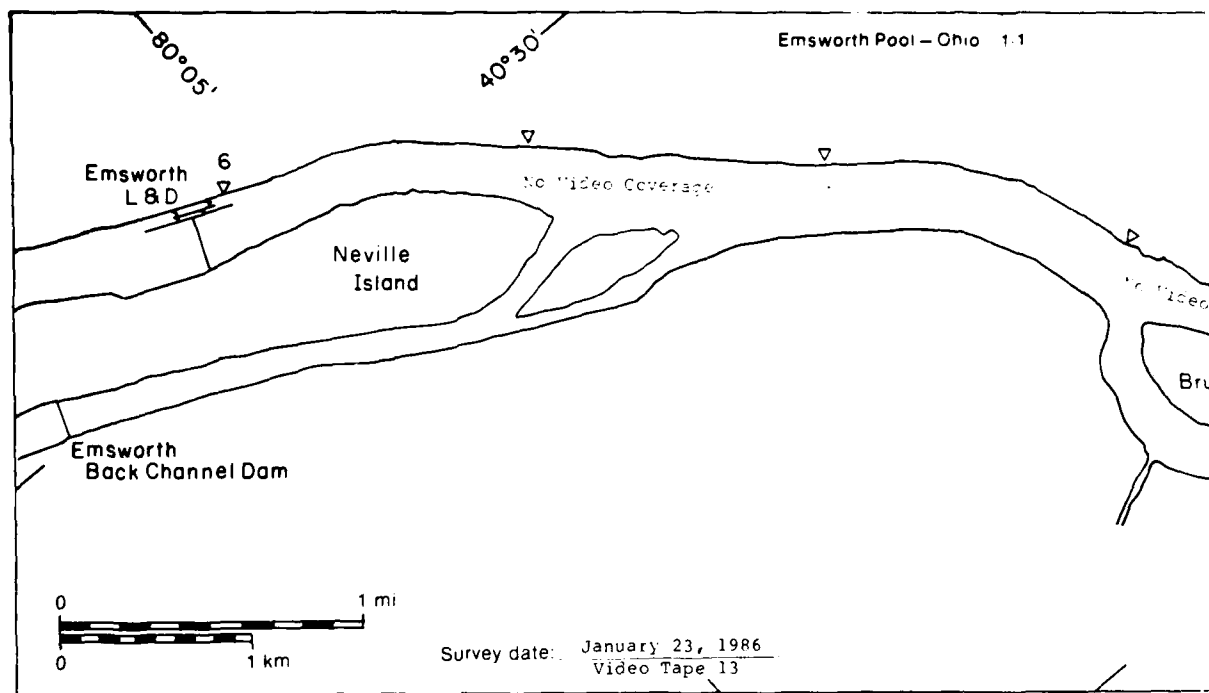




	Solid ice cover with open-water areas	0.00	NA
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	2.03	5
Total area ($m^2 \times 10^6$)		4.02	

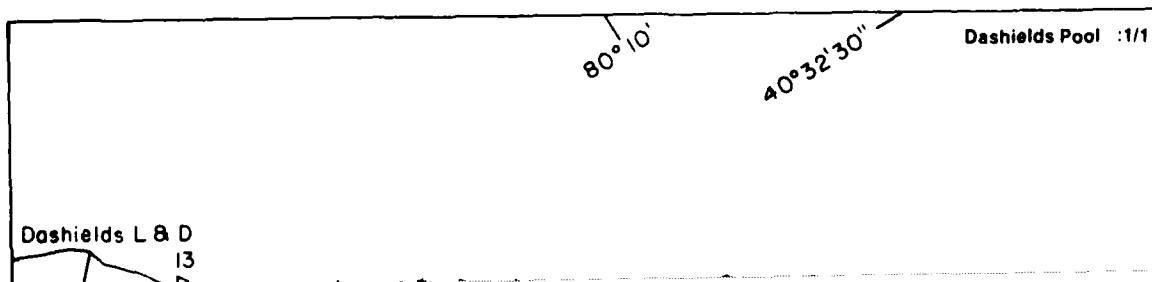


Lock and Dam #3 Pool		Area ($m^2 \times 10^6$)	Surface concentration (%)
MAP UNITS			
	Open water	0.41	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.73	5
Total area ($m^2 \times 10^6$)		1.14	

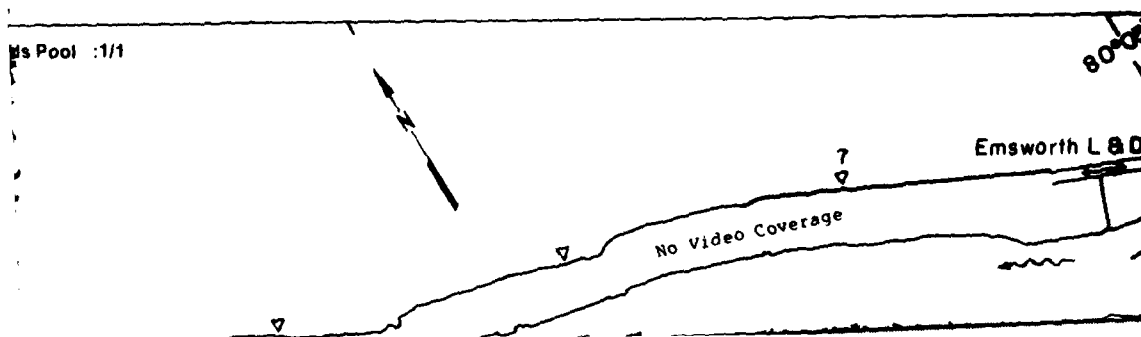
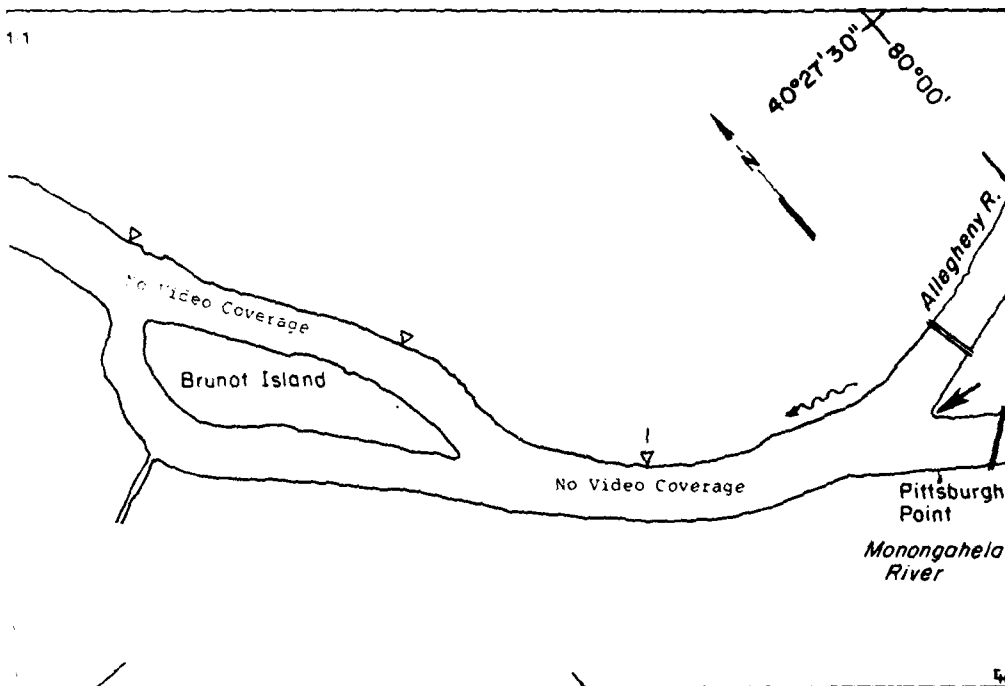


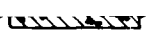



Emsworth Pool - Ohio

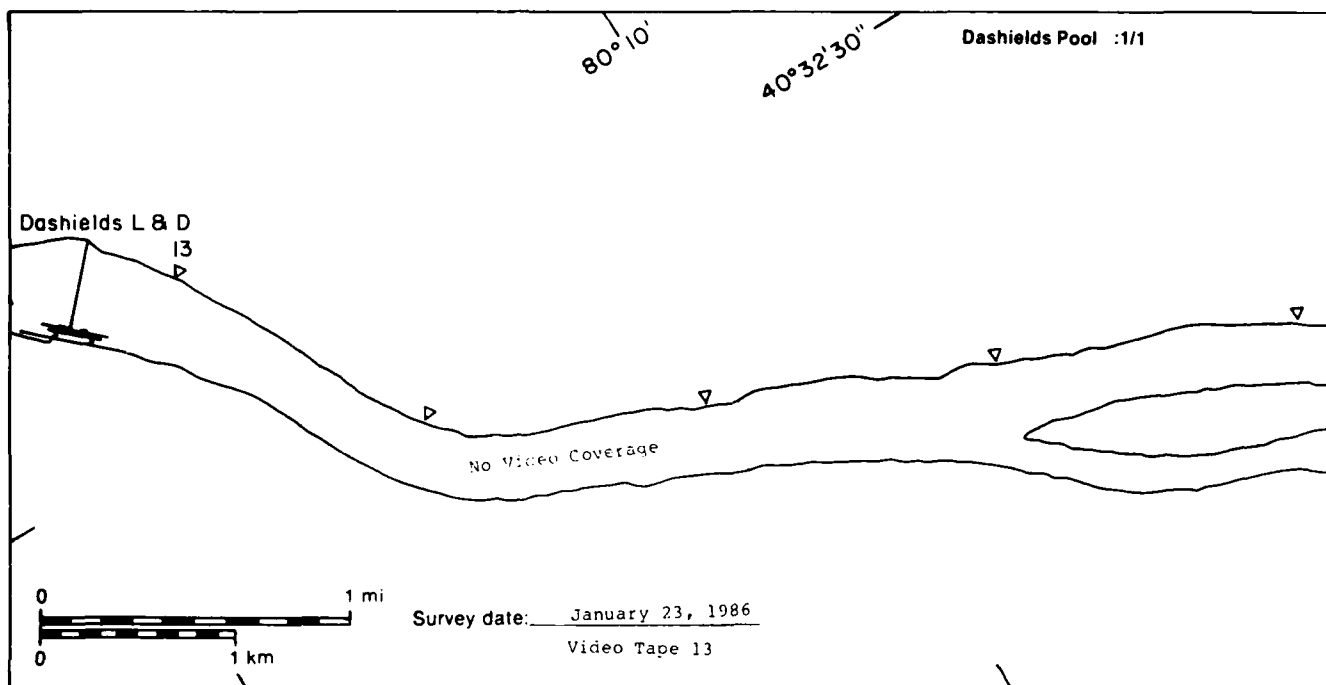
MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	0.00	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		4.49*	* Includes $4.49 \times 10^6 m^2$ of no video coverage

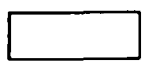


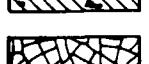
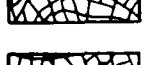



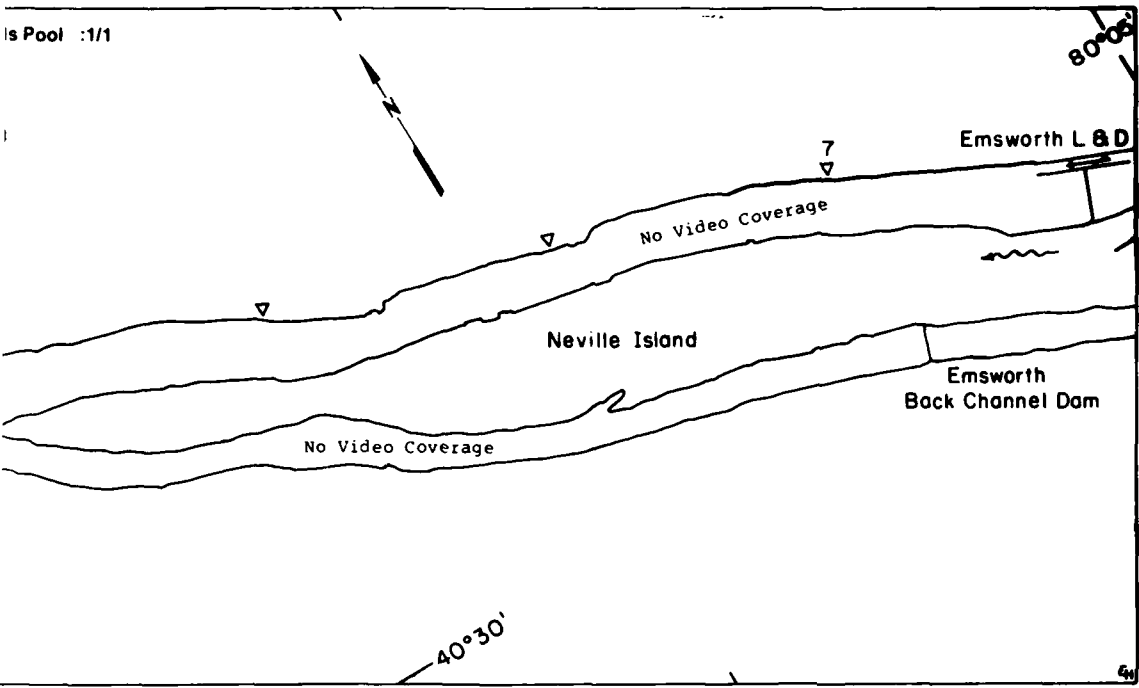
23 January 1986



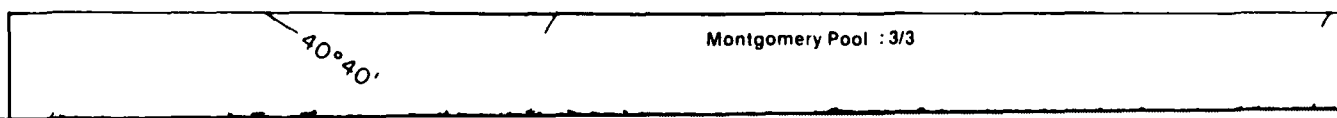
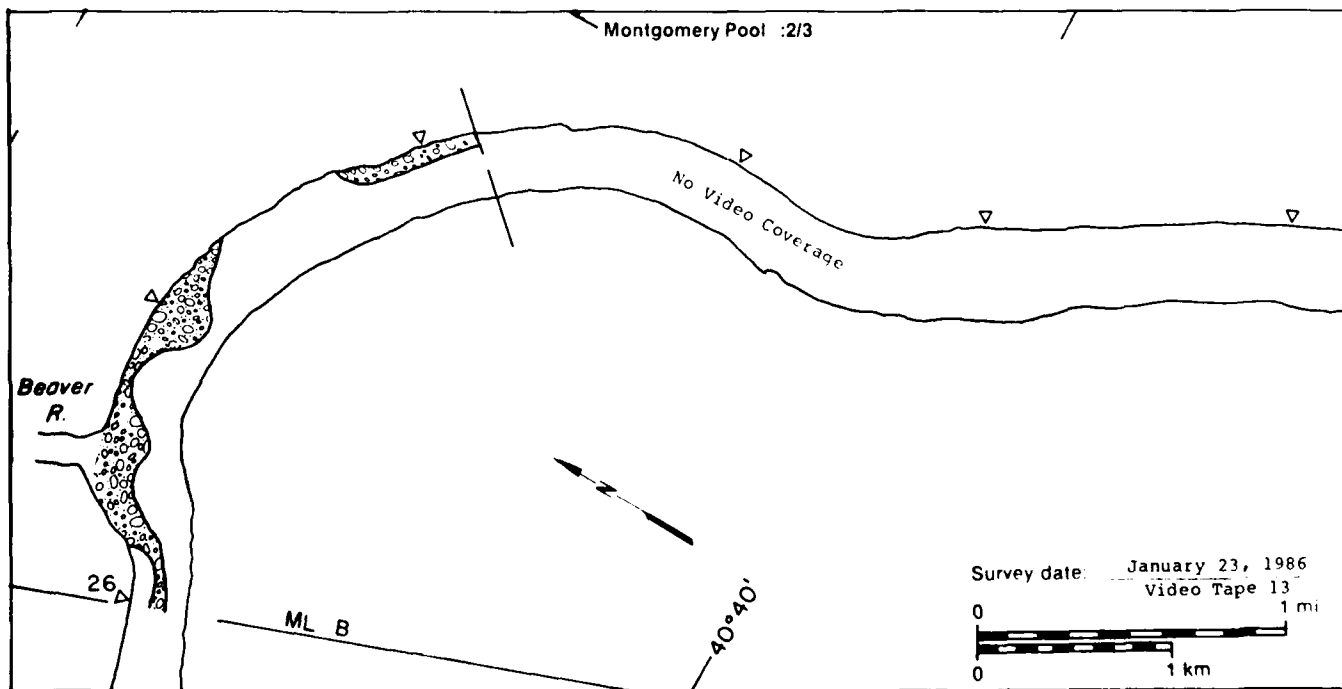
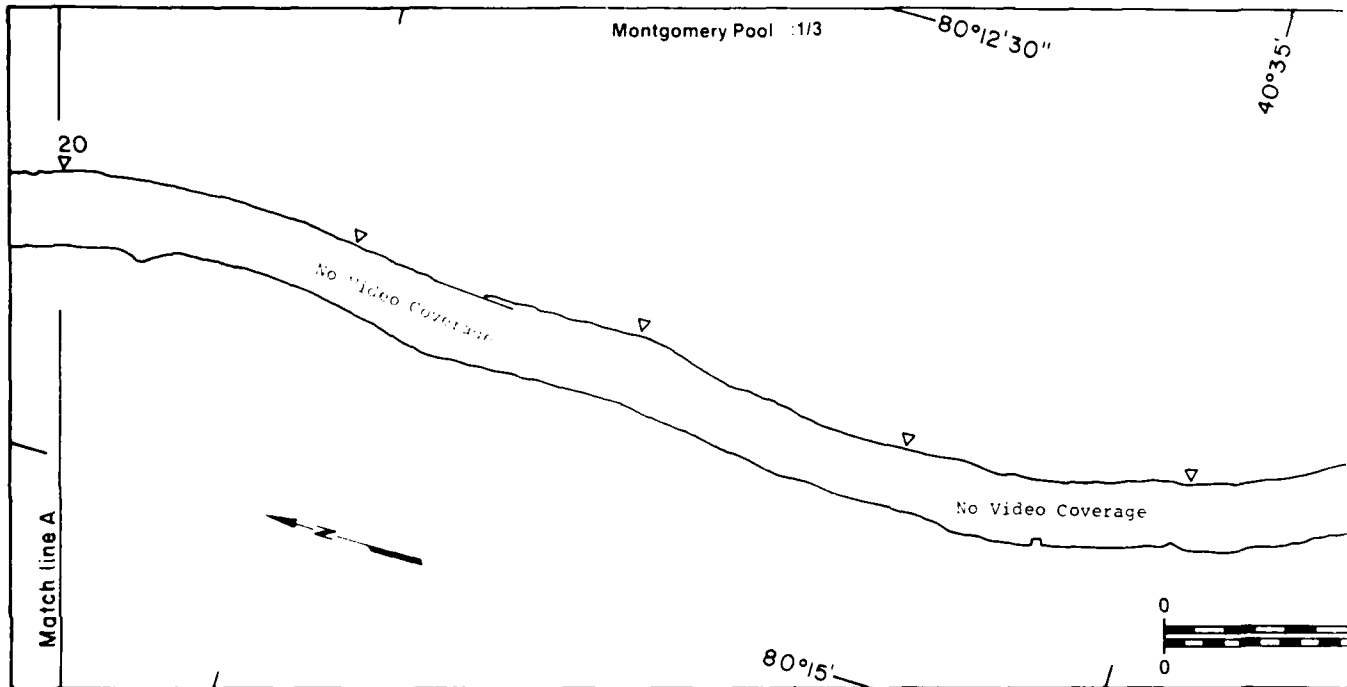
	Open water areas	0.00	NA
	Fragmented ice cover	0.00	—
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		4.49*	* Includes $4.49 \times 10^6 m^2$ of no video coverage

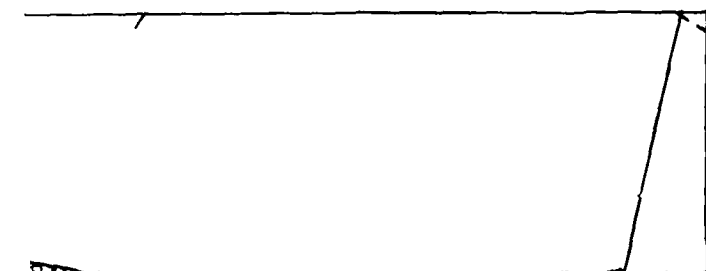
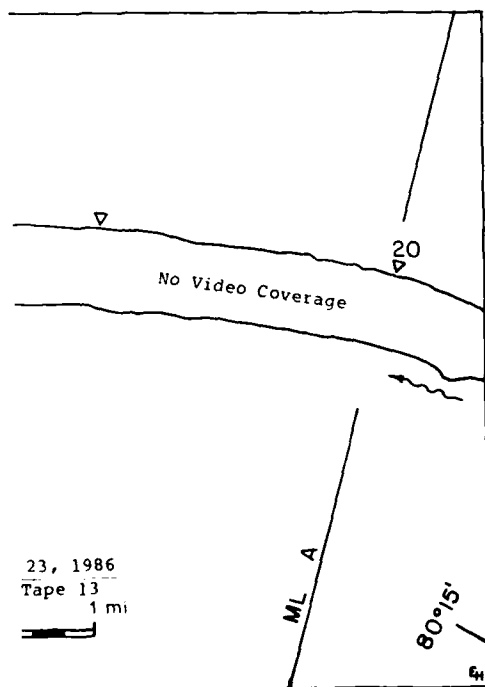
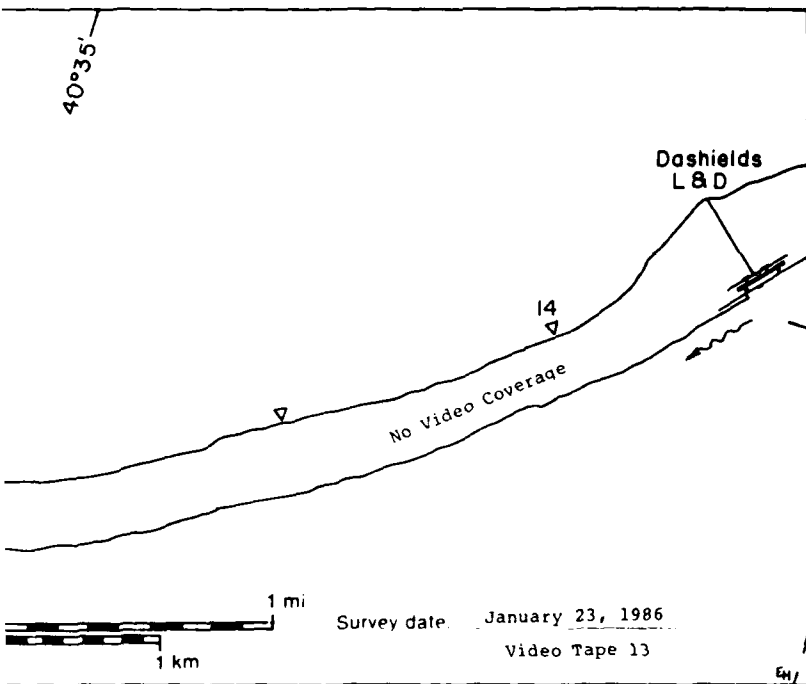


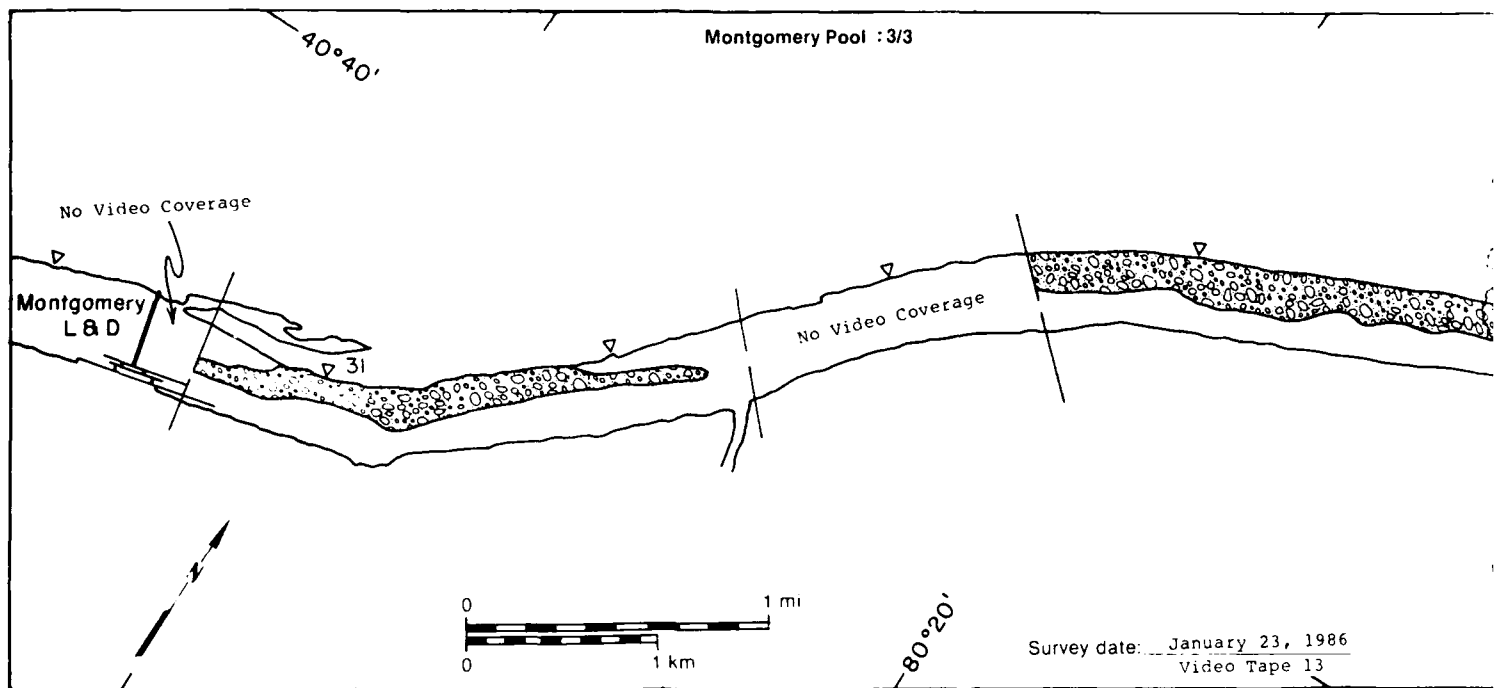
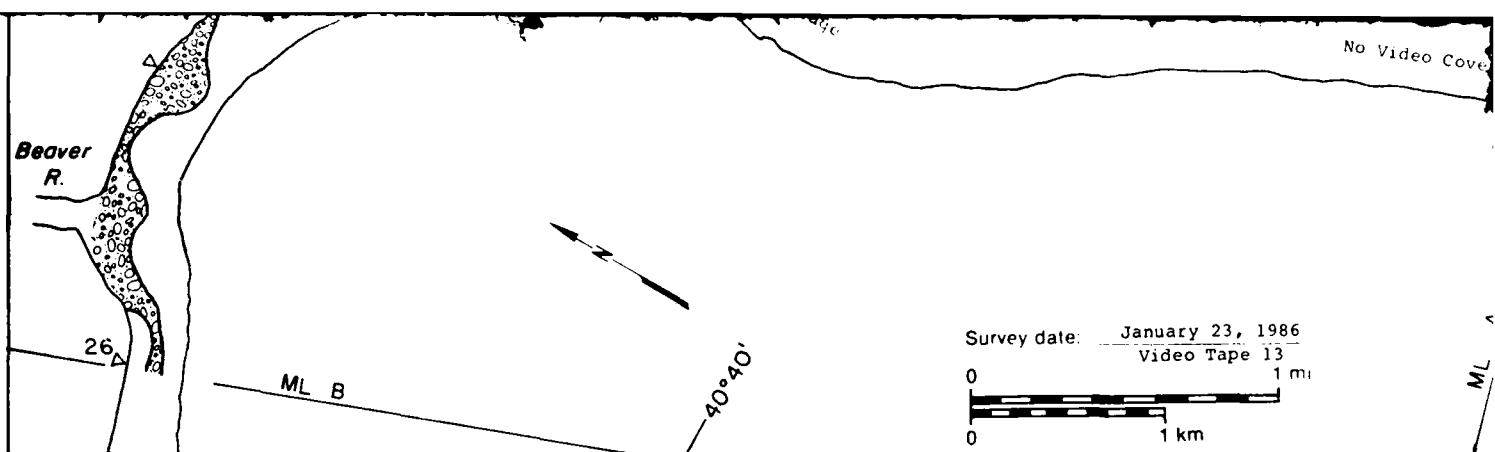
Dashiels Pool		Surface concentration	
MAP UNITS		Area ($m^2 \times 10^6$)	(%)
	Open water	0.00	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		5.00*	* Includes $5.00 \times 10^6 m^2$ of no video coverage



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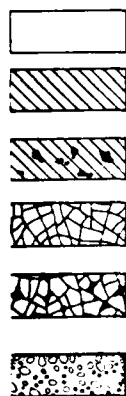






Montgomery Pool

MAP UNITS



Open water

Solid ice cover

Solid ice cover with open-water areas

Fragmented ice cover

Fragmented ice cover with open-water areas

Ice floes or frazil slush and pans

Area
($m^2 \times 10^6$)

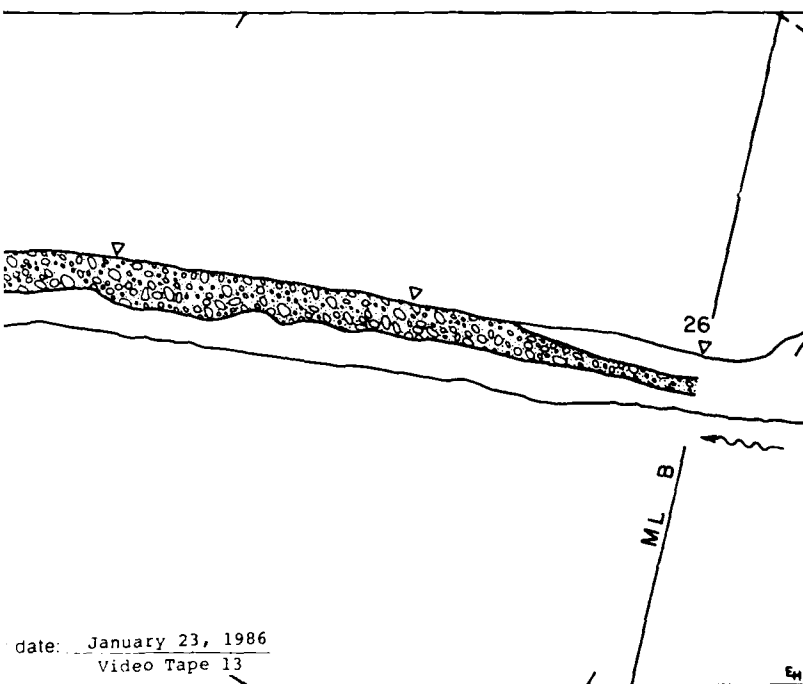
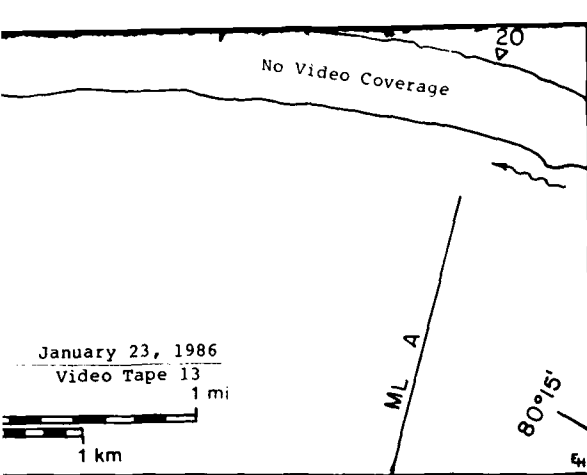
Surface
concentration
(%)

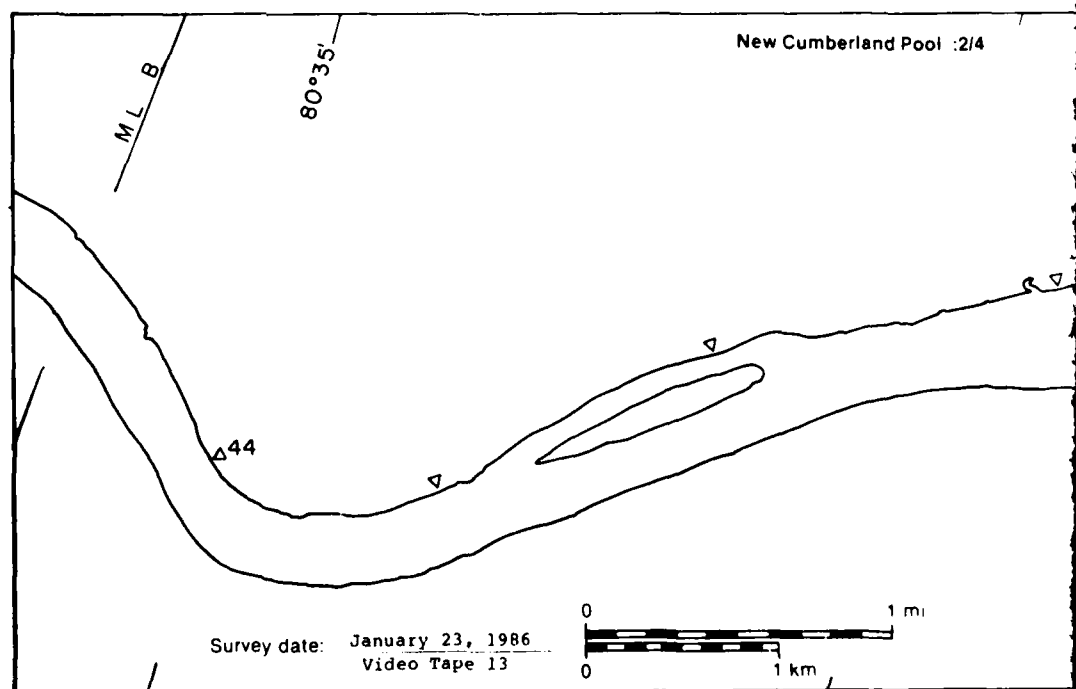
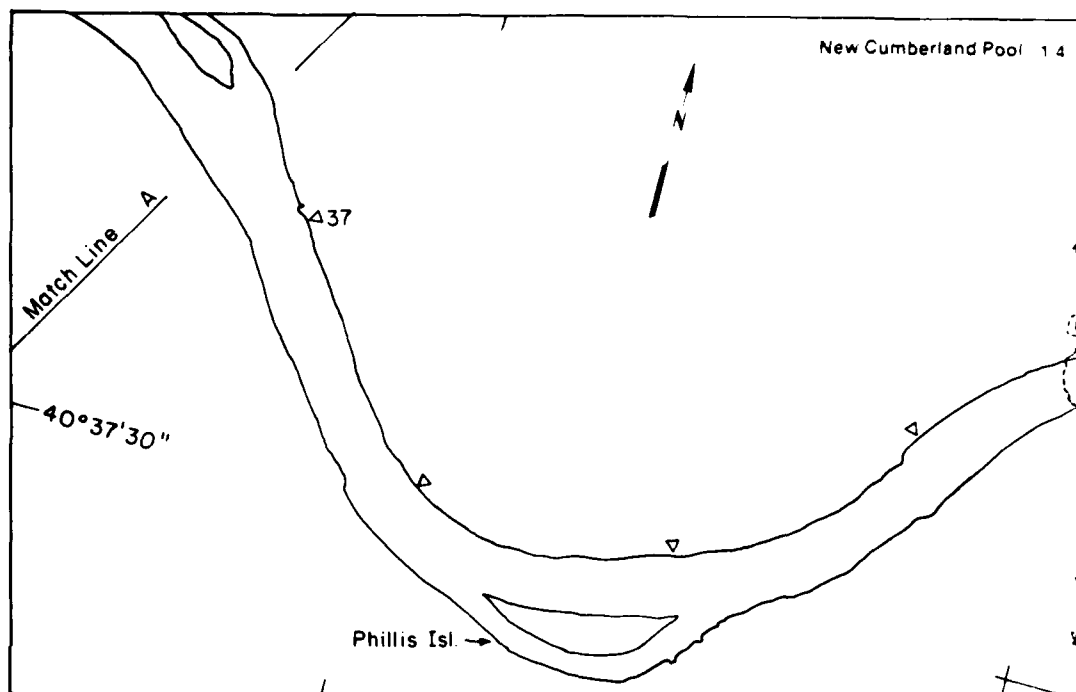
2.78	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
1.53	1

Total area ($m^2 \times 10^6$)

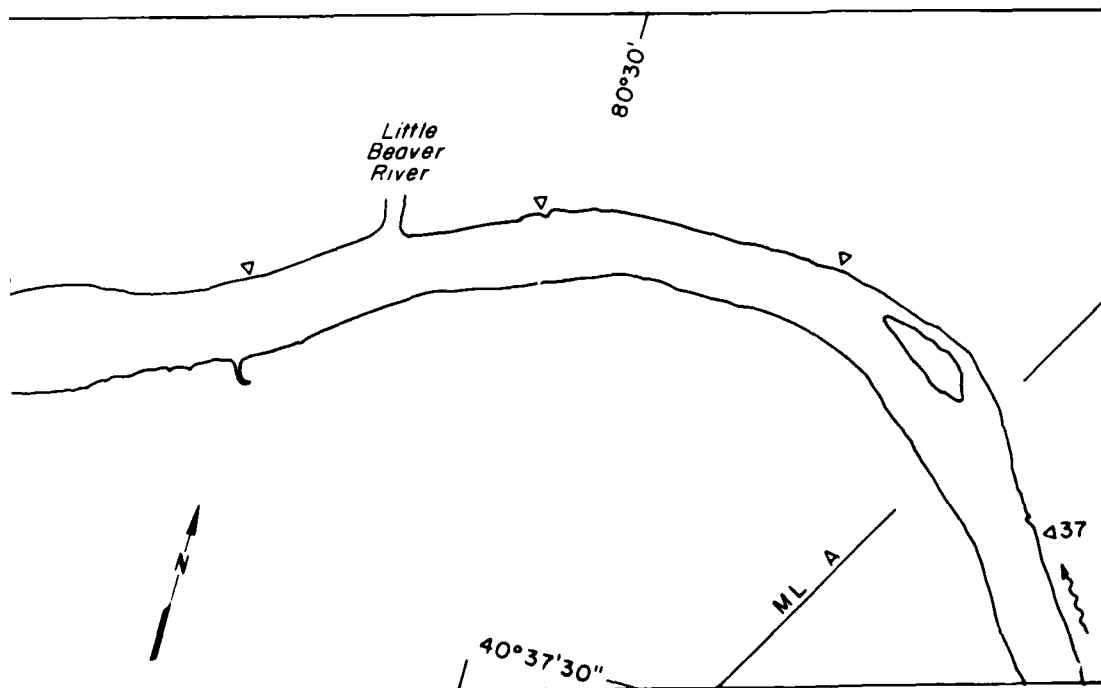
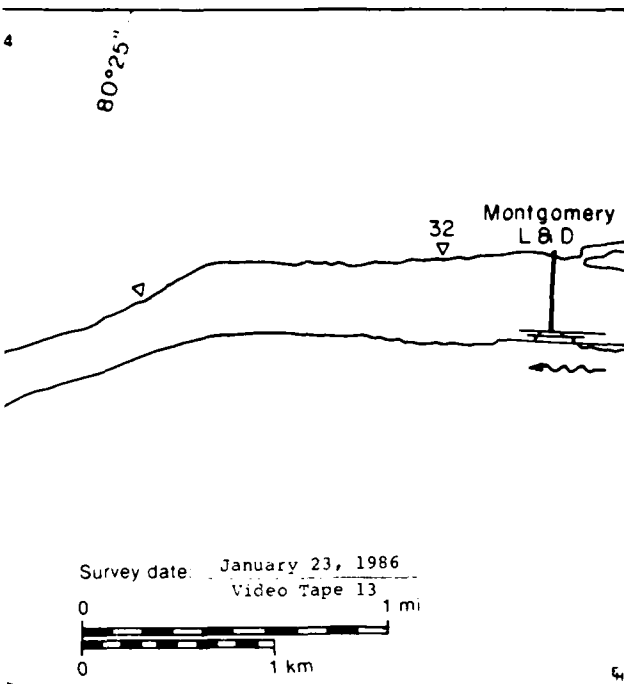
11.27*

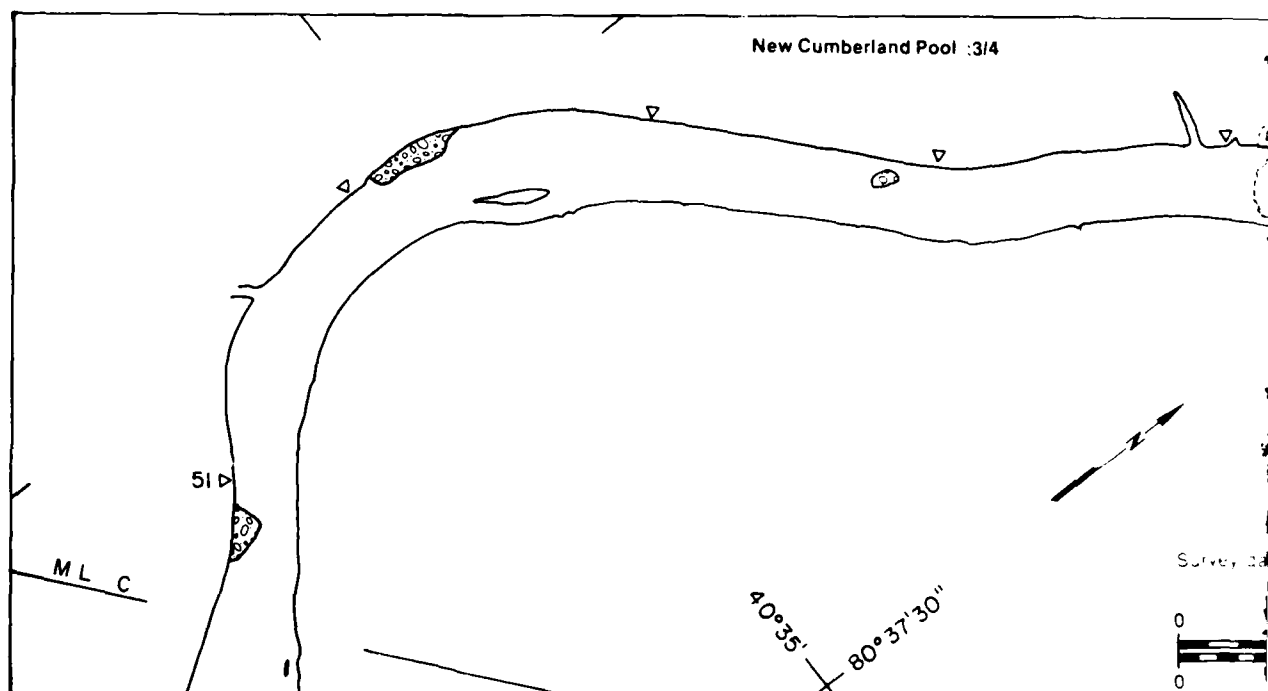
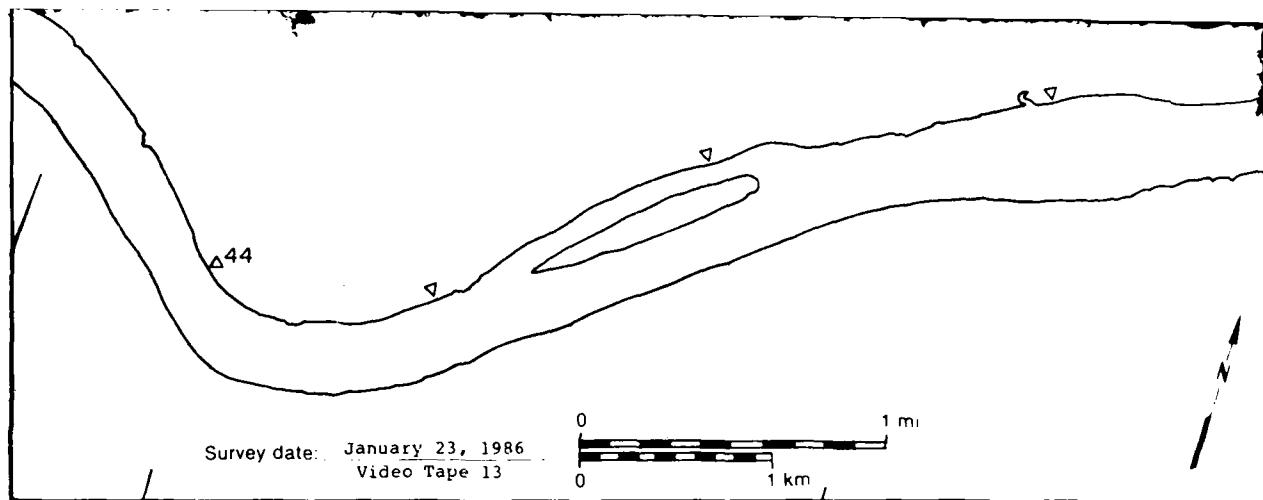
* Includes $6.96 \times 10^6 m^2$ of no video coverage

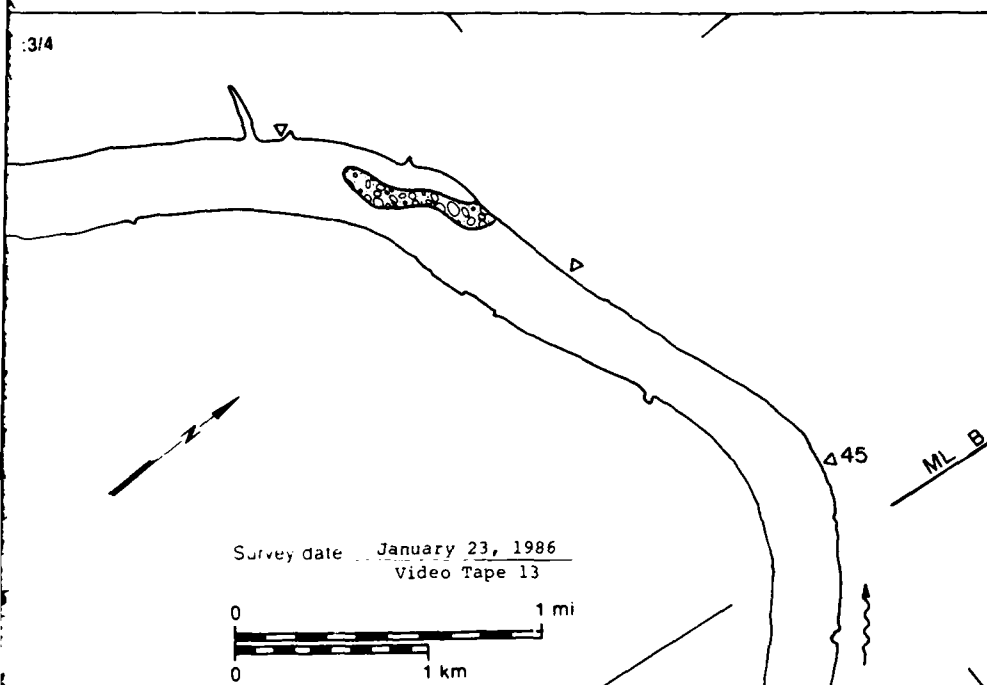
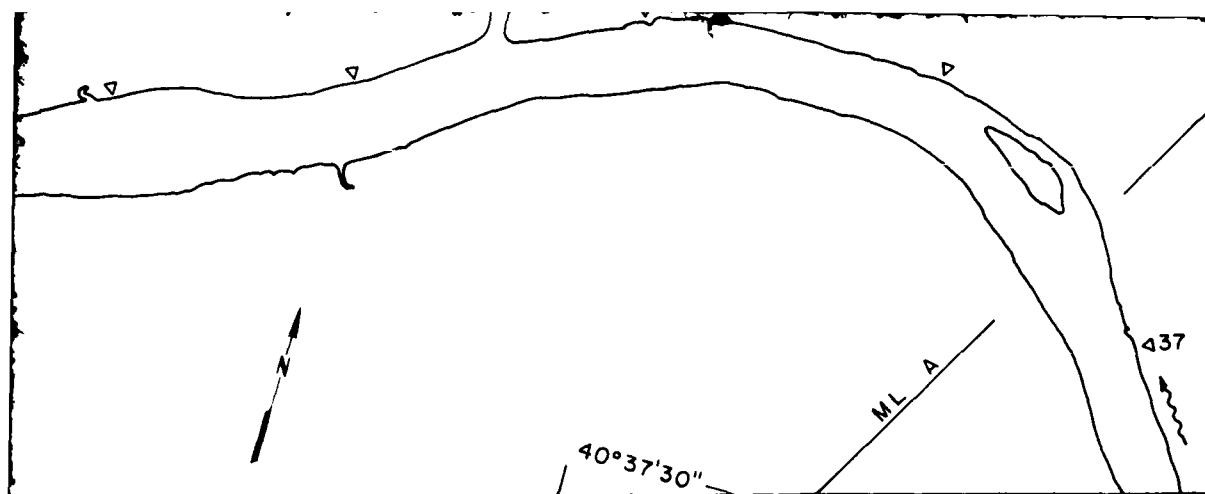




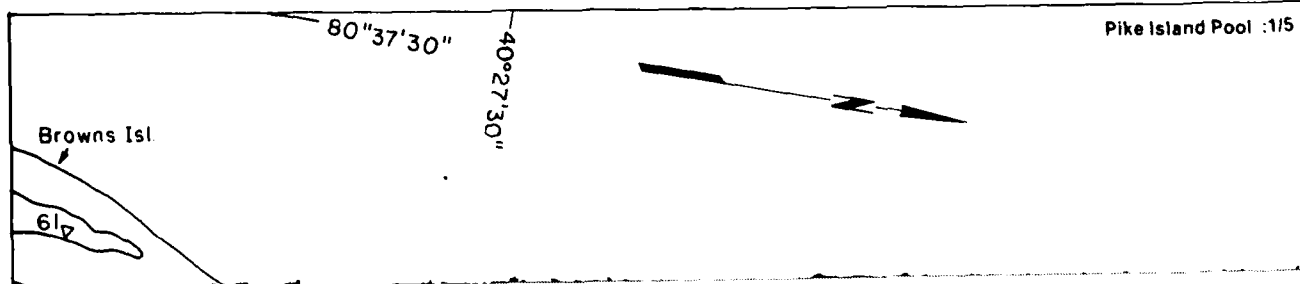
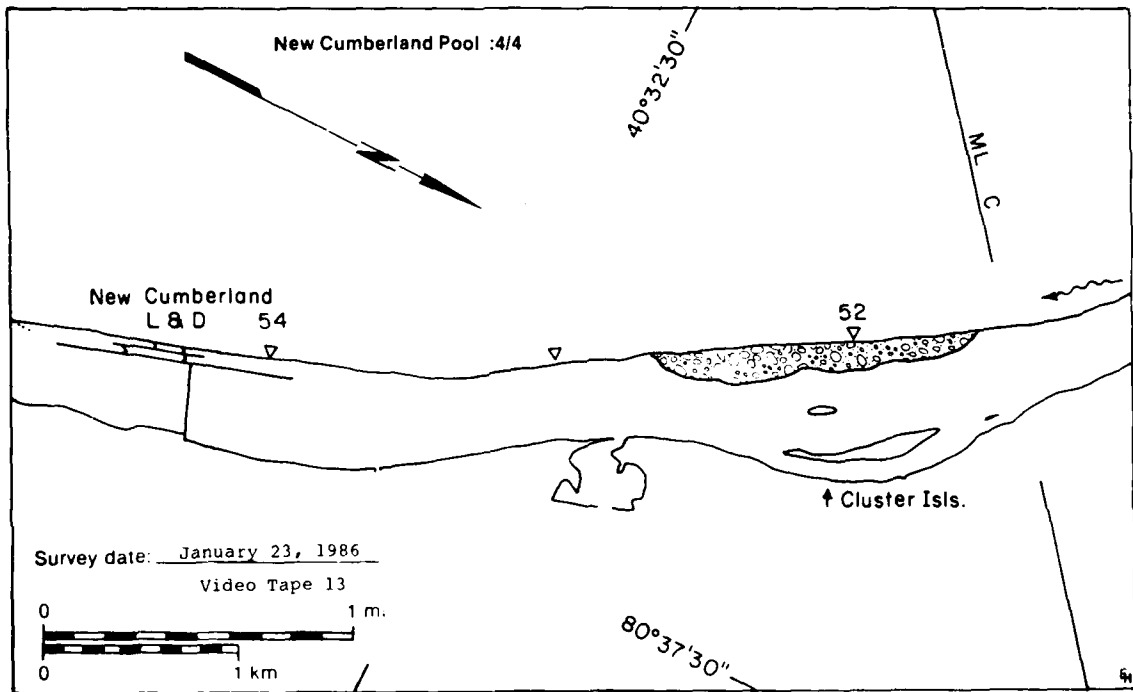
23 January 1986













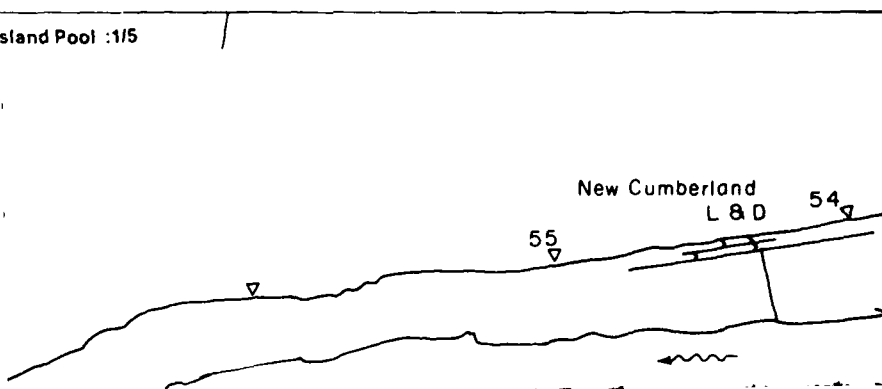
23 January 1986

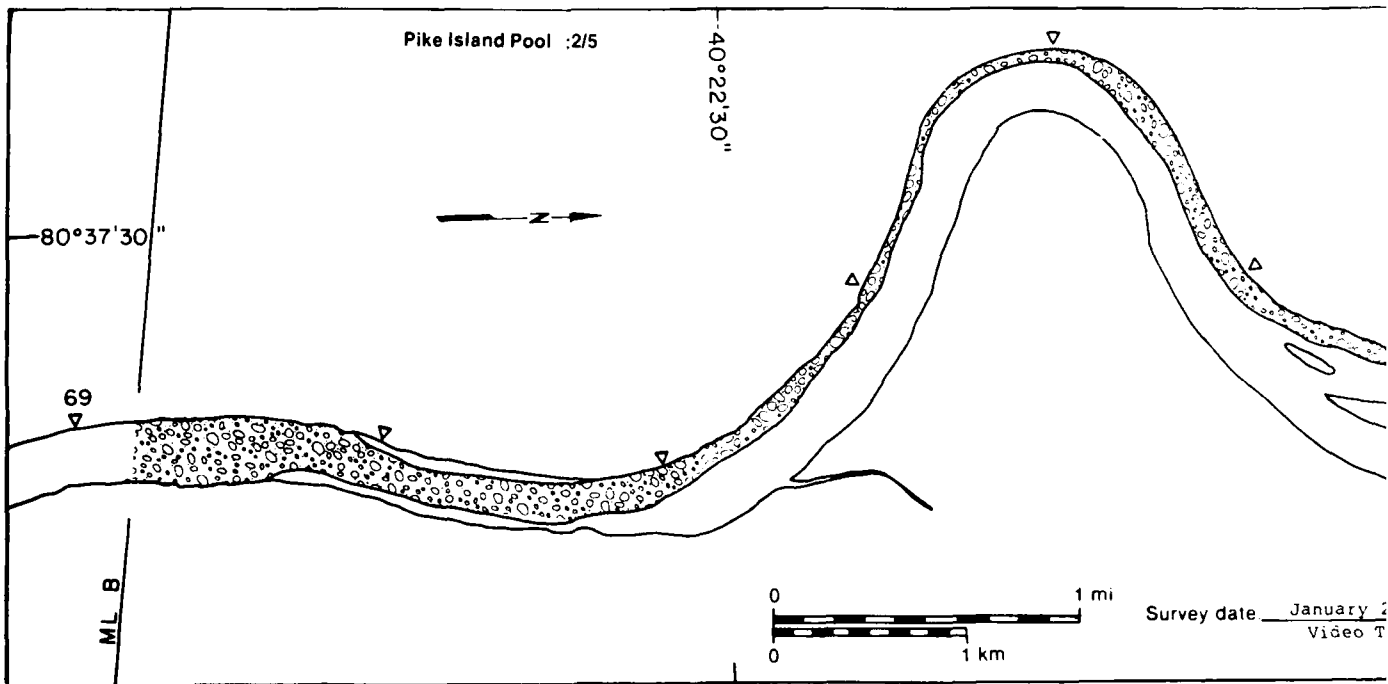
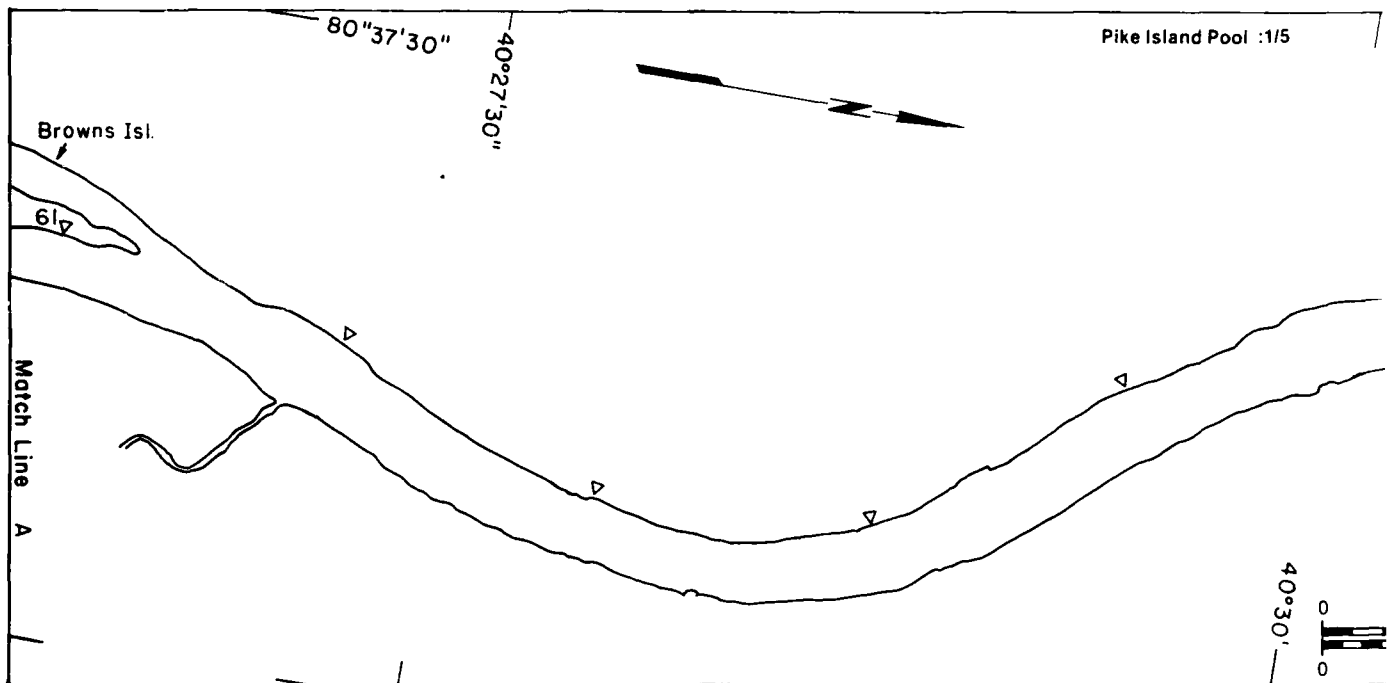


New Cumberland Pool

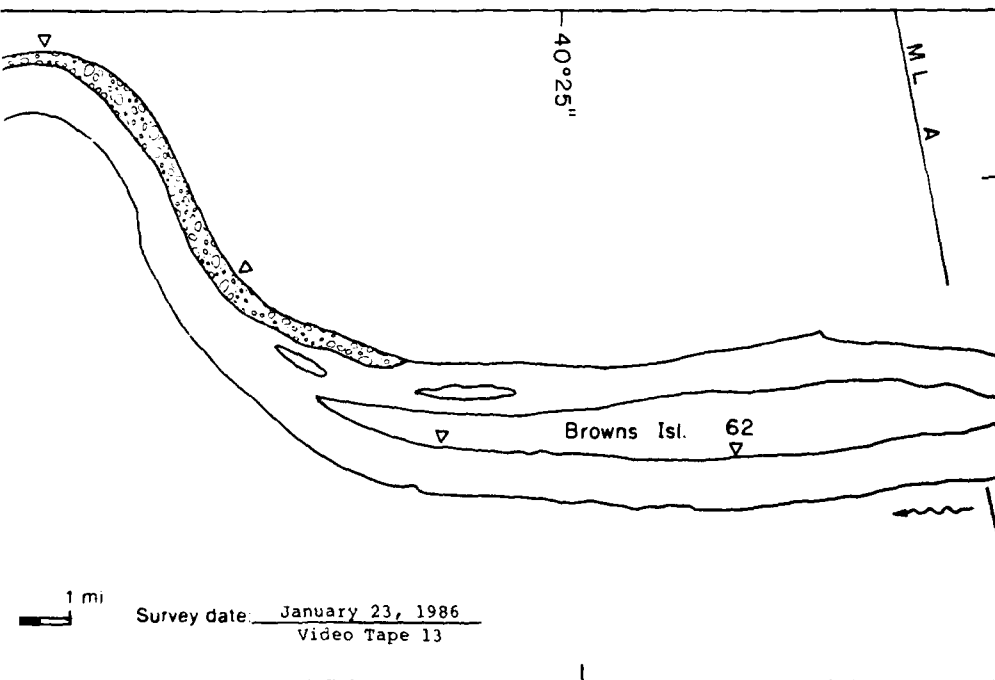
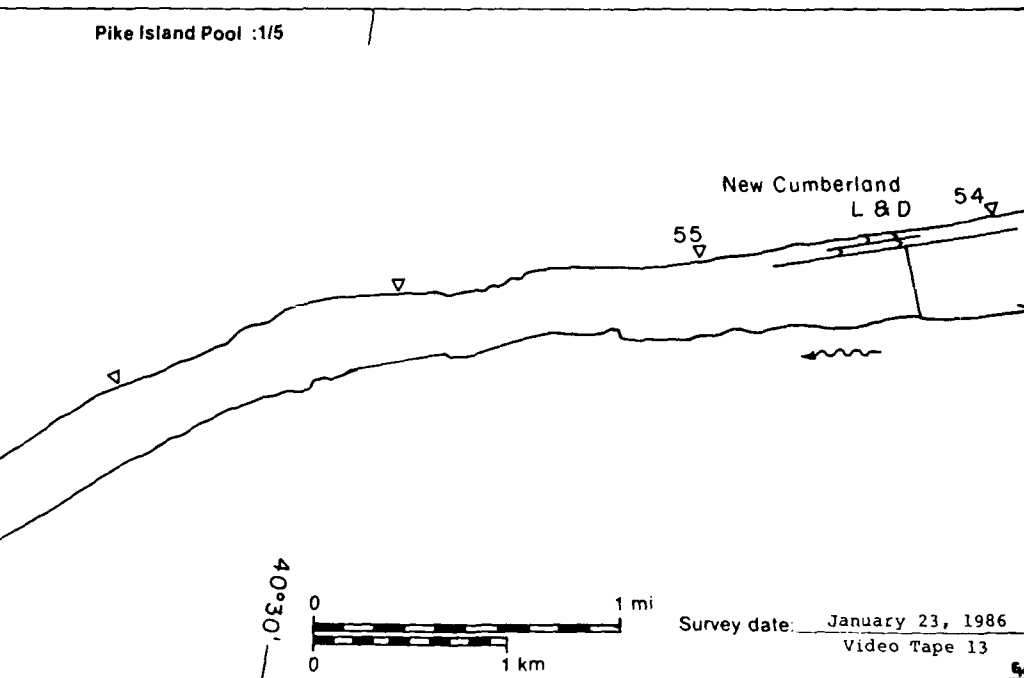
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
 Open water	14.44	NA
 Solid ice cover	0.00	NA
 Solid ice cover with open-water areas	0.00	—
 Fragmented ice cover	0.00	NA
 Fragmented ice cover with open-water areas	0.00	—
 Ice floes or frazil slush and pans	0.43	1
Total area ($m^2 \times 10^6$)	14.87	

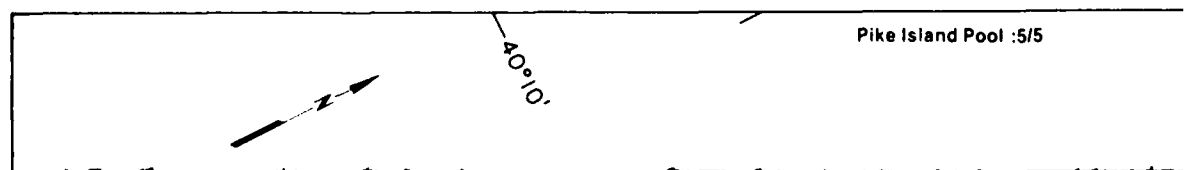
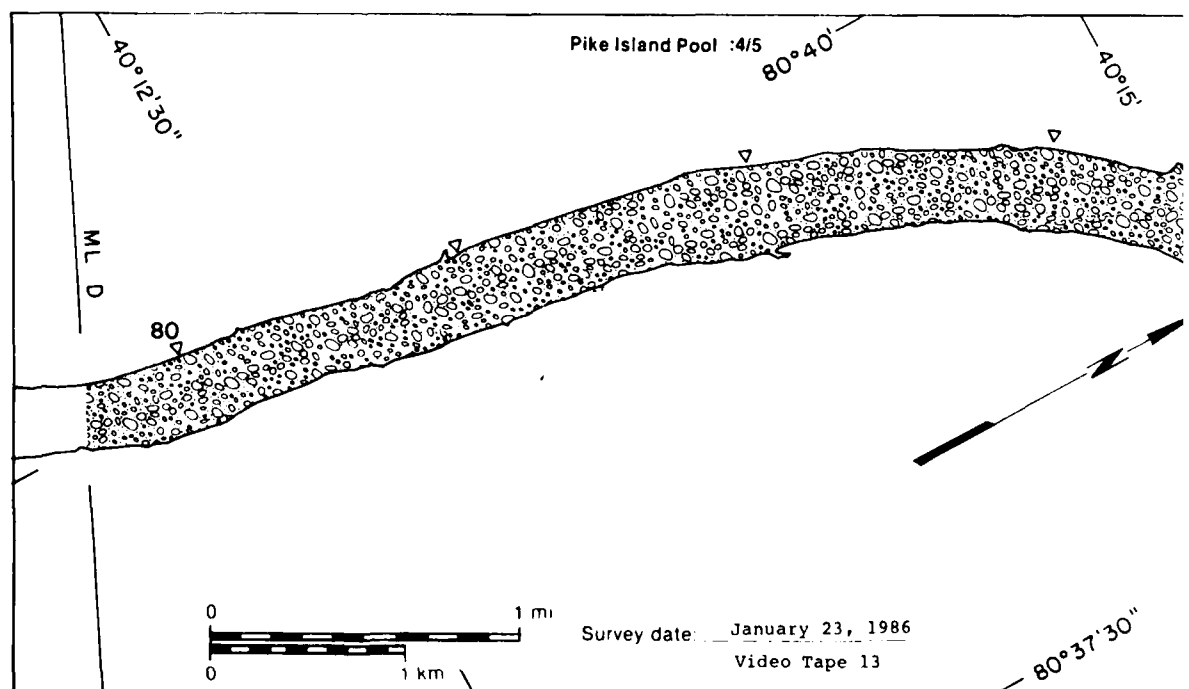
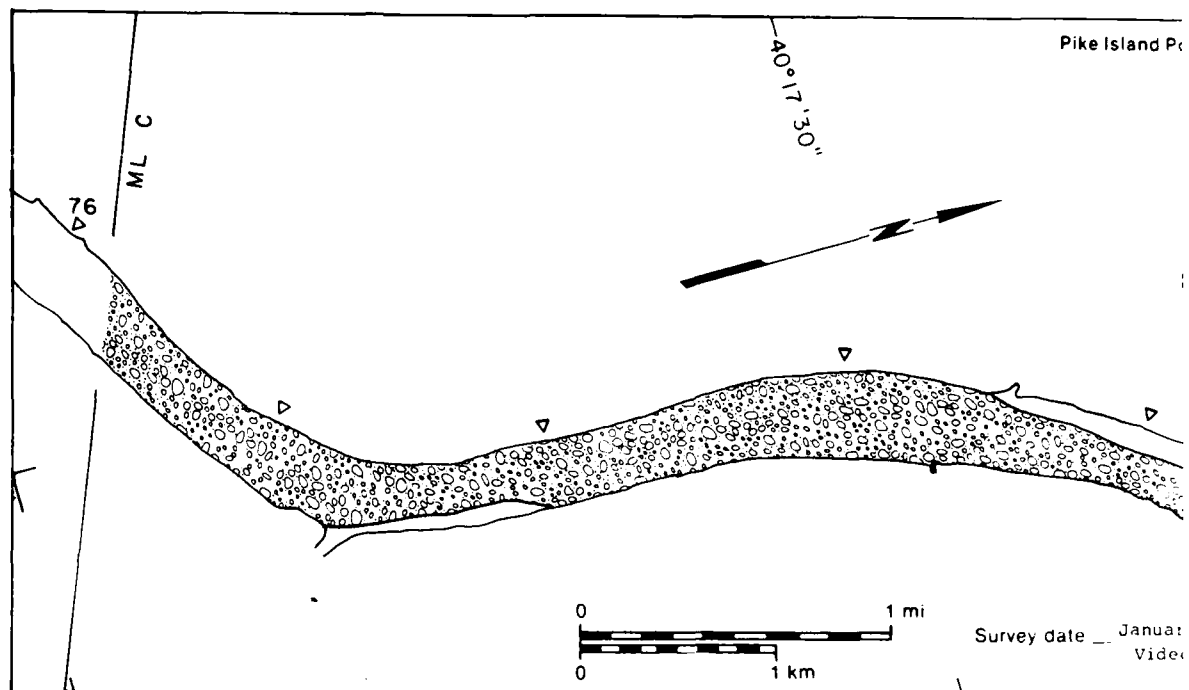
sland Pool :1/5



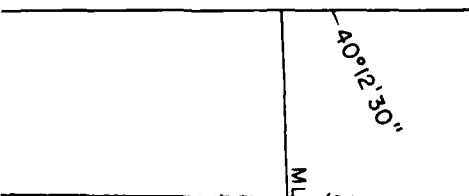
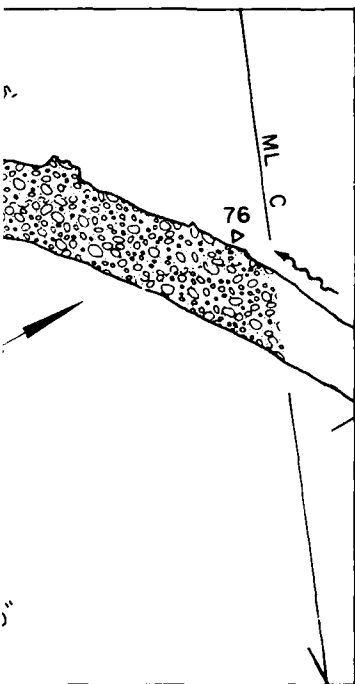
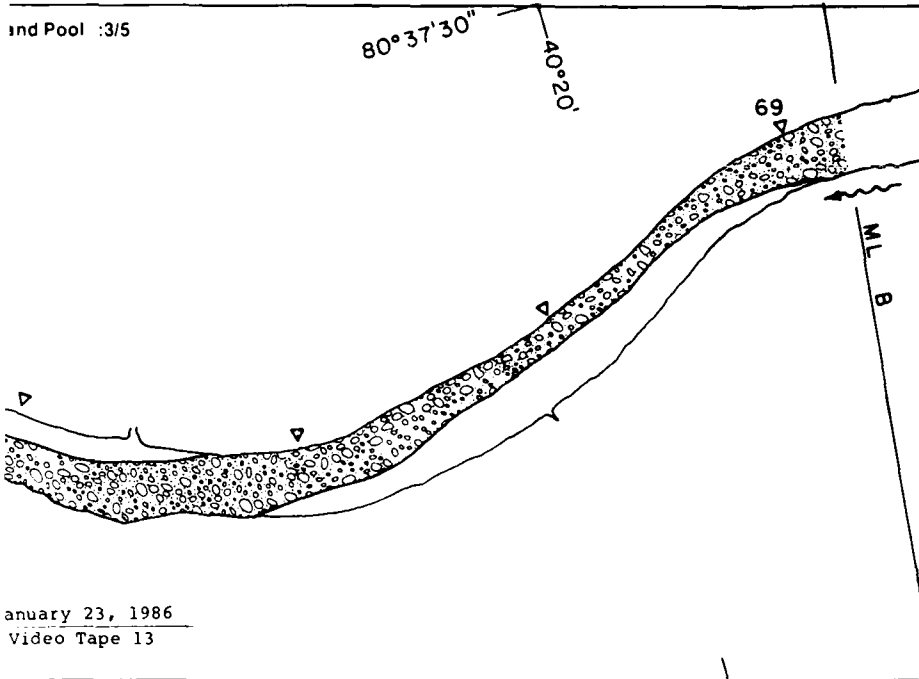


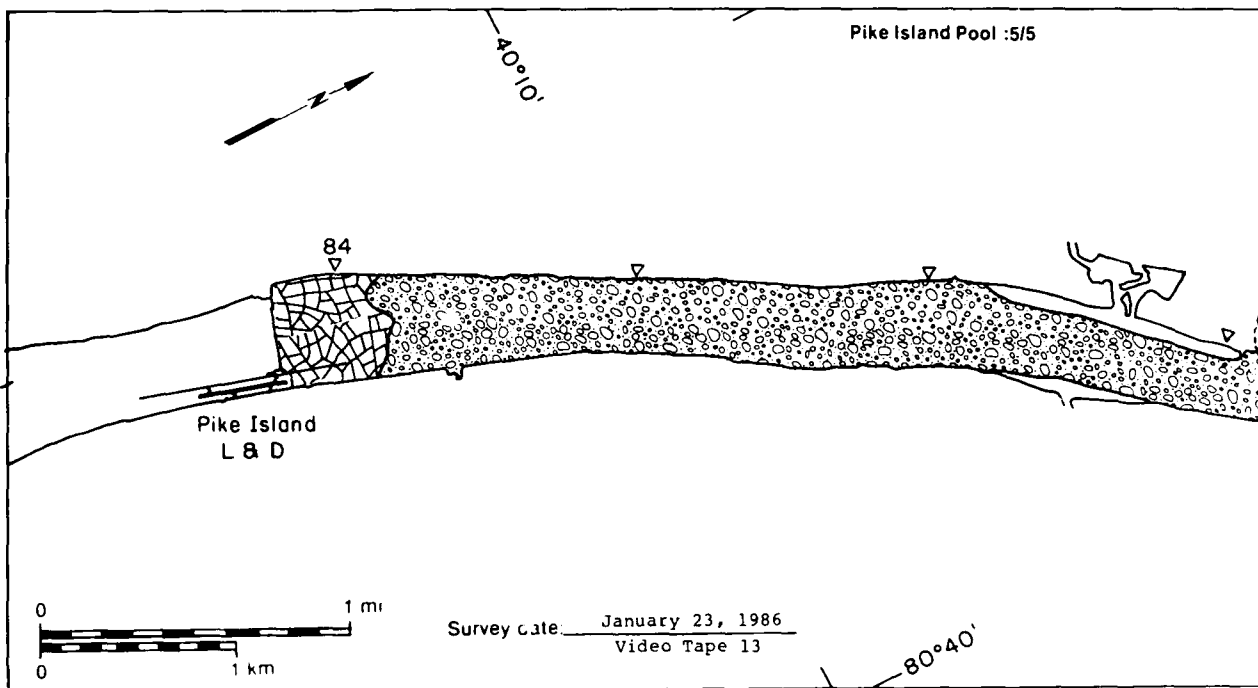
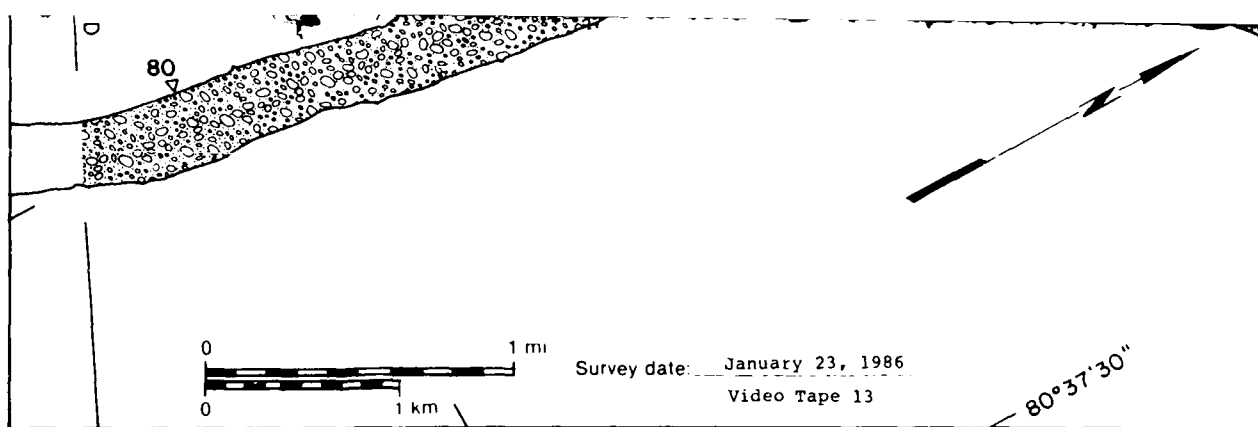
Pike Island Pool :1/5







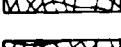



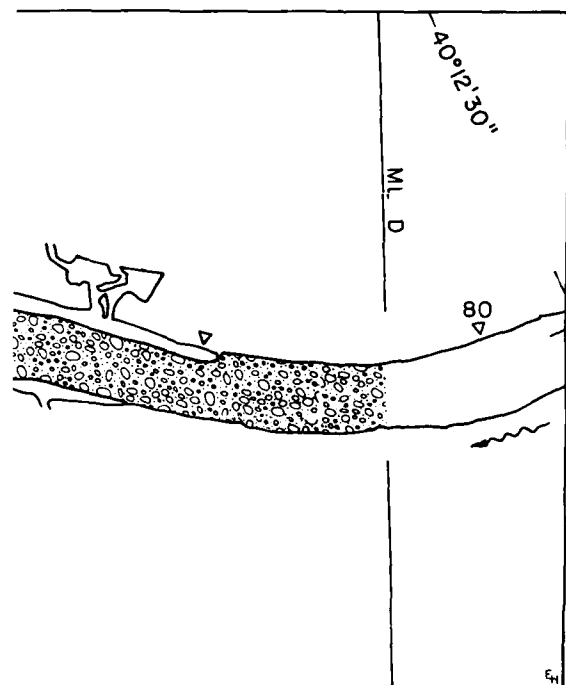
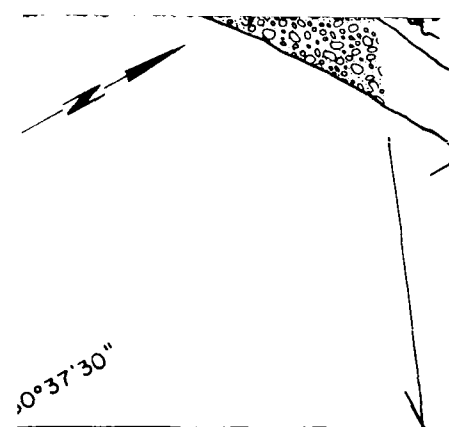
23 January 1986



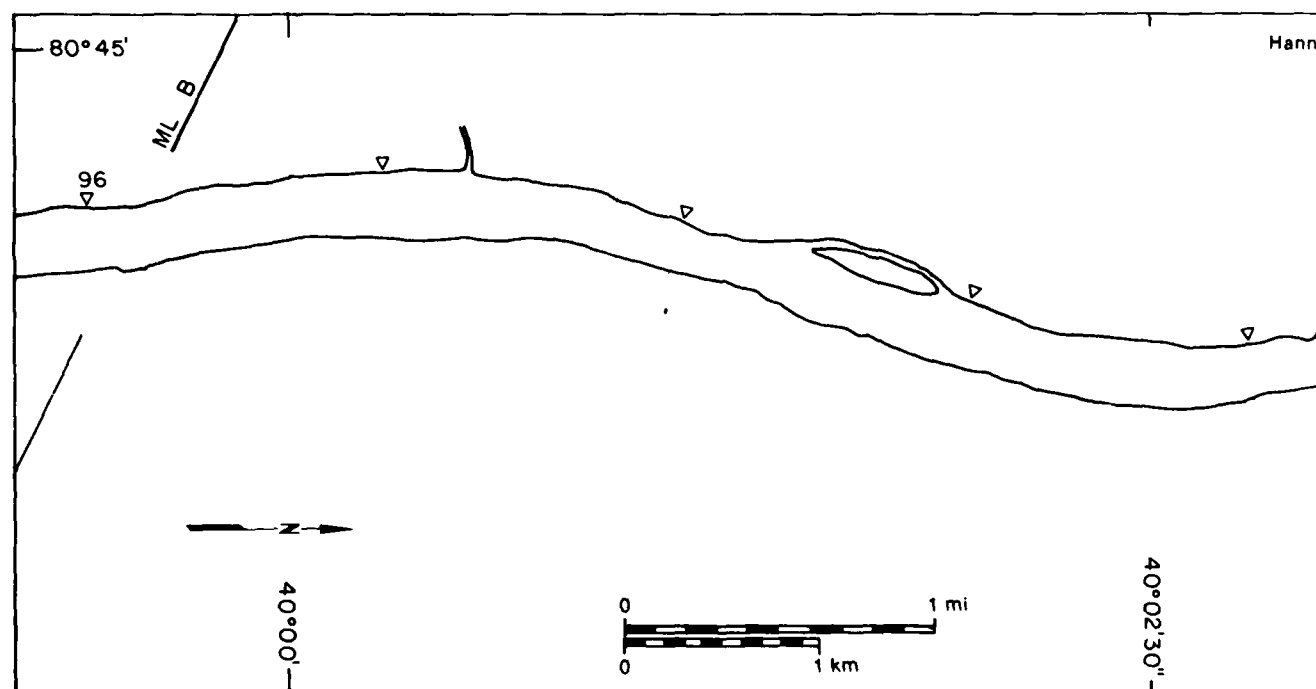
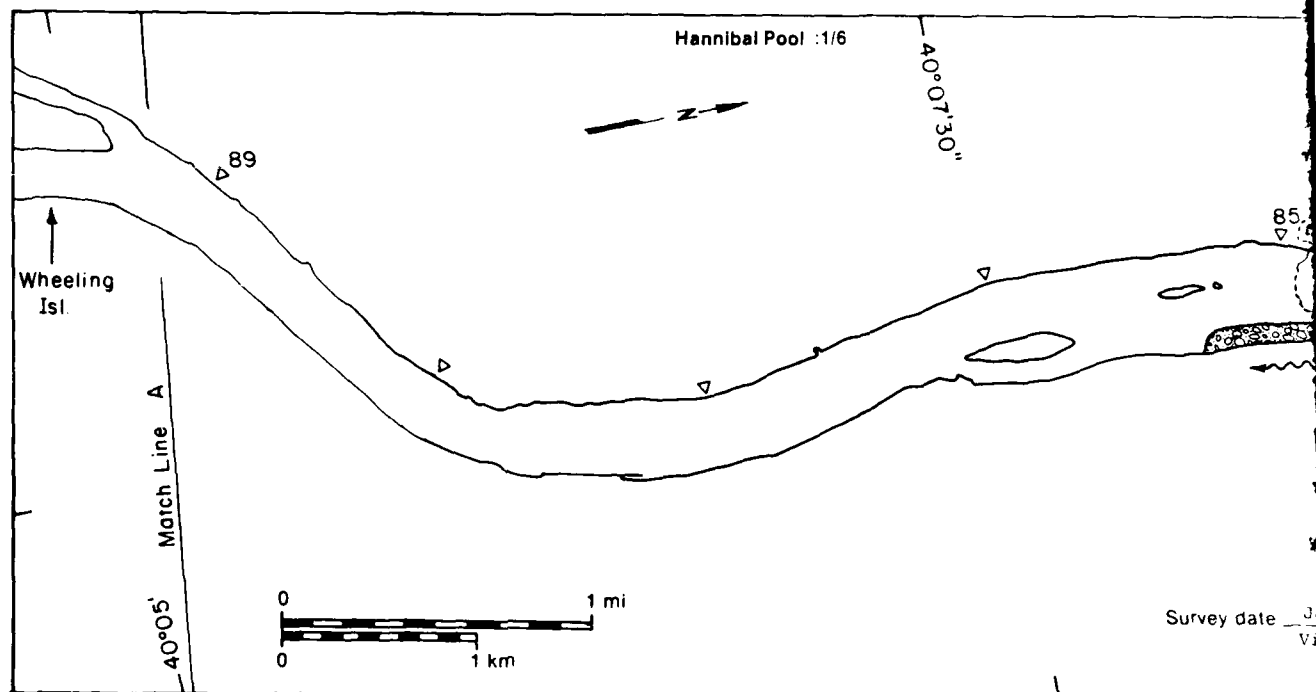


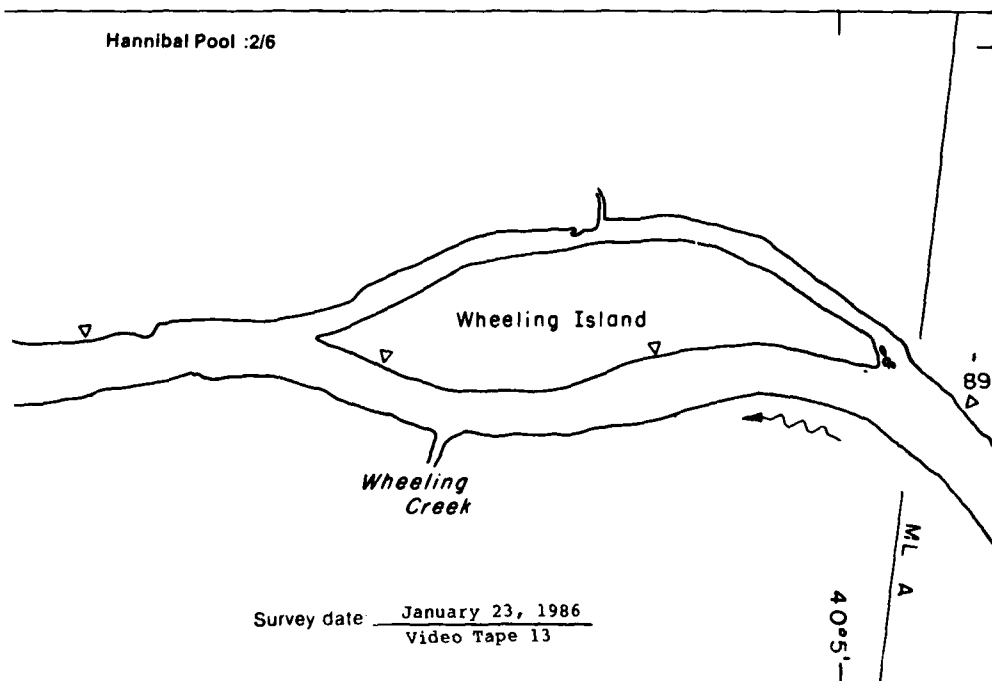
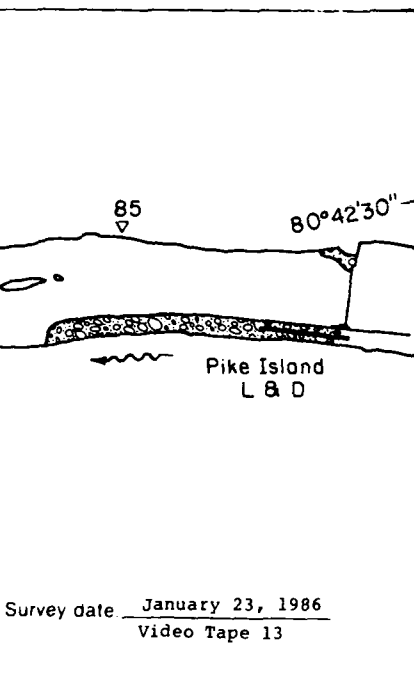
Pike Island Pool

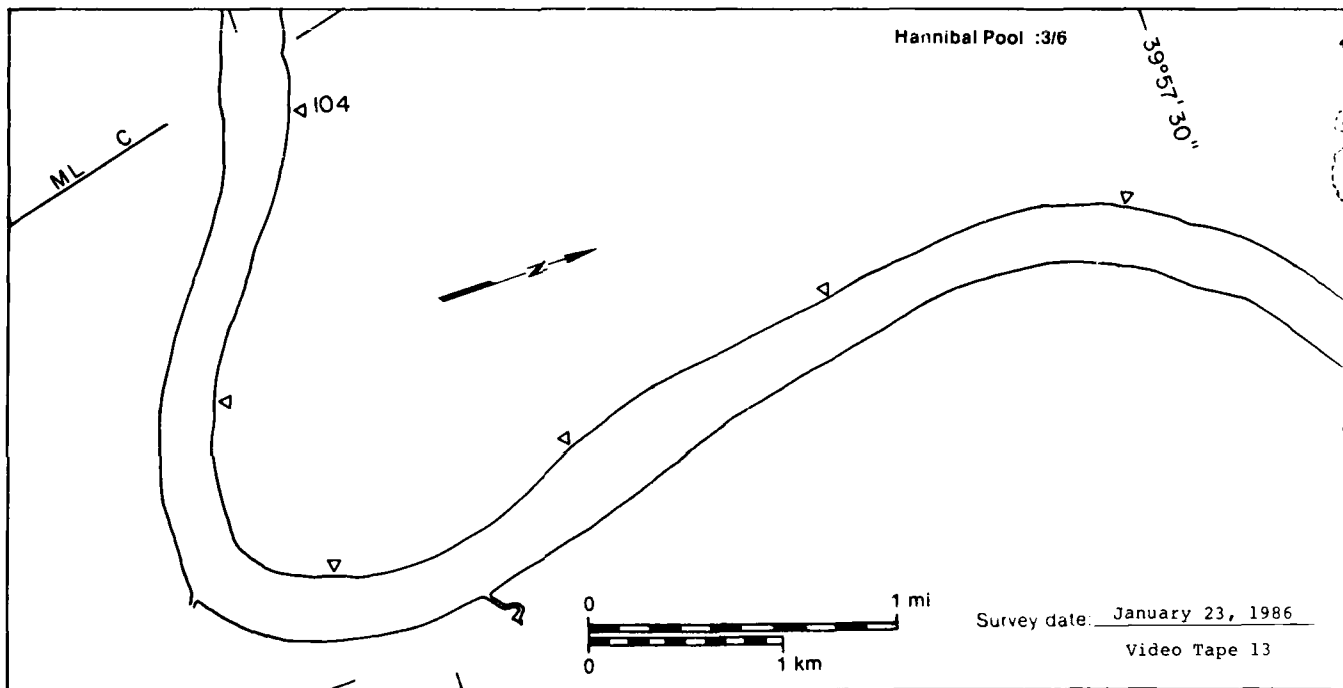
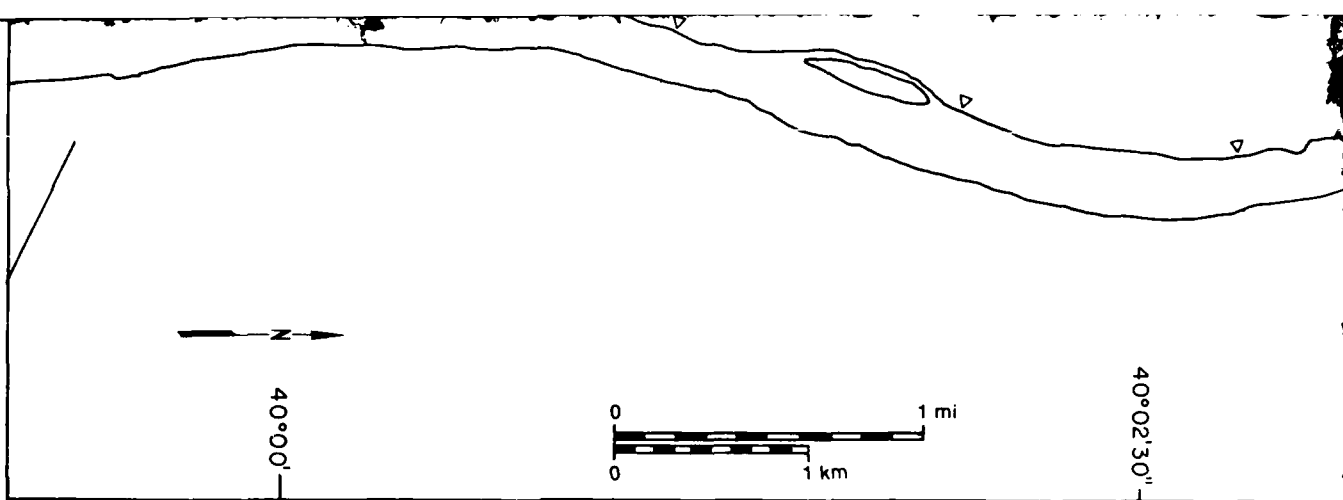
MAP UNITS	Area (m ² x 10 ⁶)	Surface concentration (%)
 Open water	8.96	NA
 Solid ice cover	0.00	NA
 Solid ice cover with open-water areas	0.00	—
 Fragmented ice cover	0.33	NA
 Fragmented ice cover with open-water areas	0.00	—
 Ice floes or frazil slush and pans	9.63	20
Total area (m ² x 10 ⁶)	18.92	

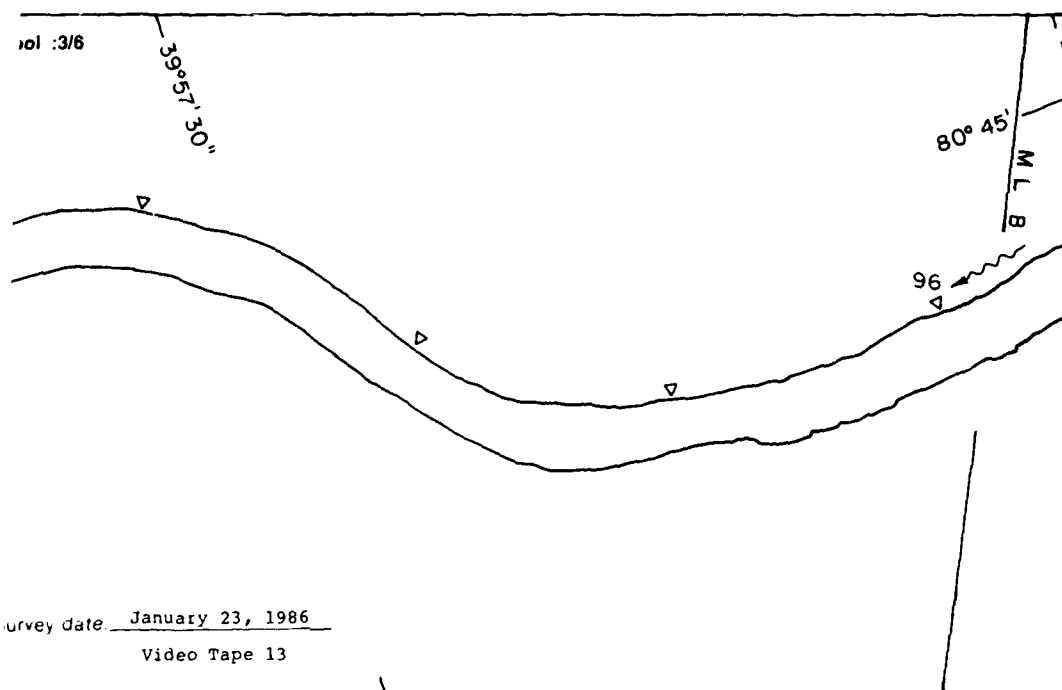
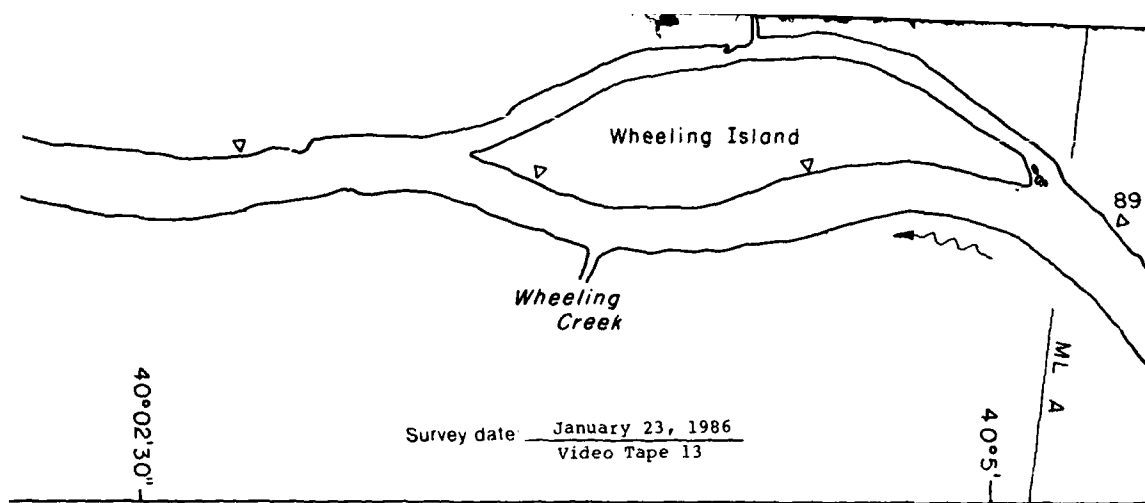


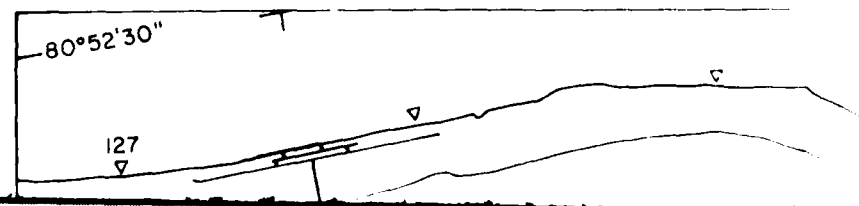
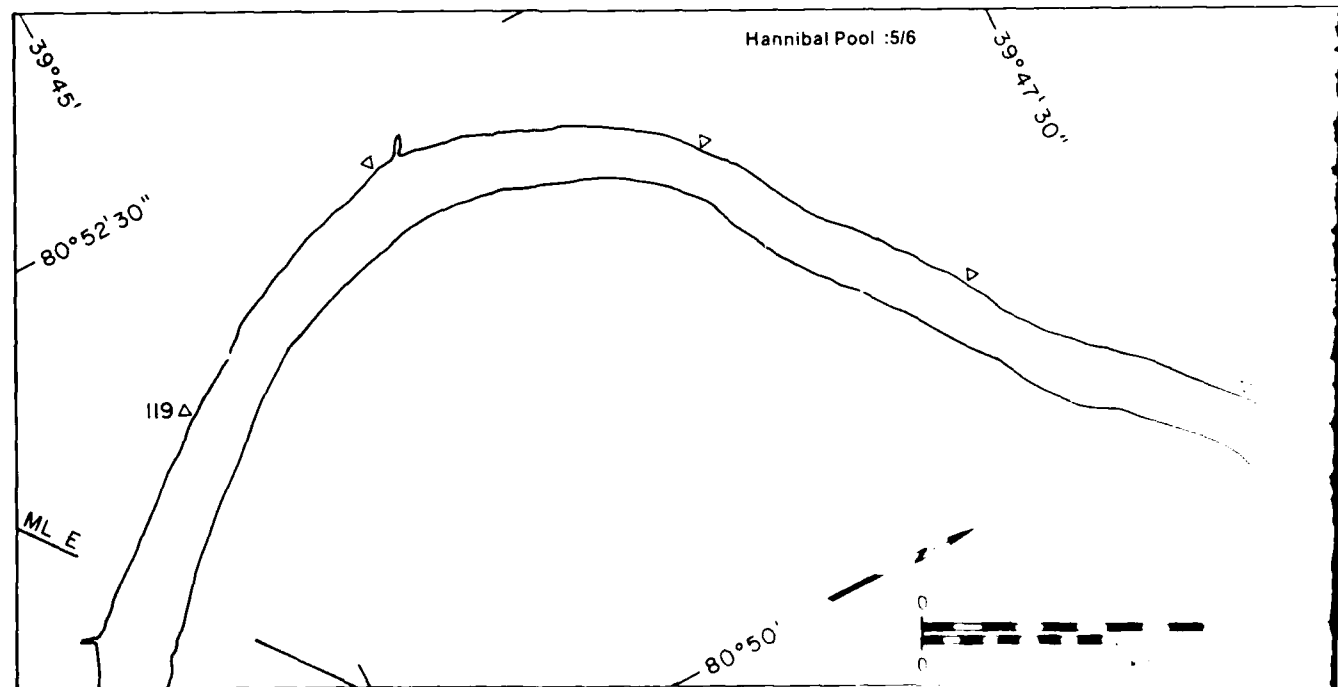
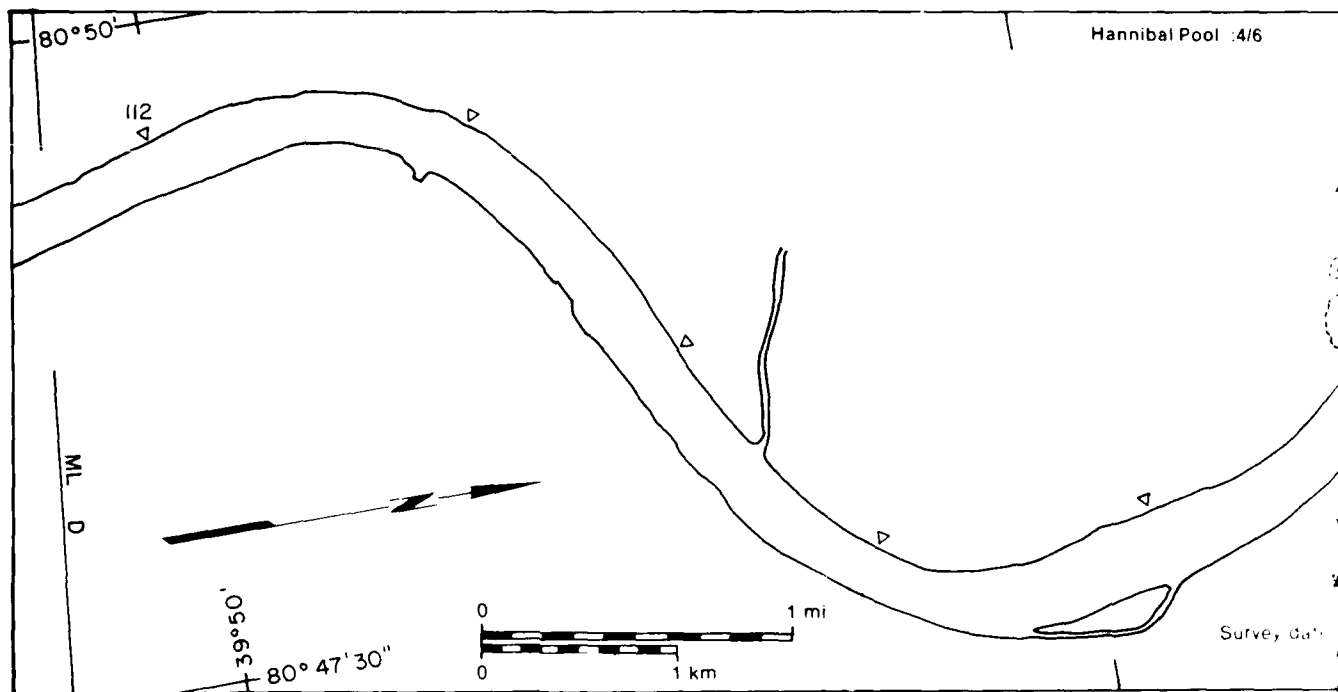
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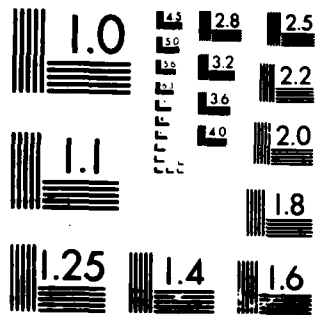
OHIO RIVER ILLINO. (U) COLD REGIONS RESEARCH AND

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UNCLASSIFIED CREL-SP-87-20

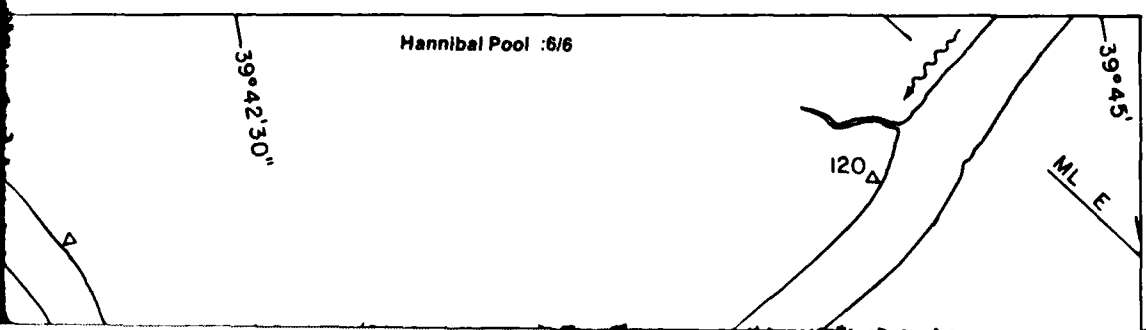
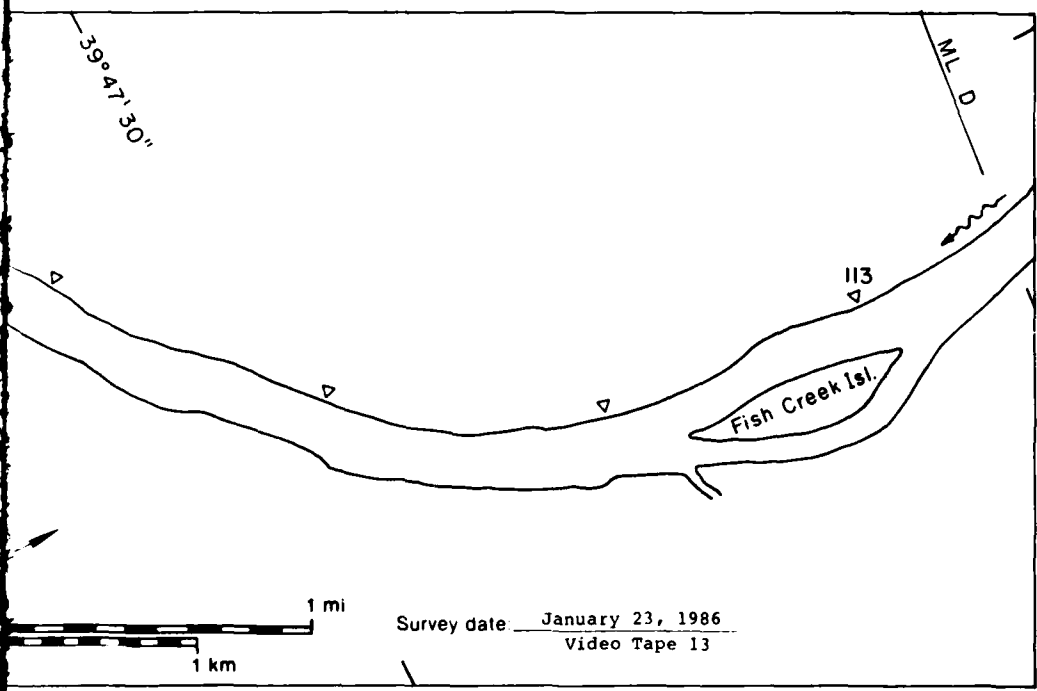
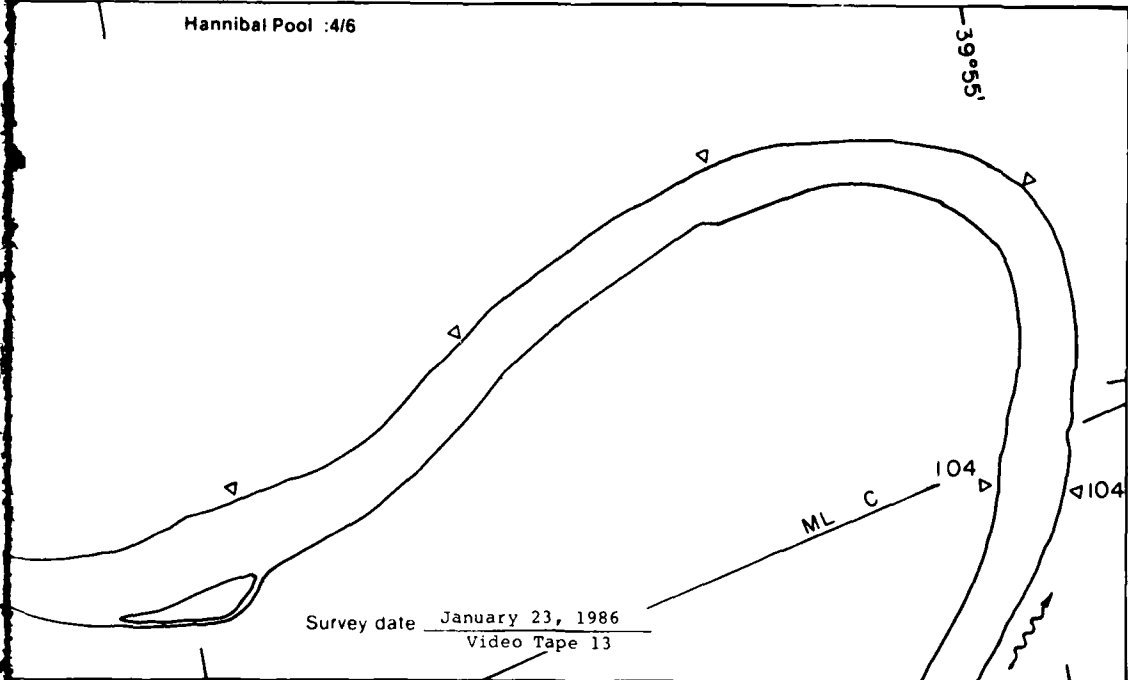
F/G 8/12

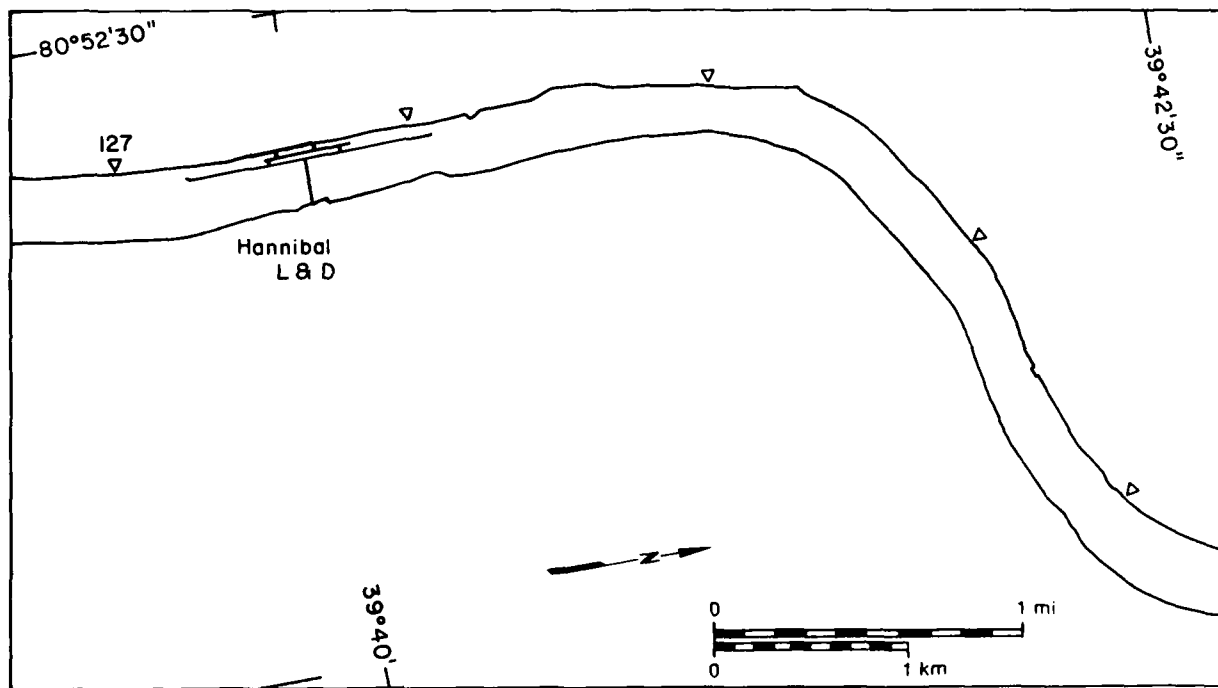
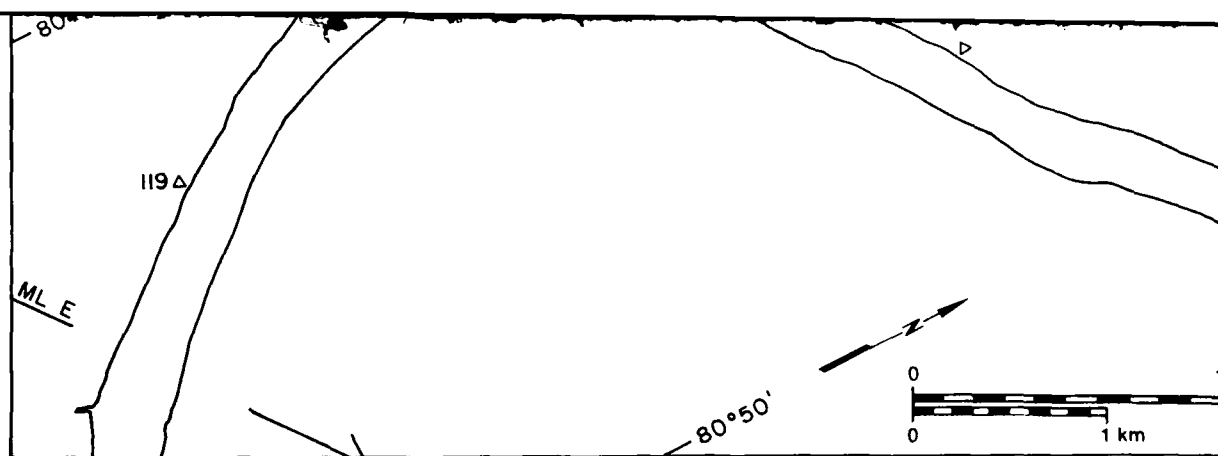
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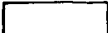




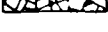
73

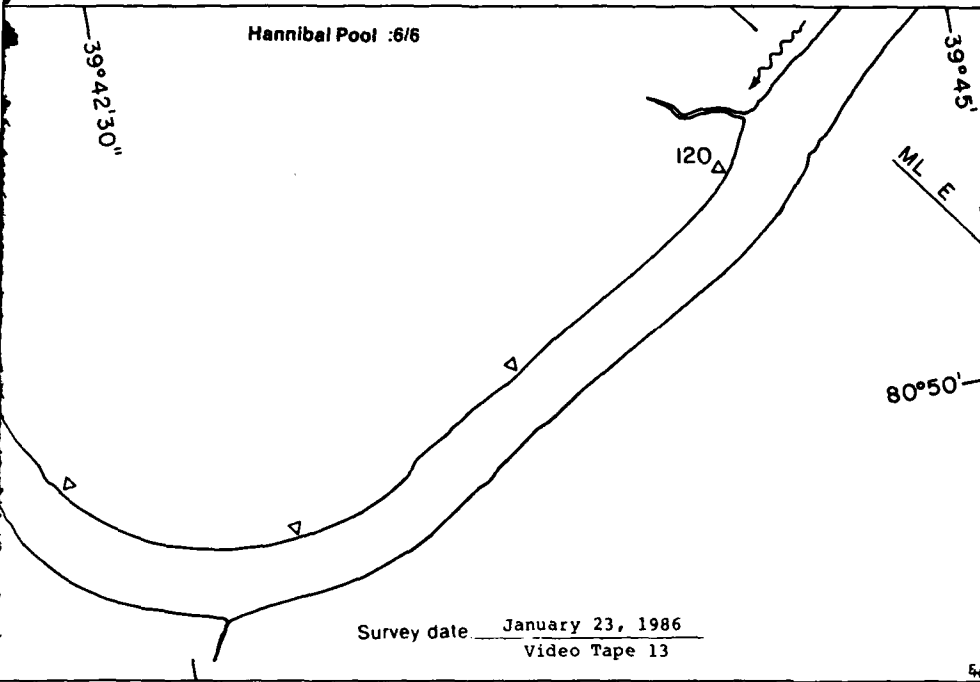
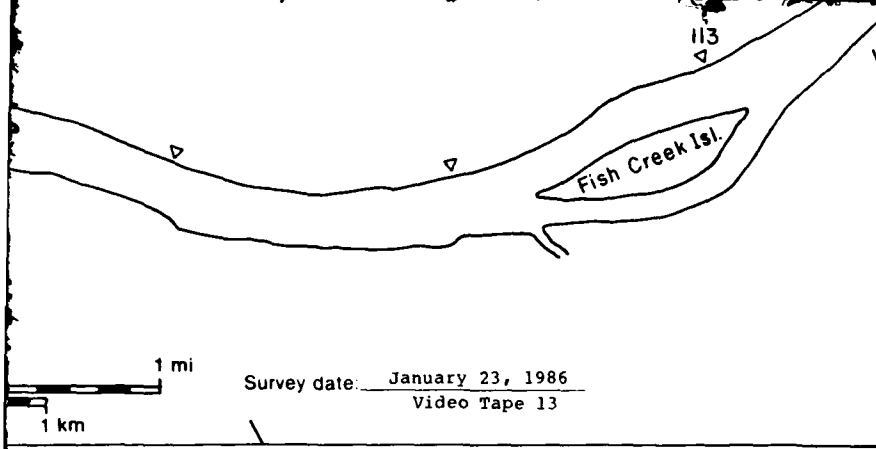
23 January 1986

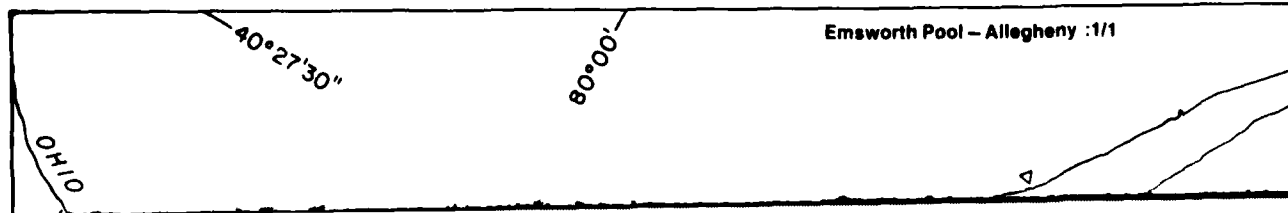
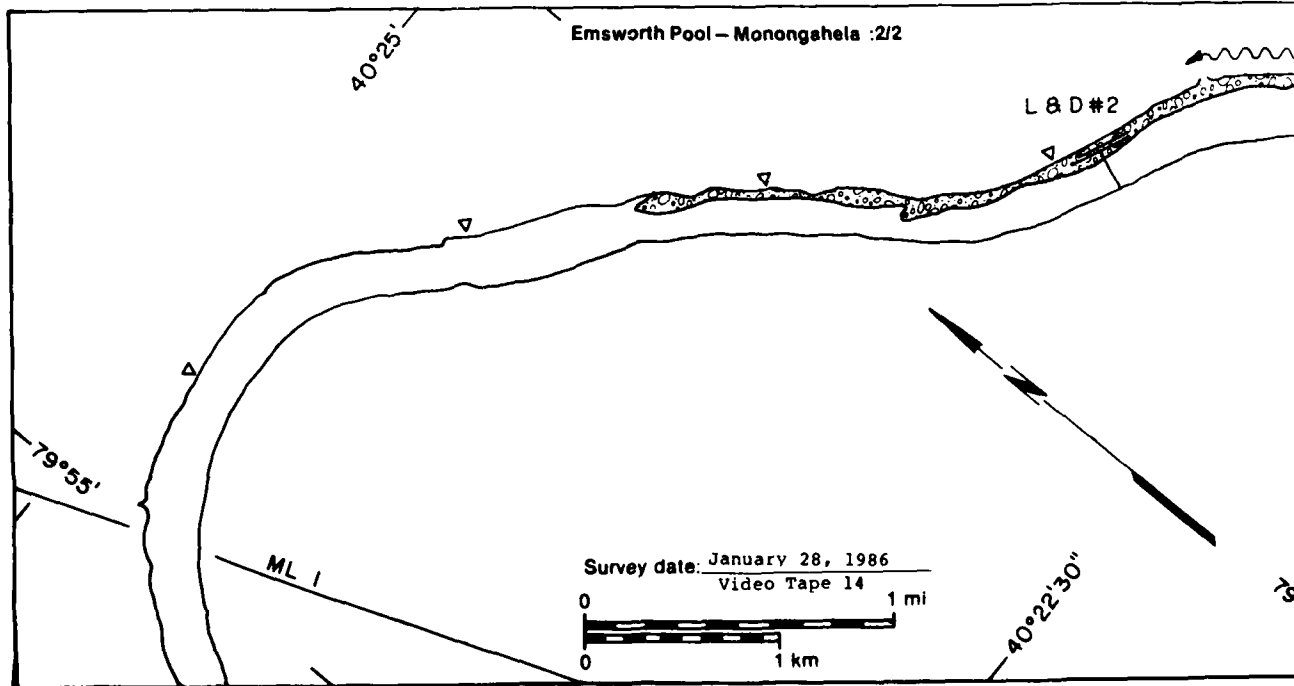
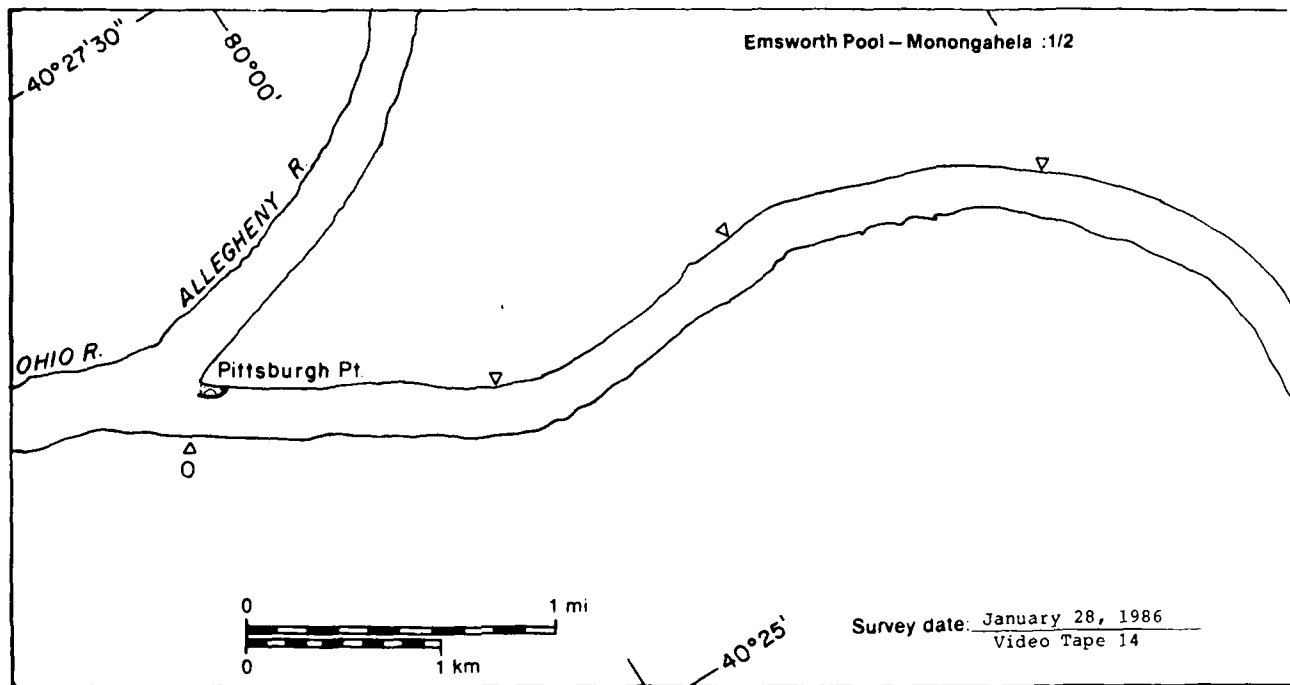




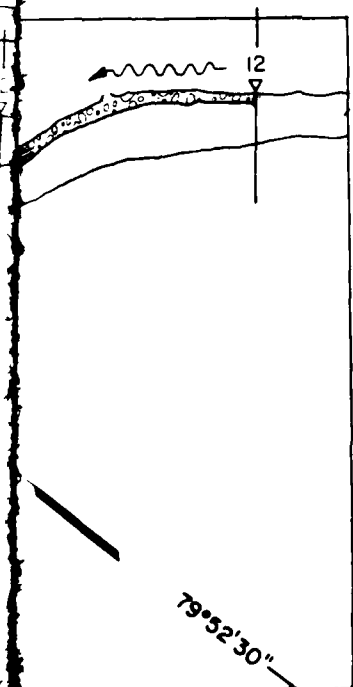
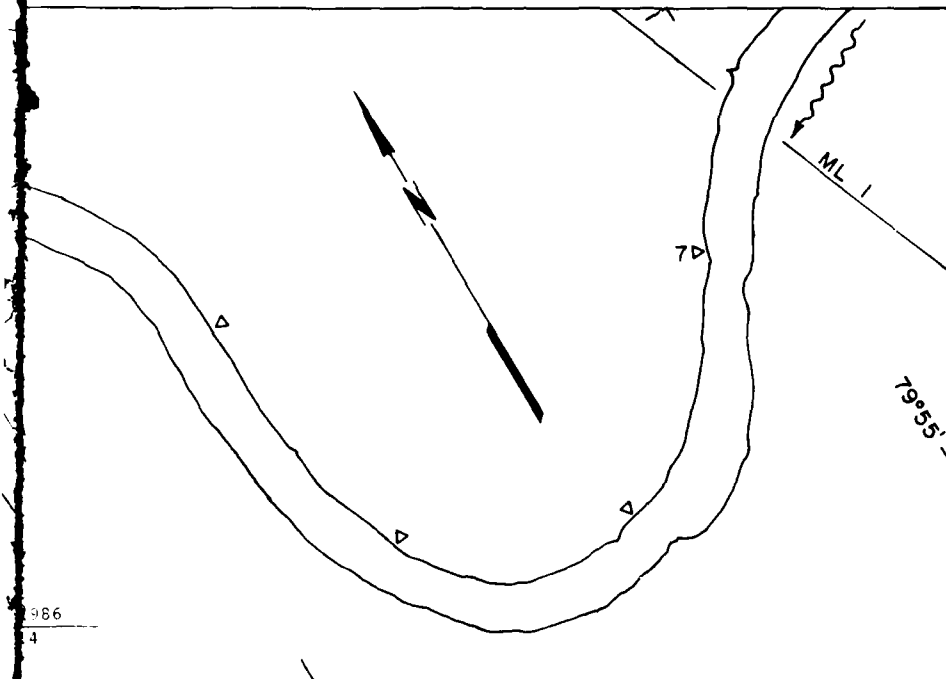
Hannibal Pool

MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
 Open water	22.31	NA
 Solid ice cover	0.00	NA
 Solid ice cover with open-water areas	0.00	—
 Fragmented ice cover	0.00	NA
 Fragmented ice cover with open-water areas	0.00	—
 Ice floes or frazil slush and pans	0.15	20
Total area ($m^2 \times 10^6$)	22.46	



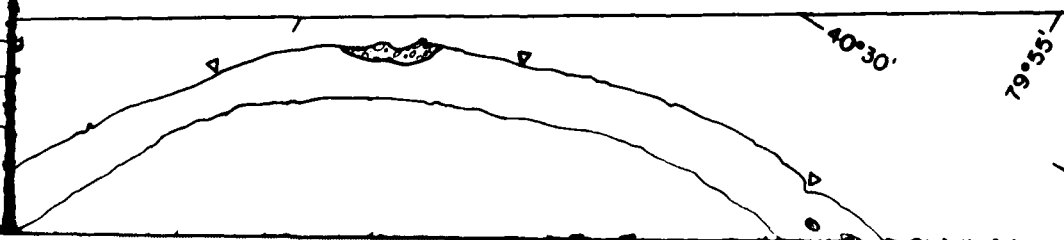


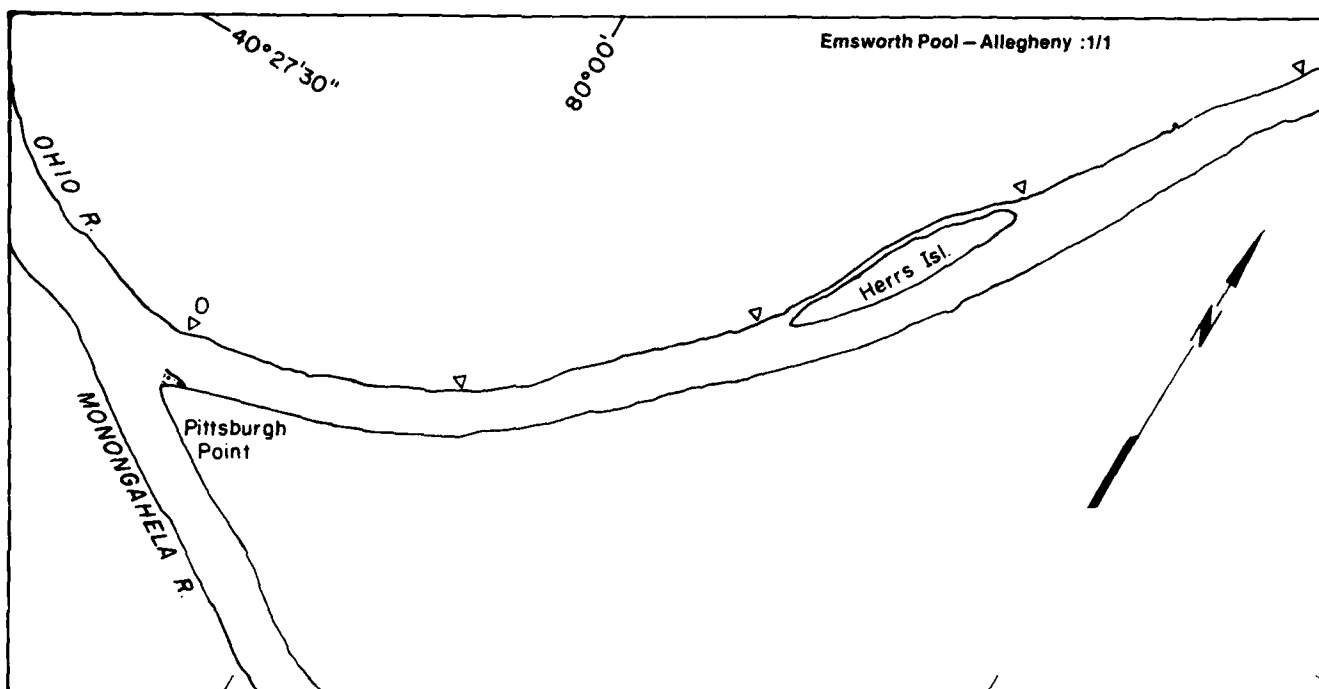
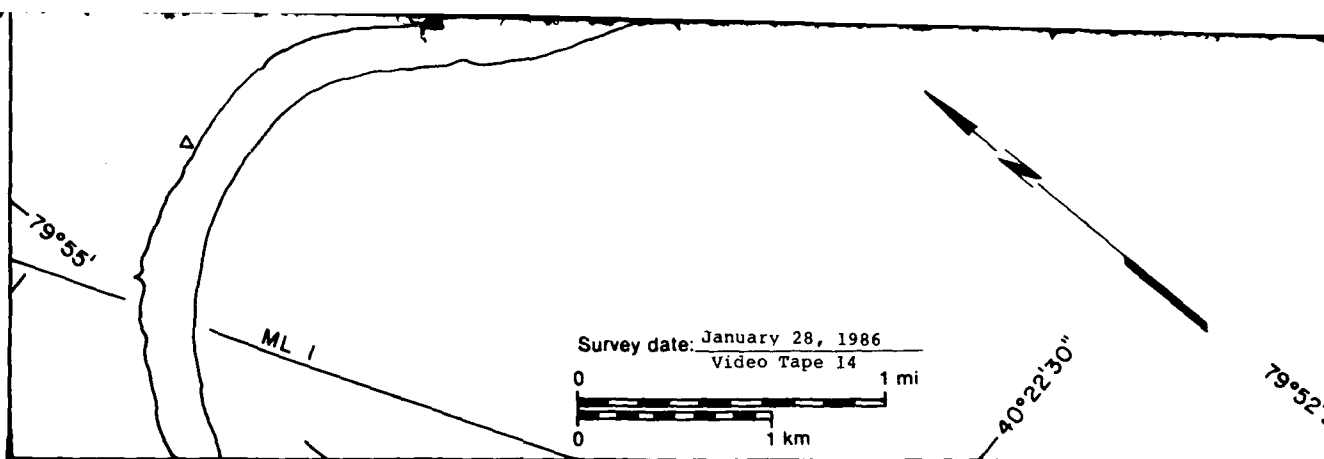
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Emsworth Pool - Monongahela

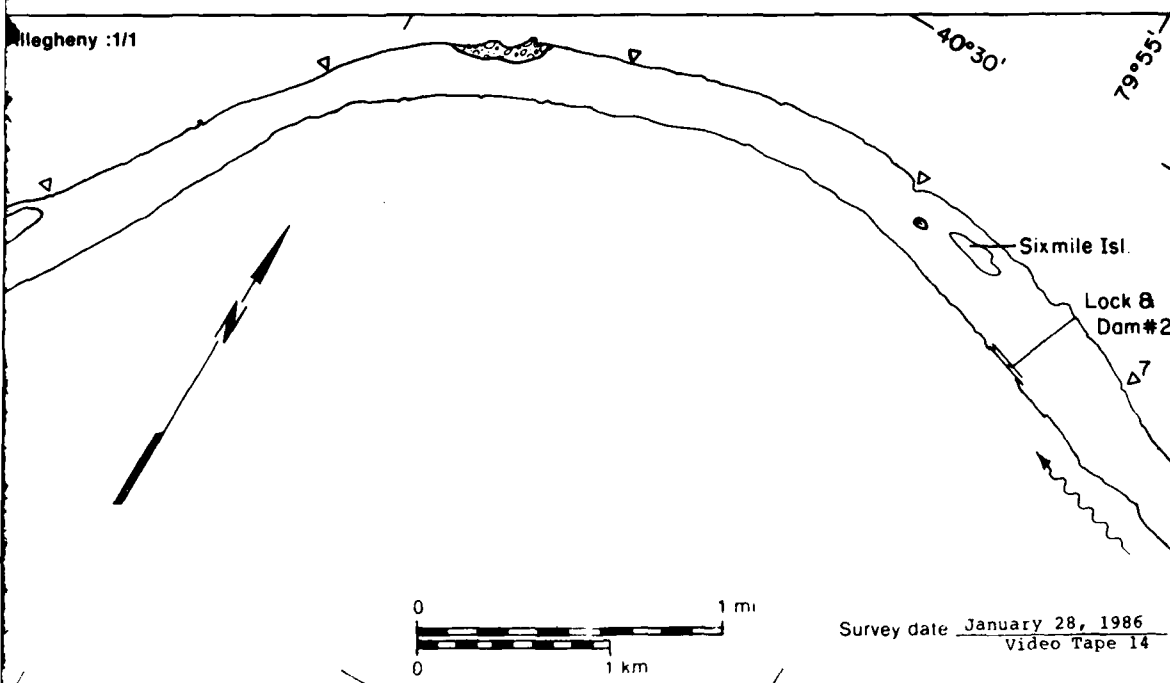
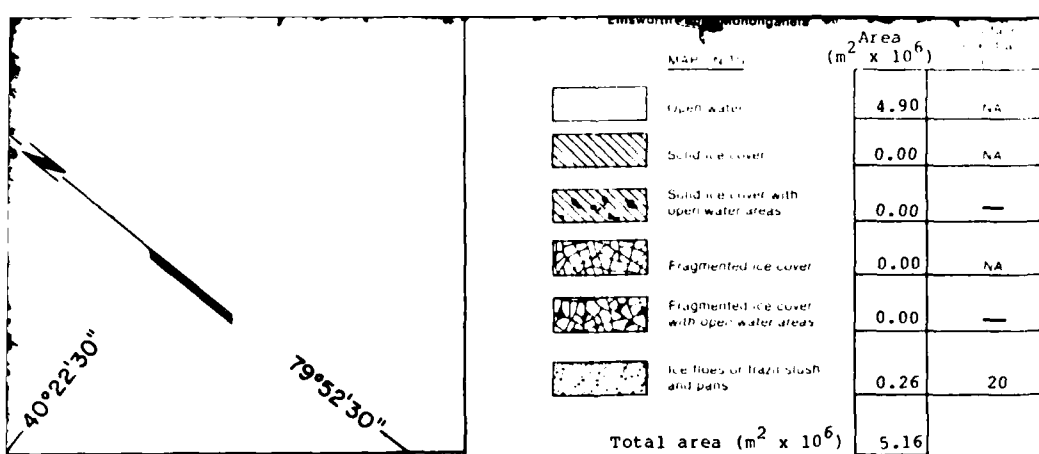
MAP UNIT	Area (m ² x 10 ⁶)	Surface elevation (m)
Open water	4.90	NA
Solid ice cover	0.00	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open water areas	0.00	—
Ice free of trail slash and pails	0.26	20
Total area (m ² x 10 ⁶)	5.16	



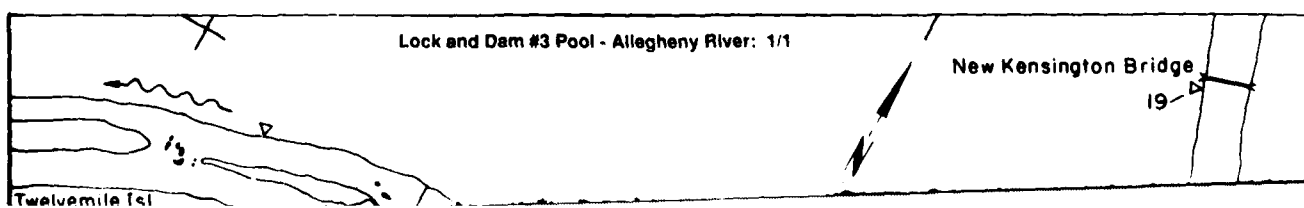
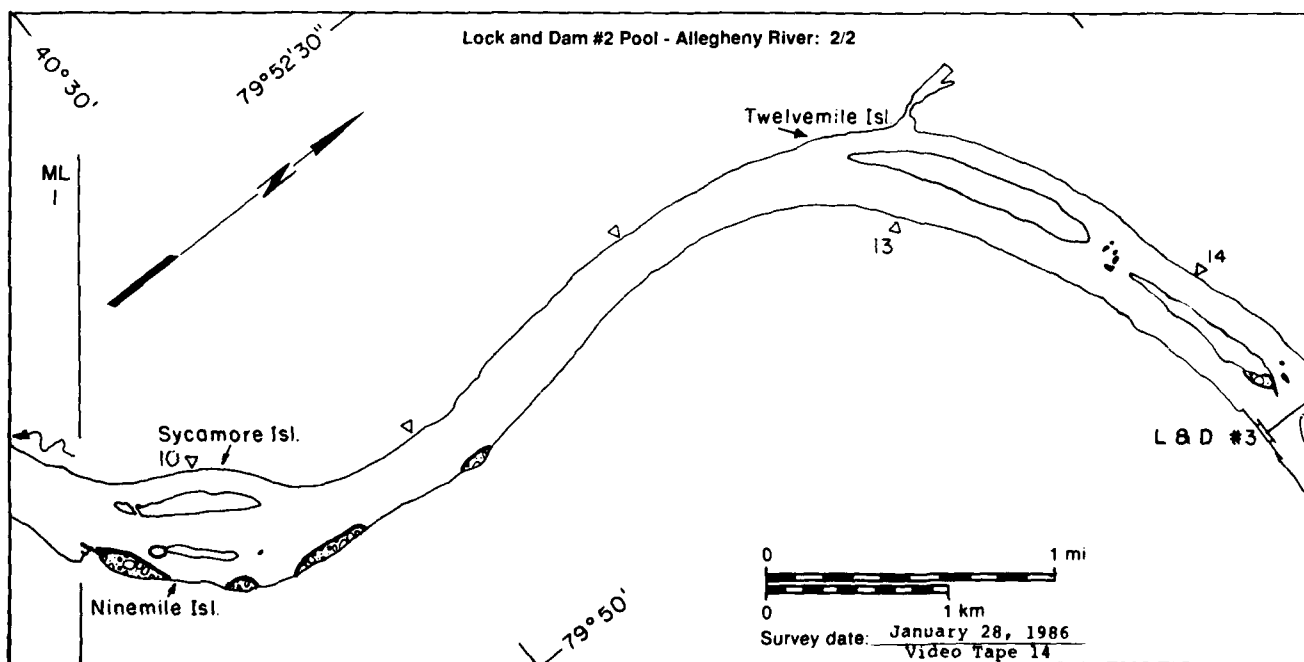
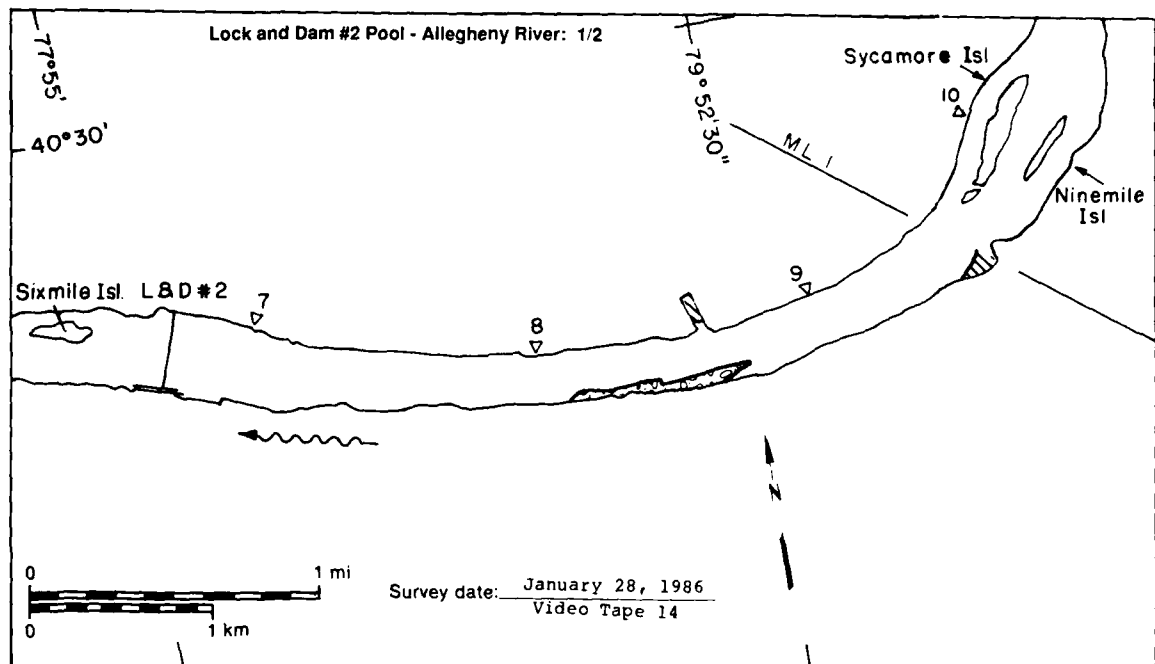


△ Emsworth Pool - Allegheny

MAP UNITS	Area (m ² x 10 ⁶)	Percent of total area
Open water	3.01	NA
Solid ice cover	0.00	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open water areas	0.00	—
Ice flows or frazil slush and pans	0.06	50
Total area (m ² x 10 ⁶)	3.07	



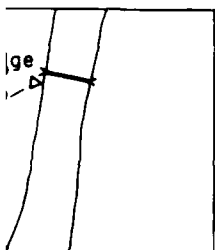
28 January 1986





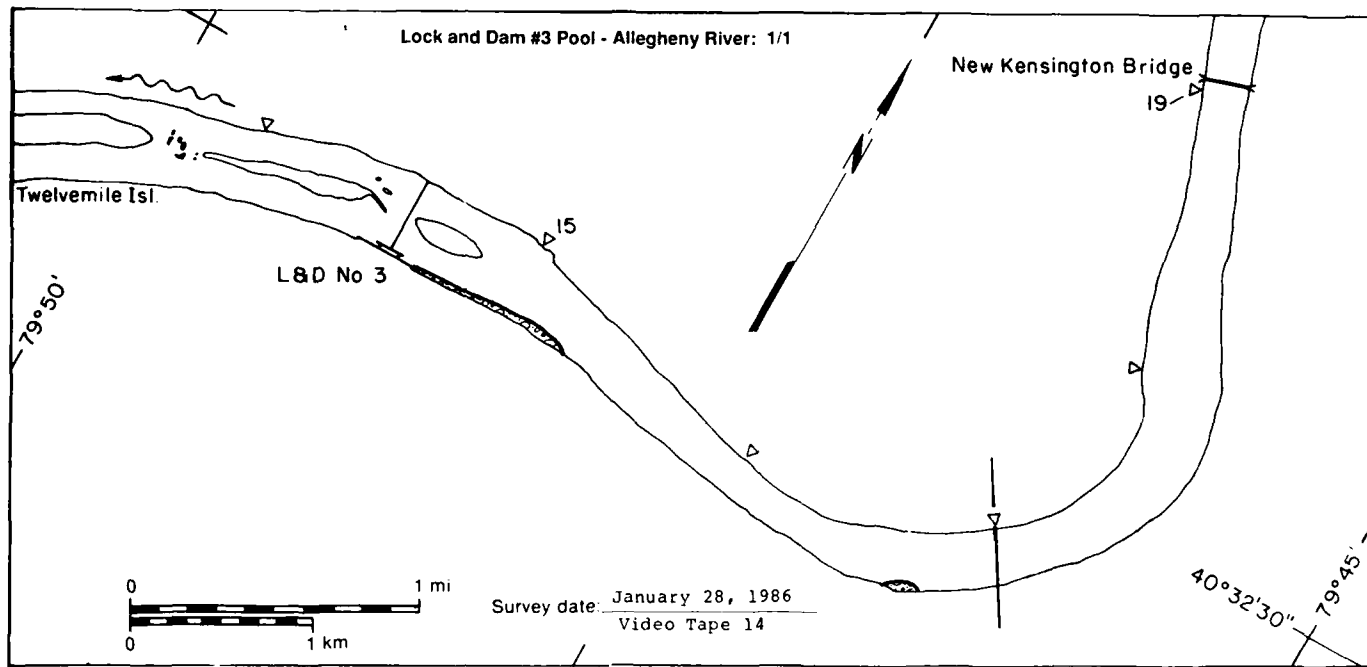
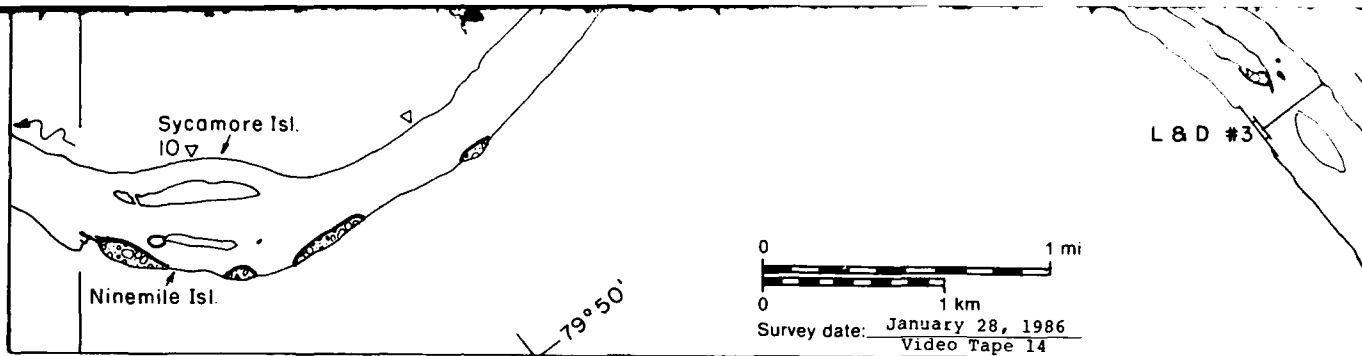
Lock and Dam #2 Pool

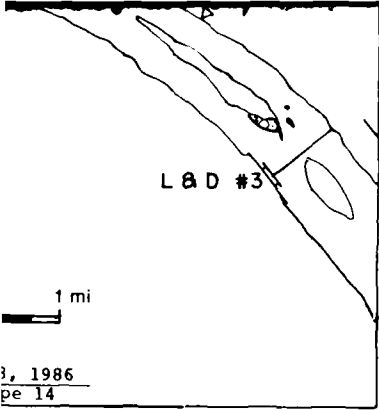
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	3.86	NA
Solid ice cover	0.03	NA
Solid ice cover with open-water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open-water areas	0.00	—
Ice floes or frazil slush and pans	0.13	10
Total area ($m^2 \times 10^6$)	4.02	



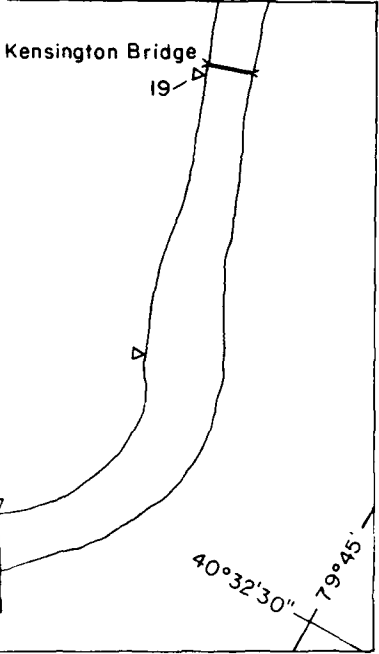
Lock and Dam #3 Pool

MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	1.09	NA



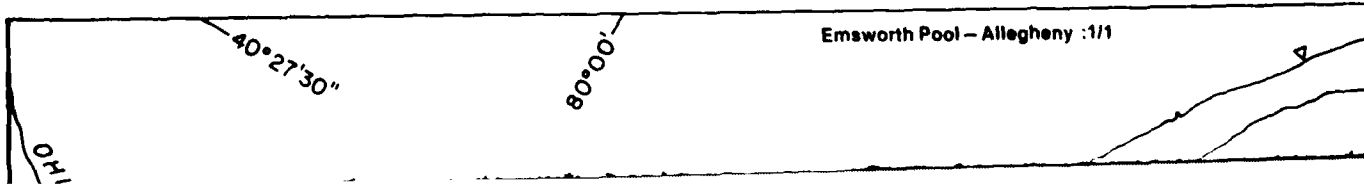
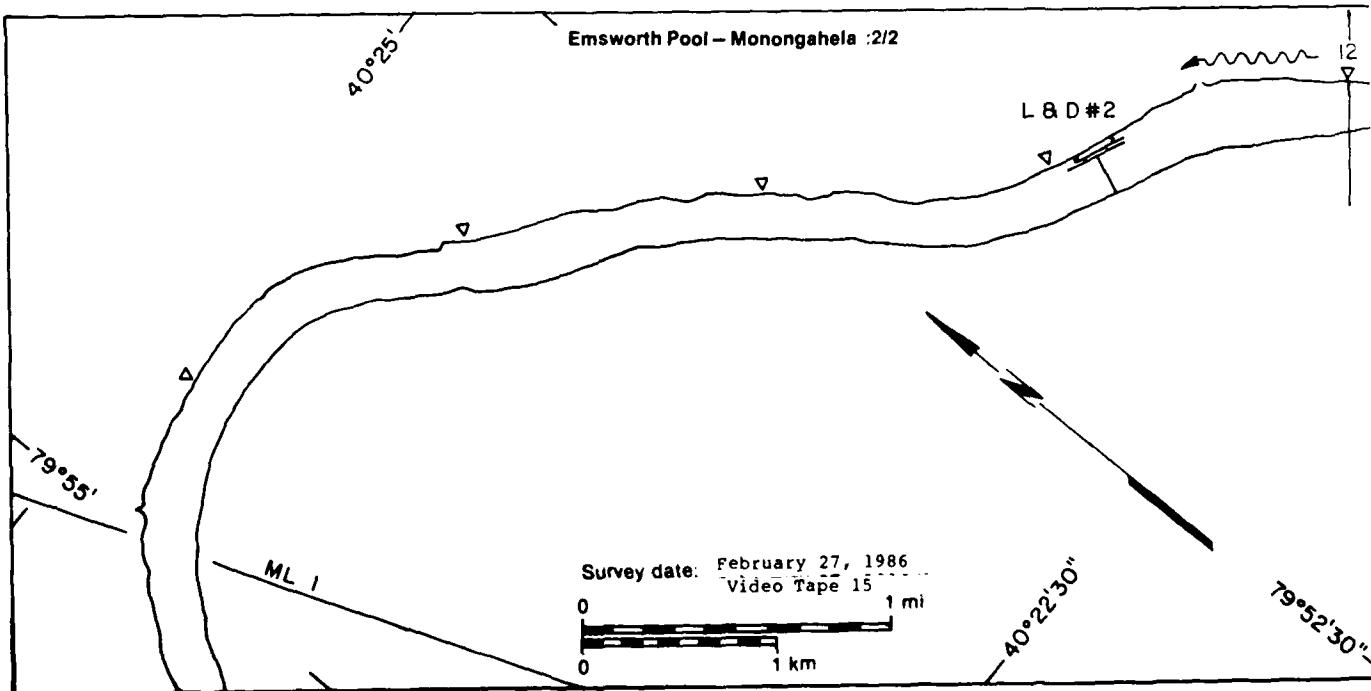
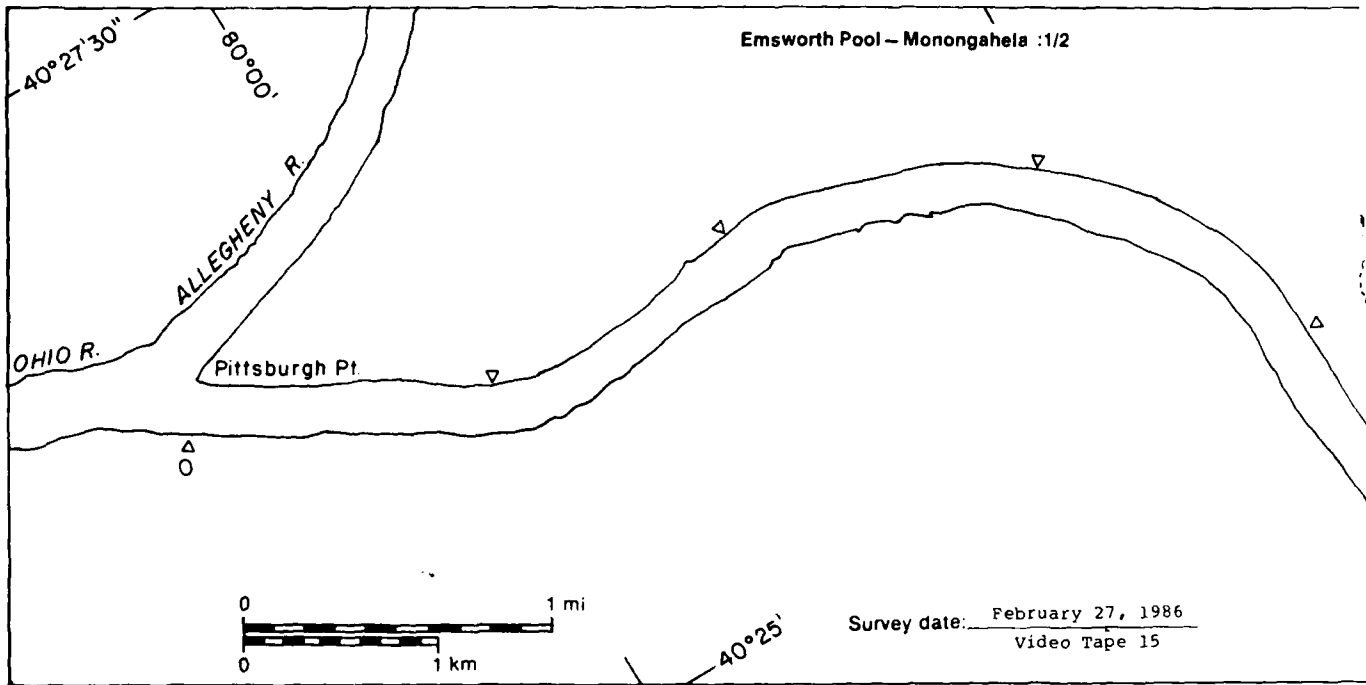


	Solid ice cover	0.03	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.13	10
Total area ($m^2 \times 10^6$)		4.02	

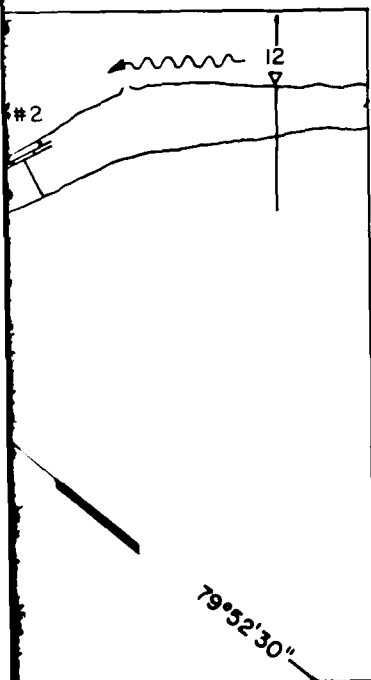
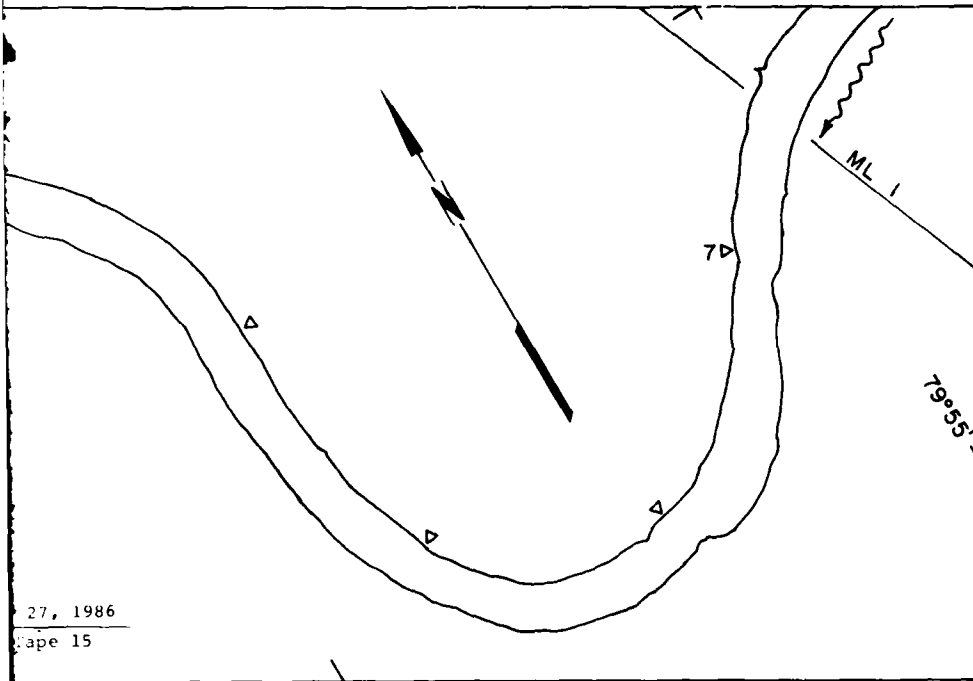


Lock and Dam #3 Pool

MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	1.09	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.05	10
Total area ($m^2 \times 10^6$)		1.14	









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Emsworth Pool - Monongahela

MAP UNITS

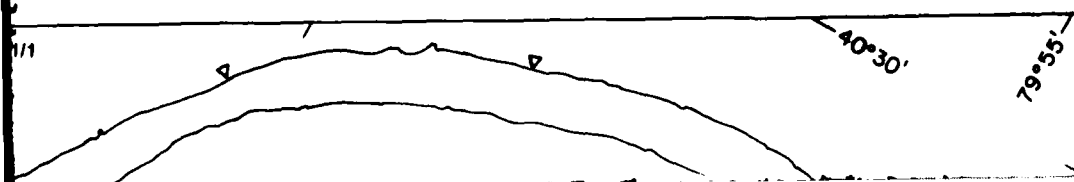
-  Open water
-  Solid ice cover
-  Solid ice cover with open water areas
-  Fragmented ice cover
-  Fragmented ice cover with open water areas
-  Ice floes or frazil slush and pans

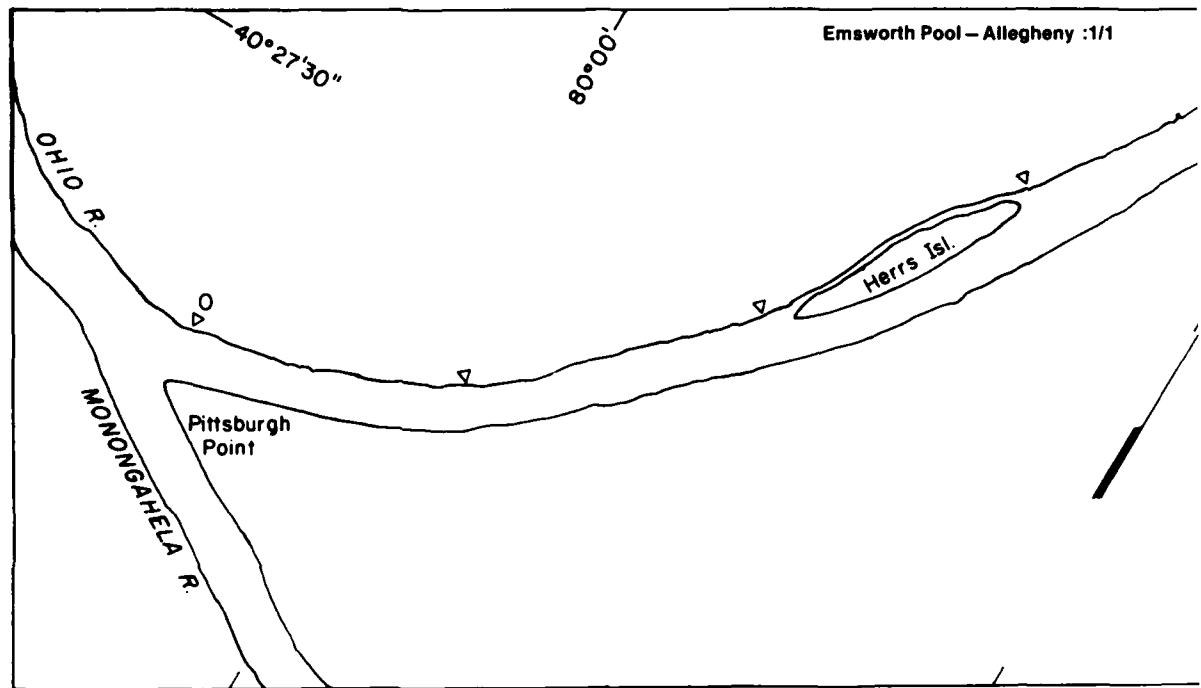
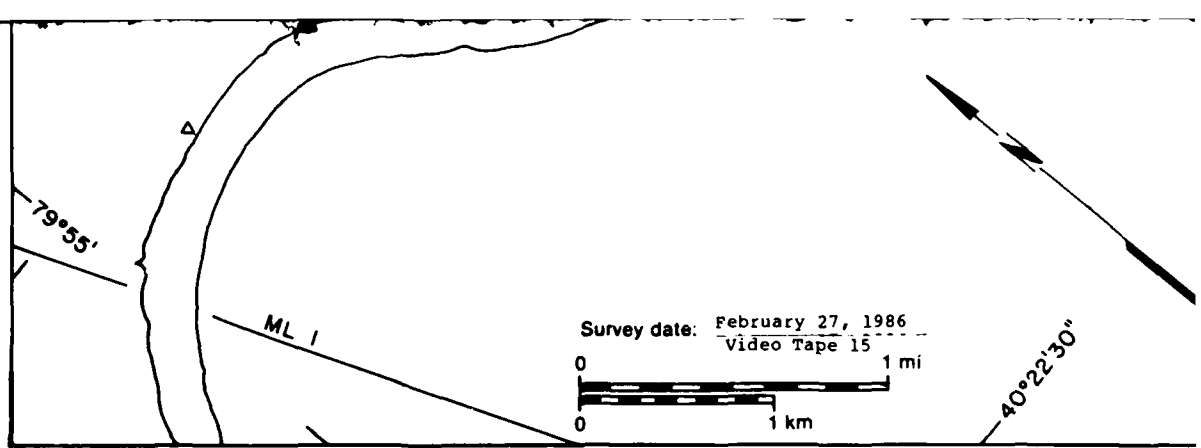
Area
($m^2 \times 10^6$)

Surface
concentration
(%)

5.16	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
0.00	—
5.16	

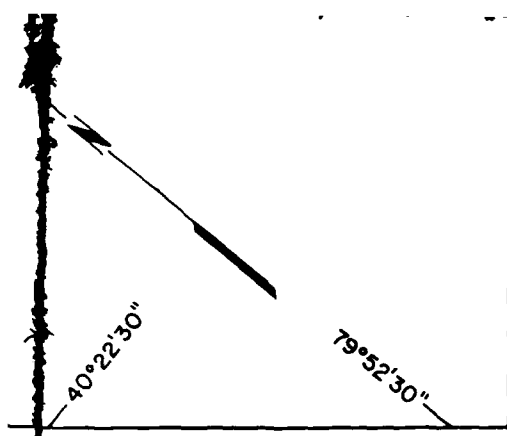
Total area ($m^2 \times 10^6$)











△ Emsworth Pool - Allegheny

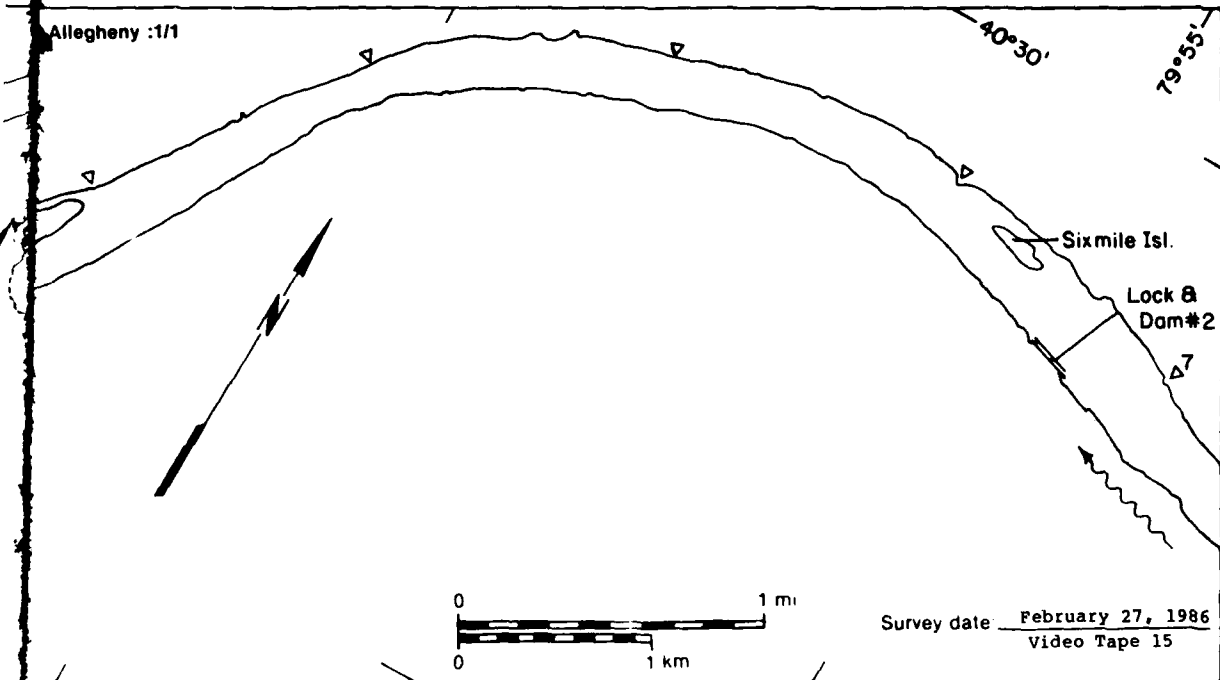
MAP UNITS	Area (m ² x 10 ⁶)	Surface concentration (%)
Open water	3.07	NA
Solid ice cover	0.00	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open water areas	0.00	—
Ice floes or frazil slush and pans	0.00	—
Total area (m² x 10⁶)	3.07	



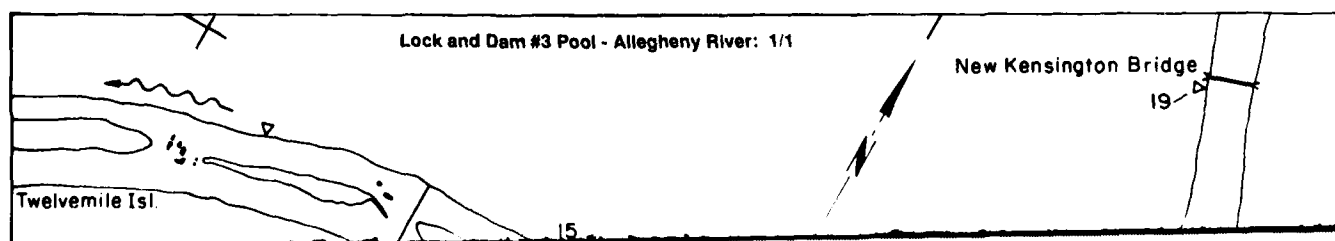
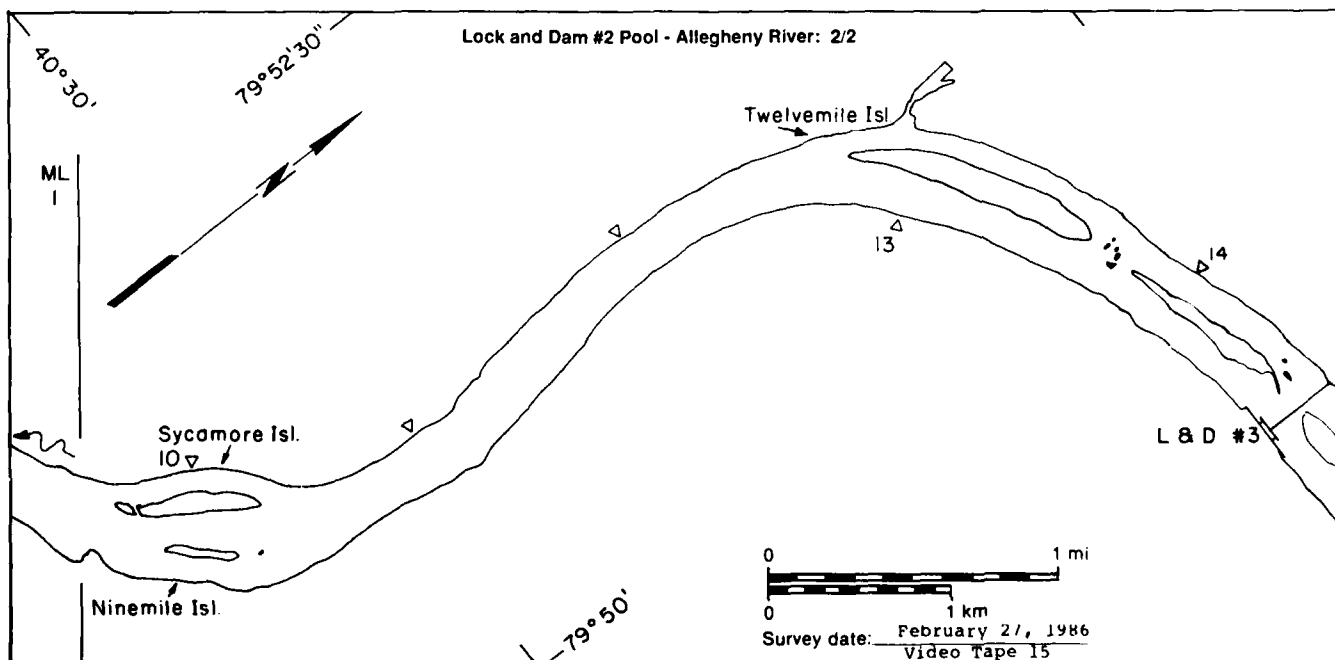
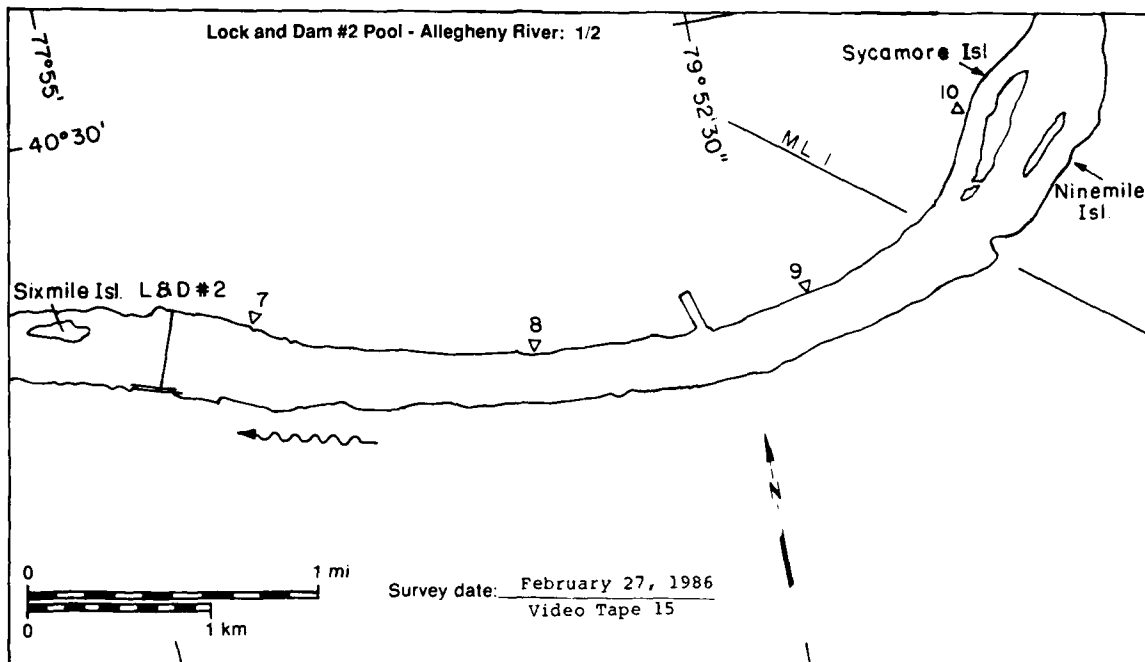
MAP UNITS	(m ² x 10 ⁶)	
	Open water	5.16
	Solid ice cover	0.00
	Solid ice cover with open water areas	0.00
	Fragmented ice cover	0.00
	Fragmented ice cover with open water areas	0.00
	Ice floes or frazil slush and pans	0.00

Total area (m² x 10⁶)

5.16



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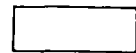



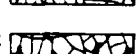



Lock and Dam #2 Pool

MAP UNITS

Area
($m^2 \times 10^6$)

Surface
concentration
(%)

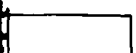


	Open water	4.02	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		4.02	

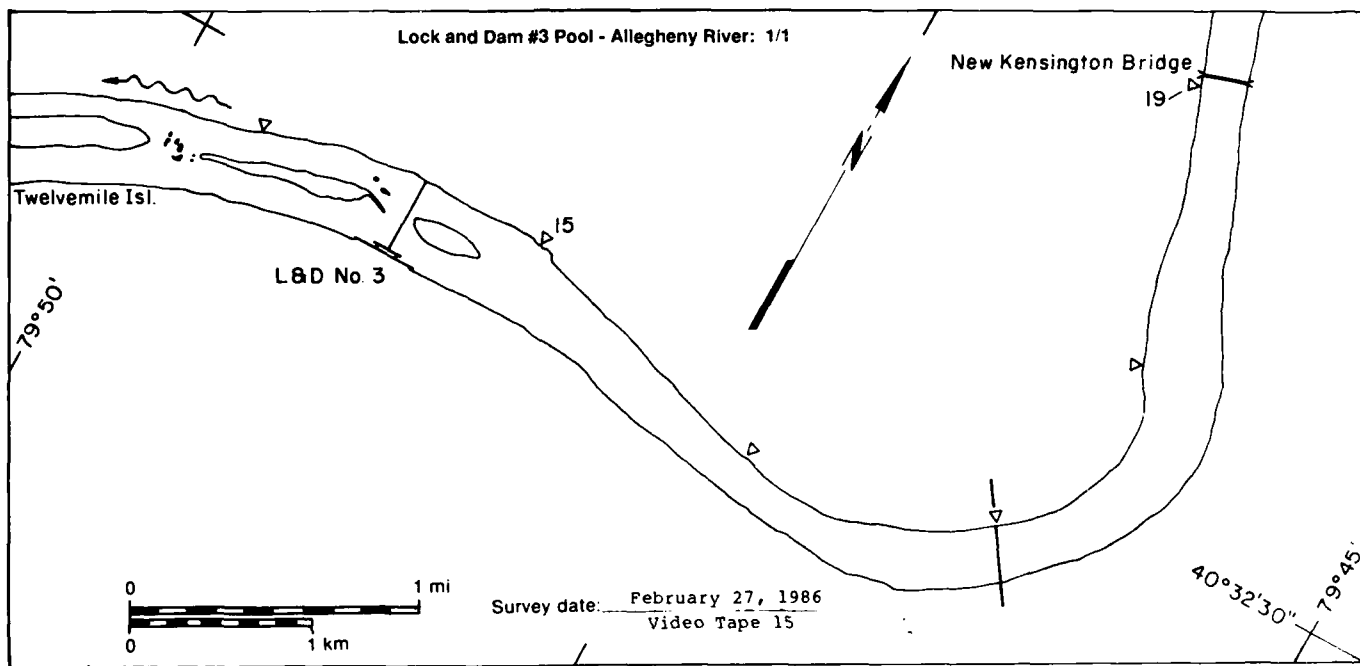
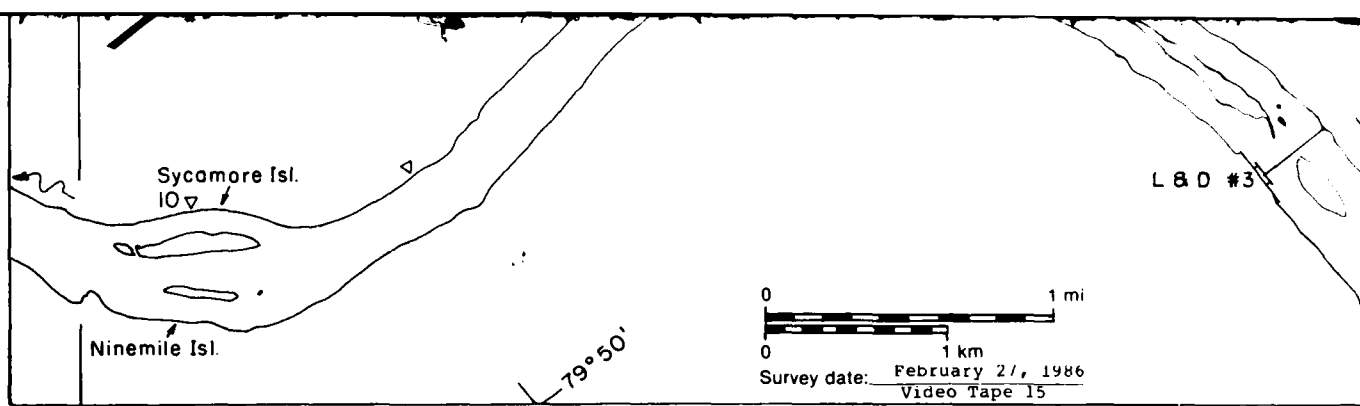
Lock and Dam #3 Pool

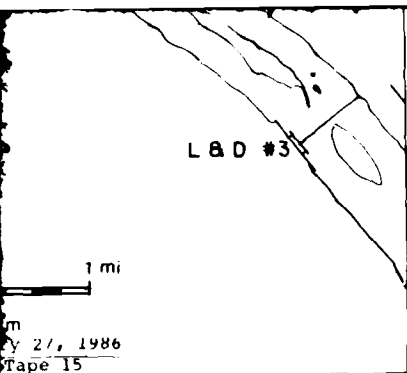
MAP UNITS

Area
($m^2 \times 10^6$)

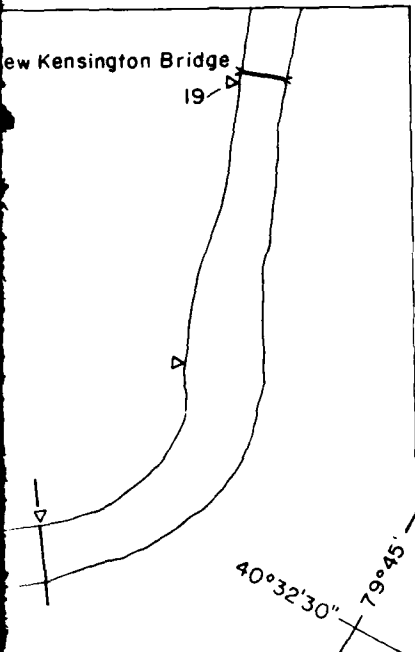
Surface
concentration
(%)

	Open water	1.14	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—

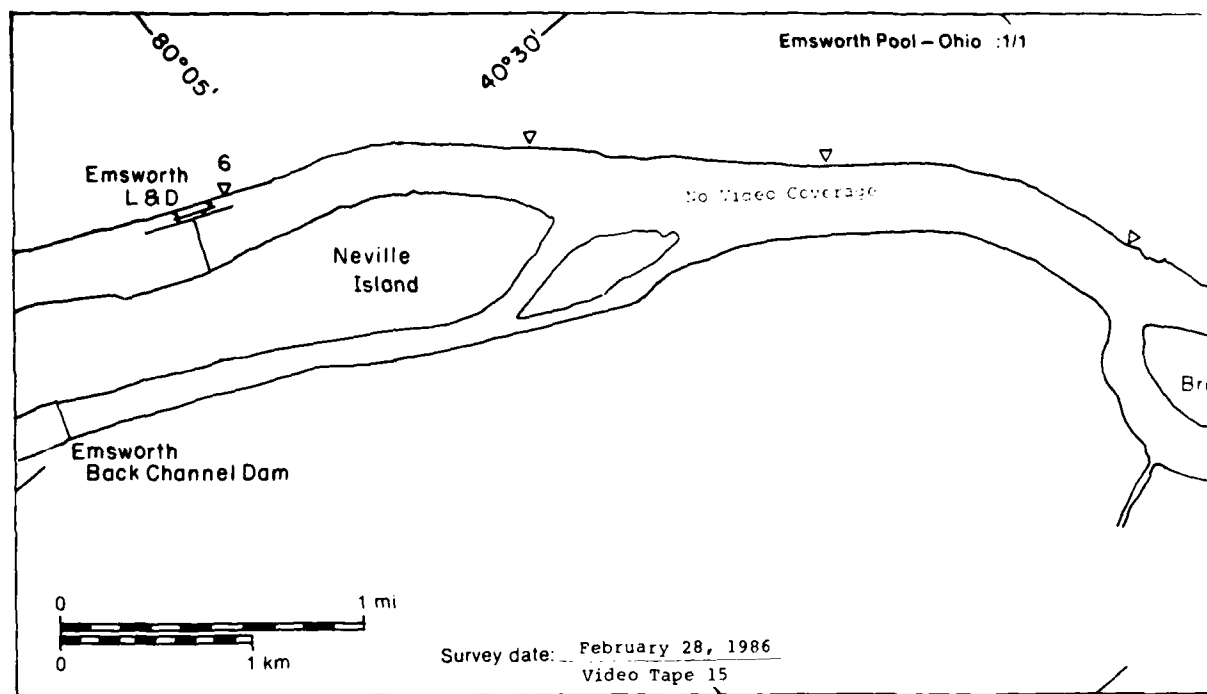




	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		4.02	

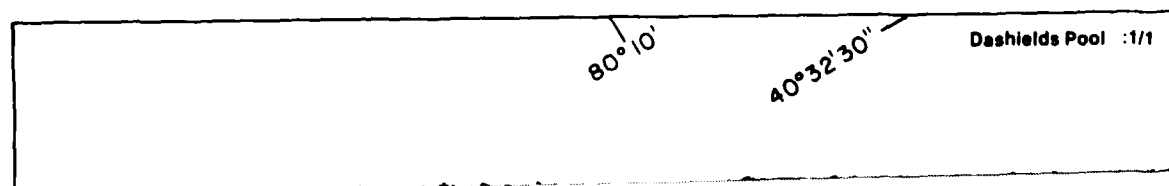


Lock and Dam #3 Pool		Area ($m^2 \times 10^6$)	Surface concentration (%)
MAP UNITS			
	Open water	1.14	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		1.14	

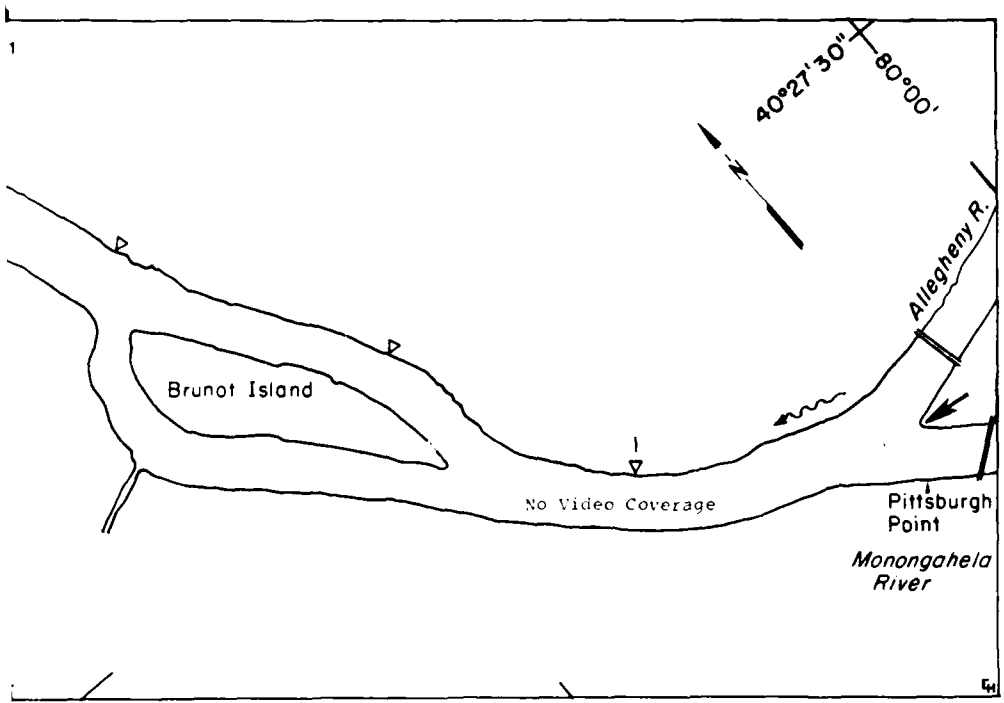





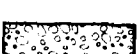
Emsworth Pool - Ohio

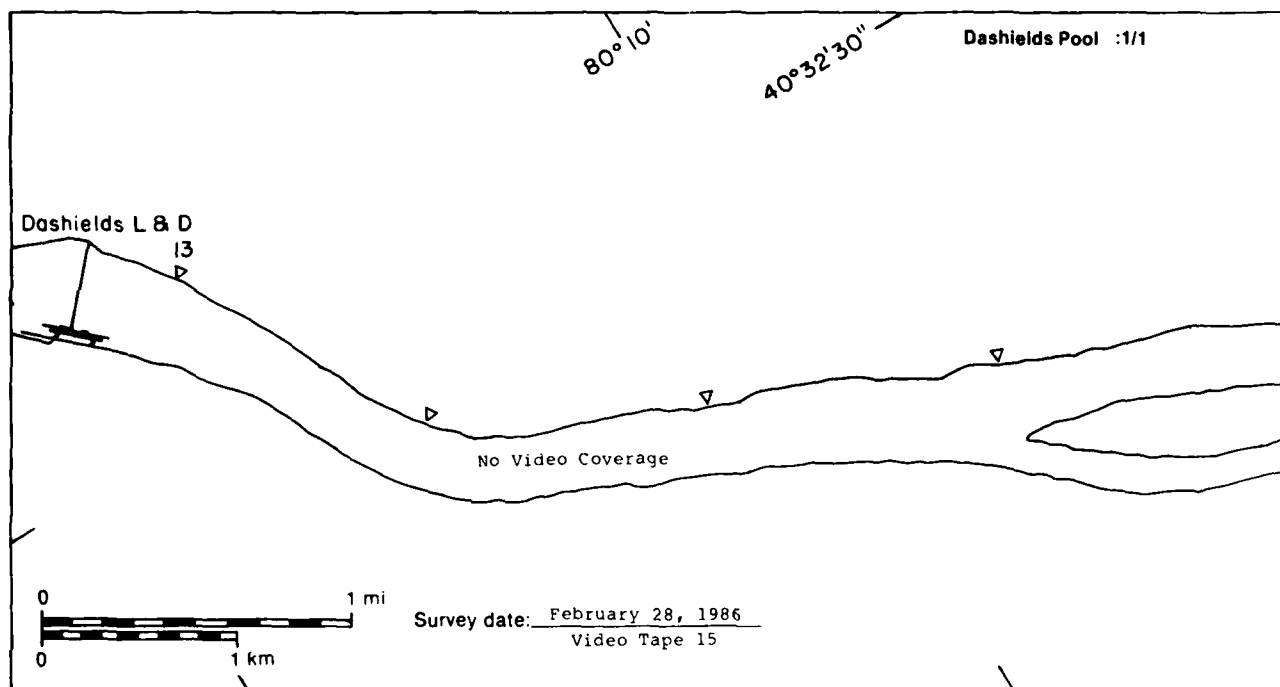
MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	0.00	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		4.49*	* Includes $4.49 \times 10^6 m^2$ of no video coverage

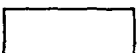




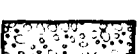


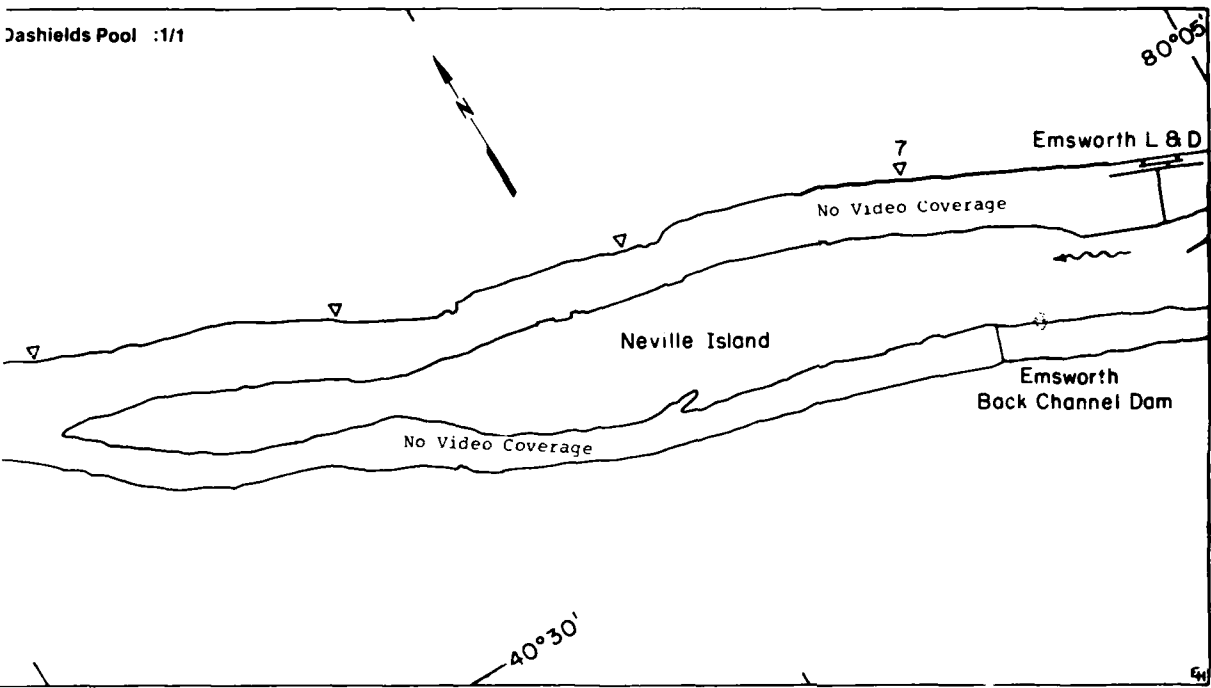
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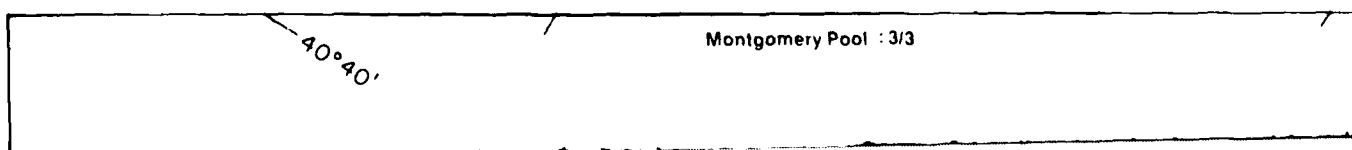
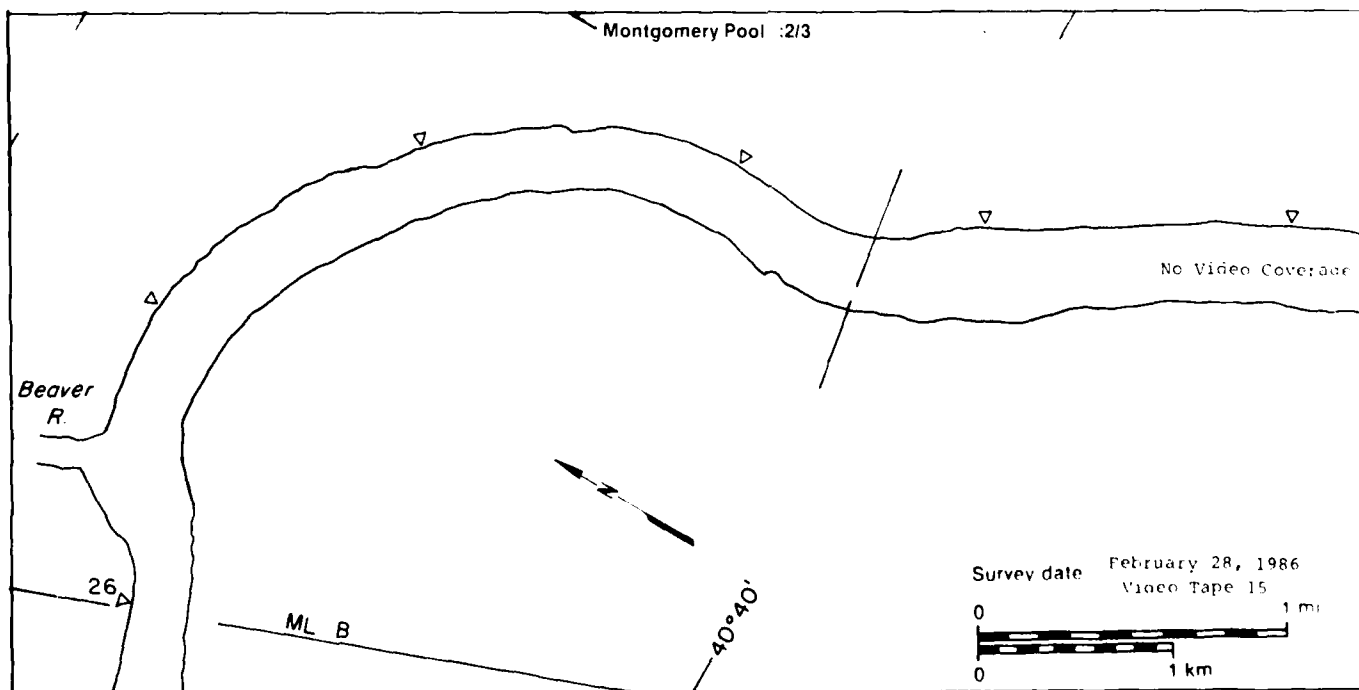
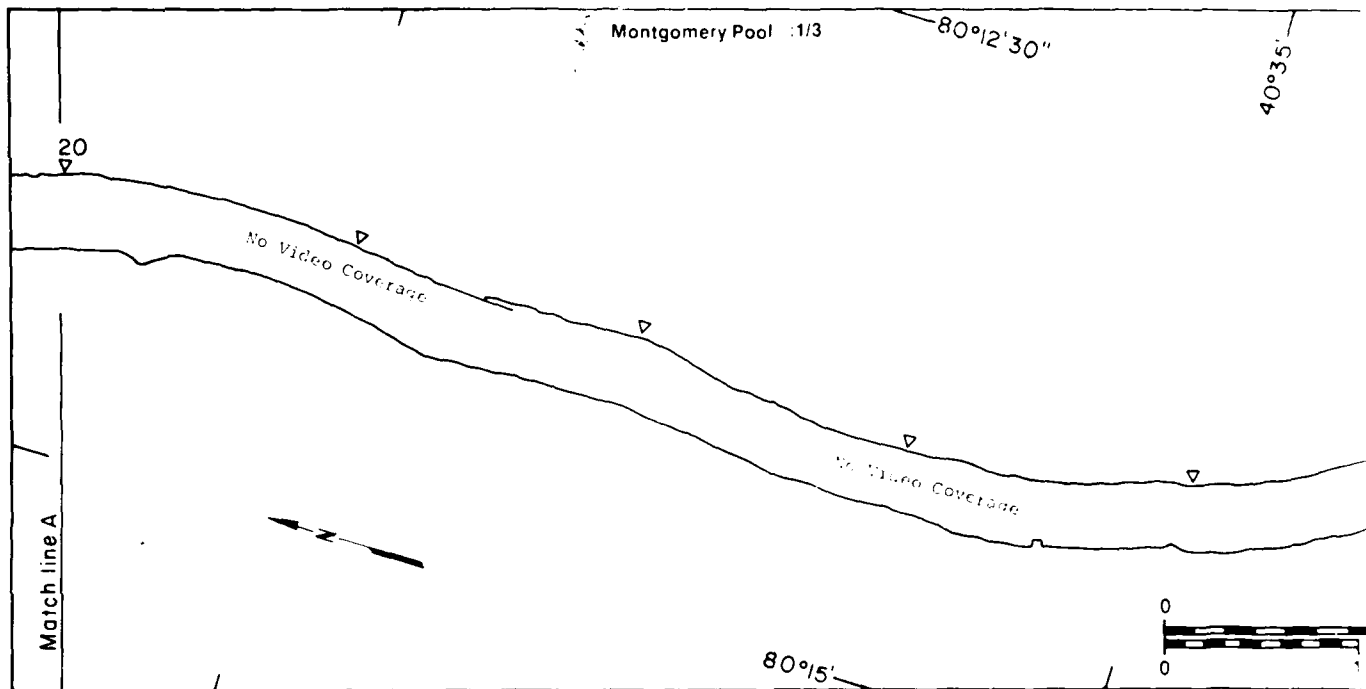
	open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		4.49*	* Includes $4.49 \times 10^6 m^2$ of no video coverage

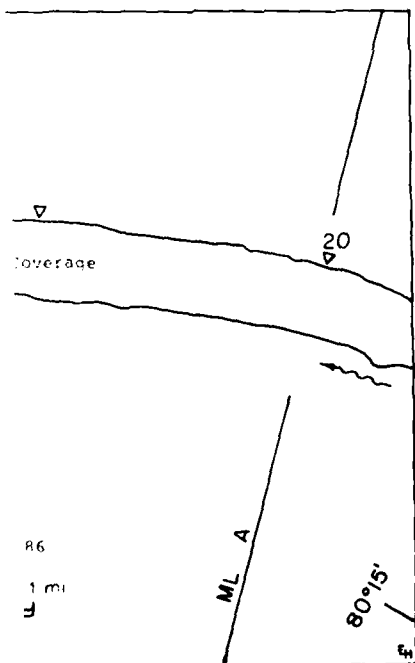
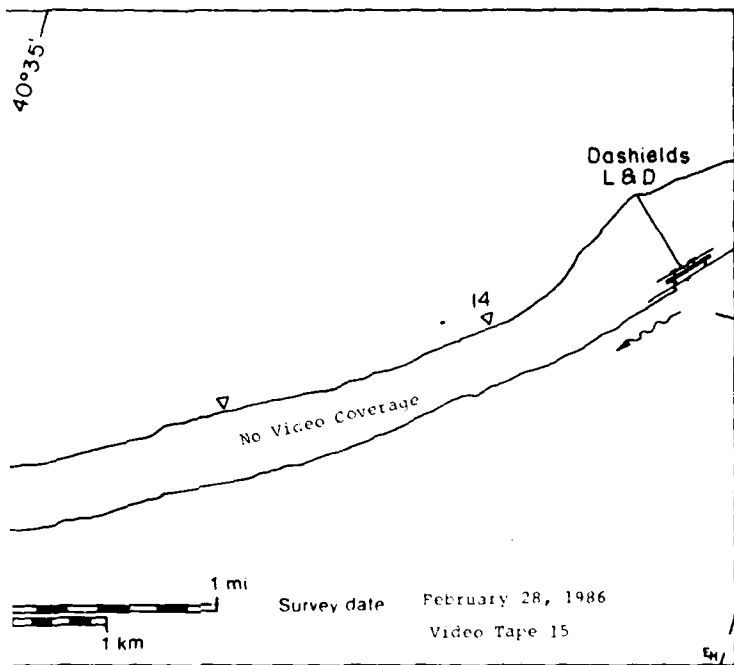


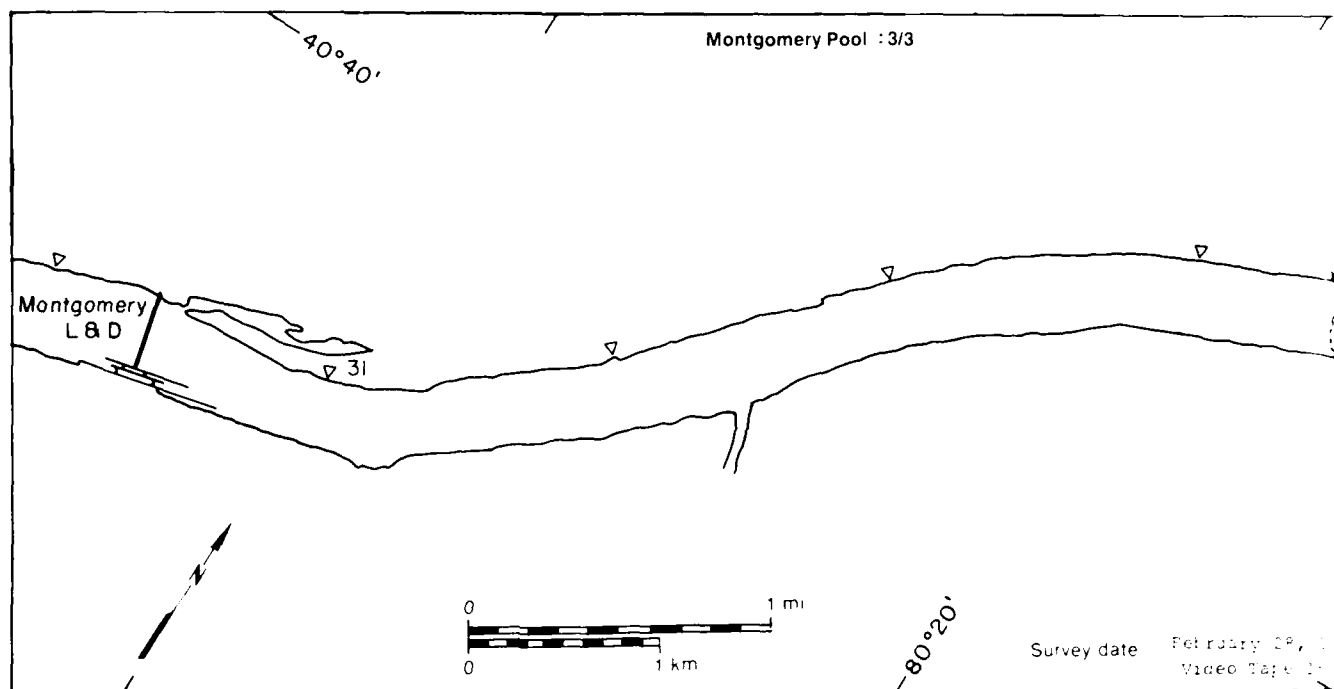
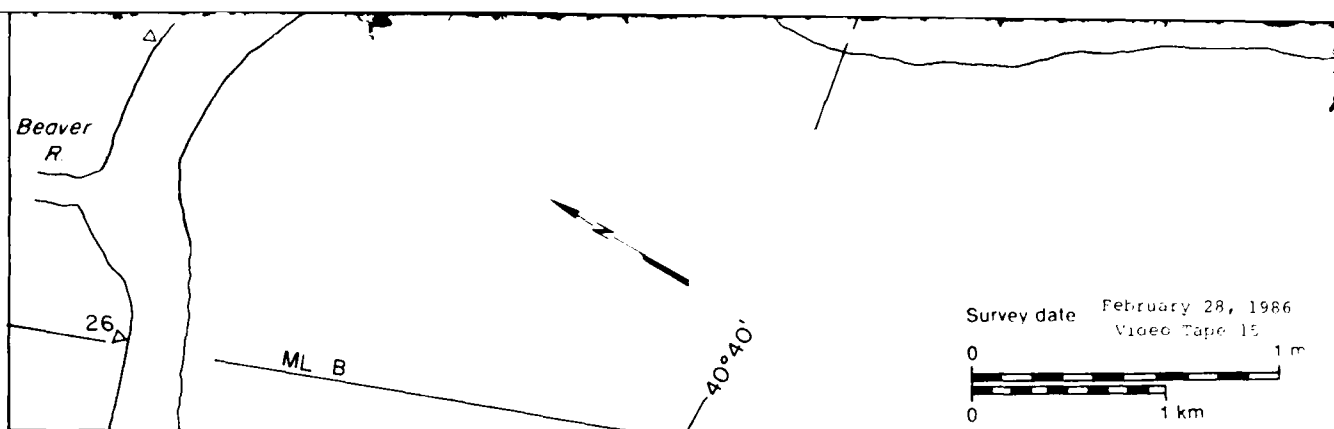
Dashields Pool		Area	Surface
MAP UNITS		($m^2 \times 10^6$)	concentration (%)
	Open water	0.00	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		5.00*	* Includes $5.00 \times 10^6 m^2$ of no video coverage



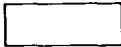

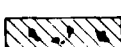
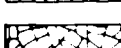
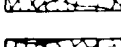

28 February 1986







Montgomery Pool

Montgomery Pool		Surface concentration (%)	
<u>MAP UNITS</u>		Area (m ² x 10 ⁶)	
	Open water	5.76	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—

Total area ($m^2 \times 10^6$)

11.27* * Includes $5.51 \times 10^6 m^2$ of no video coverage

No Video Coverage

Survey date: February 28, 1986
Video Tape 15

1 mi

1 km

ML A

80°15'

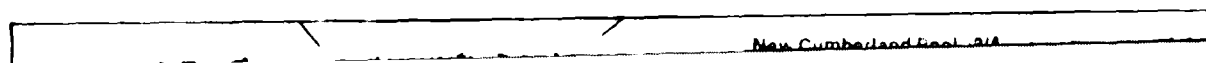
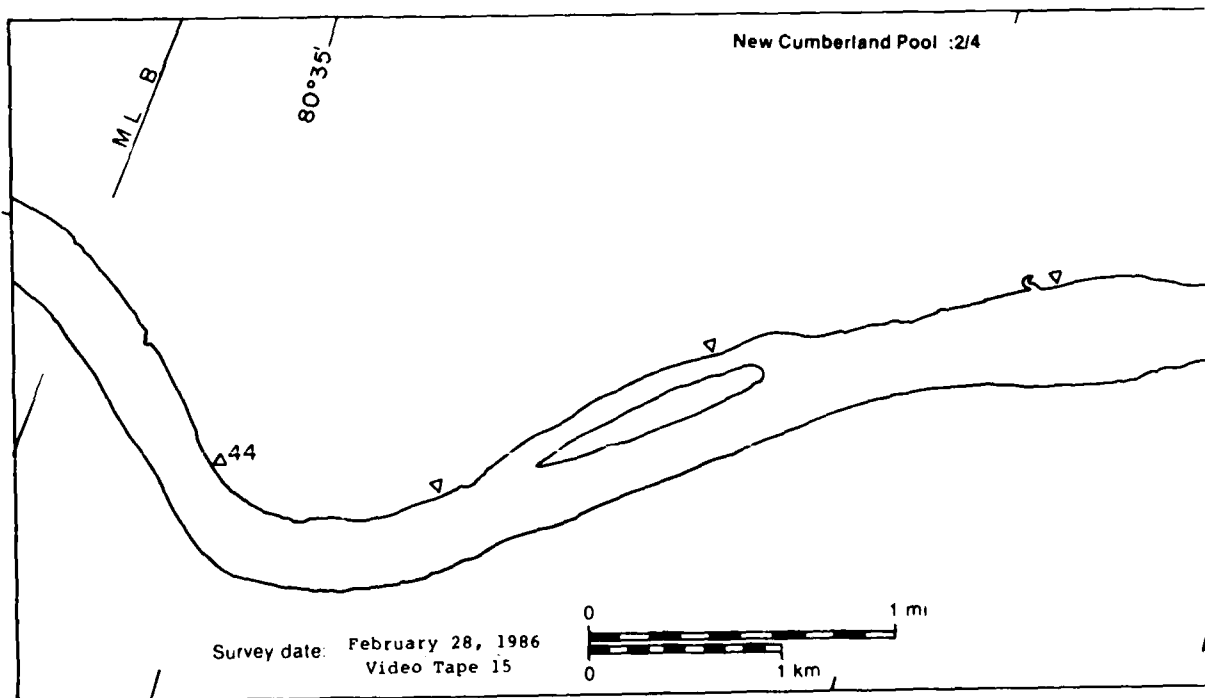
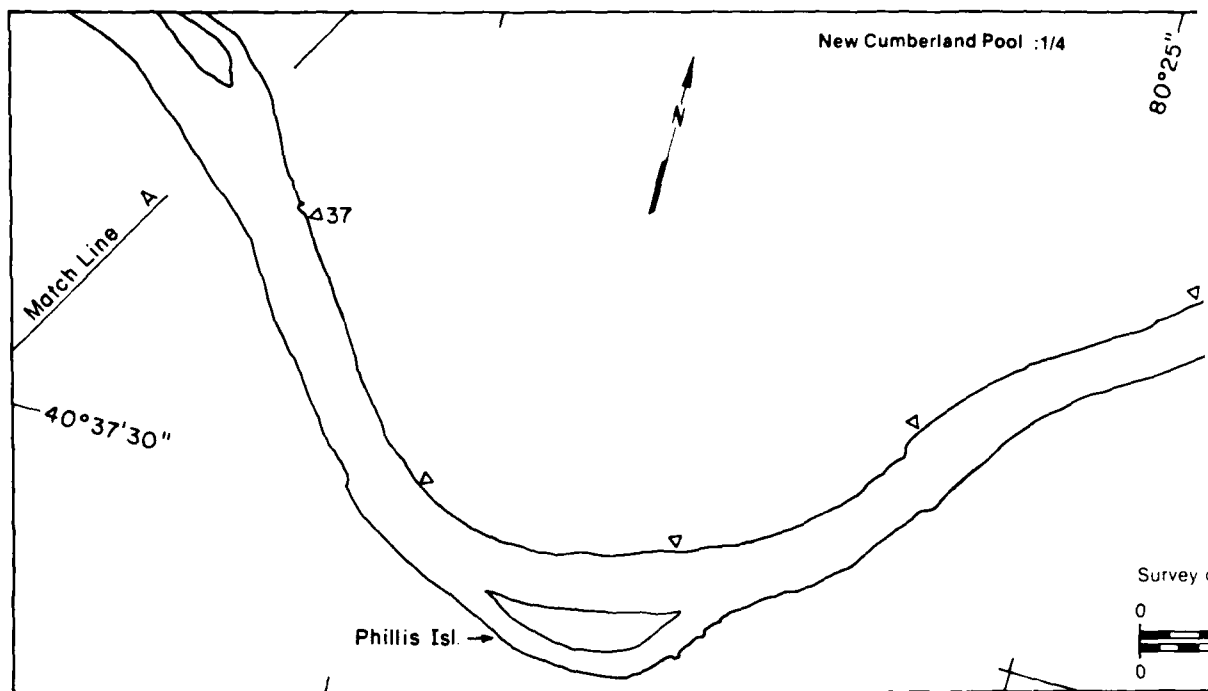
E_H

26

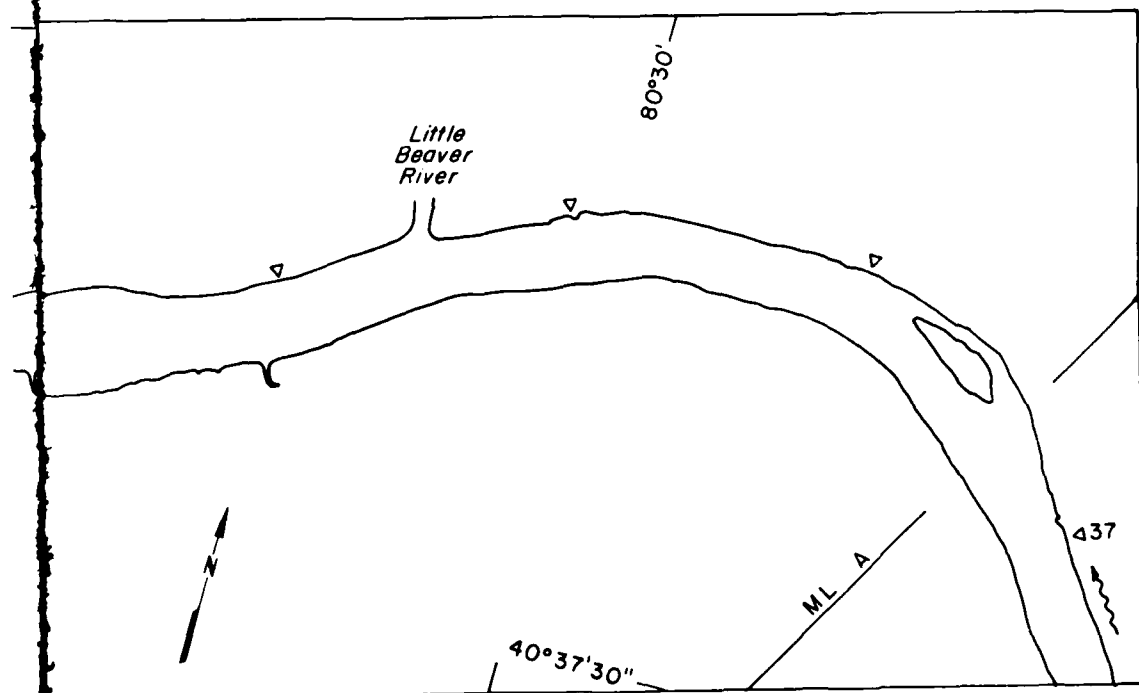
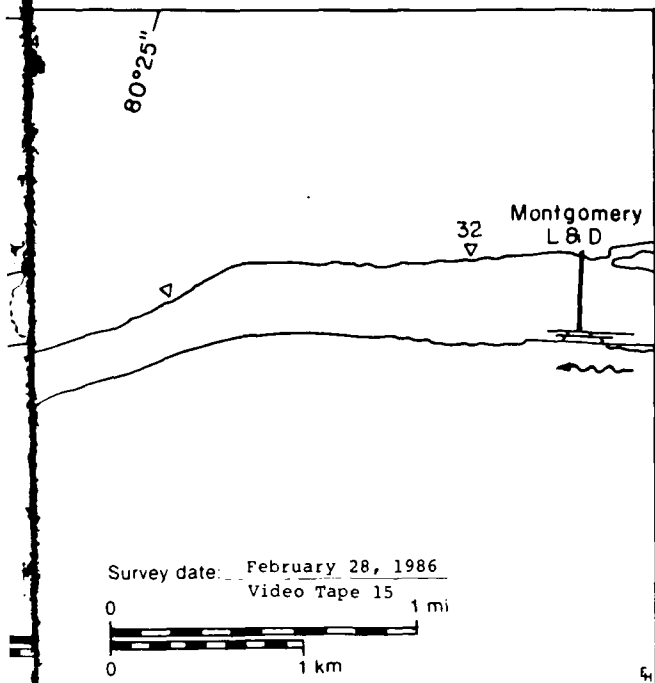
ML B

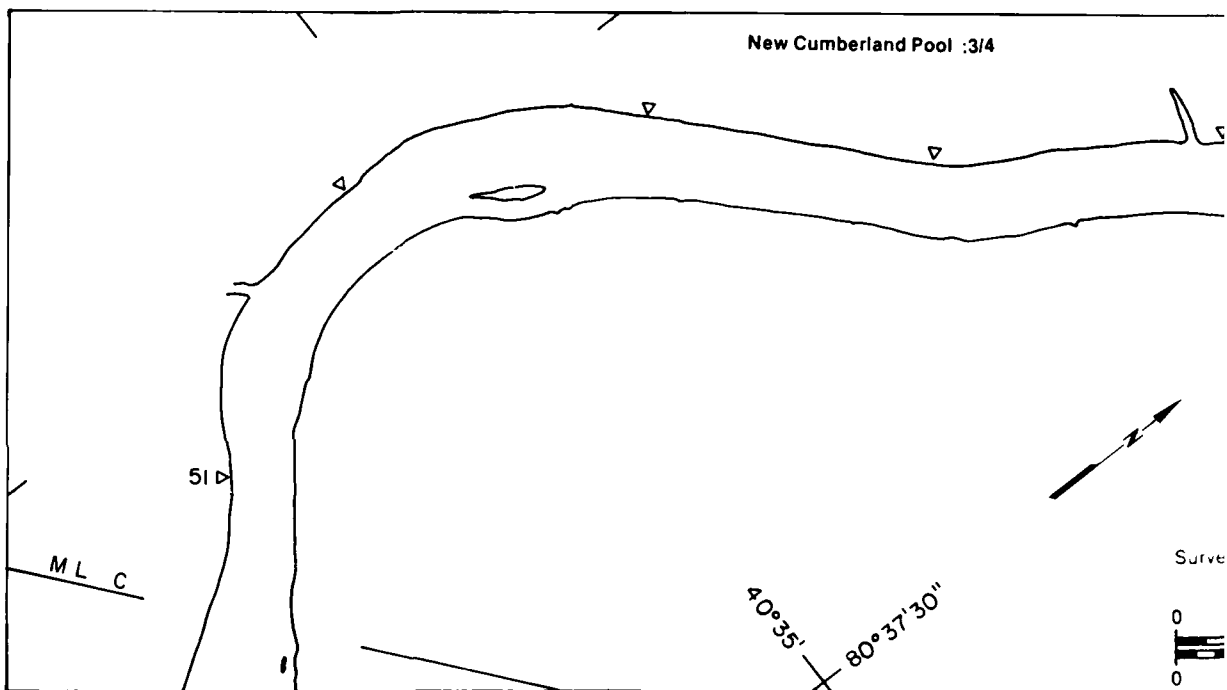
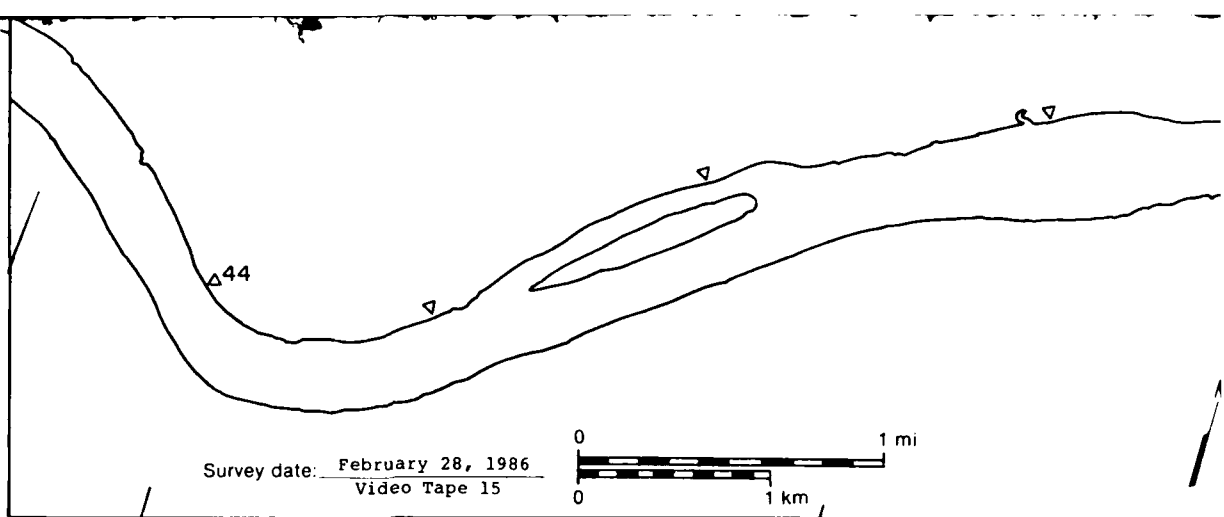
Survey date: February 28, 1986
Video Tape 15

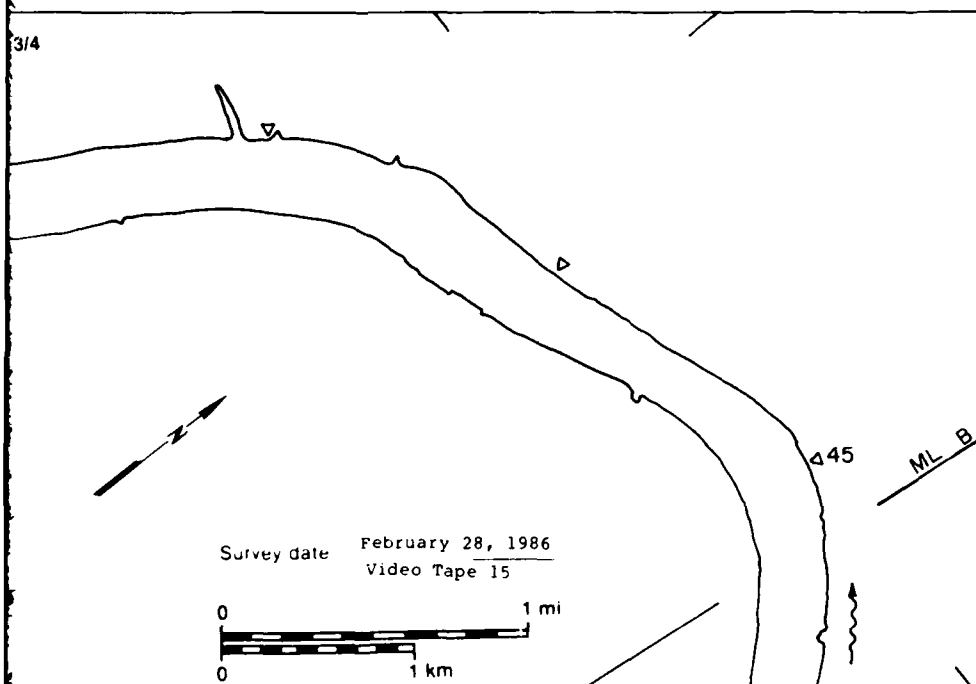
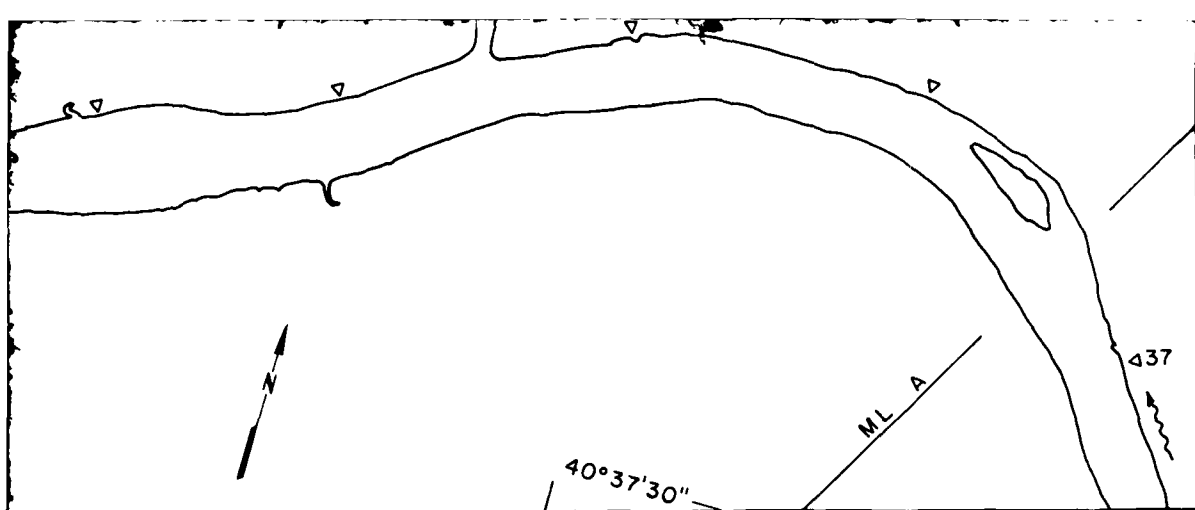
E_H



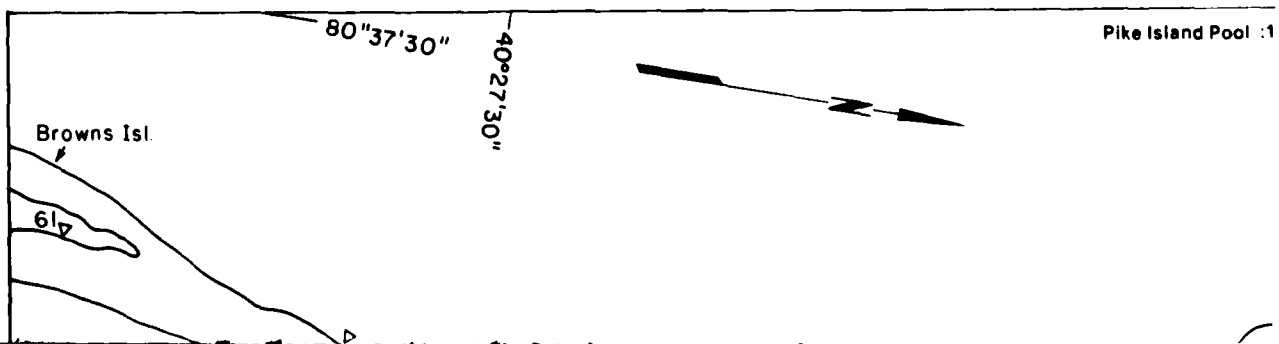
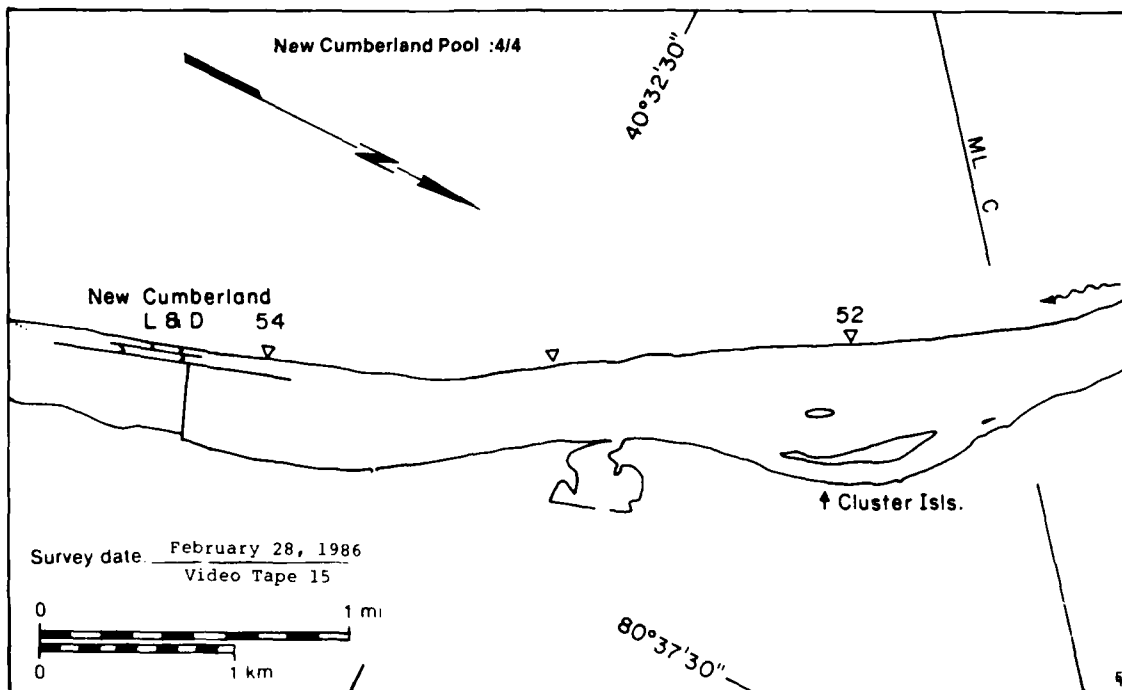
28 February 1986







28 February 1986



New Cumberland Pool

MAP UNITS

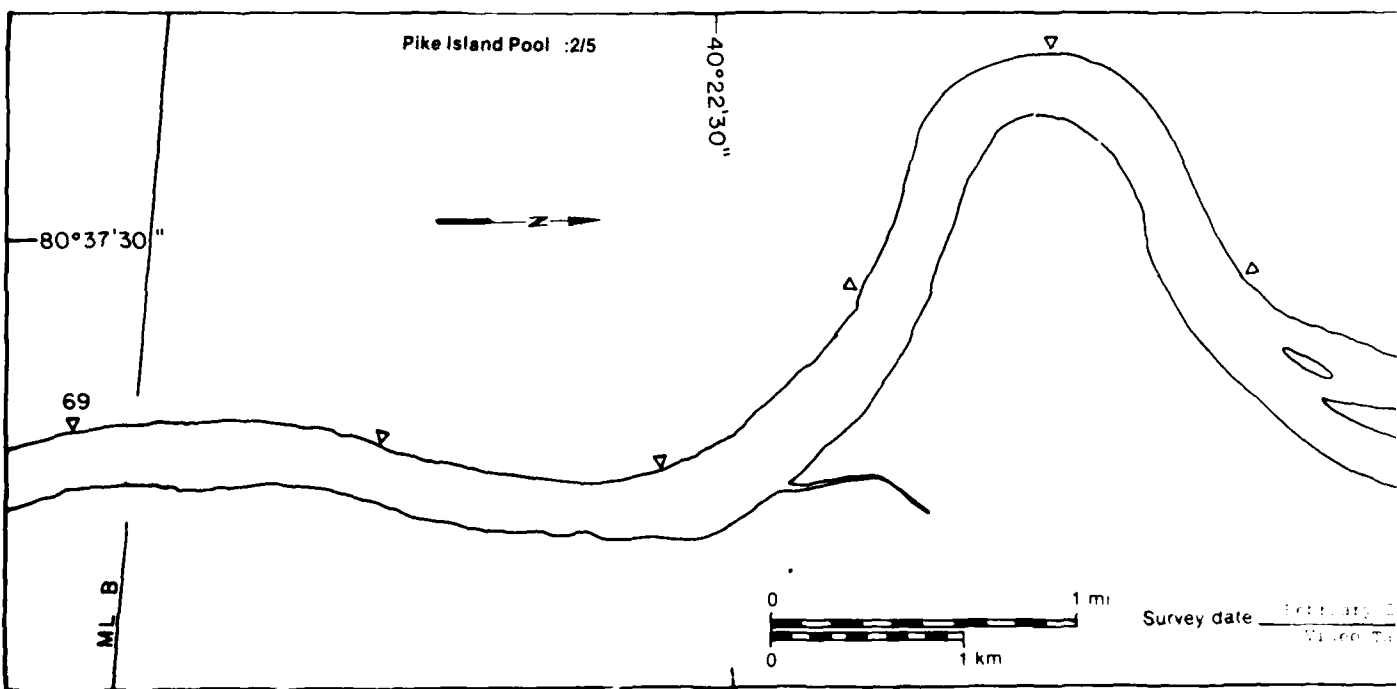
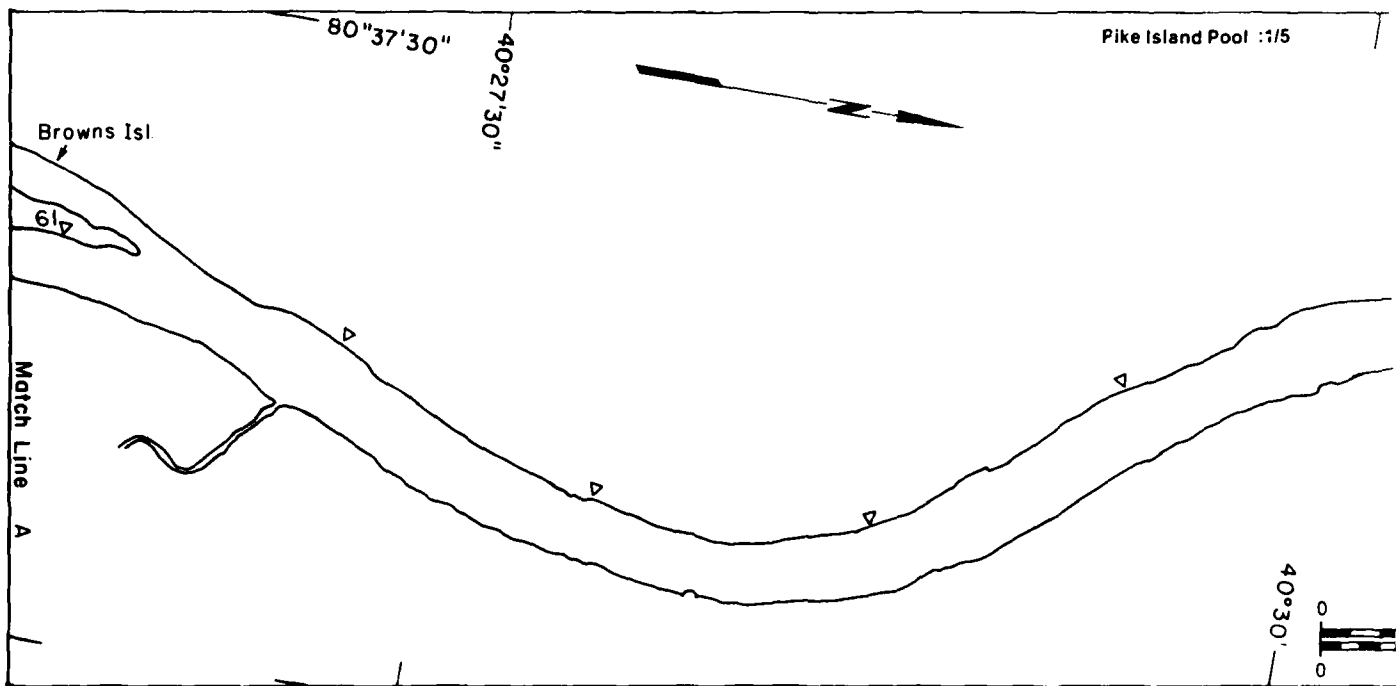
	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	14.87	NA
Solid ice cover	0.00	NA
Solid ice cover with open-water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open-water areas	0.00	—
Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)	14.87	

Pool :1/5

New Cumberland
L 8 D

54

55



Pike Island Pool :1/5

New Cumberland
L & D

54

55

40°30'

0

1 mi

Survey date

February 28, 1986

Video Tape 15

40°25'

M L A

Browns Isl

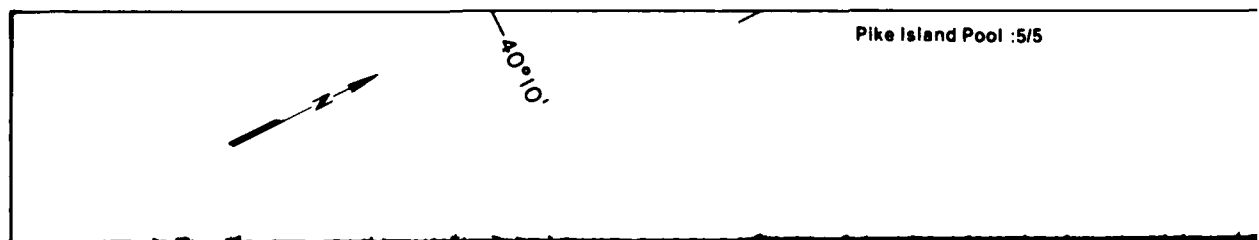
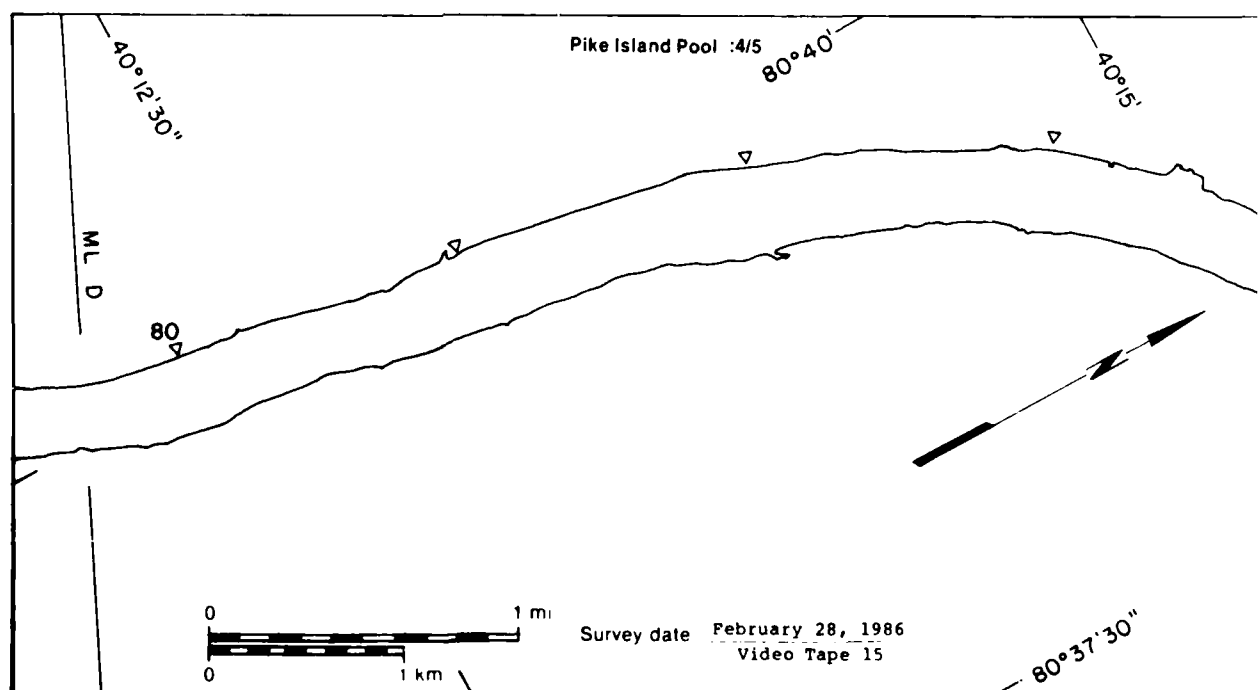
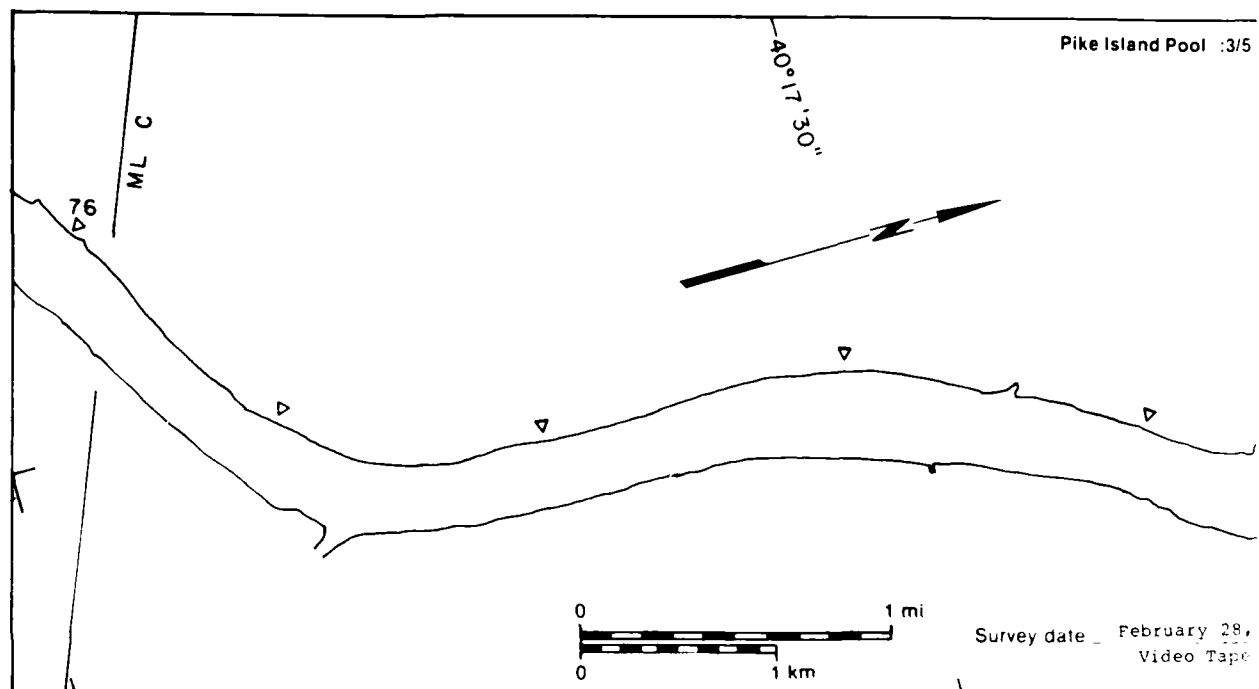
62

1 mi

Survey date

February 28, 1986

Video Tape 15



28 February 1986

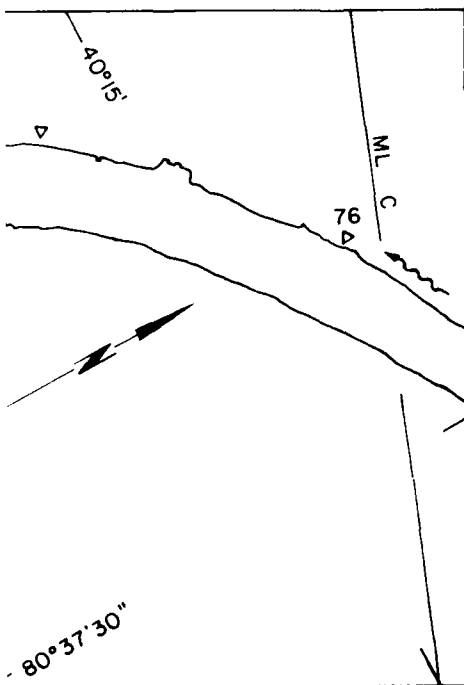
Pike Island Pool :3/5

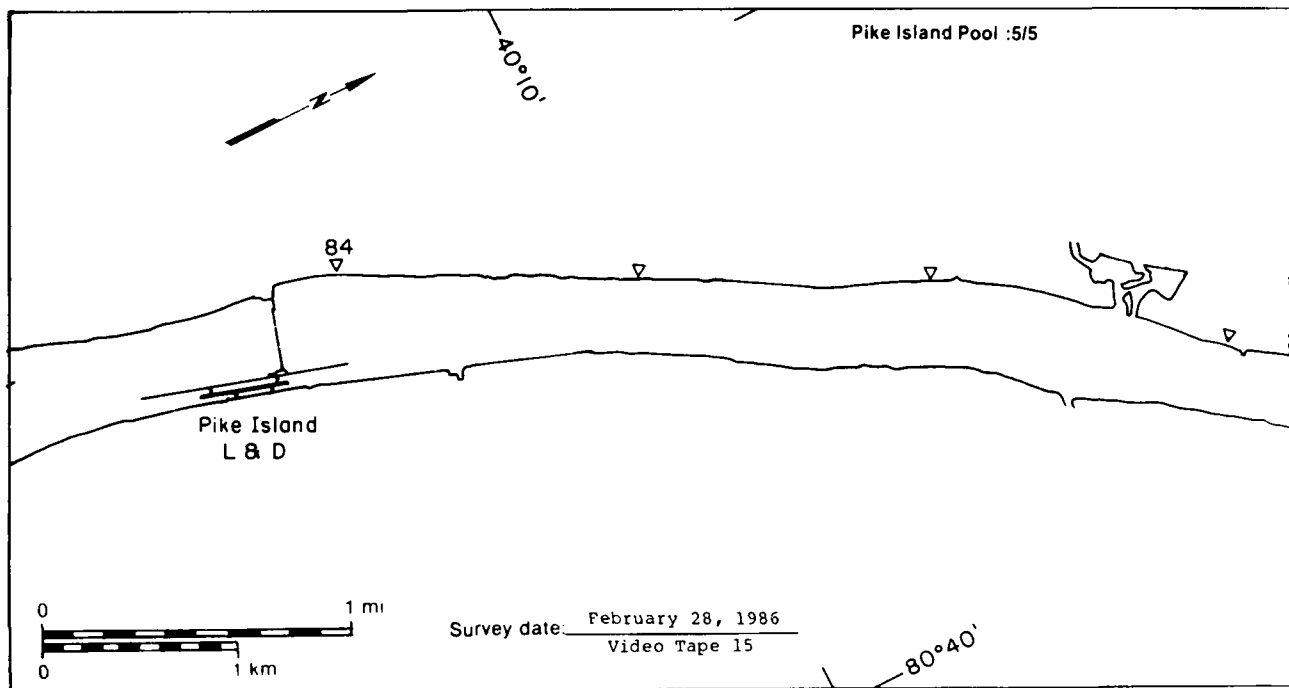
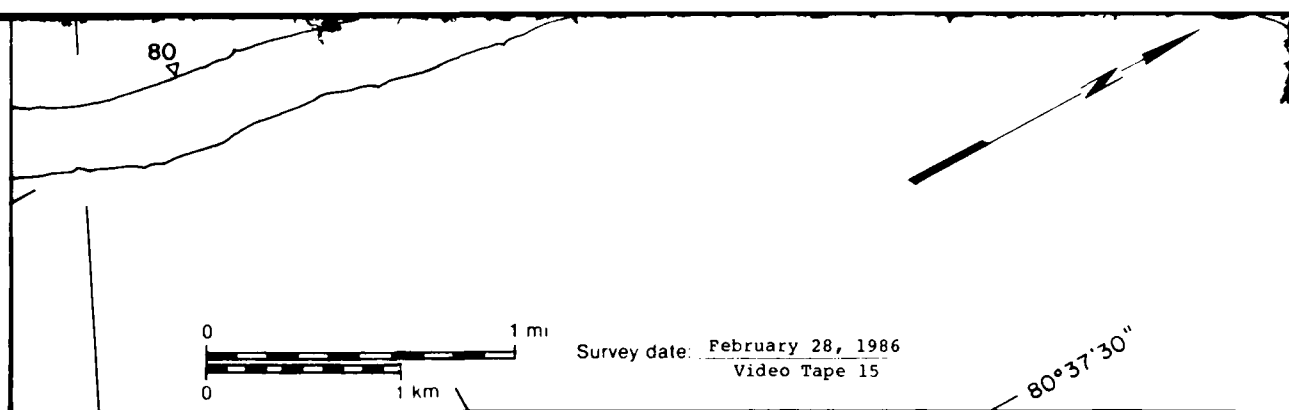
$80^{\circ}37'30''$
 $40^{\circ}20'$

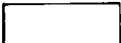
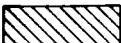

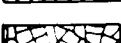


69

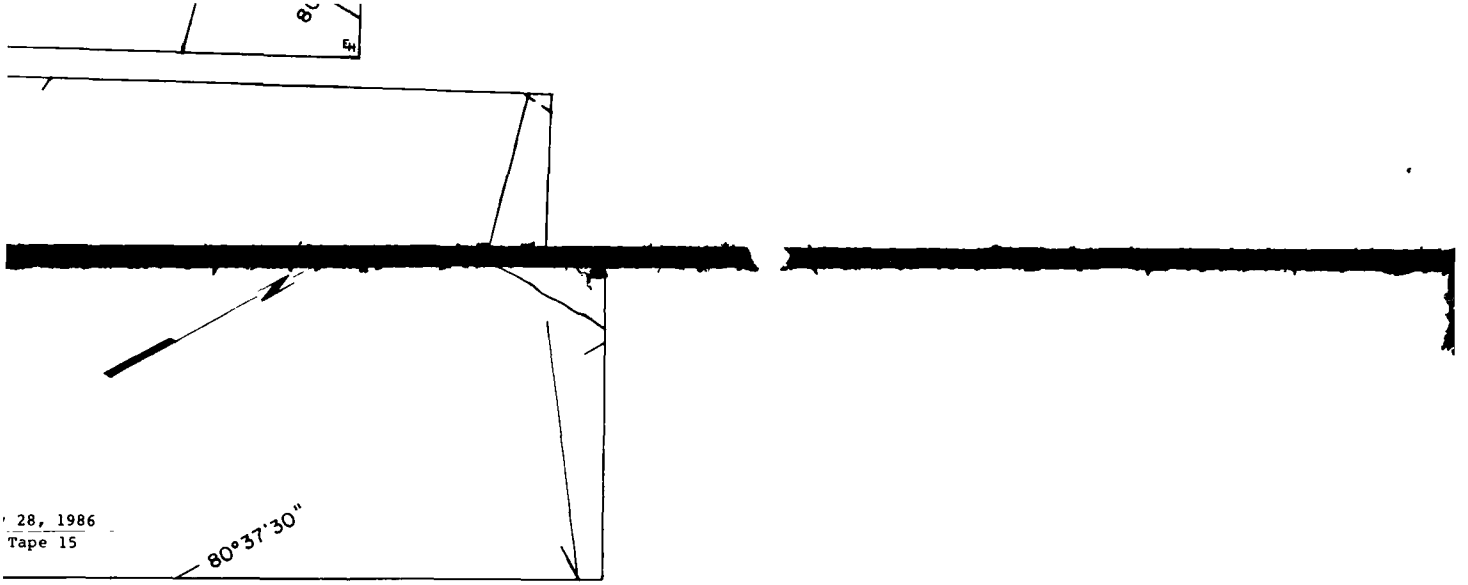
ML B

by Date February 28, 1986
Video Tape 15

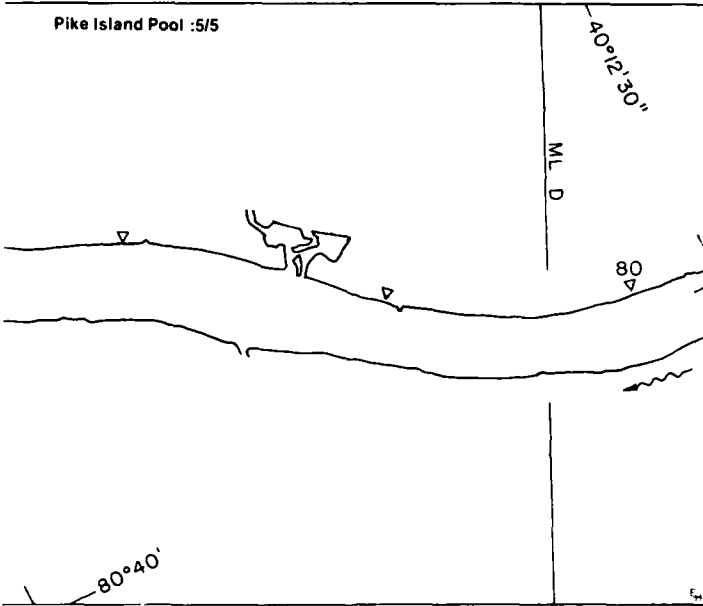




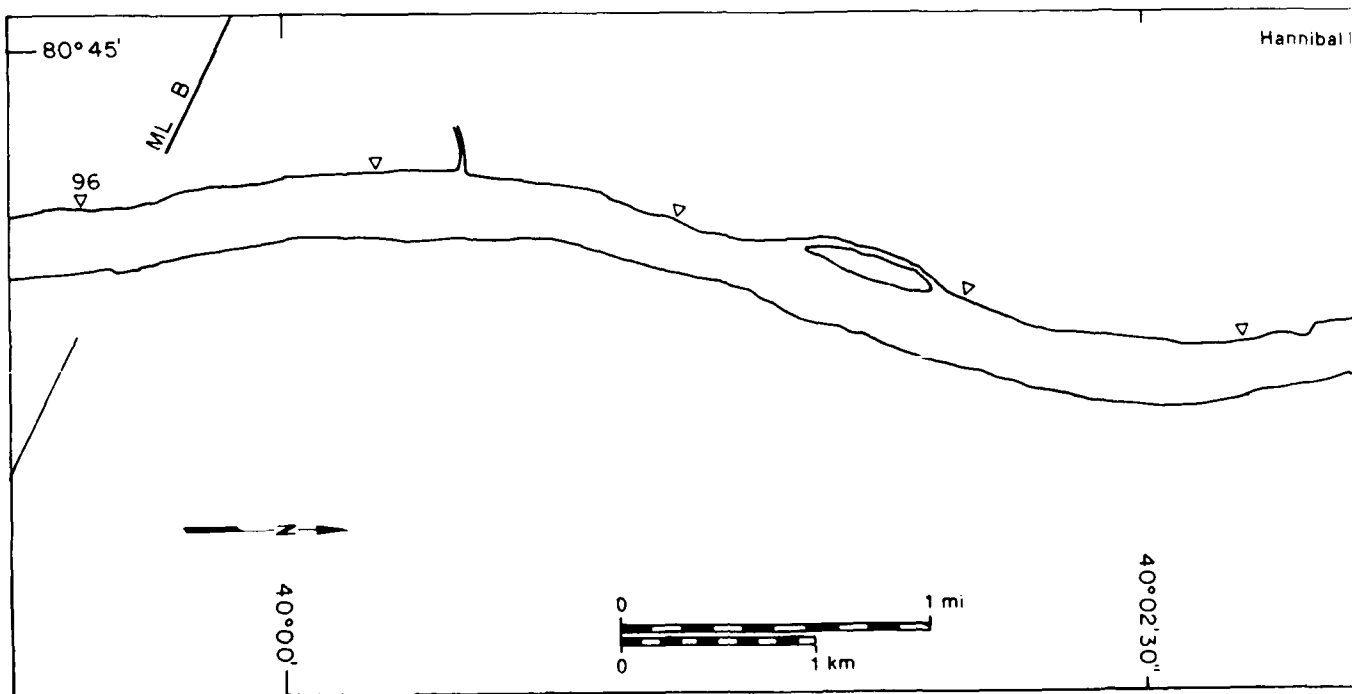
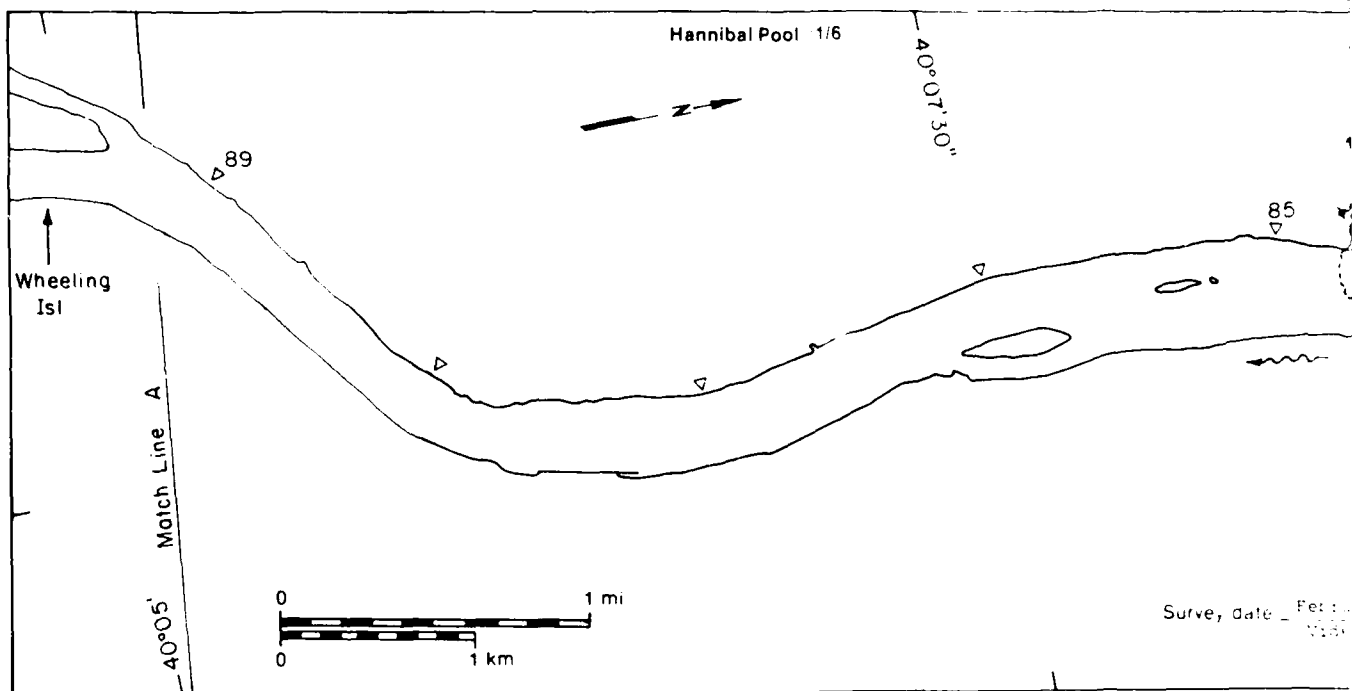
Pike Island Pool		Area (m ² x 10 ⁶)	Surface concentration (%)
MAP UNITS			
	Open water	18.92	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area (m ² x 10 ⁶)		18.92	

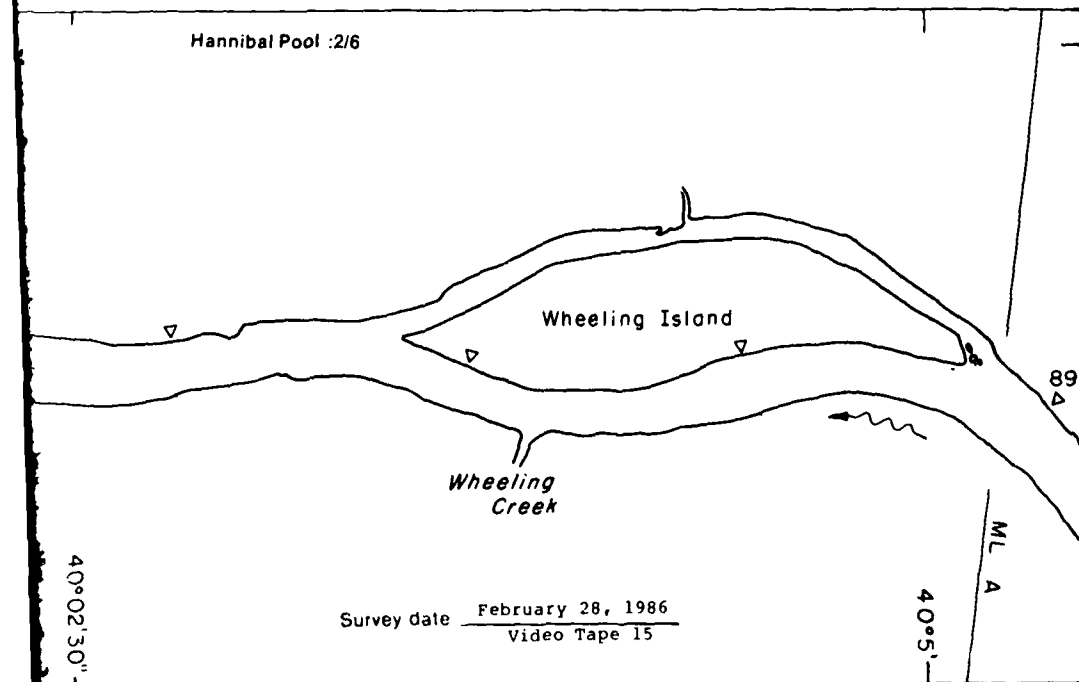
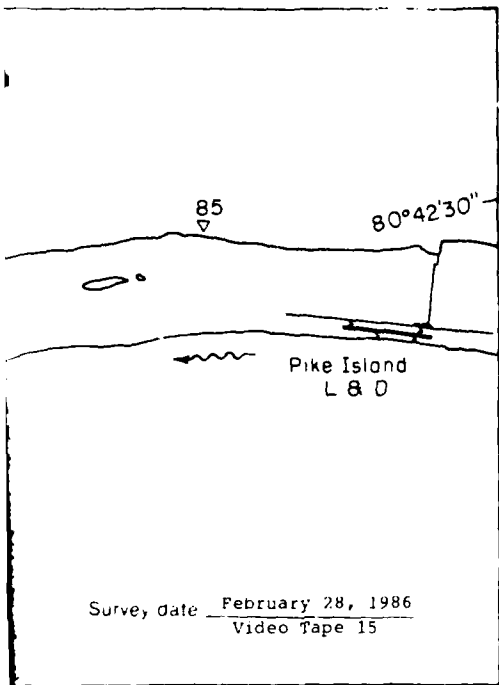


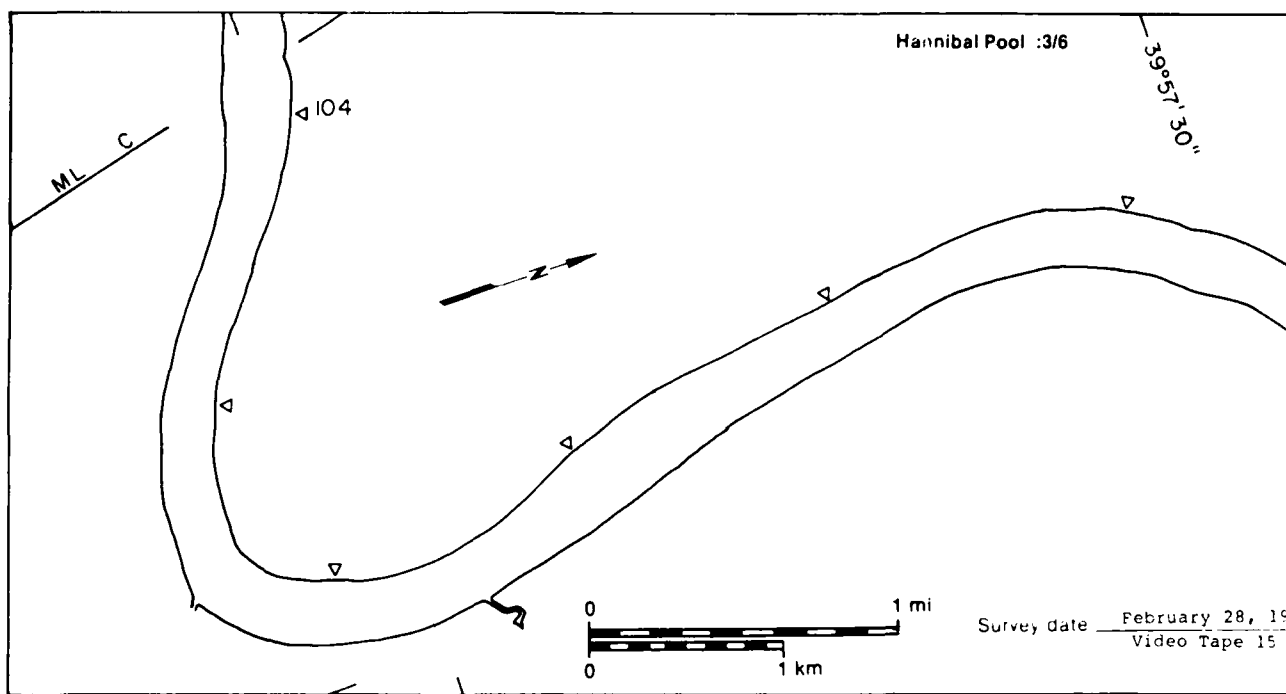
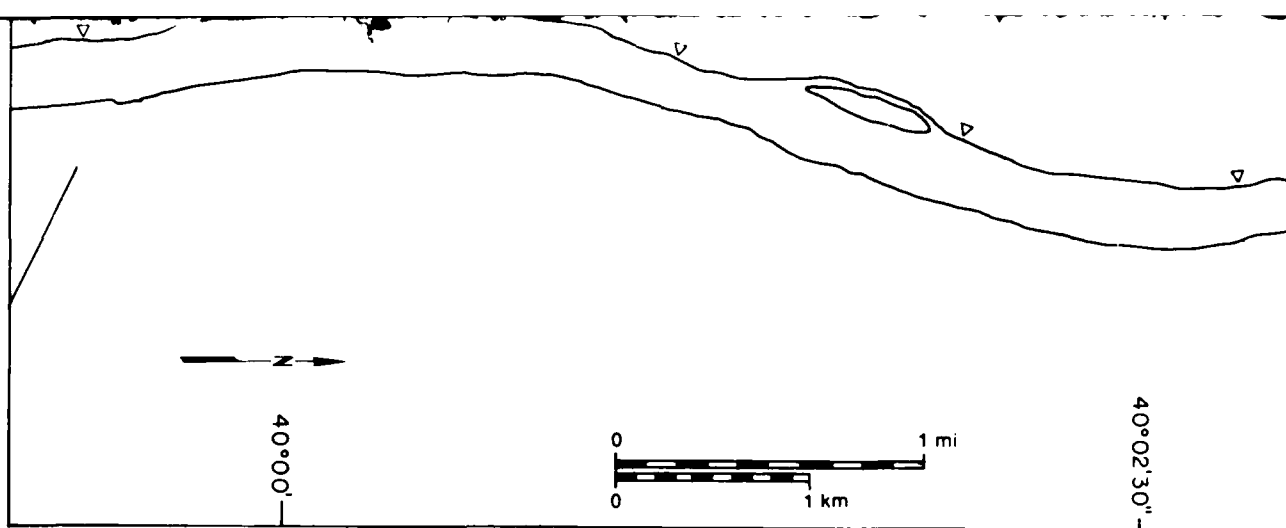
28, 1986
Tape 15

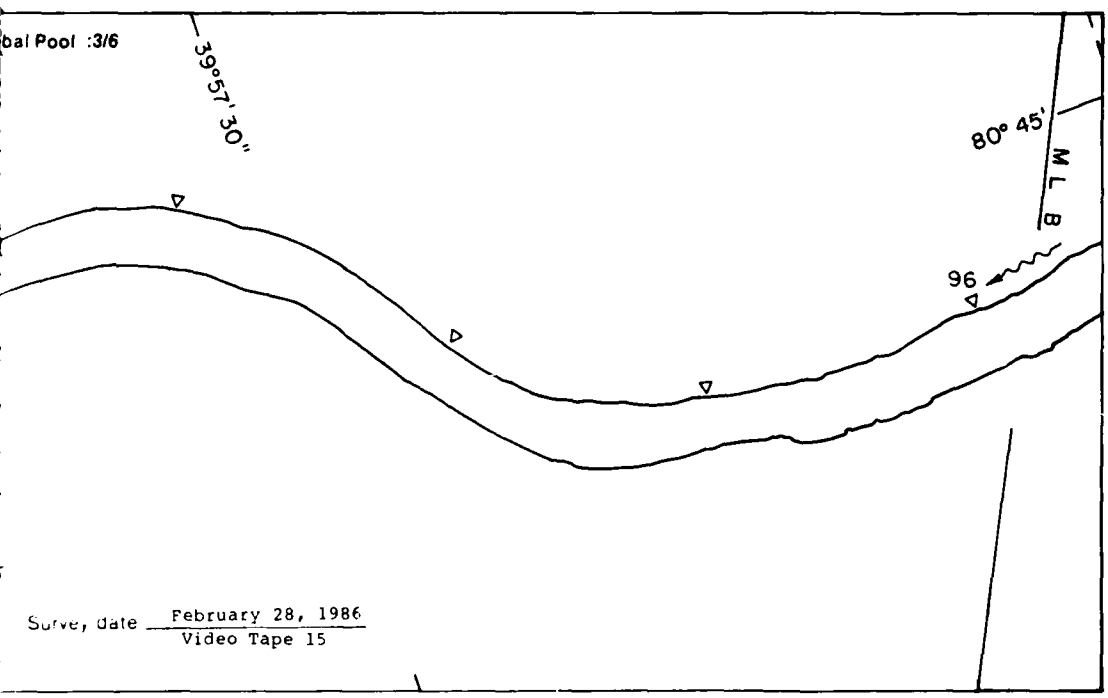
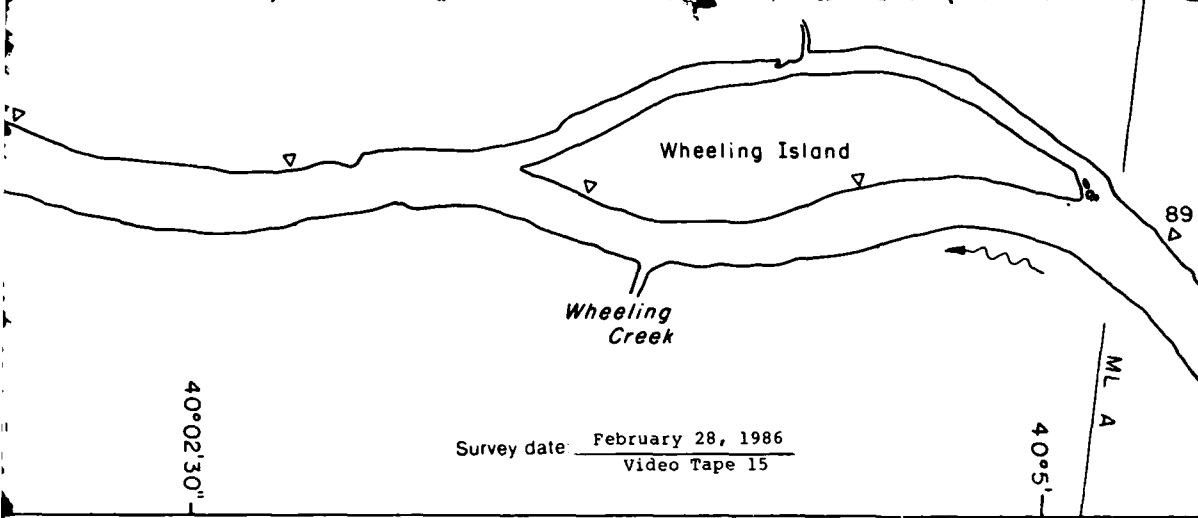


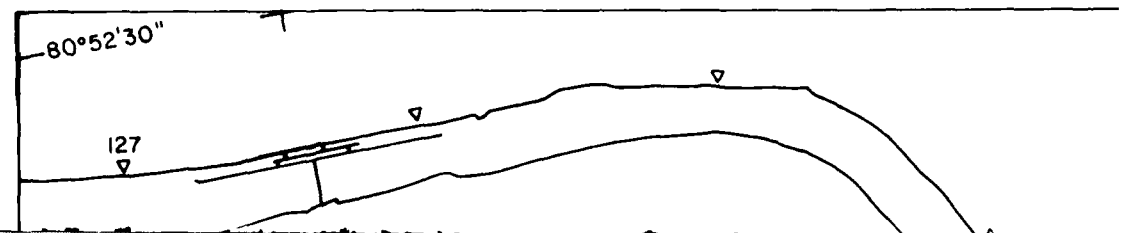
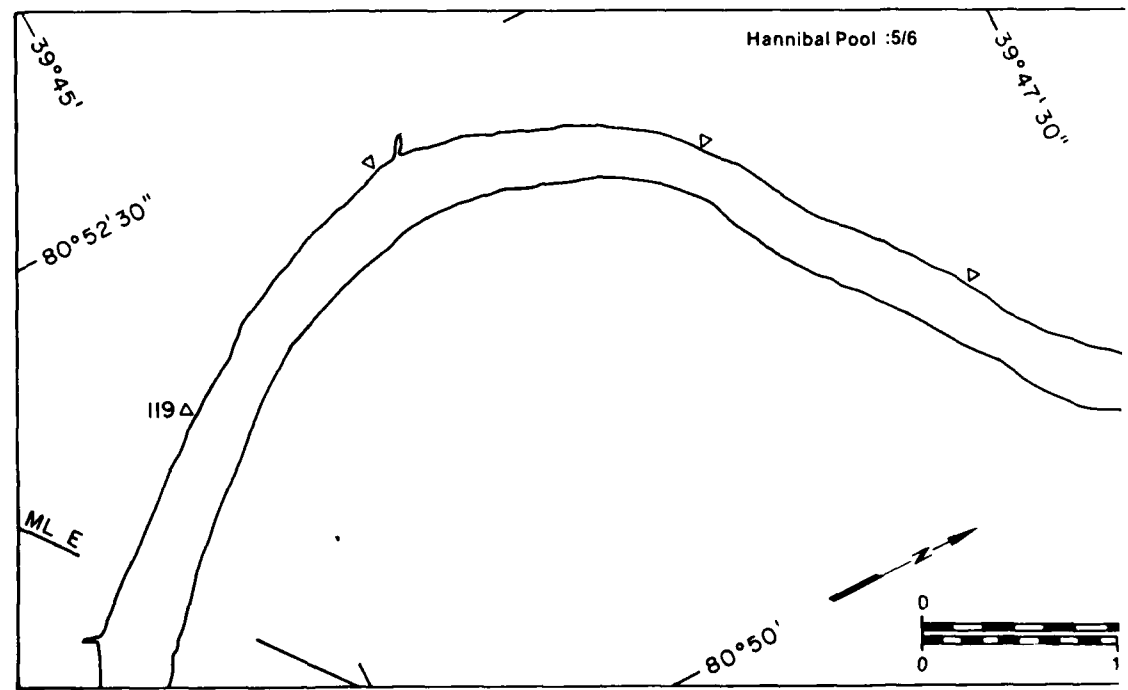
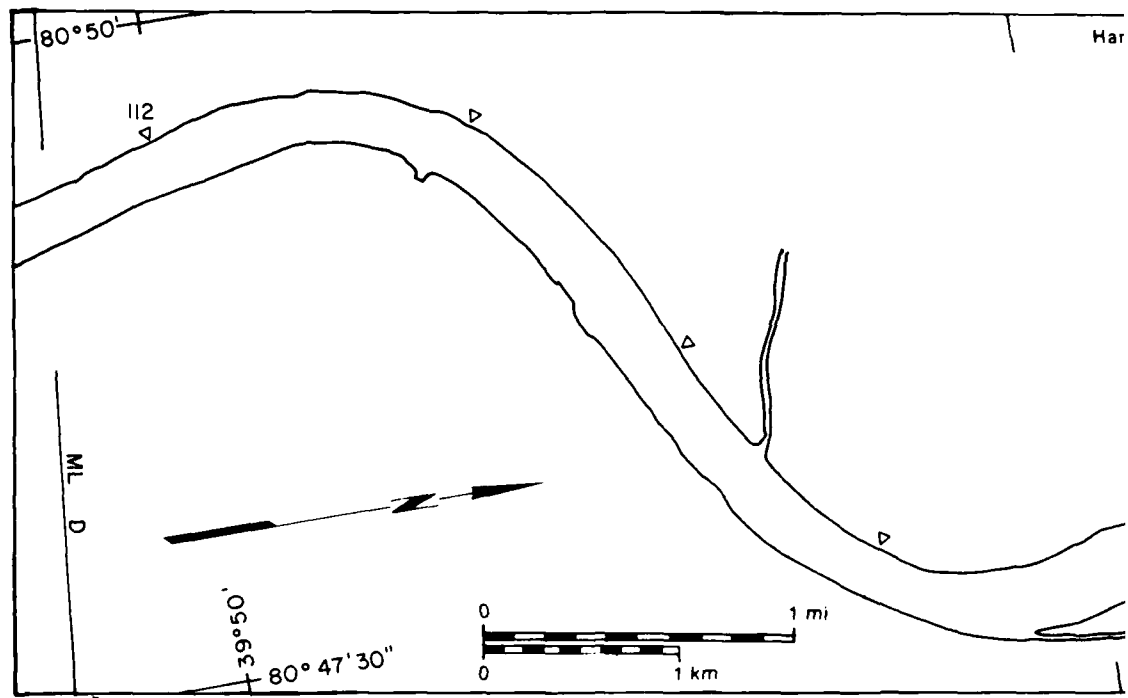
28 February 1986



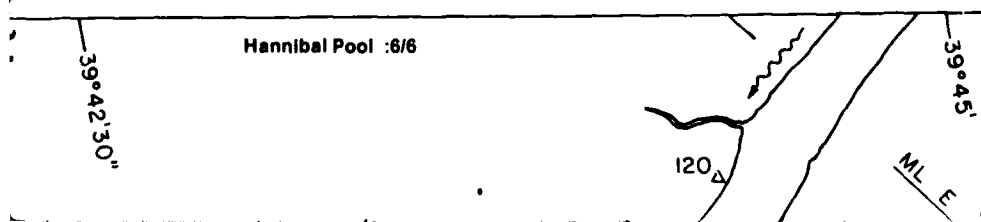
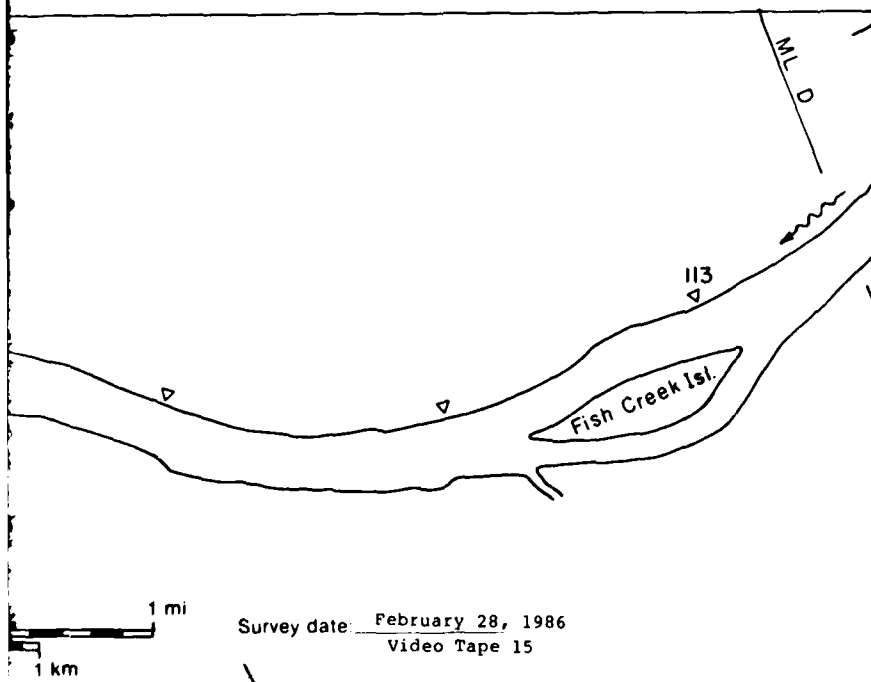
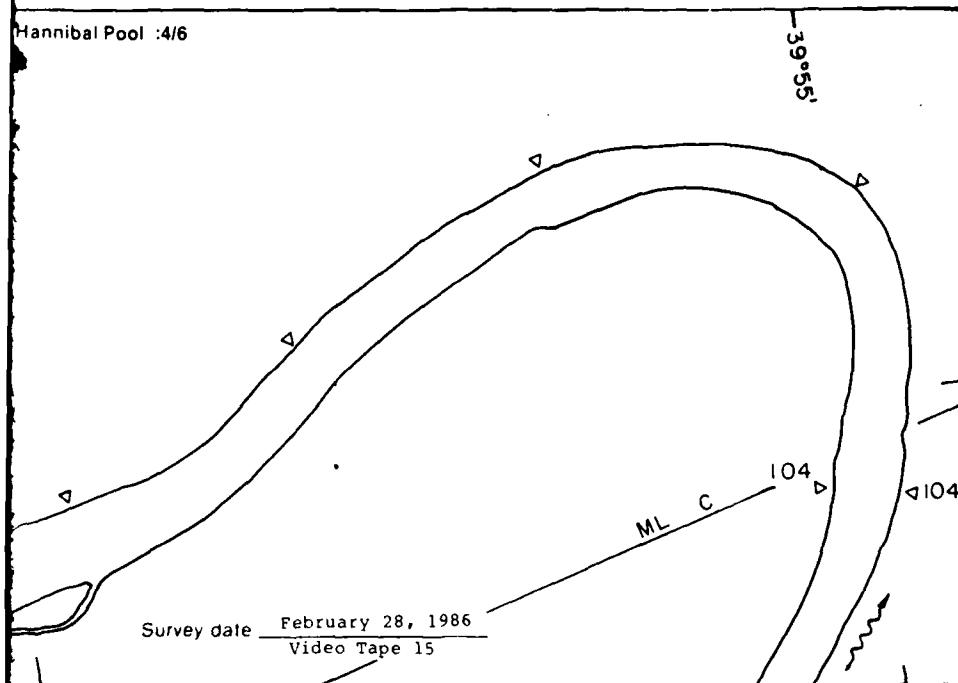


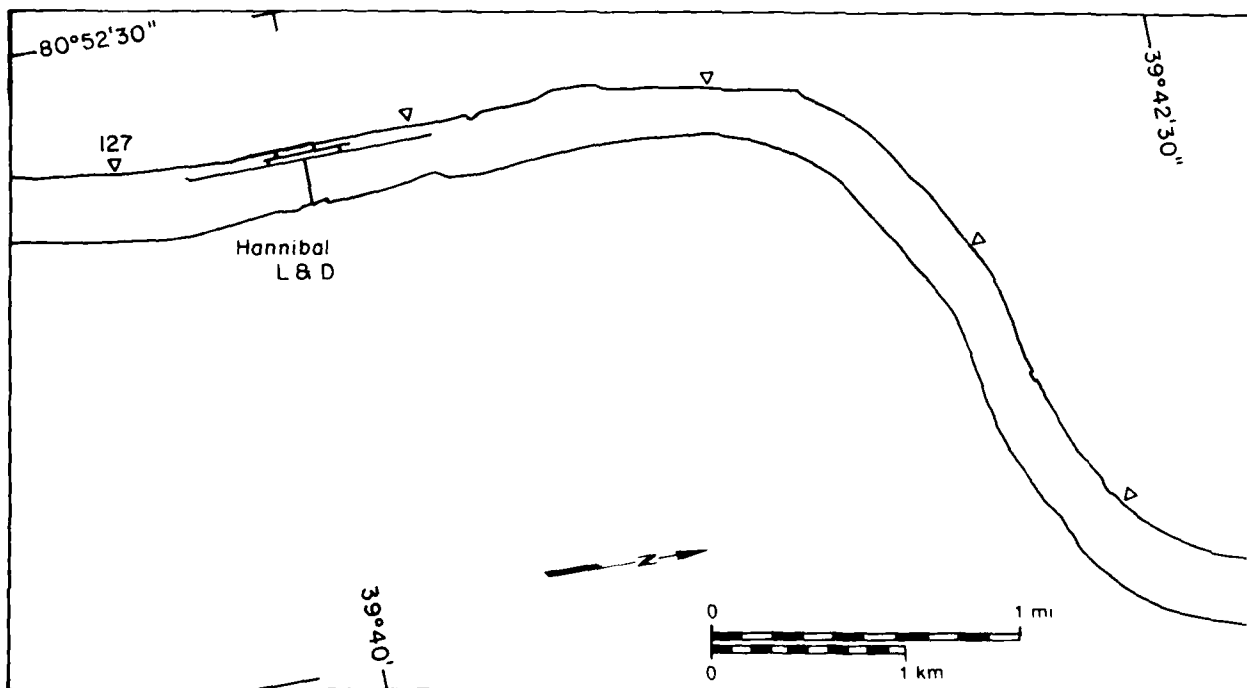
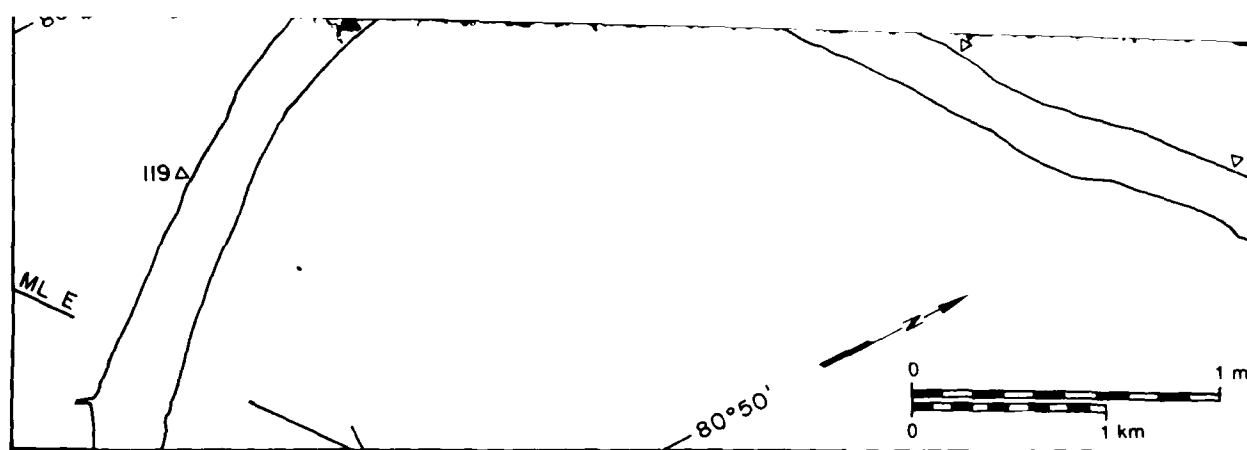









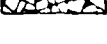


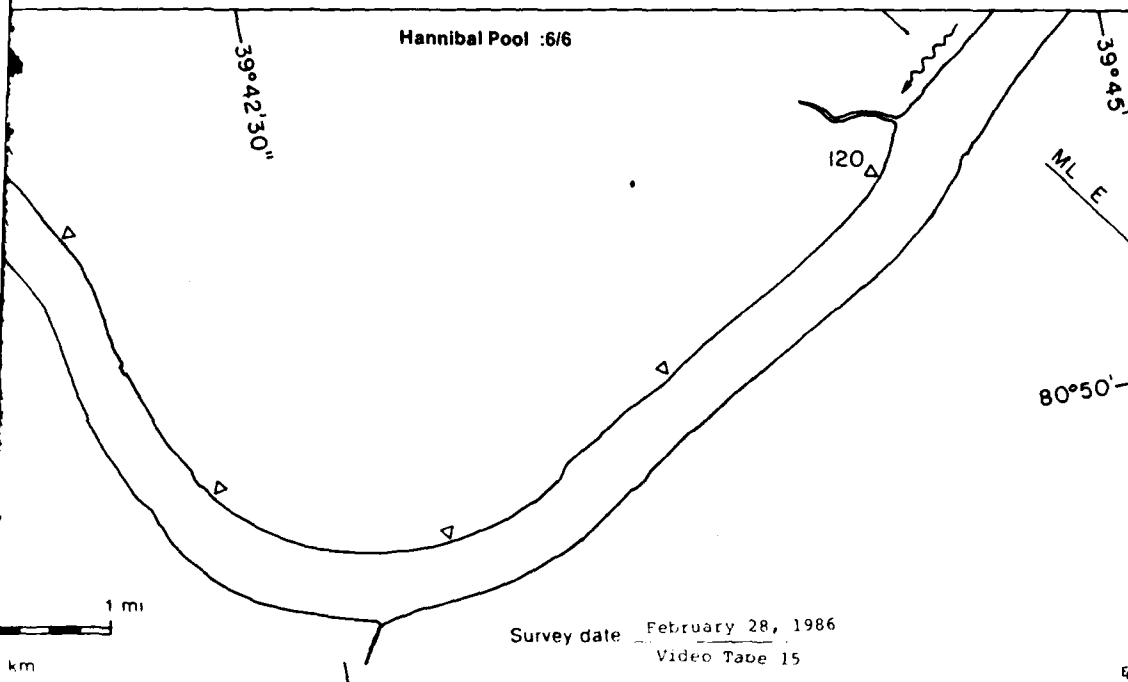
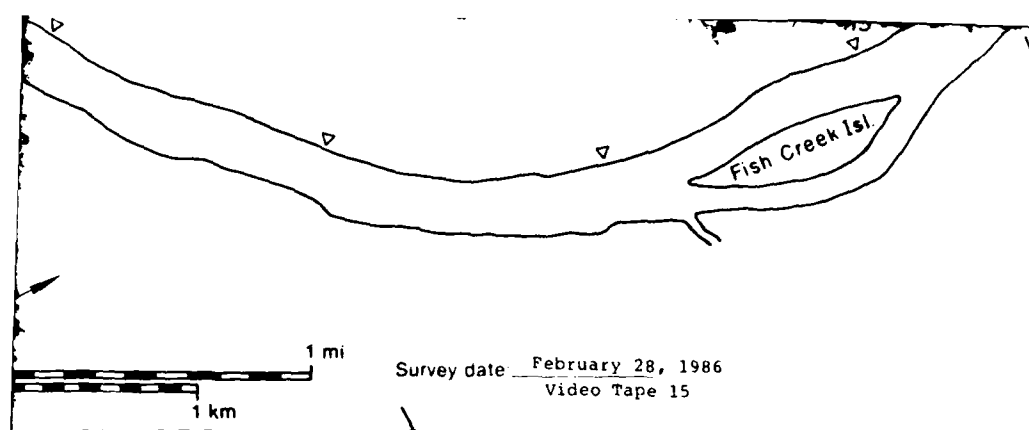
28 February 1986



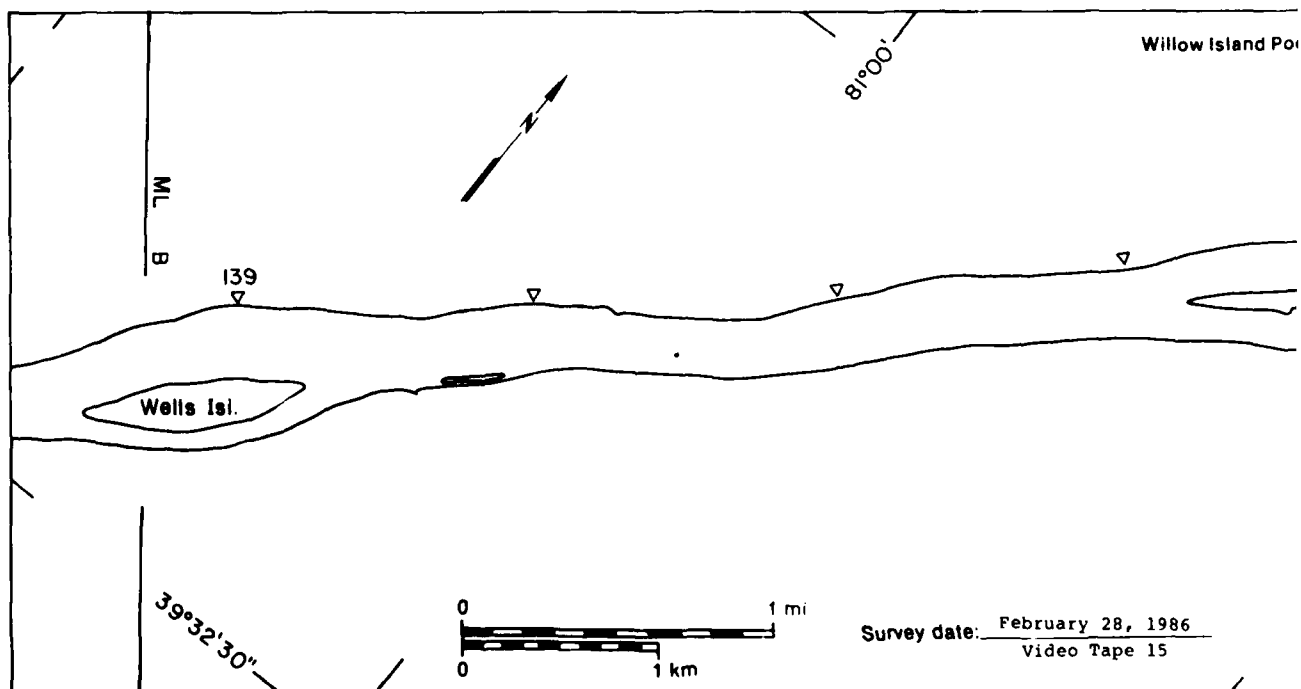
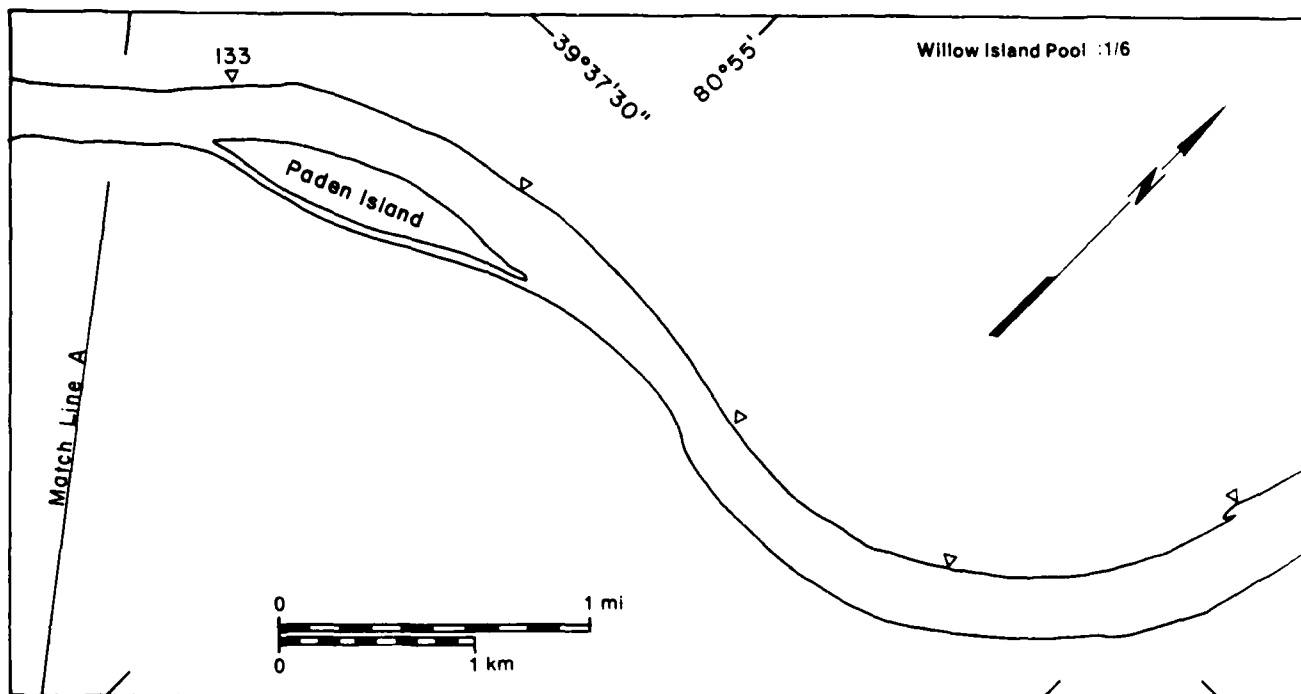


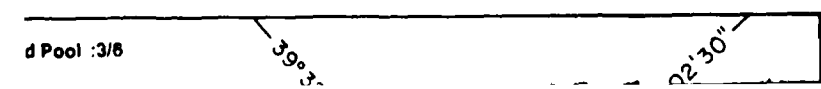
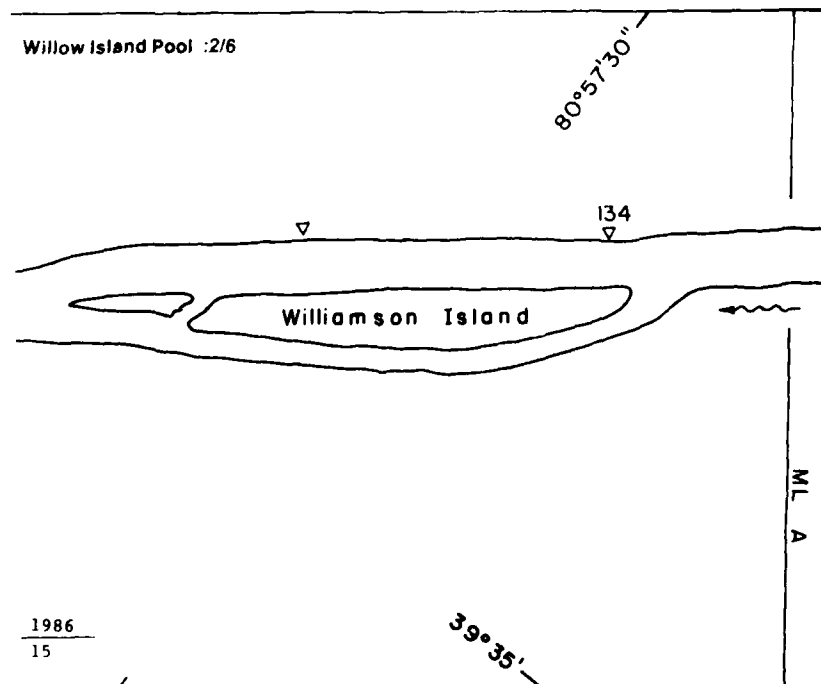
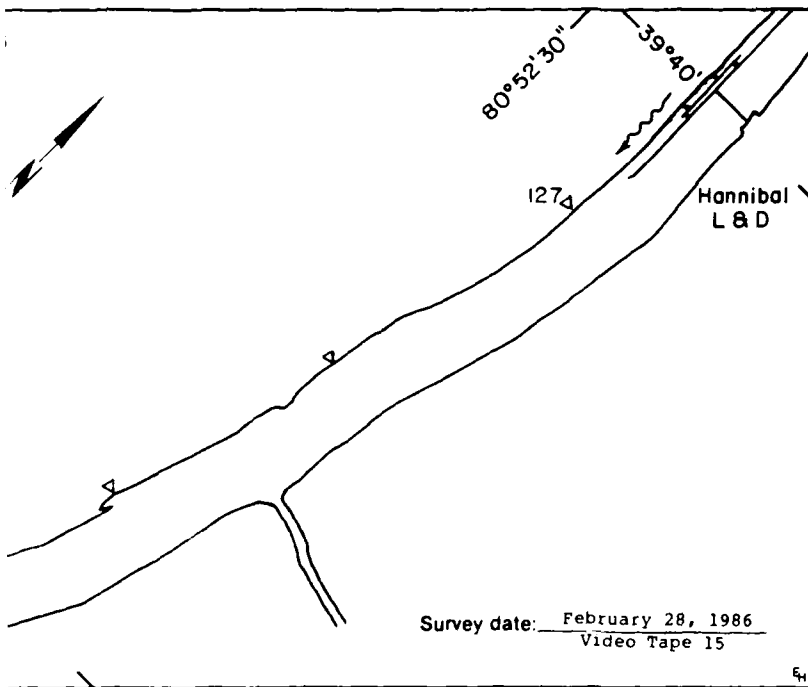
Hannibal Pool

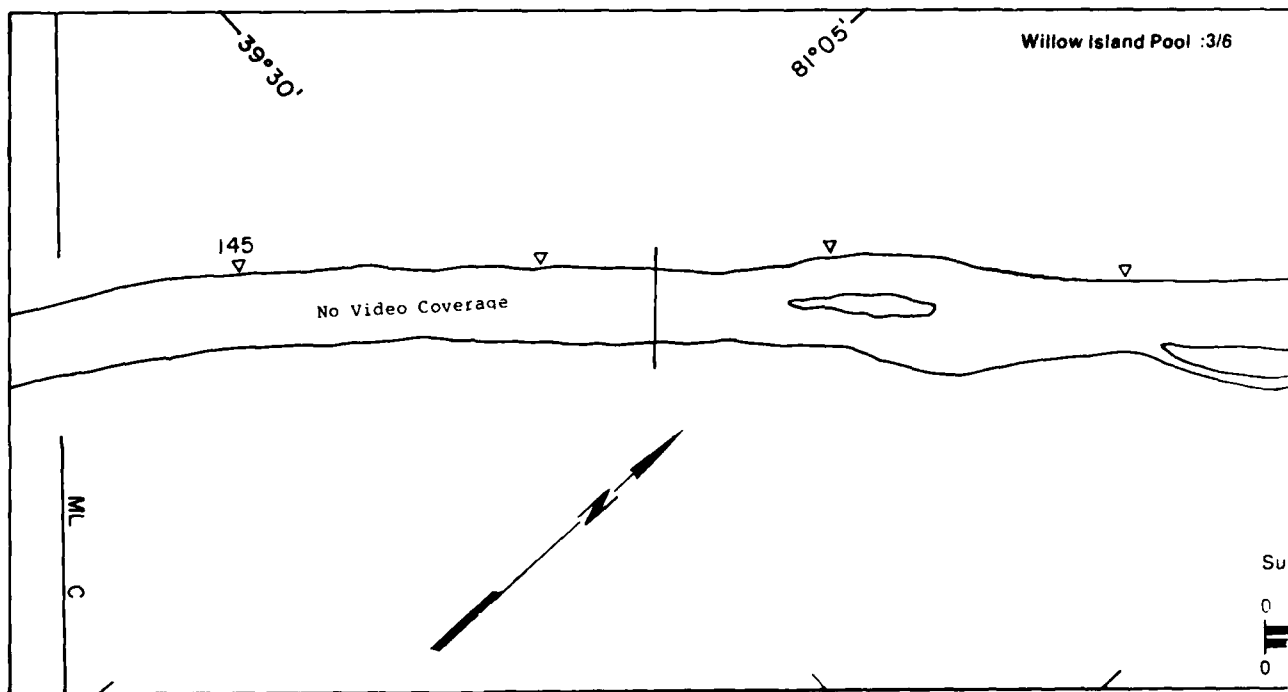
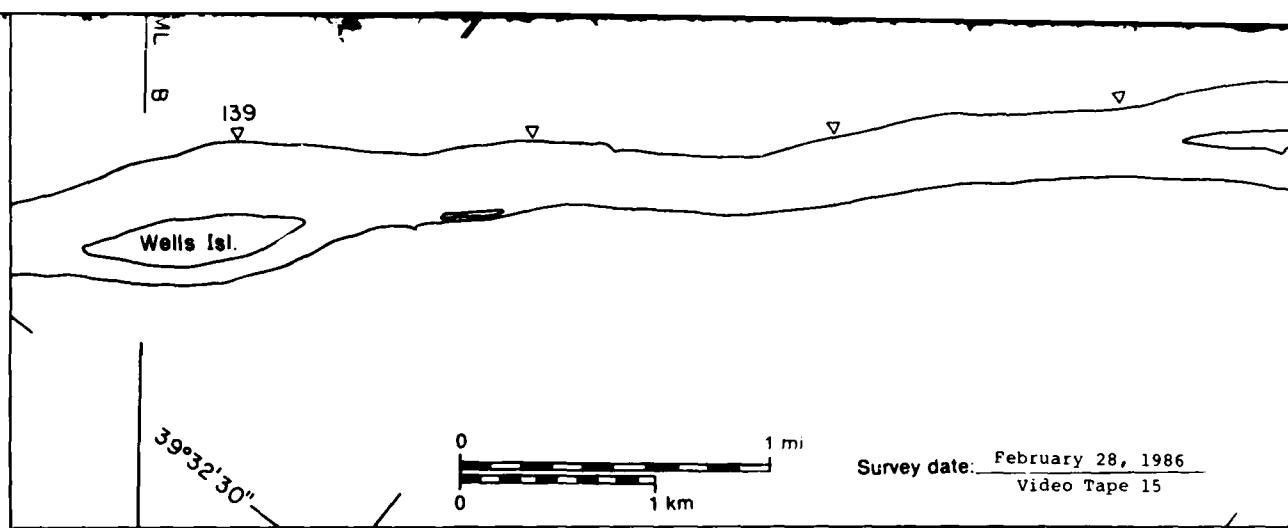
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
 Open water	22.46	NA
 Solid ice cover	0.00	NA
 Solid ice cover with open-water areas	0.00	—
 Fragmented ice cover	0.00	NA
 Fragmented ice cover with open-water areas	0.00	—
 Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)	22.46	

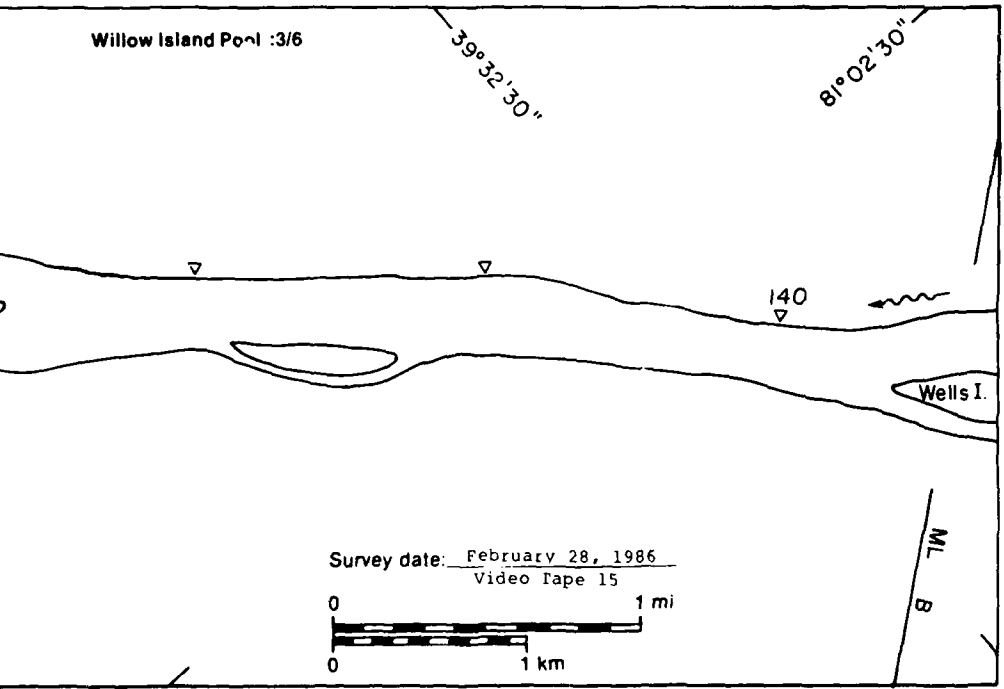
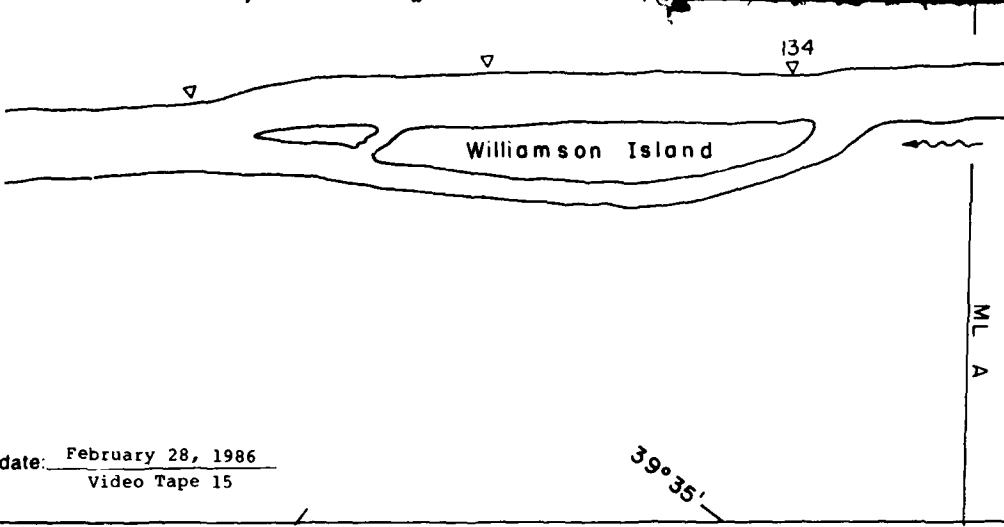


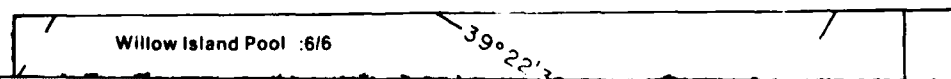
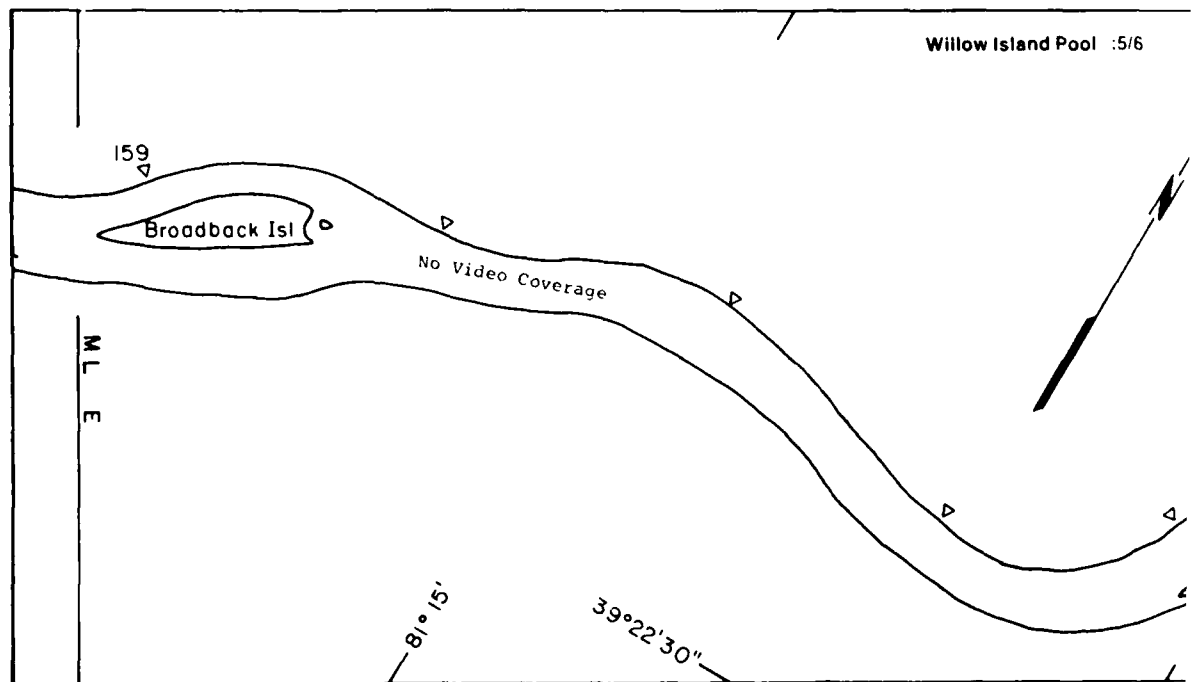
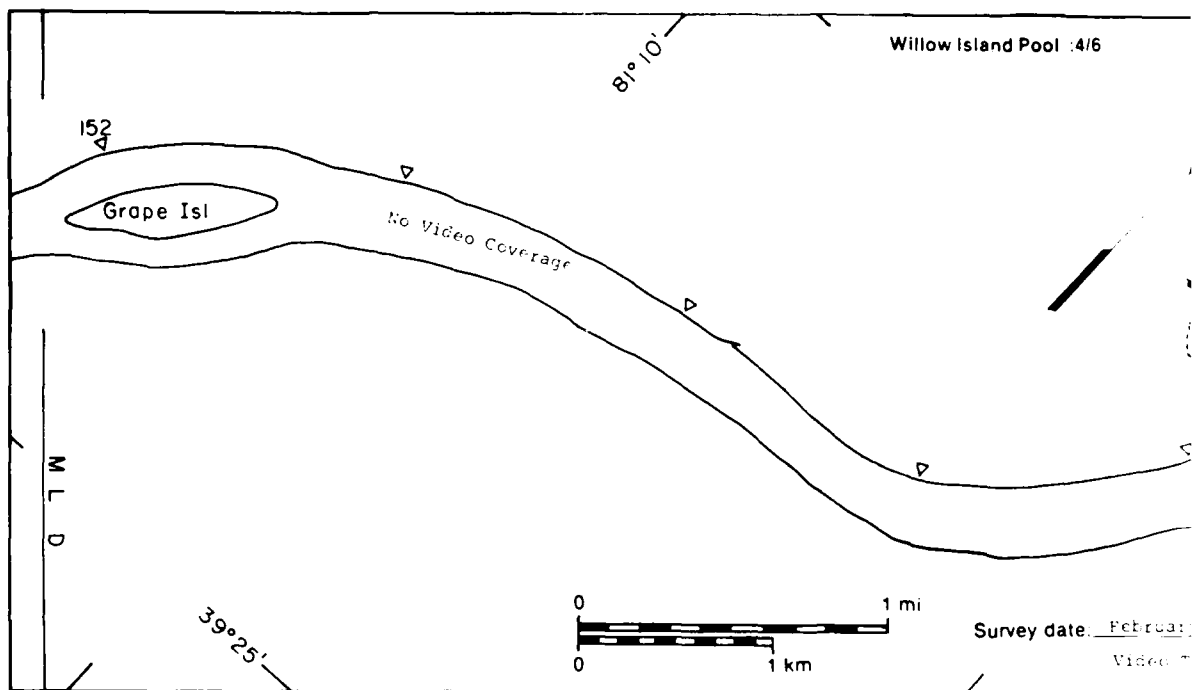
28 February 1986



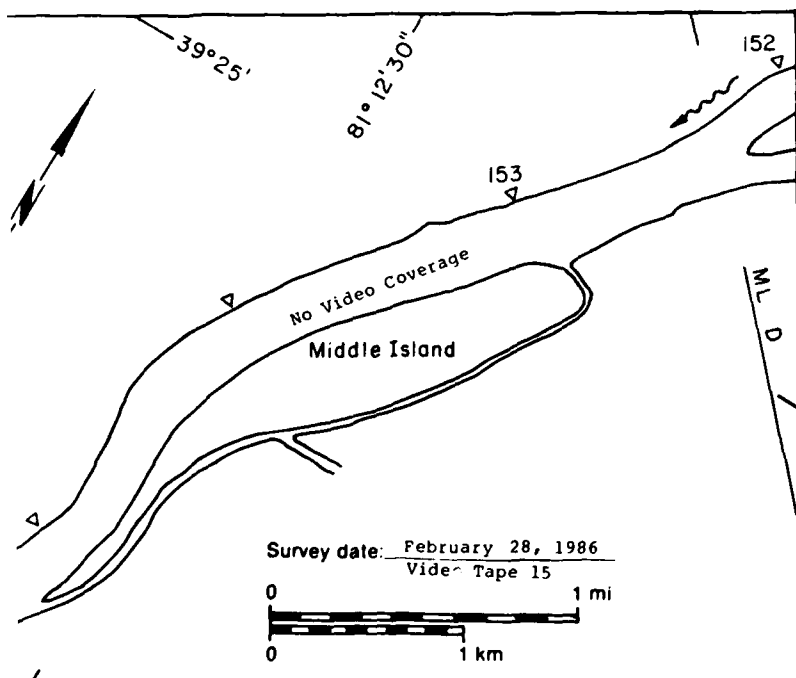
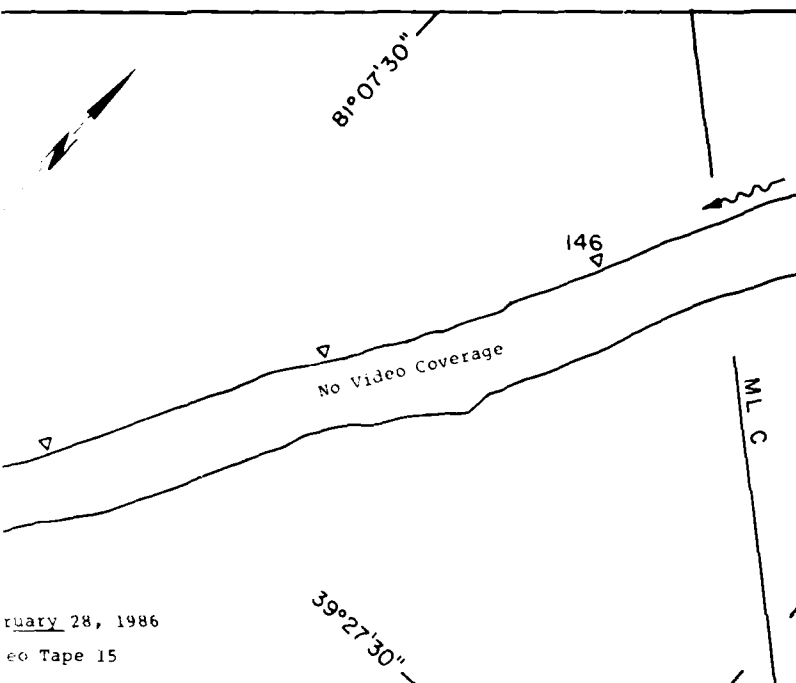








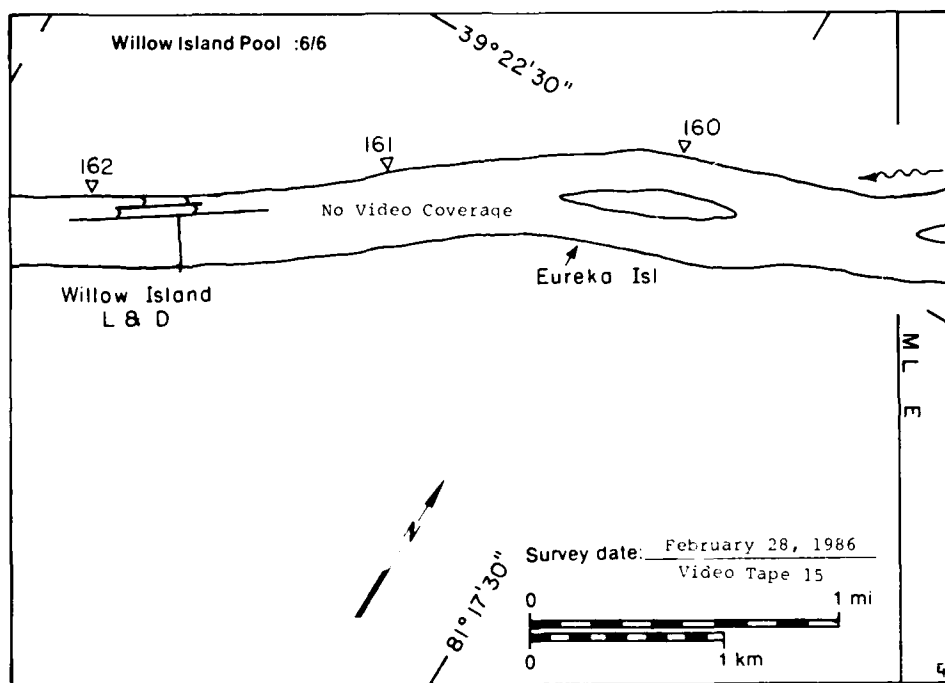
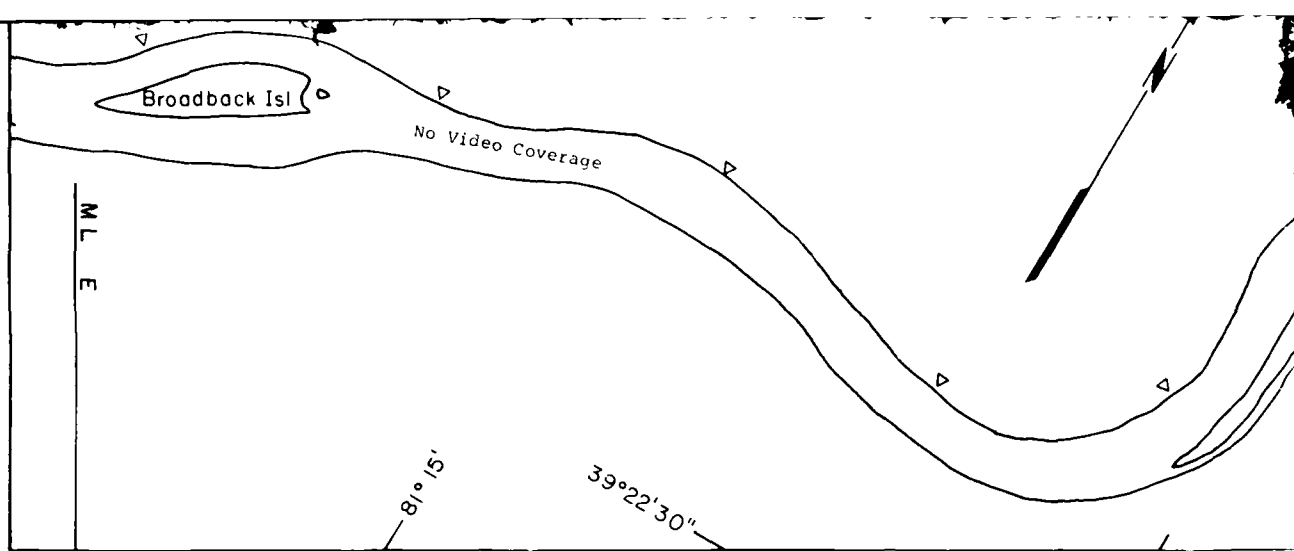
28 February 1986



Willow Island Pool

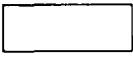

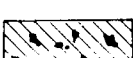
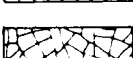
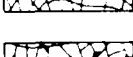

Surface
concentration

Area
1.2 x 10⁶

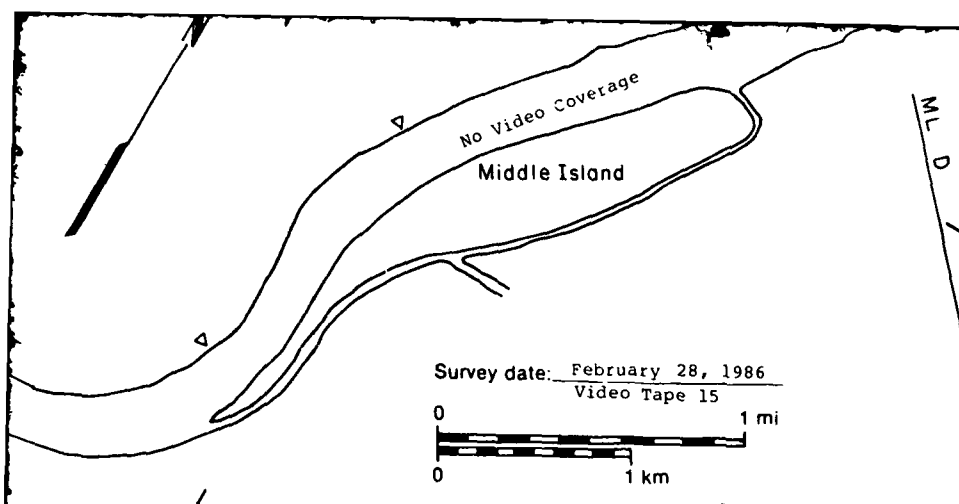


Willow Island Po

MAP UNITS

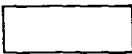





-  Open water
-  Solid ice cover
-  Solid ice cover with open water
-  Fragmented ice
-  Fragmented ice with open water
-  Ice floes and pans

Total ice

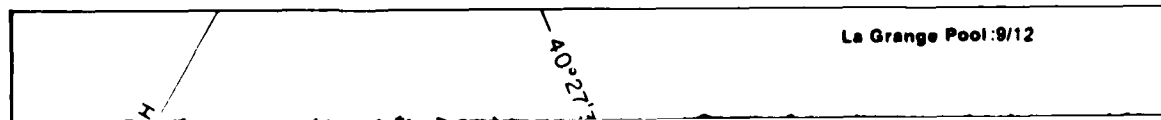
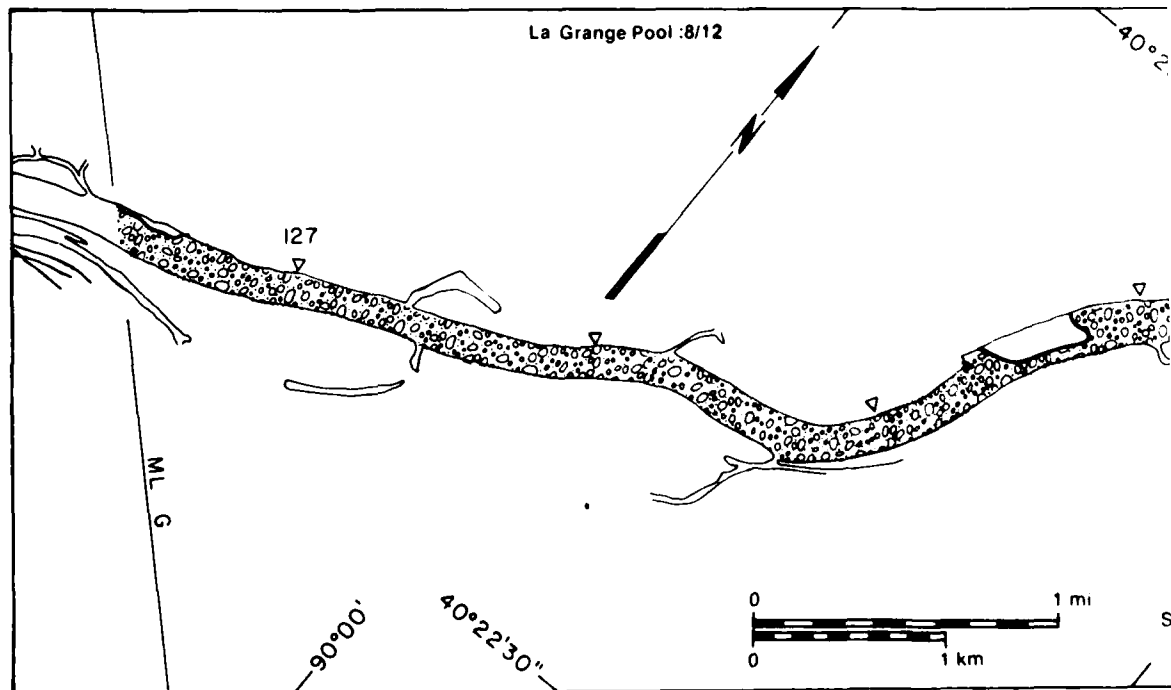
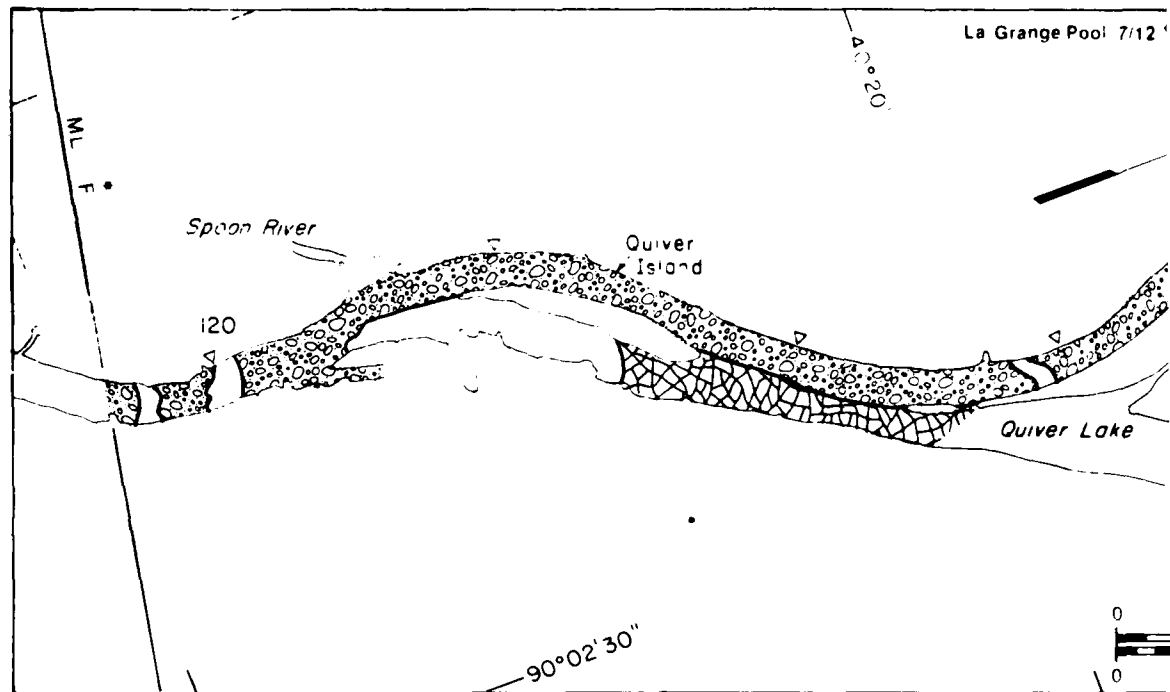


Willow Island Pool

Willow Island Pool

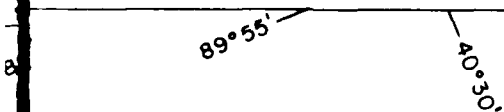
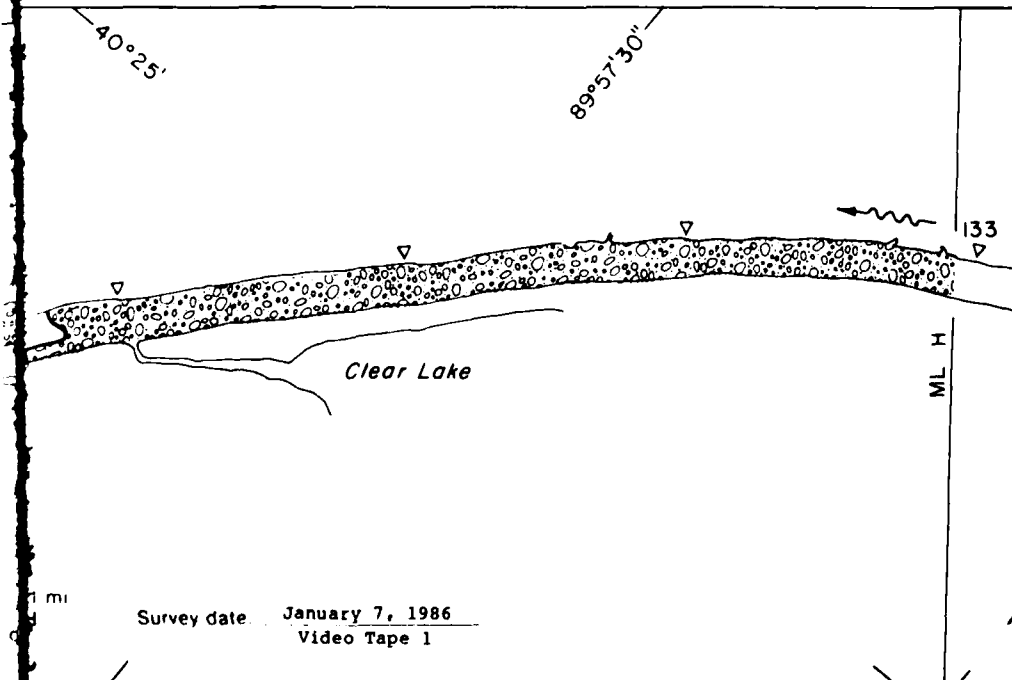
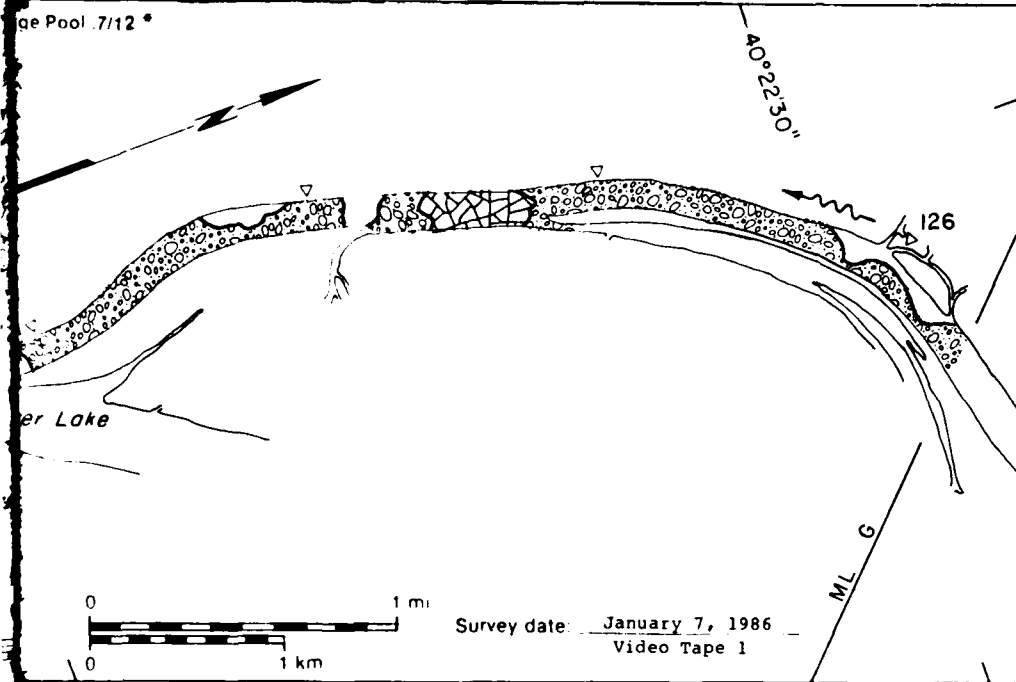
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)	
	Open water	10.21	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		21.24*	* Includes $11.03 \times 10^6 m^2$ of no video coverage

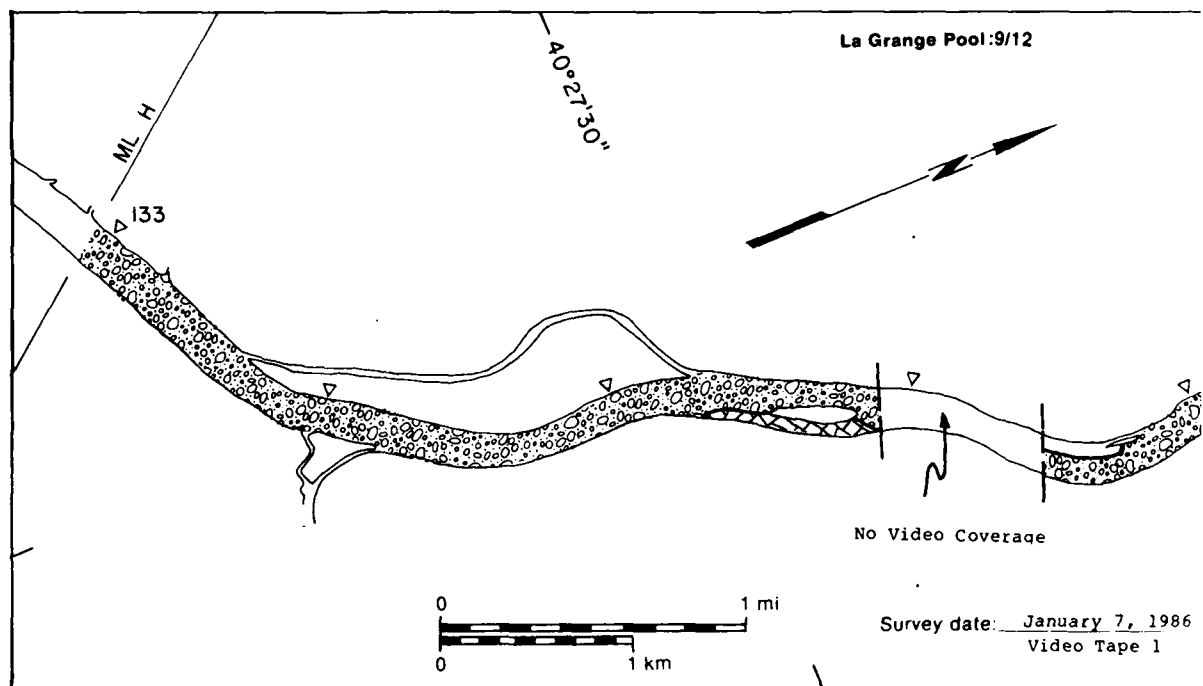
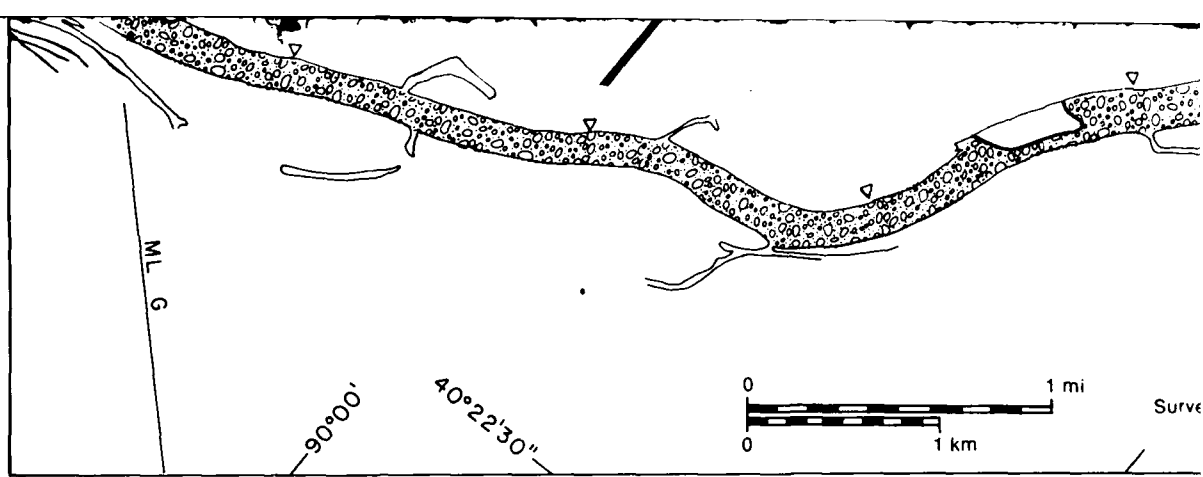
MAPS OF ICE CONDITIONS ON THE ILLINOIS AND KANKAKEE RIVERS



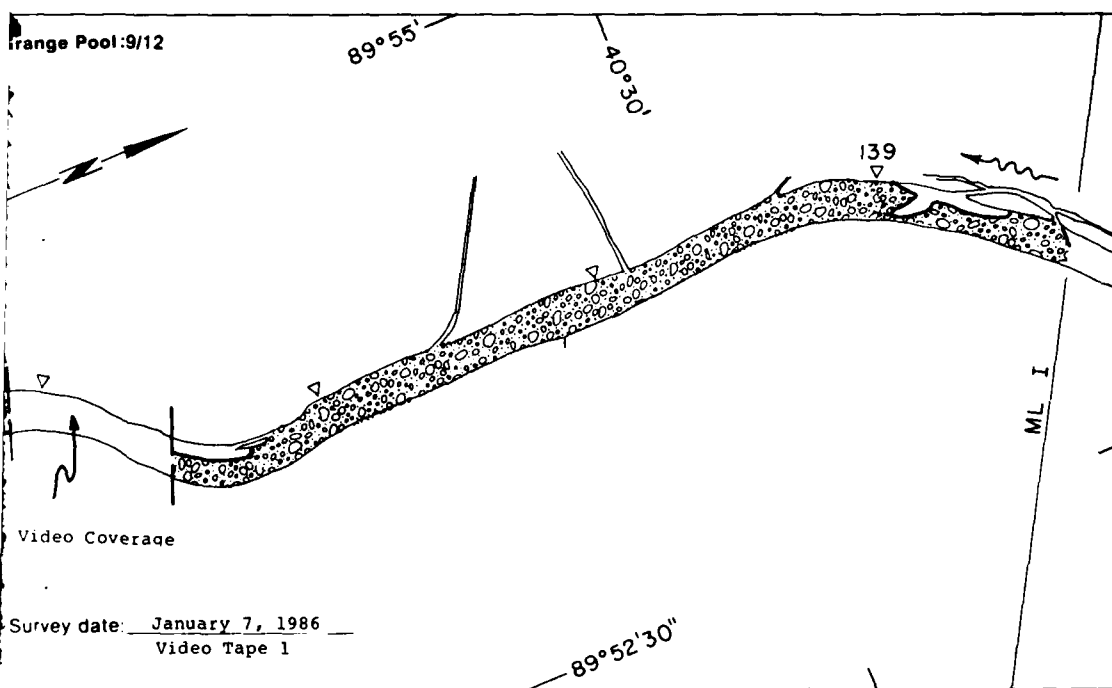
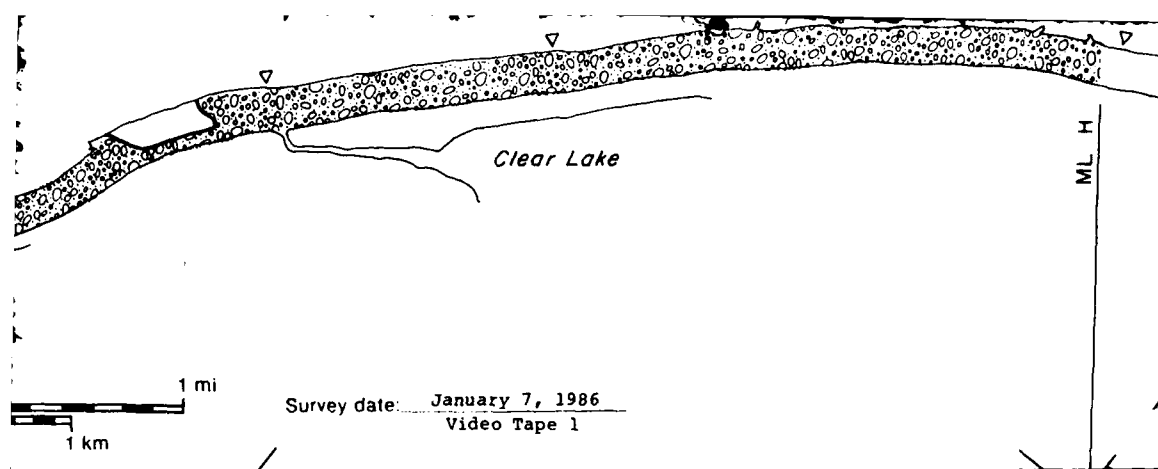
7 January 1986

ge Pool 7/12 *

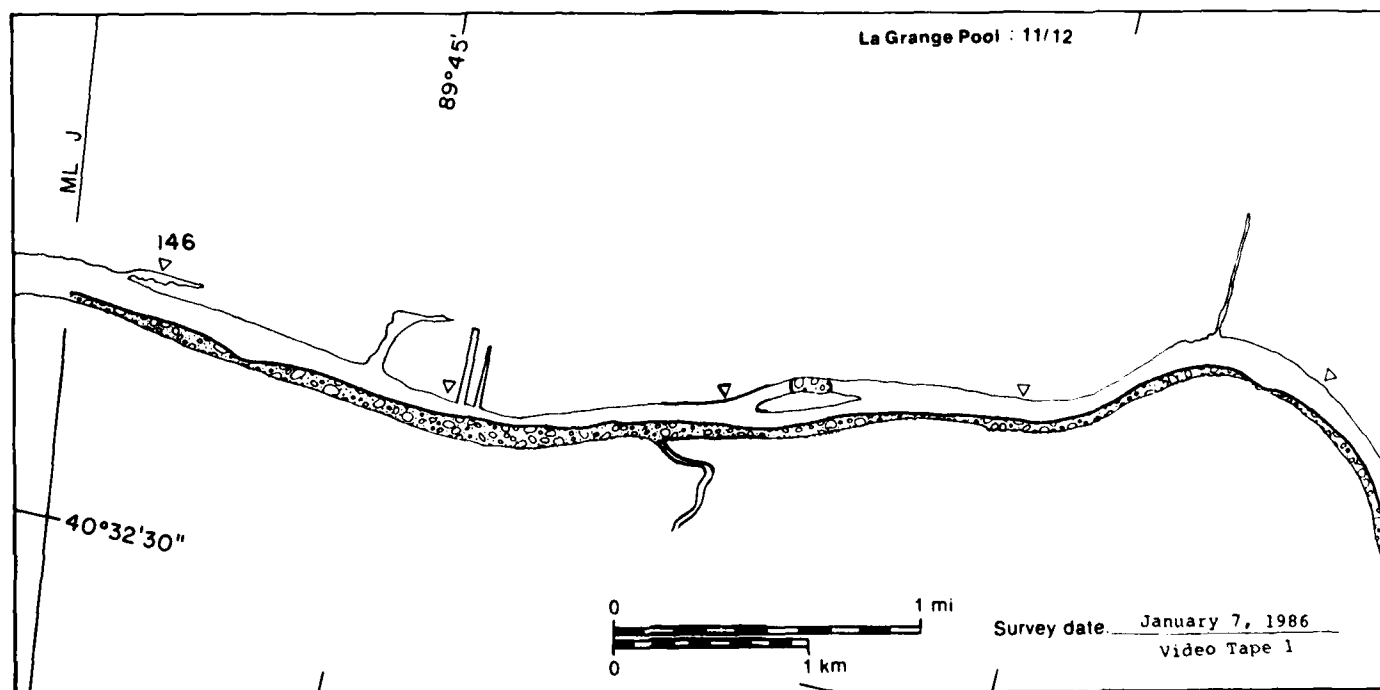
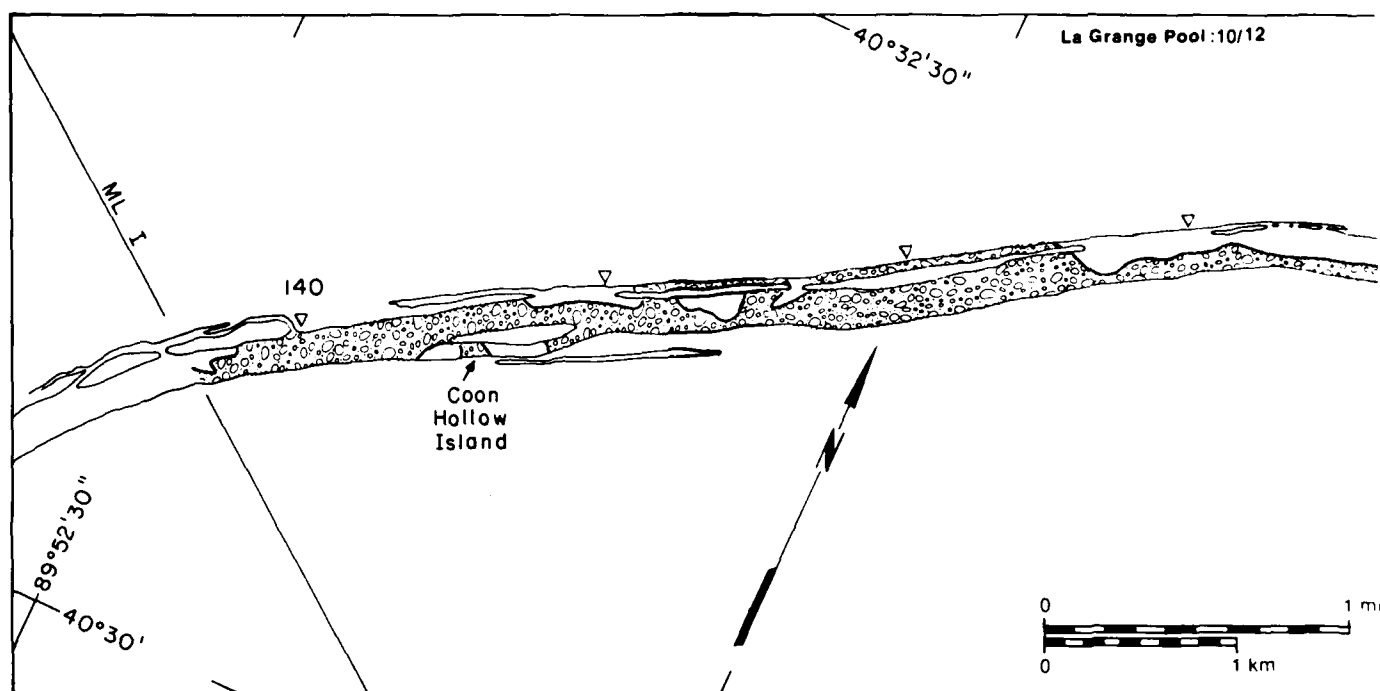




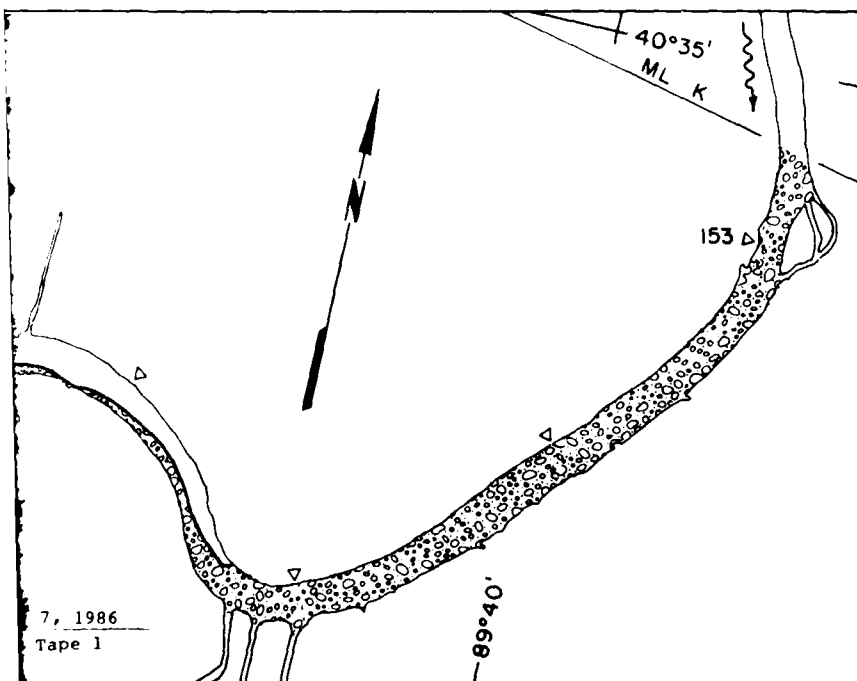
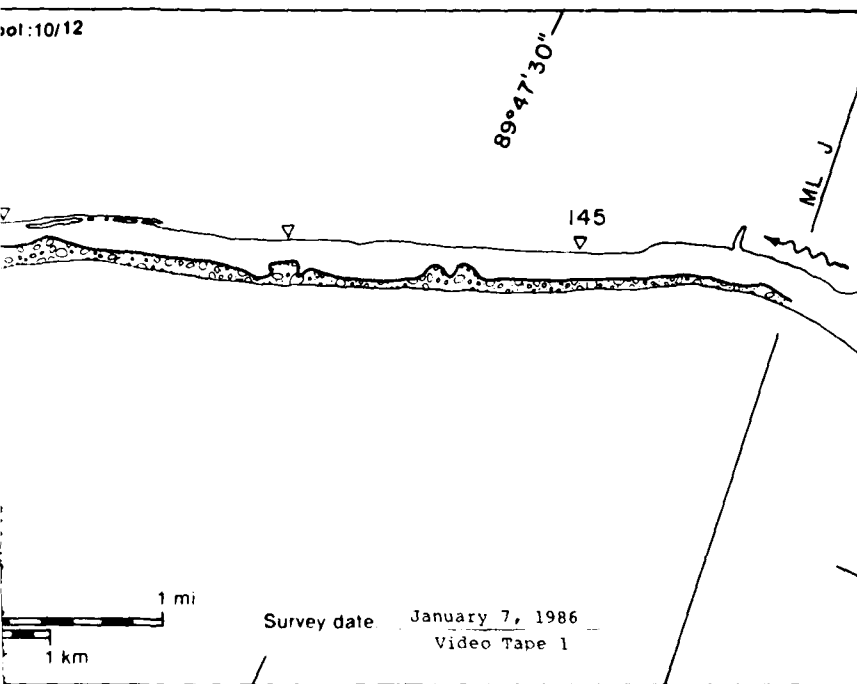
* The downstream limit of Illinois River video coverage was in the vicinity of mile 120 at Havana, Illinois, on all dates. There is no coverage of La Grange Pool maps 1/12 through 6/12 (match lines A through E).



7 January 1986



pool:10/12

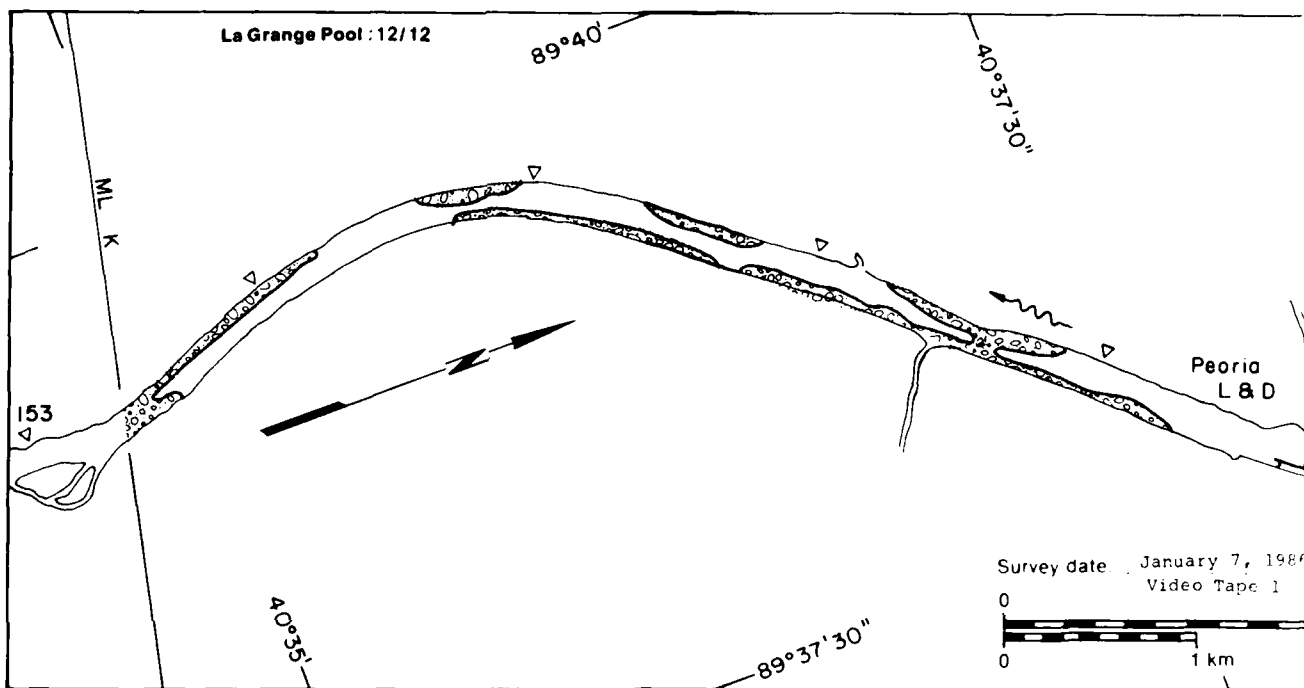
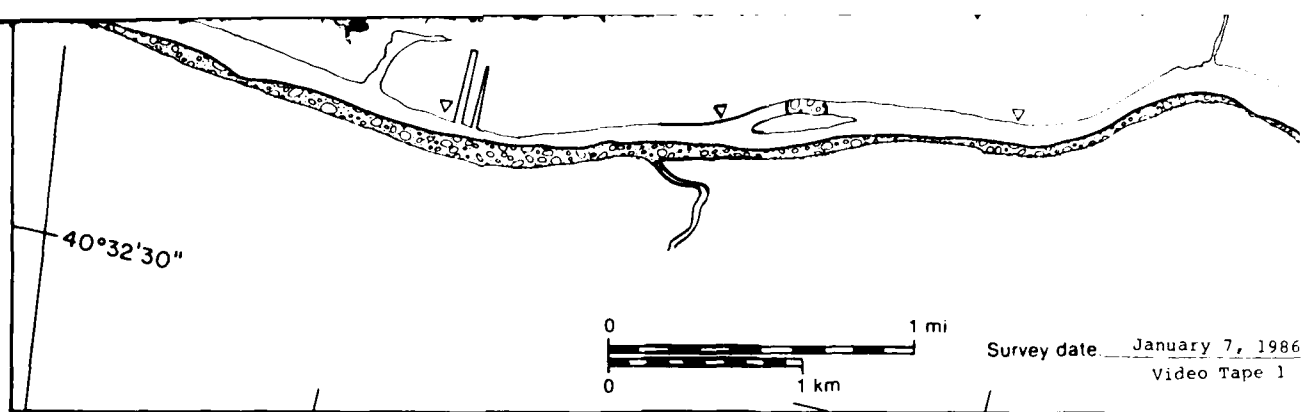


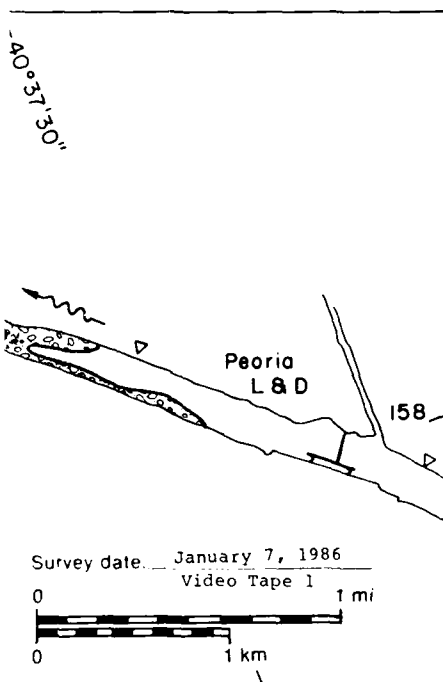
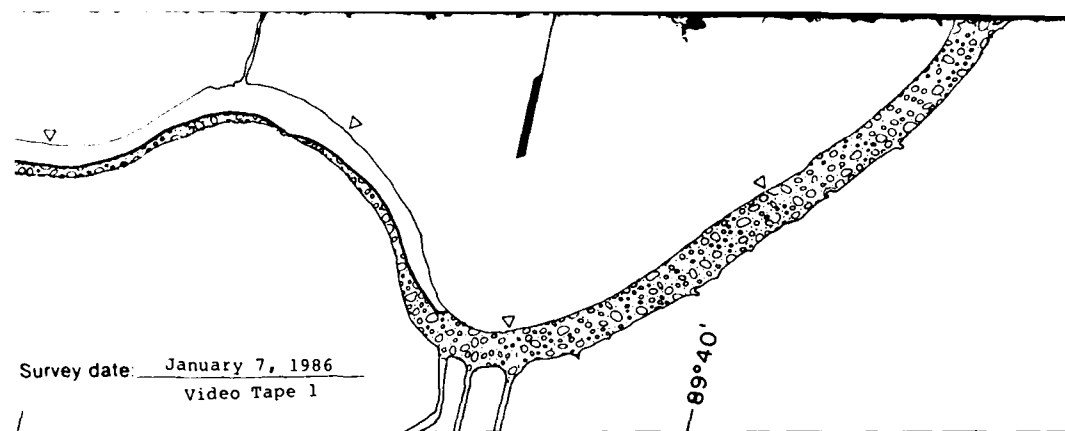
La Grange Pool

MAP UNITS

Area
(m² x 10⁶)

Surface
concentration
(%)





La Grange Pool

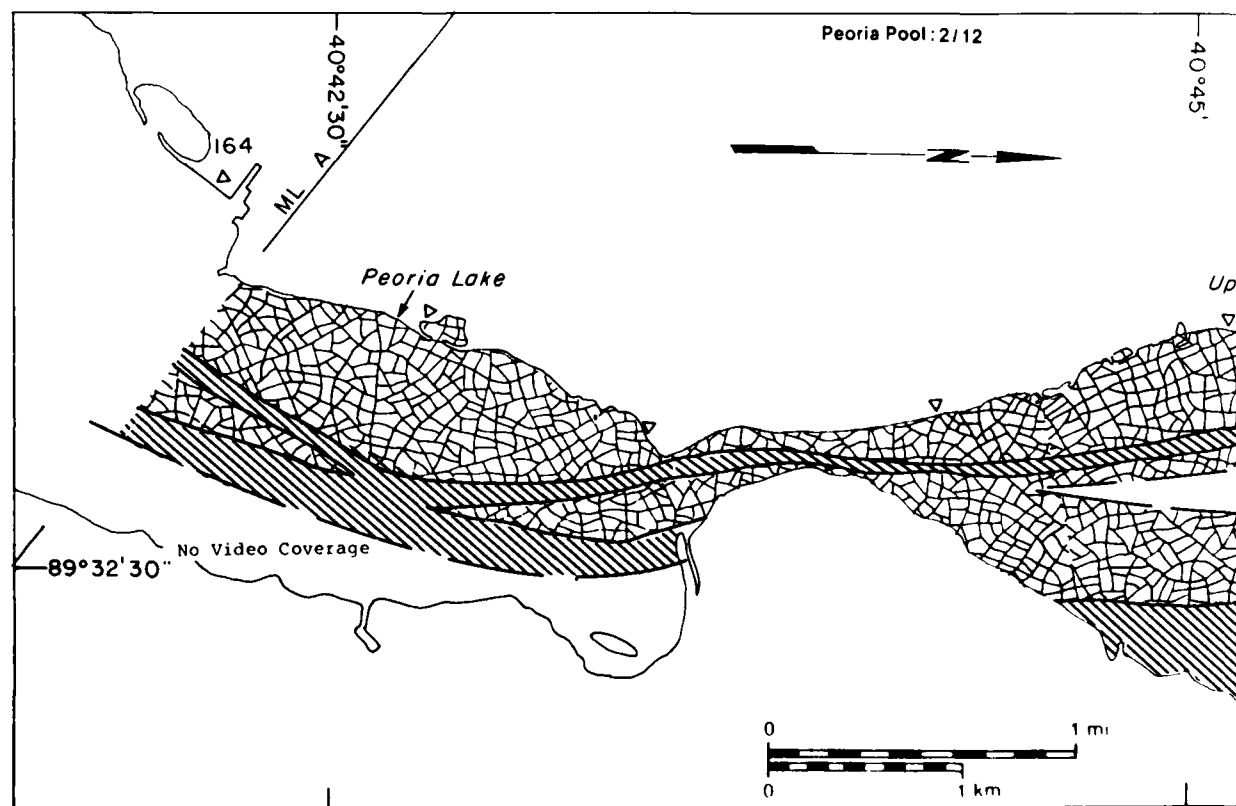
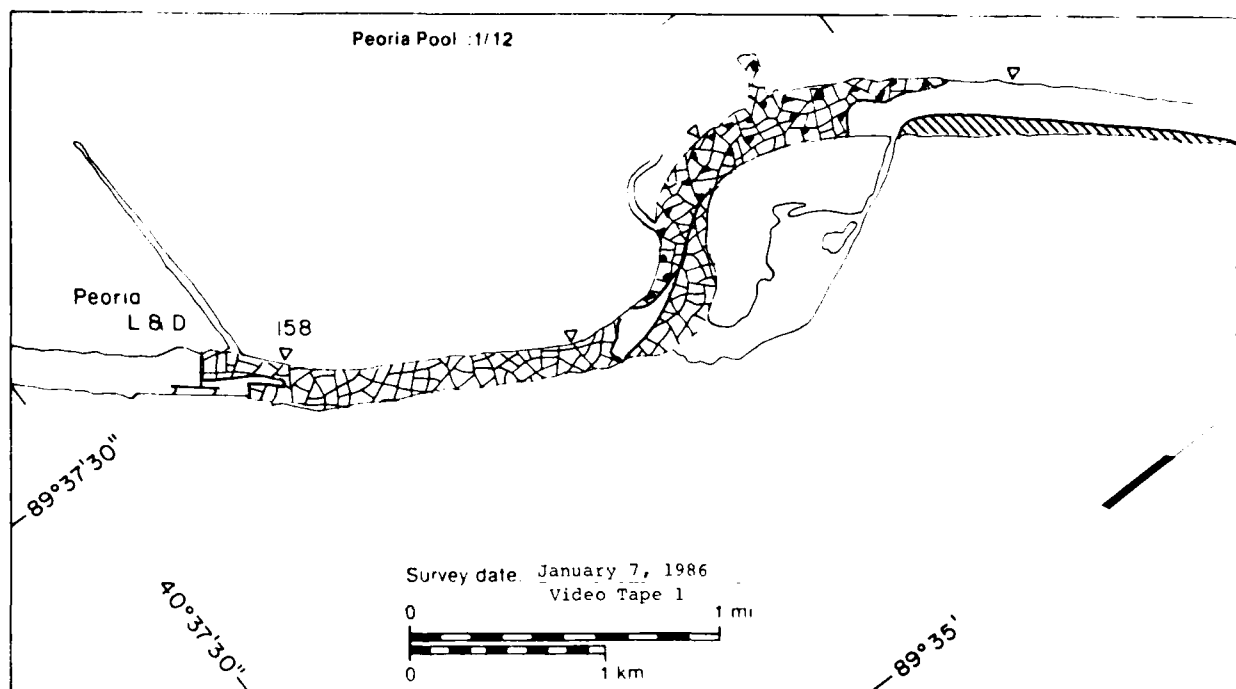
MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

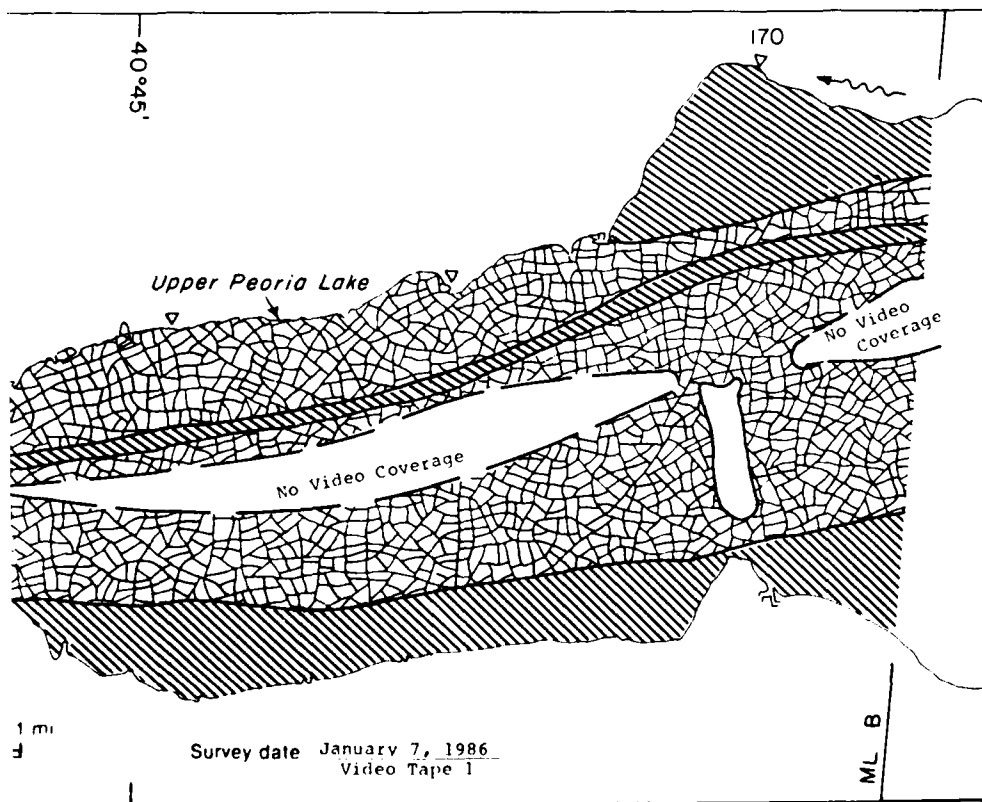
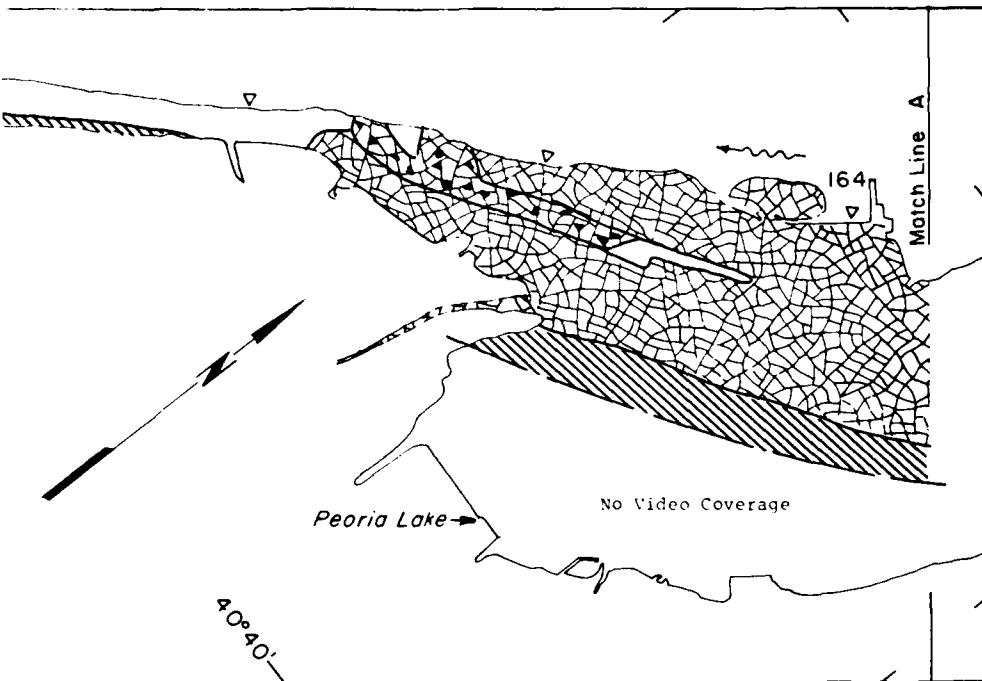
Total Area ($m^2 \times 10^6$)

Area ($m^2 \times 10^6$)	Surface concentration (%)
3.53	NA
0.00	NA
0.00	—
0.52	NA
0.00	—
7.46	40
11.71*	

* Includes $0.20 \times 10^6 m^2$
of no video coverage



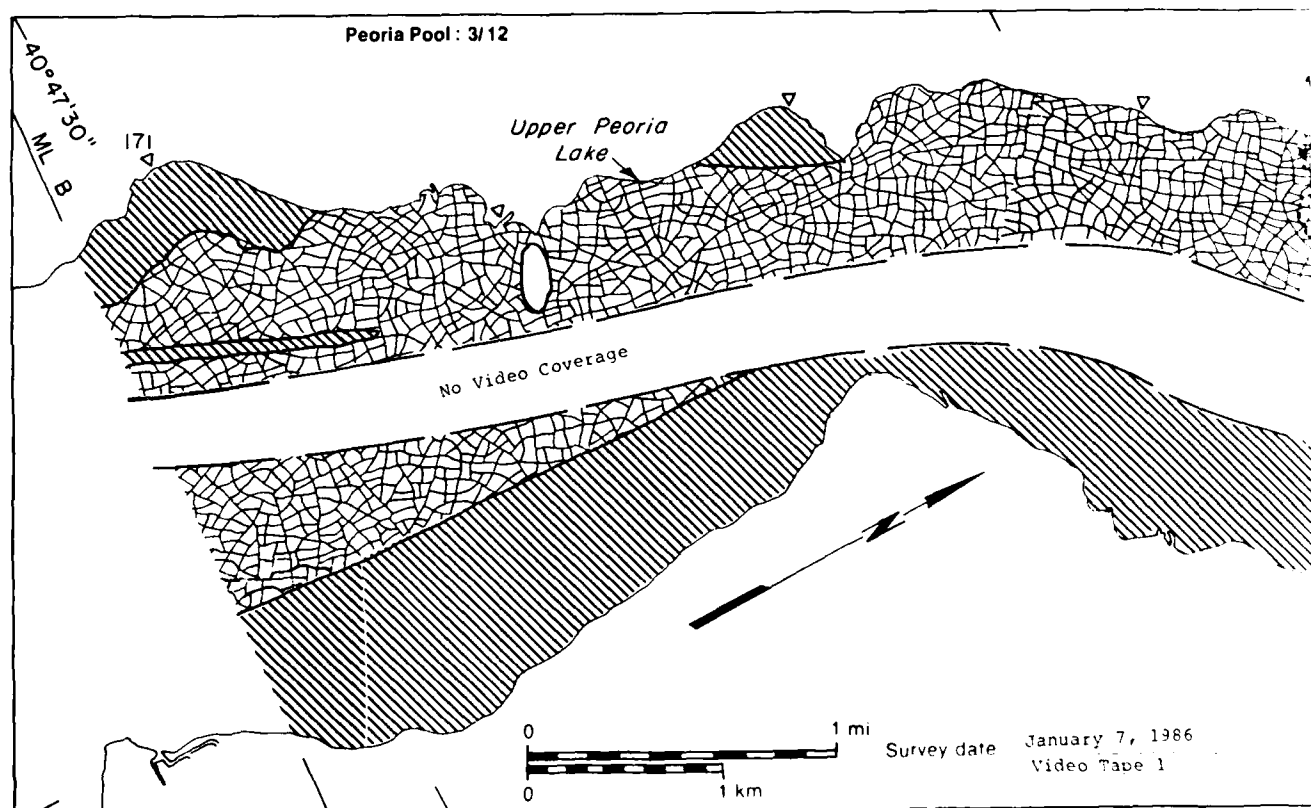
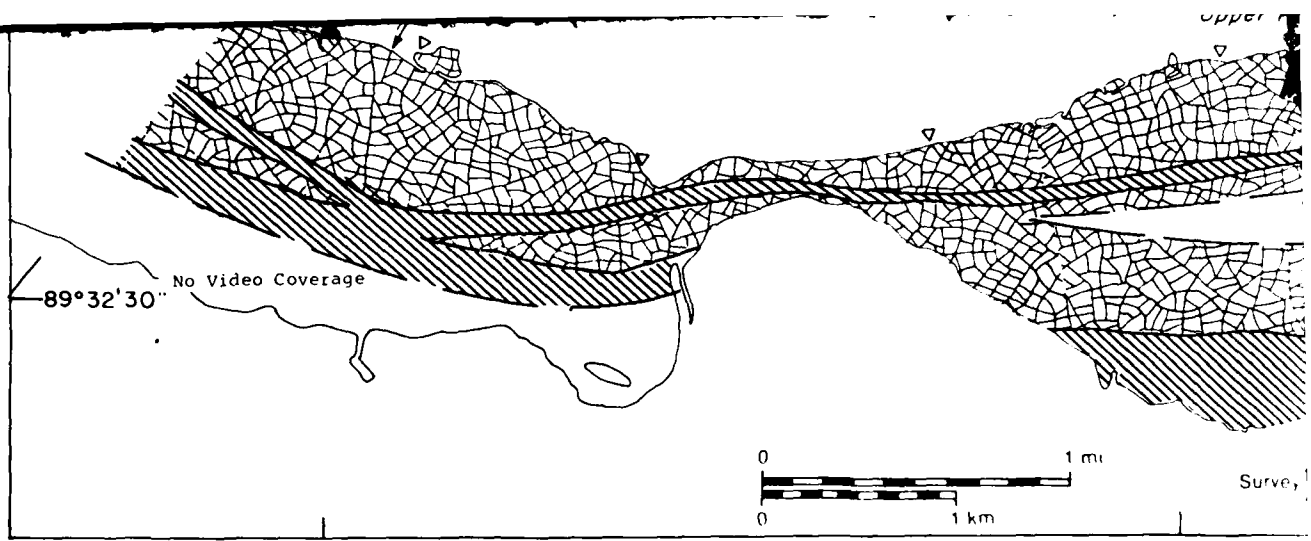
7 January 1986

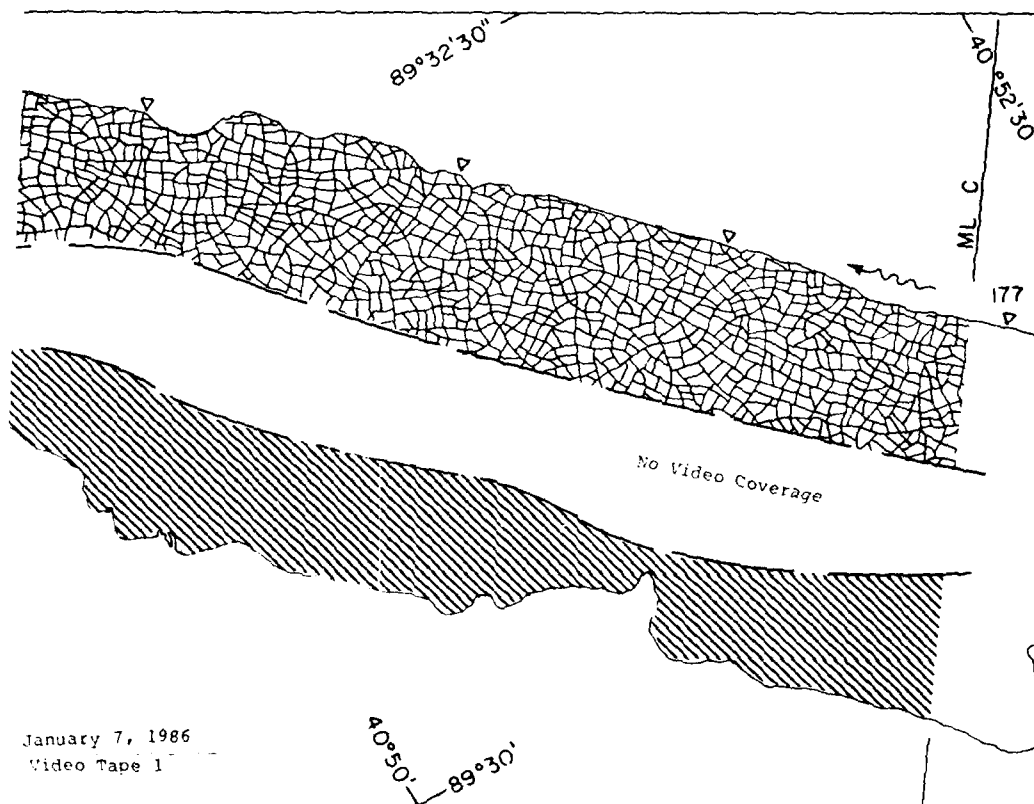
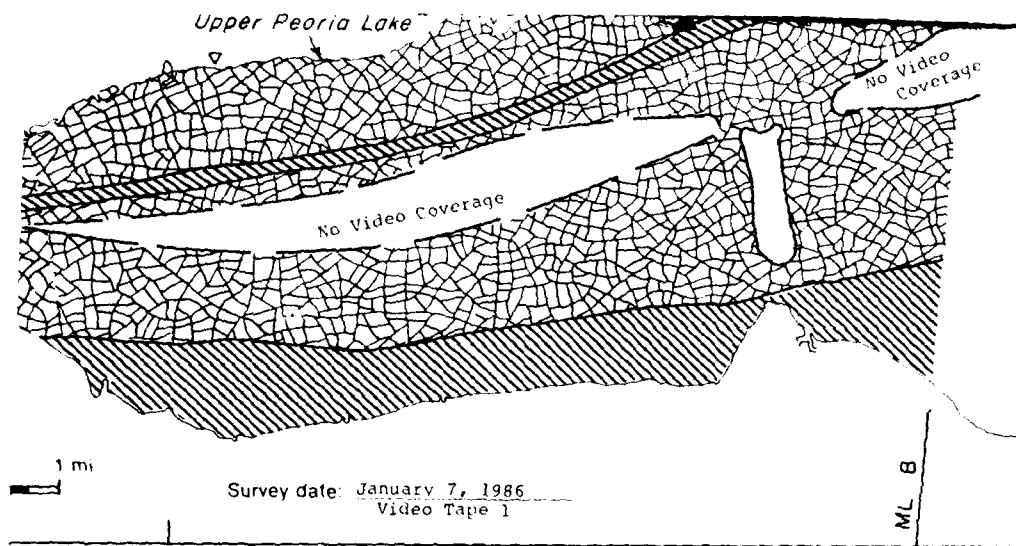


Survey date January 7, 1986
Video Tape 1

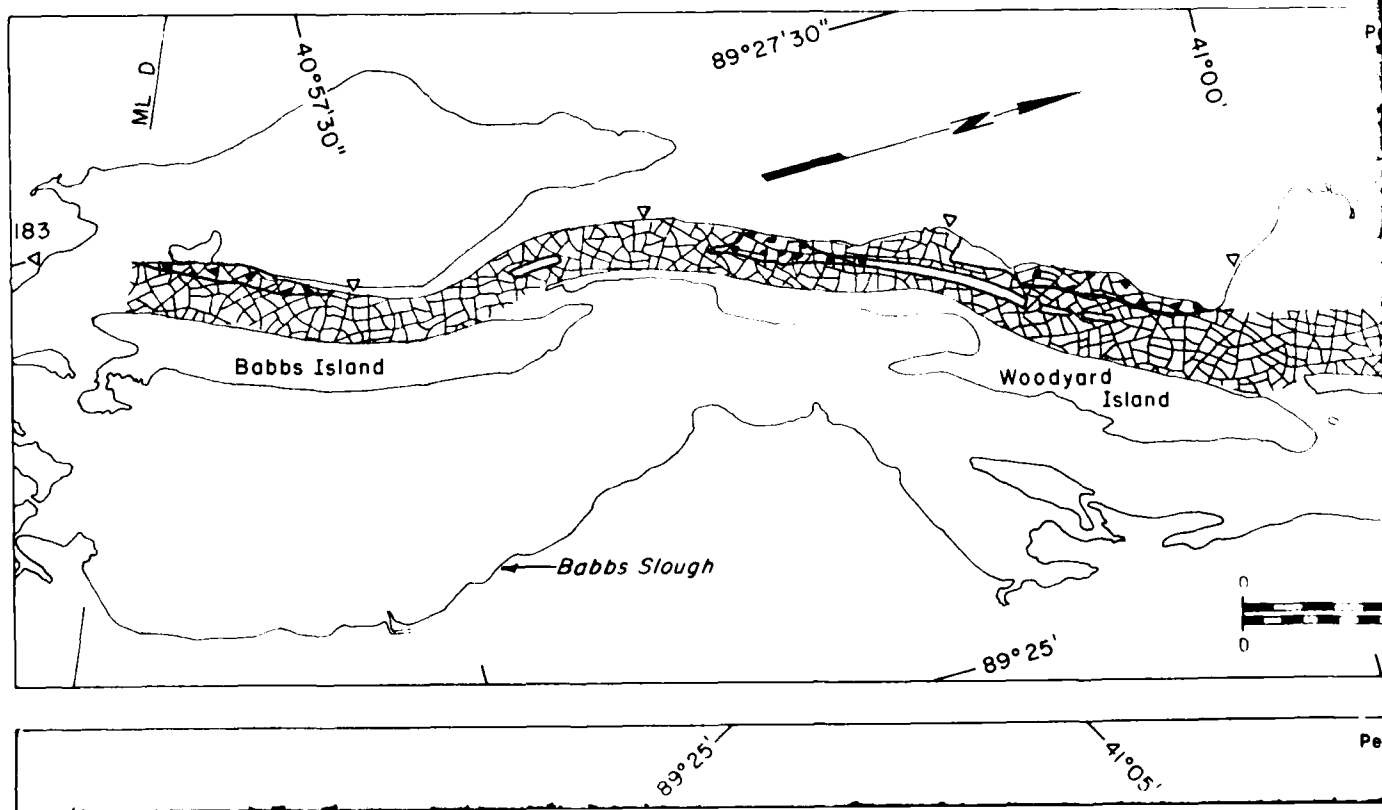
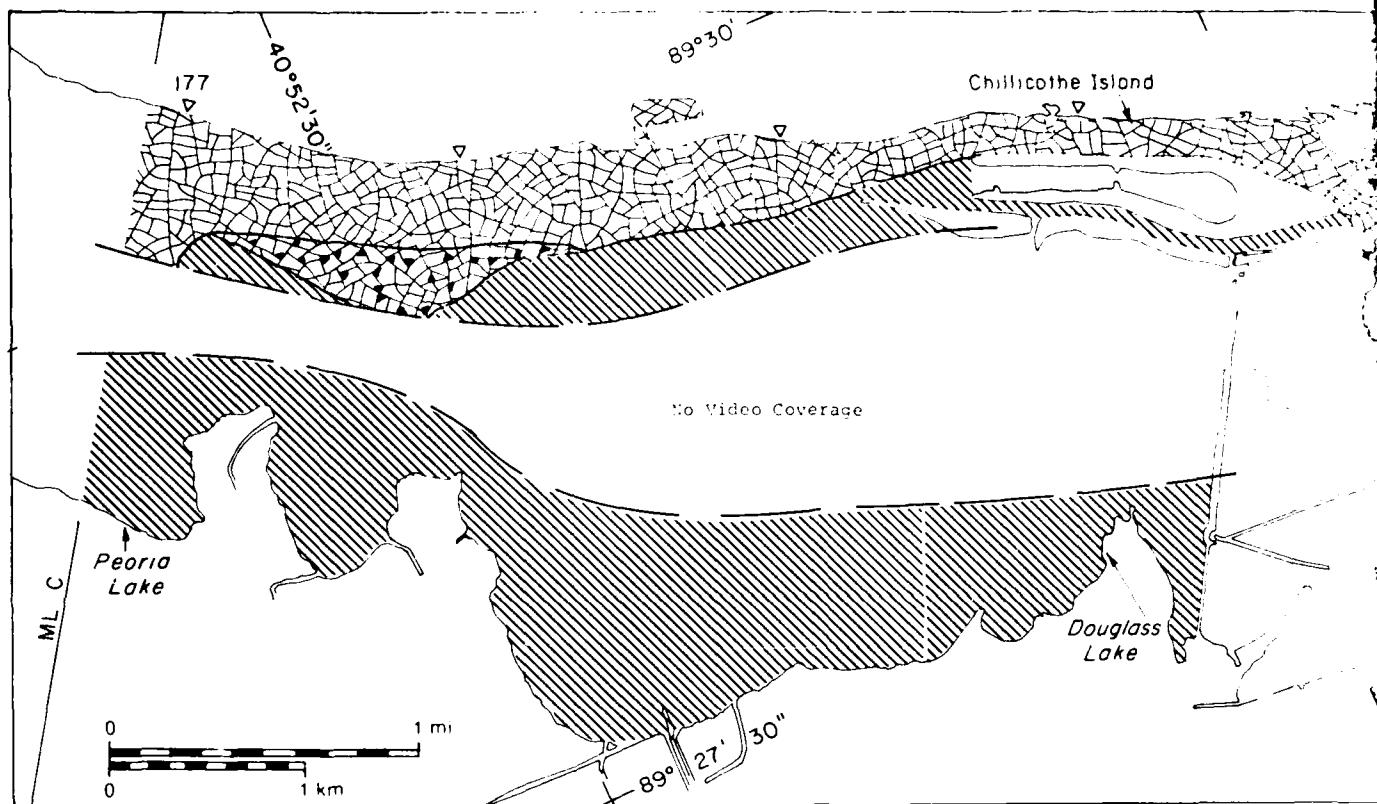
89°32'30"

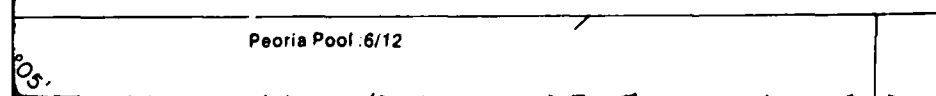
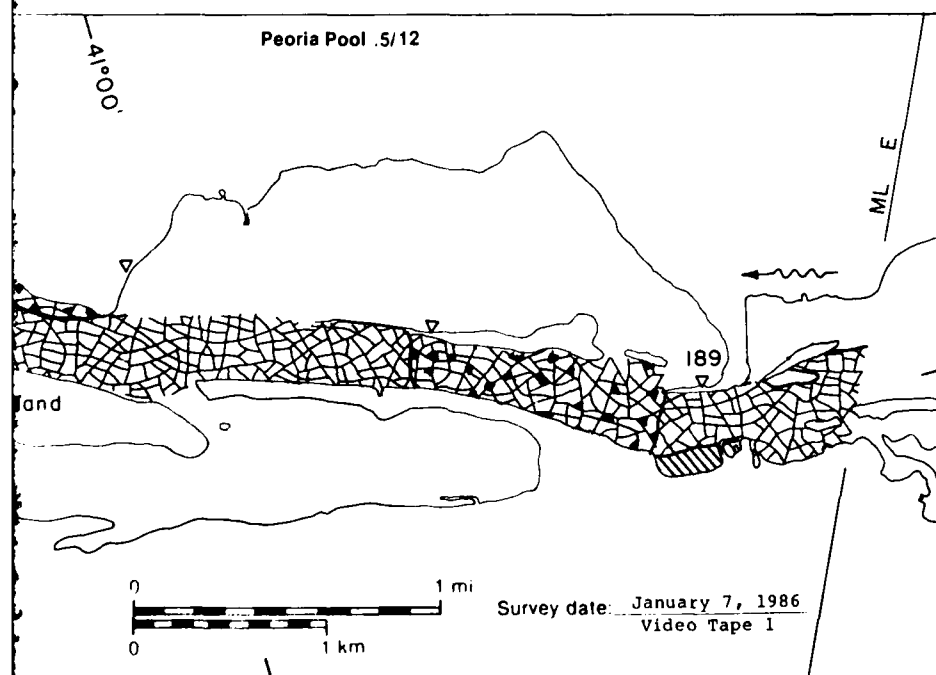
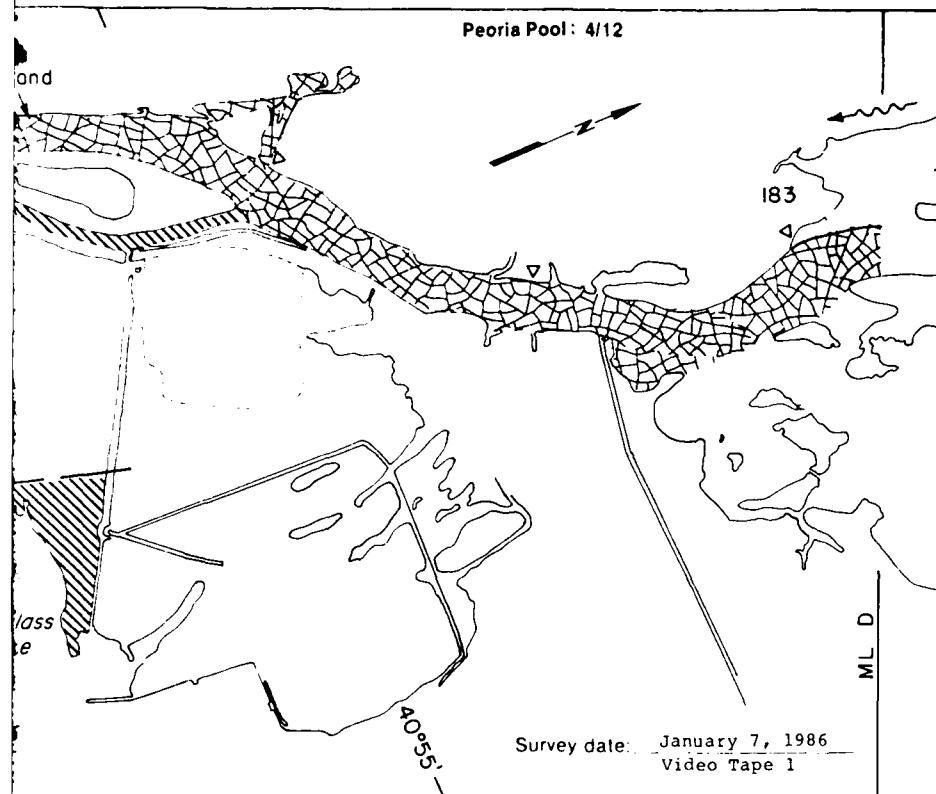
40°45'

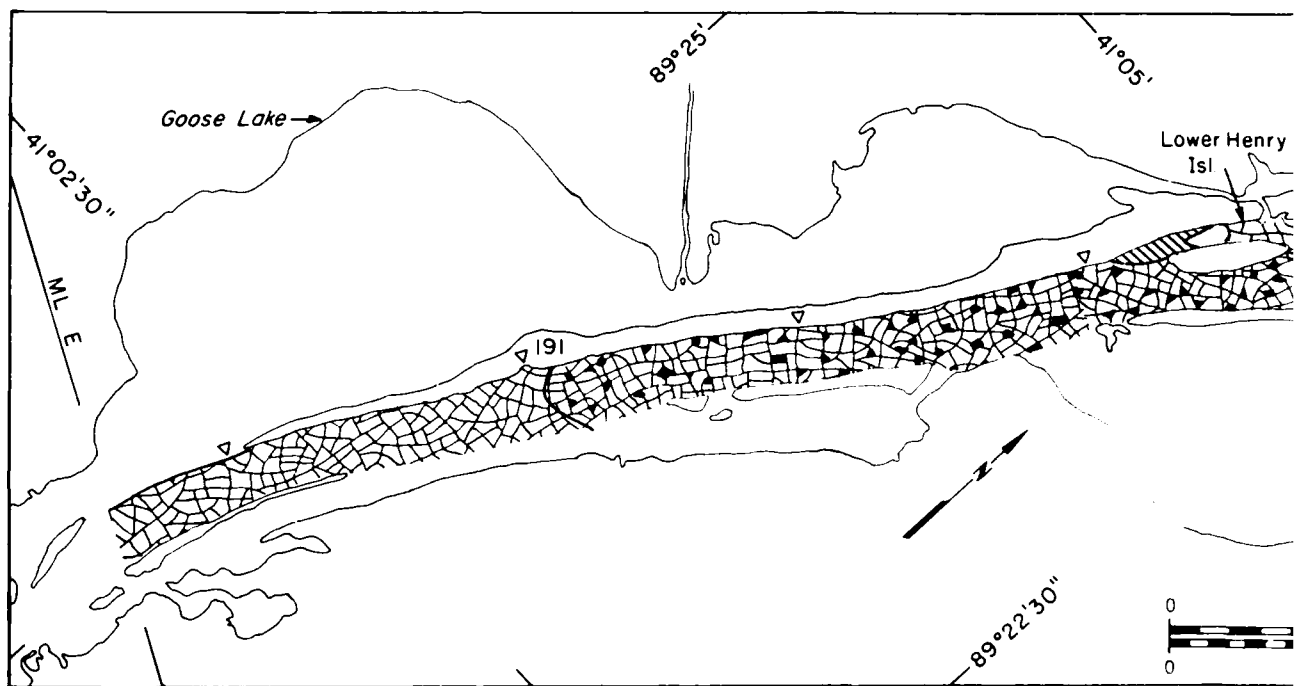
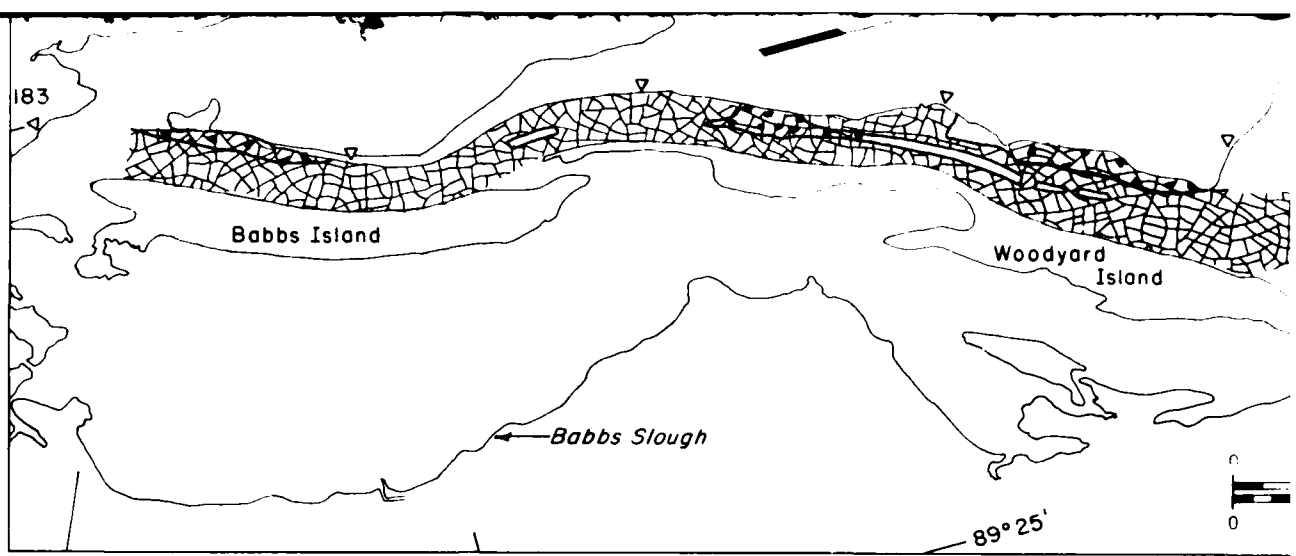


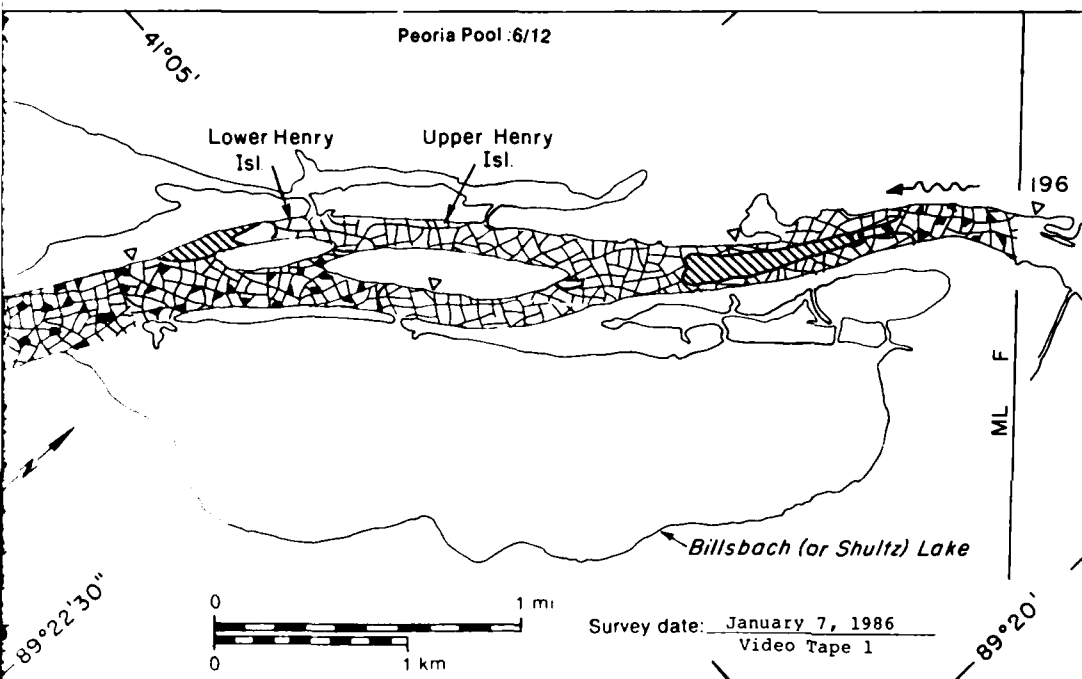
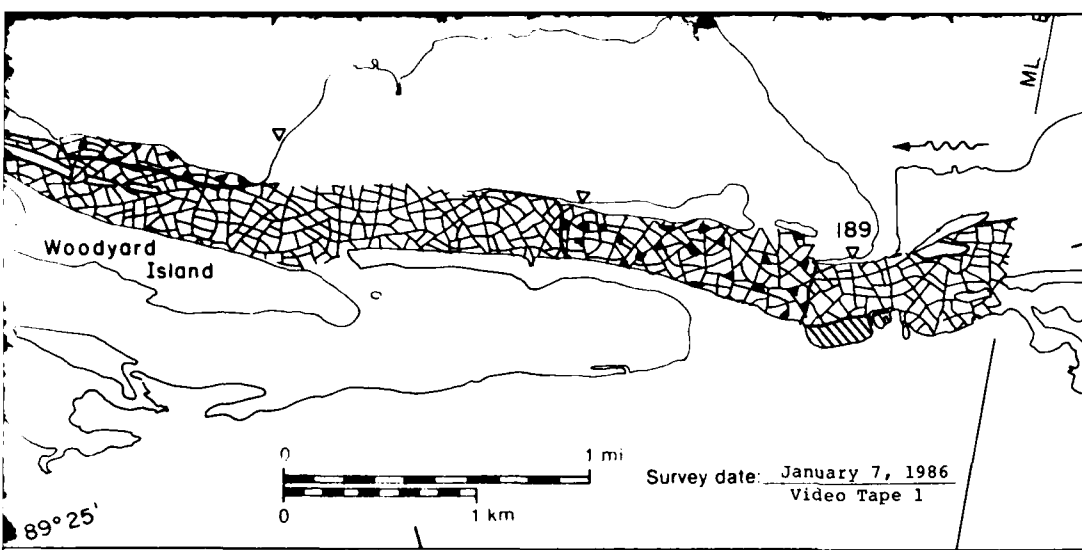


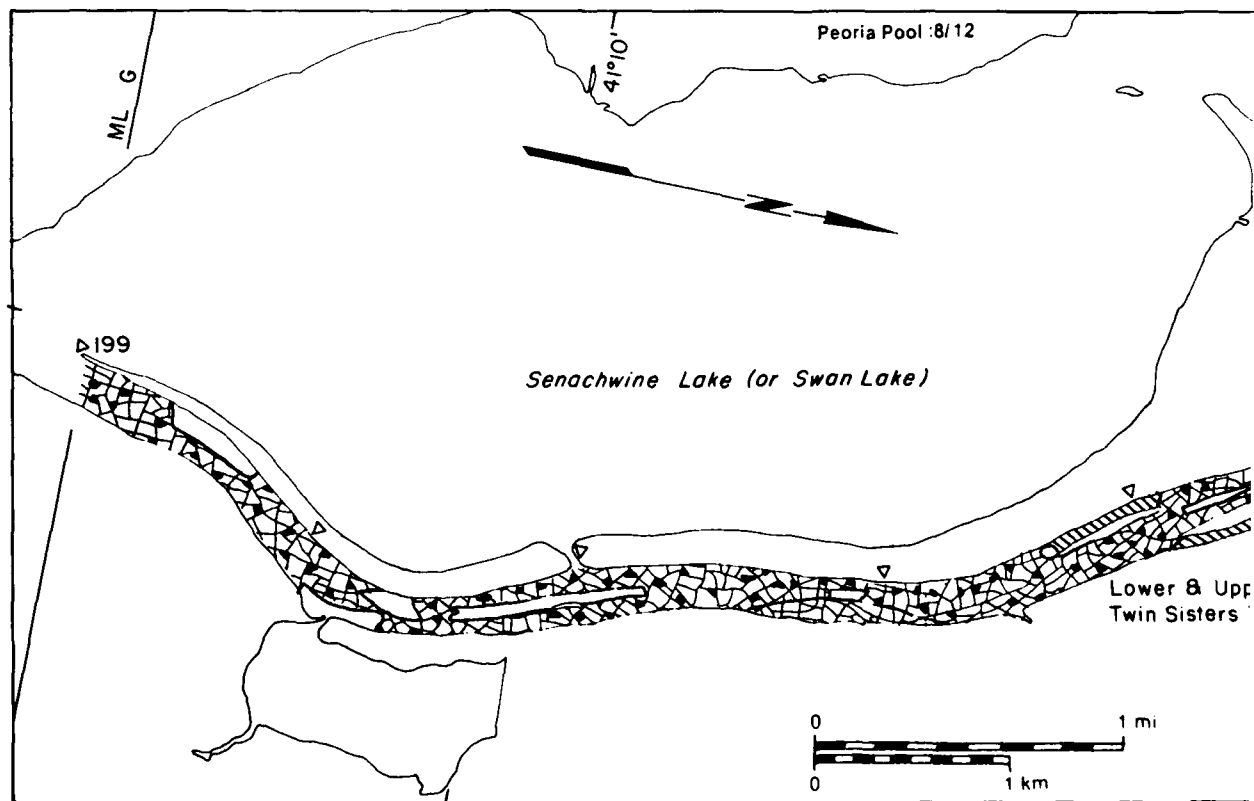
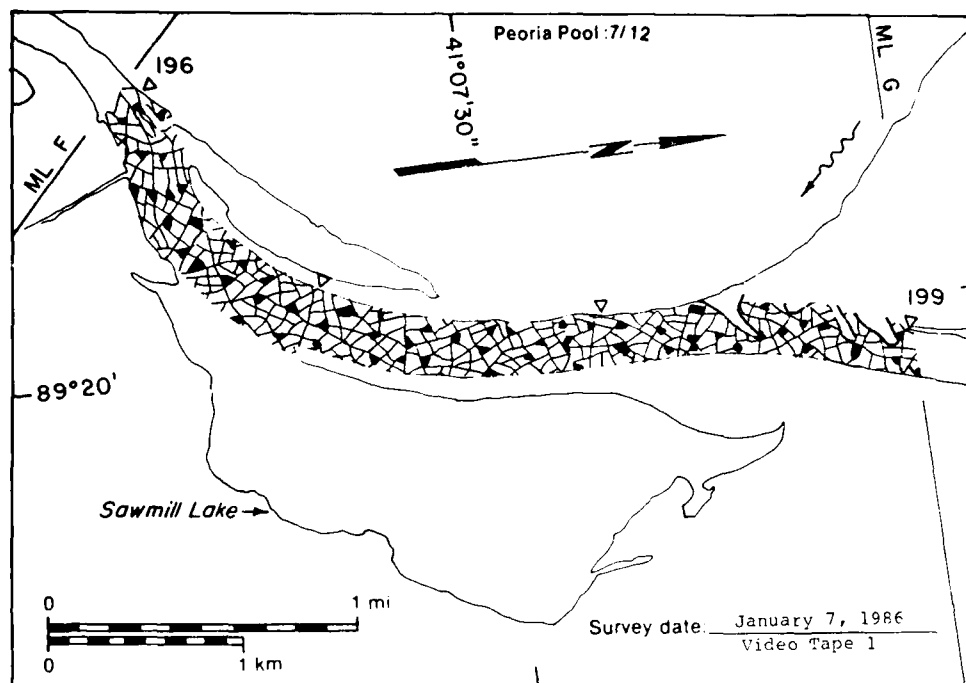
7 January 1986



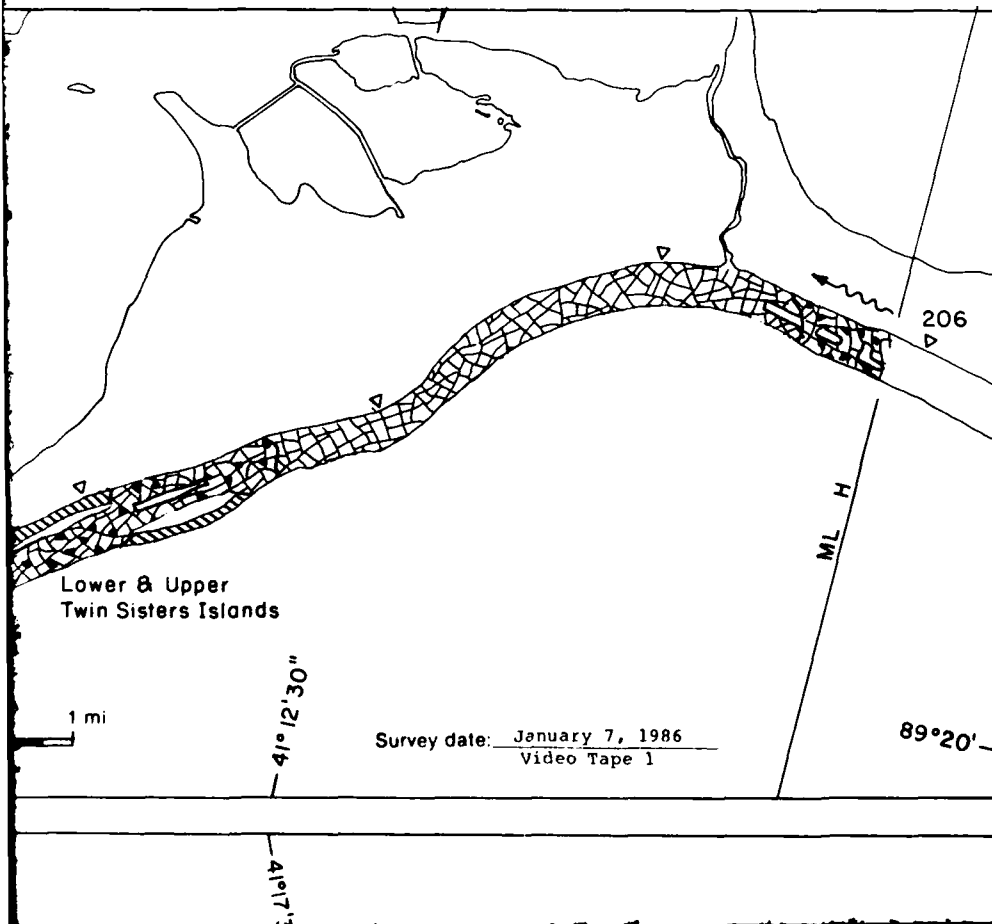


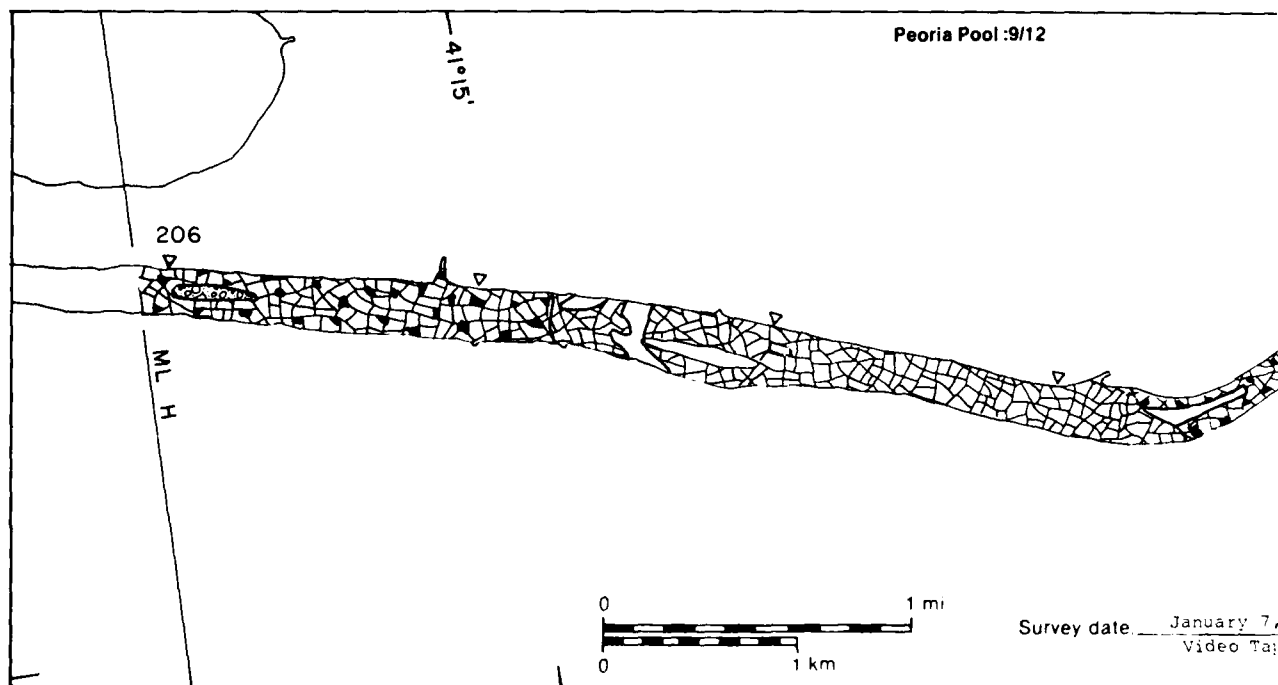
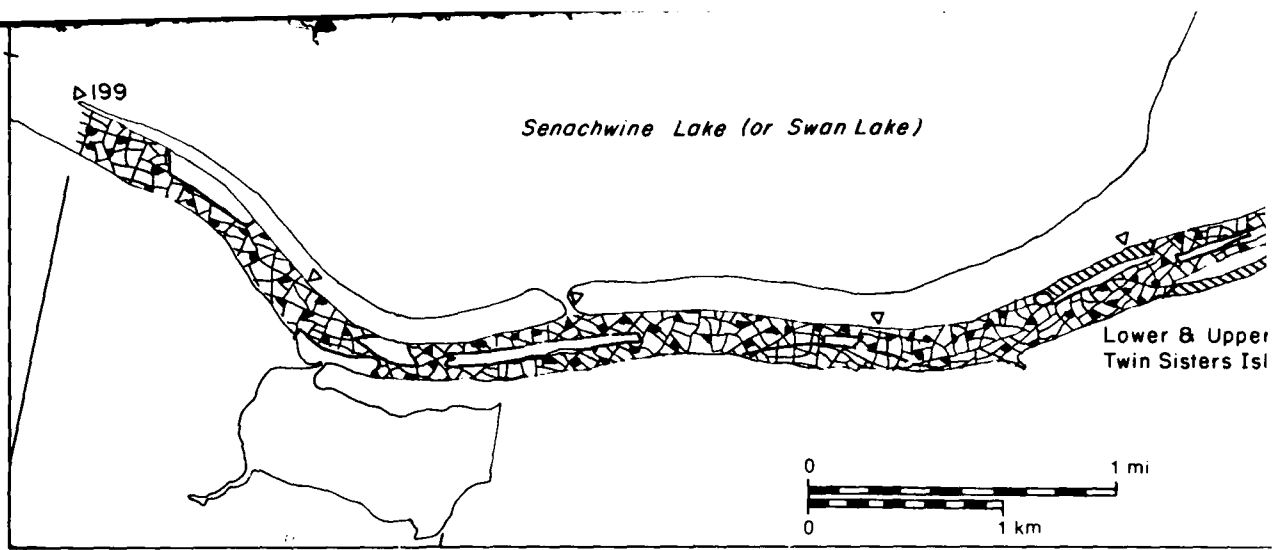


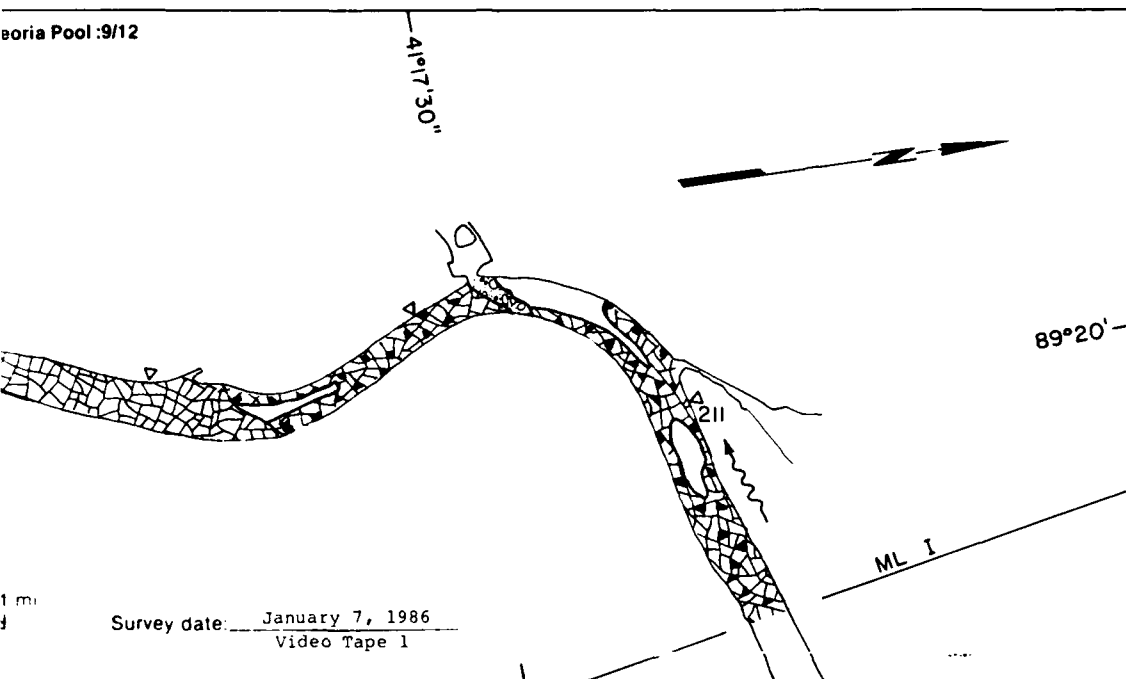
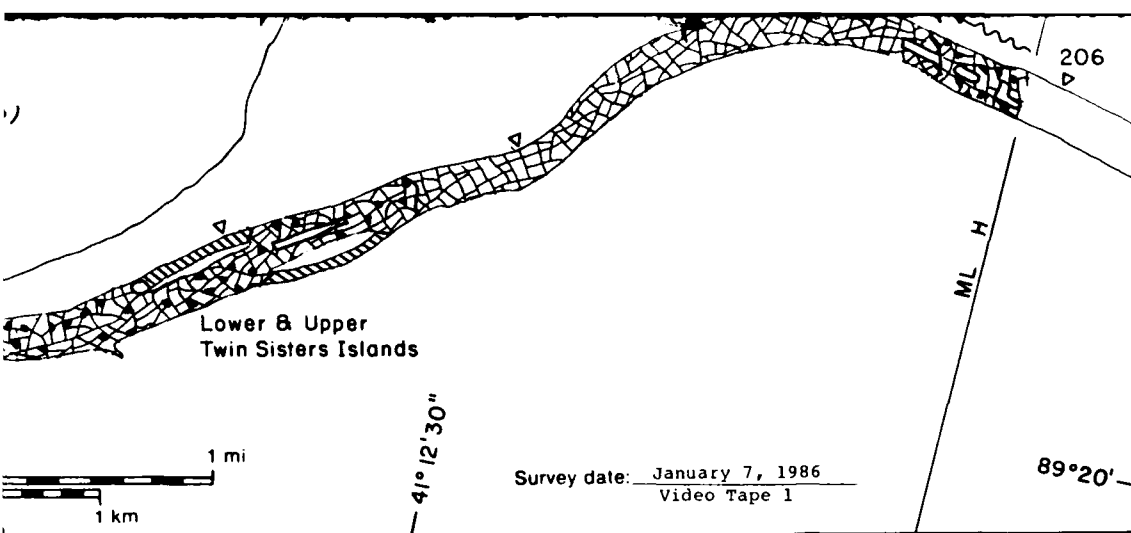




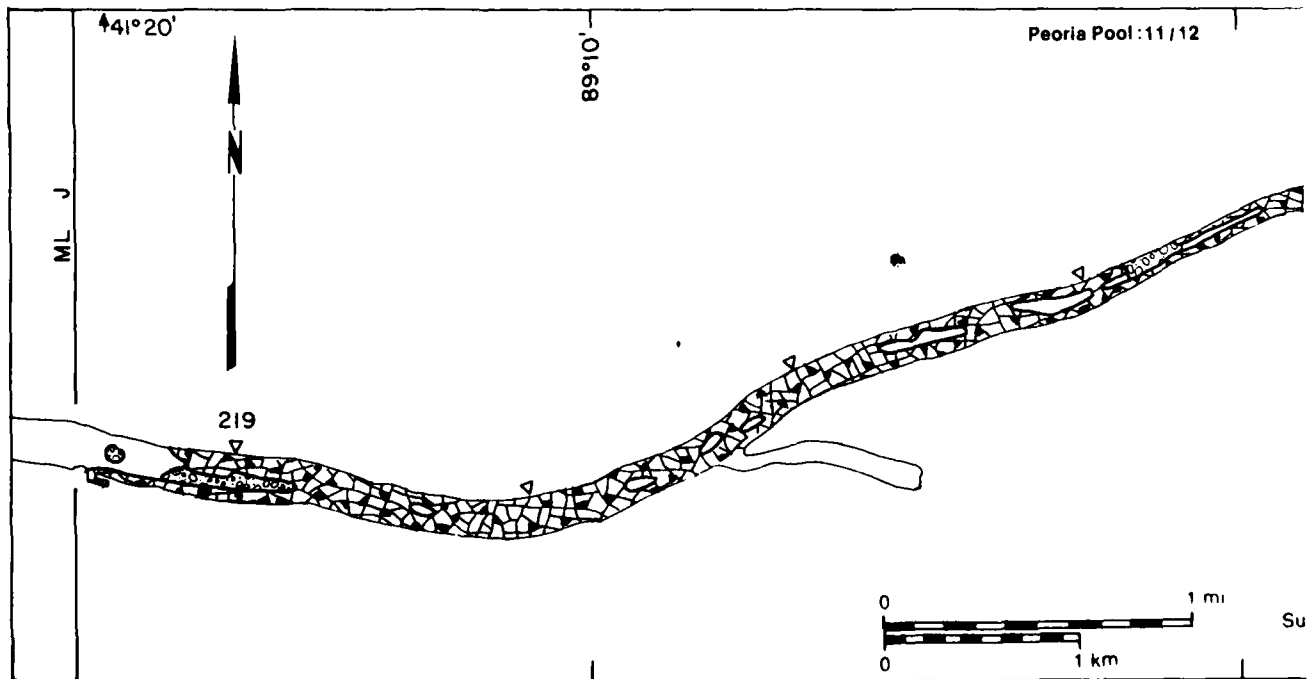
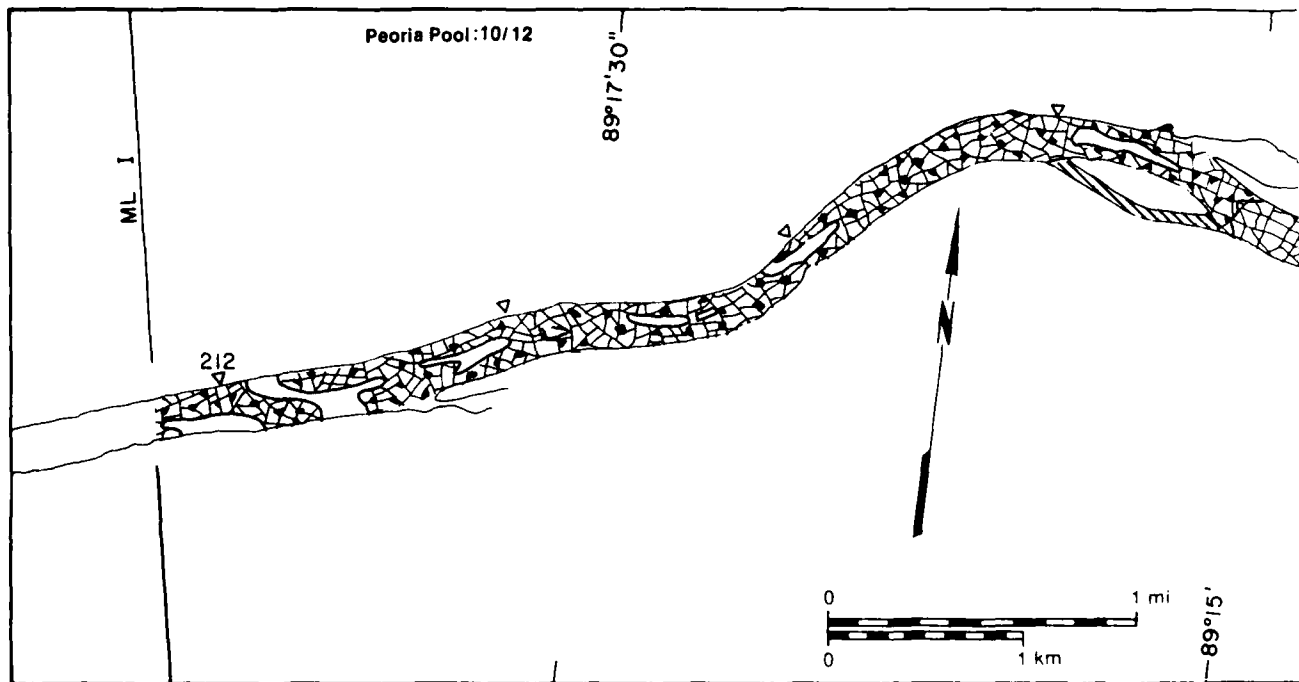
7 January 1986

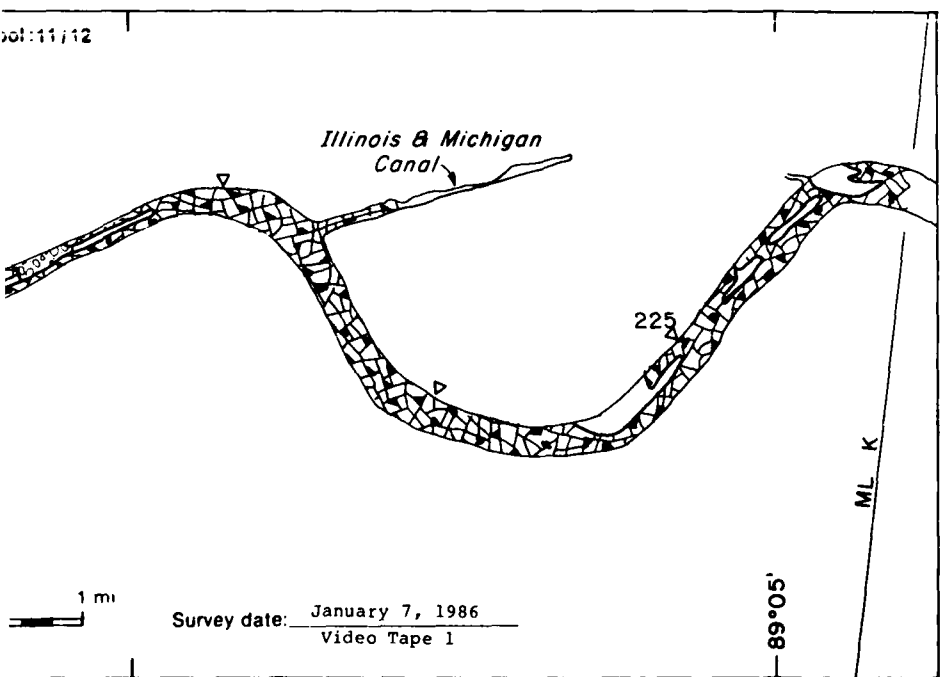
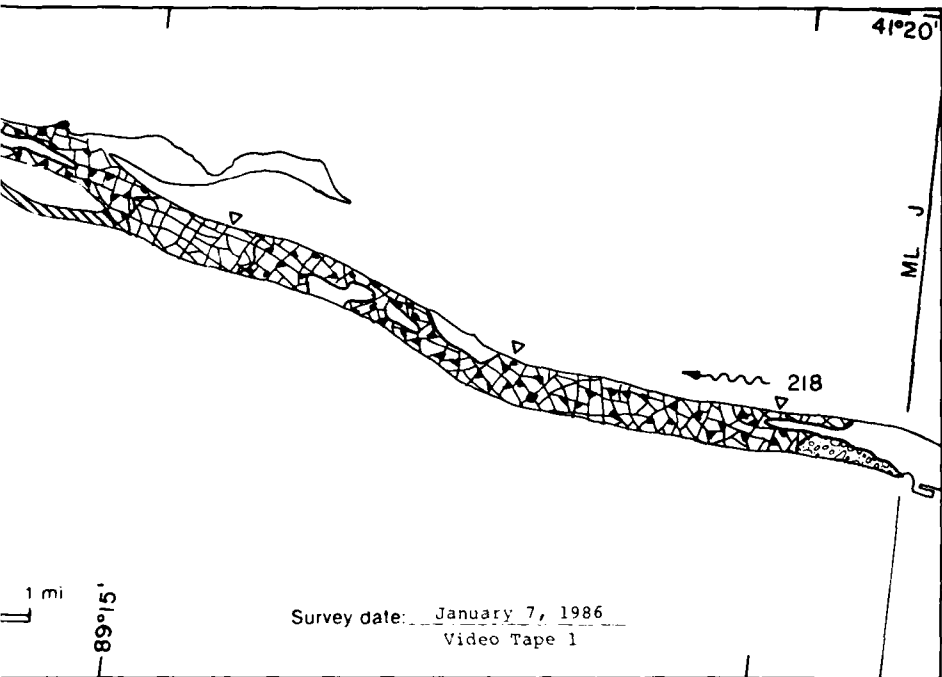


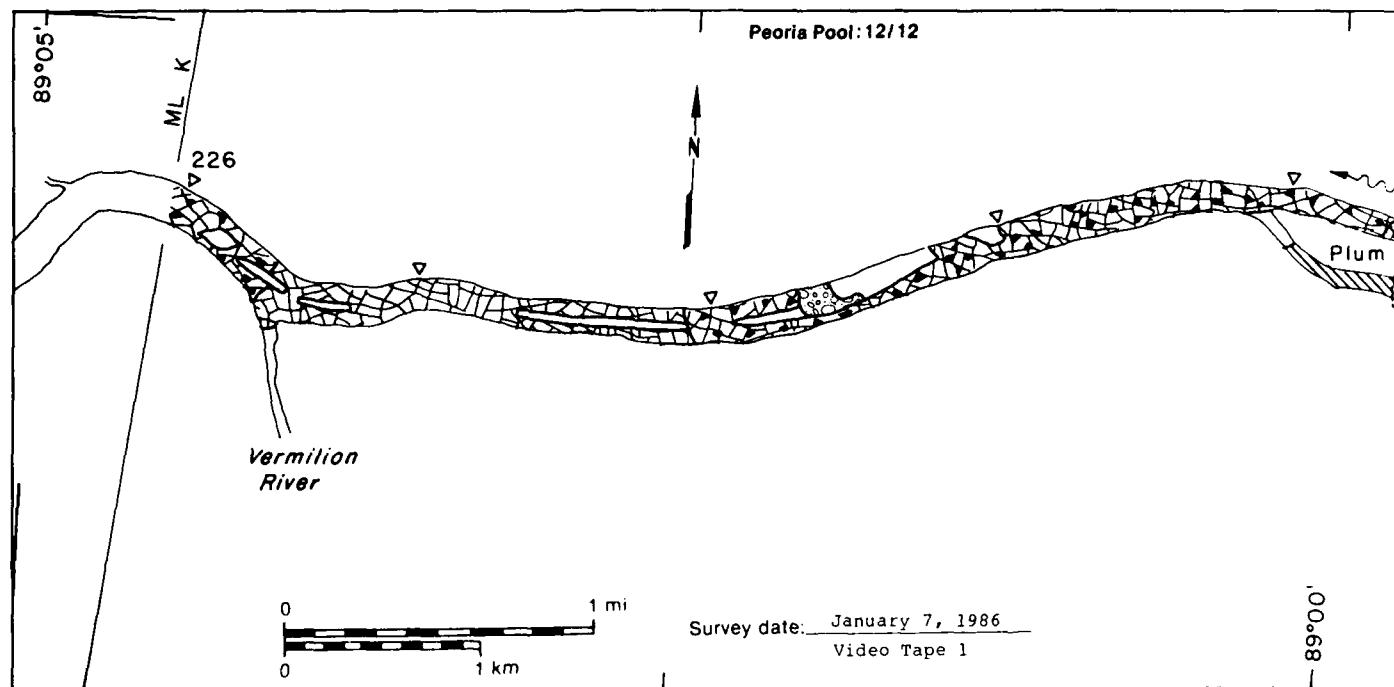
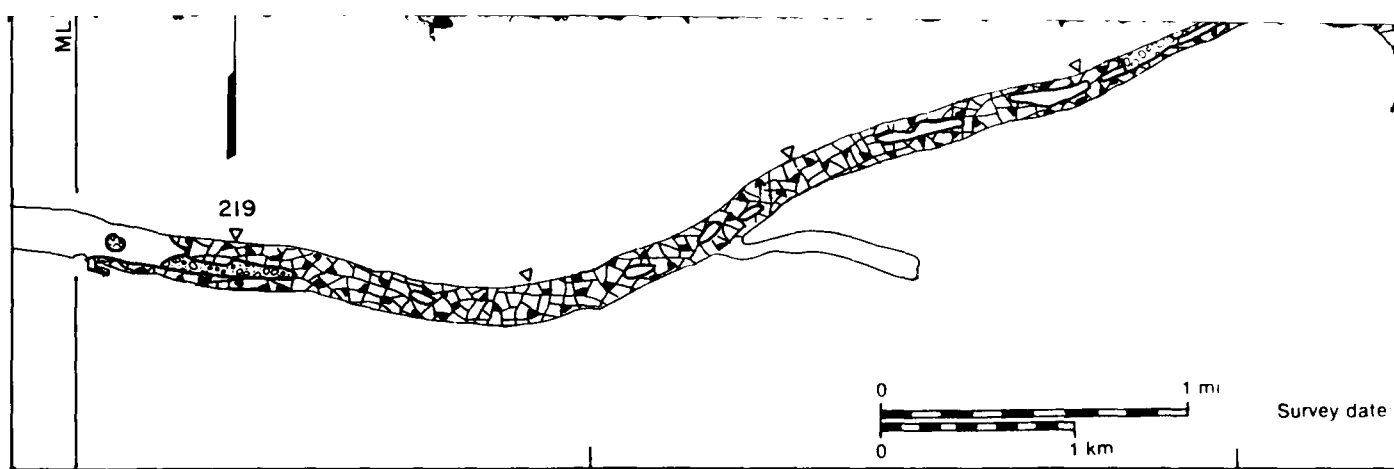




7 January 1986



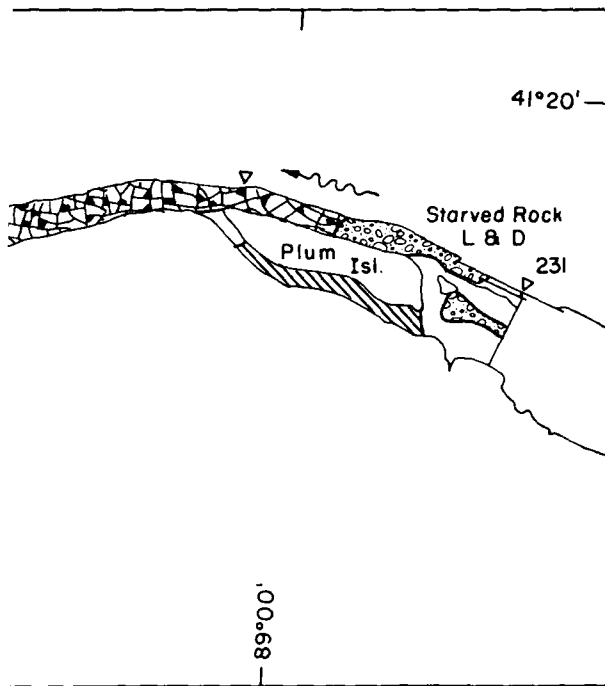
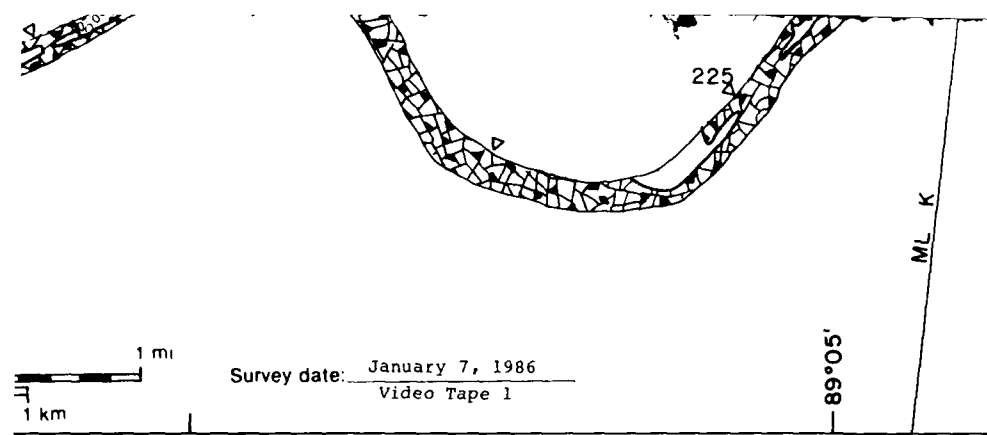


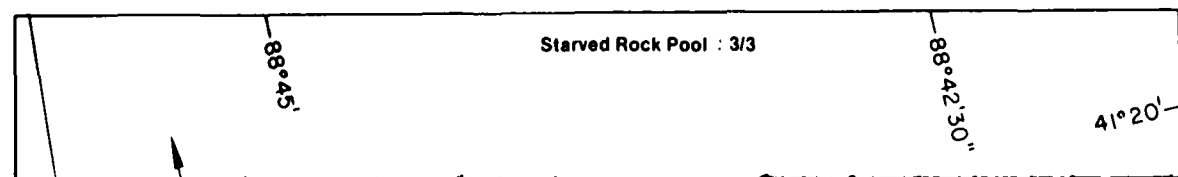
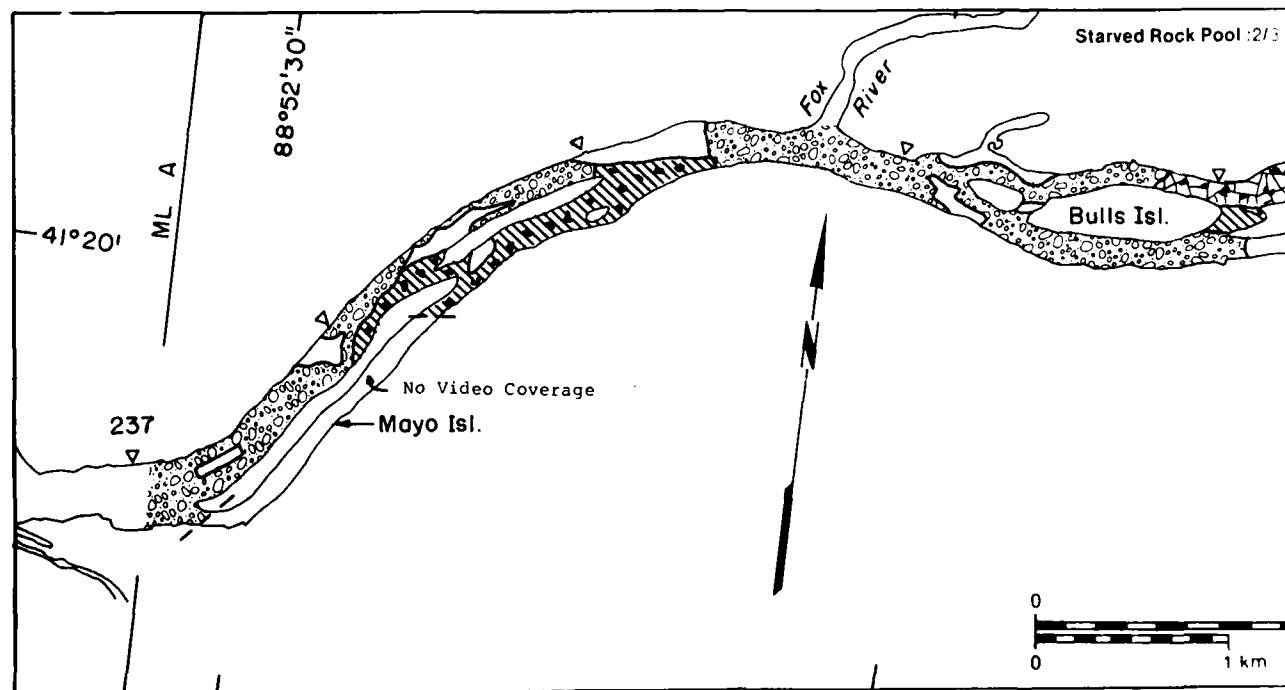
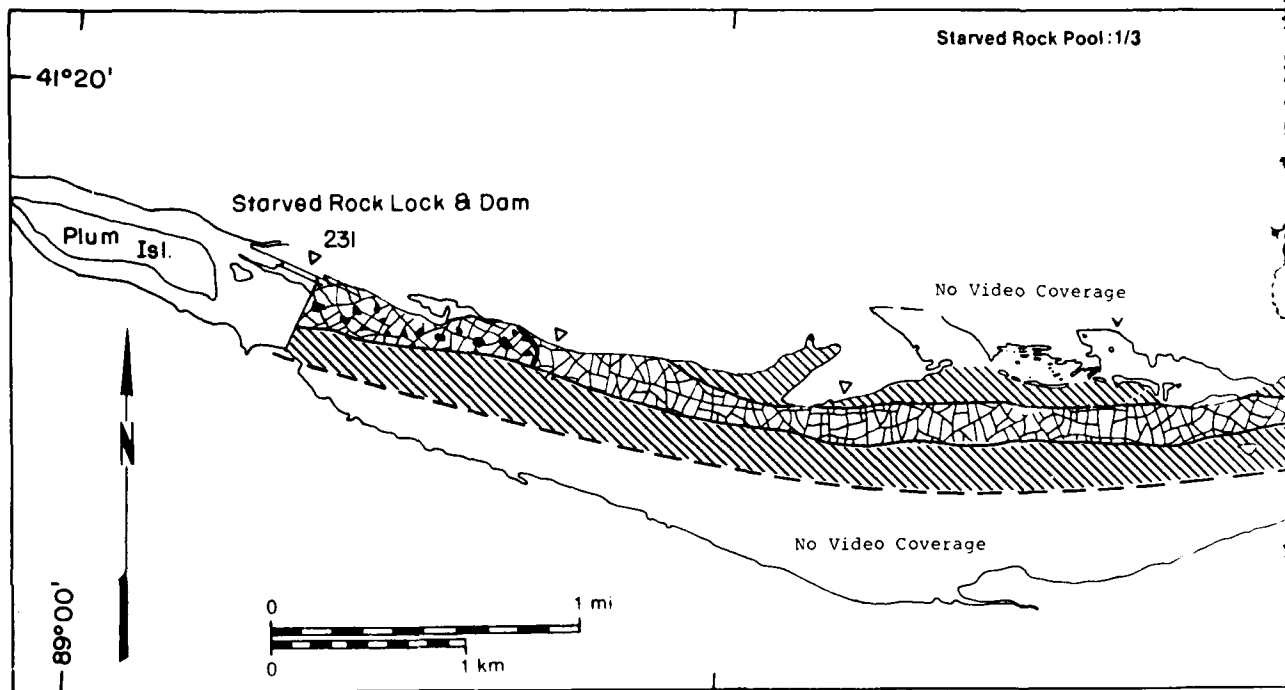


Peoria Pool

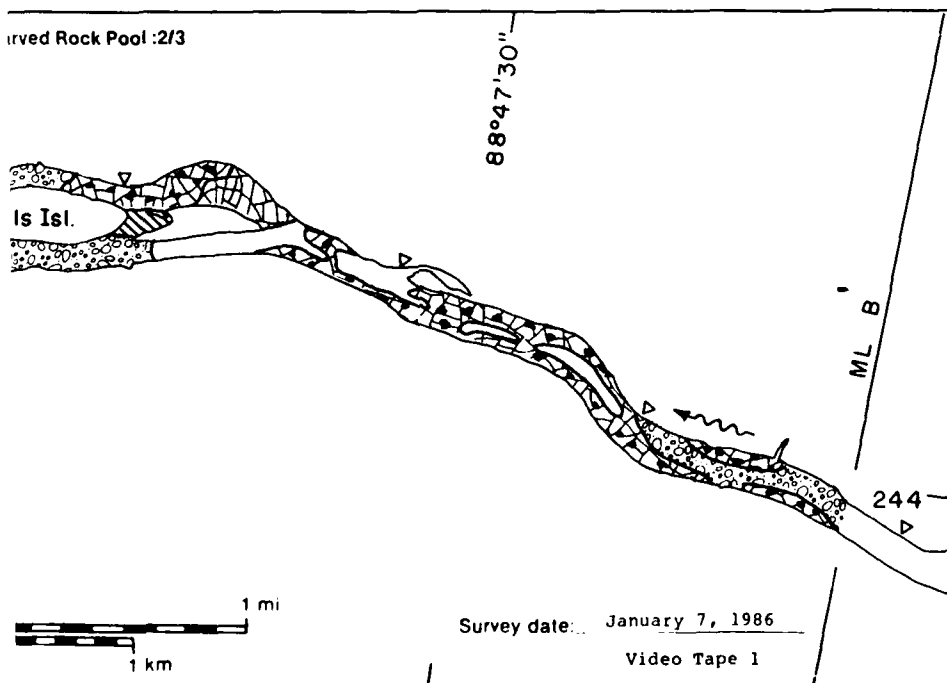
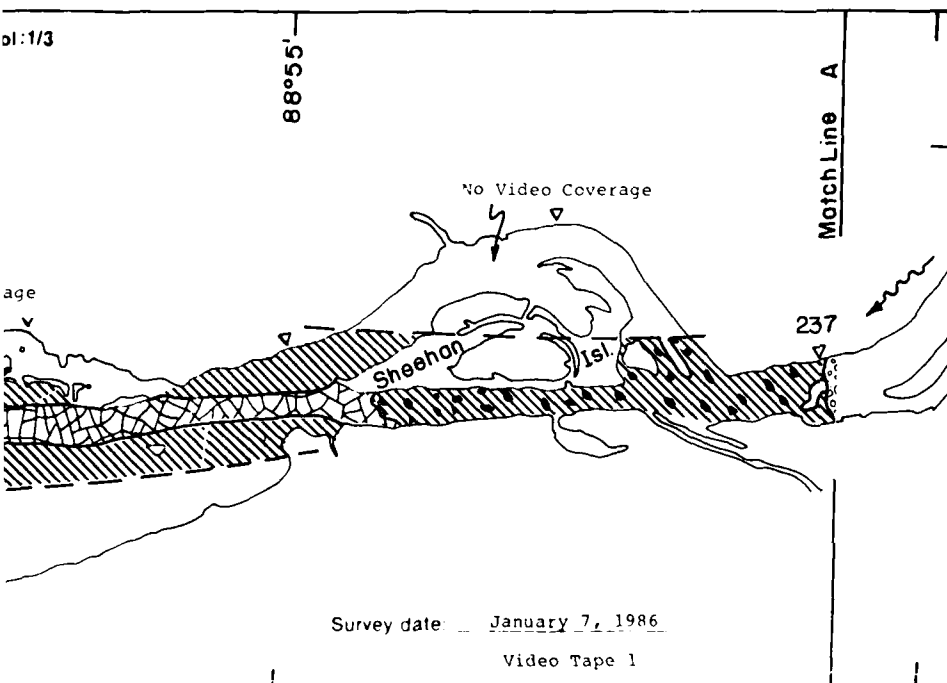
MAP UNITS		Area (m ² x 10 ⁶)	Surface concentration (%)
	Open water	2.72	NA
	Solid ice cover	20.61	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	29.71	NA
	Fragmented ice cover with open-water areas	11.92	90
	Ice floes or frazil slush and pans	0.40	80
Total Area (m ² x 10 ⁶)		81.33*	

* Includes 15.97 x 10⁶ m² of no video coverage





7 January 1986



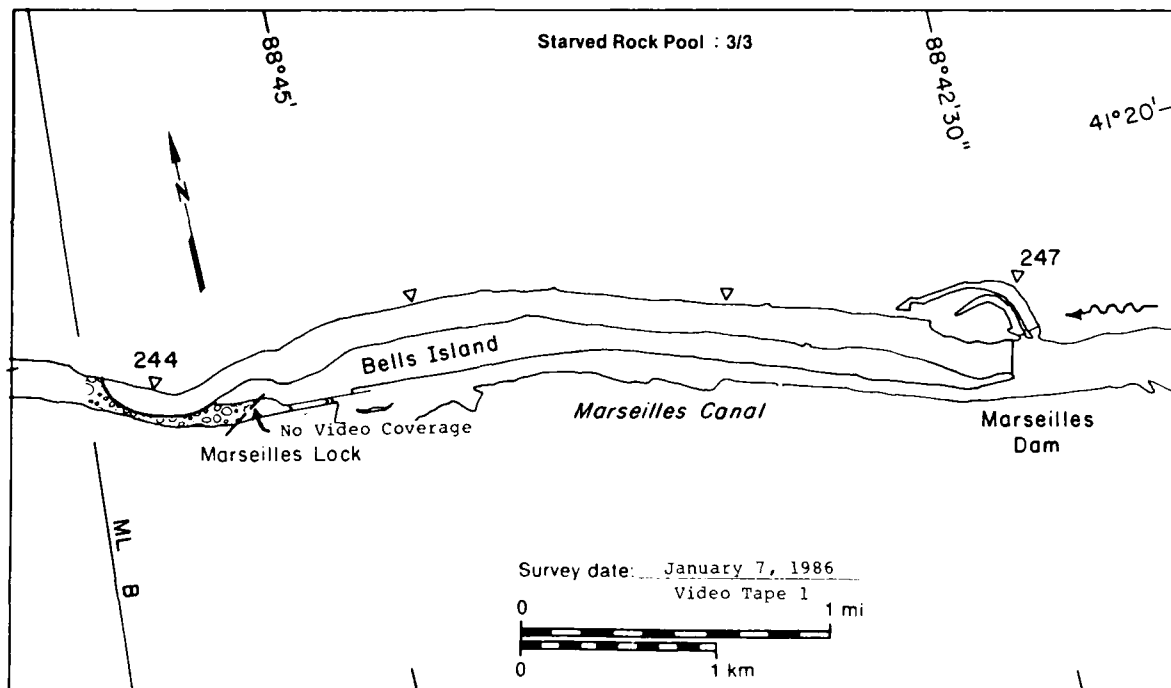
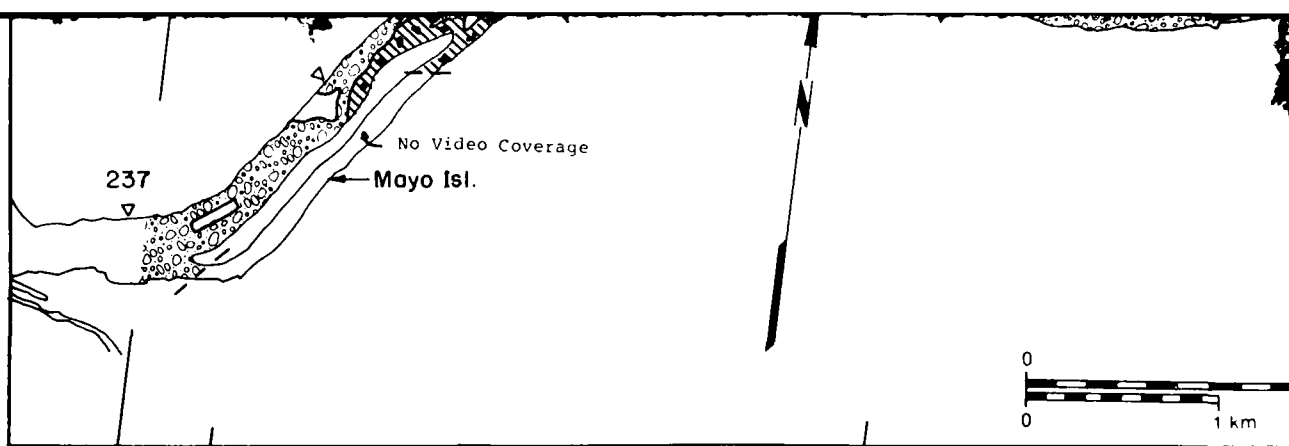
Starved Rock Pool

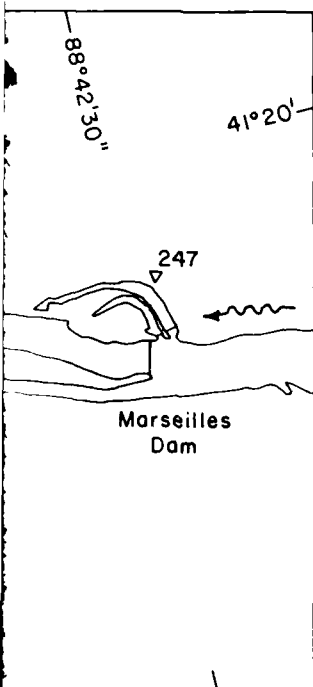
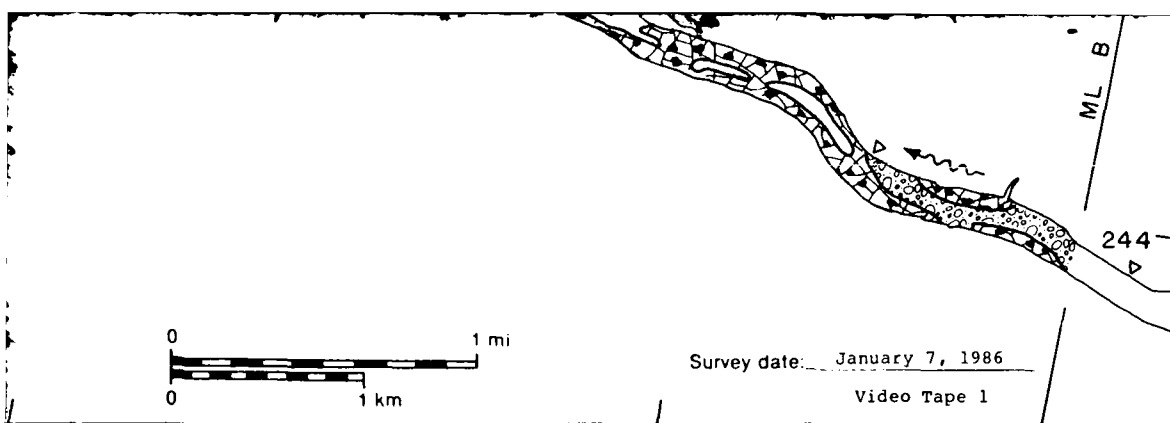
MAP UNITS

Area
(m² x 10⁶)

Surface
concentration
(%)

20'





Starved Rock Pool

MAP UNITS

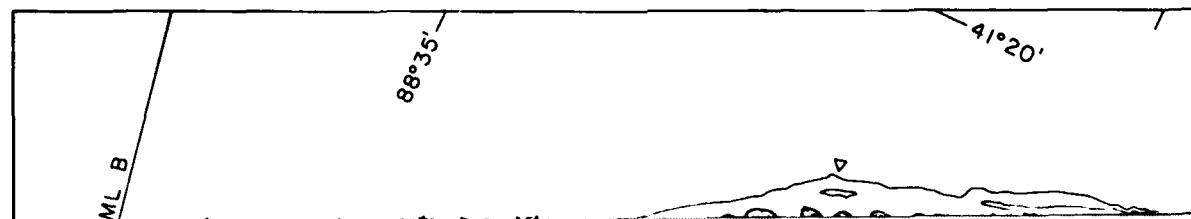
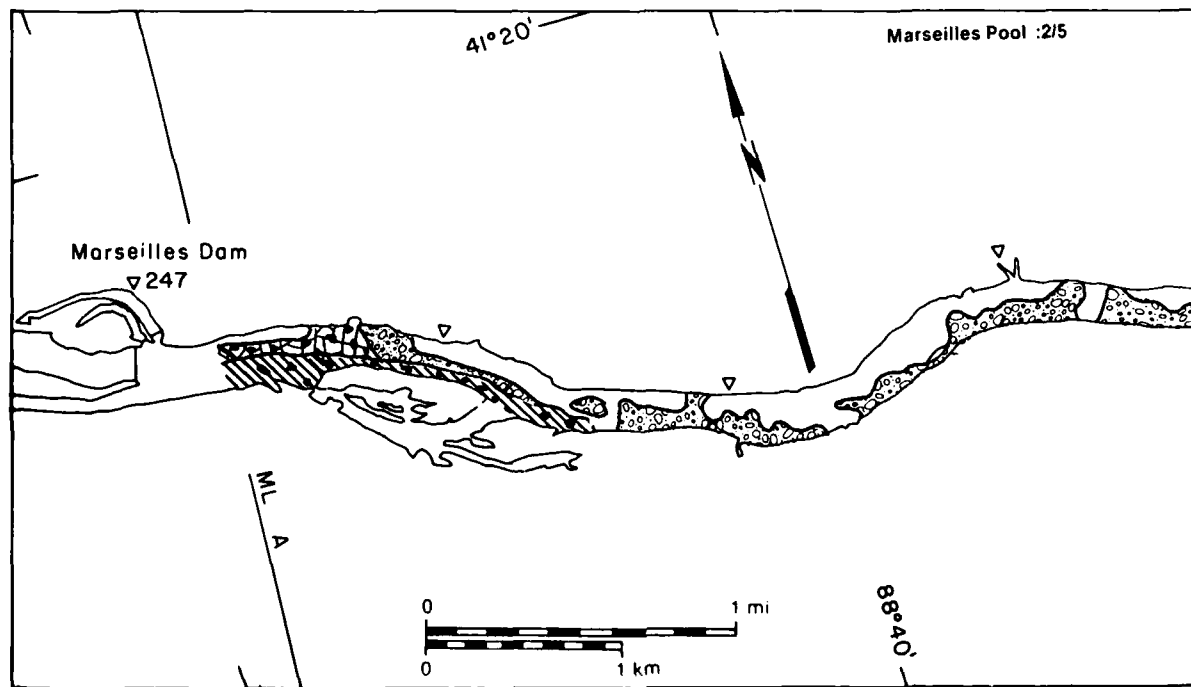
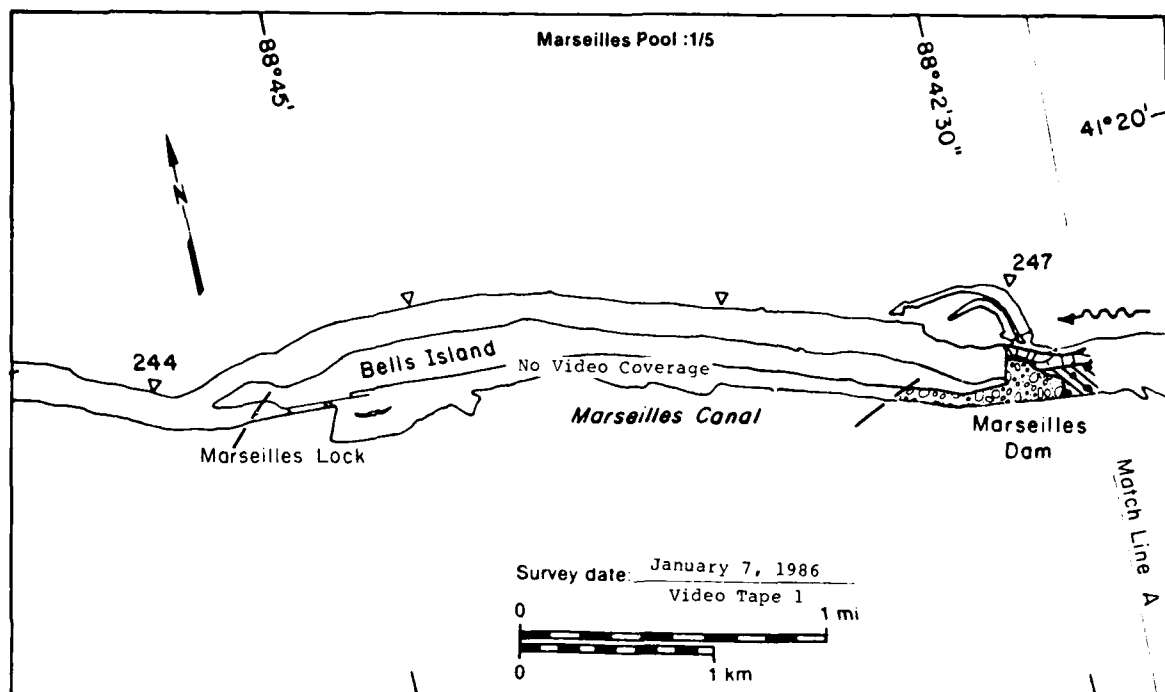
	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Total Area ($m^2 \times 10^6$)

Area ($m^2 \times 10^6$)	Surface concentration (%)
1.50	NA
2.03	NA
0.85	90
1.06	NA
0.72	90
1.28	80
10.19*	

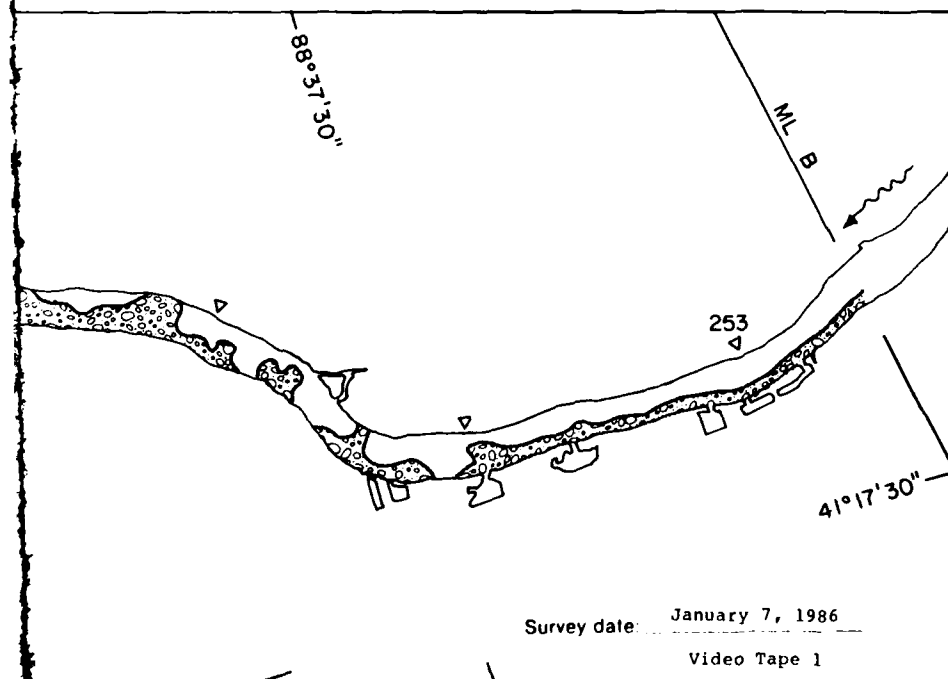
* Includes $2.75 \times 10^6 m^2$
of no video coverage

7 January 1986



20'

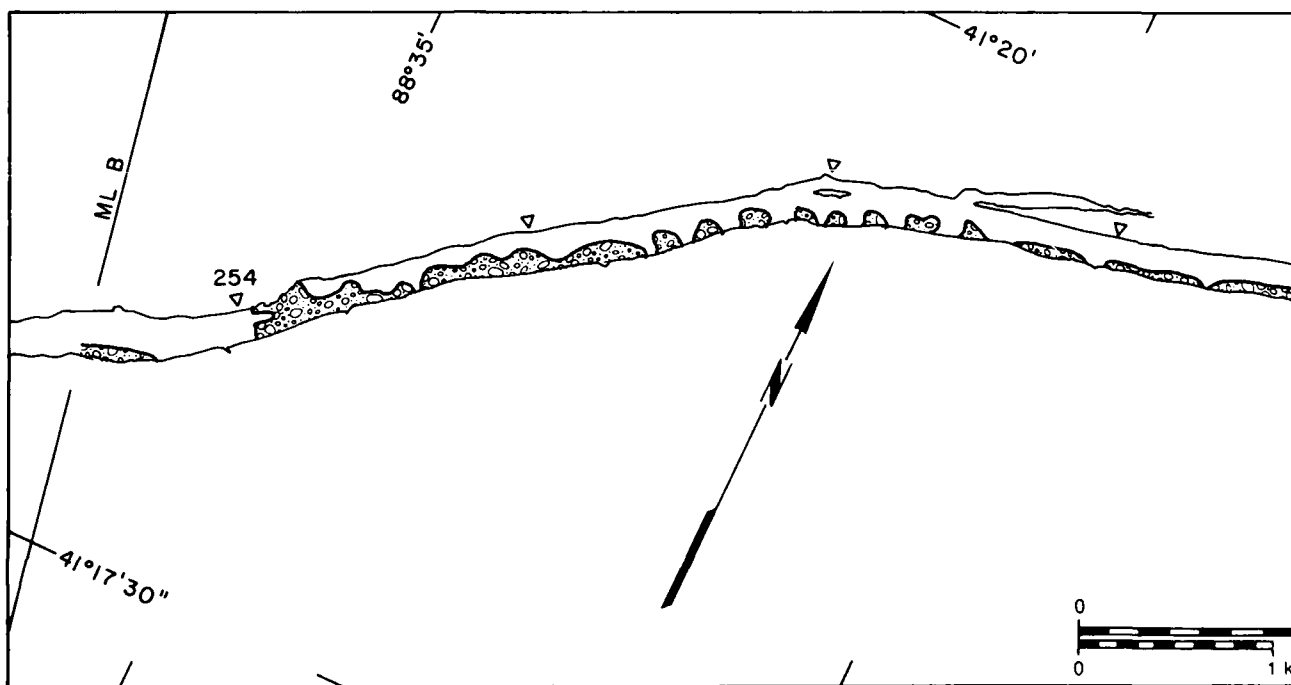
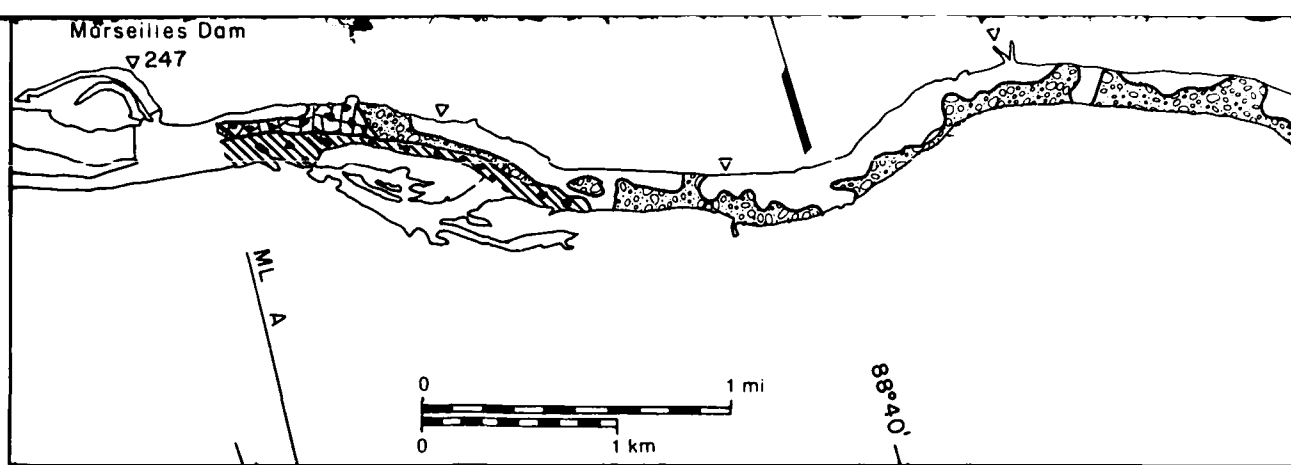
Match Line A

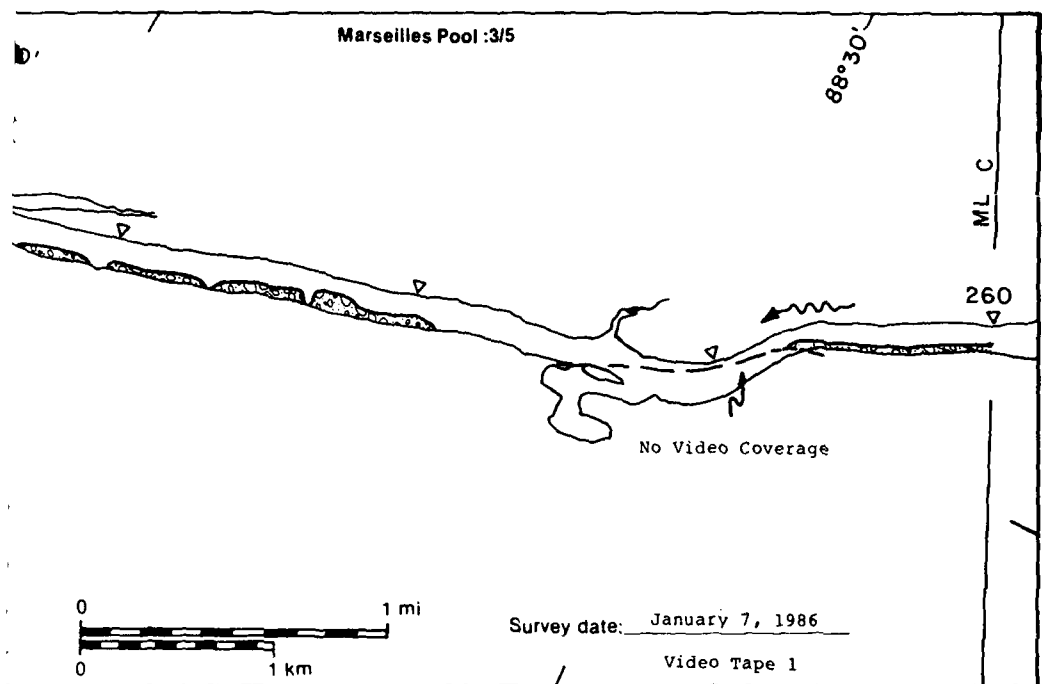
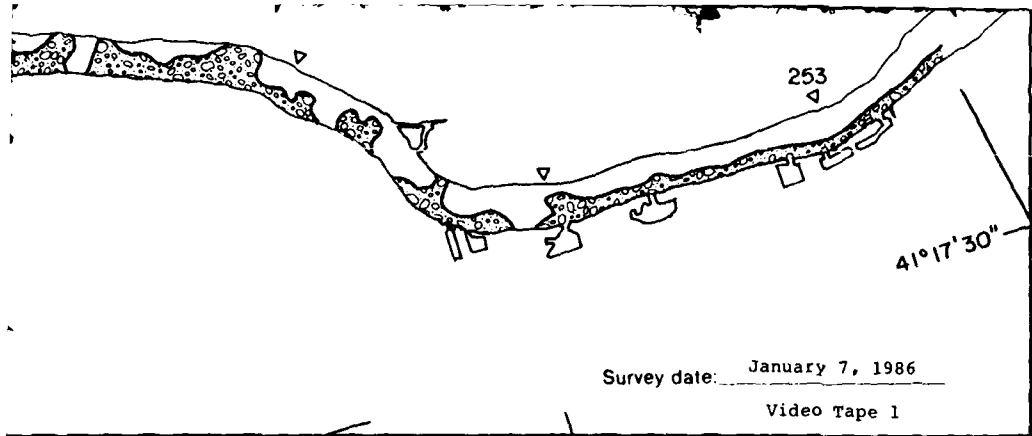


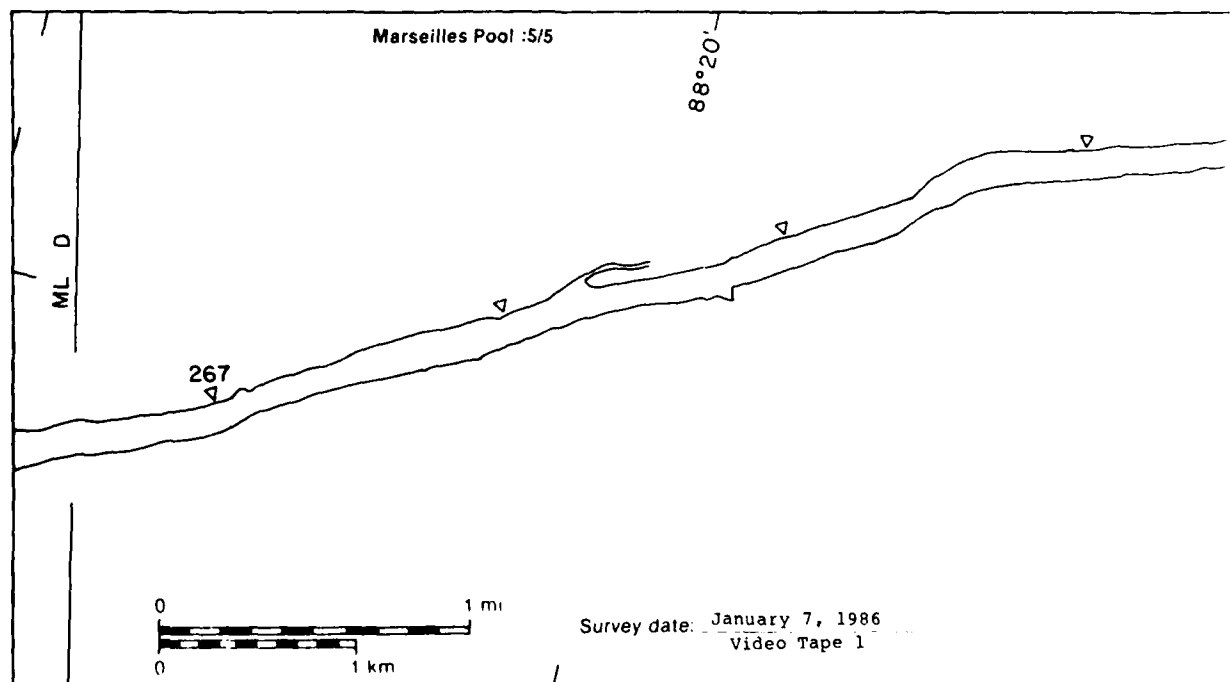
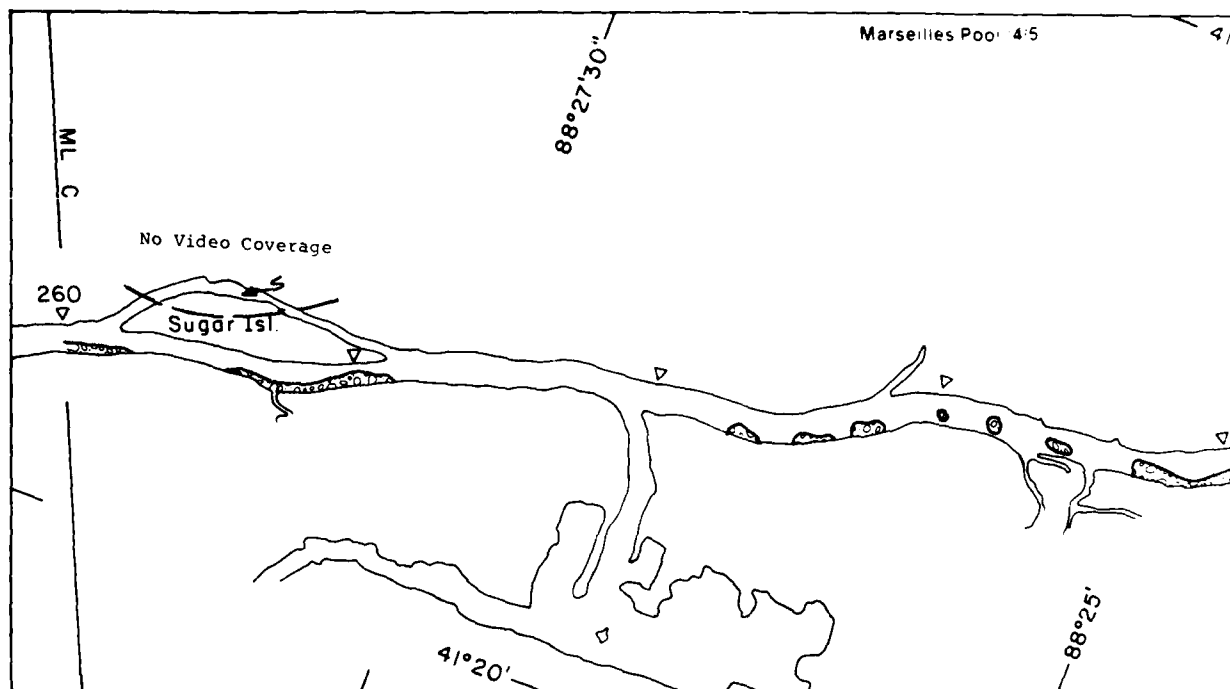
Marseilles Pool :3/5

88°30'

ML C

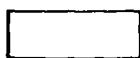






Marseilles Pool

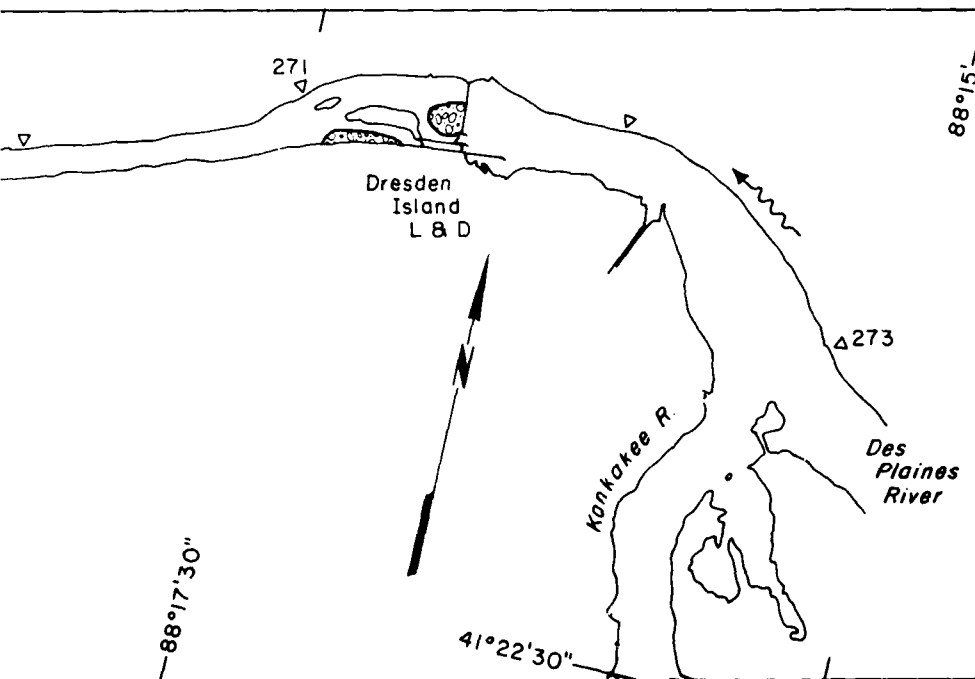
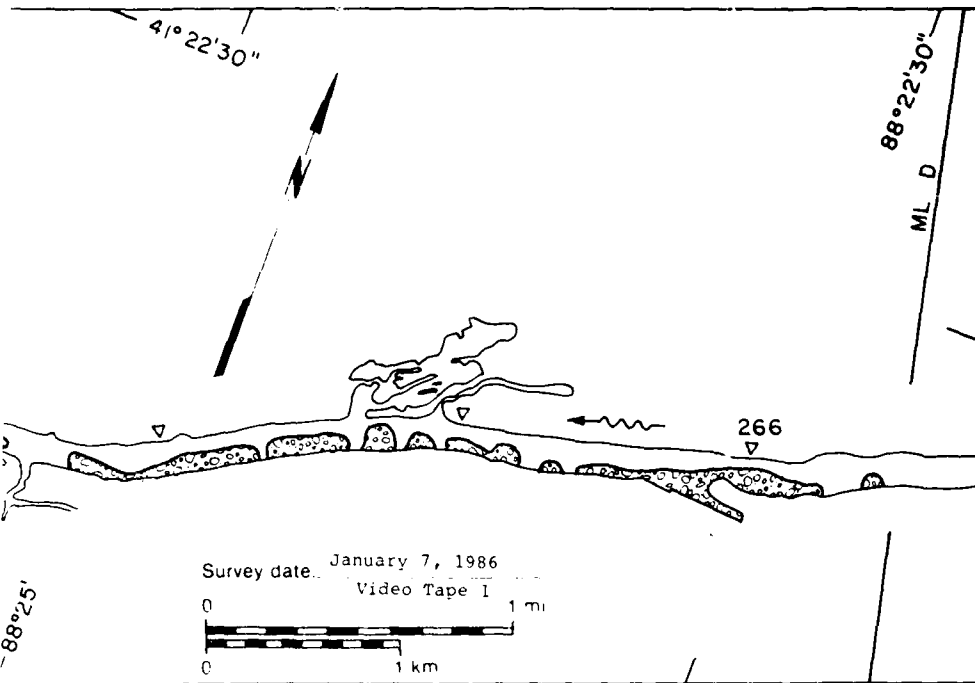
MAP UNITS

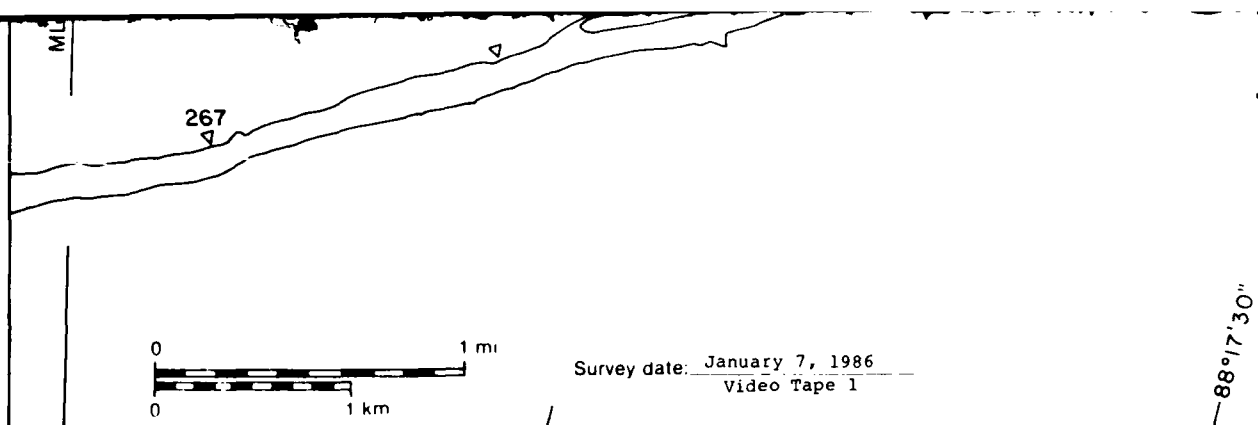


Open water

Area (m ² x 10 ⁶)	Surface concentration (%)
5.40	NA

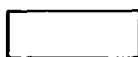
7 January 1986



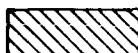


Marseilles Pool

MAP UNITS



Open water



Solid ice cover



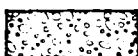
Solid ice cover with open-water areas



Fragmented ice cover



Fragmented ice cover with open-water areas

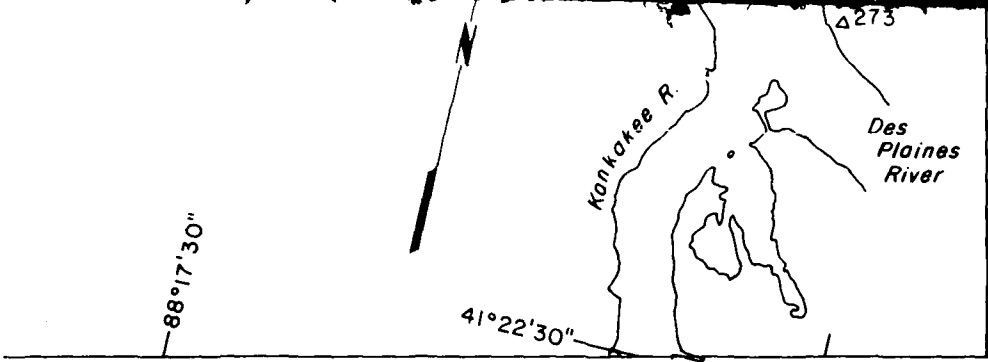


Ice floes or frazil slush and pans

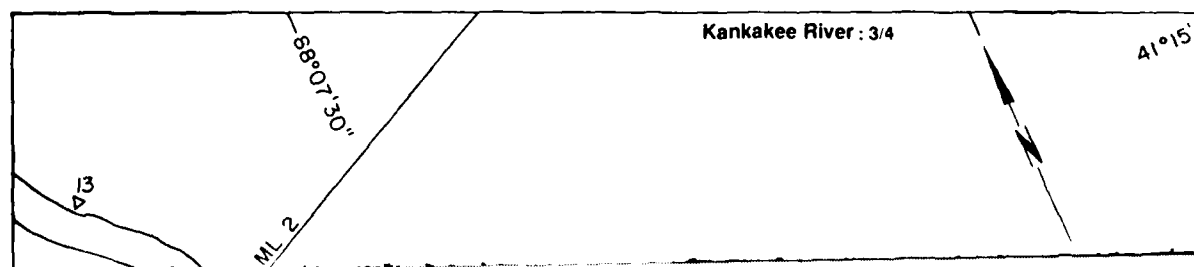
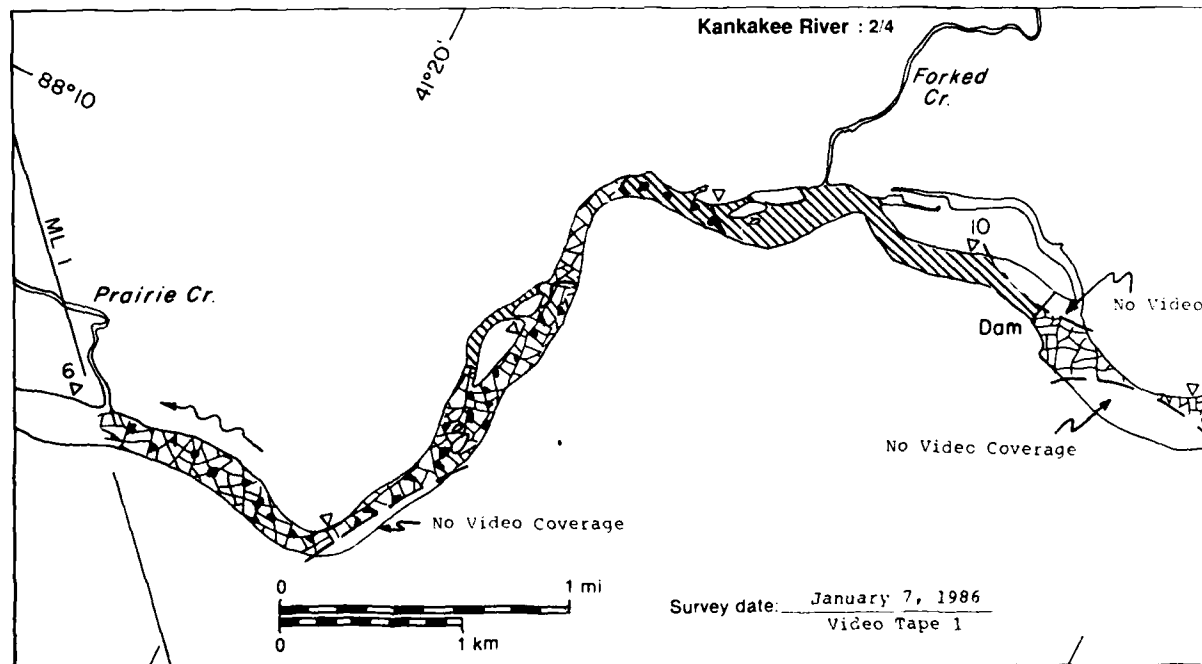
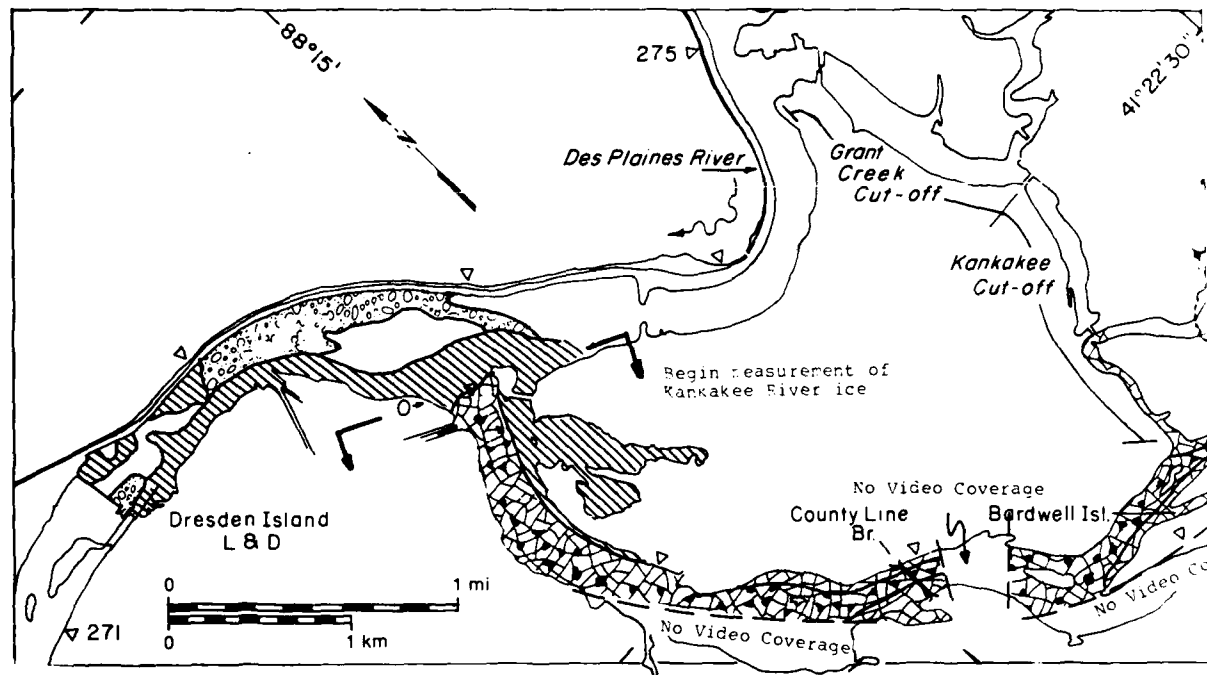
Total Area ($m^2 \times 10^6$)

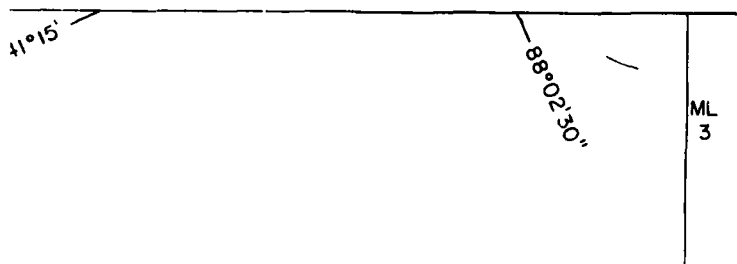
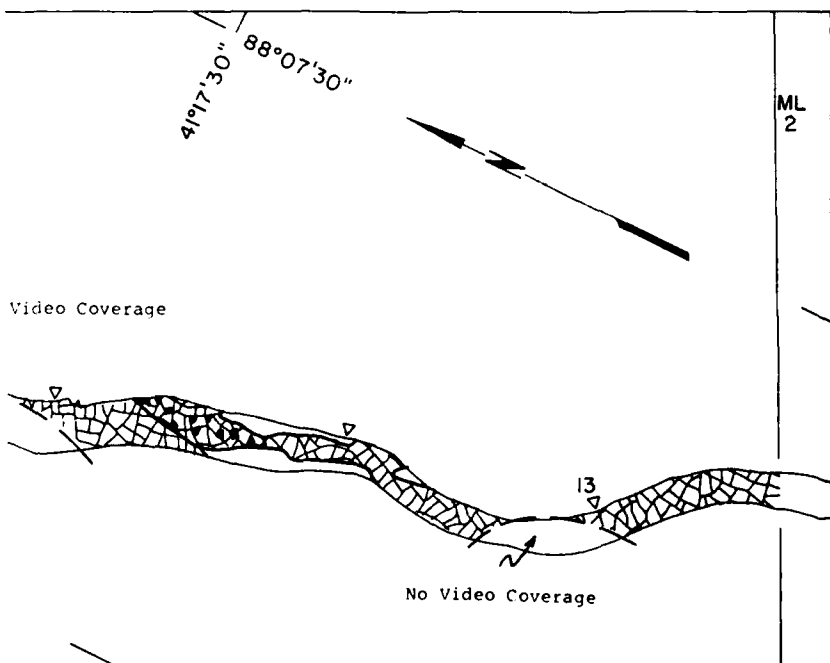
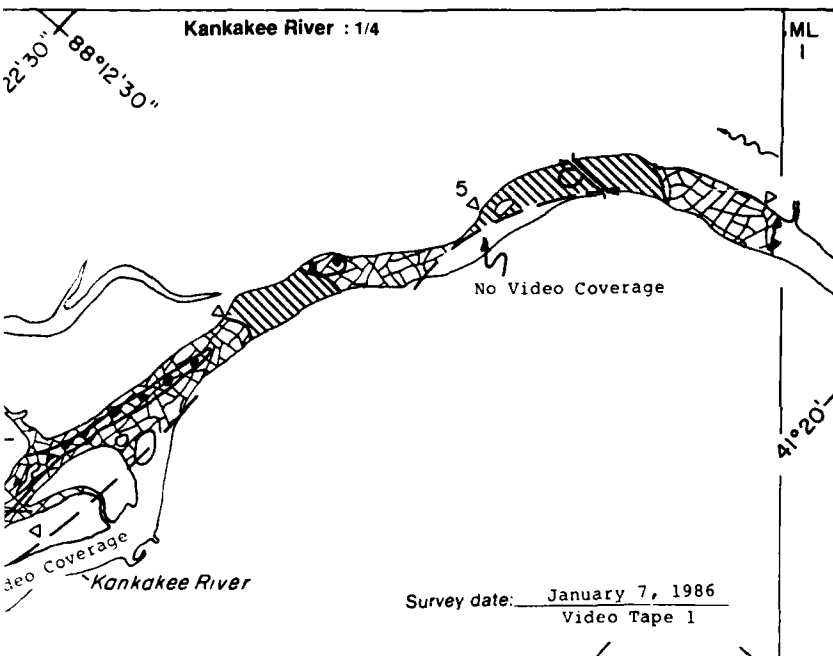
Area ($m^2 \times 10^6$)	Surface concentration (%)
5.40	NA
0.00	NA
0.21	70
0.04	NA
0.07	90
1.86	50
8.19*	

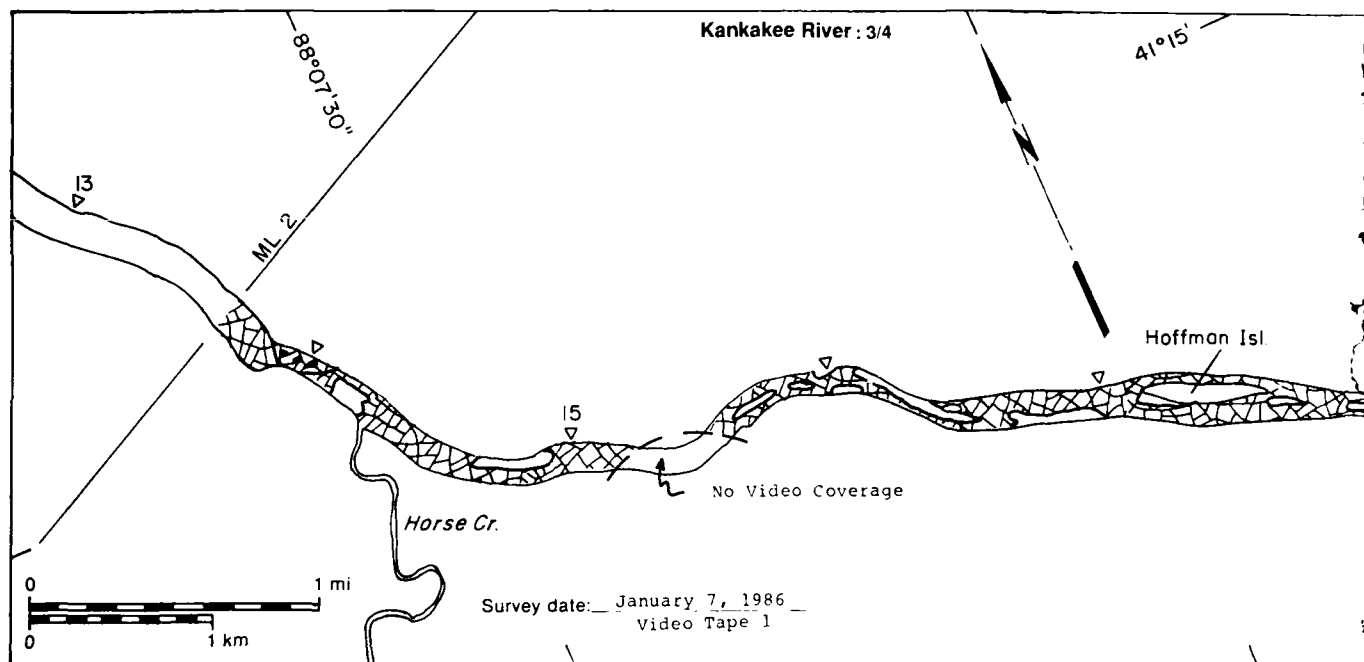
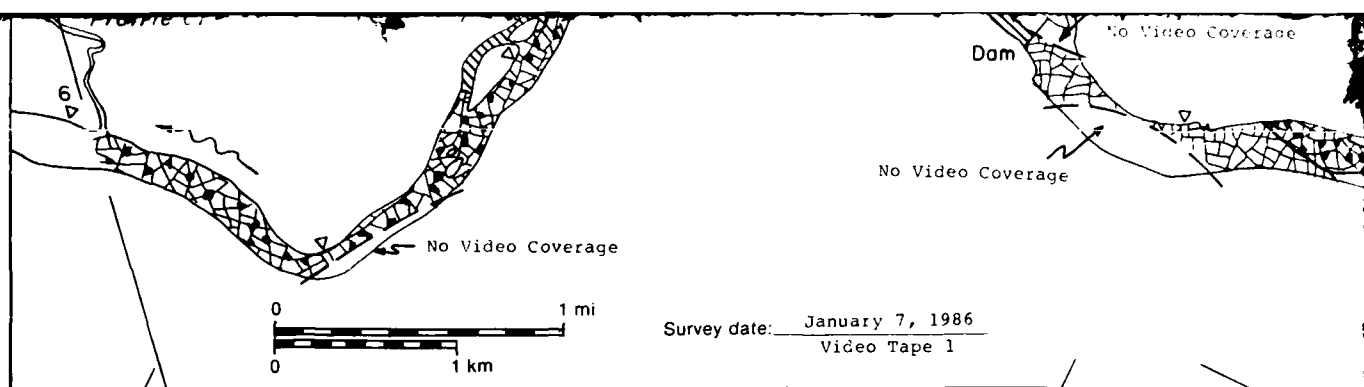
* Includes $0.61 \times 10^6 m^2$
of no video coverage

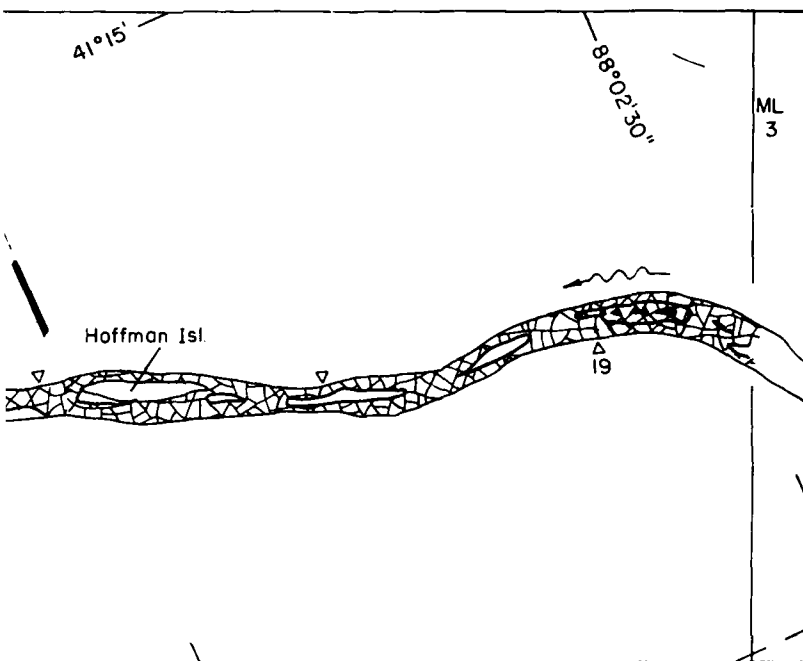
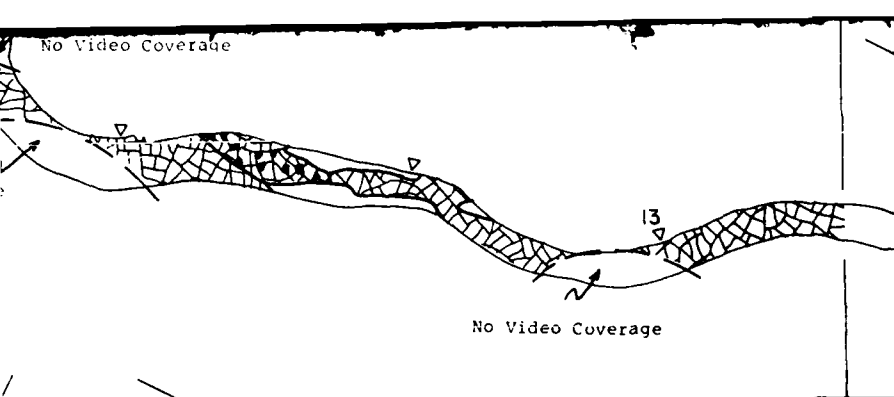


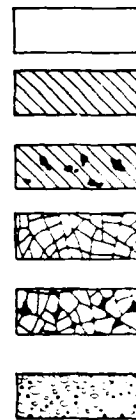
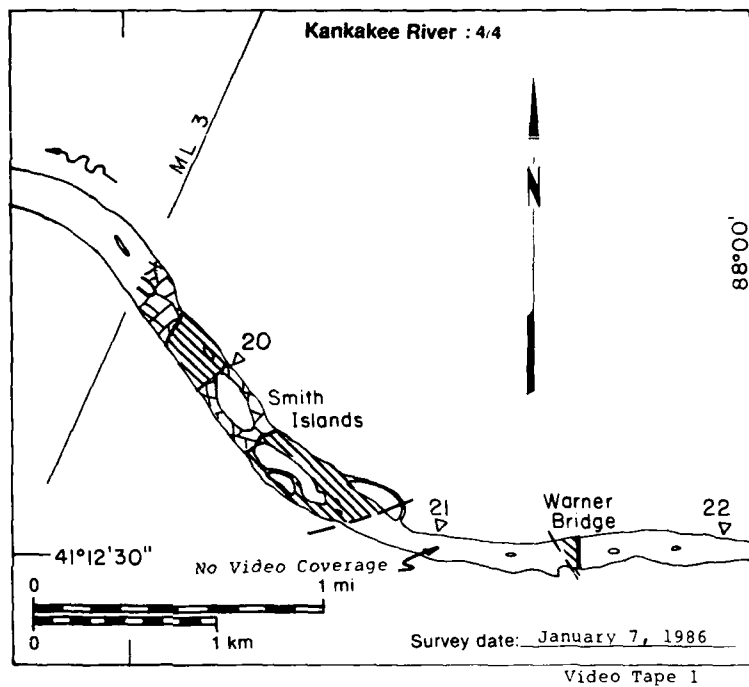
7 January 1986











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ICE ATLAS 1985 - 1986 MONONGAHELA RIVER ALLEGHENY RIVER 7/14

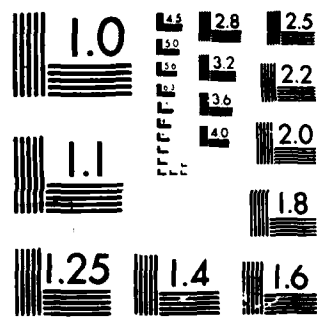
OHIO RIVER ILLINO. (U) COLD REGIONS RESEARCH AND

ENGINEERING LAB HANOVER NH L H GATTO ET AL. NOV 87

UNCLASSIFIED CRREL-SP-87-20

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7 January 1986

Kankakee River

MAP UNITS



Open water



Solid ice cover



Solid ice cover with open-water areas



Fragmented ice cover



Fragmented ice cover with open-water areas



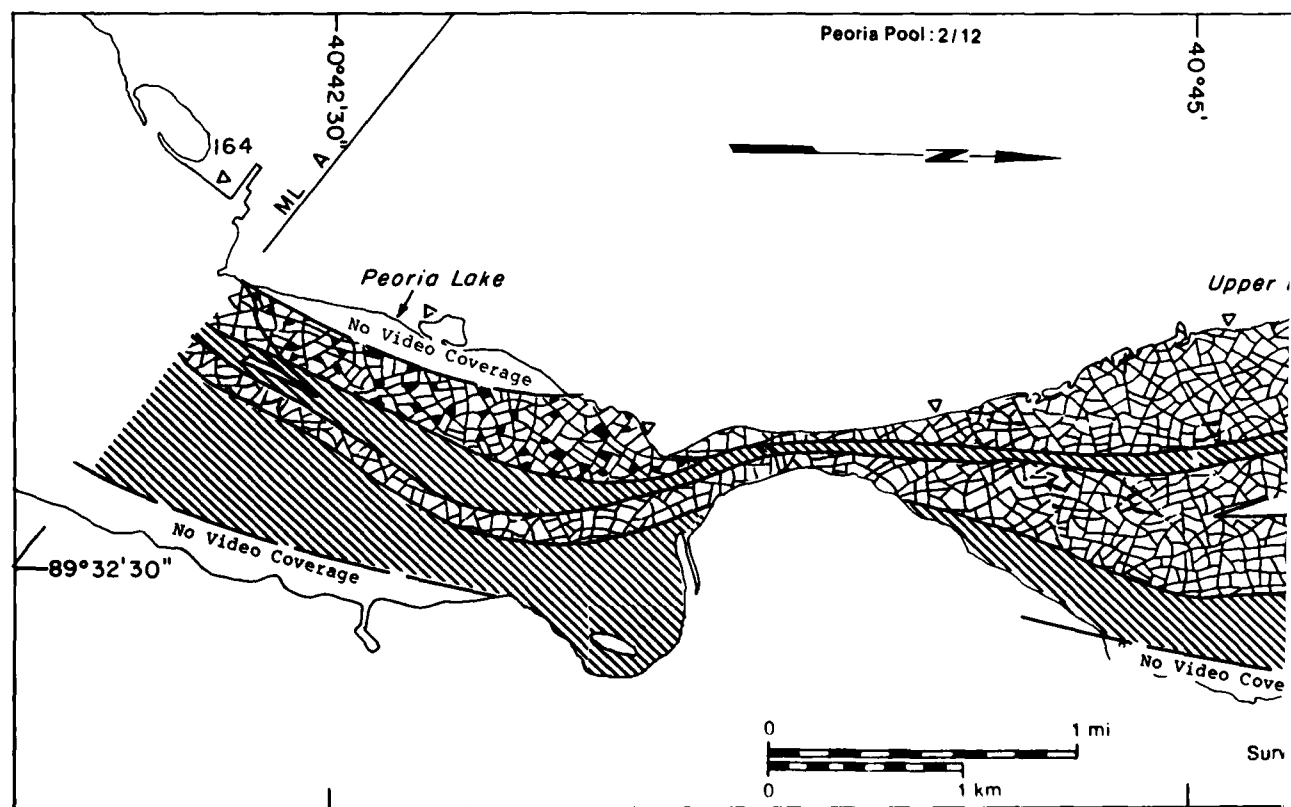
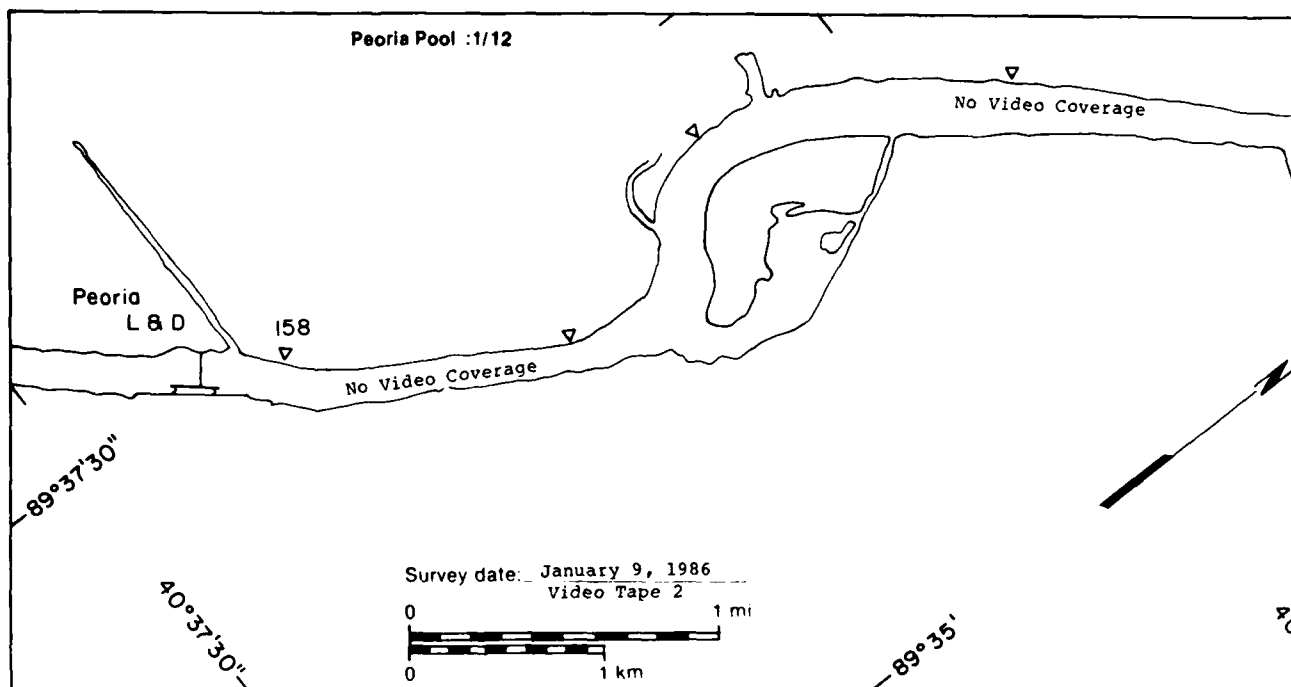
Ice floes or frazil slush and pans

Total Area ($m^2 \times 10^6$)

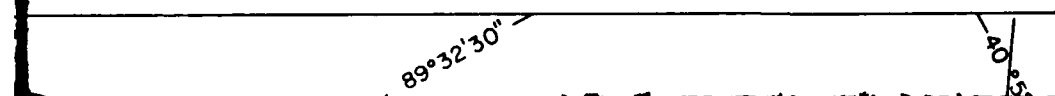
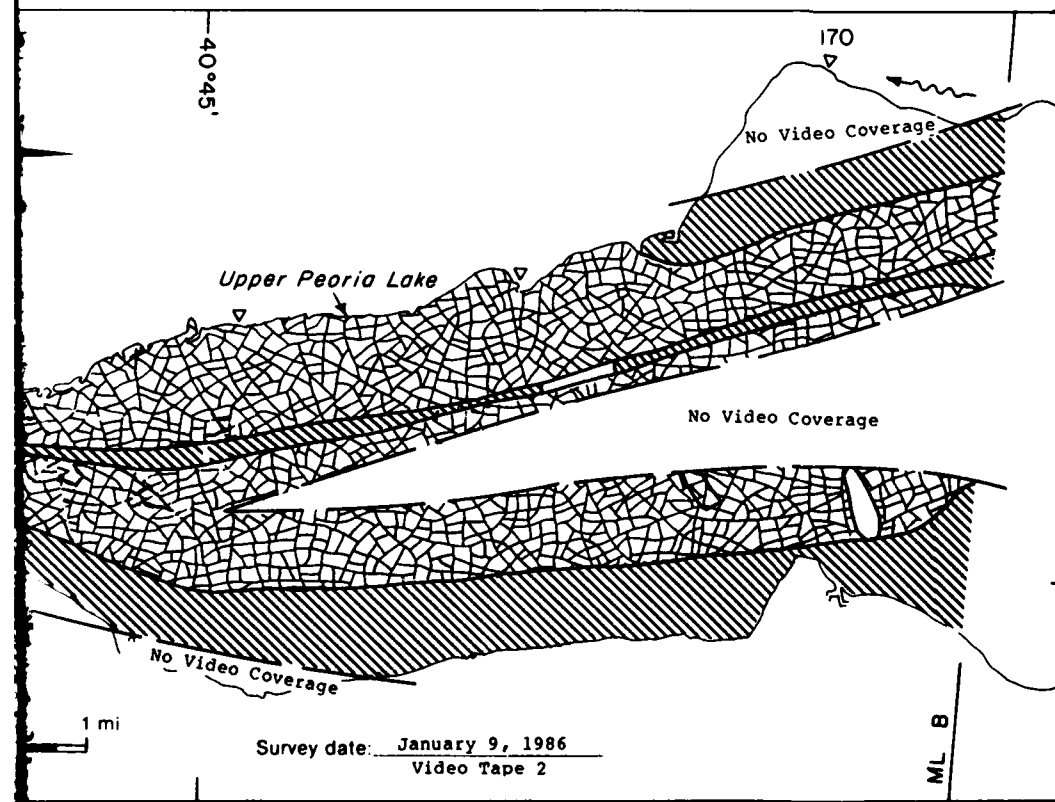
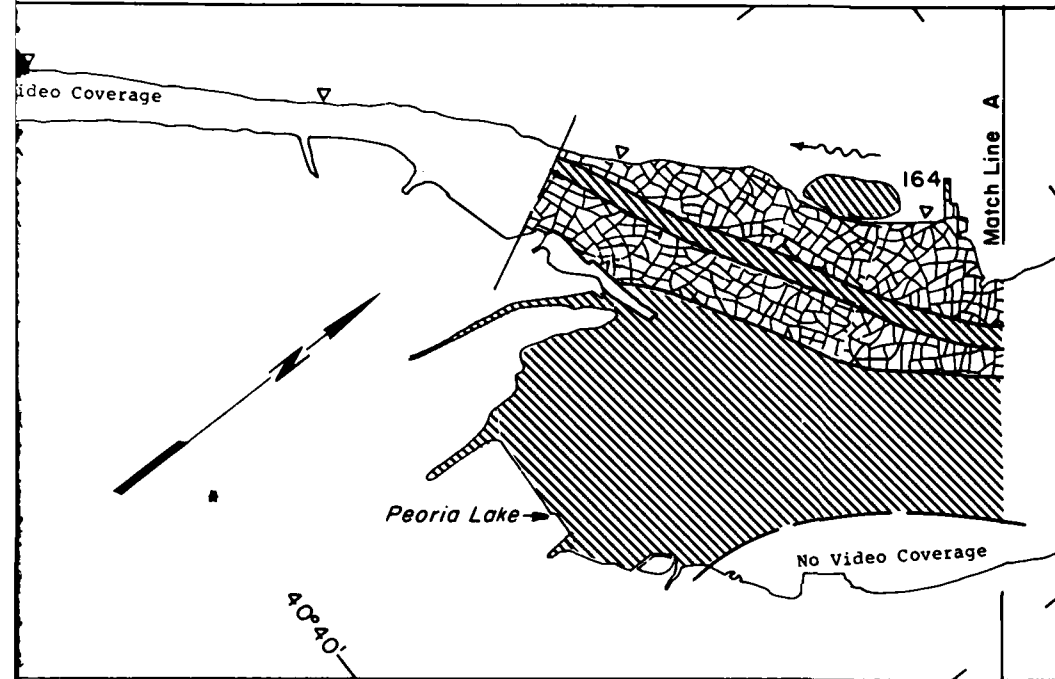
Area ($m^2 \times 10^6$)	Surface concentration (%)
0.38	NA
1.07	NA
0.09	95
1.65	NA
2.94	90
0.00	—
7.30*	

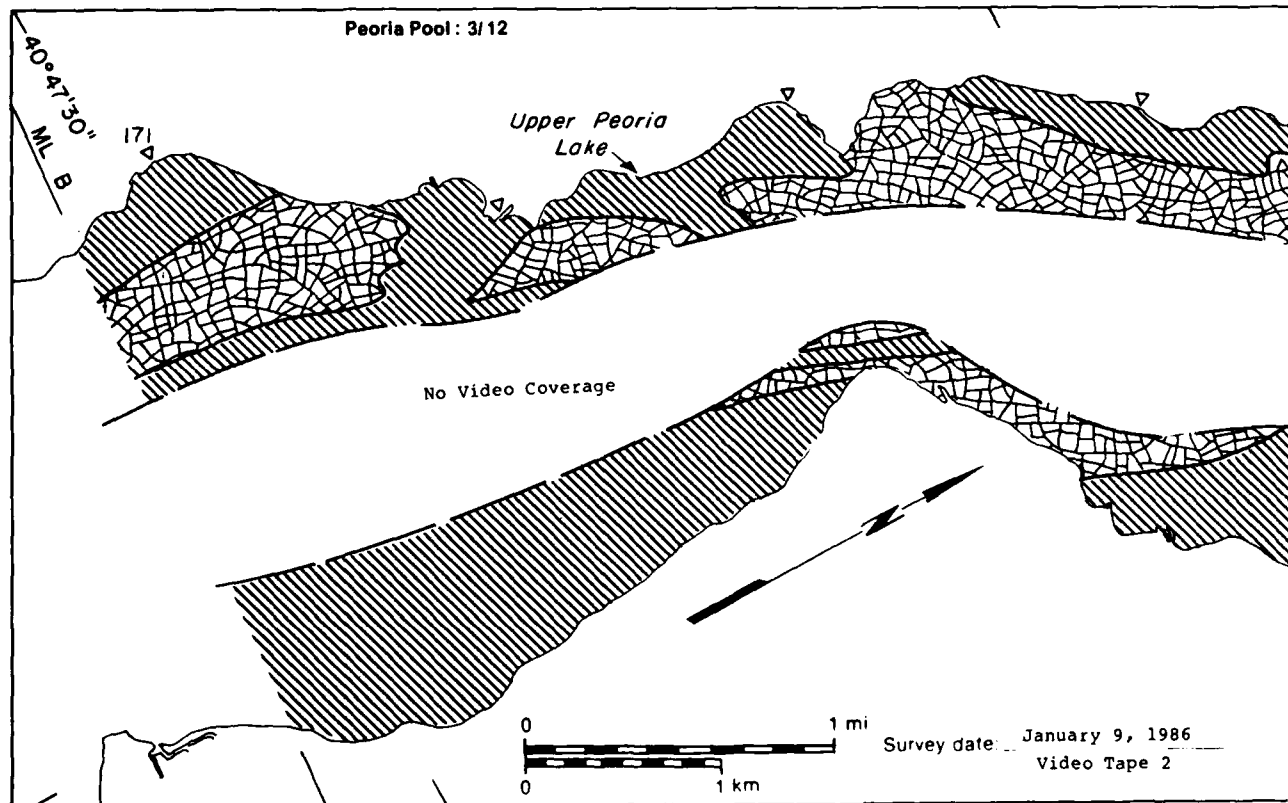
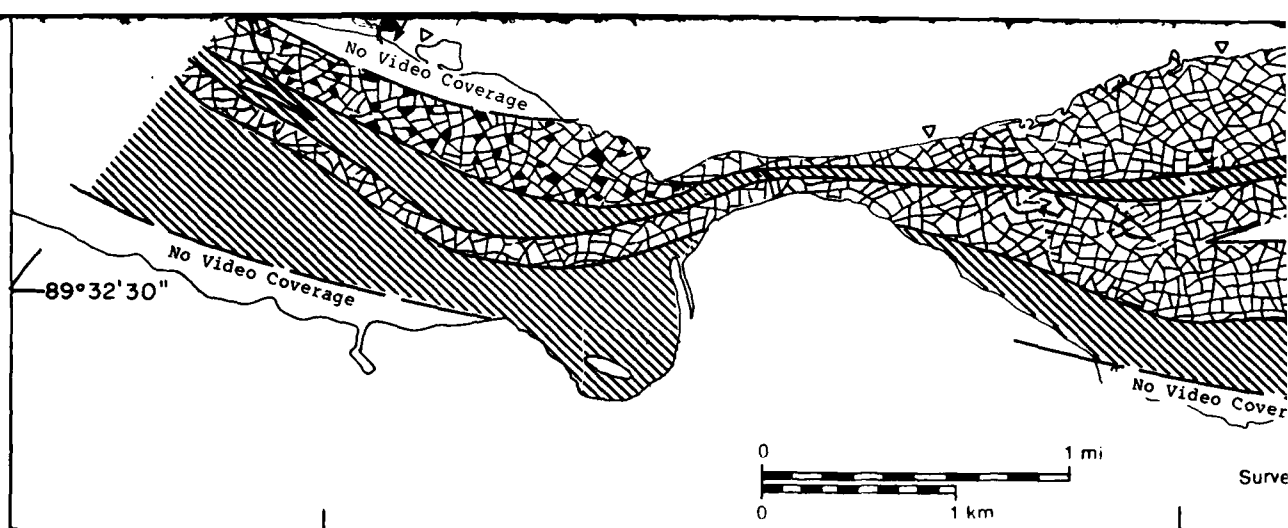
* Includes $1.17 \times 10^6 m^2$
of no video coverage

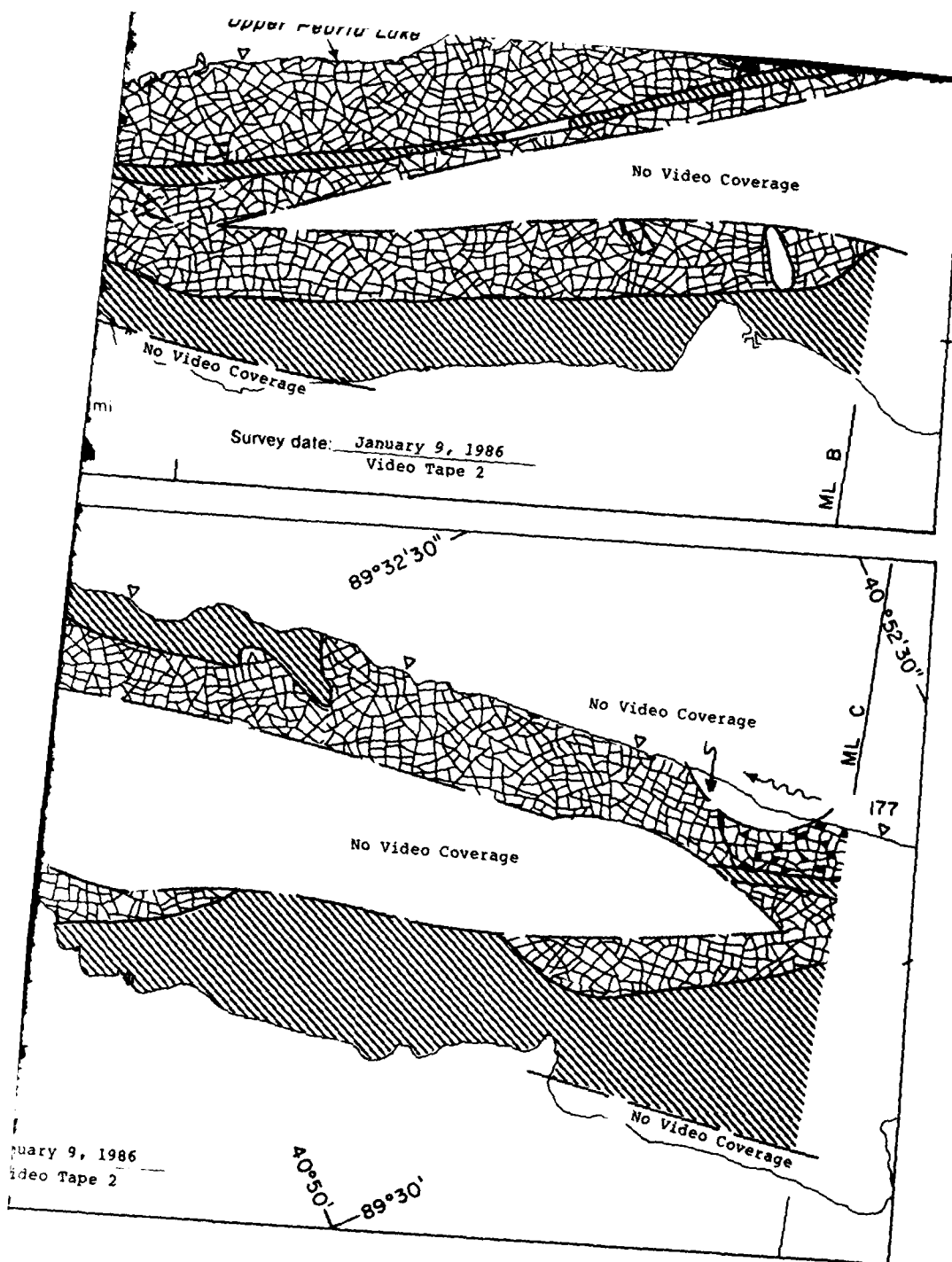
A



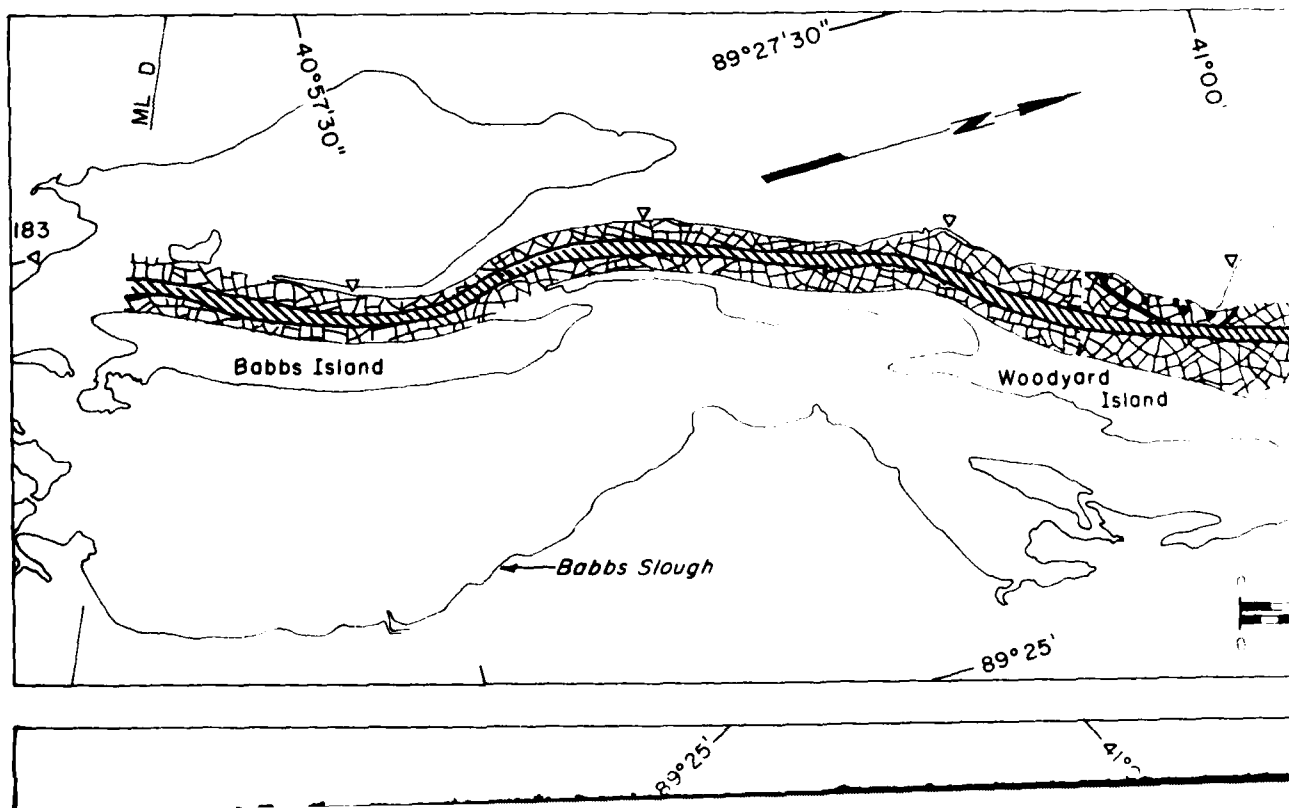
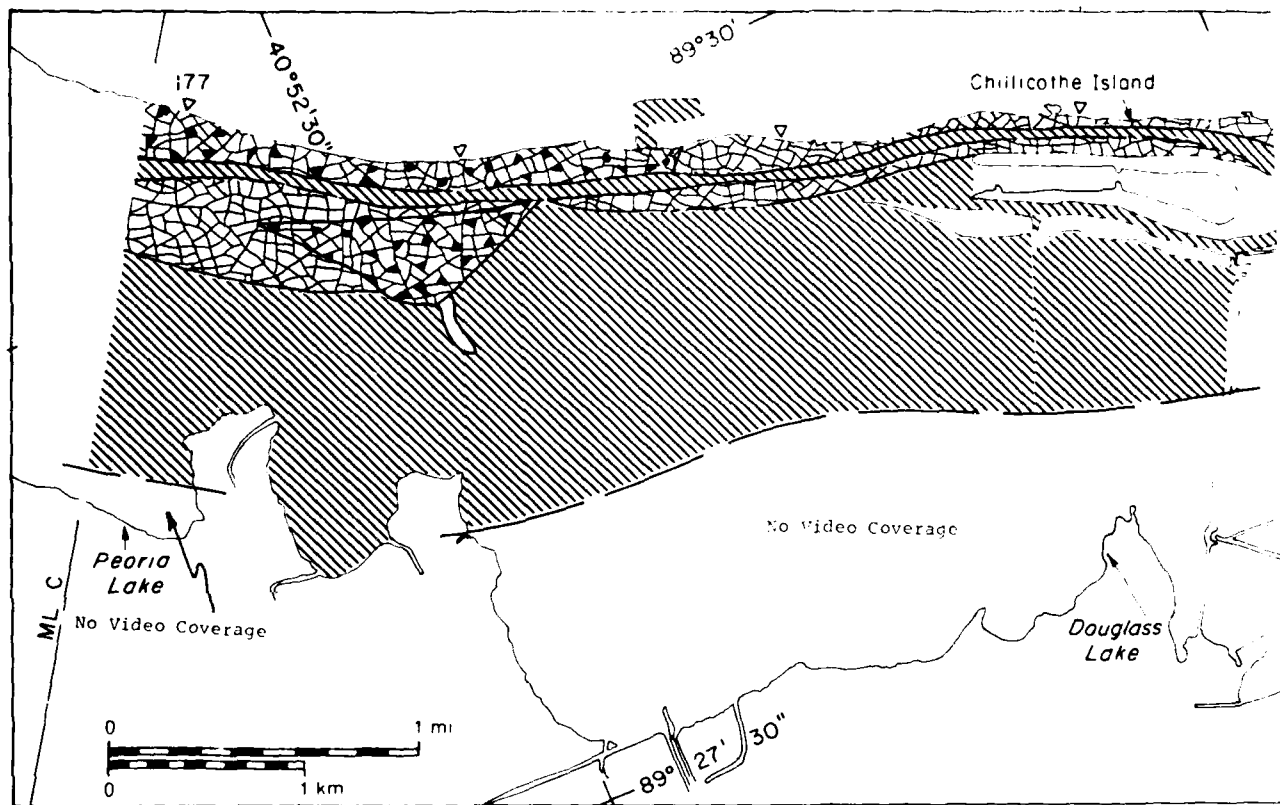
9 January 1986

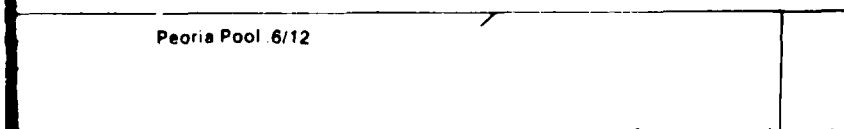
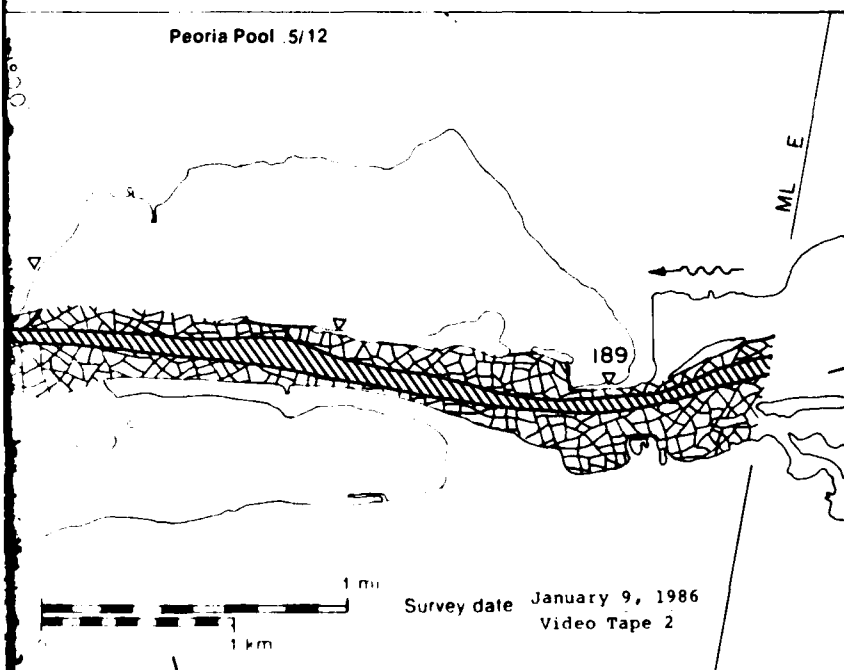
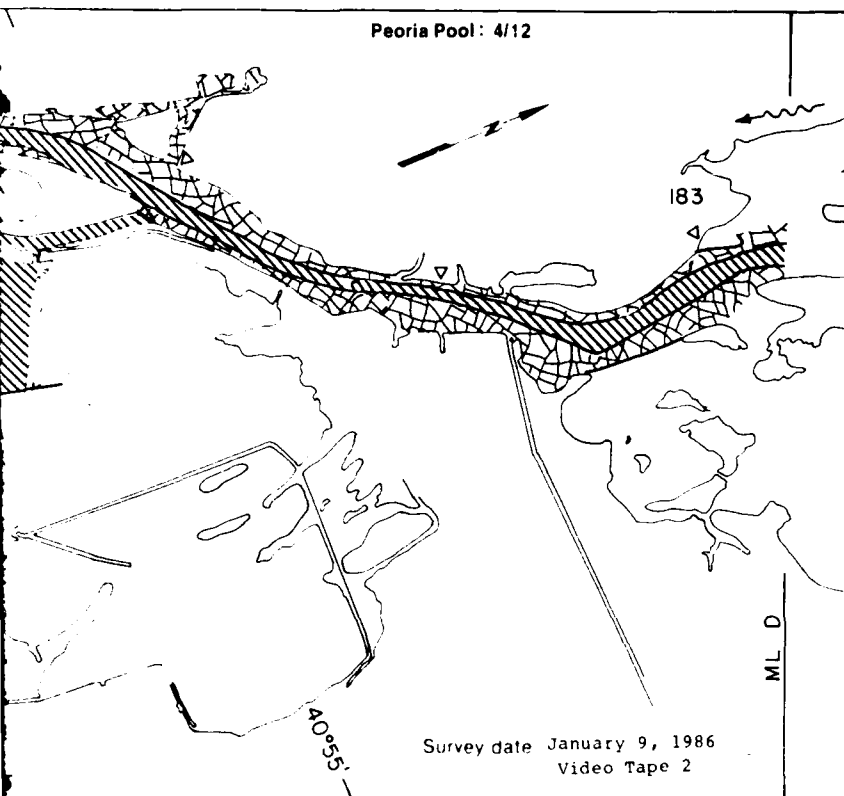


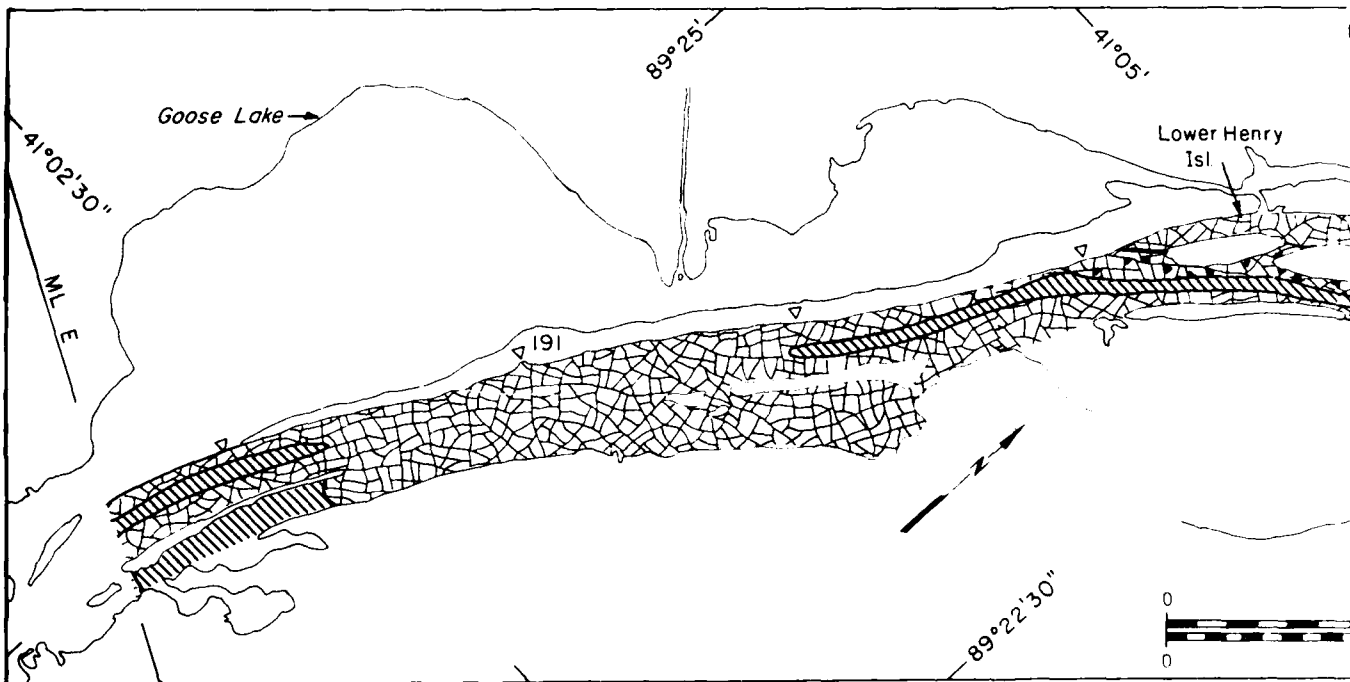
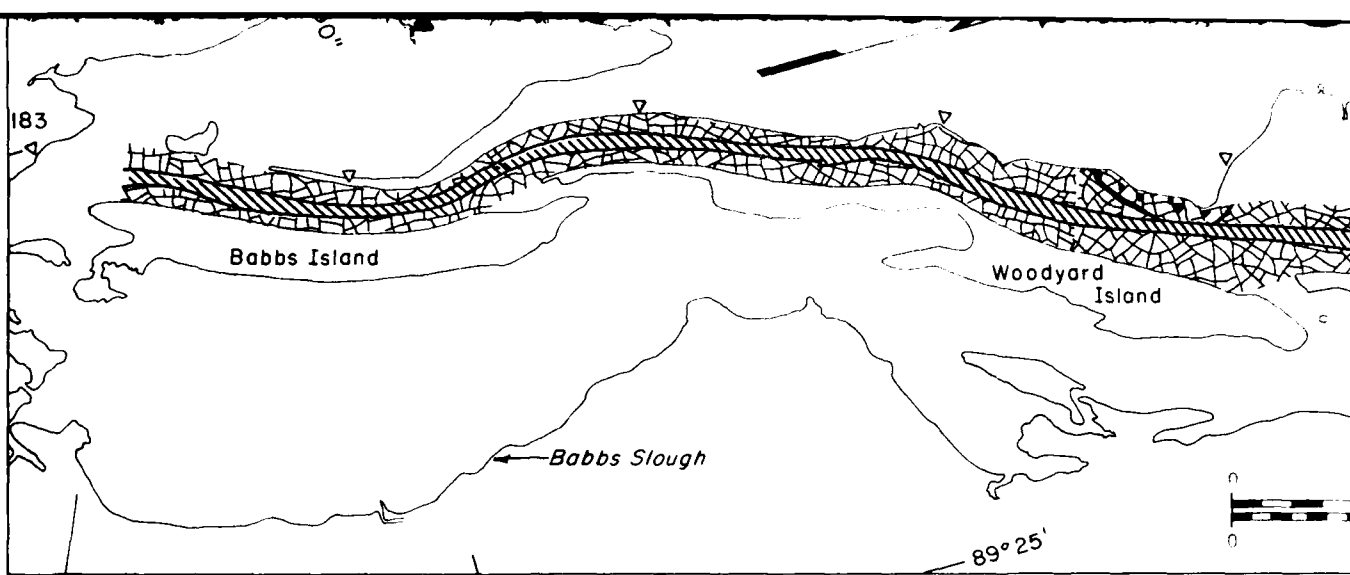


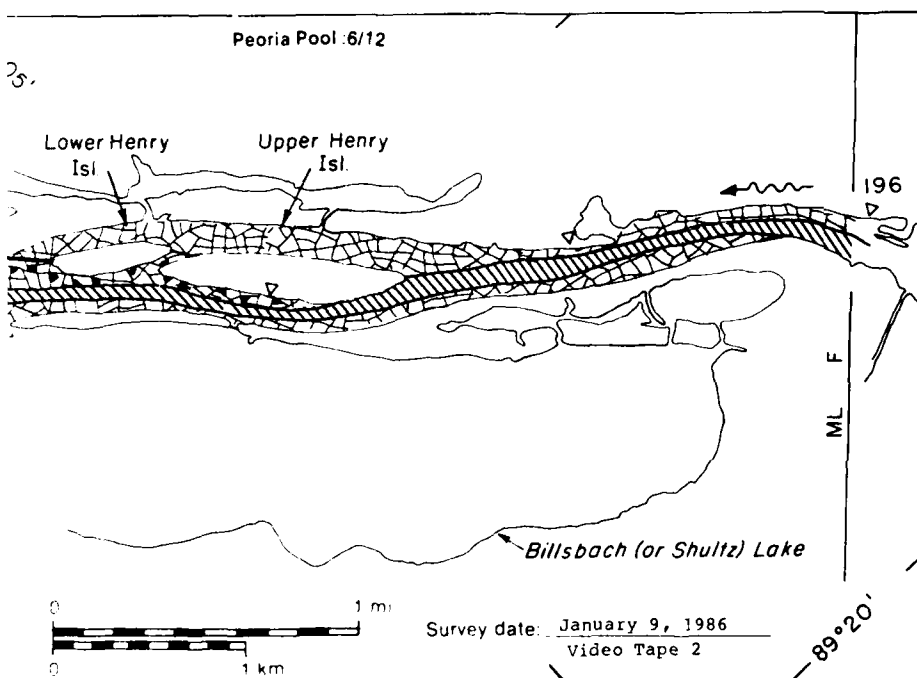
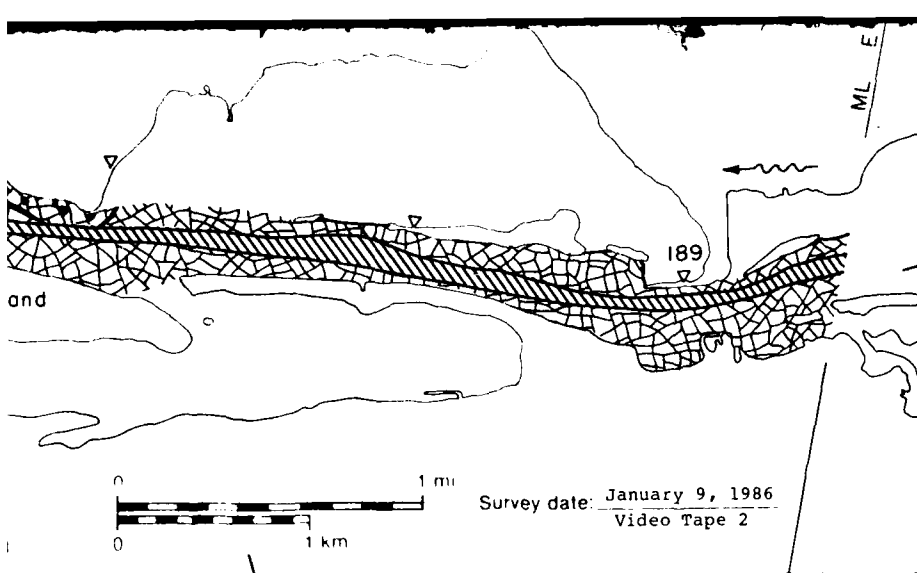


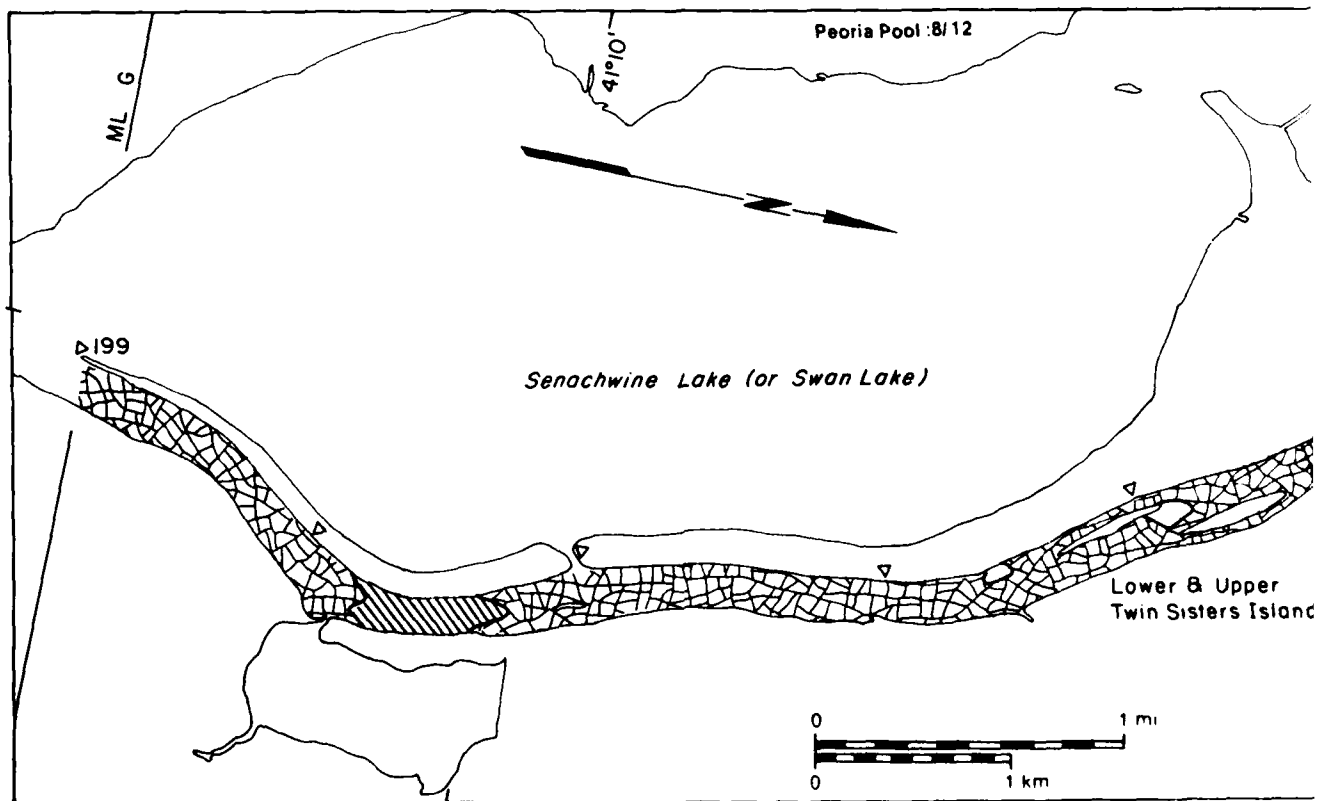
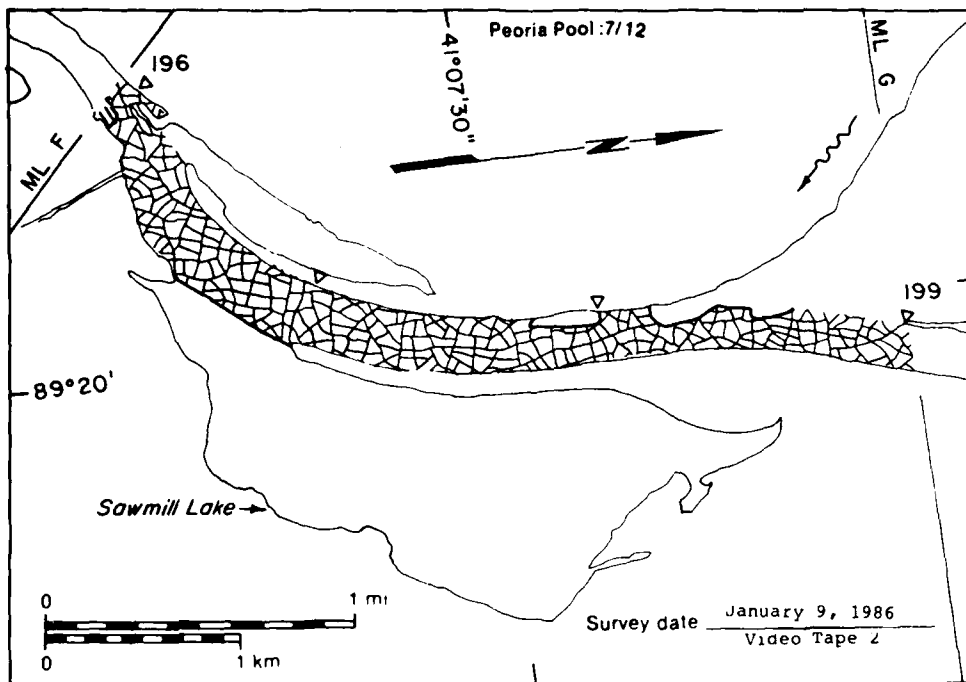
9 January 1986



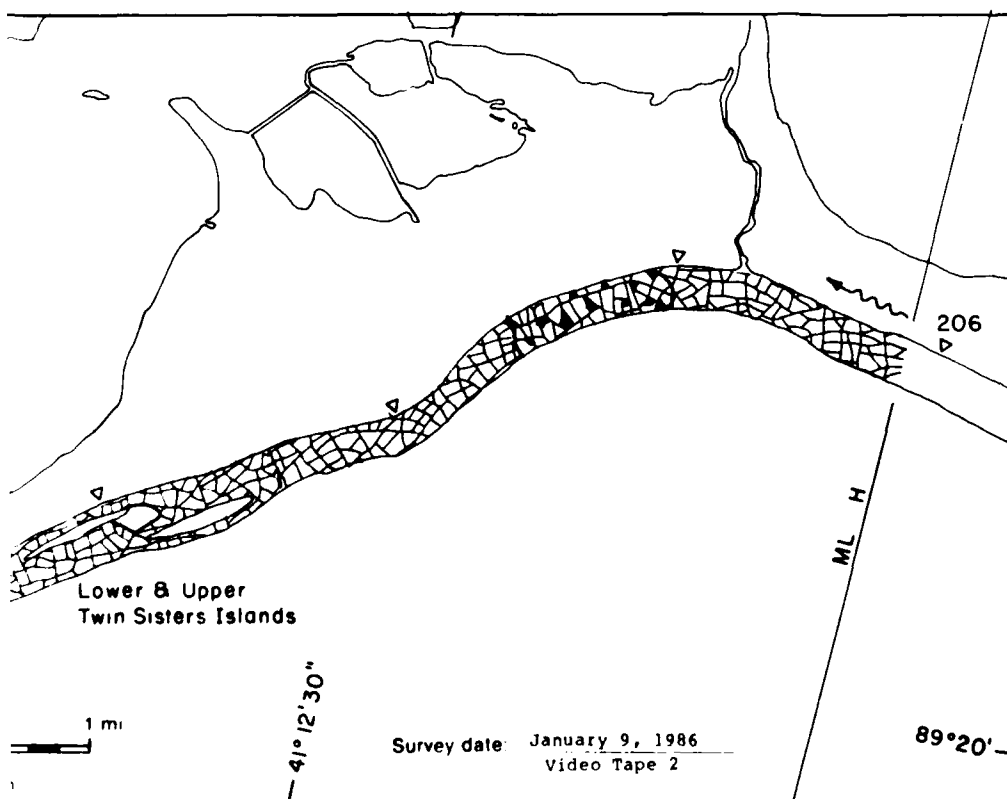


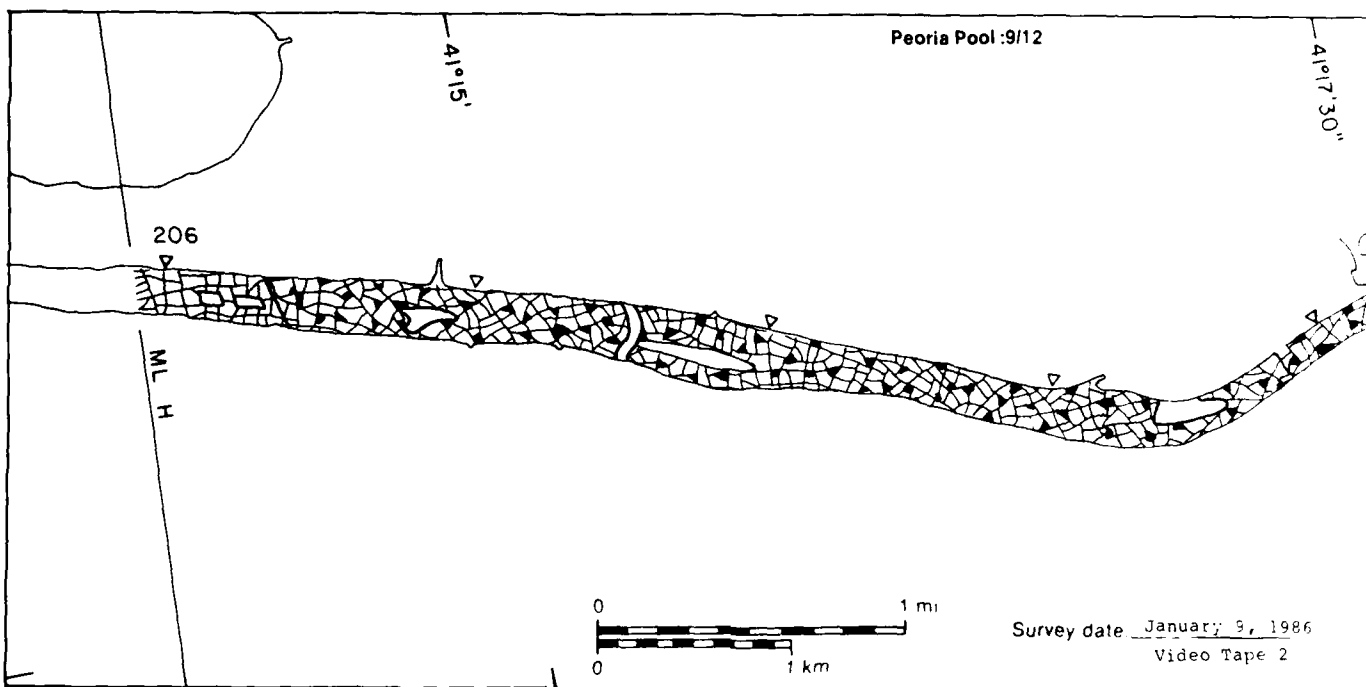
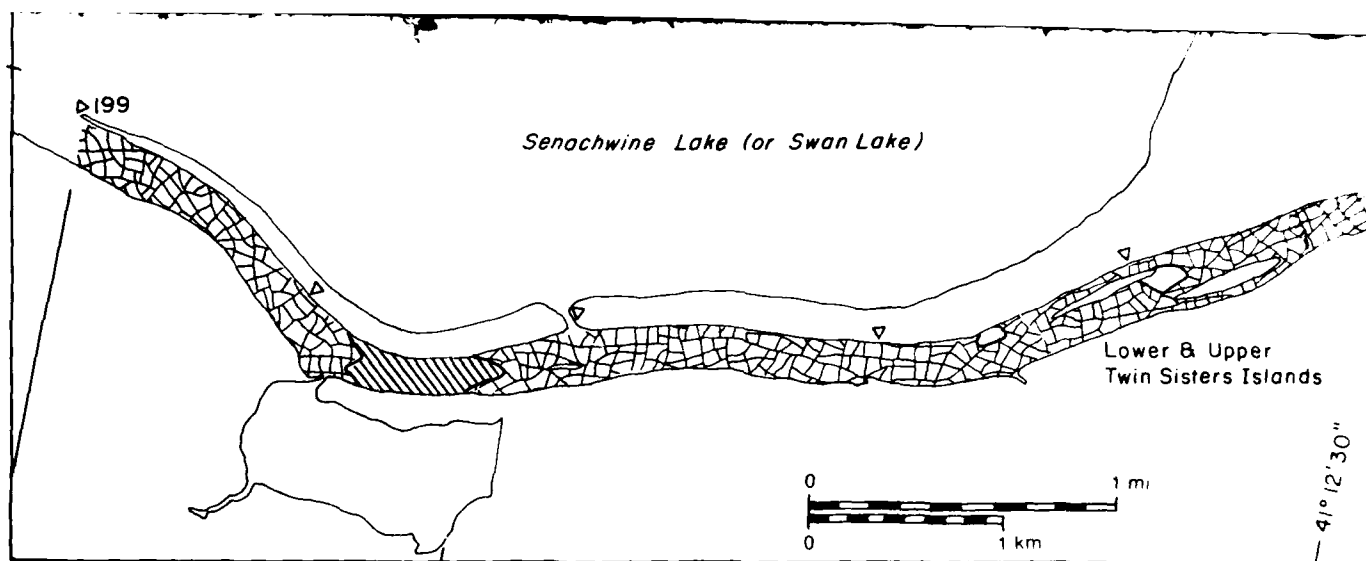


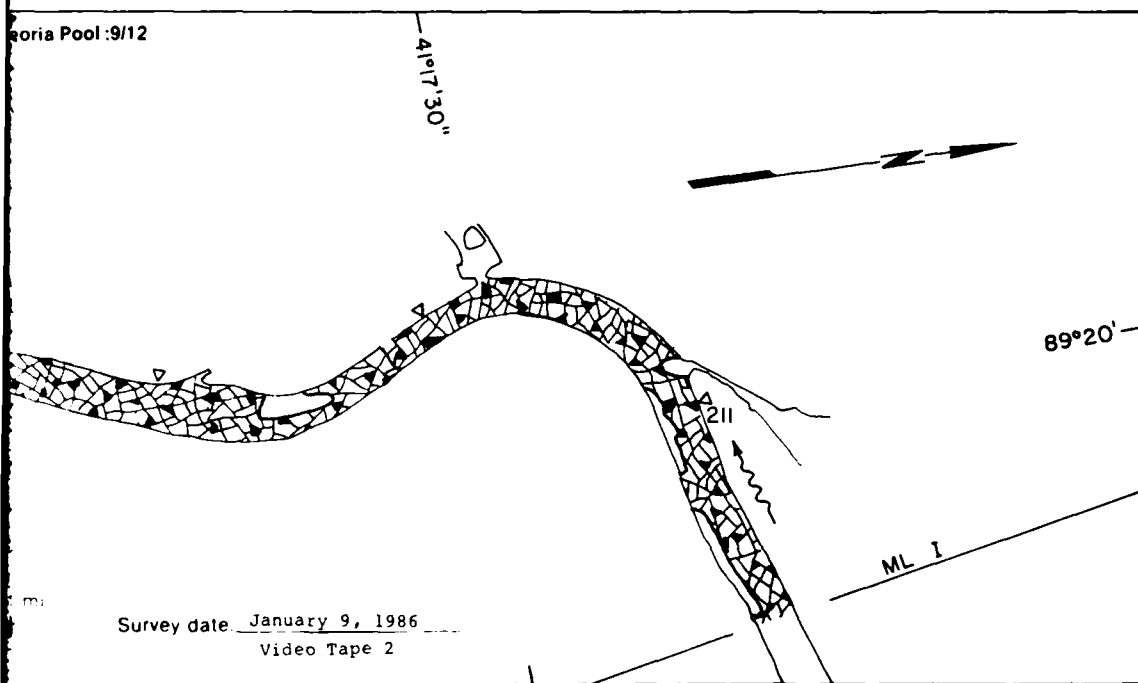
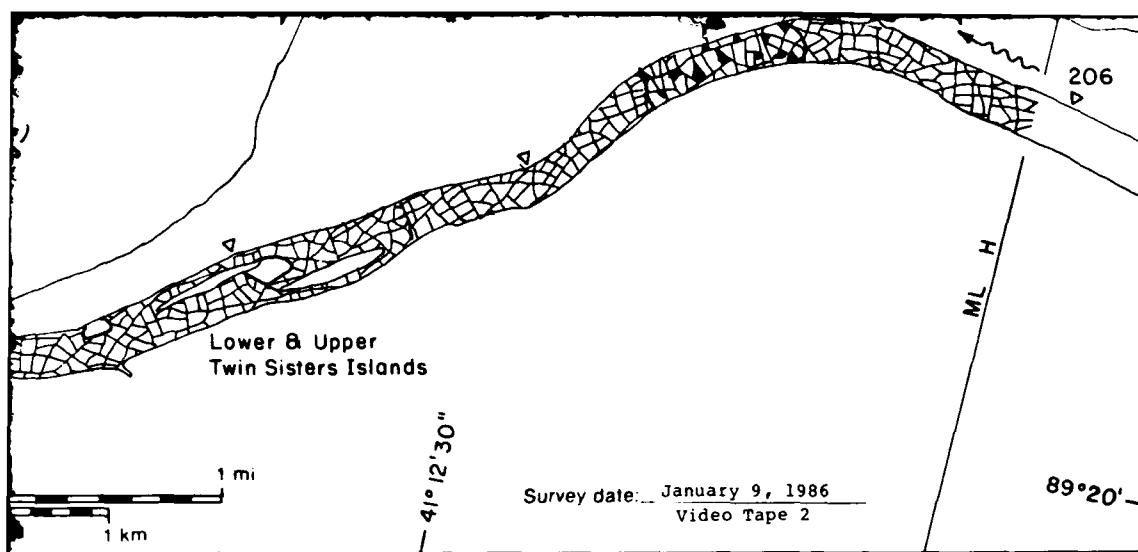




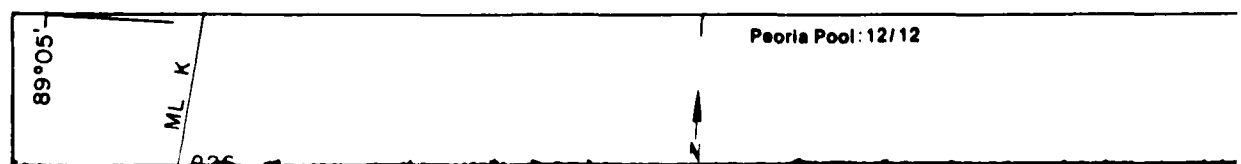
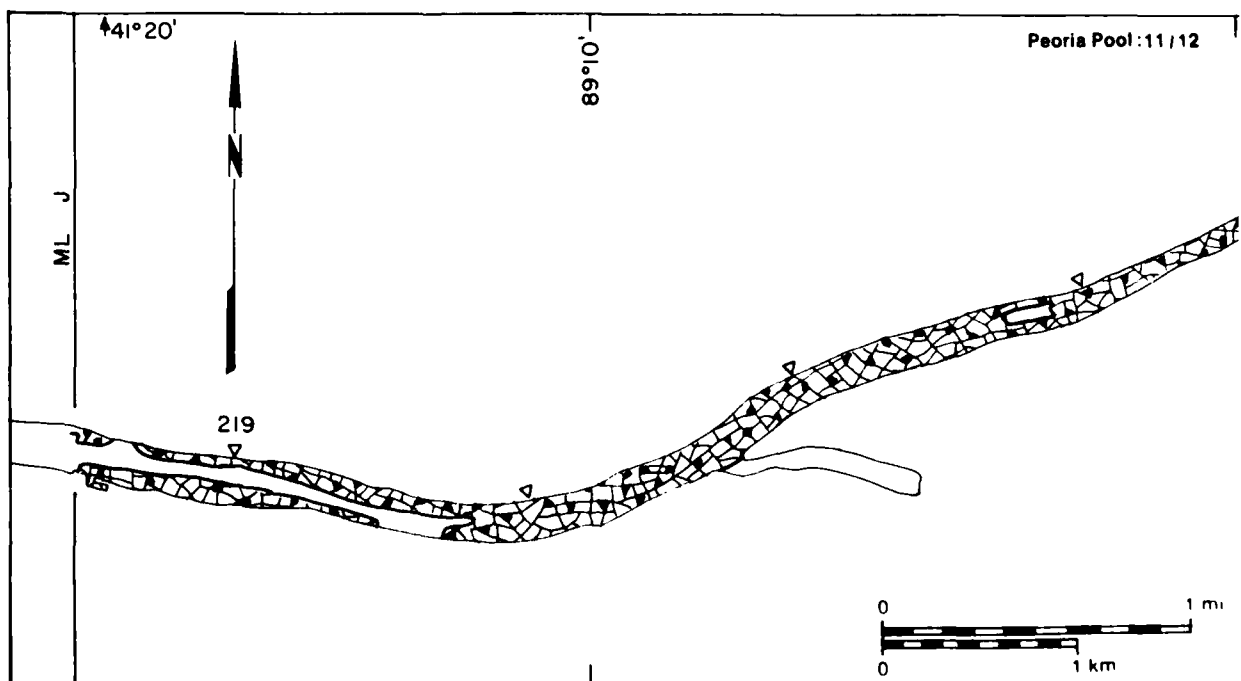
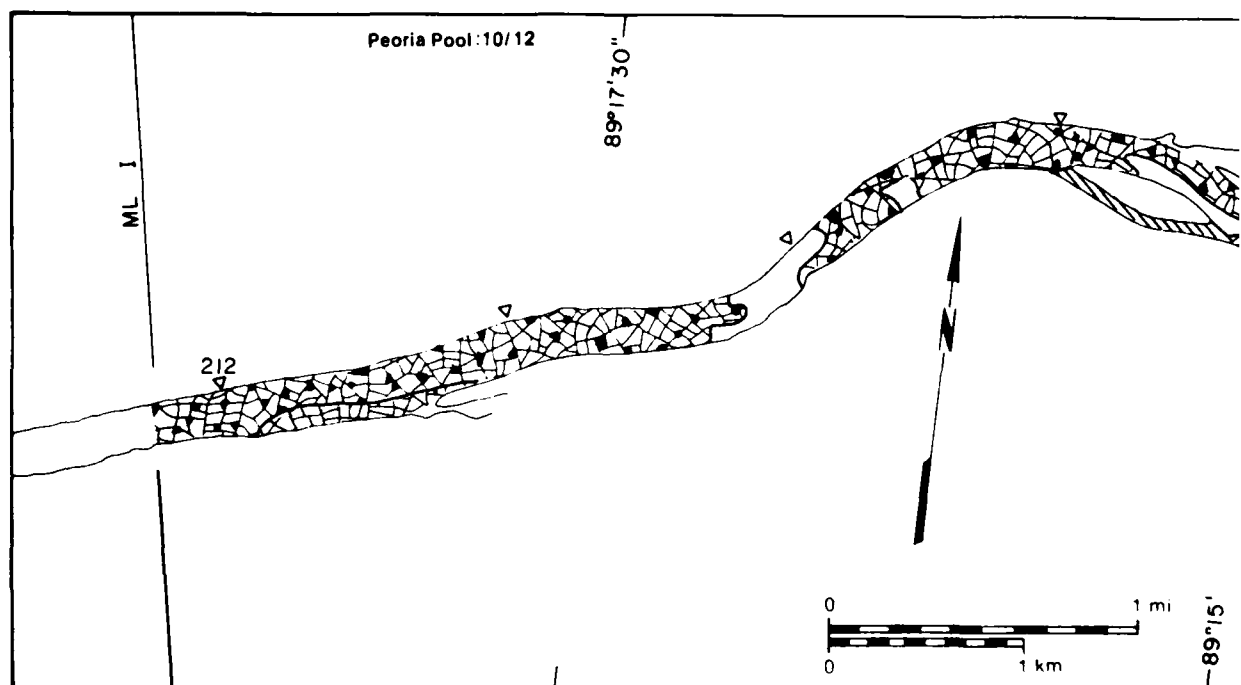
9 January 1986

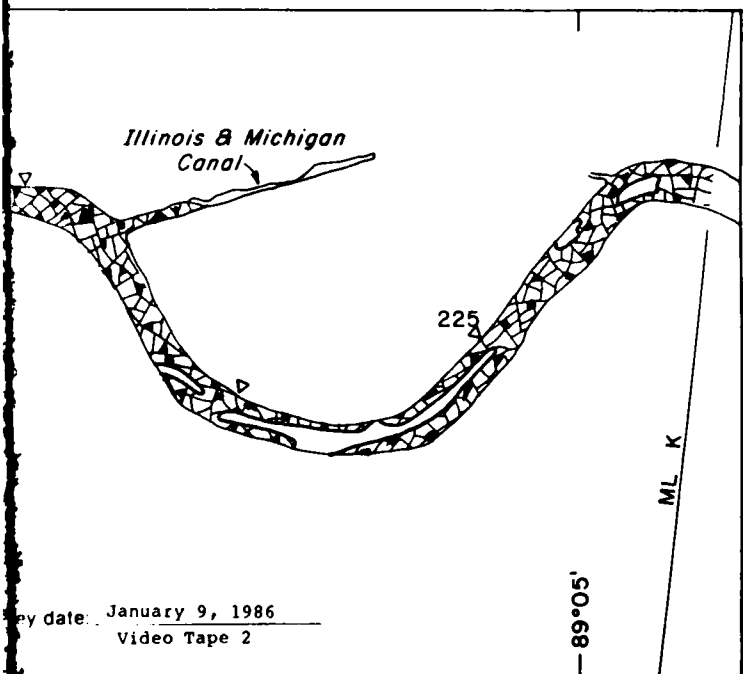
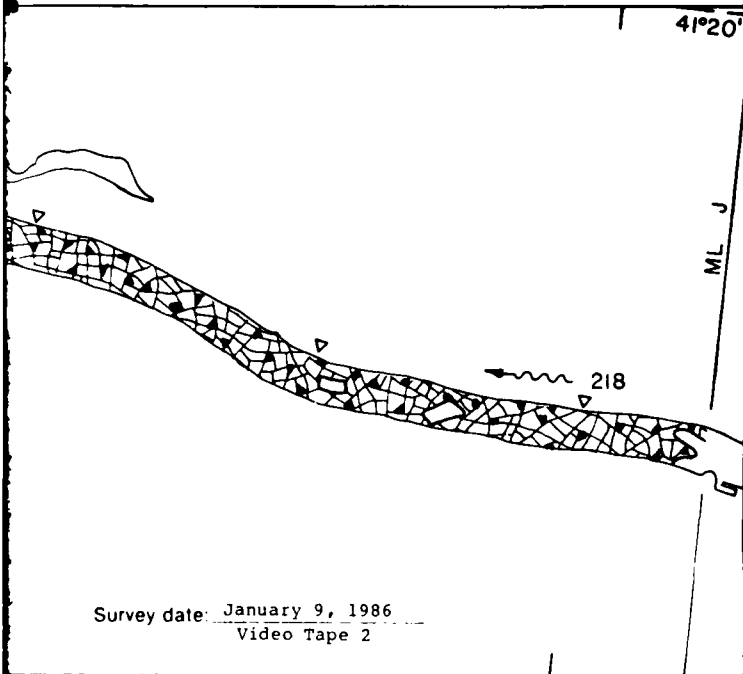




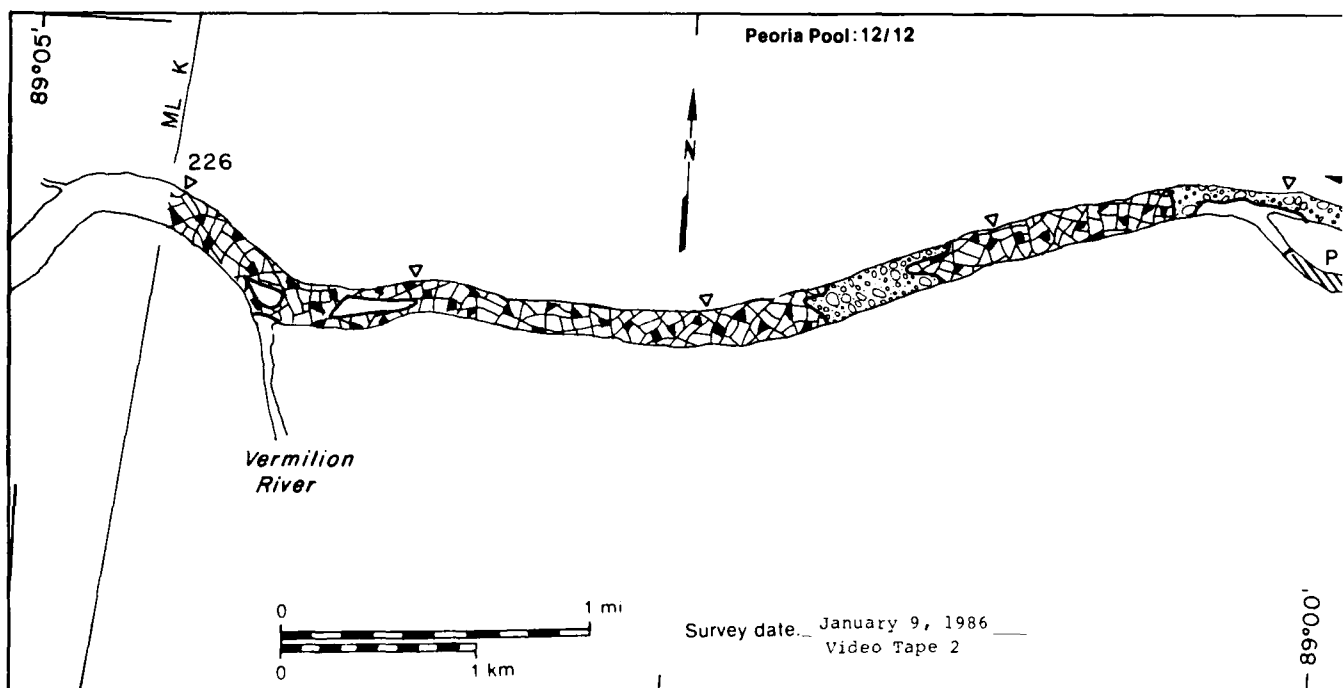
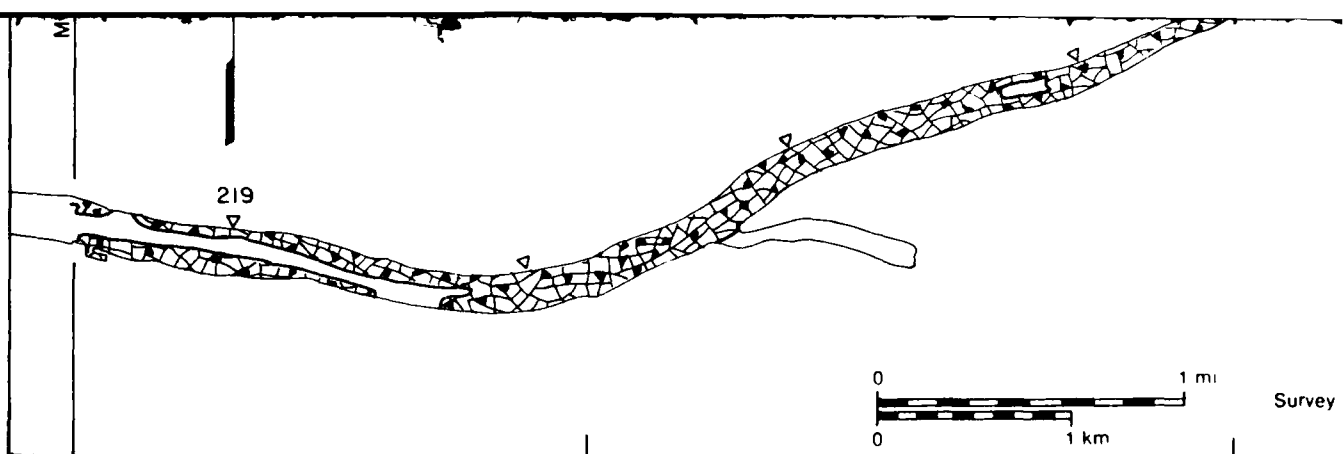


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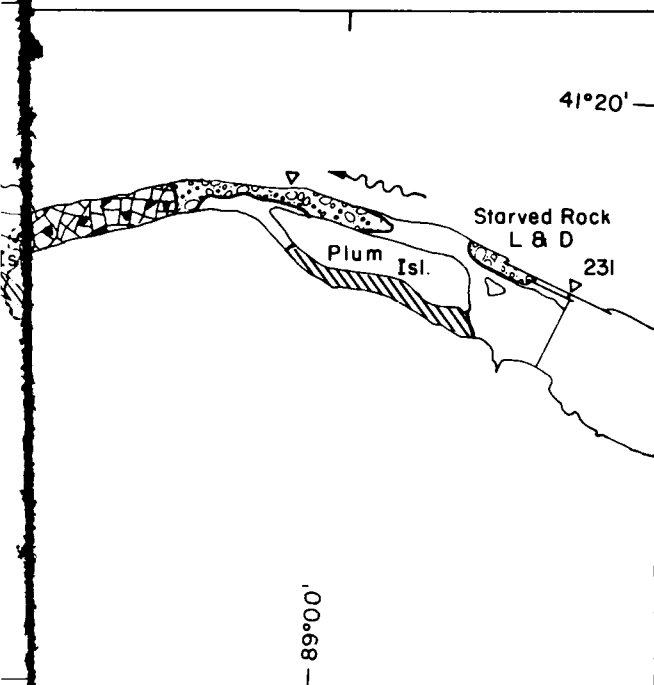
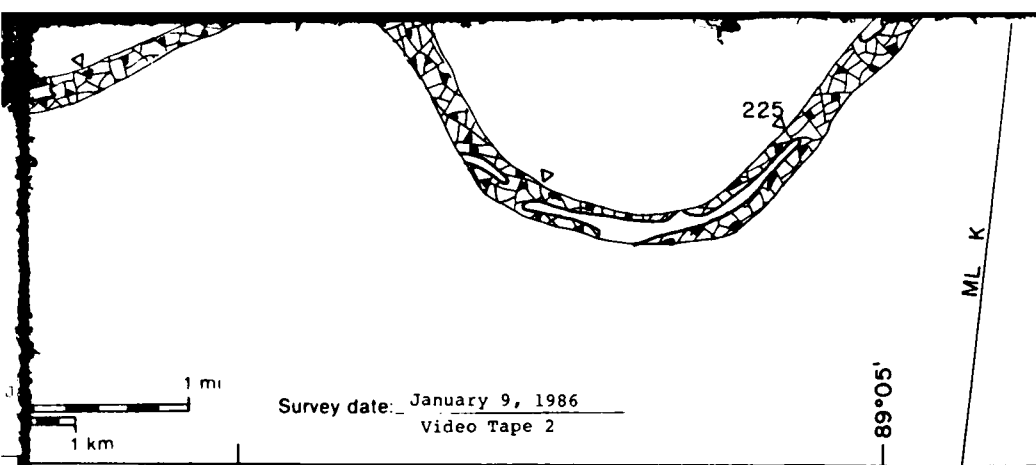
41°20'

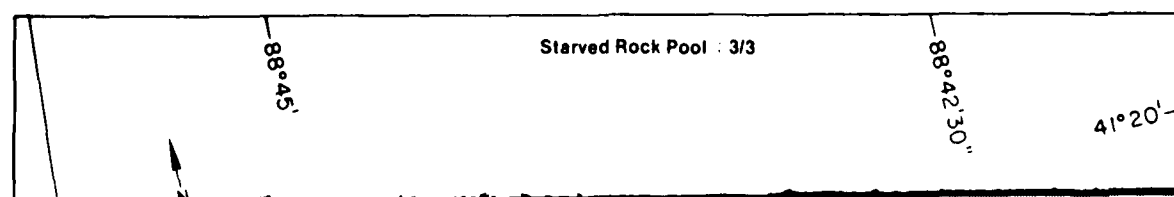
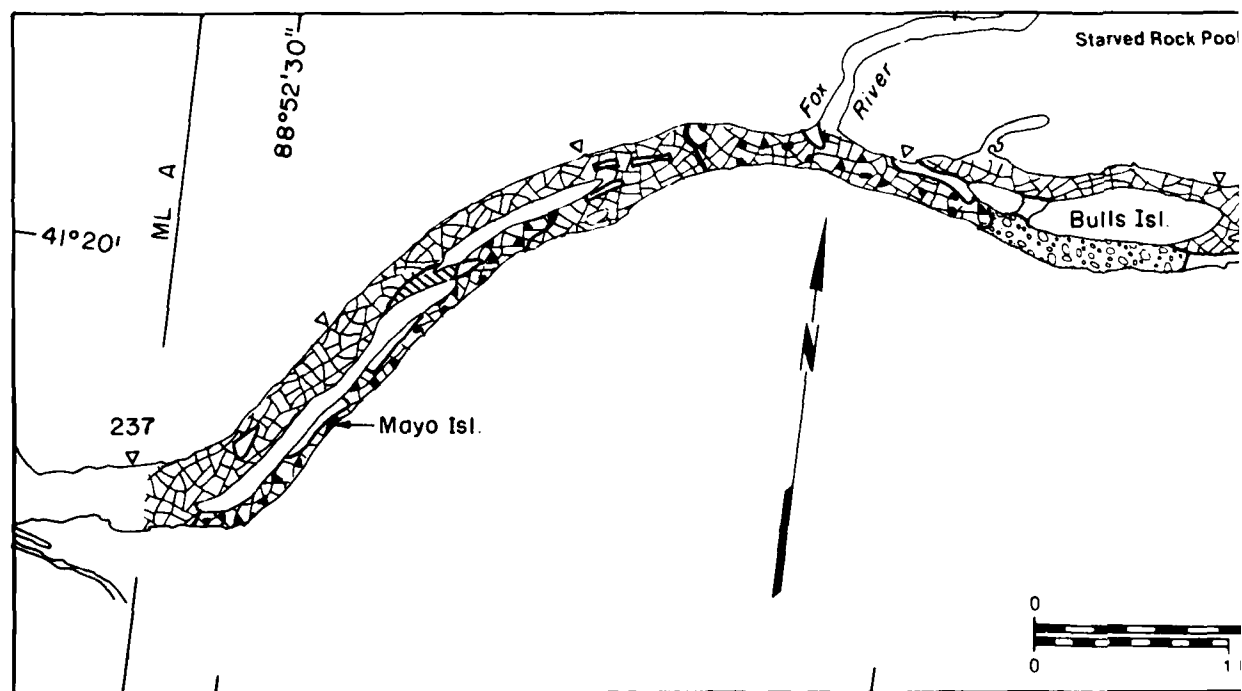
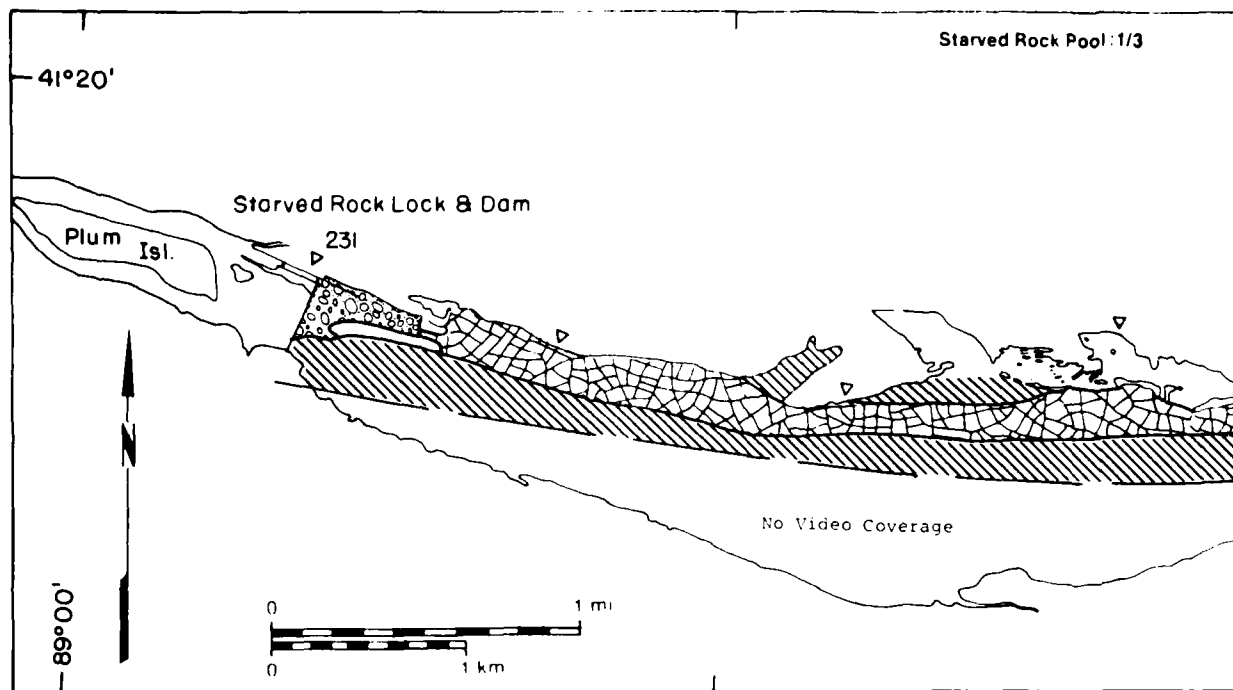


Peoria Pool

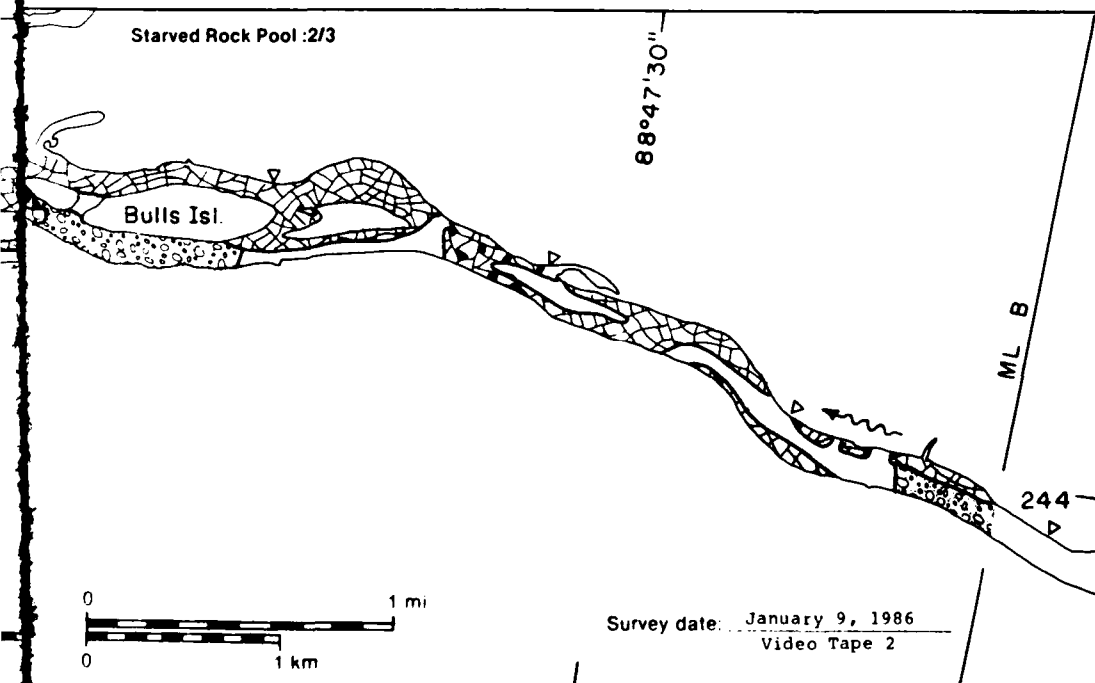
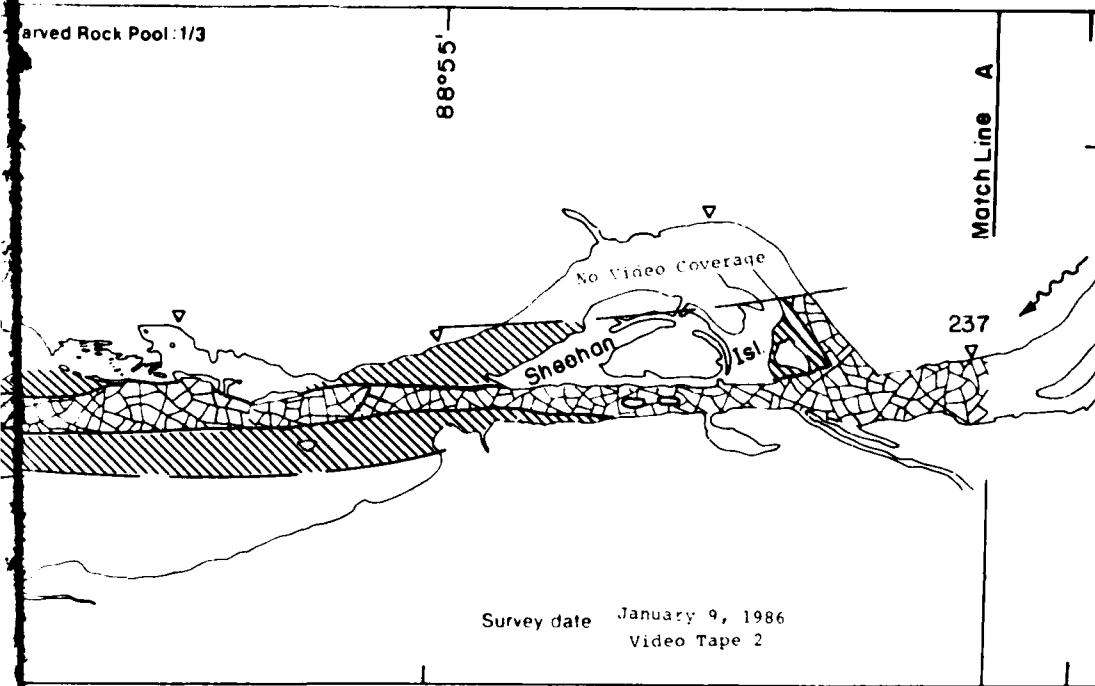
MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	1.34	NA
	Solid ice cover	26.04	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	25.96	NA
	Fragmented ice cover with open-water areas	9.00	90
	Ice floes or frazil slush and pans	0.29	50
Total area ($m^2 \times 10^6$)		81.33*	

* Includes $18.70 \times 10^6 m^2$ of no video coverage





9 January 1986



41°20'

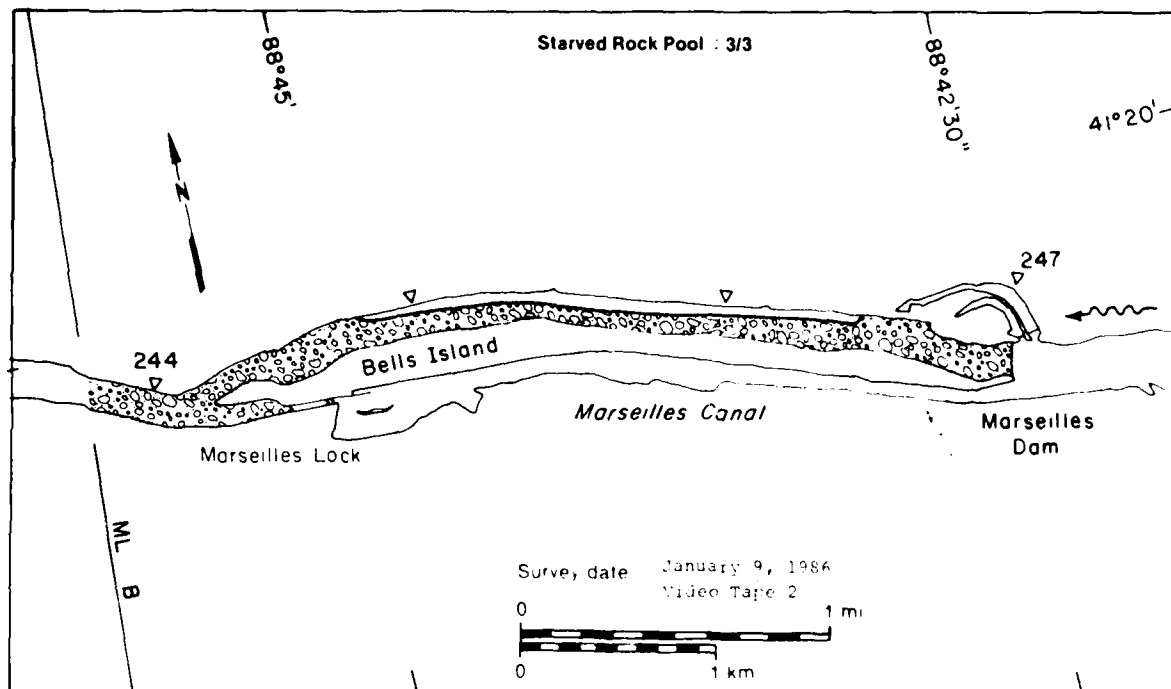
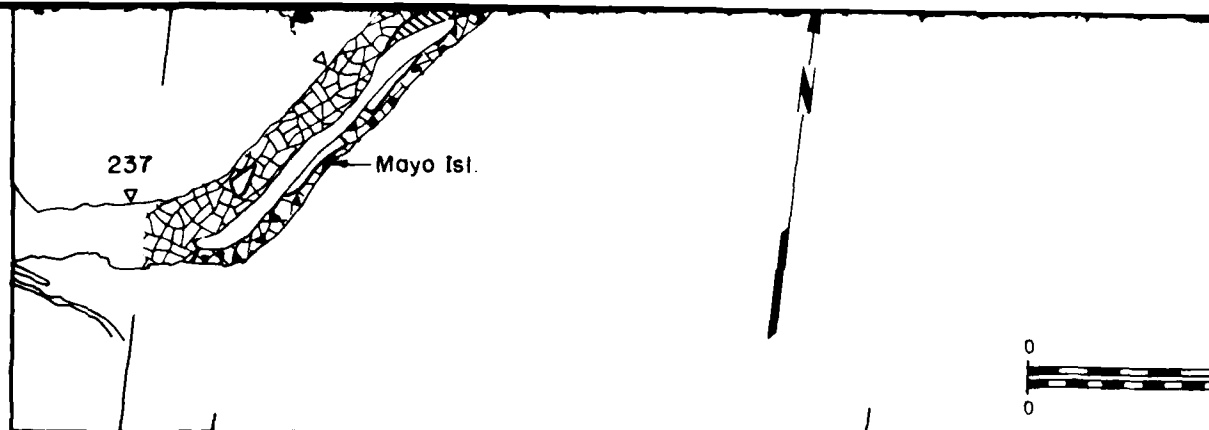
Starved Rock Pool

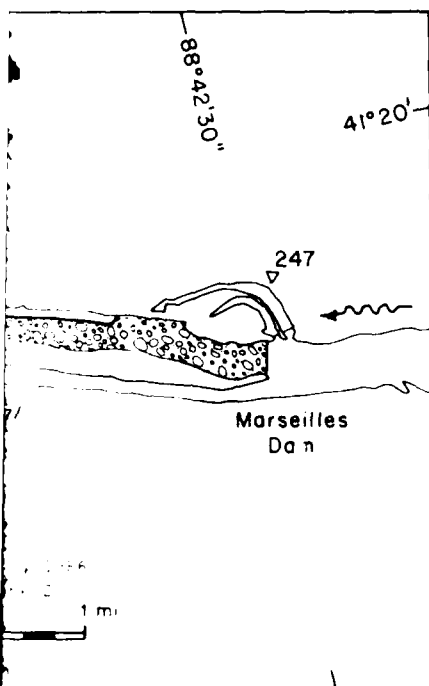
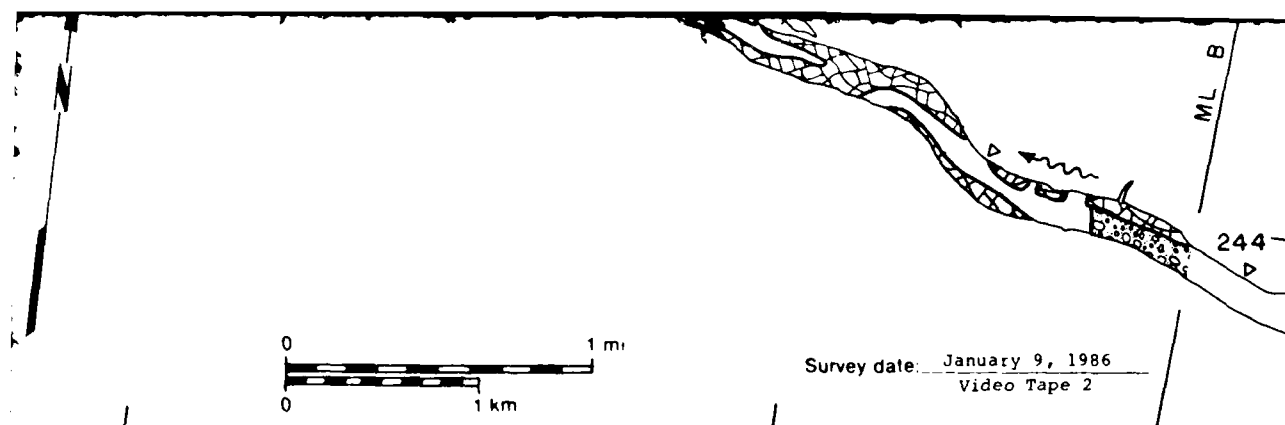
MAP UNITS

Area
(m² x 10⁶)

Surface
concentration
(‰)

--	--





Starved Rock Pool

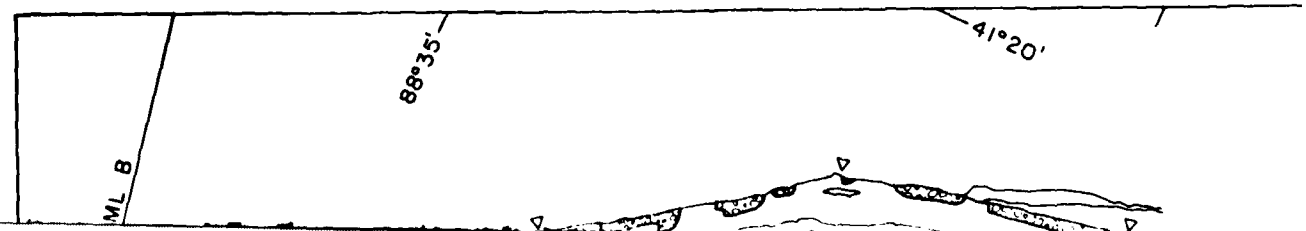
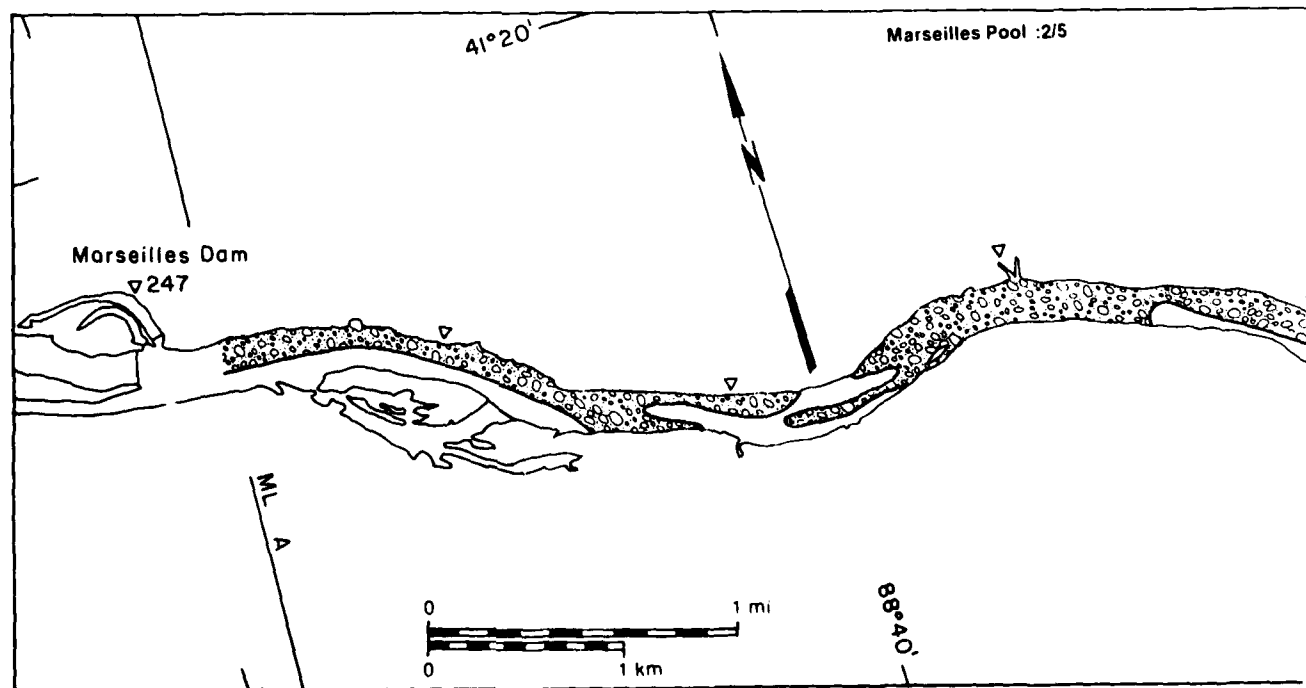
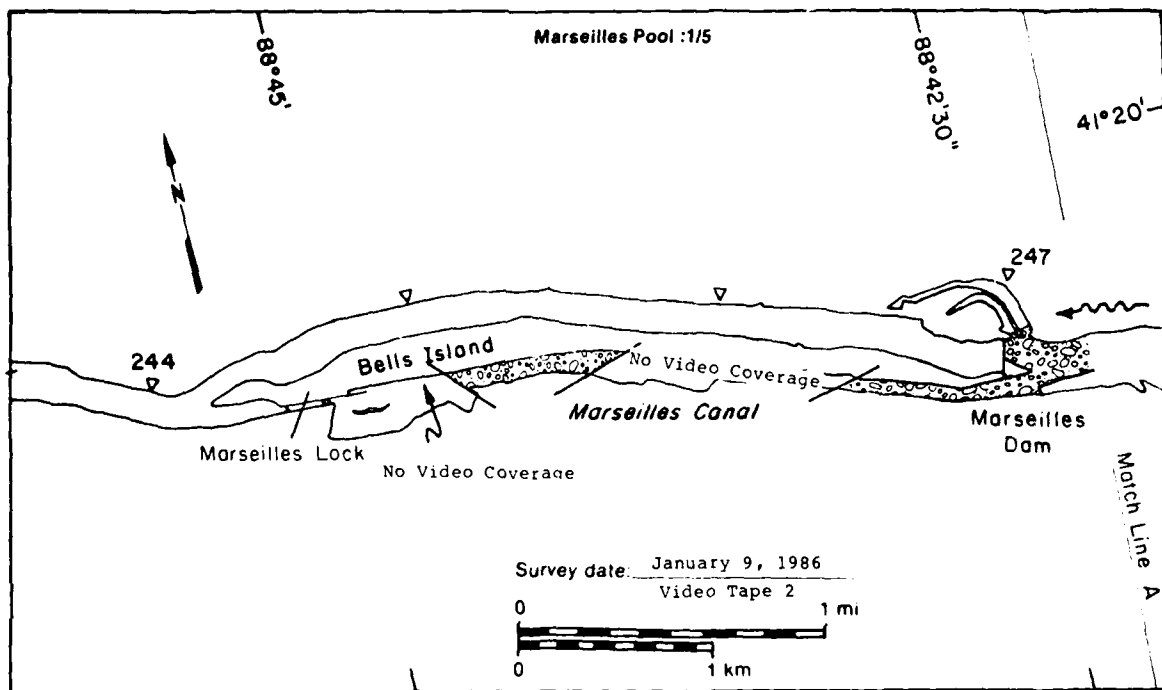
MAP UNITS

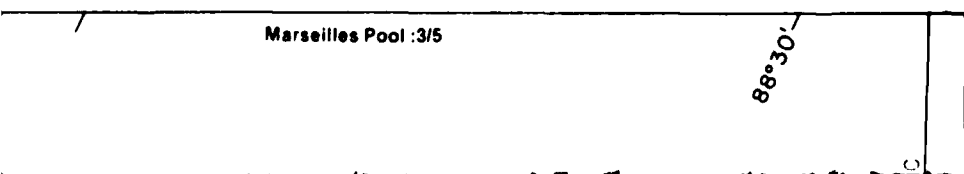
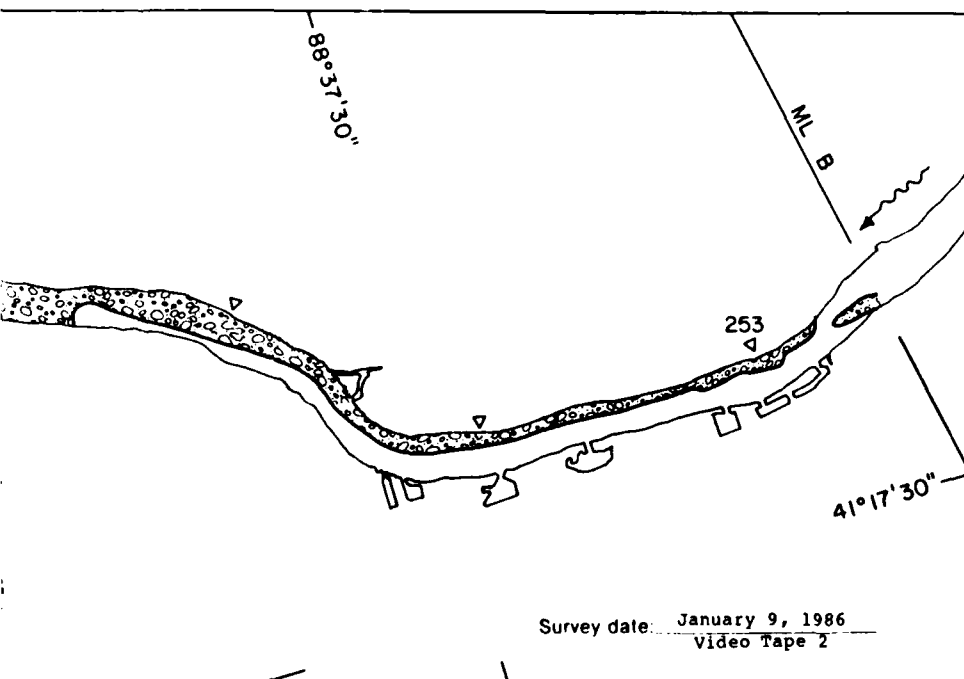
	Open water
	Solid ice cover
	Solid ice cover with open water areas
	Fragmented ice cover
	Fragmented ice cover with open water areas
	Ice floes or frazil slush and pans

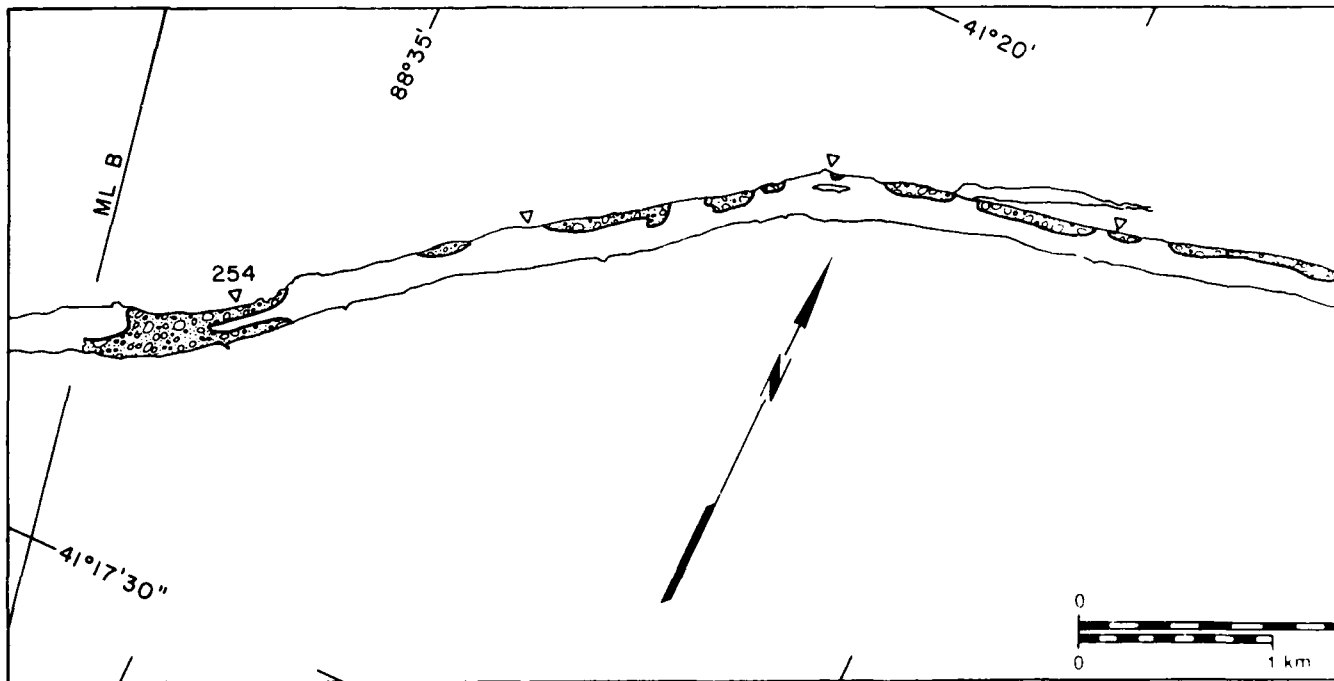
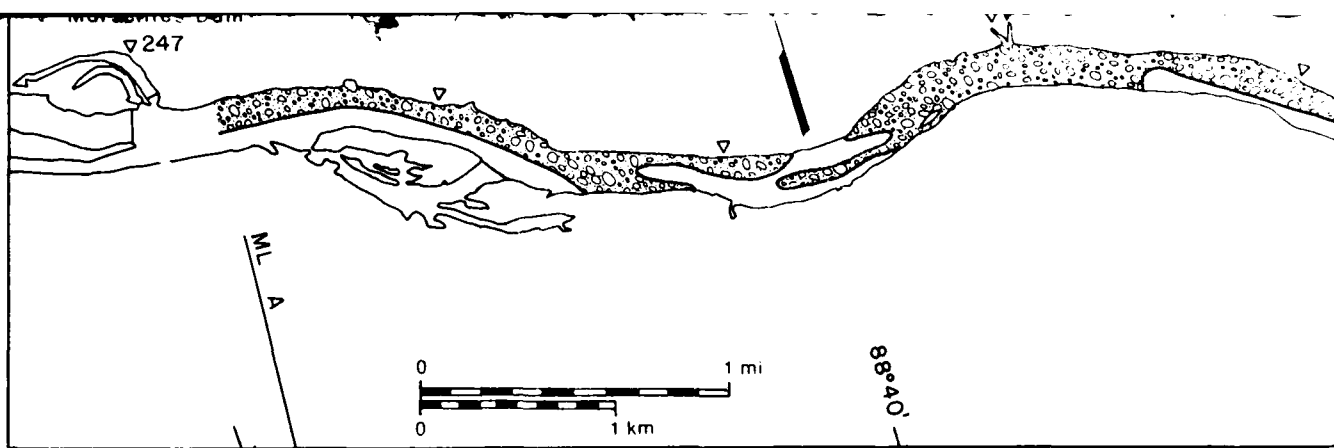
Area (m ² x 10 ⁶)	Surface concentration (%)
0.63	NA
2.01	NA
0.00	—
3.25	NA
0.61	80
1.10	60
Total area (m ² x 10 ⁶)	10.19*

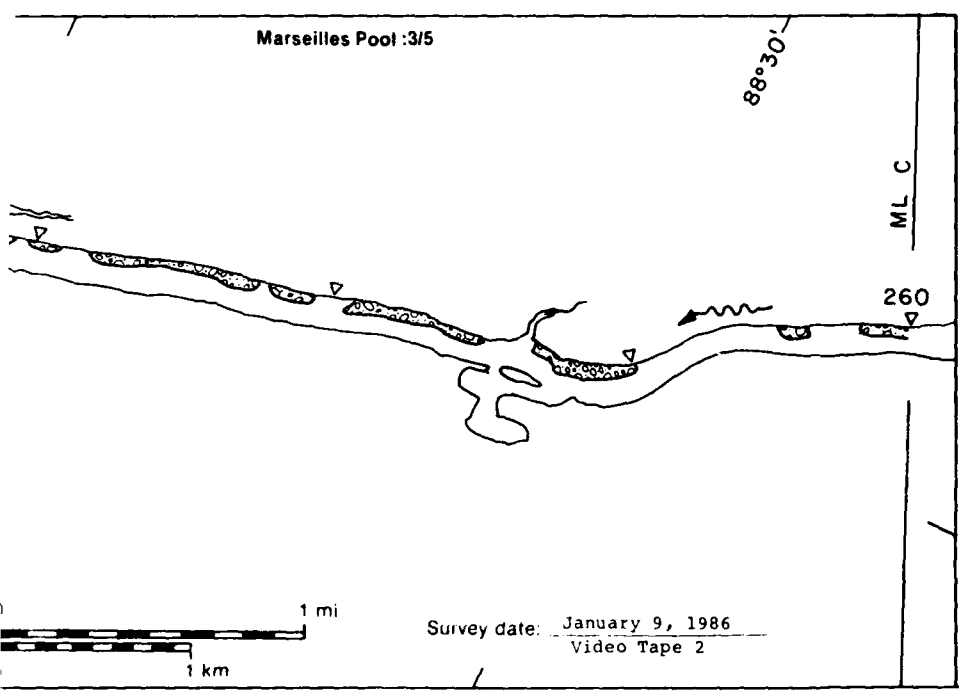
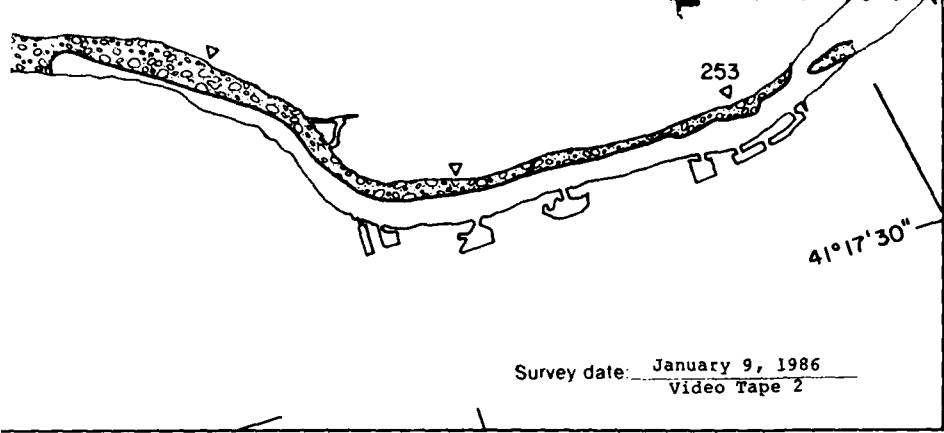
* Includes 2.59 x 10⁶ m²
of no video coverage

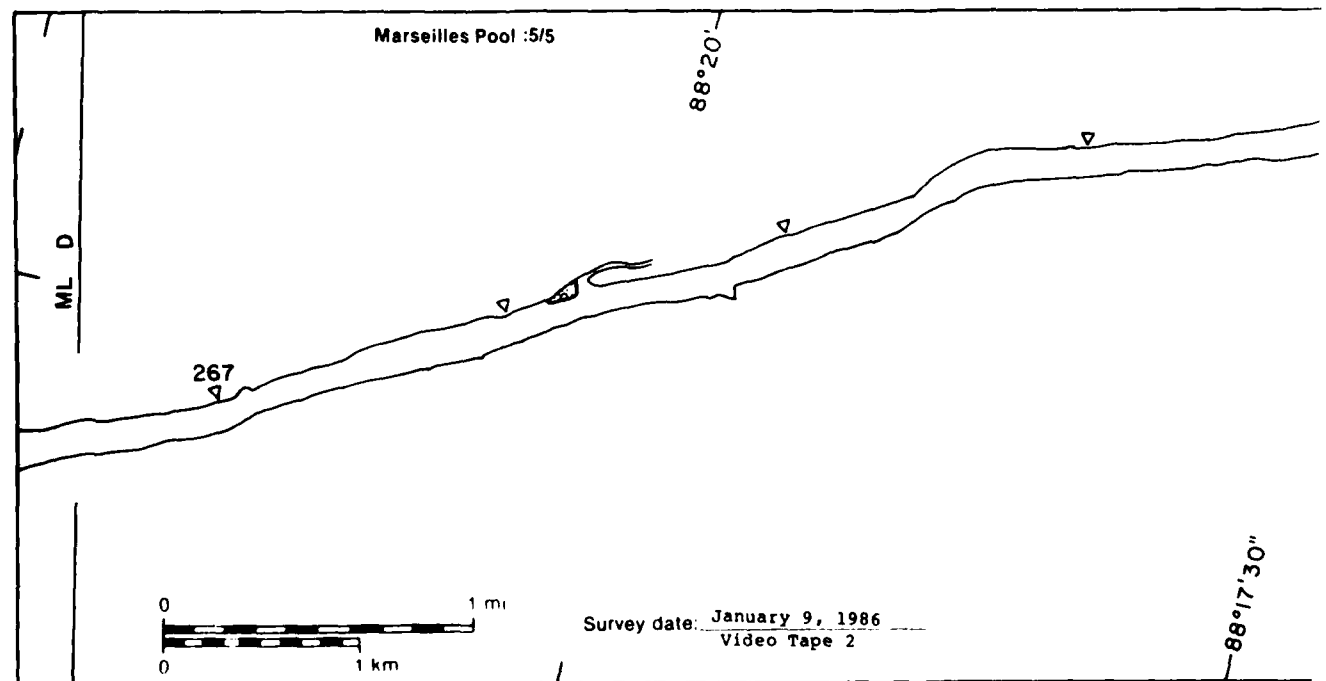
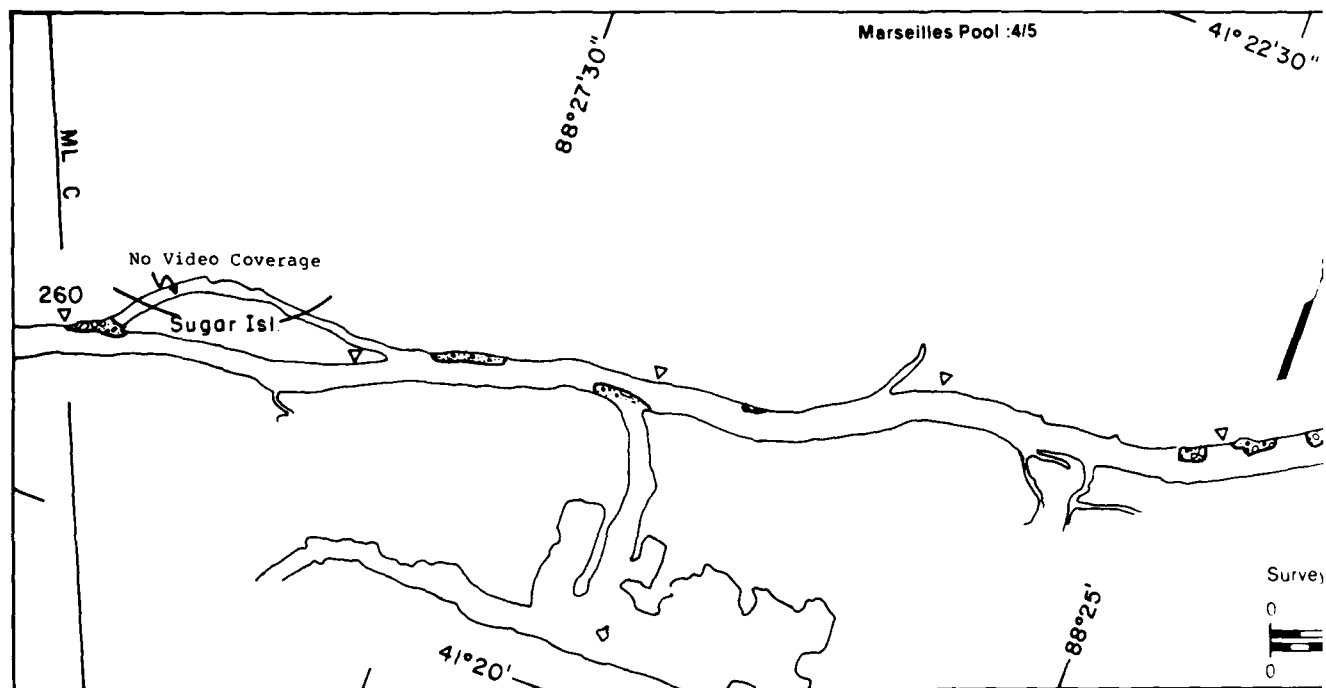
9 January 1986











Marseilles Pool

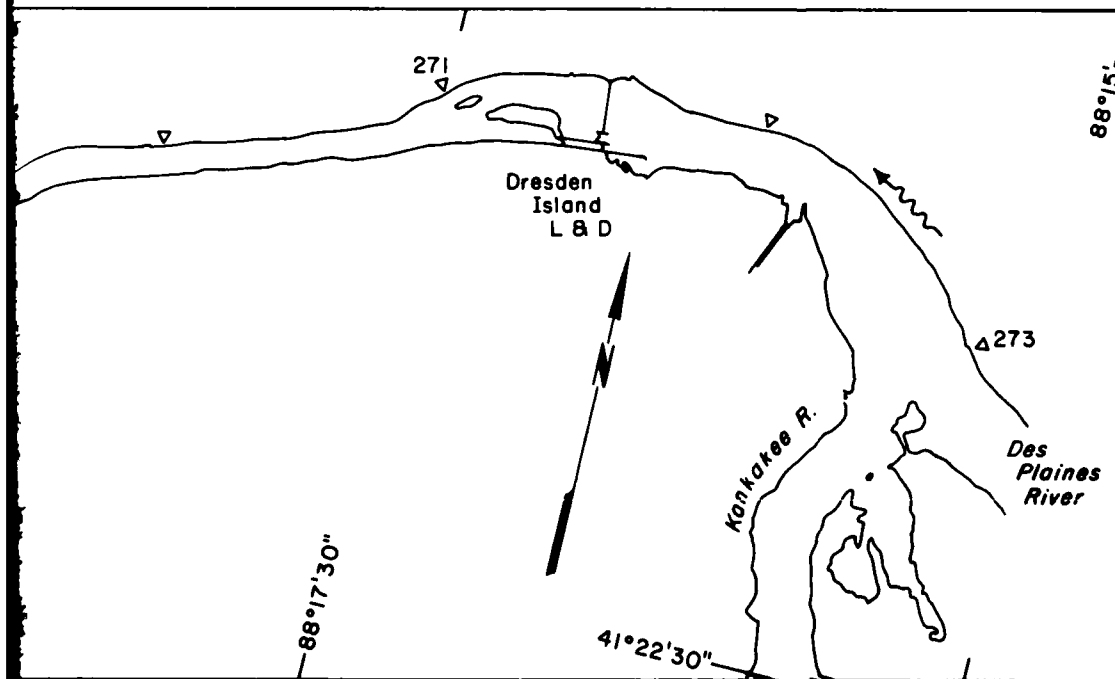
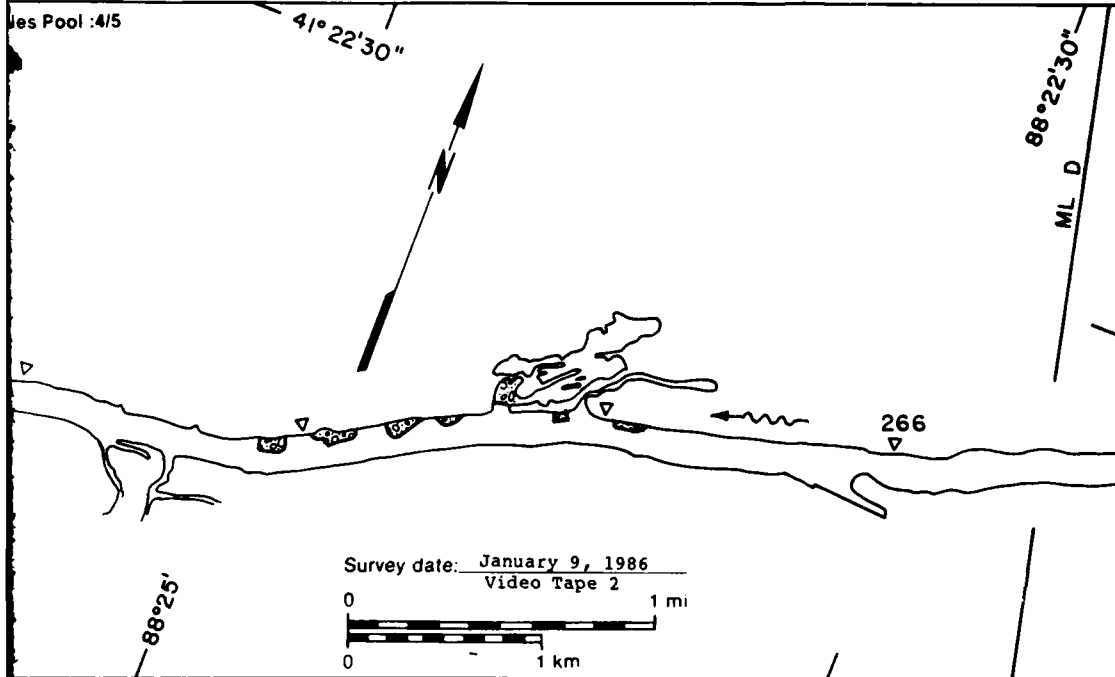
MAP UNITS

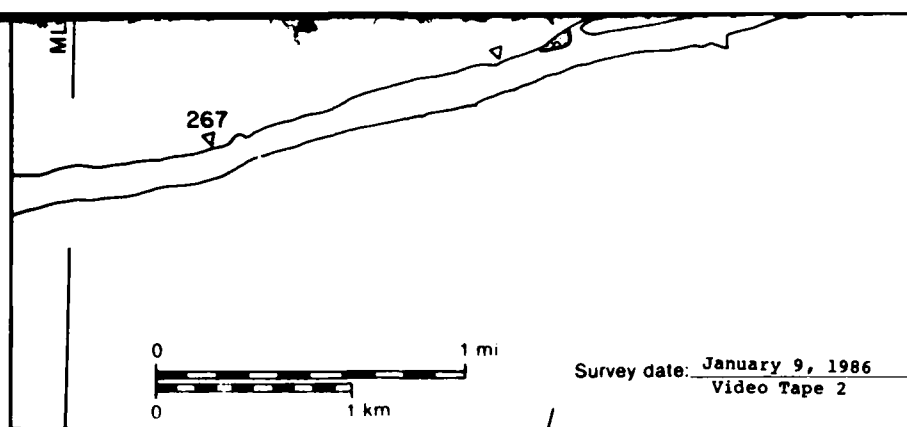
Area
($m^2 \times 10^6$)

Surface
concentration
(%)

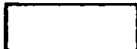




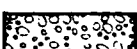
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9 January 1986





Marselles Pool

MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	5.66	NA
	Solid ice cover	0.00	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	2.03	60
Total area ($m^2 \times 10^6$)		8.19*	

* Includes $0.50 \times 10^6 m^2$
of no video coverage

88°17'30"

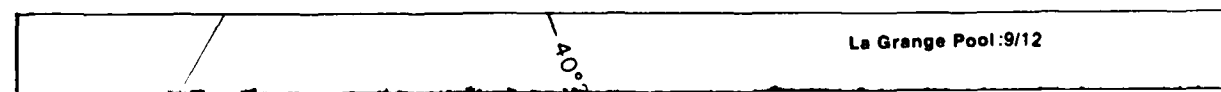
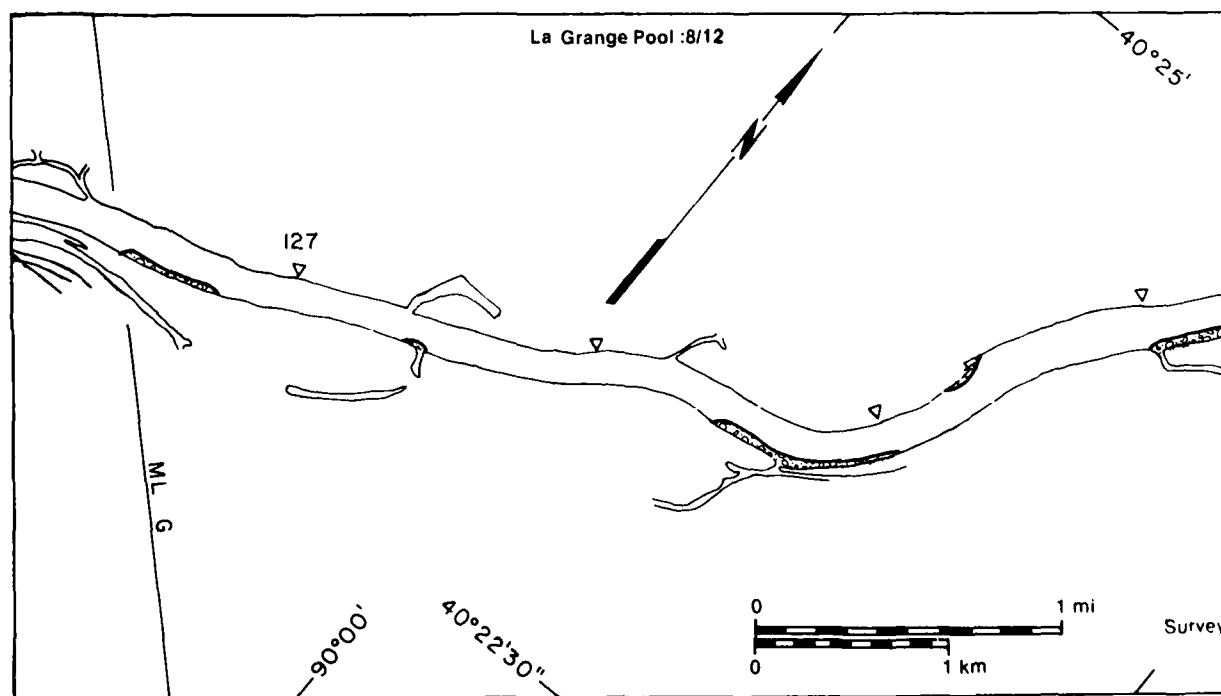
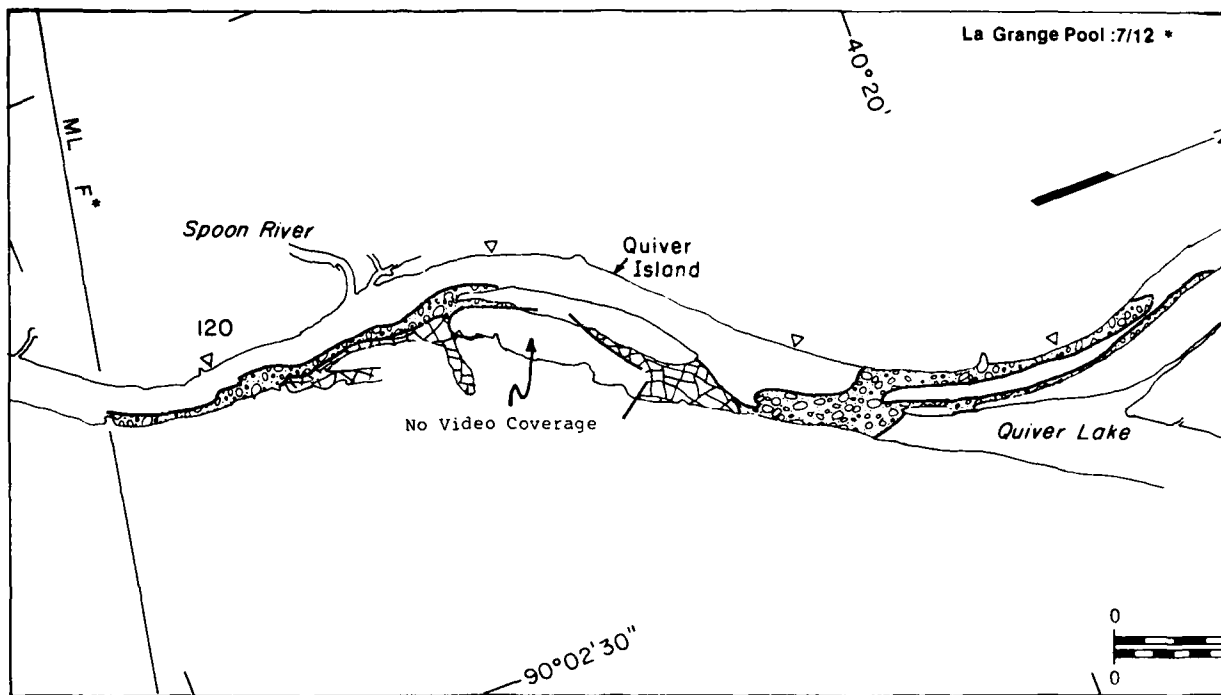
41°22'30"



Kankakee R.

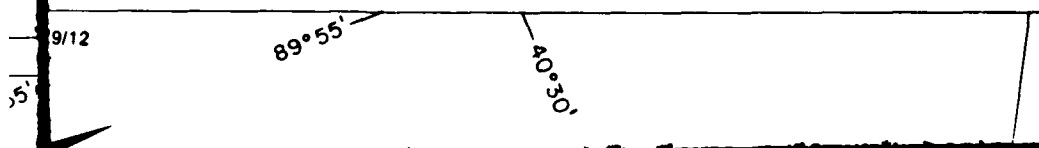
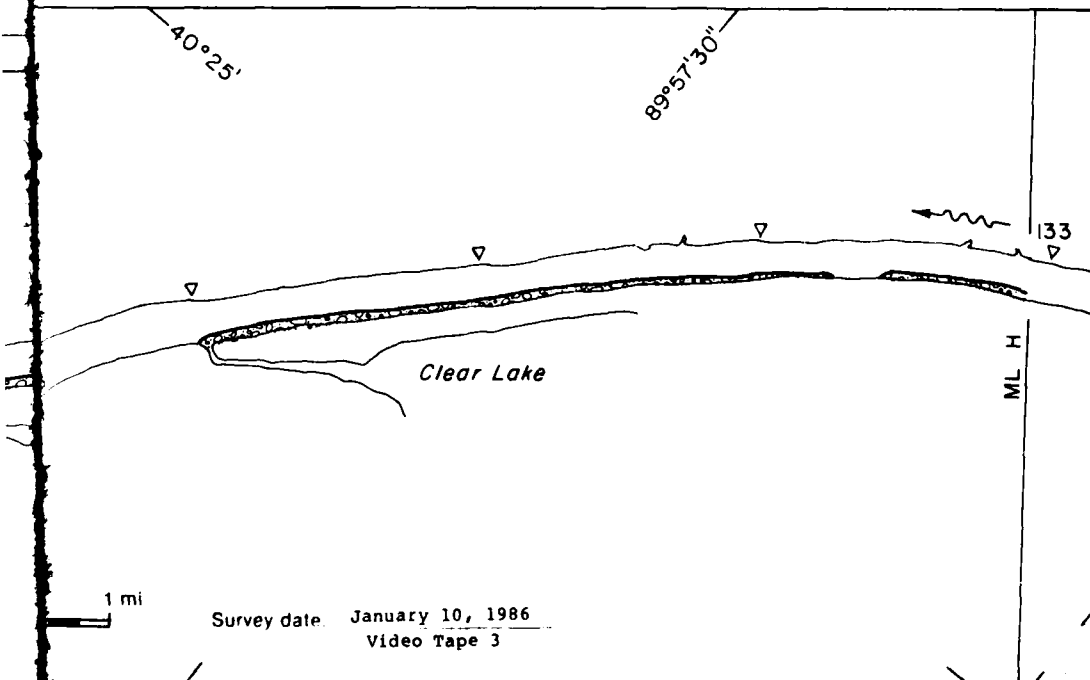
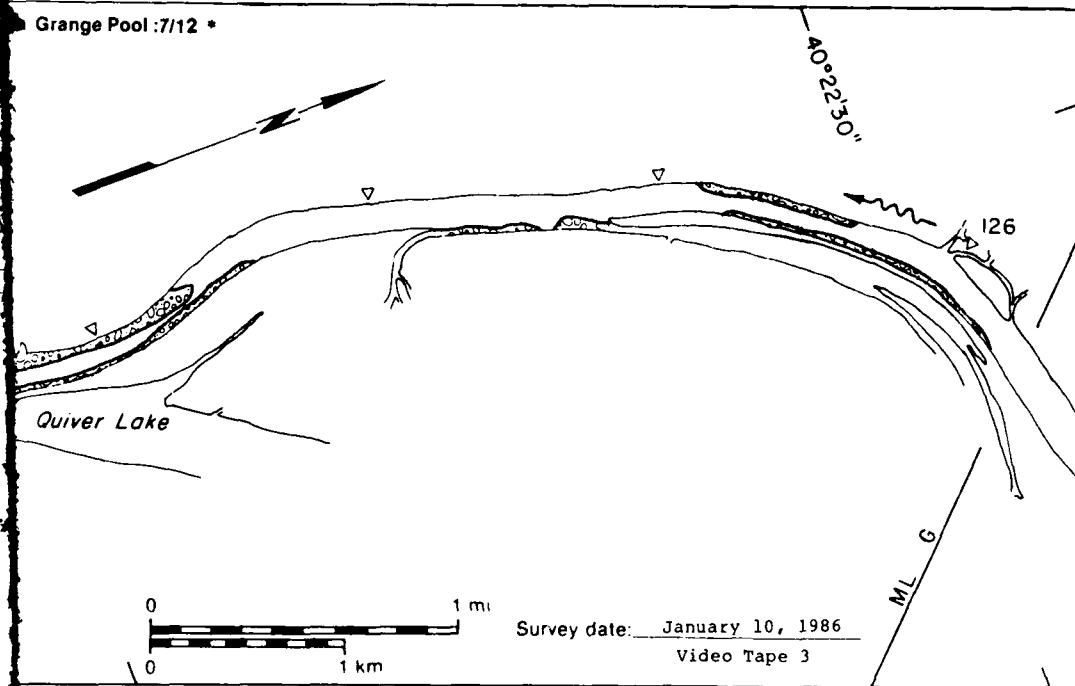
Δ273

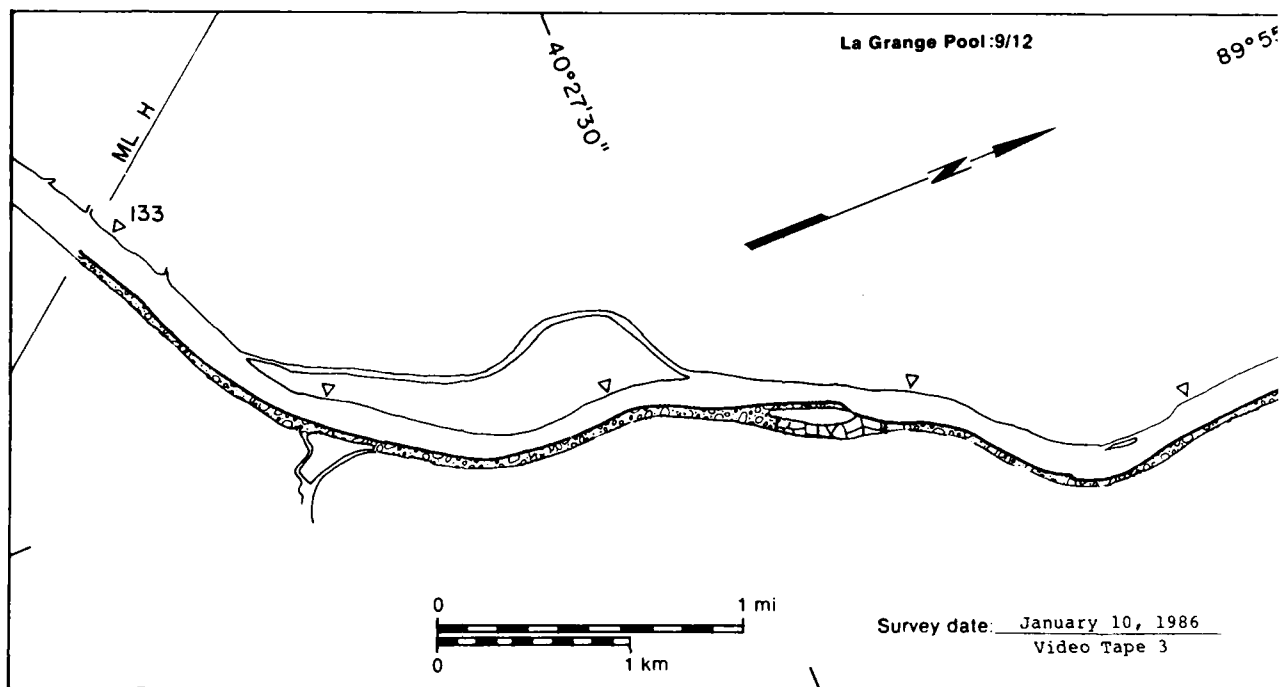
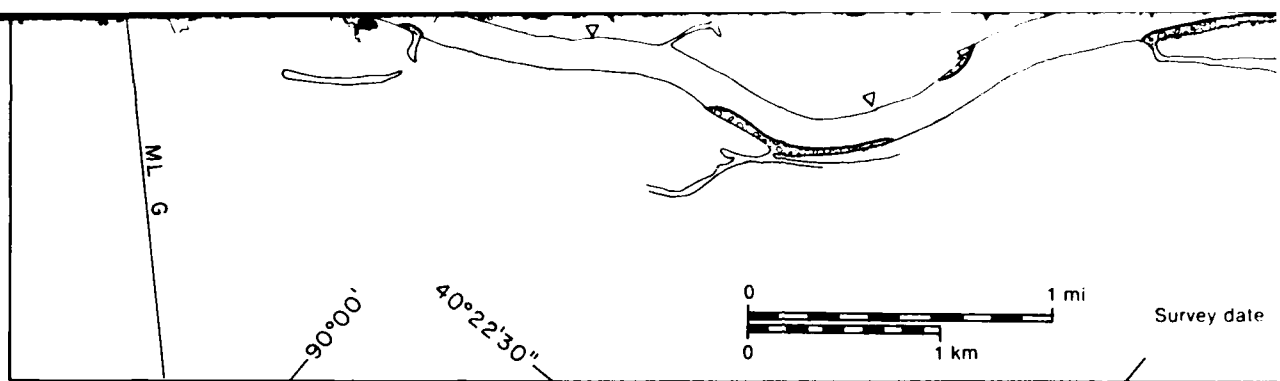
Des
Plaines
River



10 January 1986

Grange Pool :7/12 *





* The downstream limit of Illinois River video coverage was in the vicinity of mile 120 at Havana, Illinois, on all dates. There is no coverage of La Grange Pool maps 1/12 through 6/12 (match lines A through E).

Clear Lake

ML H

1 mi

Survey date January 10, 1986
Video Tape 3

89°55'

40°30'

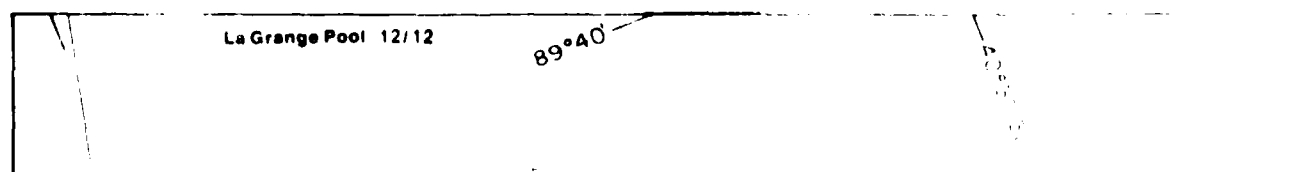
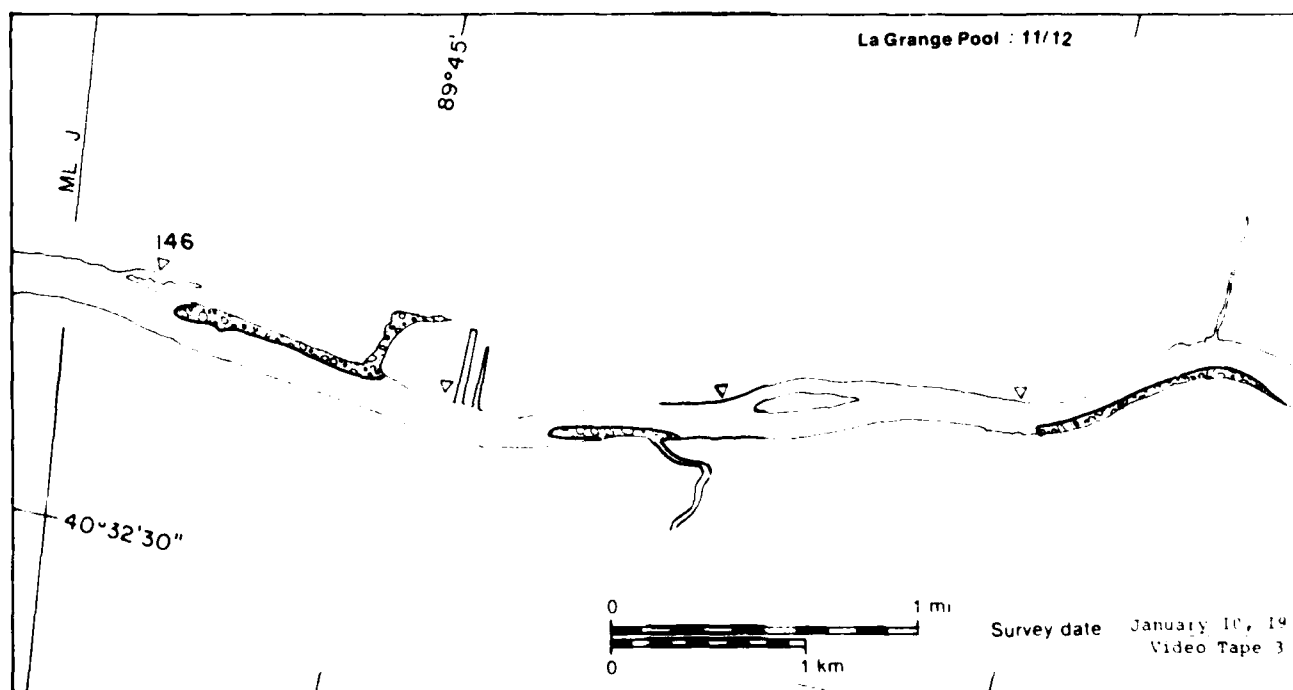
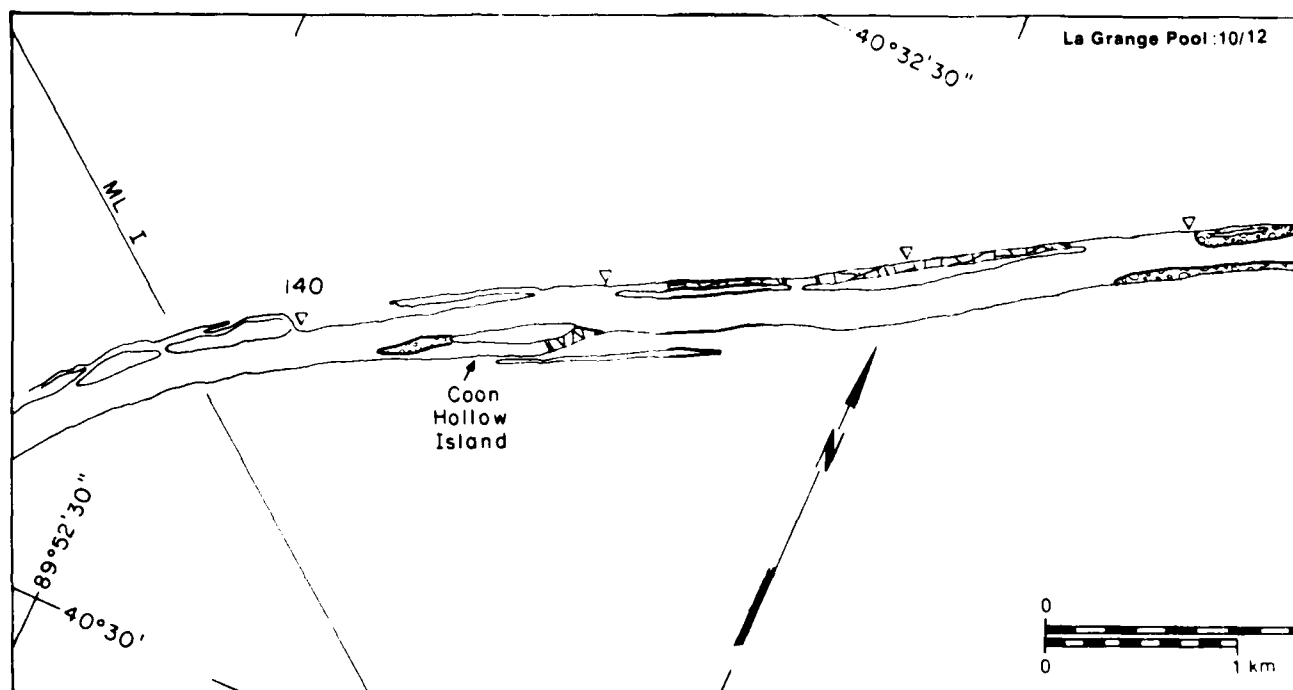
139

ML I

January 10, 1986
Video Tape 3

89°52'30"

10 January 1986



La Grange Pool:10/12

89°47'30"

ML J

145



Survey date: January 10, 1986
Video Tape 3

11/12

40°35'

ML K

153

89°40'

Survey date: January 10, 1986
Video Tape 3

La Grange Pool

SP UNITS

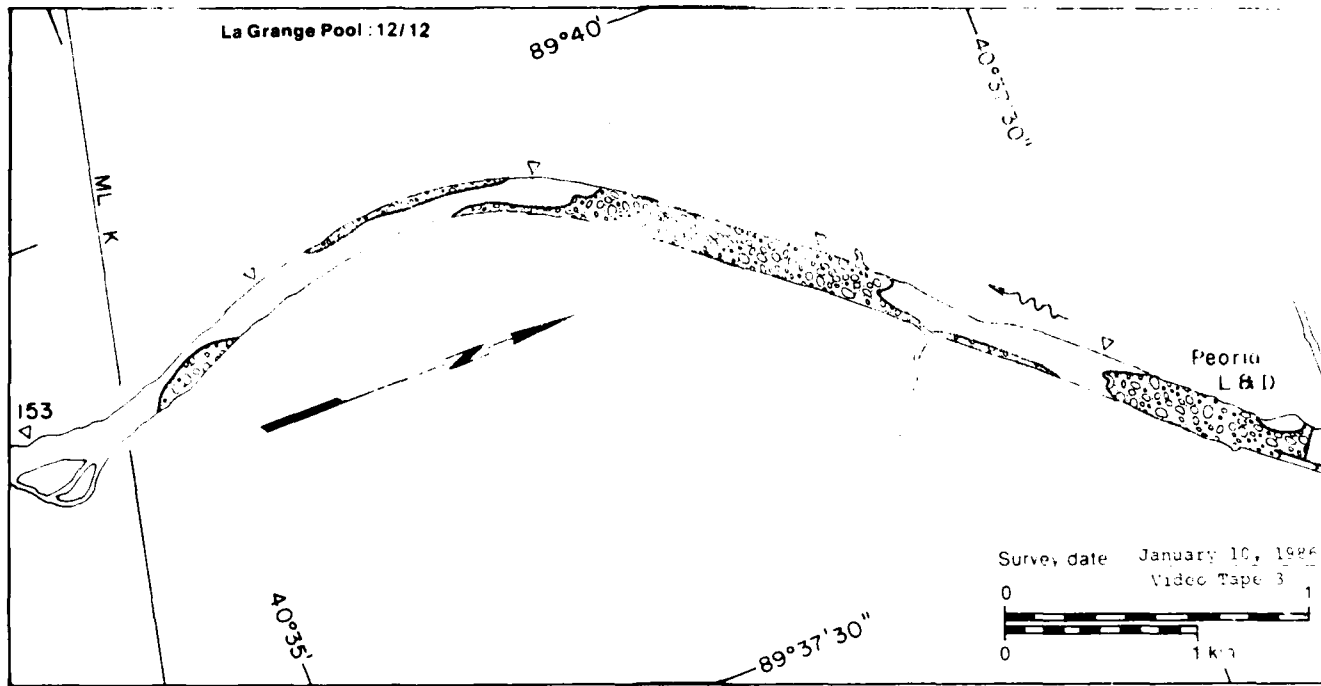
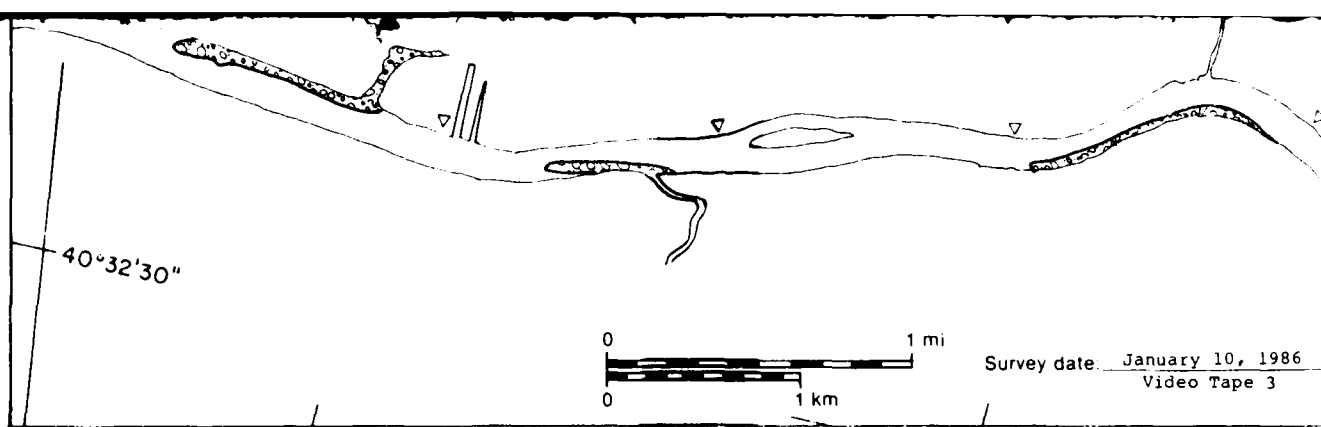
Area
(m² x 10⁶)

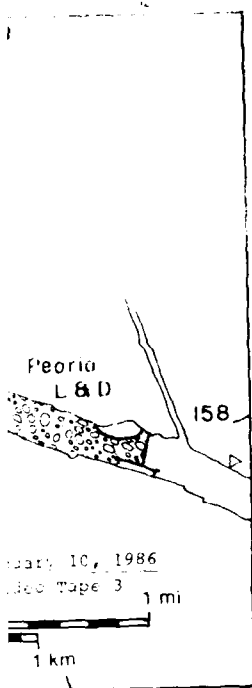
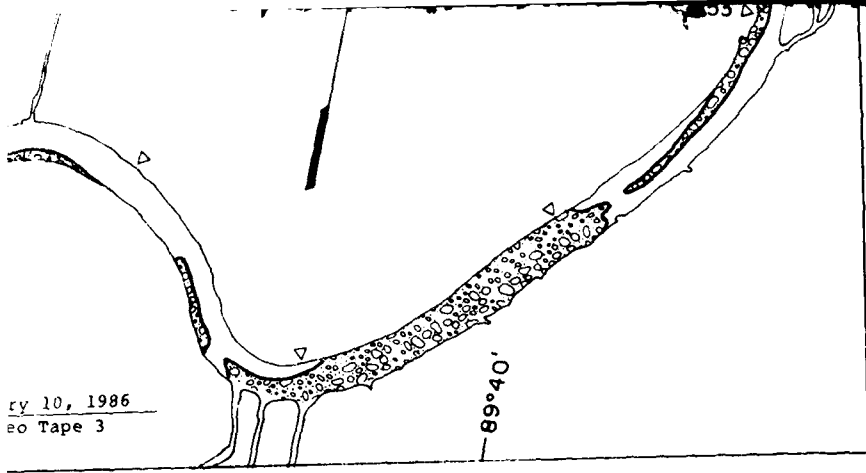
Surface
concentration
(%)

Open water

8.24


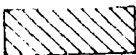


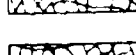

NA





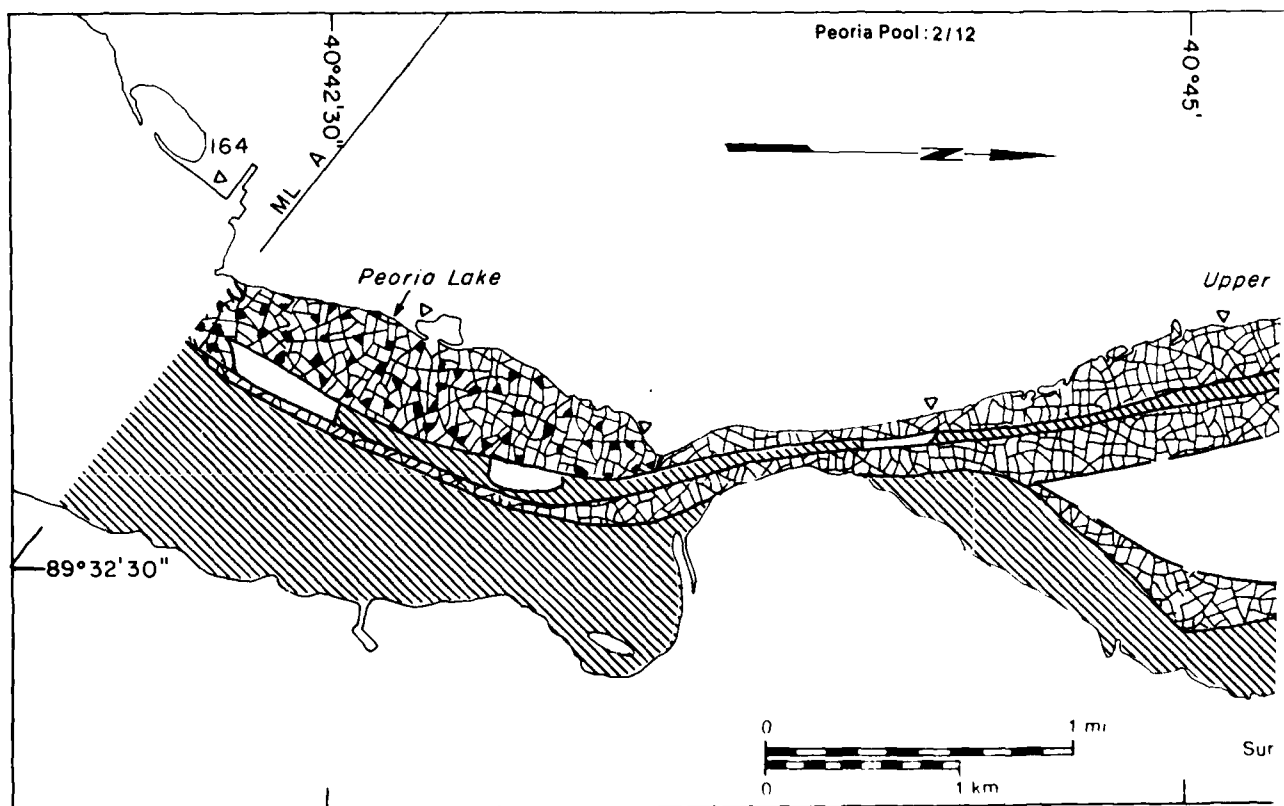
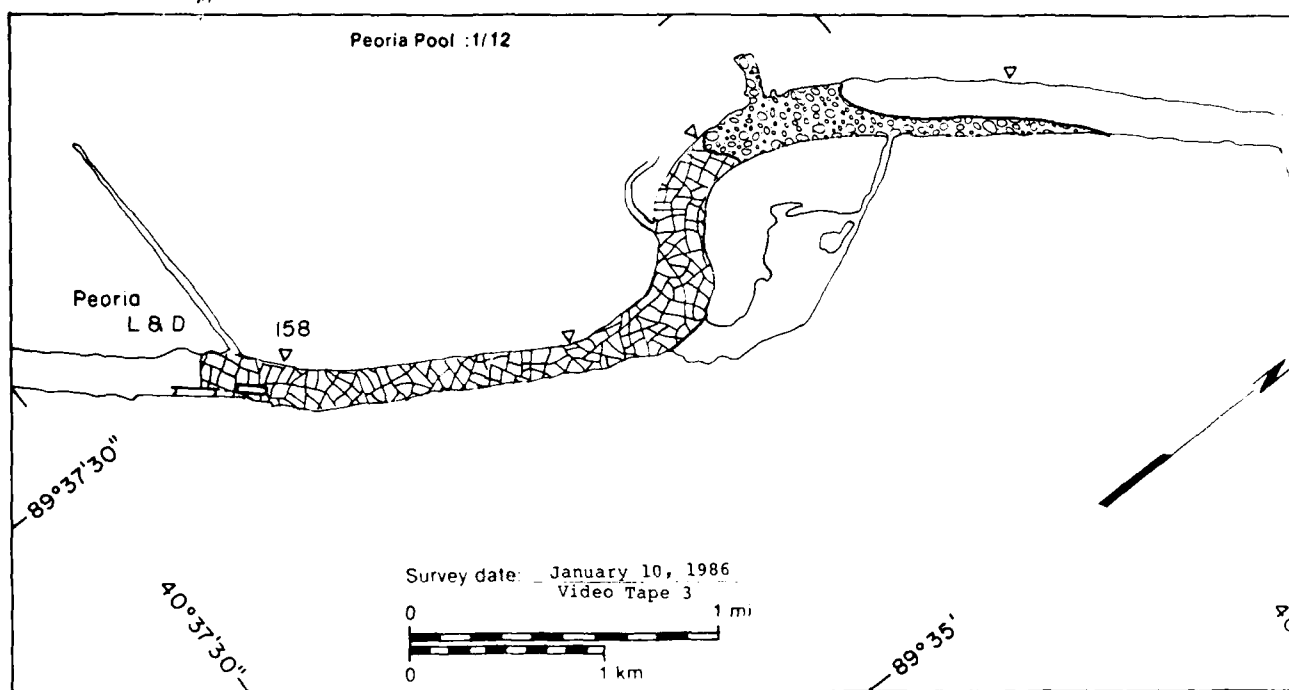
La Grange Pool

MAP UNITS

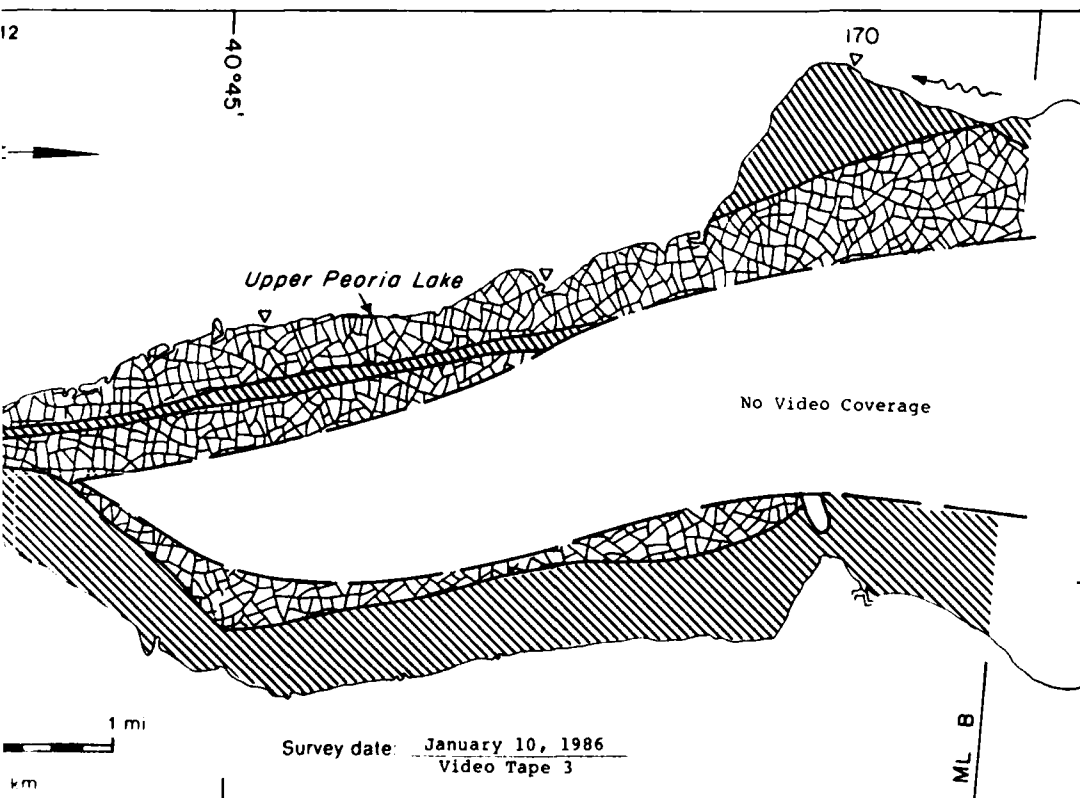
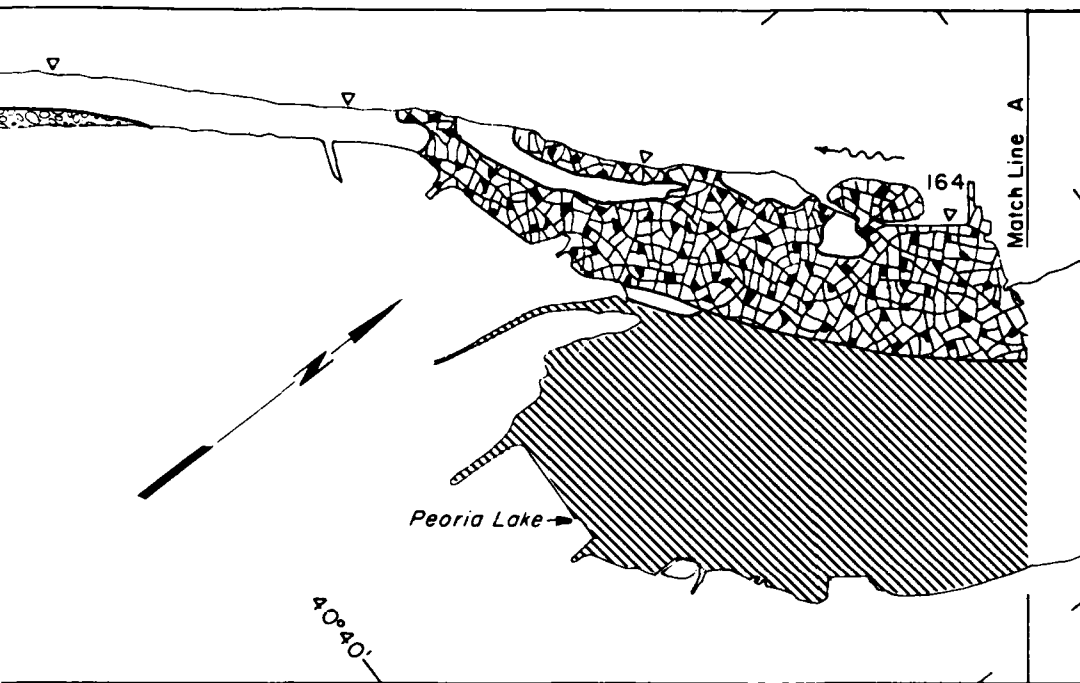
-  Open water
-  Solid ice cover
-  Solid ice cover with open-water areas
-  Fragmented ice cover
-  Fragmented ice cover with open-water areas
-  Ice floes or frazil slush and pans

Area ($m^2 \times 10^6$)	Surface concentration (%)
8.24	NA
0.00	NA
0.00	—
0.24	NA
0.00	—
3.06	60
Total area ($m^2 \times 10^6$)	11.71*

* Includes $0.17 \times 10^6 m^2$ of no video coverage

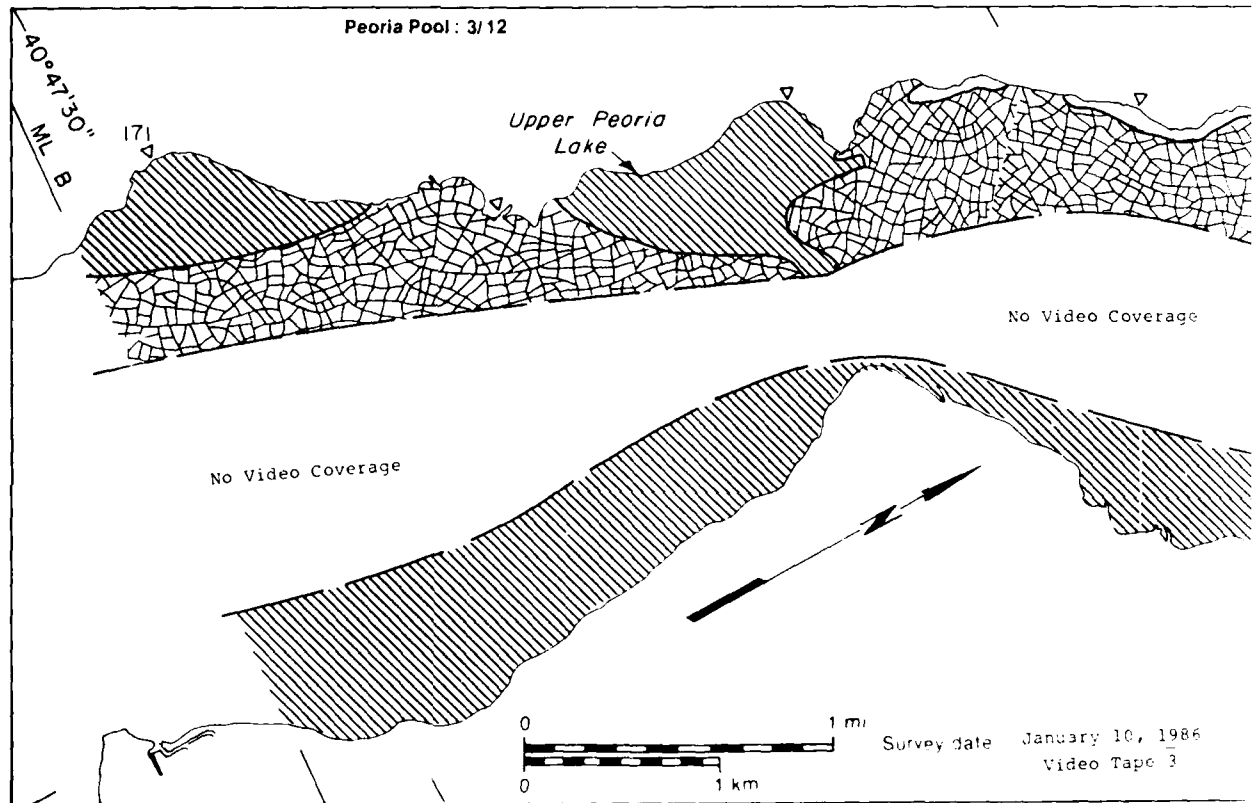
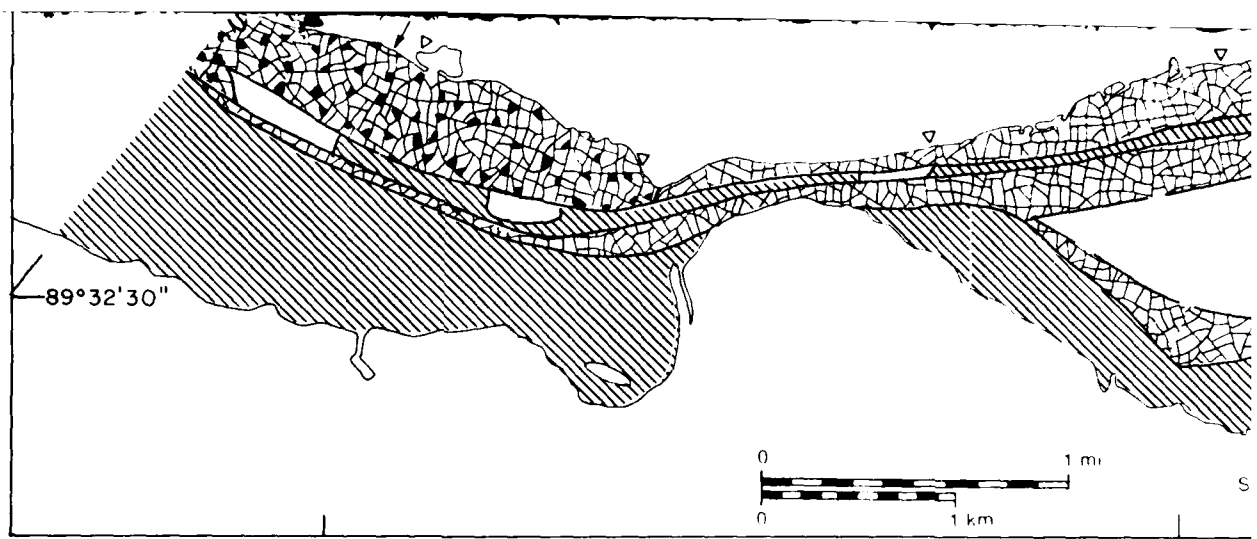


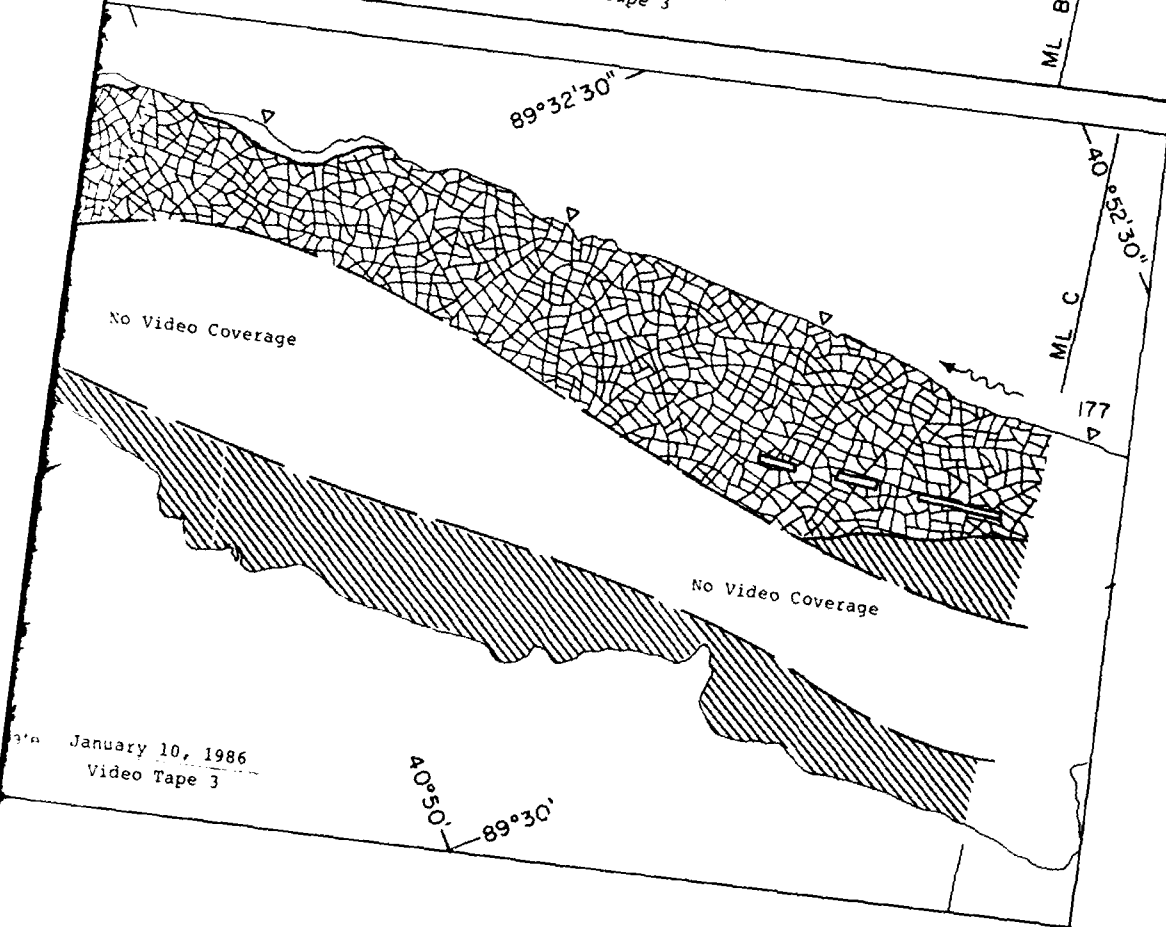
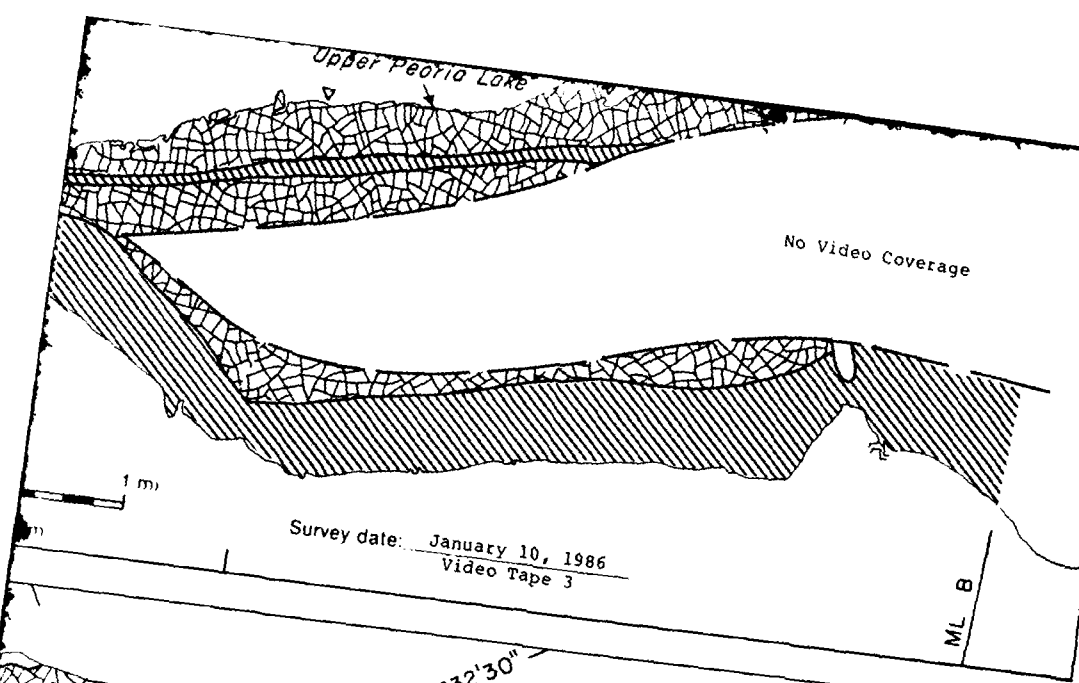
10 January 1986



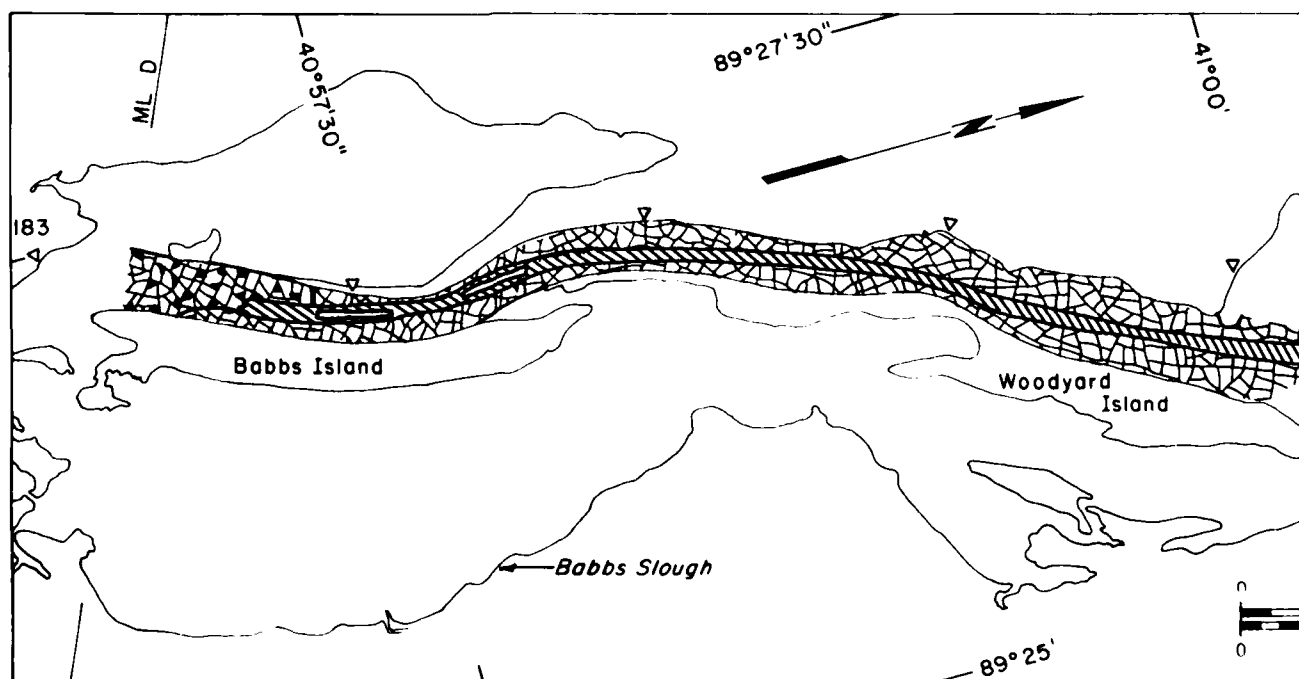
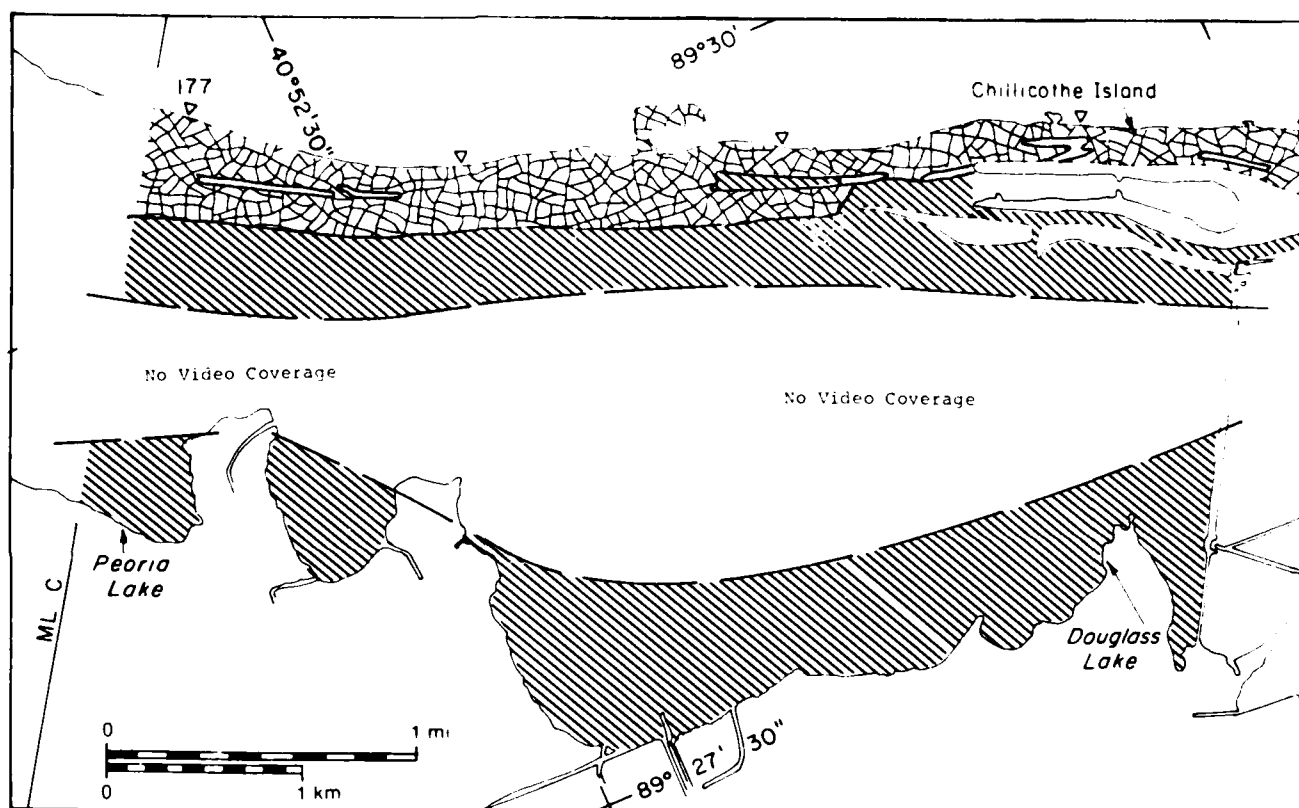
49°32'30"

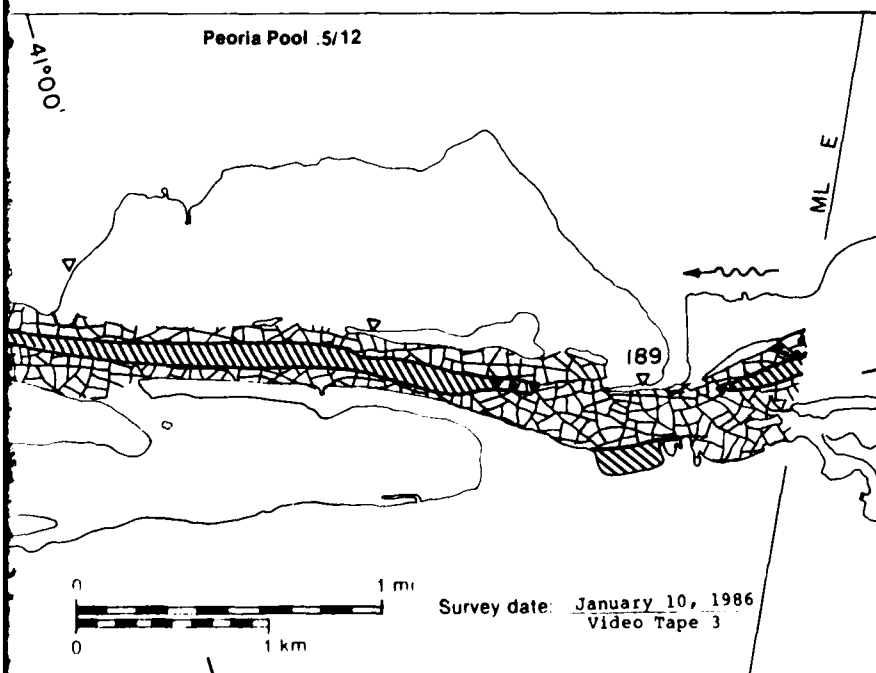
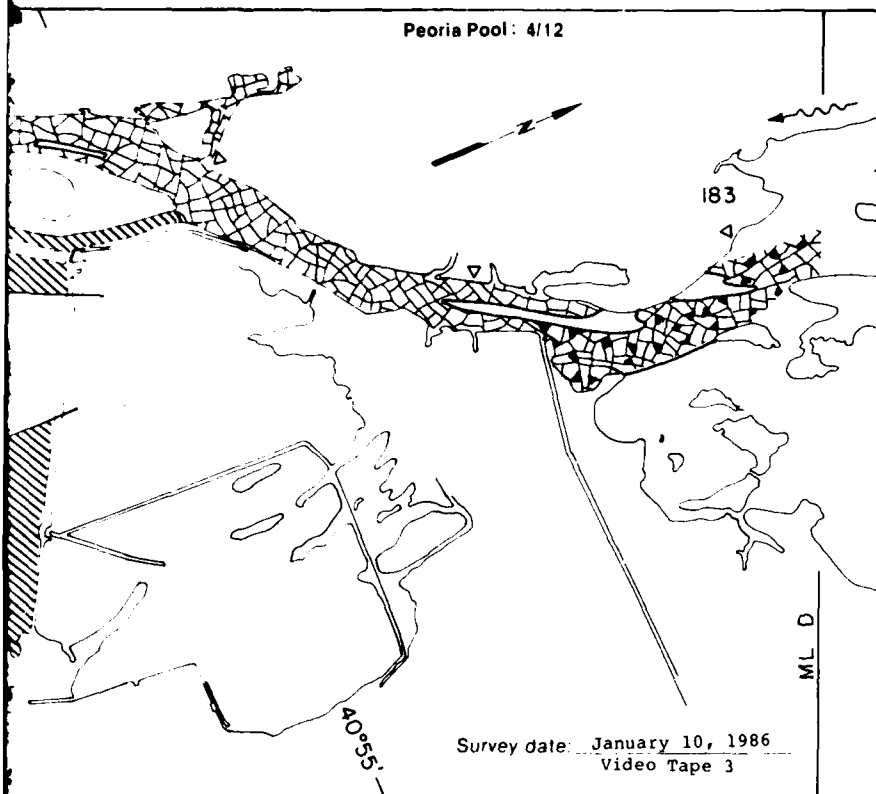
40



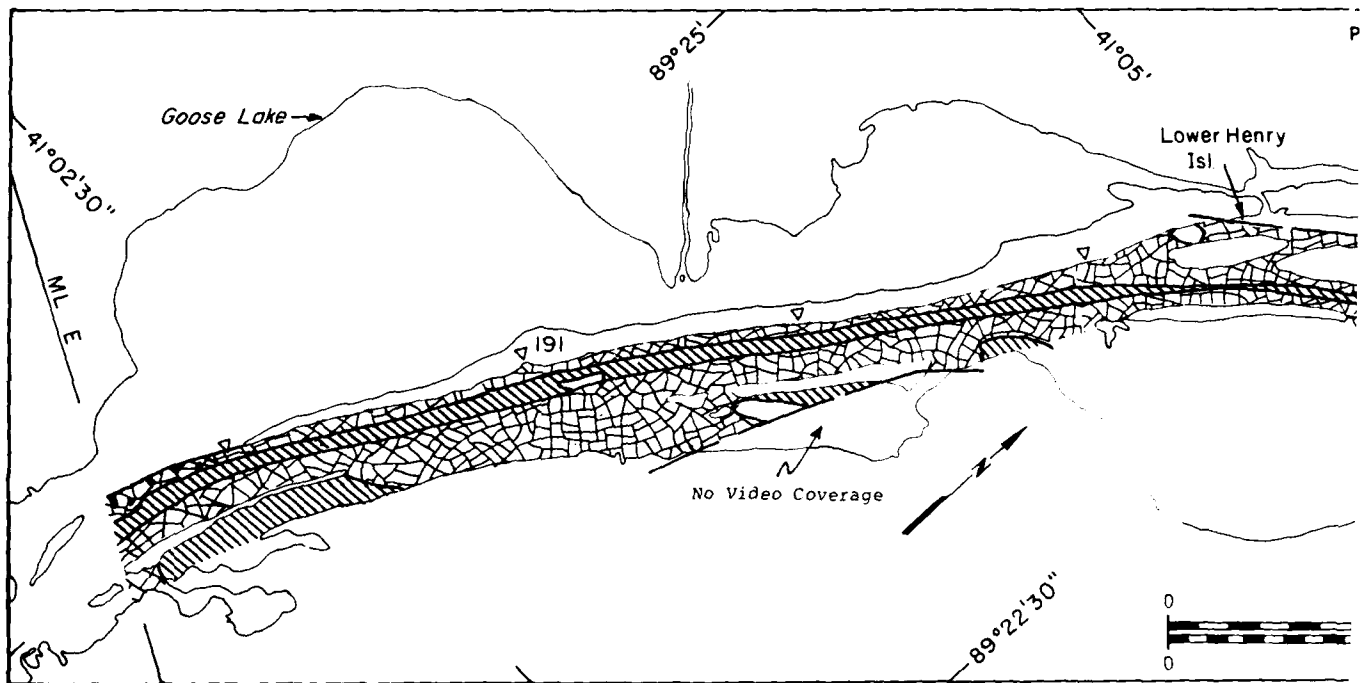
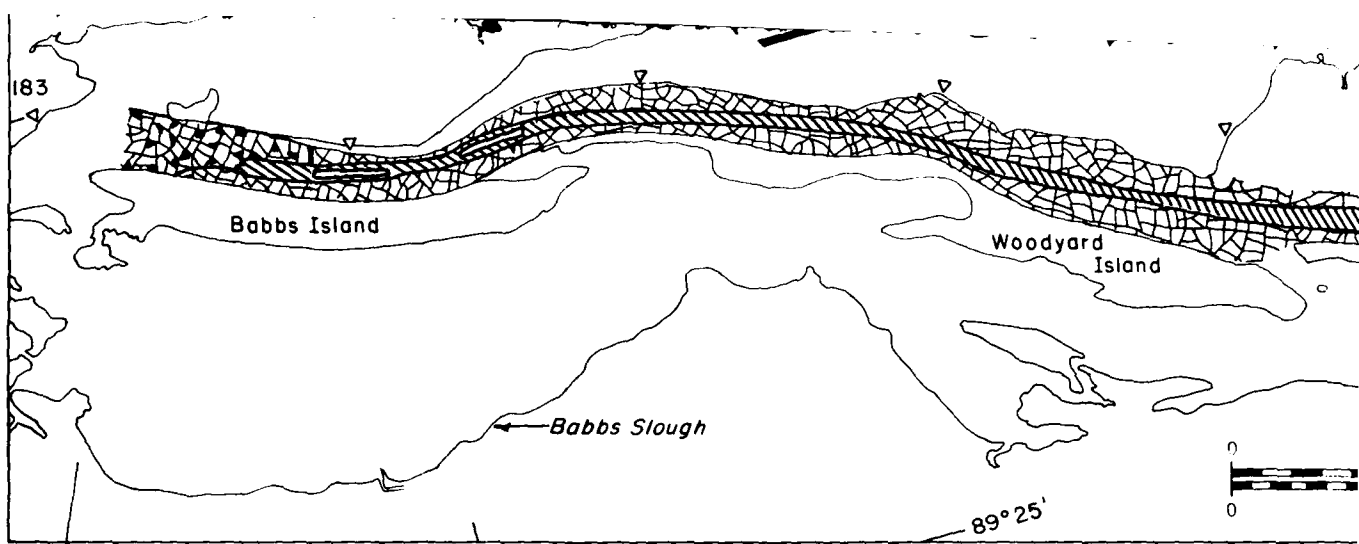


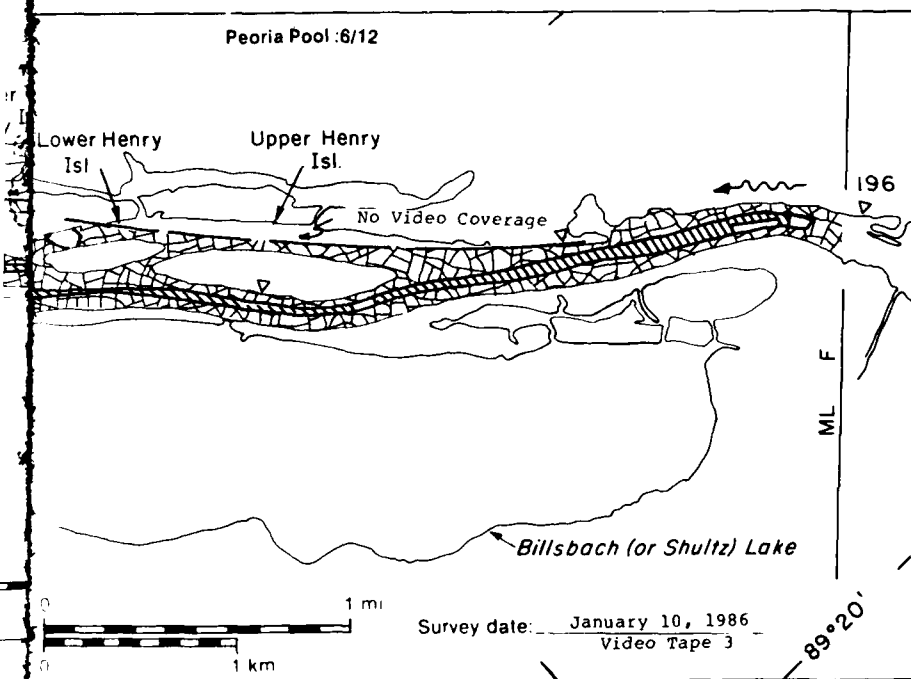
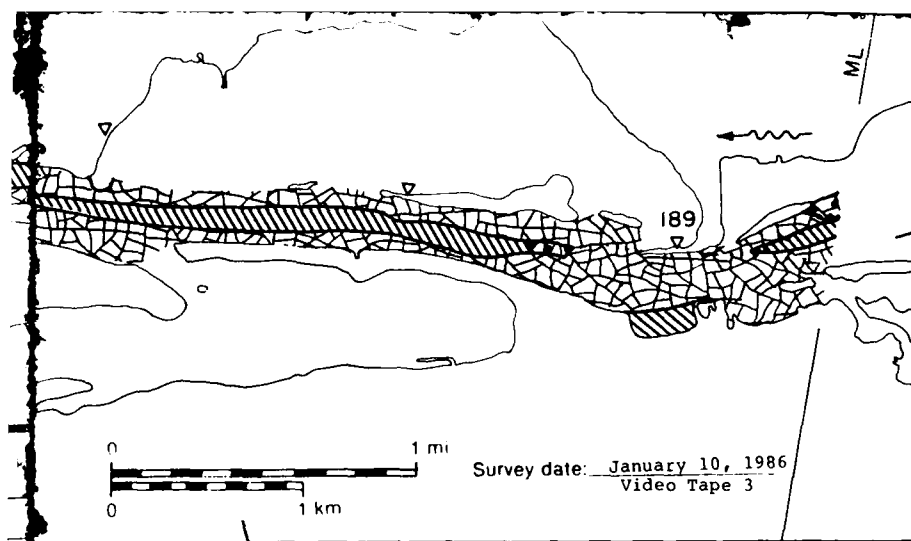
10 January 1986

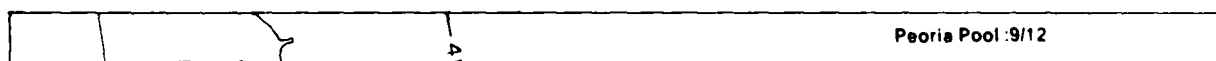
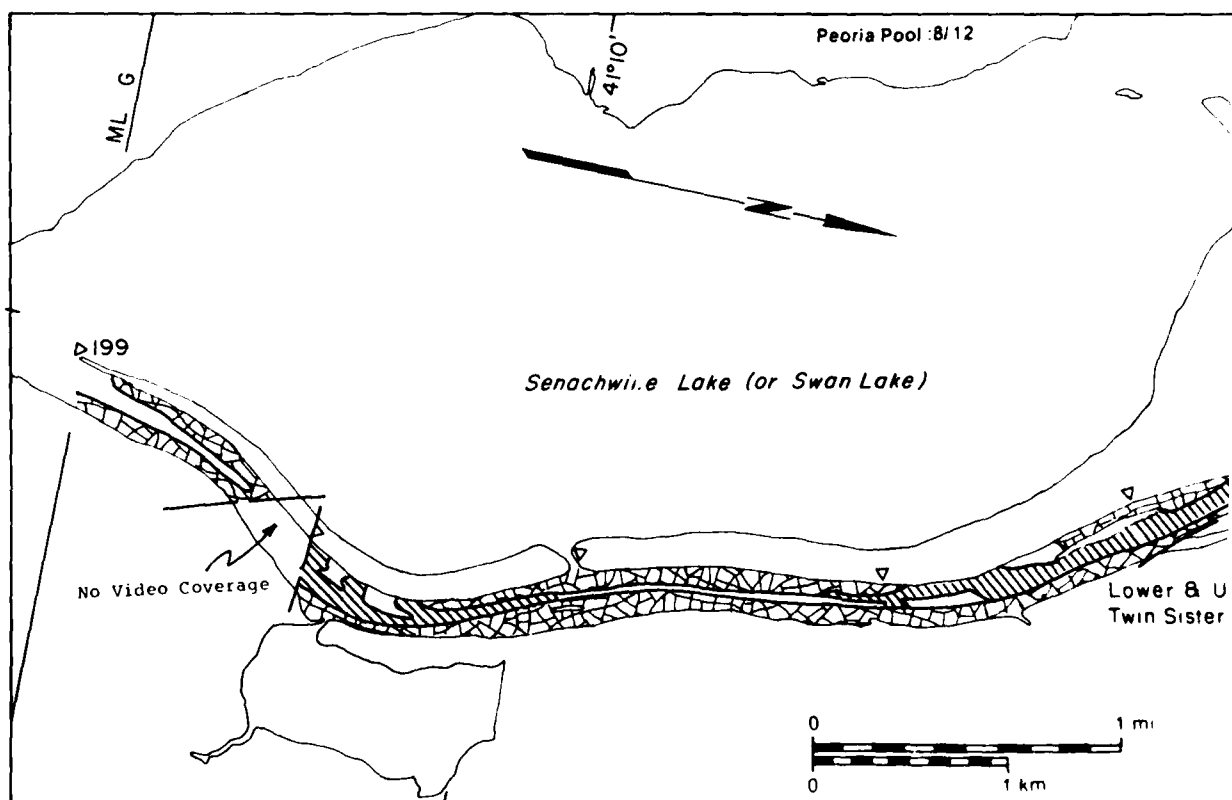
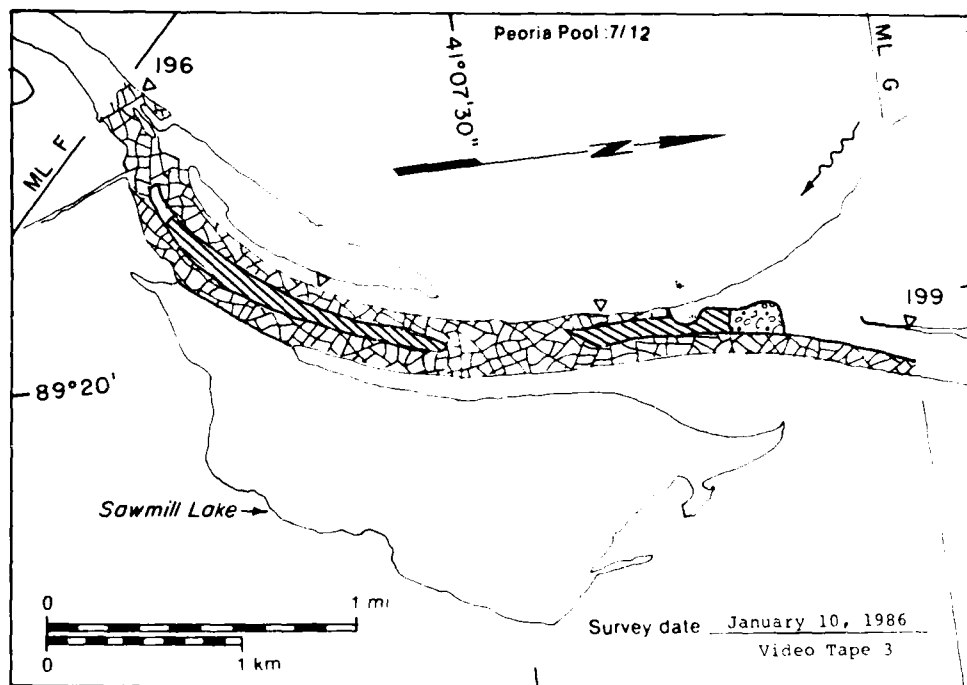




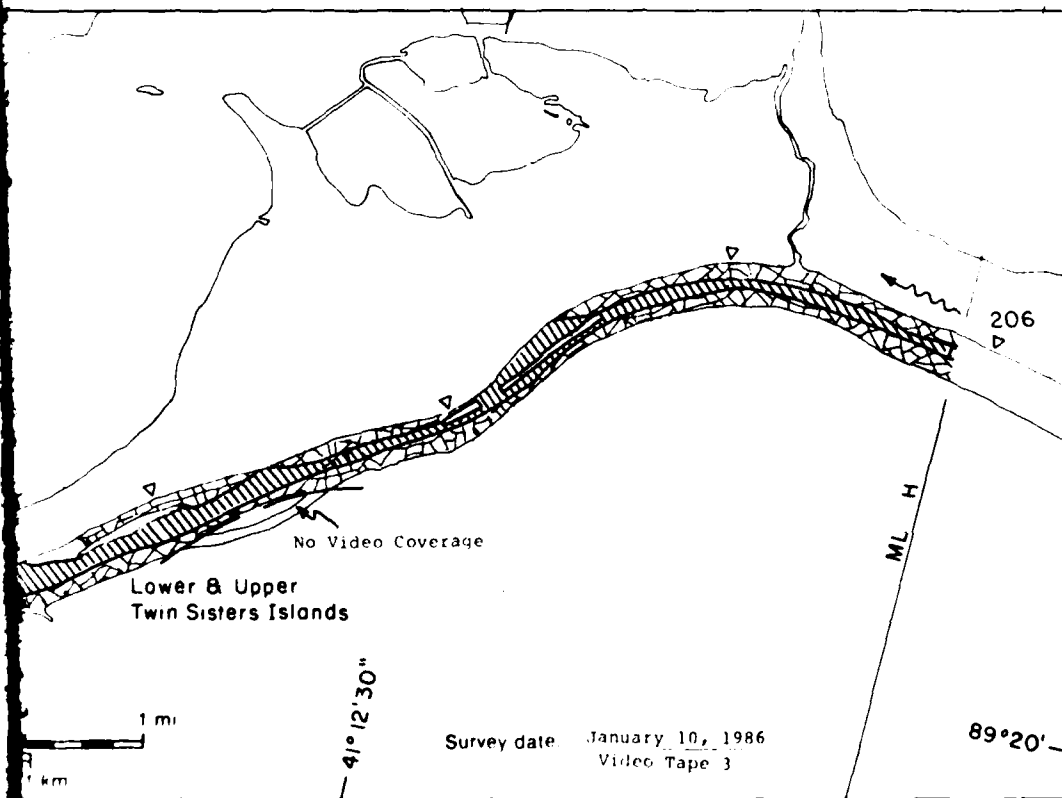
Peoria Pool: 6/12

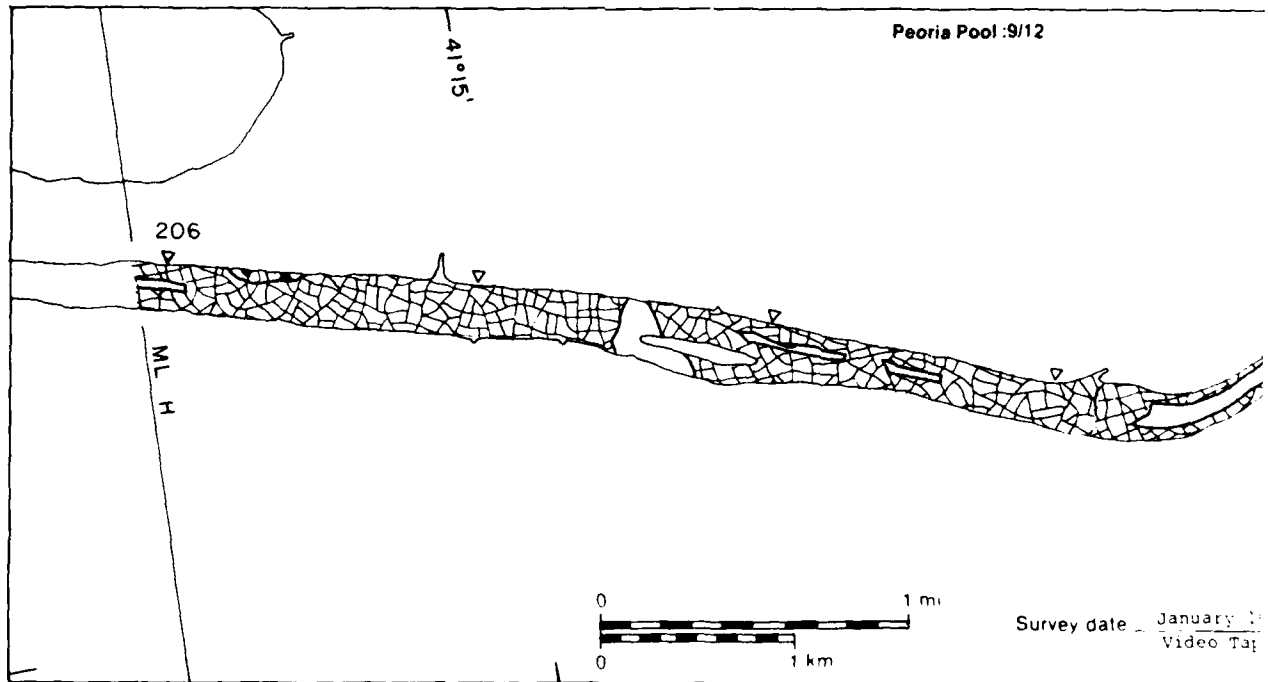
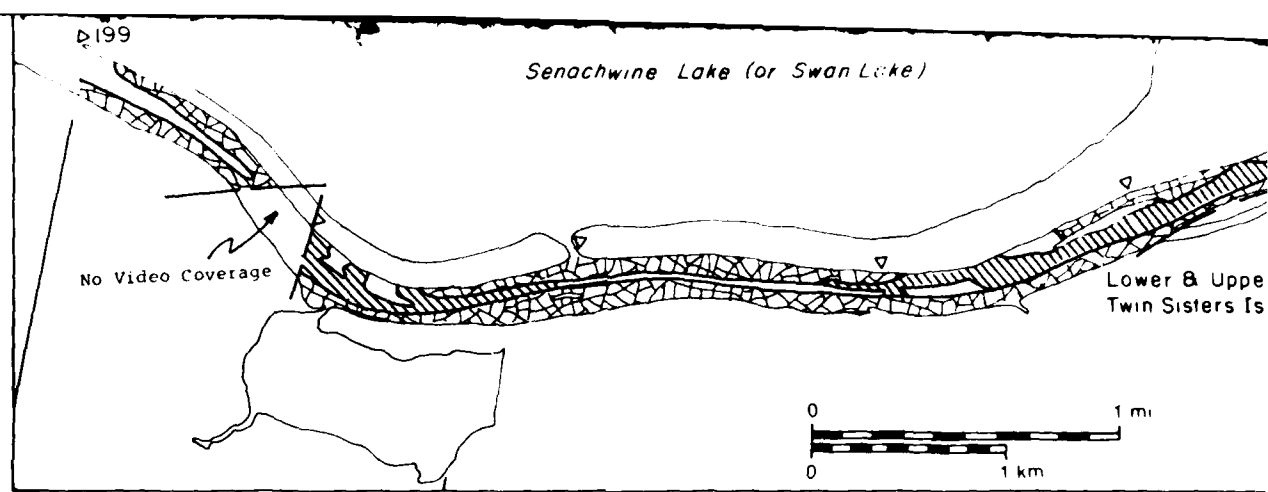


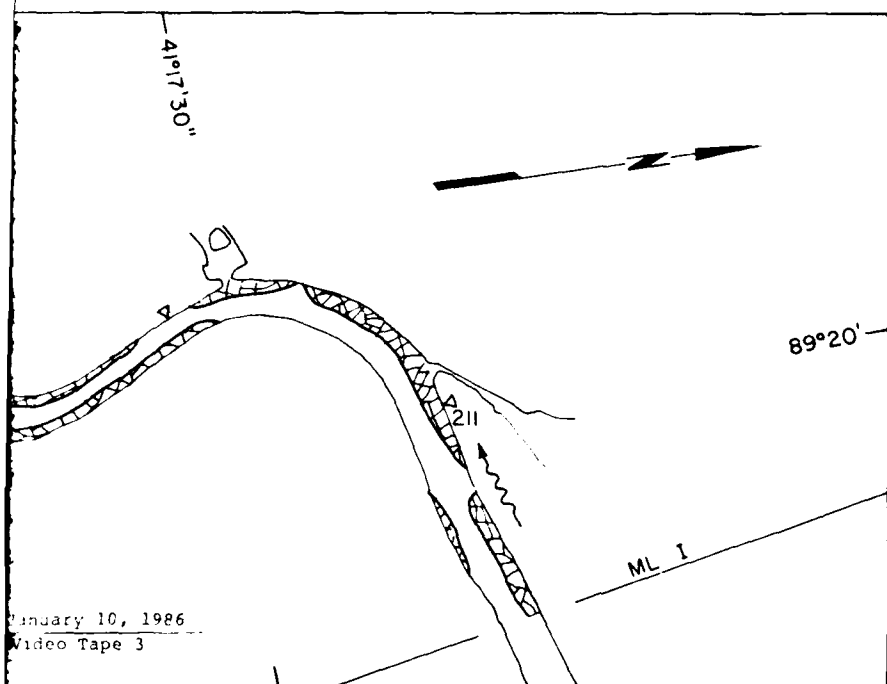
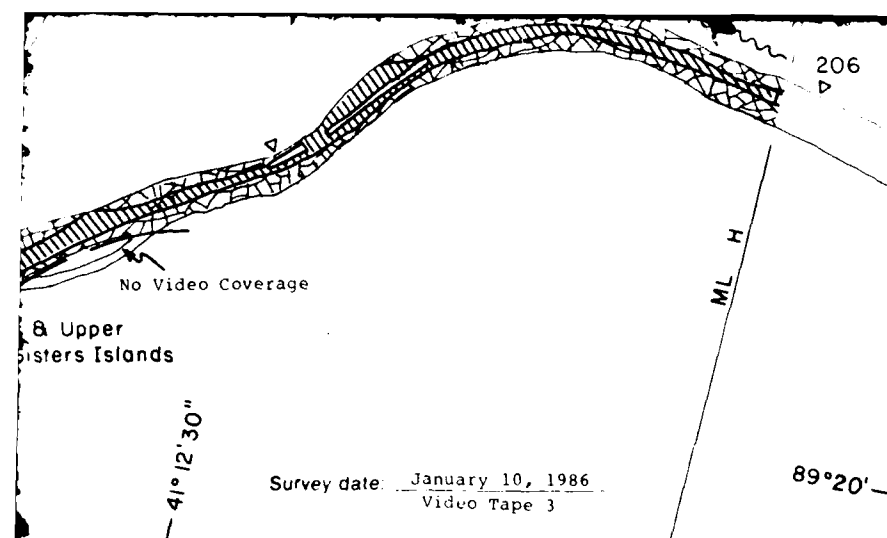




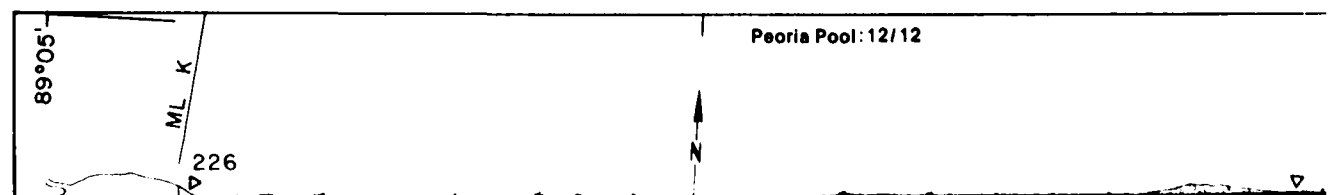
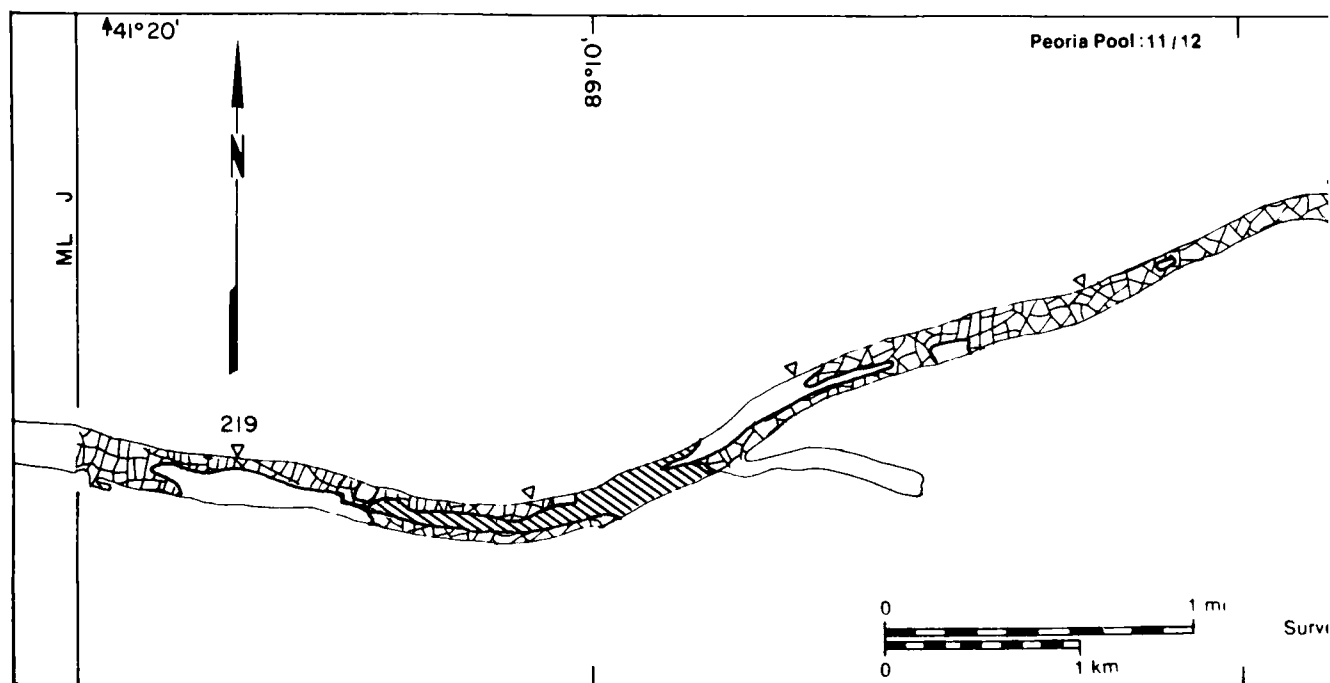
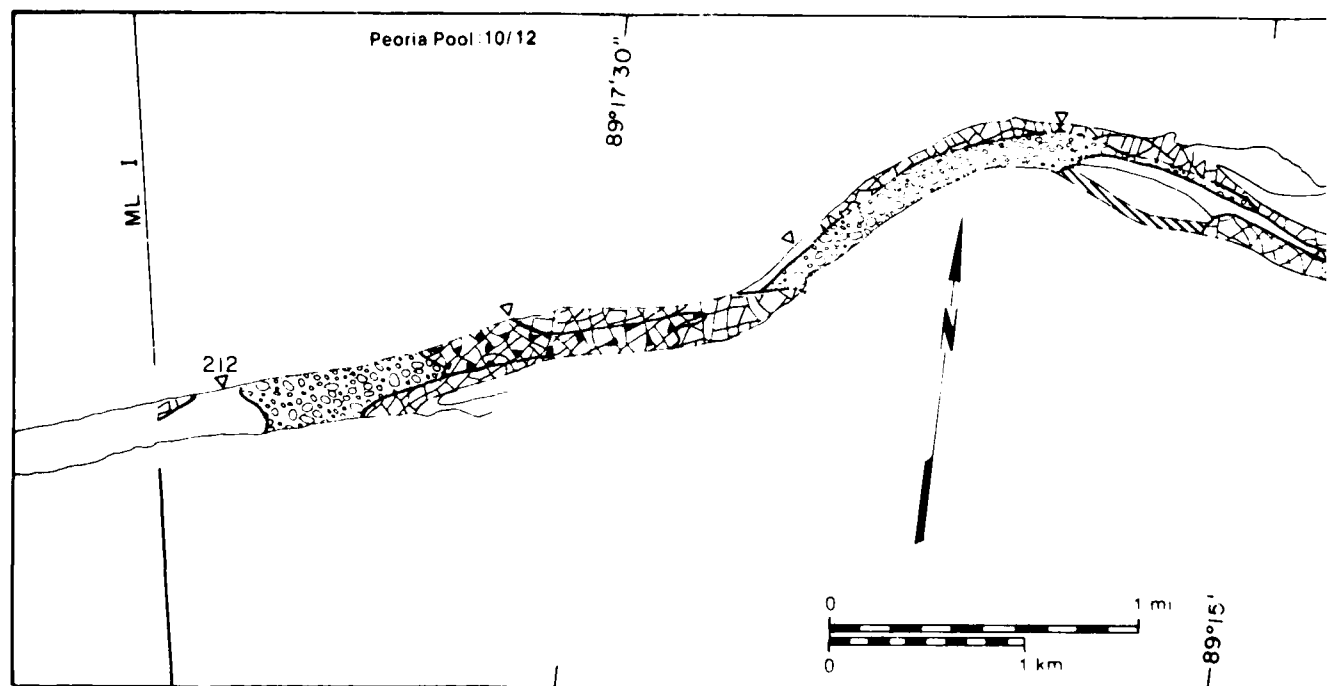
10 January 1986

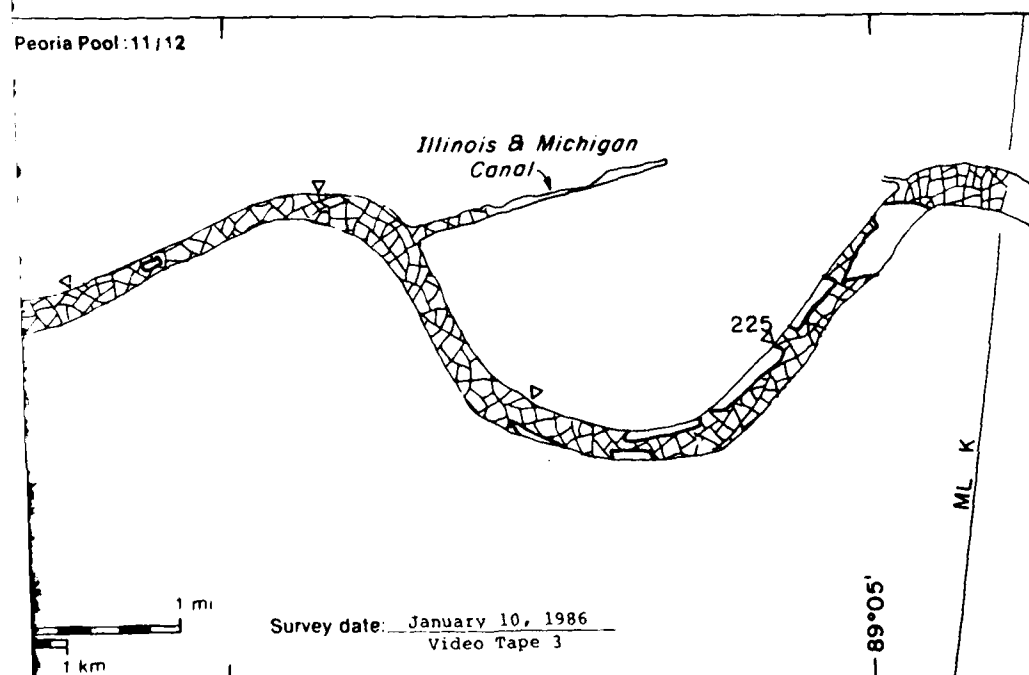
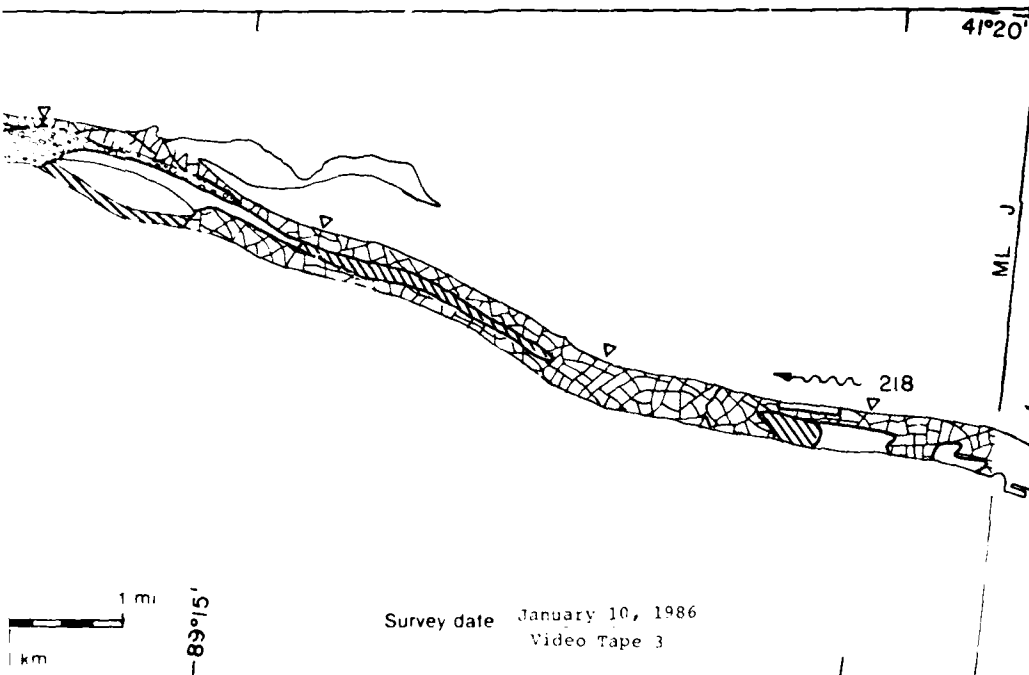




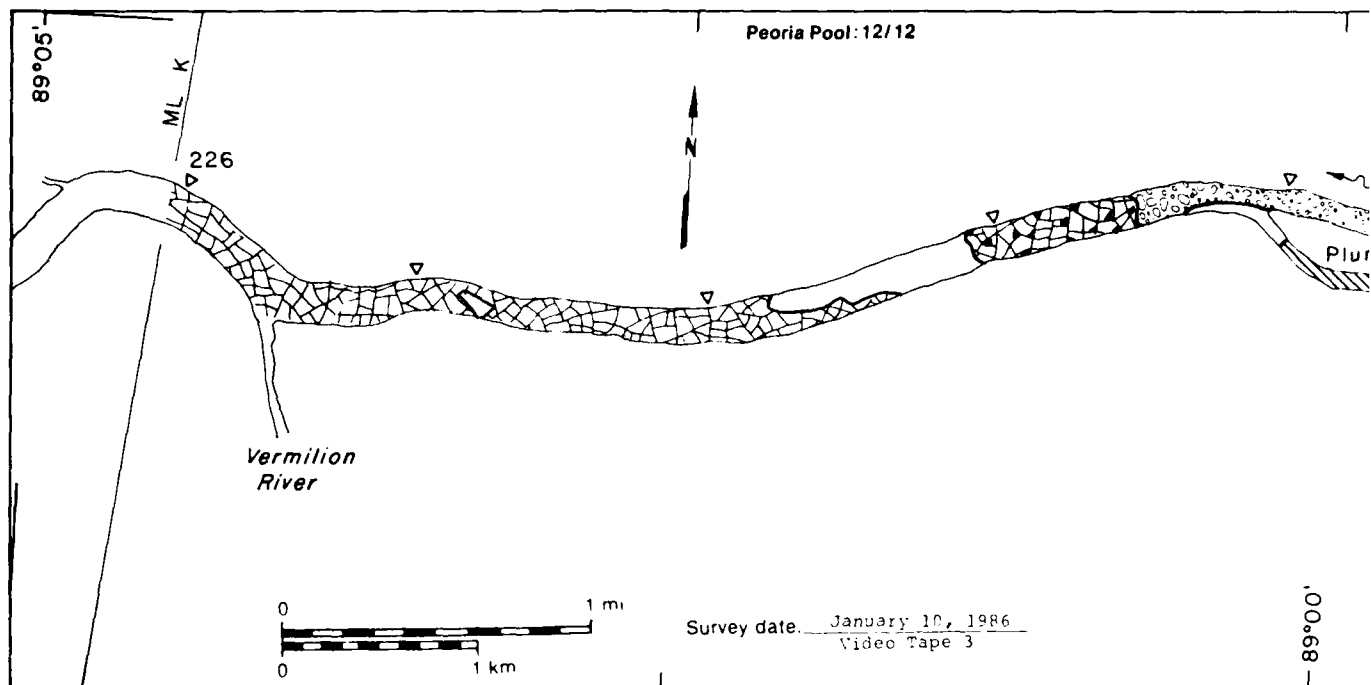
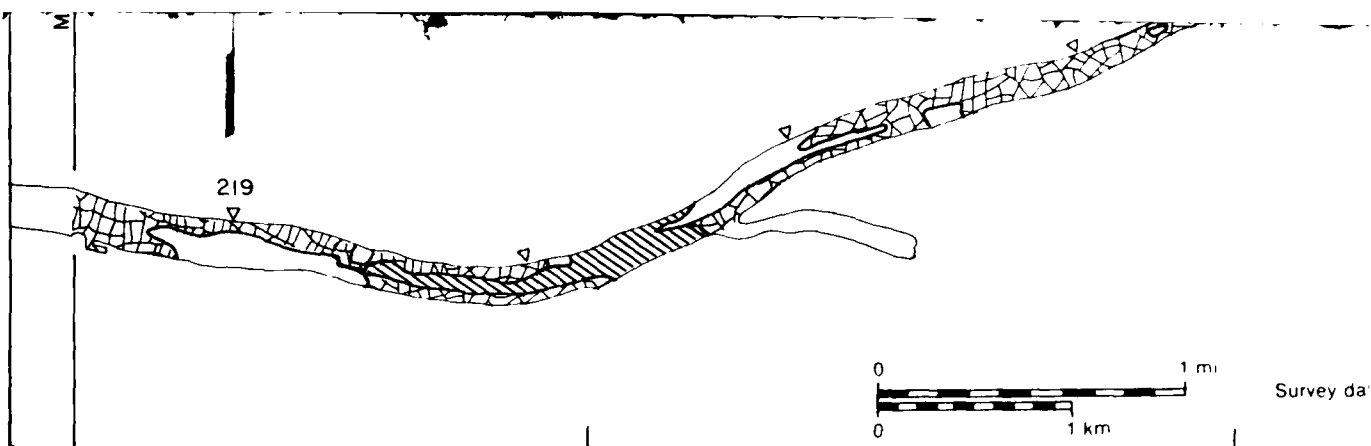


10 January 1986





41°20'



Peoria Pool

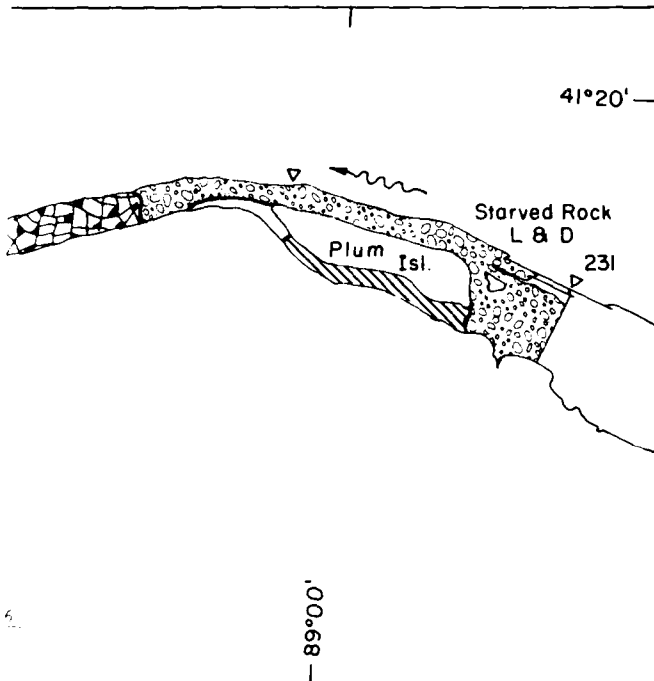
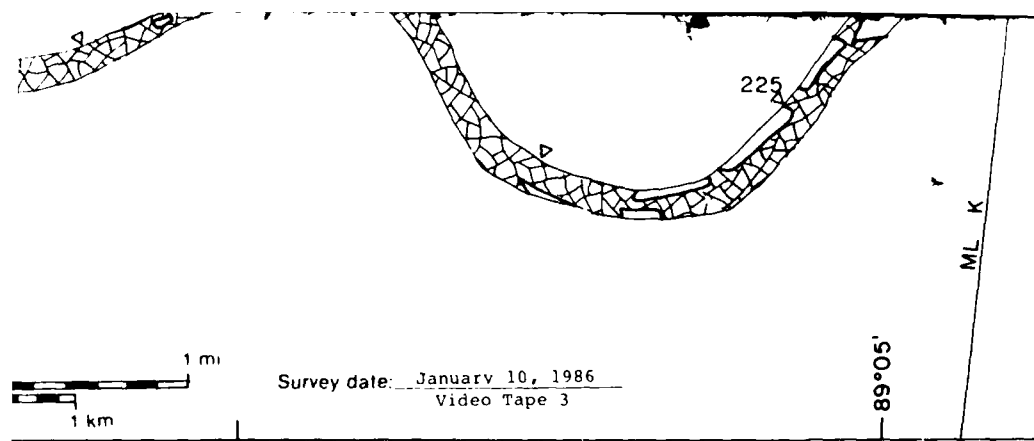
MAP UNITS

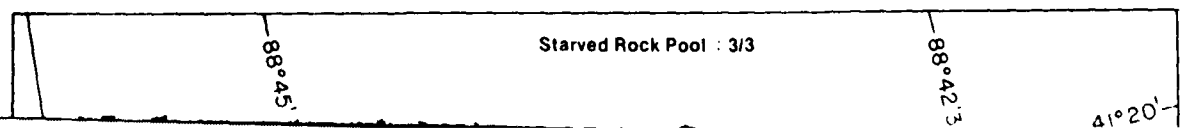
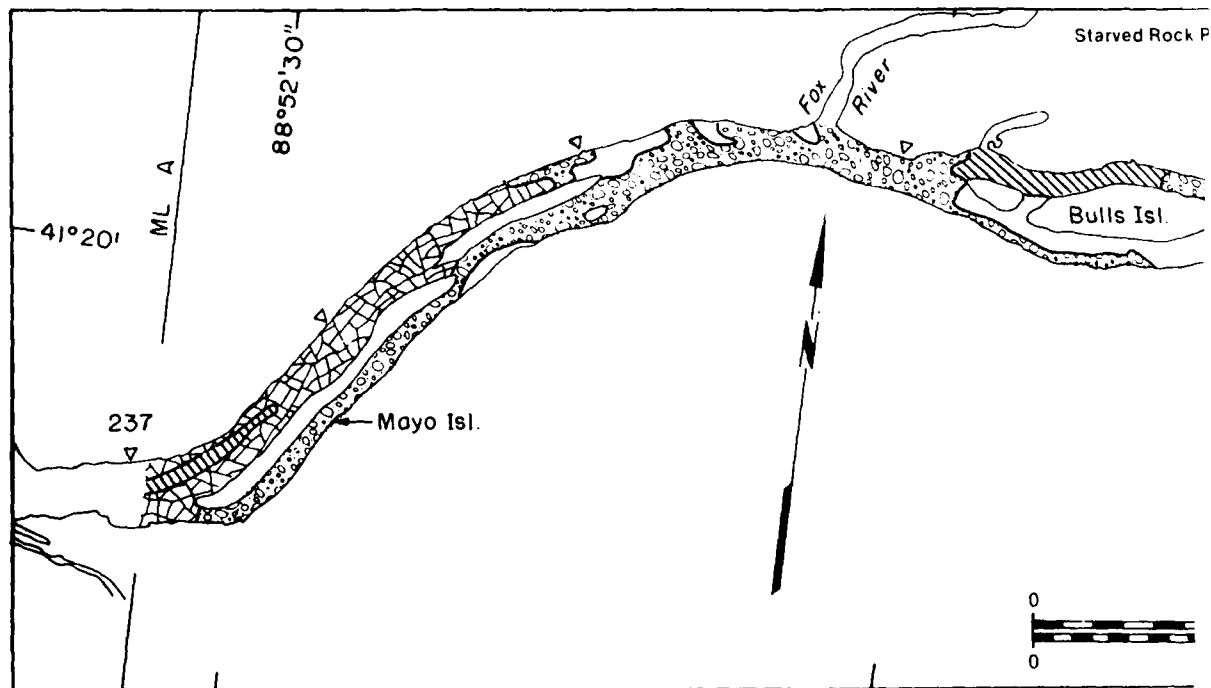
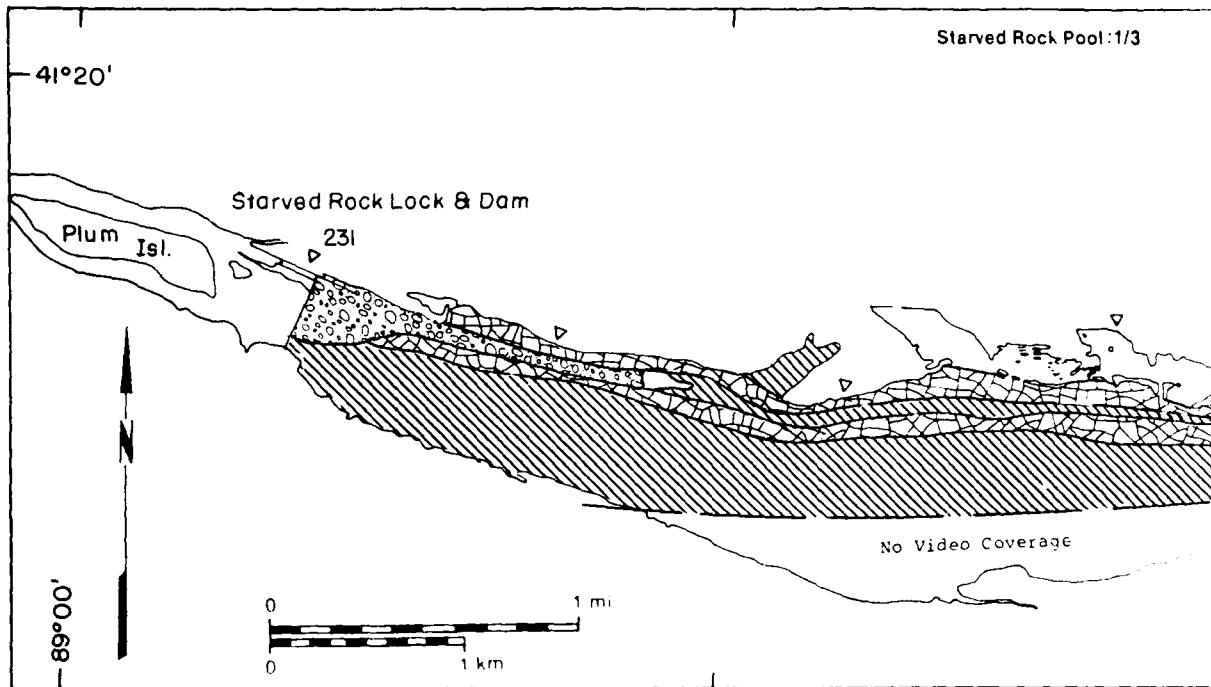
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	5.25	NA
Solid ice cover	23.10	NA
Solid ice cover with open water areas	0.00	—
Fragmented ice cover	26.41	NA
Fragmented ice cover with open water areas	4.24	80
Ice floes or frazil slush and pans	1.27	20

Total area ($m^2 \times 10^6$)

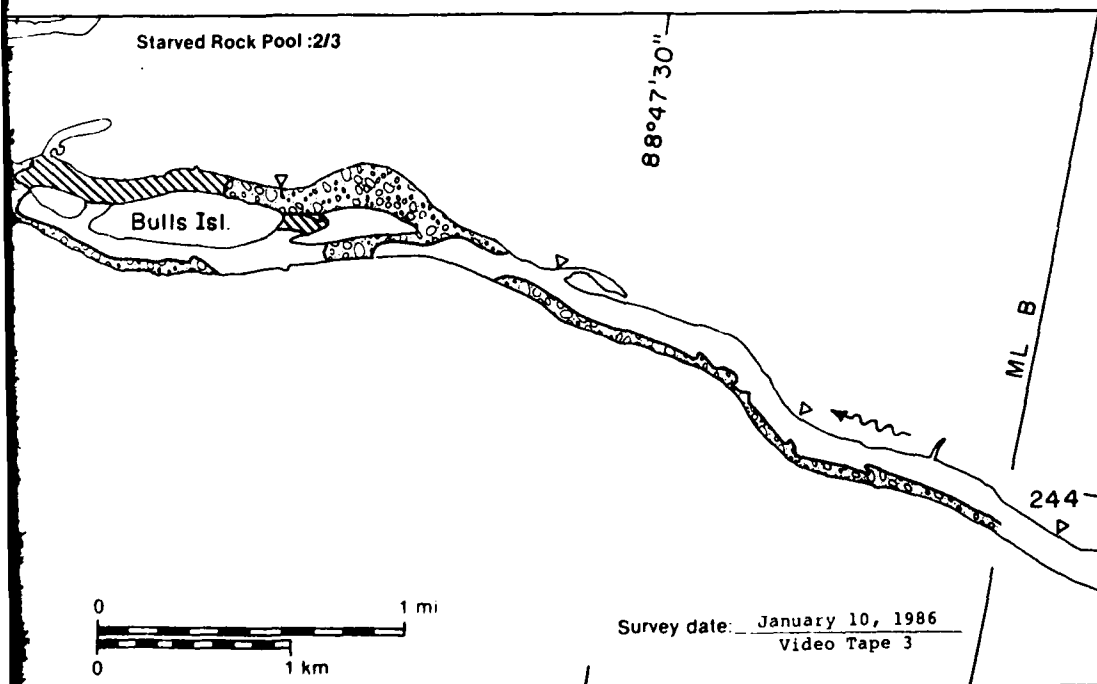
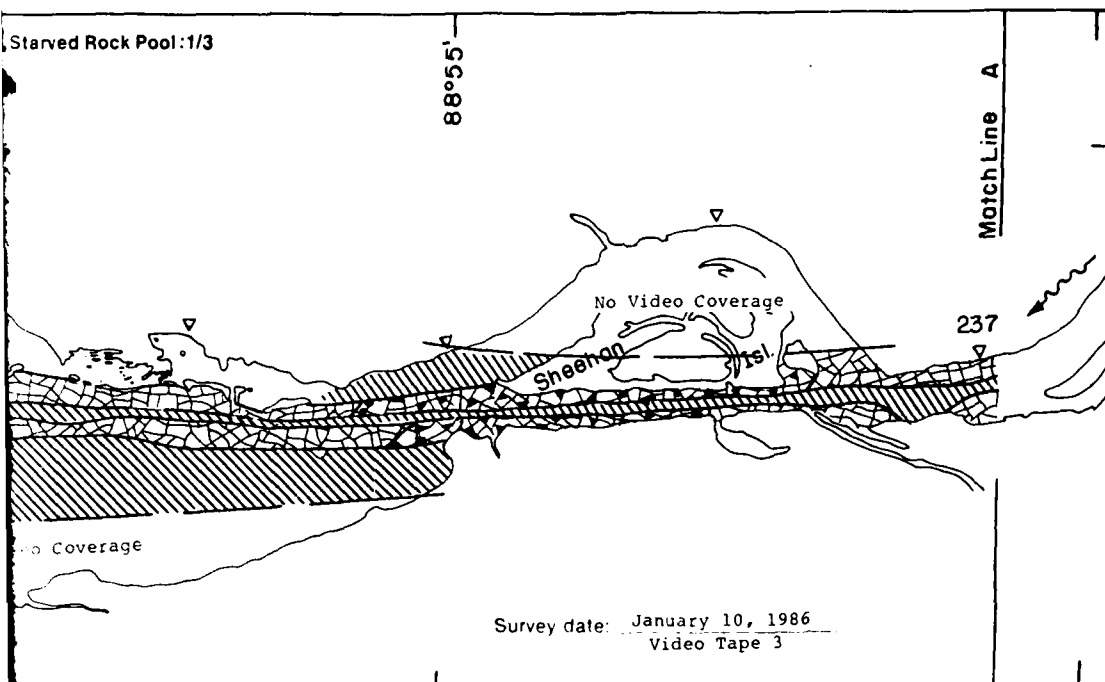
81.33*

* Includes $21.06 \times 10^6 m^2$
of no video coverage





10 January 1986



41°20'

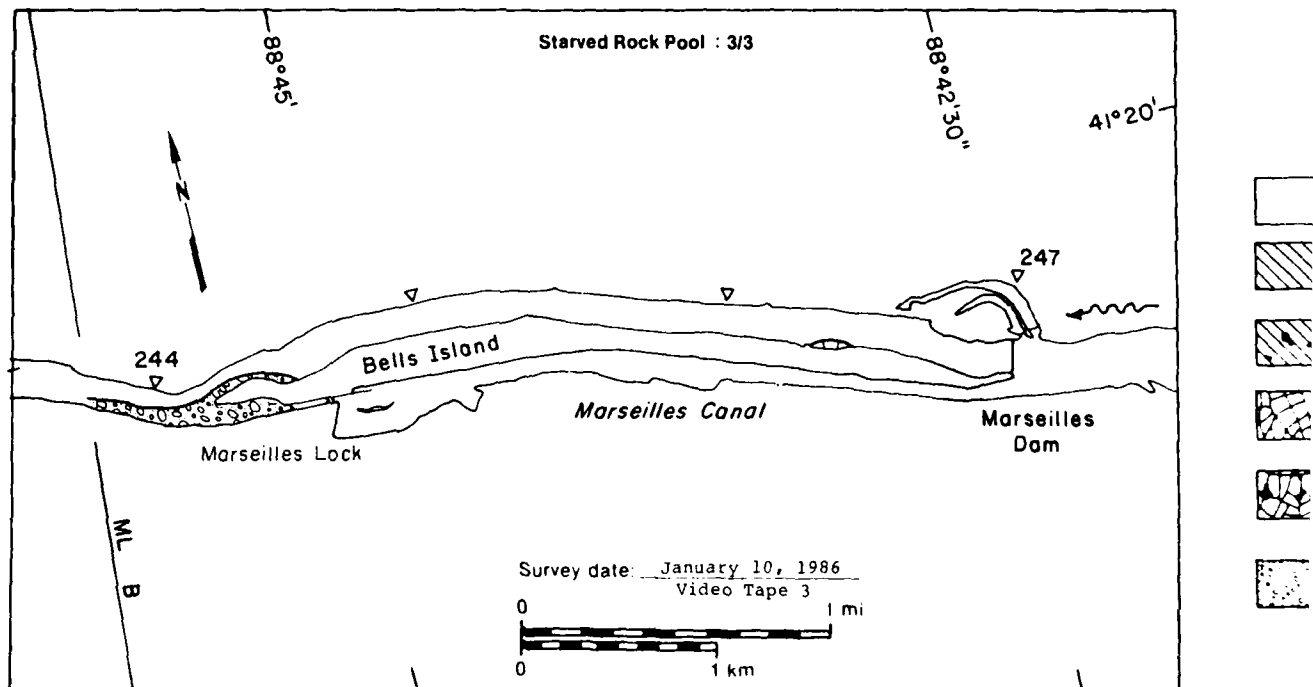
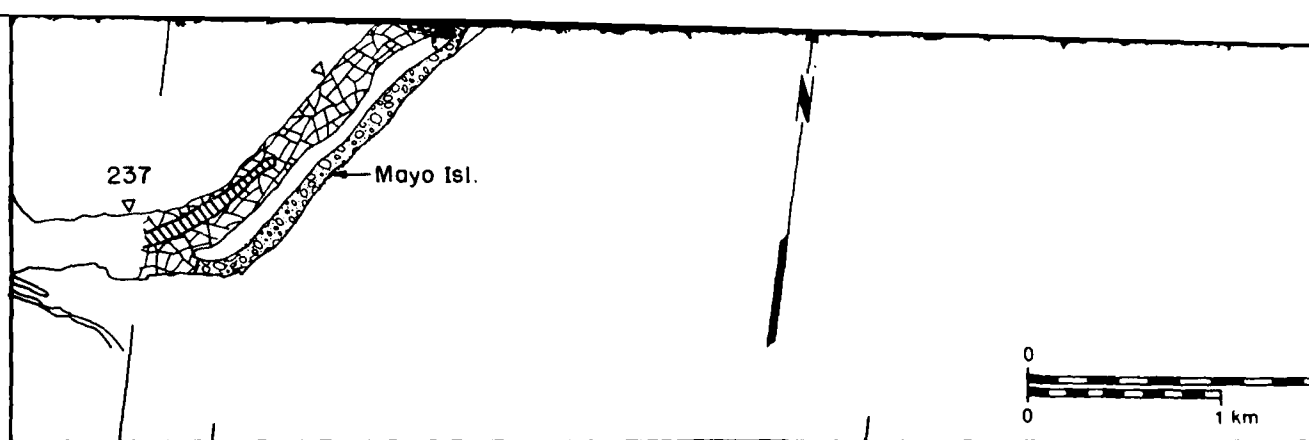
Starved Rock Pool

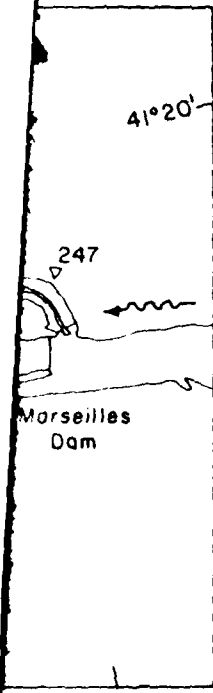
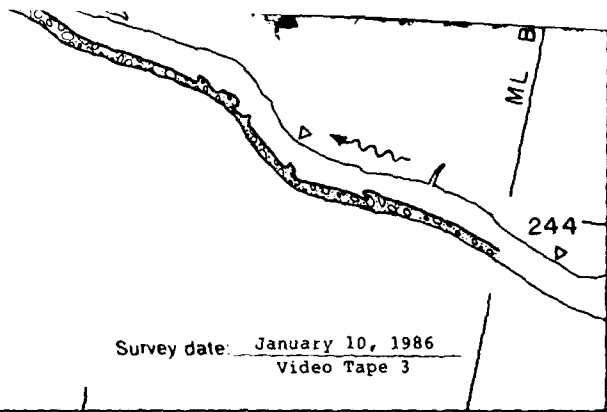
MAP UNITS

Area
(m² x 10⁶)

Surface
concentration
(%)

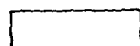
Open water 1.73



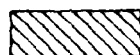


Starved Rock Pori

MAP UNITS



Open water



Solid ice cover



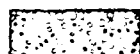
Solid ice cover with open-water areas



Fragmented ice cover



Fragmented ice cover with open-water areas



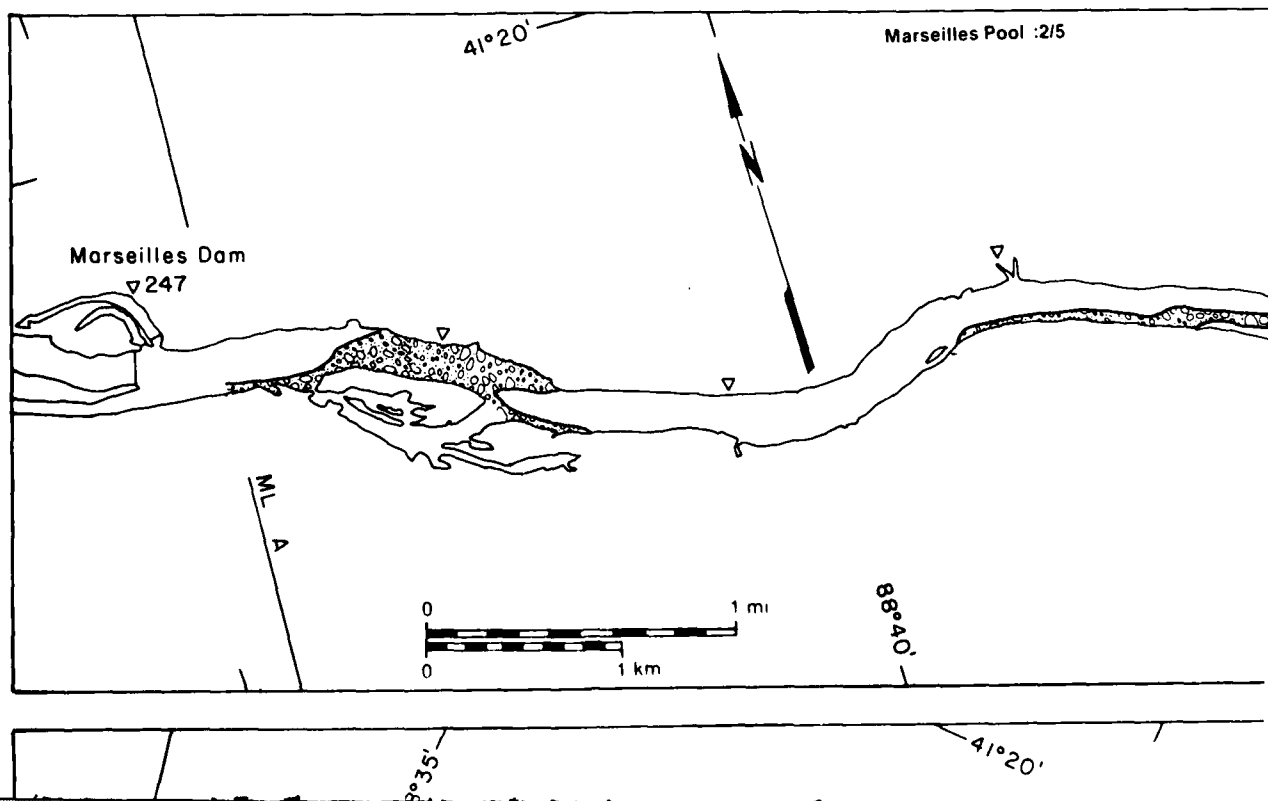
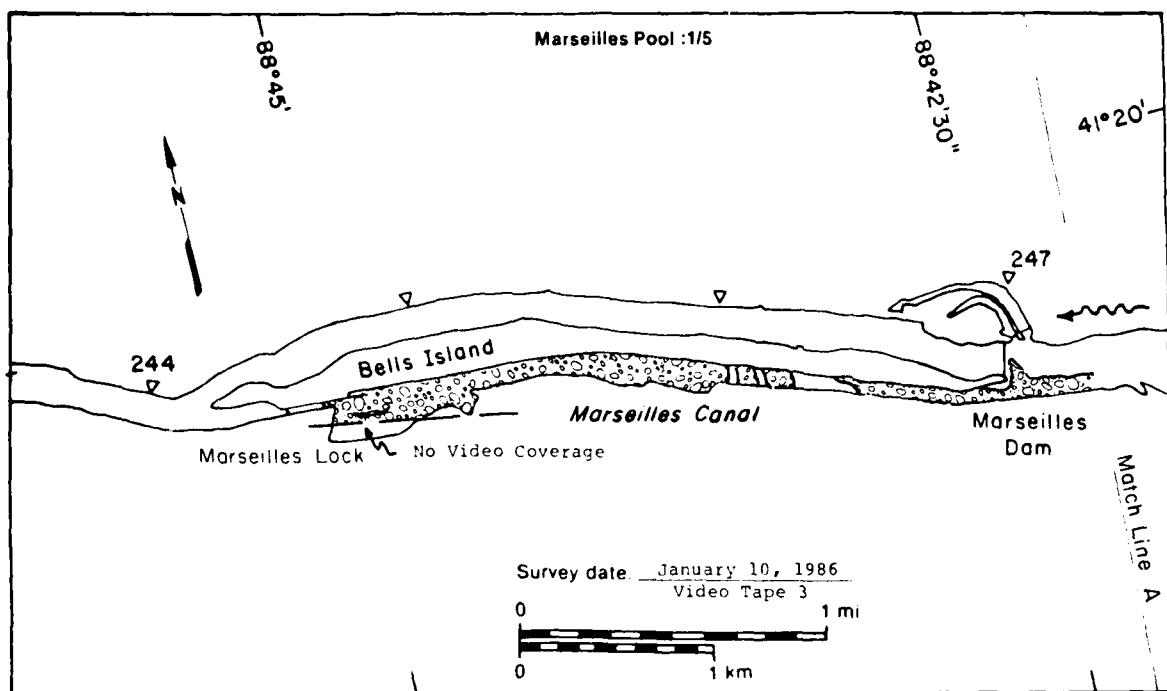
Ice floes or frazil slush and pans

Total area ($m^2 \times 10^6$)

Area ($m^2 \times 10^6$)	Surface concentration (%)
1.73	NA
3.28	NA
0.00	—
1.65	NA
0.31	90
1.65	60
10.19*	

* Includes $1.57 \times 10^6 m^2$ of no video coverage

10 January 1986



20'

Match Line A

88°37'30"

ML B

253

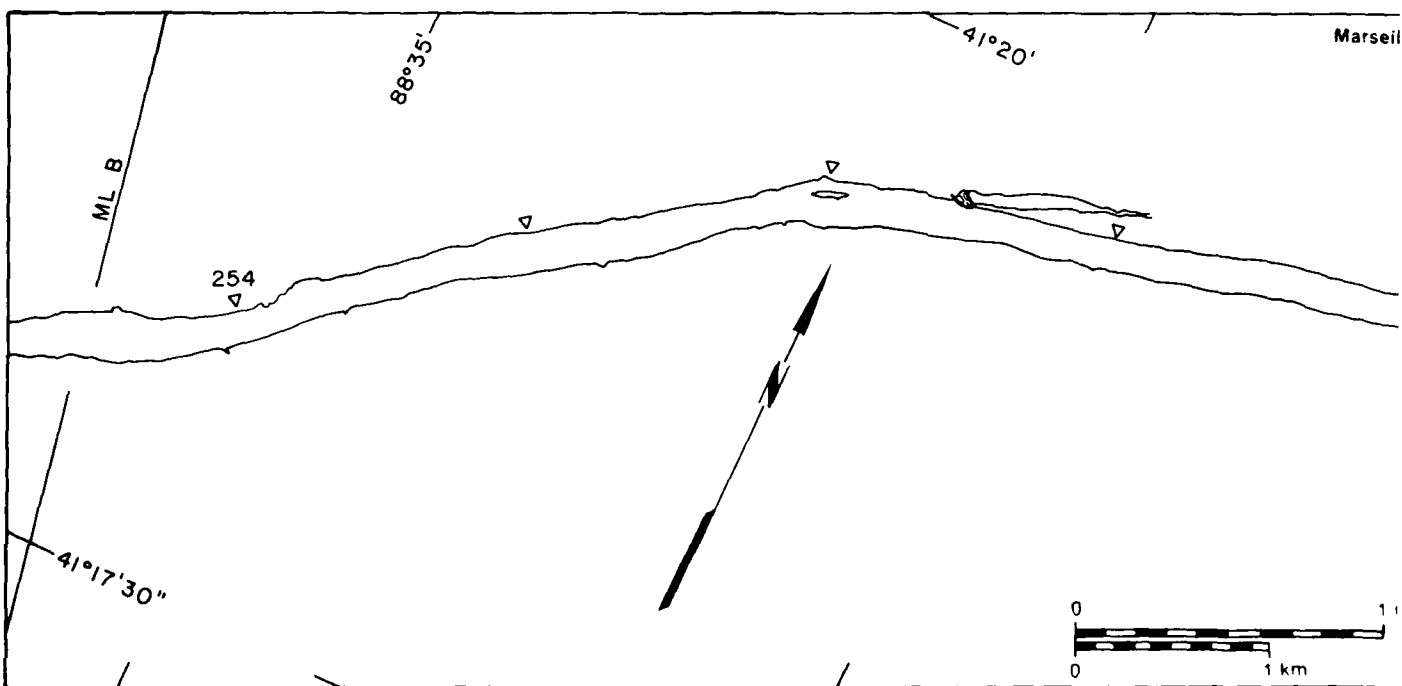
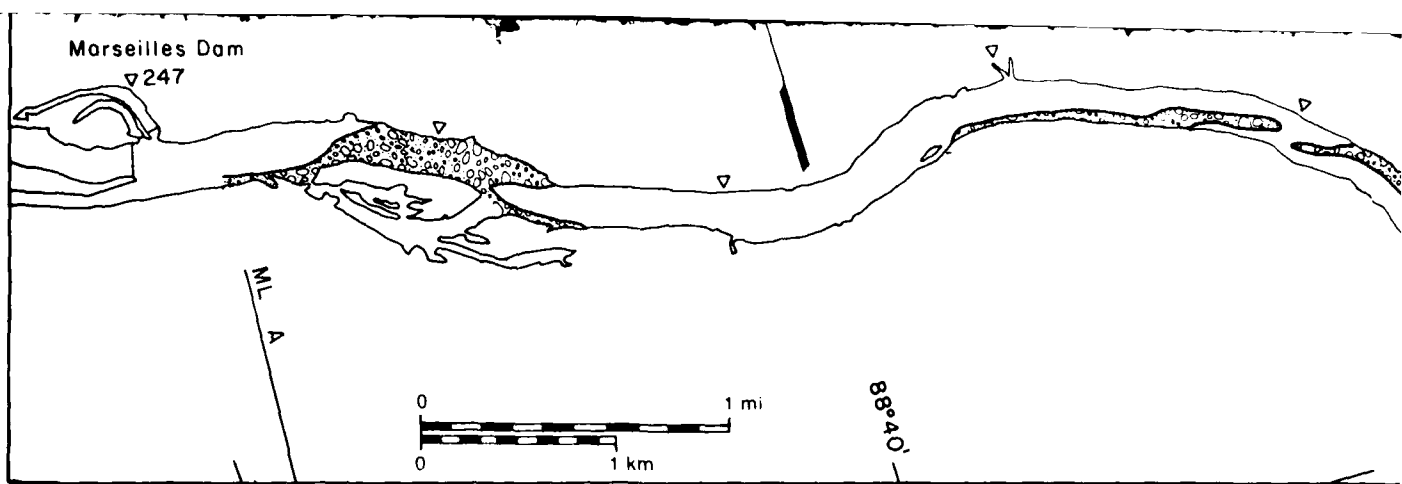
41°17'30"

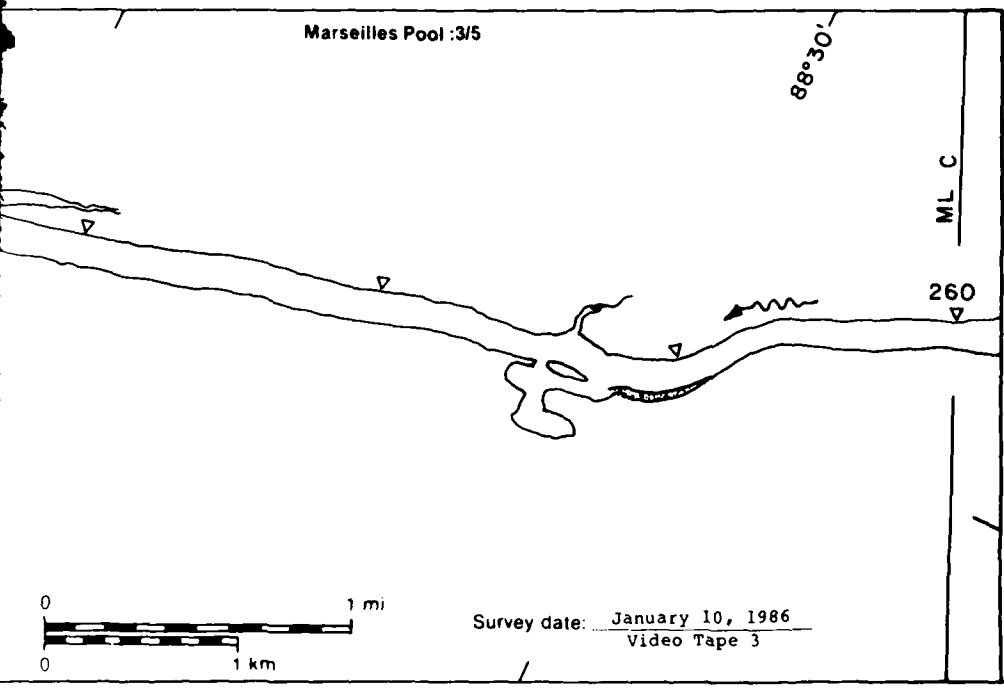
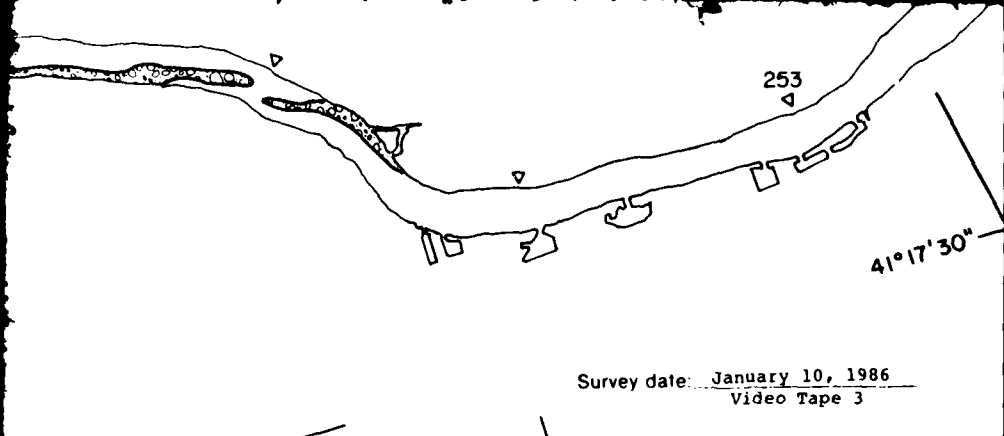
Survey date: January 10, 1986
Video Tape 3

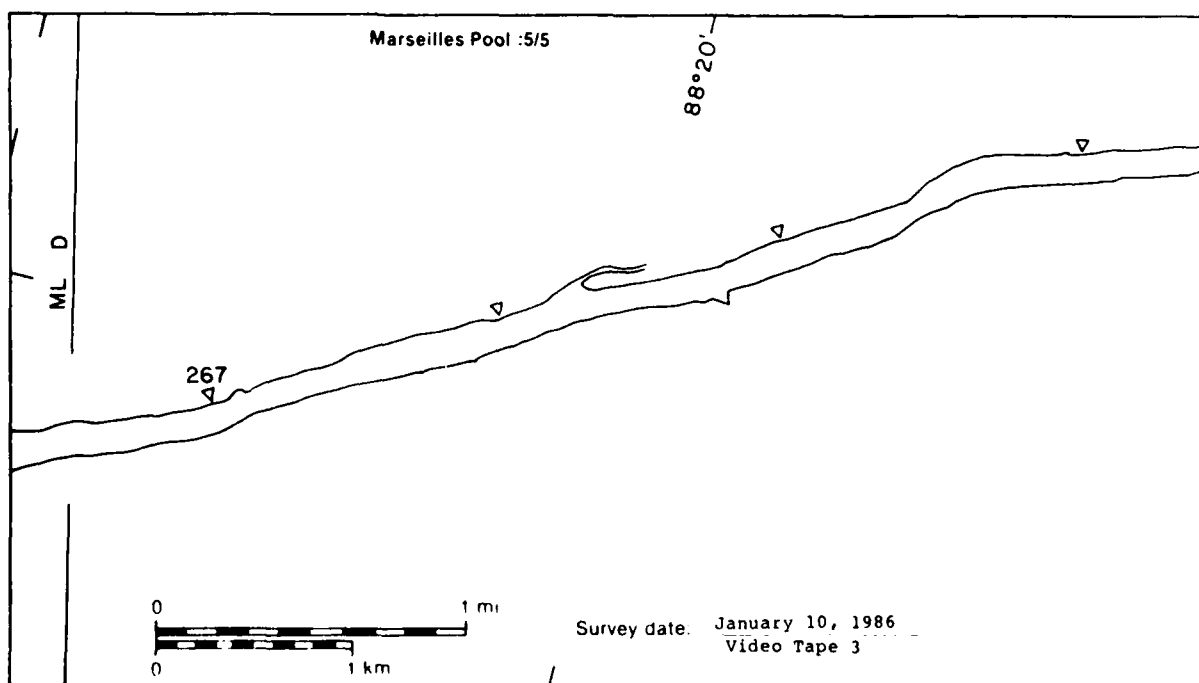
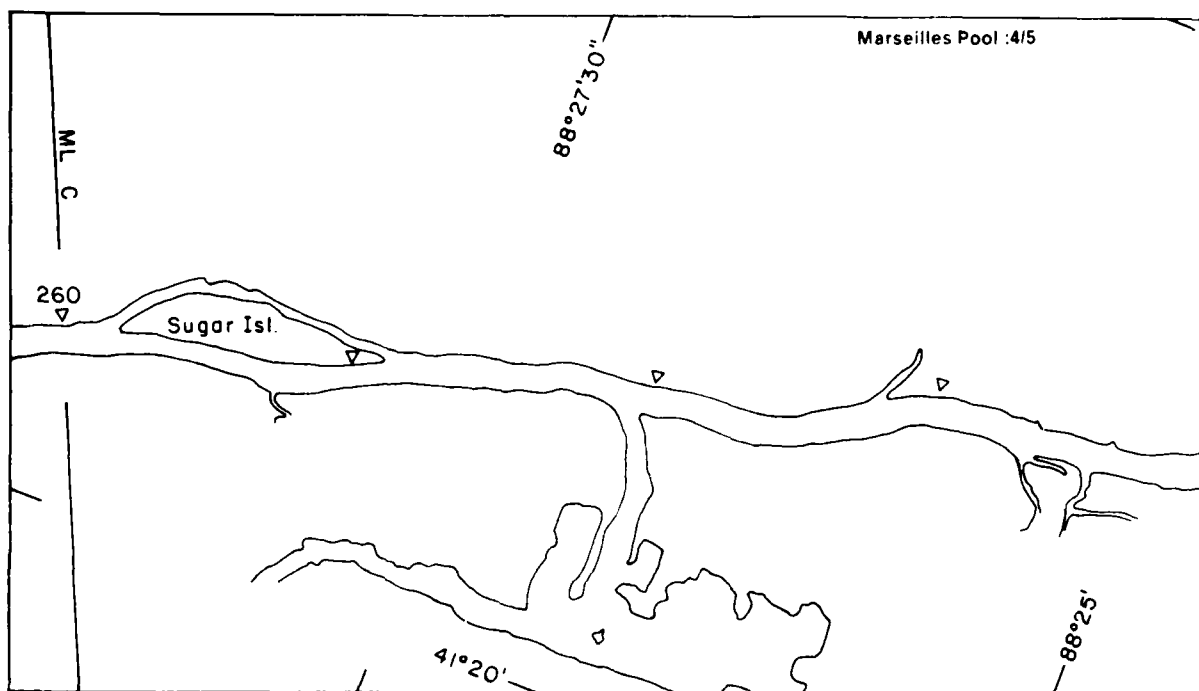
Marseilles Pool :3/5

88°30'

ML C

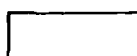






Marseilles Pool

MAP UNITS



Open water

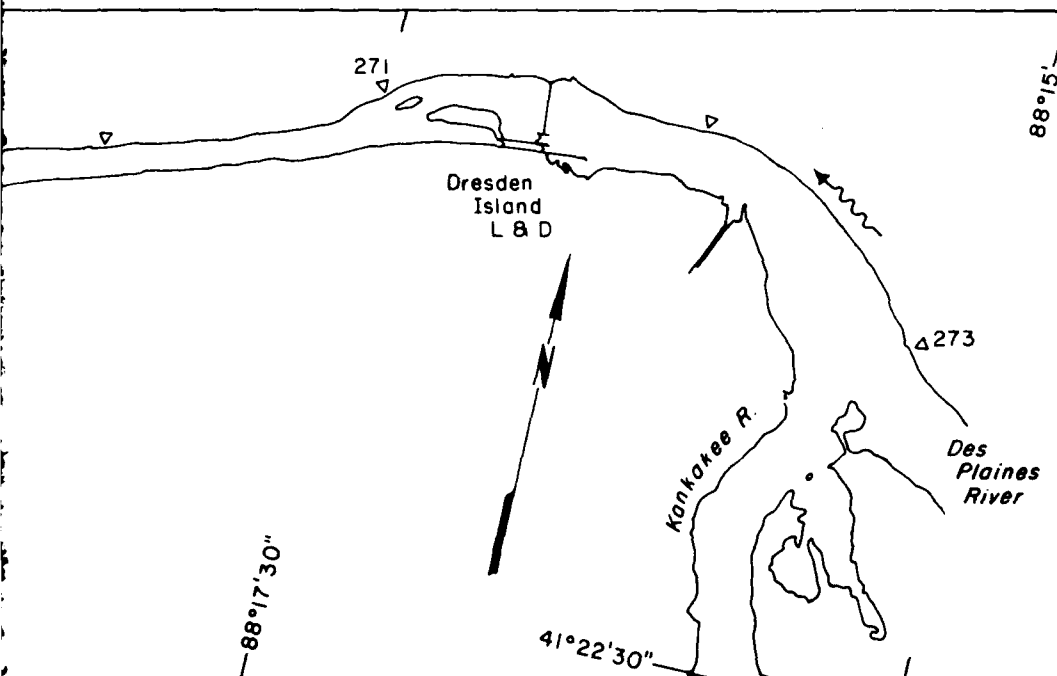
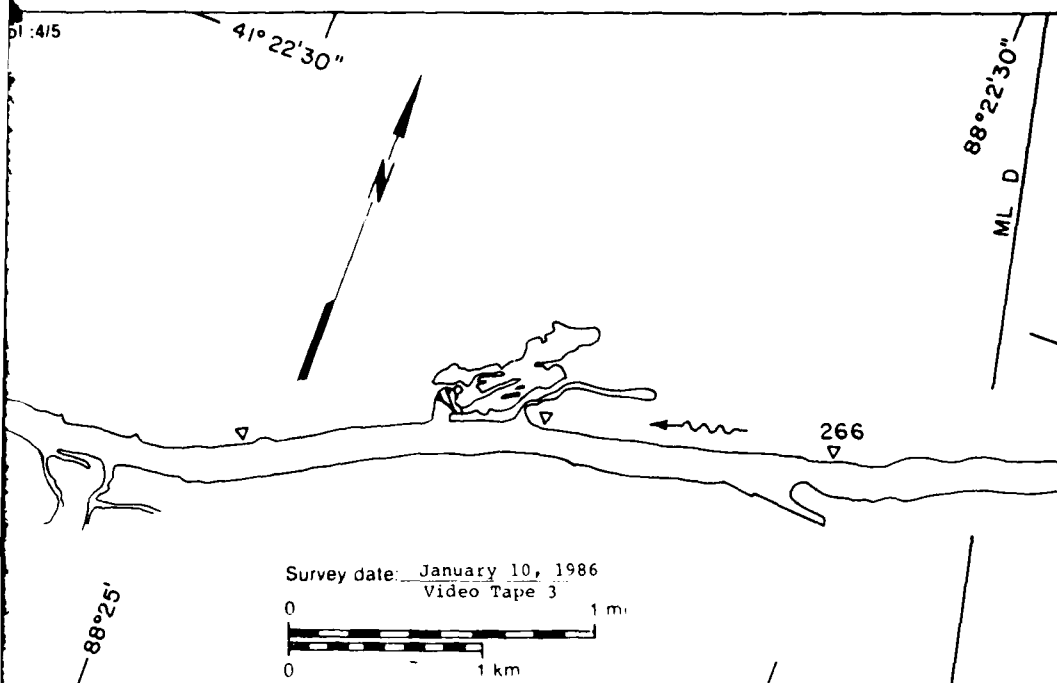
Area
(m² x 10⁶)

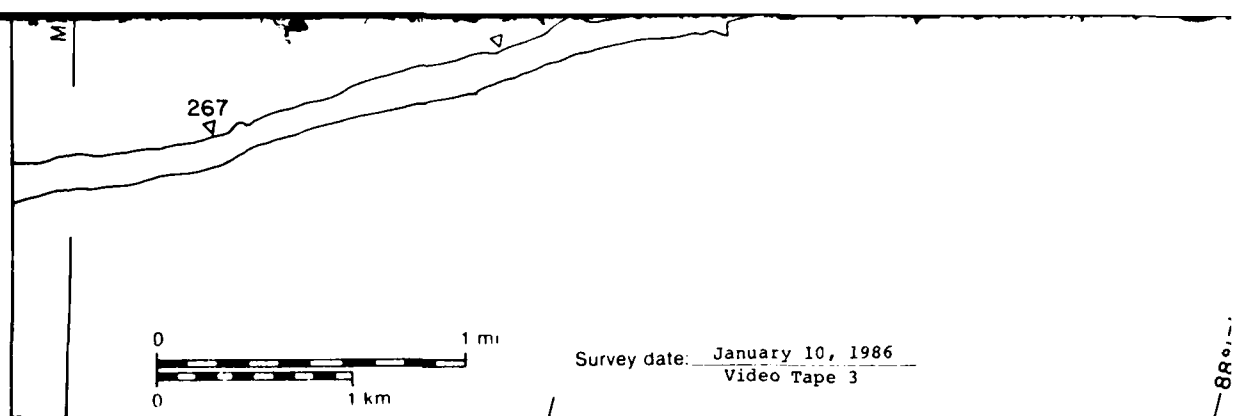
7.30

Surface
concentration
(‰)

NA

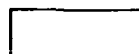
10 January 1986





Marseilles Pool

MAP UNITS



Open water



Solid ice cover



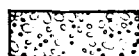
Solid ice cover with open-water areas



Fragmented ice cover



Fragmented ice cover with open-water areas



Ice floes or frazil slush and pans

Total area ($m^2 \times 10^6$)

Area ($m^2 \times 10^6$)	Surface concentration (%)
7.30	NA
Trace	NA
0.00	—
0.00	NA
0.00	—
0.84	60
8.19*	

* Includes $0.05 \times 10^6 m^2$ of no video coverage

88°17'30"

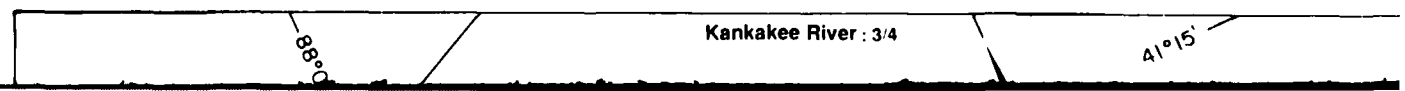
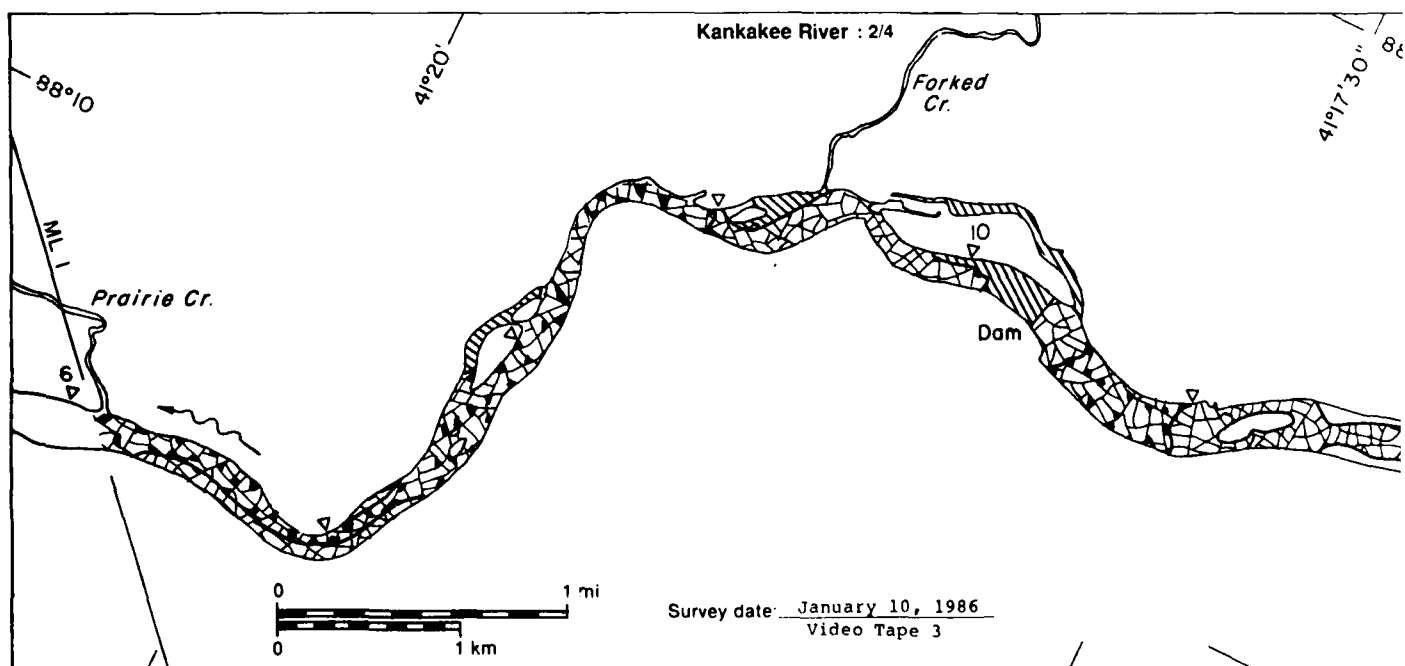
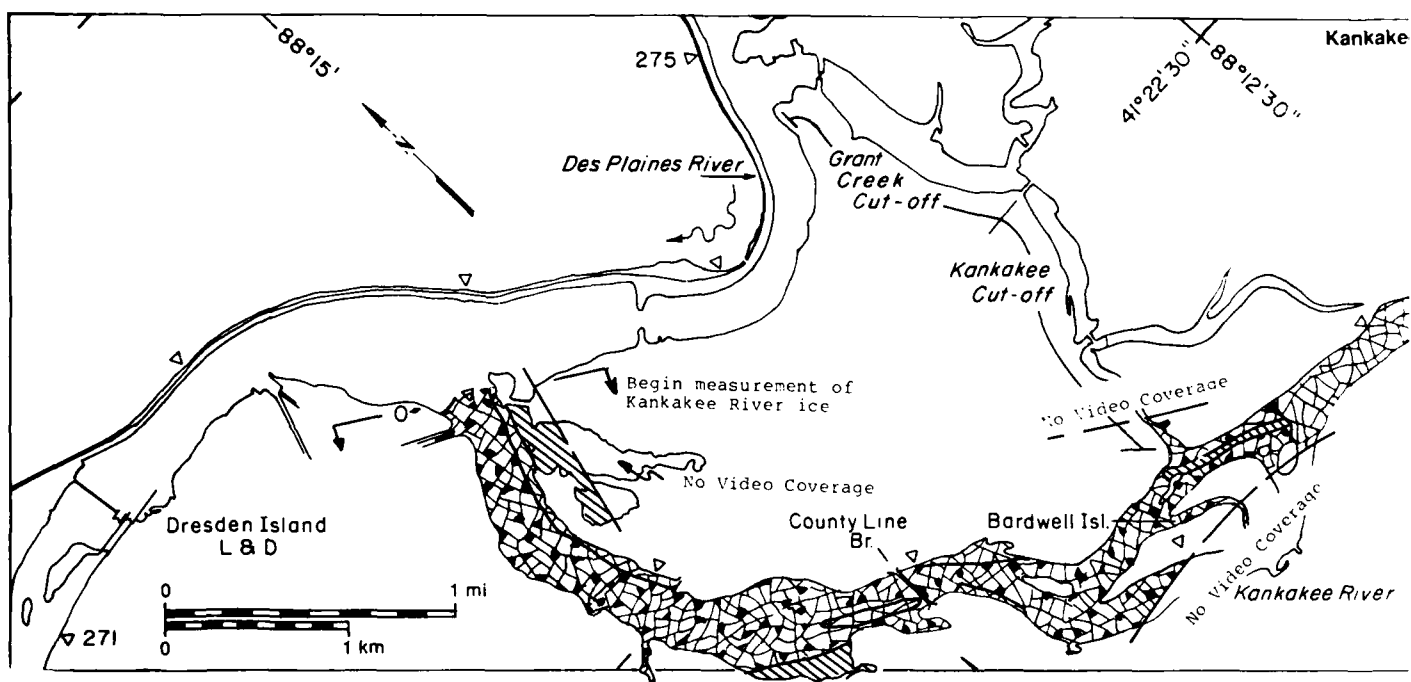
41°22'30"

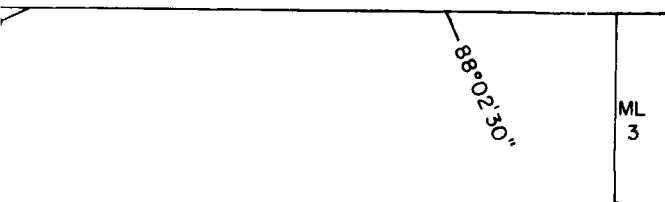
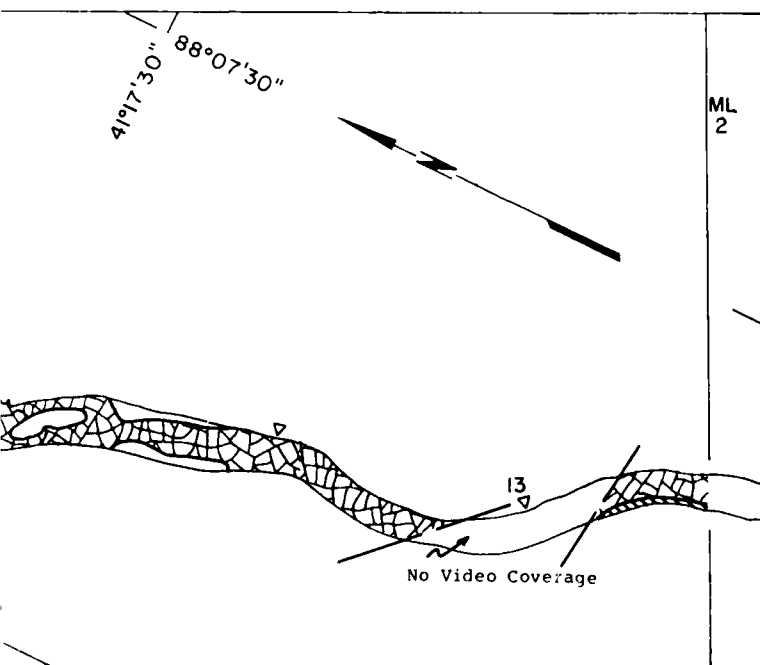
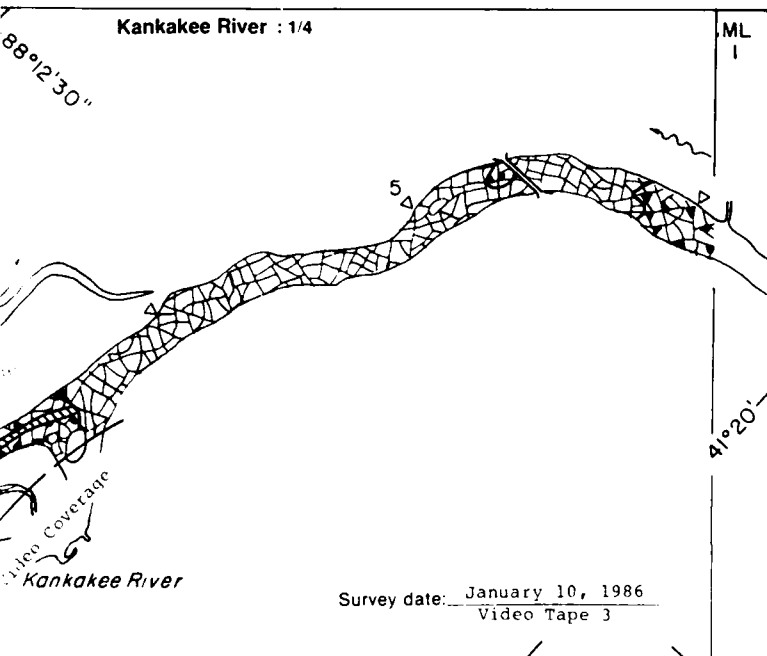
Kankakee R.

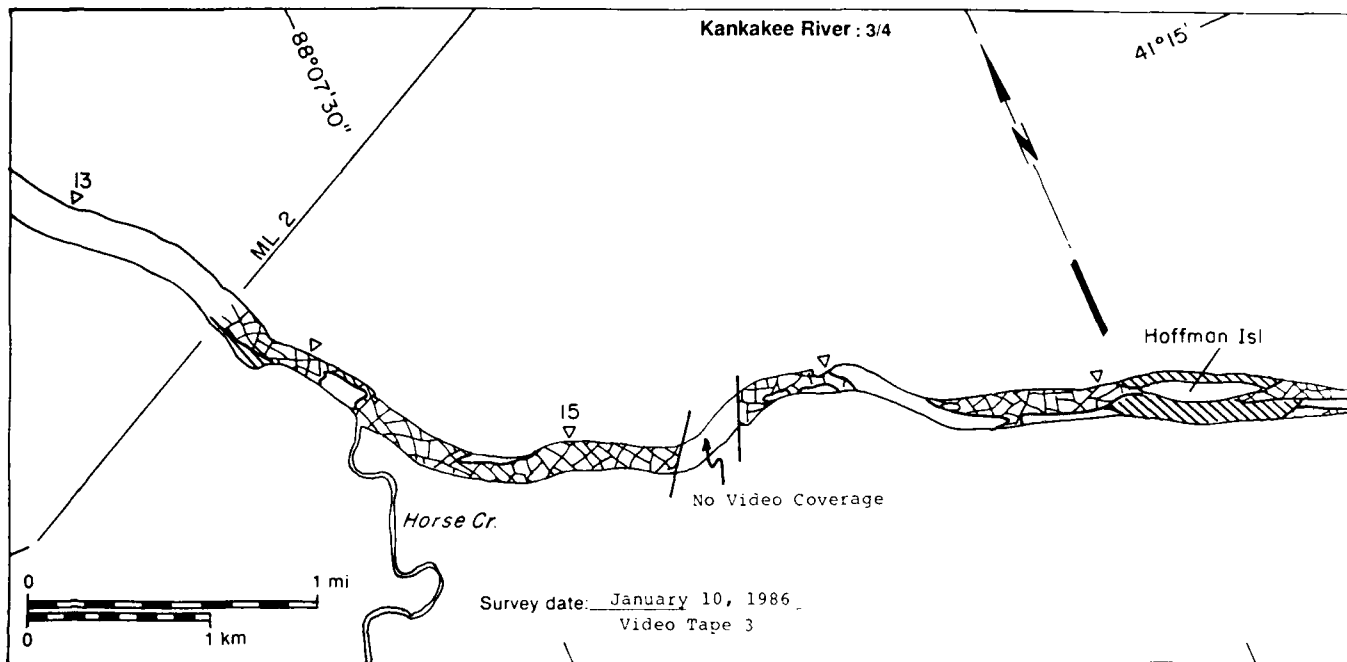
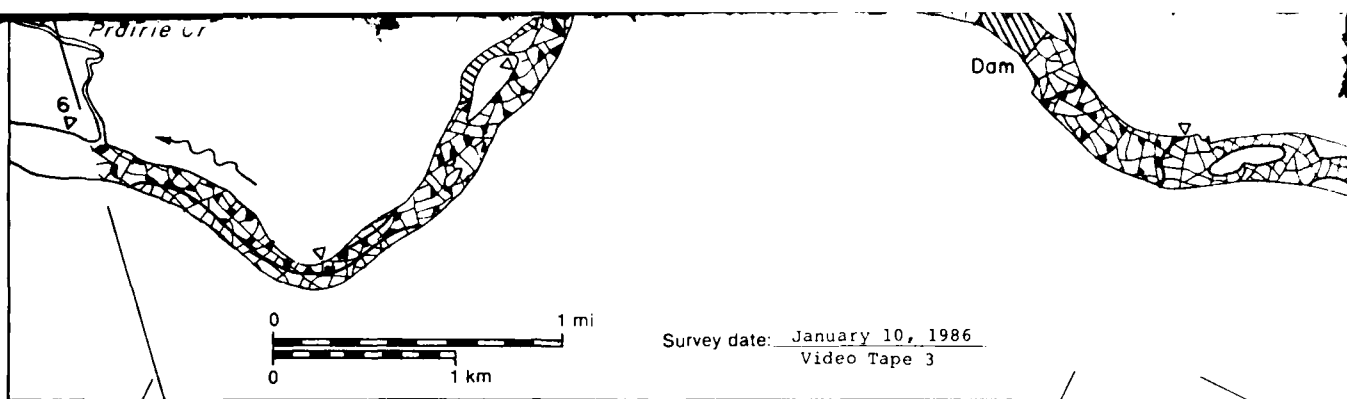
Δ273

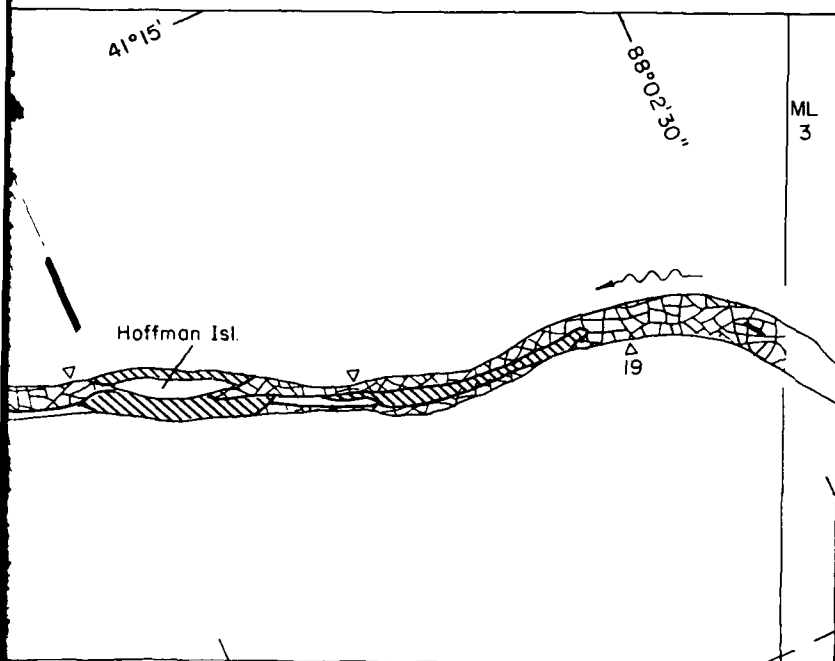
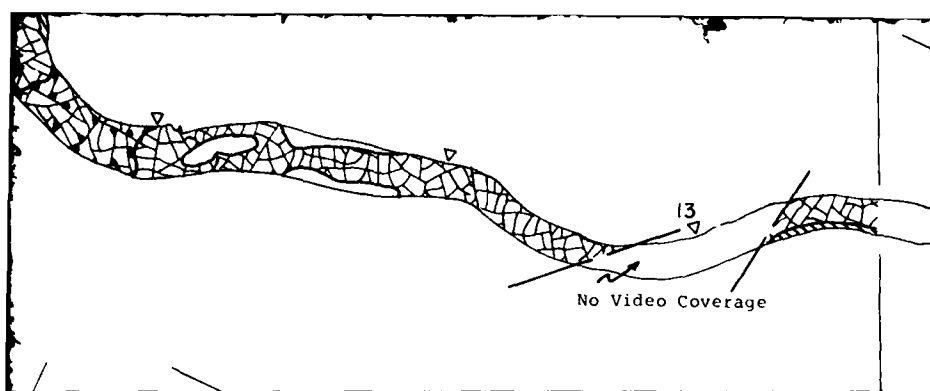
Des
Plaines
River

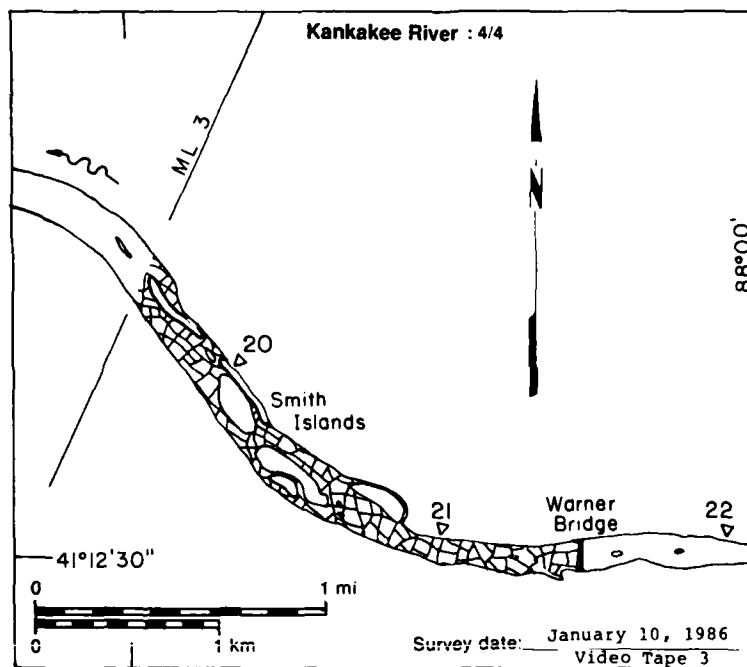
10 January 1986





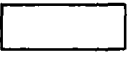



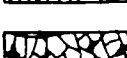
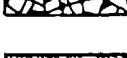






Kankakee River

MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cov
	Fragmented ice cov with open-water are
	Ice floes or frazil sl and pans

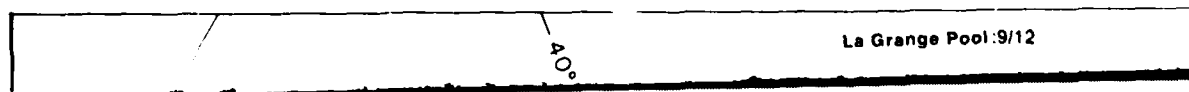
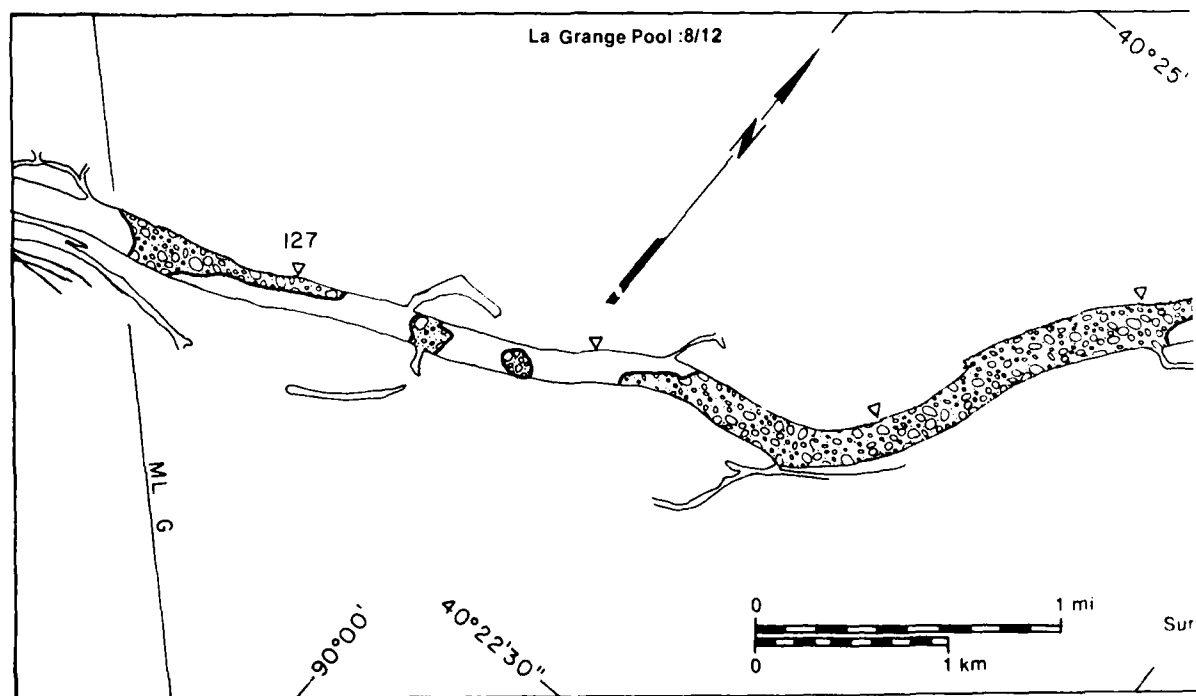
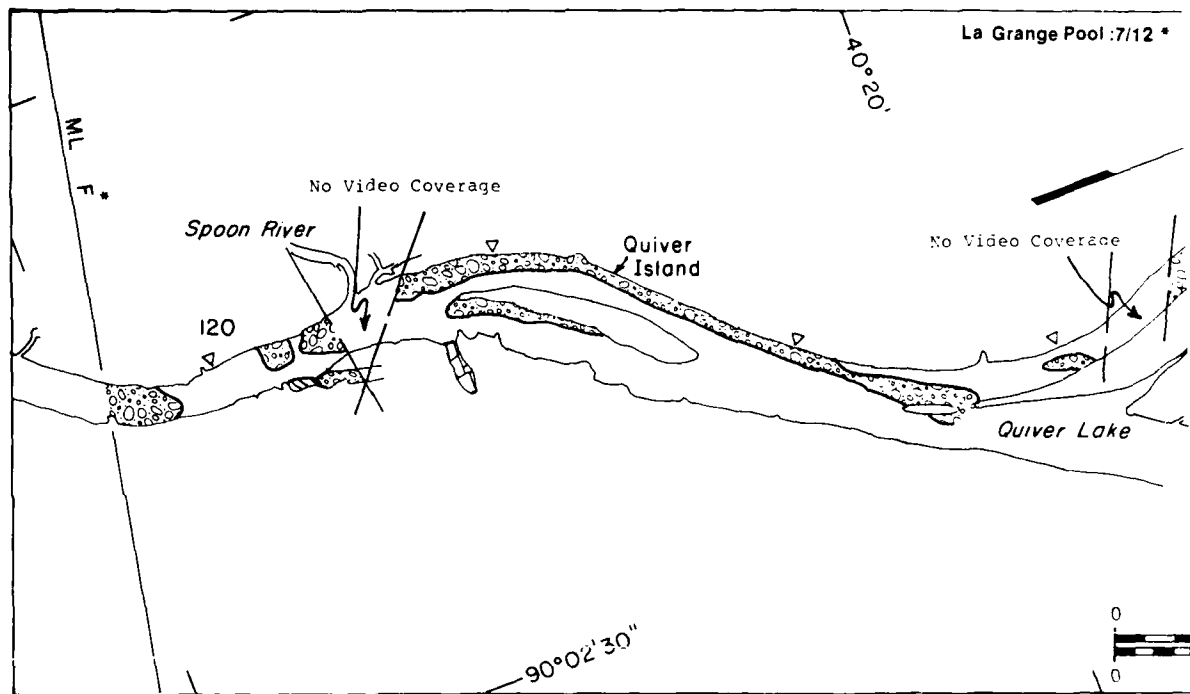
Total area (m²)

10 January 1986

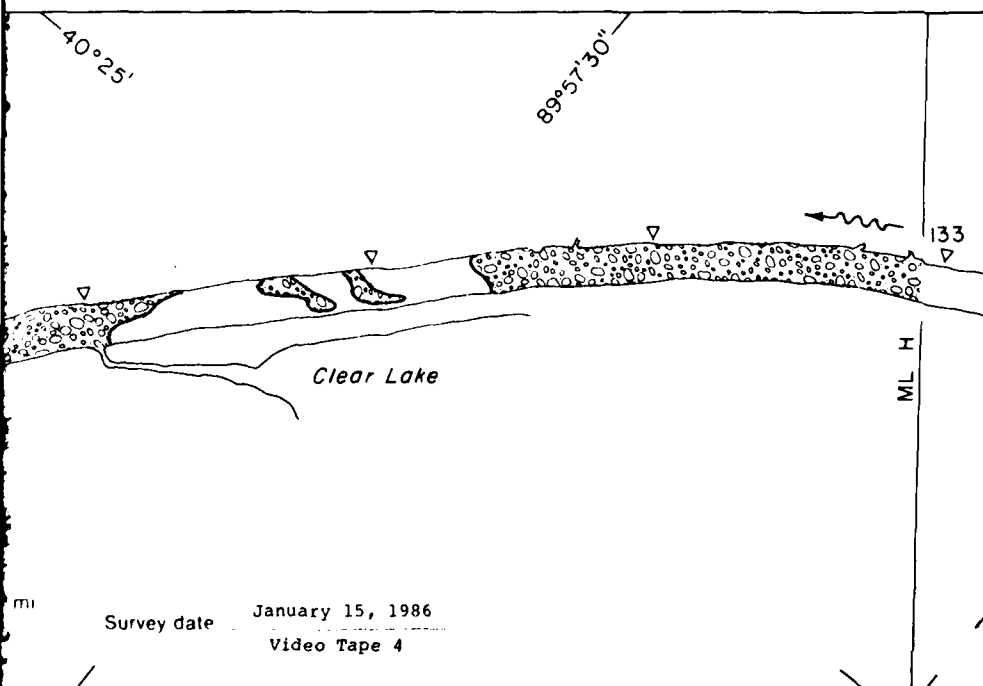
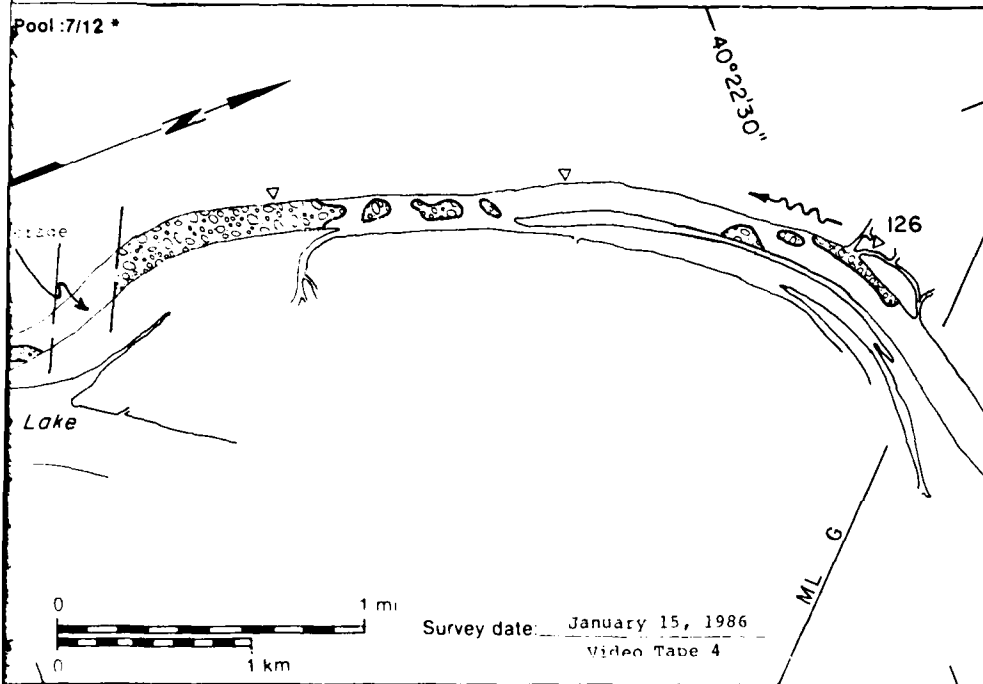
	Area ($\text{m}^2 \times 10^6$)	Surface concentration (%)
	0.24	NA
	0.75	NA
er with reas	0.00	—
ice cover	3.37	NA
ice cover er areas	2.38	80
razil slush	0.00	—
($\text{m}^2 \times 10^6$)	7.30*	

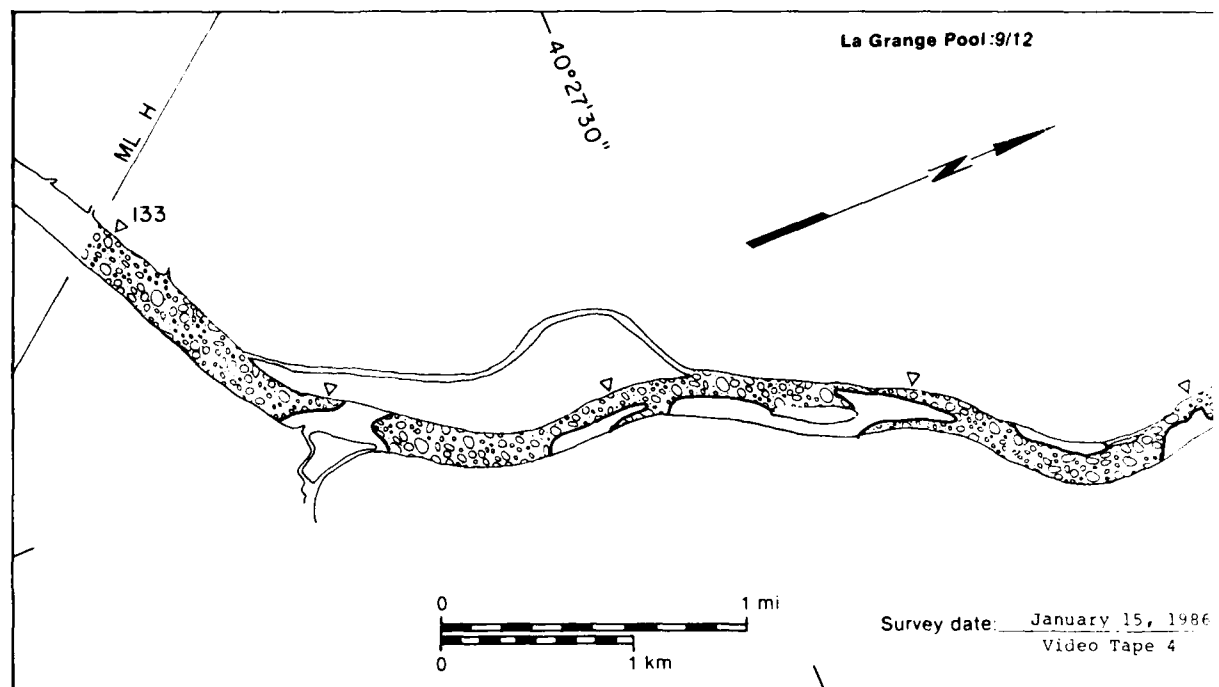
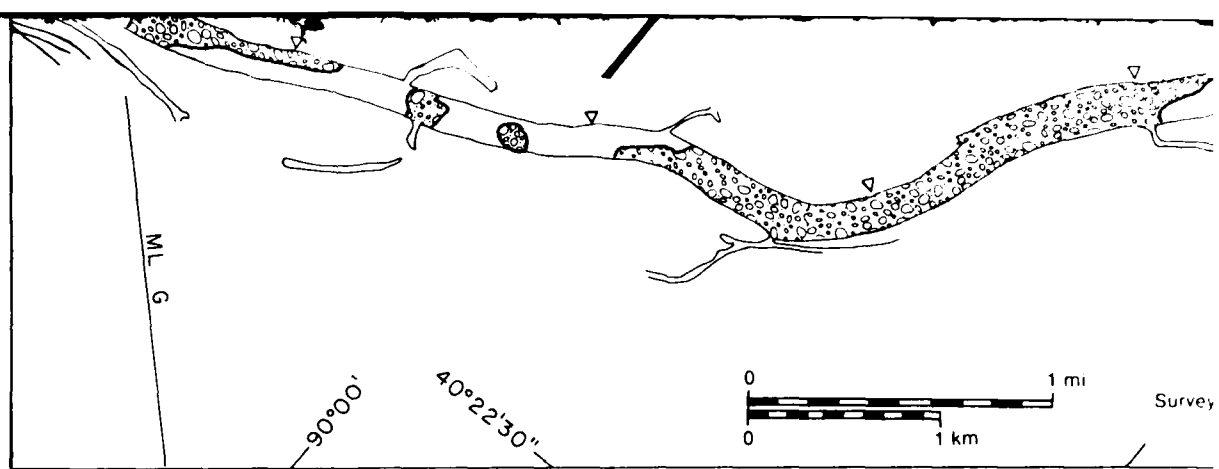
* Includes $0.56 \times 10^6 \text{ m}^2$
of no video coverage

H



15 January 1986



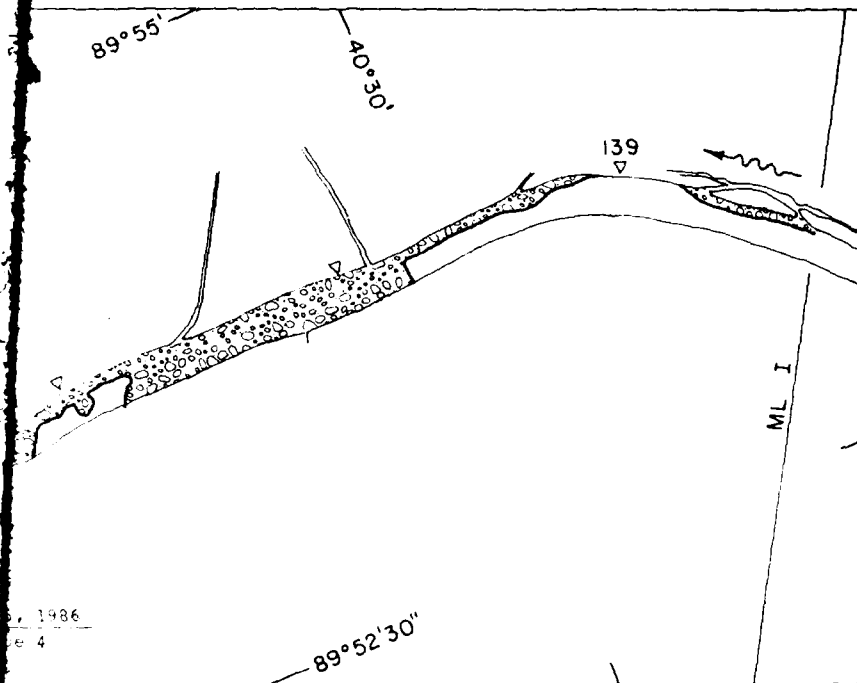


* The downstream limit of Illinois River video coverage was in the vicinity of mile 120 at Havana, Illinois, on all dates. There is no coverage of La Grange Pool maps 1/12 through 6/12 (match lines A through E).

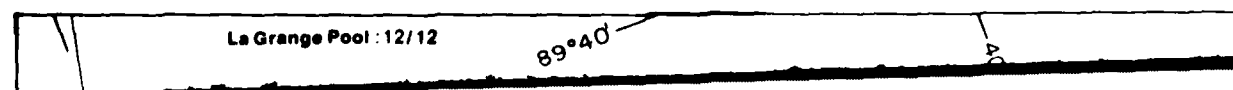
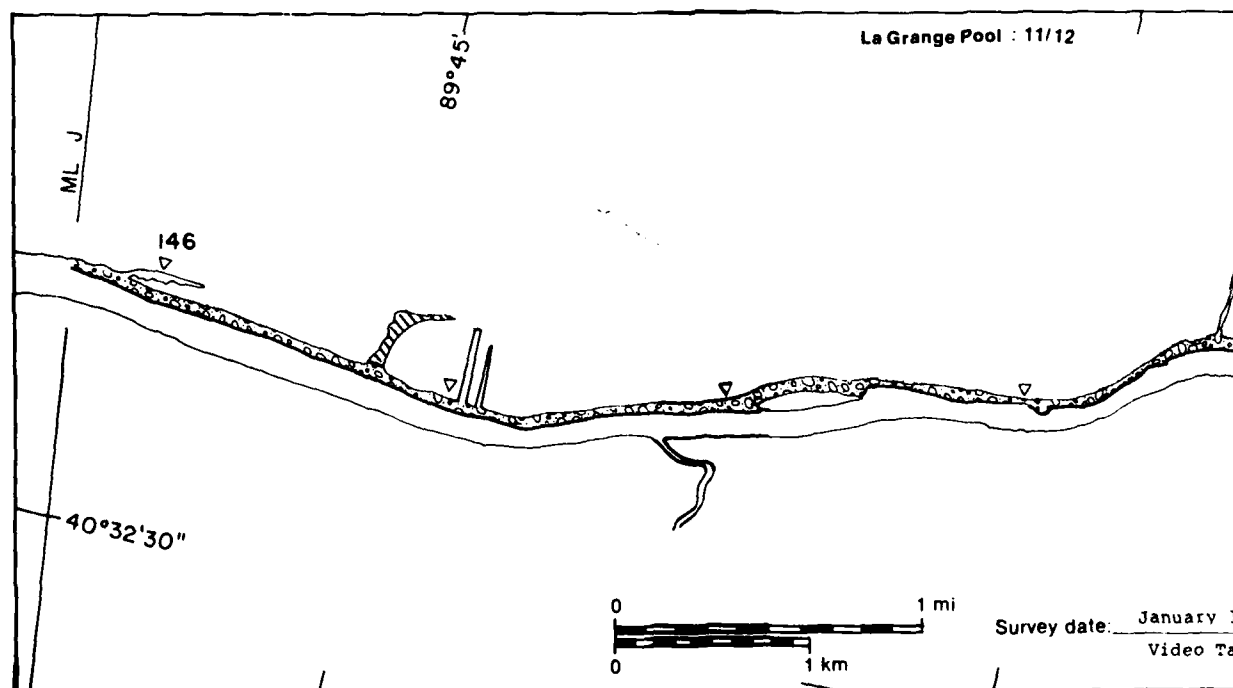
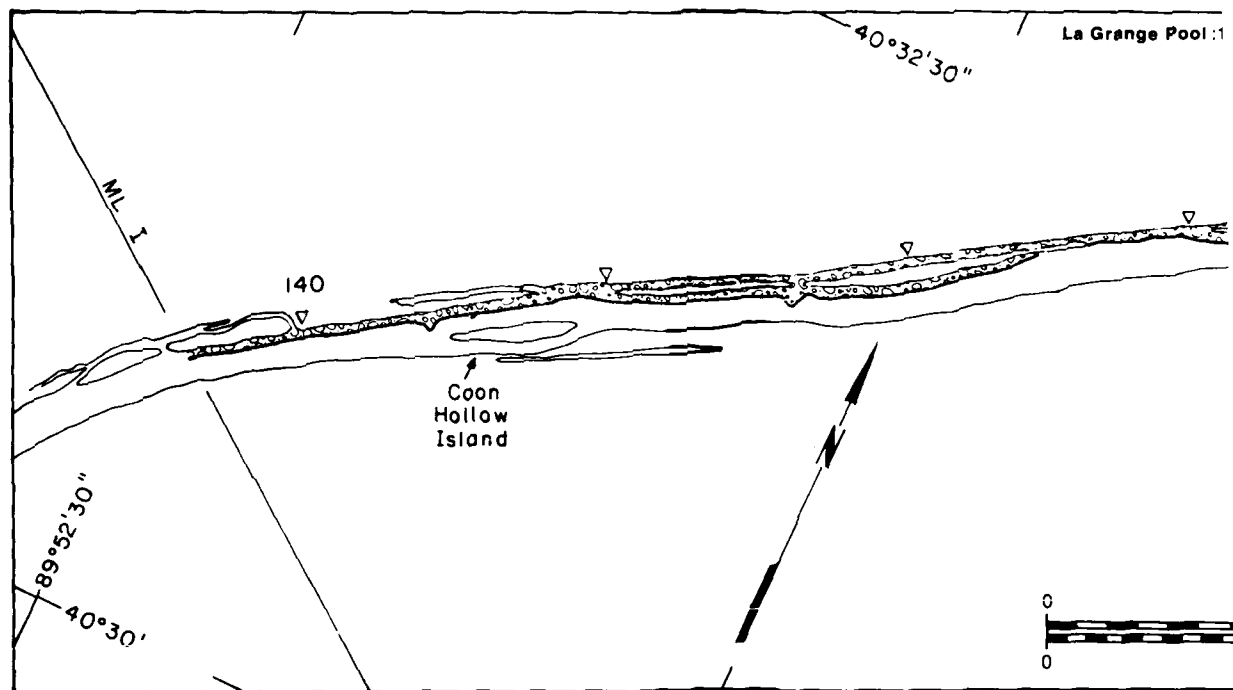
Clear Lake

ML H

Survey date January 15, 1986
Video Tape 4



15 January 1986



La Grange Pool:10/12

89°47'30"

ML J

145



Survey date: January 15, 1986
Video Tape 4

11/12

40°35'

ML K

153

Survey date: January 15, 1986
Video Tape 4

89°40'

La Grange Pool

MAP UNITS

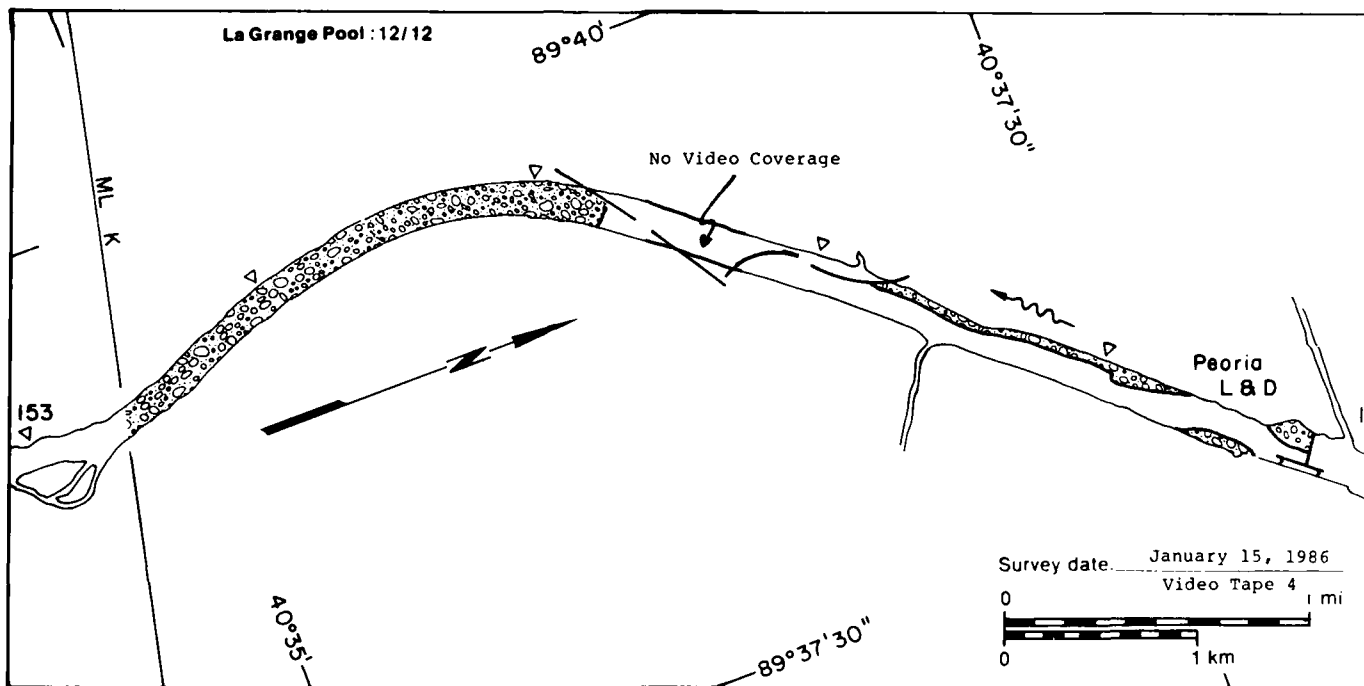
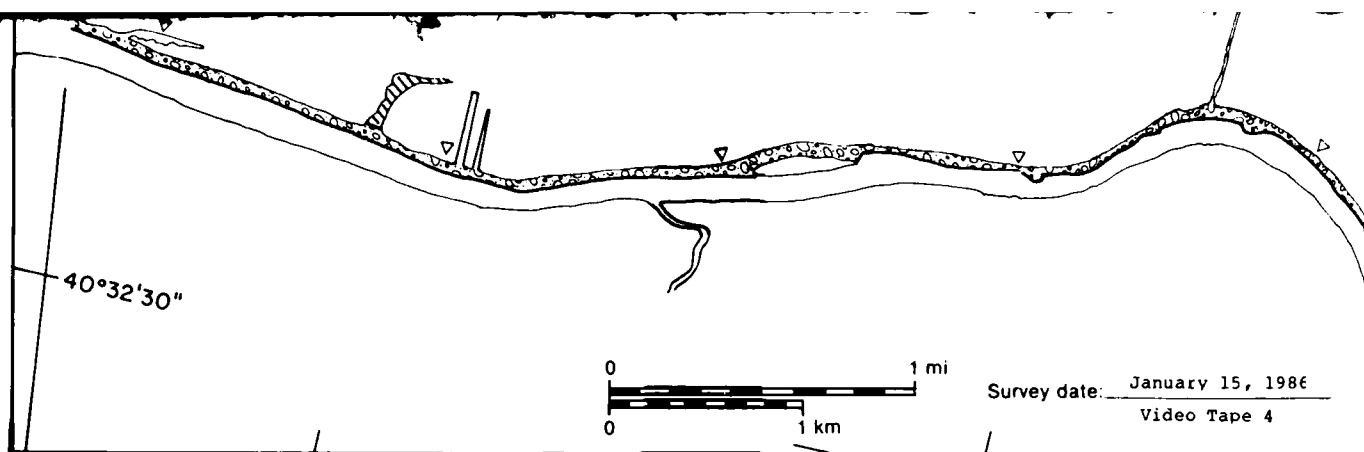
Area
(m² x 10⁶)

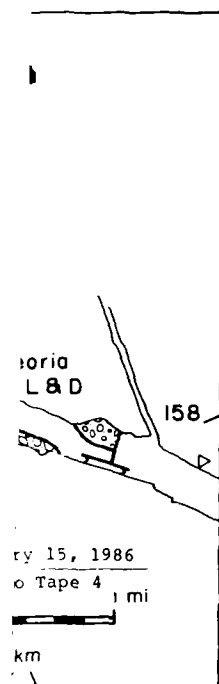
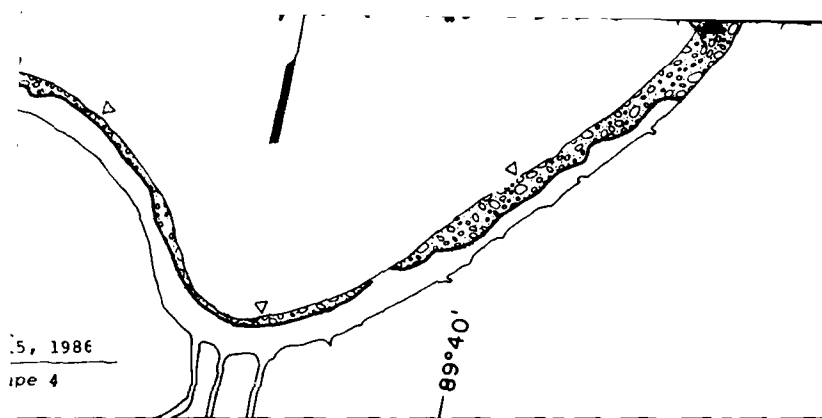
Surface
concentration
(%)

Open water

5.26

NA





La Grange Pool

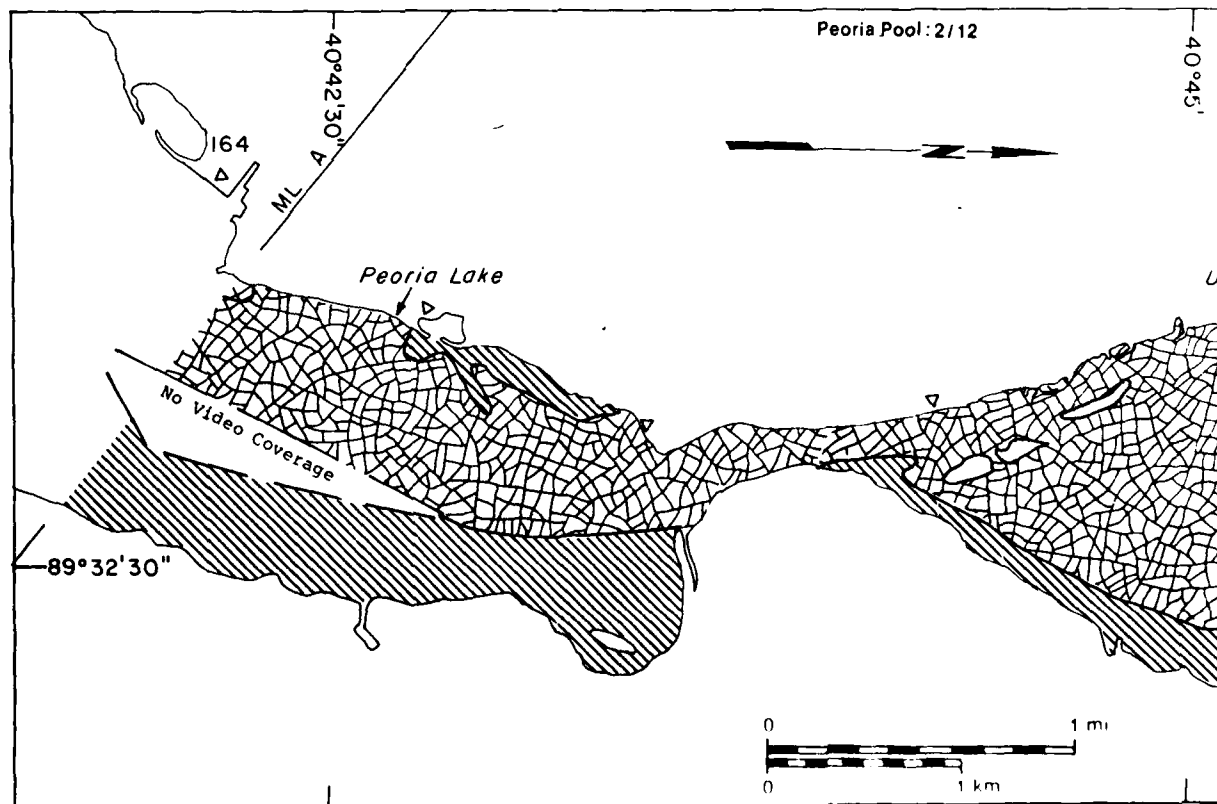
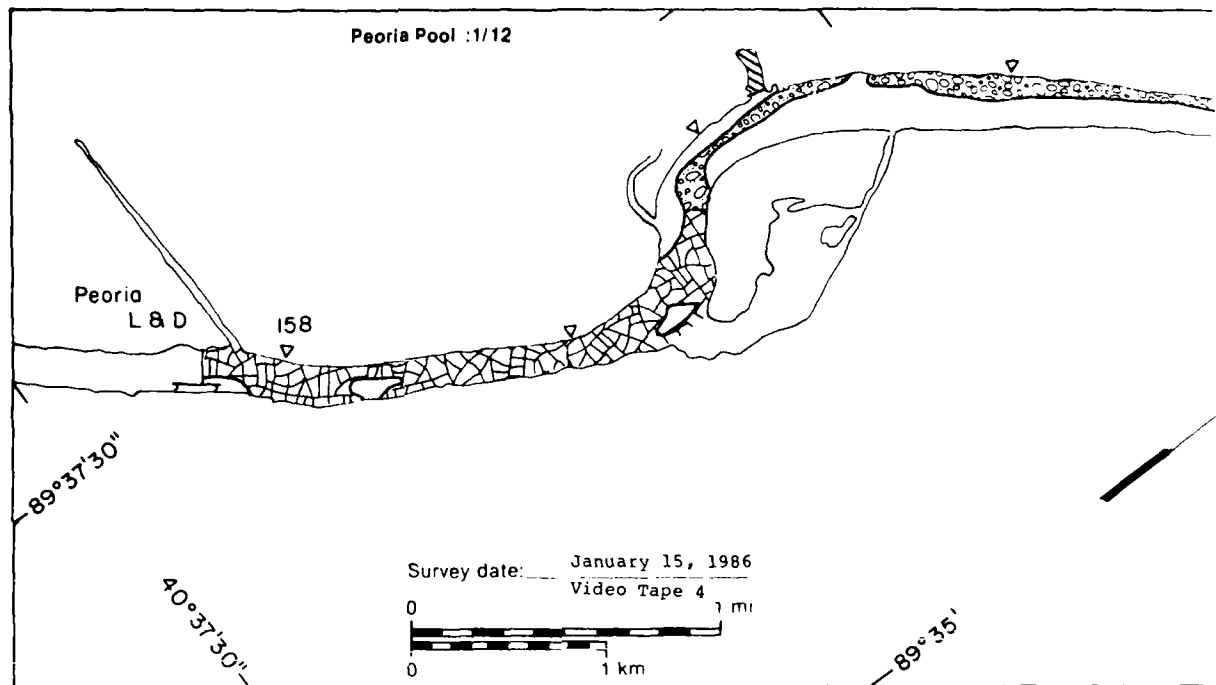
MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

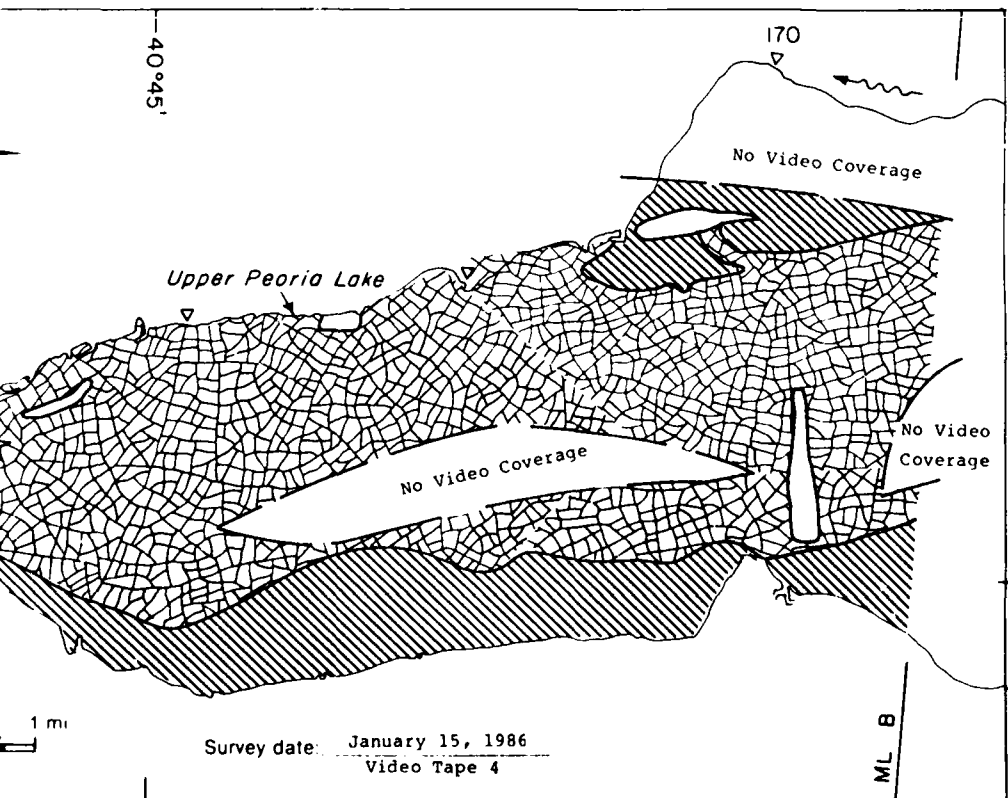
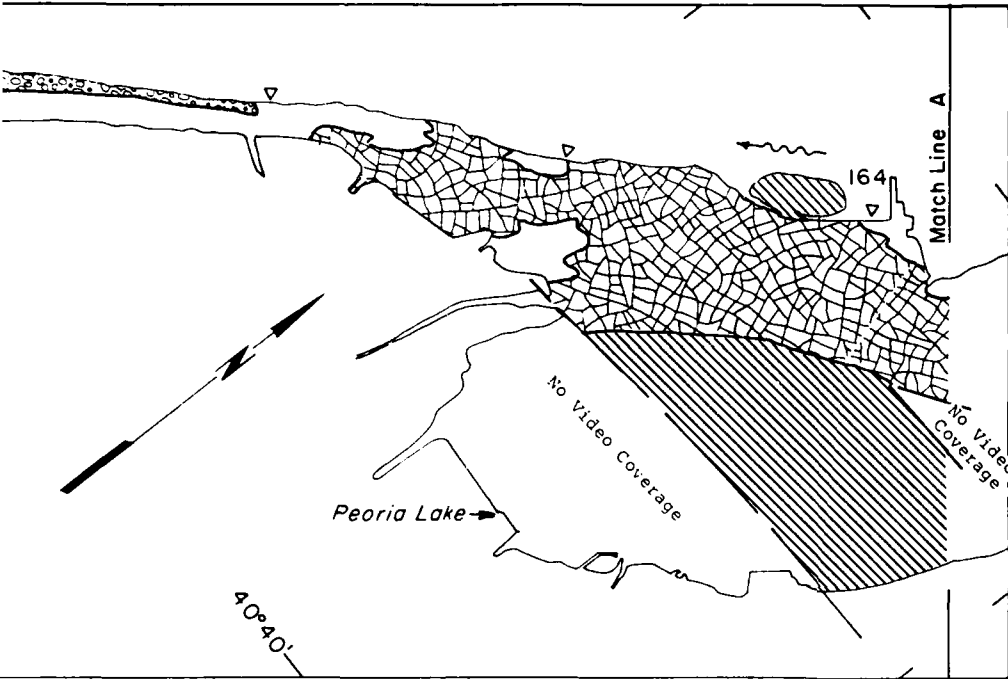
Total area ($m^2 \times 10^6$)

Area ($m^2 \times 10^6$)	Surface concentration (%)
5.26	NA
0.04	NA
0.00	—
0.04	NA
0.00	—
6.06	30
11.71*	

* Includes $0.31 \times 10^6 m^2$
of no video coverage

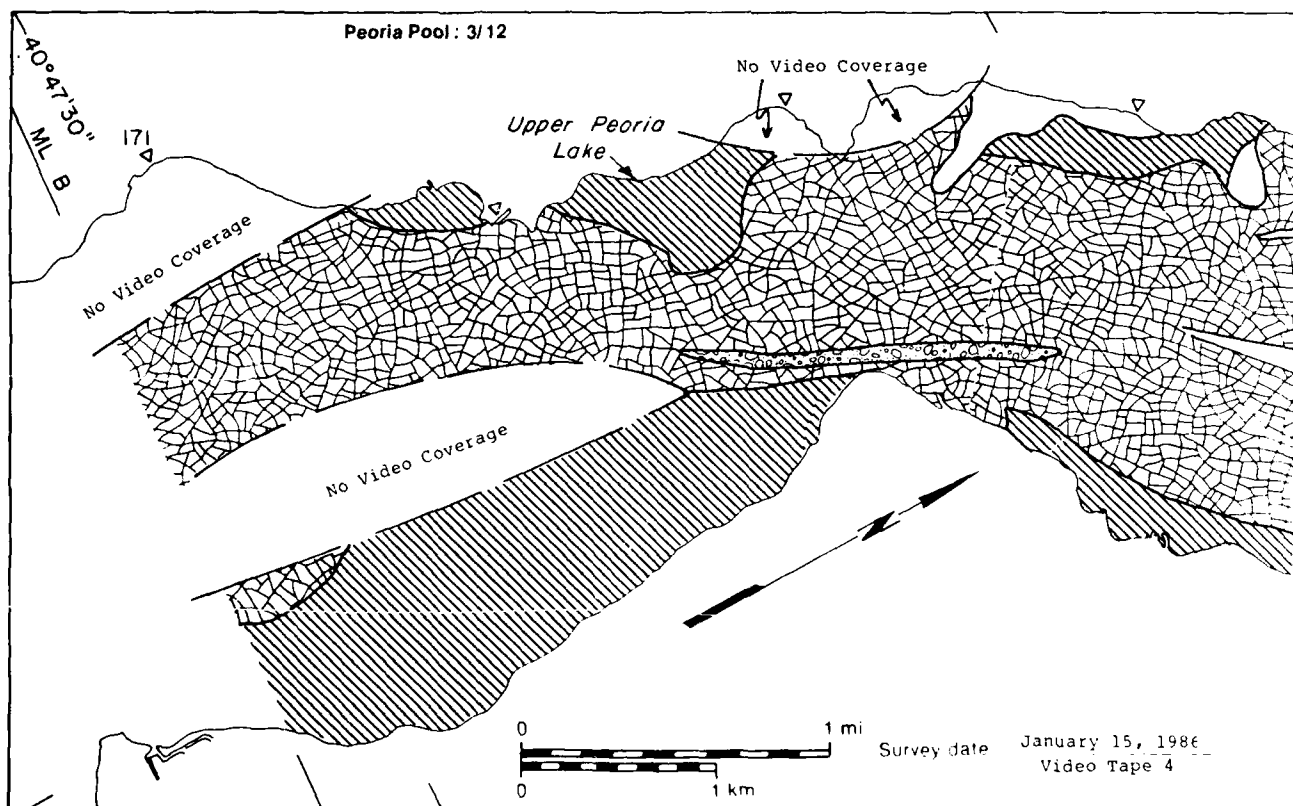
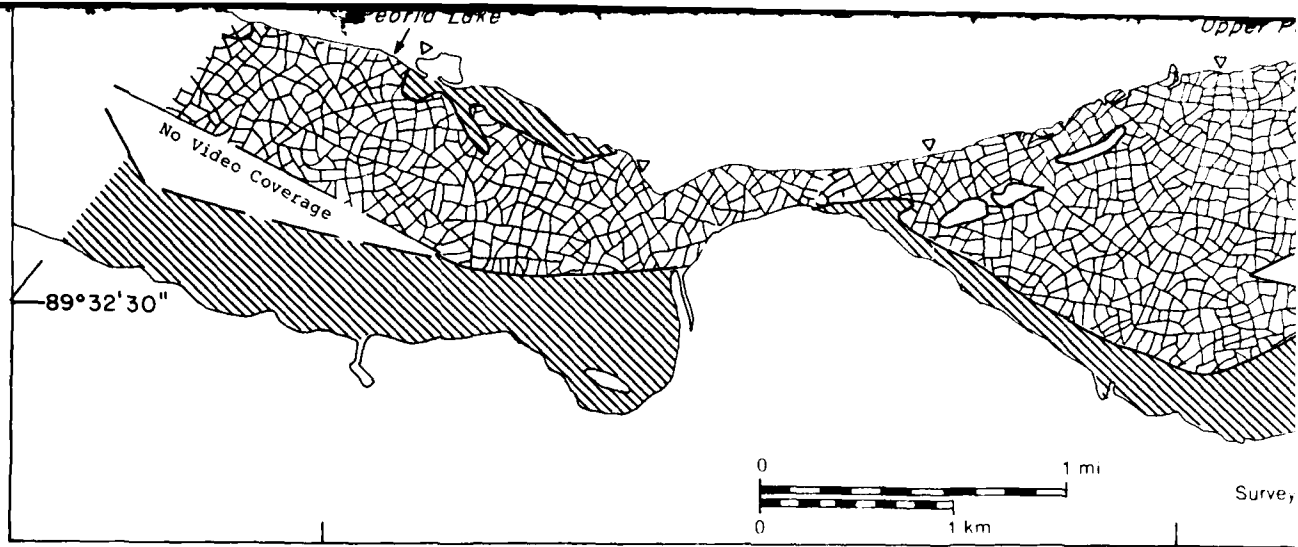


15 January 1986



89°32'30"

40°55'



Upper Peoria Lake

No Video Coverage

No Video Coverage

1 mi

Survey date: January 15, 1986
Video Tape 4

ML B

89°32'30"

40°52'30"

ML C

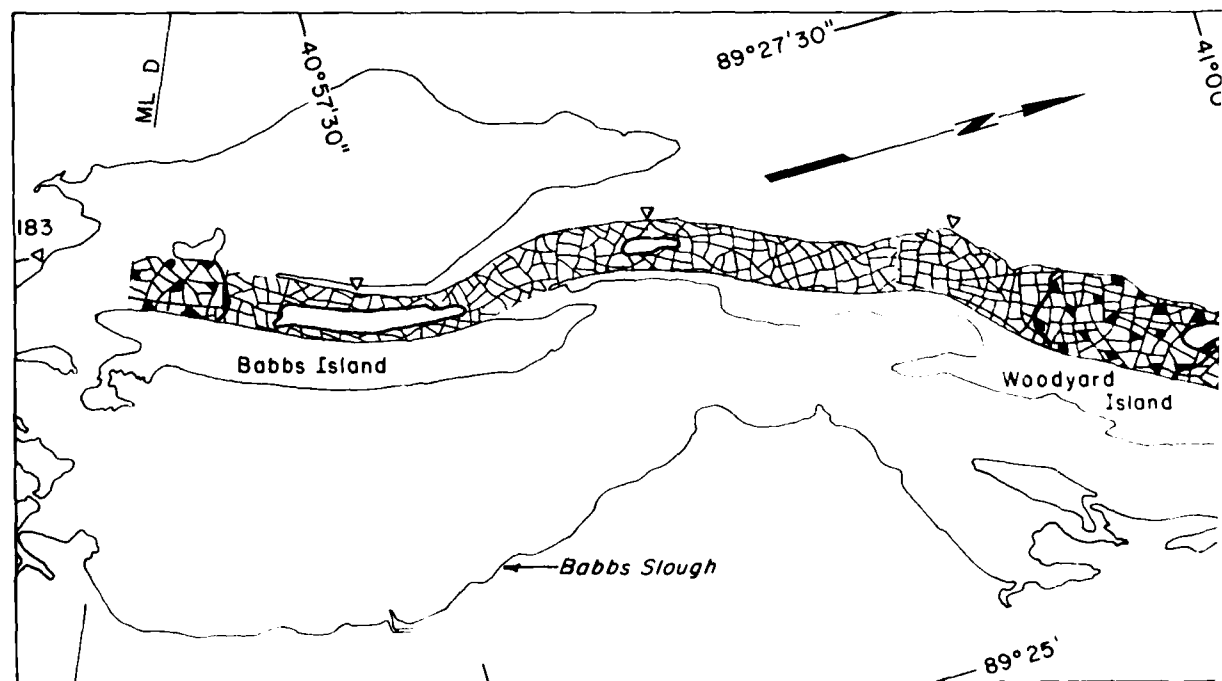
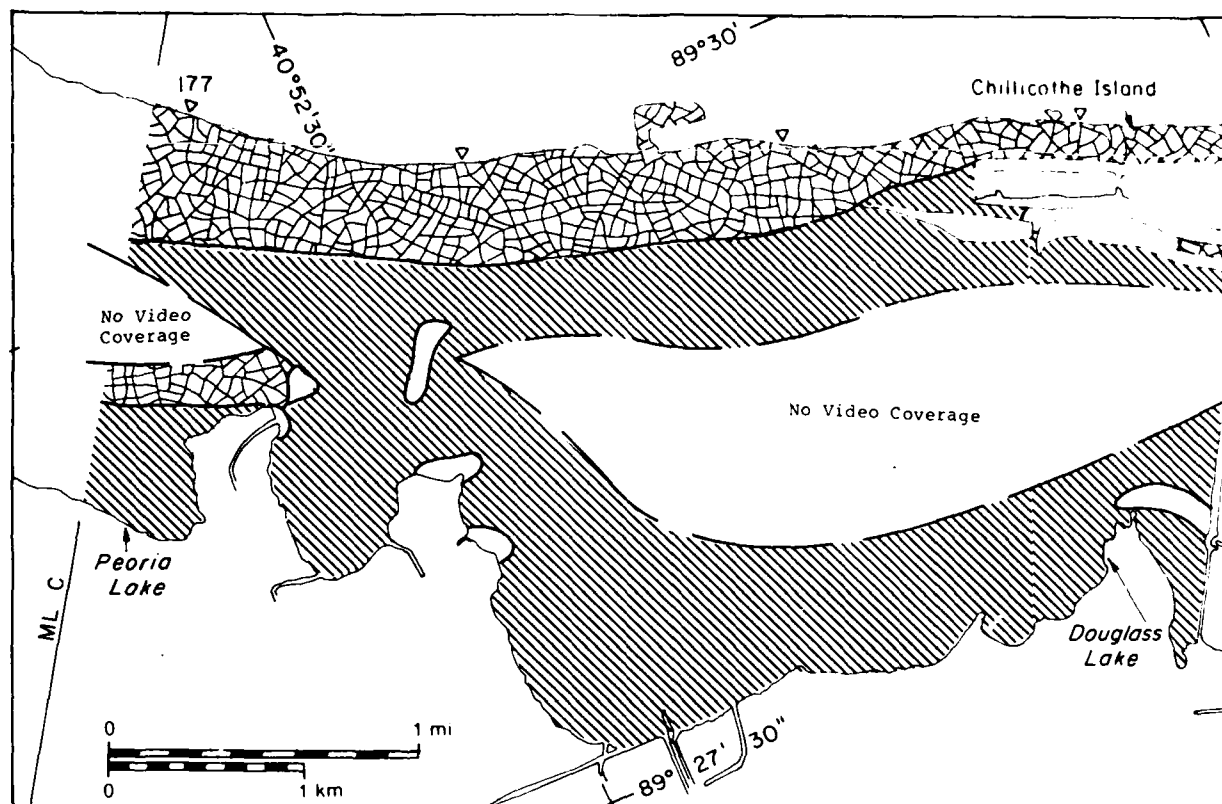
177

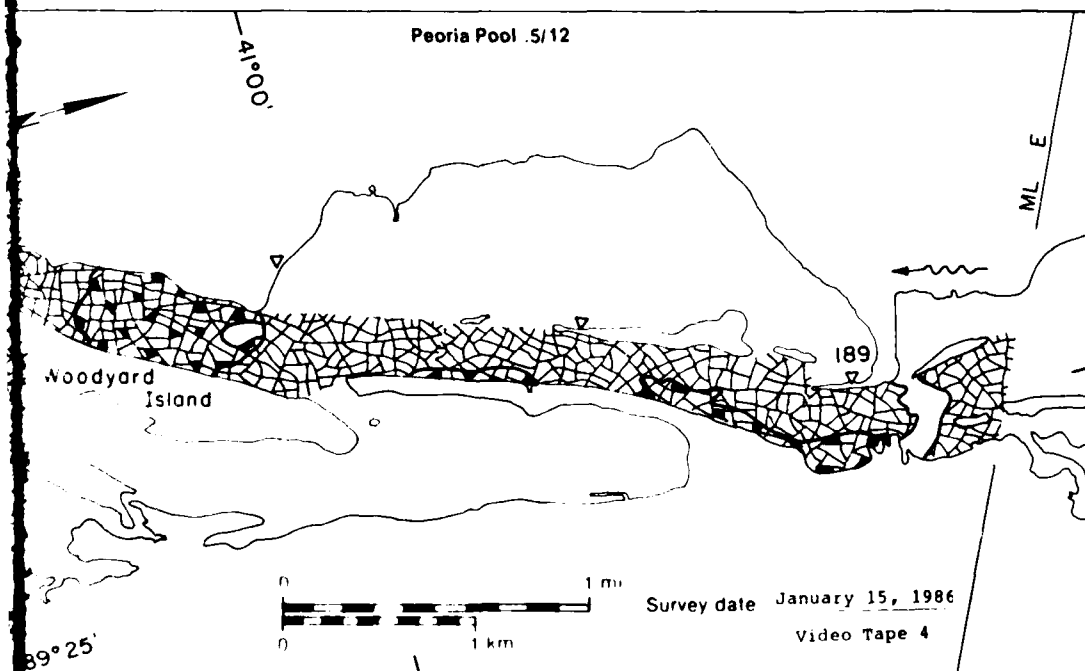
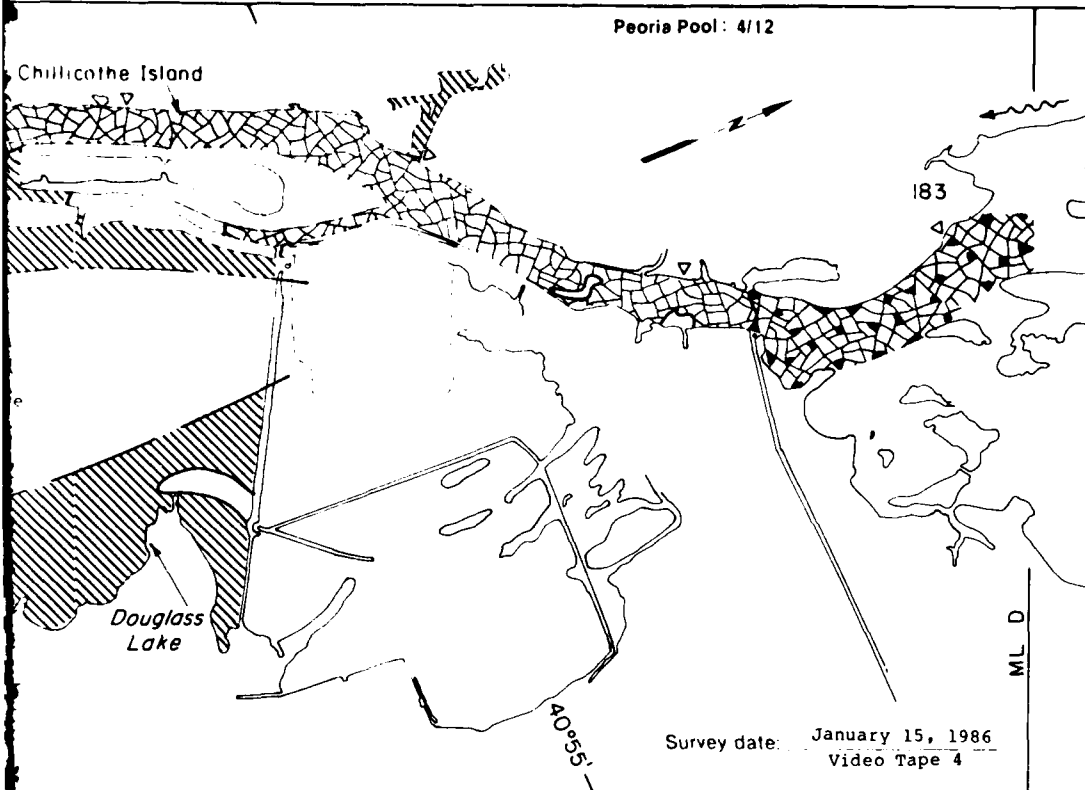
No Video Coverage

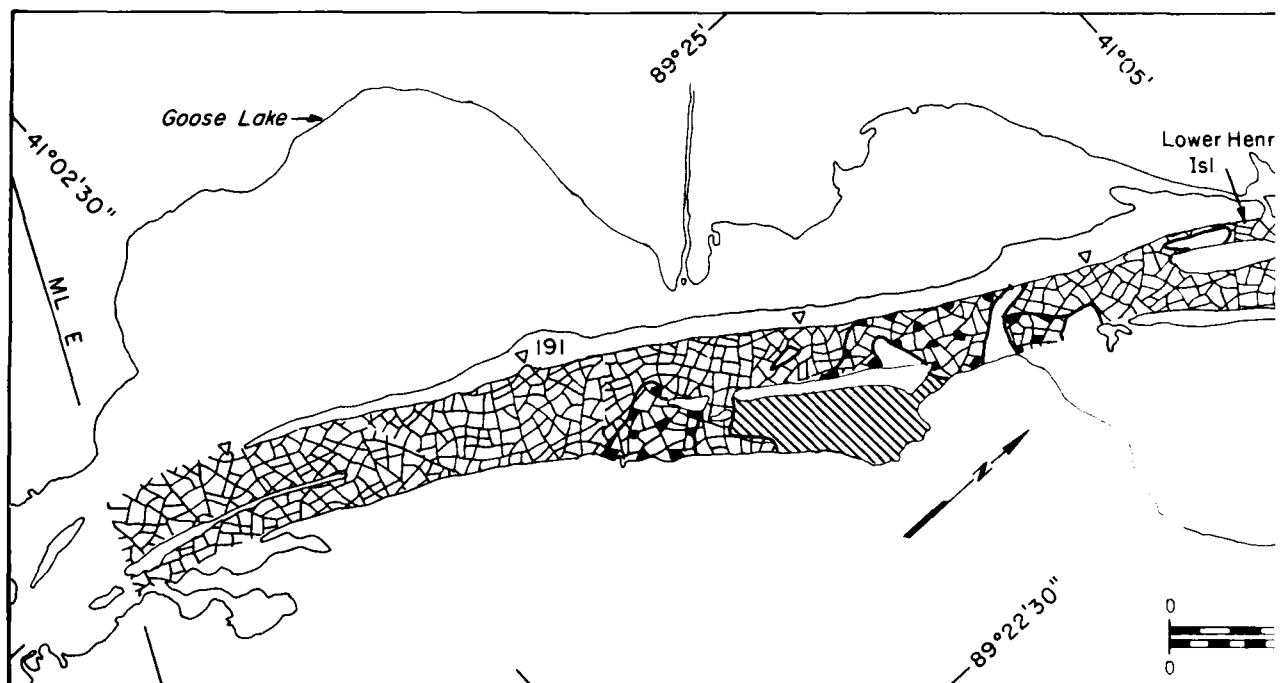
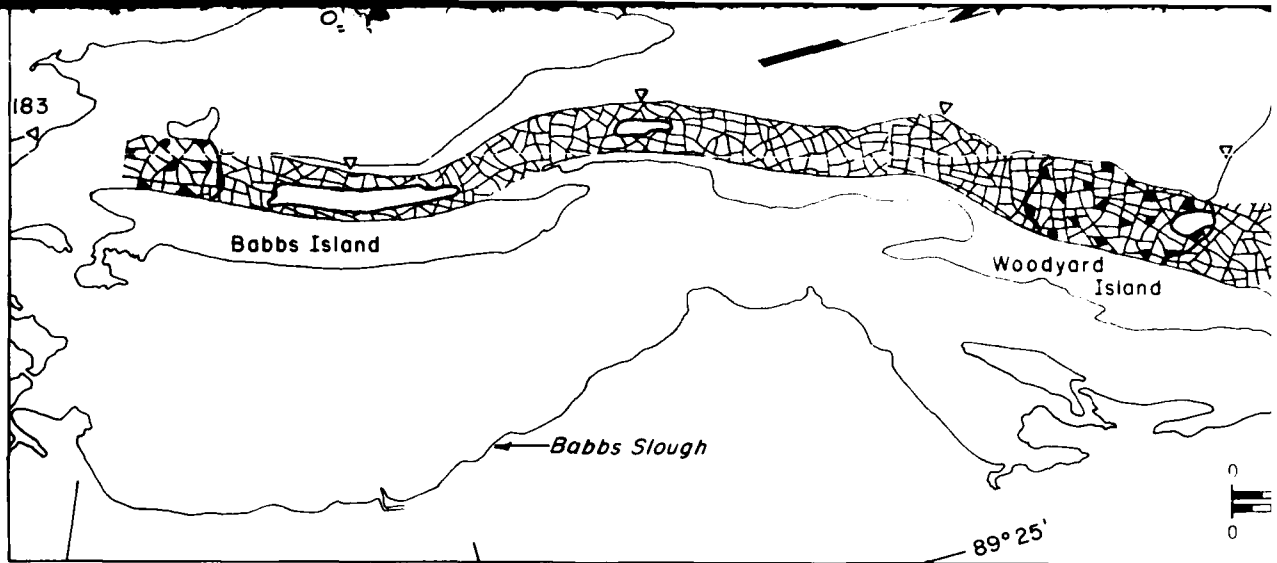
40°50' 89°30'

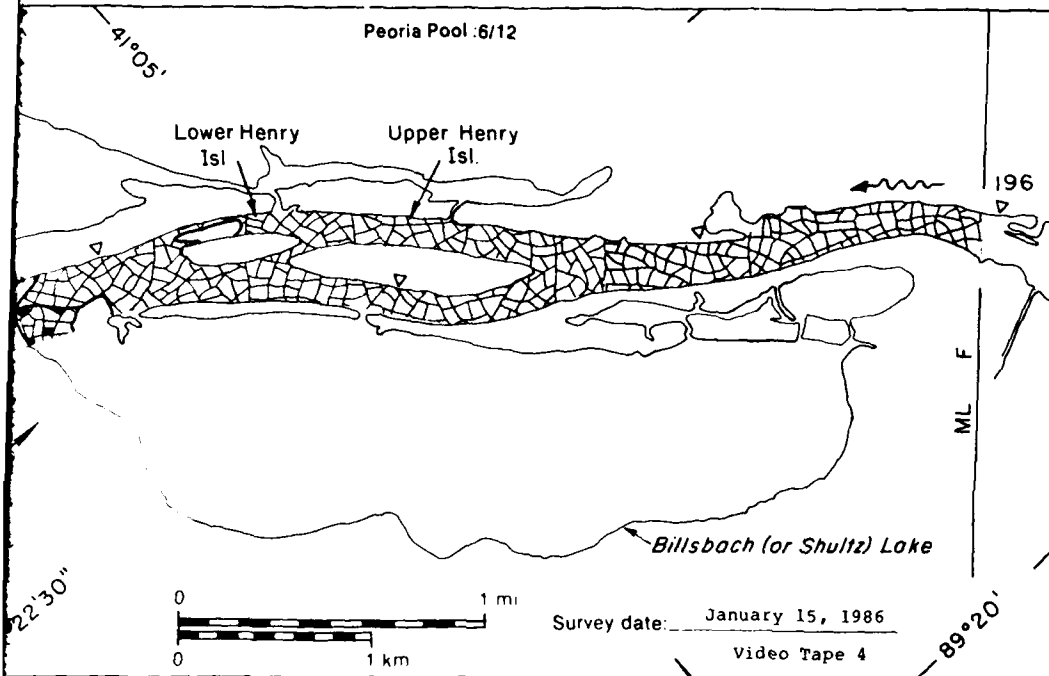
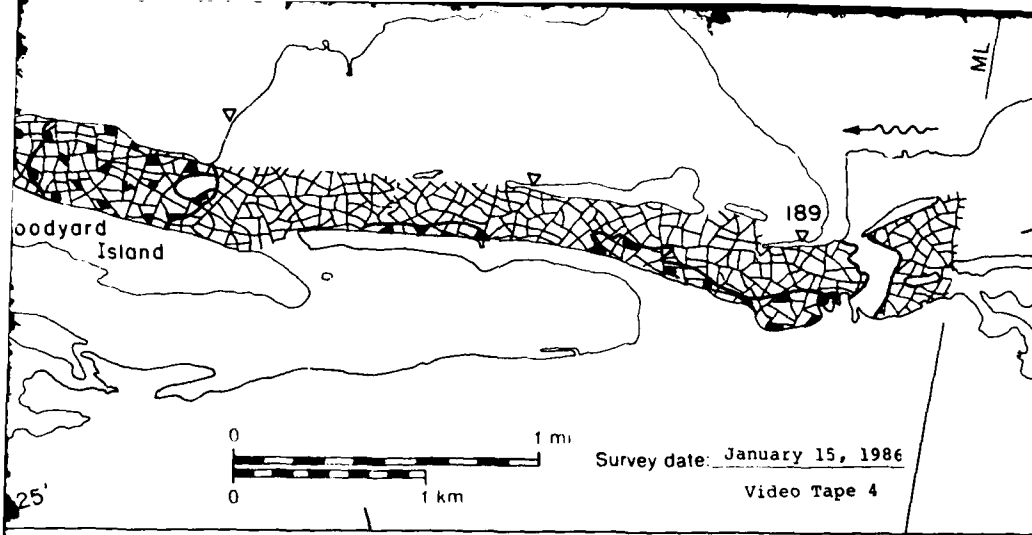
January 15, 1986
Video Tape 4

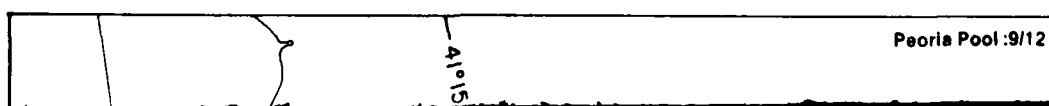
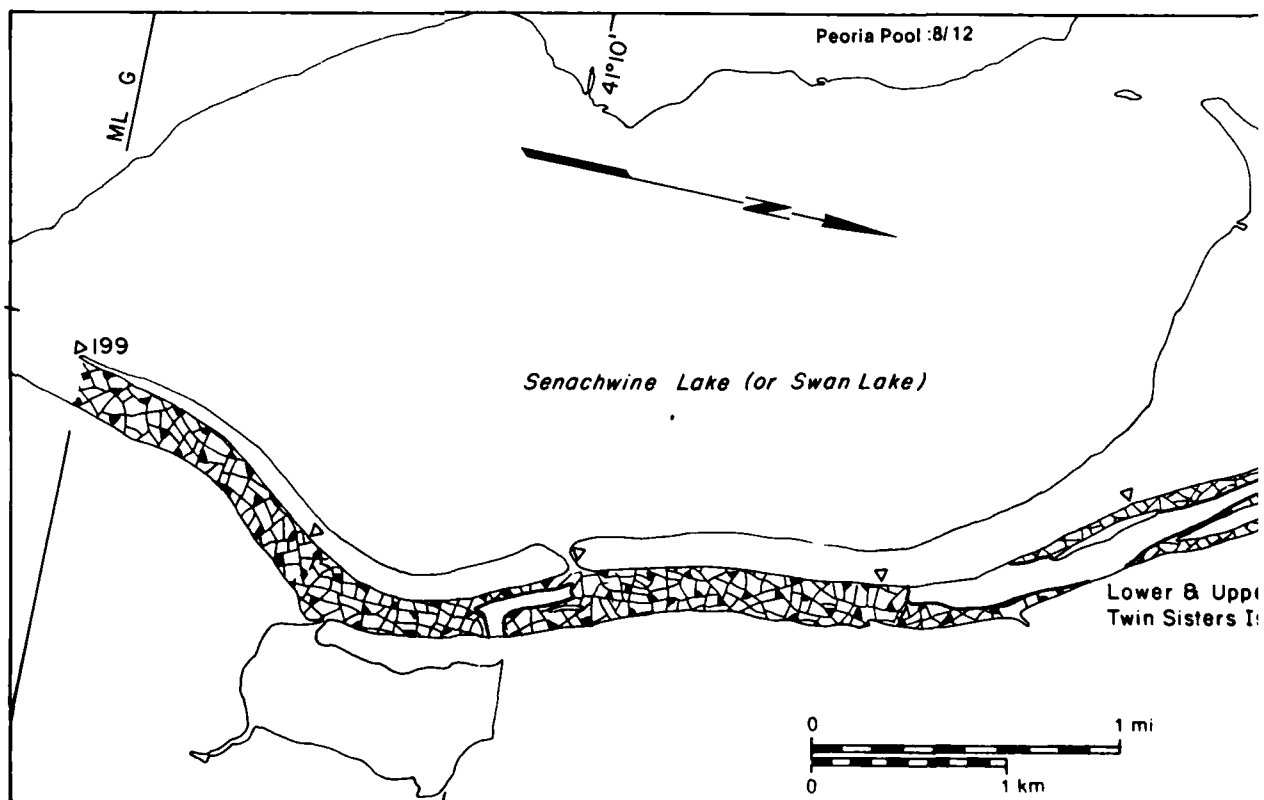
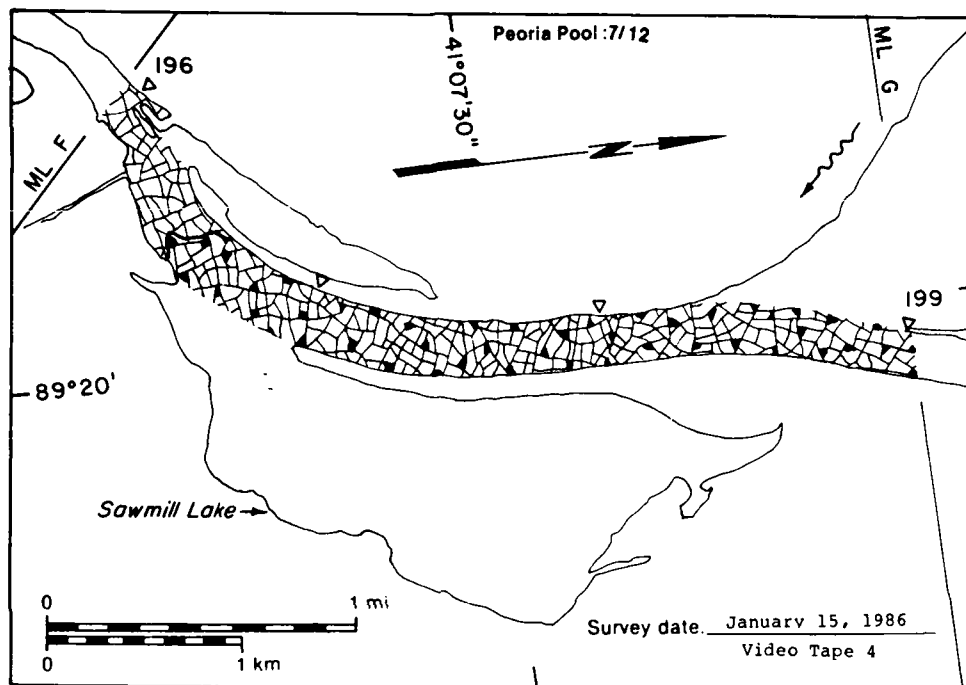
15 January 1986



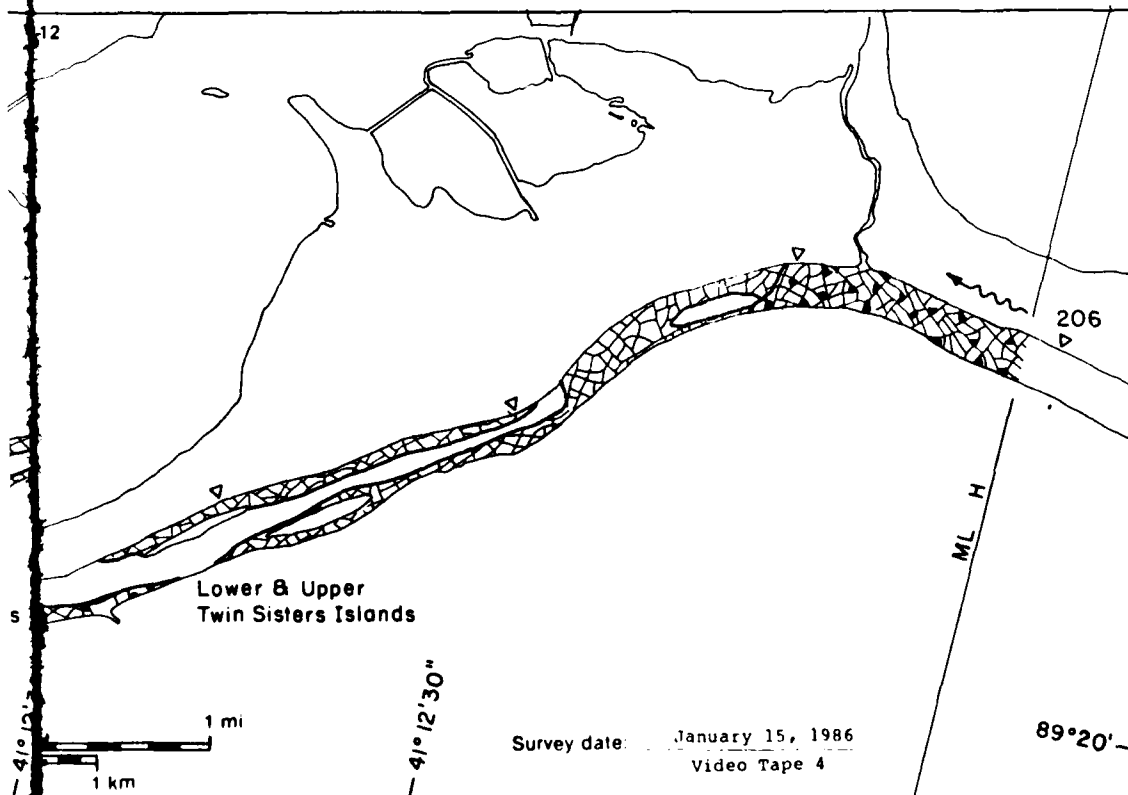


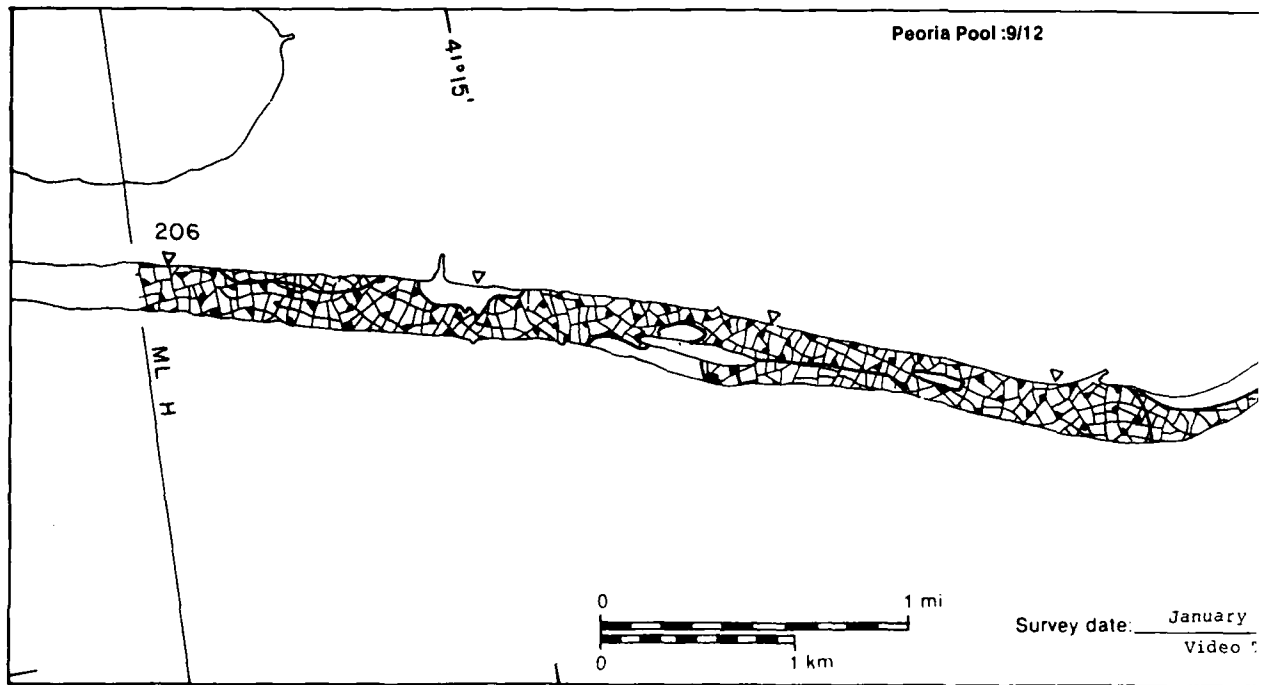
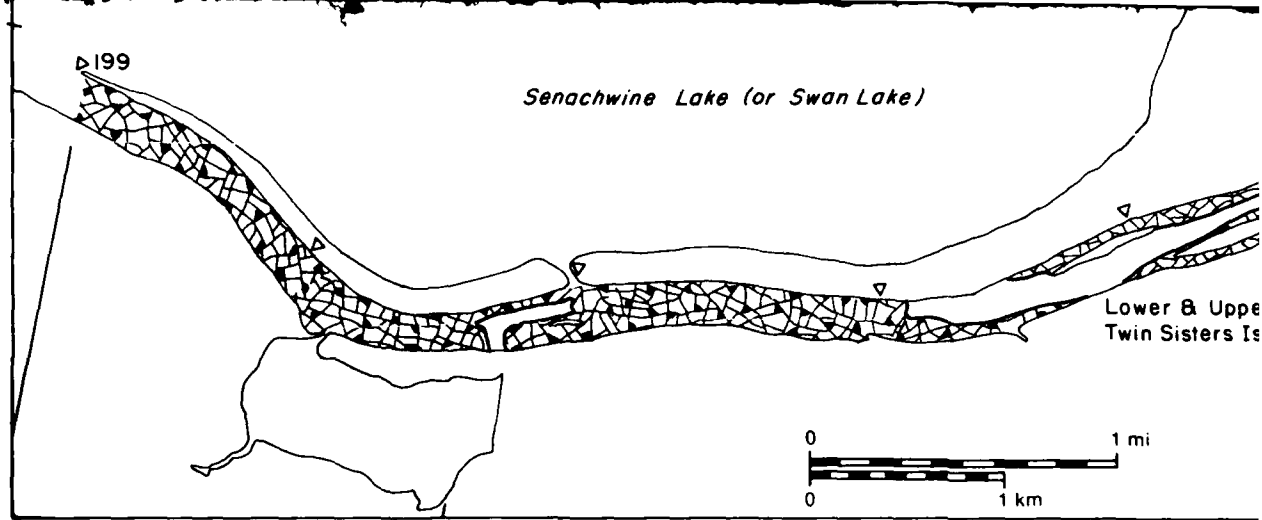


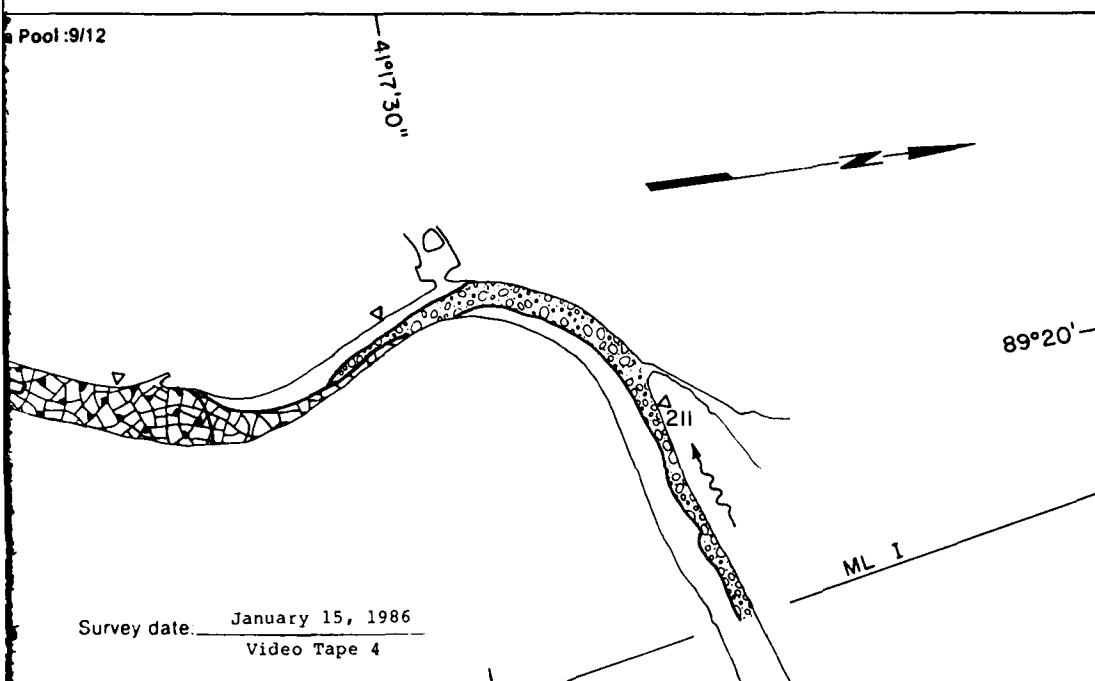
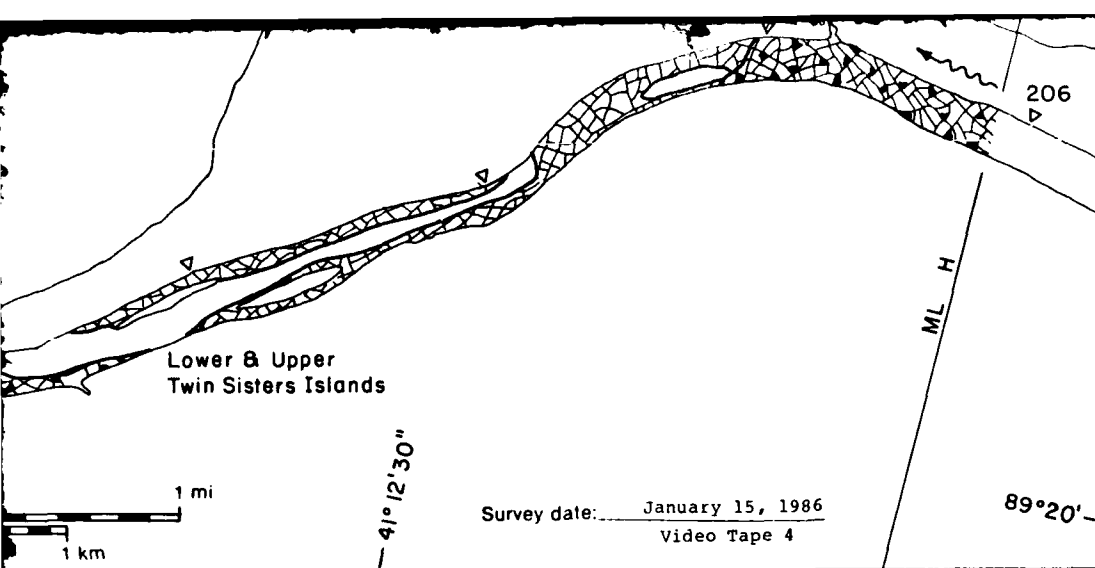




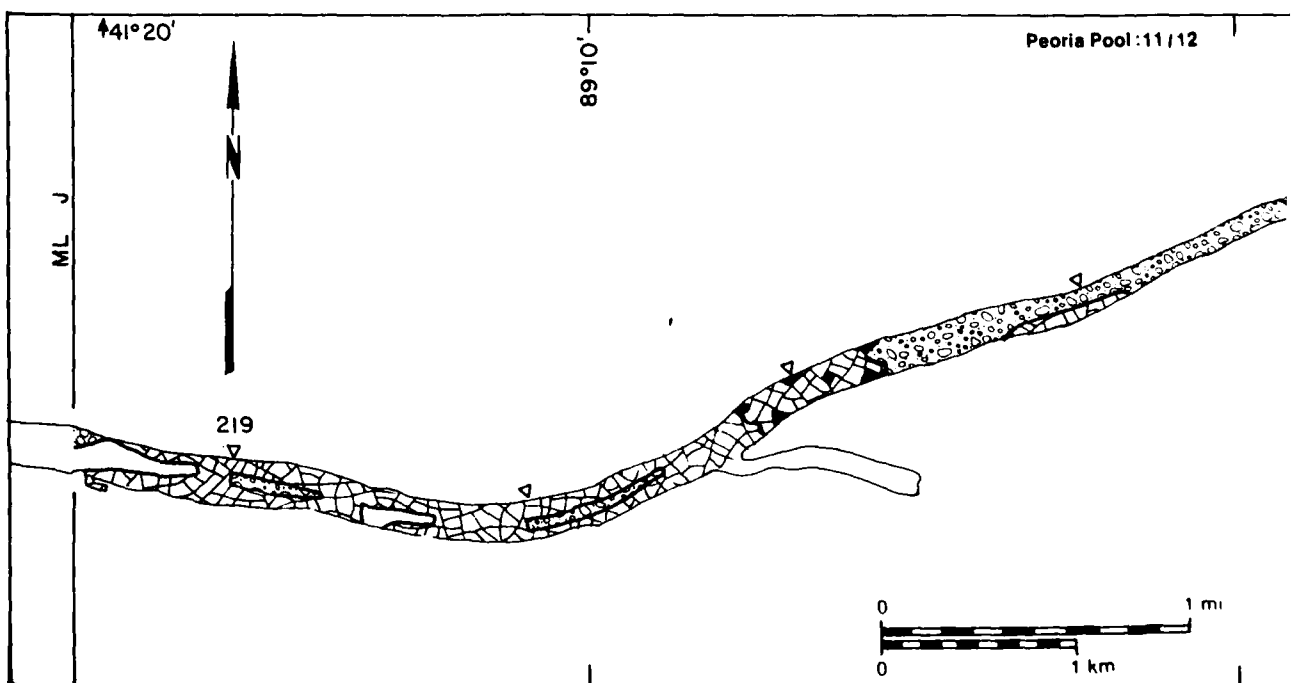
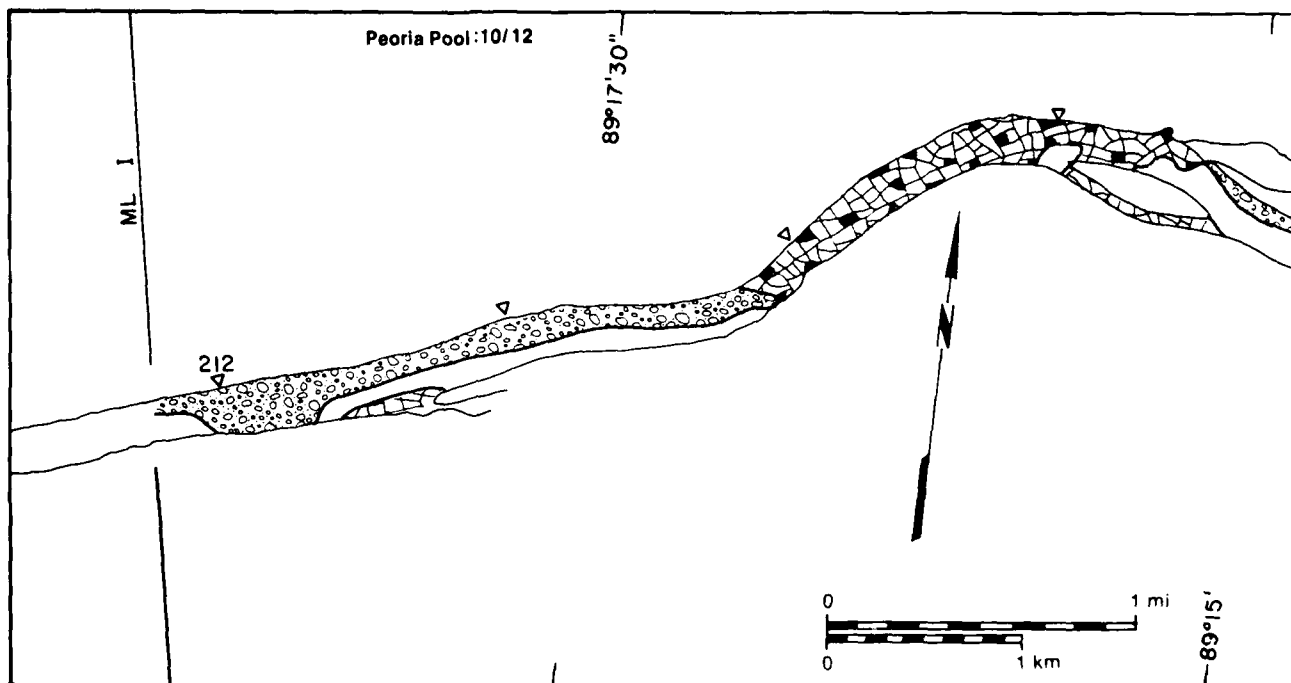
15 January 1986

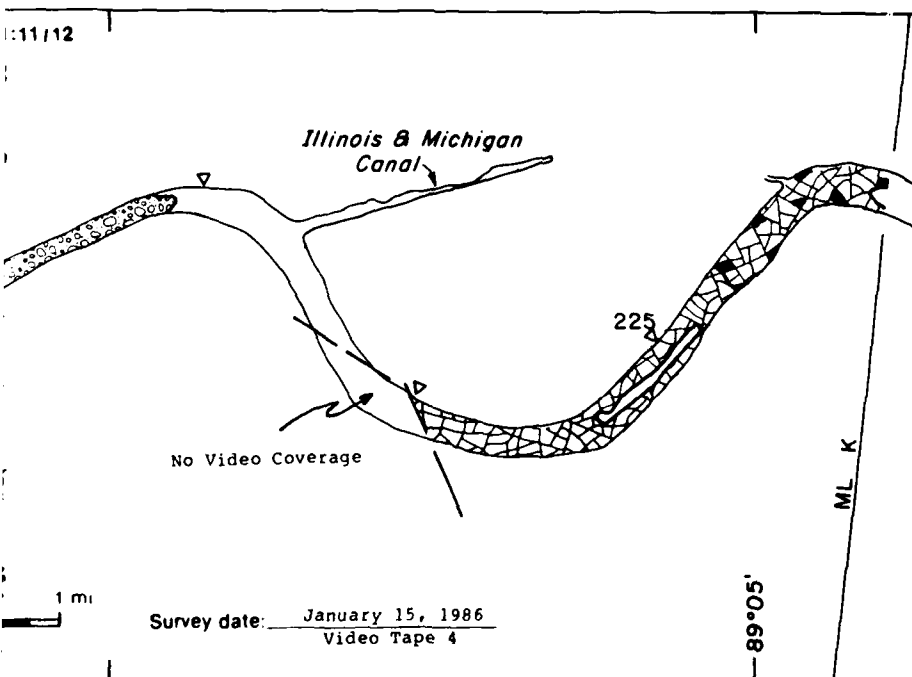
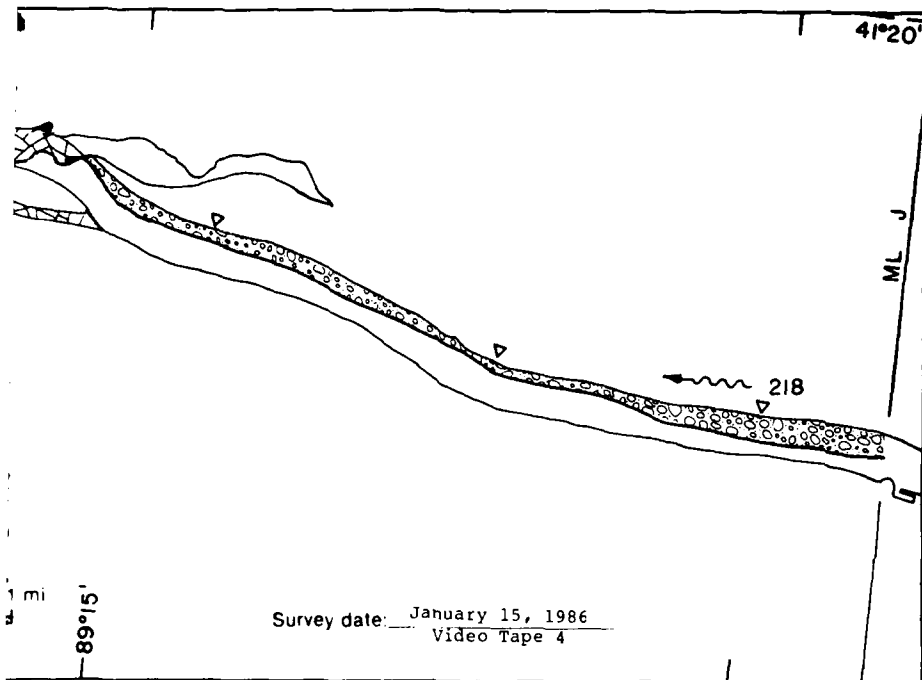




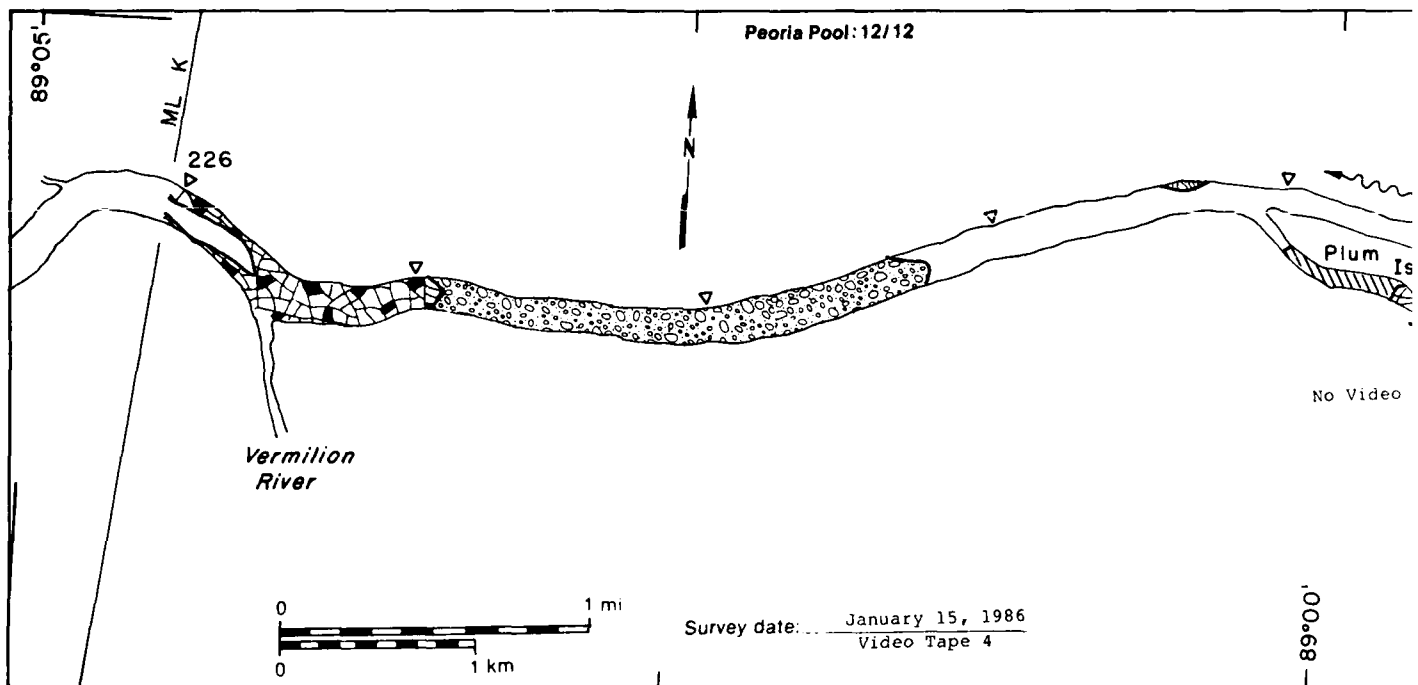
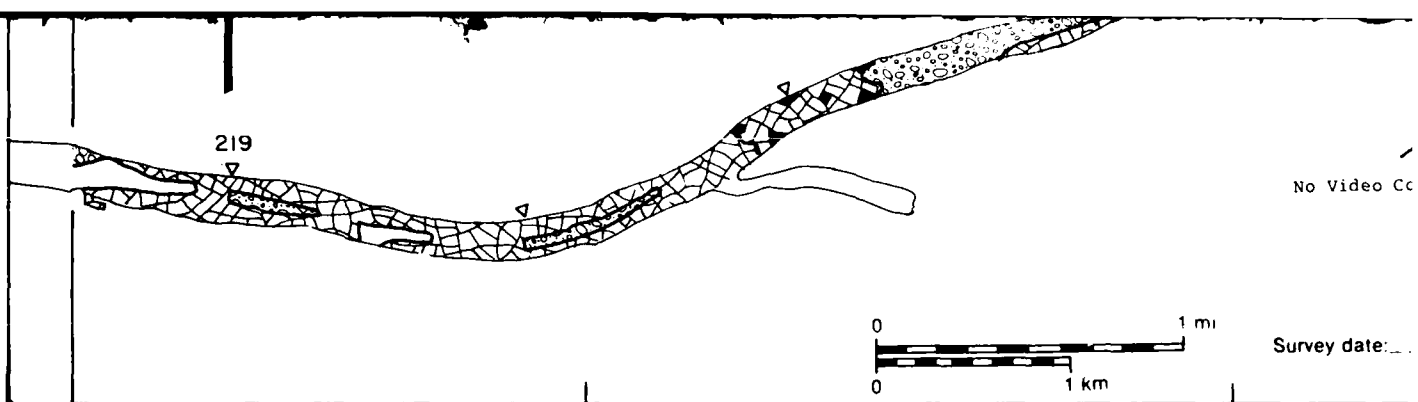


15 January 1986






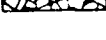




41°20'



Peoria Pool

MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
	5.73	NA
	18.85	NA
	0.00	—
	34.24	NA
	6.81	80
	2.85	20
Total area ($m^2 \times 10^6$)	81.33*	

* Includes $12.85 \times 10^6 m^2$ of no video coverage

No Video Coverage

22

ML K

89°05'

1 mi

Survey date: January 15, 1986
Video Tape 4

41°20'

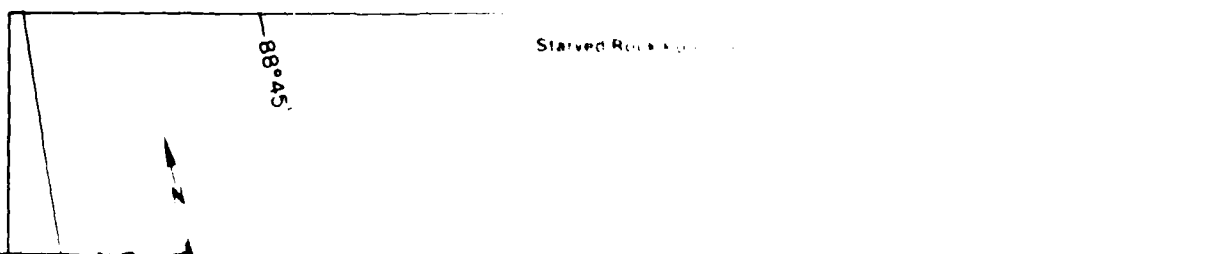
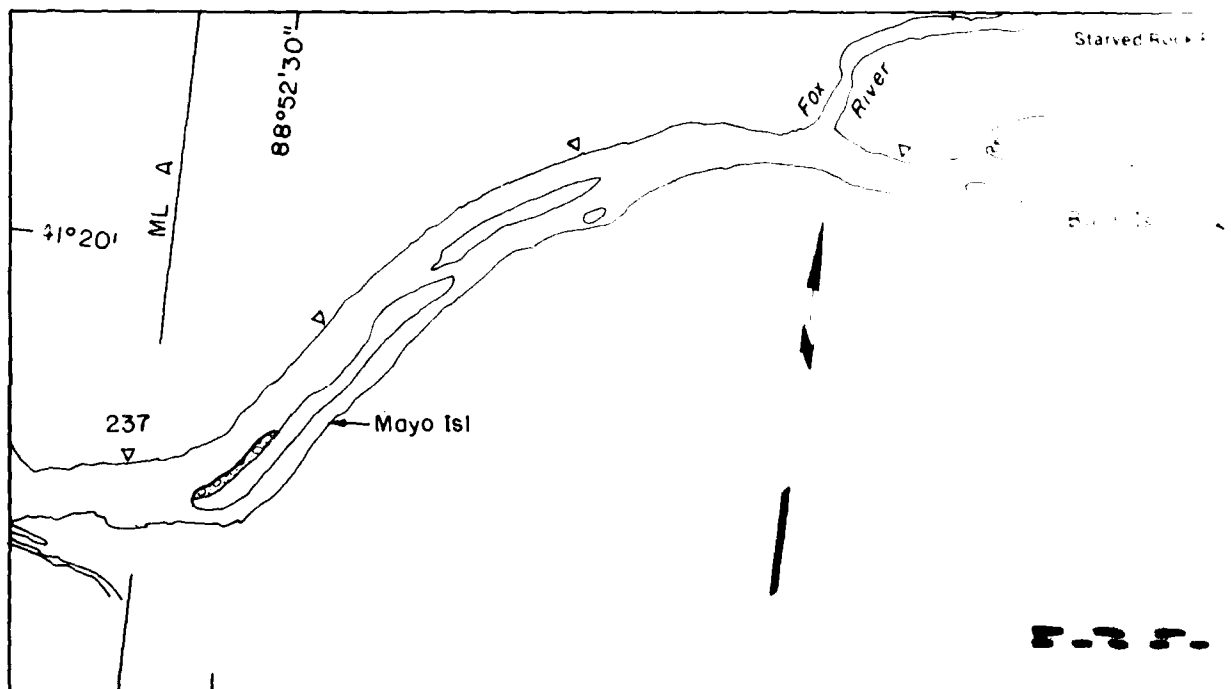
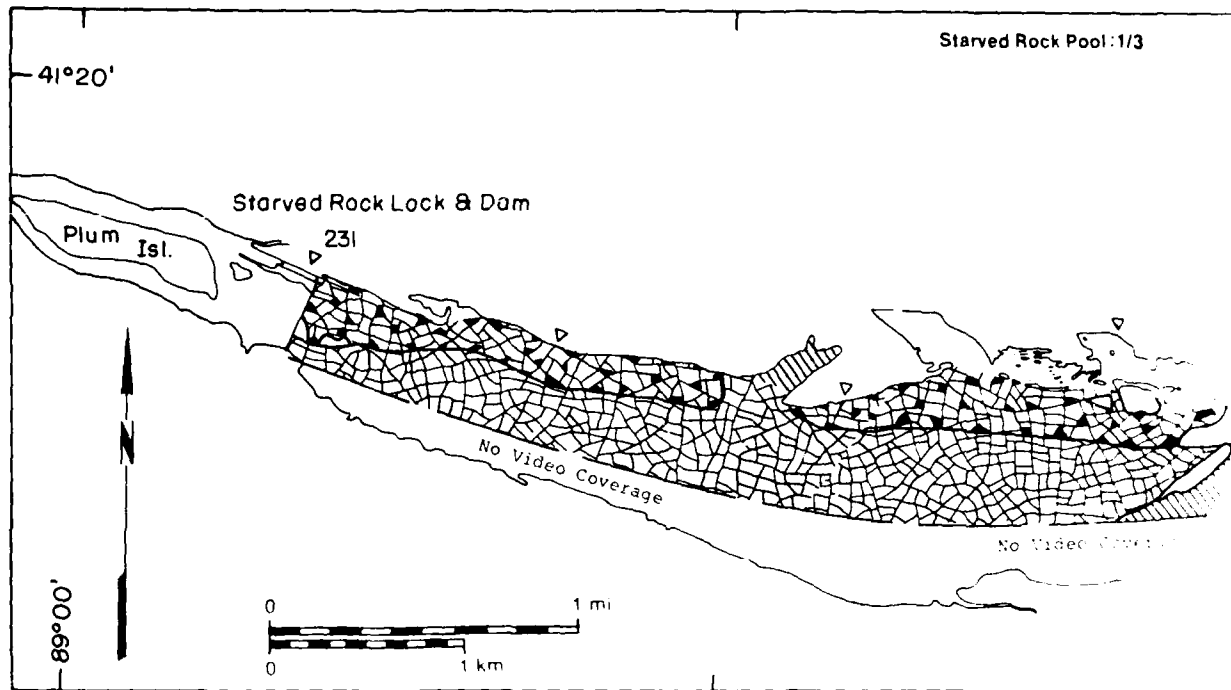
Starved Rock
L & D

Plum Isl.

23

No Video Coverage

89°00'



AD- A191 865

ICE ATLAS 1985 - 1986 MONONGAHELA RIVER ALLEGHENY RIVER

8/14

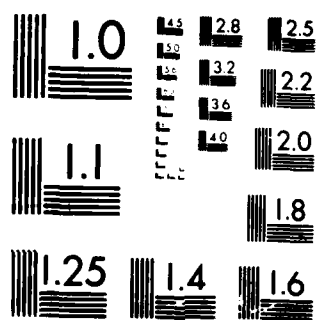
OHIO RIVER ILLINO. (U) COLD REGIONS RESEARCH AND

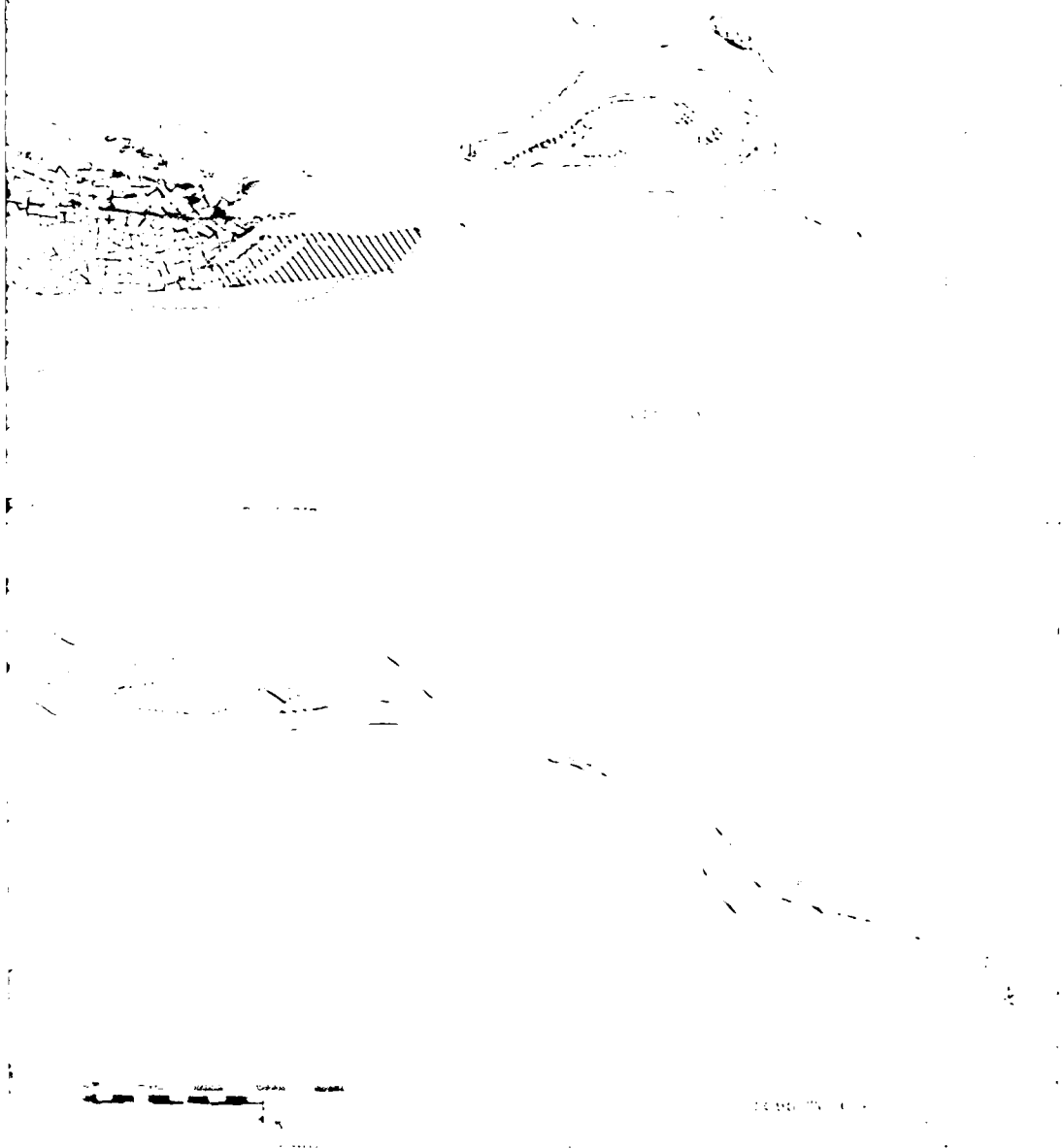
ENGINEERING LAB HANOVER NH L A CATTO ET AL. NOV 87

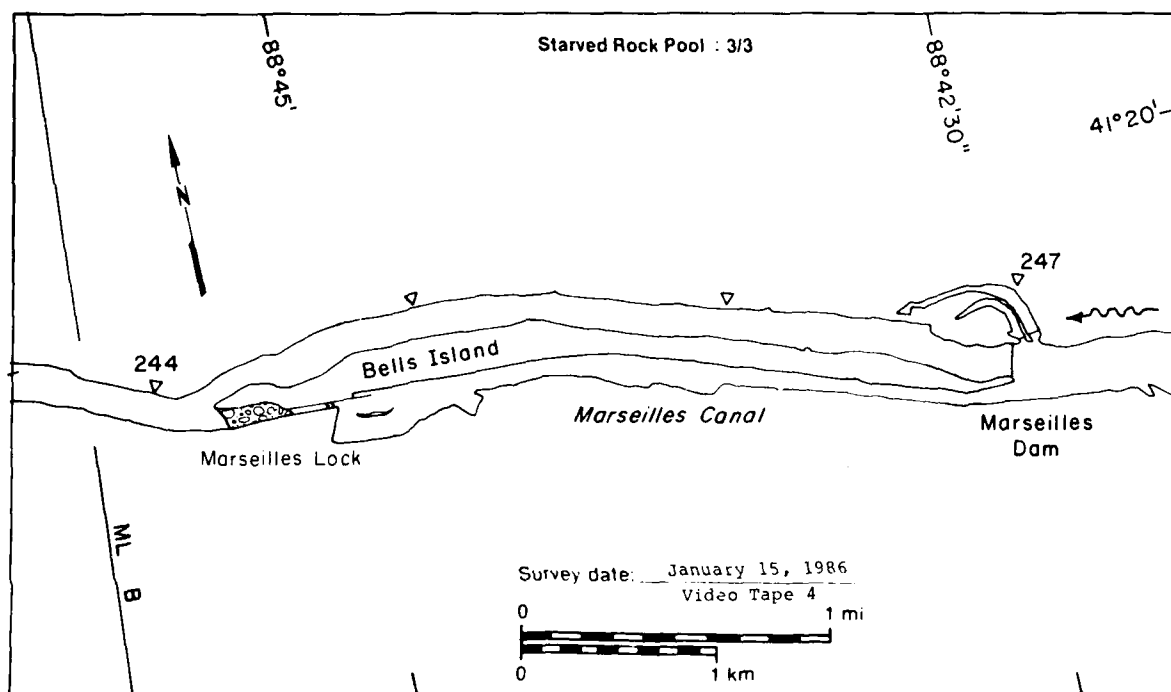
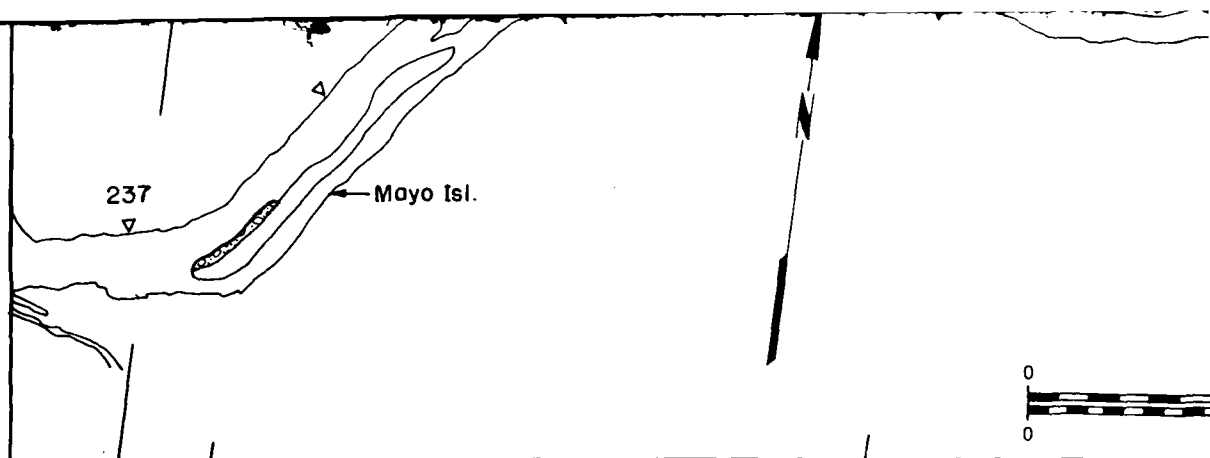
UNCLASSIFIED CRREL-SF-87-28

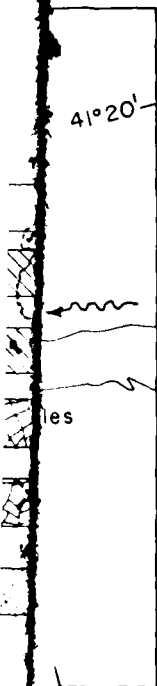
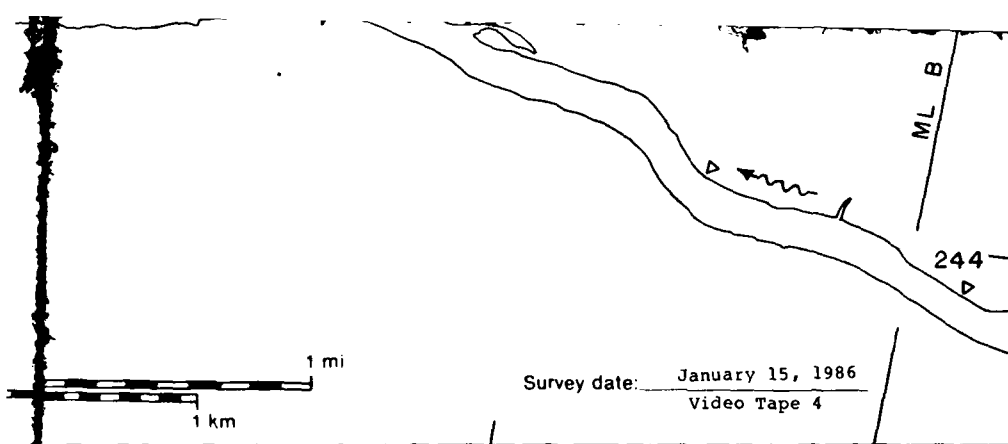
F/G 8/12

NL









Starved Rock Pool

MAP UNITS

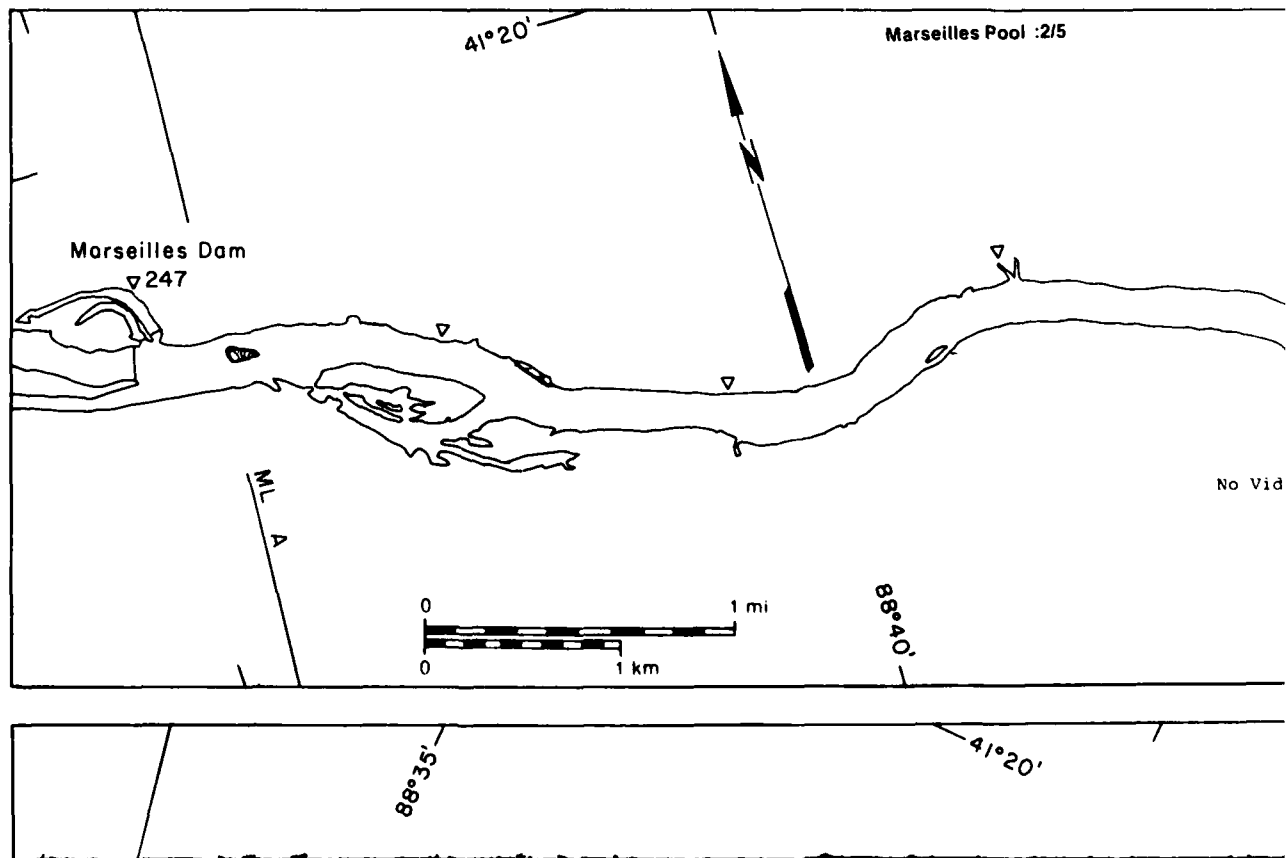
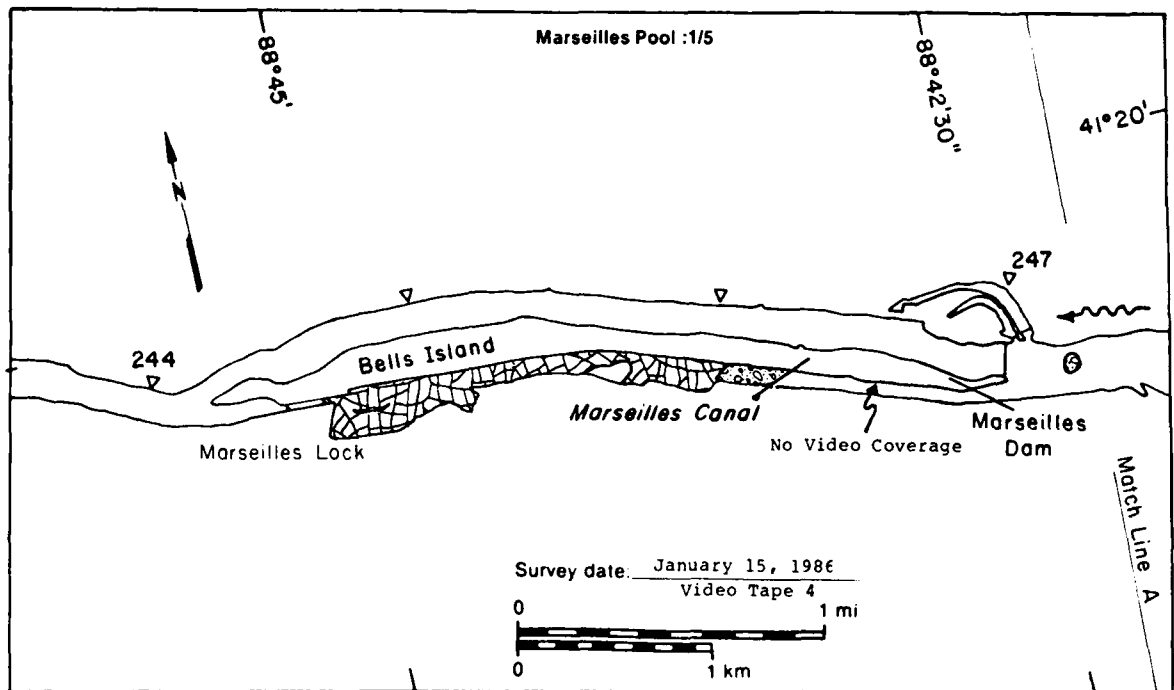
	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Area (m ² x 10 ⁶)	Surface concentration (%)
5.20	NA
0.40	NA
0.00	—
2.10	NA
0.98	80
0.07	50
Total area (m ² x 10 ⁶)	10.19*

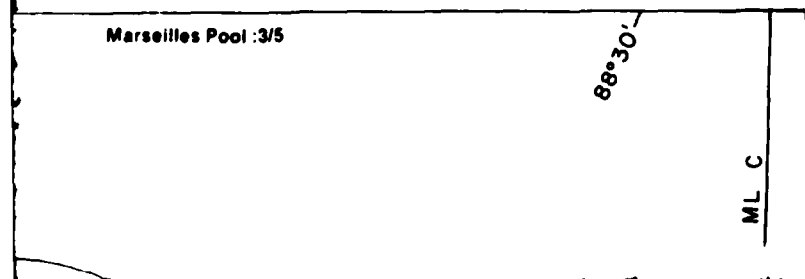
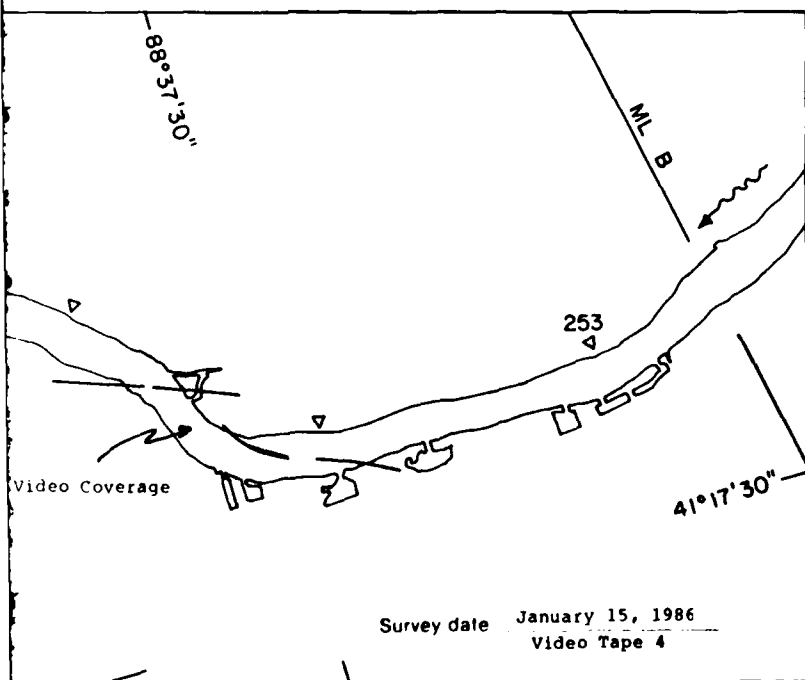
* Includes 1.44 x 10⁶ m²
of no video coverage

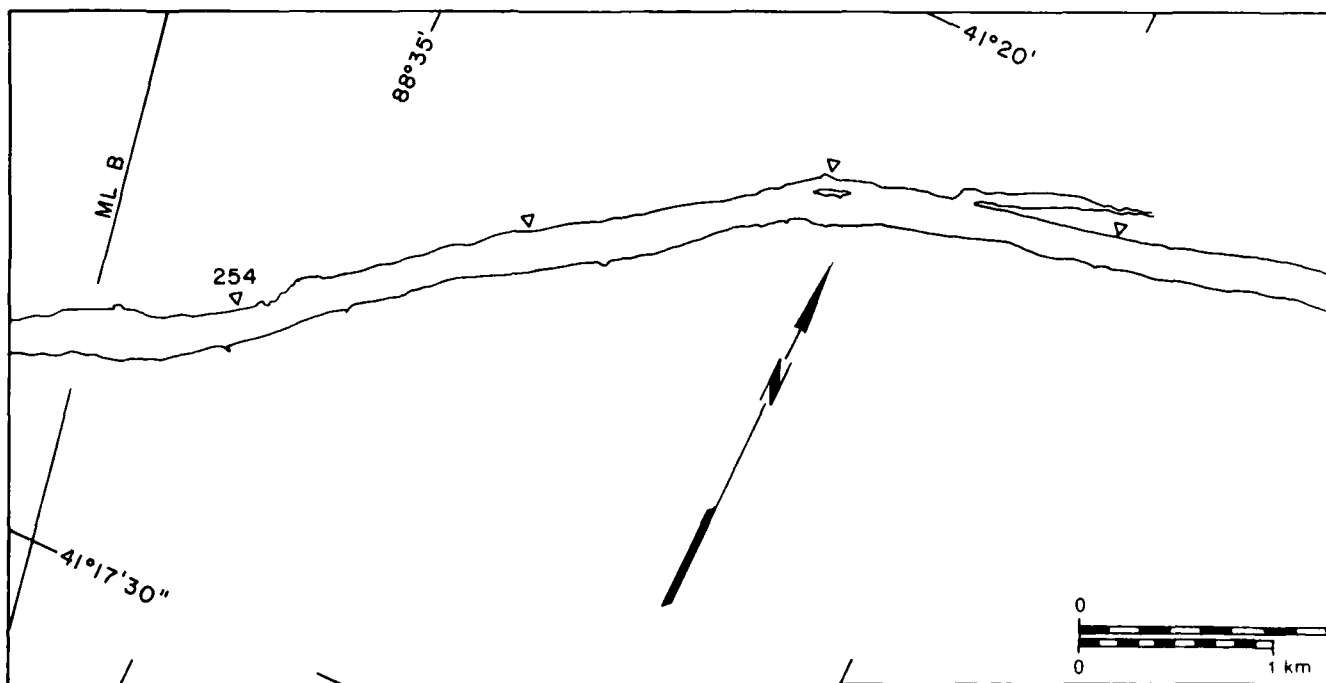
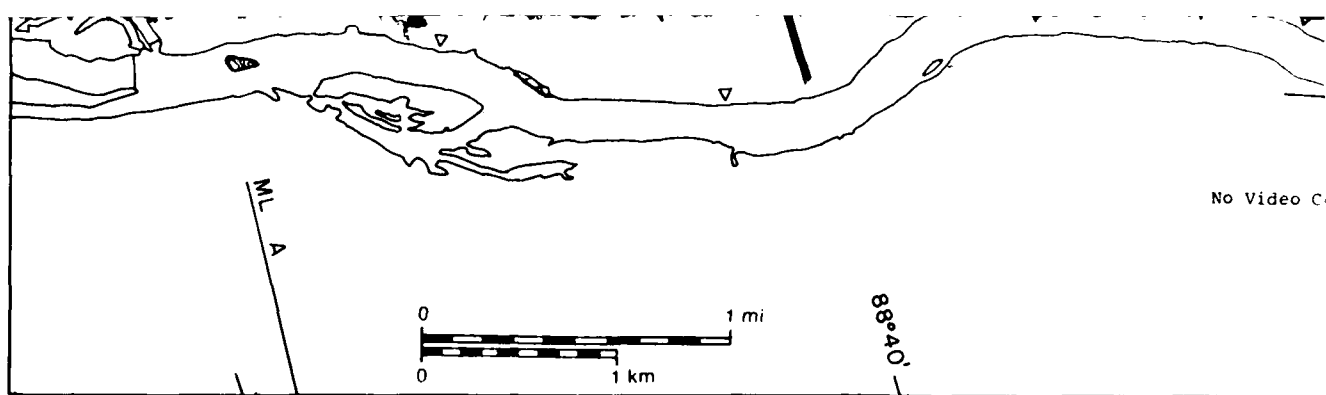
A

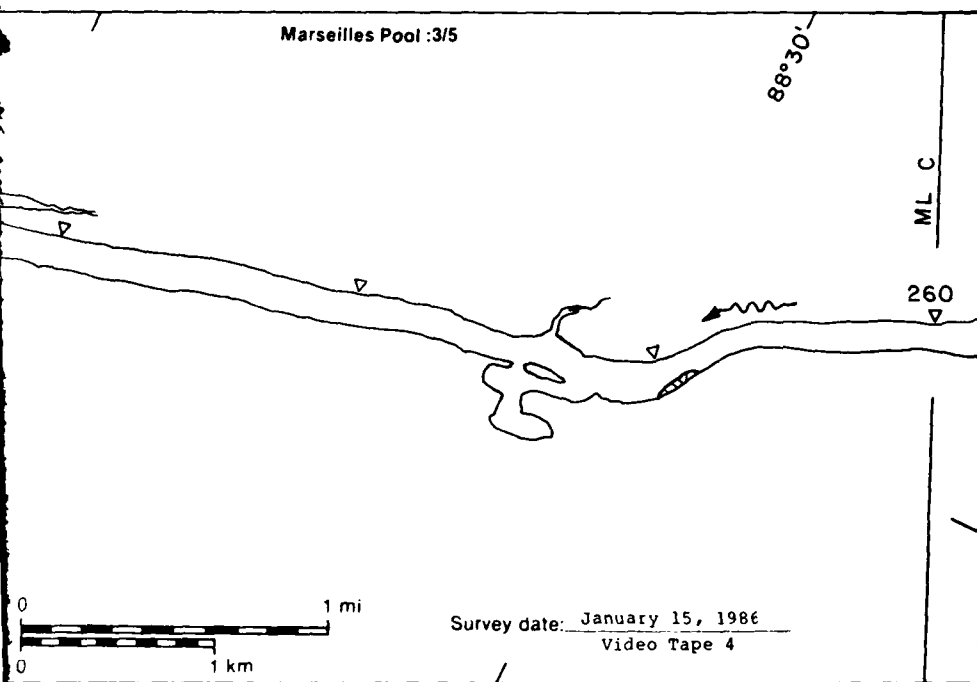
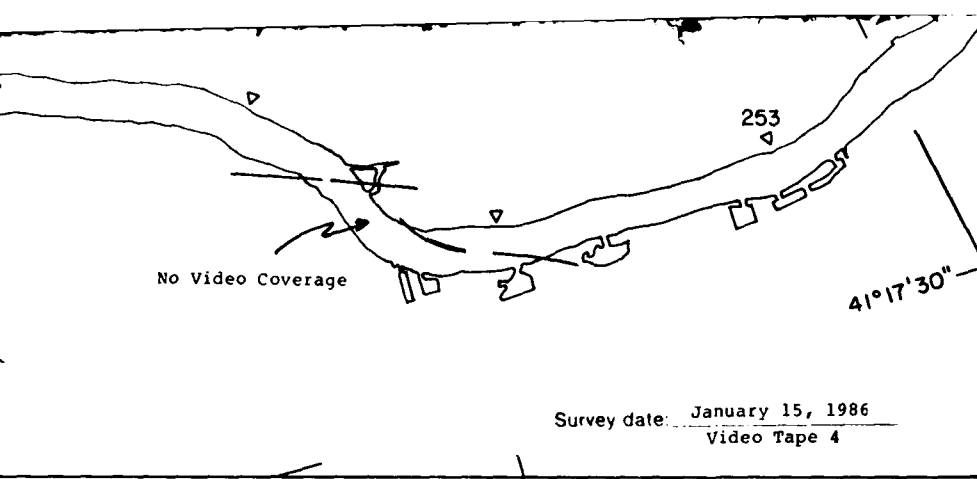
15 January 1986

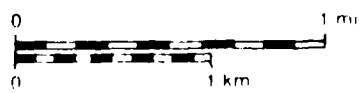
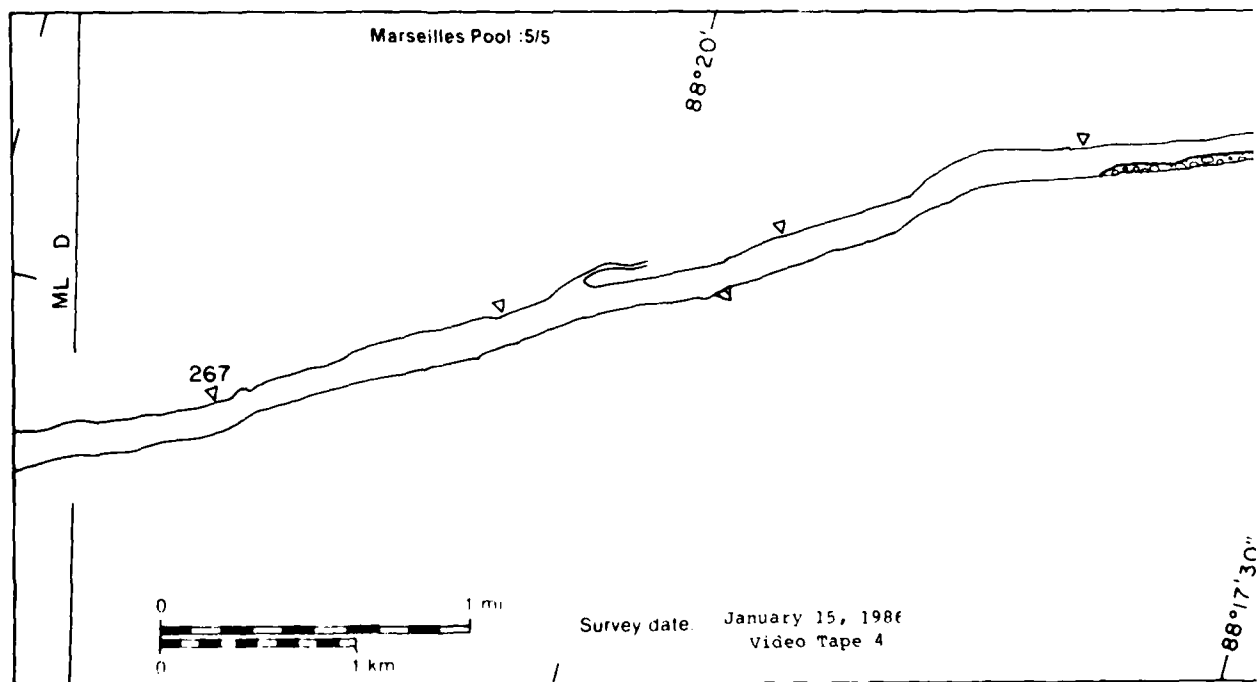
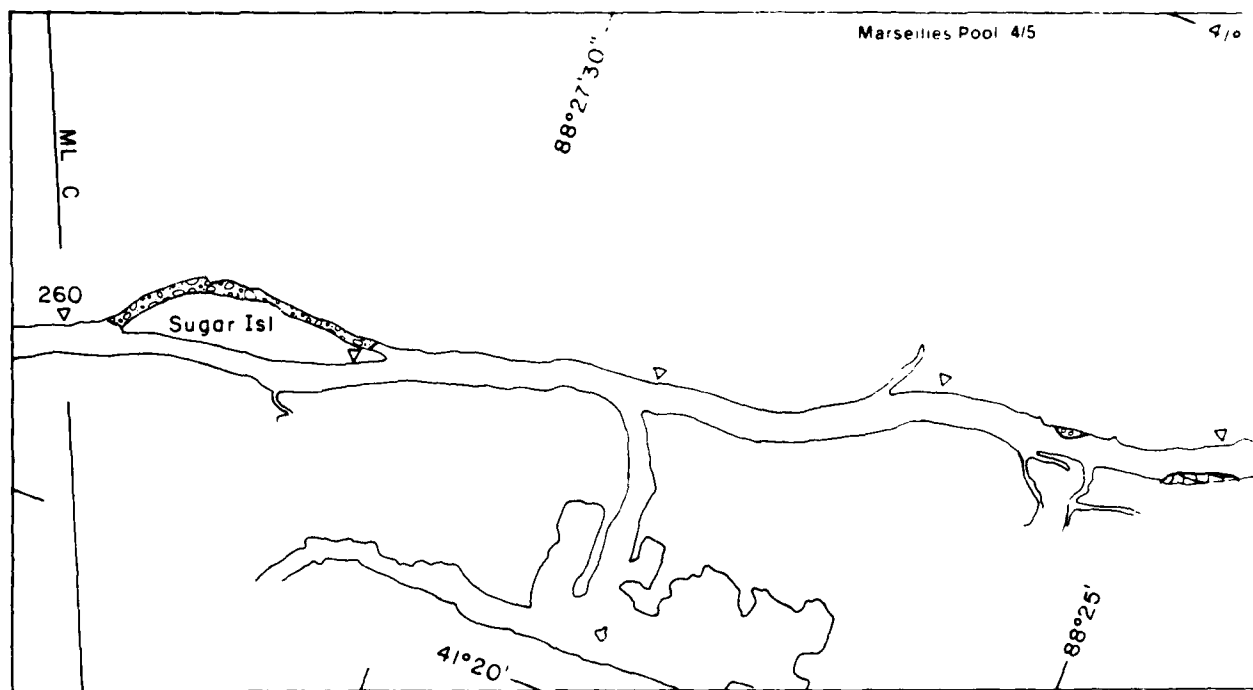


15





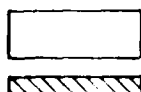




Survey date: January 15, 1986
Video Tape 4

Marseilles Pool

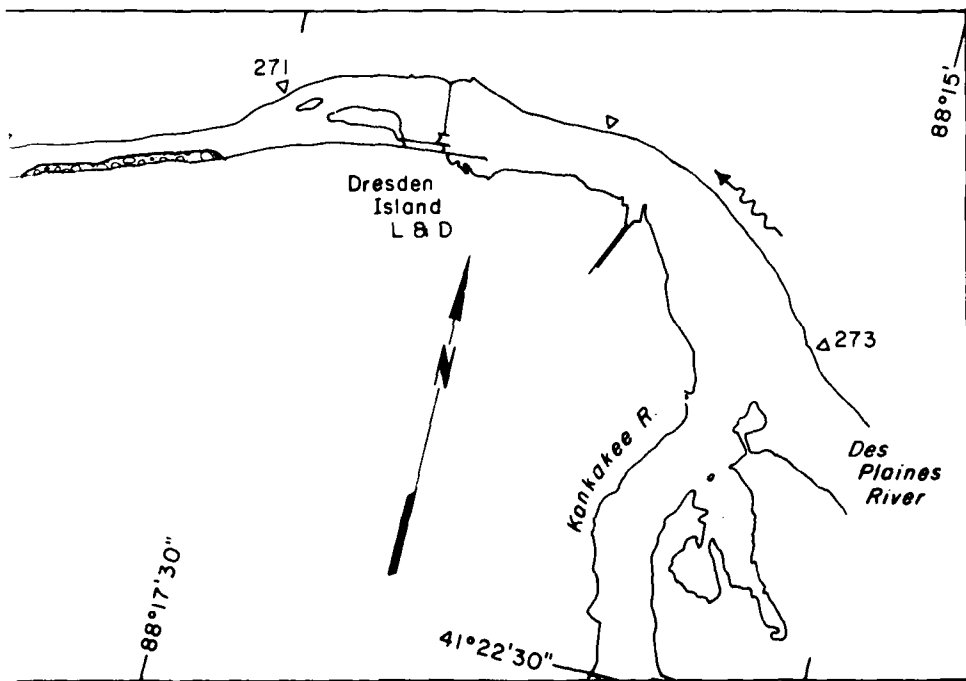
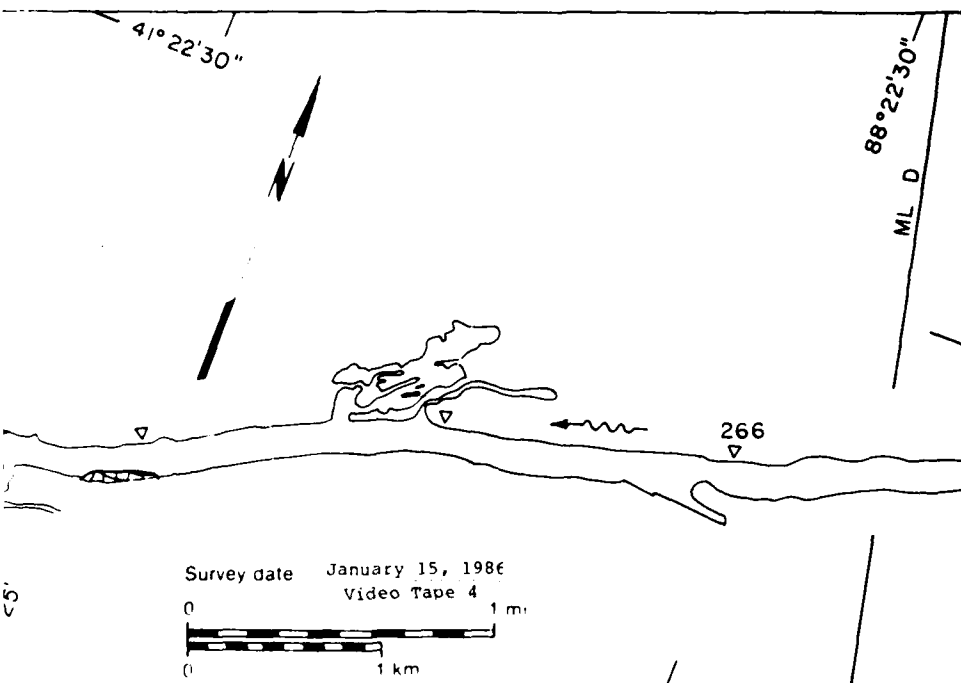
MAP UNITS

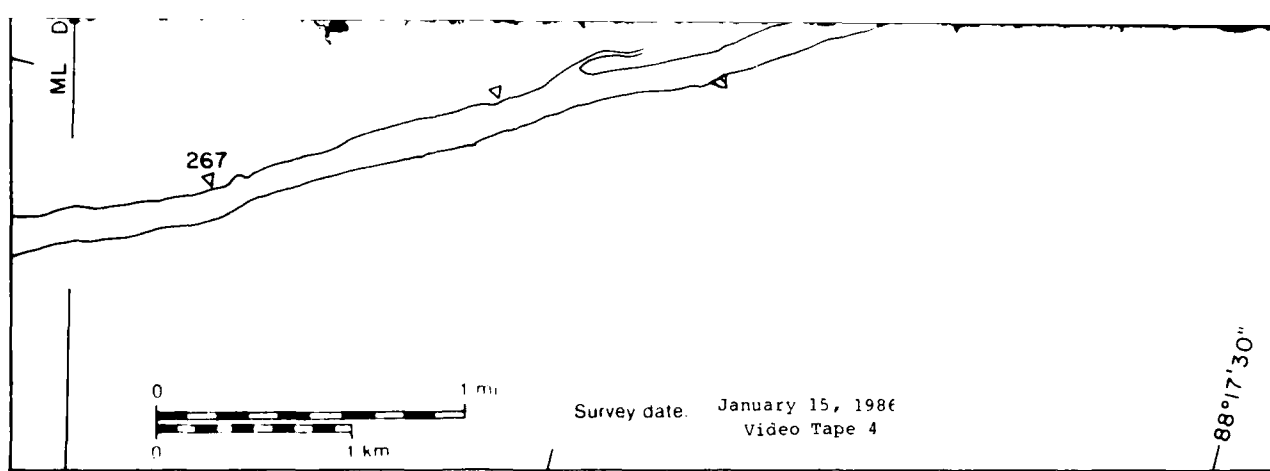


Open water

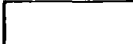




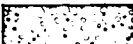
Area (m ² x 10 ⁶)	Surface concentration (%)
7.32	NA

15 January 1986

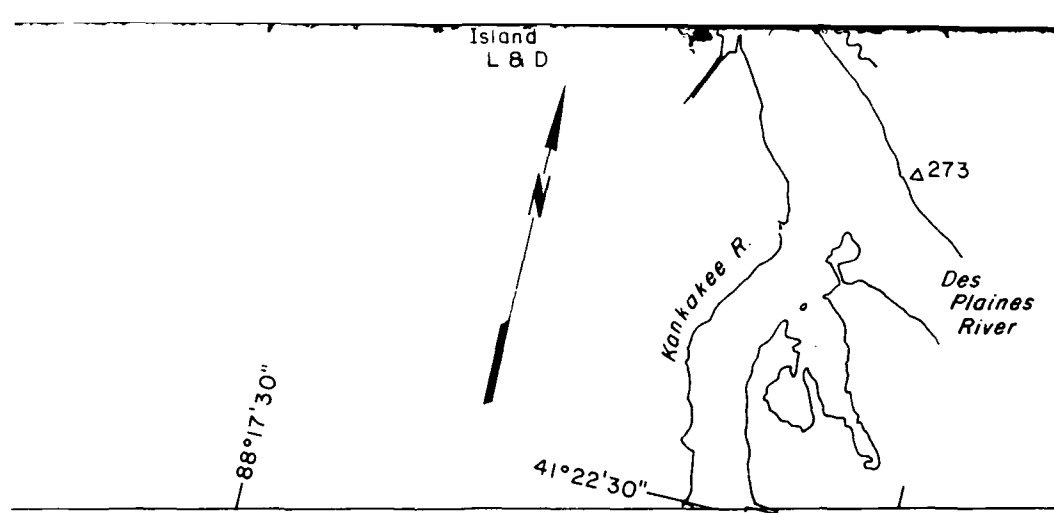




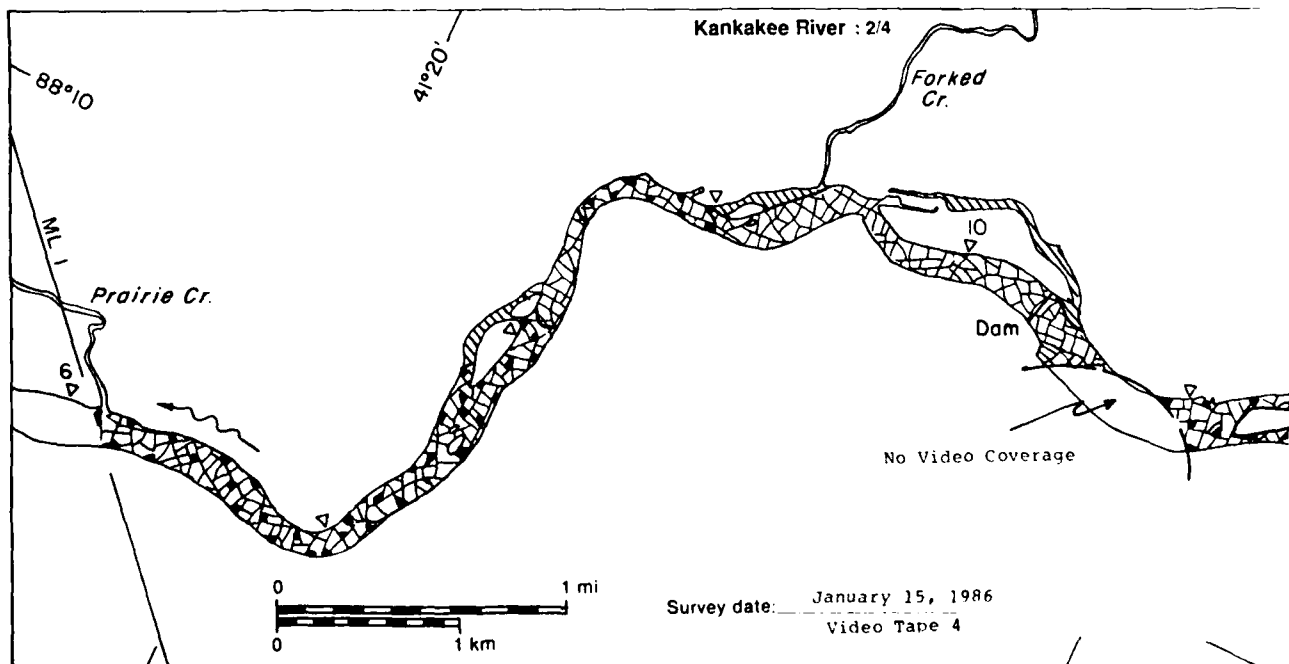
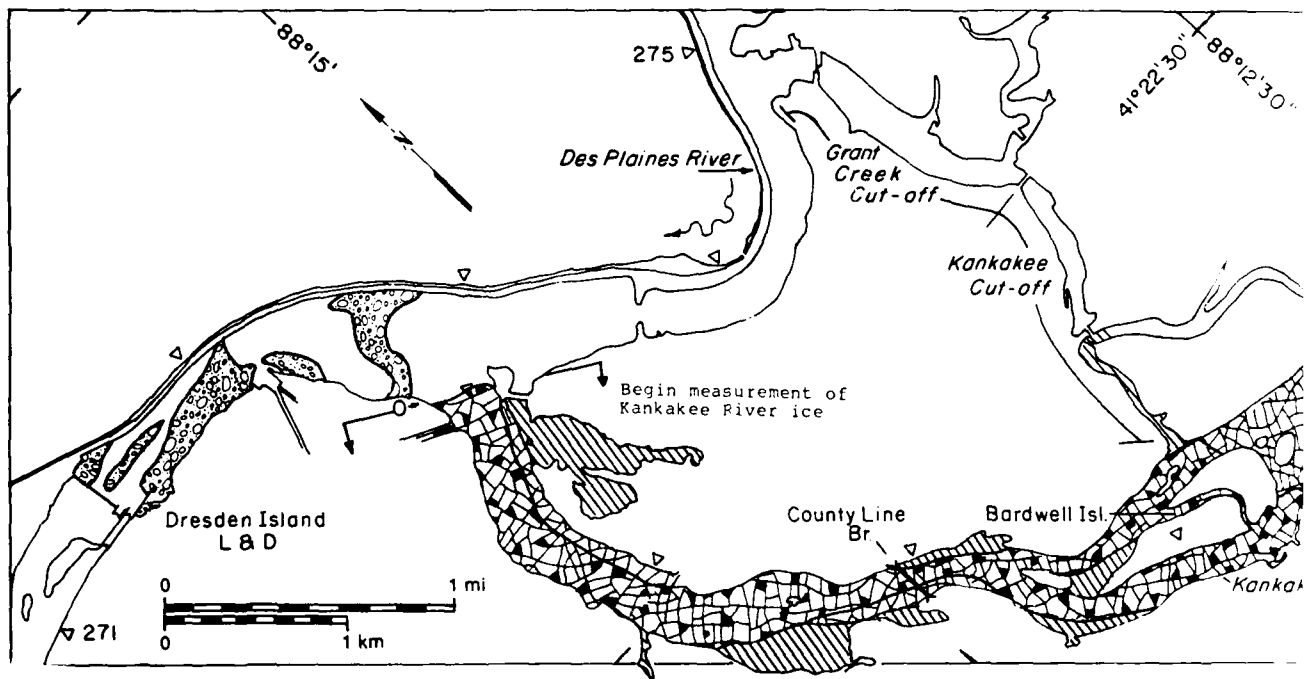
Marseilles Pool

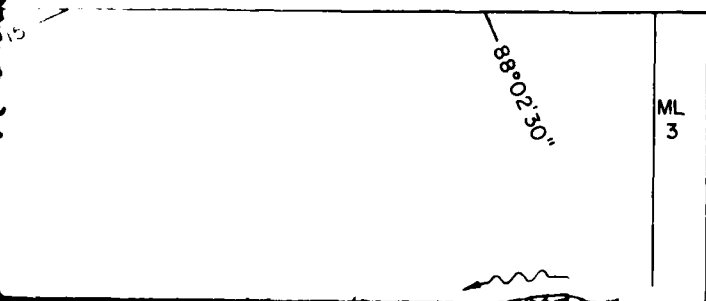
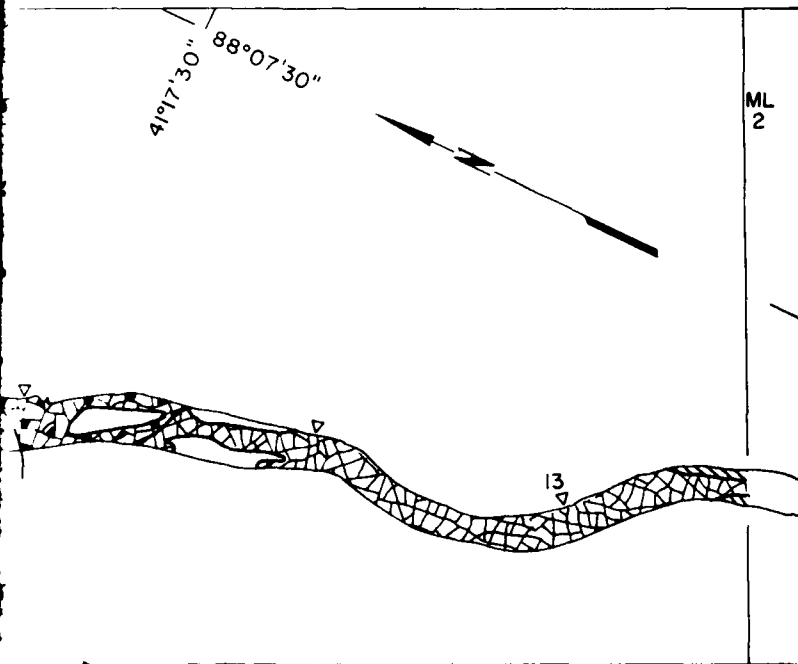
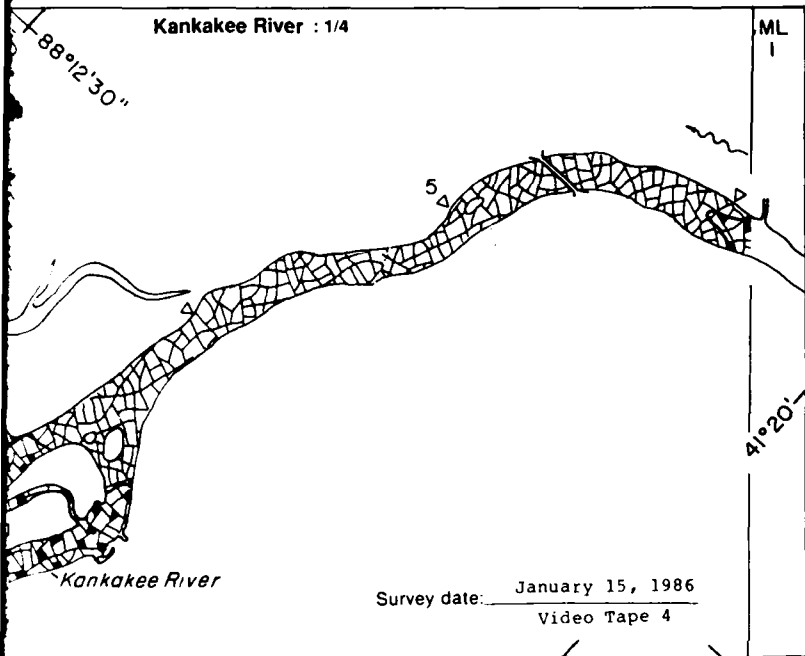
MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	7.32	NA
	Solid ice cover	Trace	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.40	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.21	30
Total area ($m^2 \times 10^6$)		8.19*	

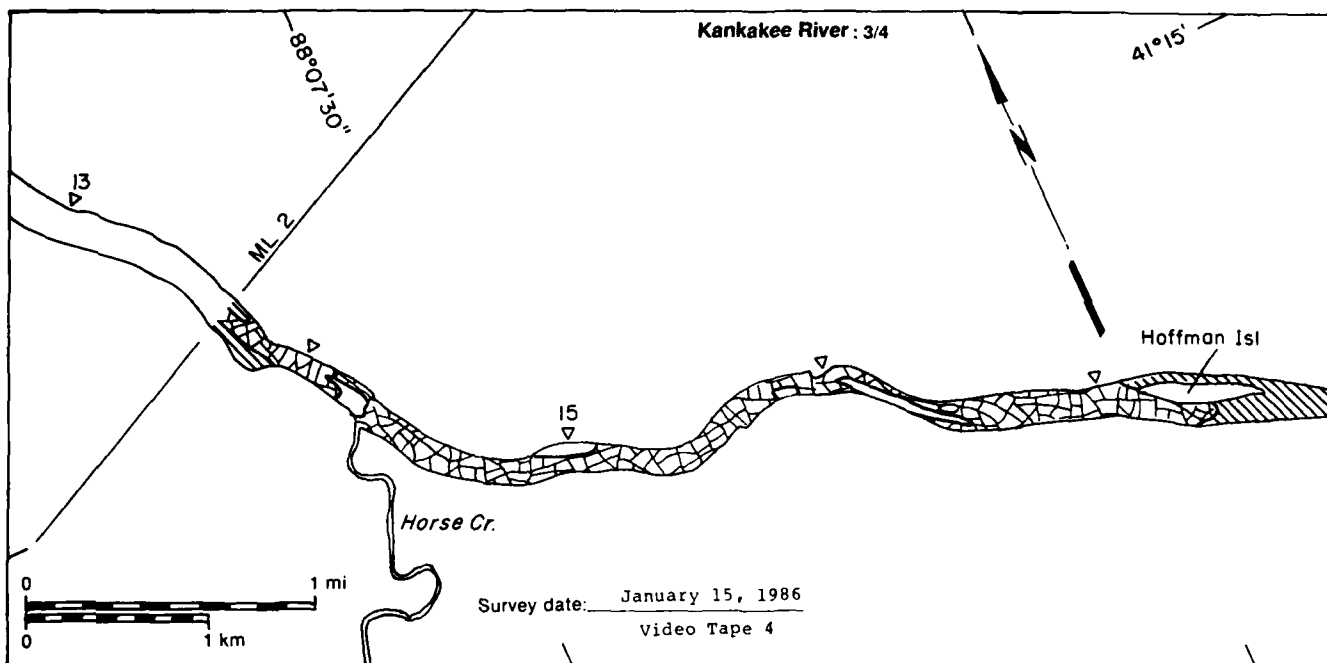
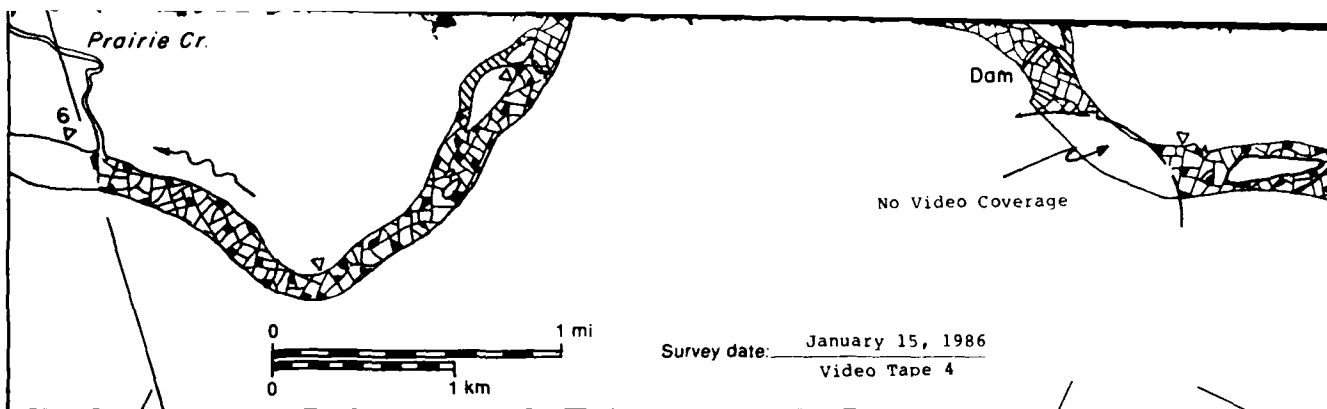
* Includes $0.26 \times 10^6 m^2$ of no video coverage

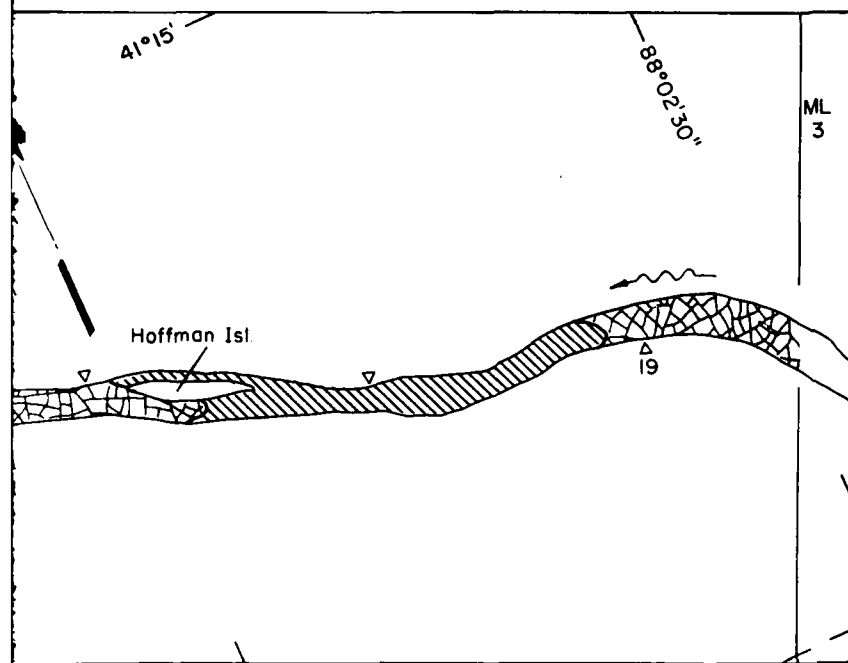
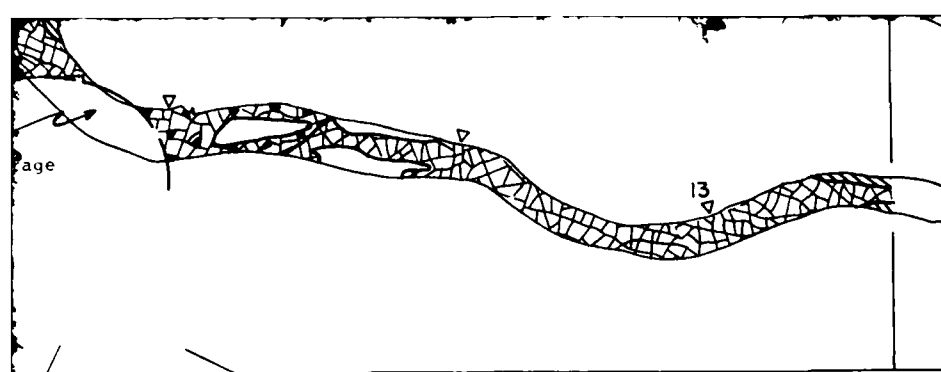


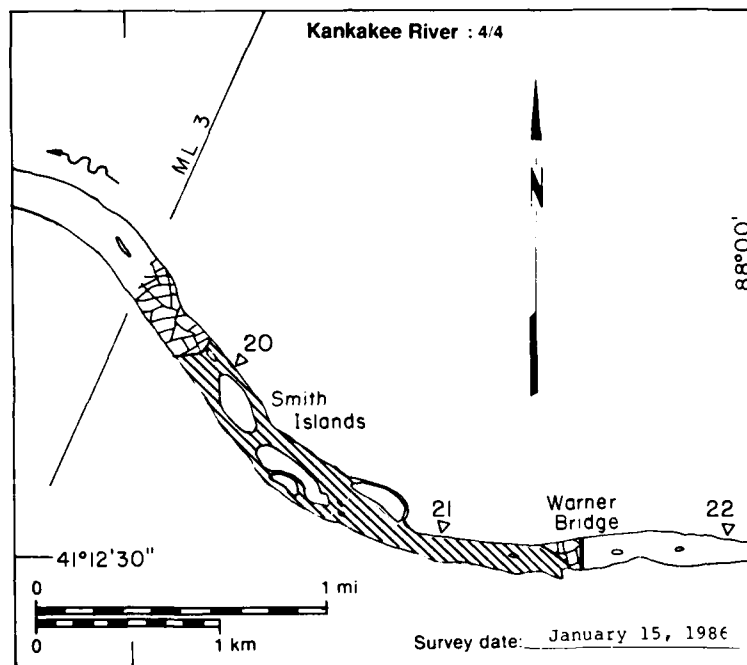
15 January 1986








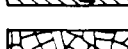








Kankakee River

MAP UNITS

-  Open water
-  Solid ice cover
-  Solid ice cover with open-water areas
-  Fragmented ice cover
-  Fragmented ice cover with open-water areas
-  Ice floes or frazil slus and pans

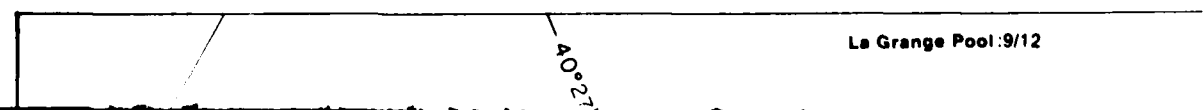
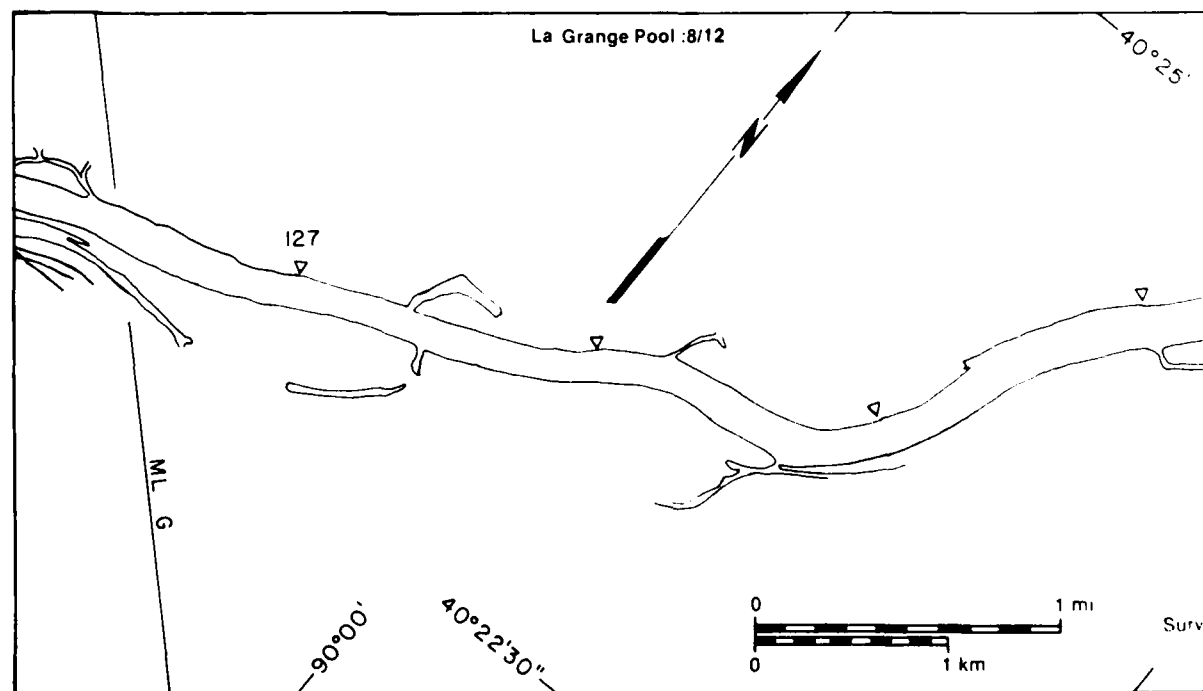
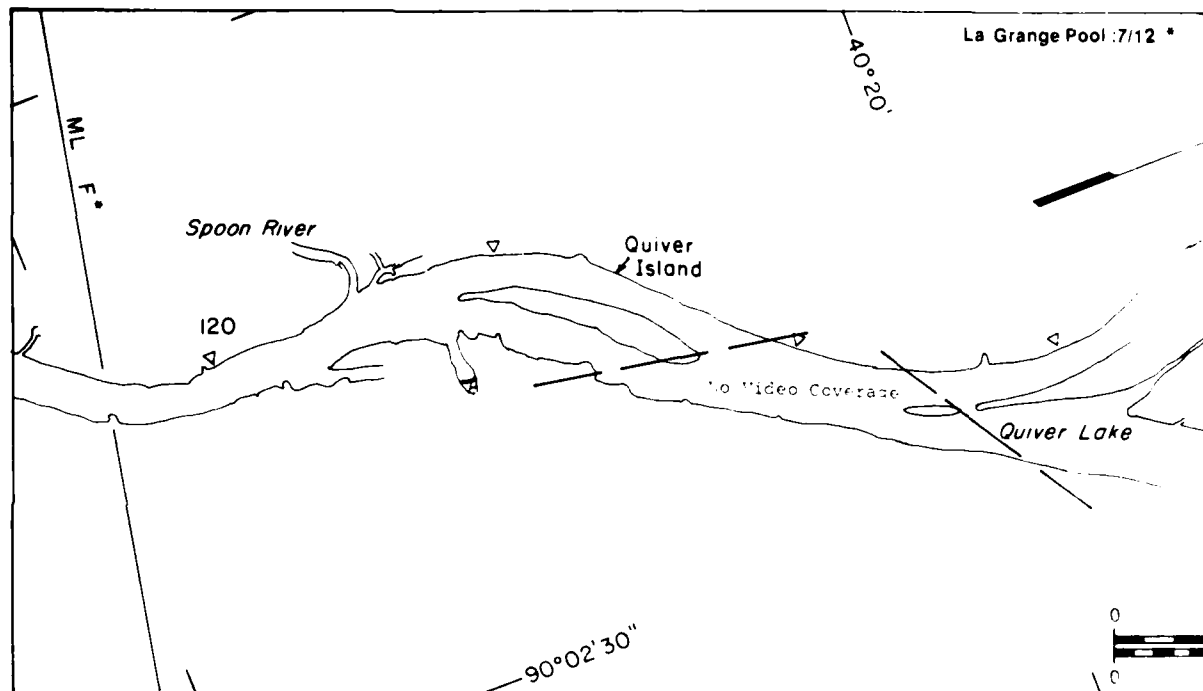
Total area ($m^2 \times$

Video Tape 4

15 January 1986

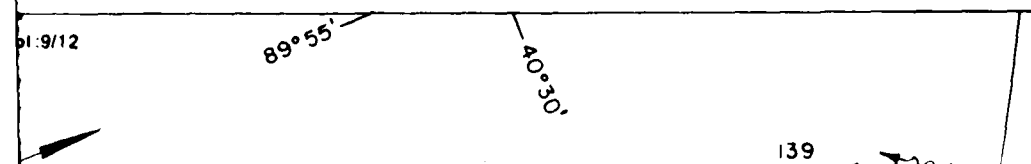
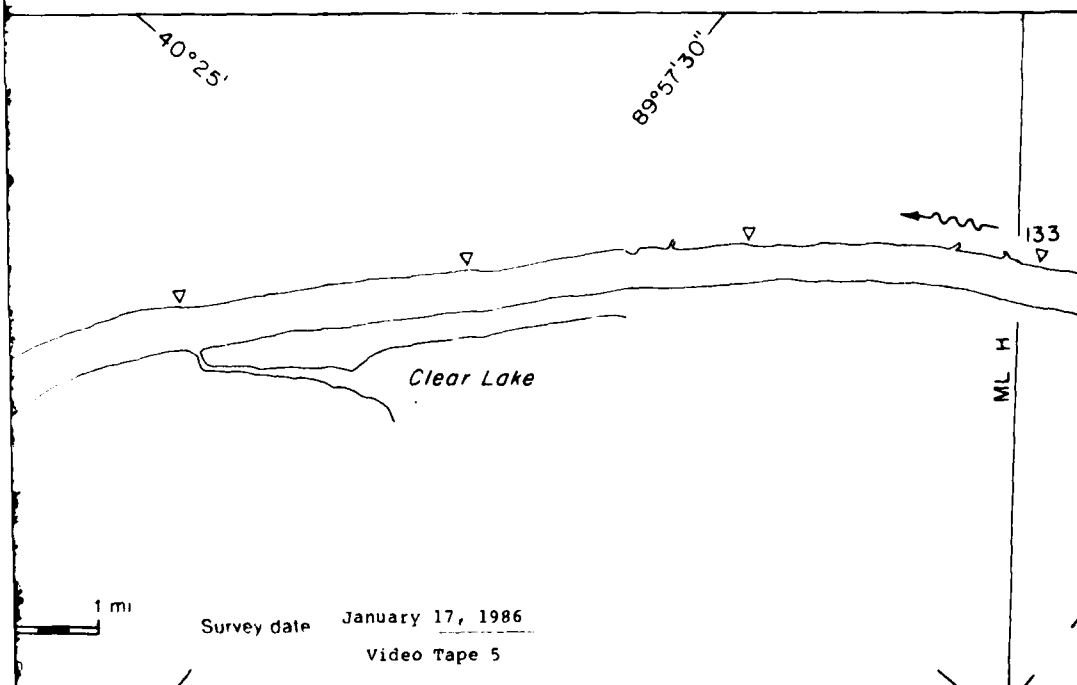
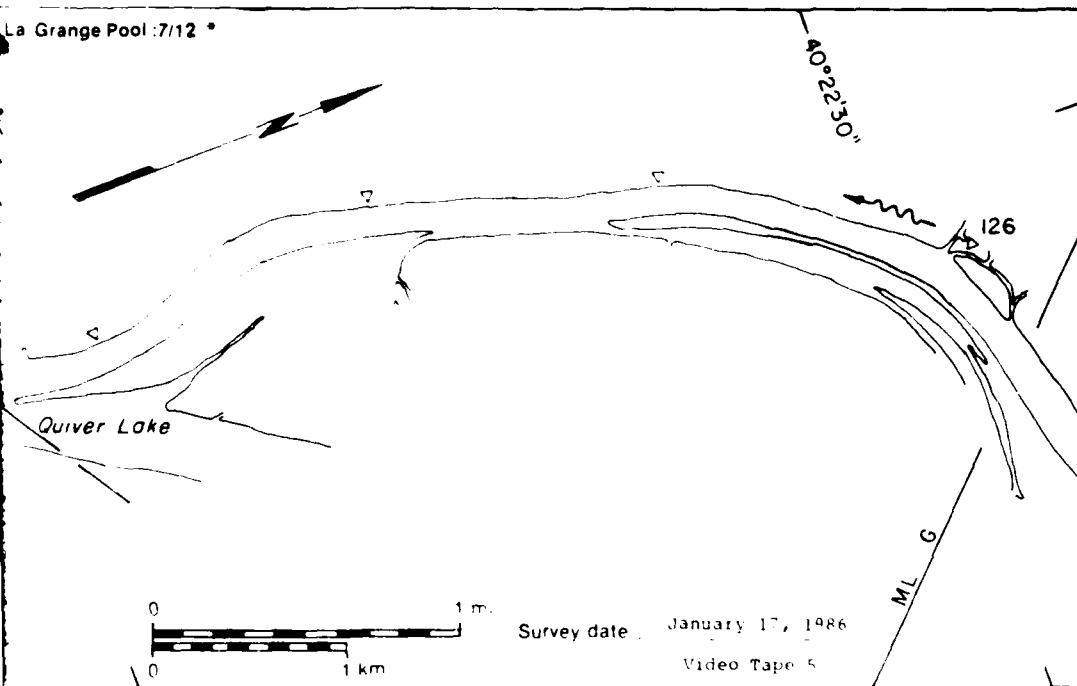
Kankakee River

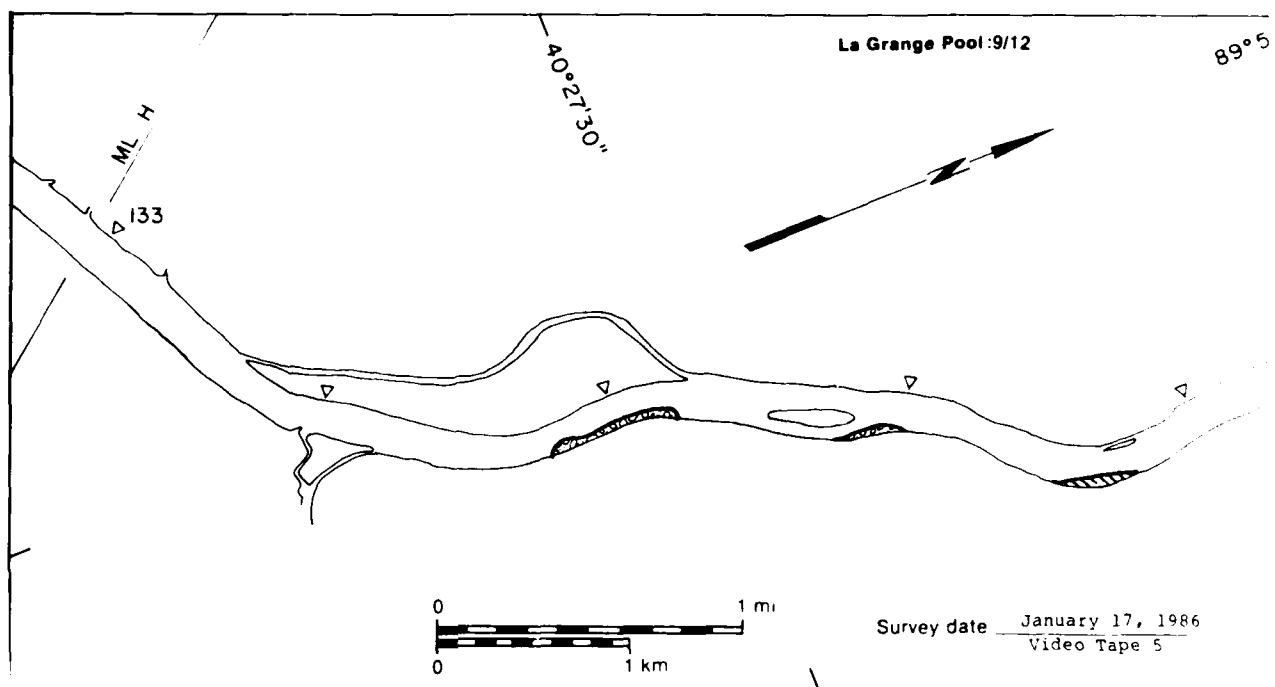
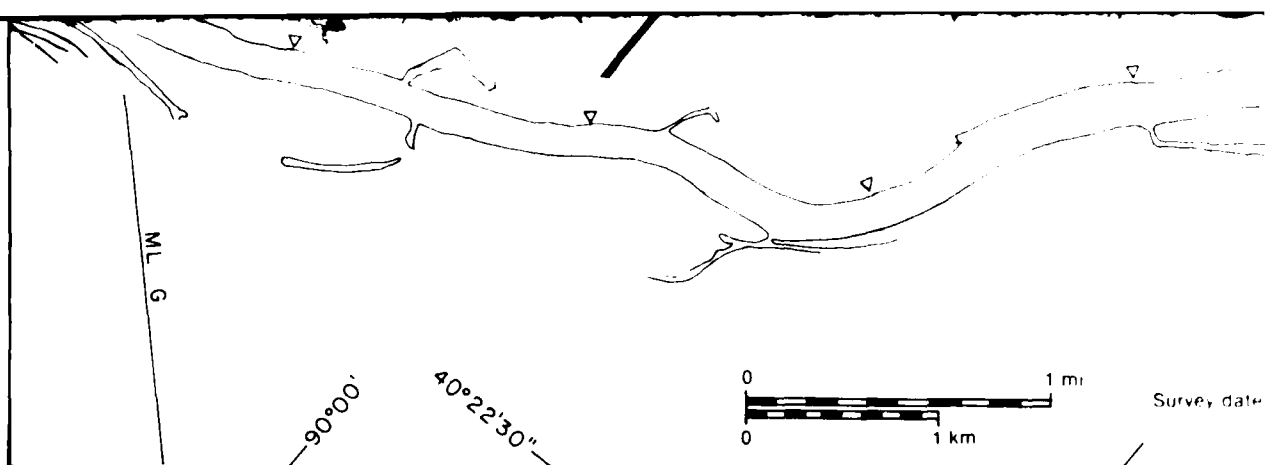
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	0.26	NA
Solid ice cover	1.07	NA
Solid ice cover with open-water areas	0.00	—
Fragmented ice cover	3.18	NA
Fragmented ice cover with open-water areas	2.67	90
Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)	7.30*	* Includes $0.12 \times 10^6 m^2$ of no video coverage



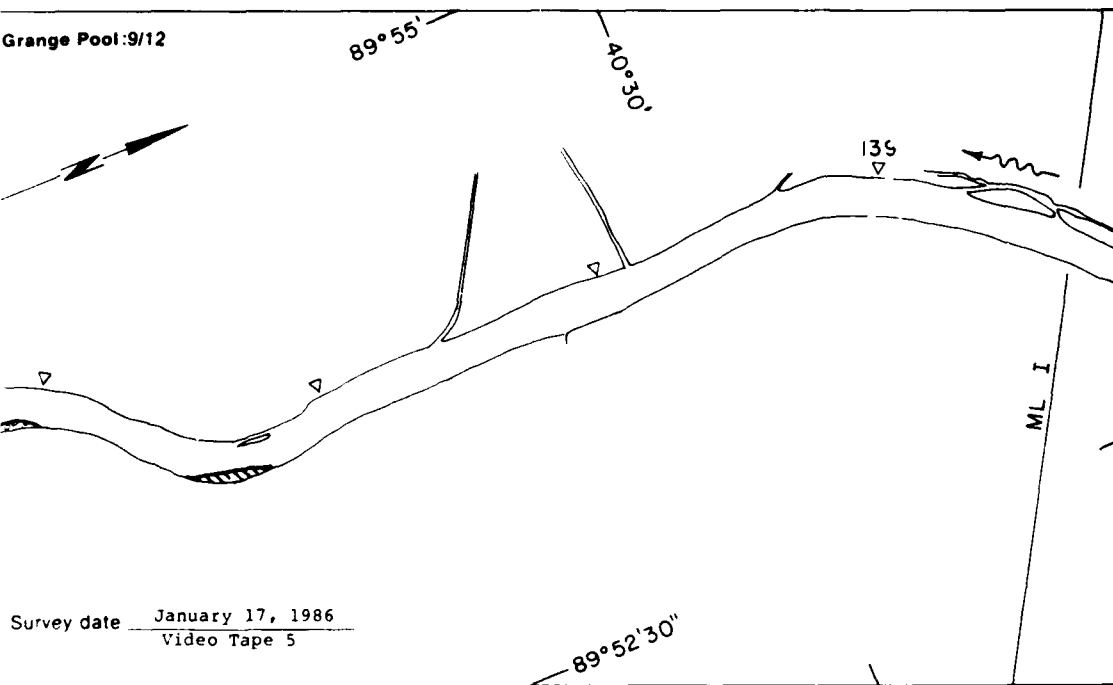
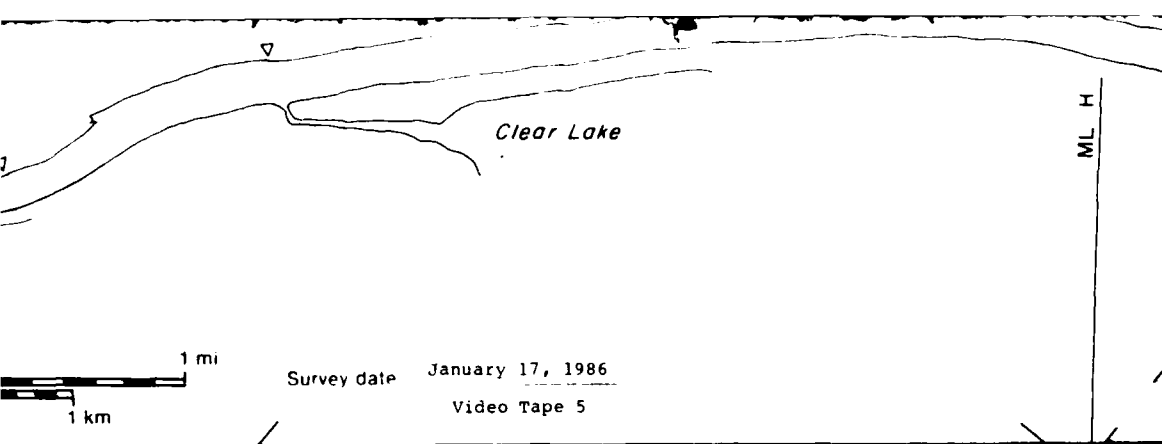
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La Grange Pool :7/12 *

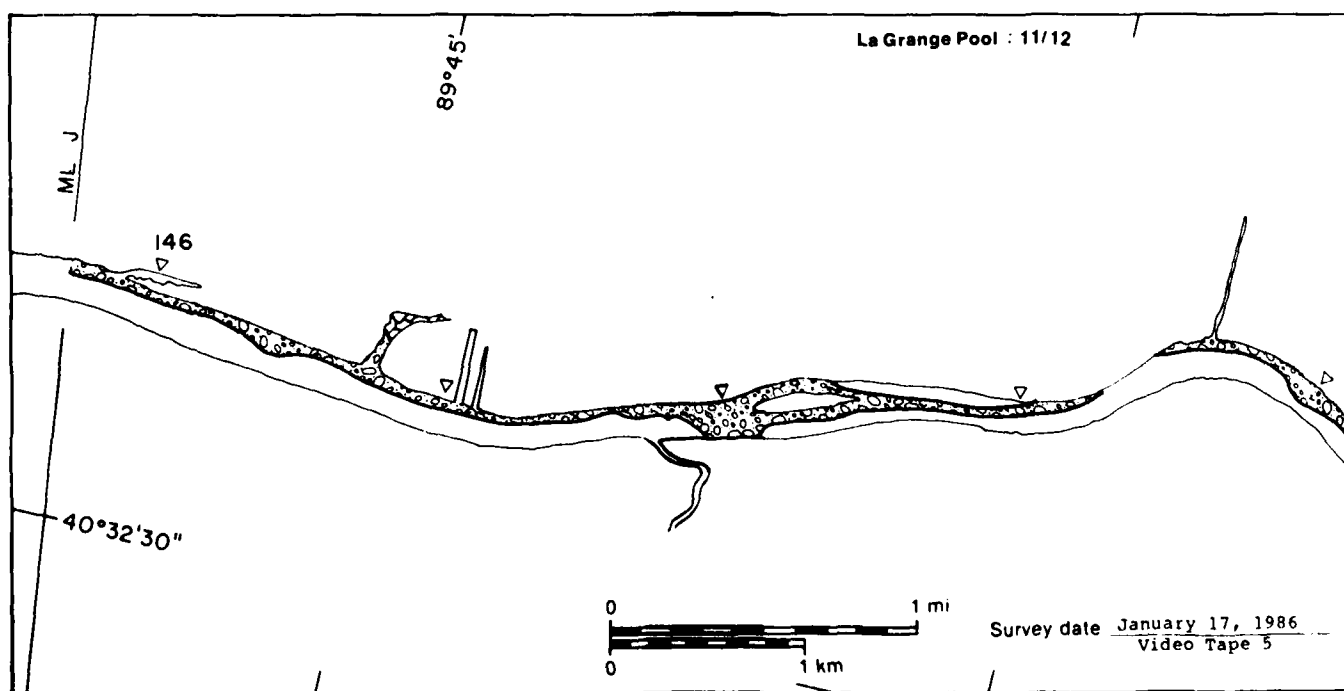
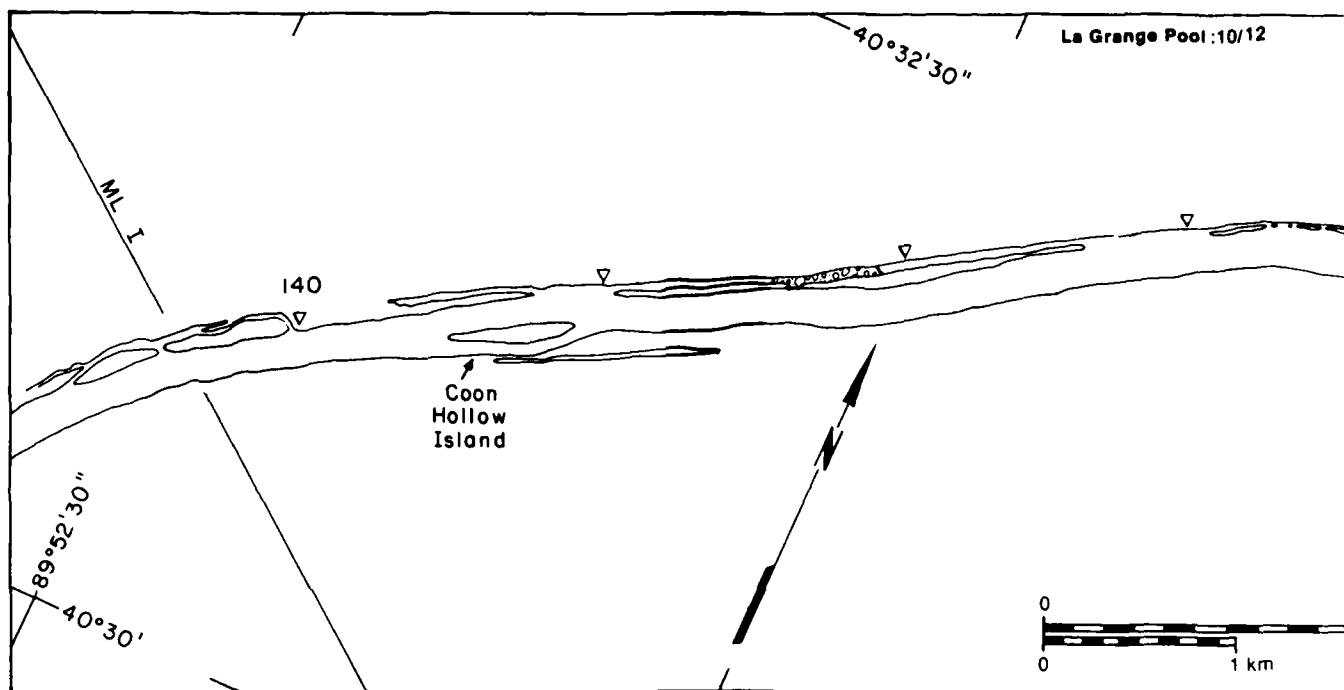




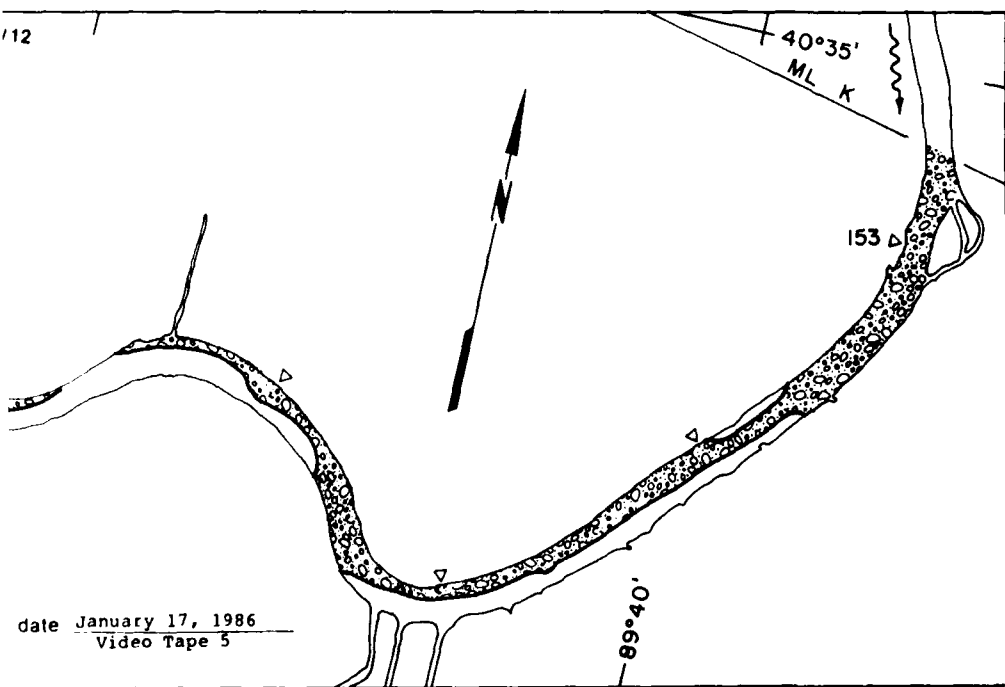
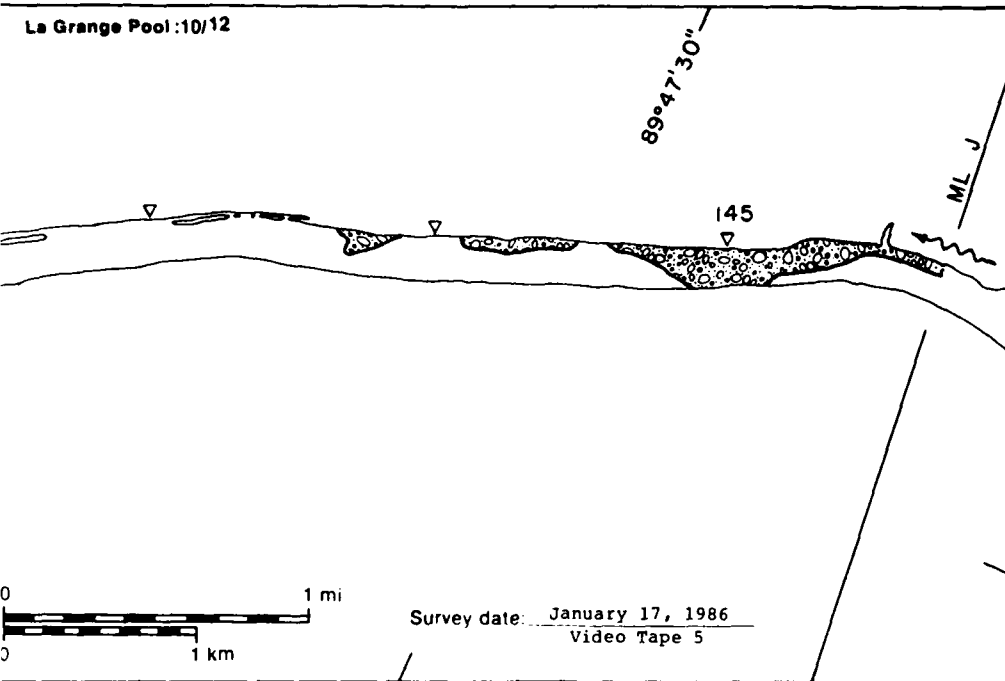
* The downstream limit of Illinois River video coverage was in the vicinity of mile 120 at Havana, Illinois, on all dates. There is no coverage of La Grange Pool maps 1/12 through 6/12 (match lines A through E).



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La Grange Pool:10/12

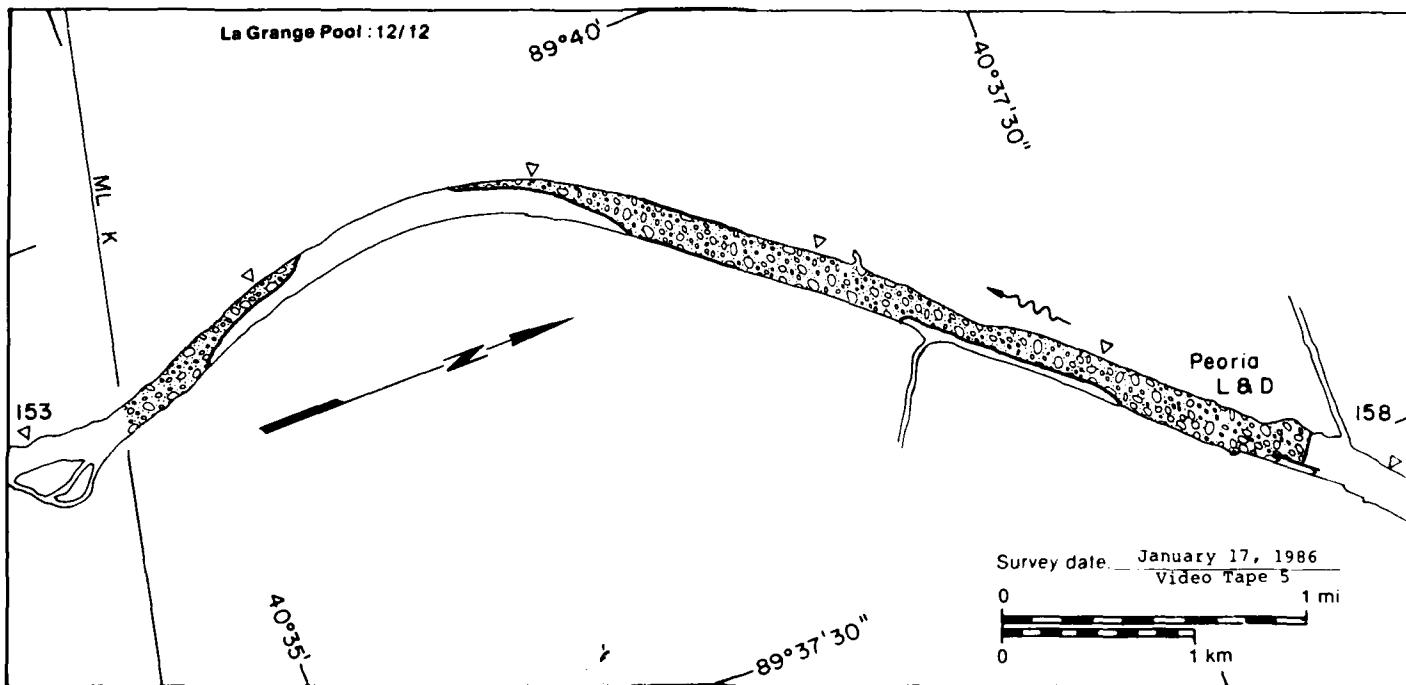
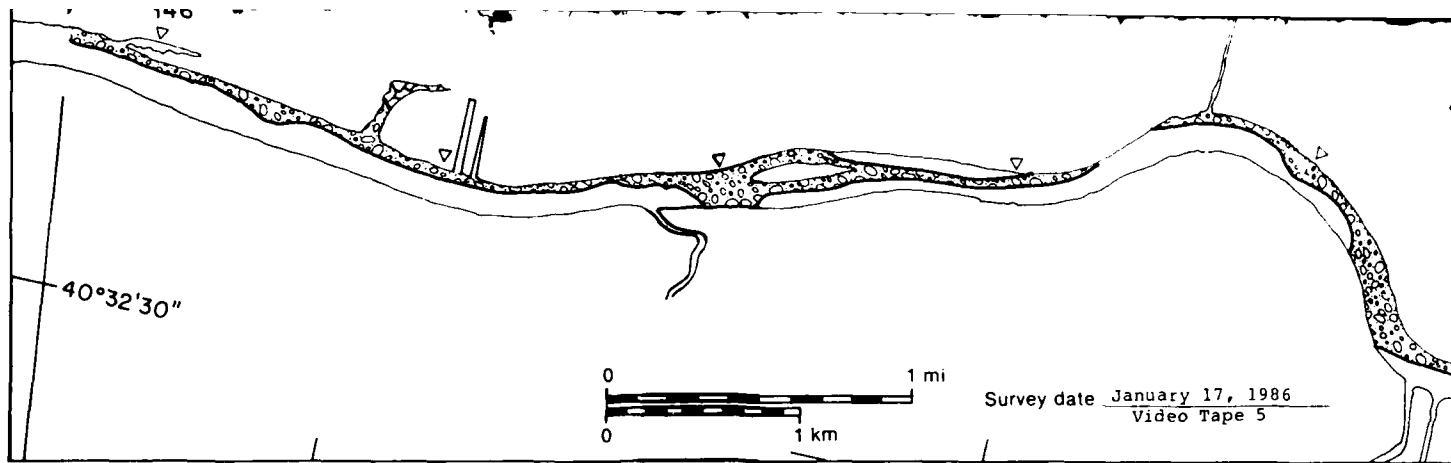


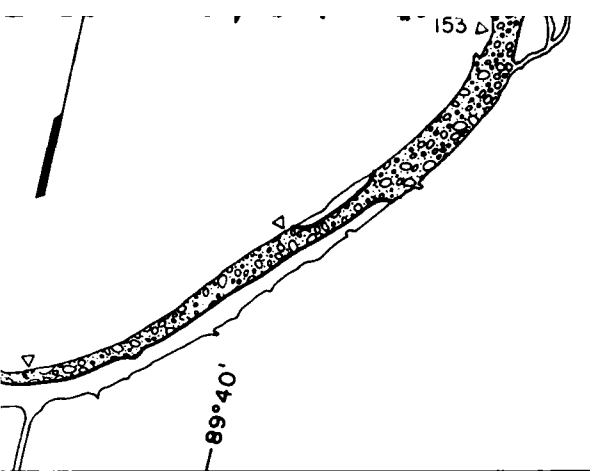
La Grange Pool

MAP UNITS

Area
(m² x 10⁶)

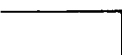


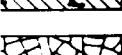


Surface
concentration
(%)





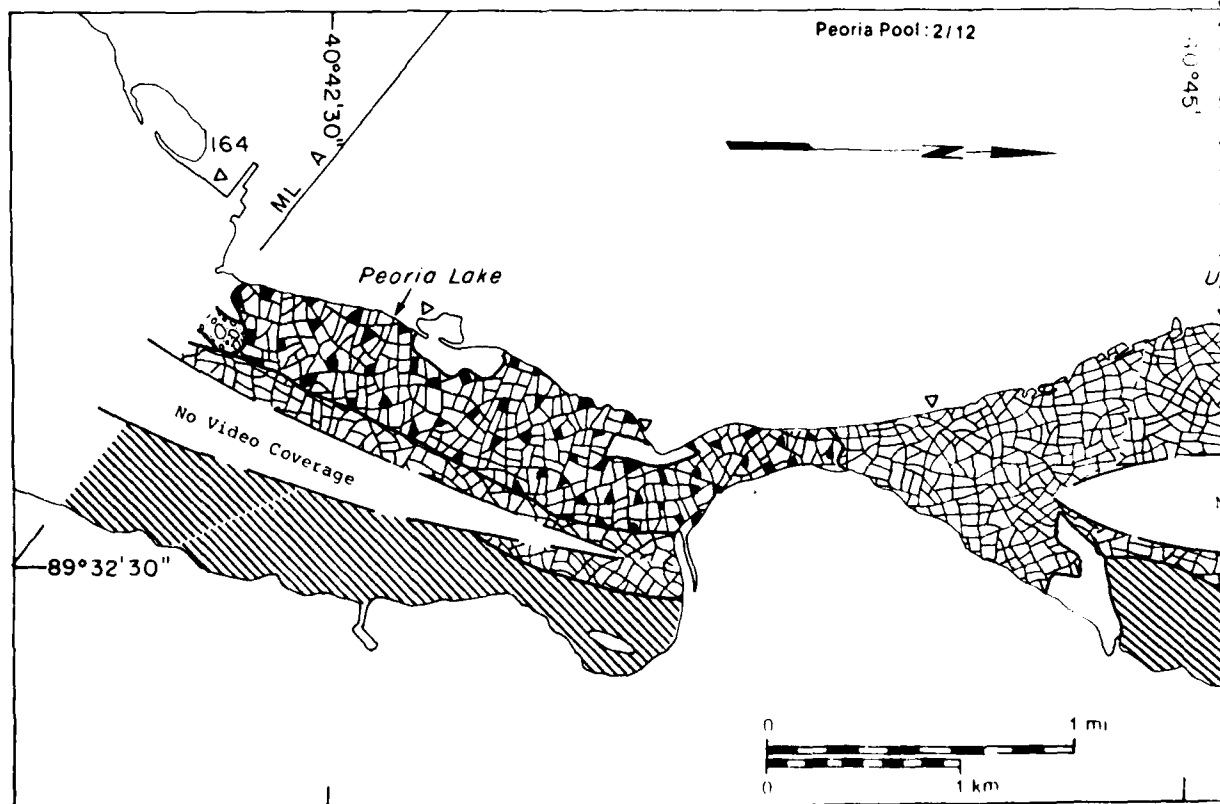
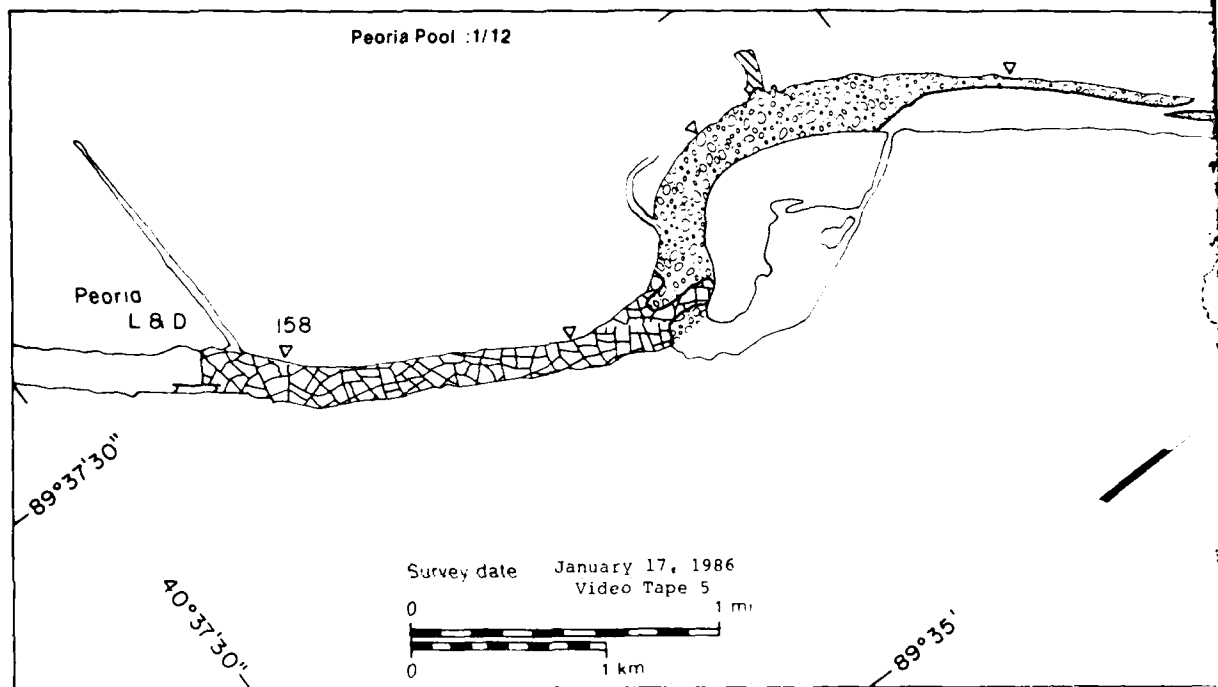
La Grange Pool

MAP UNITS

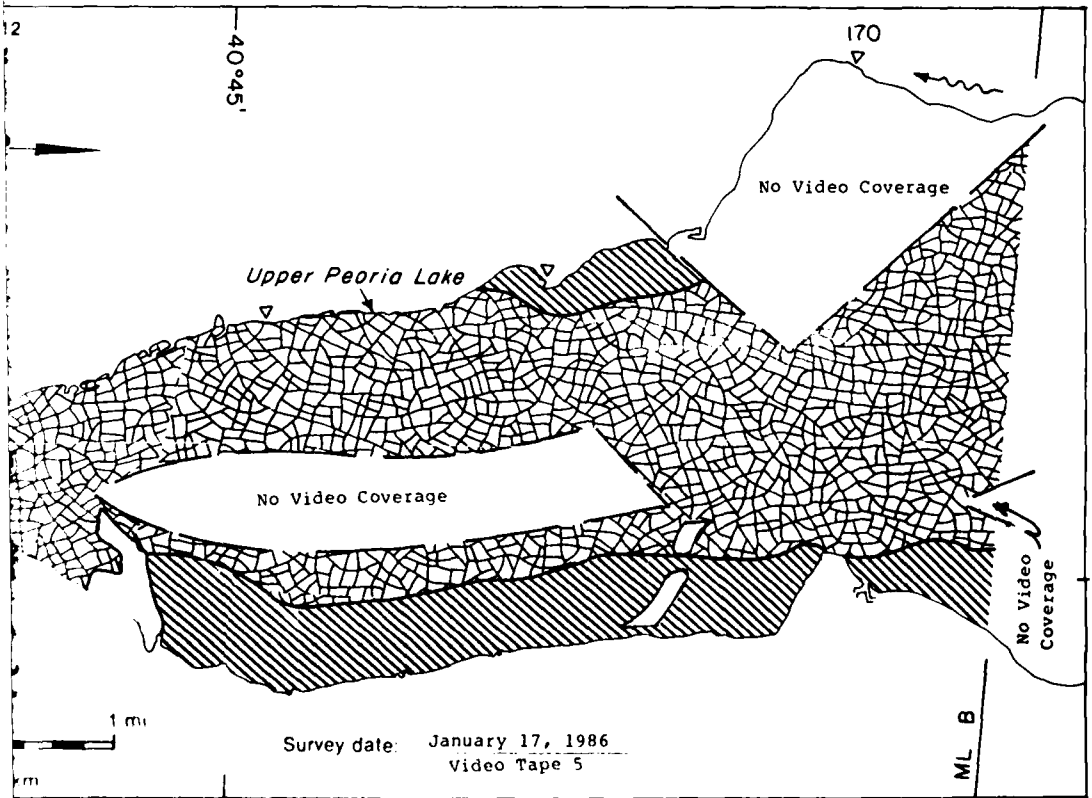
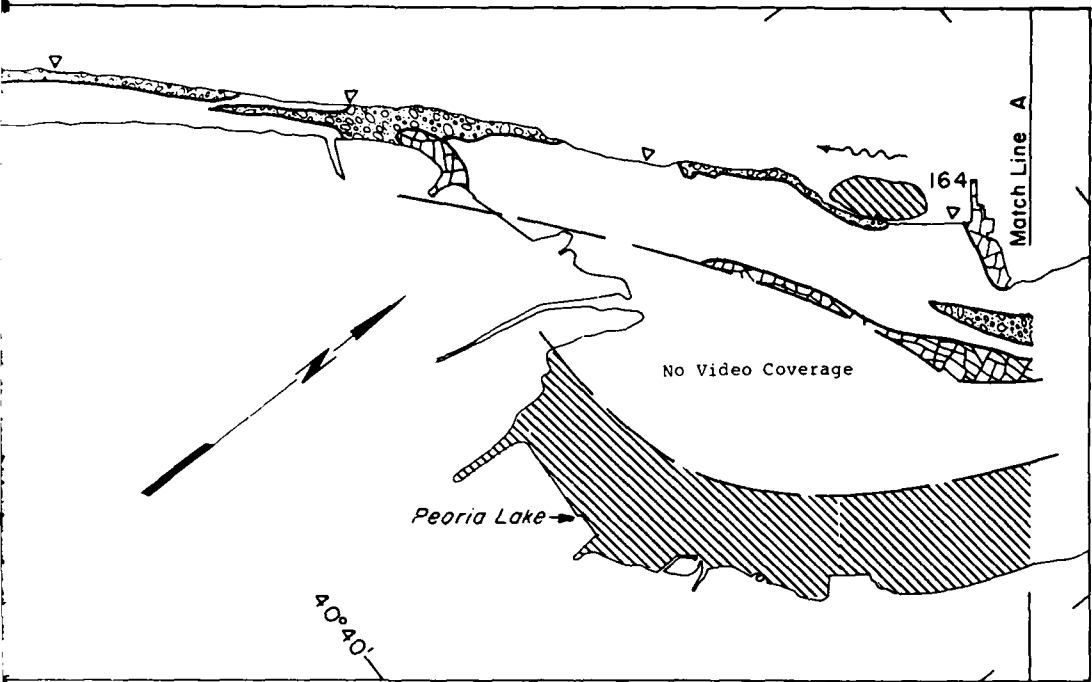
-  Open water
-  Solid ice cover
-  Solid ice cover with open-water areas
-  Fragmented ice cover
-  Fragmented ice cover with open-water areas
-  Ice floes or frazil slush and pans

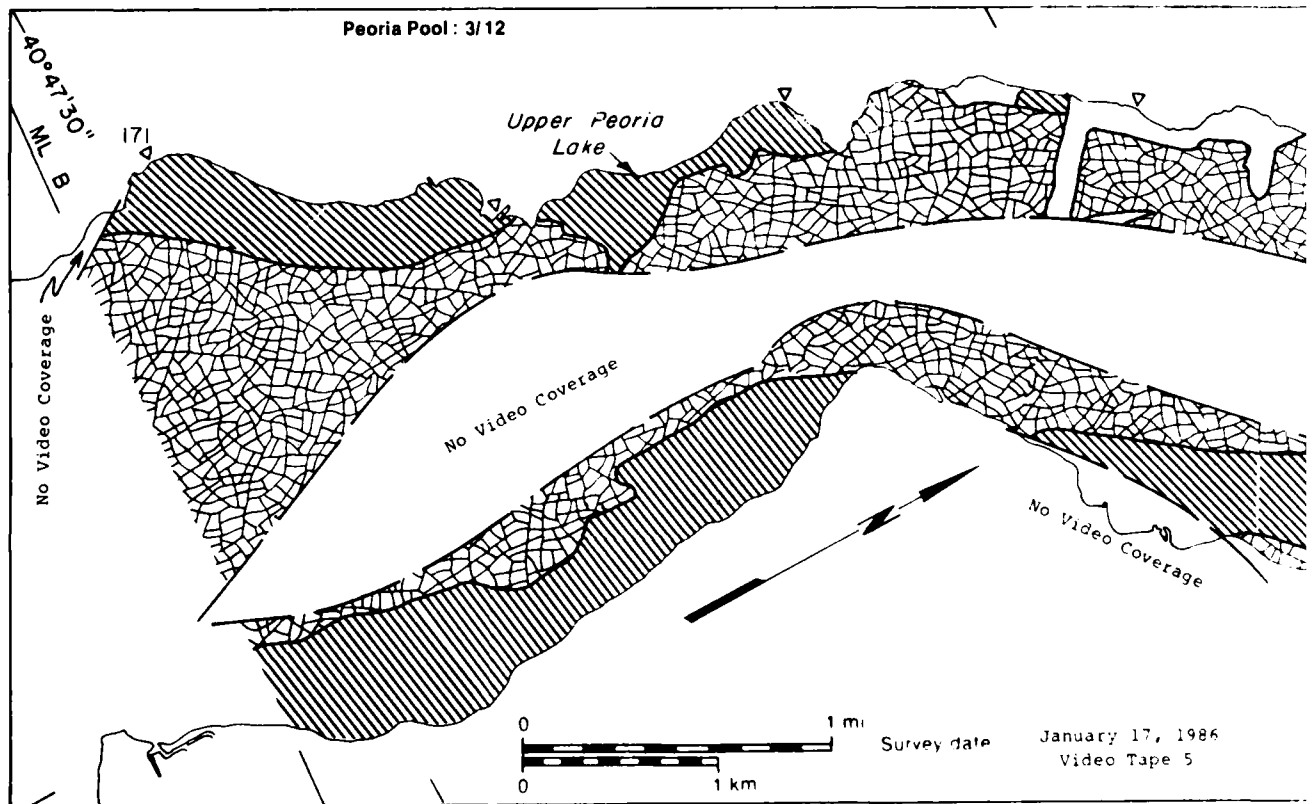
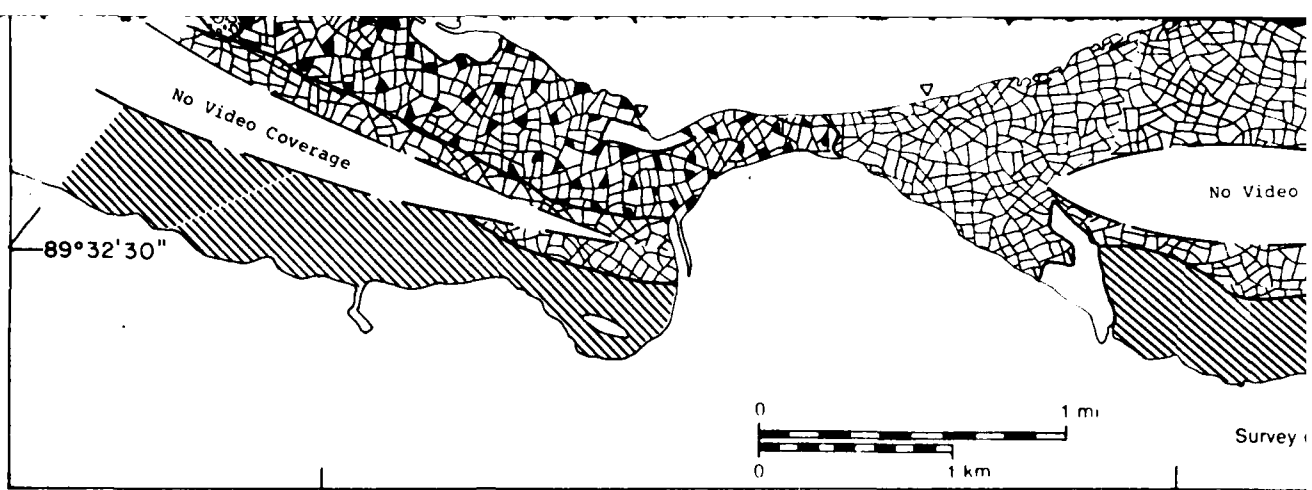
Area (m ² x 10 ⁶)	Surface concentration (%)
8.63	NA
0.02	NA
0.00	—
0.03	NA
0.00	—
2.49	10
Total area (m ² x 10 ⁶)	11.71*

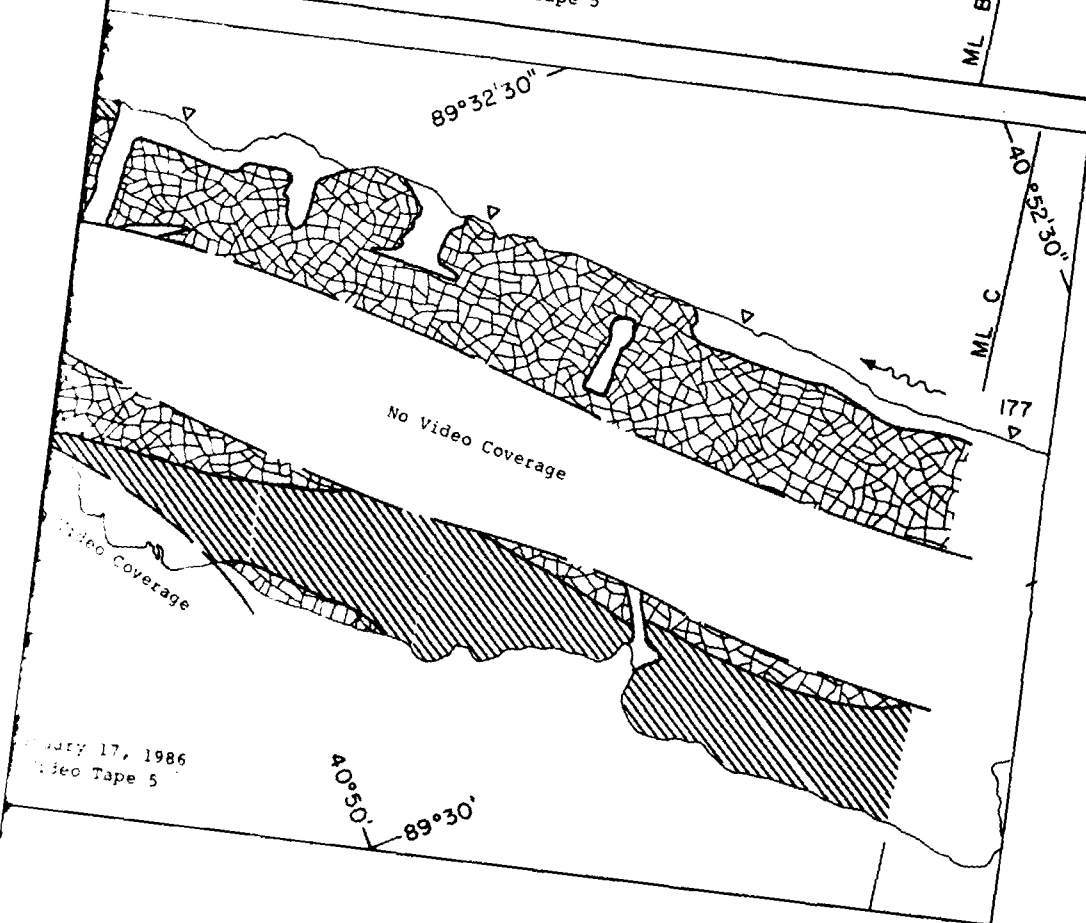
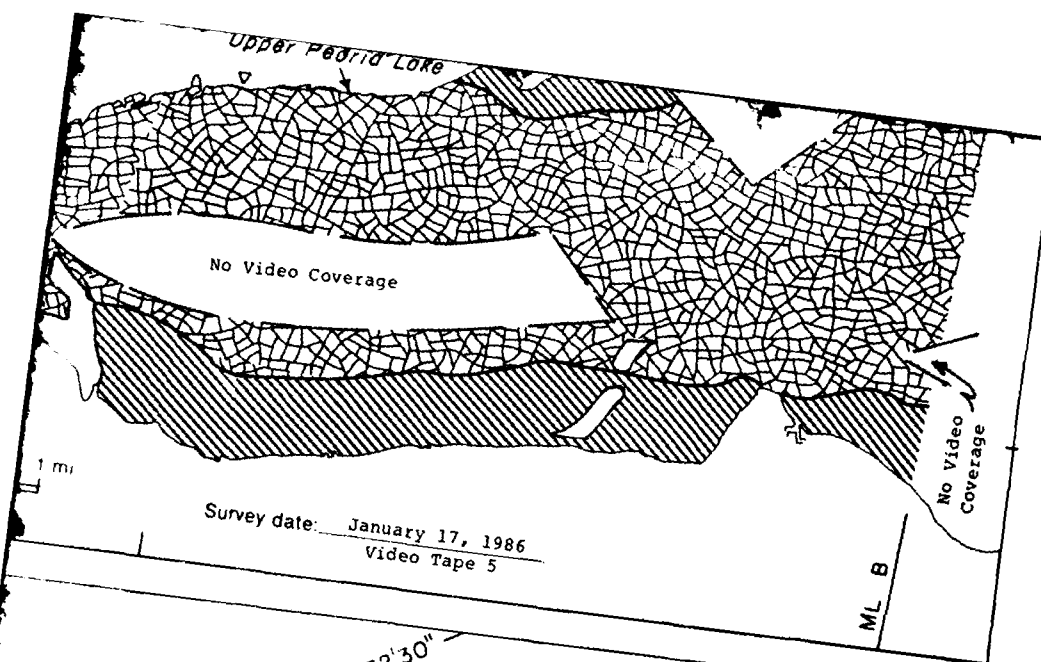
* Includes 0.54 x 10⁶ m²
of no video coverage



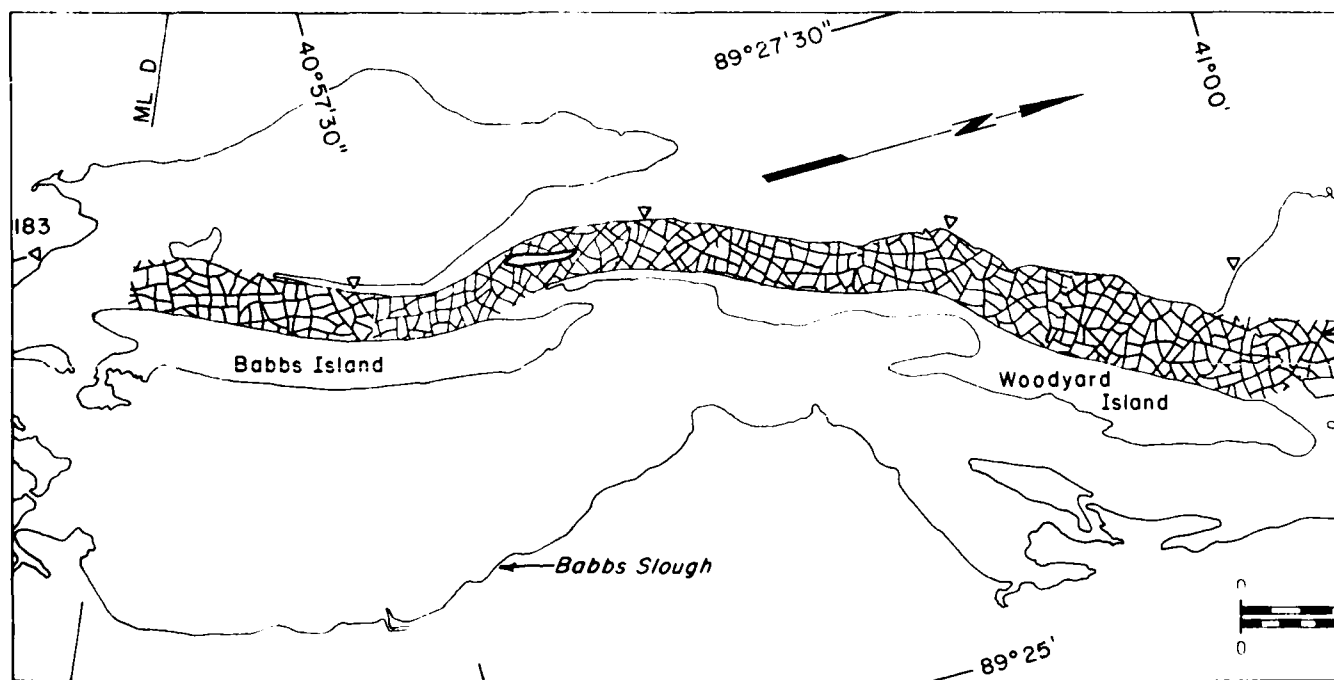
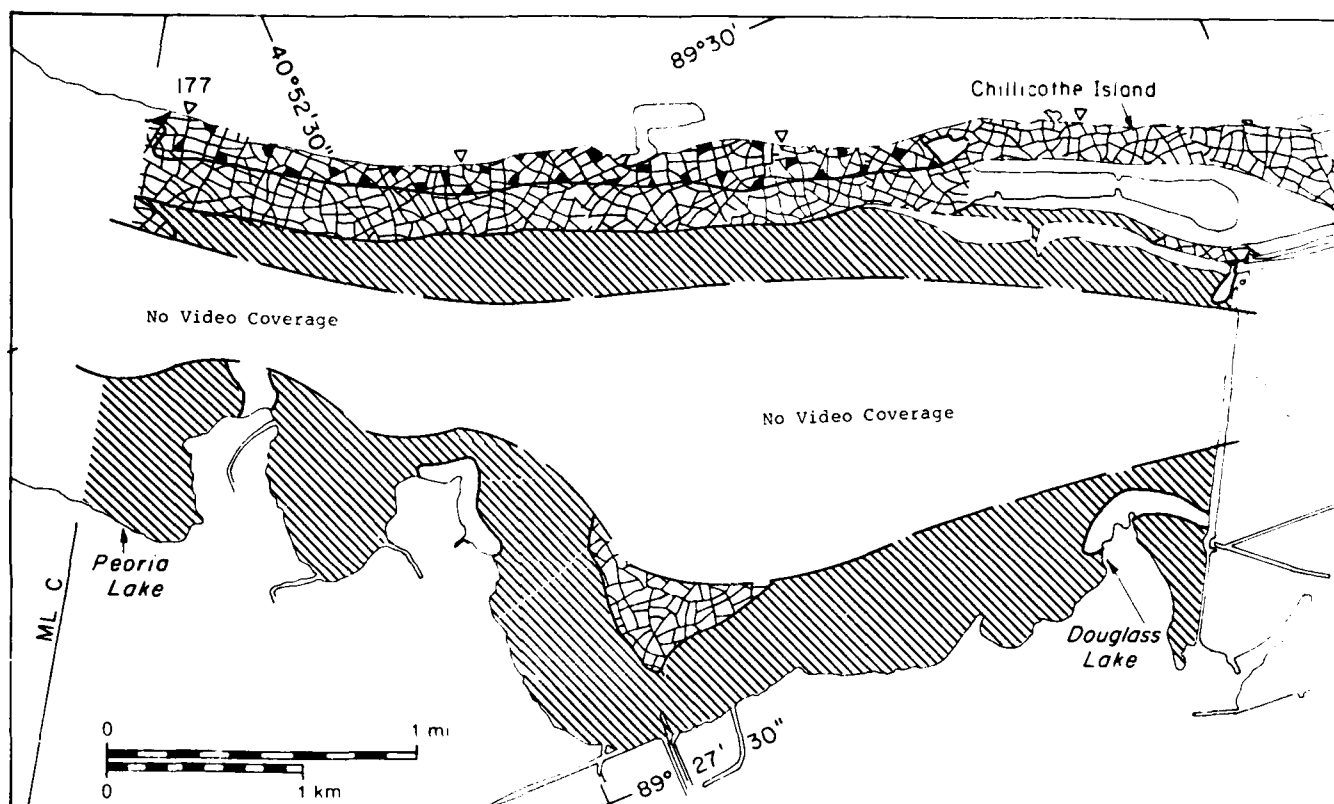
17 January 1986

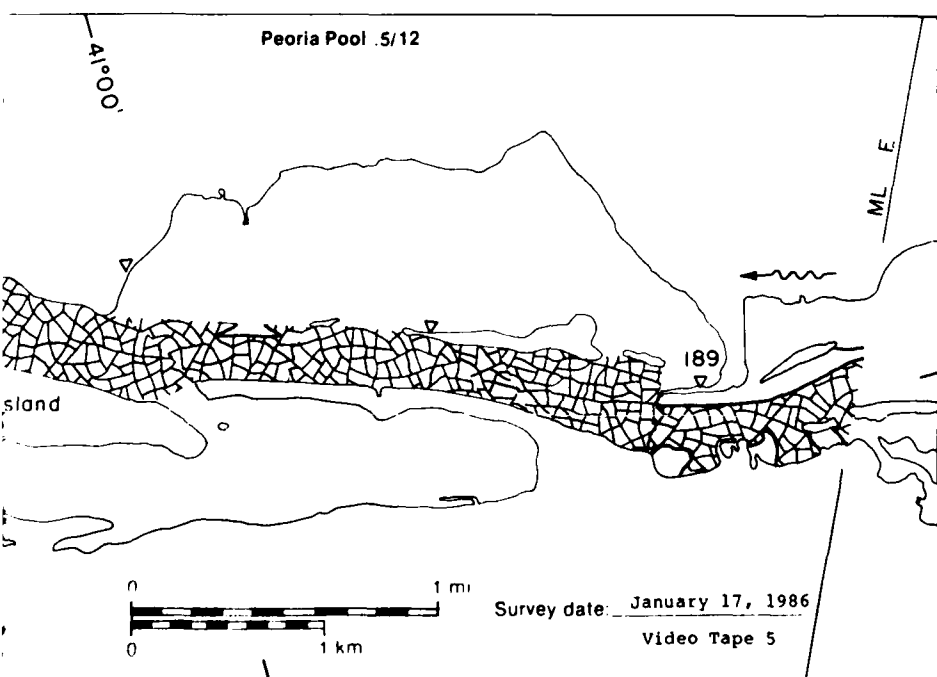
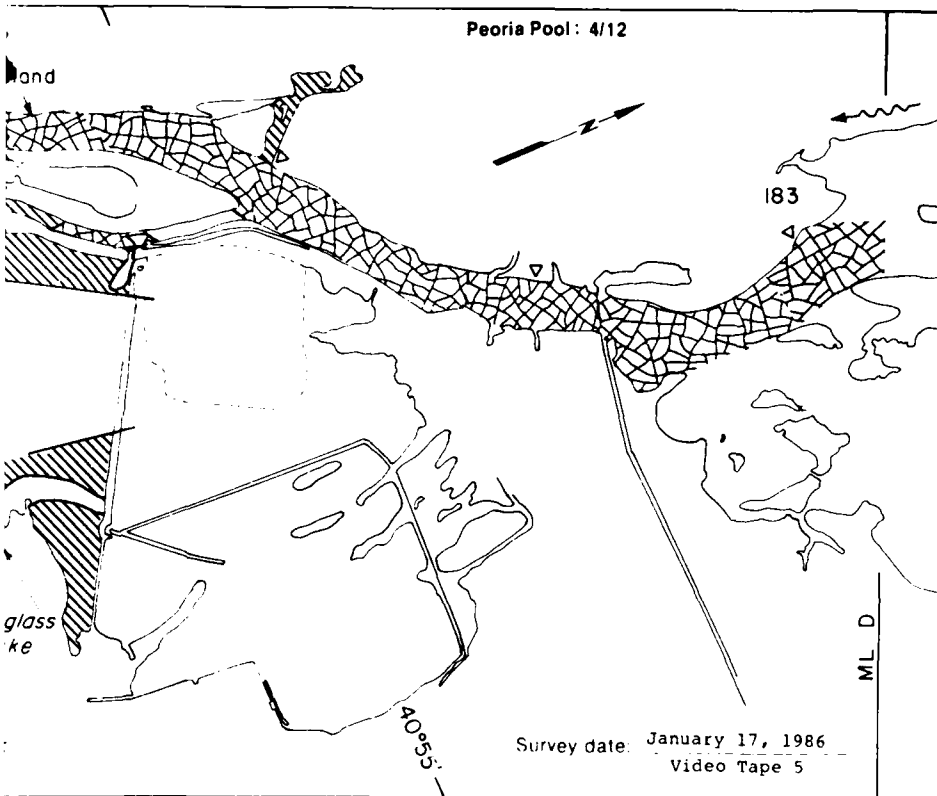


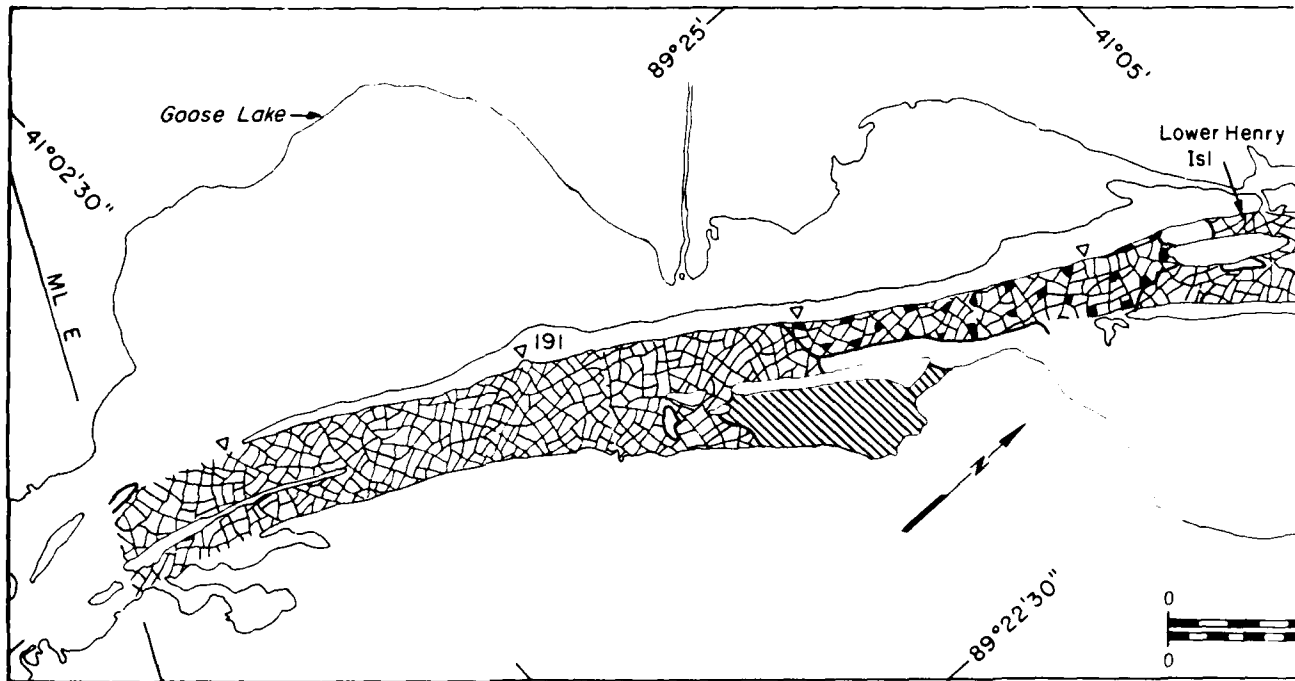
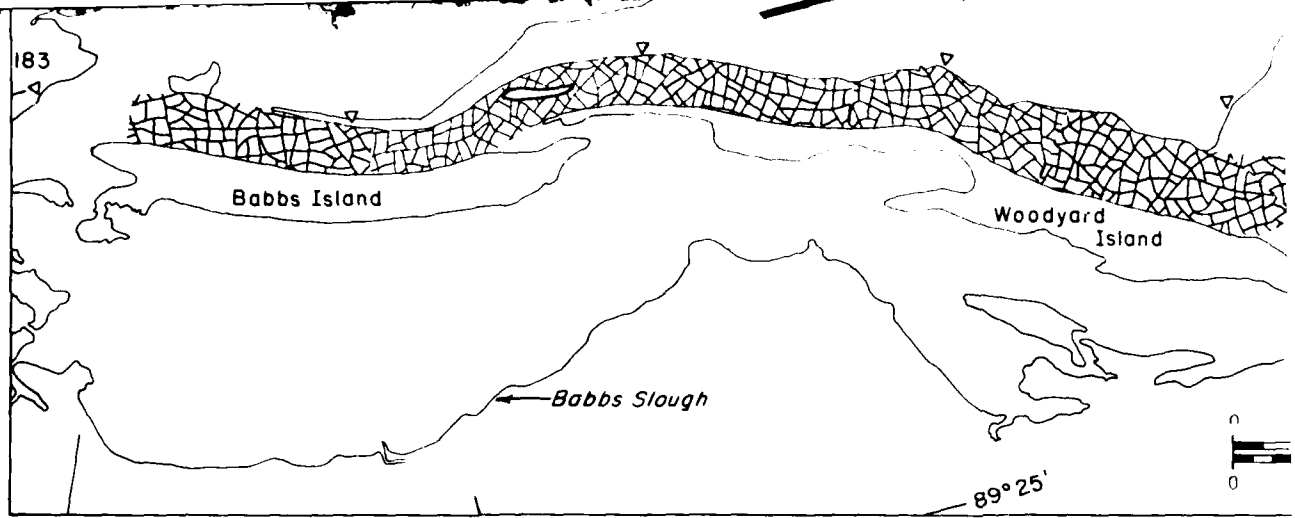


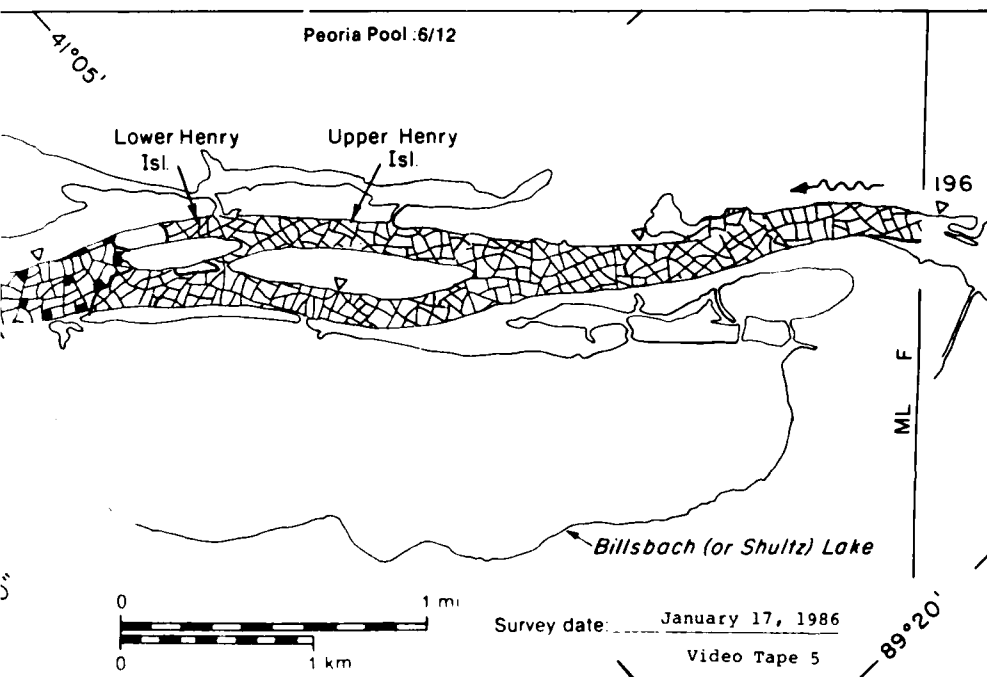
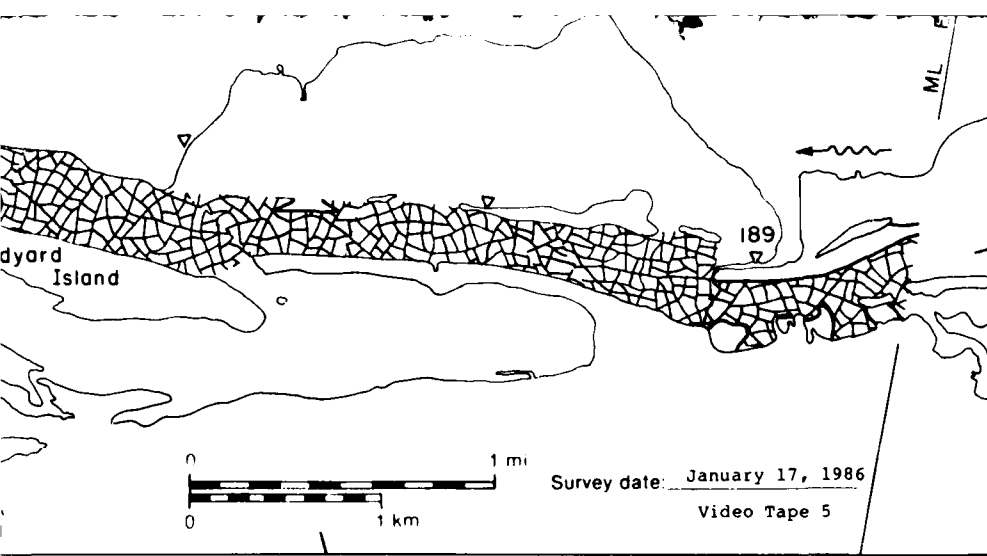


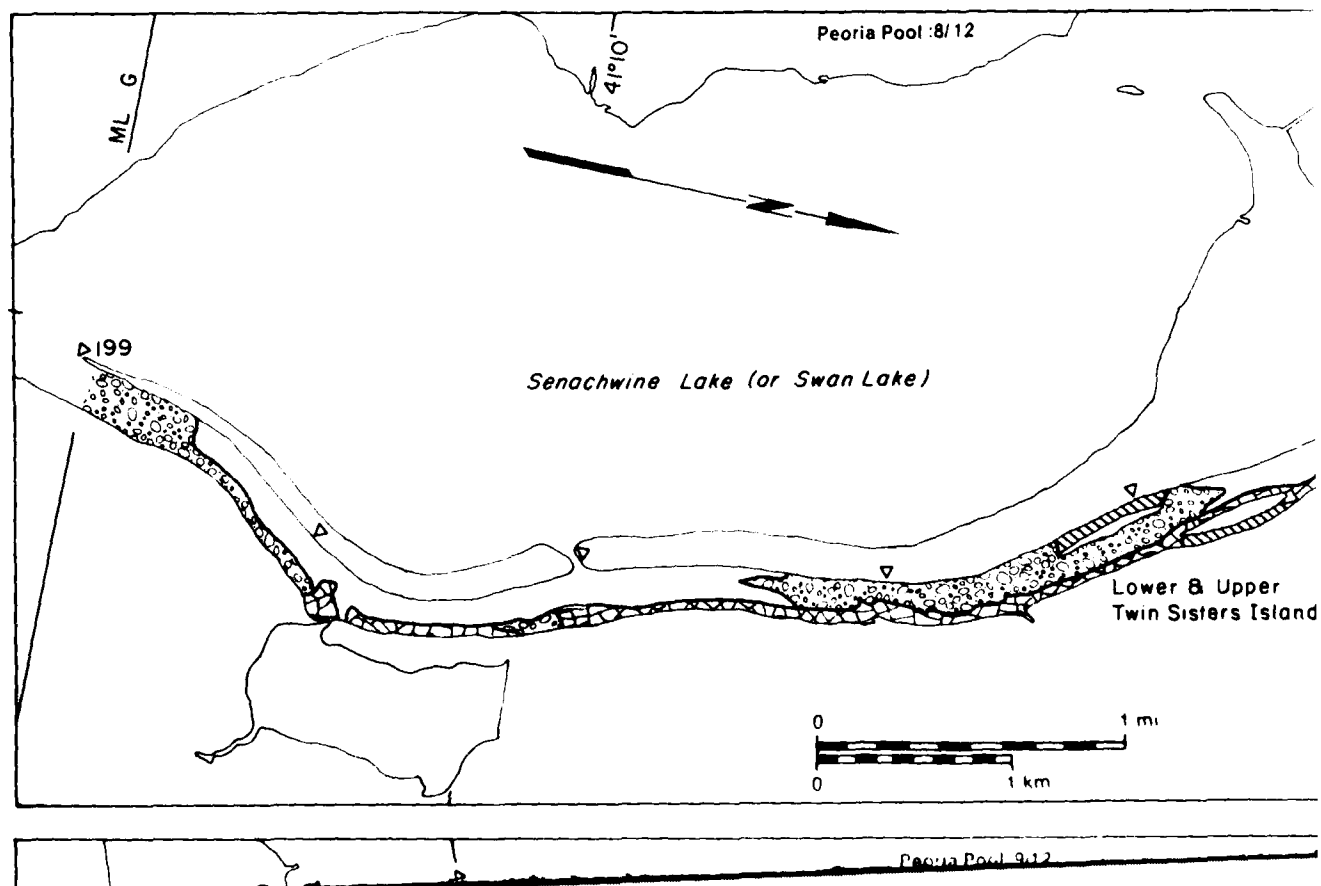
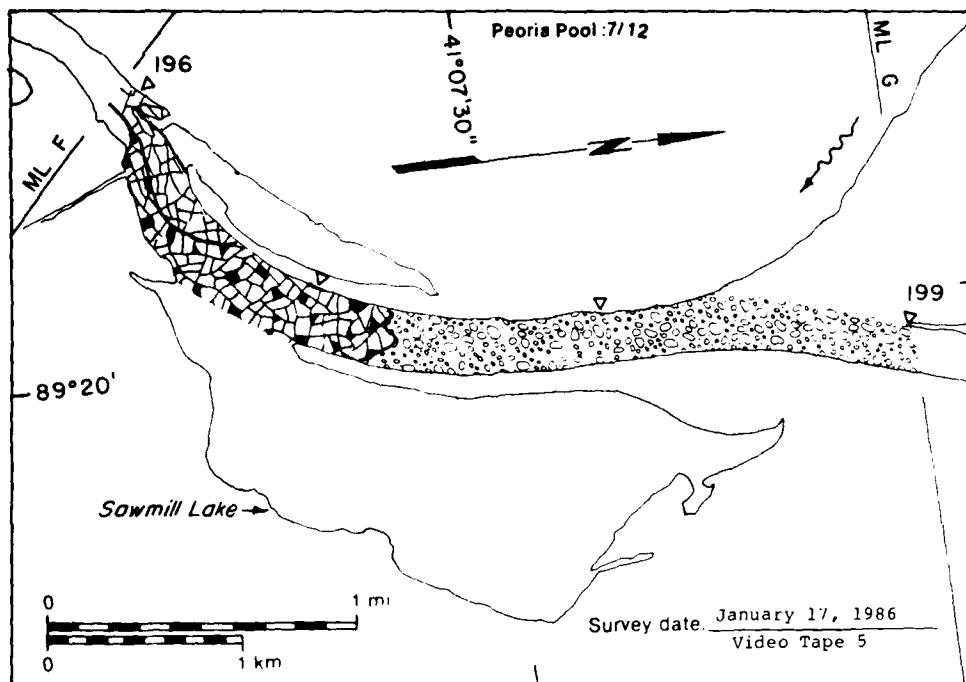
17 January 1986



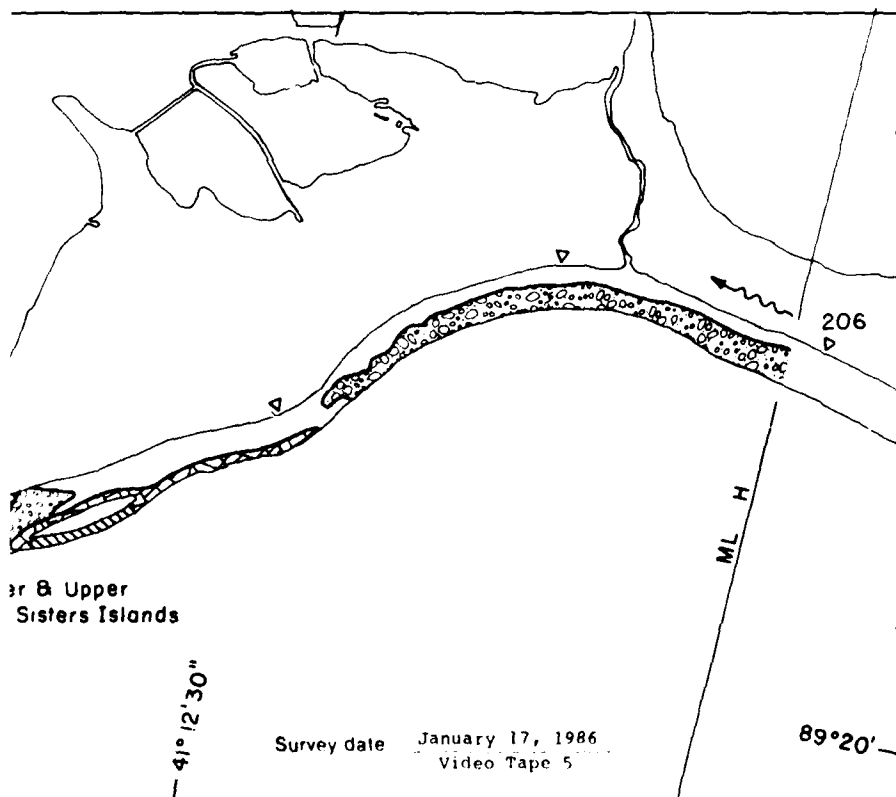


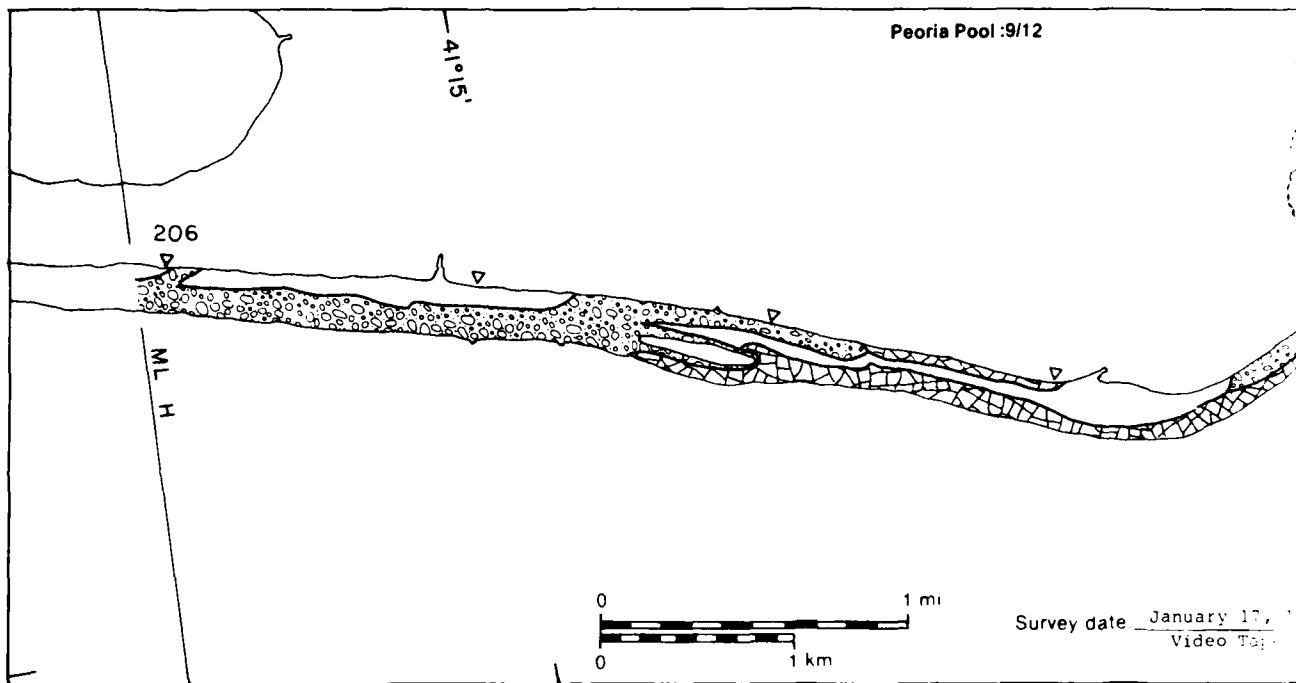
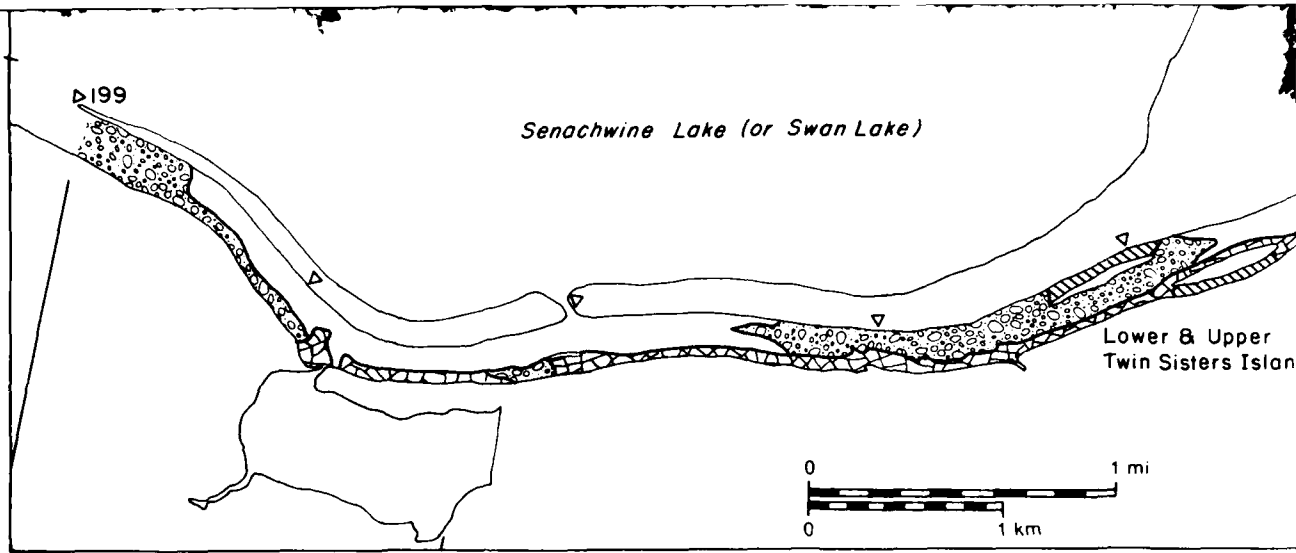


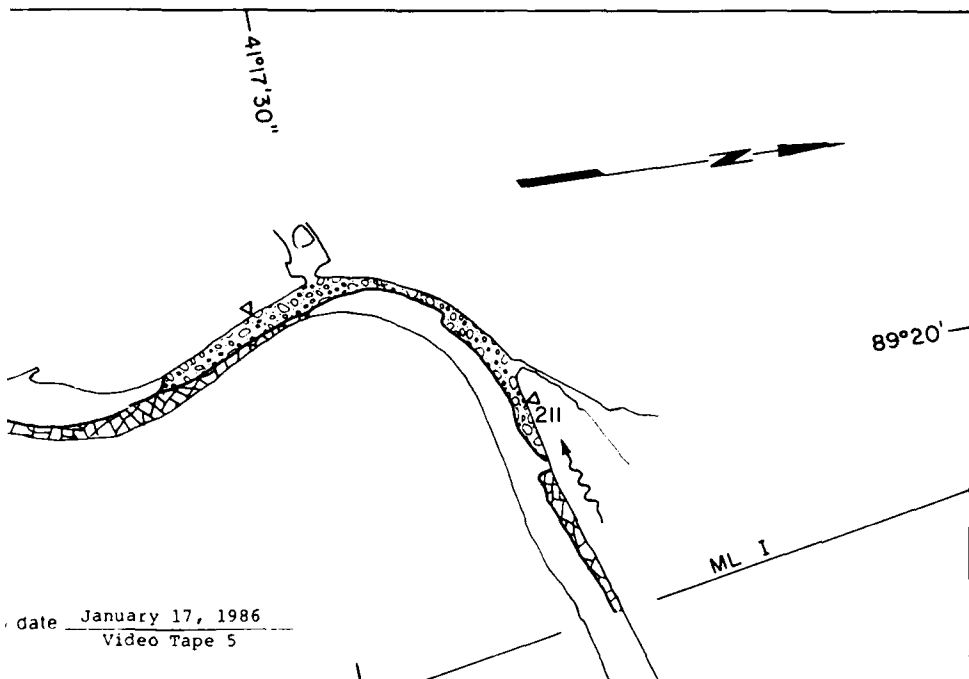
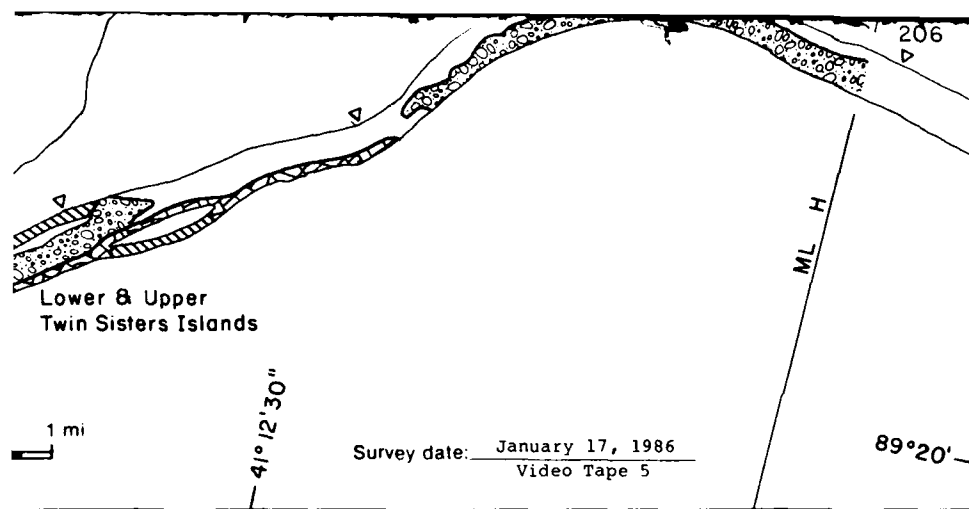




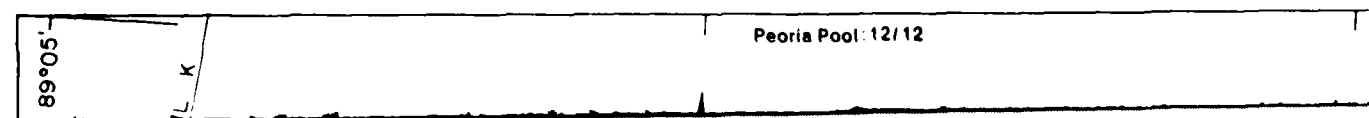
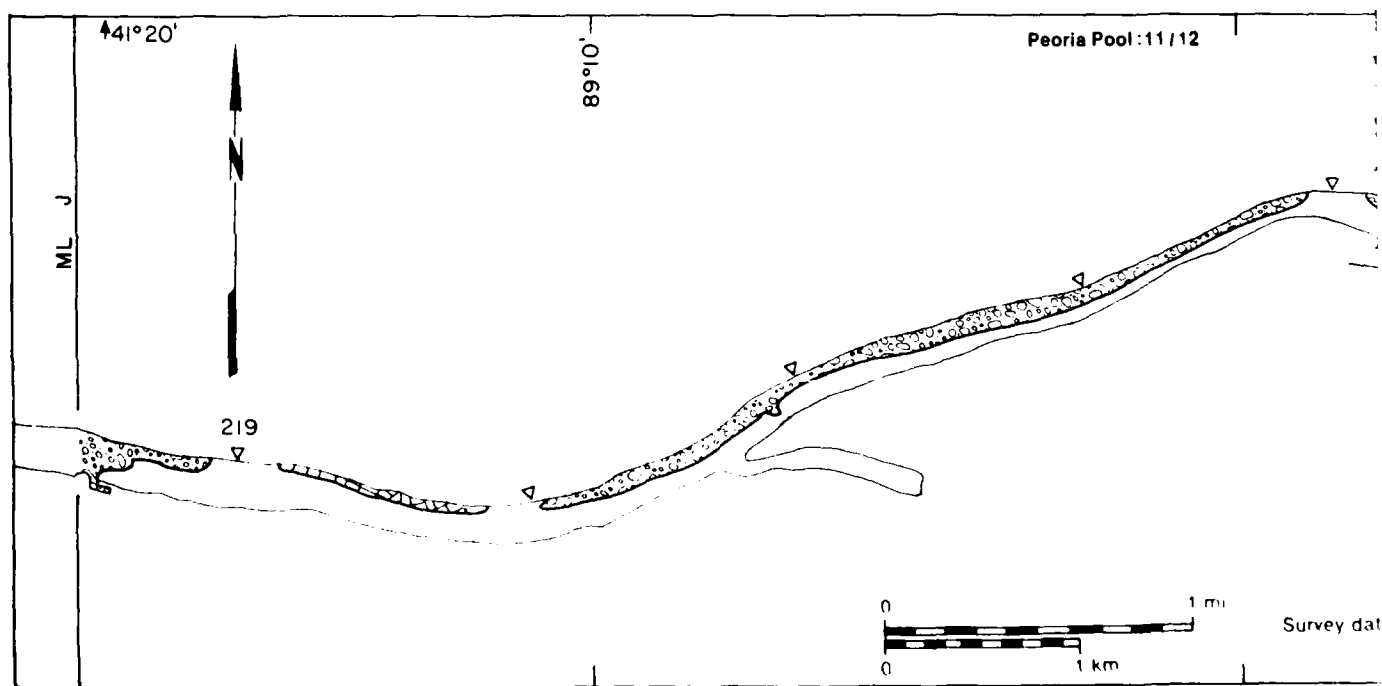
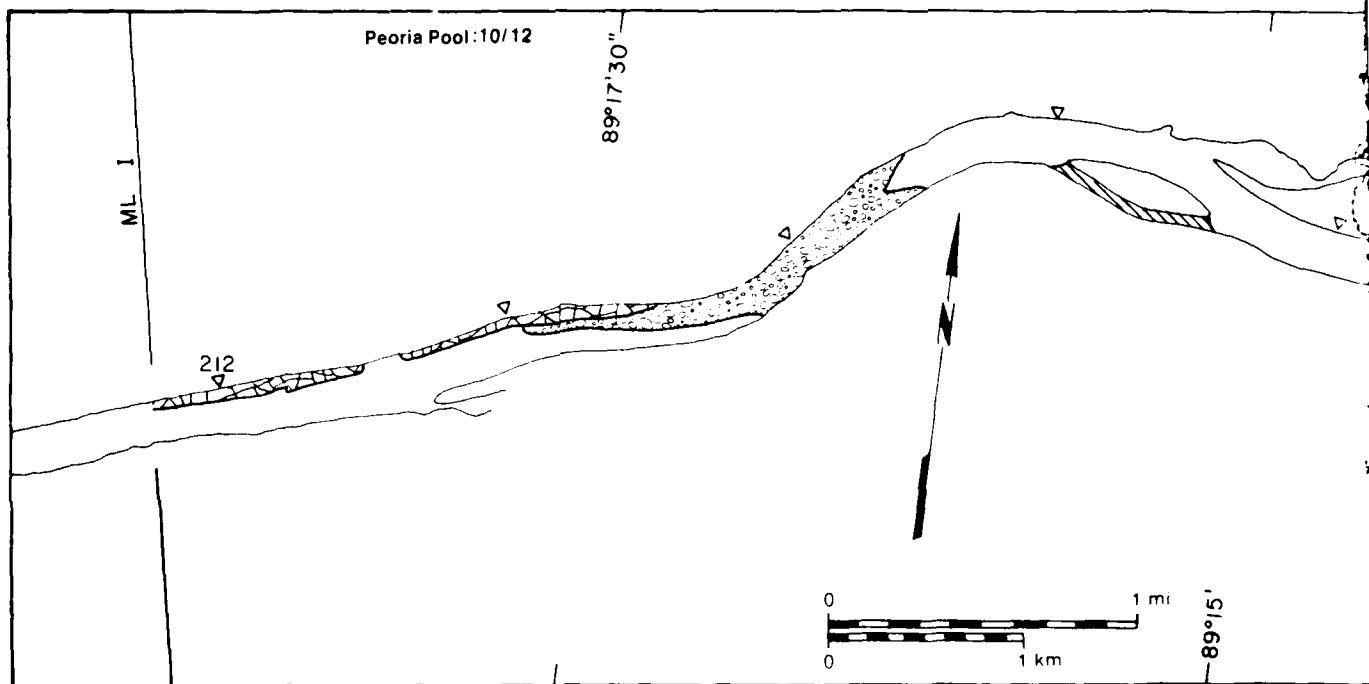
17 January 1986

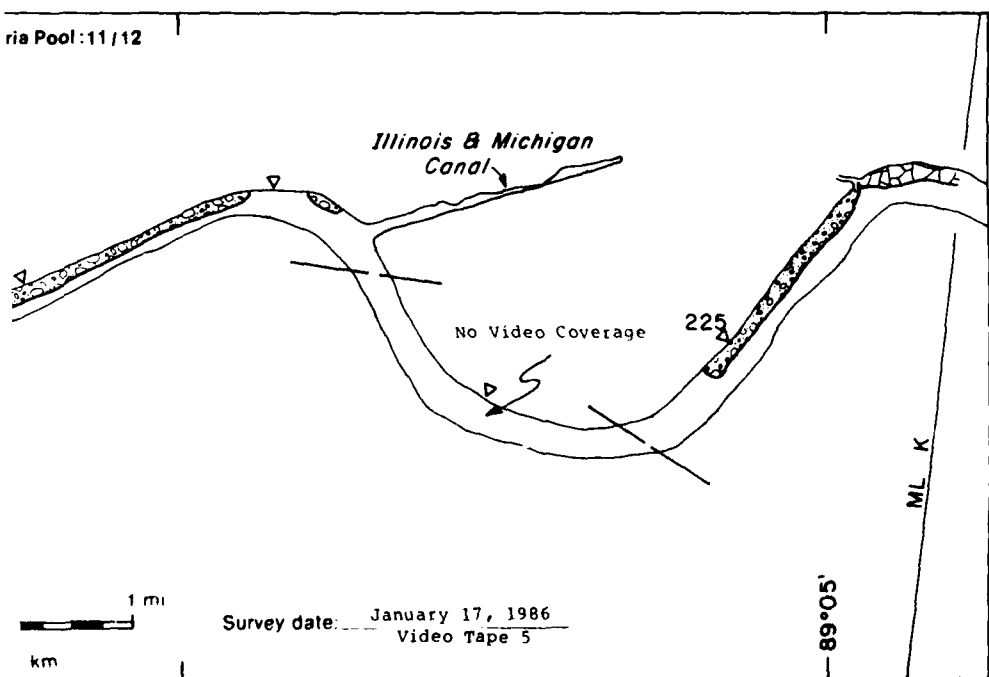
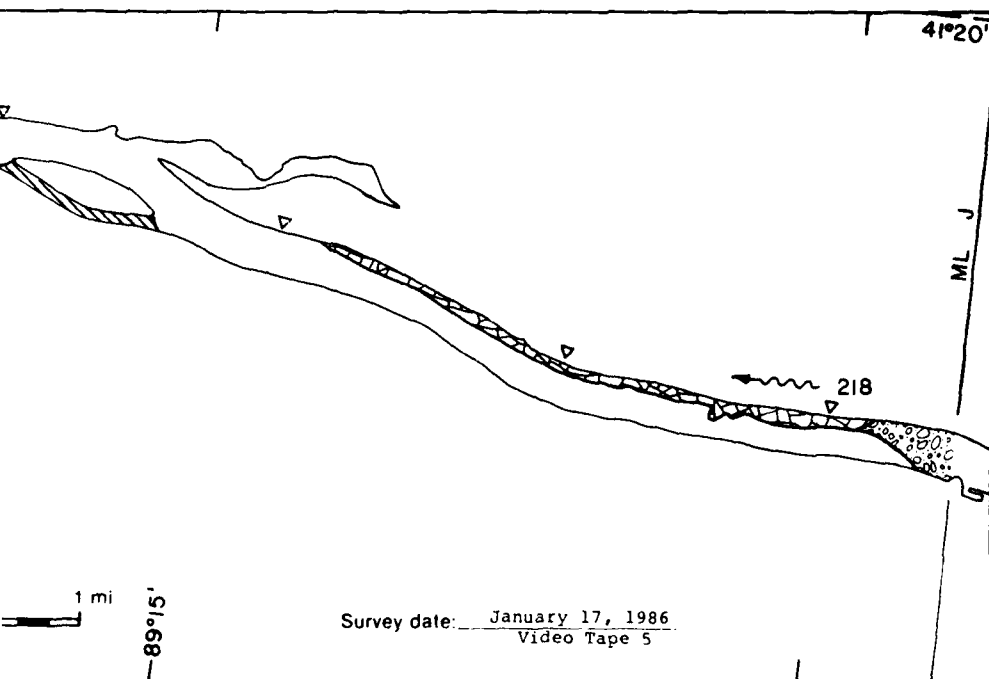




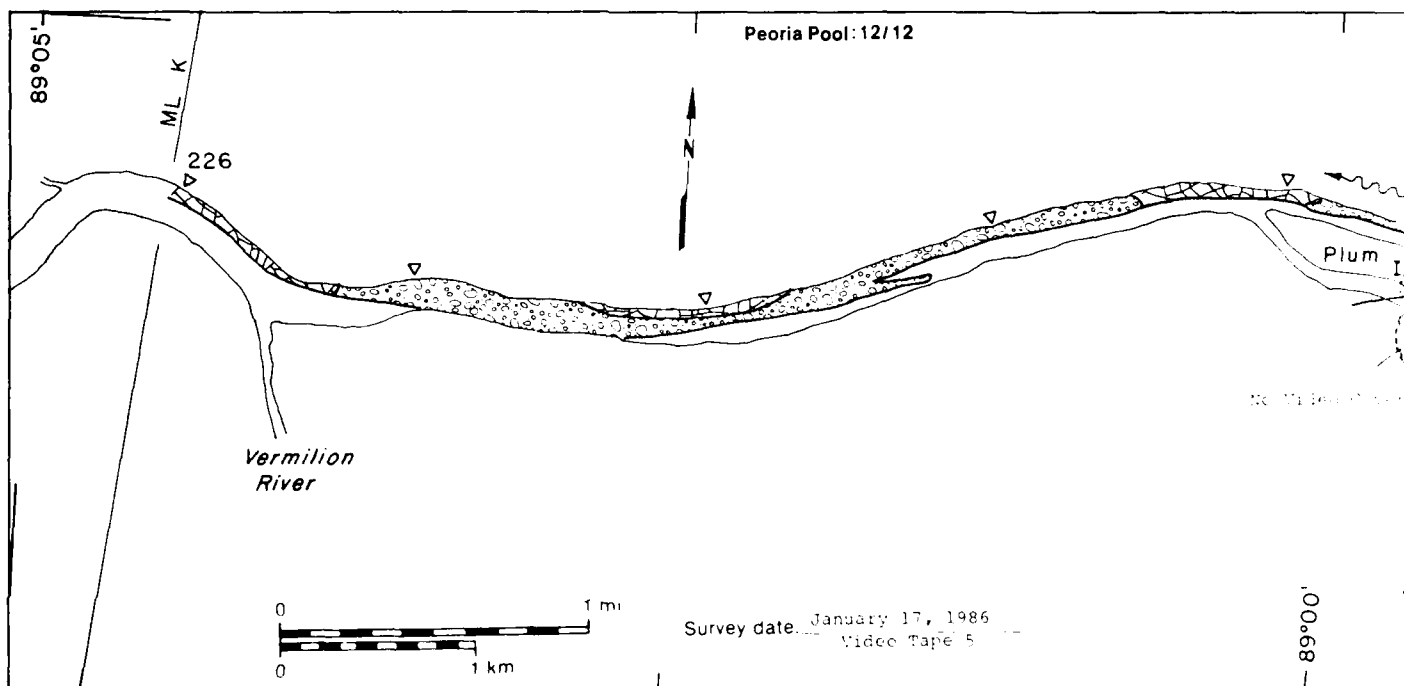
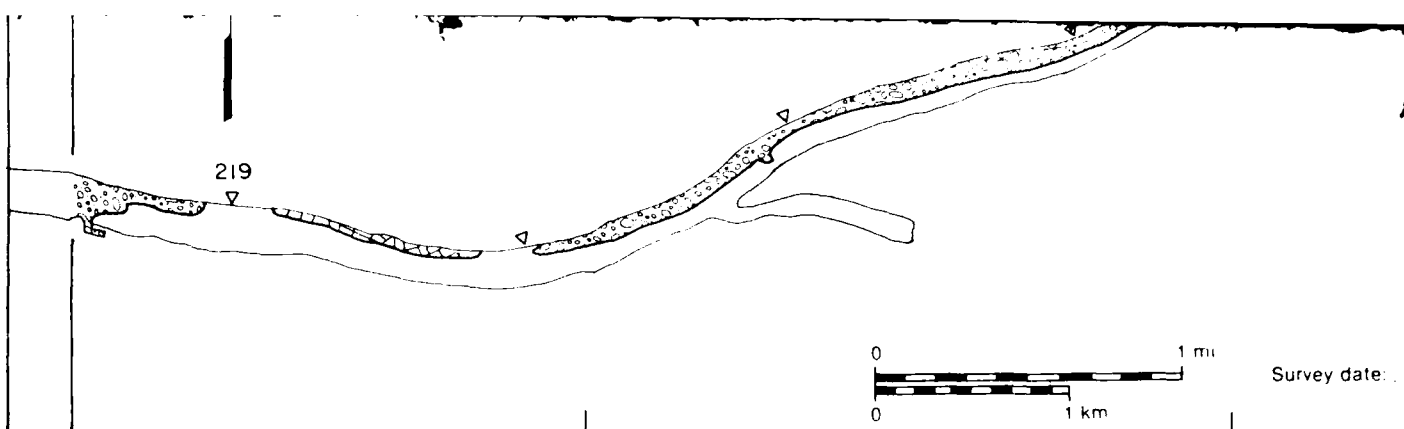


17 January 1986

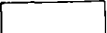
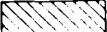








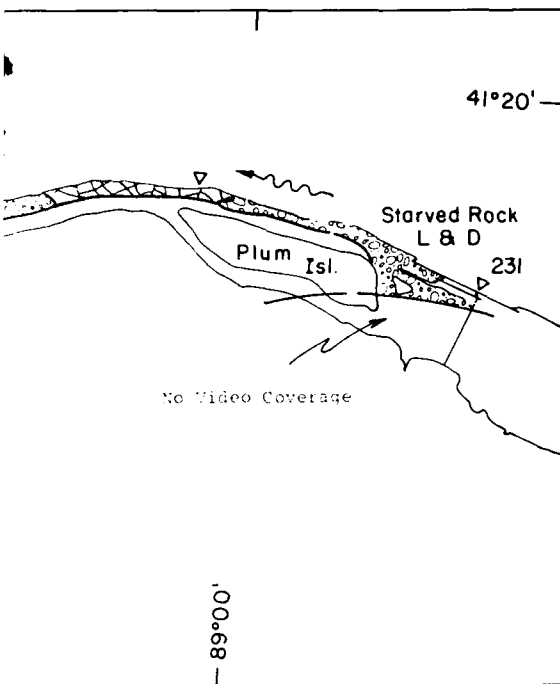
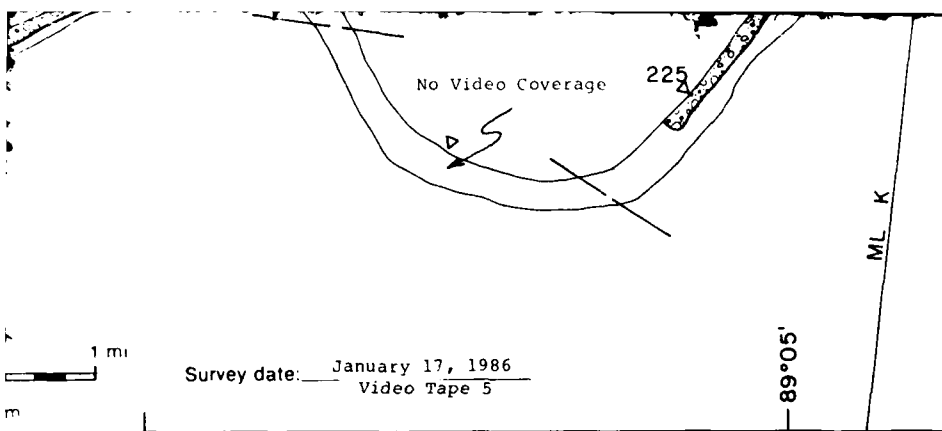
41°20'

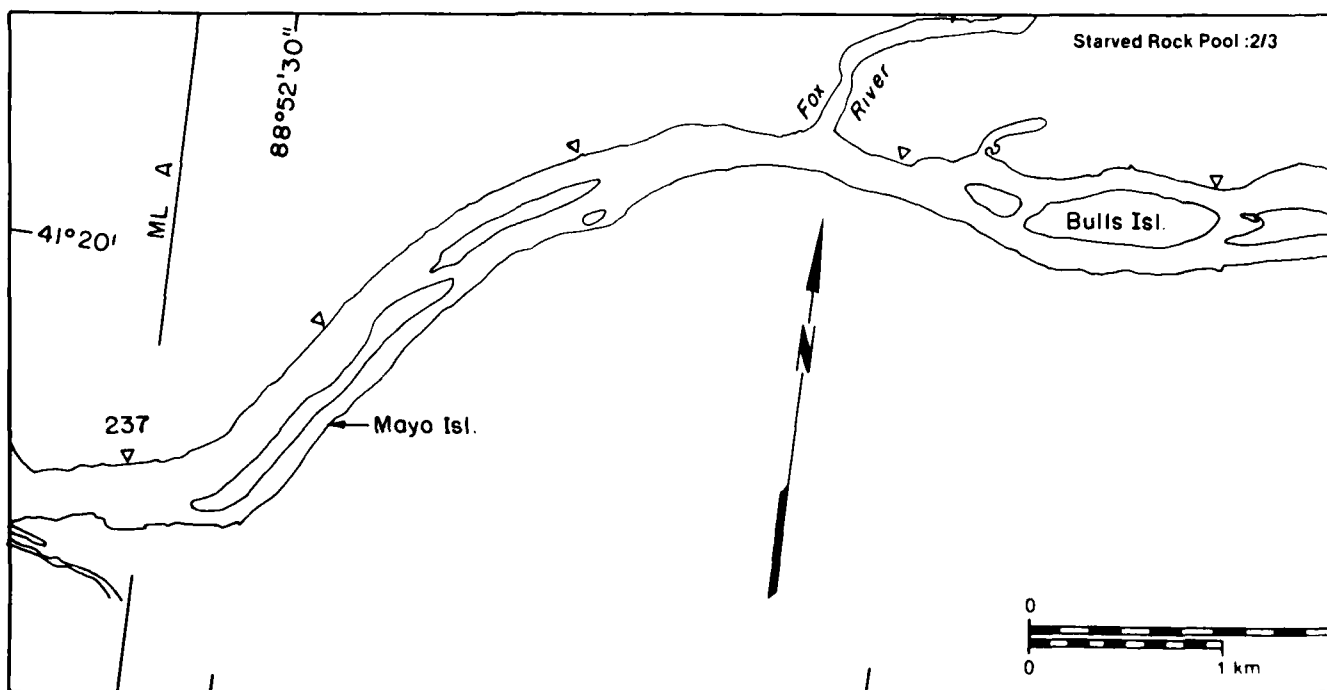
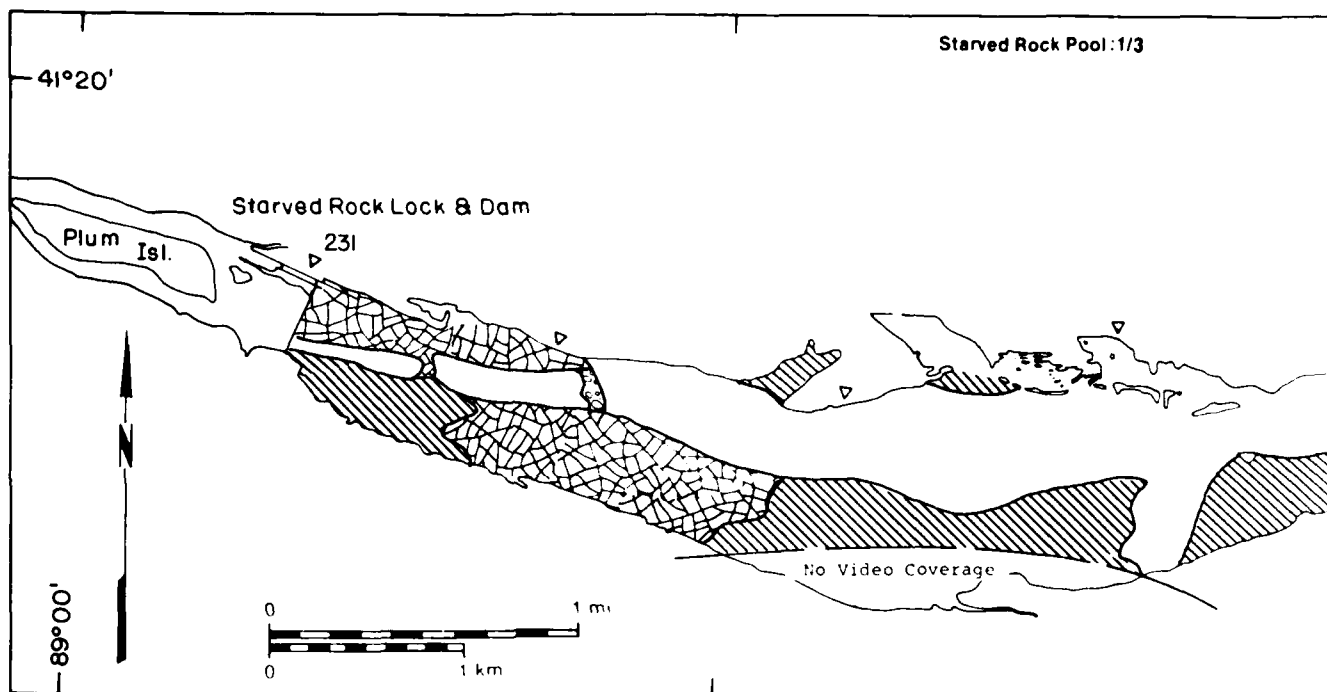


Peoria Pool

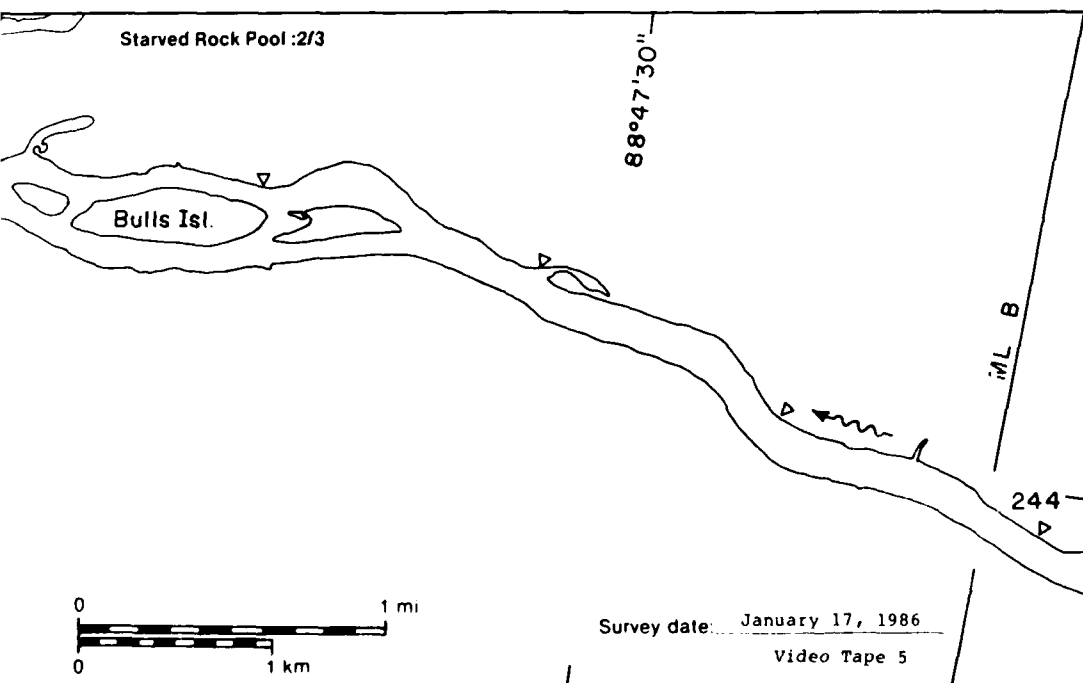
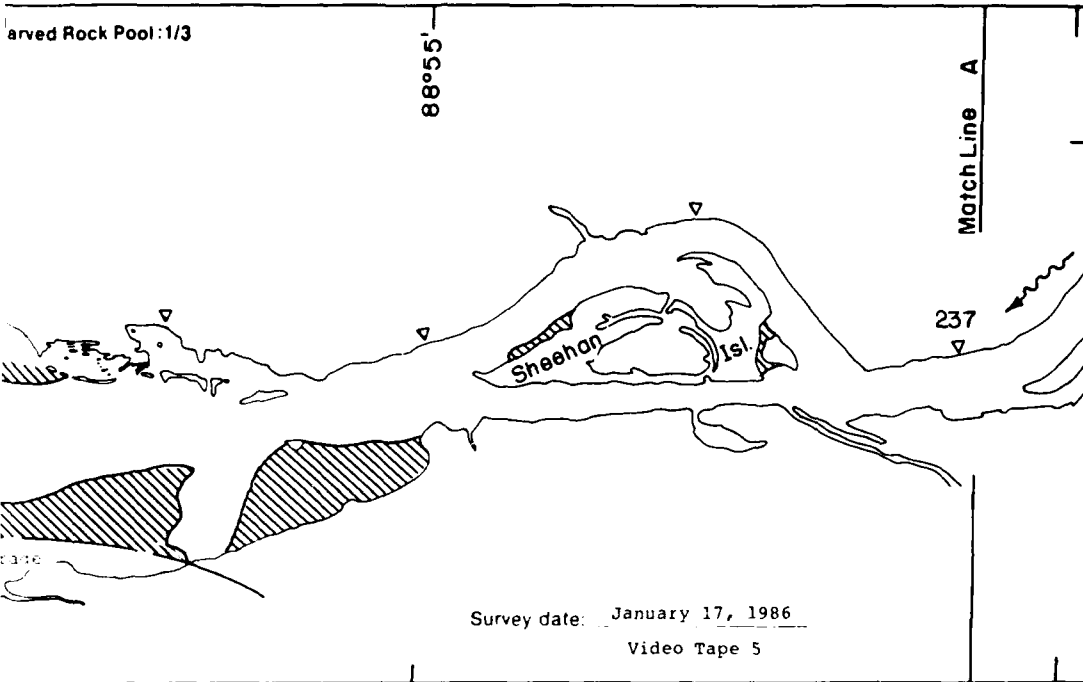
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration
 Open water	9.47	NA
 Solid ice cover	16.16	NA
 Solid ice cover with open water areas	0.00	—
 Fragmented ice cover	26.93	NA
 Fragmented ice cover with open water areas	3.18	75
 Ice floes or frazil slush and pans	5.16	30
Total area ($m^2 \times 10^6$)	81.33*	

* Includes $20.43 \times 10^6 m^2$ of no video coverage

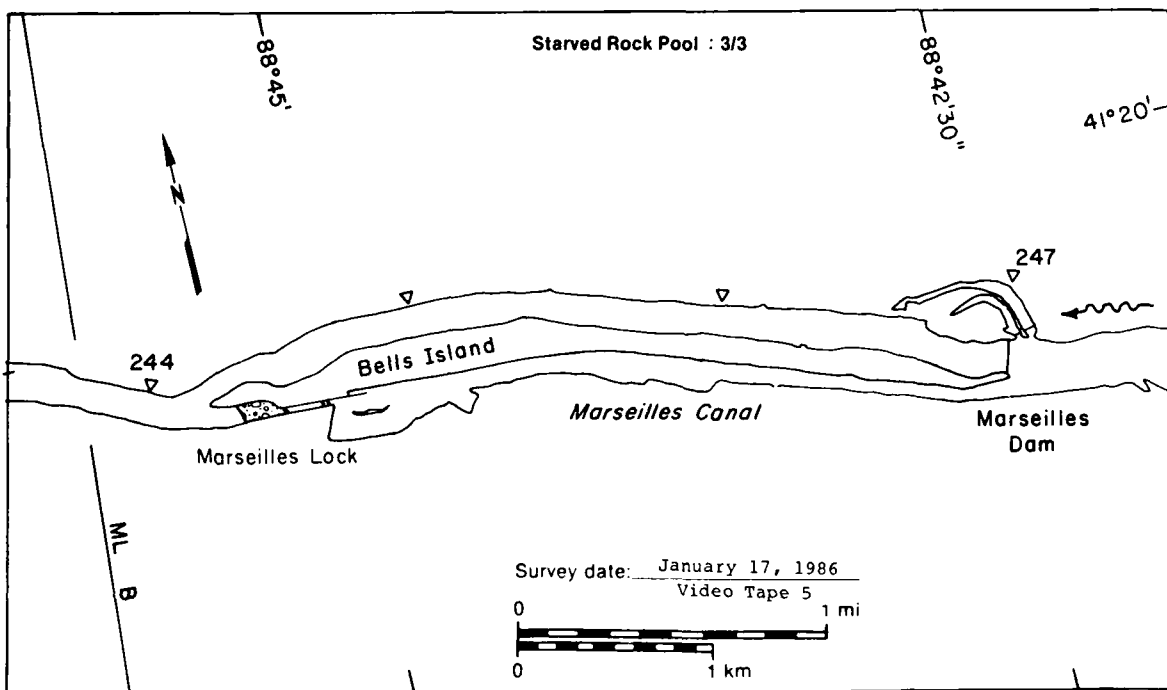
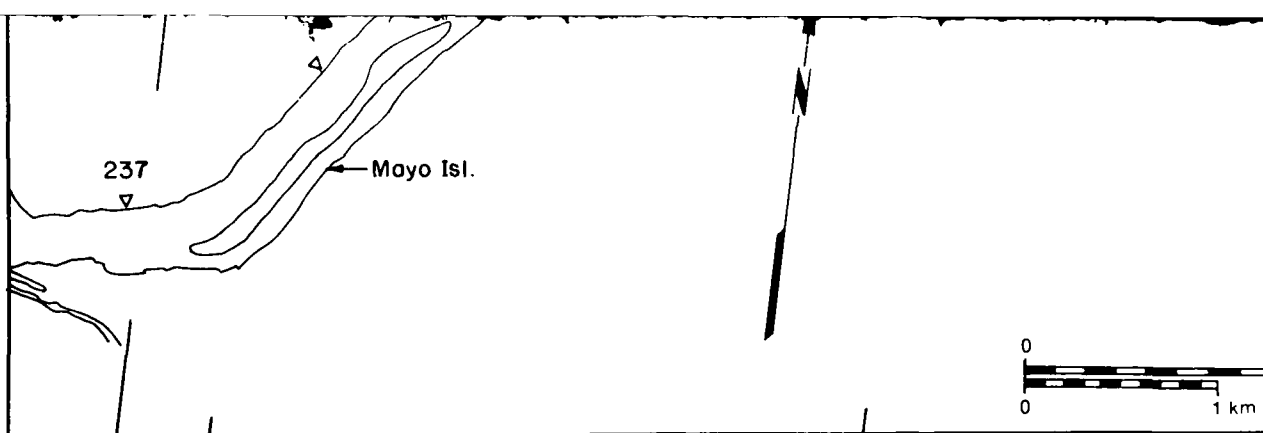


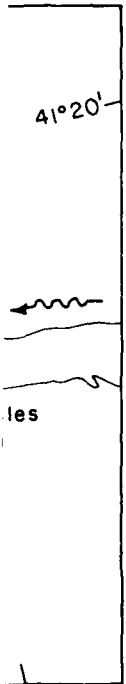
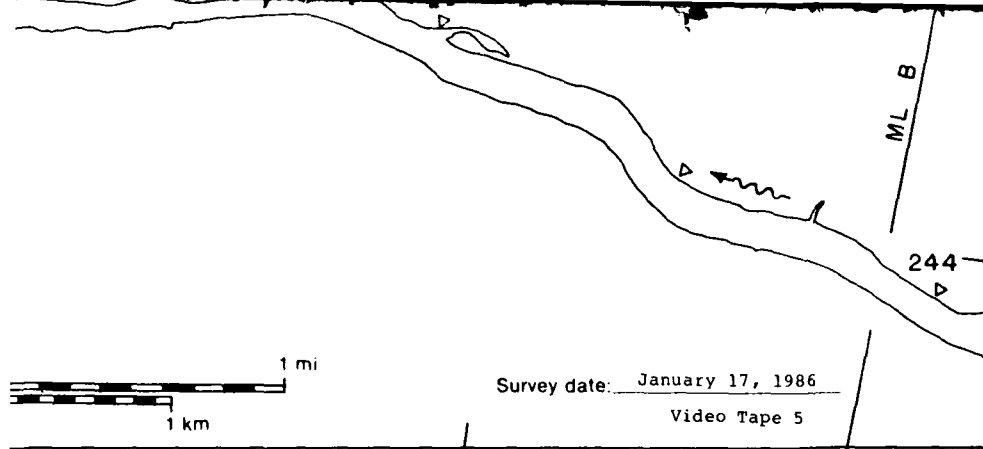


17 January 1986



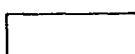
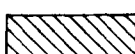


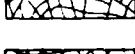

41°20'	Starved Rock Pool	Area (m ² x 10 ⁶)	Surface concentration (%)
MAP UNITS			





Starved Rock Pool

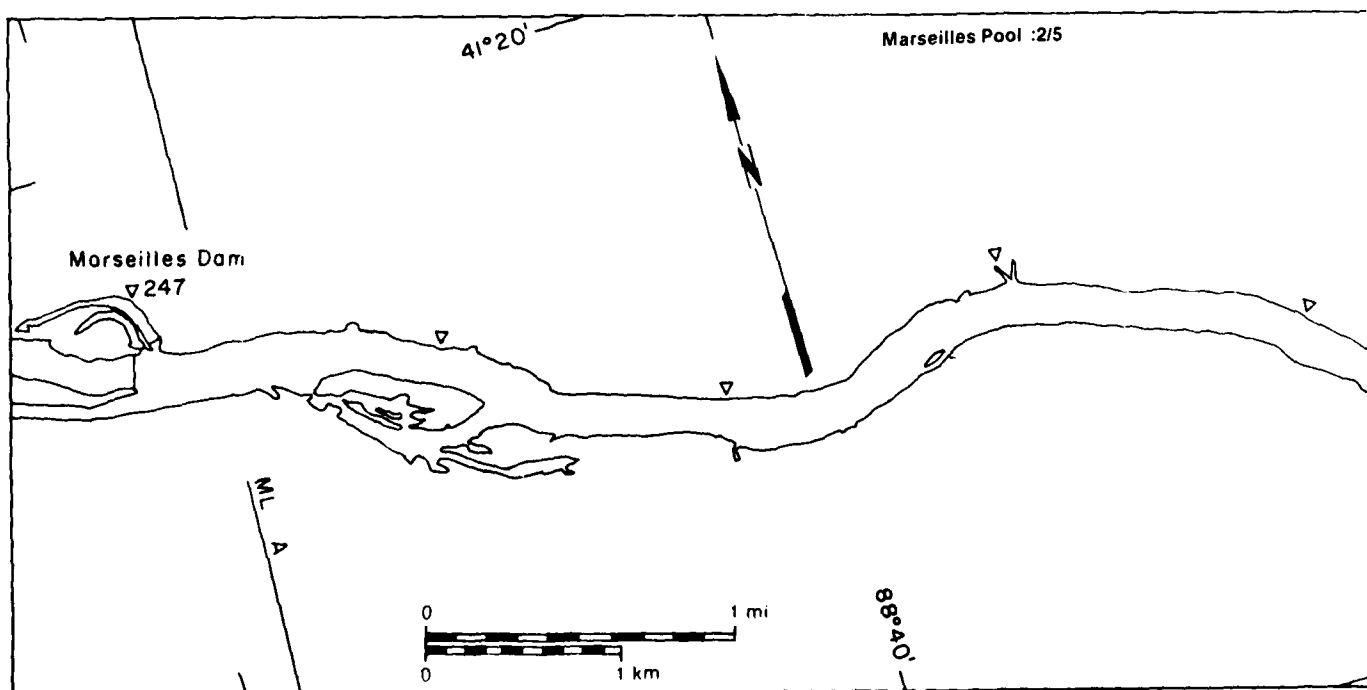
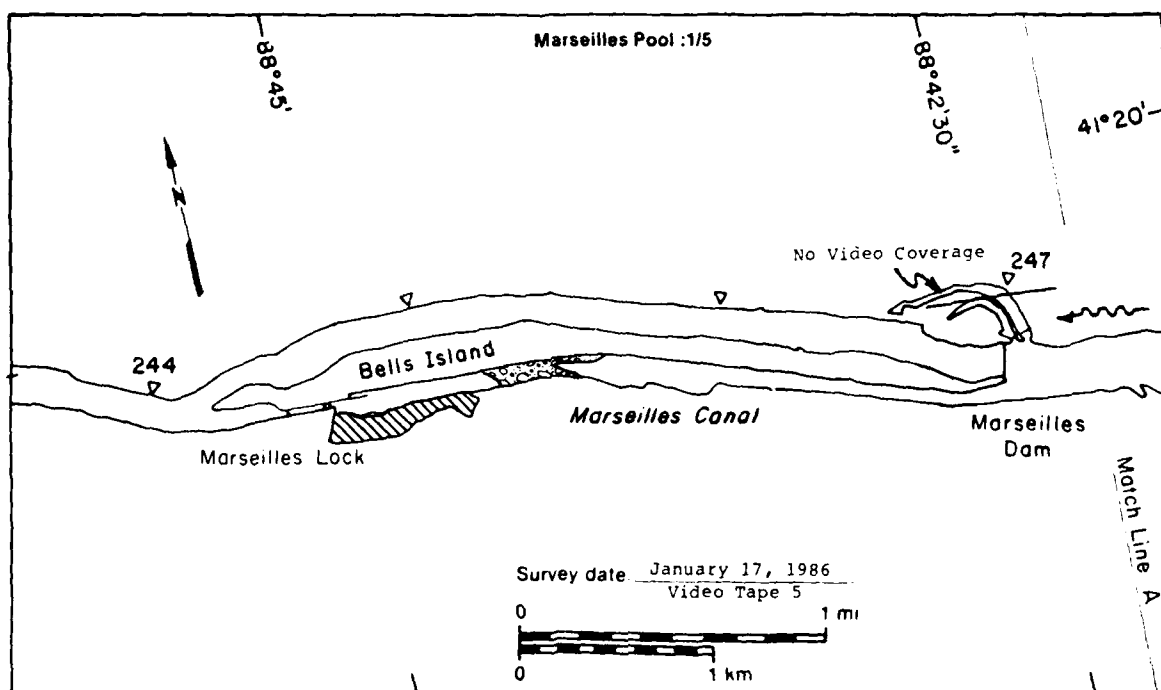
MAP UNITS

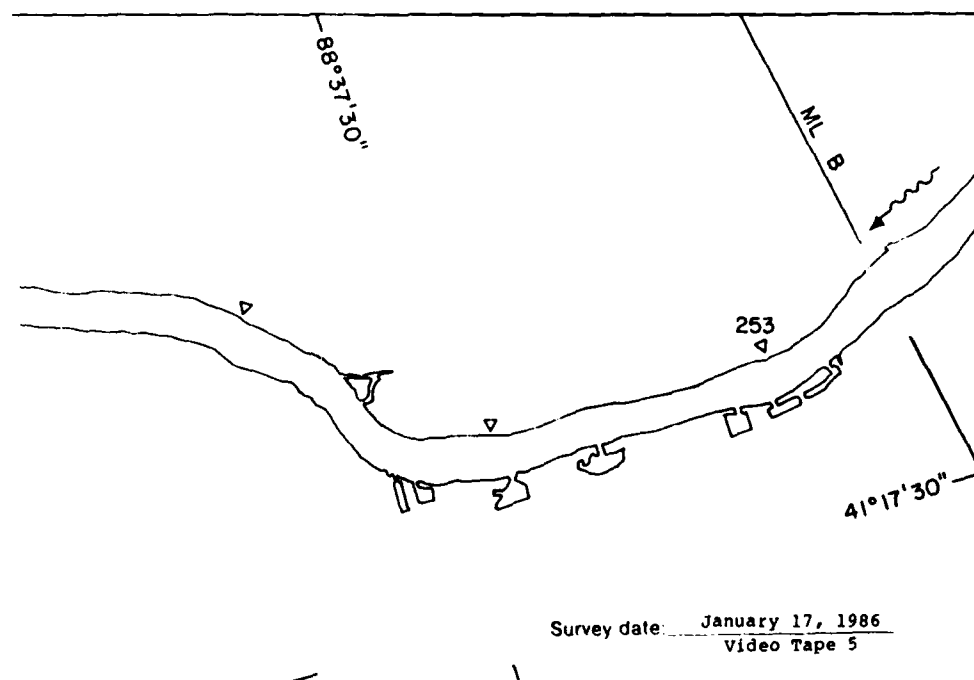
-  Open water
-  Solid ice cover
-  Solid ice cover with open-water areas
-  Fragmented ice cover
-  Fragmented ice cover with open-water areas
-  Ice floes or frazil slush and pans

Area (m ² x 10 ⁶)	Surface concentration (%)
7.30	NA
1.46	NA
0.00	—
1.03	NA
0.00	—
0.04	20
Total area (m ² x 10 ⁶)	10.19*

* Includes 0.36 x 10⁶ m² of no video coverage

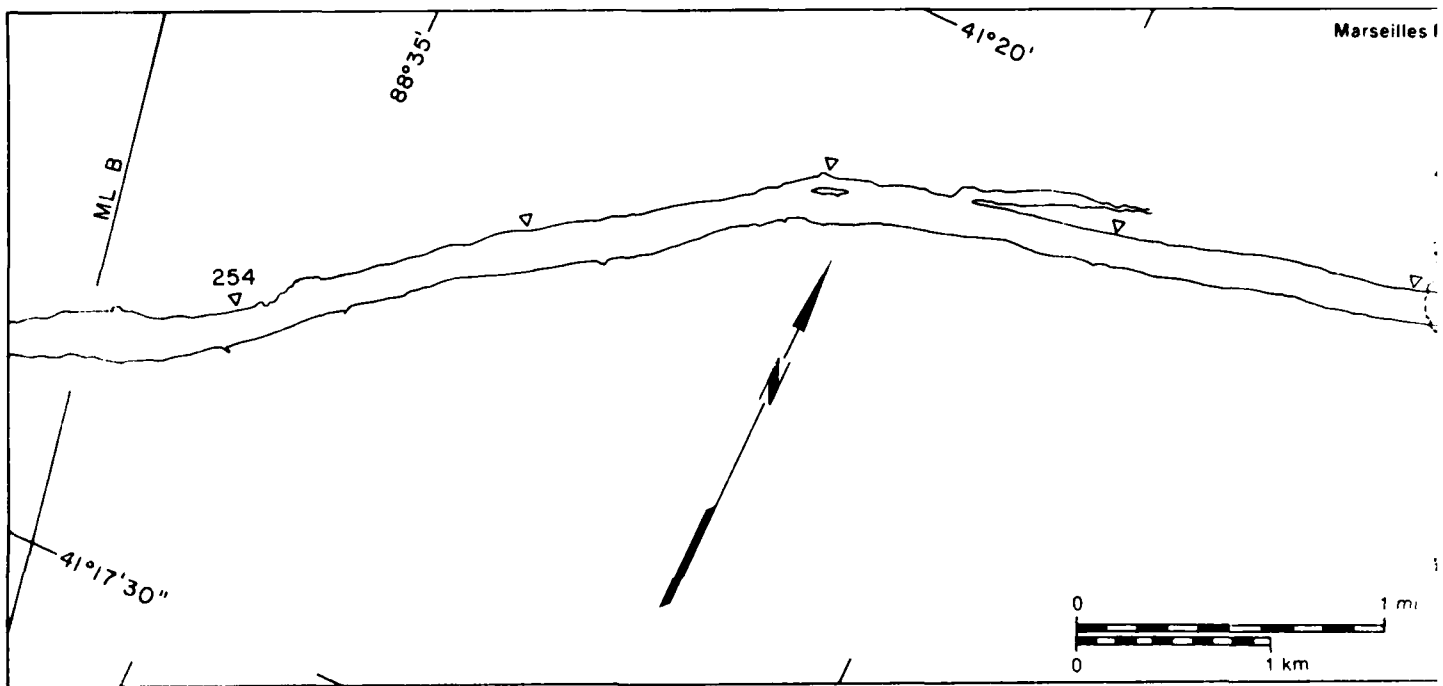
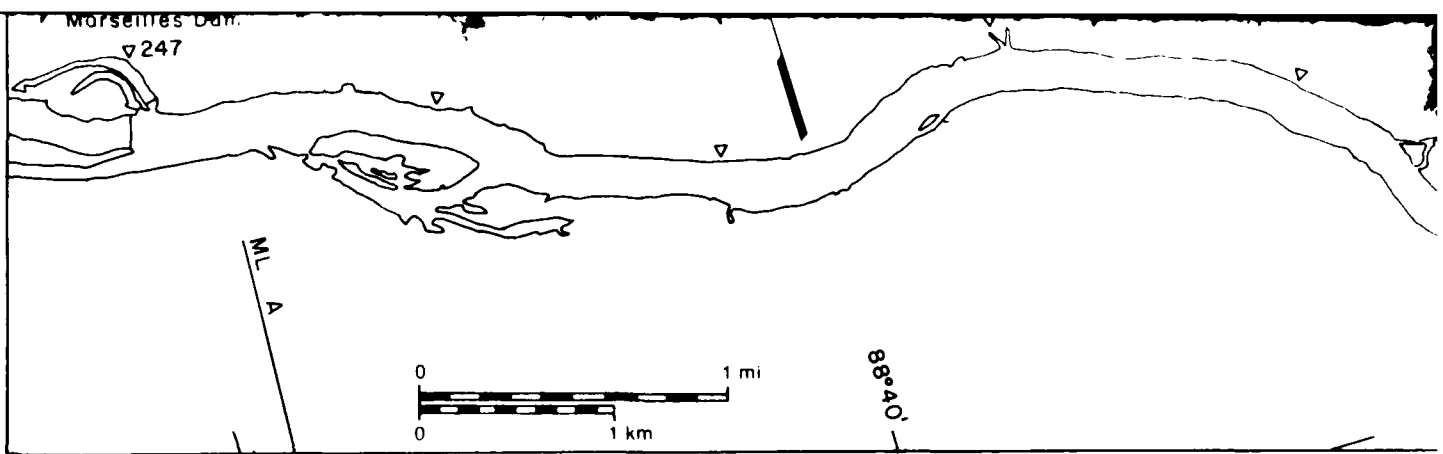
17 January 1986

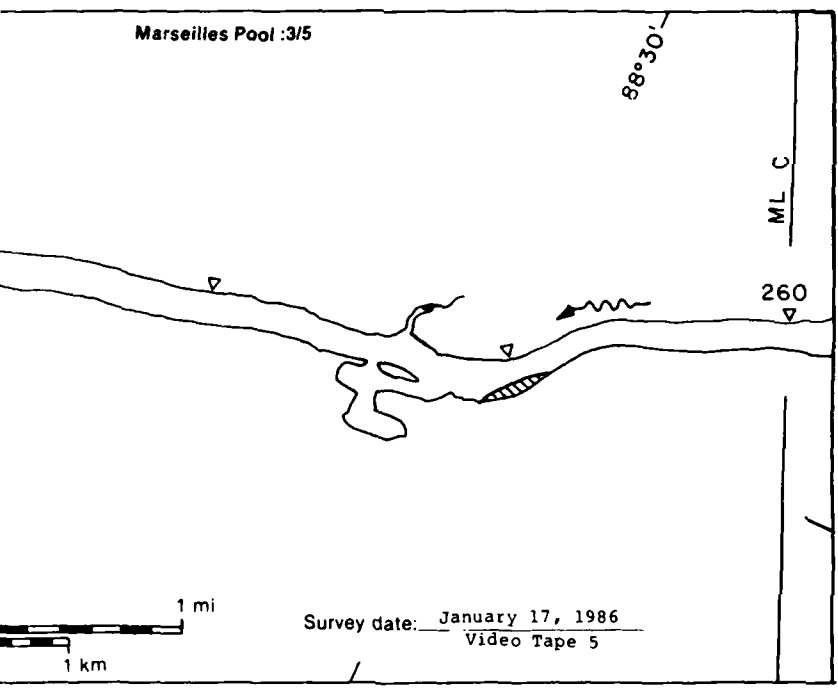
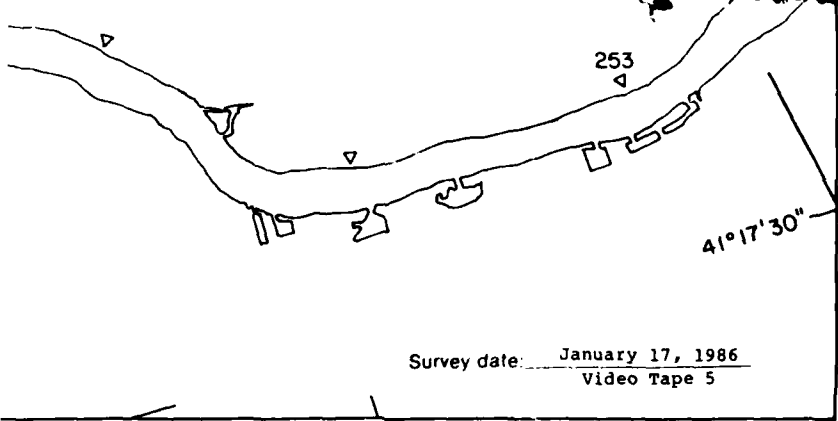


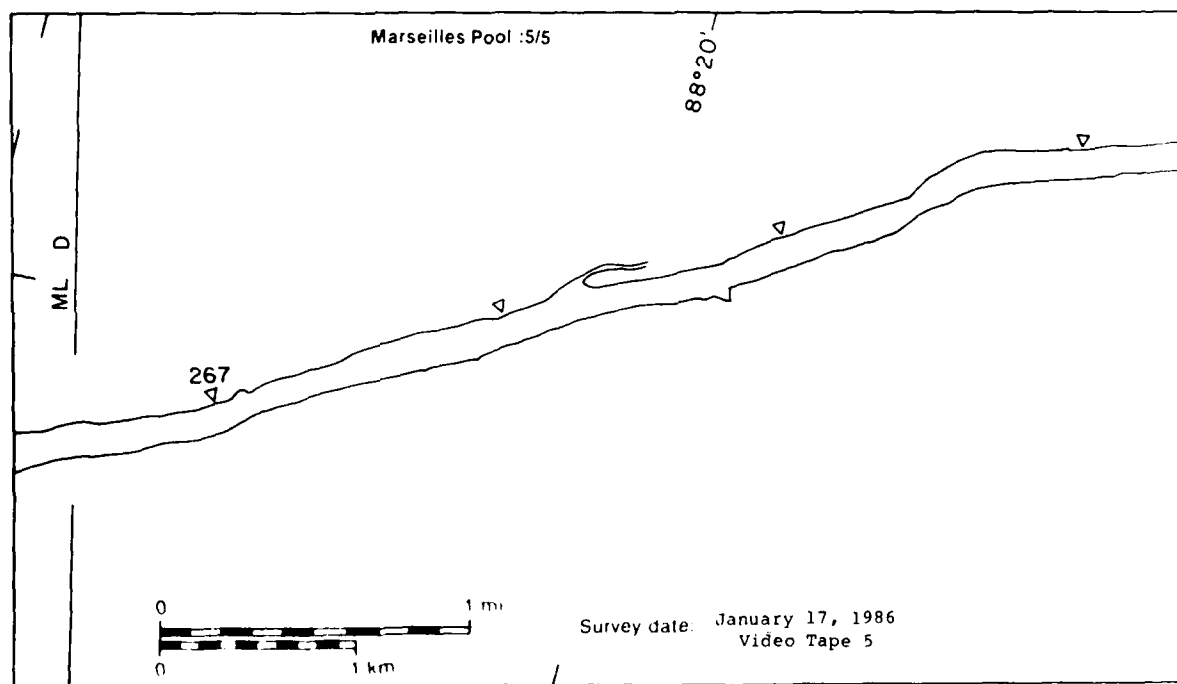
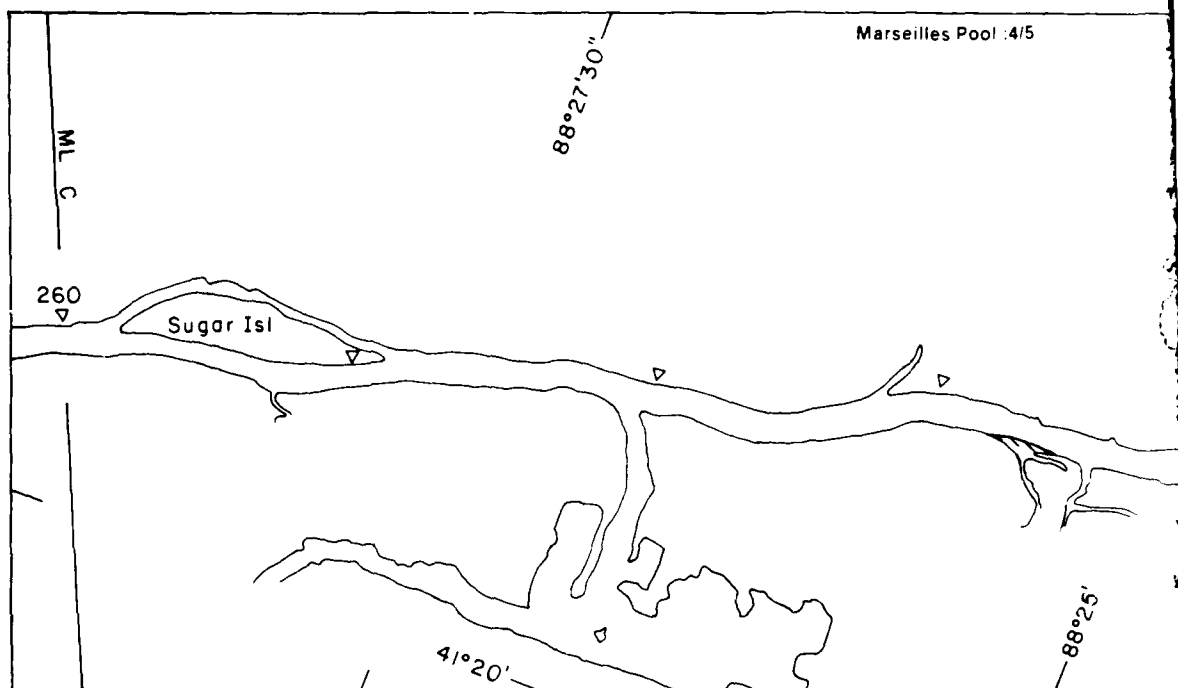


Marseilles Pool :3/5

88°30'

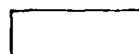






Marseilles Pool

MAP UNITS



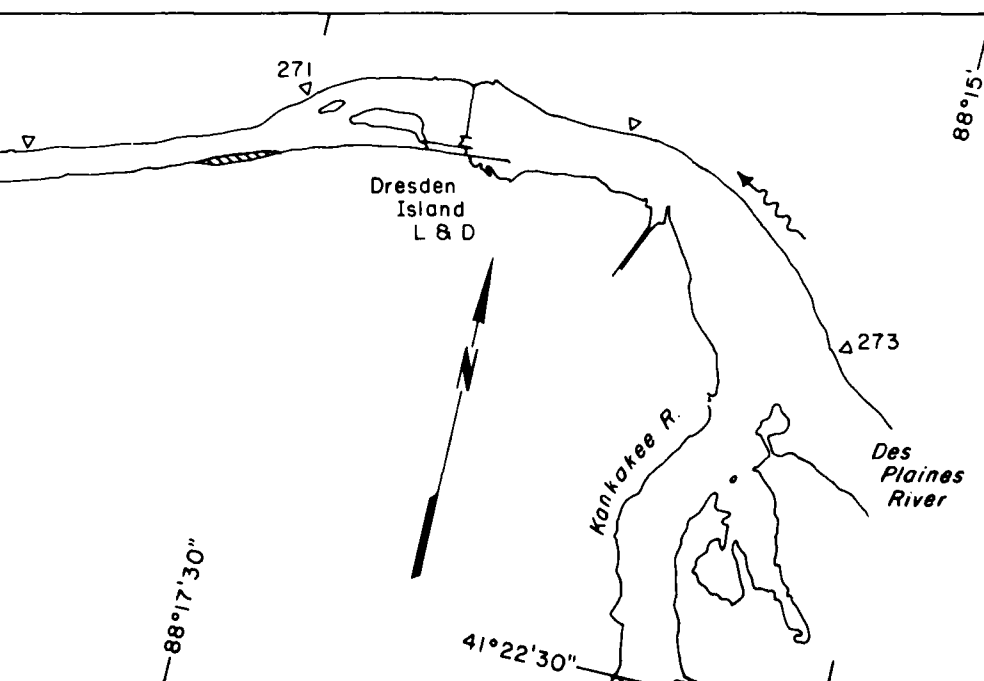
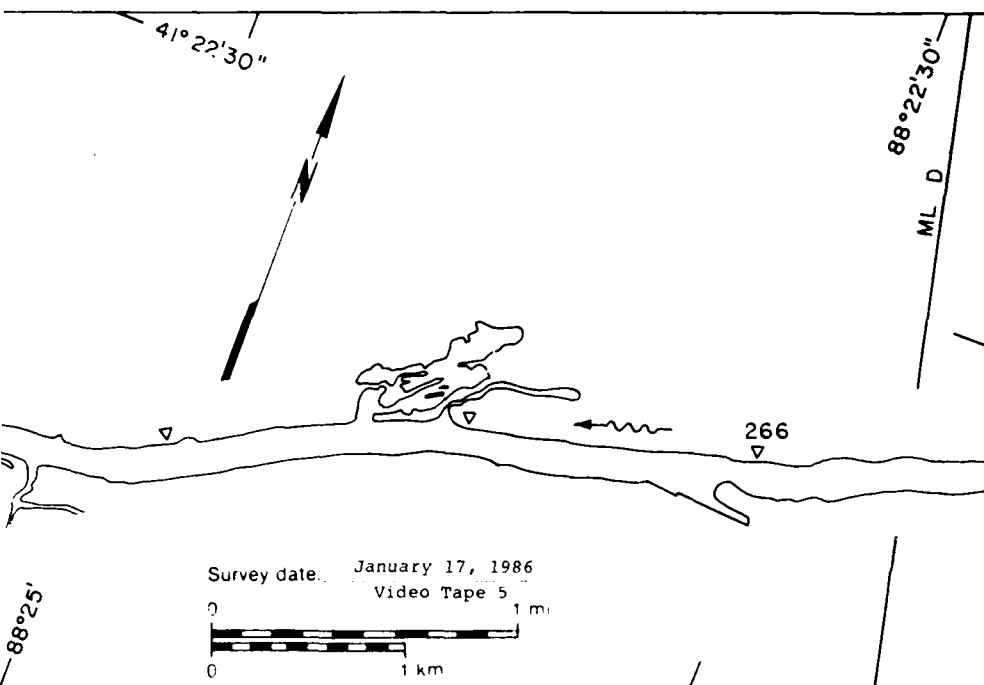
Open water

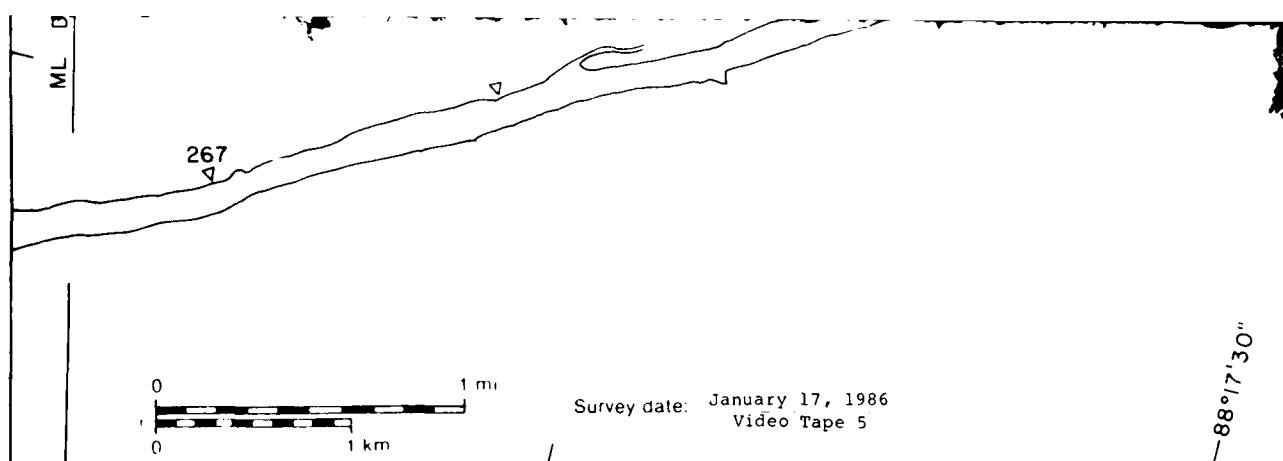
Area
(m² x 10⁶)

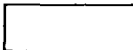




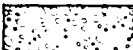
Surface
concentration
(‰)

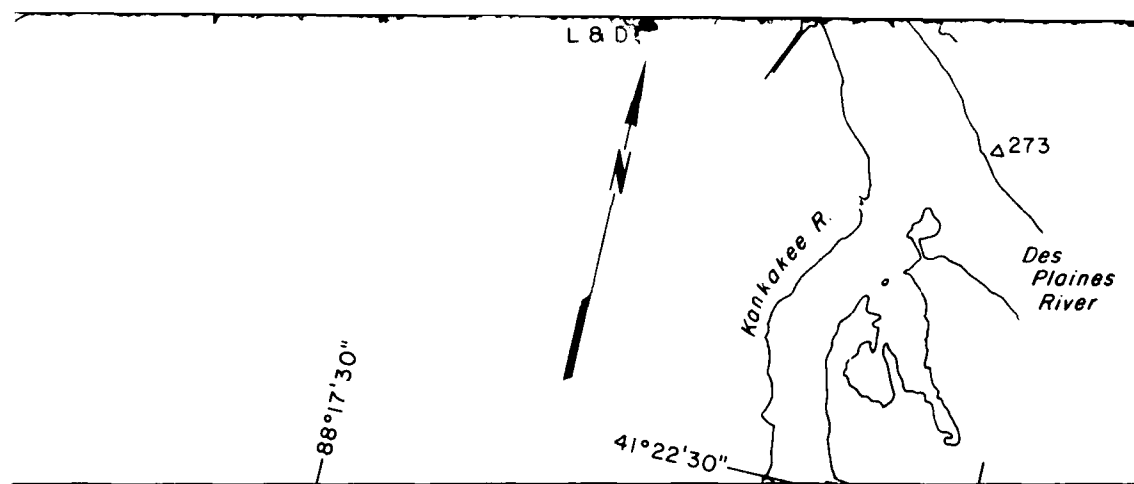
7.96	NA

17 January 1986

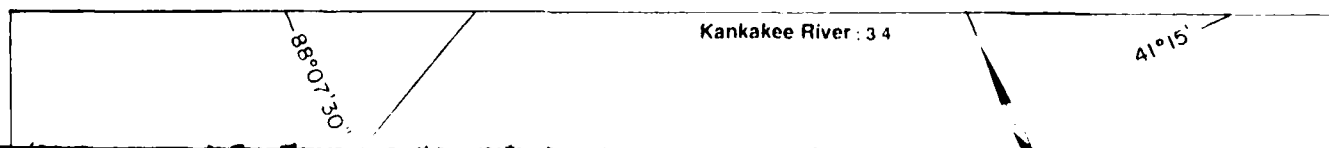
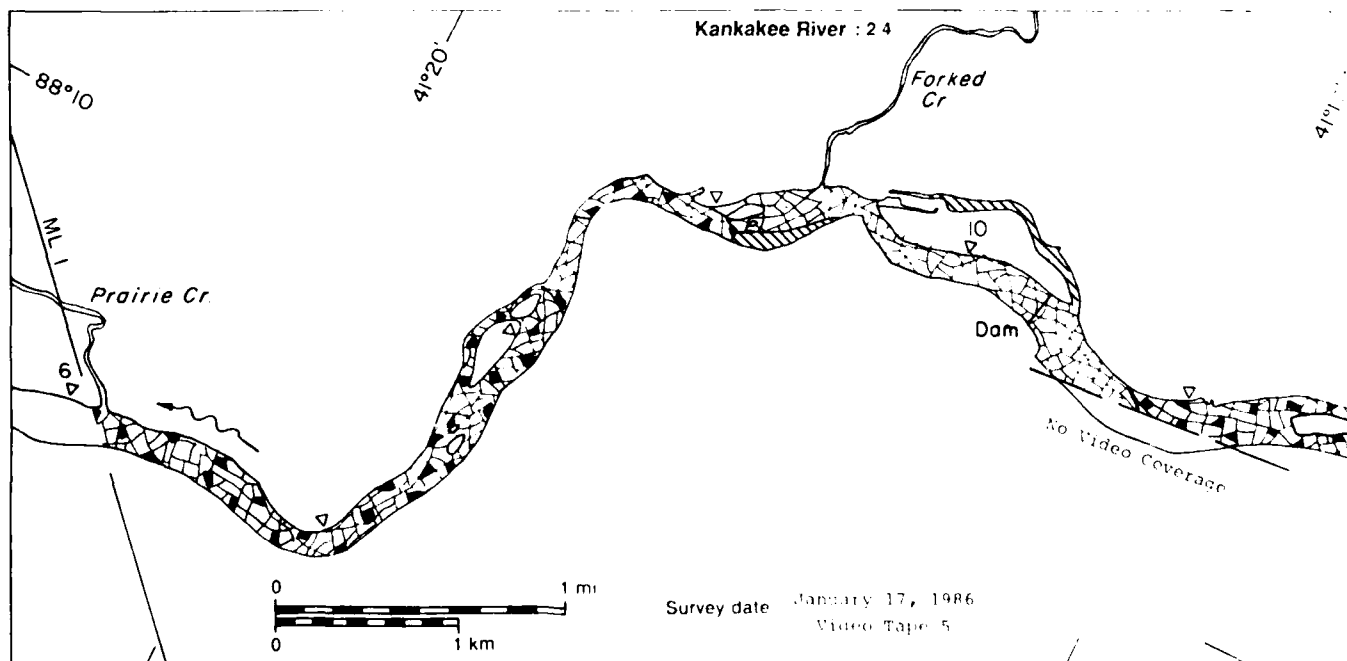
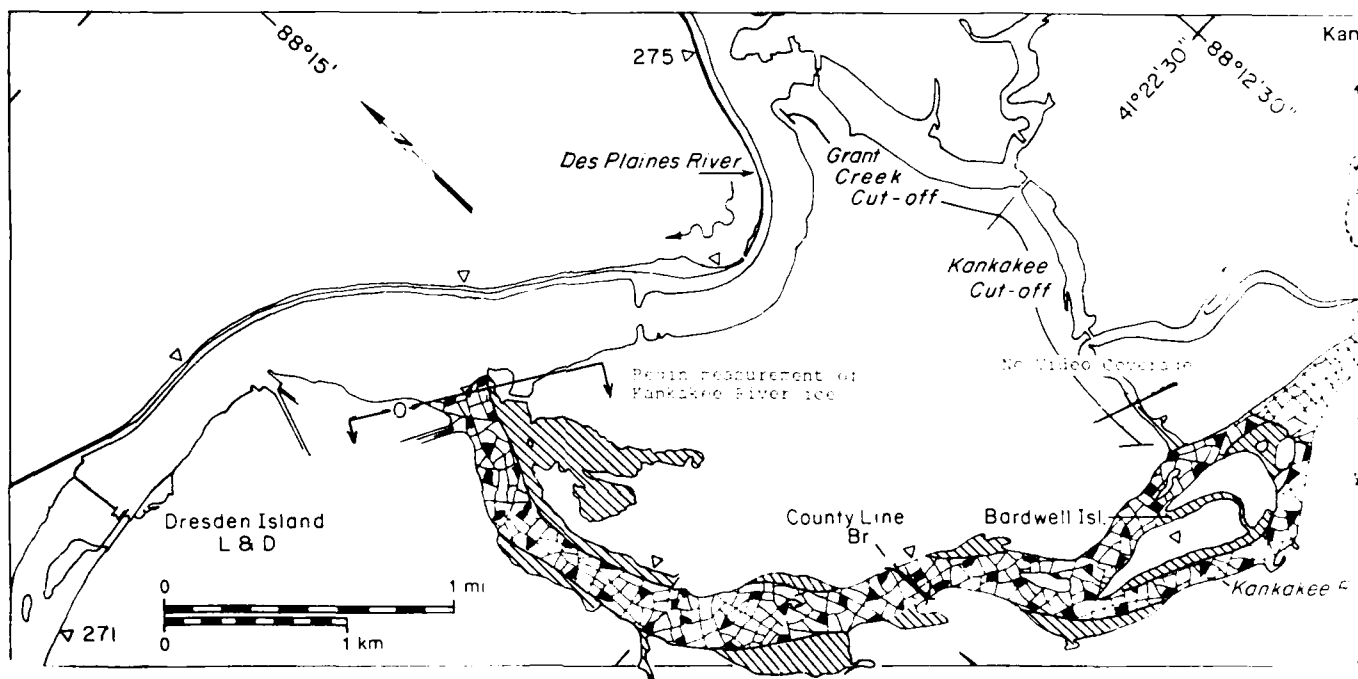


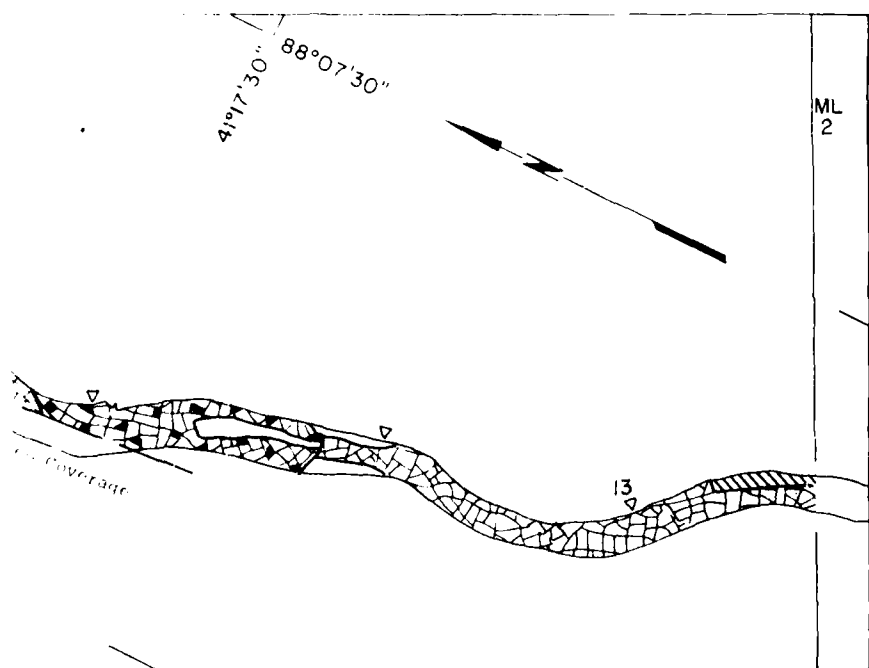
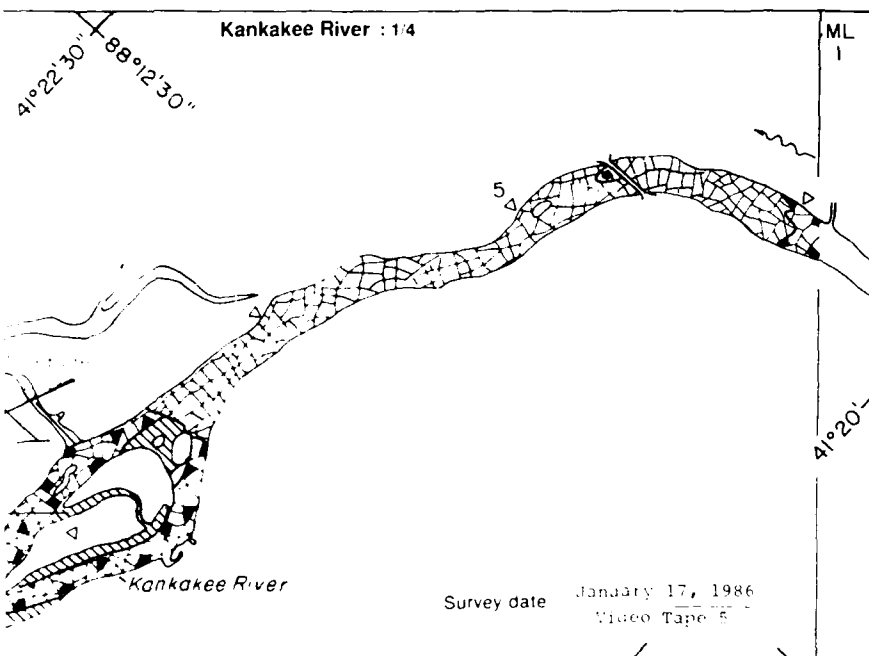


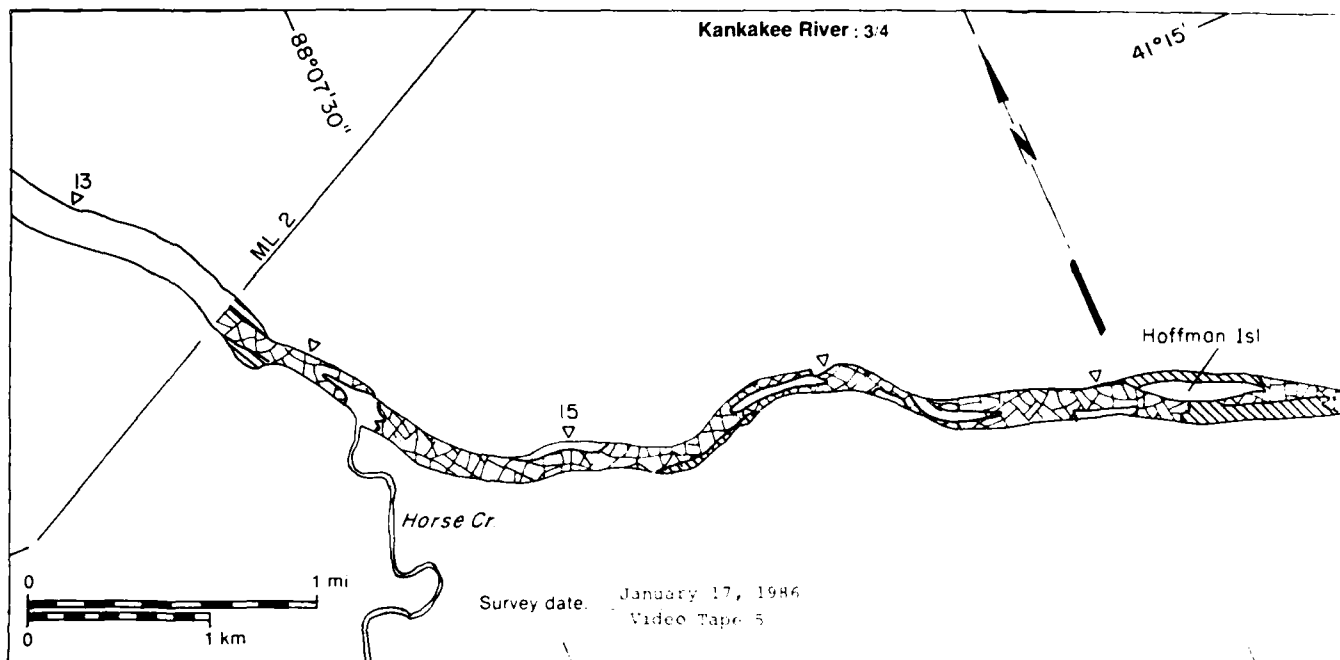
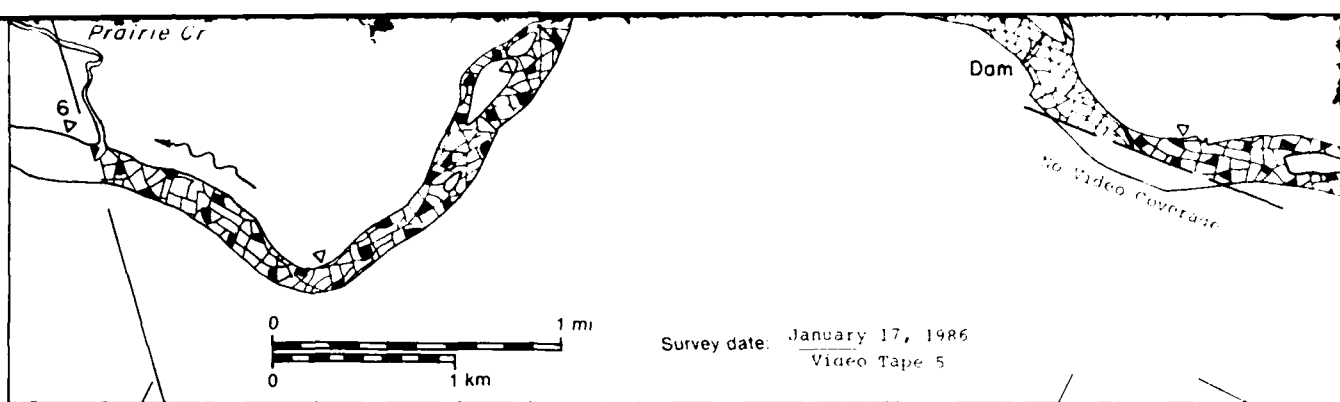
Marseilles Pool		Area	Surface
MAP UNITS		($m^2 \times 10^6$)	concentration
			(%)
	Open water	7.96	NA
	Solid ice cover	0.14	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.06	30
Total area ($m^2 \times 10^6$)		8.19*	* Includes $0.03 \times 10^6 m^2$ of no video coverage

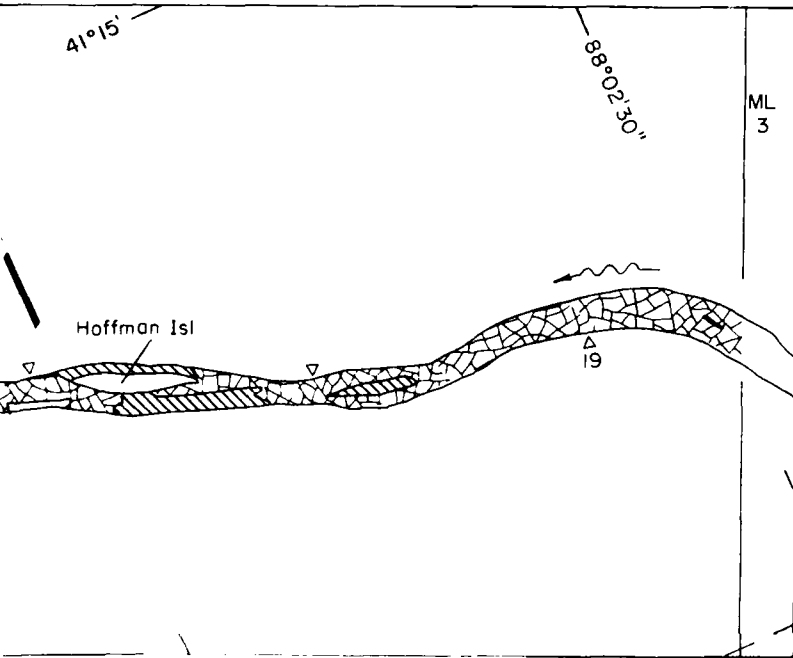
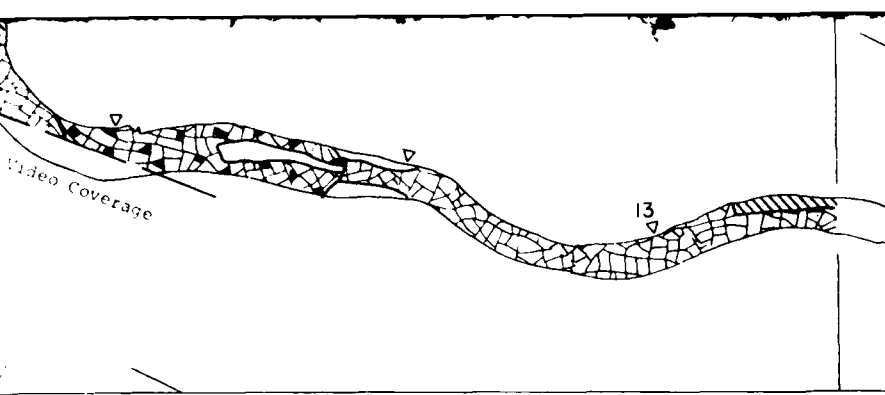


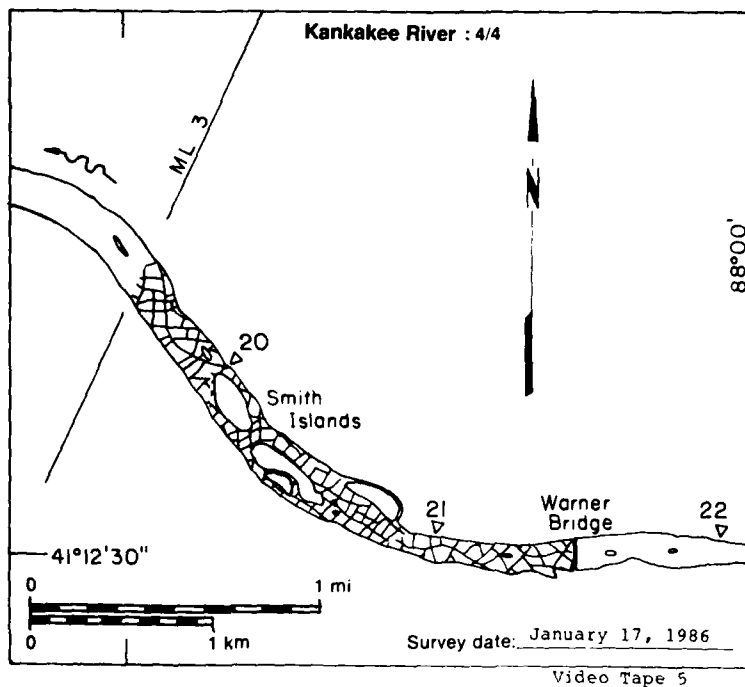
17 January 1986





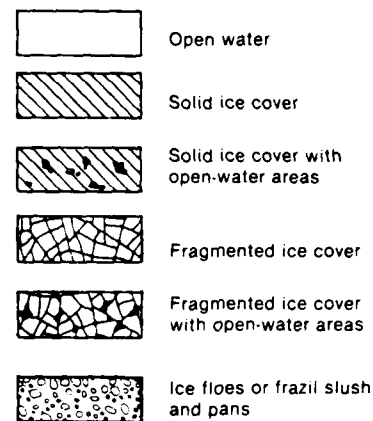






Kankakee River

MAP UNITS



Total area (m² x 10⁶)

Area (m ² x 10 ⁶)
0.29
1.05
0.06
3.39
2.45
0.00
7.30*

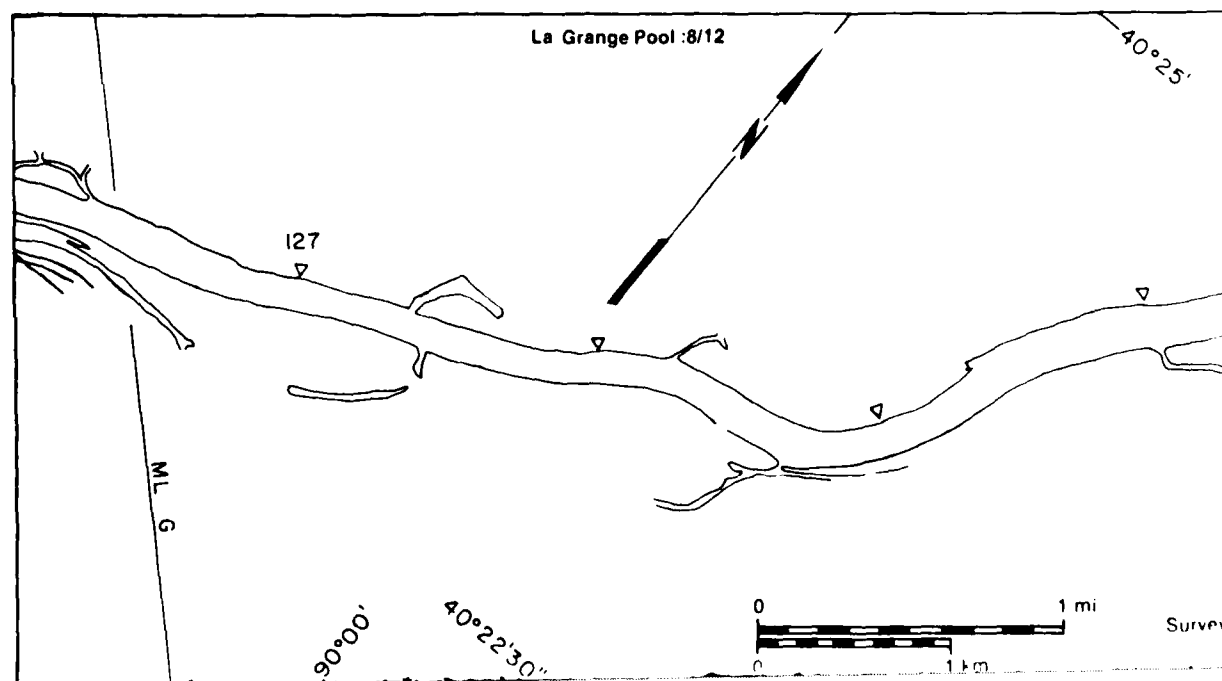
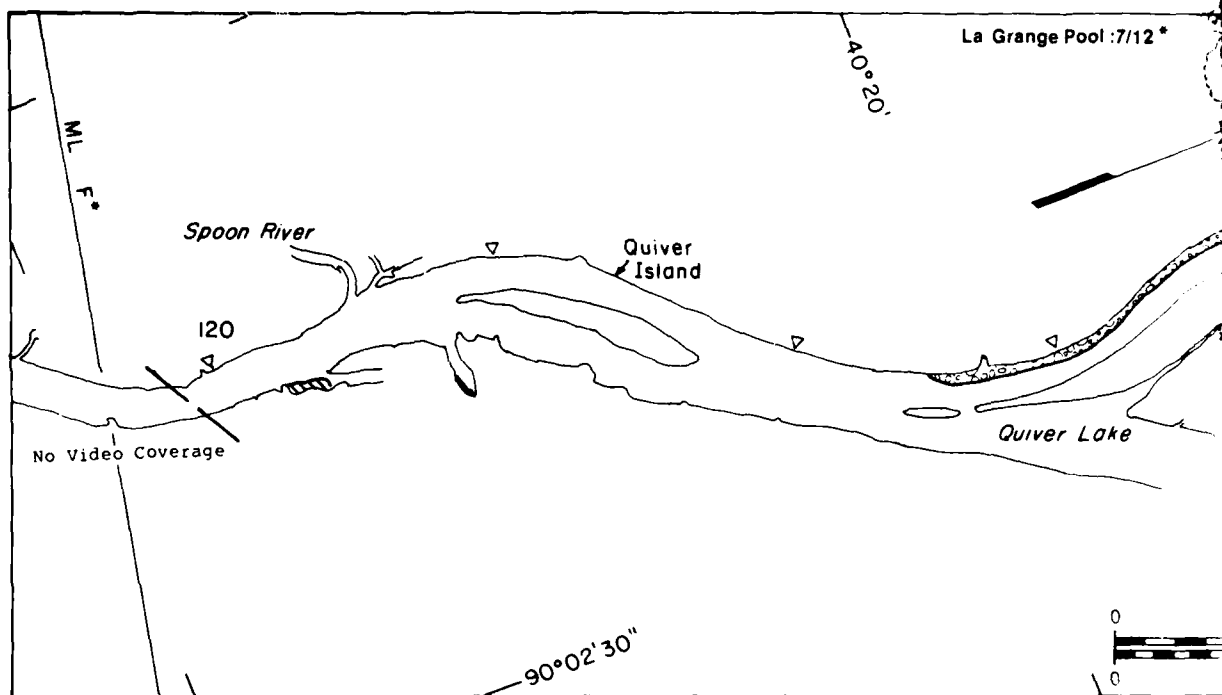
15
17 January 1986

Waukegan River

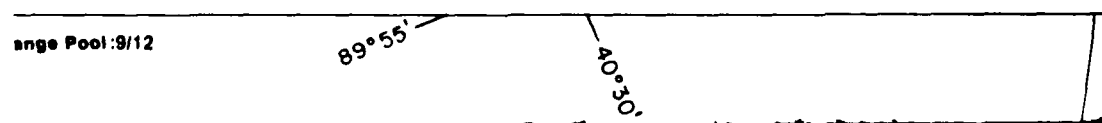
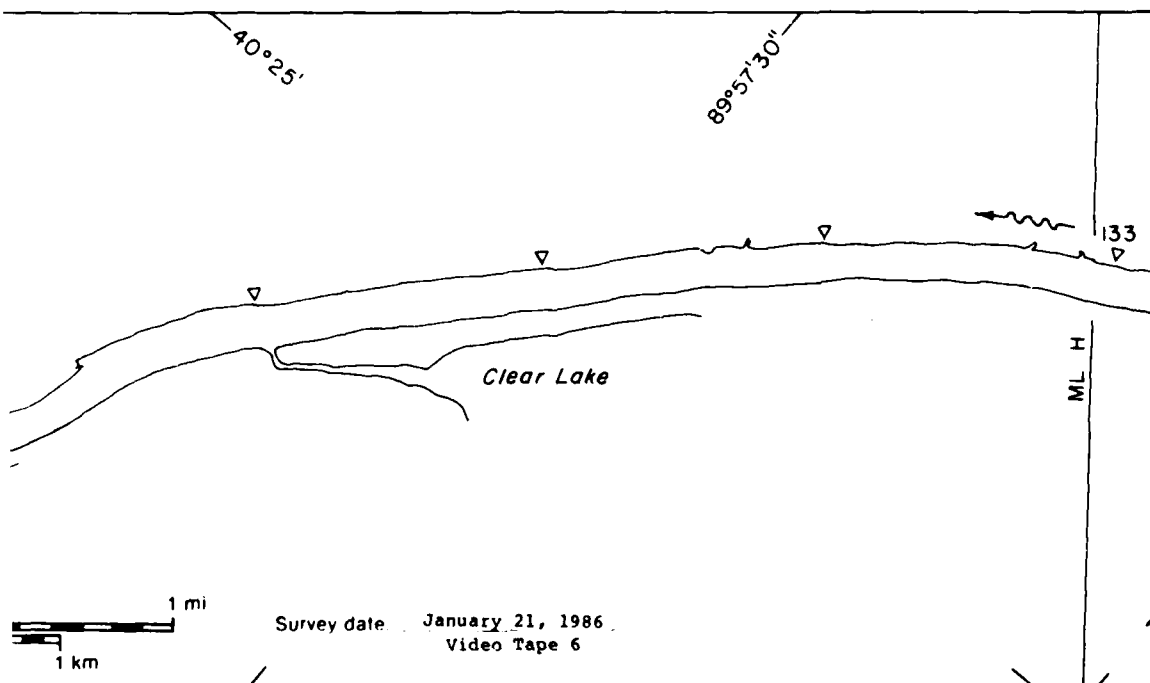
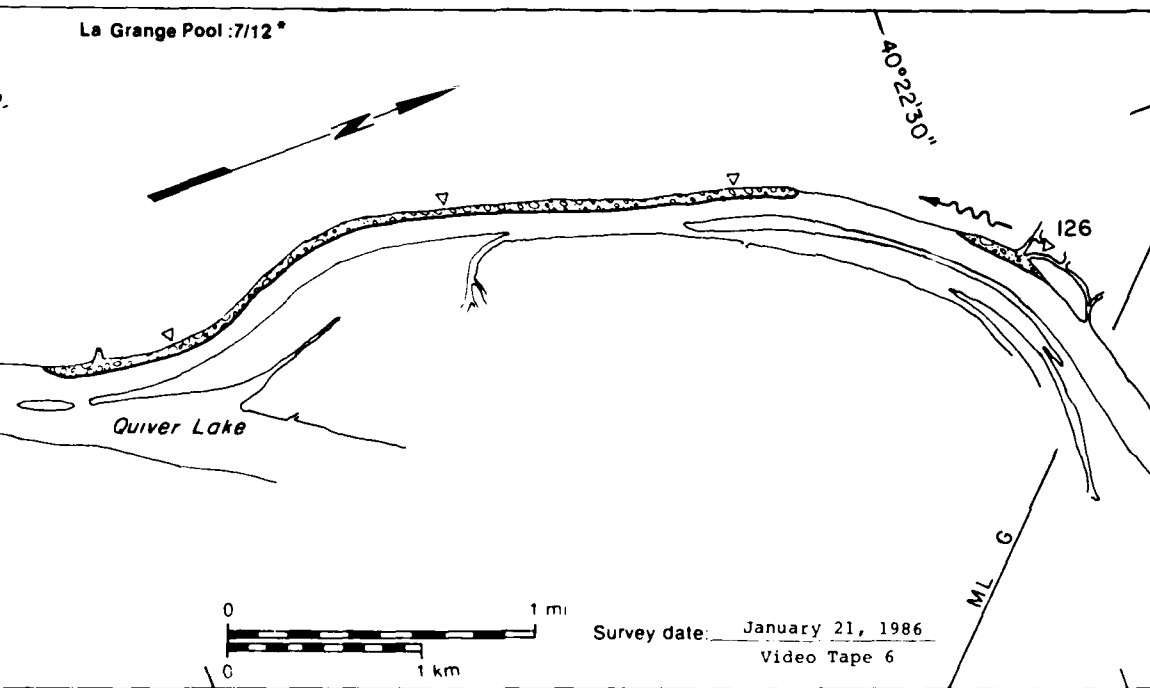
MAP UNITS

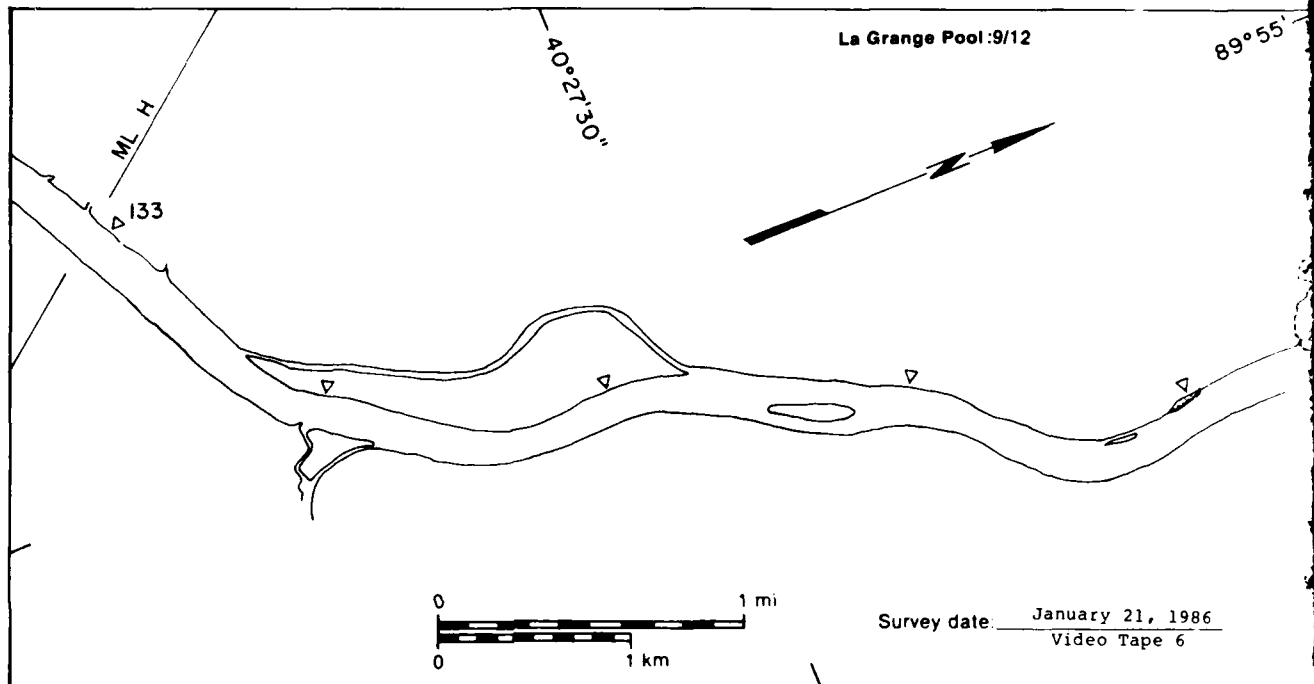
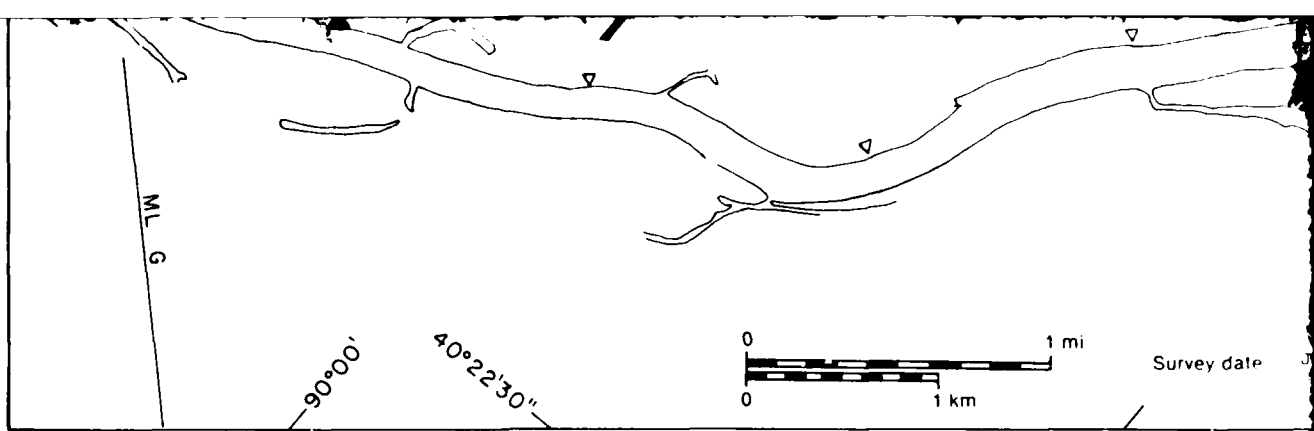
	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	0.29	NA
Solid ice cover	1.05	NA
Solid ice cover with open-water areas	0.00	—
Fragmented ice cover	3.39	NA
Fragmented ice cover with open-water areas	2.45	80
Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)	7.30*	

* Includes $0.12 \times 10^6 m^2$
of no video coverage

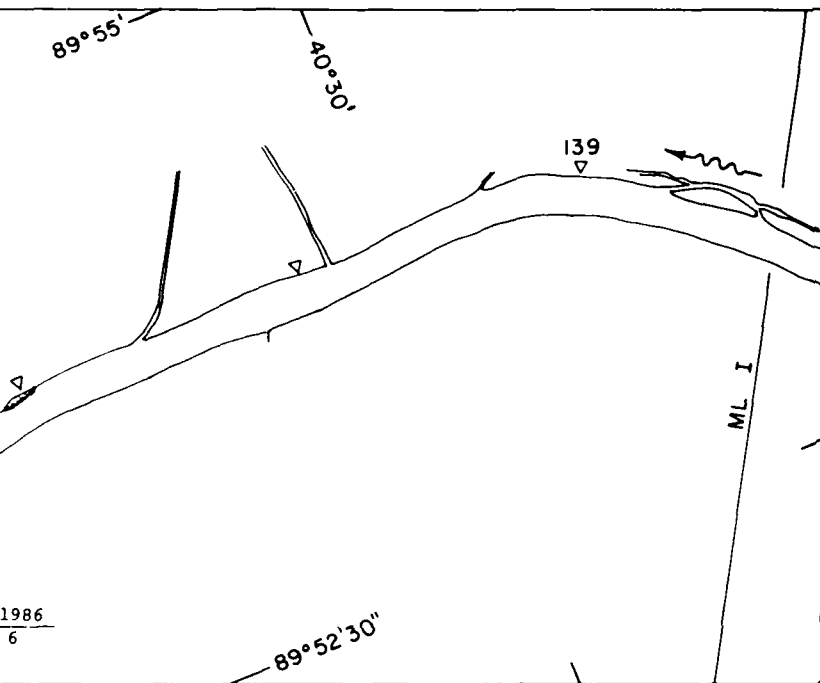
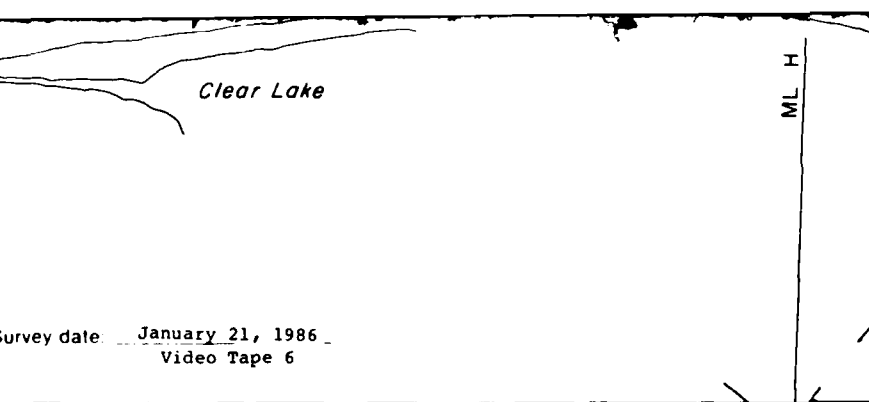


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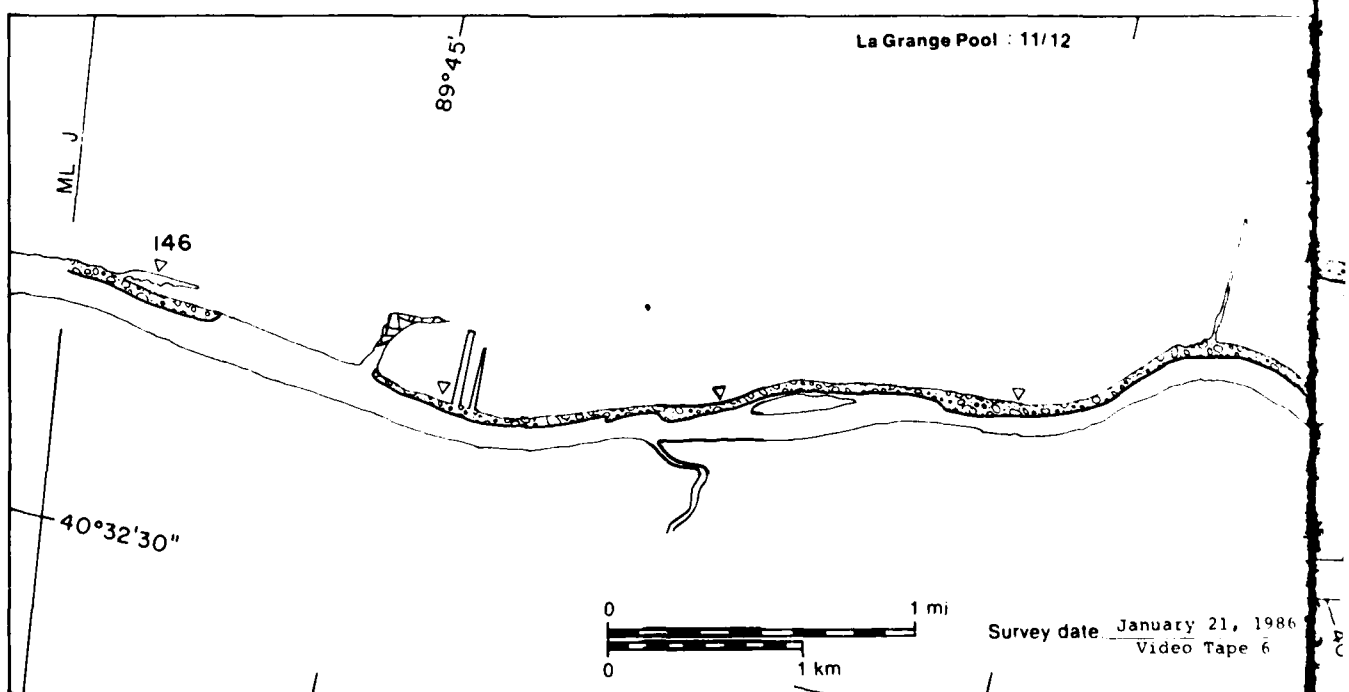
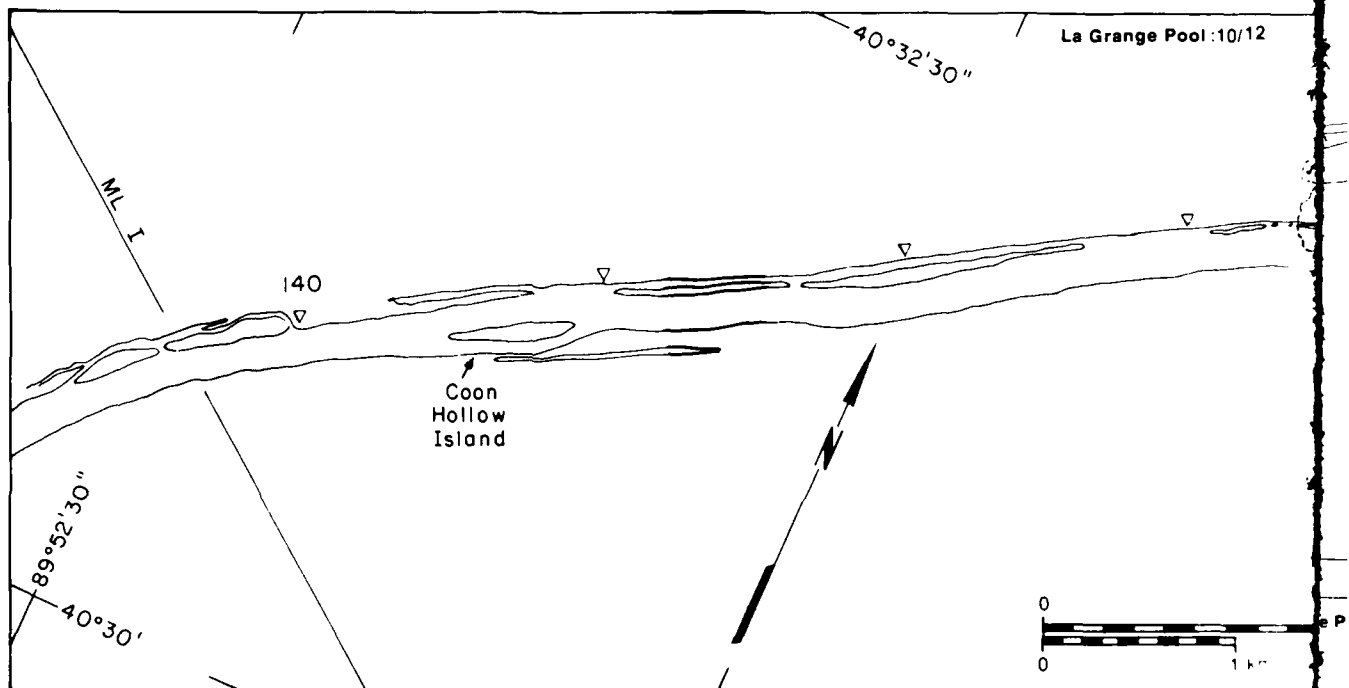


* The downstream limit of Illinois River video coverage was in the vicinity of mile 120 at Havana, Illinois, on all dates. There is no coverage of La Grange Pool maps 1/12 through 6/12 (match lines A through E).



D

21 January 1986



La Grange Pool: 10/12

89°47'30"

ML J

145



Survey date: January 21, 1986
Video Tape 6

11/12

40°35'
ML K

153



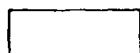
No Video Coverage

89°40'

Survey date: January 21, 1986
Video Tape 6

La Grange Pool

MAP UNITS



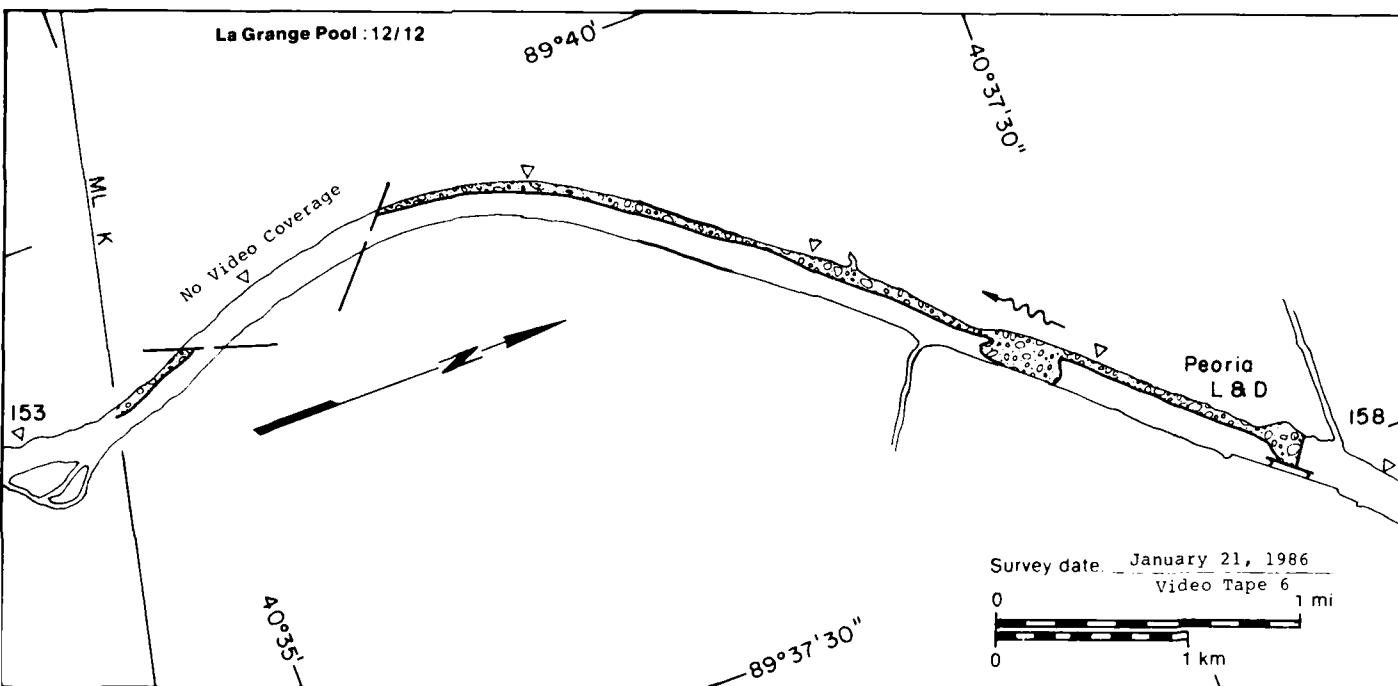
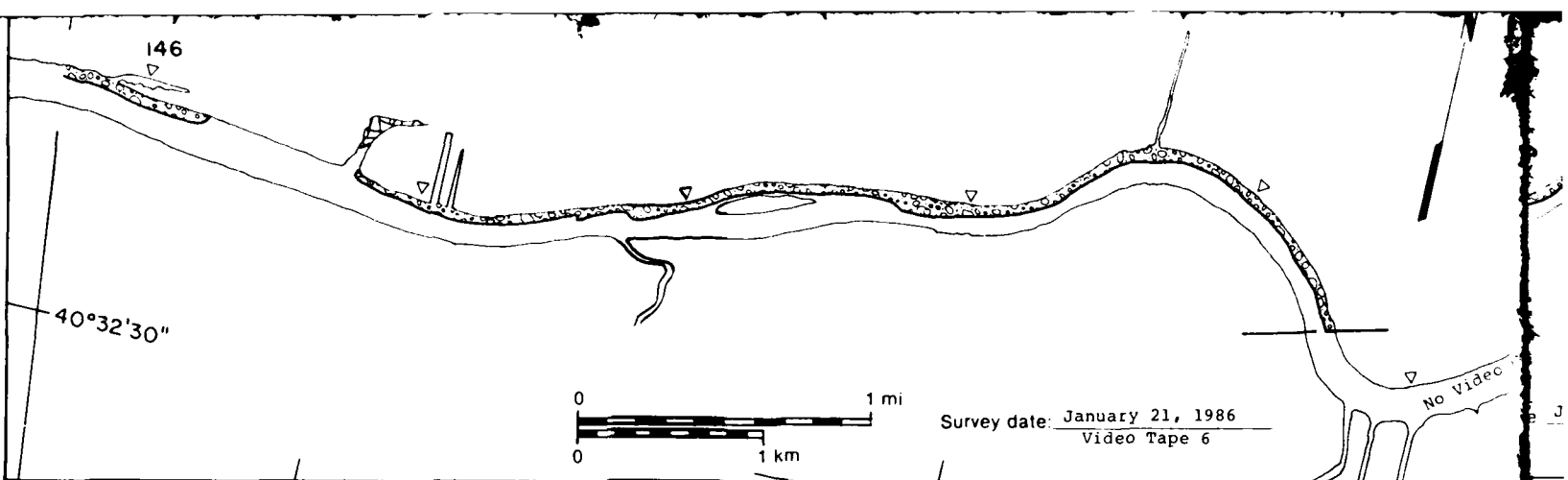
Open water

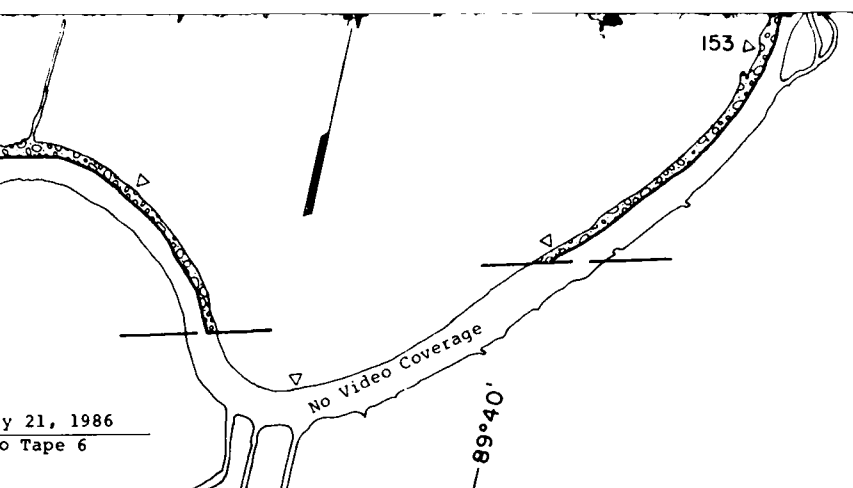
Area
(m² x 10⁶)

10.26

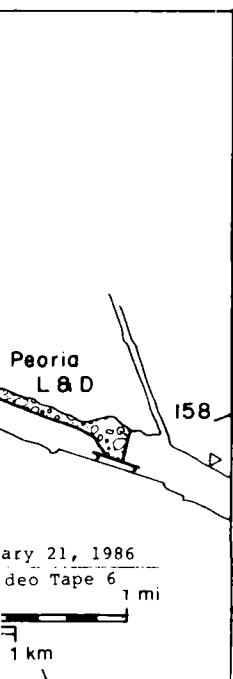
Surface
concentration
(%)

NA





ary 21, 1986
deo Tape 6



ary 21, 1986
deo Tape 6

La Grange Pool

MAP UNITS



Open water



Solid ice cover



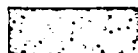
Solid ice cover with open-water areas



Fragmented ice cover



Fragmented ice cover with open-water areas



Ice floes or frazil slush and pans

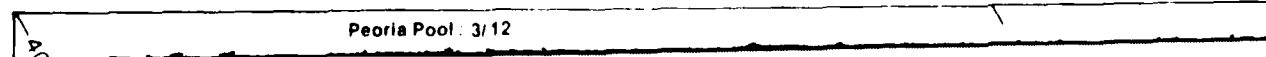
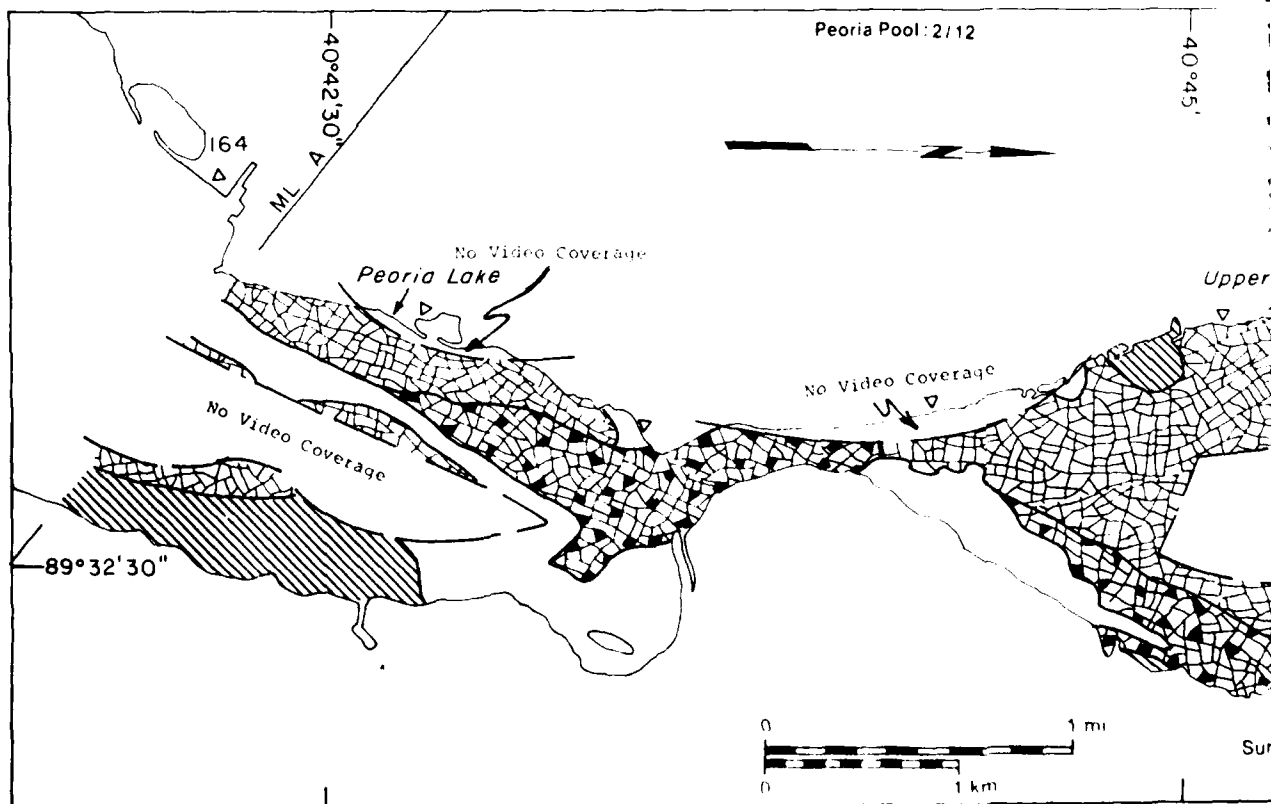
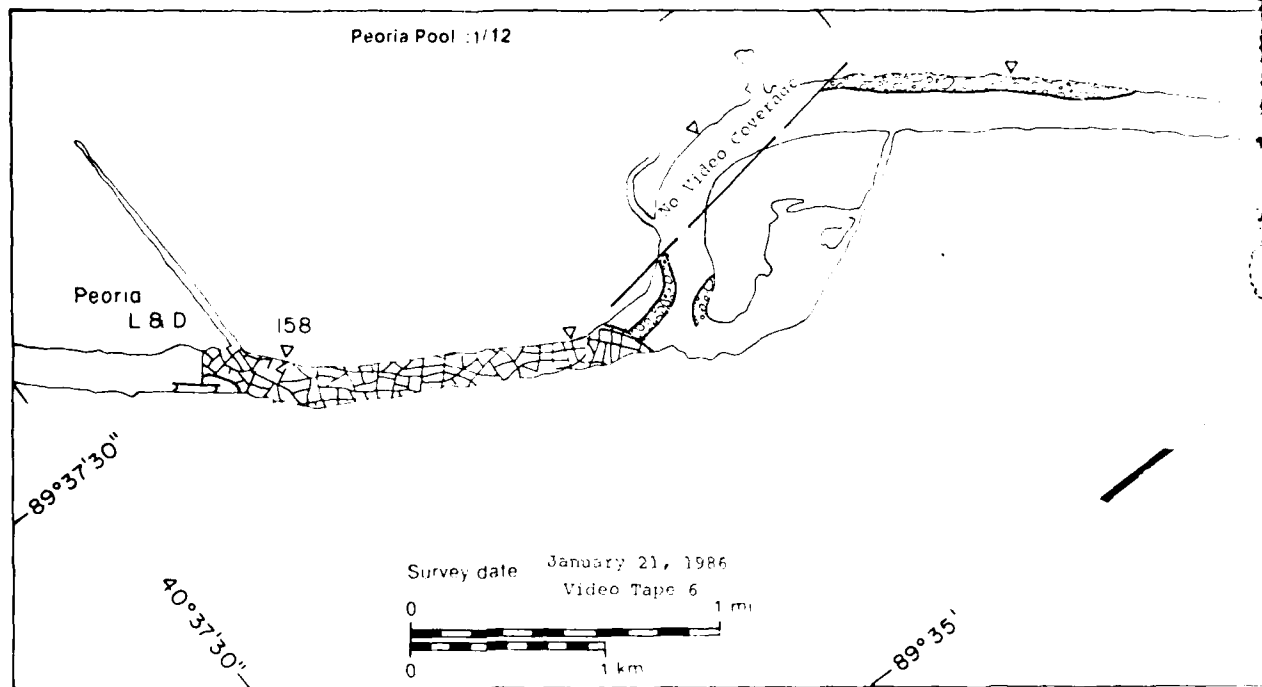
Total area ($m^2 \times 10^6$)

Area
($m^2 \times 10^6$)

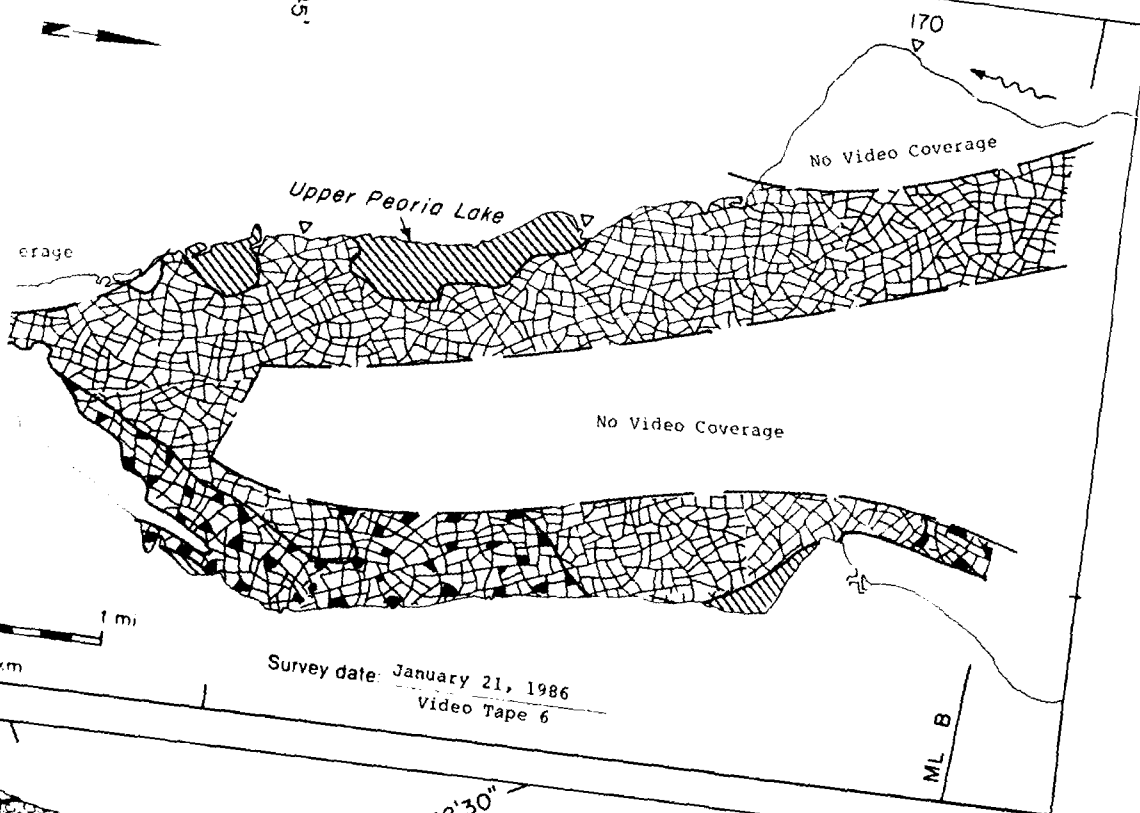
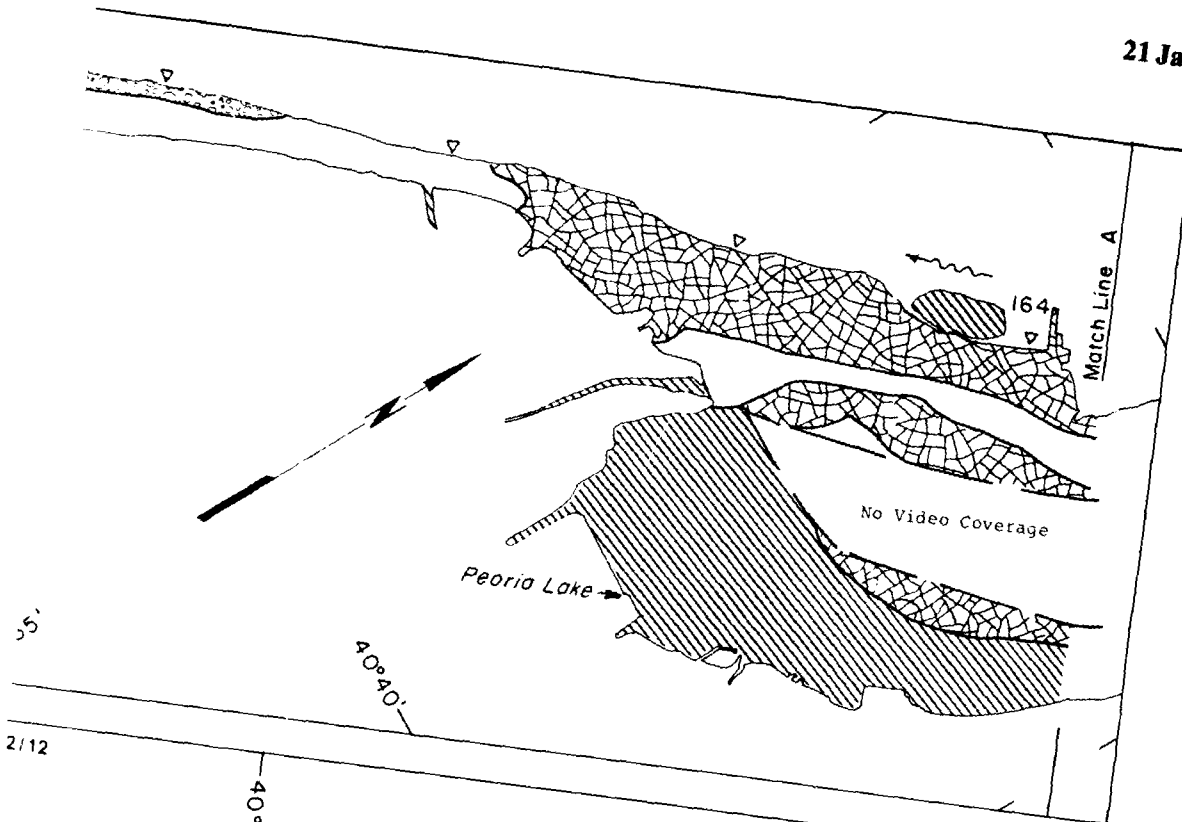
Surface
concentration
(%)

10.26	NA
0.00	NA
0.00	—
0.02	NA
0.00	—
0.69	50
11.71*	

* Includes $0.74 \times 10^6 m^2$
of no video coverage



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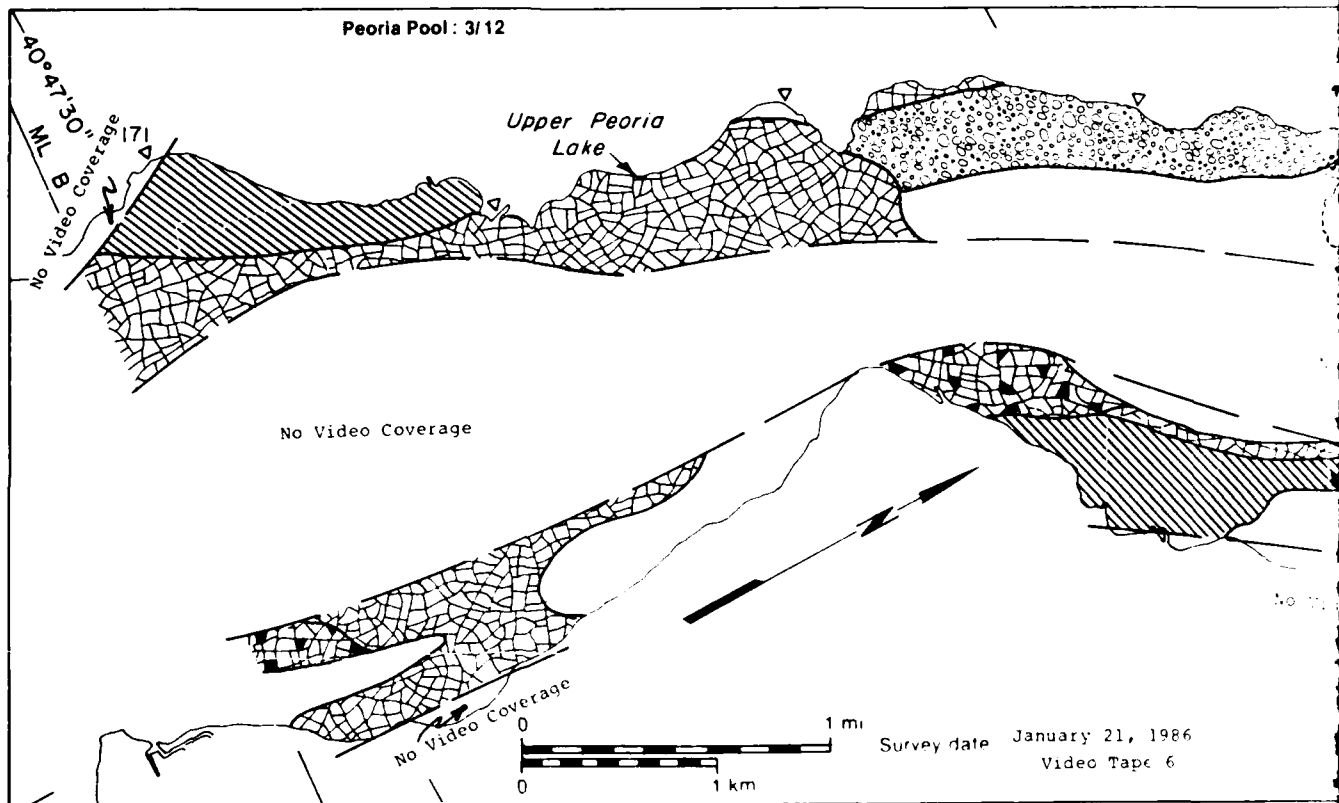
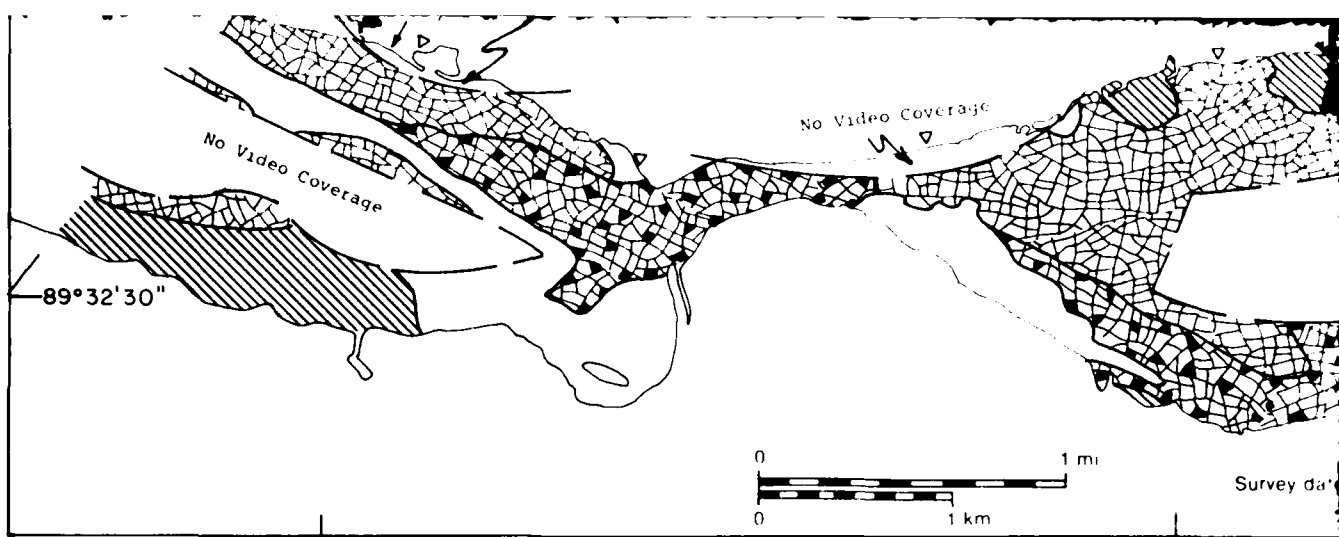


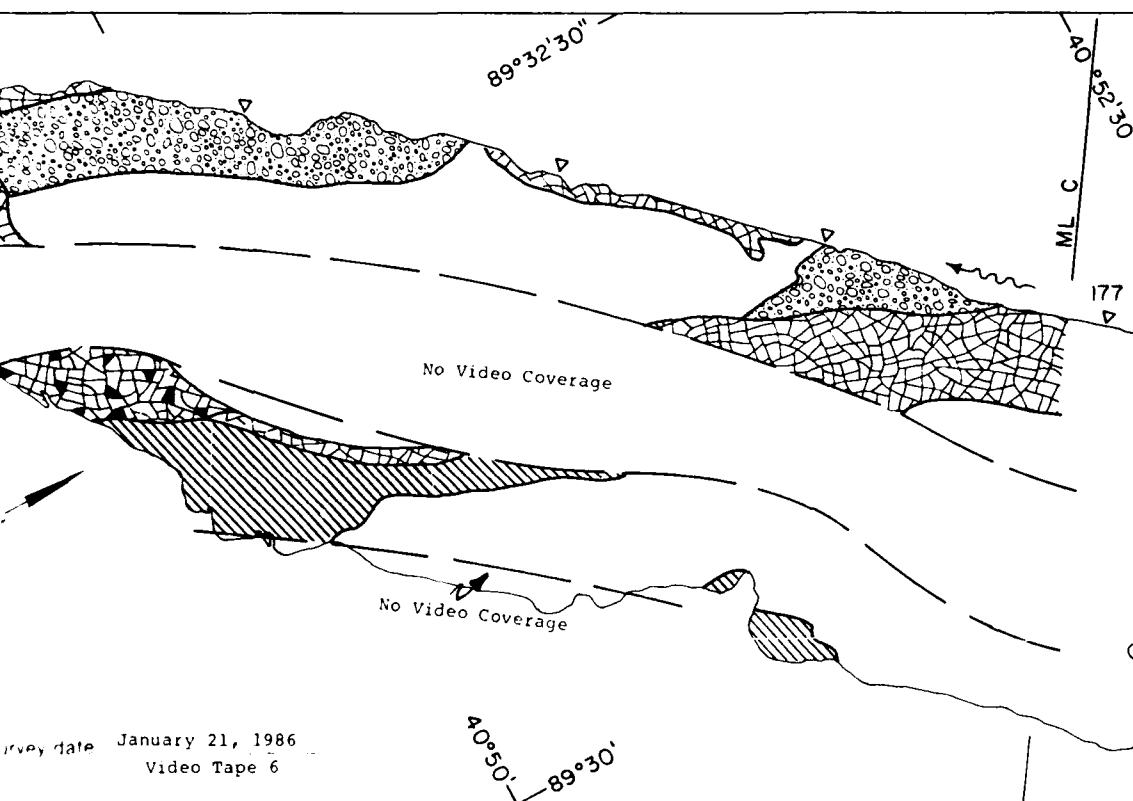
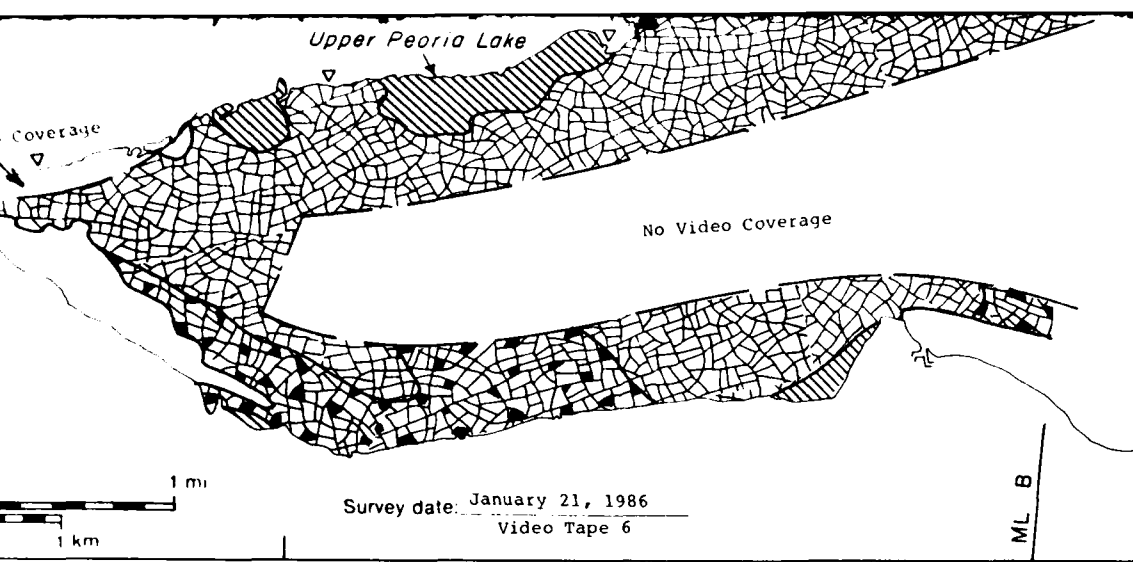
Survey date: January 21, 1986
Video Tape 6

89°32'30"

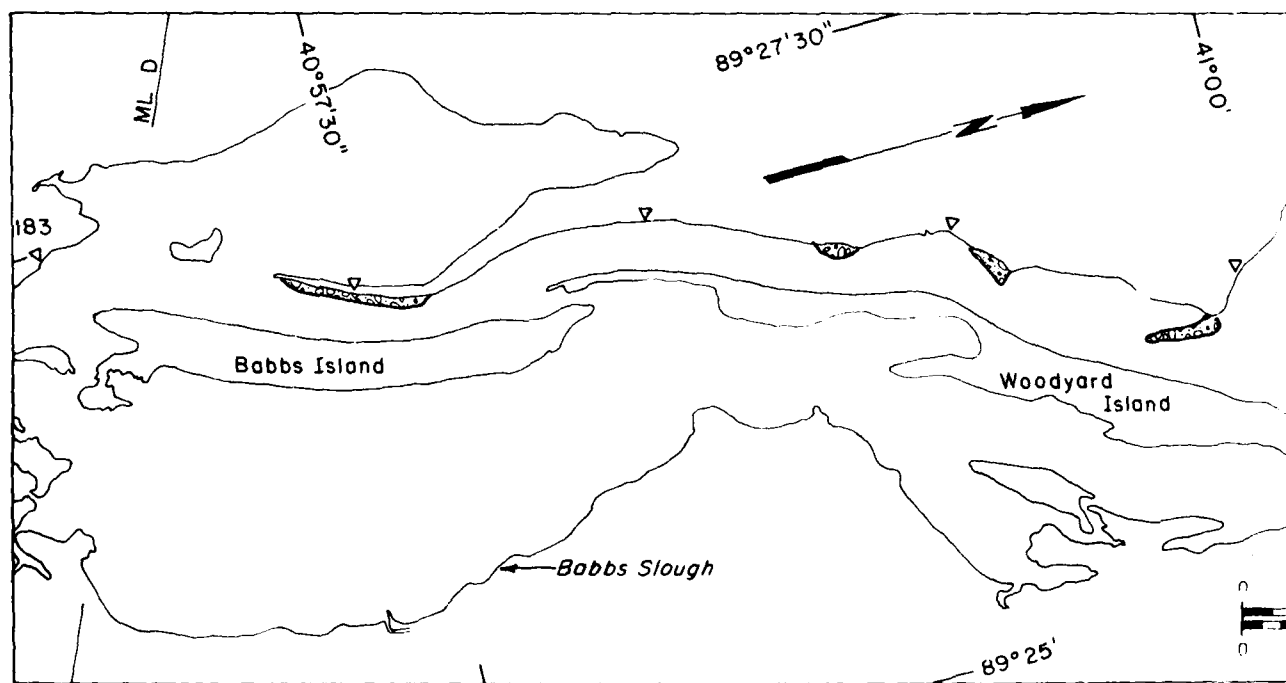
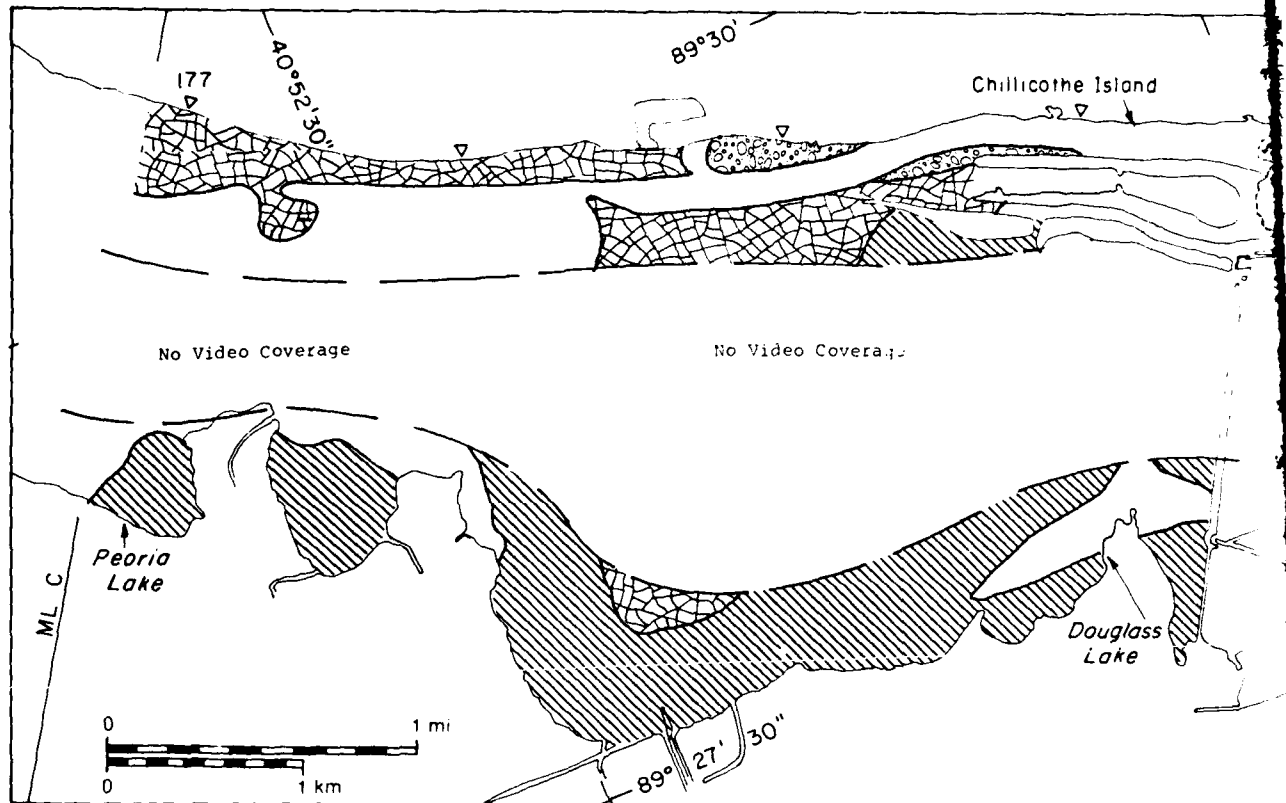
40°52'30"

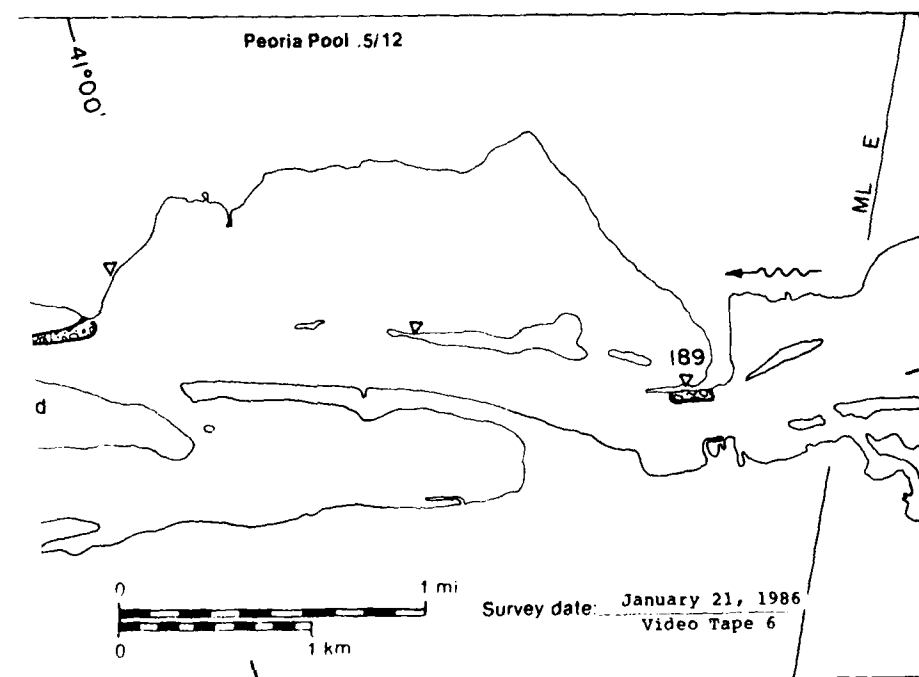
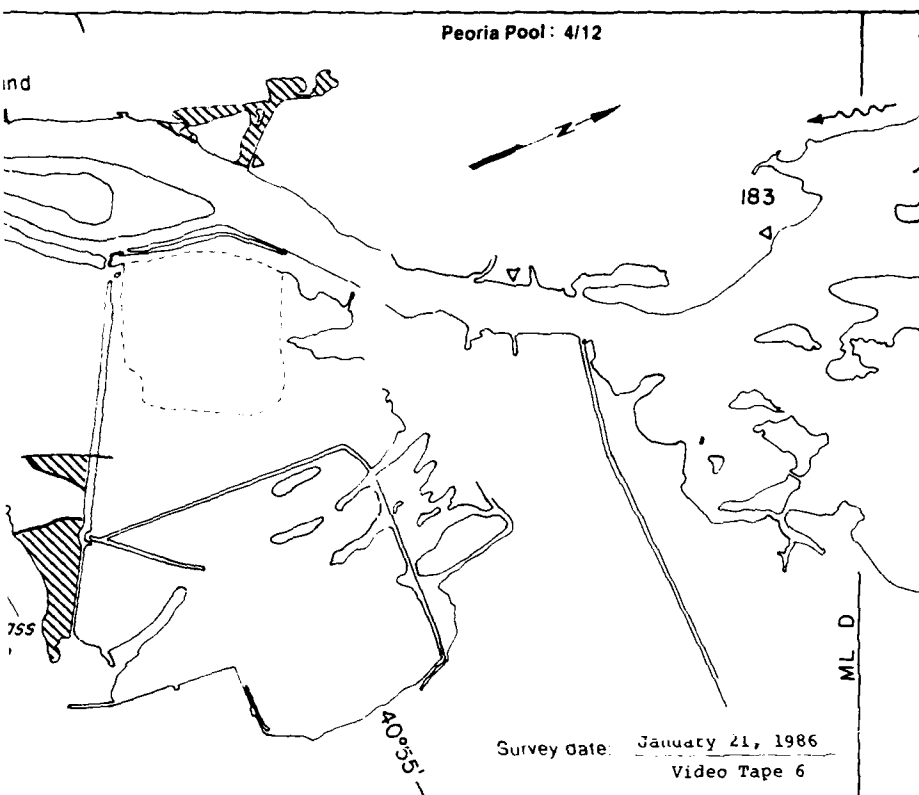
1 mi
1 km



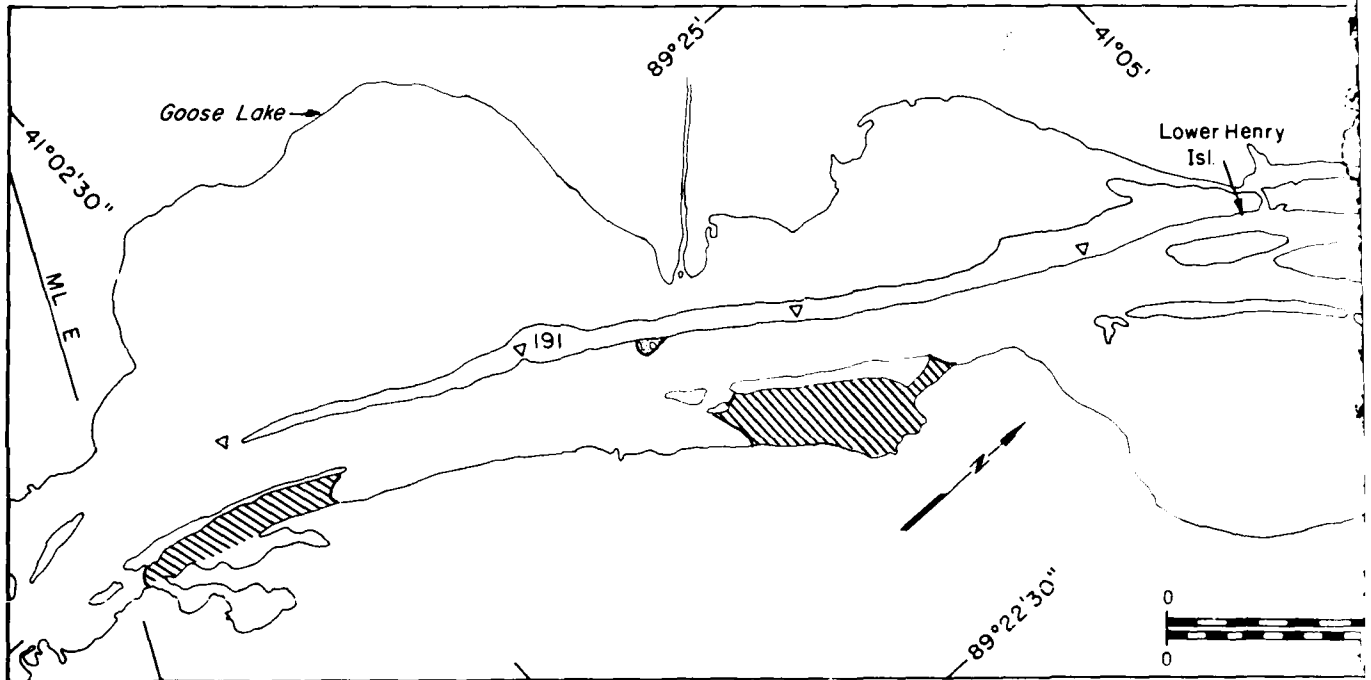
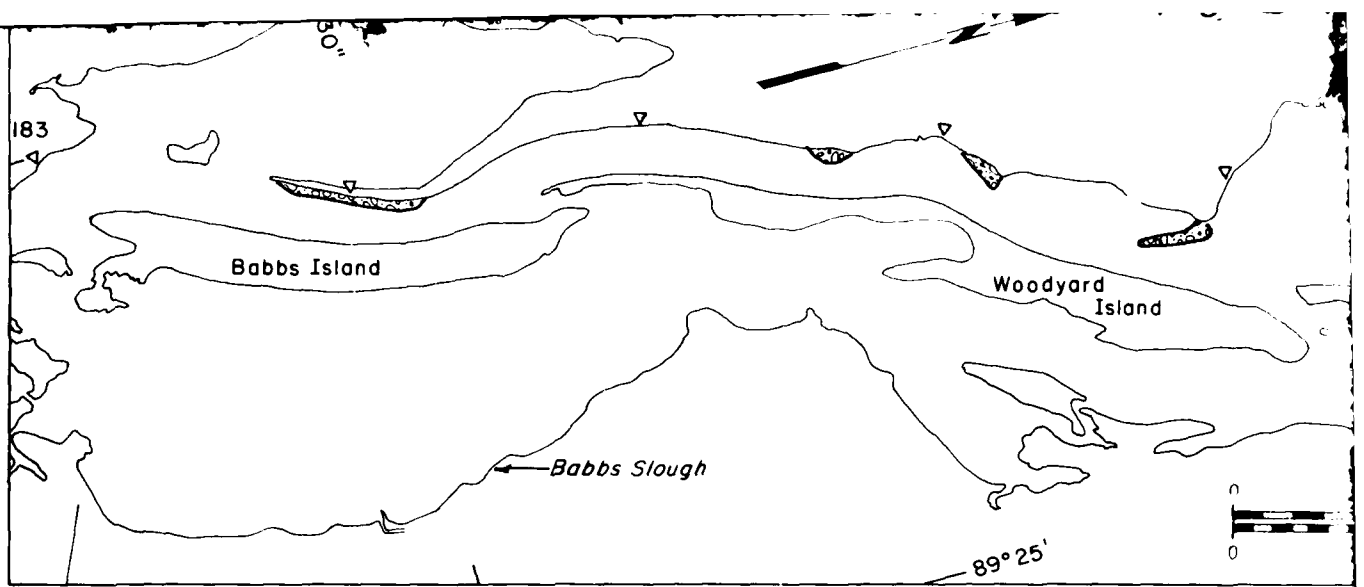


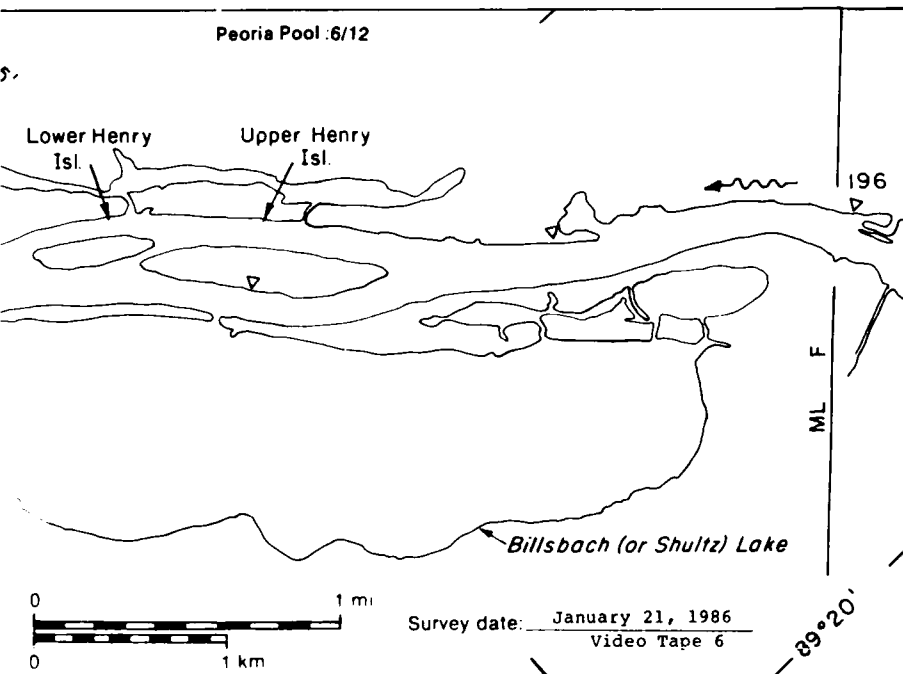
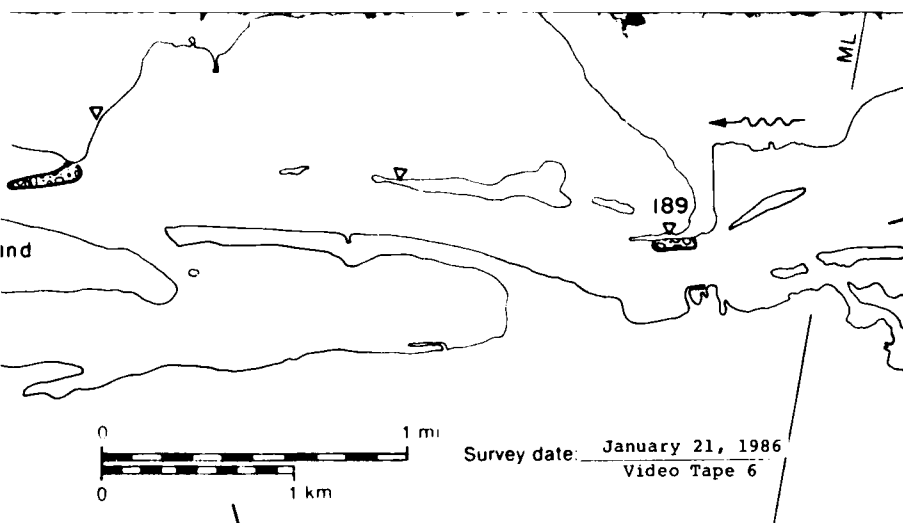
21 January 1986

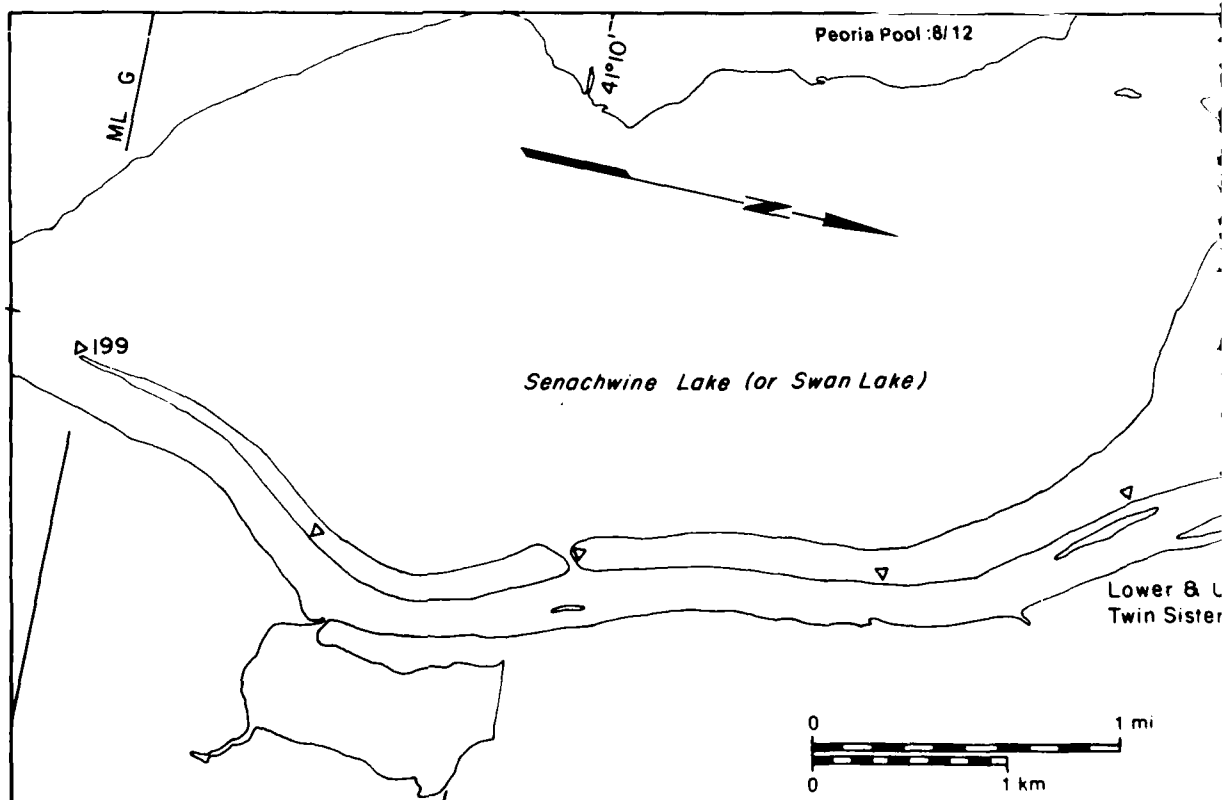
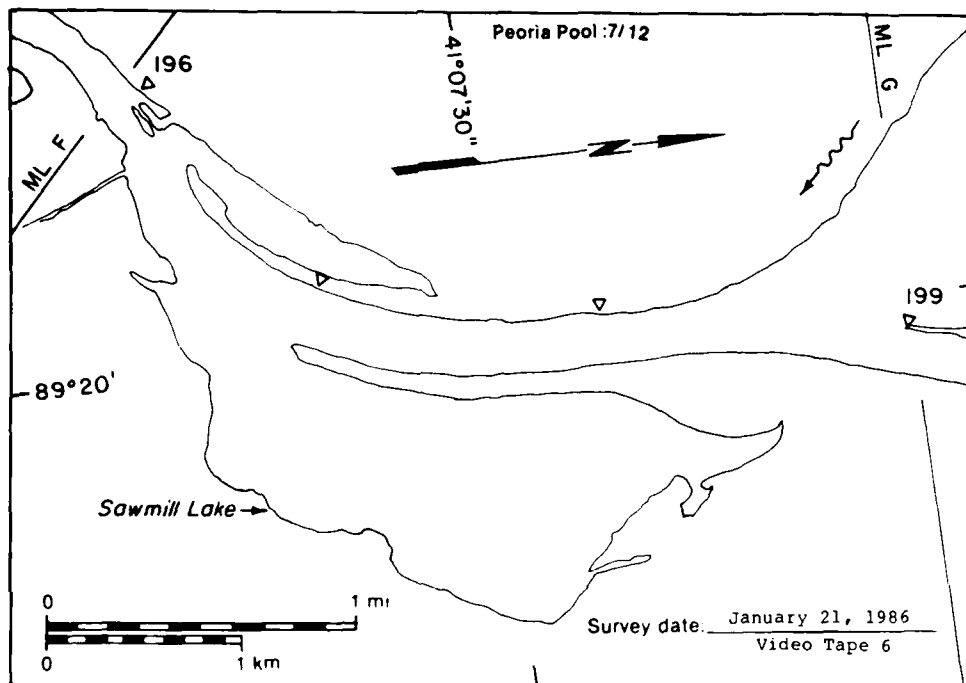




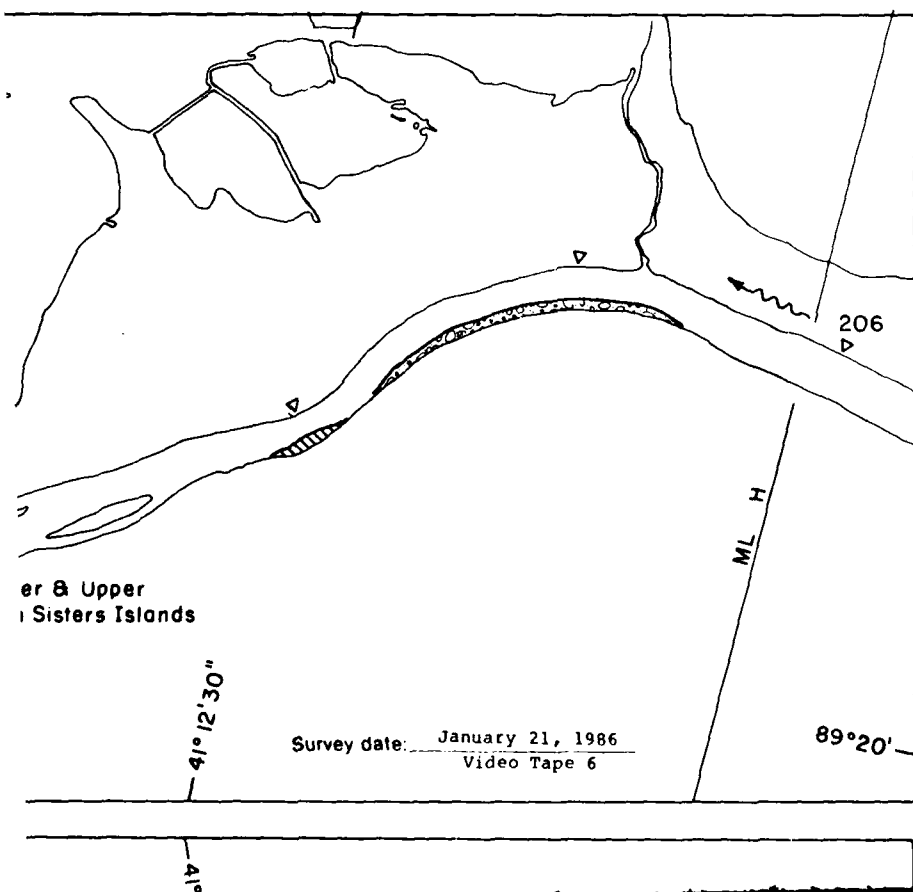
Peoria Pool: 6/12

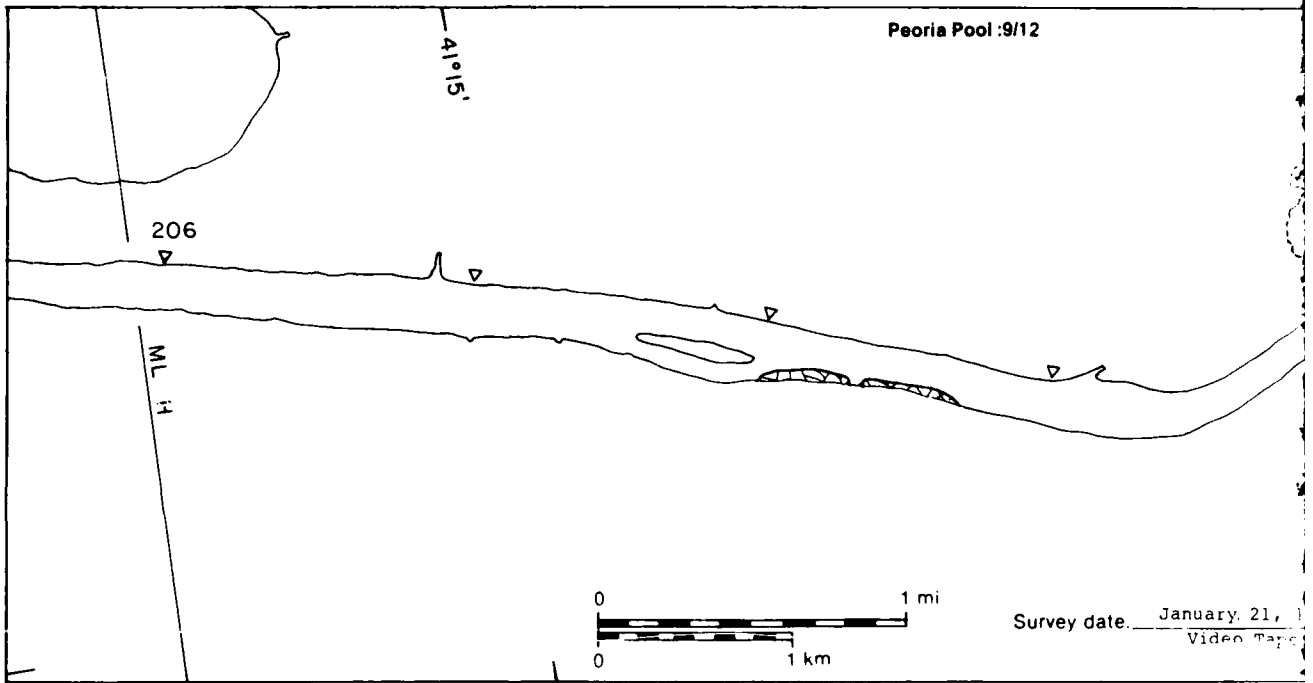
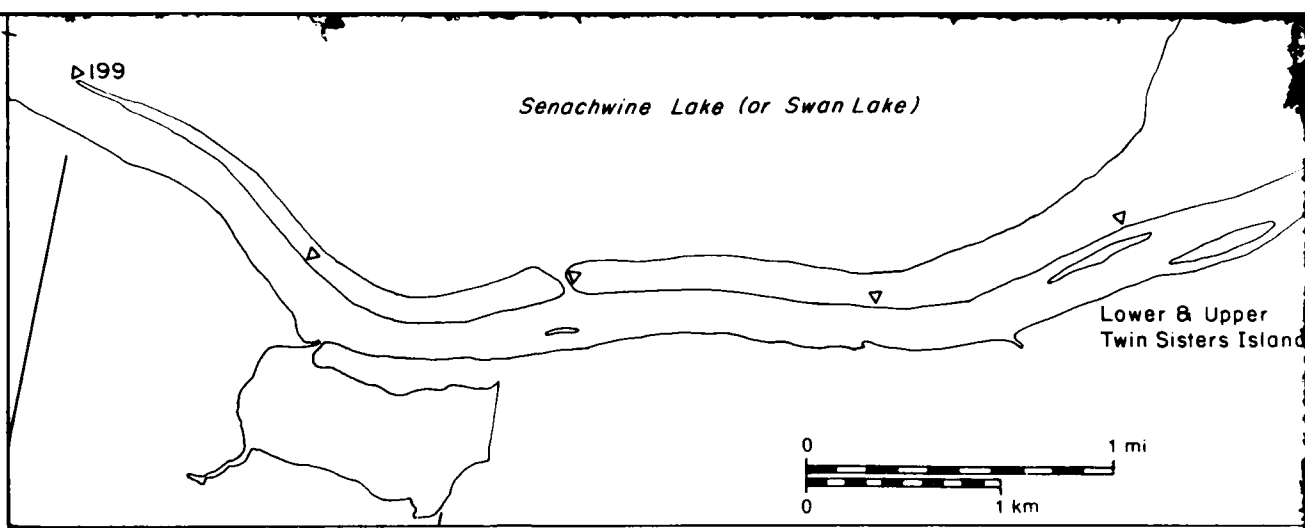


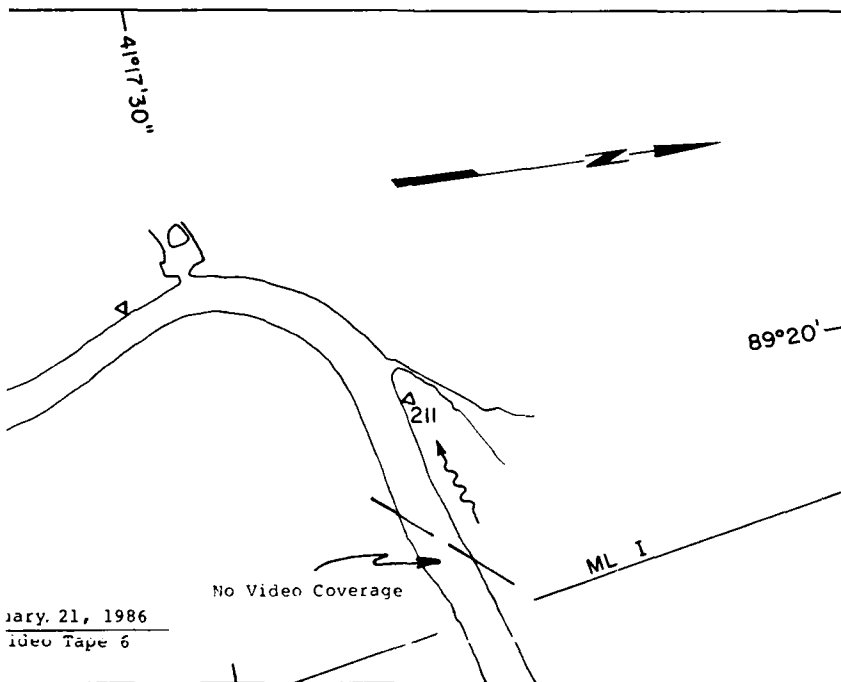
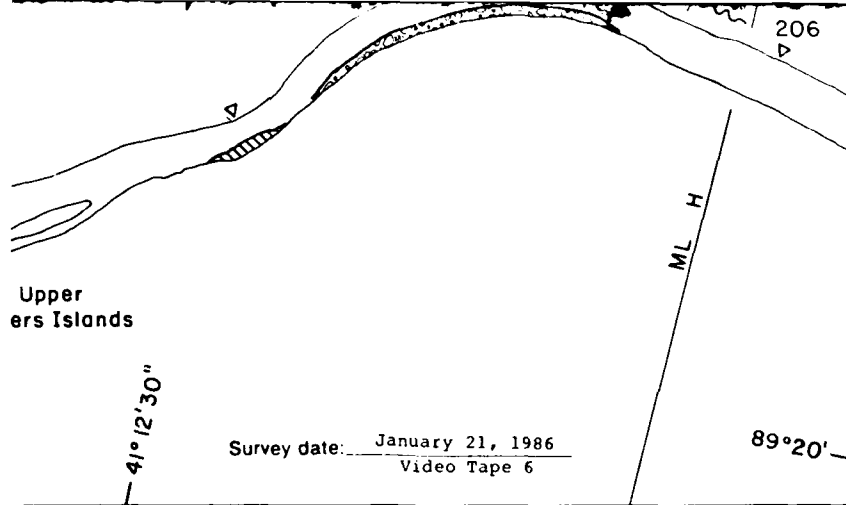




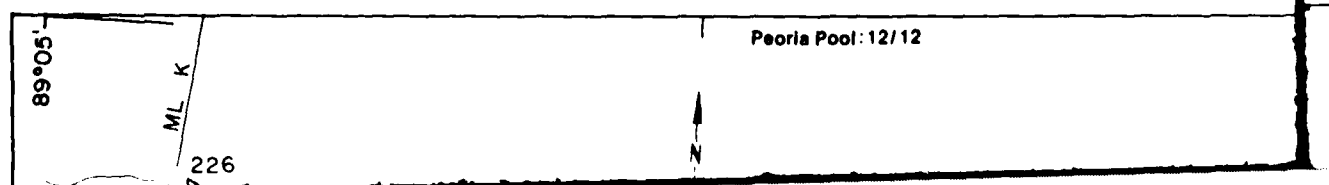
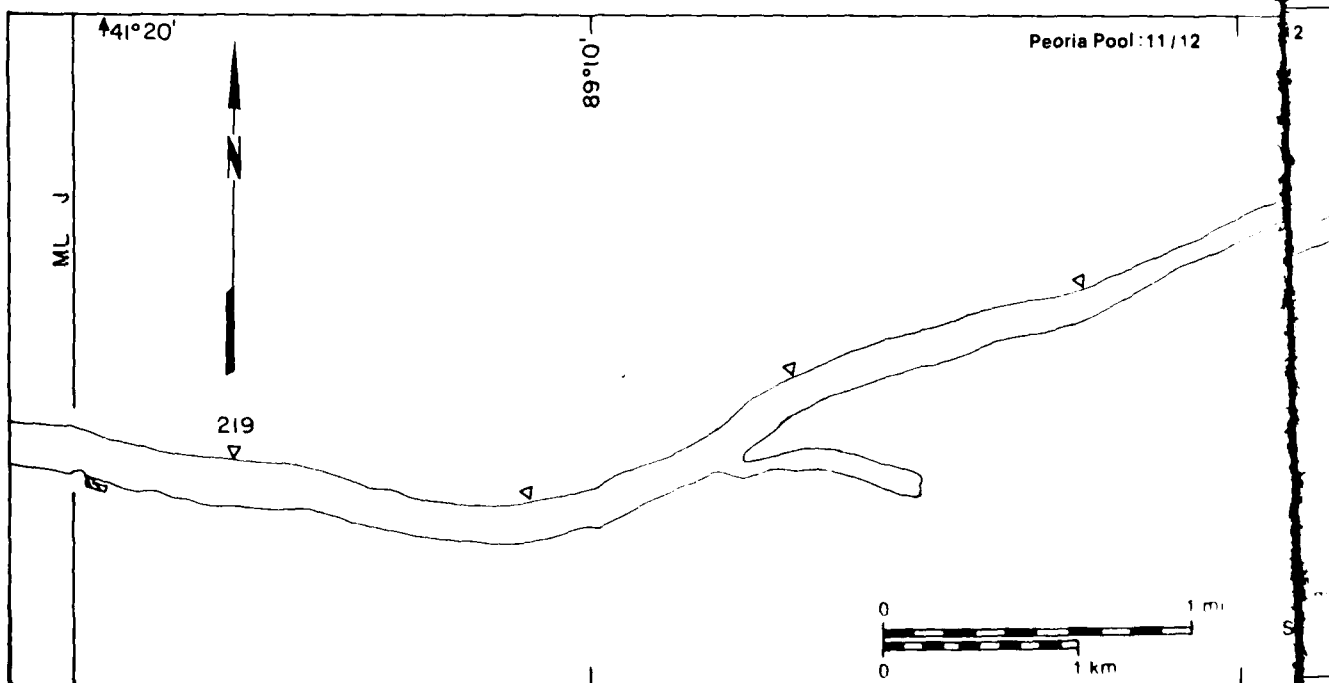
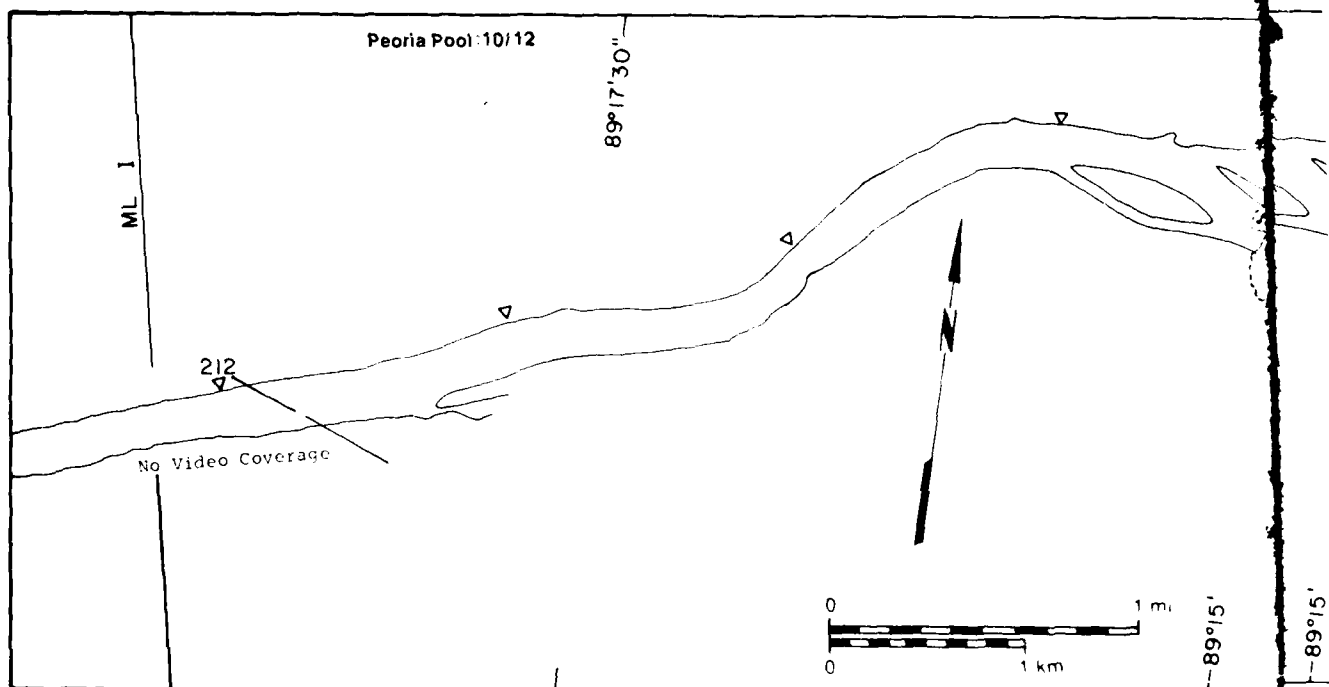
21 January 1986

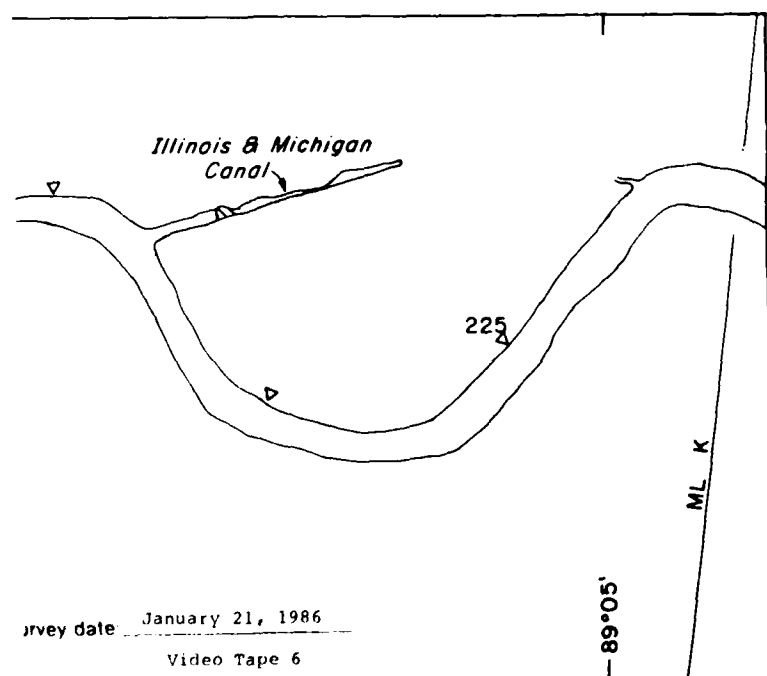
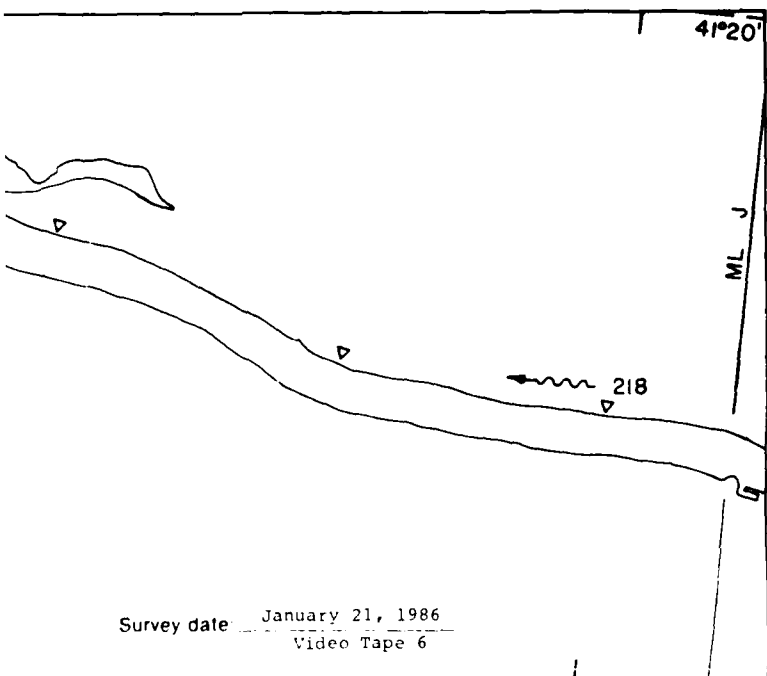




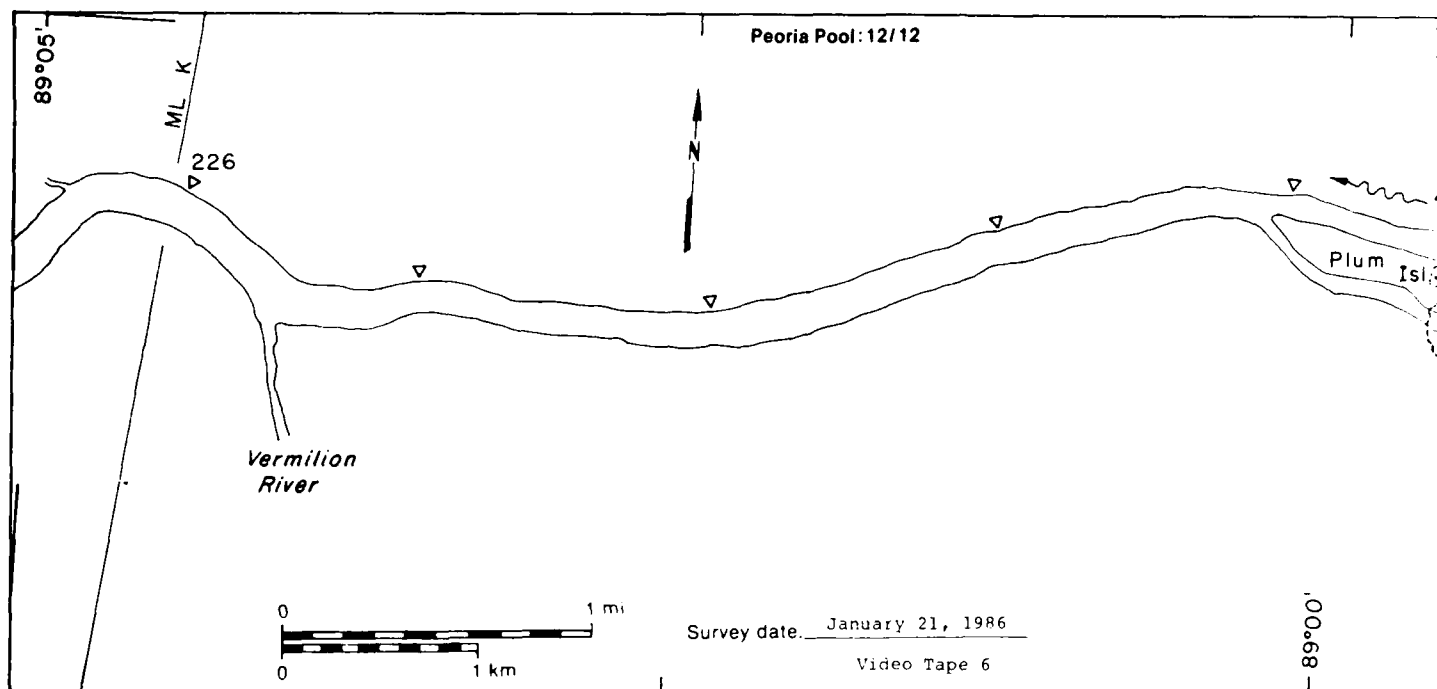
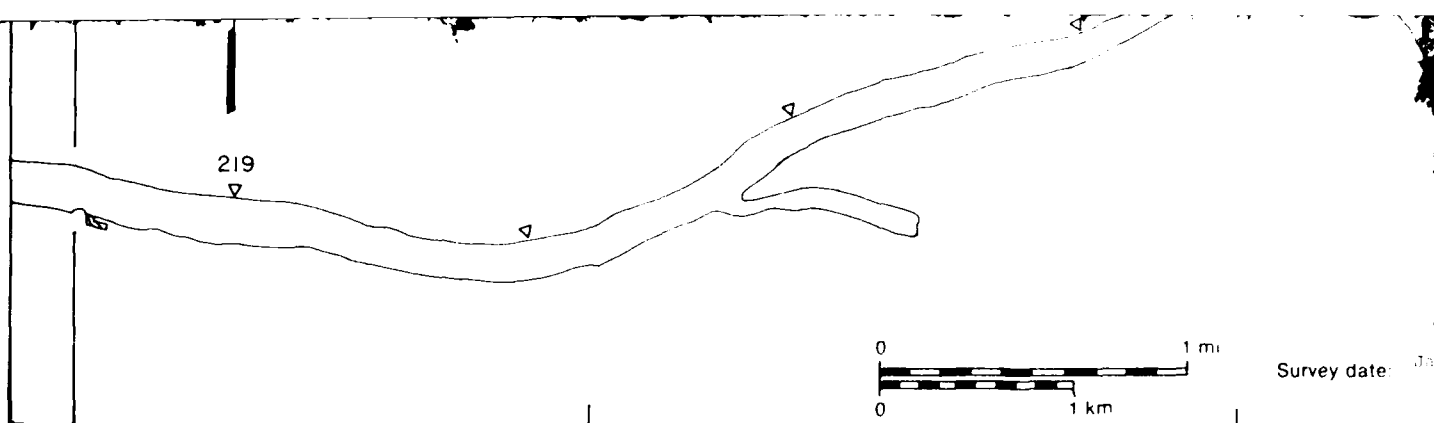


21 January 1986





41°20'



Peoria Pool

MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Area
($m^2 \times 10^6$)

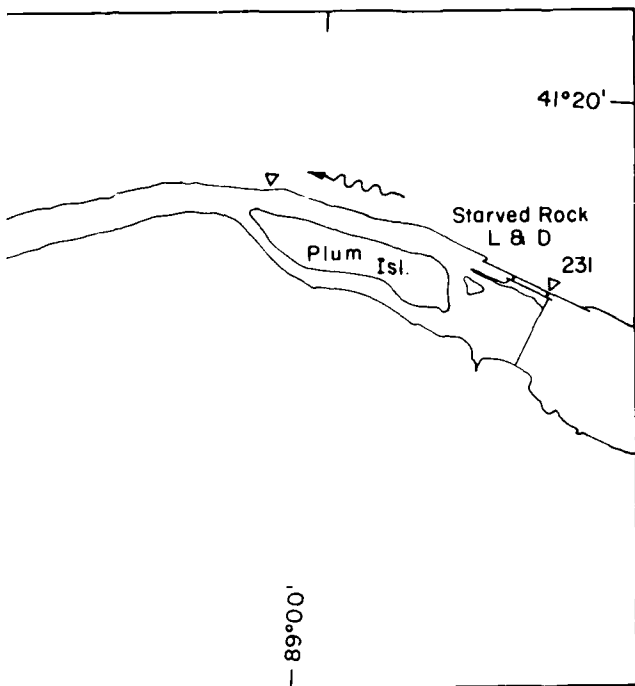
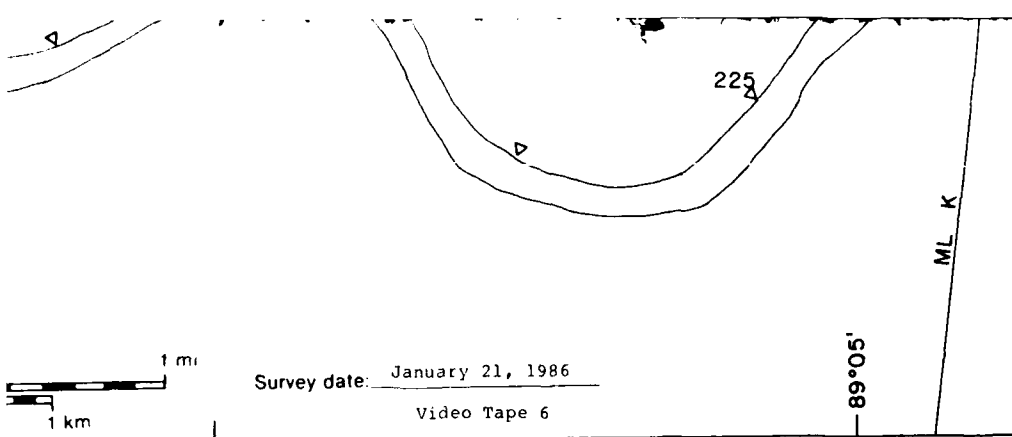
Surface
concentration

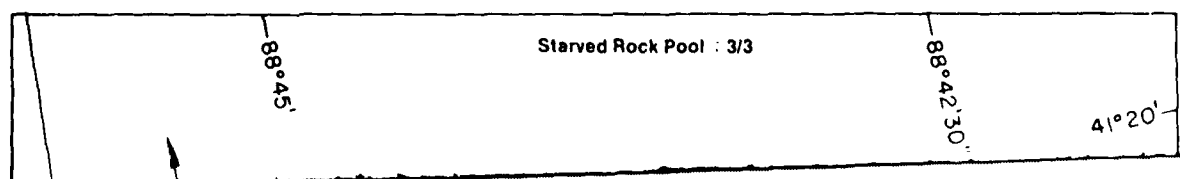
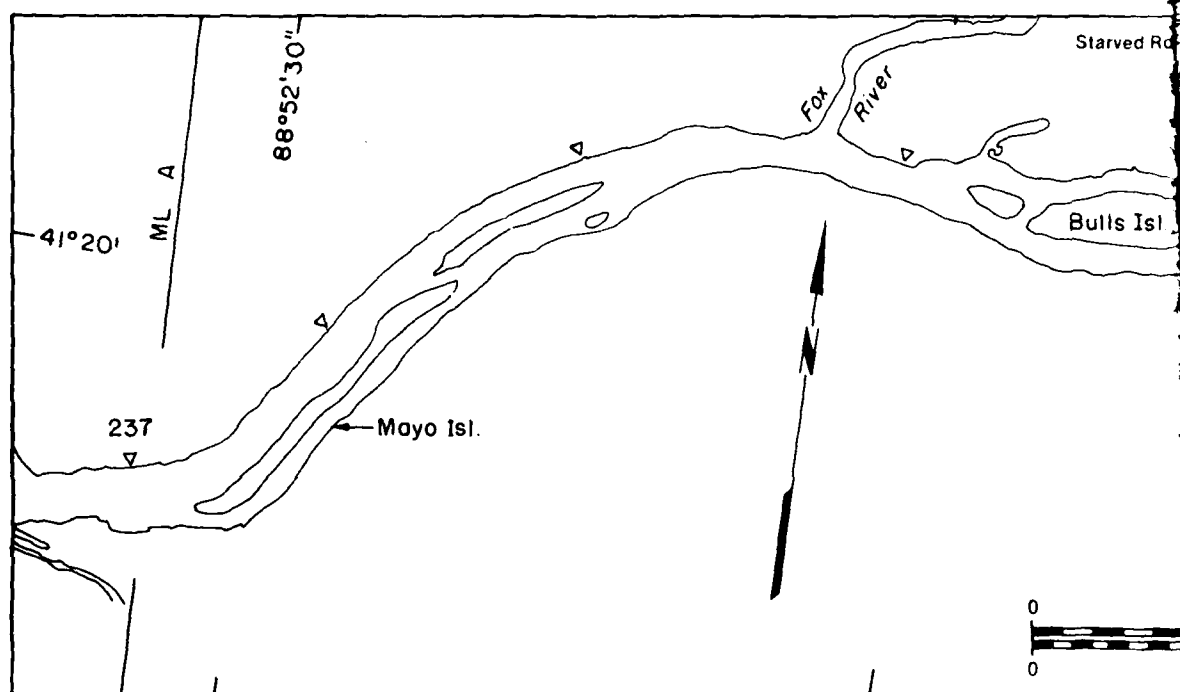
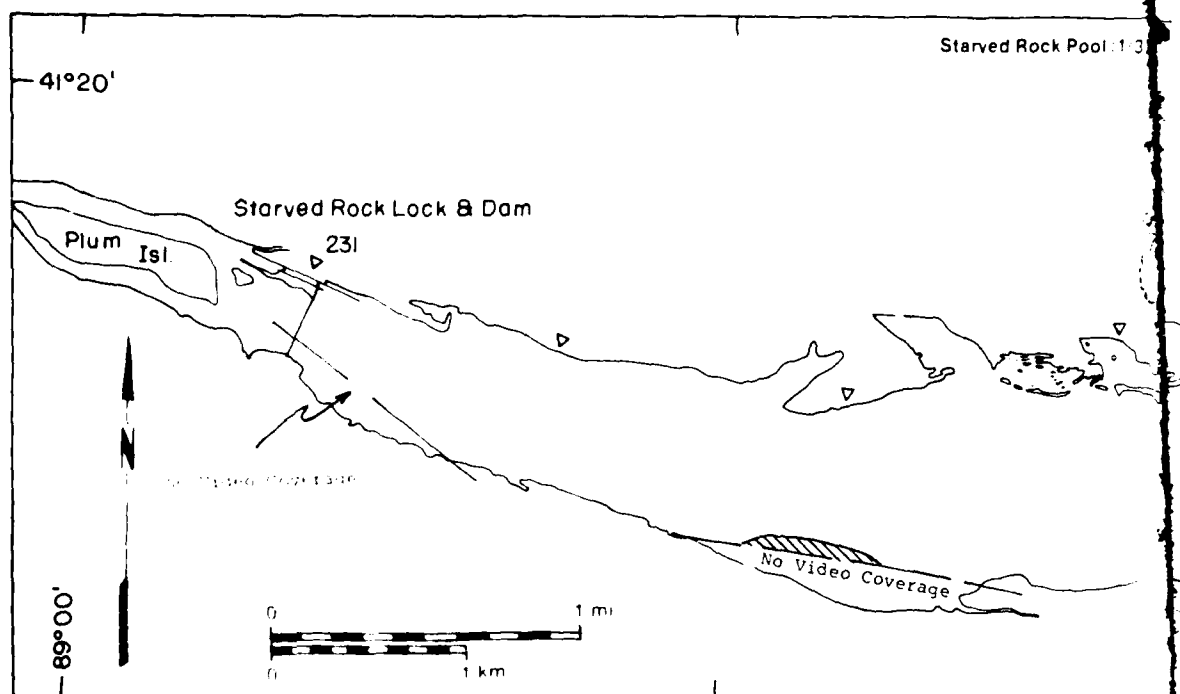
32.13	NA
8.45	NA
0.00	—
11.69	NA
2.46	70
1.83	70

Total area ($m^2 \times 10^6$)

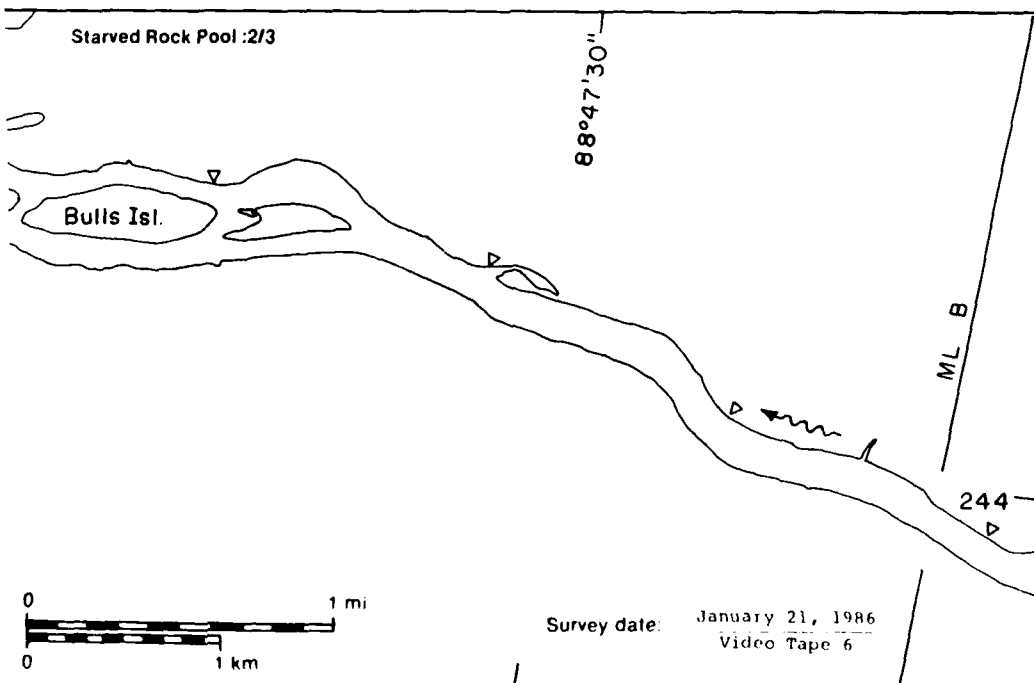
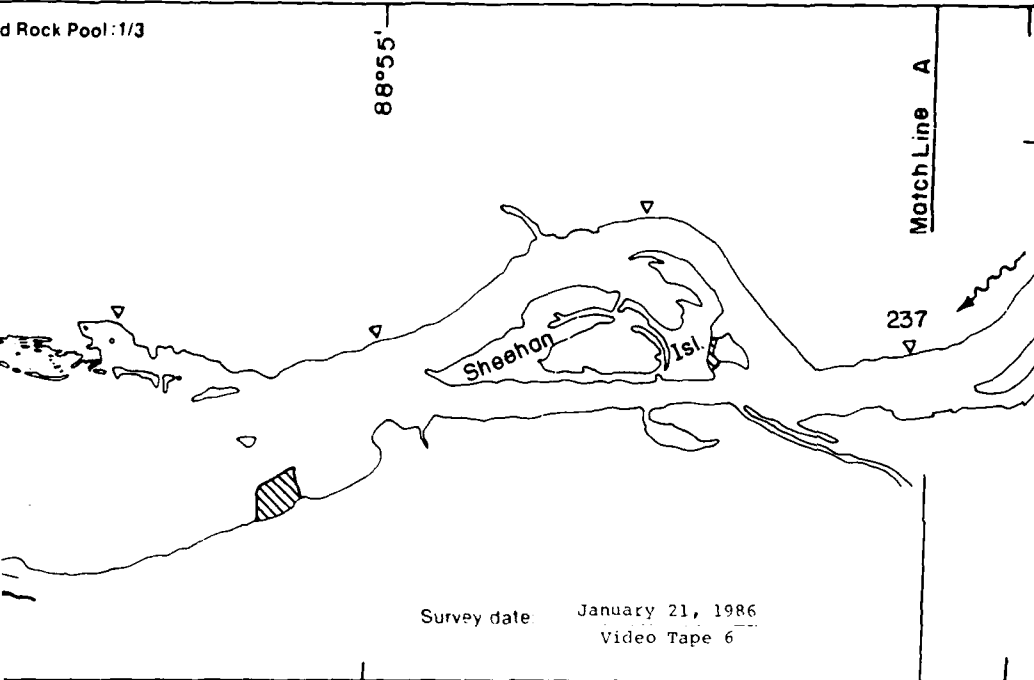
81.33*

* Includes $24.77 \times 10^6 m^2$
of no video coverage





21 January 1986



41°20'

Starved Rock Pool

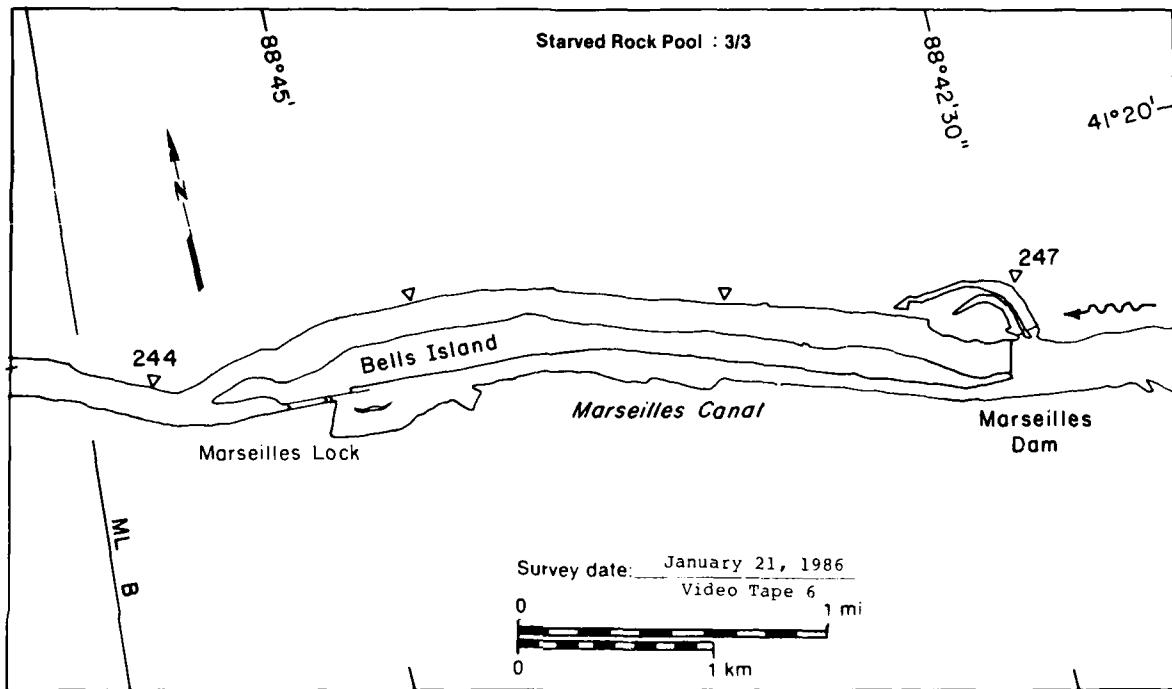
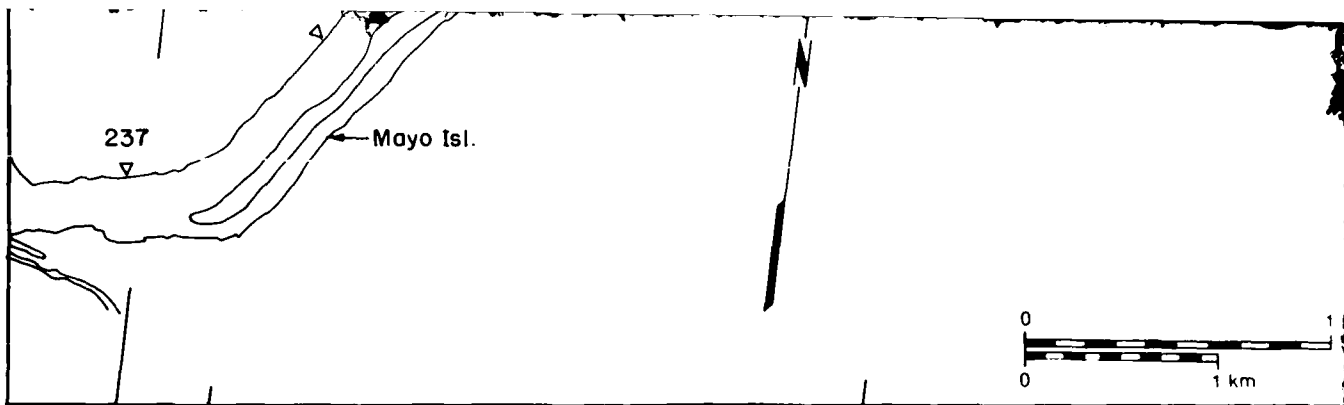
MAP UNITS

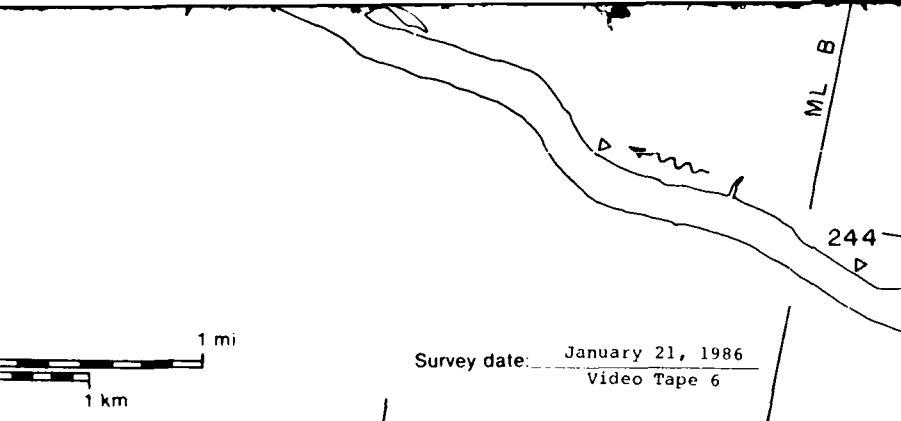
Area

2 x 3.6

Surface

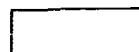
concentration





Starved Rock Pool

MAP UNITS



Open water



Solid ice cover



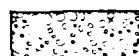
Solid ice cover with open-water areas



Fragmented ice cover



Fragmented ice cover with open-water areas



Ice floes or frazil slush and pans

Area
($m^2 \times 10^6$)

Surface
concentration
(%)

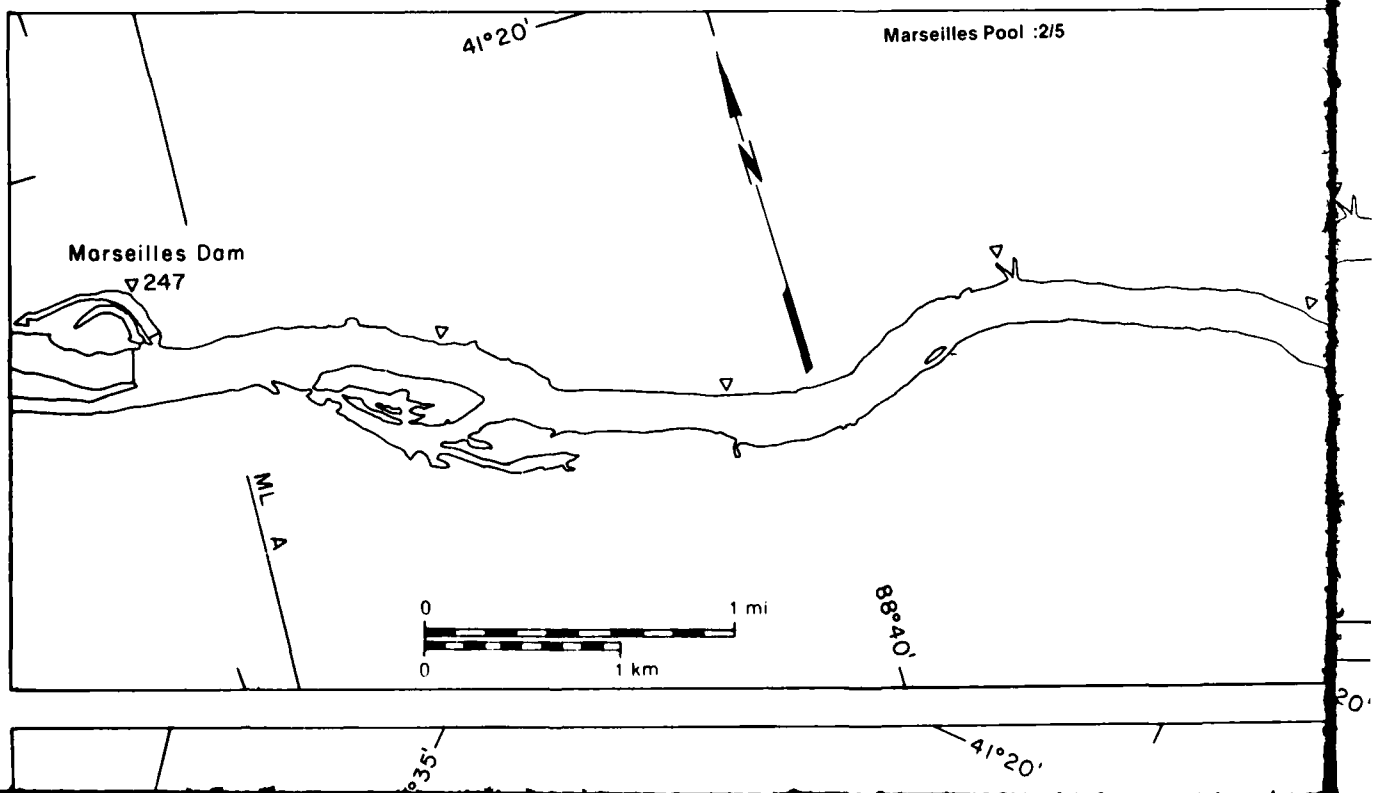
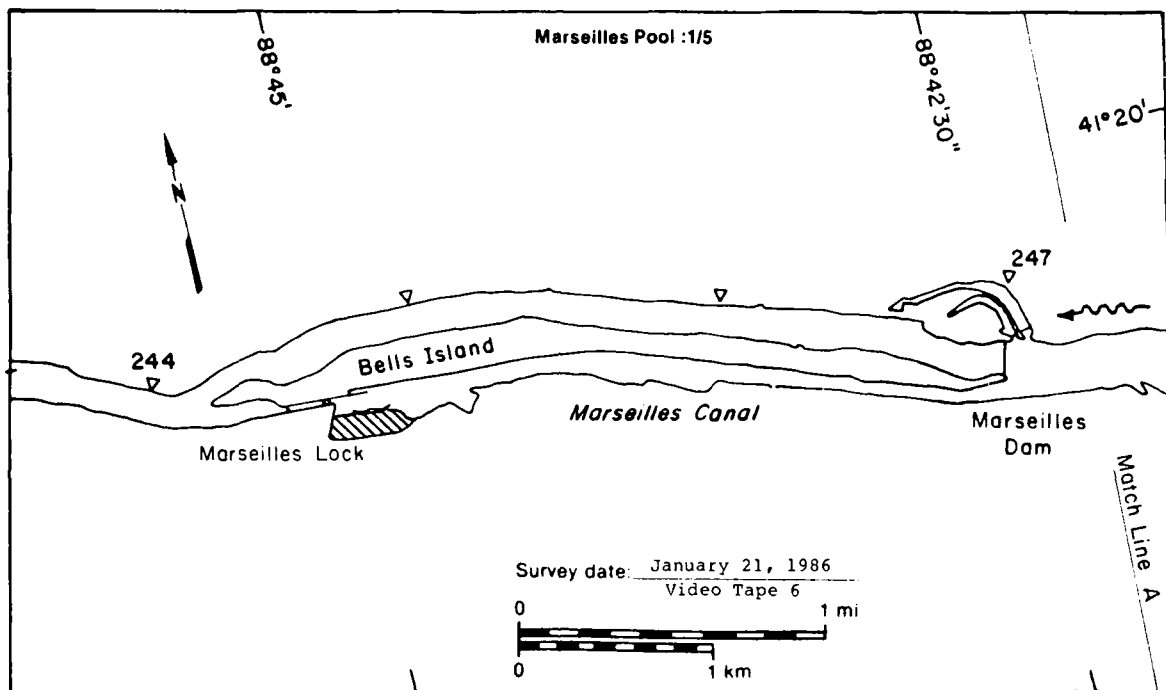
9.75	NA
0.09	NA
0.00	—
0.00	NA
0.00	—
0.00	—

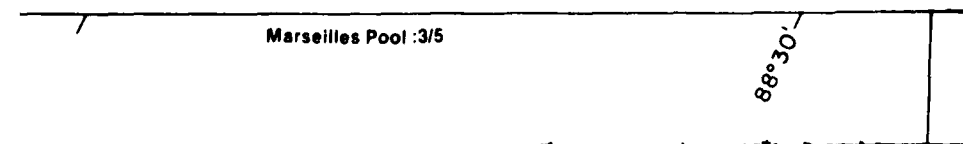
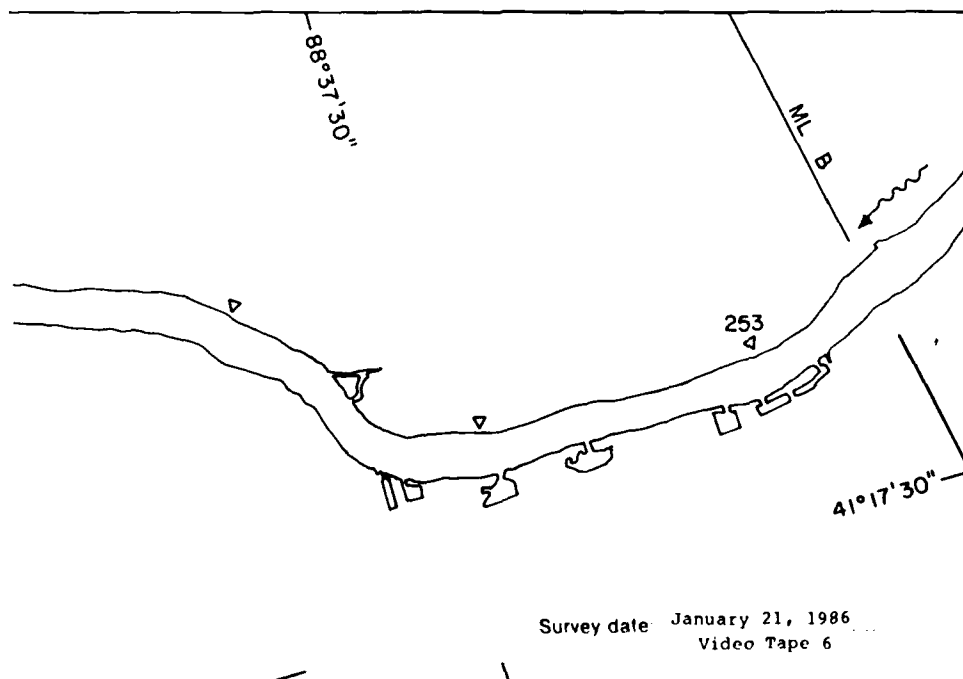
Total area ($m^2 \times 10^6$)

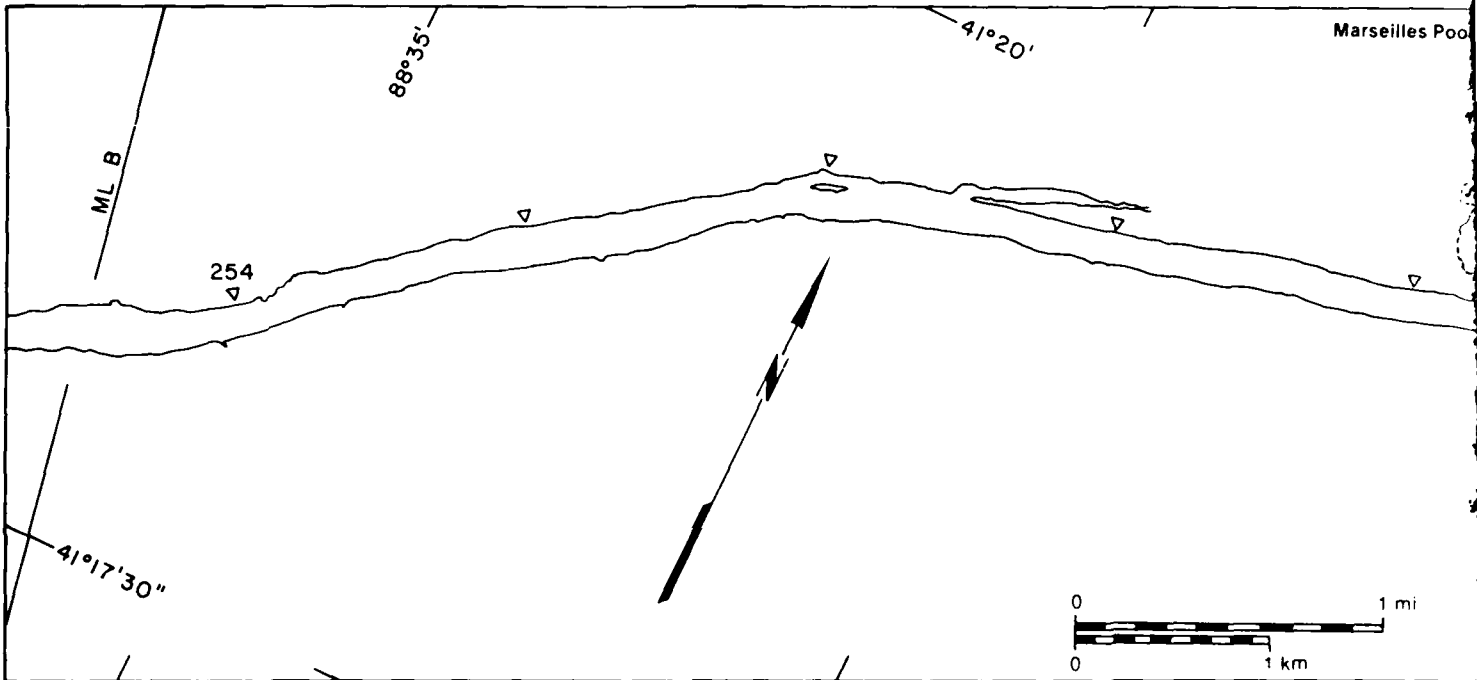
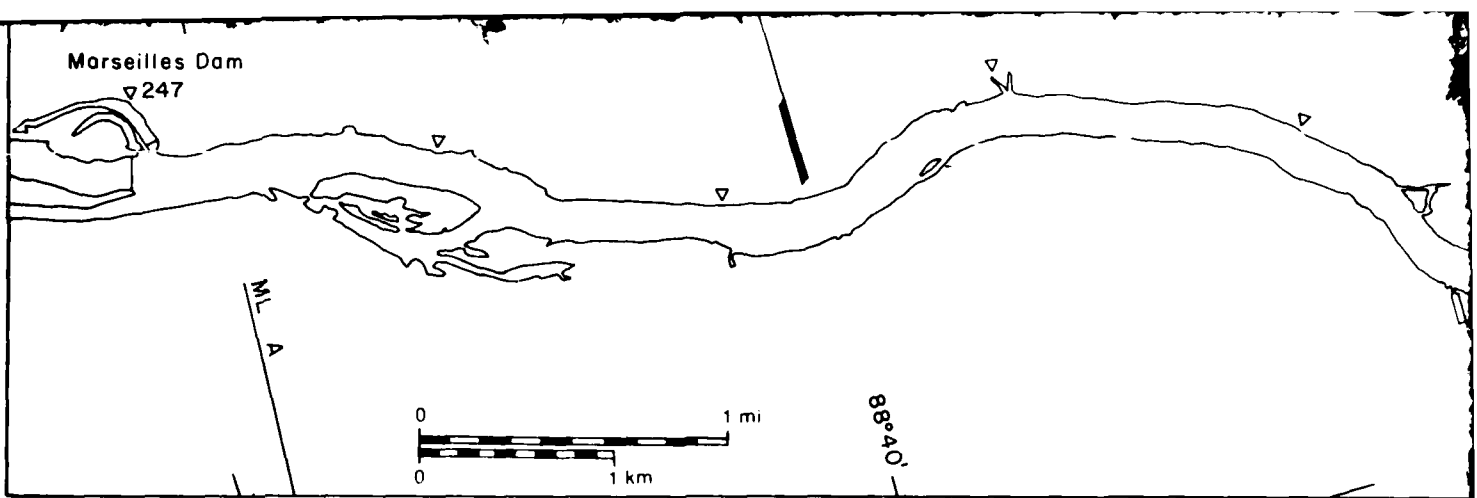
10.19*

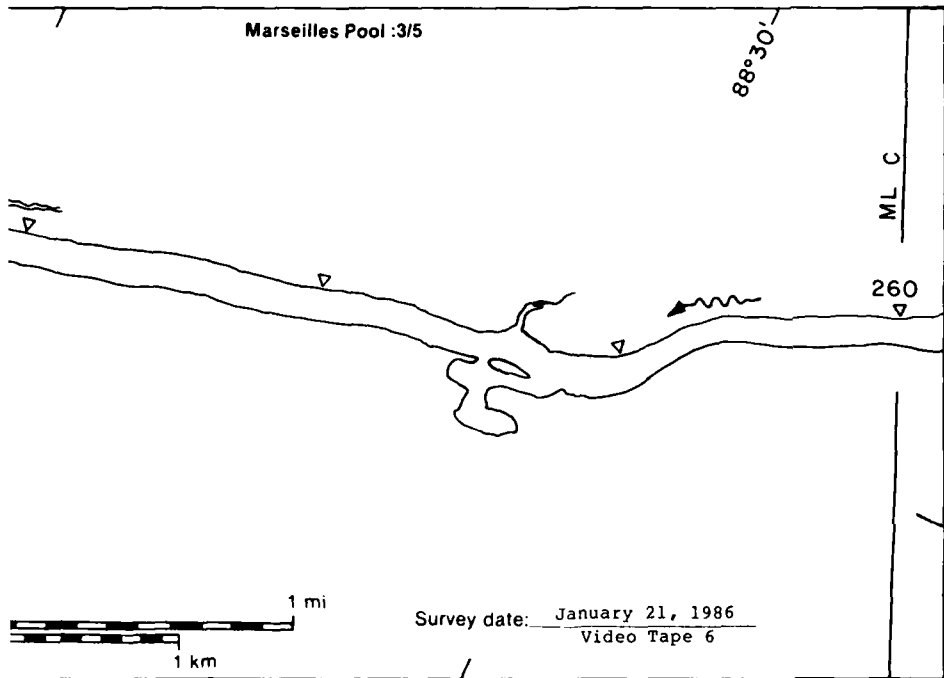
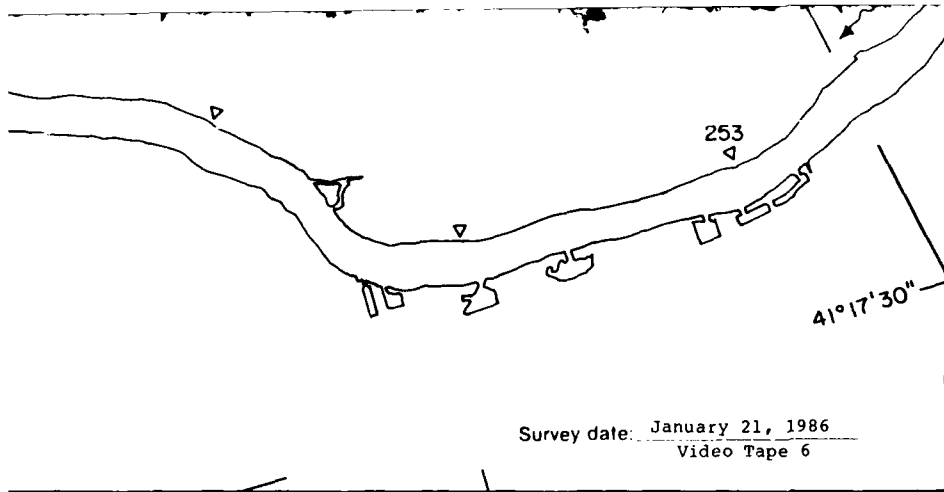
* Includes $0.35 \times 10^6 m^2$
of no video coverage

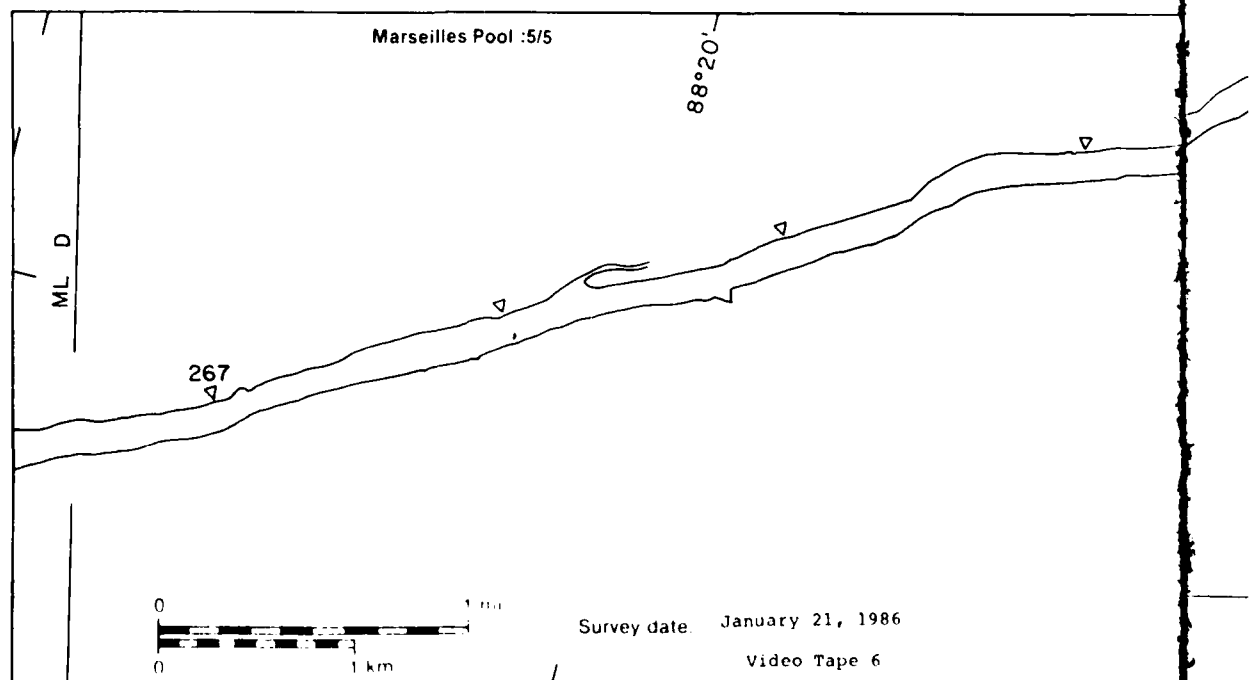
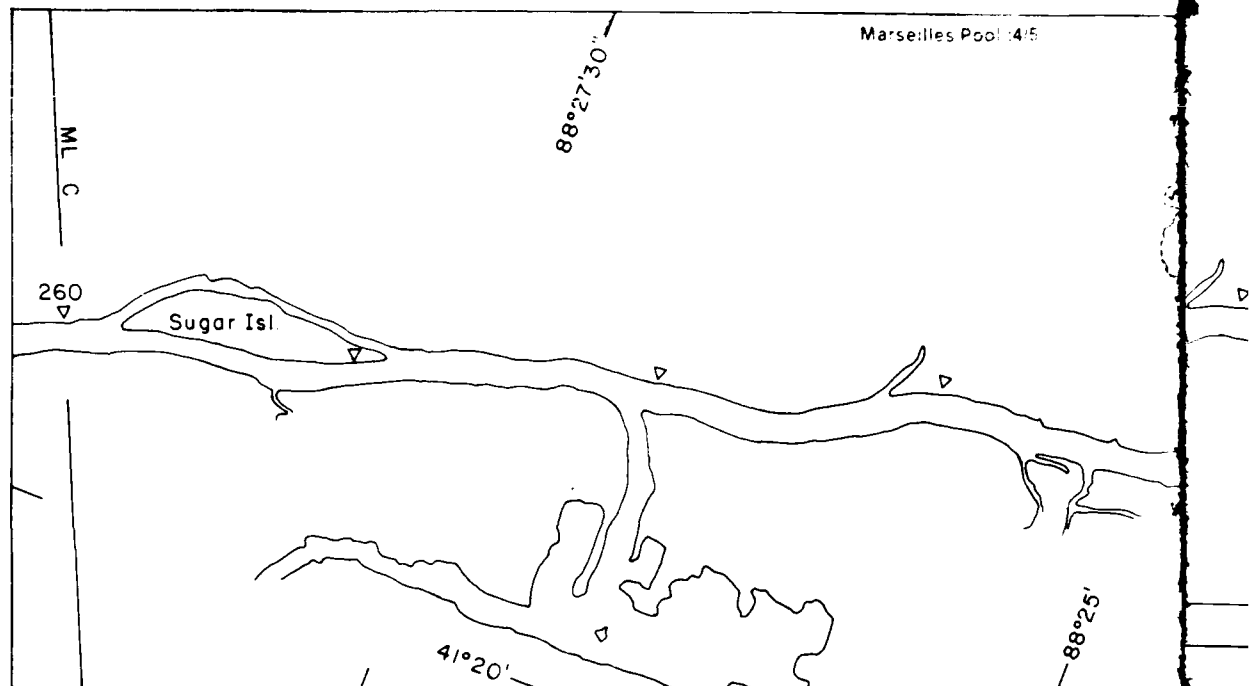
21 January 1986











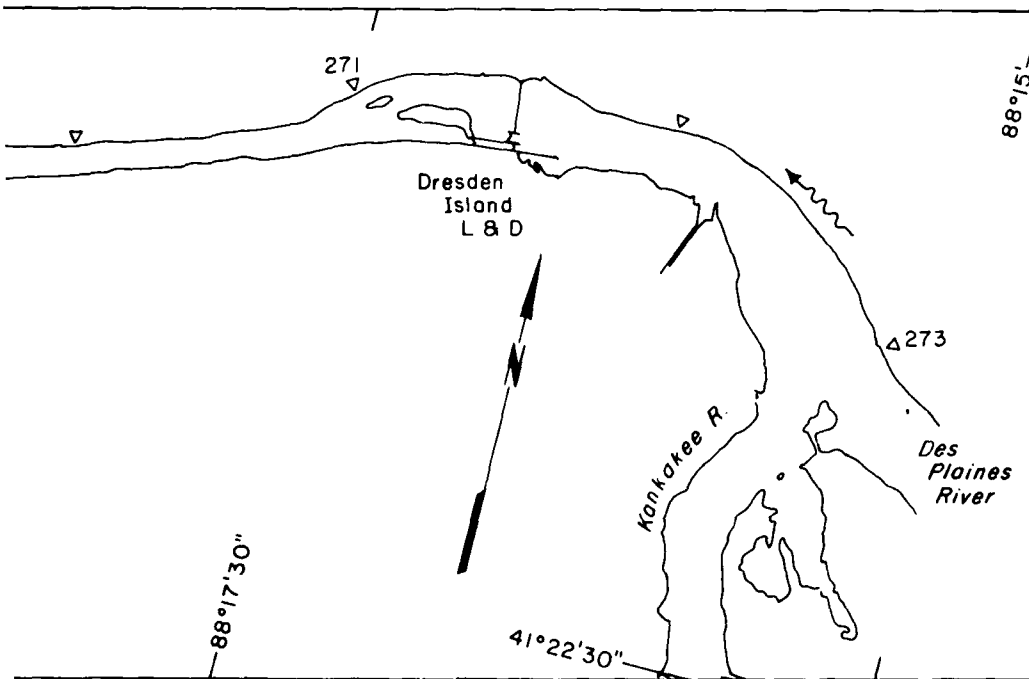
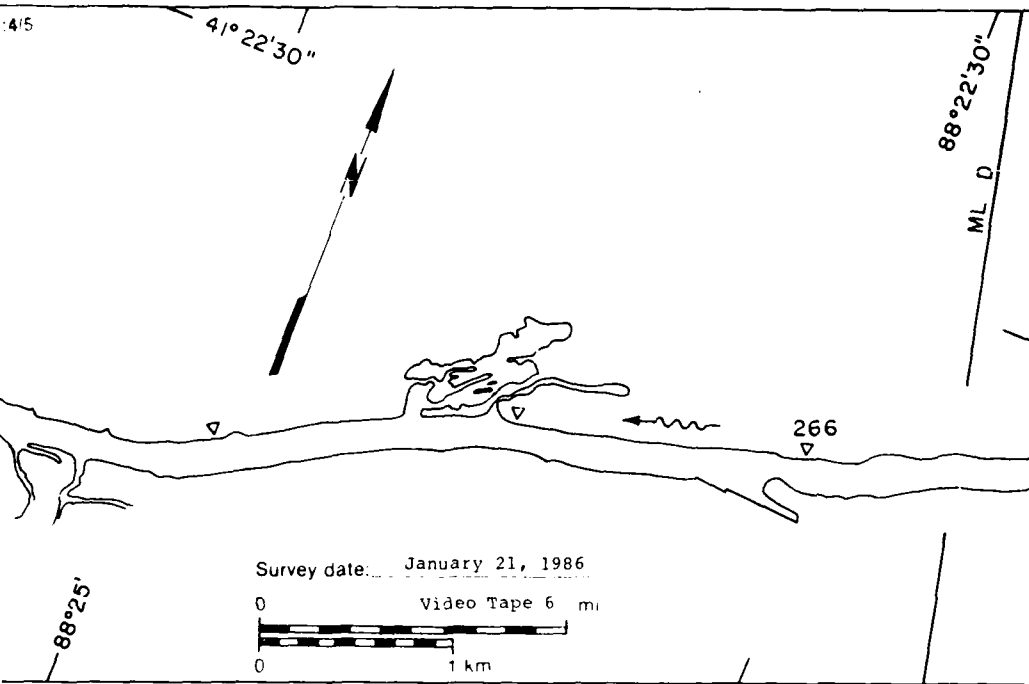
Marseilles Pool

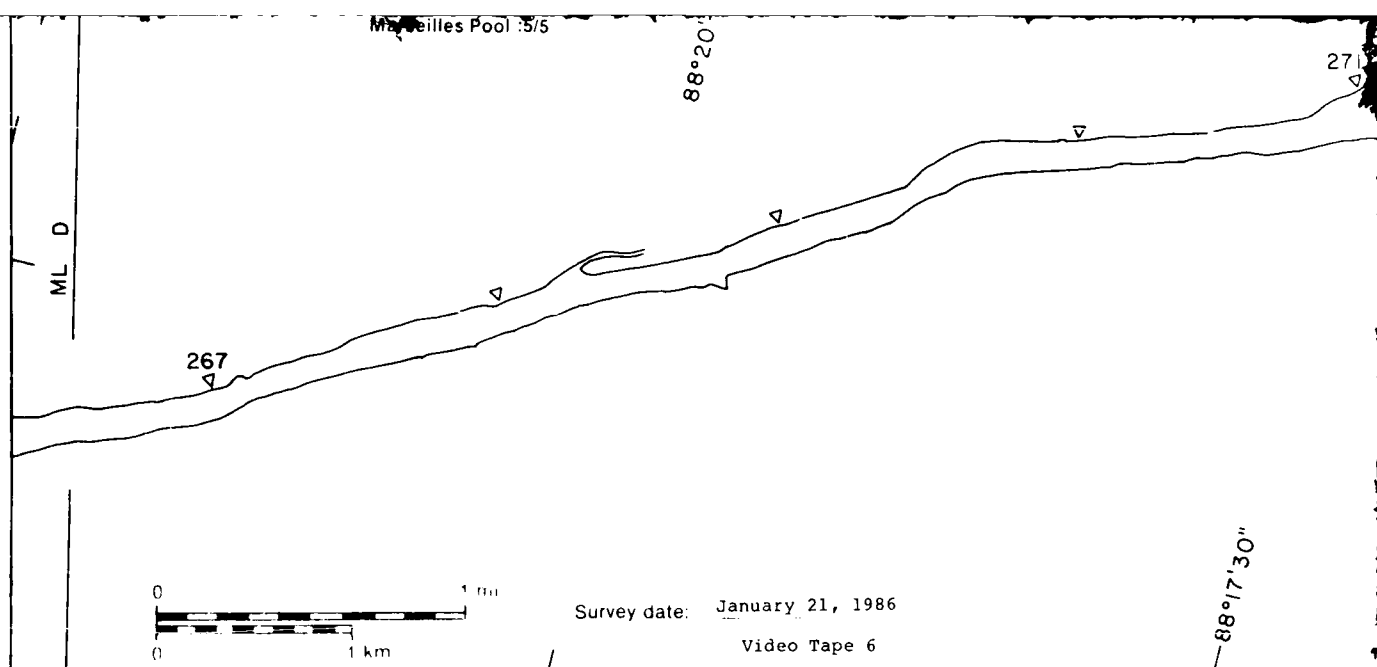
MAP UNITS

Area
($\times 10^6$)

Surface
concentration
(%)

21 January 1986



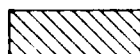


Marseilles Pool

MAP UNITS



Open water



Solid ice cover



Solid ice cover with open-water areas



Fragmented ice cover



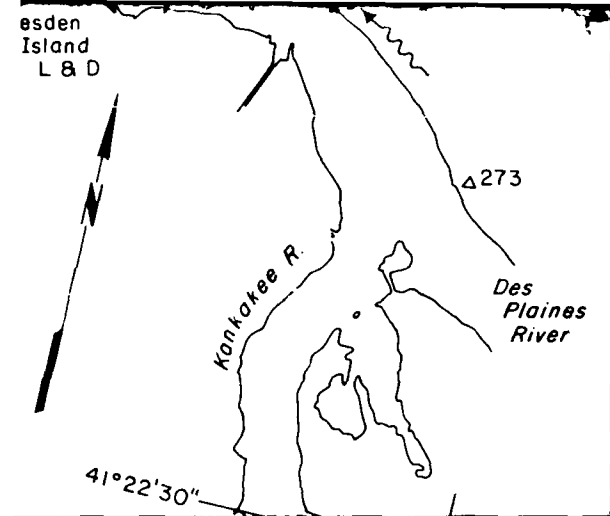
Fragmented ice cover with open-water areas



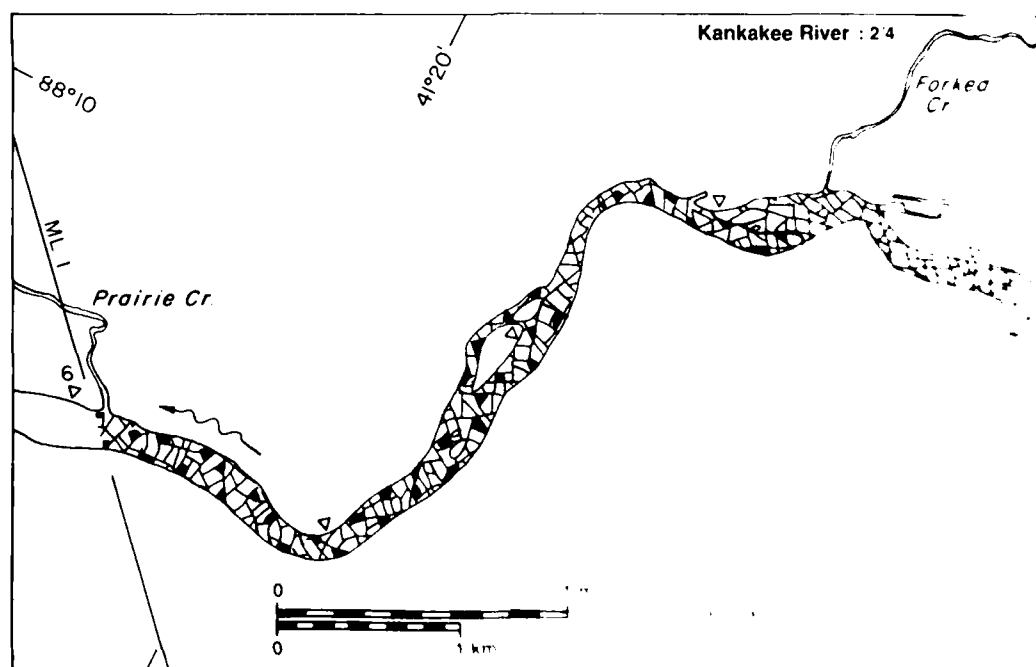
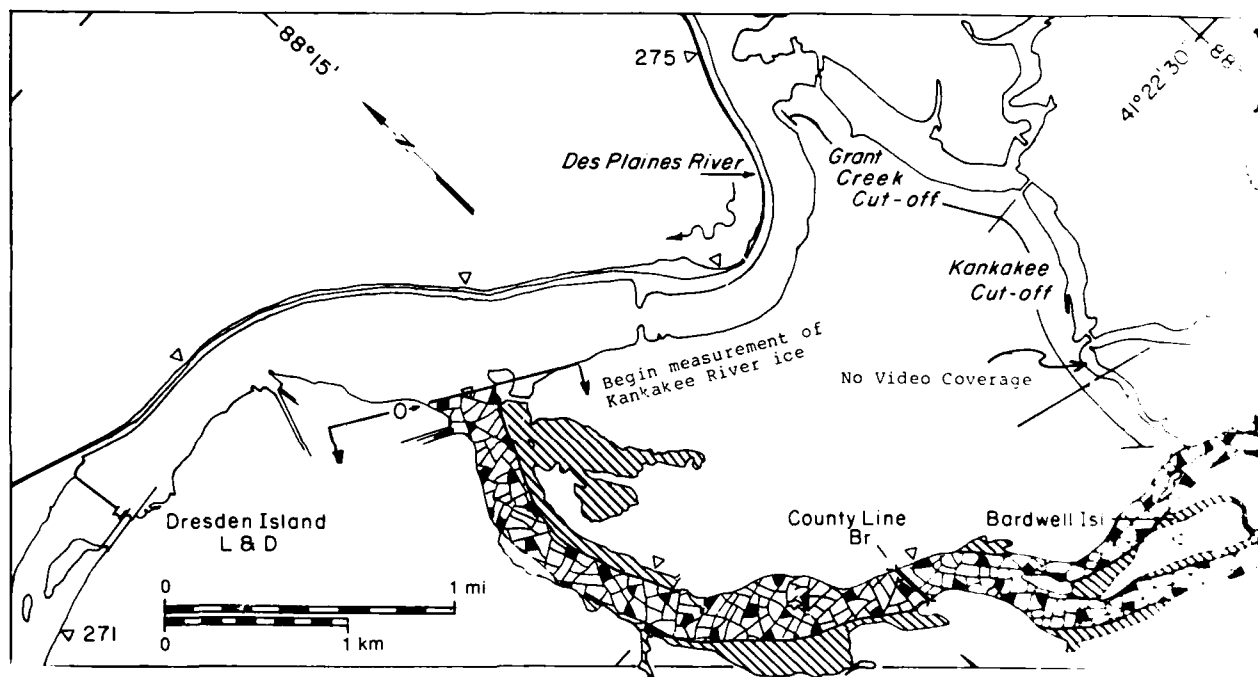
Ice floes or frazil slush and pans

Total area ($m^2 \times 10^6$)

Area ($m^2 \times 10^6$)	Surface concentration (%)
0.13	NA
0.06	NA
0.00	—
0.00	NA
0.00	—
0.00	—
8.19	



21 January 1986



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ICE ATLAS 1985 - 1986 MONONGAHELA RIVER ALLEGHENY RIVER 9/14

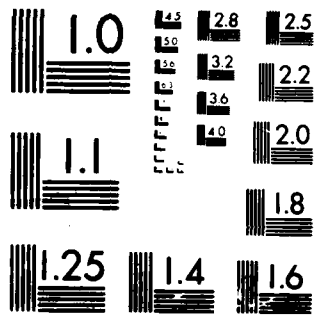
ONTO RIVER ILLINO. (U) COLD REGIONS RESEARCH AND

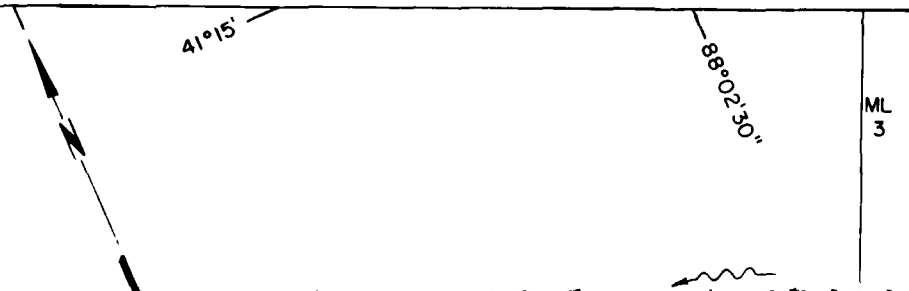
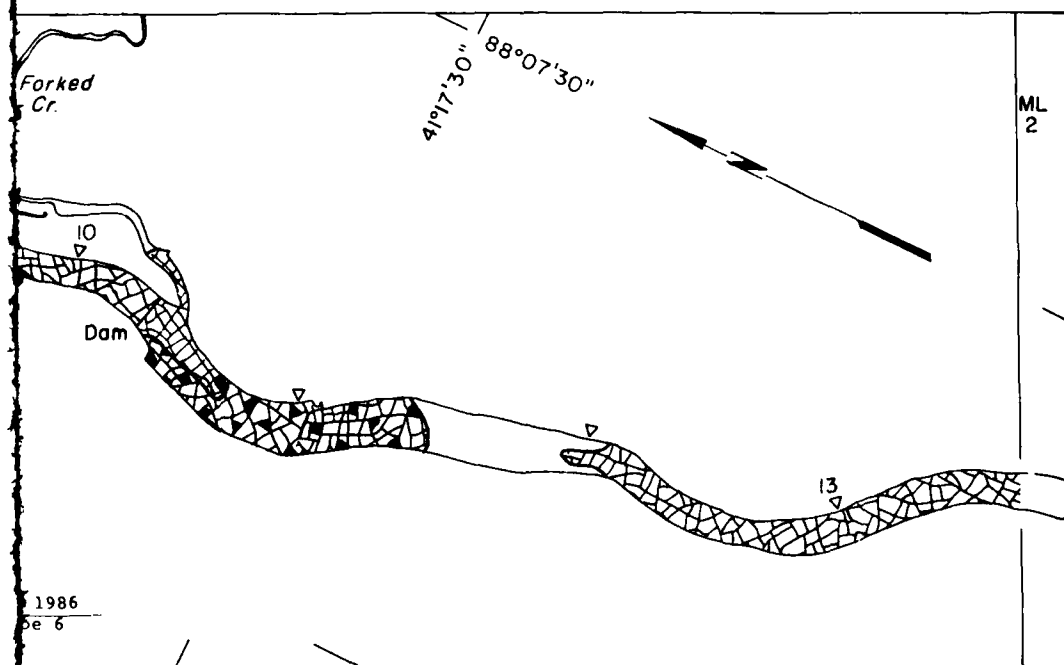
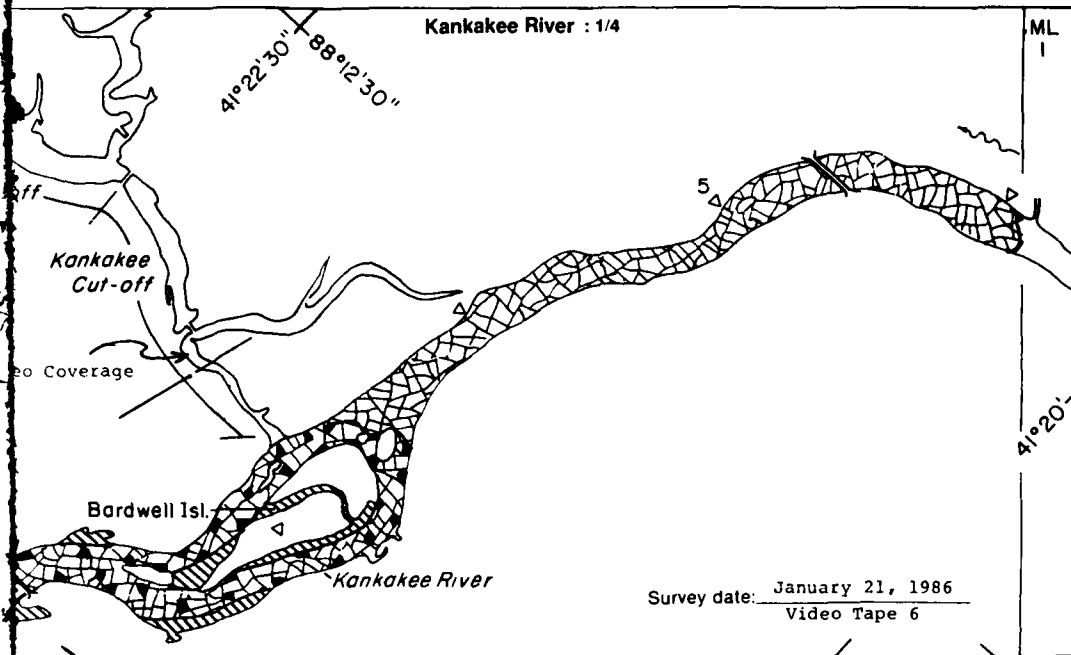
ENGINEERING LAB HANOVER NH L W CATTO ET AL. NOV 87

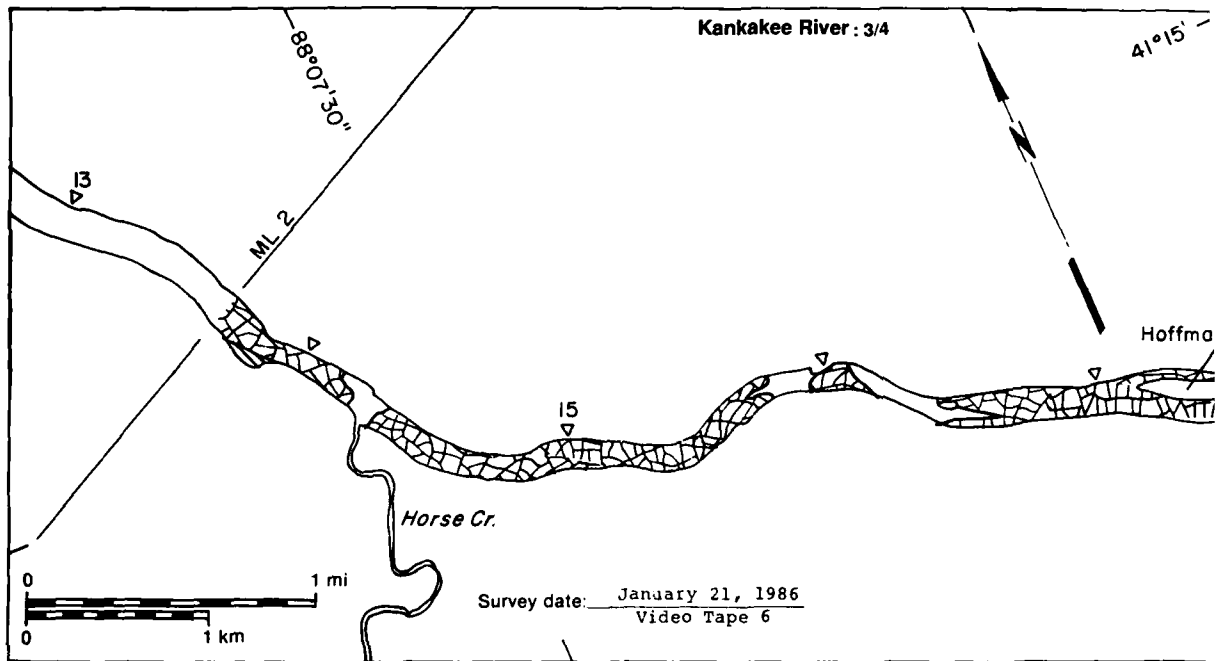
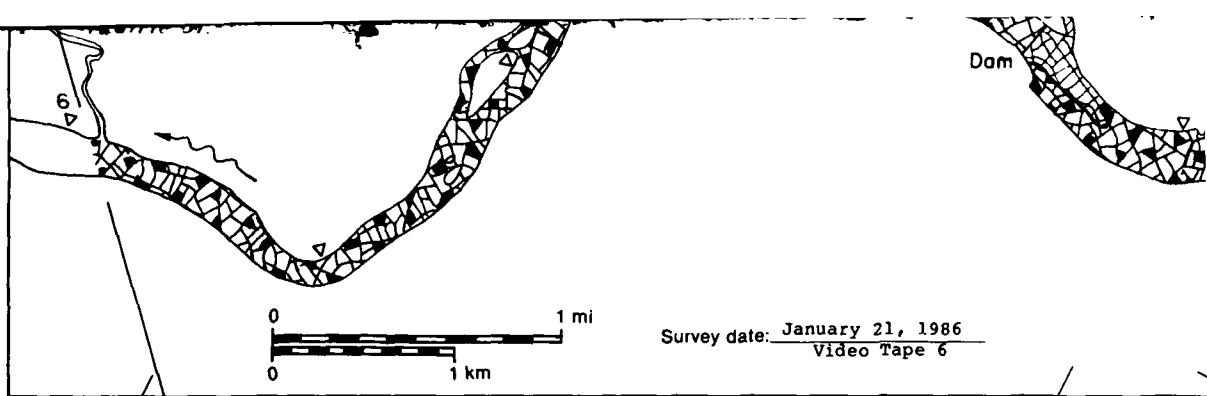
UNCLASSIFIED CRREL-SP-87-20

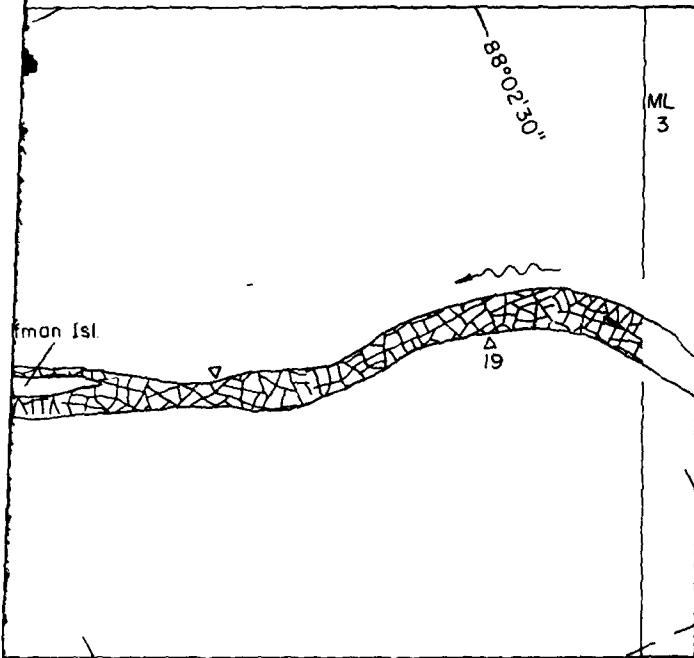
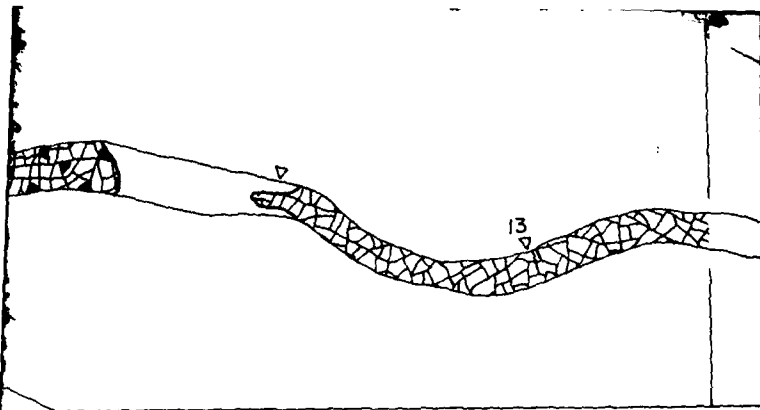
F/G 8/12

NL



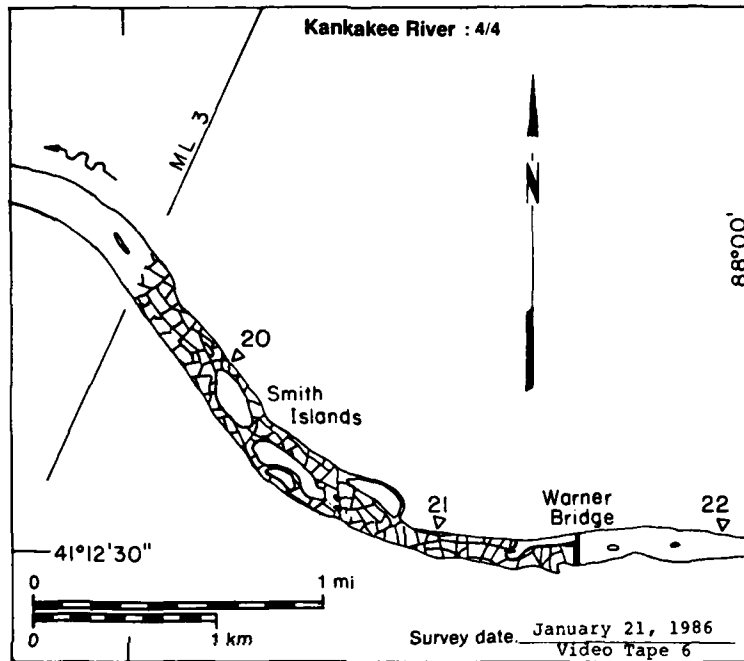












D

A



Kankakee River

MAP UNITS

-  Open water
-  Solid ice cover
-  Solid ice cover with open-water areas
-  Fragmented ice cover
-  Fragmented ice cover with open-water area
-  Ice floes or frazil slus and pans

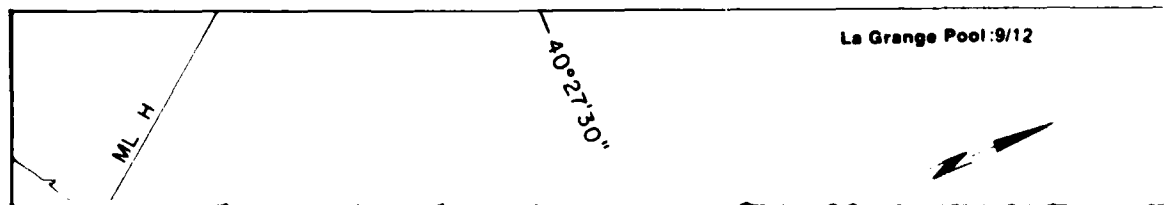
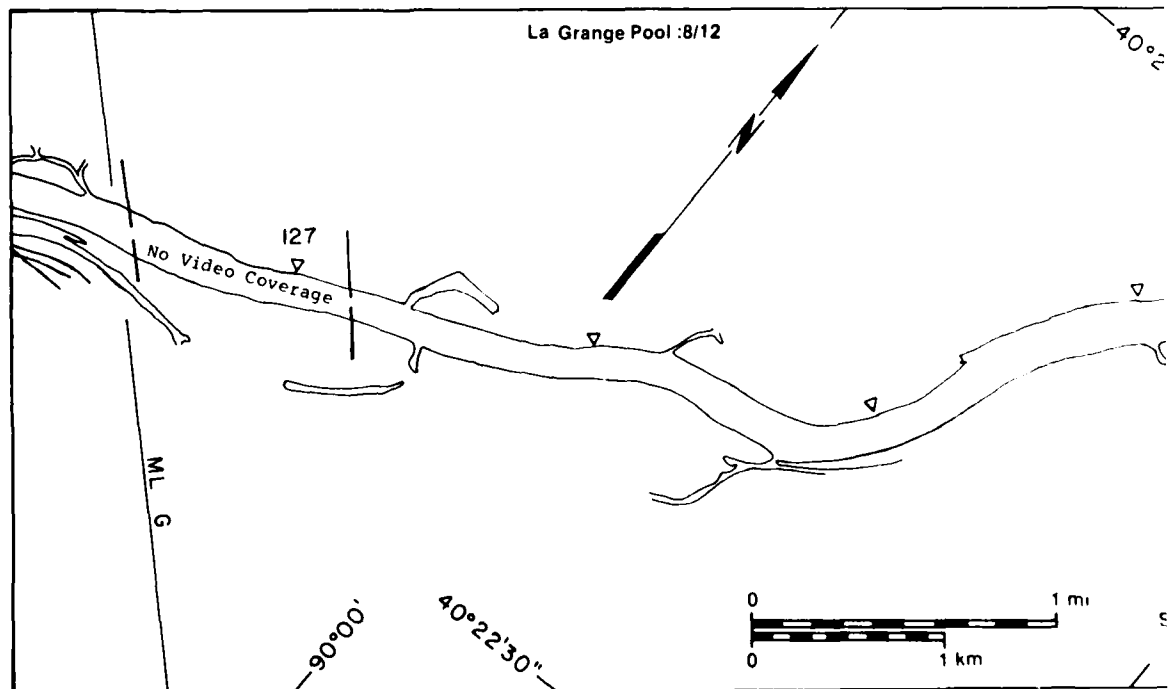
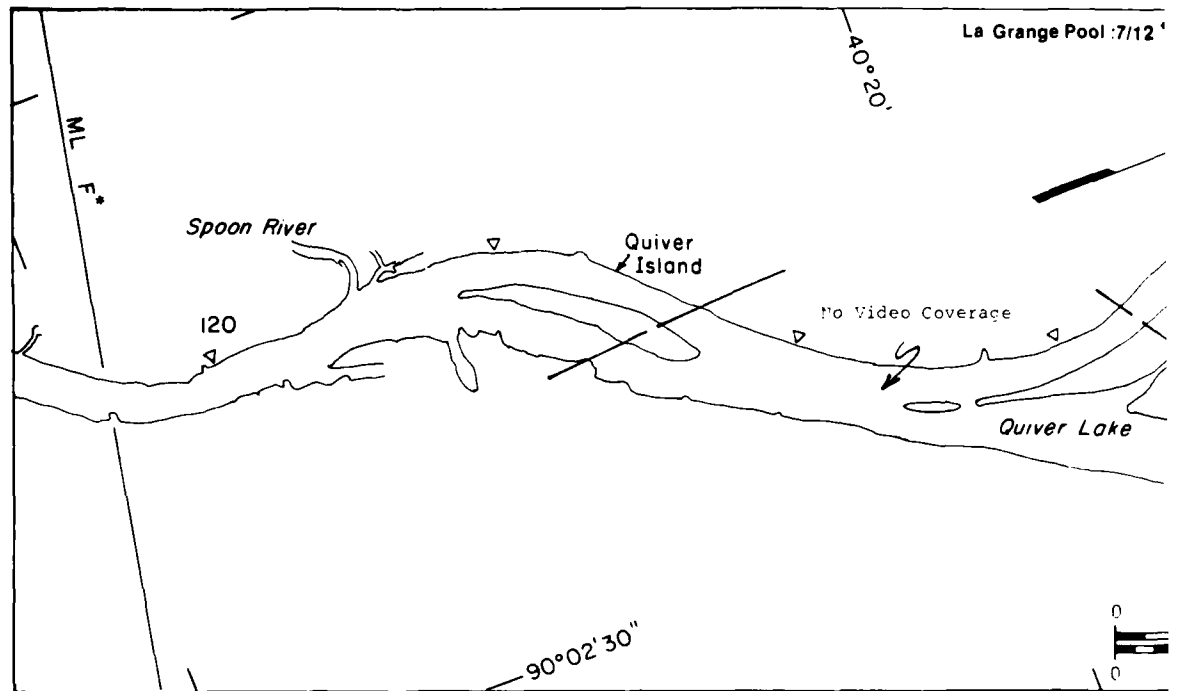
Total area (m² x

B

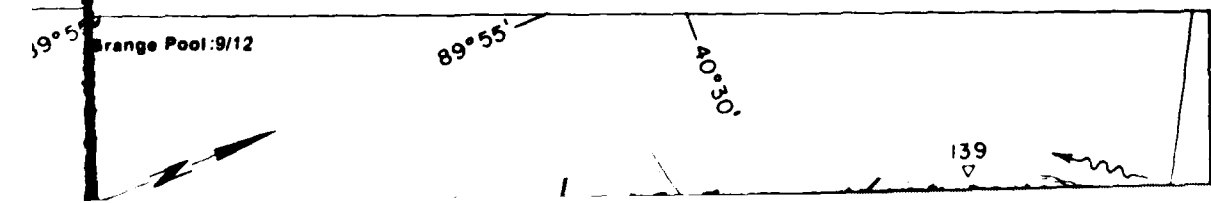
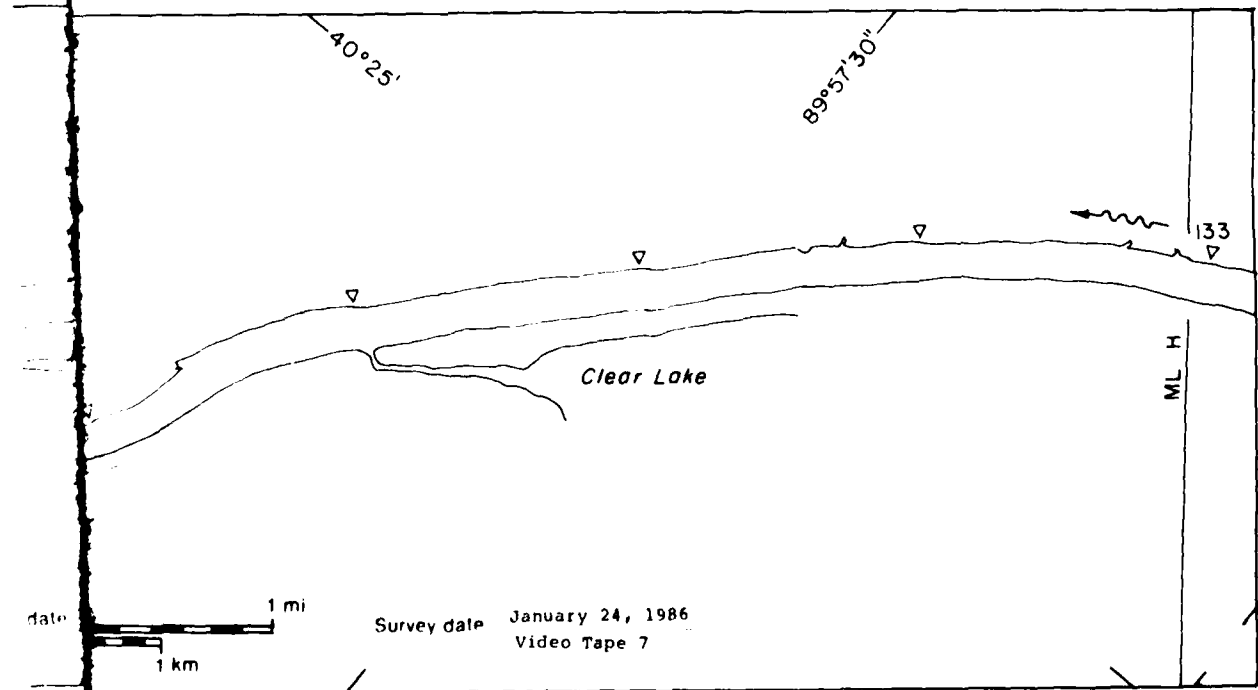
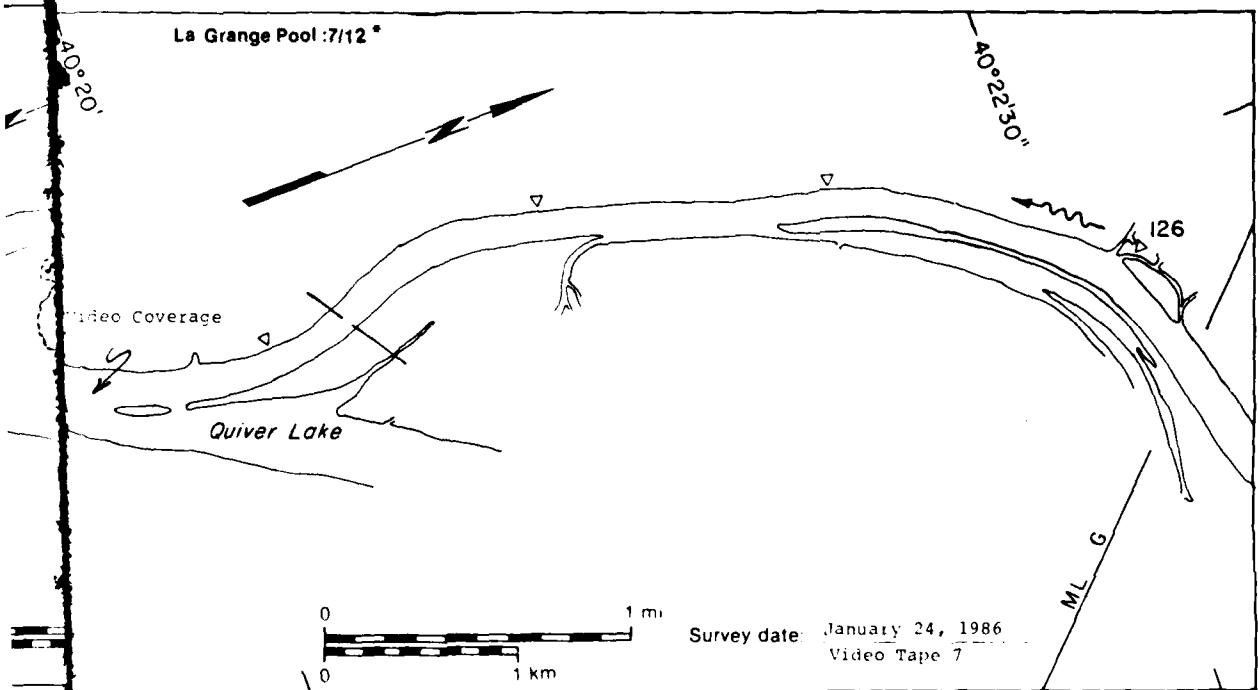
21 January 1986

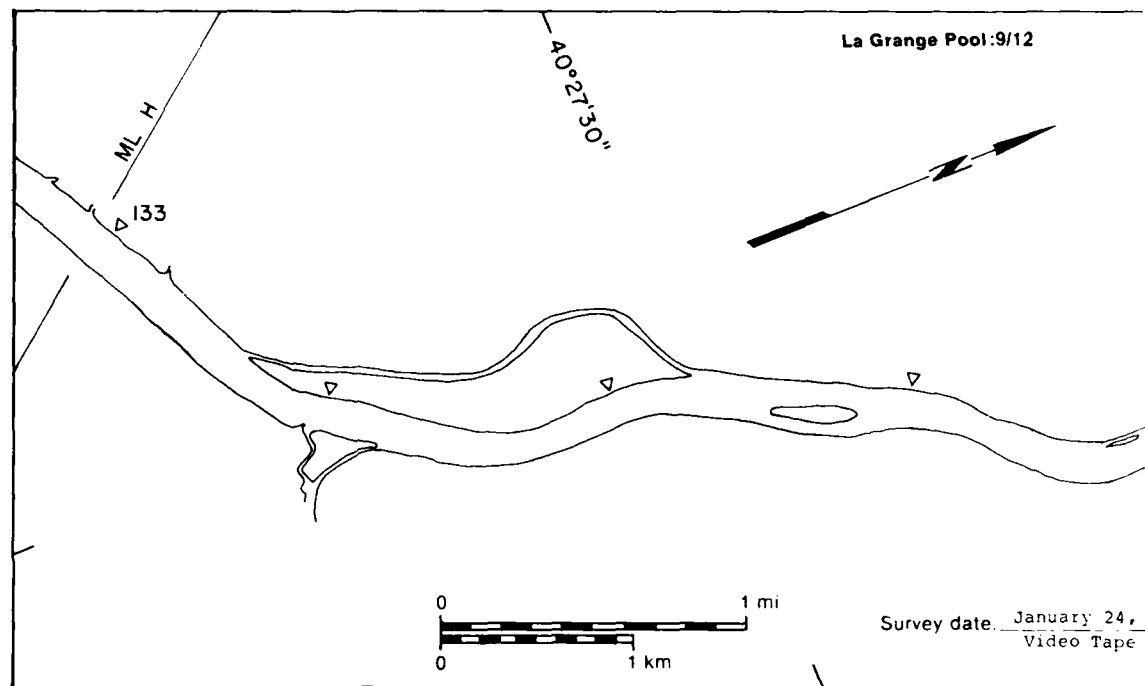
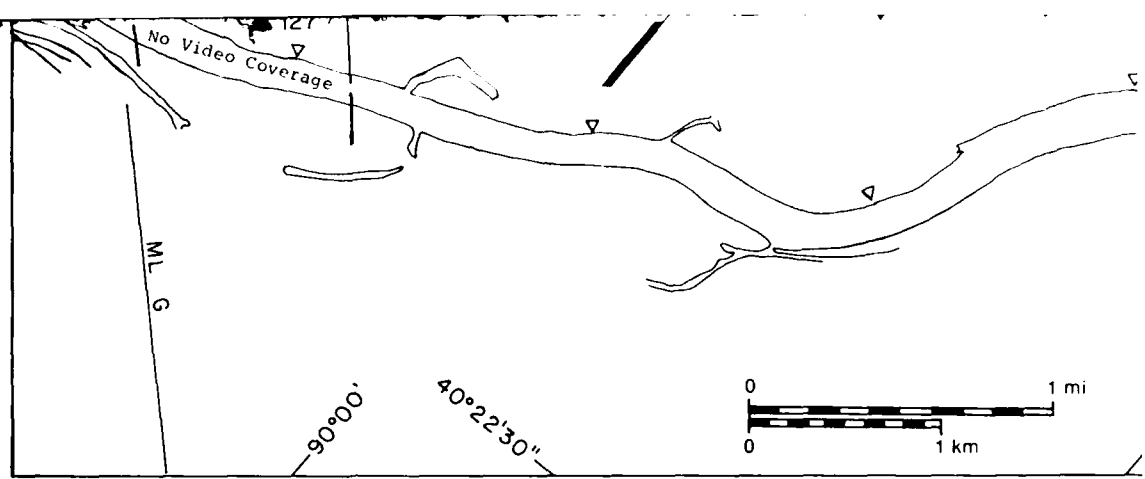
Kankakee River		Area	Surface
MAP UNITS		(m ² x 10 ⁶)	concentration (%)
0.4	Open water	0.44	NA
0.6	Solid ice cover	0.68	NA
0.6	Solid ice cover with open-water areas	0.00	—
3.7	Fragmented ice cover	3.72	NA
2.4	Fragmented ice cover with open-water areas	2.43	90
0.0	Ice floes or frazil slush and pans	0.00	—
7.3	Total area (m ² x 10 ⁶)	7.30*	* Includes 0.03 x 10 ⁶ m ² of no video coverage

A

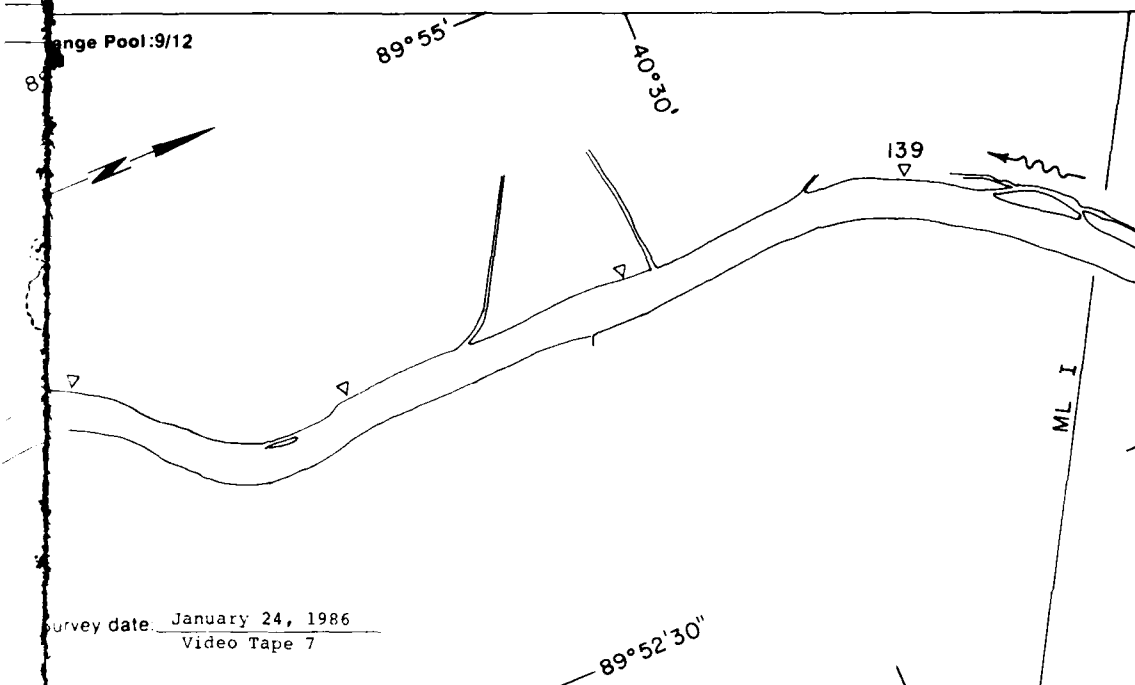
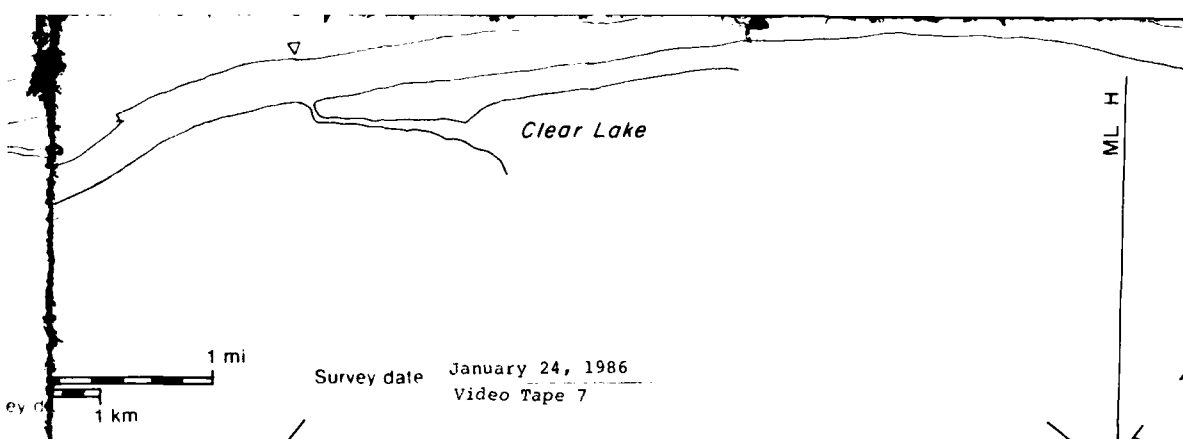


24 January 1986

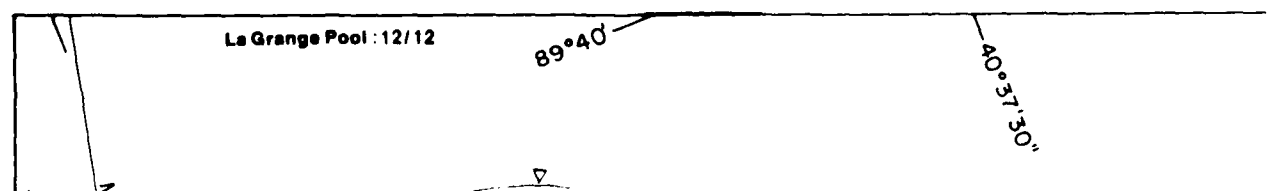
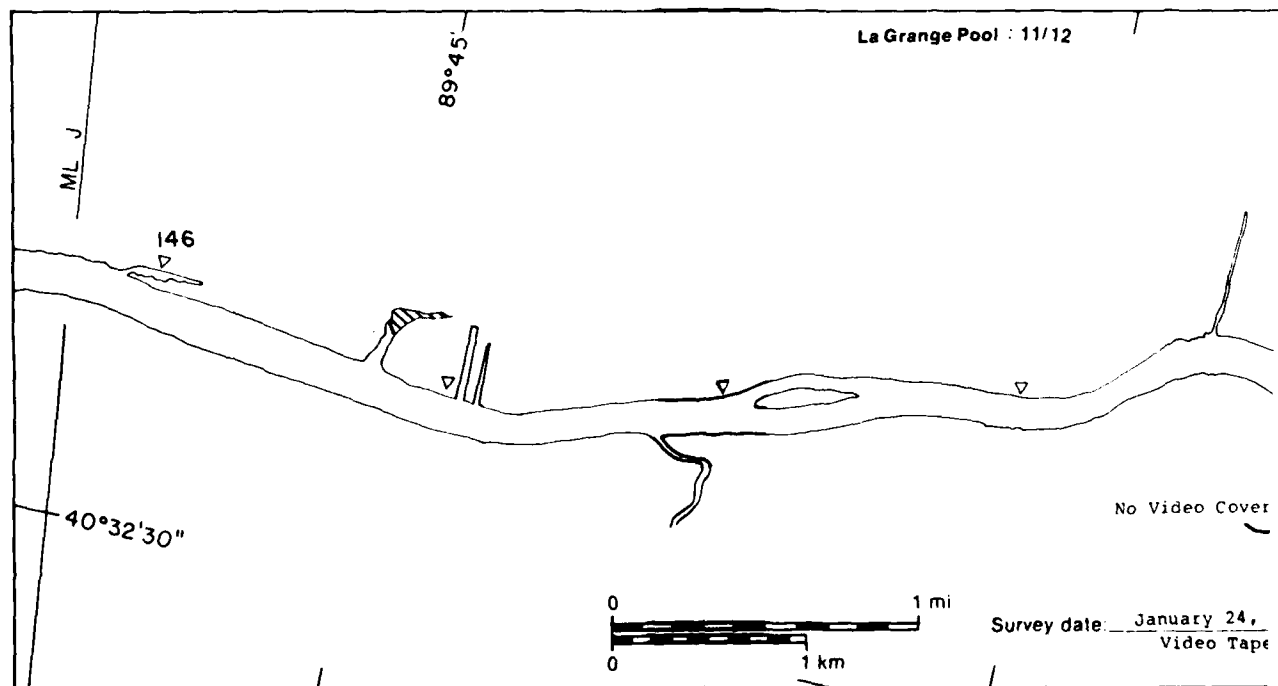
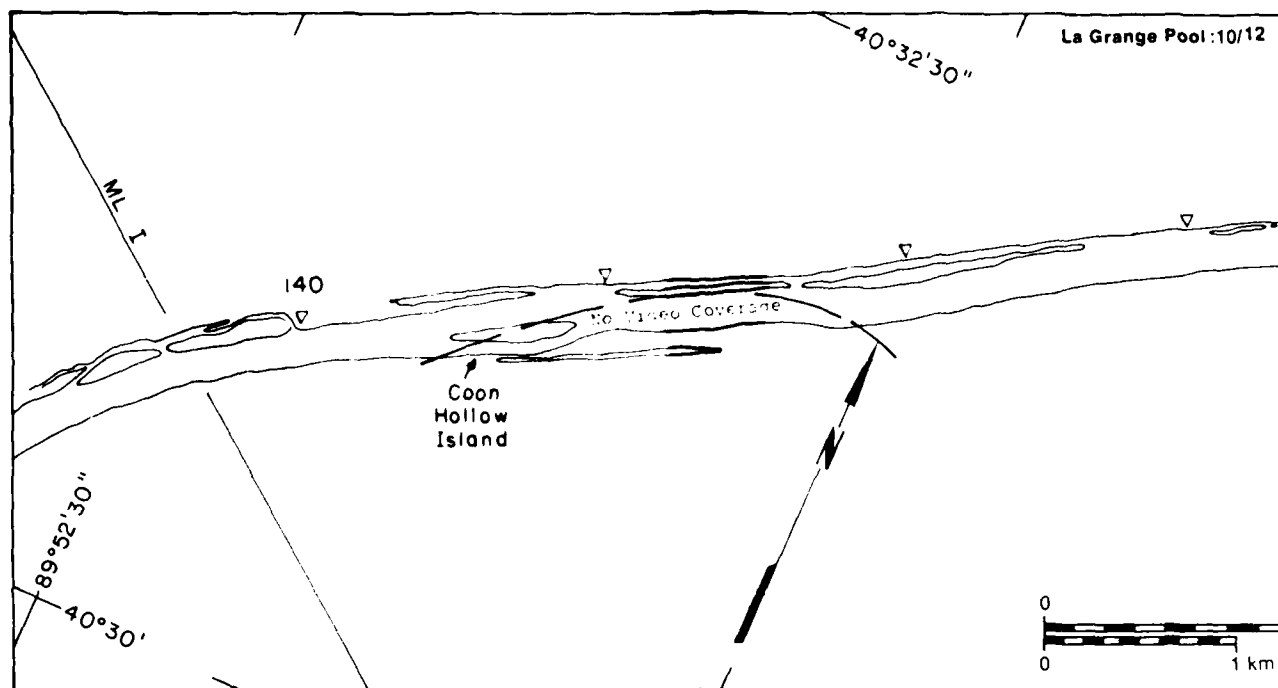




* The downstream limit of Illinois River video coverage was in the vicinity of mile 120 at Havana, Illinois, on all dates. There is no coverage of La Grange Pool maps 1/12 through 6/12 (match lines A through E).



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La Grange Pool:10/12

89°47'30"

ML J

145



Survey date: January 24, 1986
Video Tape 7

11/12

40°35'
ML K

153

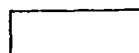
No Video Coverage

Survey date: January 24, 1986
Video Tape 7

89°40'

La Grange Pool

MAP UNITS

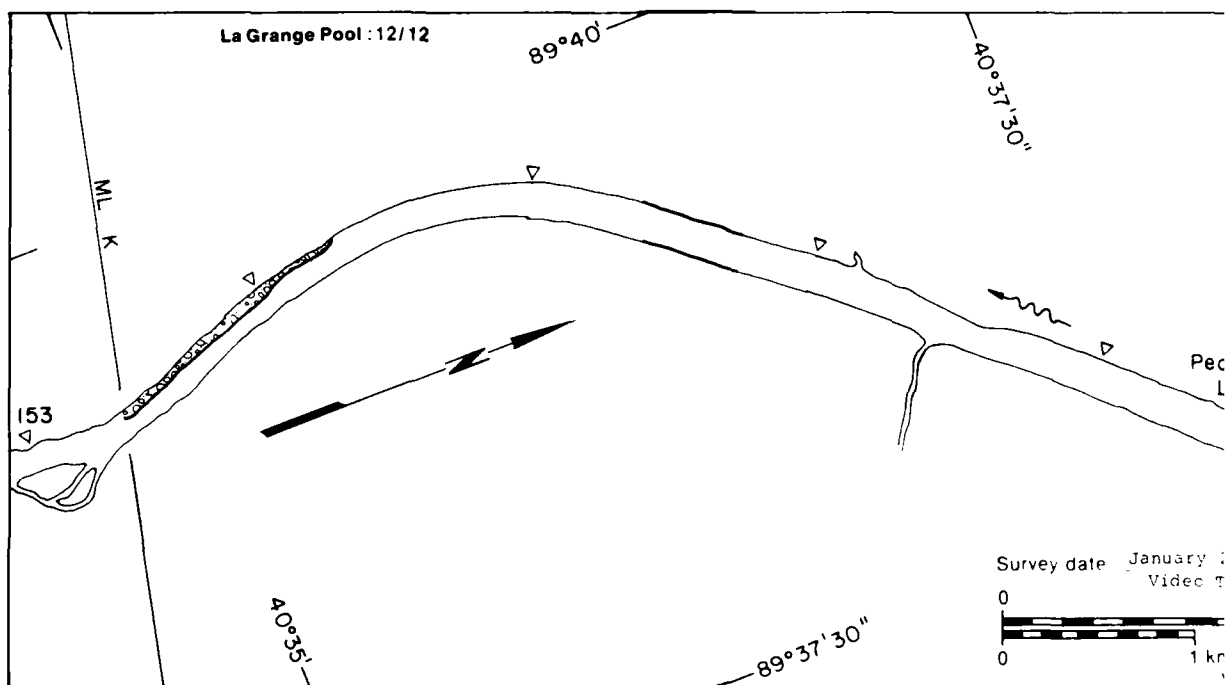
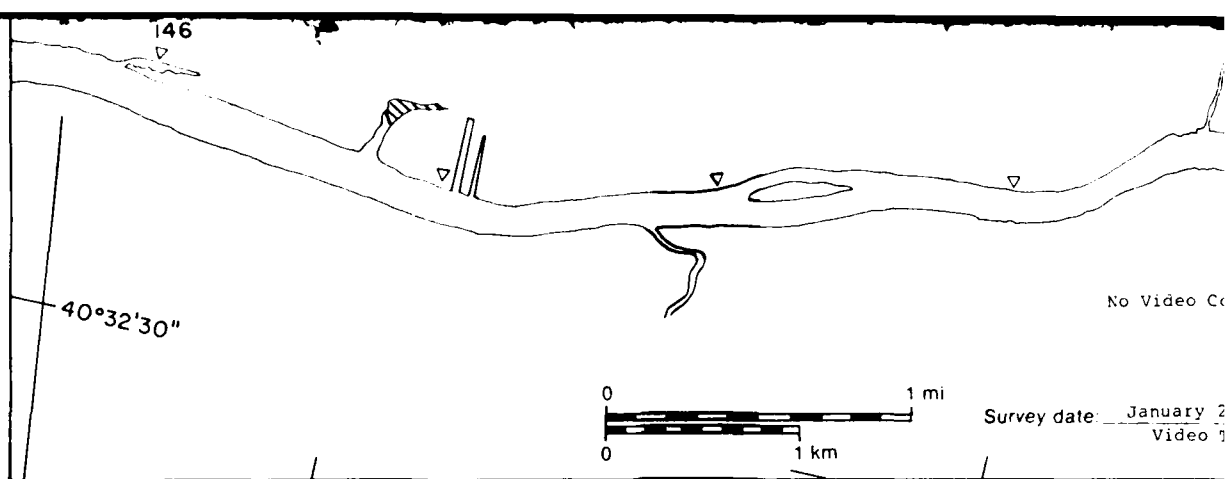


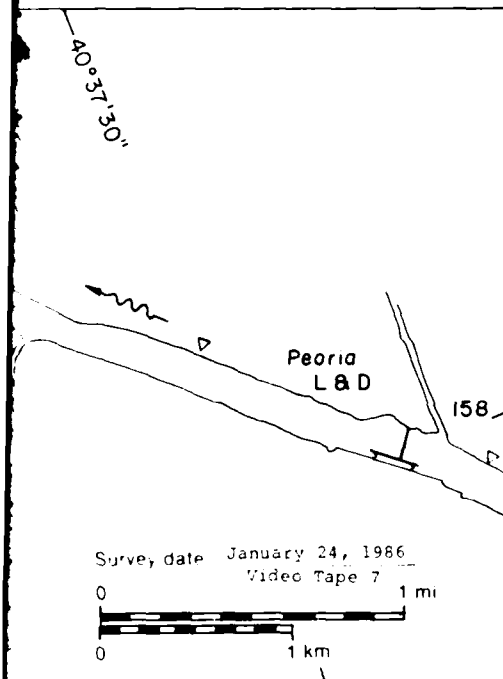
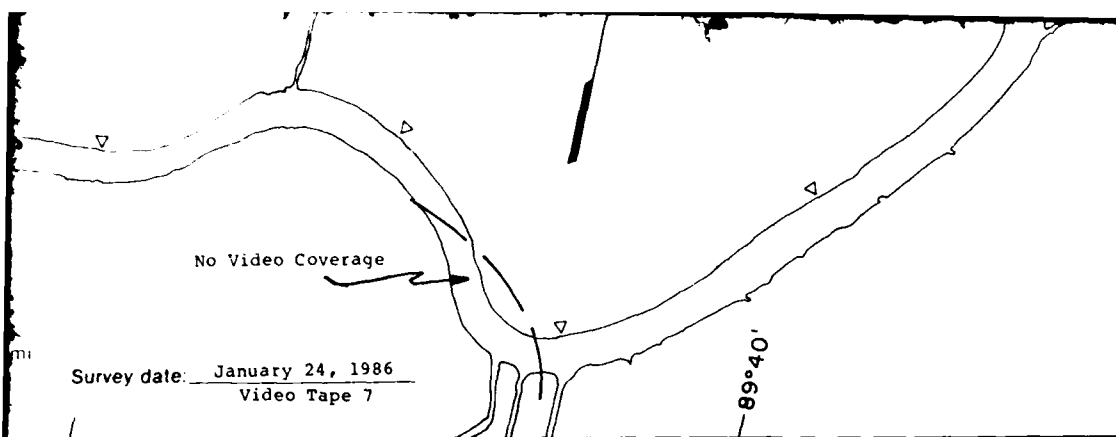
Open water

Area
(m² x 10⁶)

Surface
concentration
(%)

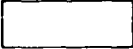

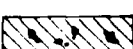

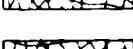

10.14	NA
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La Grange Pool

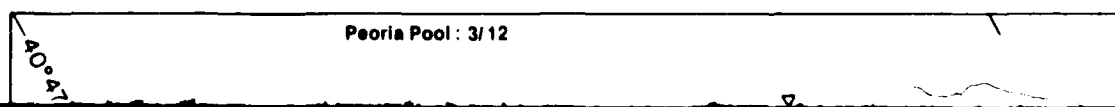
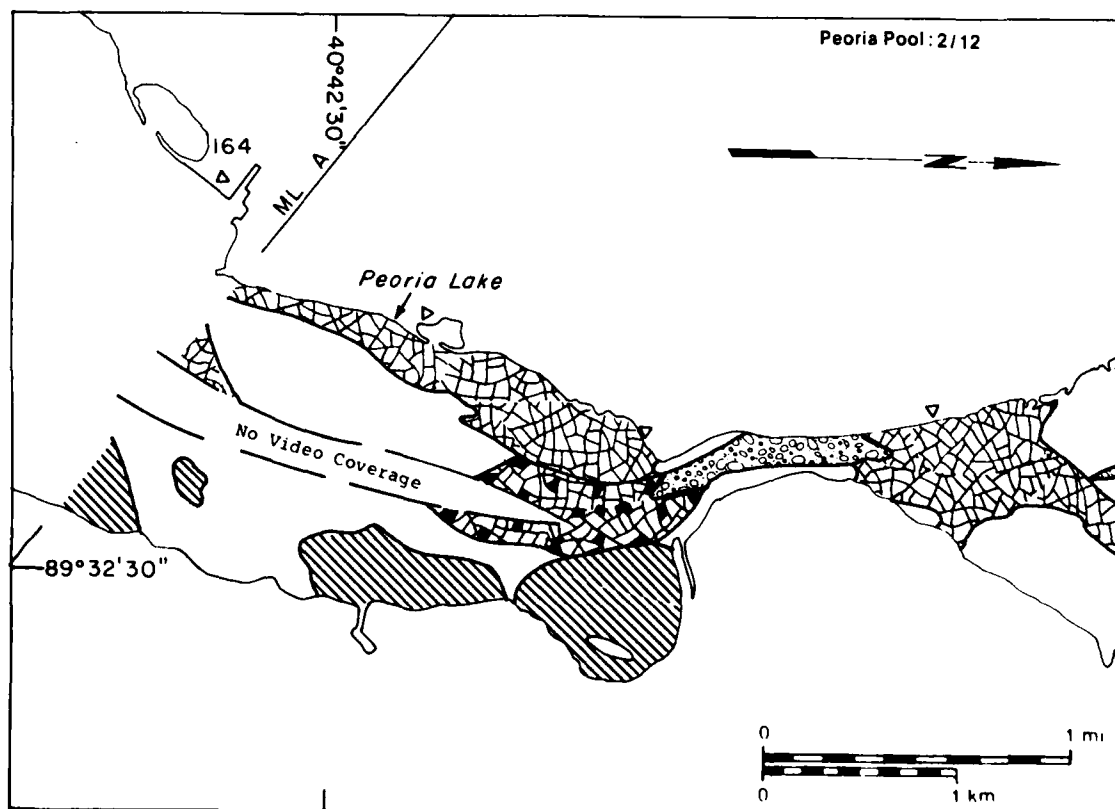
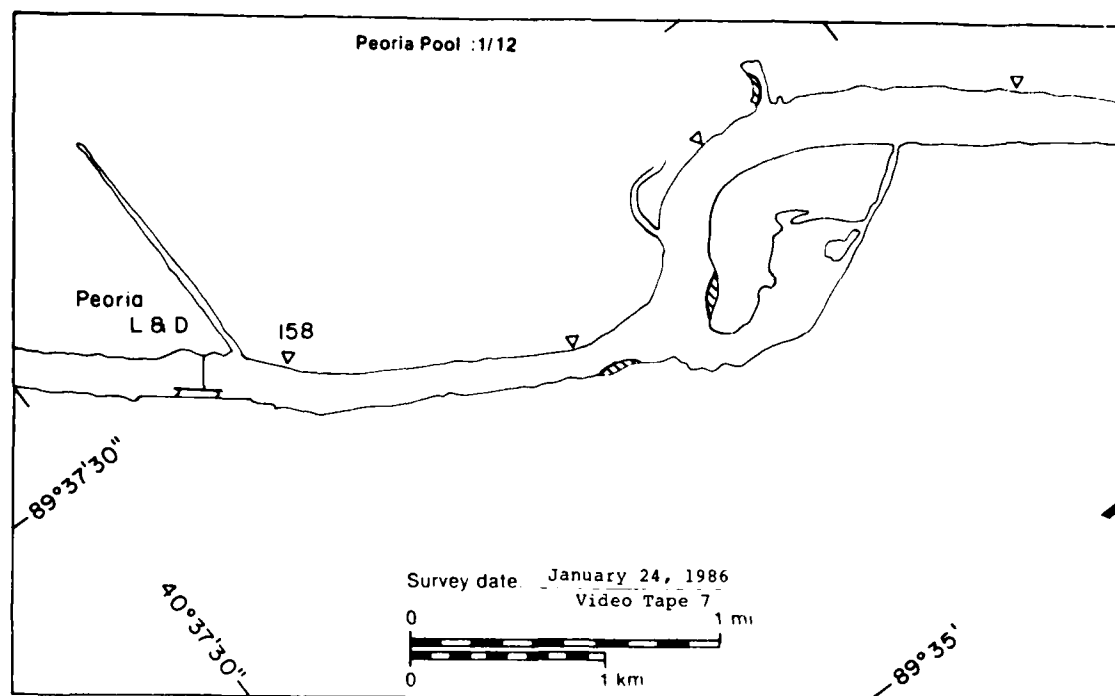
MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

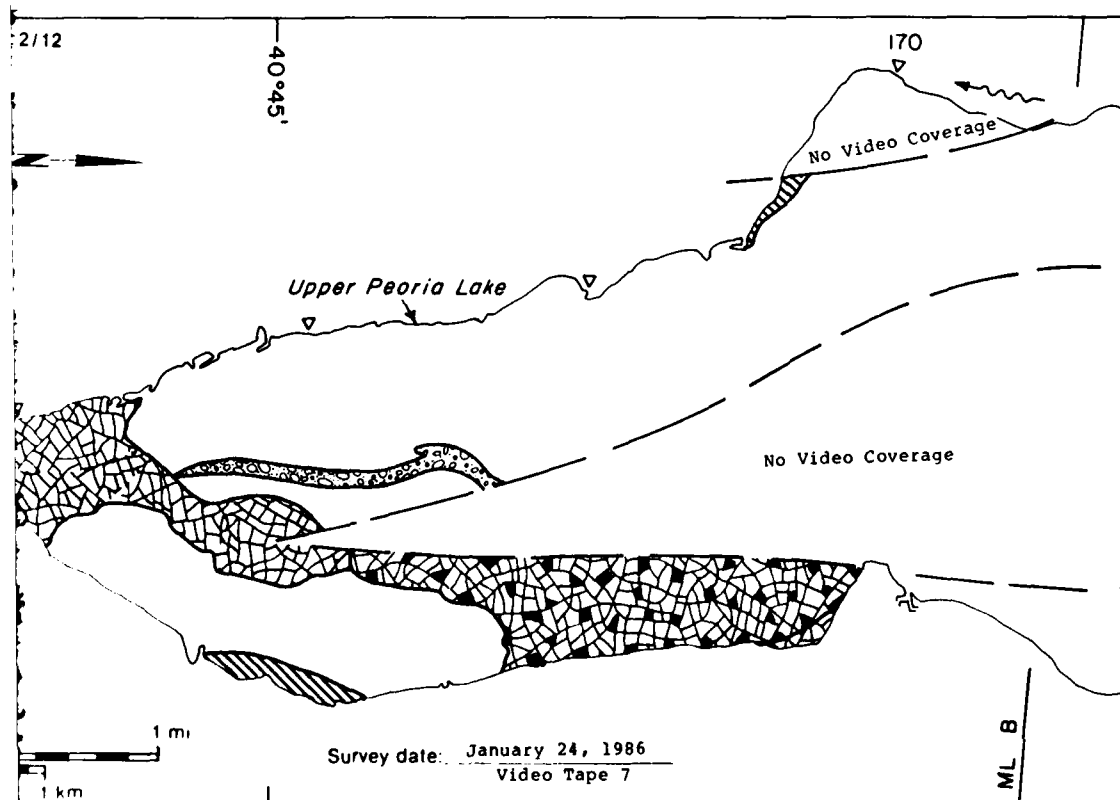
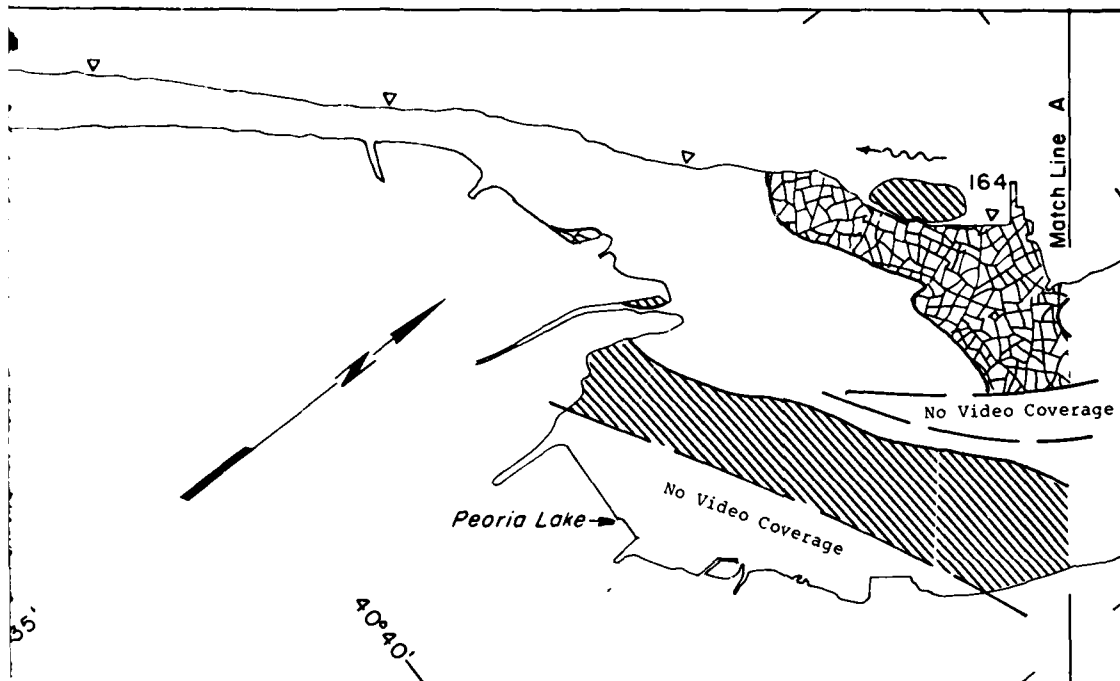
Total area ($m^2 \times 10^6$)

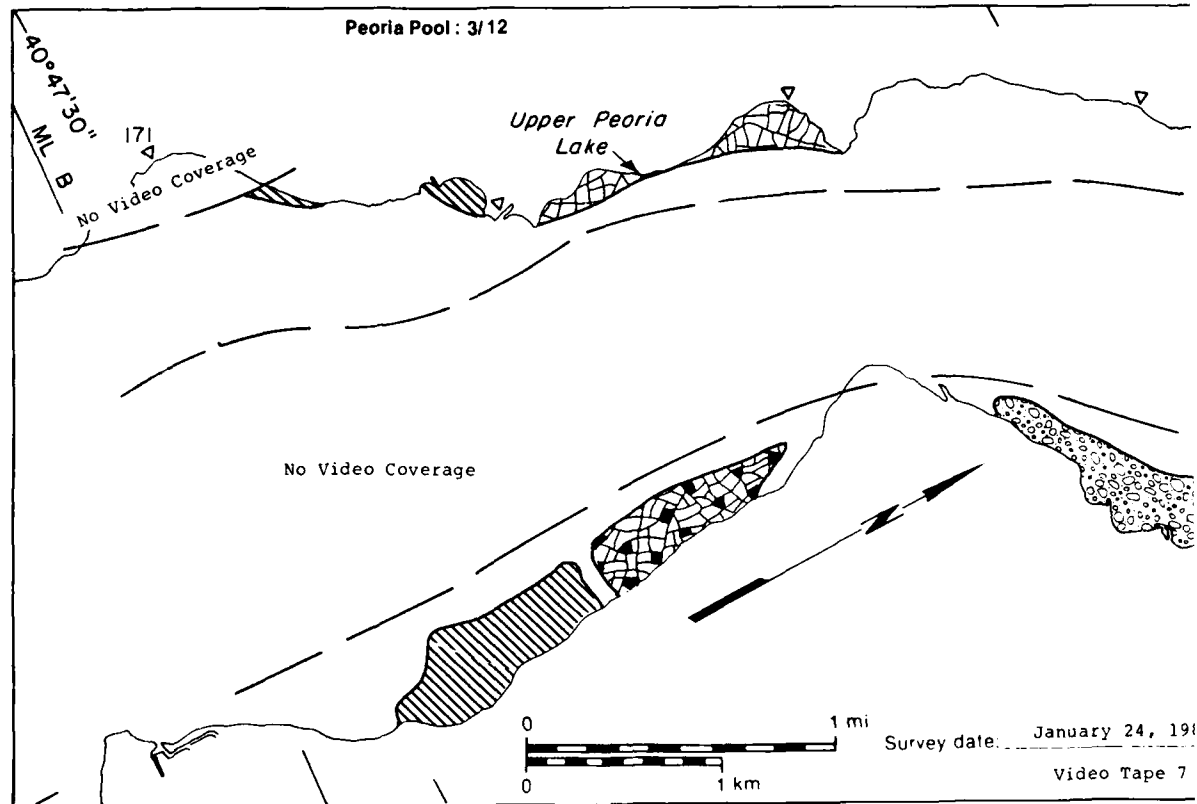
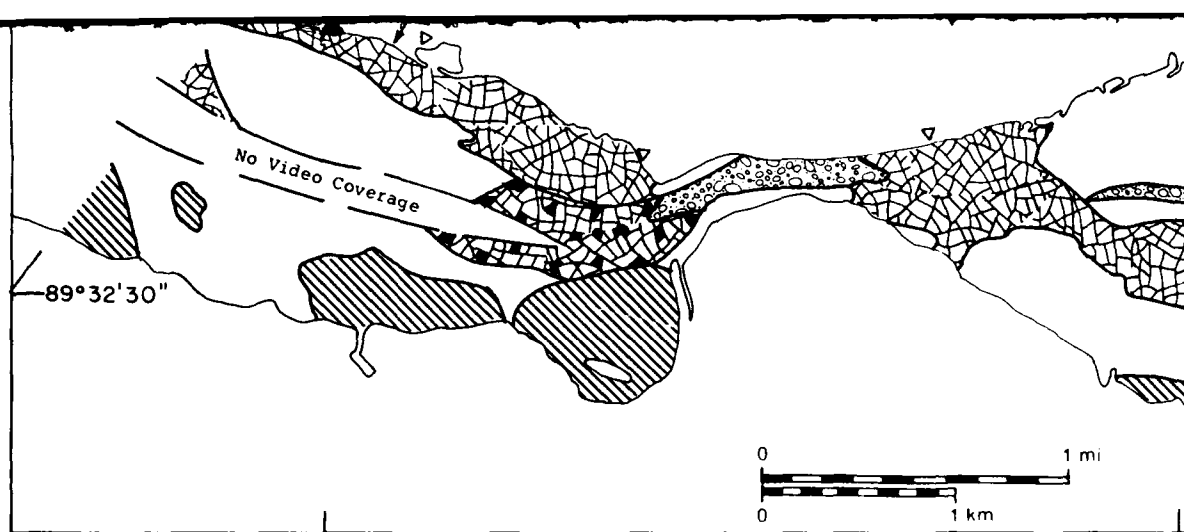
Area ($m^2 \times 10^6$)	Surface concentration (%)
10.14	NA
0.02	NA
0.00	—
0.00	NA
0.00	—
0.08	10
11.71*	

* Includes $1.47 \times 10^6 m^2$
of no video coverage

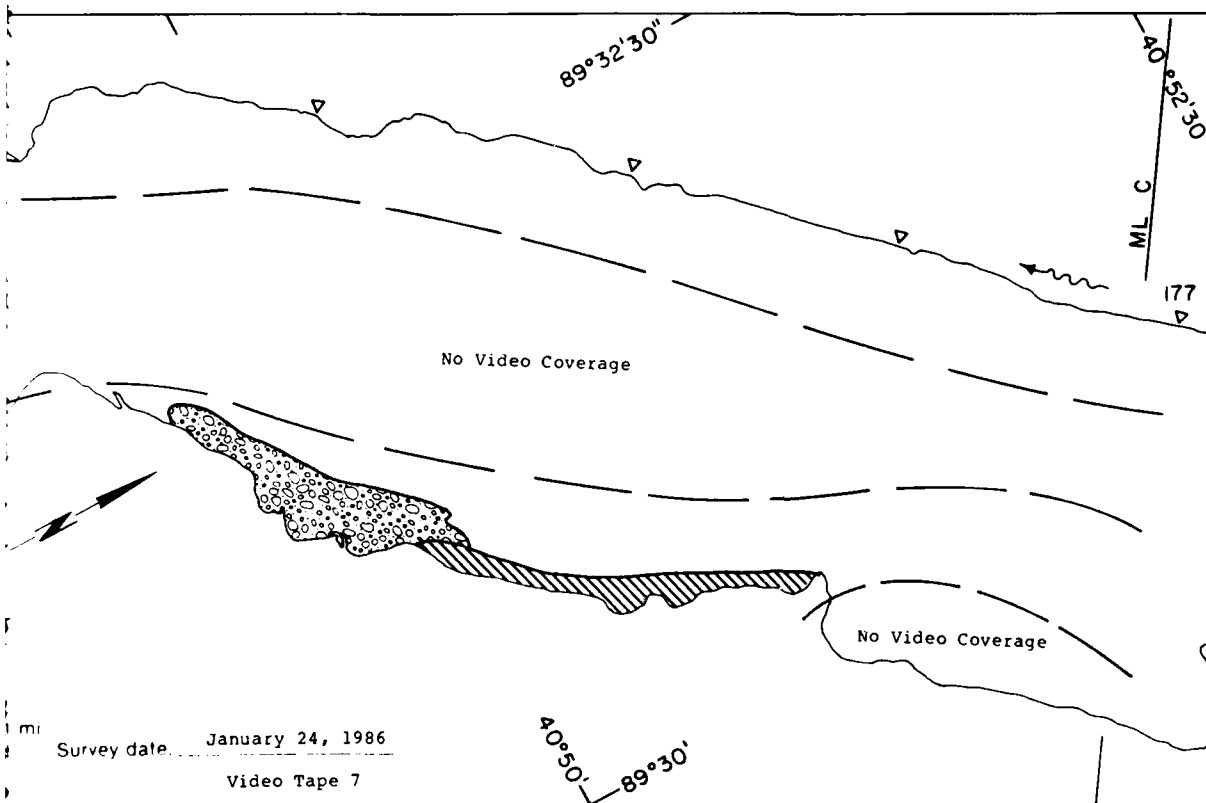
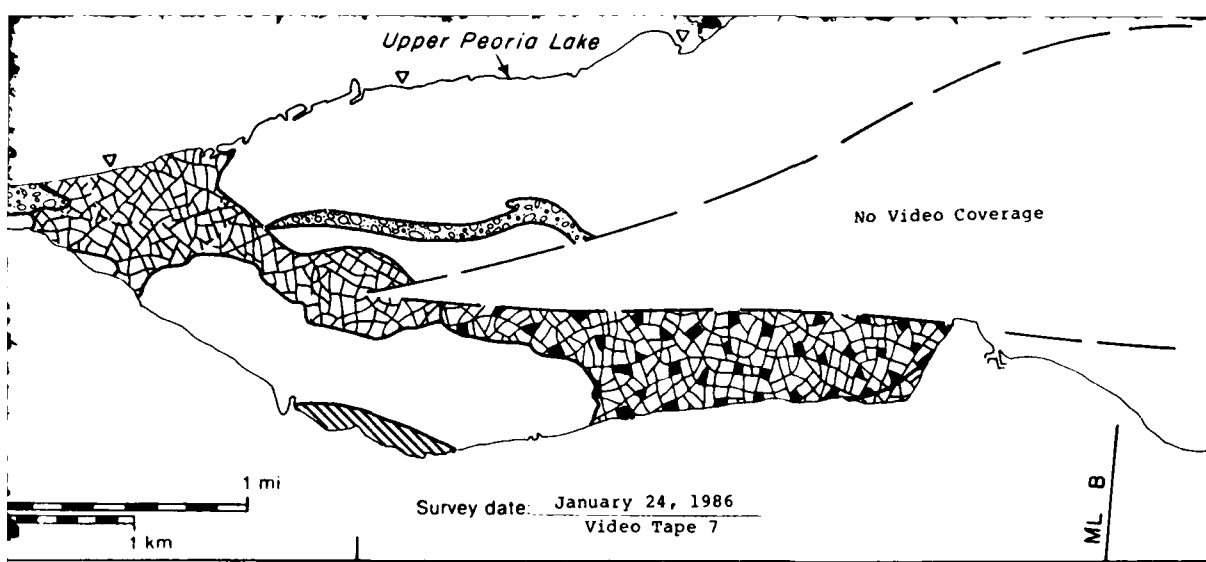


24 January 1986

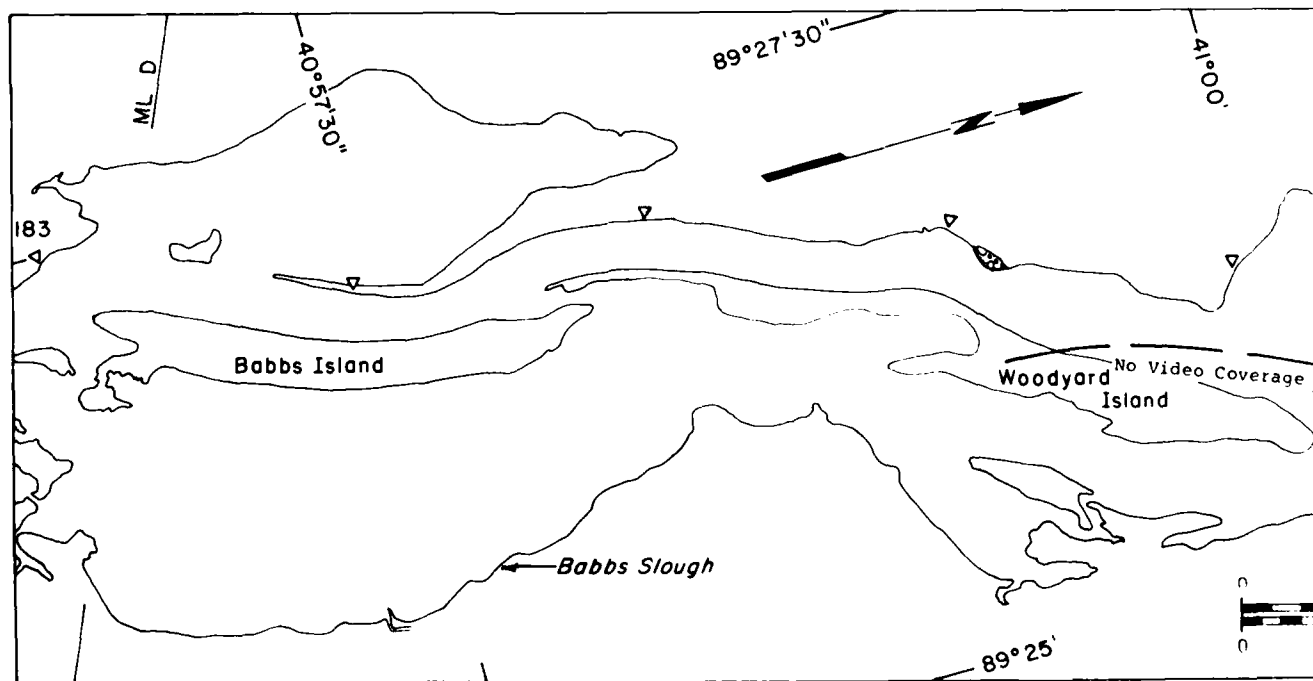
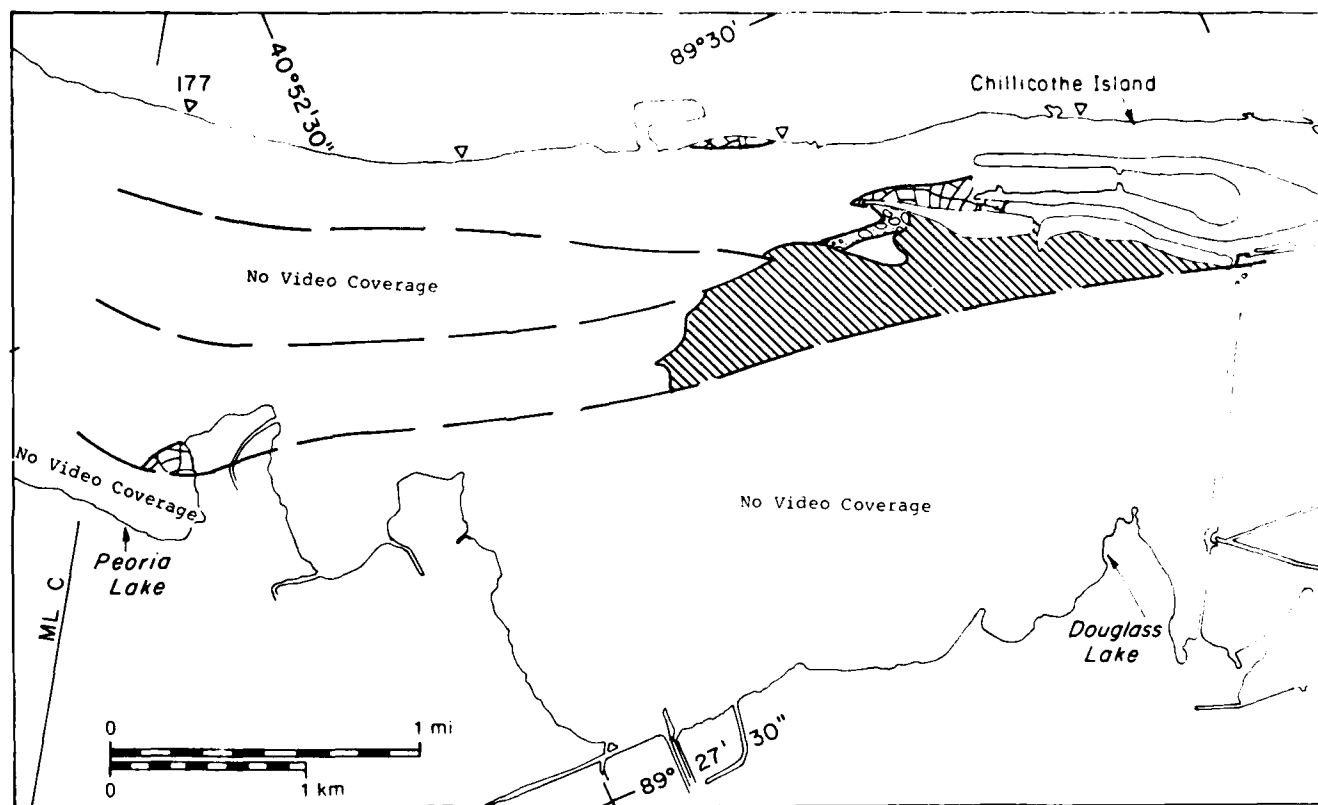


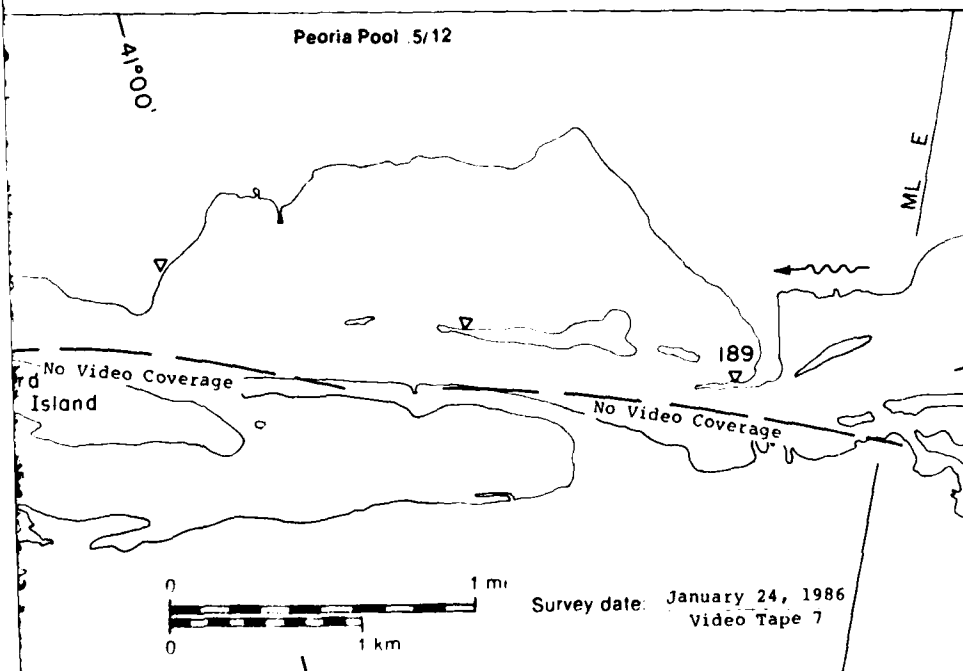
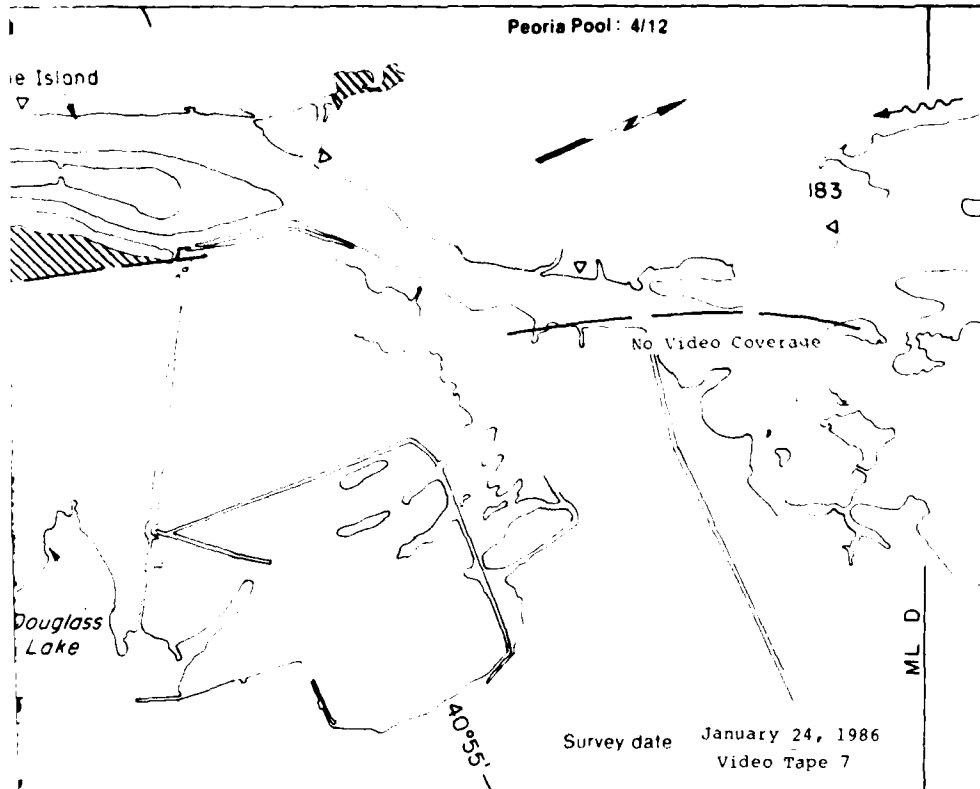


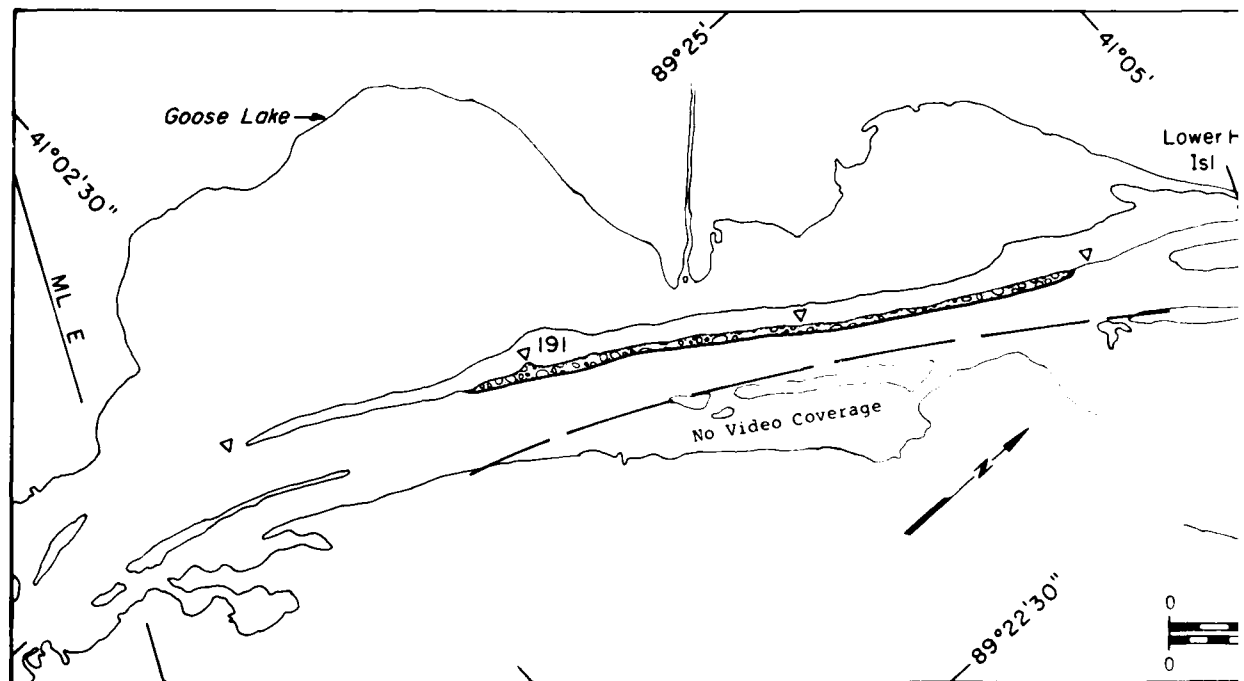
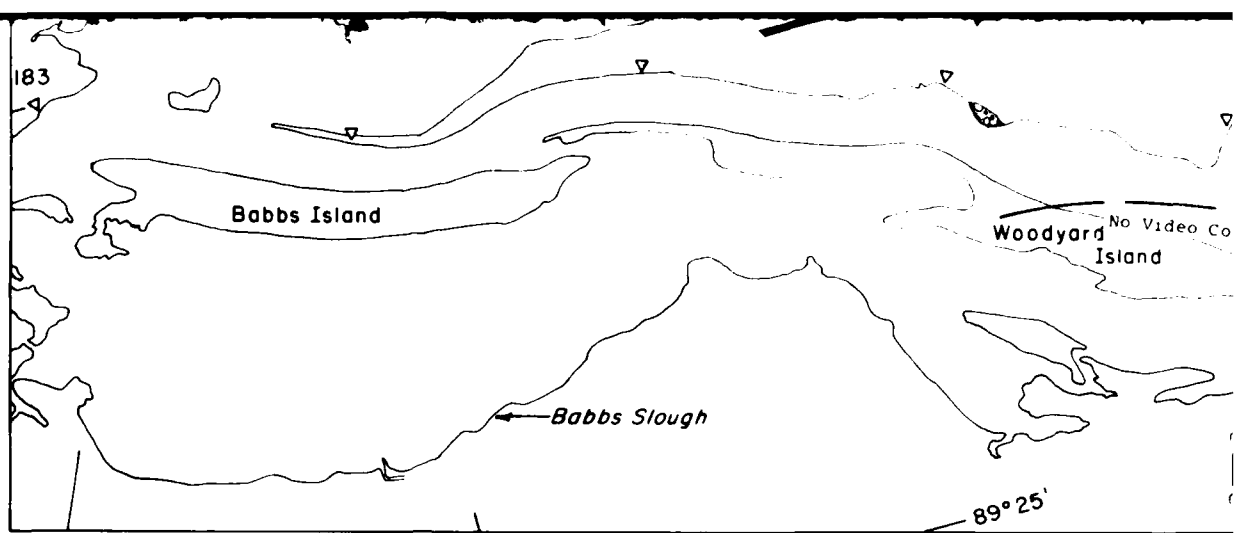
Survey date: January 24, 1981
Video Tape 7

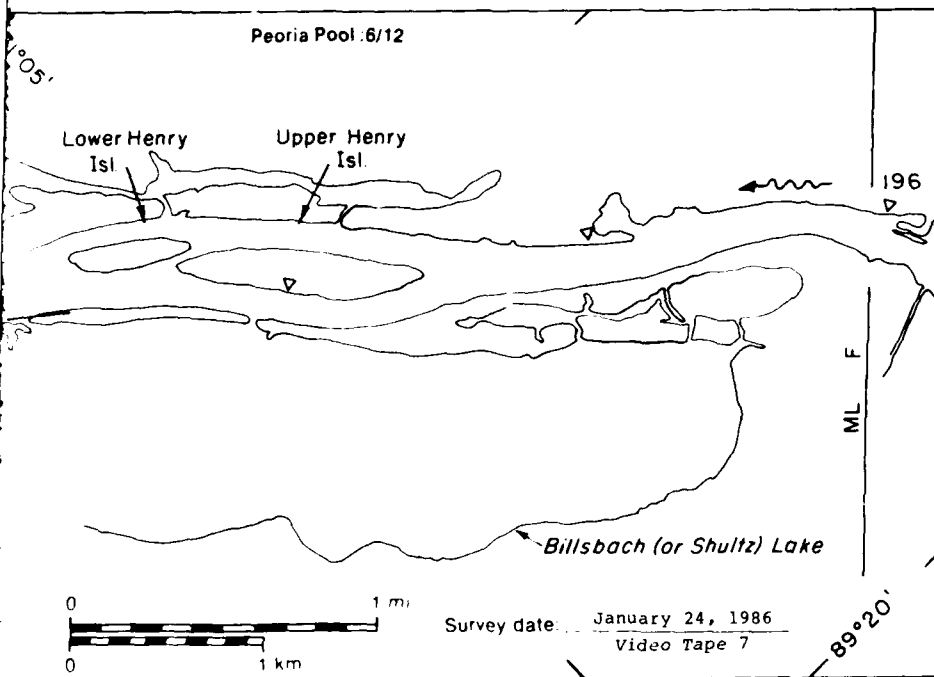
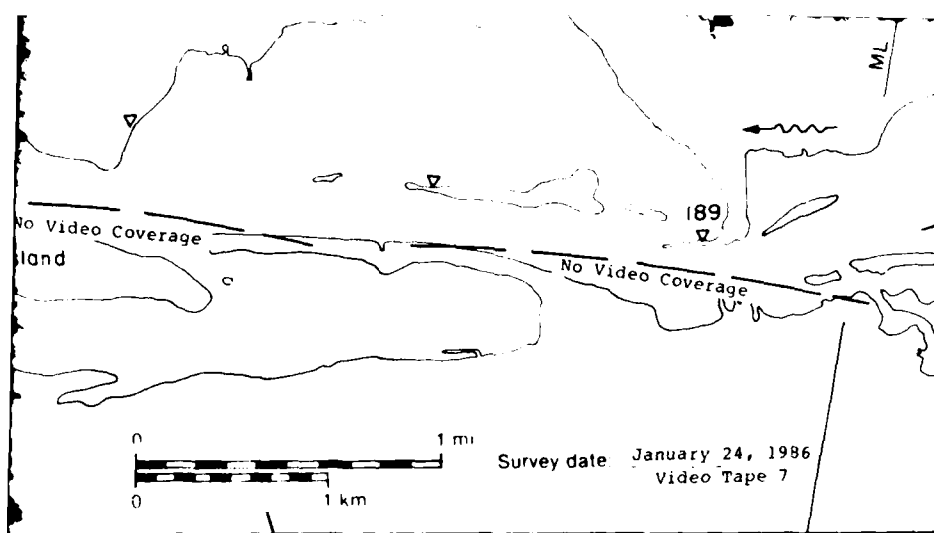


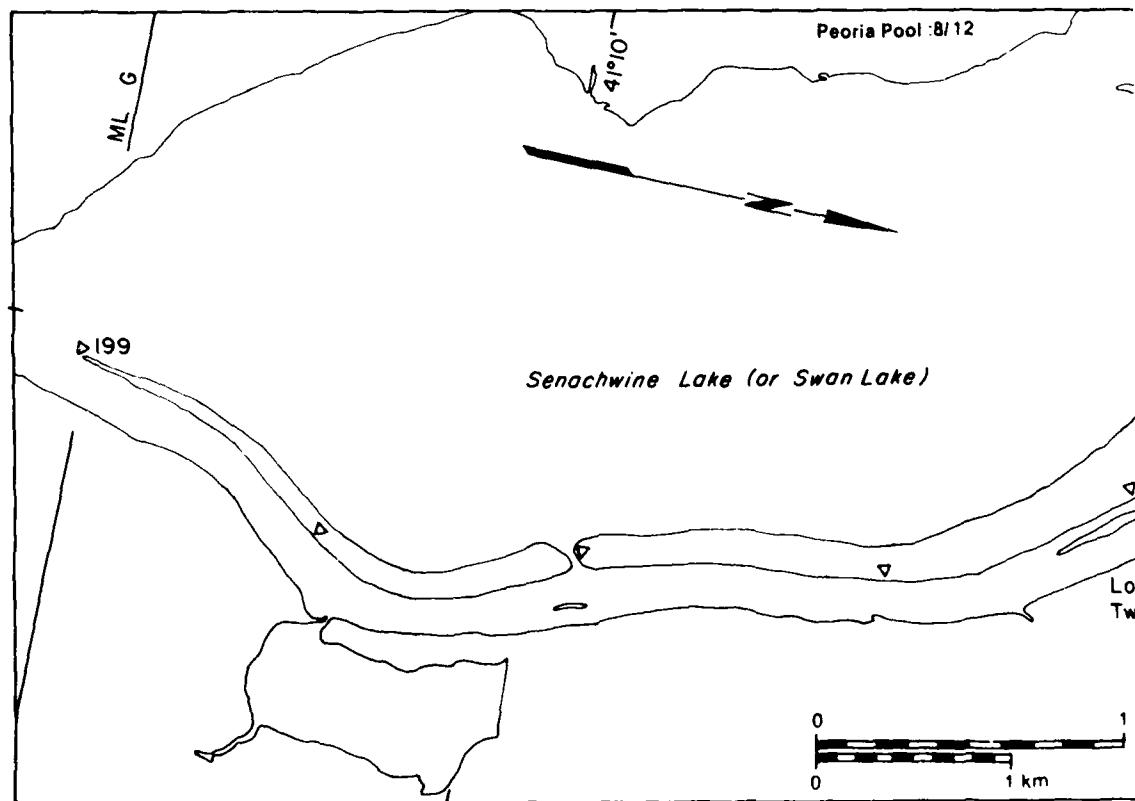
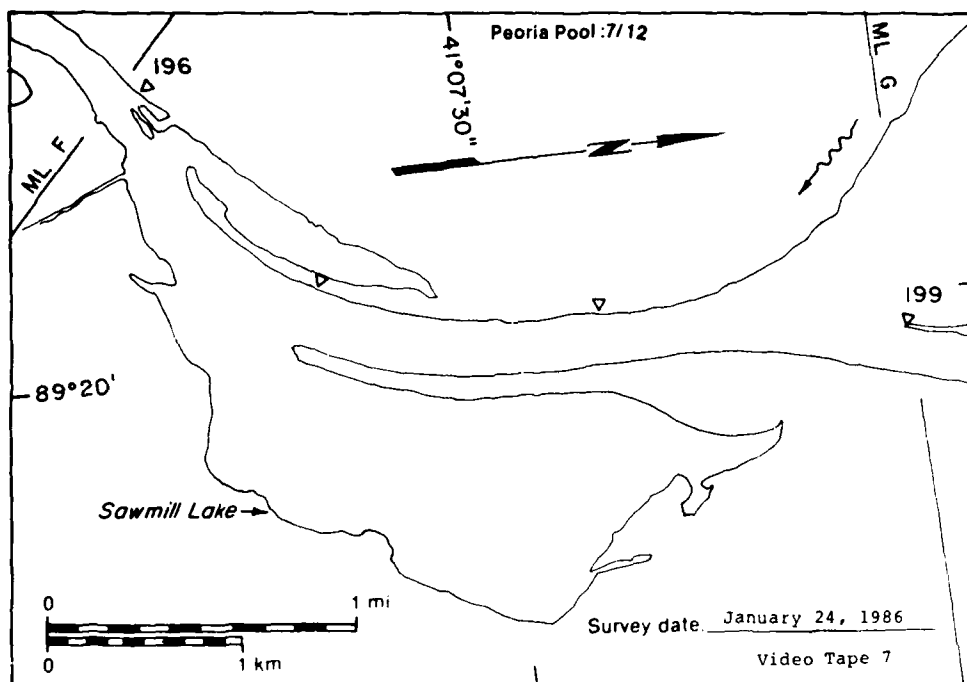
24 January 1986



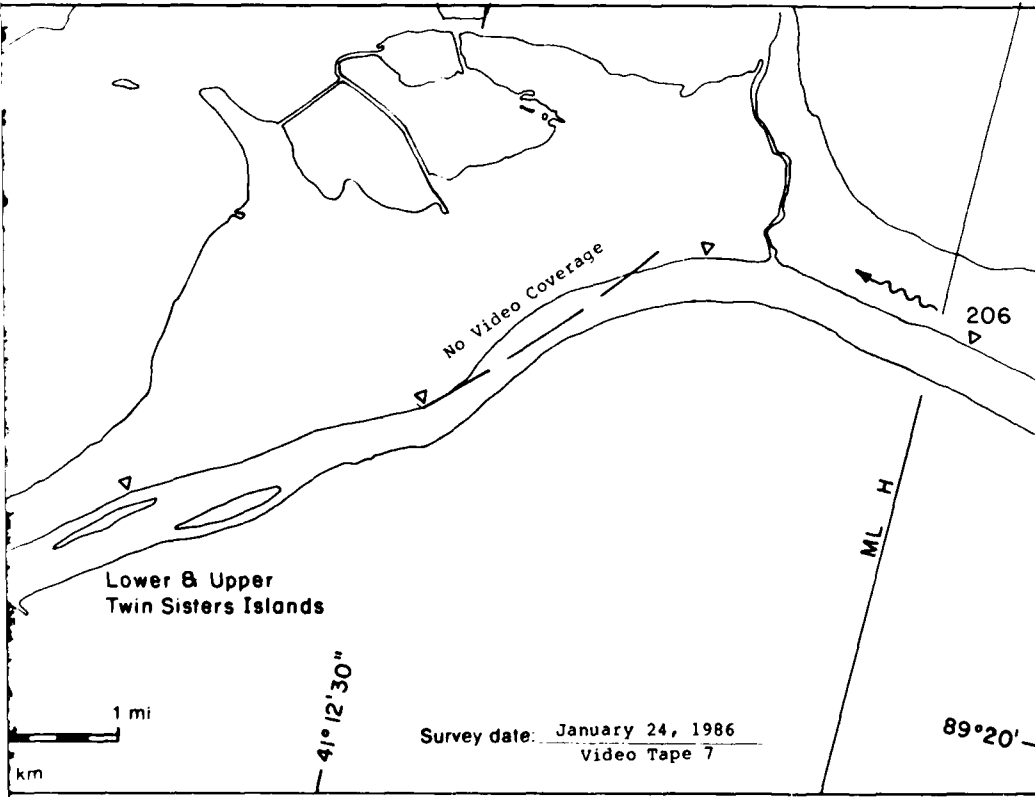


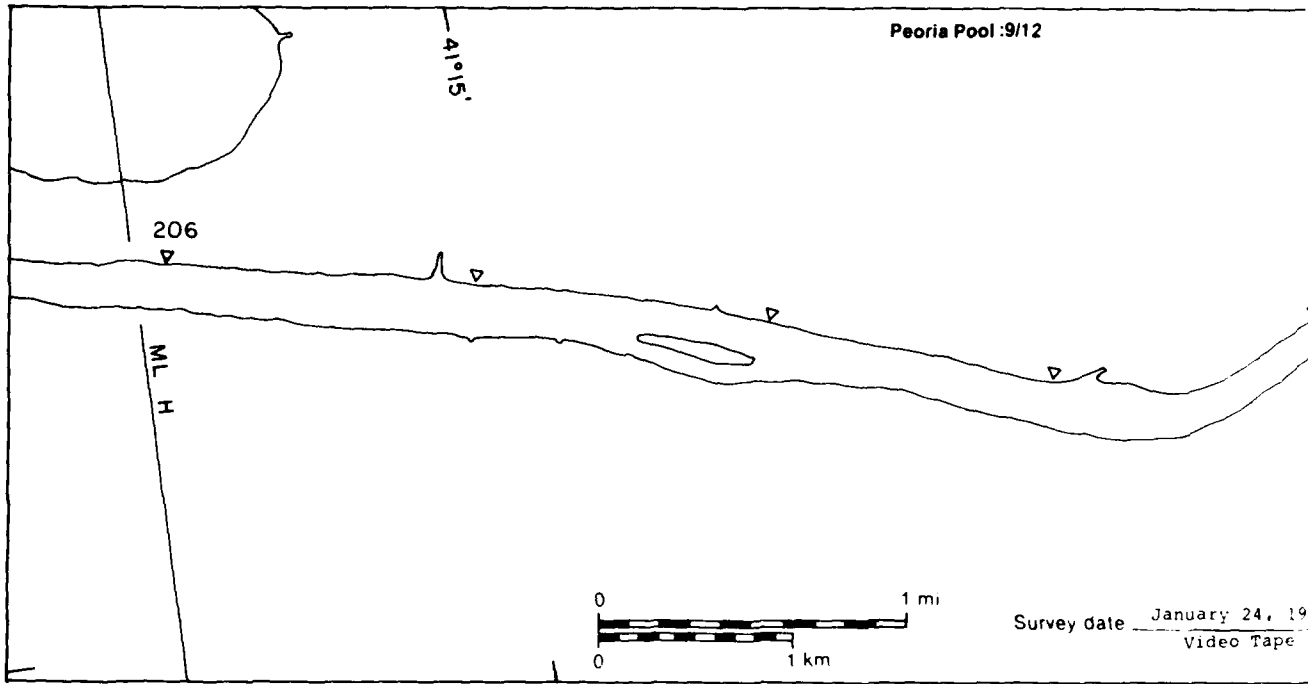
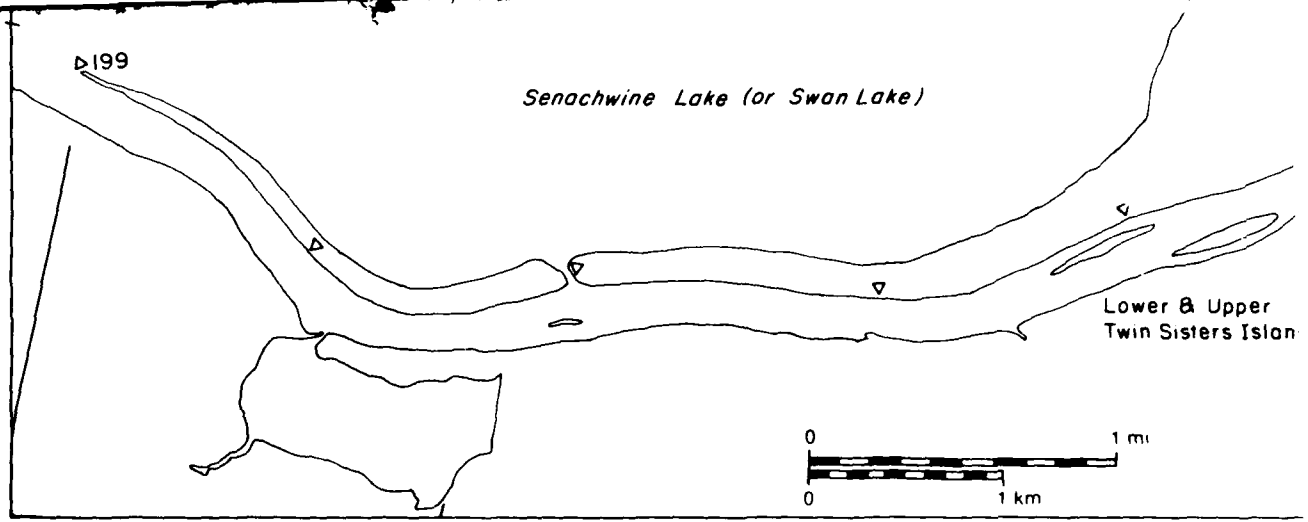


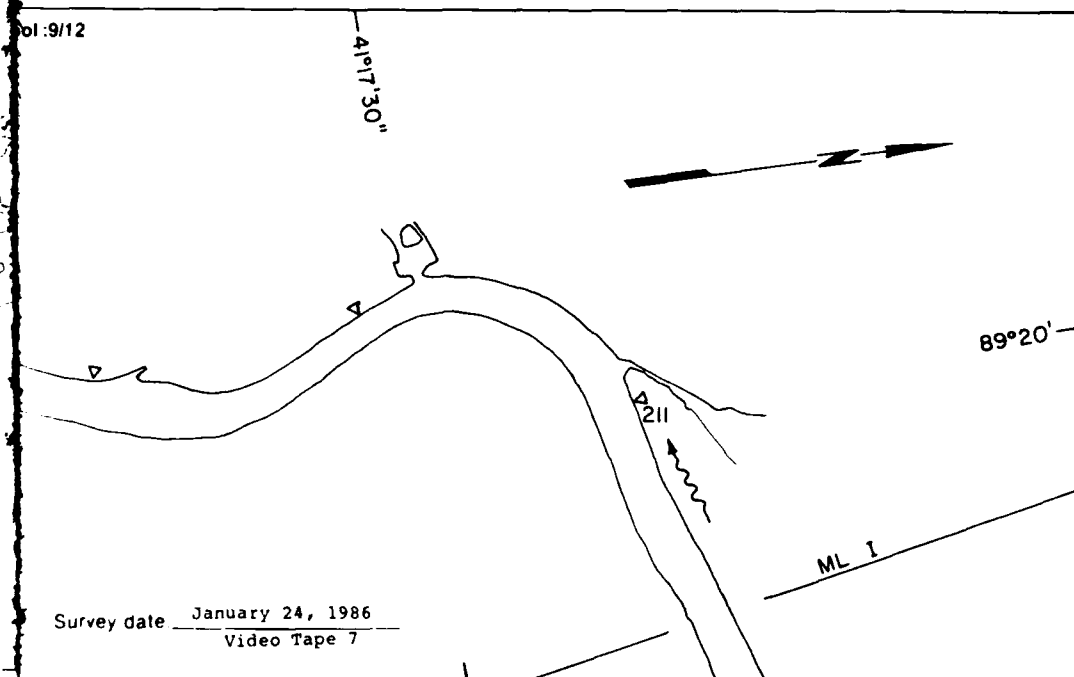
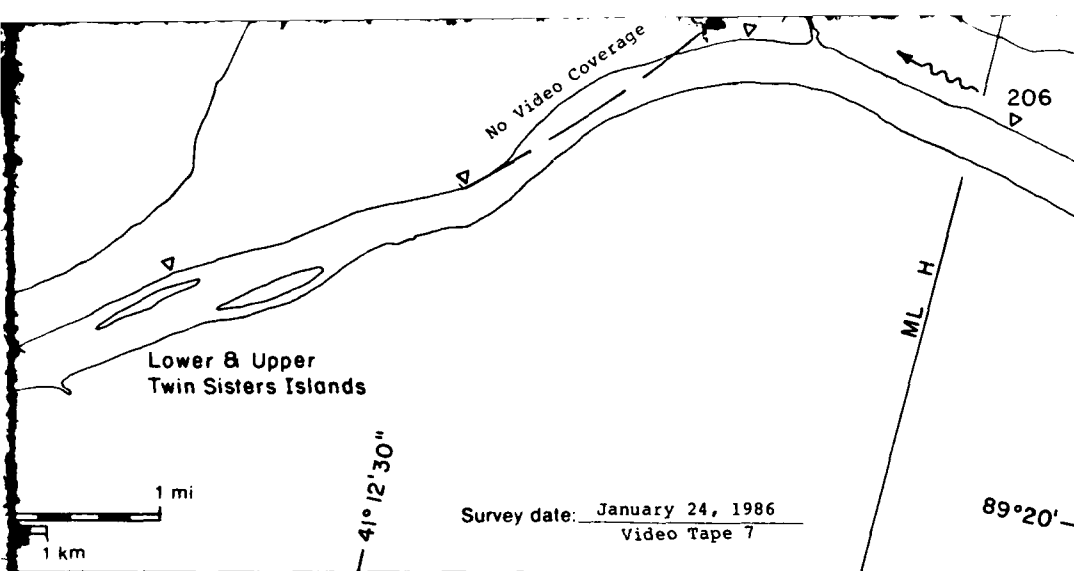




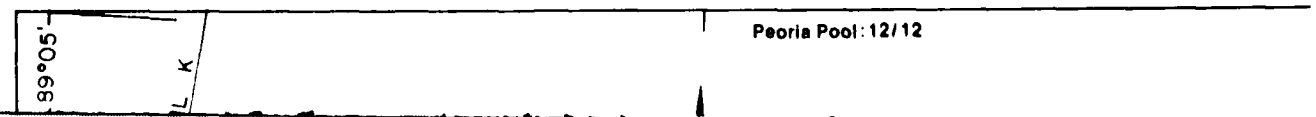
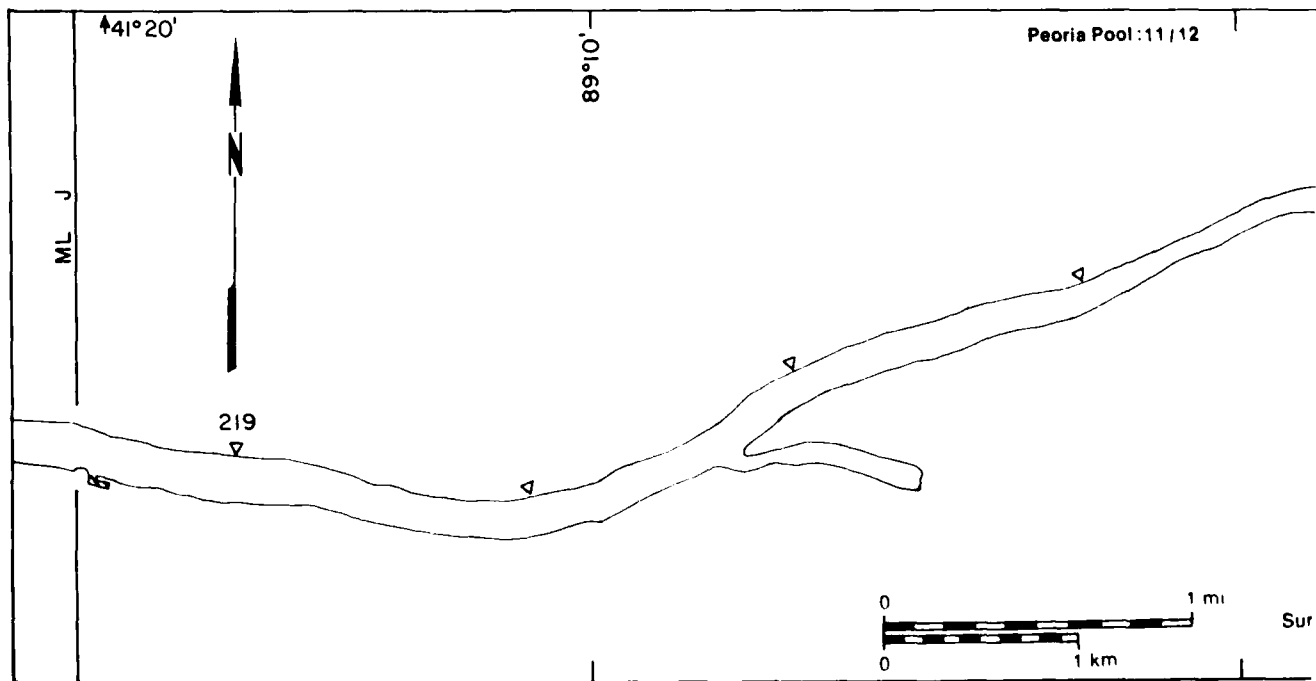
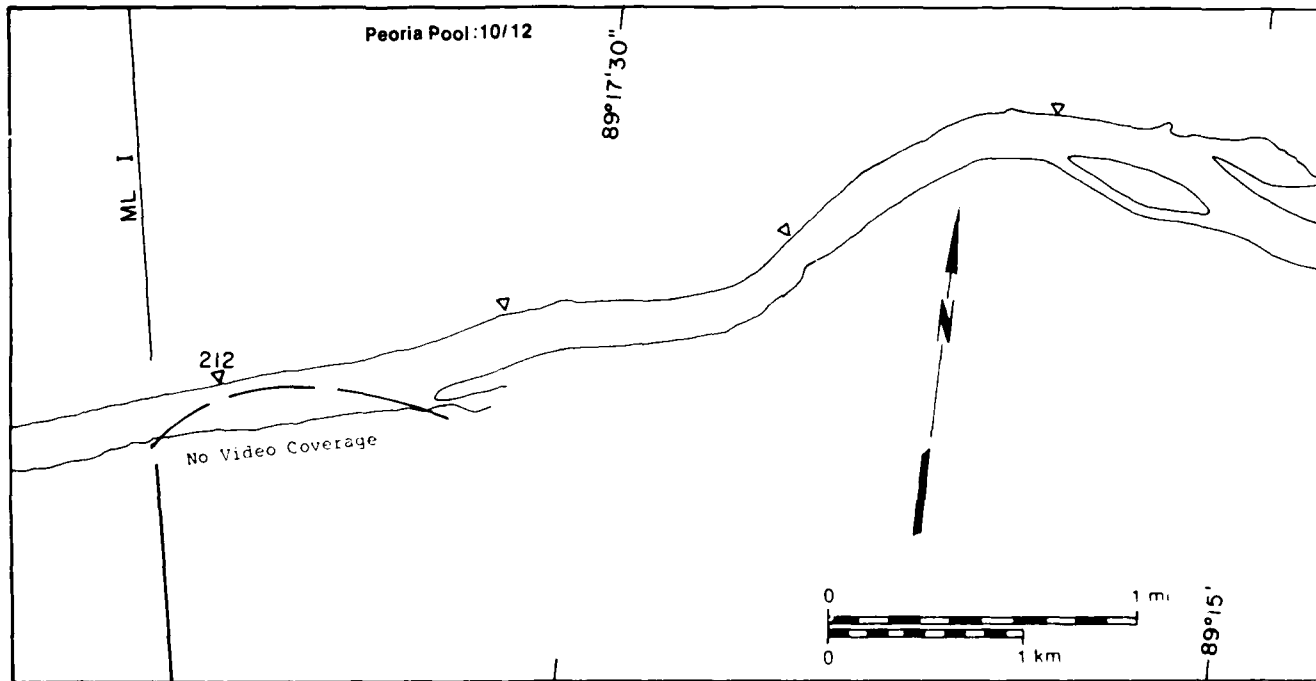
24 January 1986

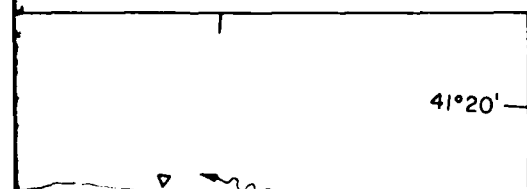
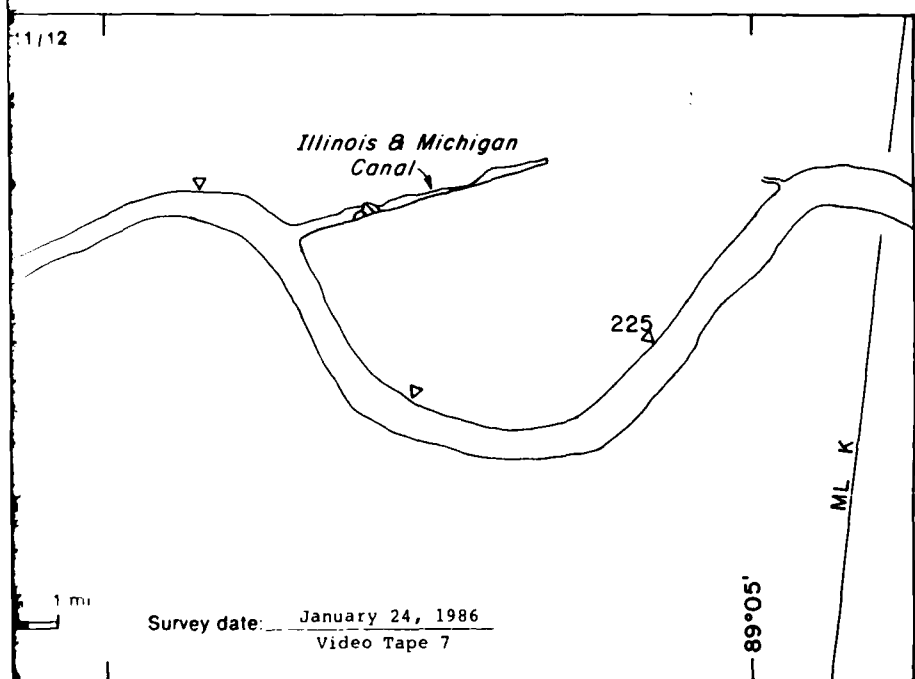
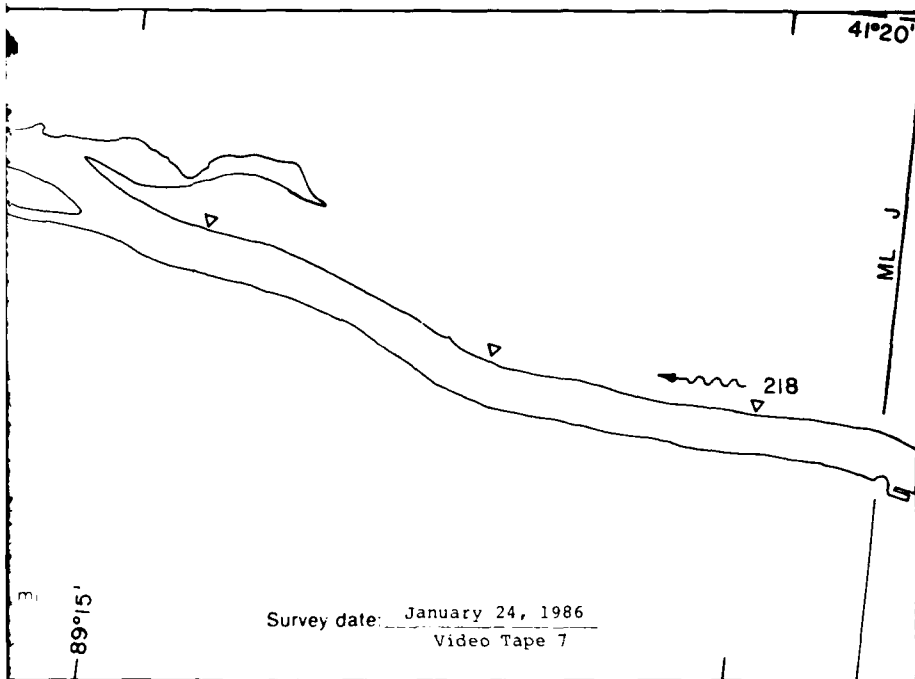


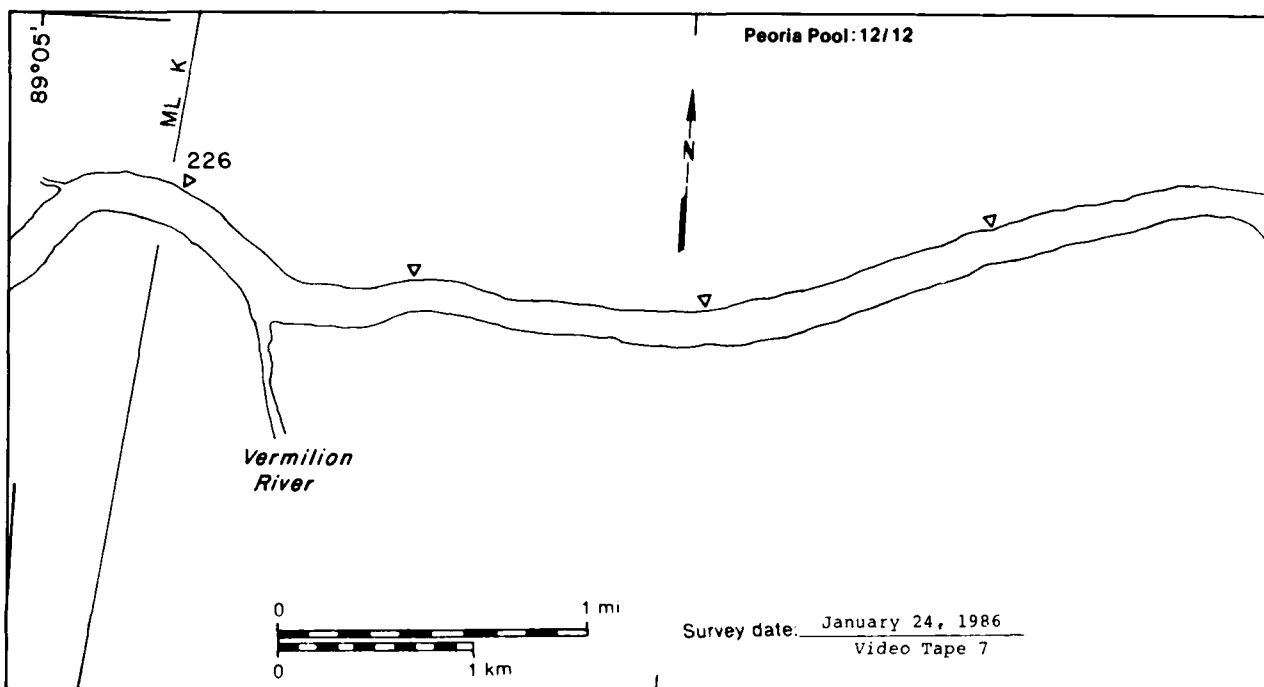
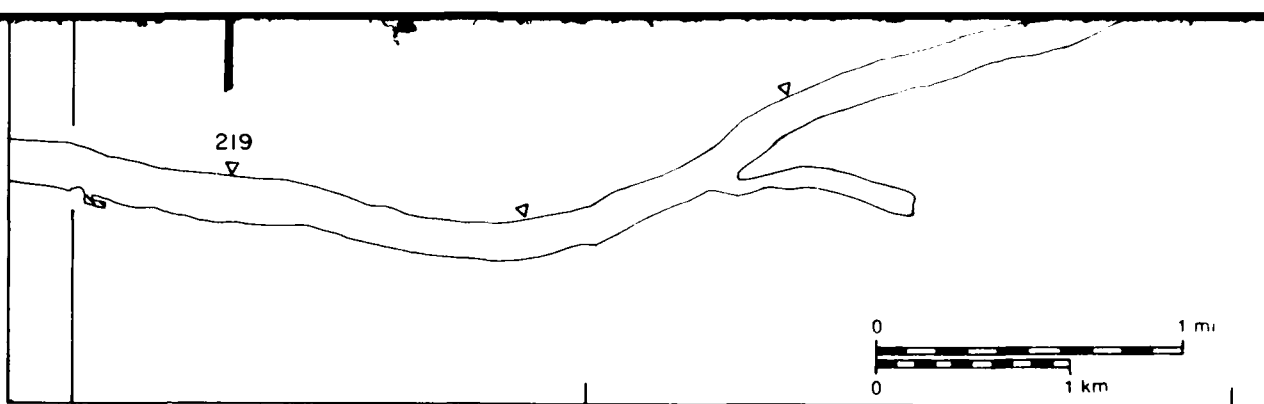










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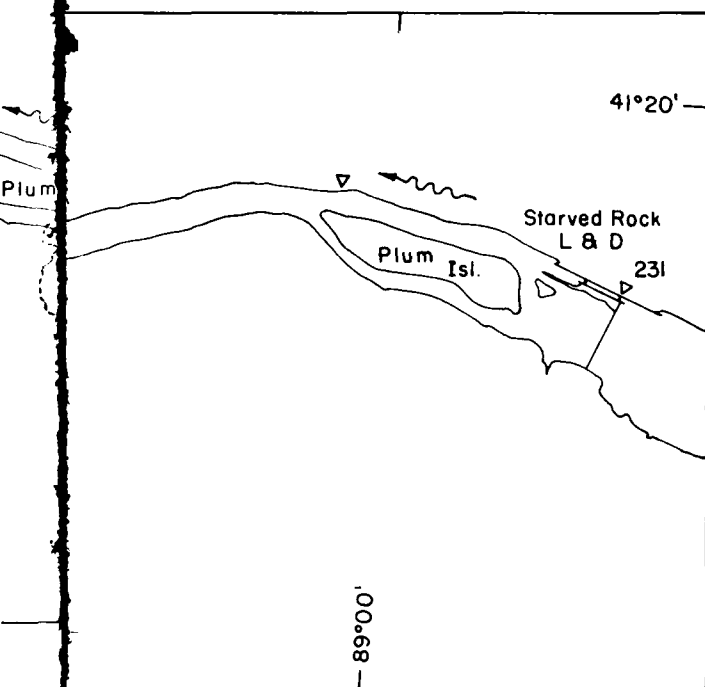
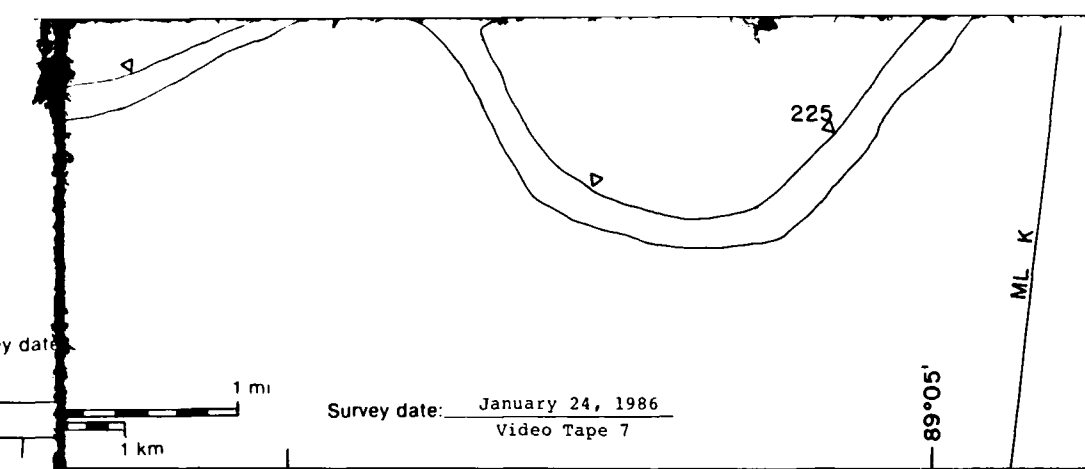
Peoria Pool

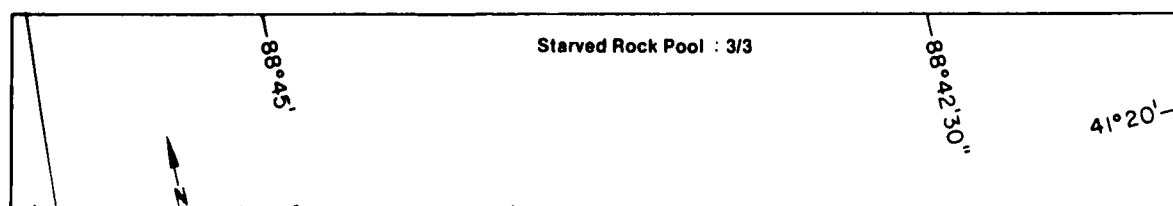
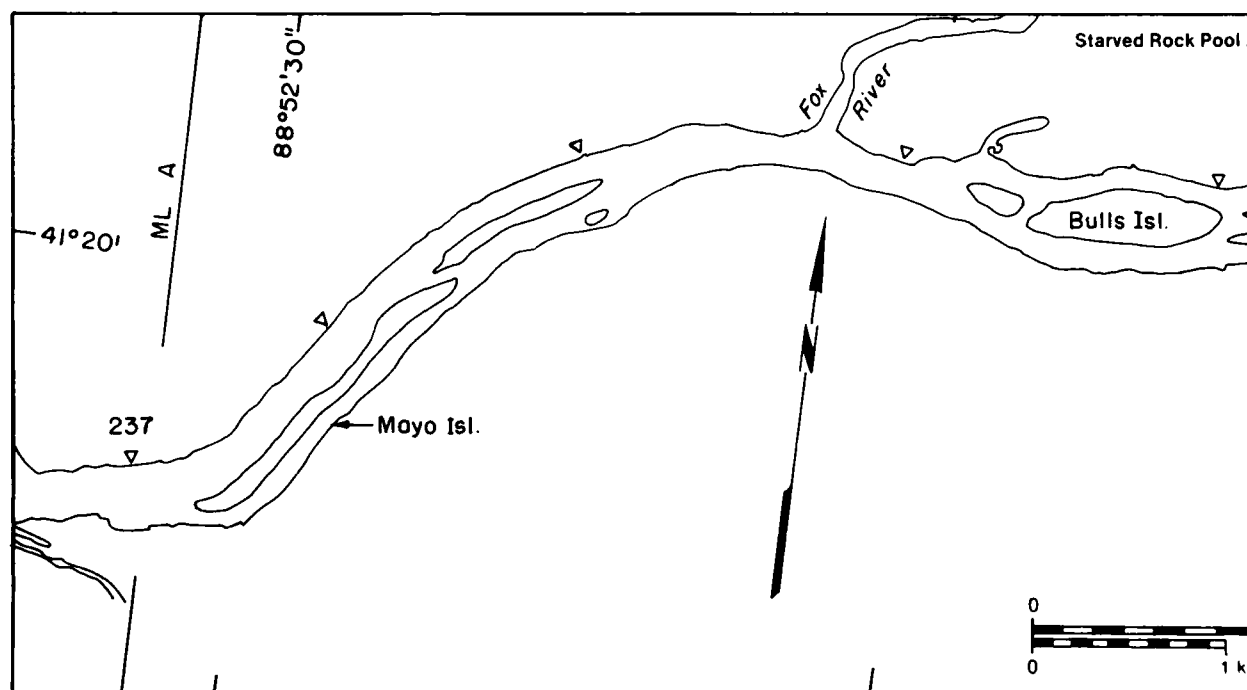
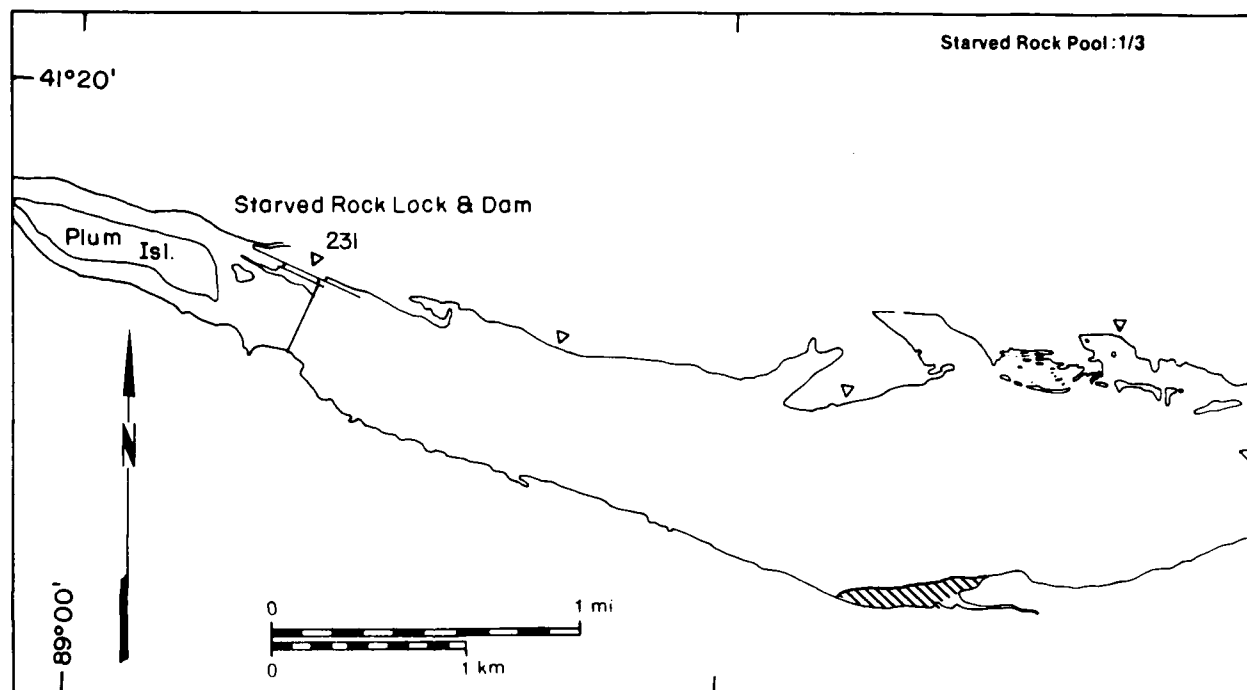
MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	43.53	NA
	Solid ice cover	4.52	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	2.41	NA
	Fragmented ice cover with open-water areas	1.44	70
	Ice floes or frazil slush and pans	1.01	30

Total area ($m^2 \times 10^6$)

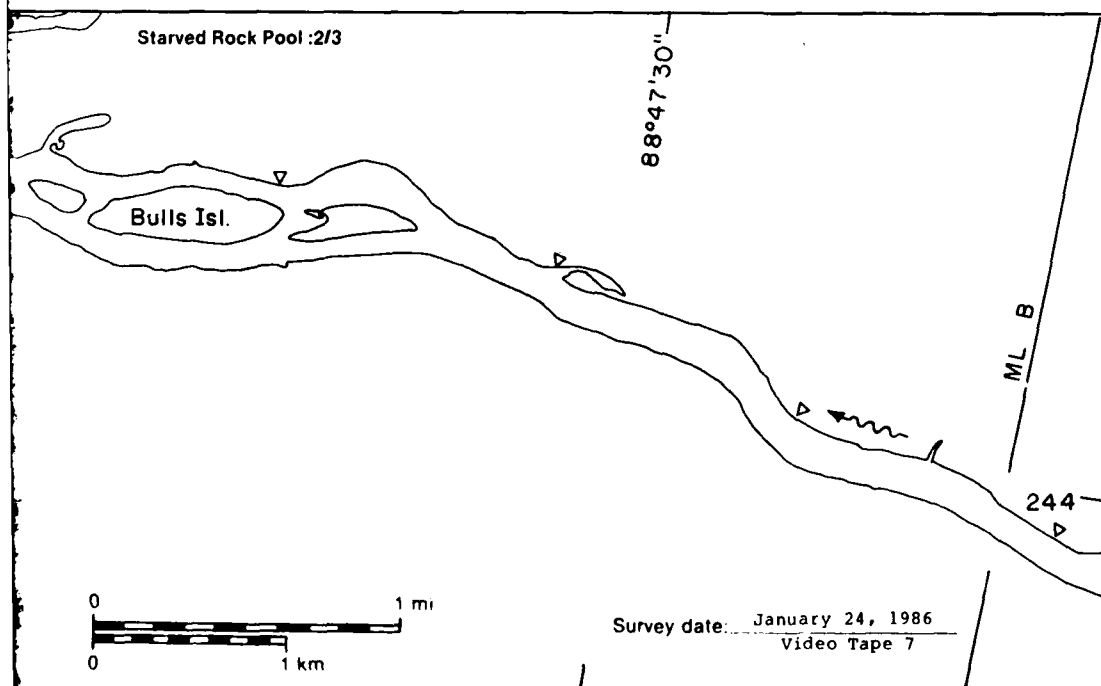
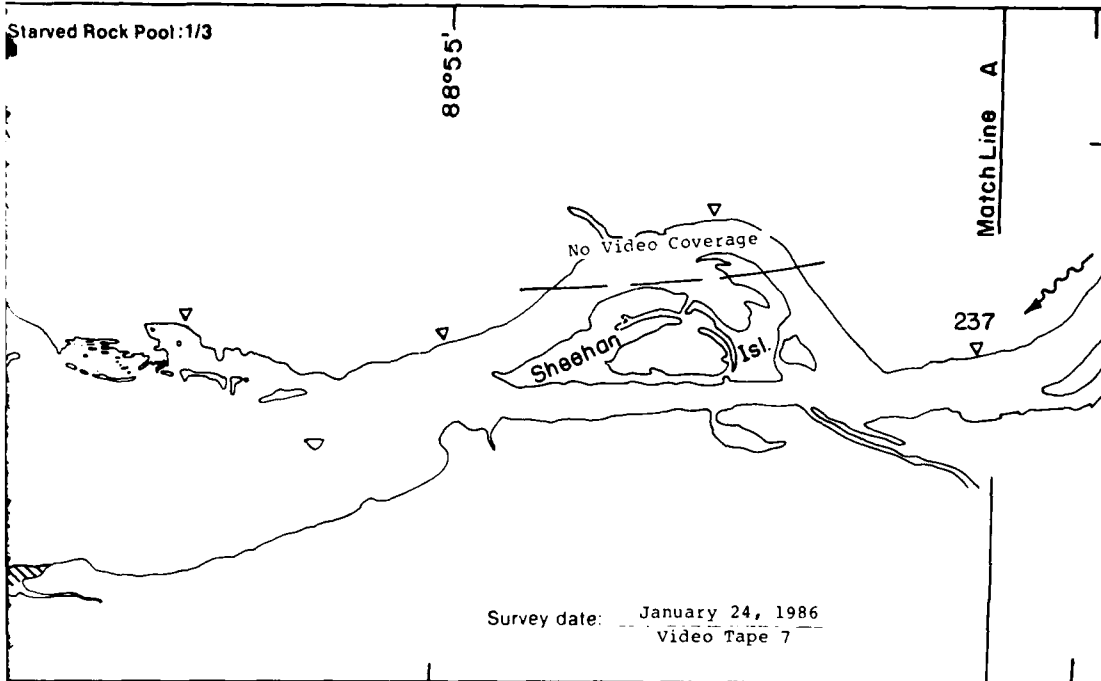
81.33*

* Includes $28.42 \times 10^6 m^2$ of no video coverage





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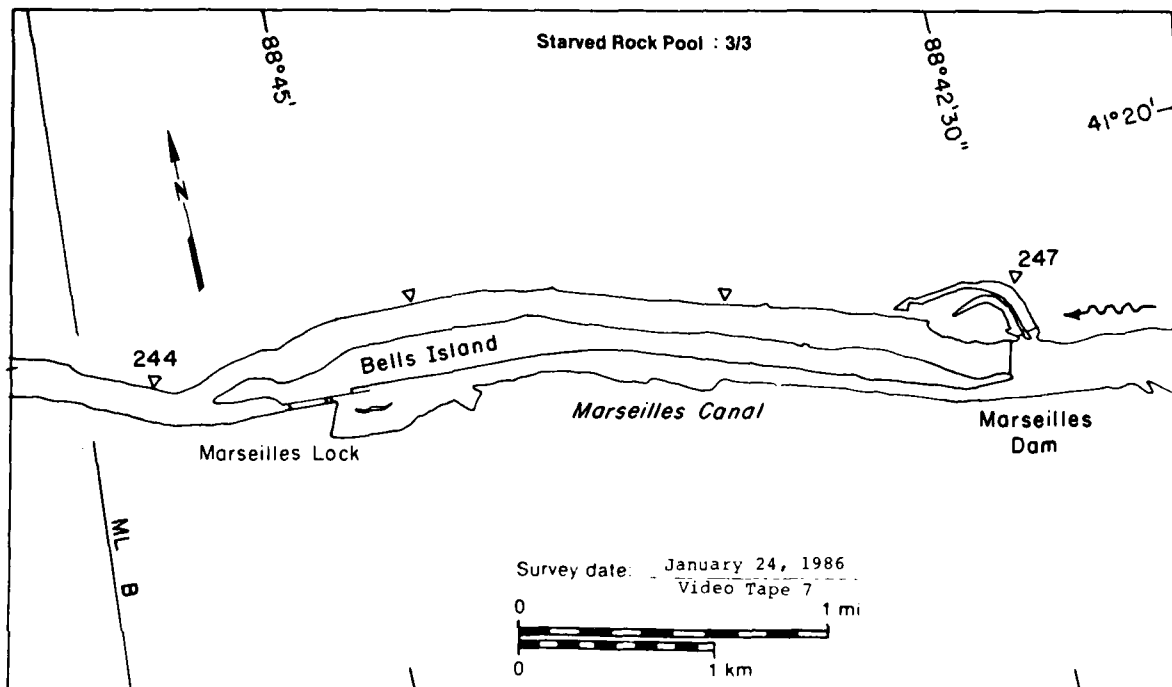
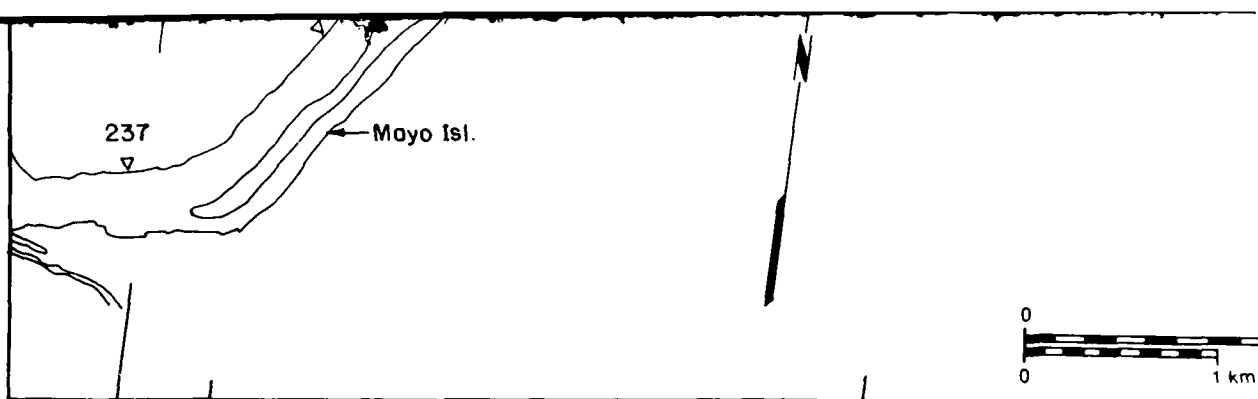


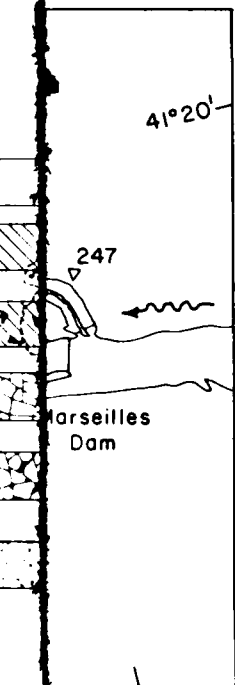
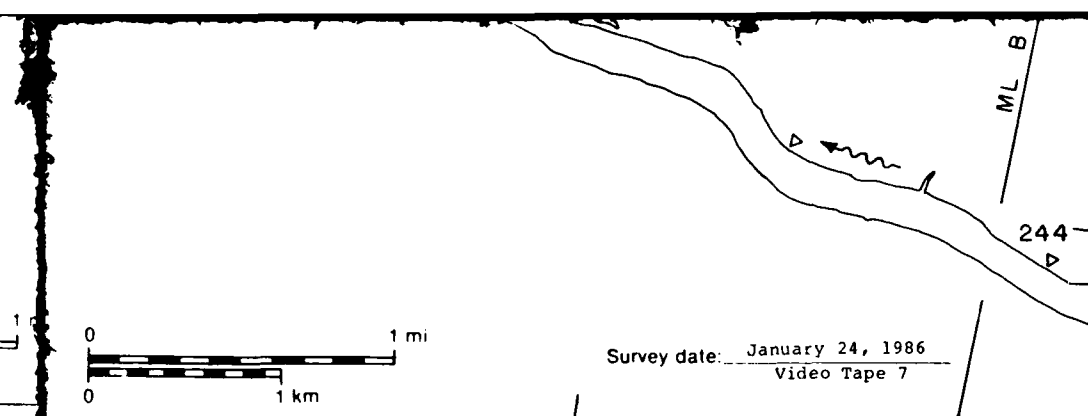
41°20'

Starved Rock Pool

MAP UNITS

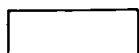
Area (m ² x 10 ⁶)	Surface concentration (%)





Starved Rock Pool

MAP UNITS



Open water



Solid ice cover



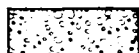
Solid ice cover with open-water areas



Fragmented ice cover



Fragmented ice cover with open-water areas

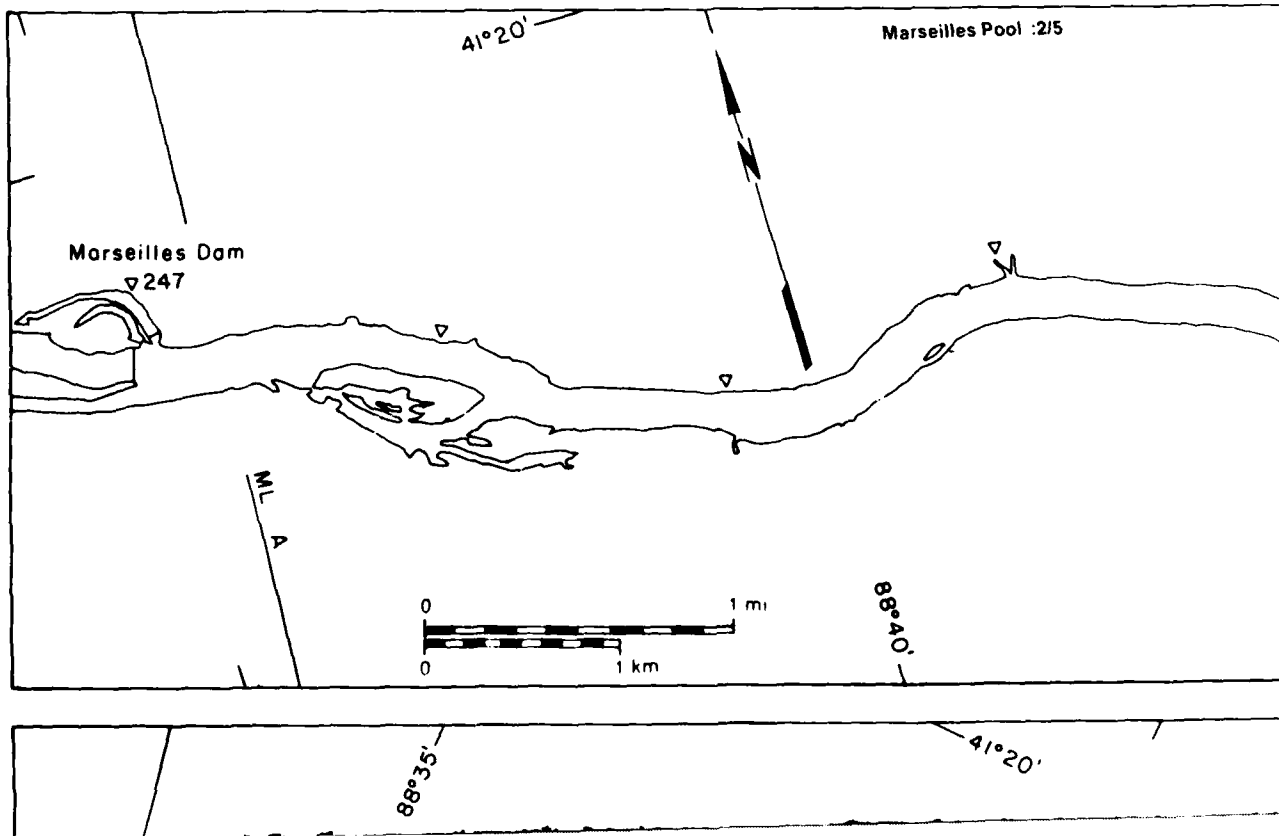
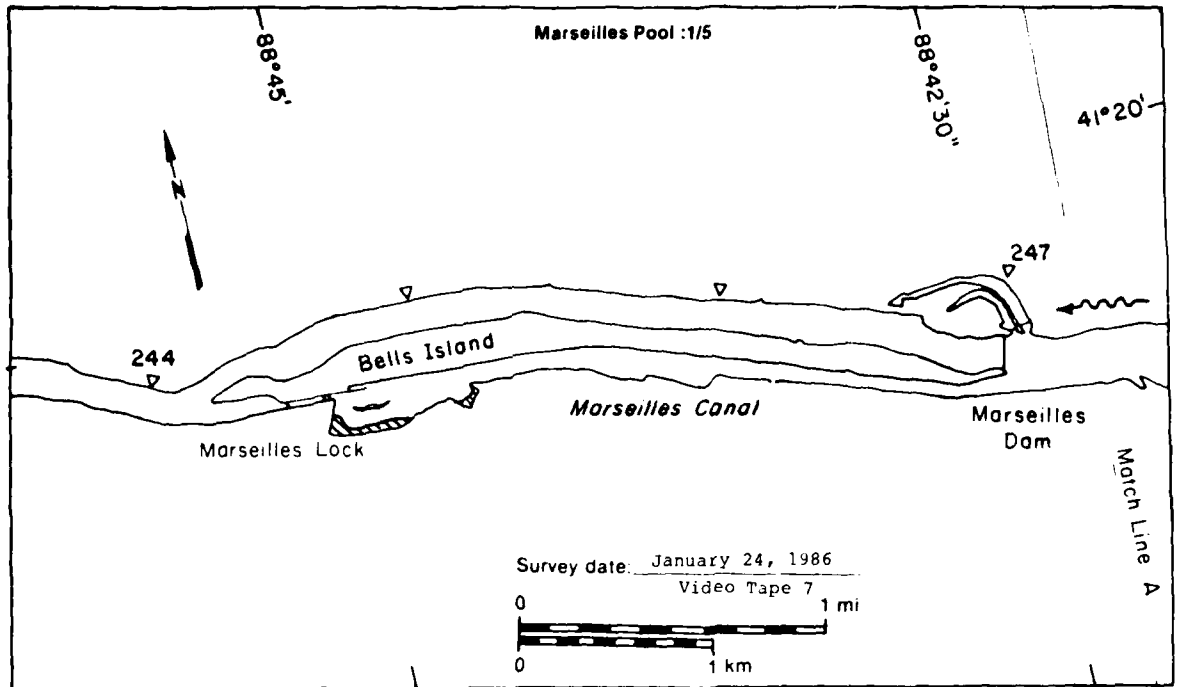


Ice floes or frazil slush and pans

Total area ($m^2 \times 10^6$)

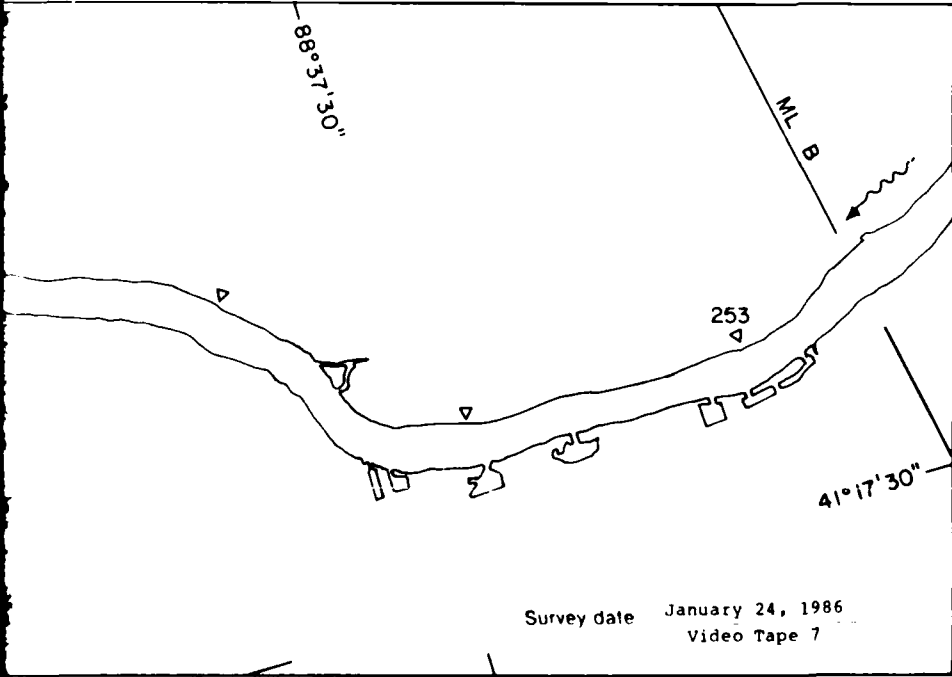
Area ($m^2 \times 10^6$)	Surface concentration (%)
9.91	NA
0.04	NA
0.00	—
0.00	NA
0.00	—
0.00	—
10.19*	* Includes $0.24 \times 10^6 m^2$ of no video coverage

24 January 1986



1°20'

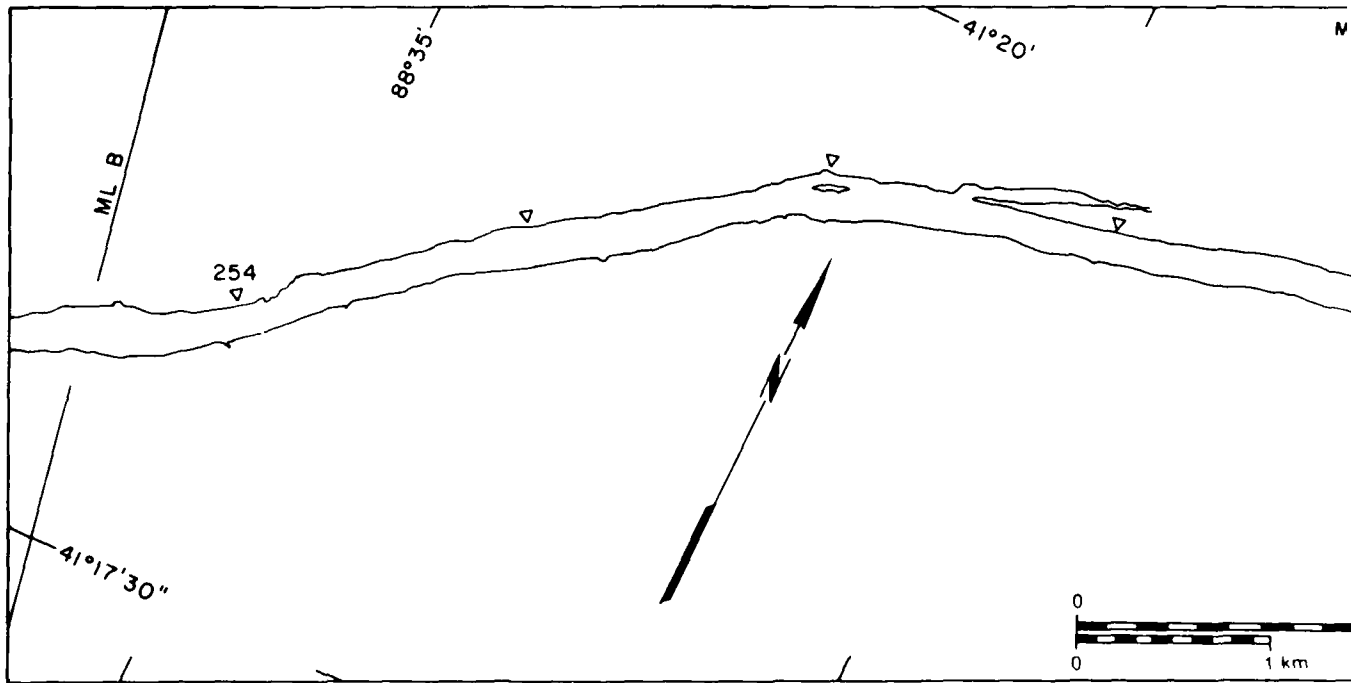
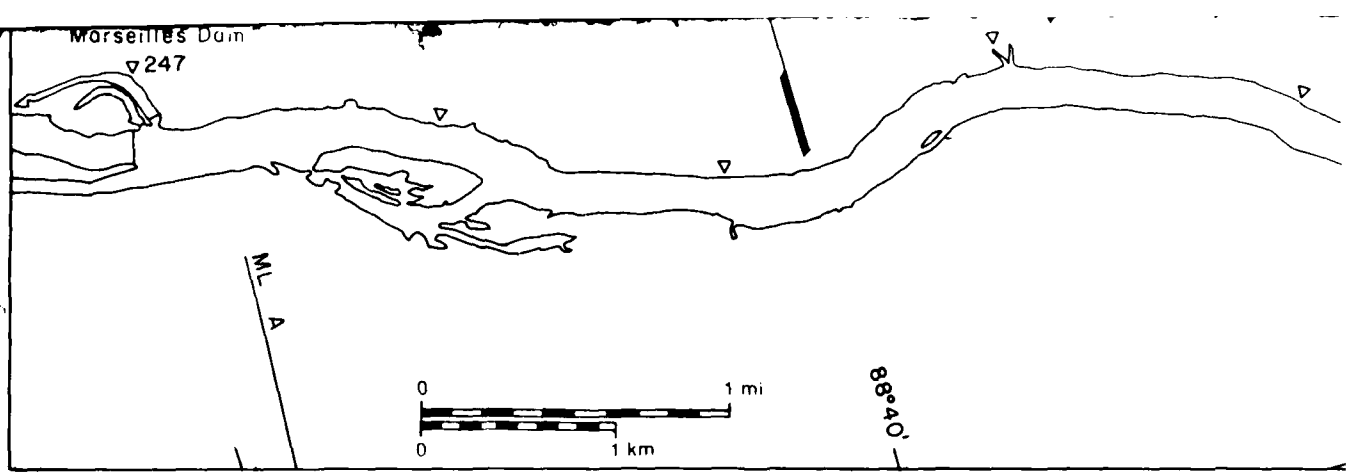
Match Line A

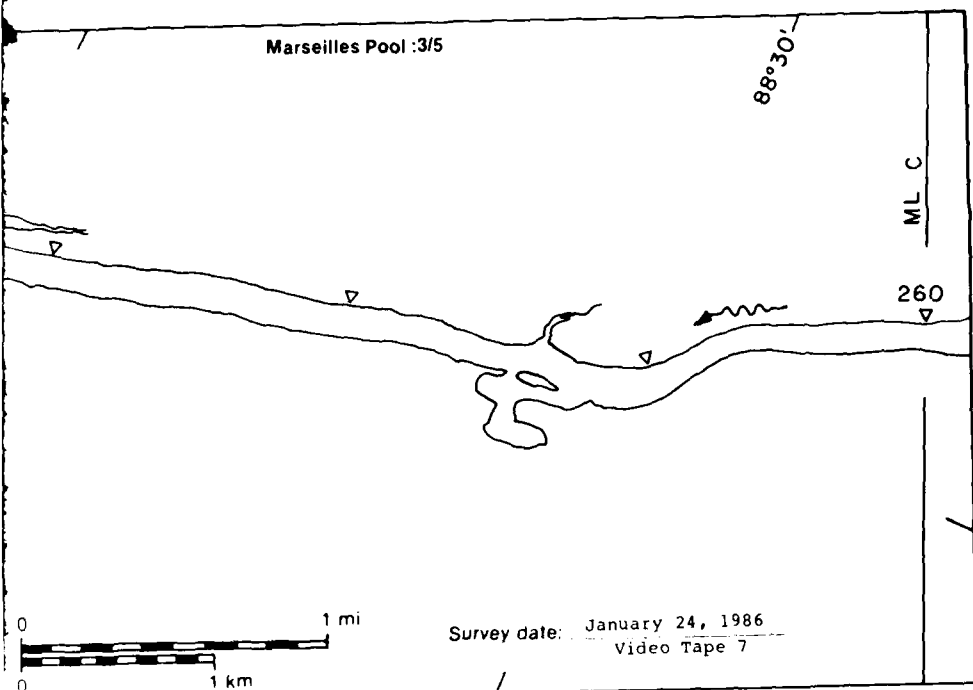
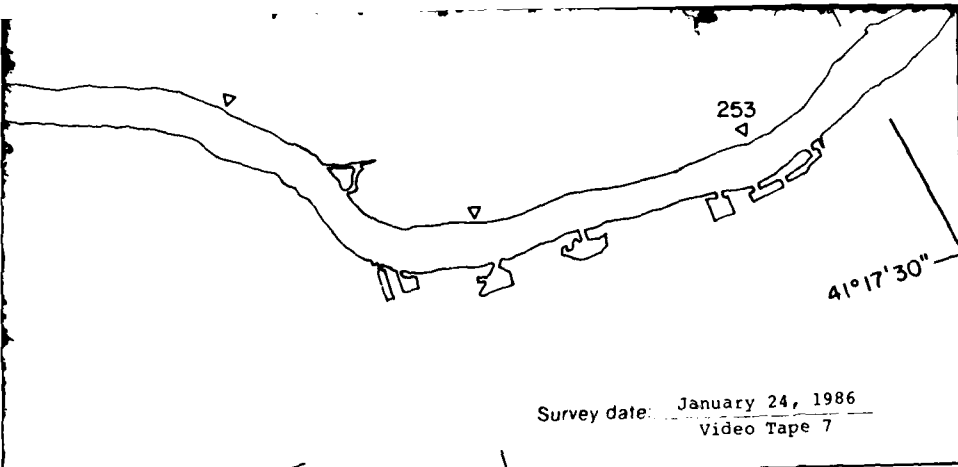


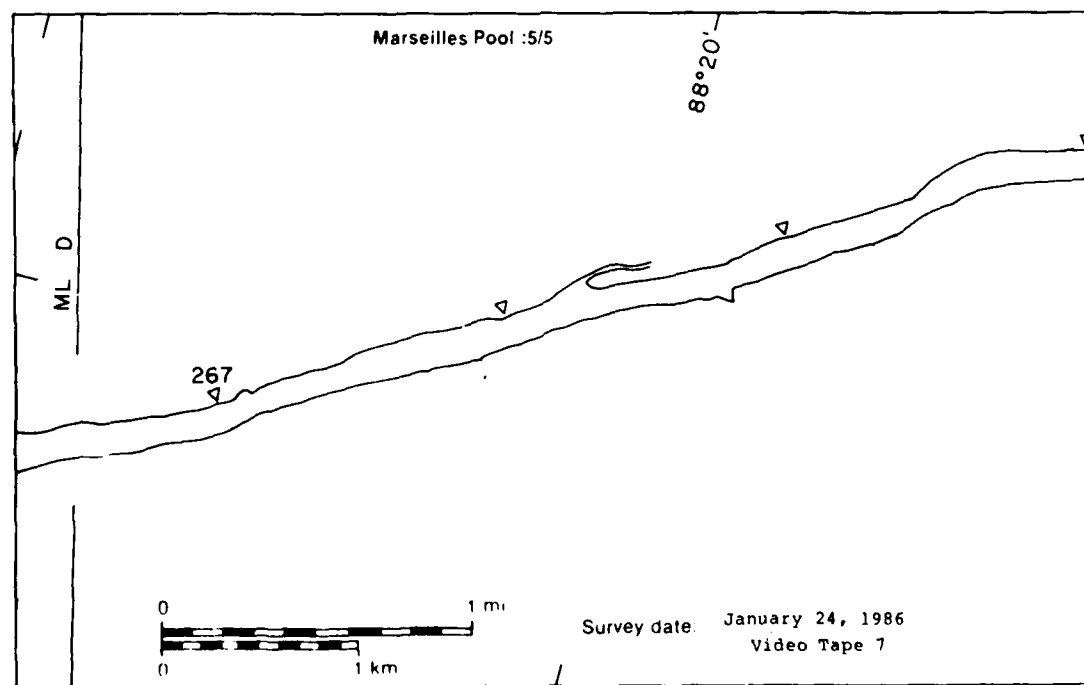
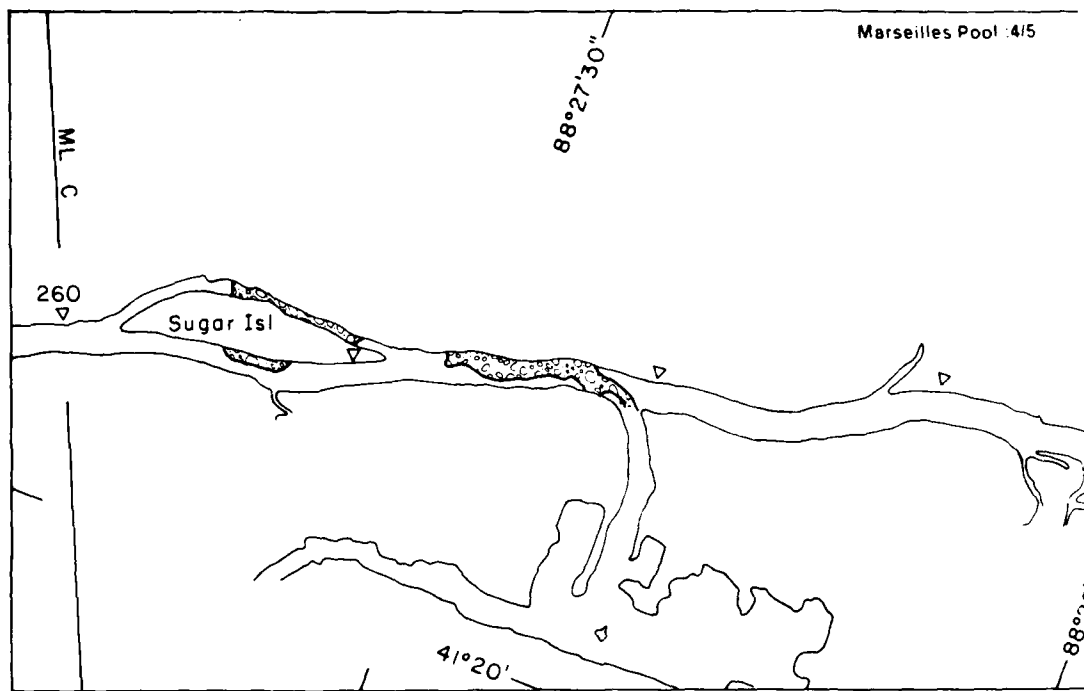
Marseilles Pool :3/5

88°30'

C

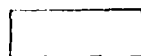






Marseilles Pool

MAP UNITS



Open water

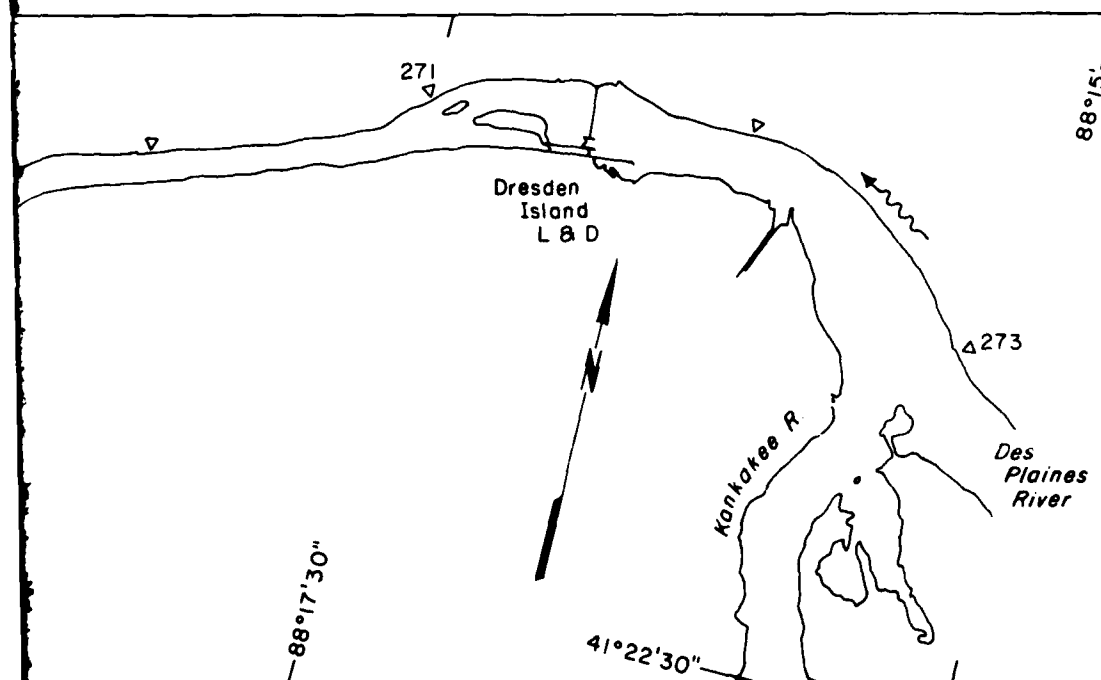
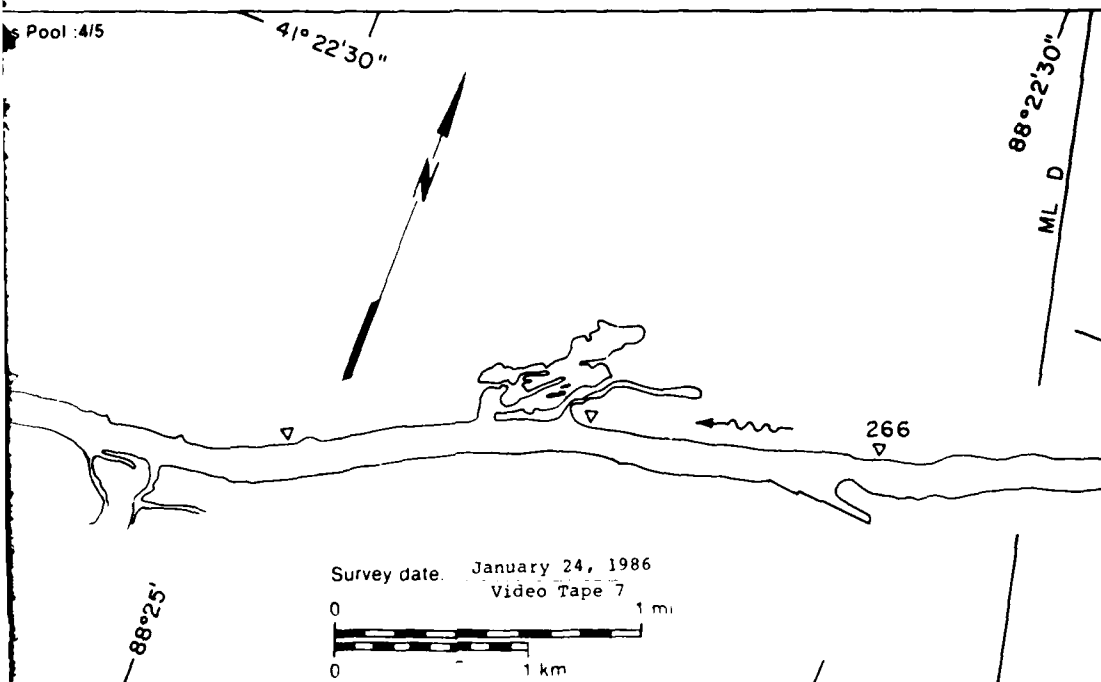
Area
($m^2 \times 10^6$)

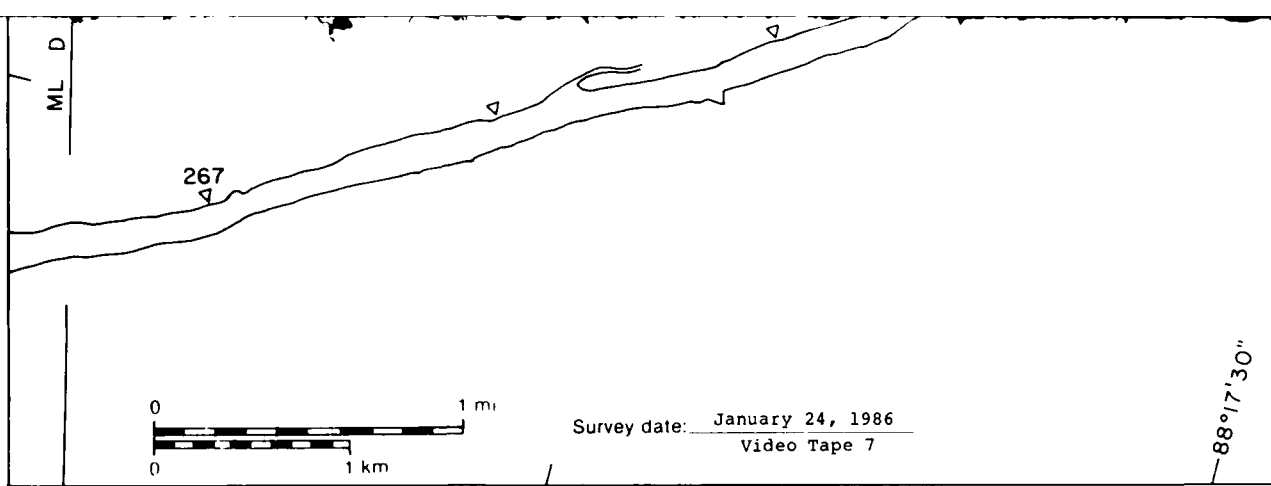
Surface
concentration
(%)

8.00

NA

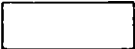


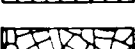
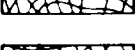

24 January 1986





Marseilles Pool

MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Total area ($m^2 \times 10^6$)

Area ($m^2 \times 10^6$)	Surface concentration (%)
8.00	NA
0.03	NA
0.00	—
0.00	NA
0.00	—
0.16	1
8.19	

ary 24, 1986
deo Tape 7

88°17'30"

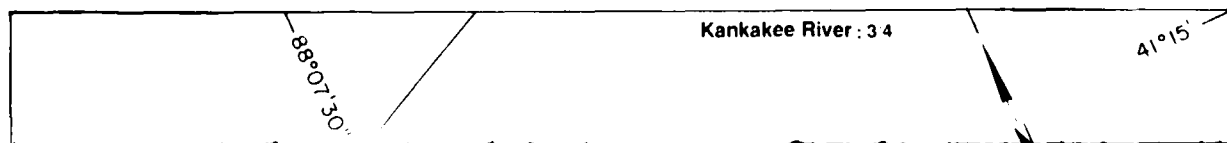
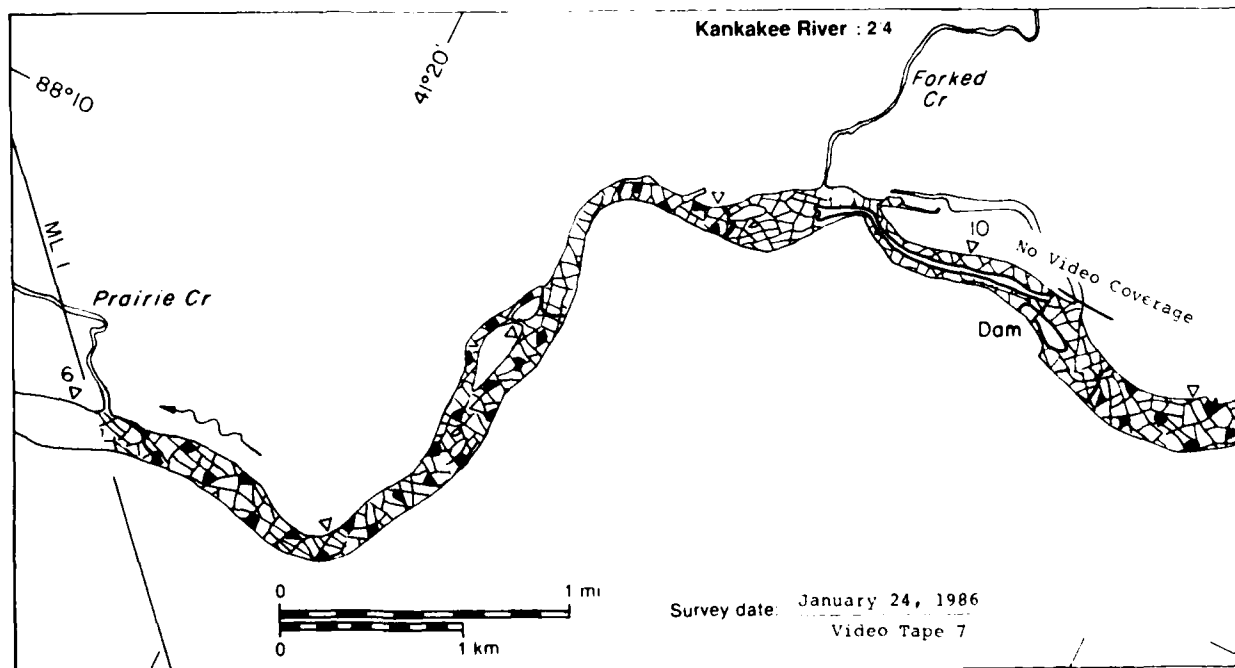
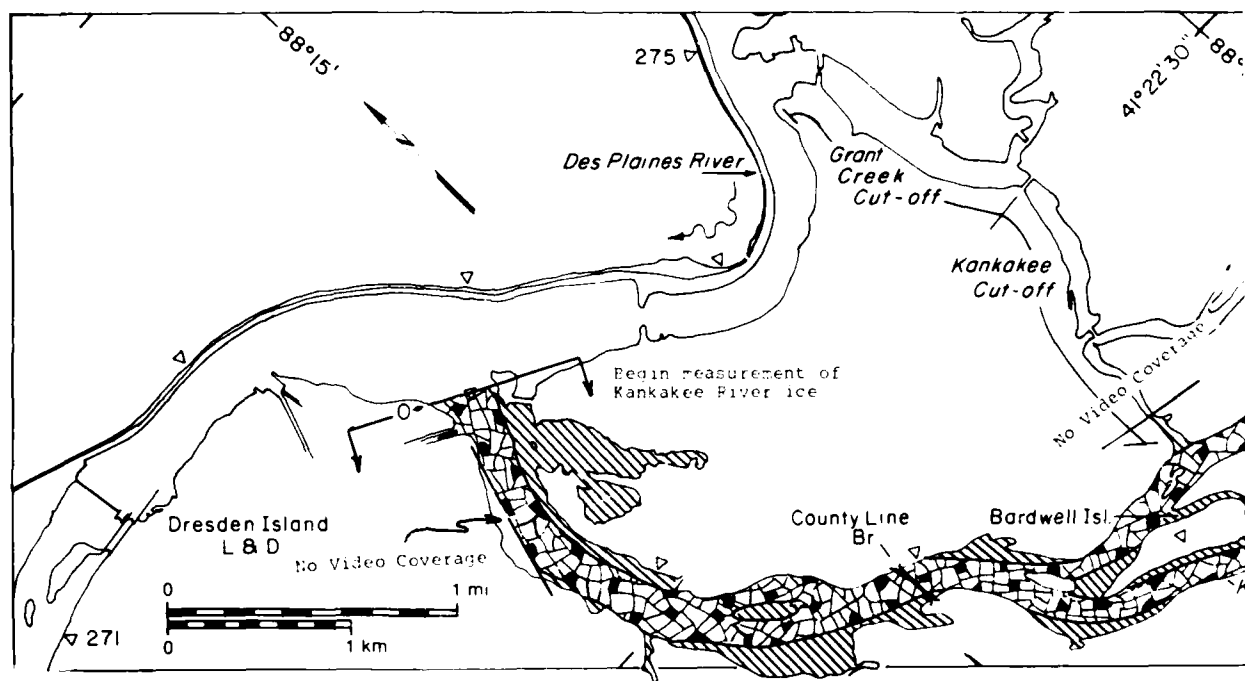
41°22'30"

Kankakee R.

Des
Plaines
River

Δ273

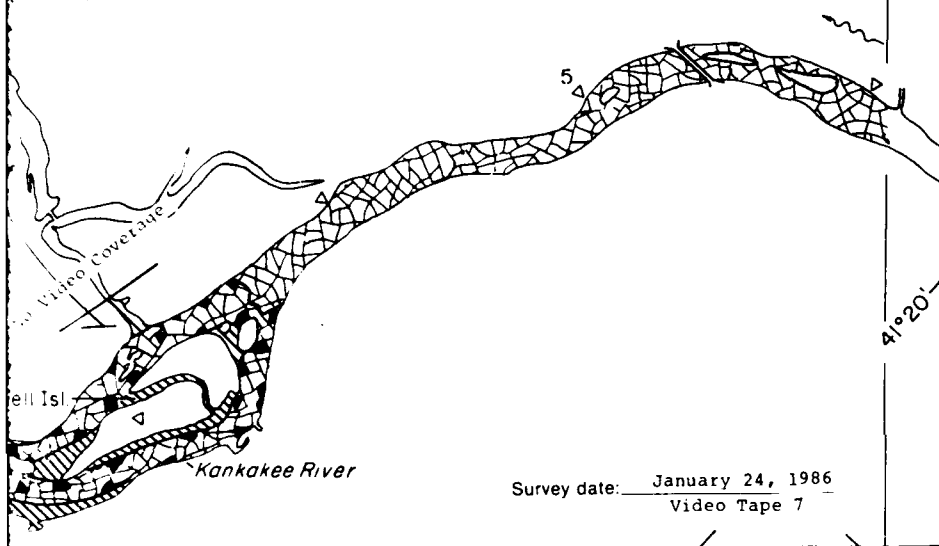
24 January 1986



Kankakee River : 1/4

ML
1

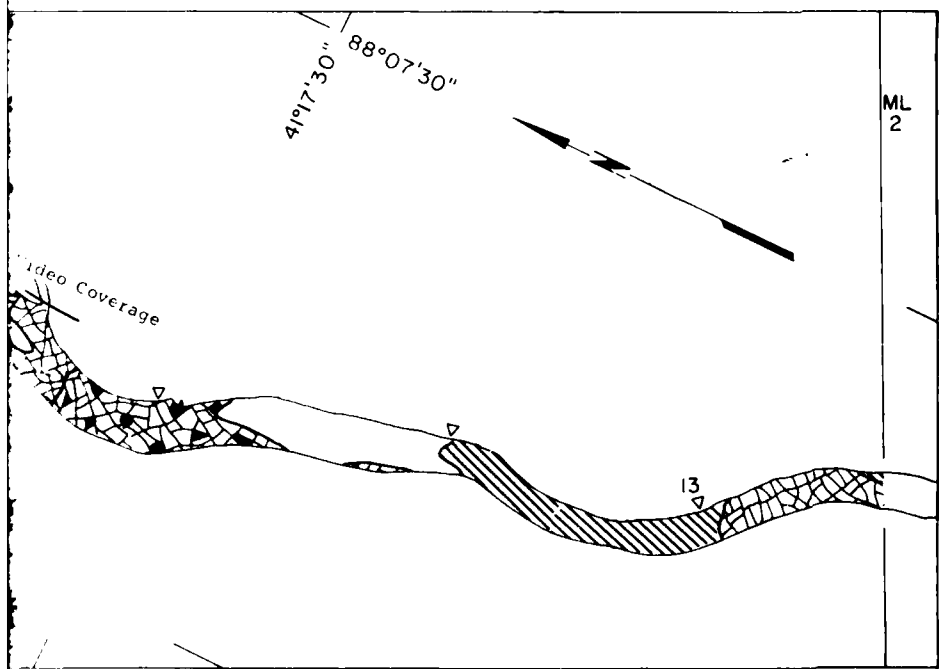
41°22'30" 88°12'30"



Survey date: January 24, 1986
Video Tape 7

ML
2

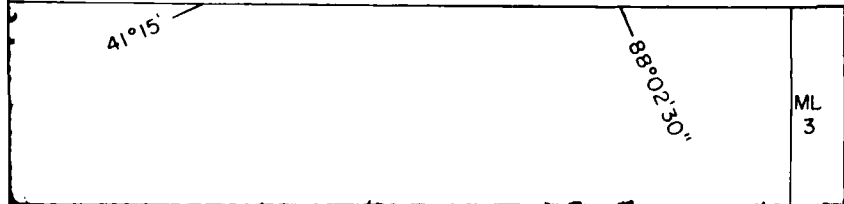
41°17'30" 88°07'30"

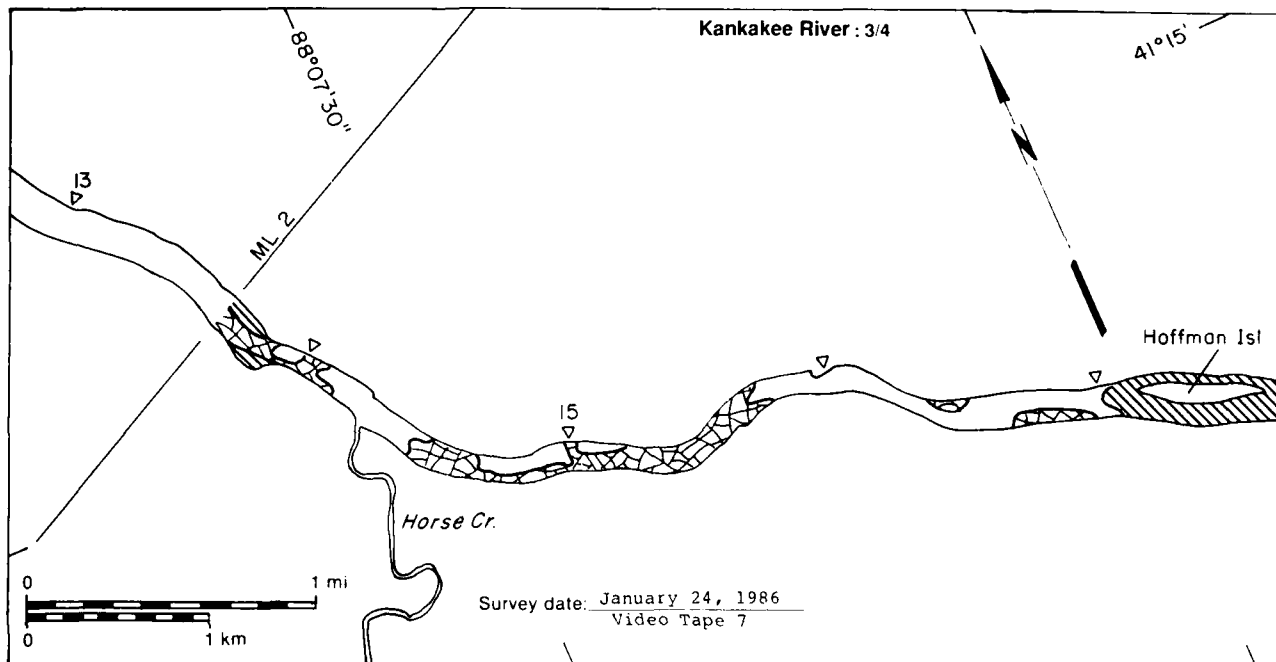
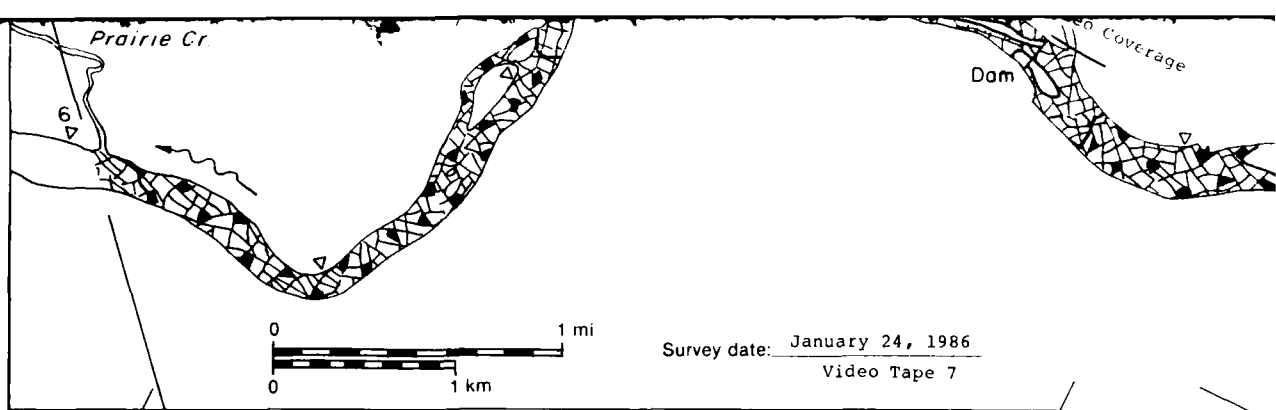


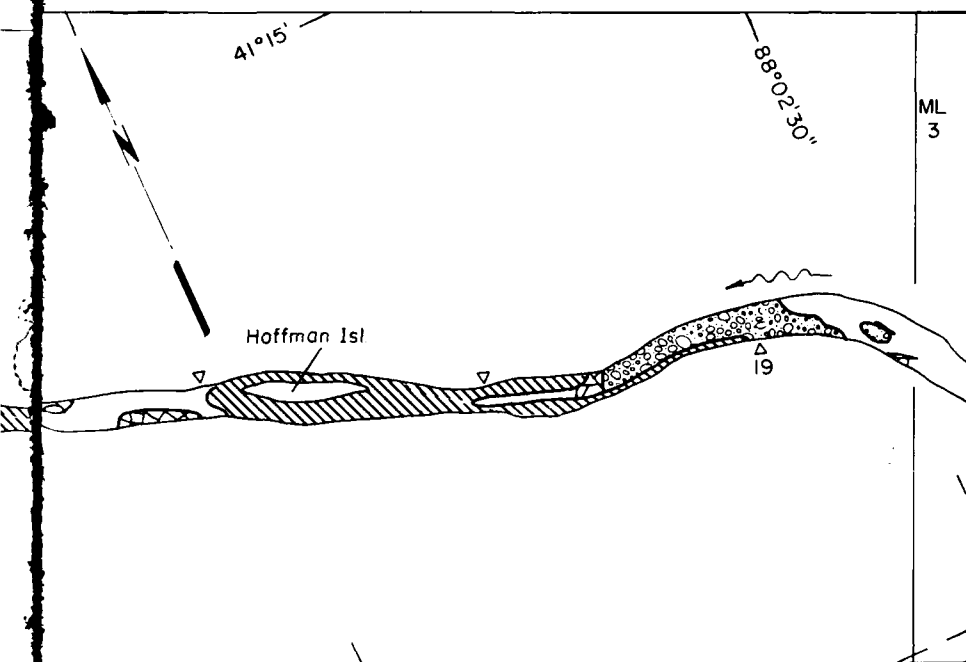
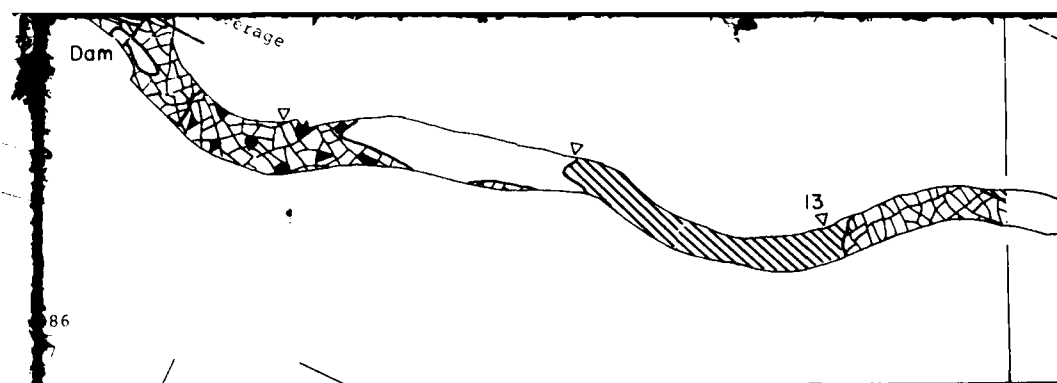
ML
3

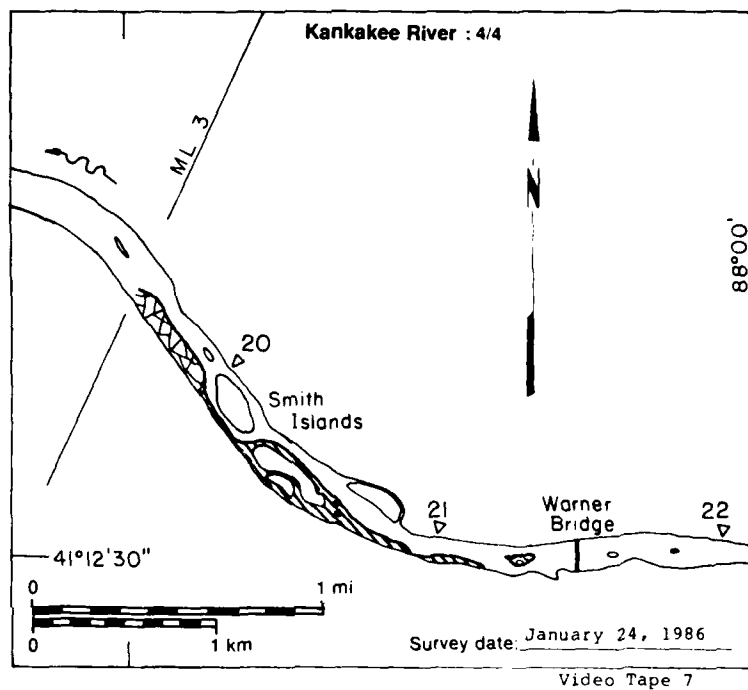
41°15'

88°02'30"



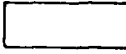



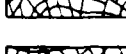







Kankakee River

MAP UNITS







-  Open water
-  Solid ice cover
-  Solid ice cover open-water area
-  Fragmented ice
-  Fragmented ice with open-water
-  Ice floes or frazil and pans

Total area (

24 January 1986

Kankakee River

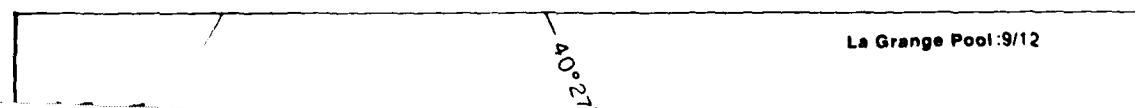
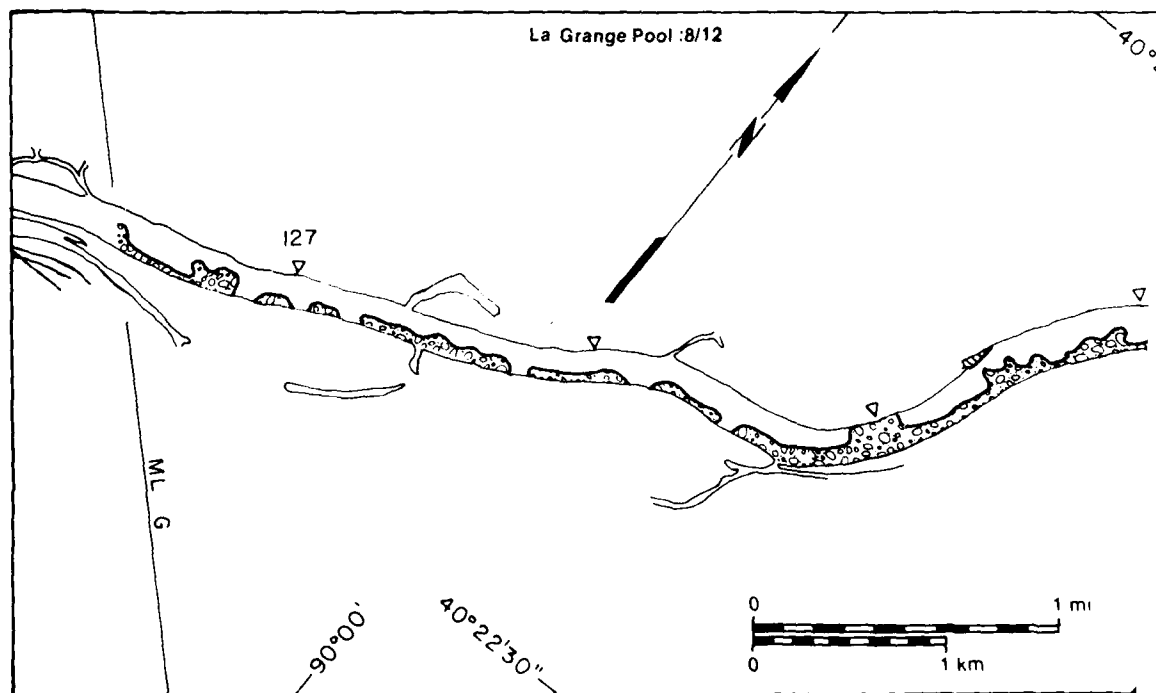
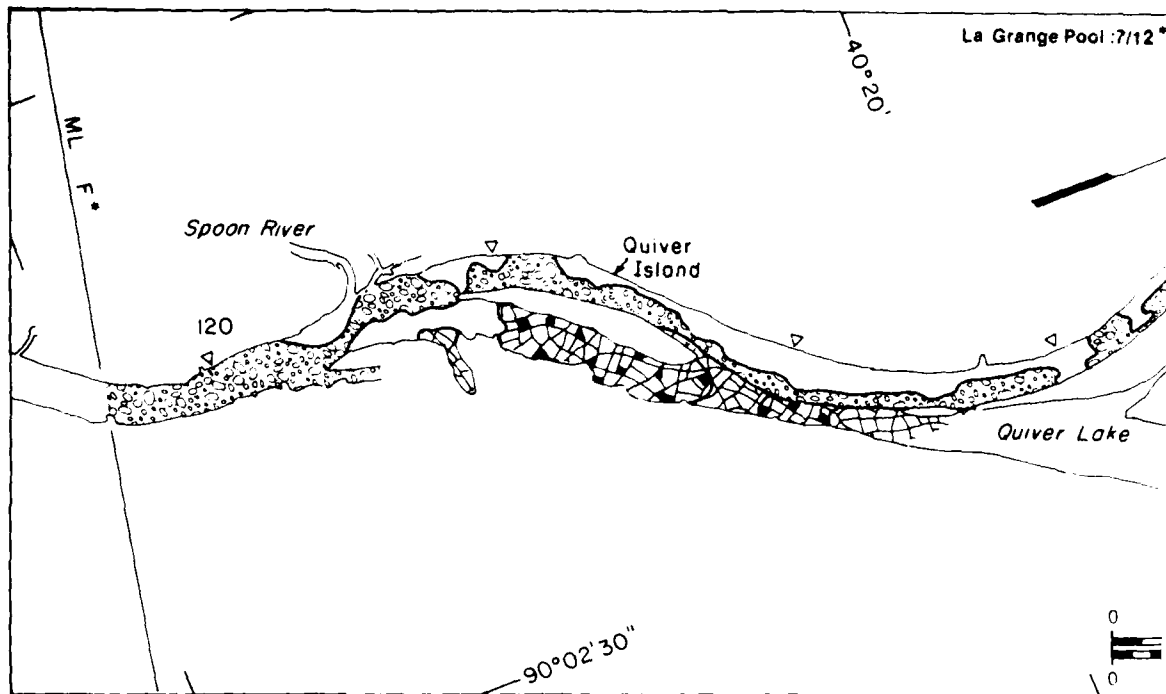
MAP UNITS

	Area ($m^2 \times 10^6$)	Surface concentration (%)
 Open water	1.42	NA
 Solid ice cover	1.54	NA
 Solid ice cover with open-water areas	0.00	—
 Fragmented ice cover	1.81	NA
 Fragmented ice cover with open-water areas	2.21	80
 Ice floes or frazil slush and pans	0.18	1

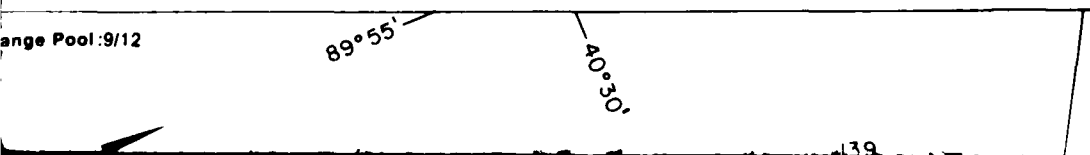
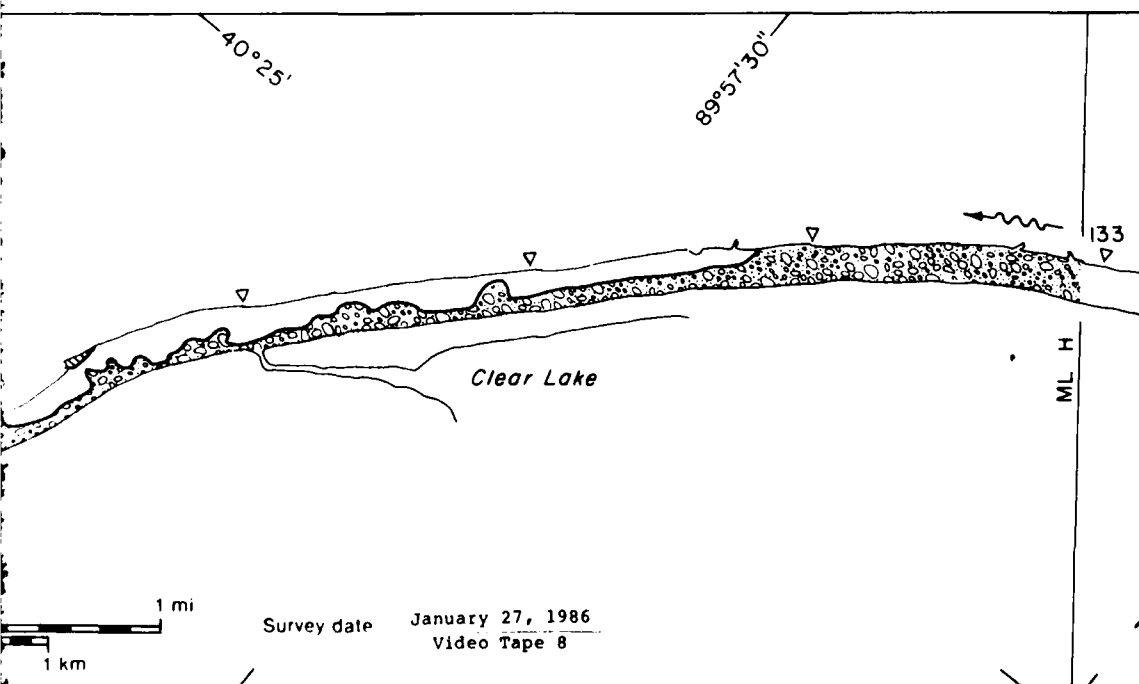
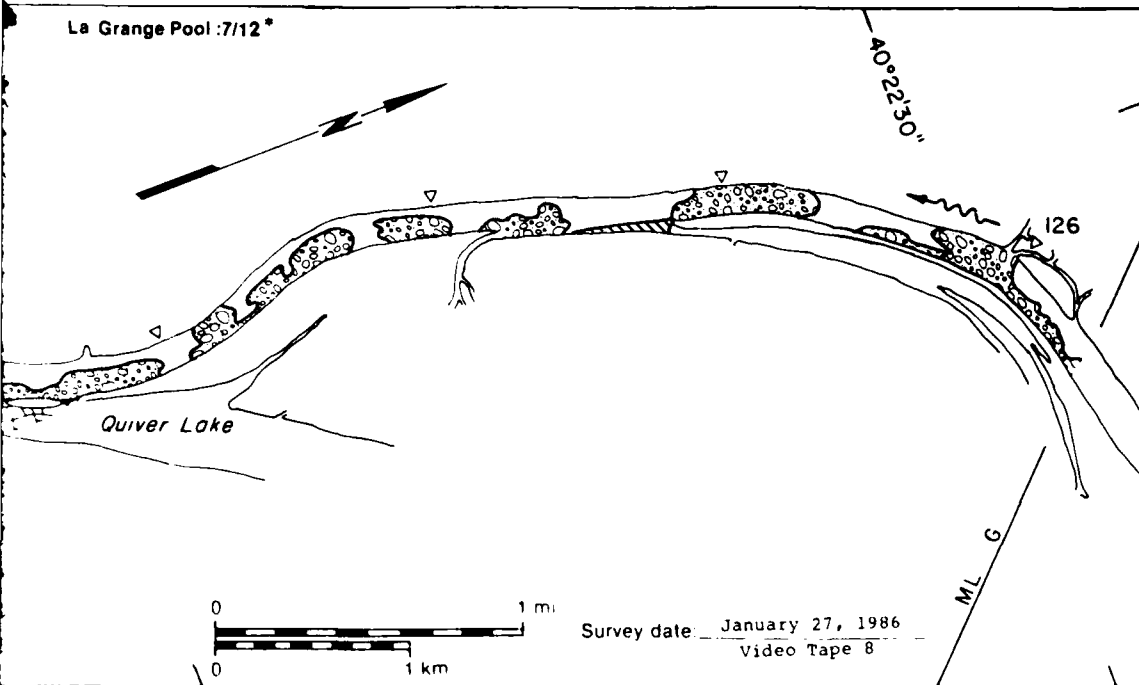
Total area ($m^2 \times 10^6$)

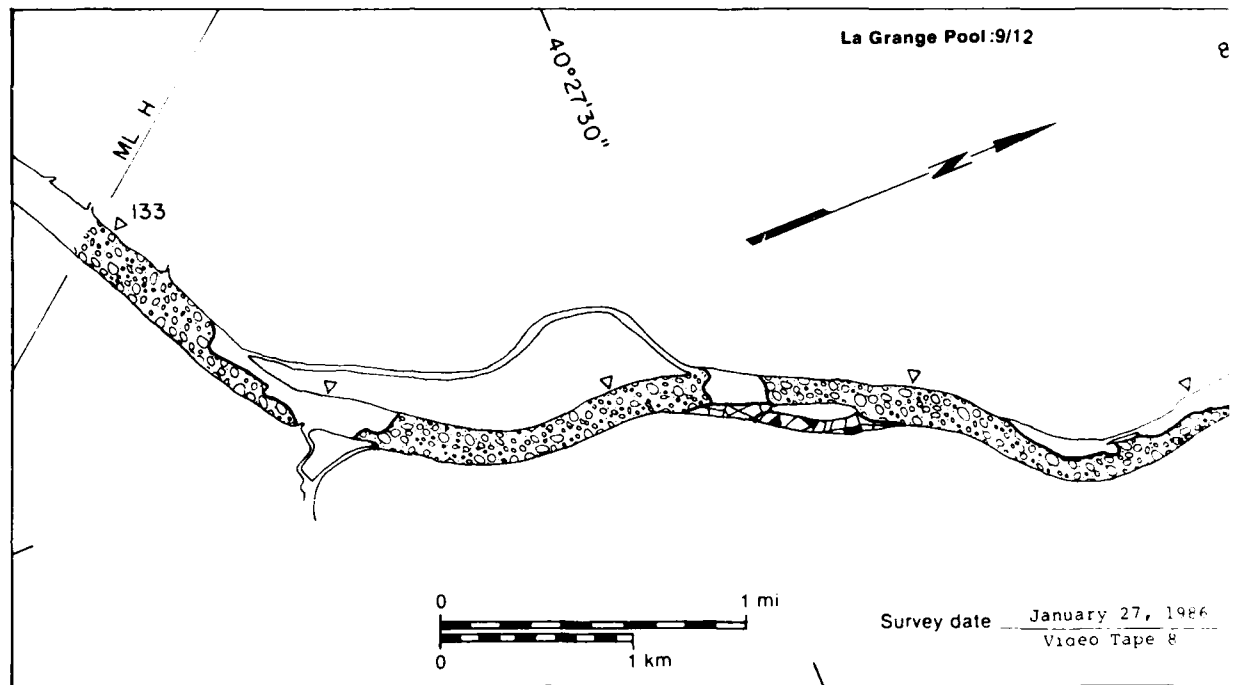
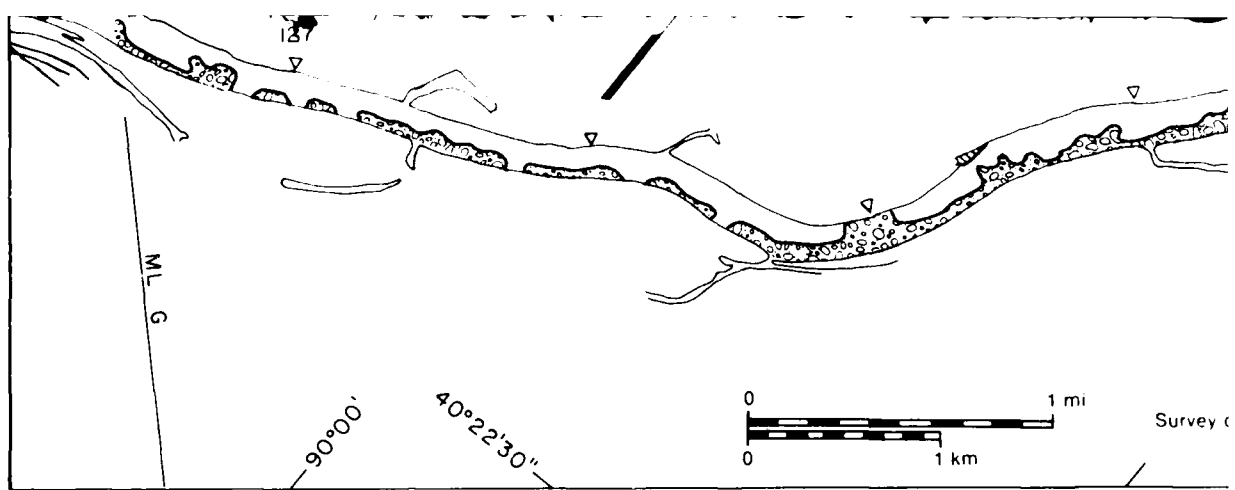
7.30*

* Includes $0.14 \times 10^6 m^2$ of no video coverage

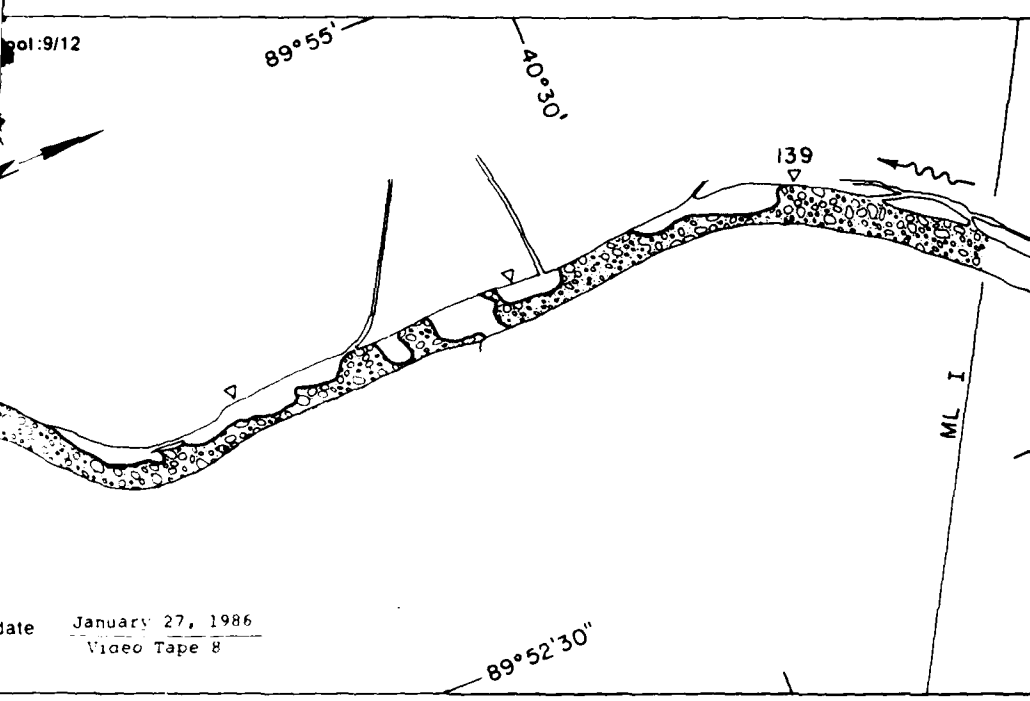
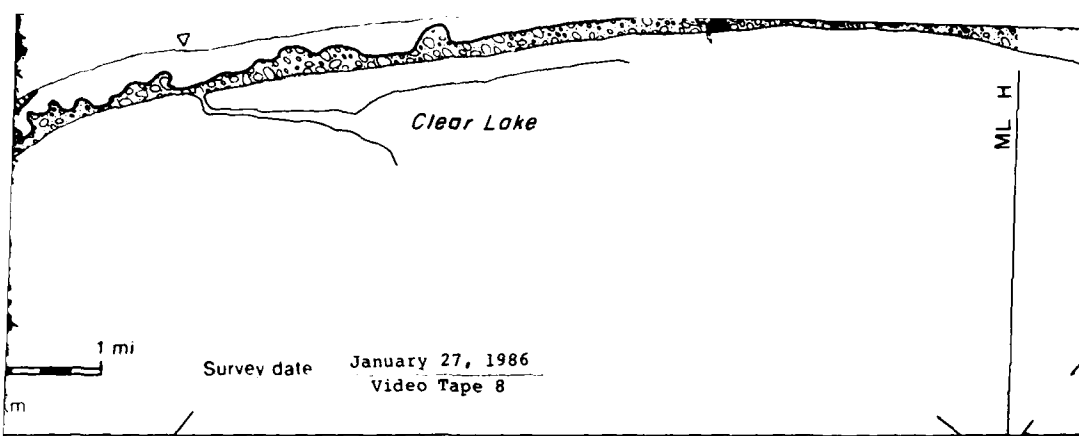


27 January 1986

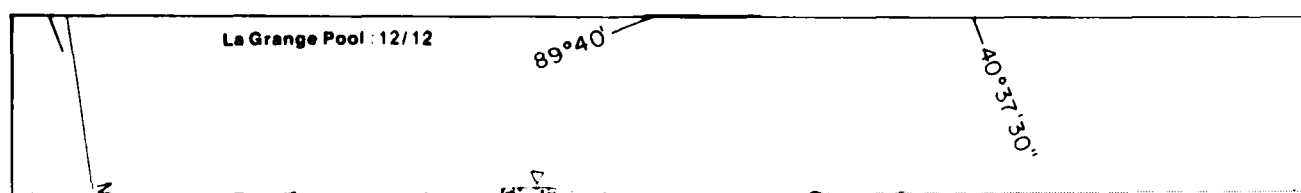
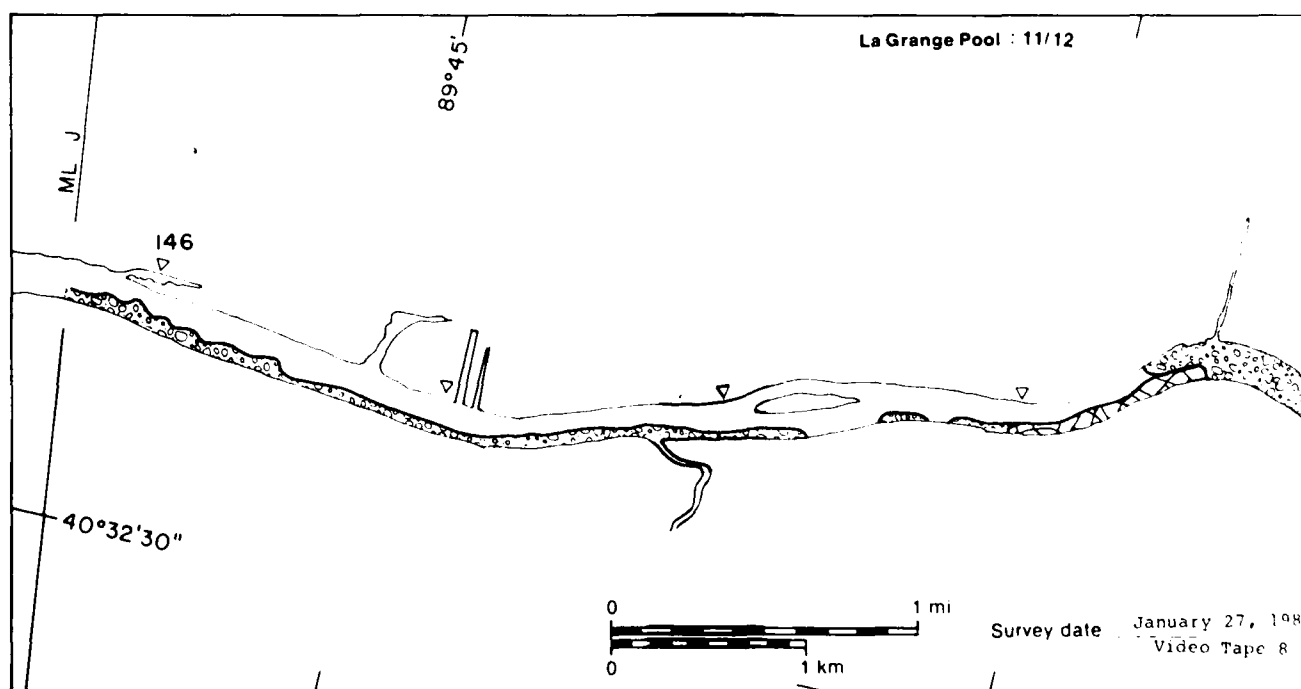
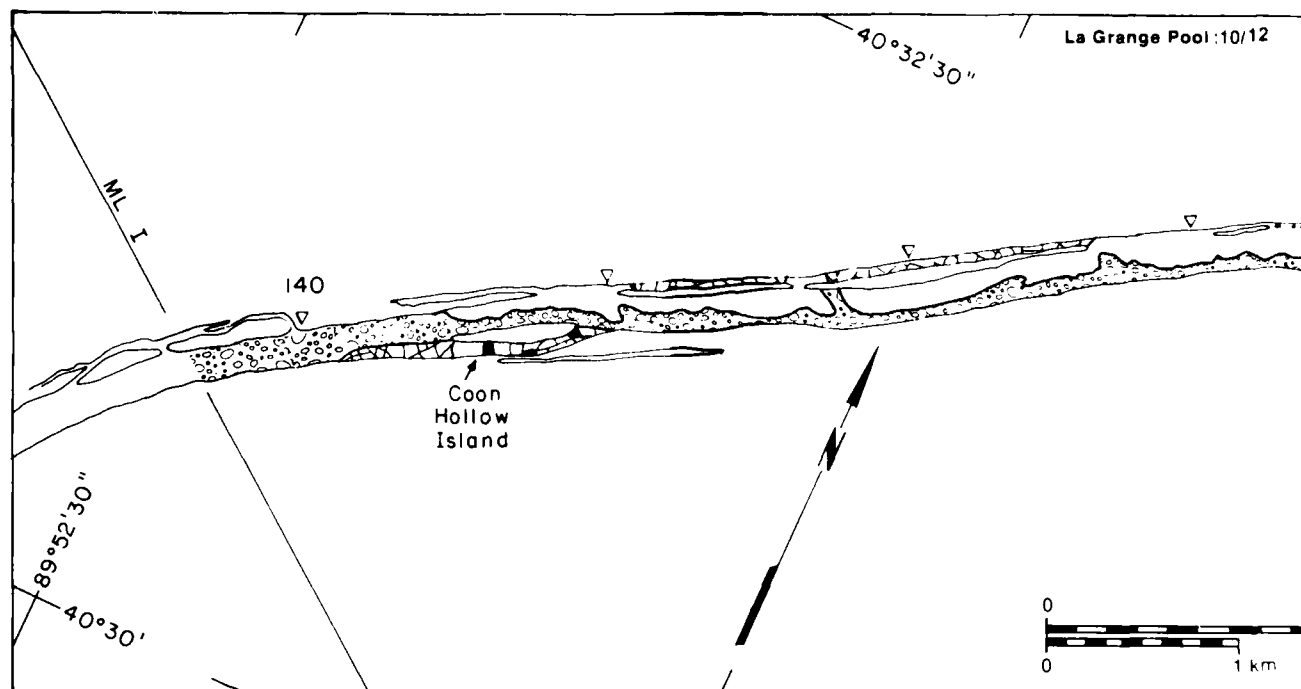


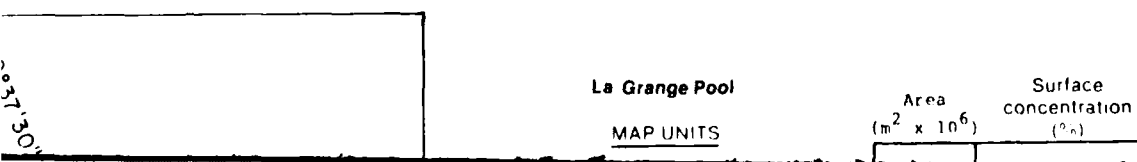
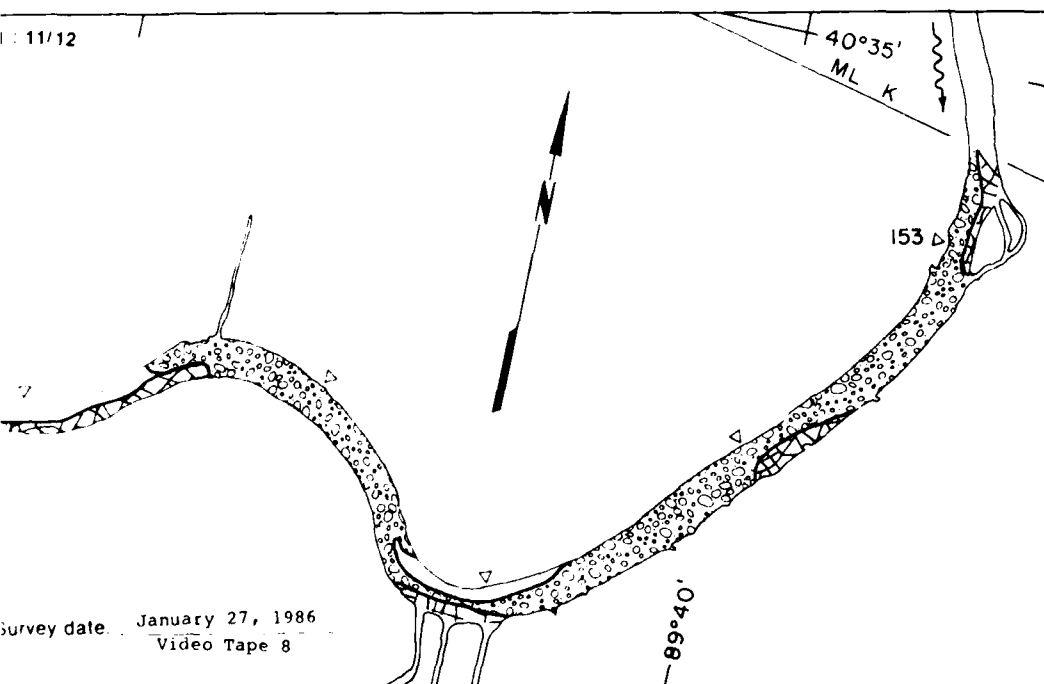
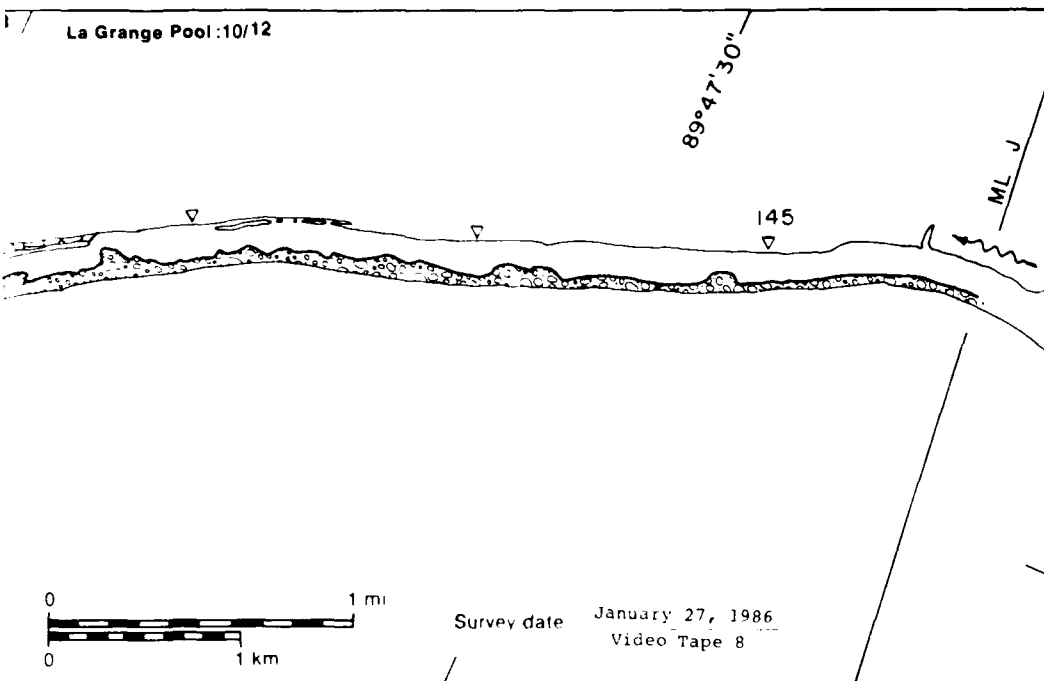


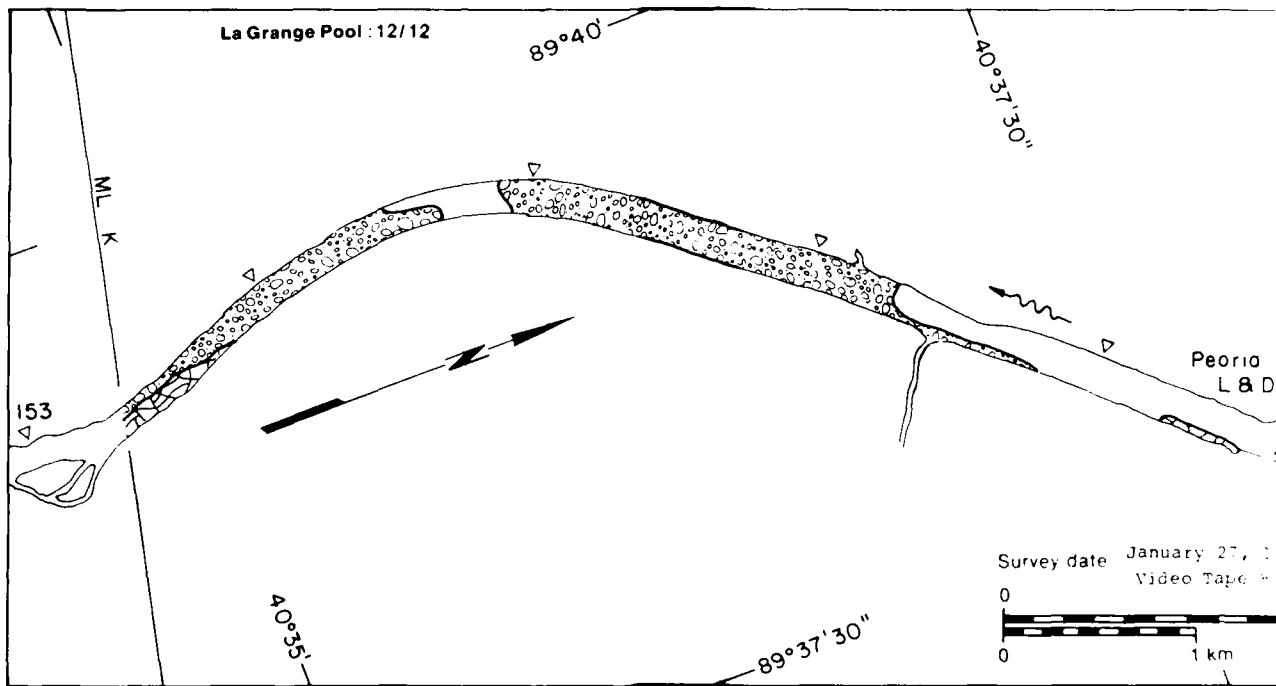
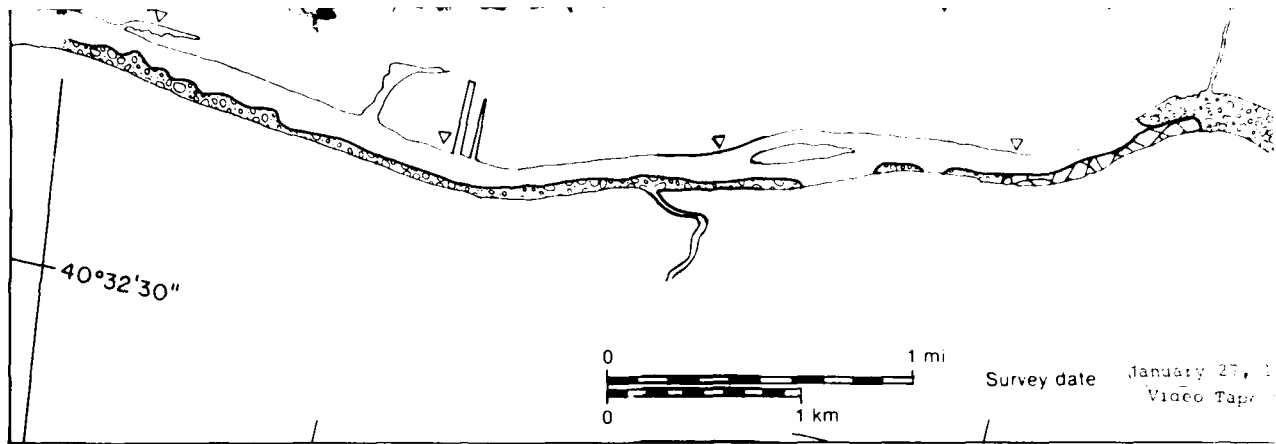
* The downstream limit of Illinois River video coverage was in the vicinity of mile 120 at Havana, Illinois, on all dates. There is no coverage of La Grange Pool maps 1/12 through 6/12 (match lines A through E).

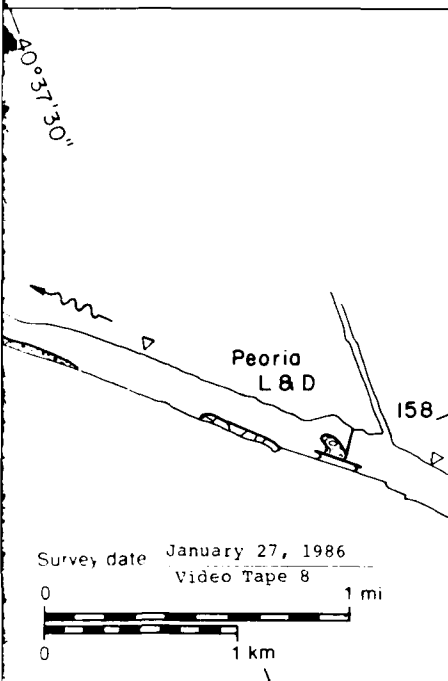
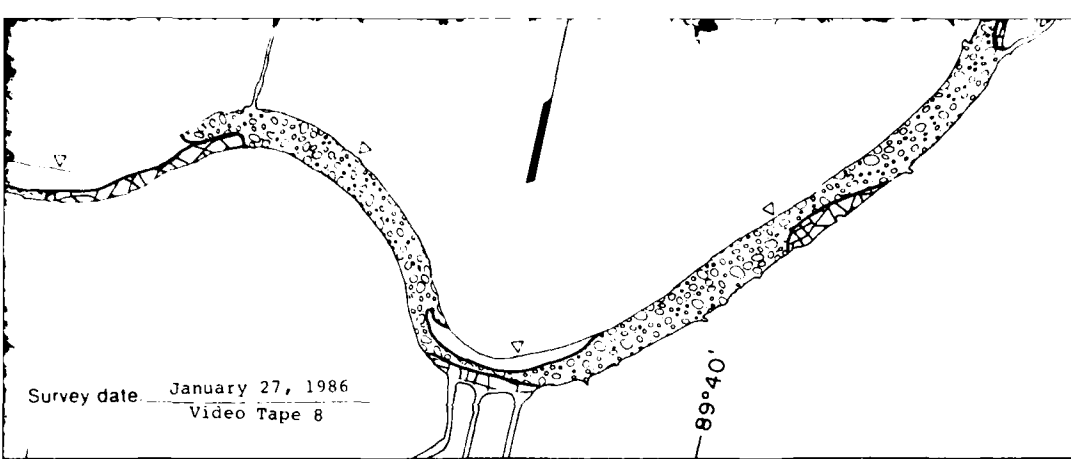


27 January 1986









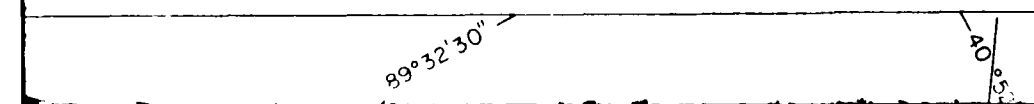
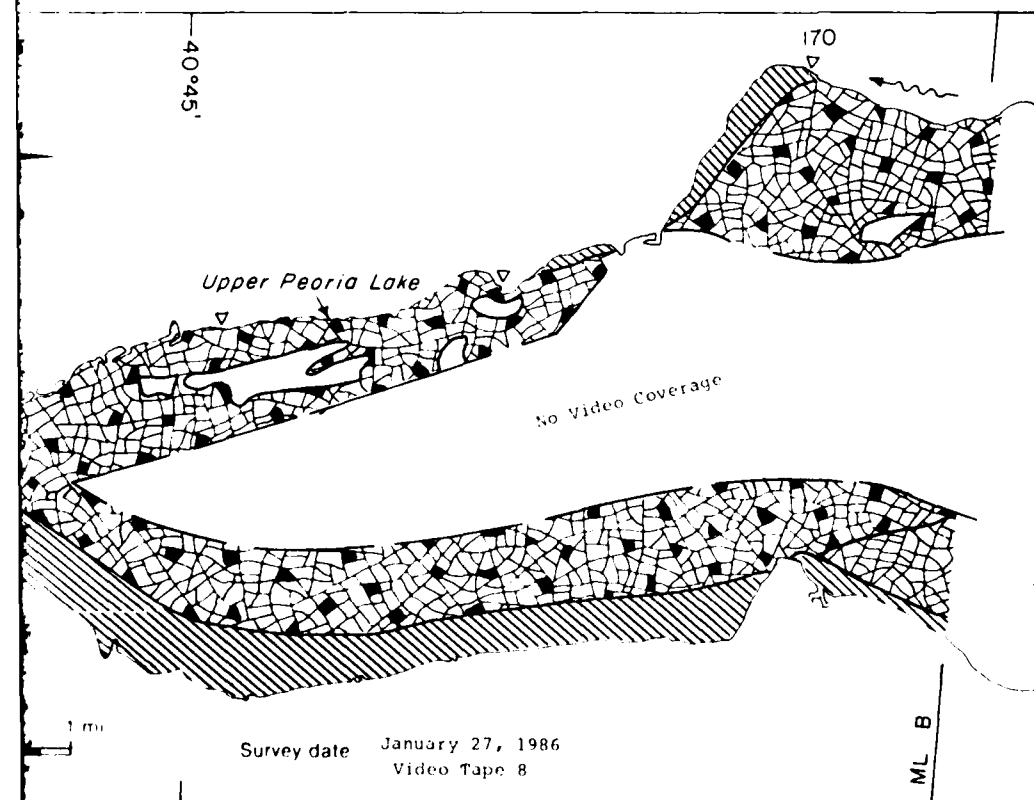
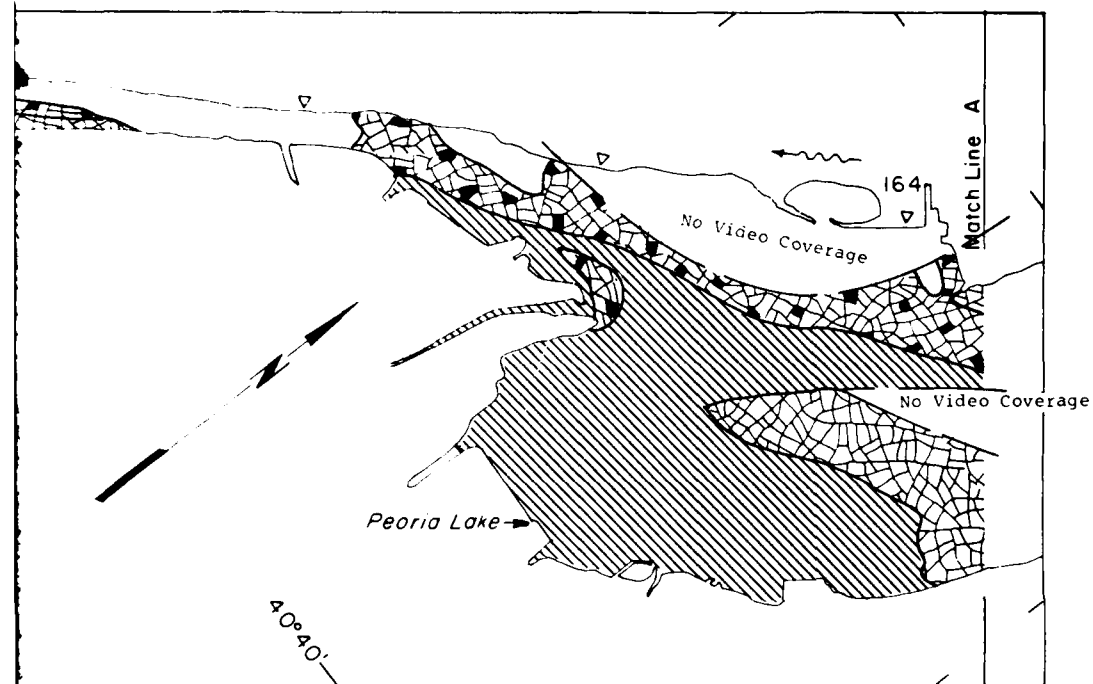
La Grange Pool

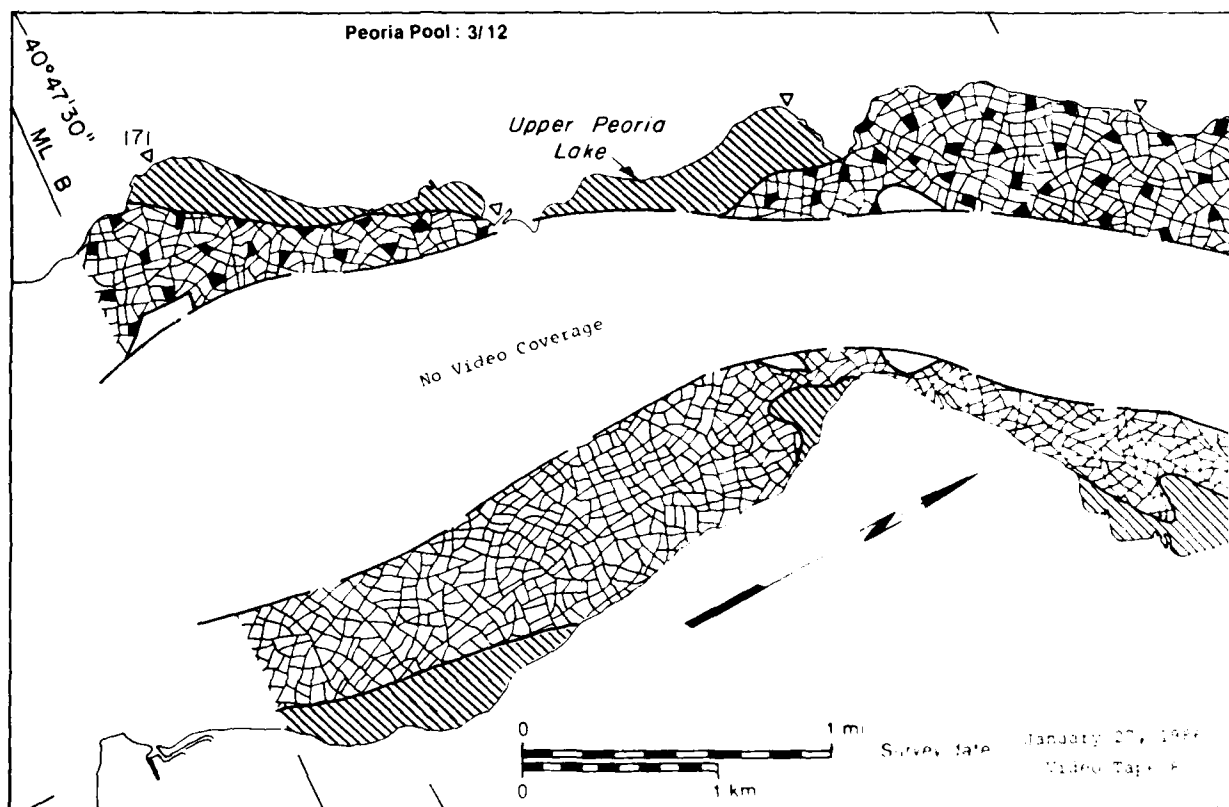
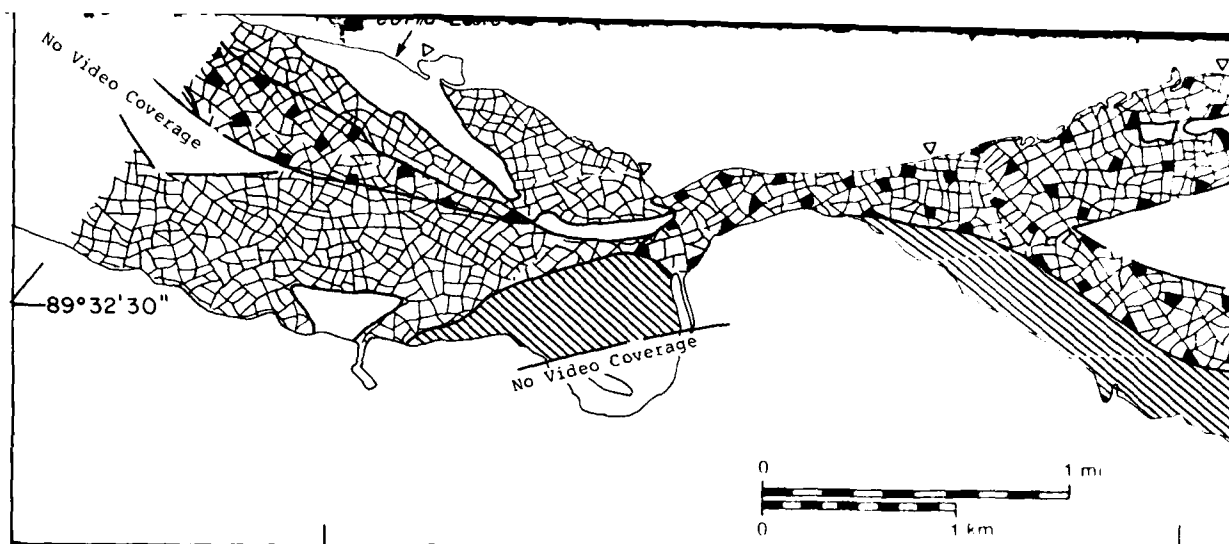
MAP UNITS

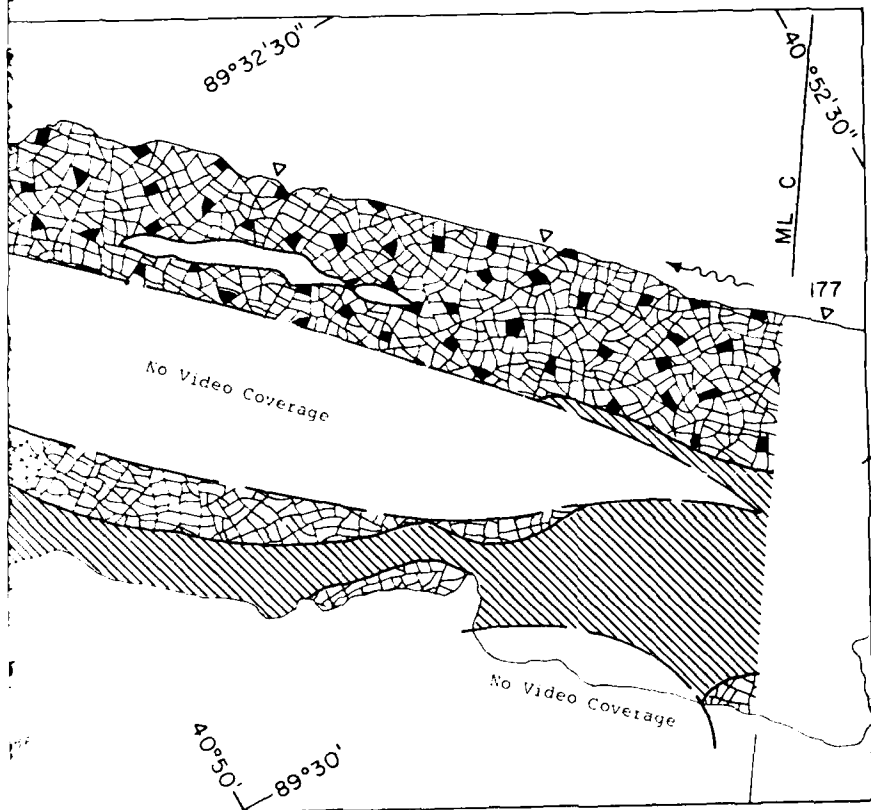
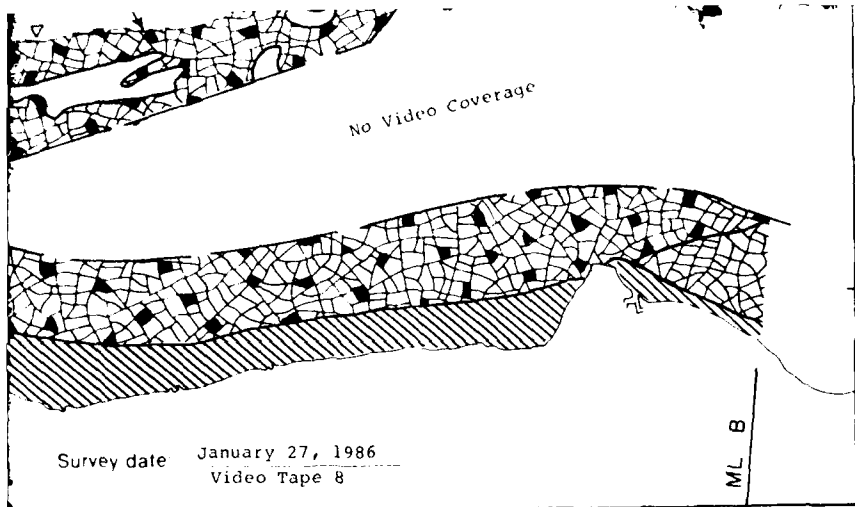
	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Area ($m^2 \times 10^6$)	Surface concentration (%)
3.88	NA
0.02	NA
0.00	—
0.73	NA
0.41	80
6.67	30
Total area ($m^2 \times 10^6$)	11.71

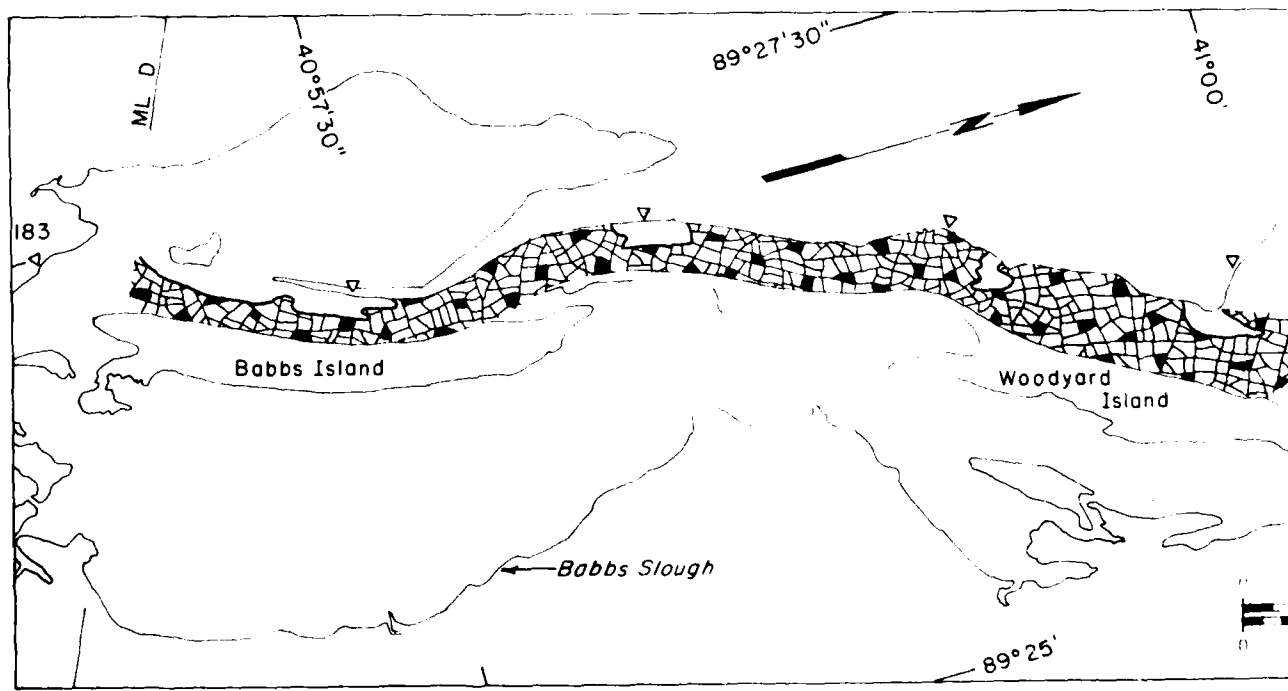
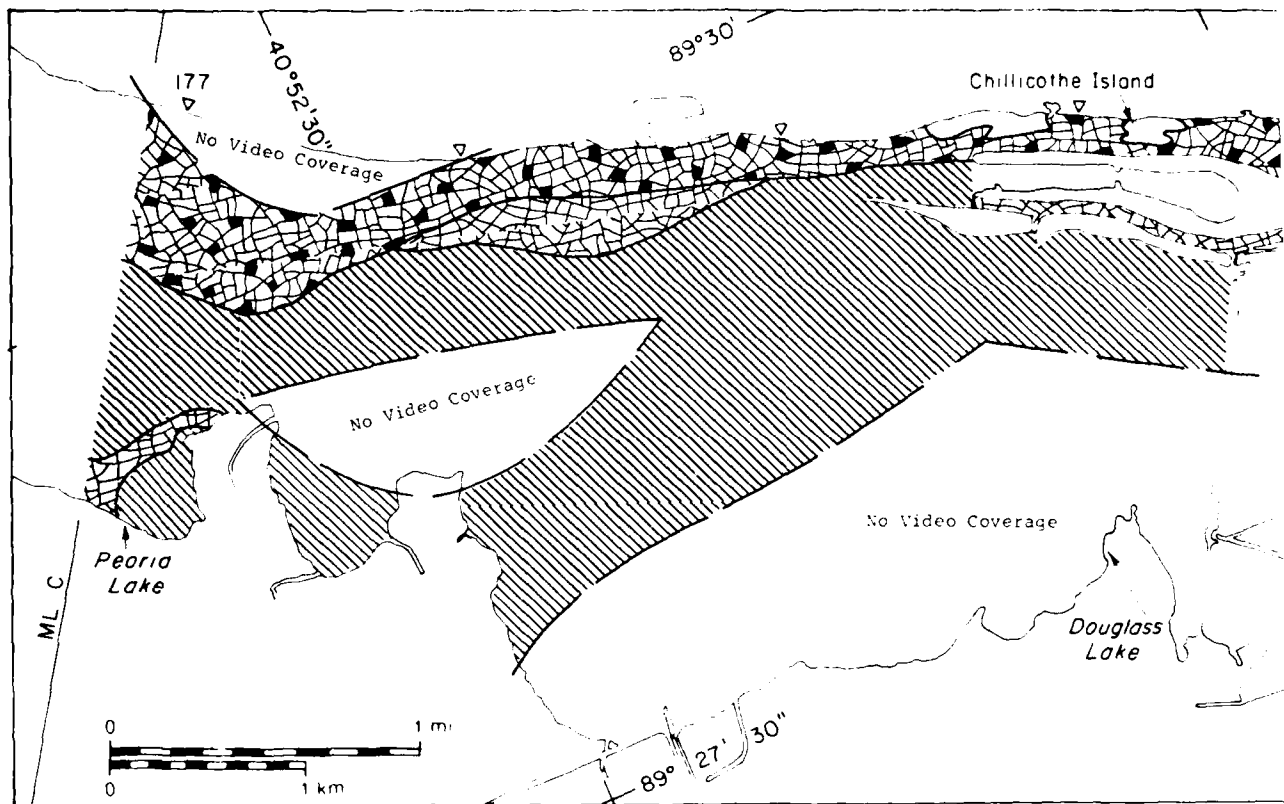
27 January 1986

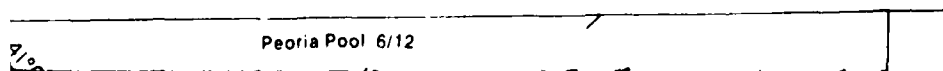
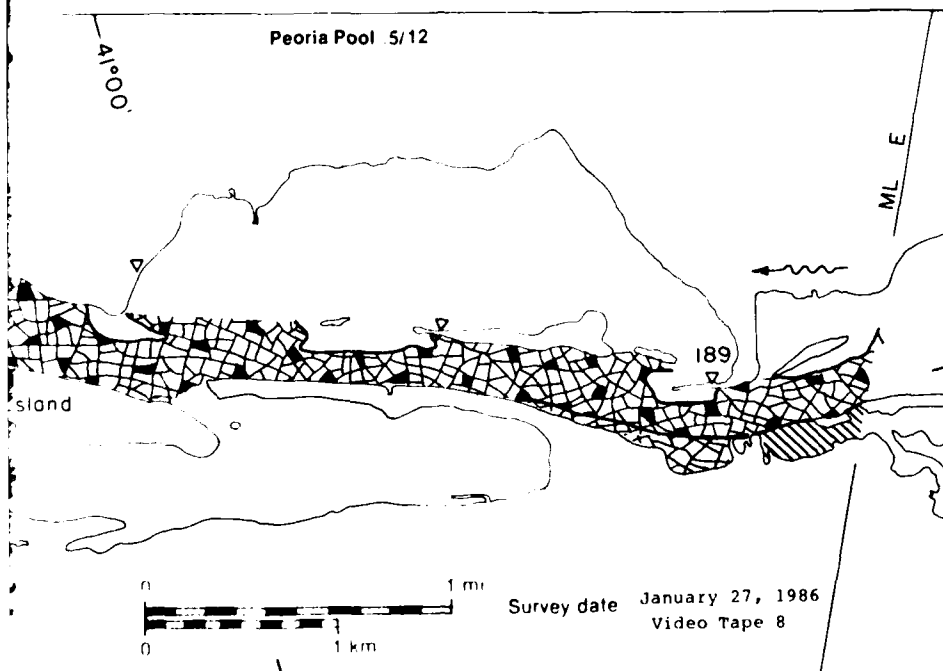
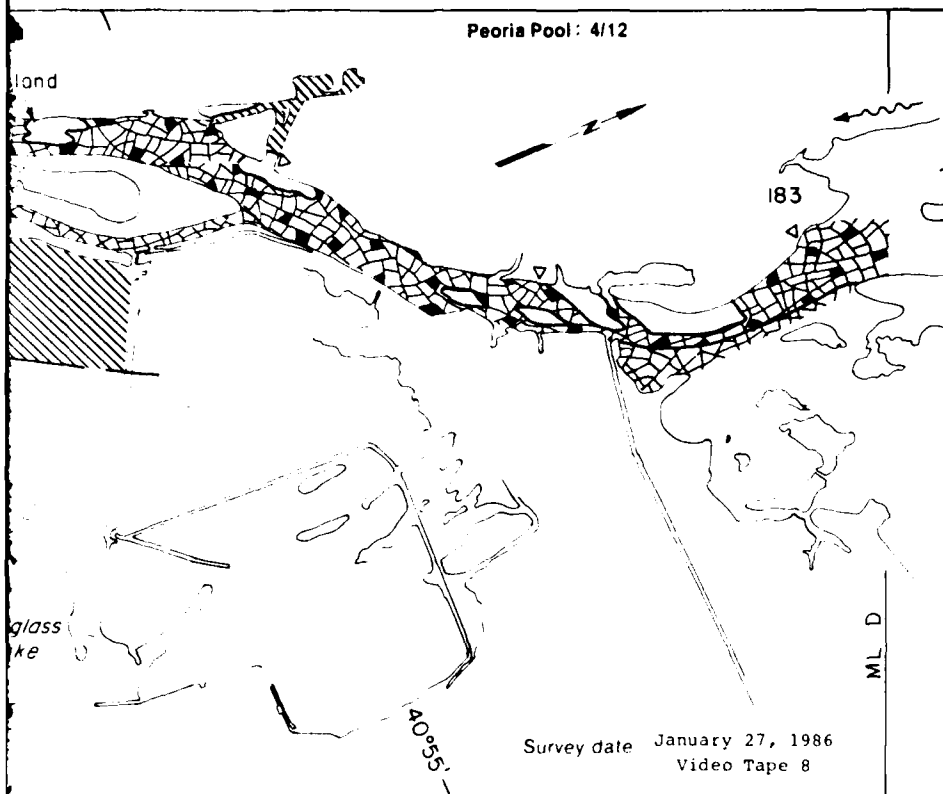


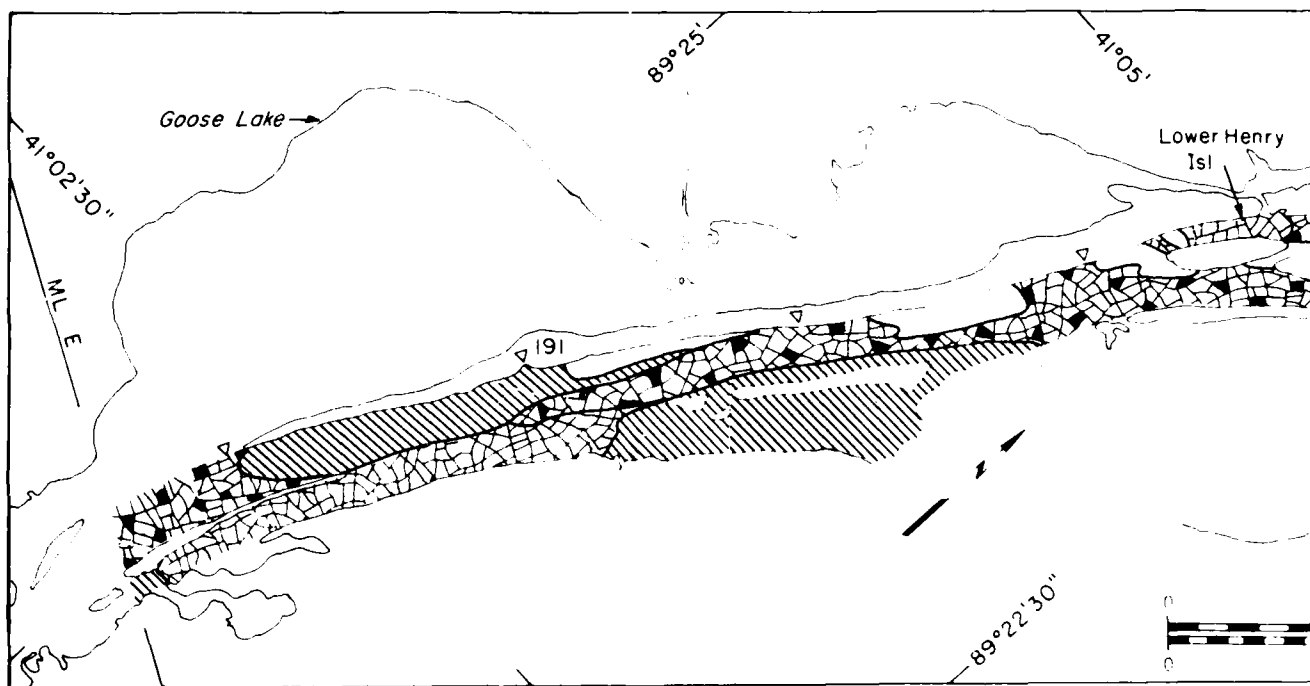
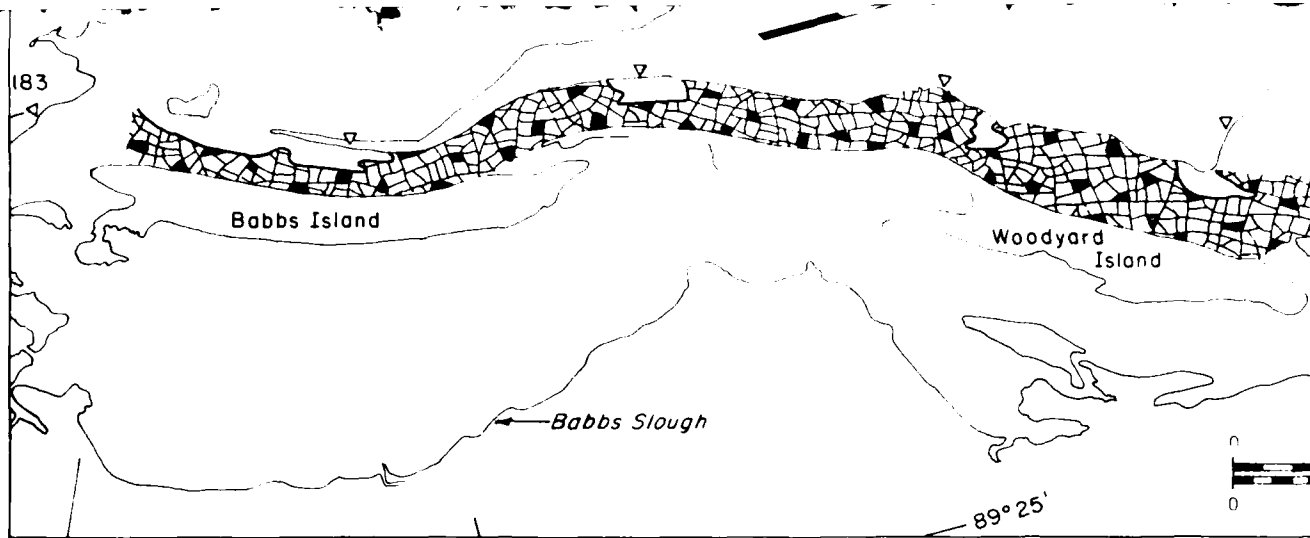


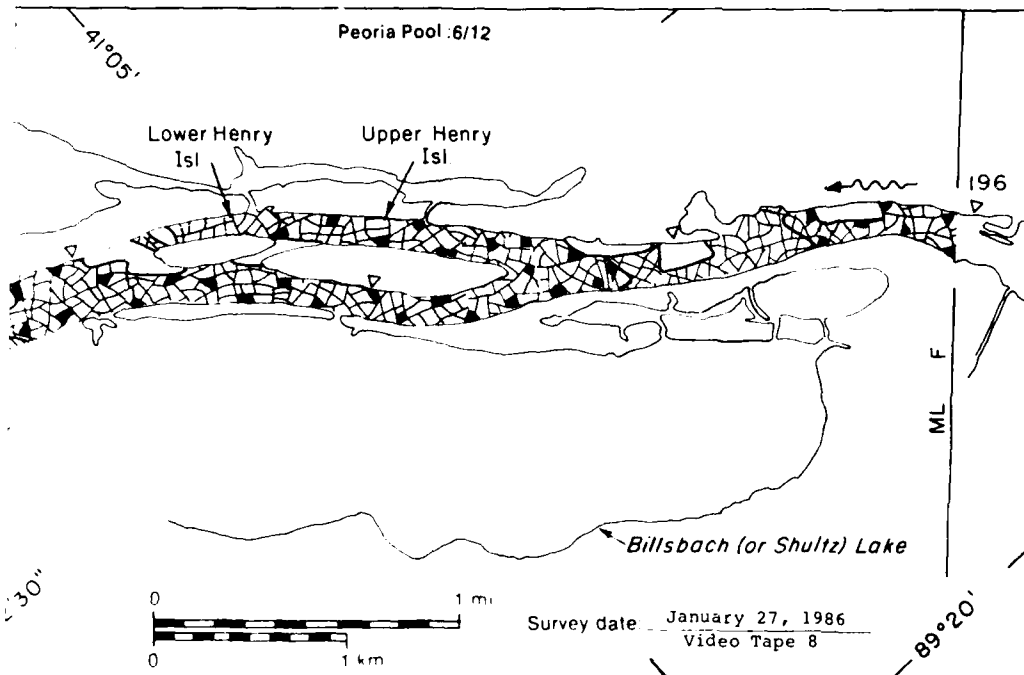
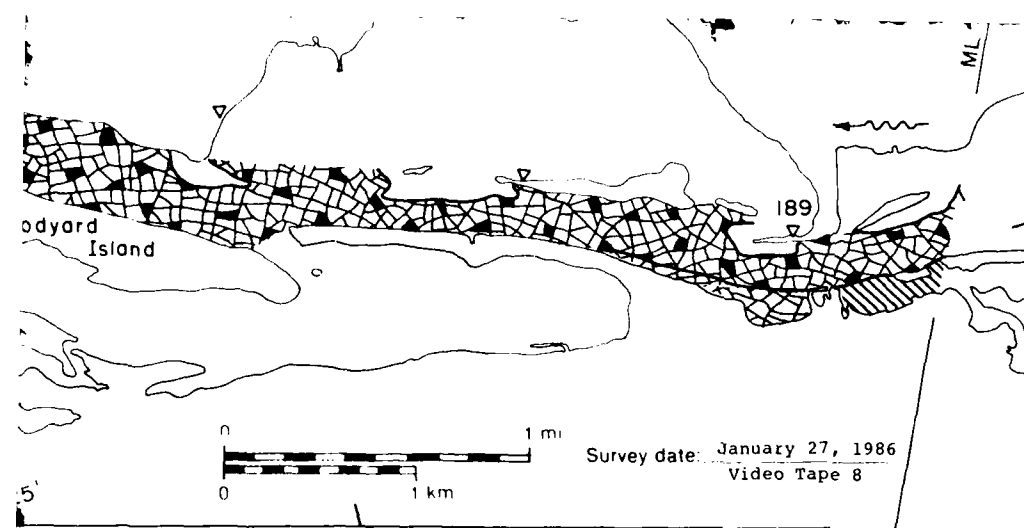


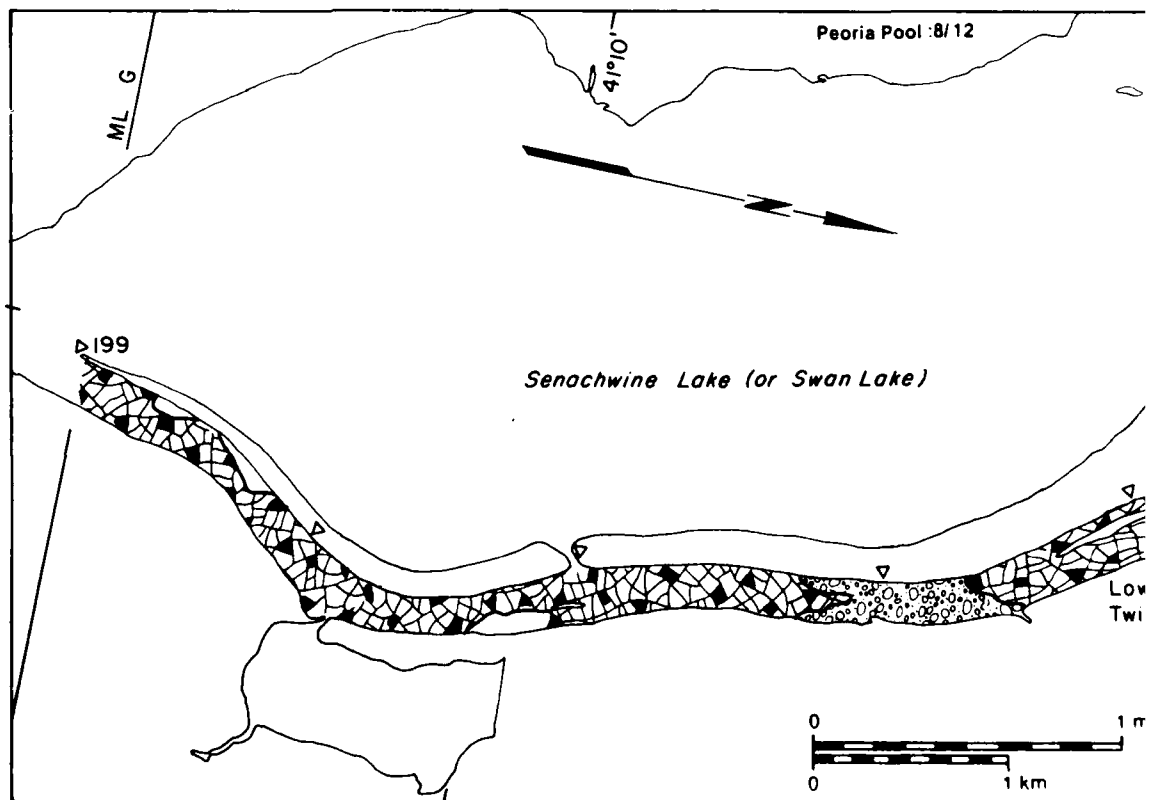
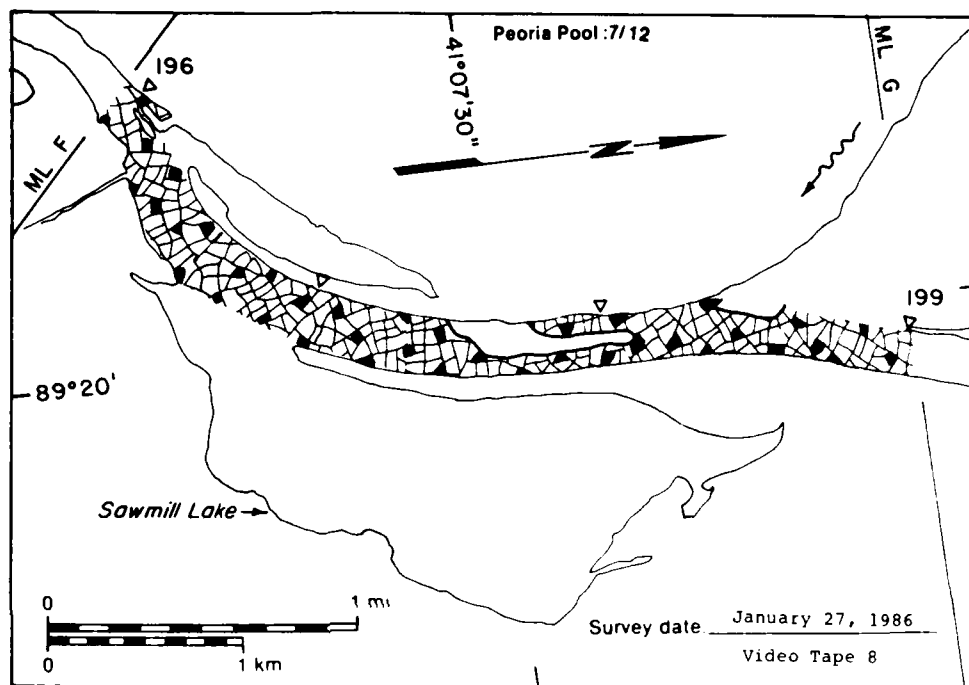
27 January 1986



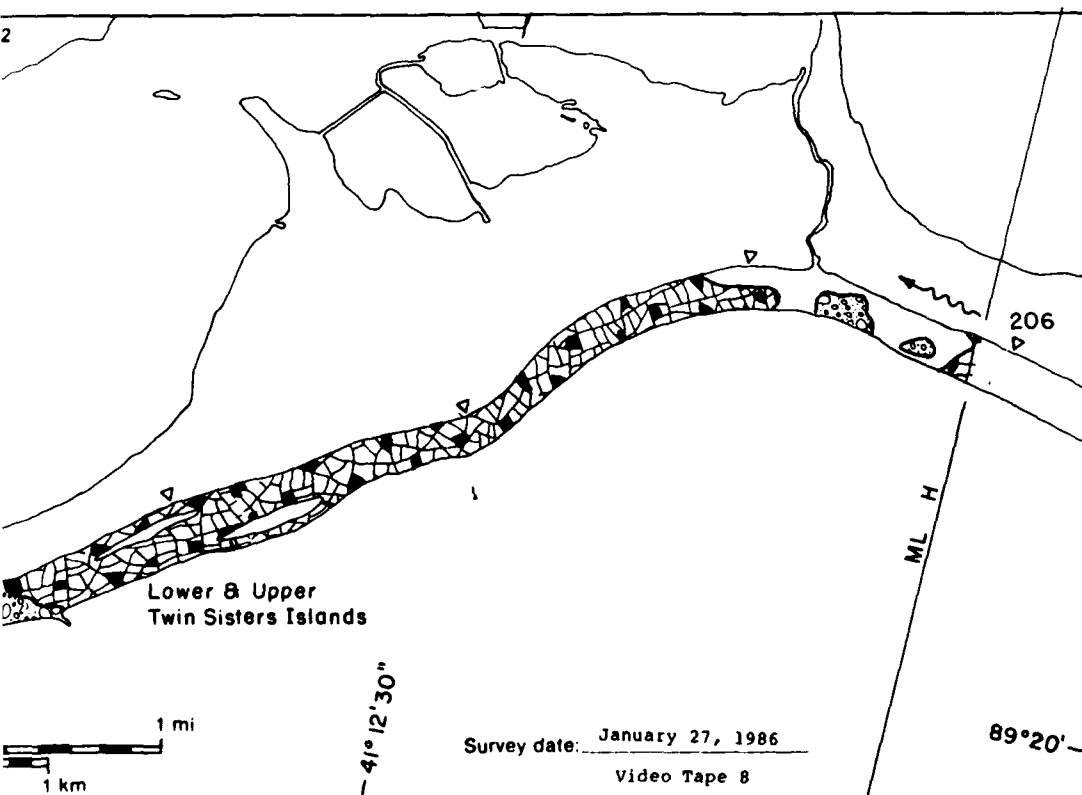


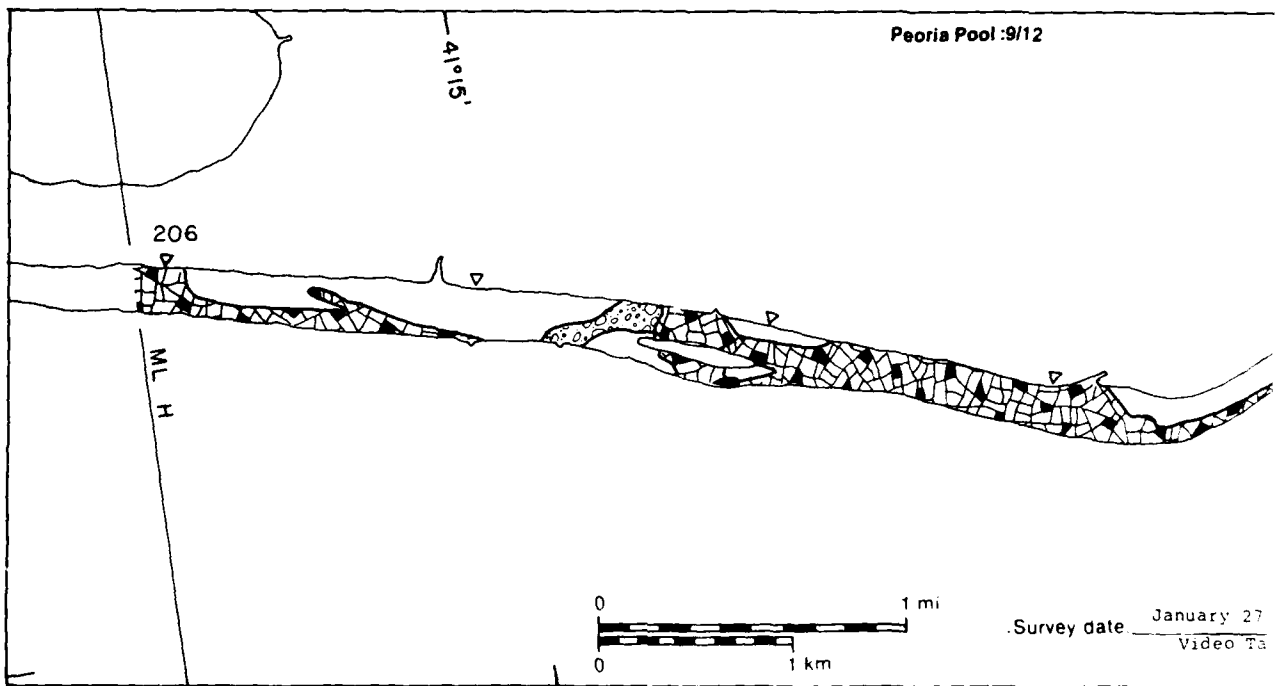
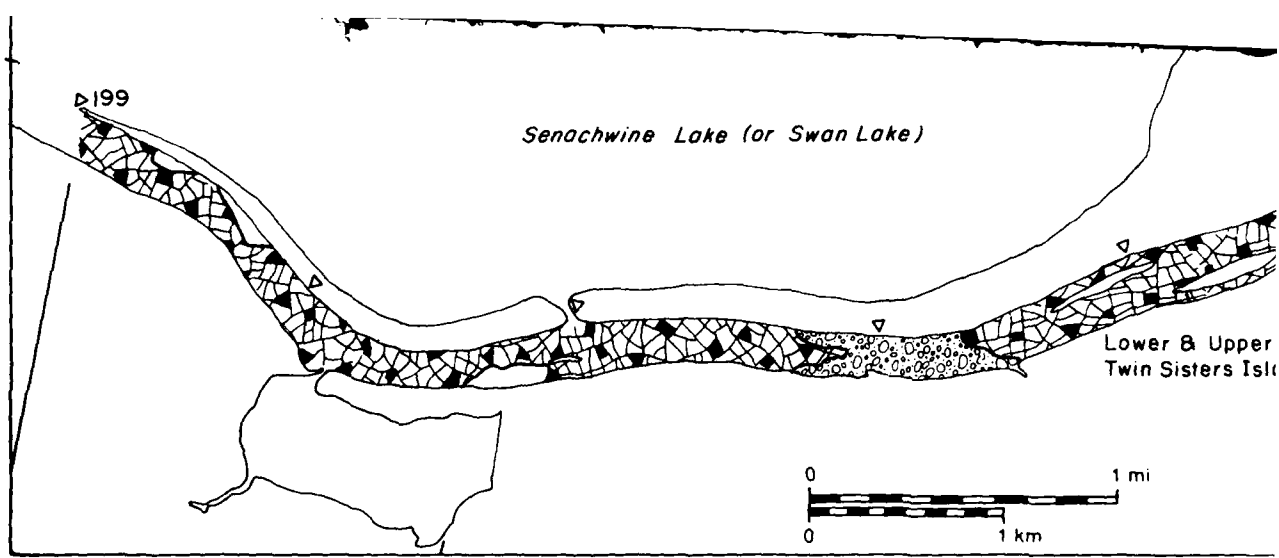


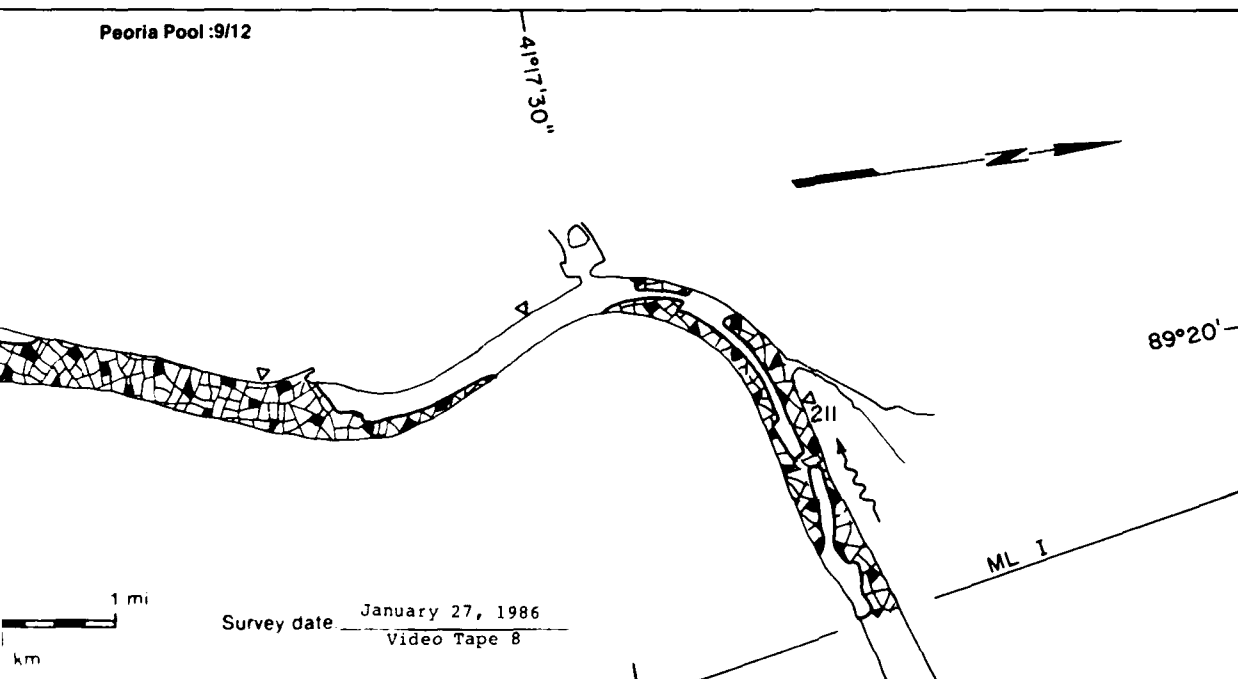
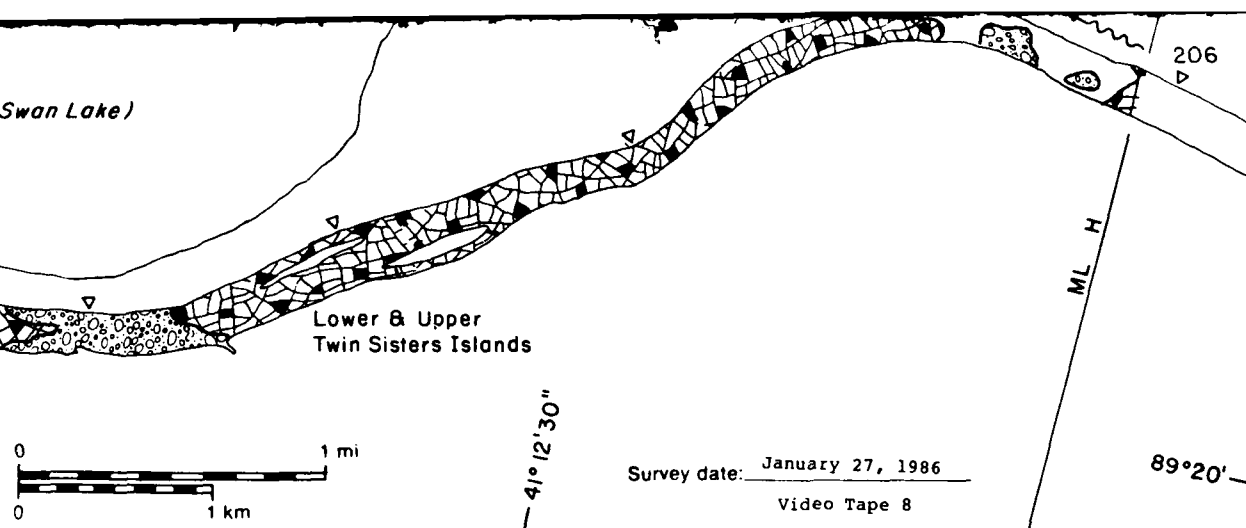




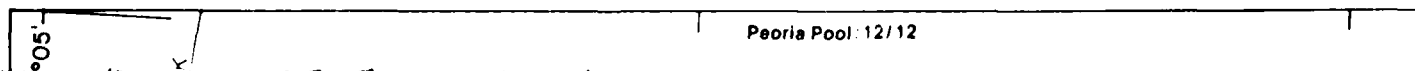
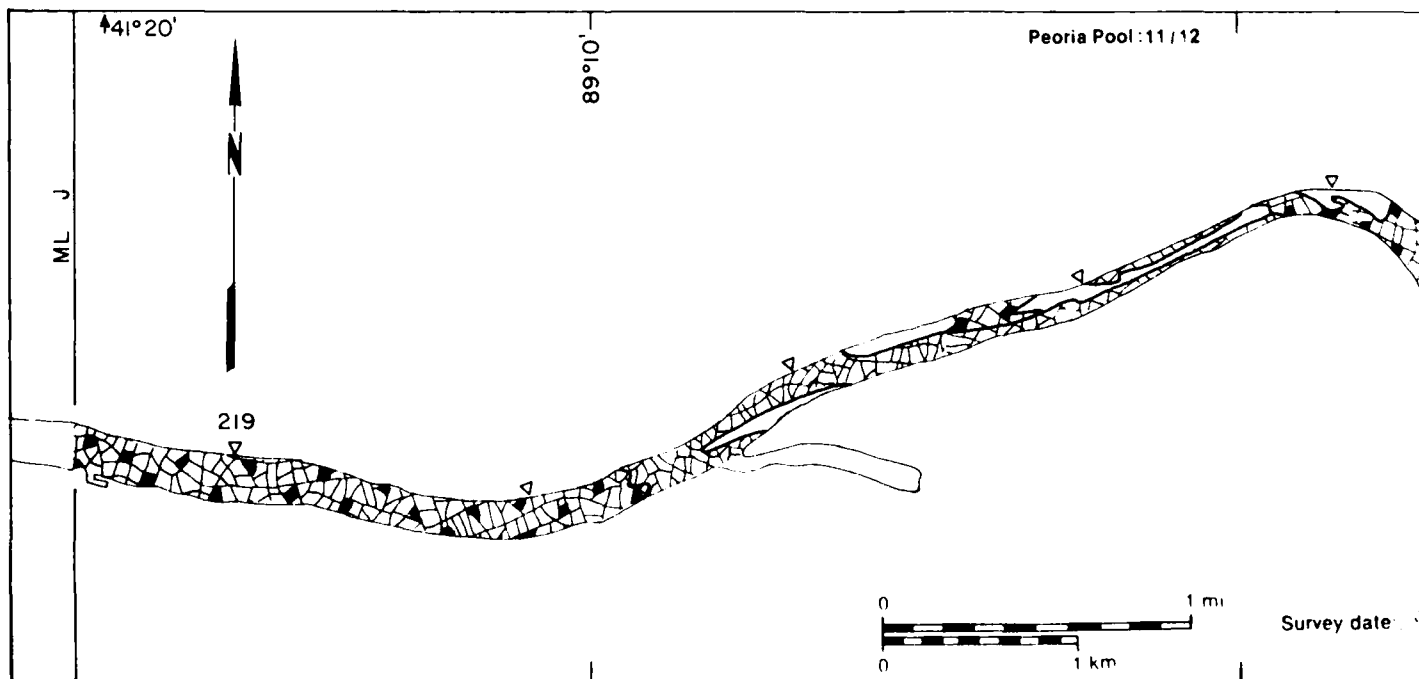
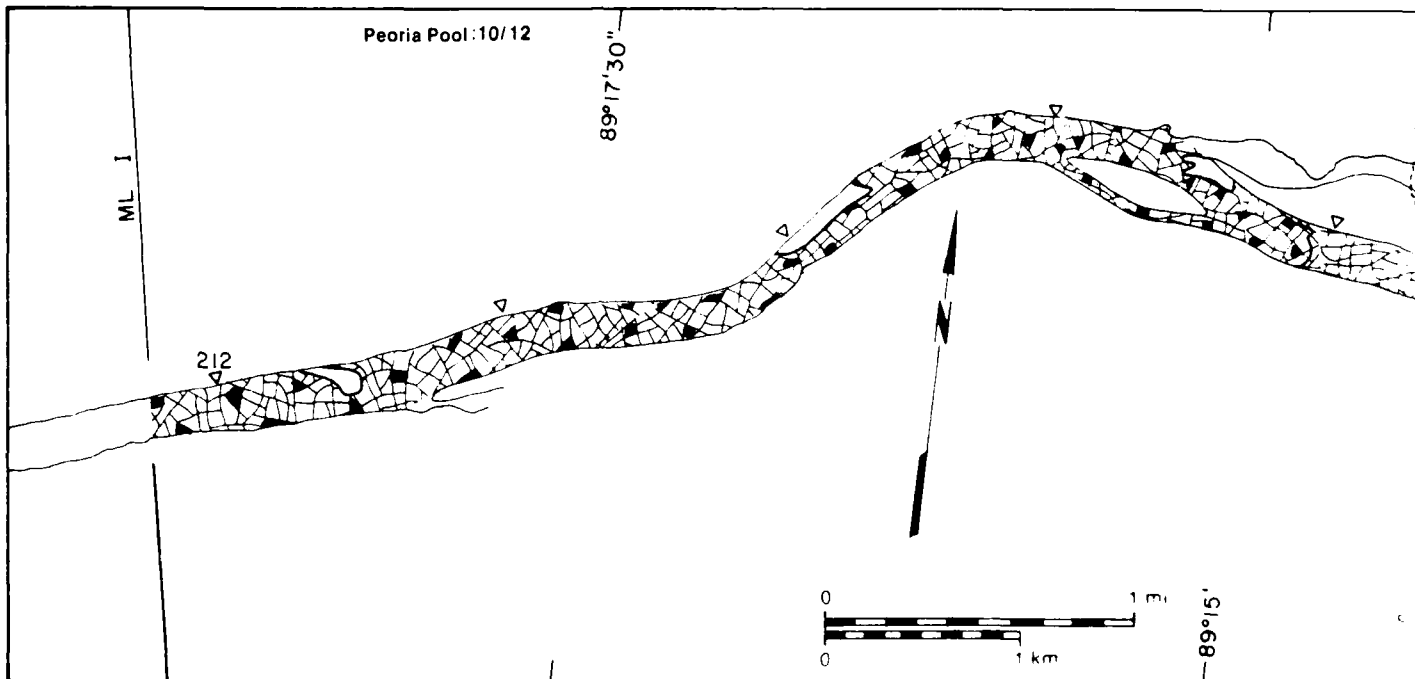
27 January 1986

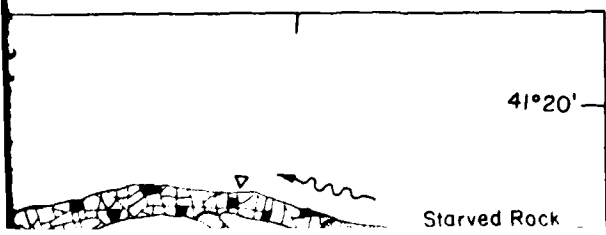
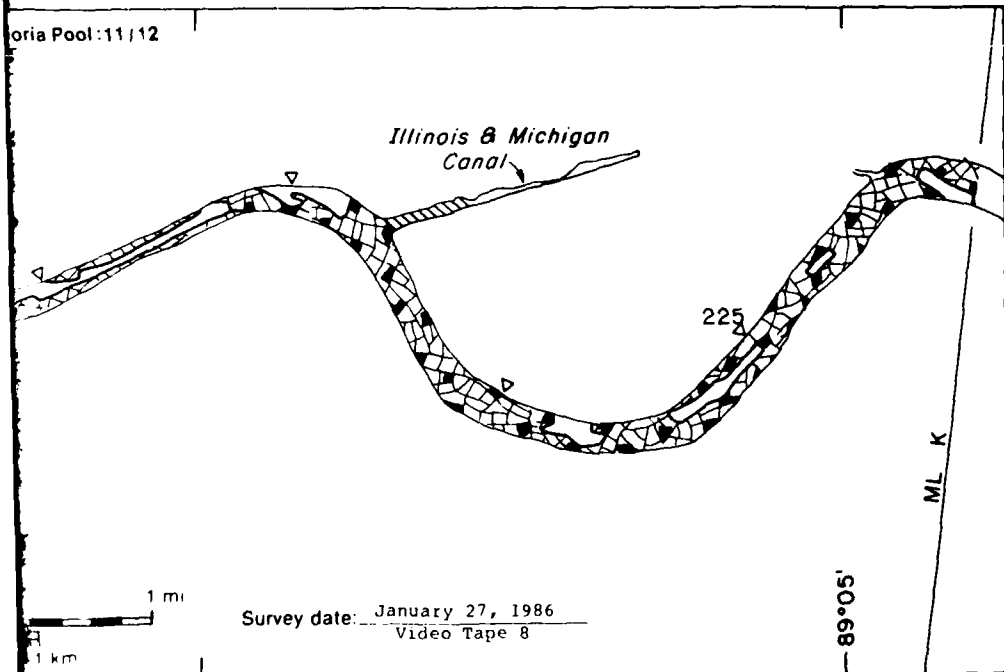
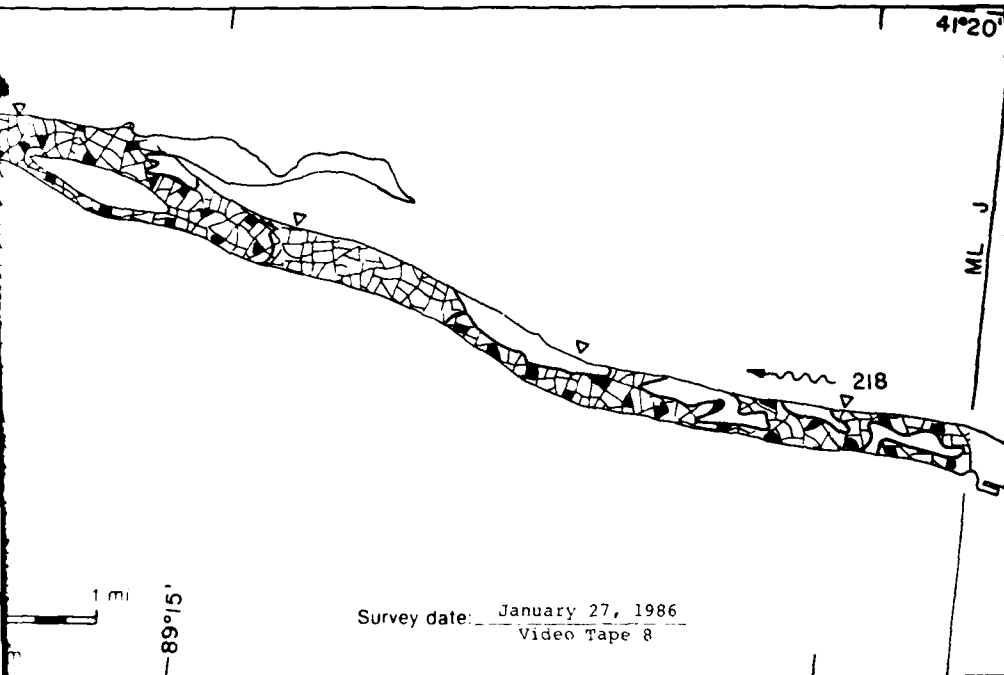


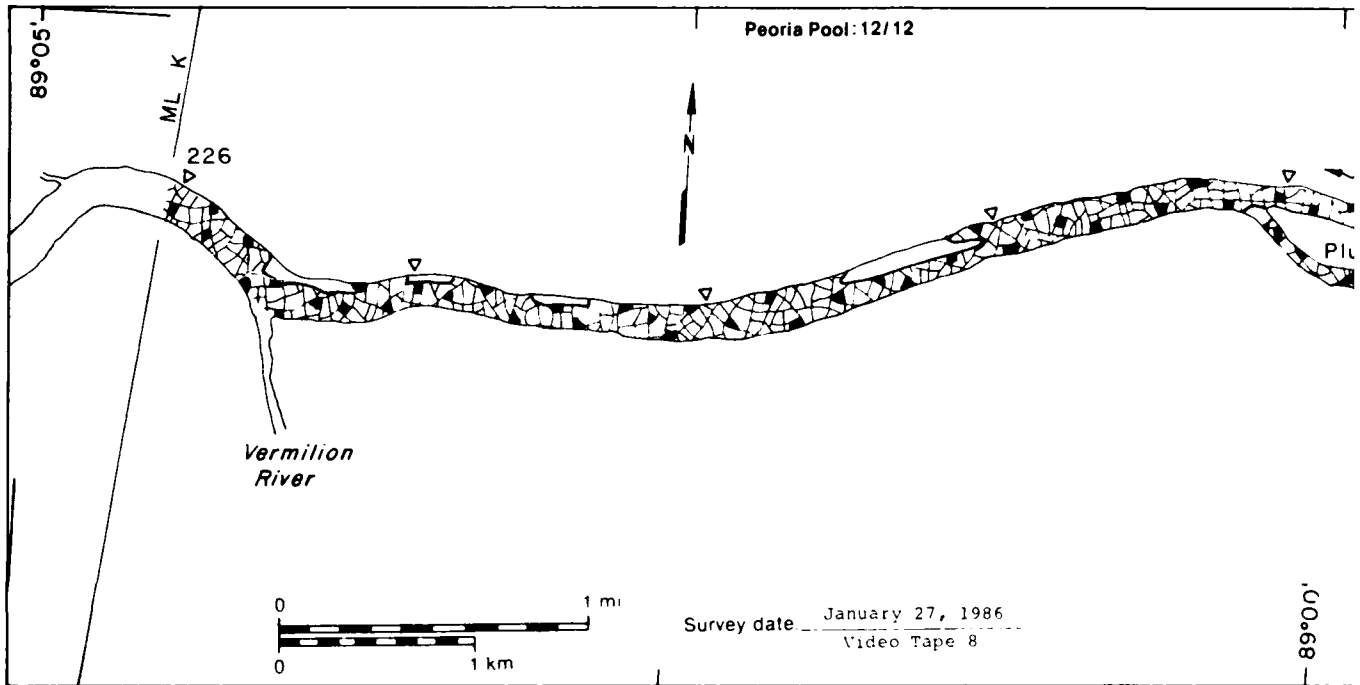
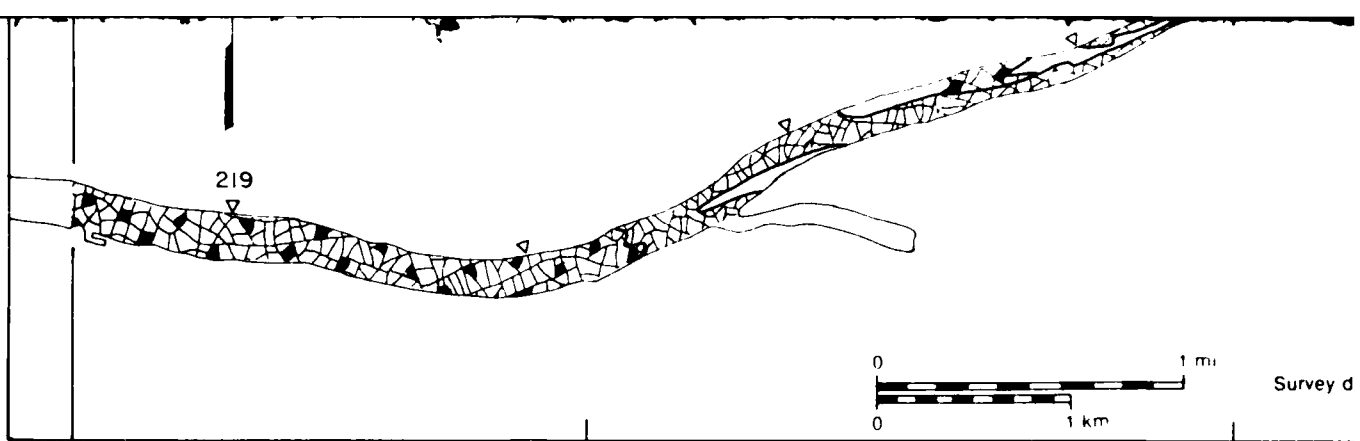






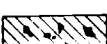

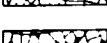

27 January 1986







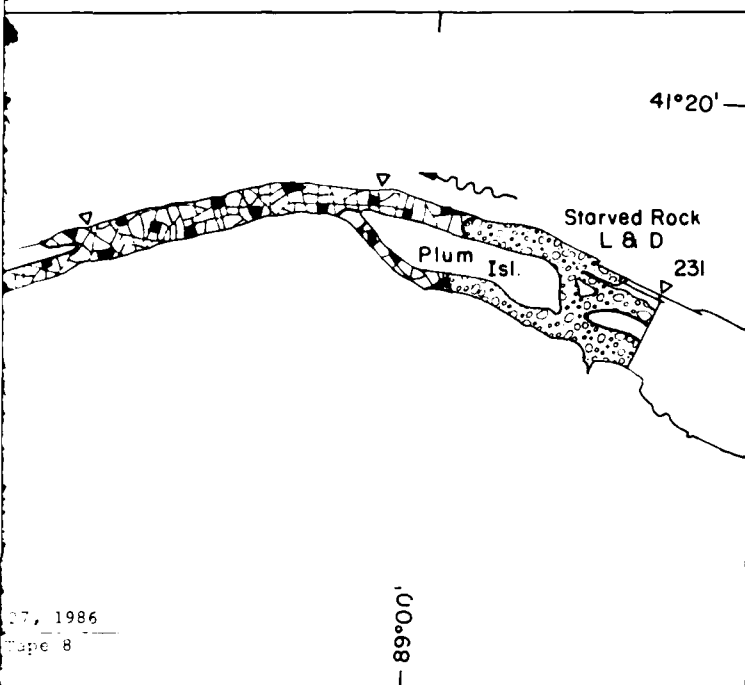
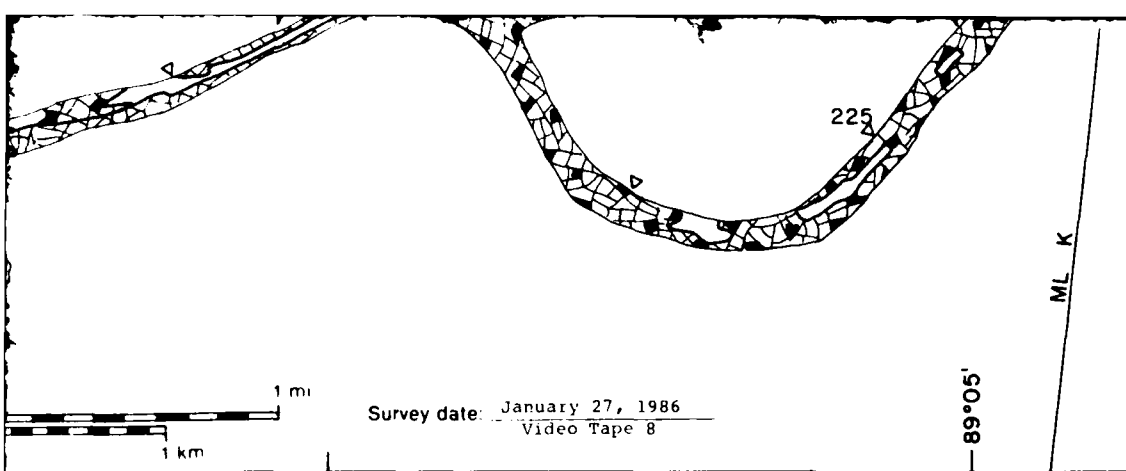
Peoria Pool

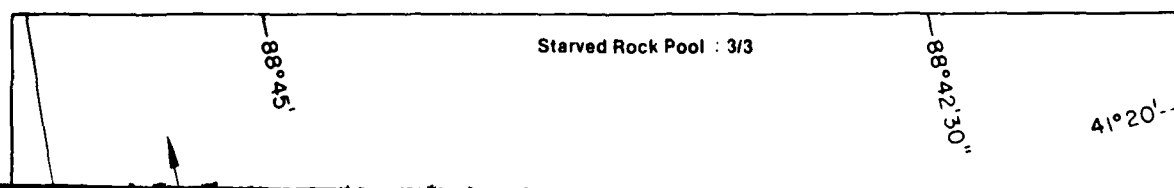
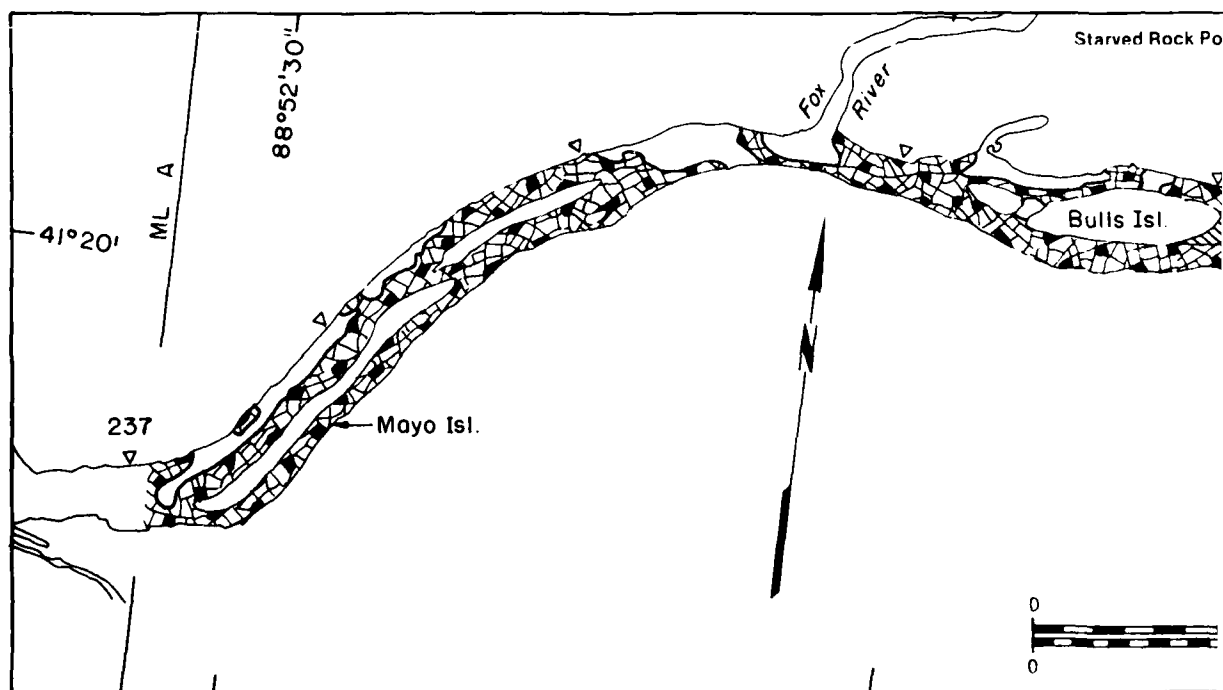
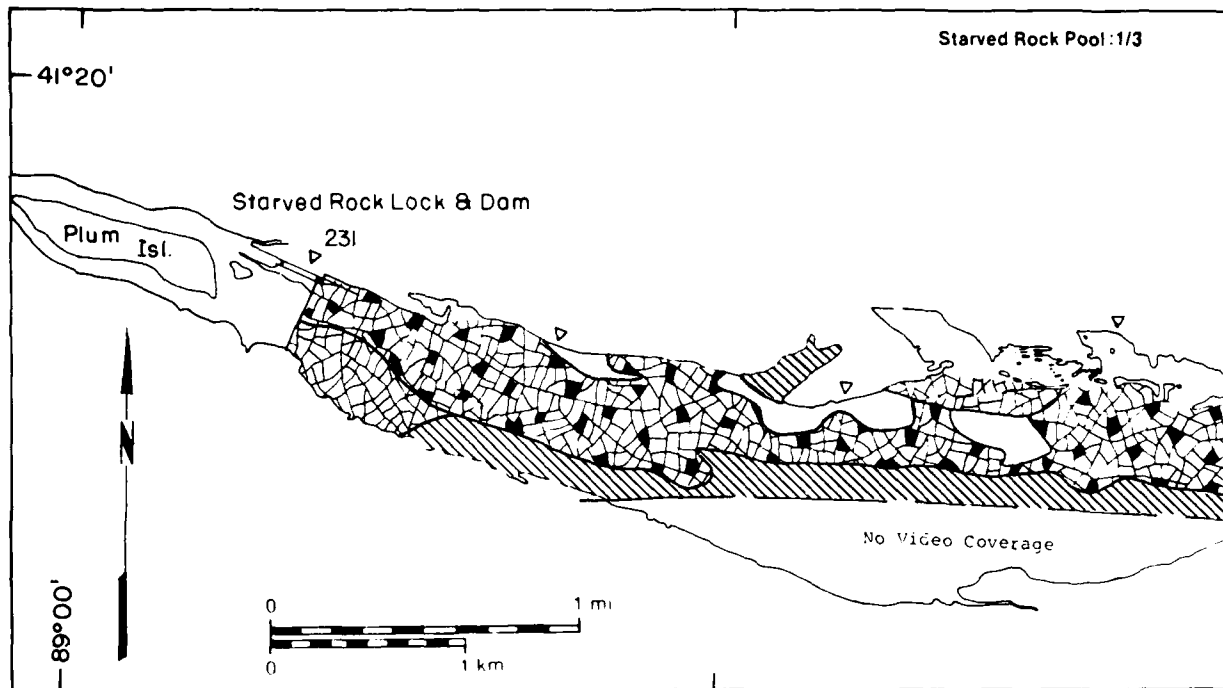
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
	4.58	NA
	15.84	NA
	0.00	—
	9.40	NA
	29.63	80
	0.82	40

Total area ($m^2 \times 10^6$)

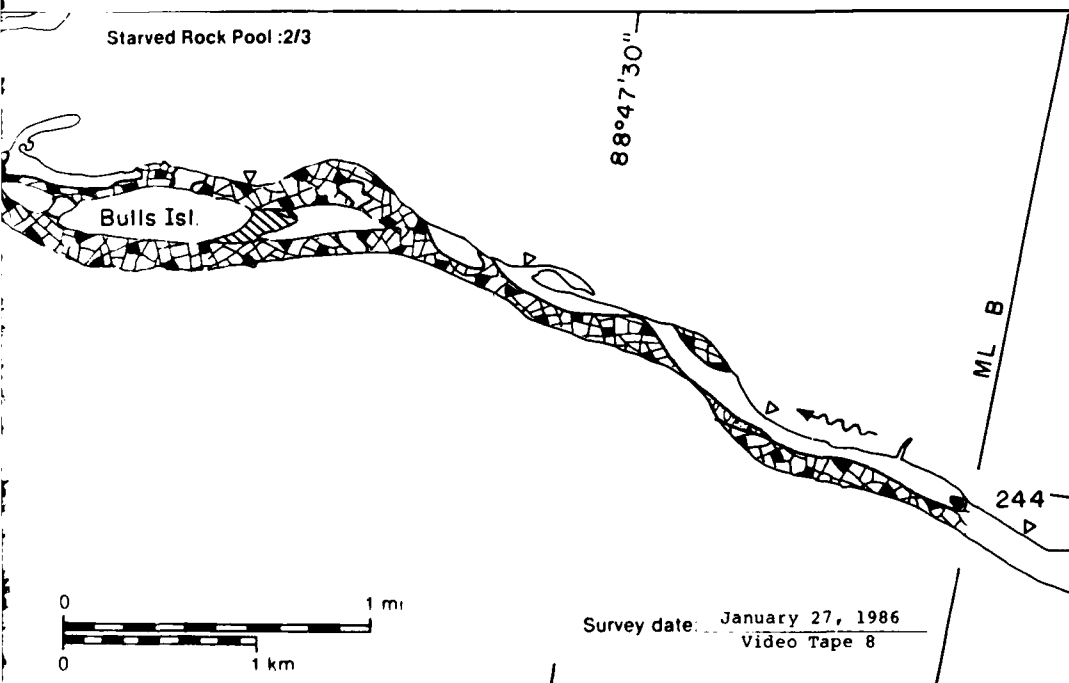
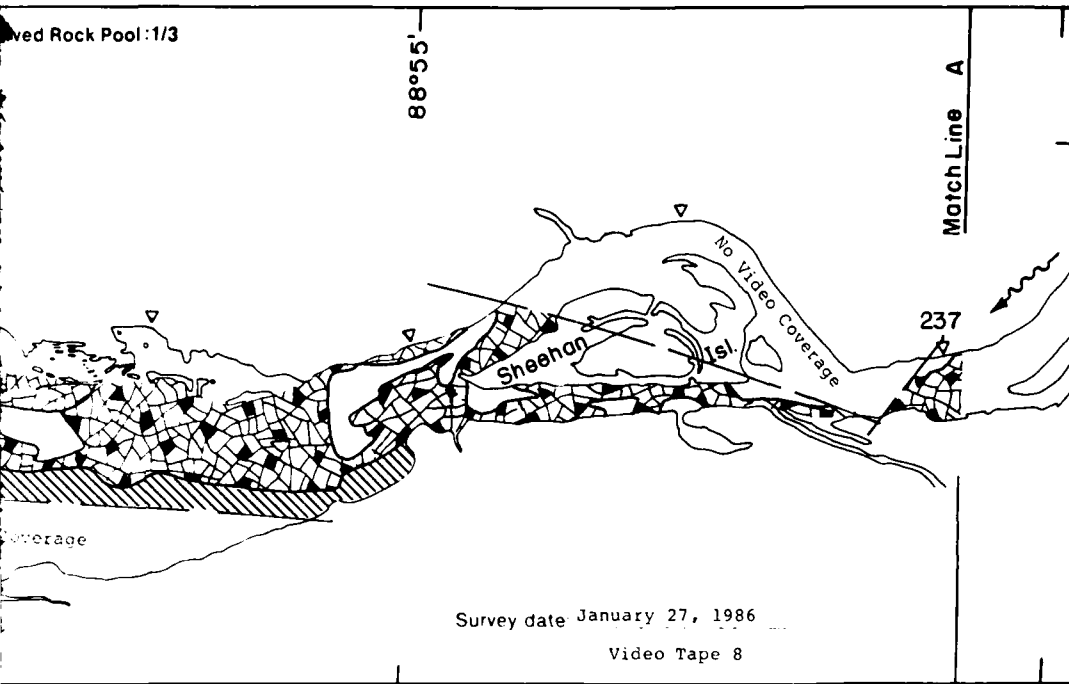
81.33*

* Includes $21.06 \times 10^6 m^2$ of no video coverage

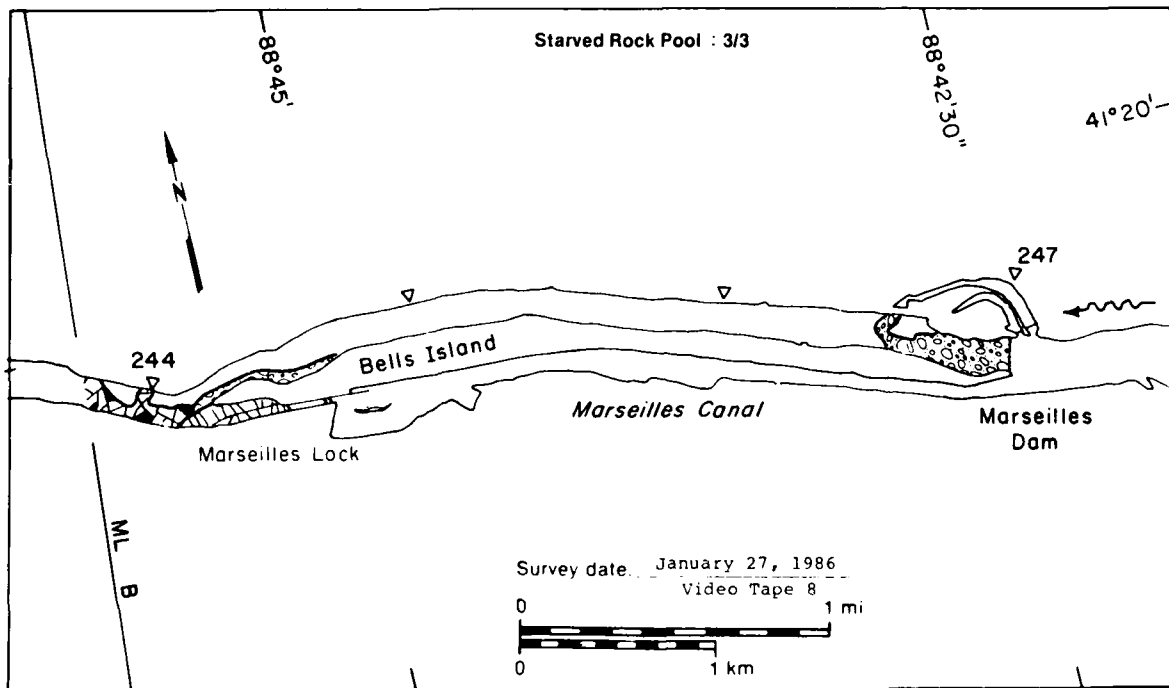
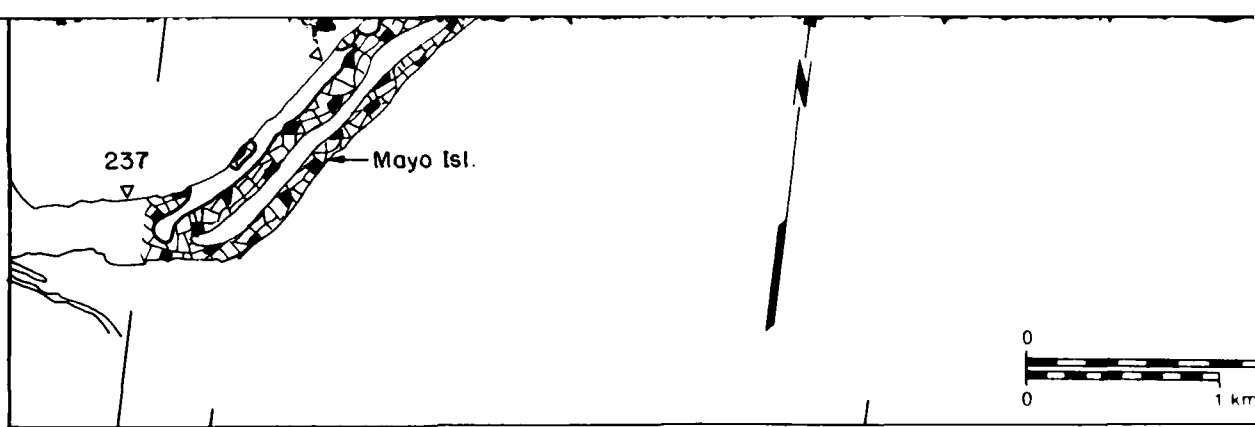


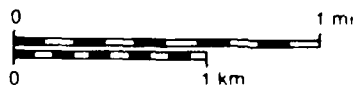


27 January 1986



41°20'	Starved Rock Pool	
MAP UNITS	Area (m ² x 10 ⁶)	Surface concentration (%)

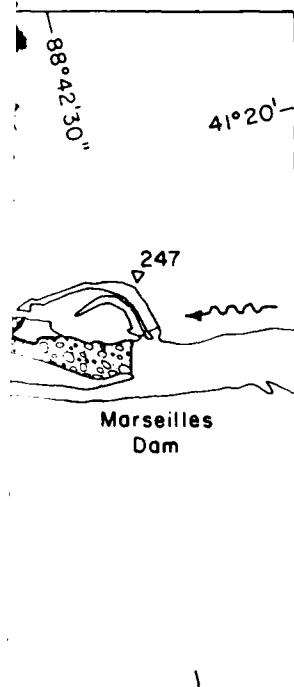




Survey date: January 27, 1986
Video Tape 8

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Starved Rock Pool

MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

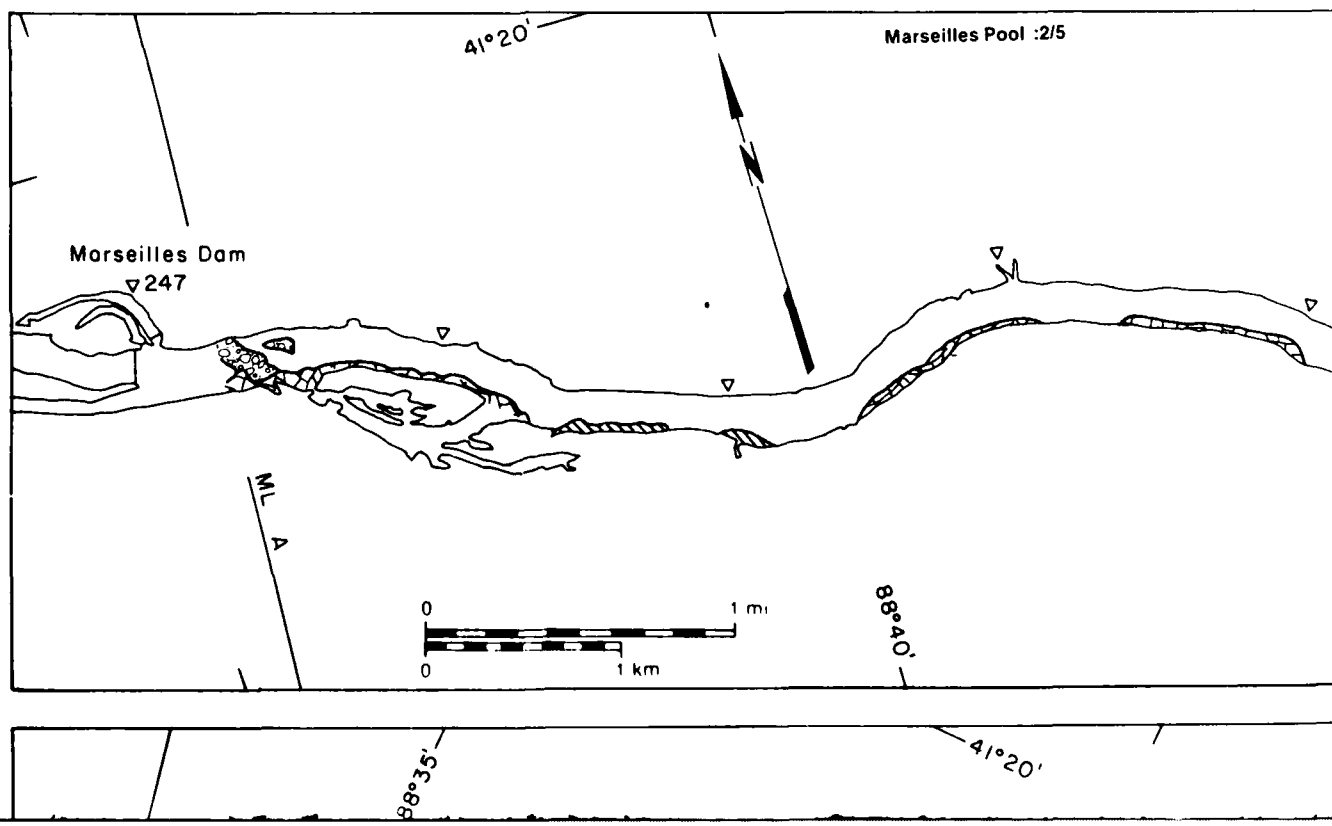
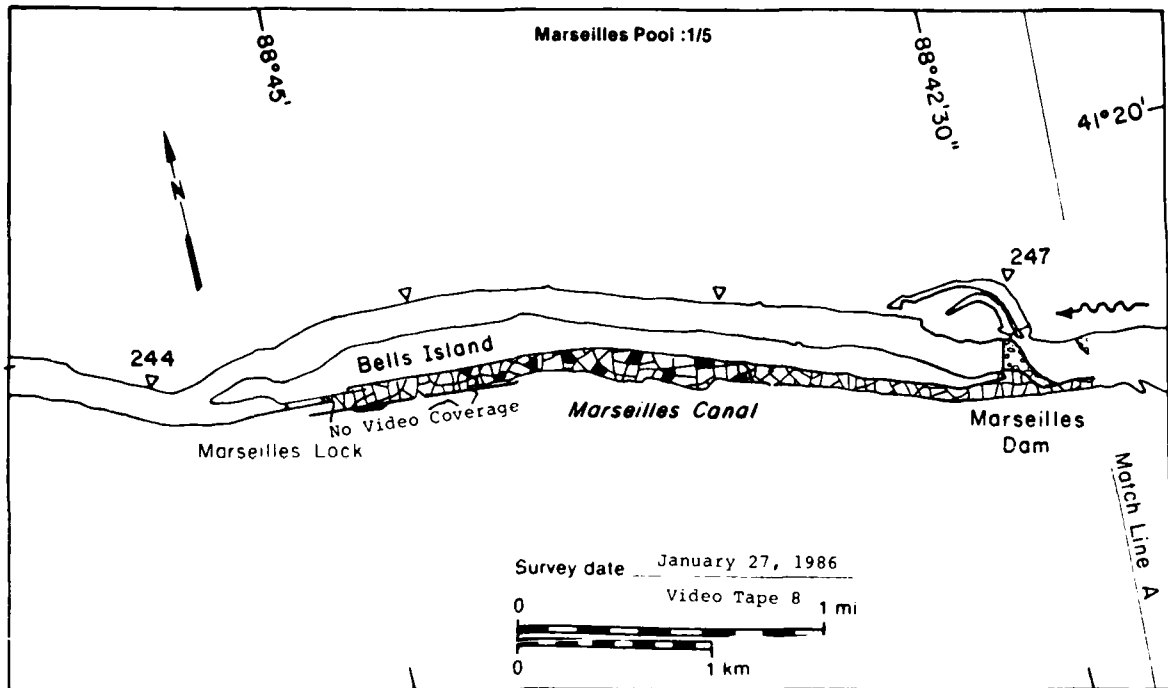
Area ($m^2 \times 10^6$)	Surface concentration (%)
1.86	NA
1.14	NA
0.00	—
0.37	NA
5.04	75
0.15	40

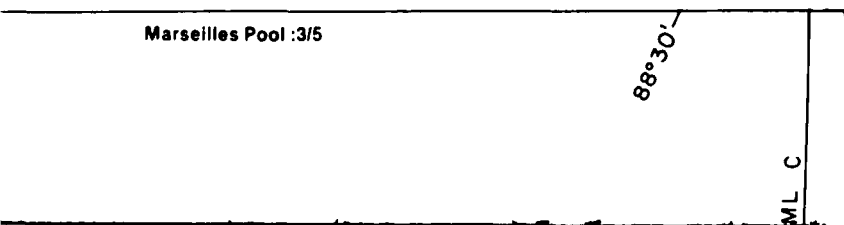
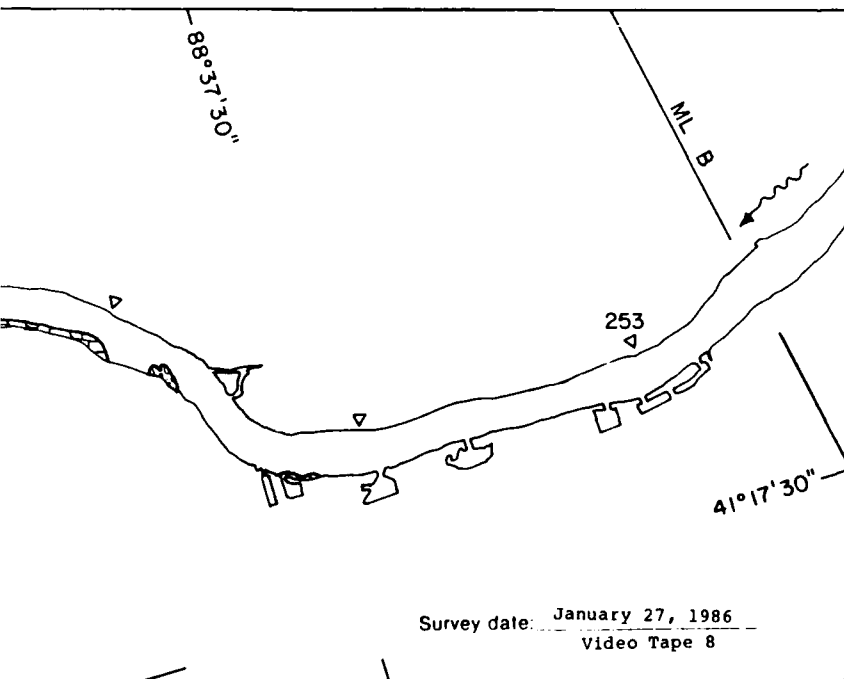
Total area ($m^2 \times 10^6$)

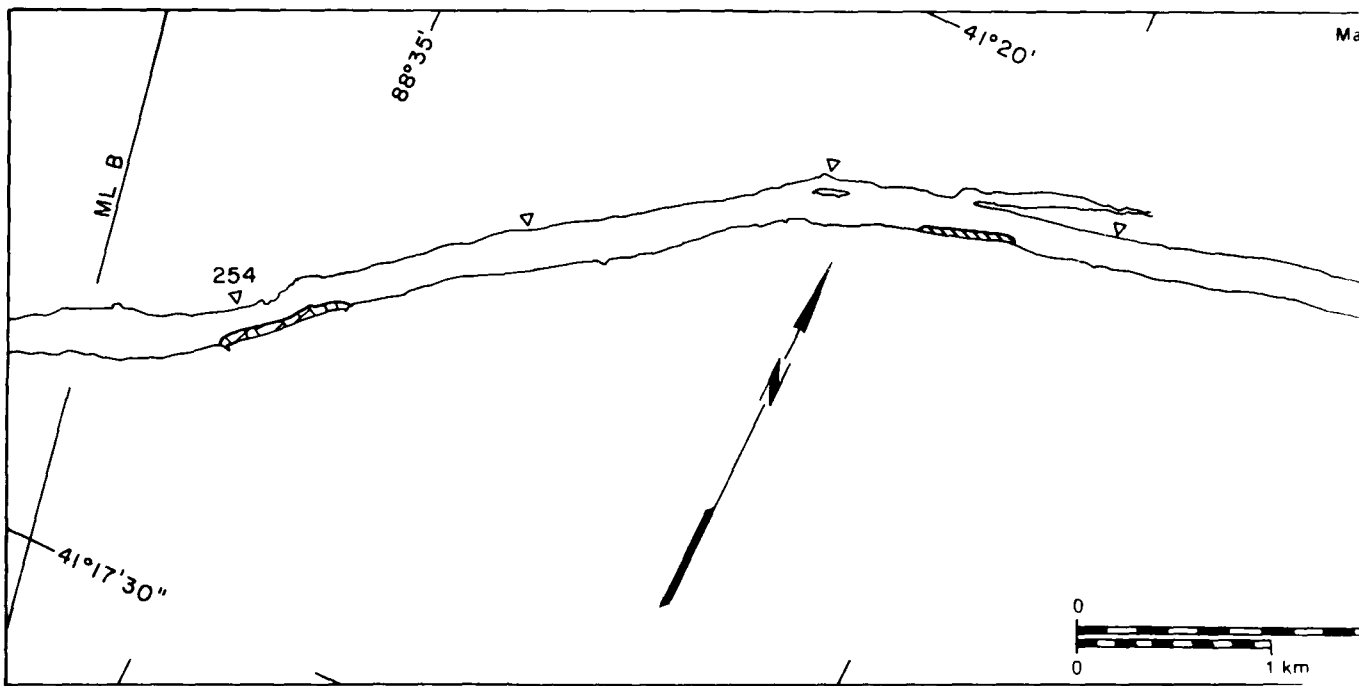
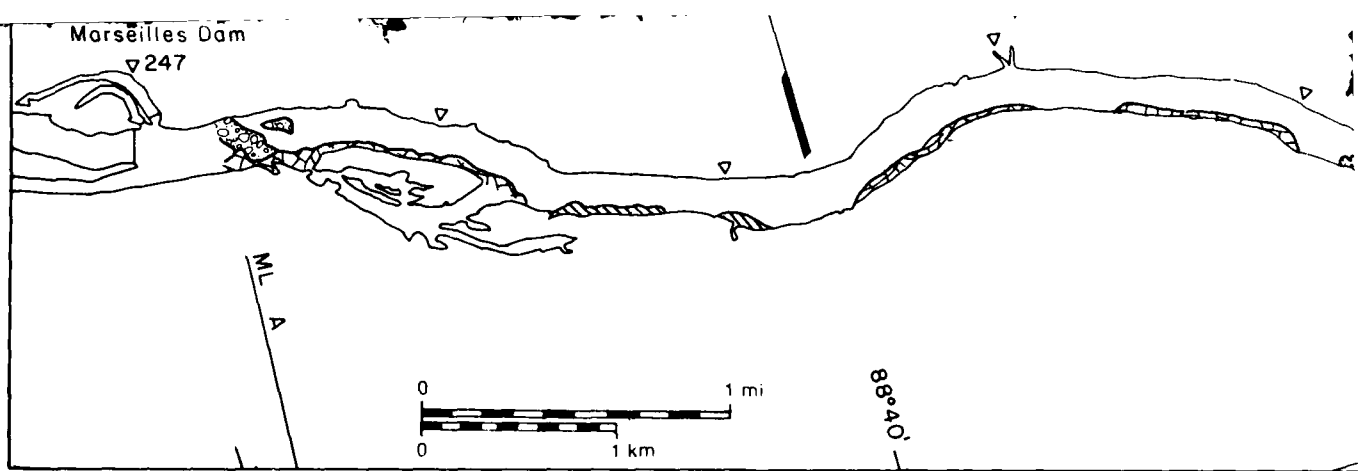
10.19*

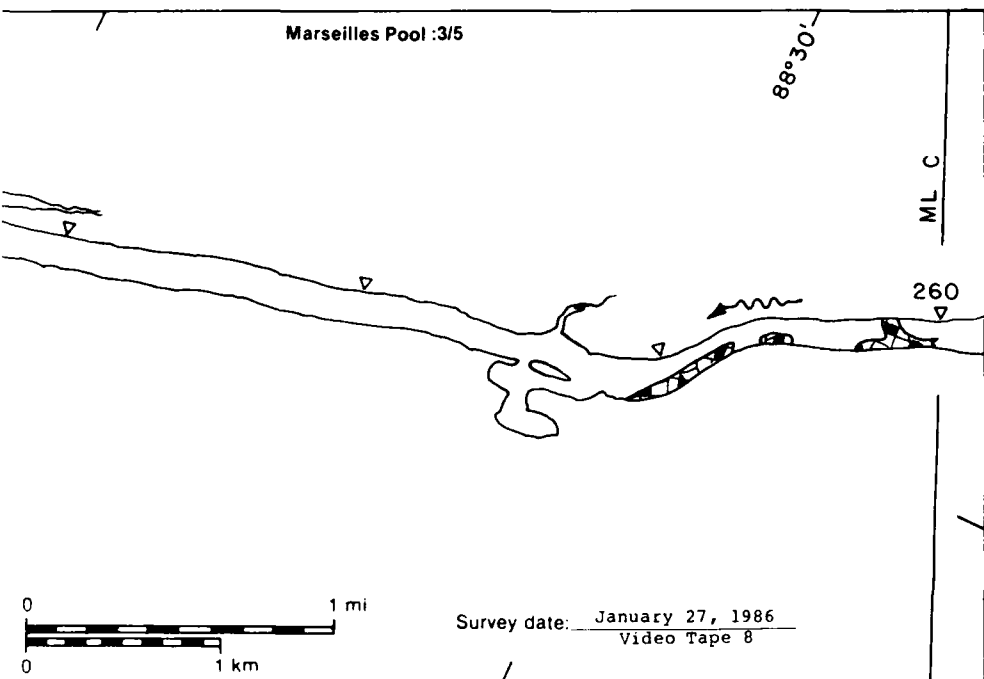
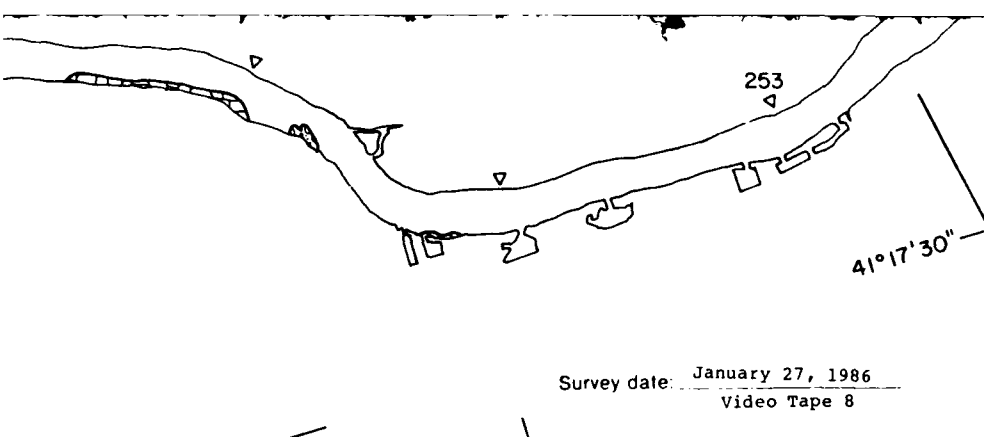
* Includes $1.63 \times 10^6 m^2$ of no video coverage

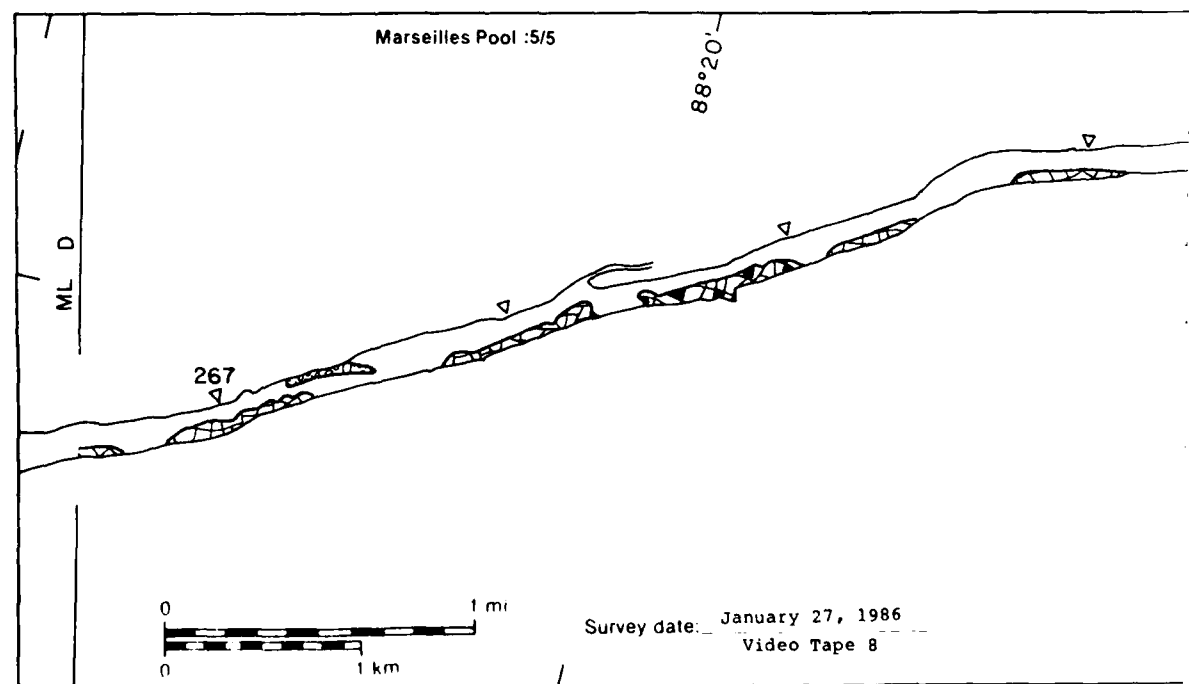
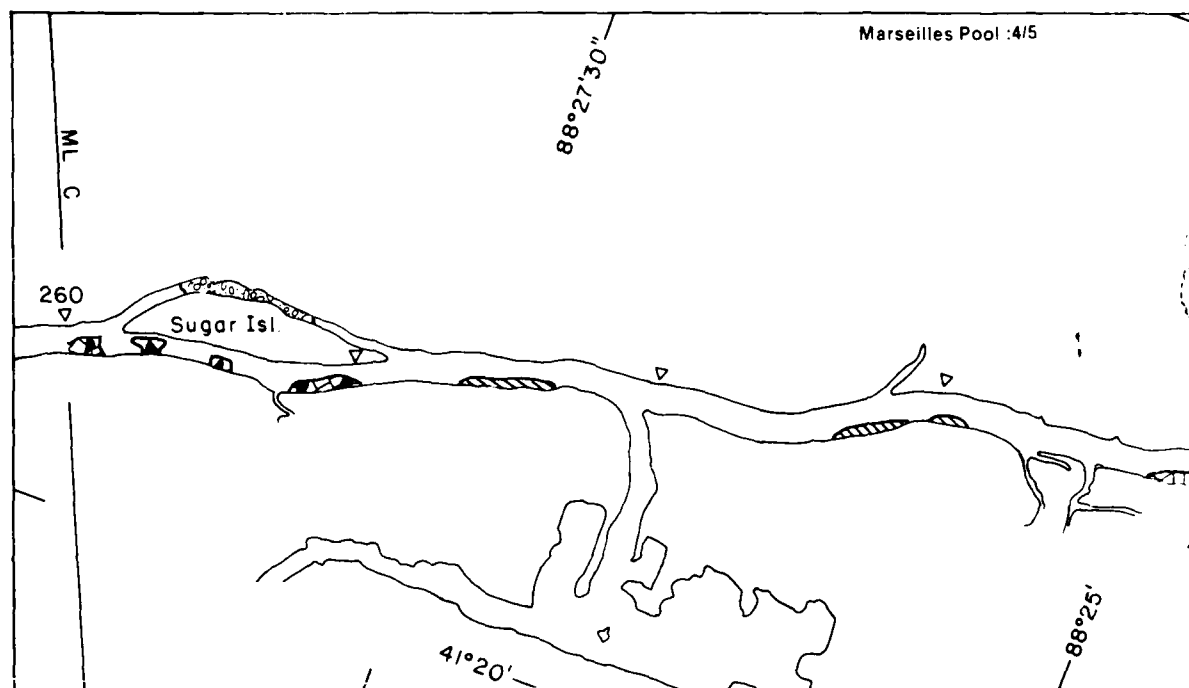
27 January 1986











Marseilles Pool

MAP UNITS

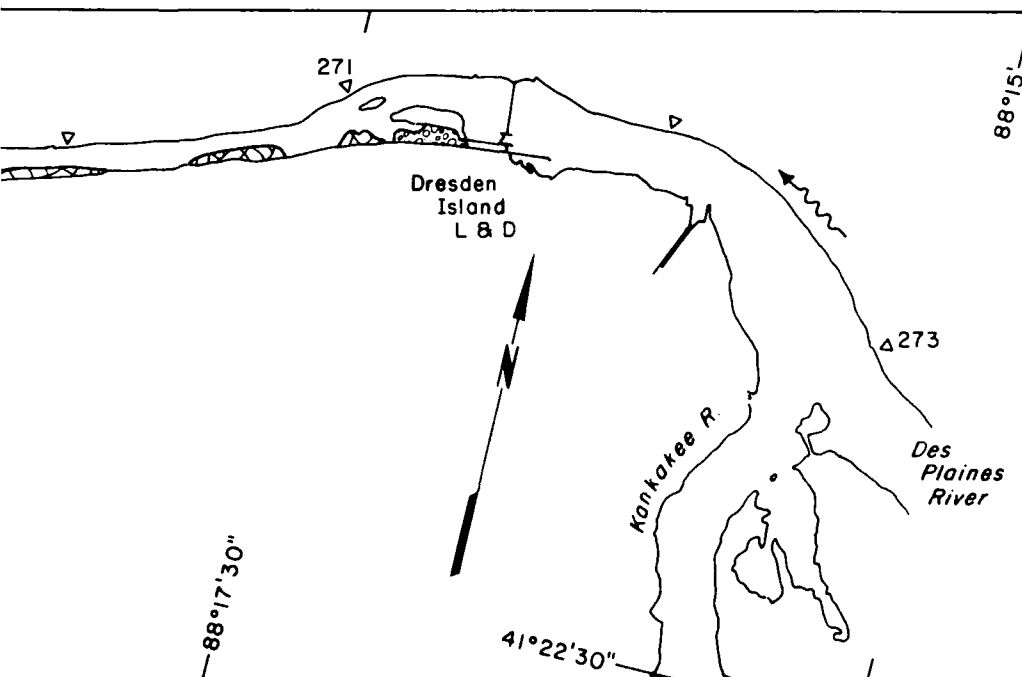
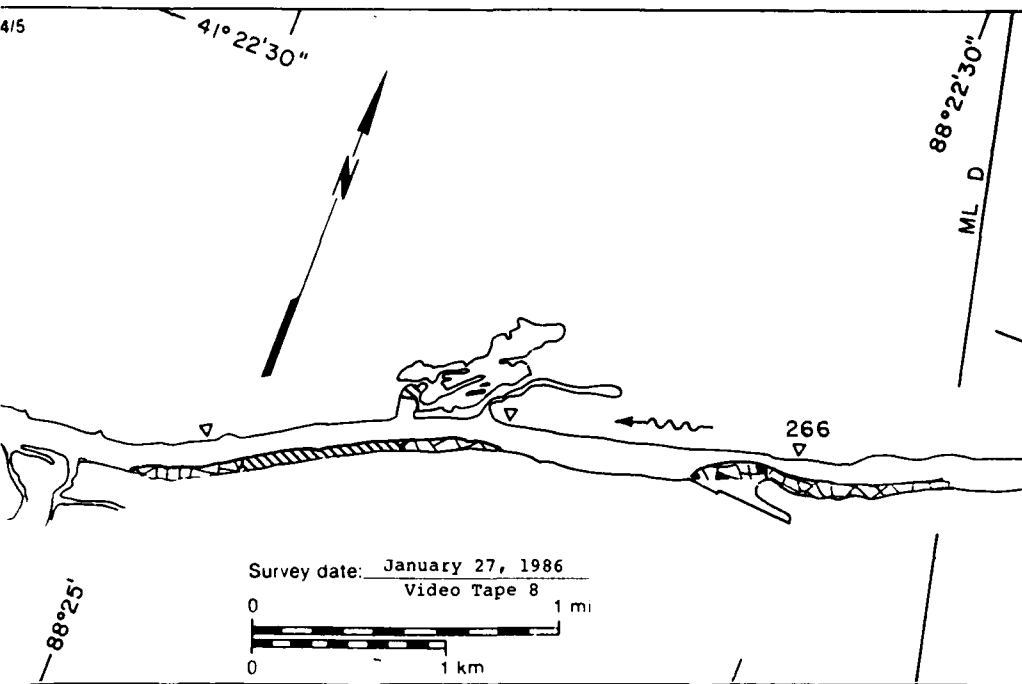
Area
(m² x 10⁶)

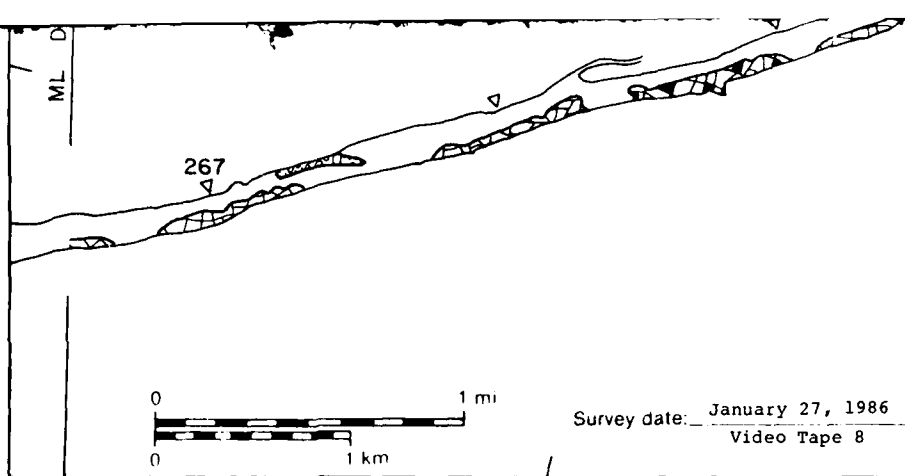
Surface
concentration
(‰)

6.44

NA






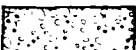
27 January 1986





Marseilles Pool

MAP UNITS

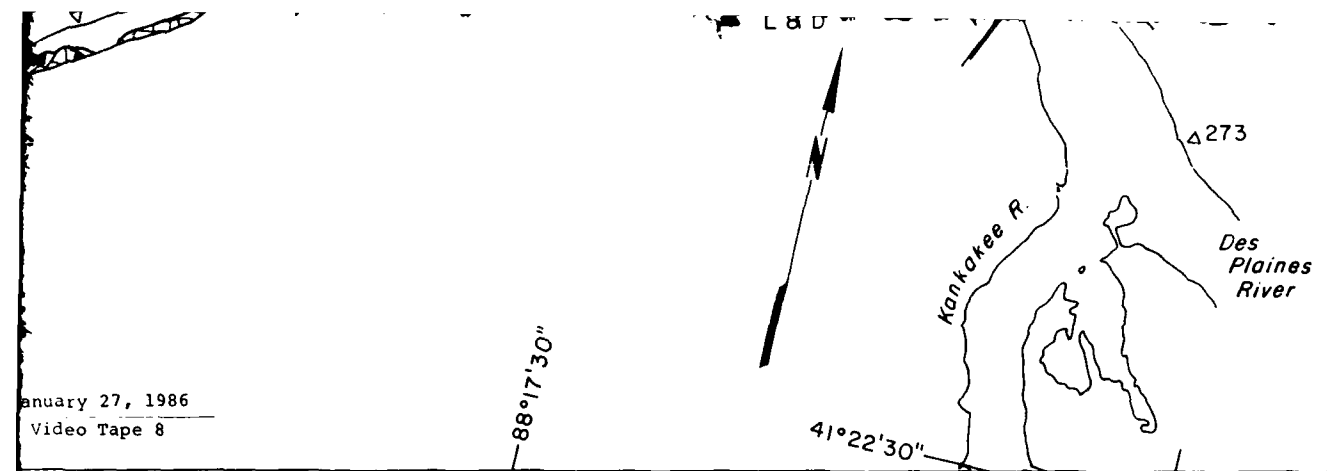
	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Area ($m^2 \times 10^6$)	Surface concentration (%)
6.44	NA
0.21	NA
0.00	—
0.84	NA
0.39	80
0.23	40

Total area ($m^2 \times 10^6$)

8.19*

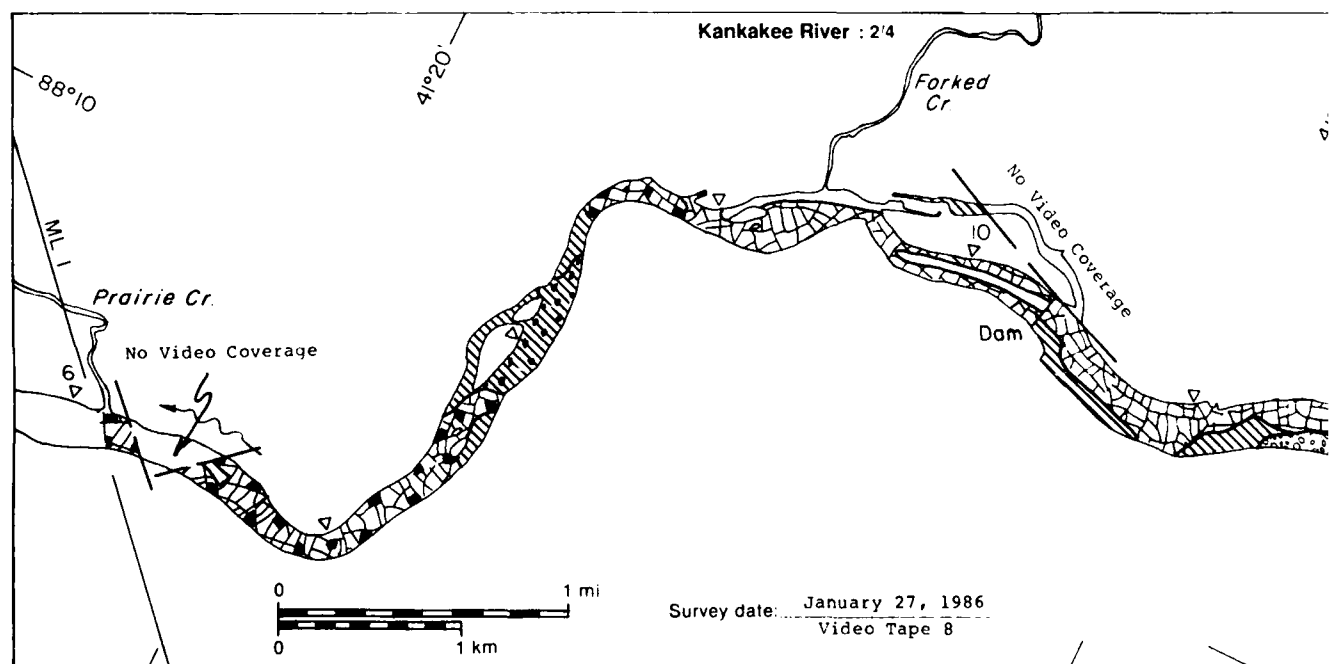
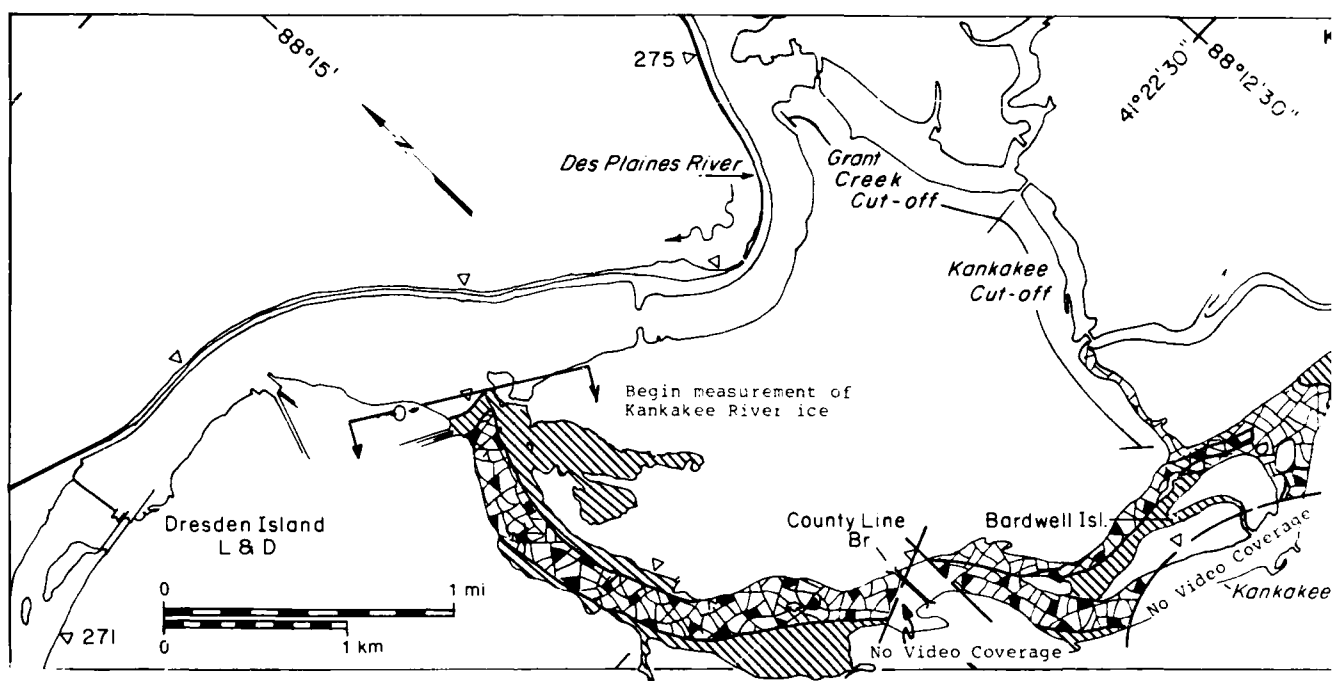
* Includes $0.08 \times 10^6 m^2$ of no video coverage

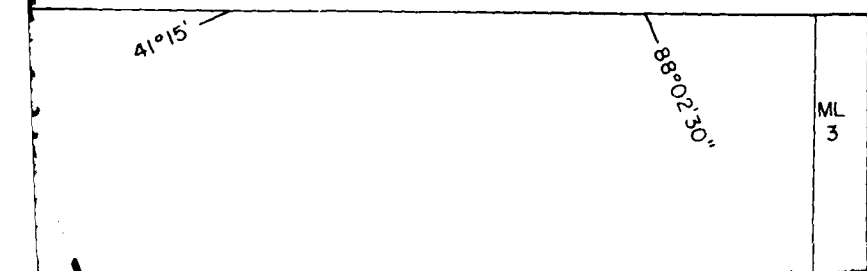
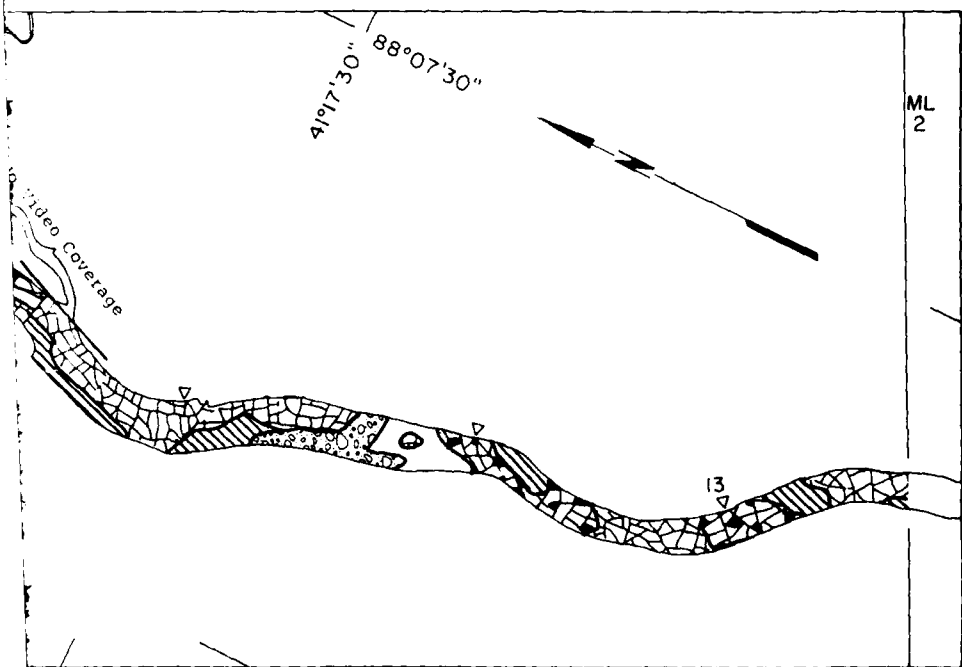
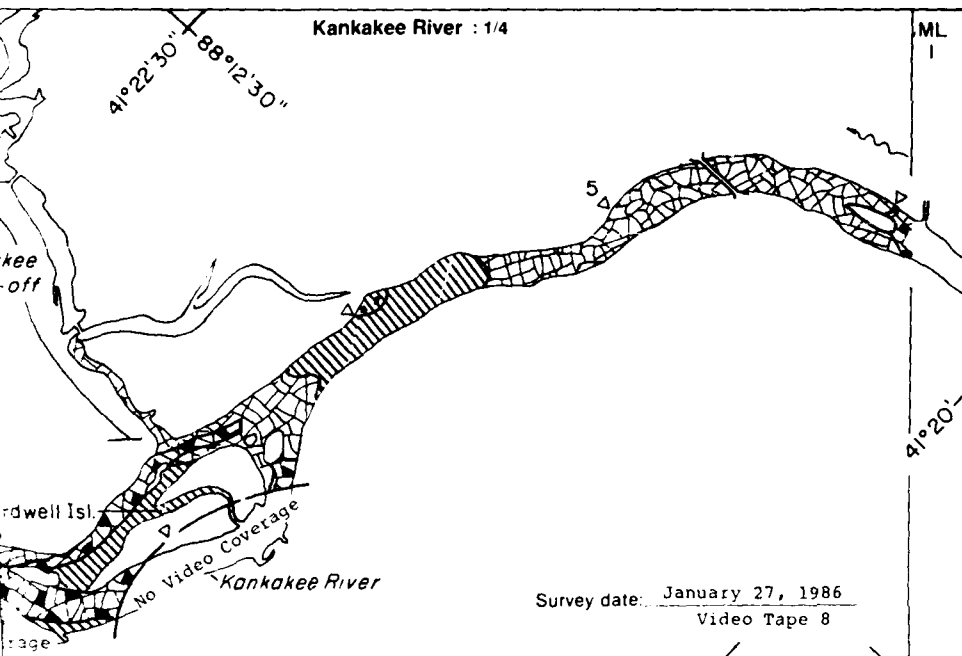


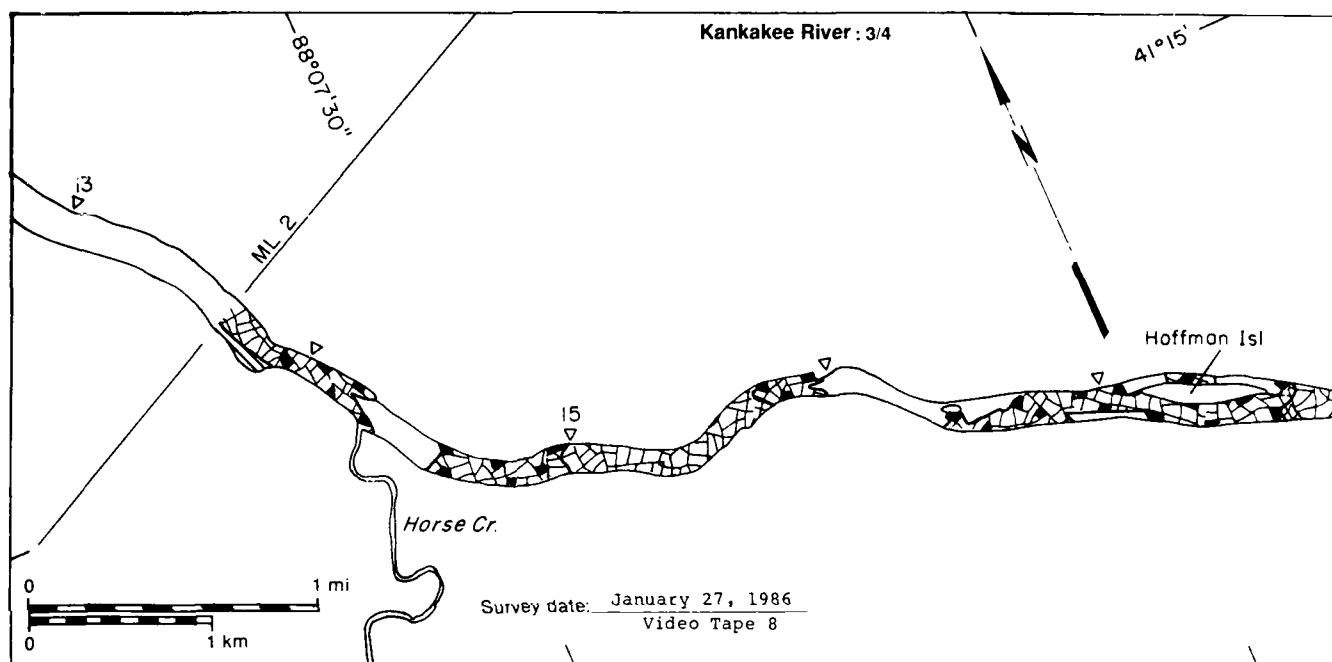
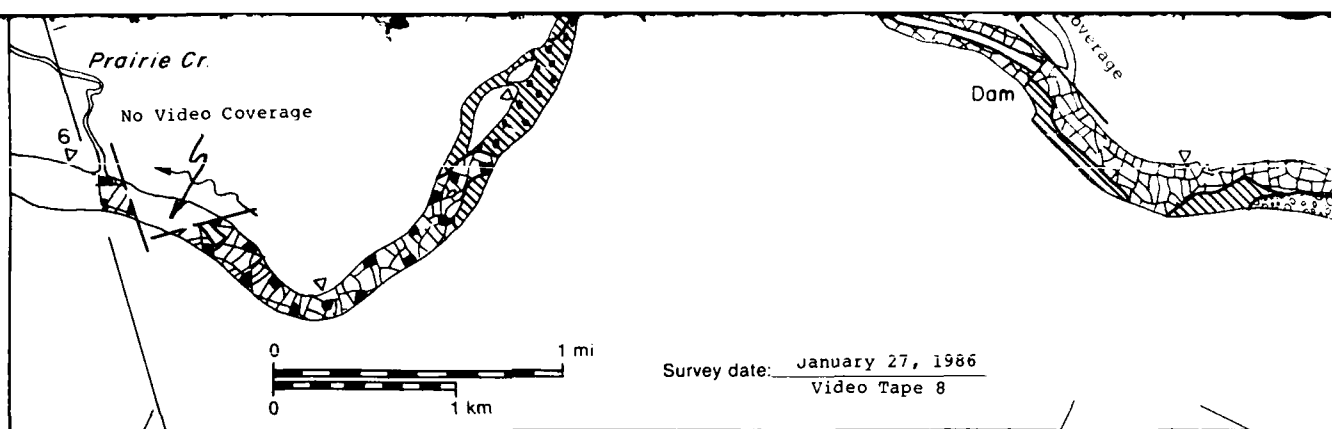
January 27, 1986
Video Tape 8

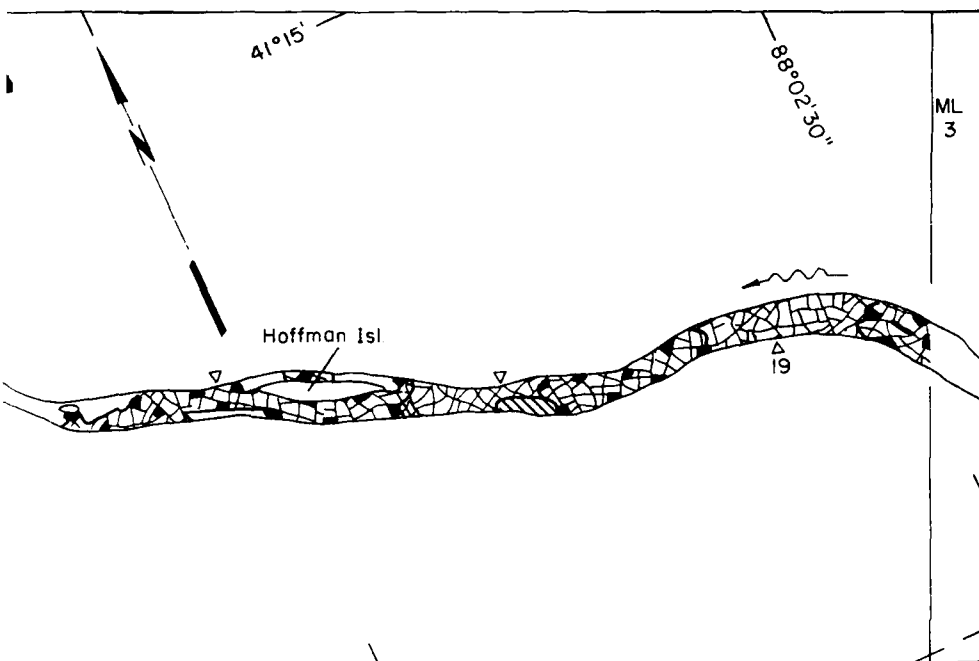
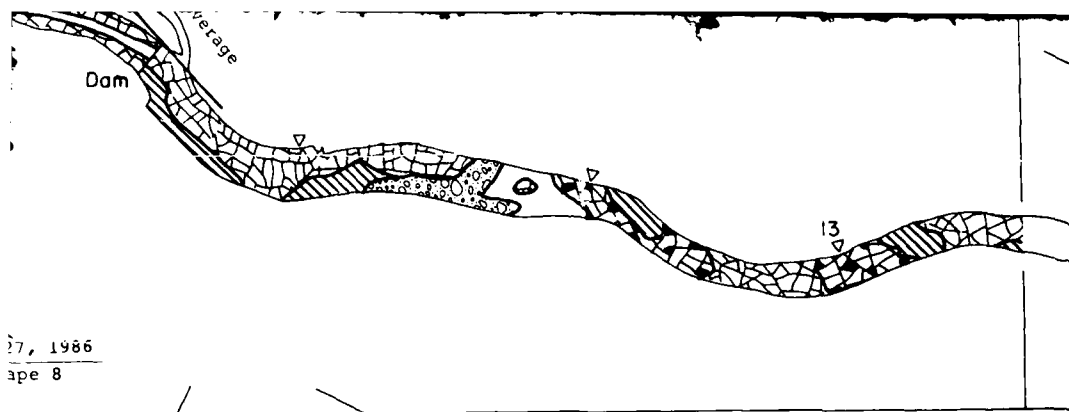
$0.8 \times 10^6 \text{ m}^2$
Average

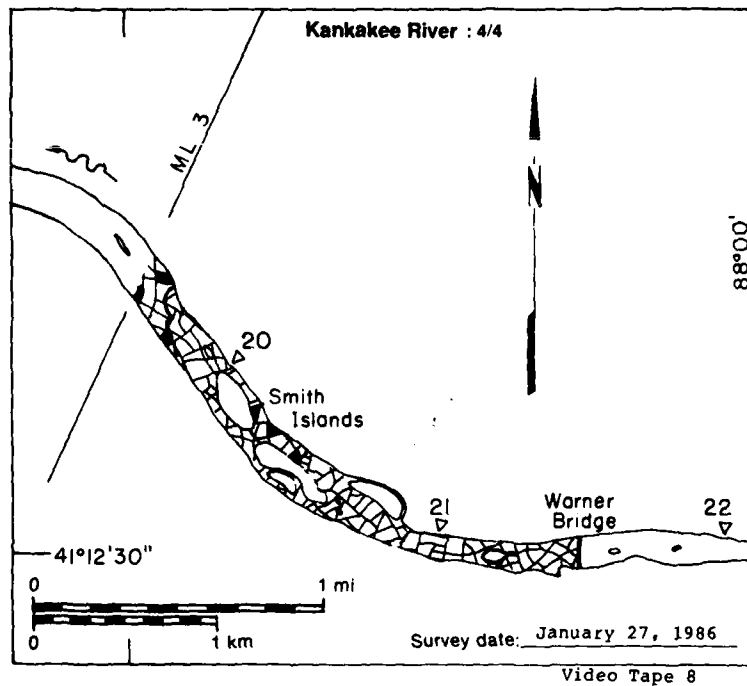
27 January 1986








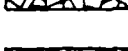








Kankakee River
MAP UNITS

-  Open water
-  Solid ice cover
-  Solid ice cover open-water area
-  Fragmented ice
-  Fragmented ice with open-water
-  Ice floes or fra and pans

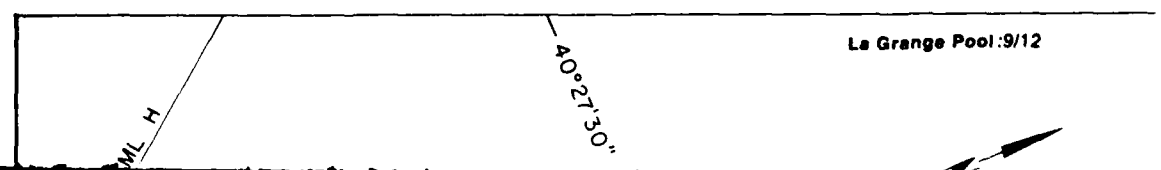
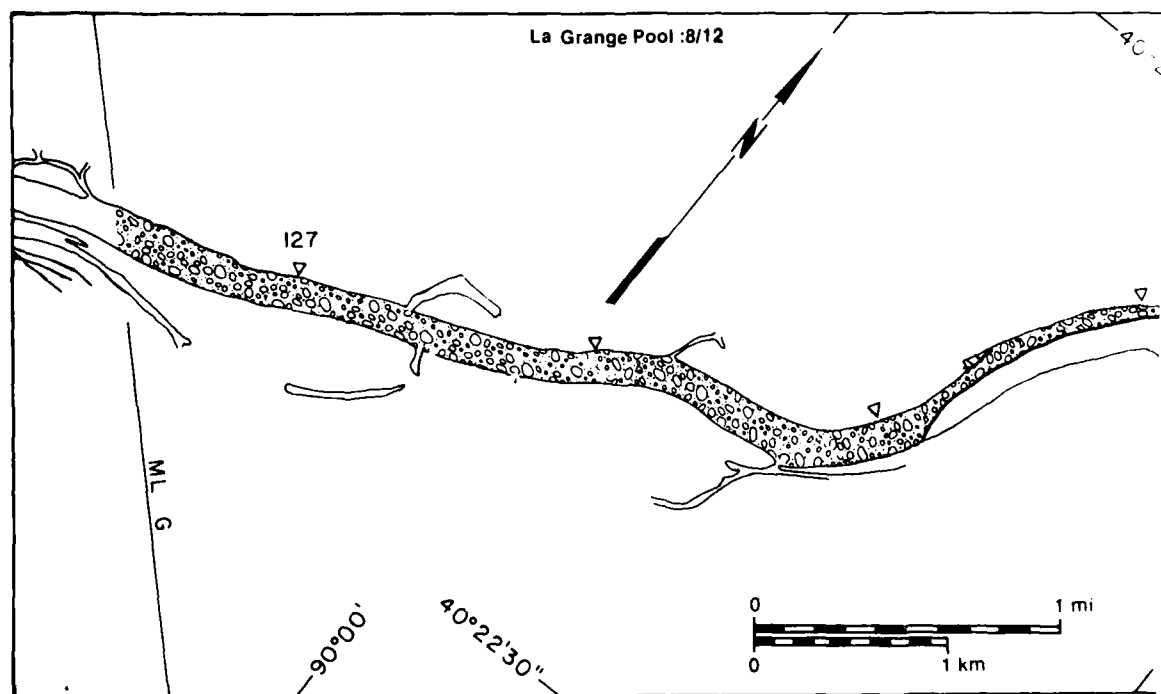
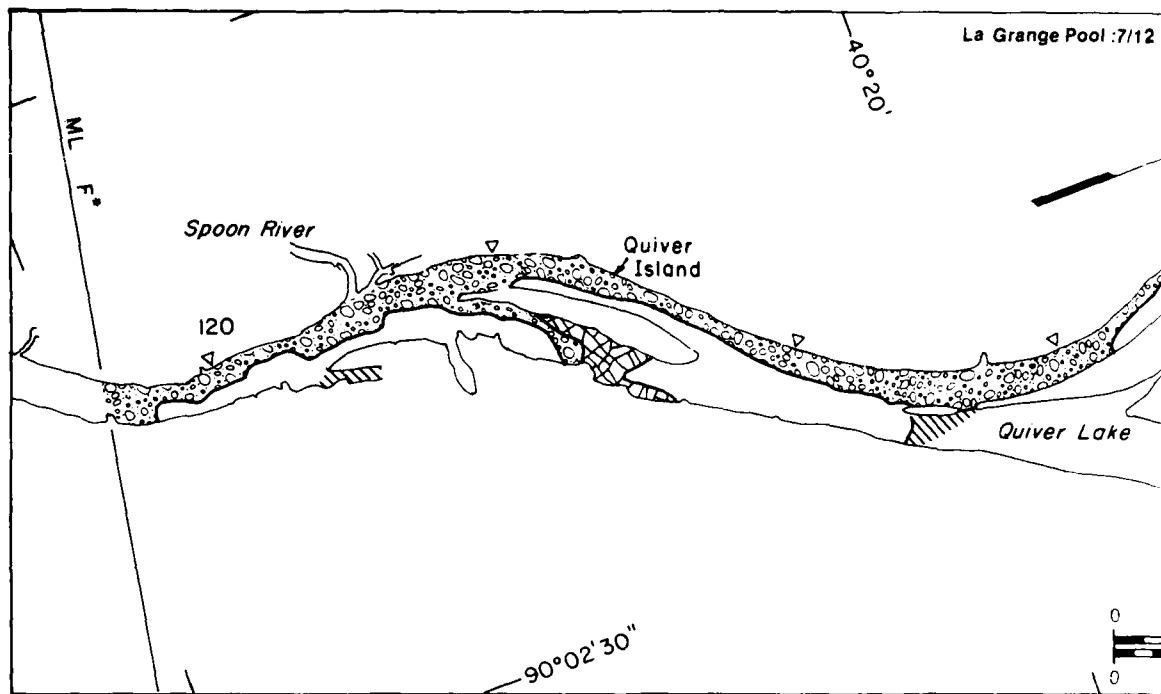
Total area (

27 January 1986

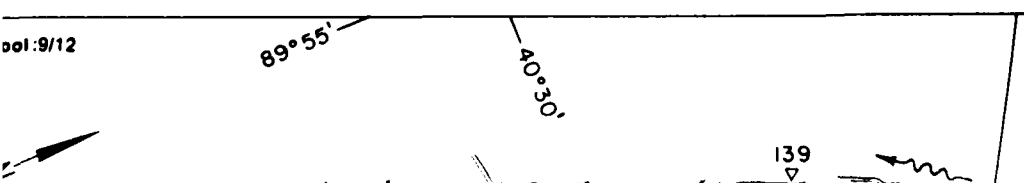
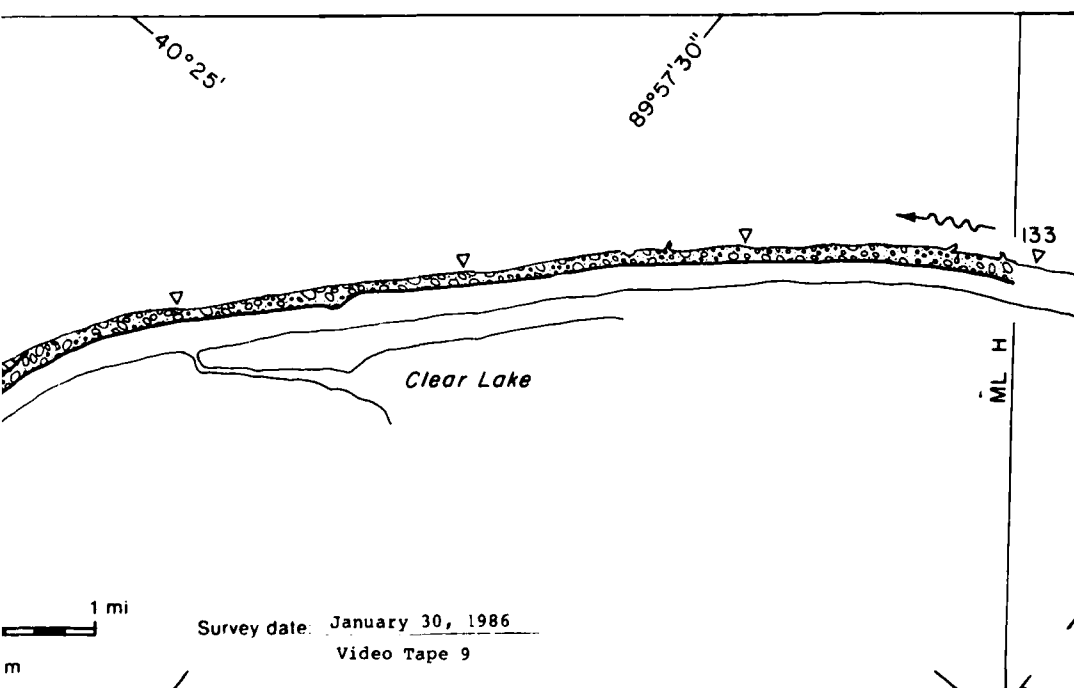
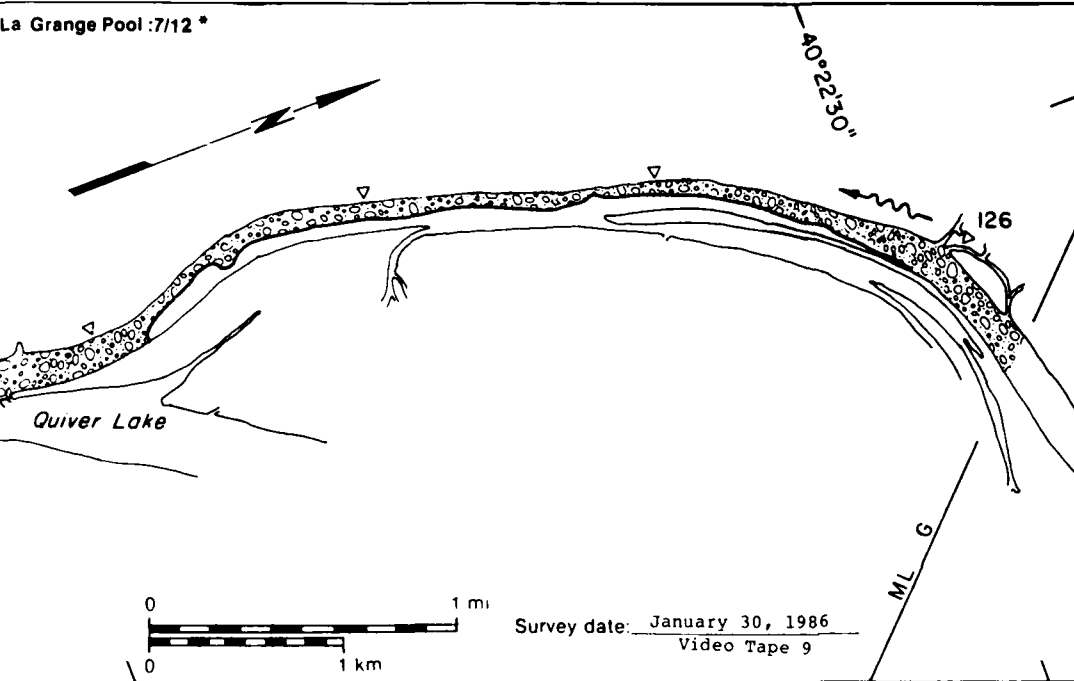
ankakee River

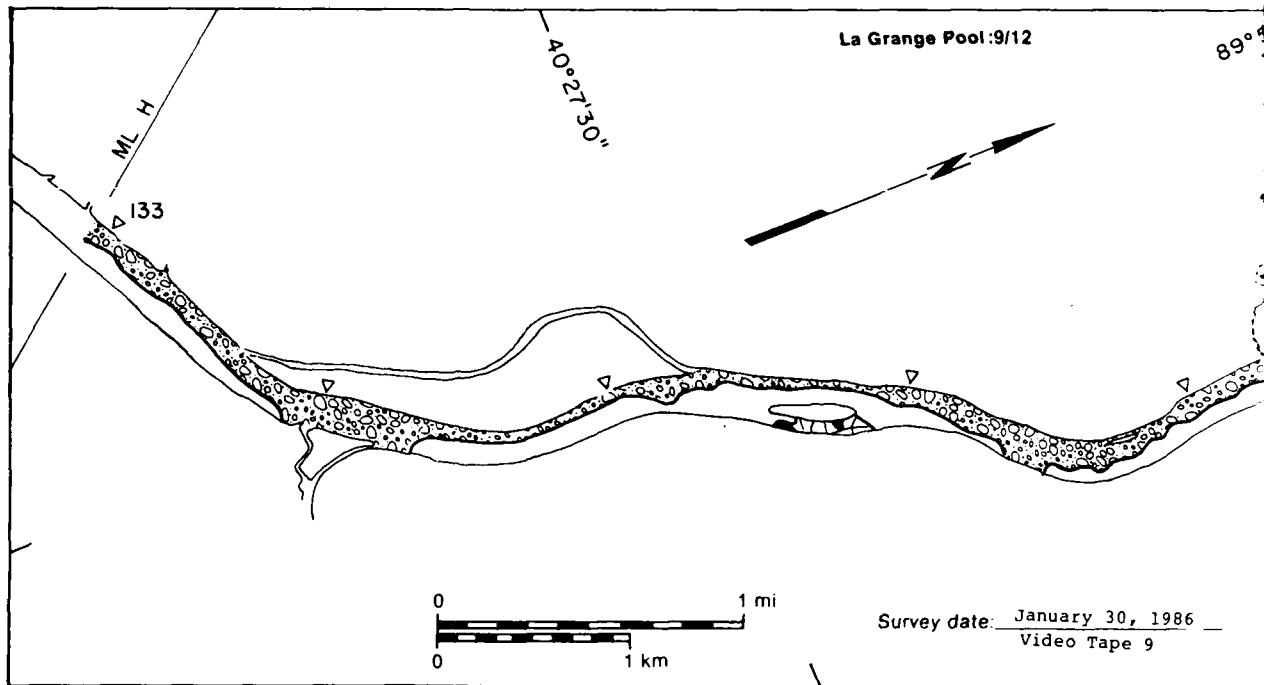
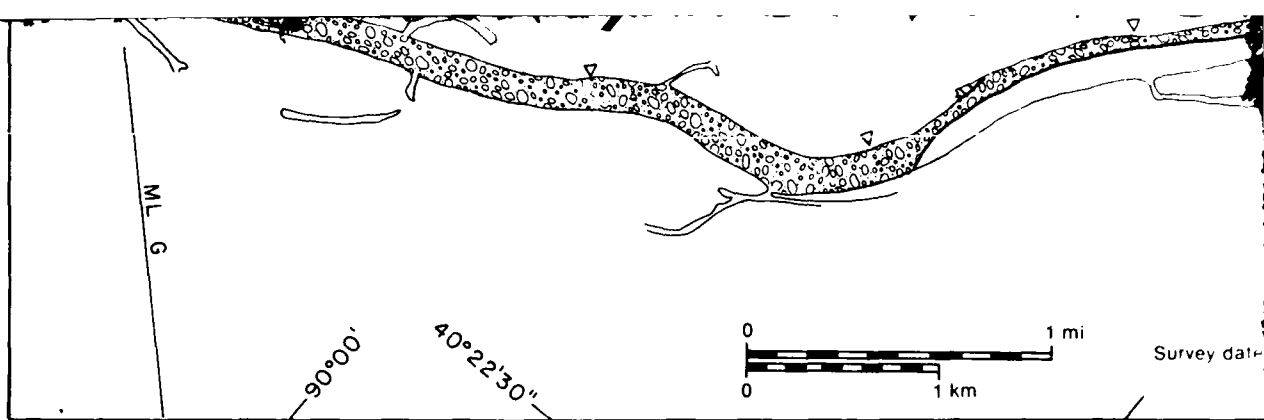
MAP UNITS

	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	0.39	NA
Solid ice cover	1.28	NA
Solid ice cover with open-water areas	0.10	90
Fragmented ice cover	2.79	NA
Fragmented ice cover with open-water areas	2.24	90
Ice floes or frazil slush and pans	0.13	20
Total area ($m^2 \times 10^6$)	7.30*	* Includes $0.37 \times 10^6 m^2$ of no video coverage

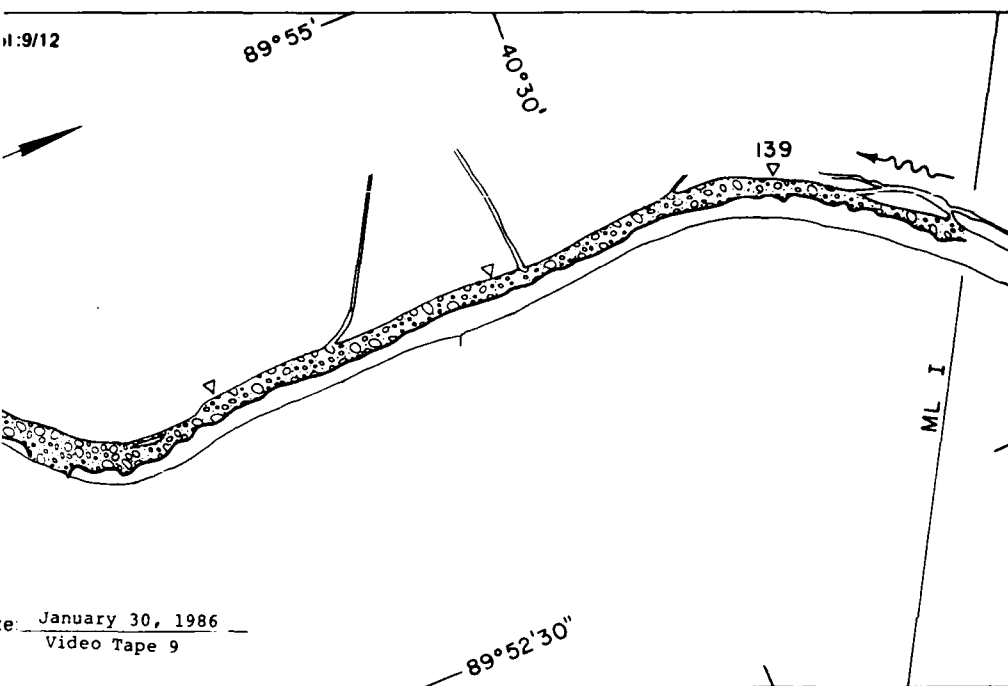
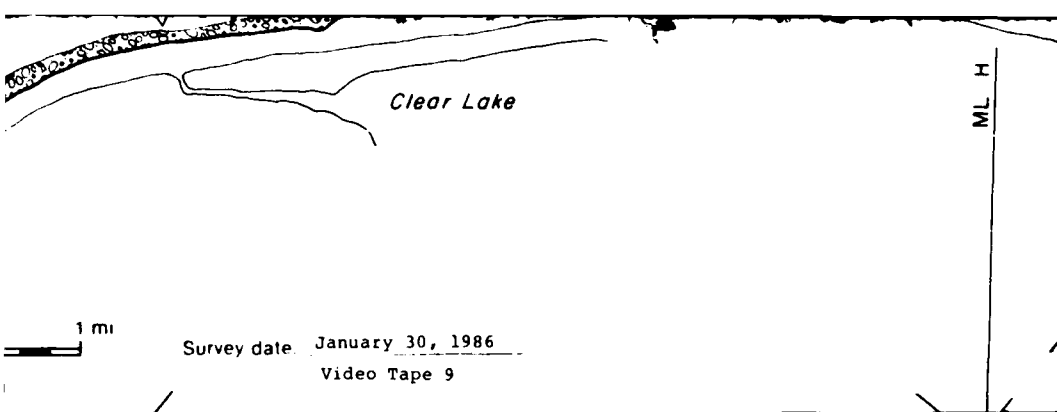


30 January 1986

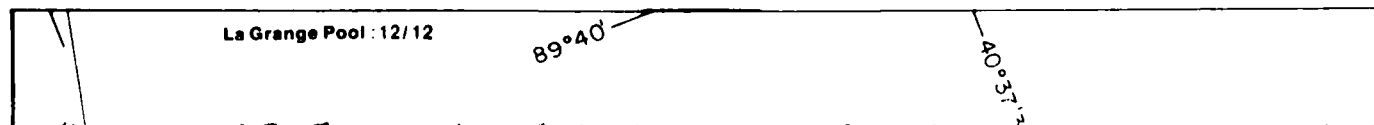
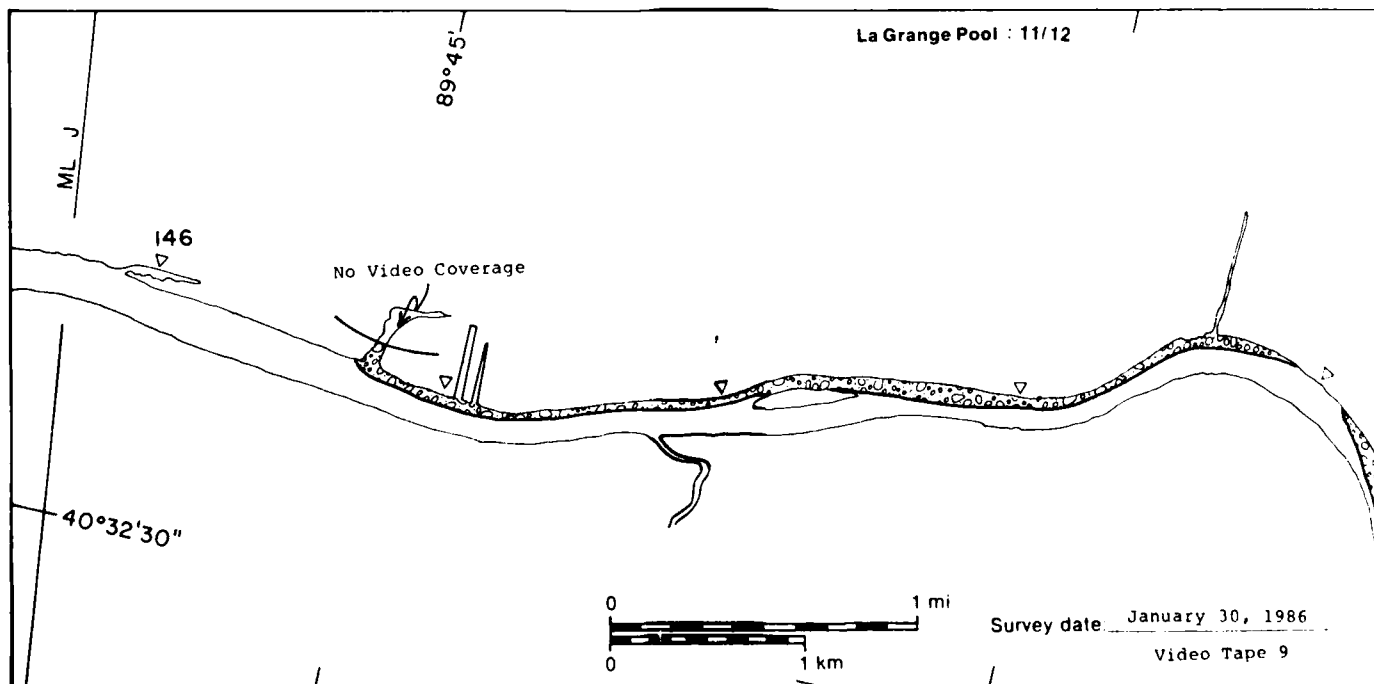
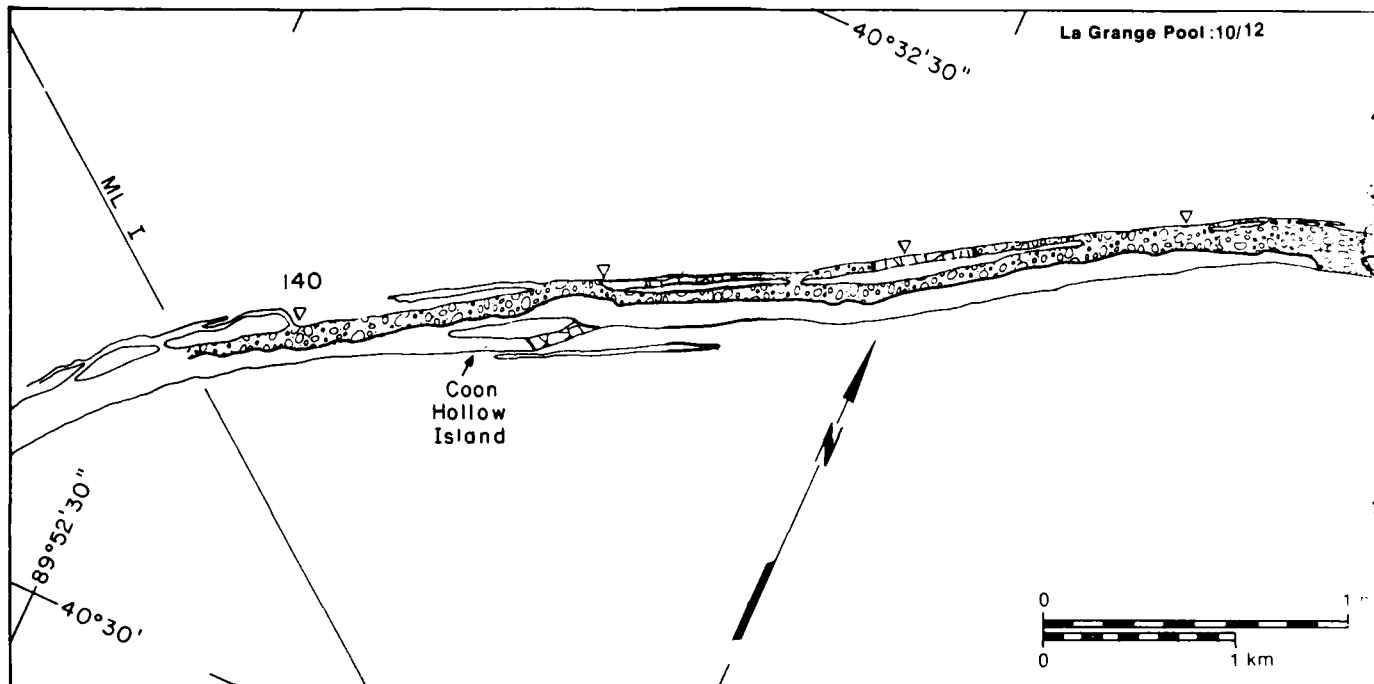


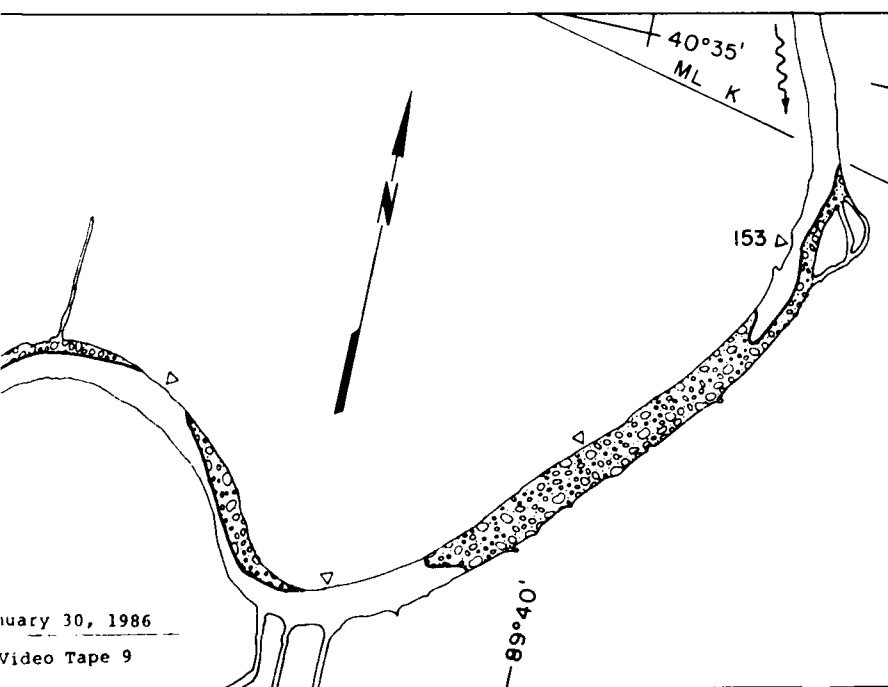
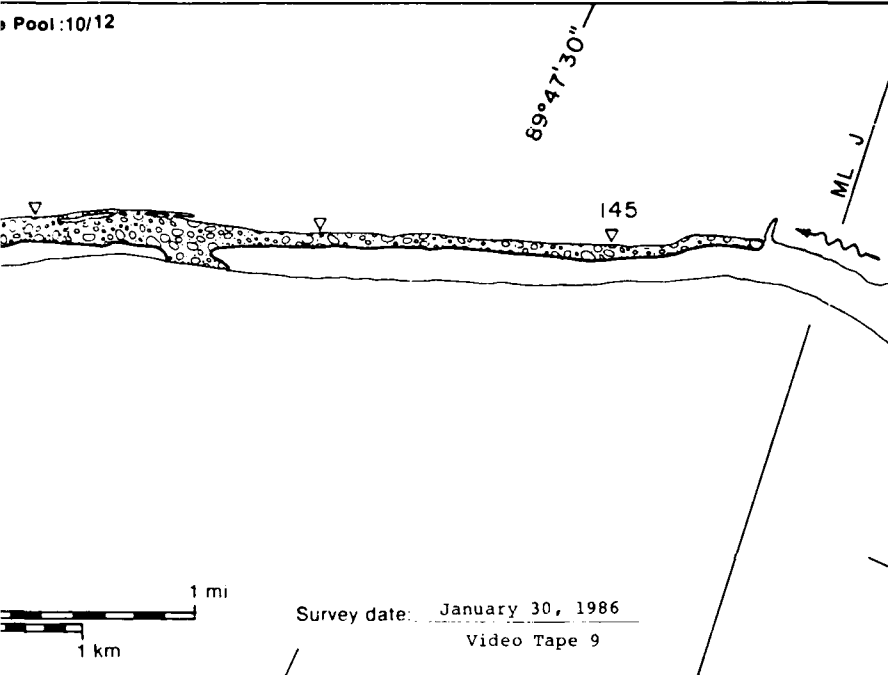


* The downstream limit of Illinois River video coverage was in the vicinity of mile 120 at Havana, Illinois, on all dates. There is no coverage of La Grange Pool maps 1/12 through 6/12 (match lines A through E).



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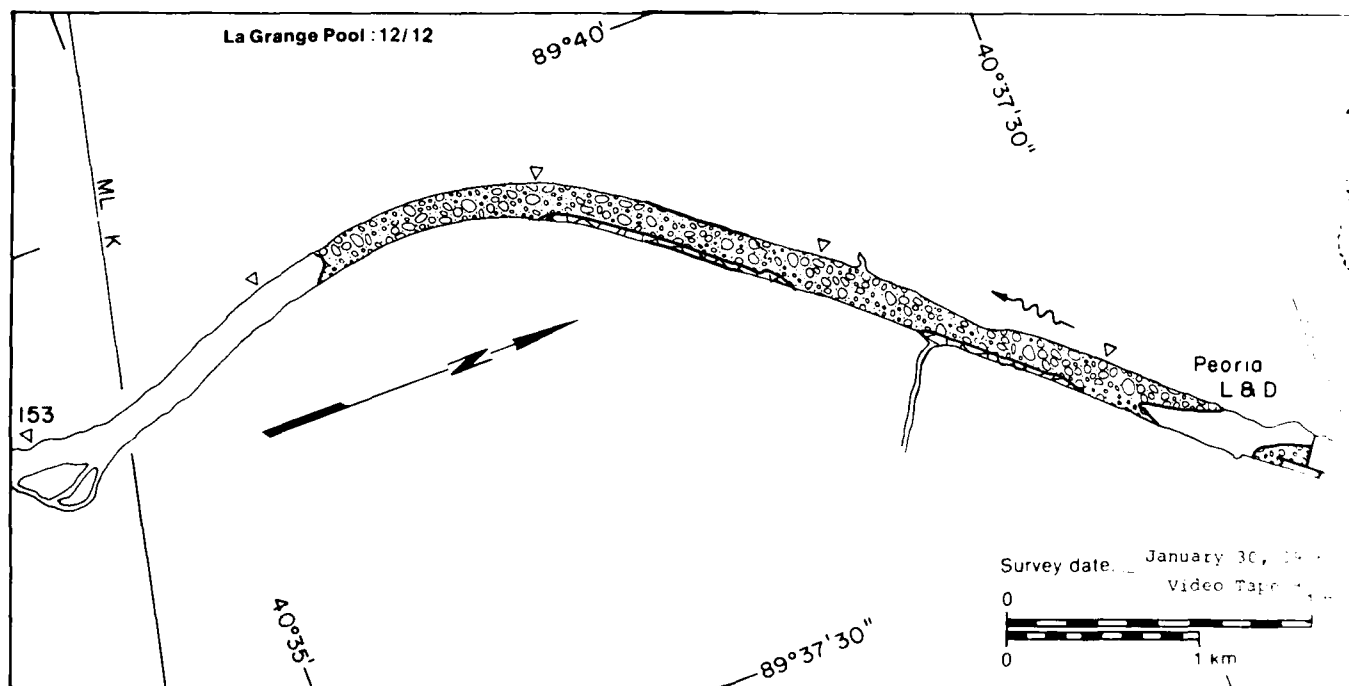
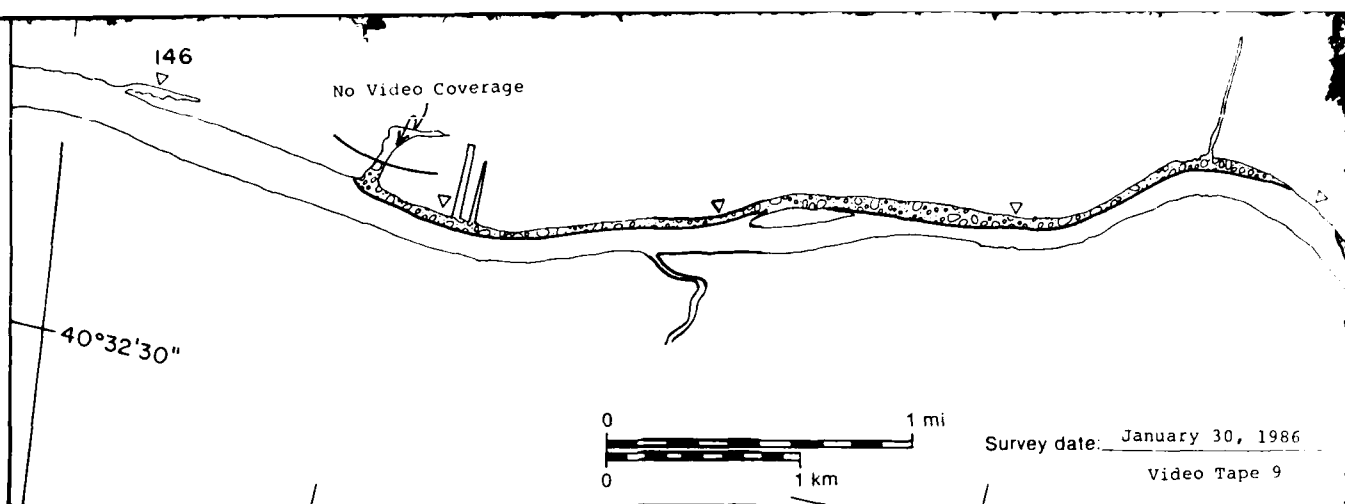


La Grange Pool

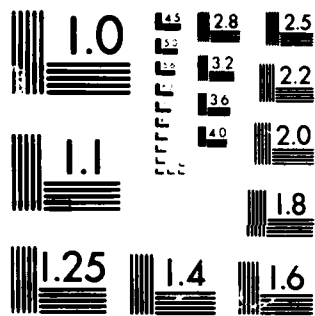
MAP UNITS

Area
(m² x 10⁶)

Surface
concentration
(%)



AD-A191 865 ICE ATLAS 1985 - 1986 MONONGAHELA RIVER ALLEGHENY RIVER 18/14
ONTO RIVER ILLINO. (U) COLD REGIONS RESEARCH AND
ENGINEERING LAB HANOVER NH L W GATTO ET AL. NOV 87
UNCLASSIFIED CREL-SP-87-28 F/G 8/12 NL



January 30, 1986

Video Tape 9

89°40'

Peoria
L & D

158

January 30, 1986

Video Tape 9

1 mi

1 km

La Grange Pool

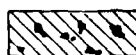
MAP UNITS



Open water



Solid ice cover



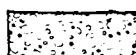
Solid ice cover with
open-water areas



Fragmented ice cover



Fragmented ice cover
with open-water areas

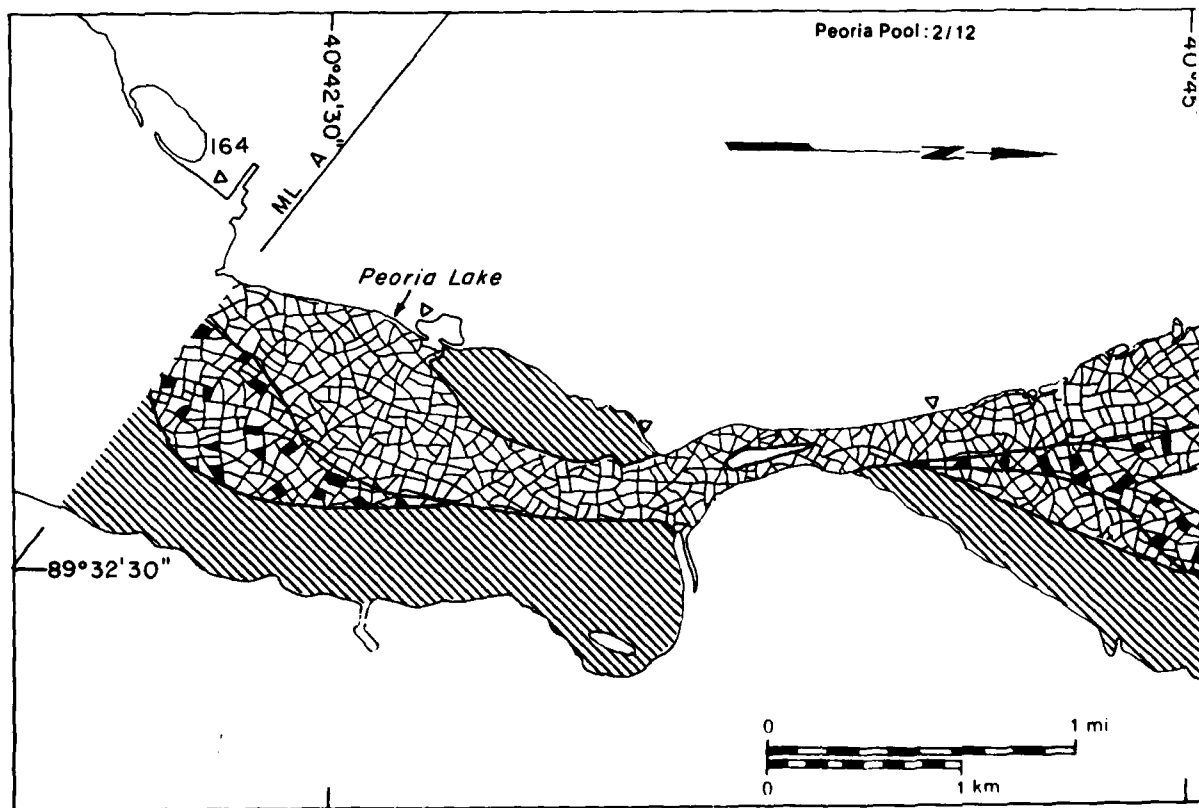
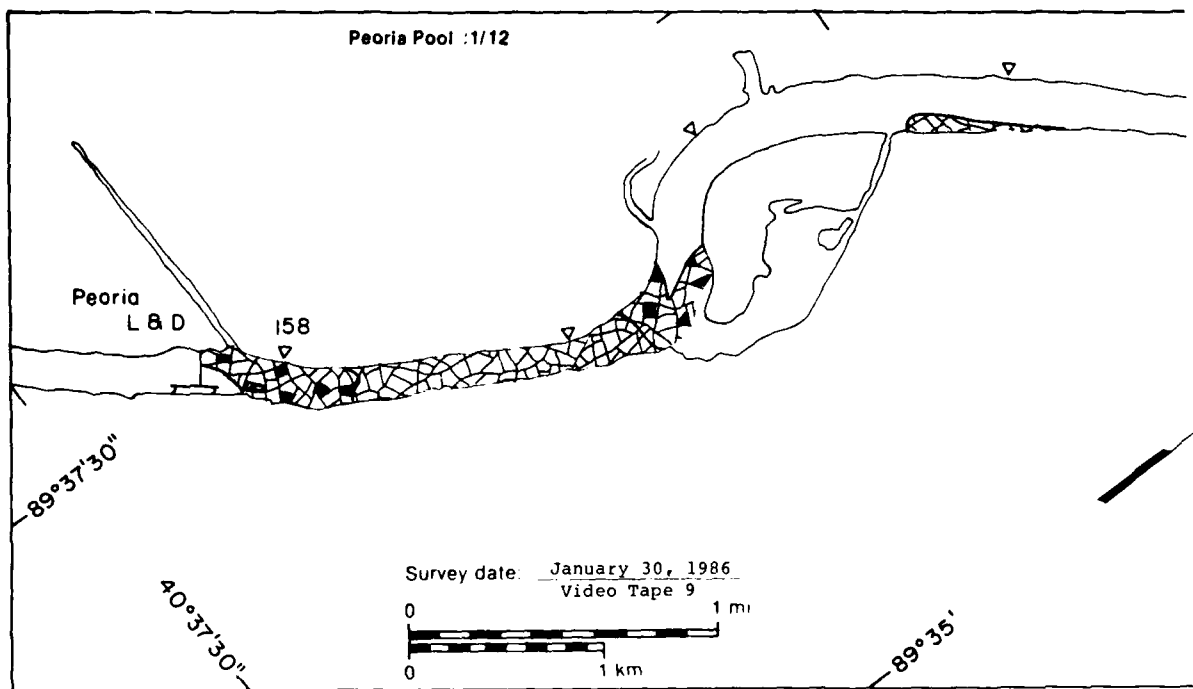


Ice floes or frazil slush
and pans

Total area ($m^2 \times 10^6$)

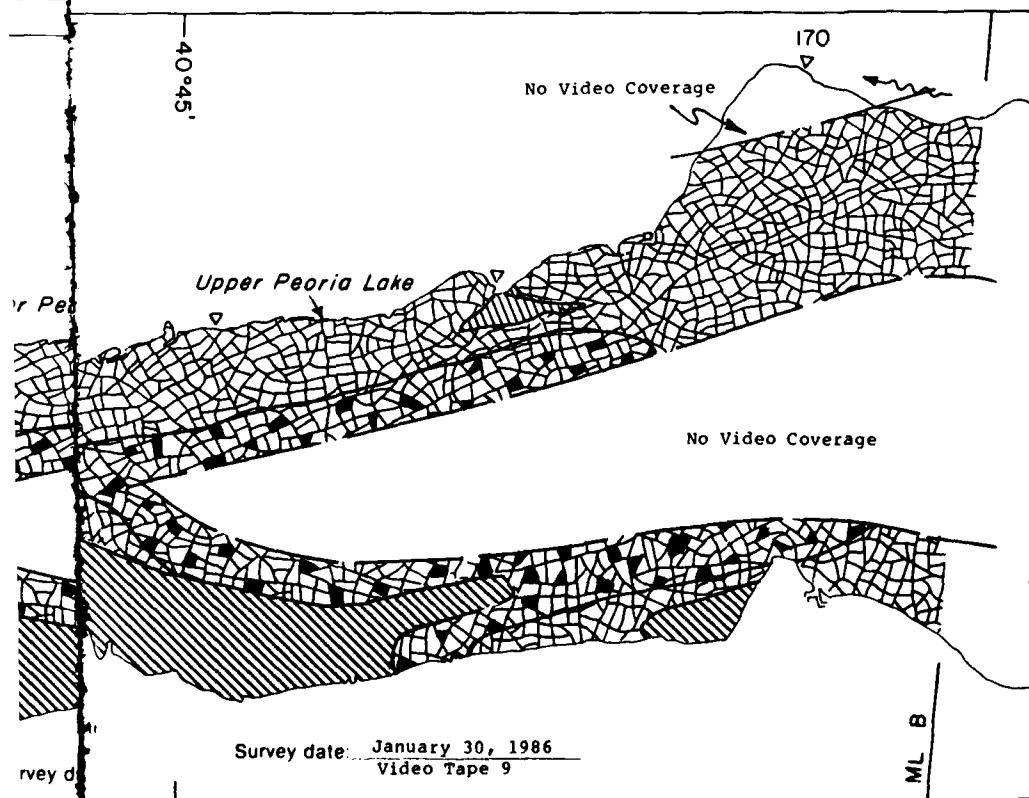
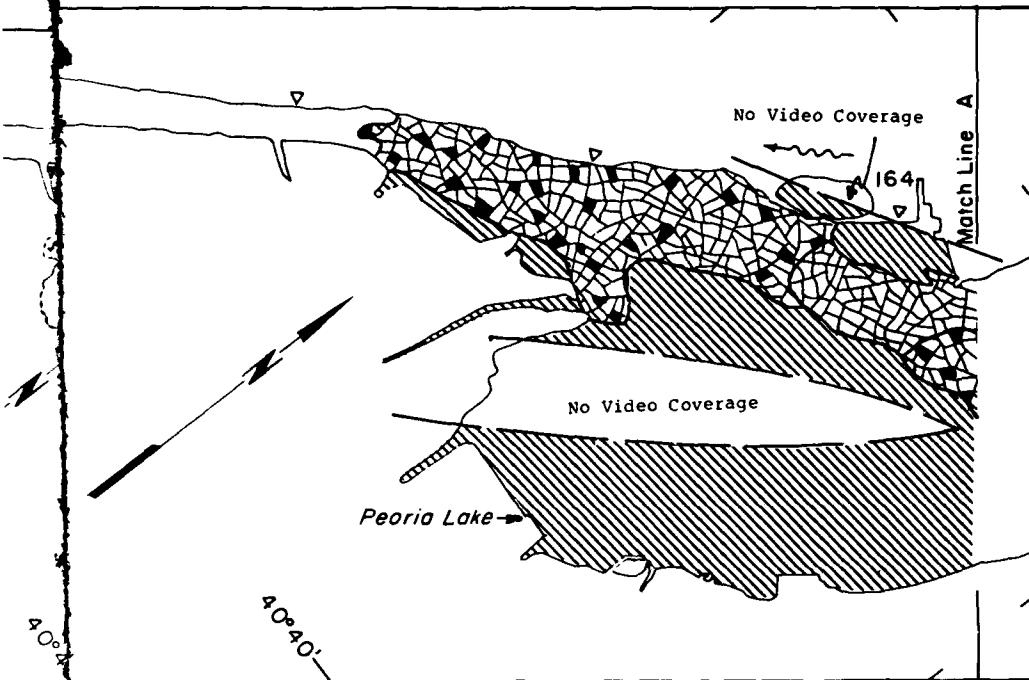
Area ($m^2 \times 10^6$)	Surface concentration (%)
4.94	NA
0.04	NA
0.00	—
0.27	NA
0.04	80
6.39	40
11.71*	

* Includes $0.03 \times 10^6 m^2$
of no video coverage

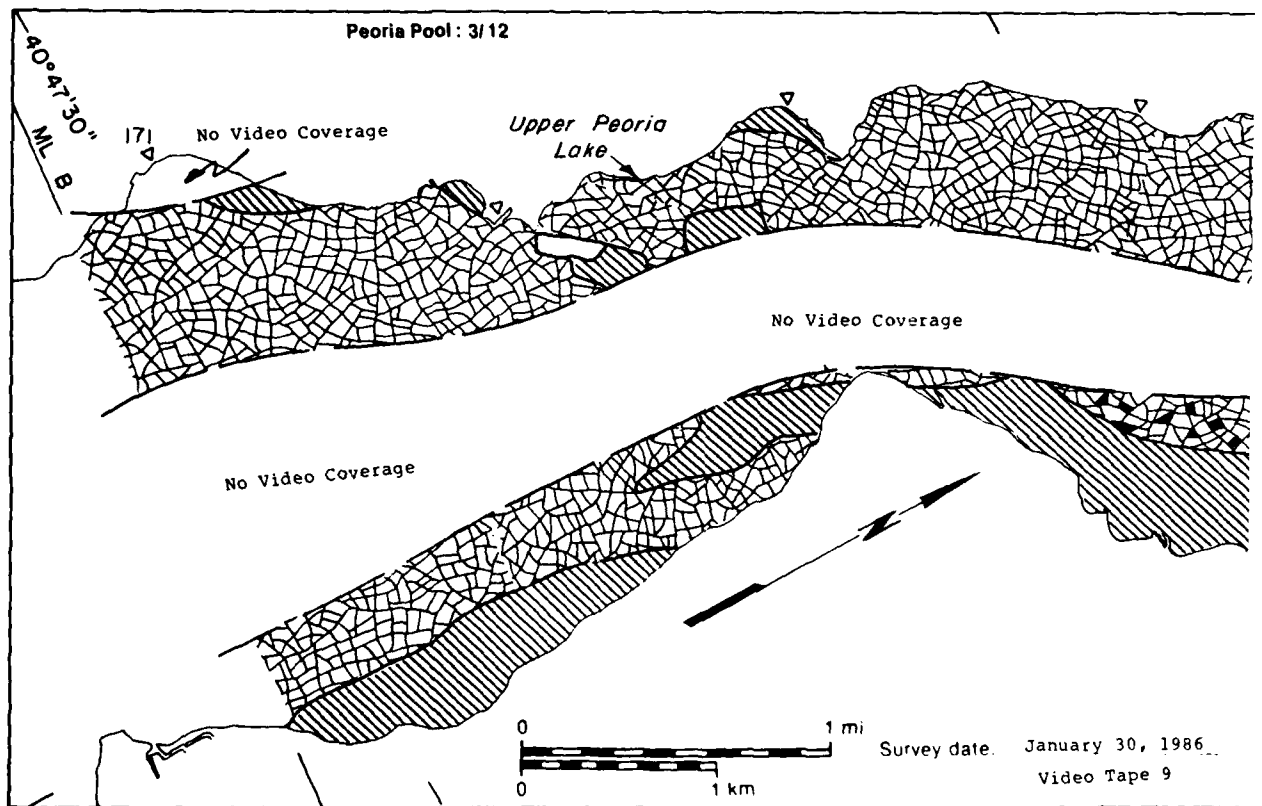
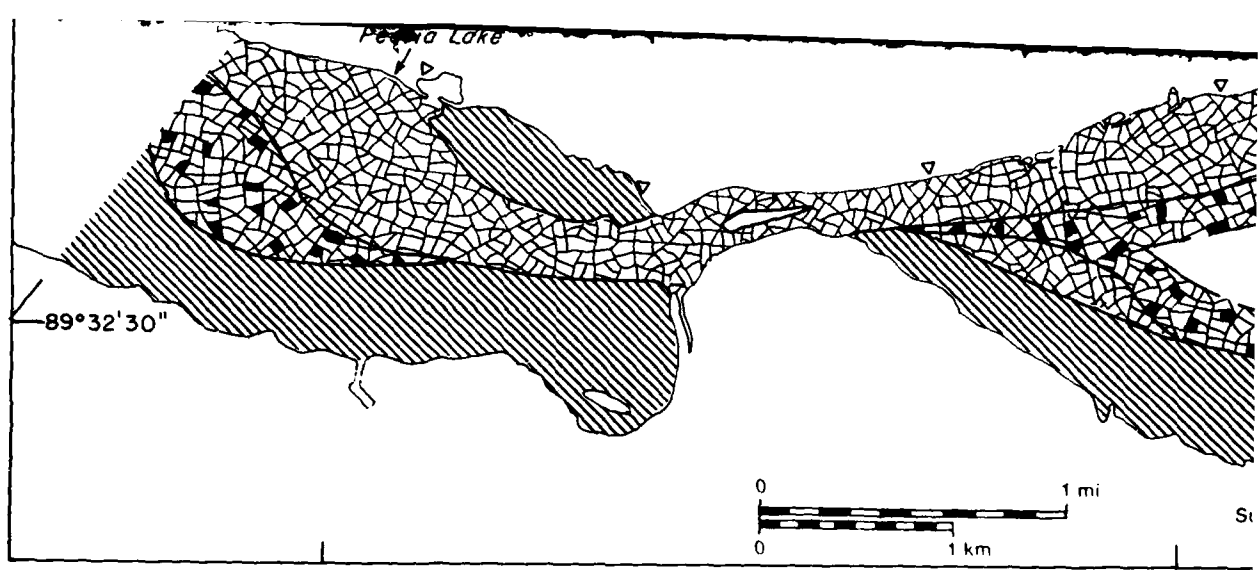


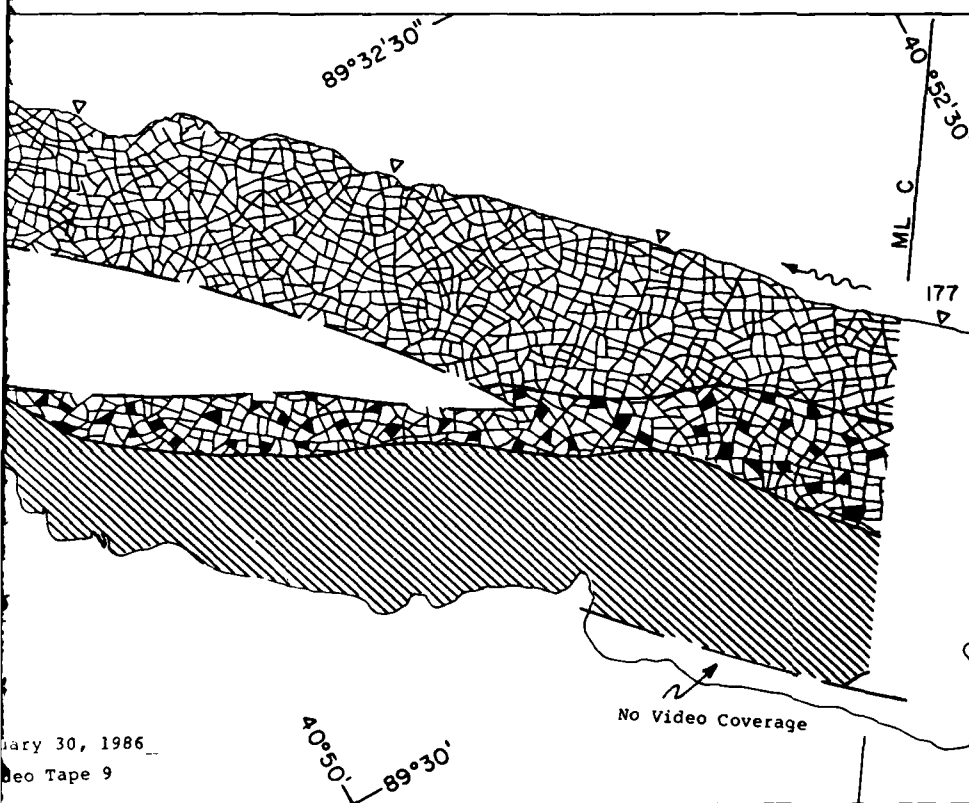
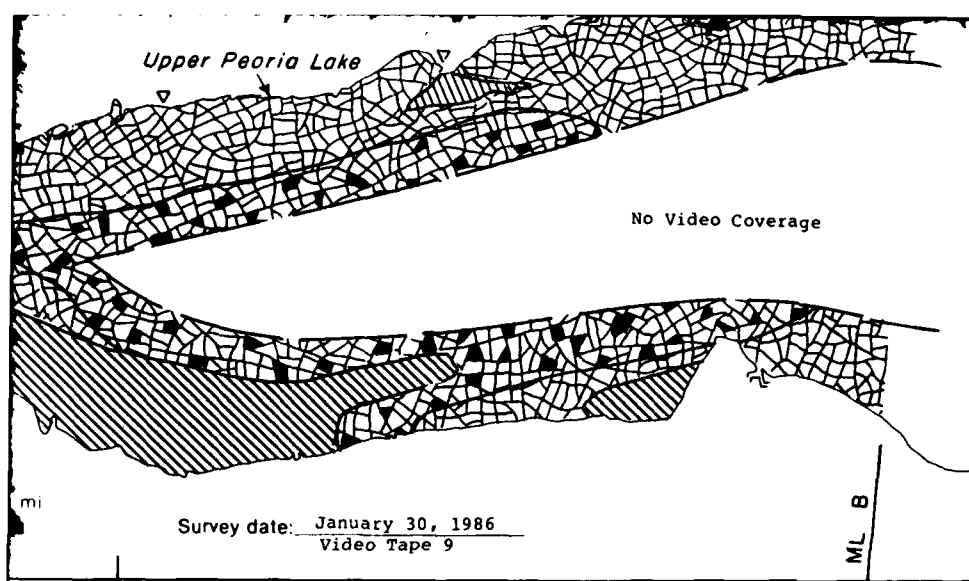
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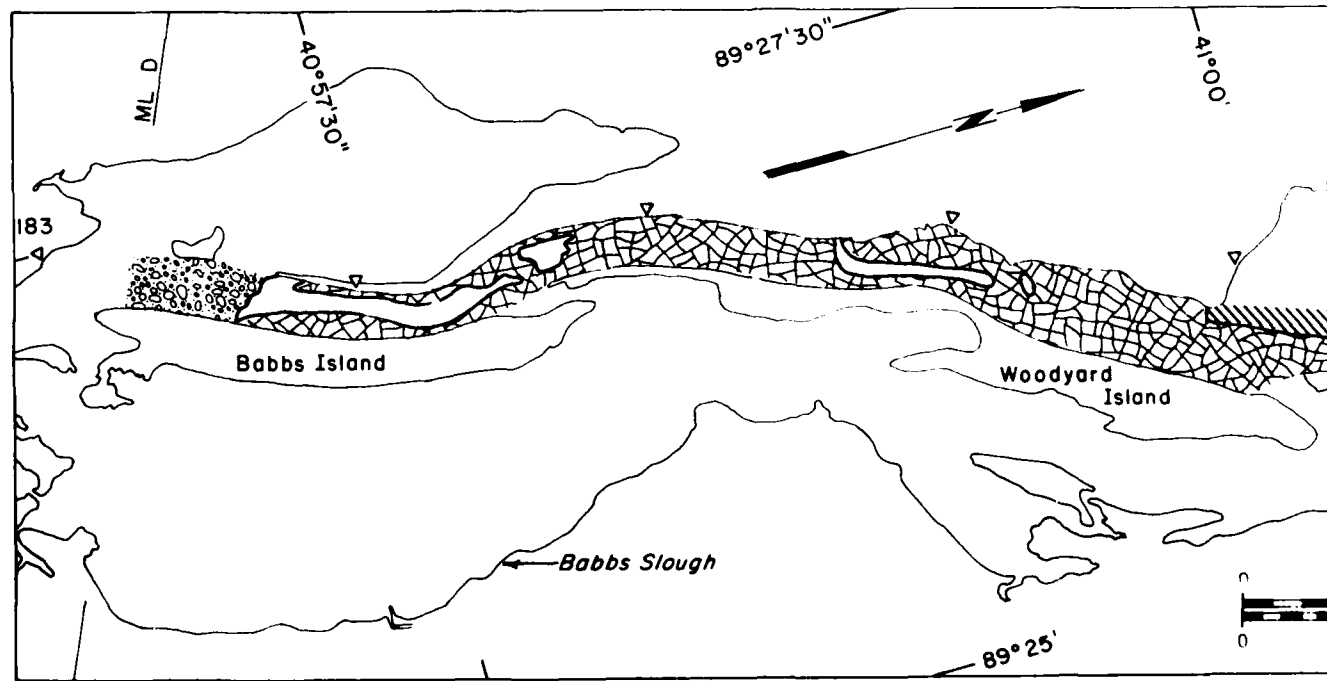
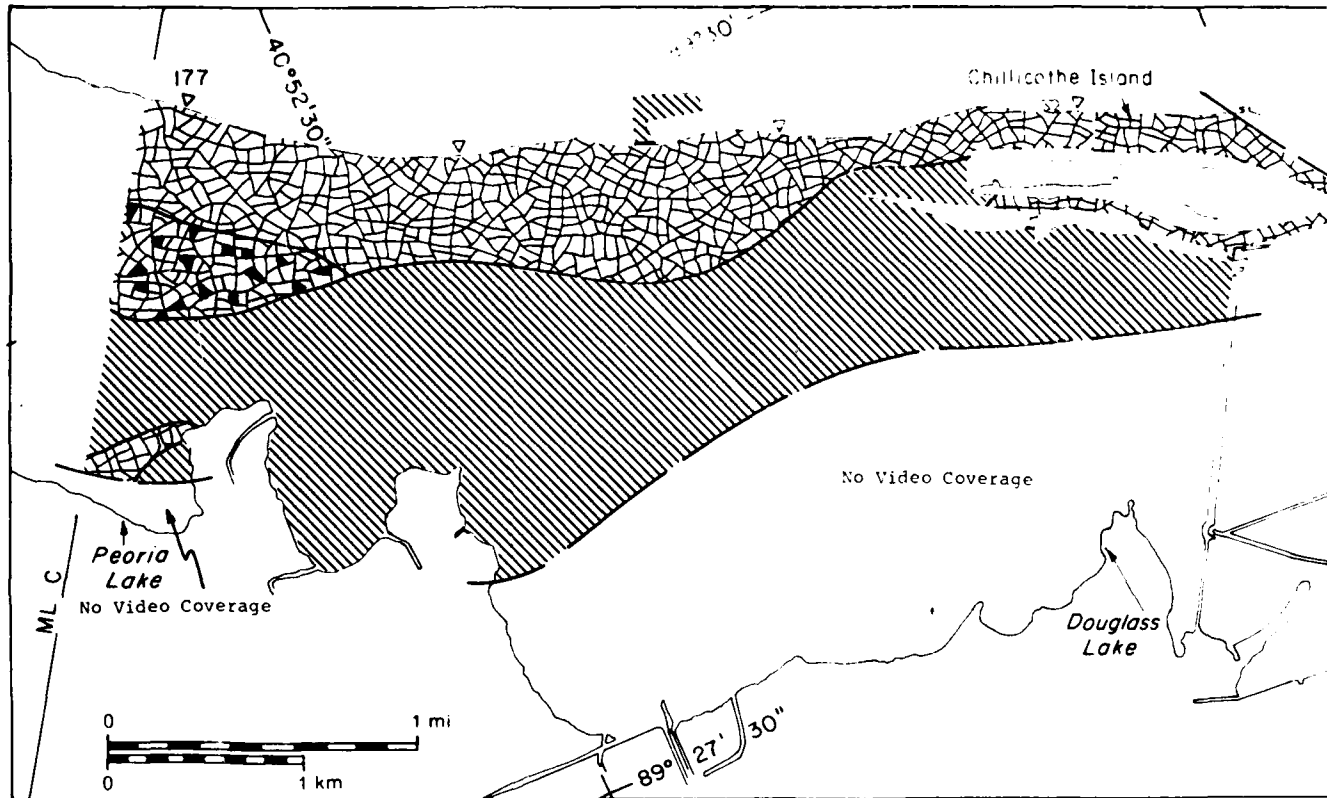
99°32'30"

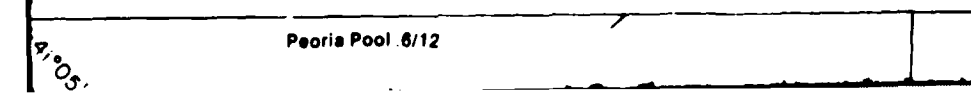
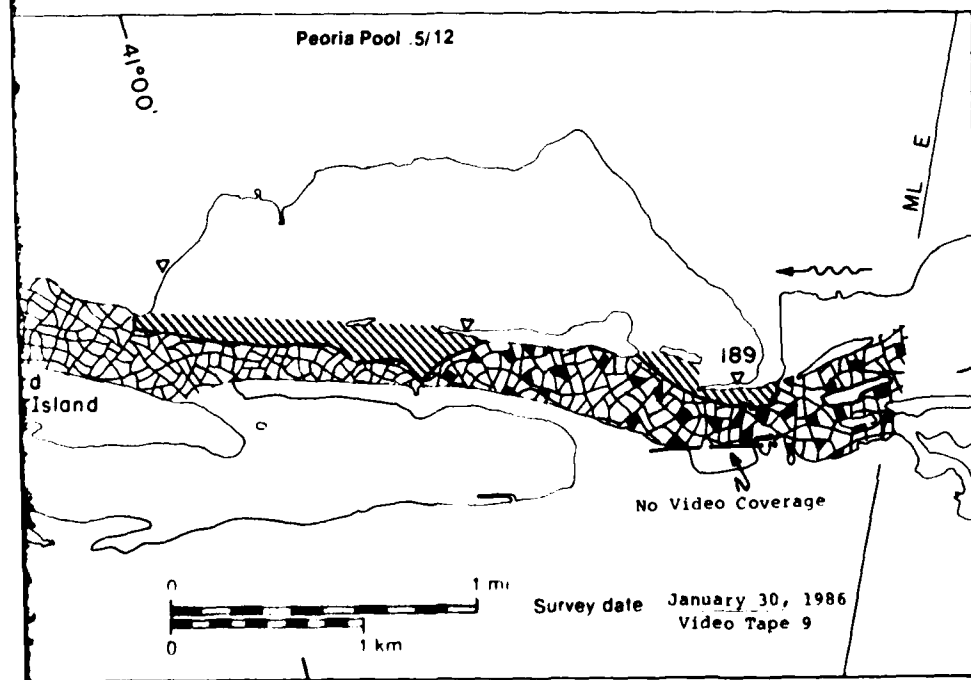
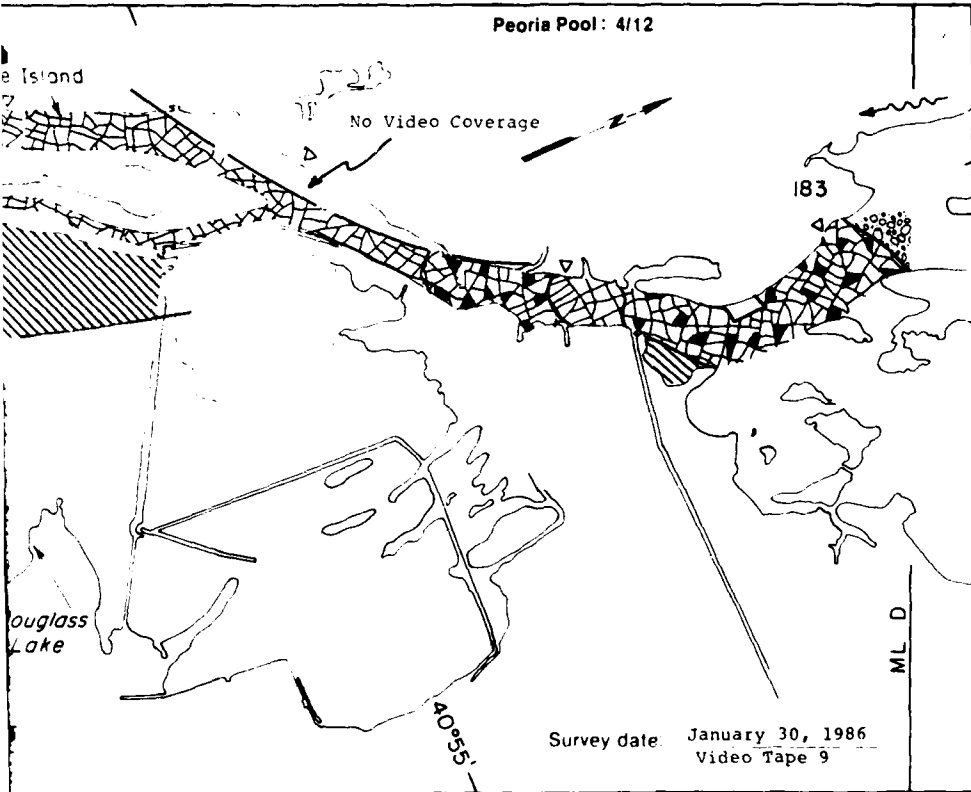


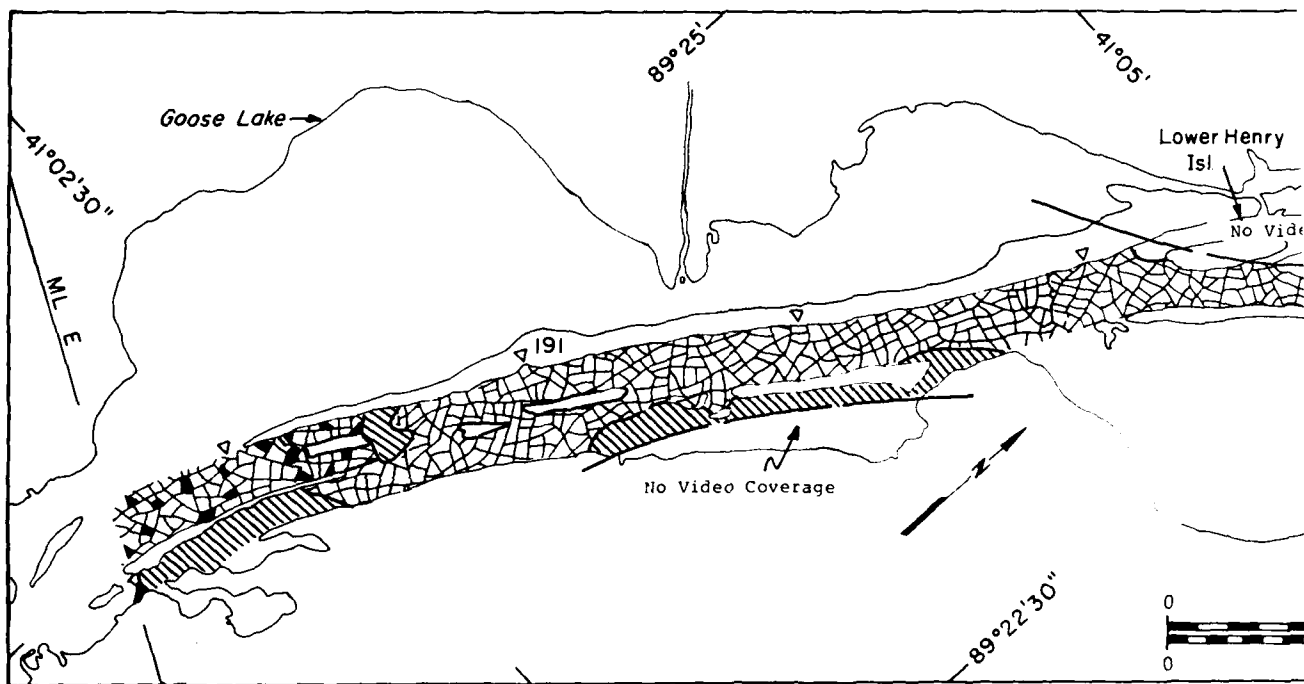
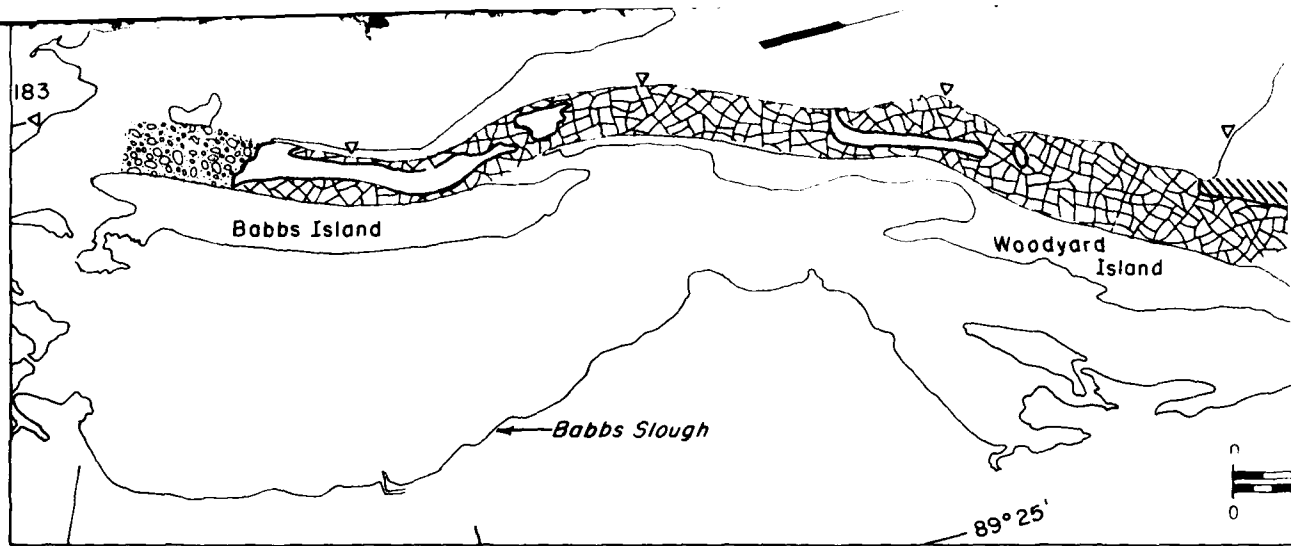


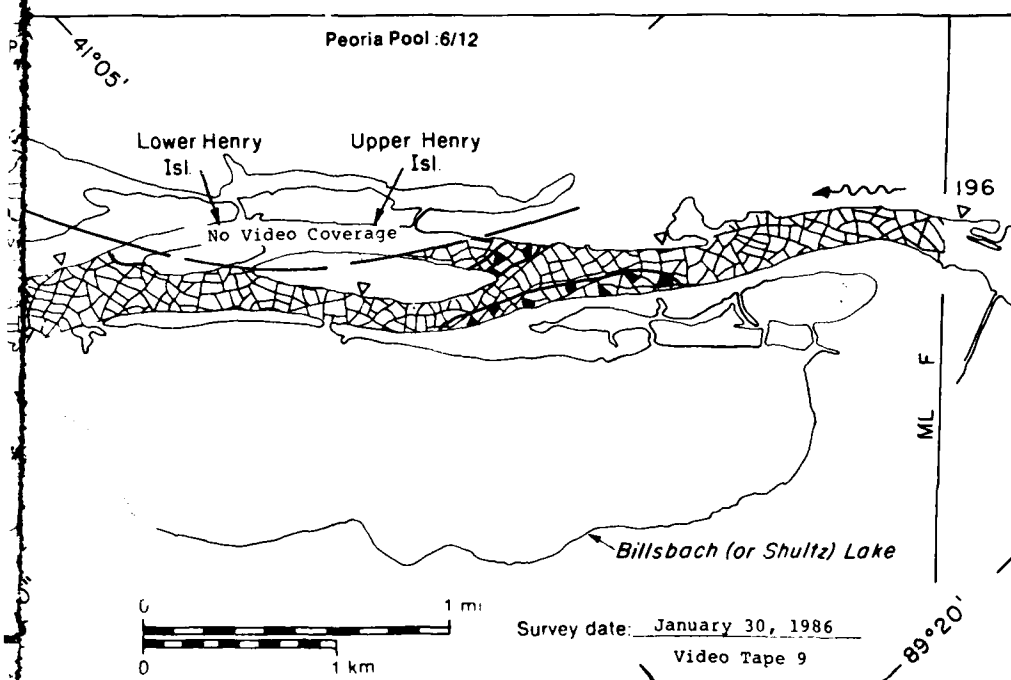
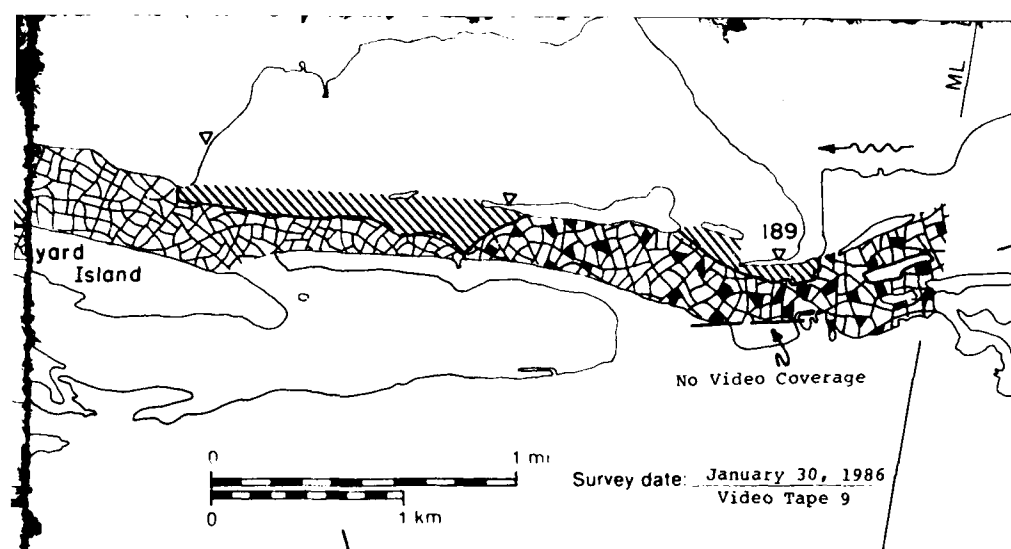
D

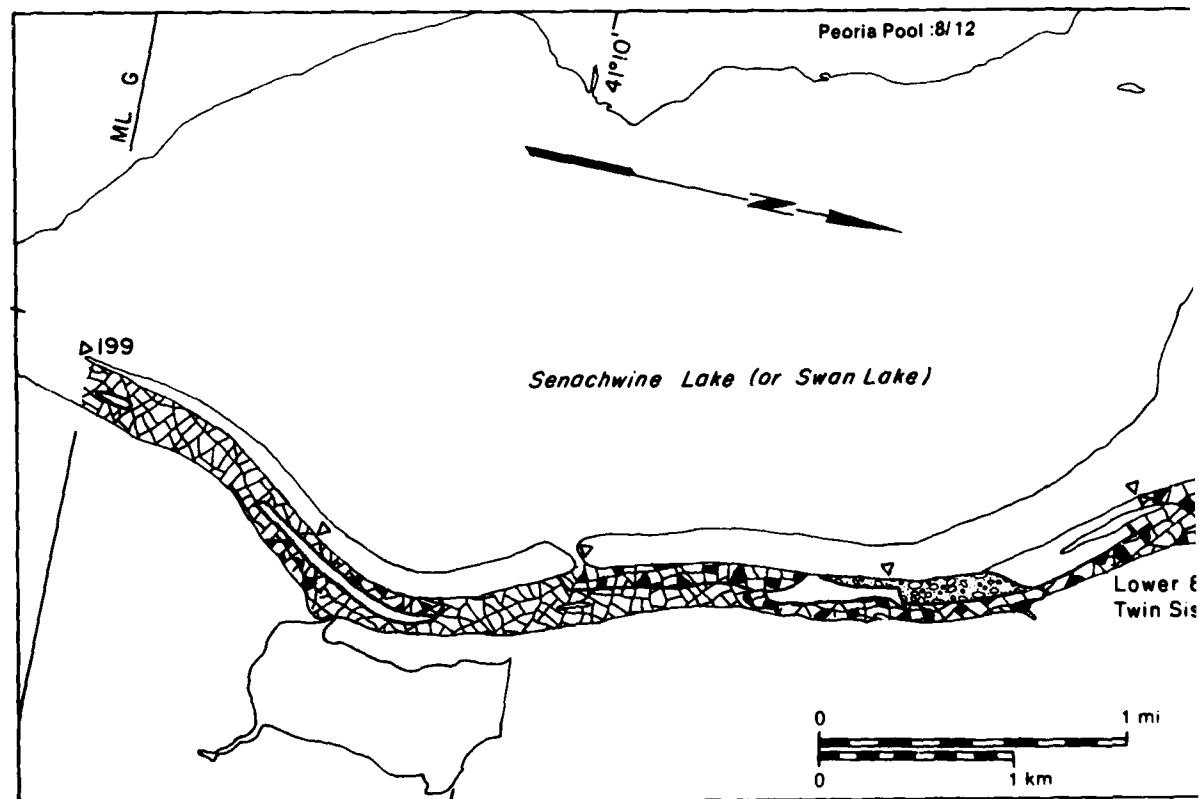
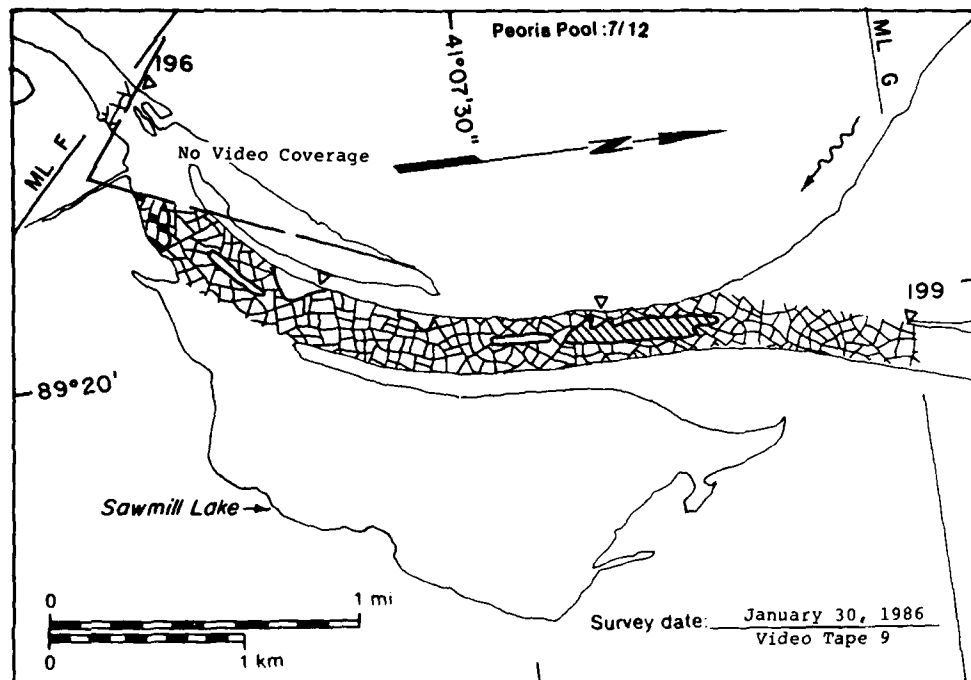
30 January 1986



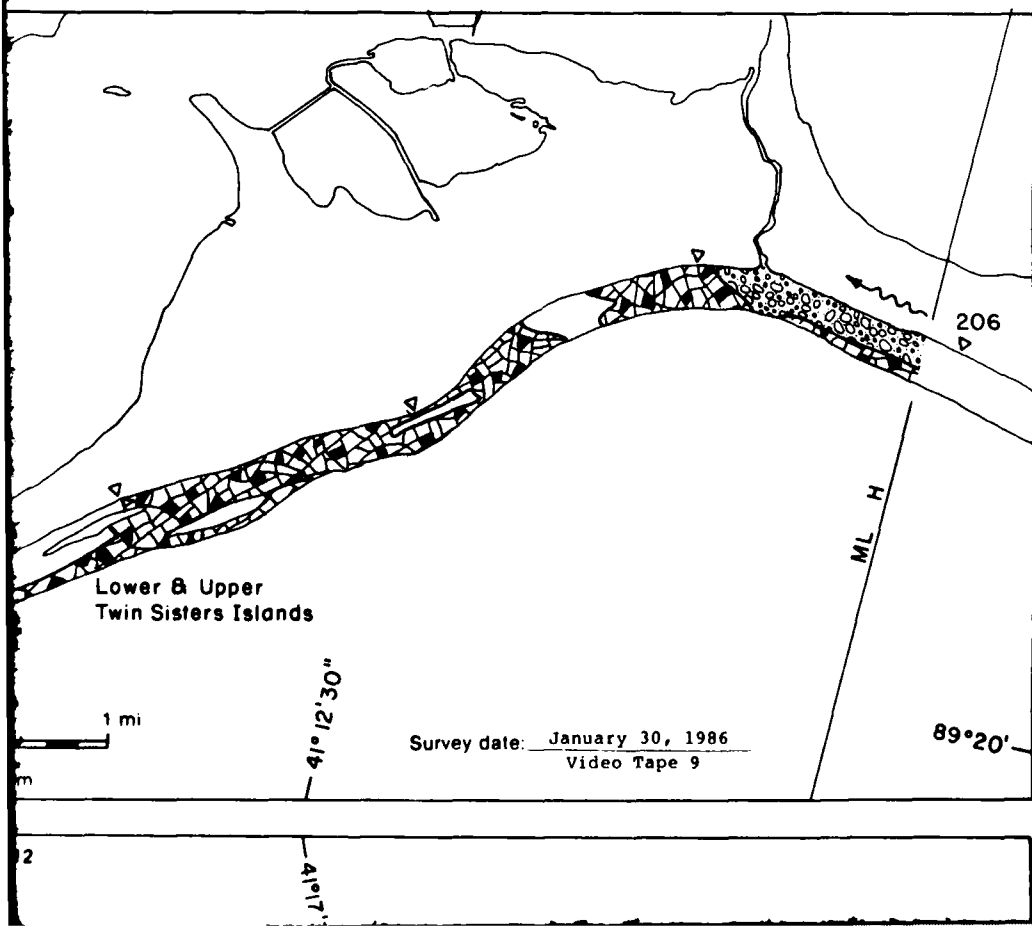


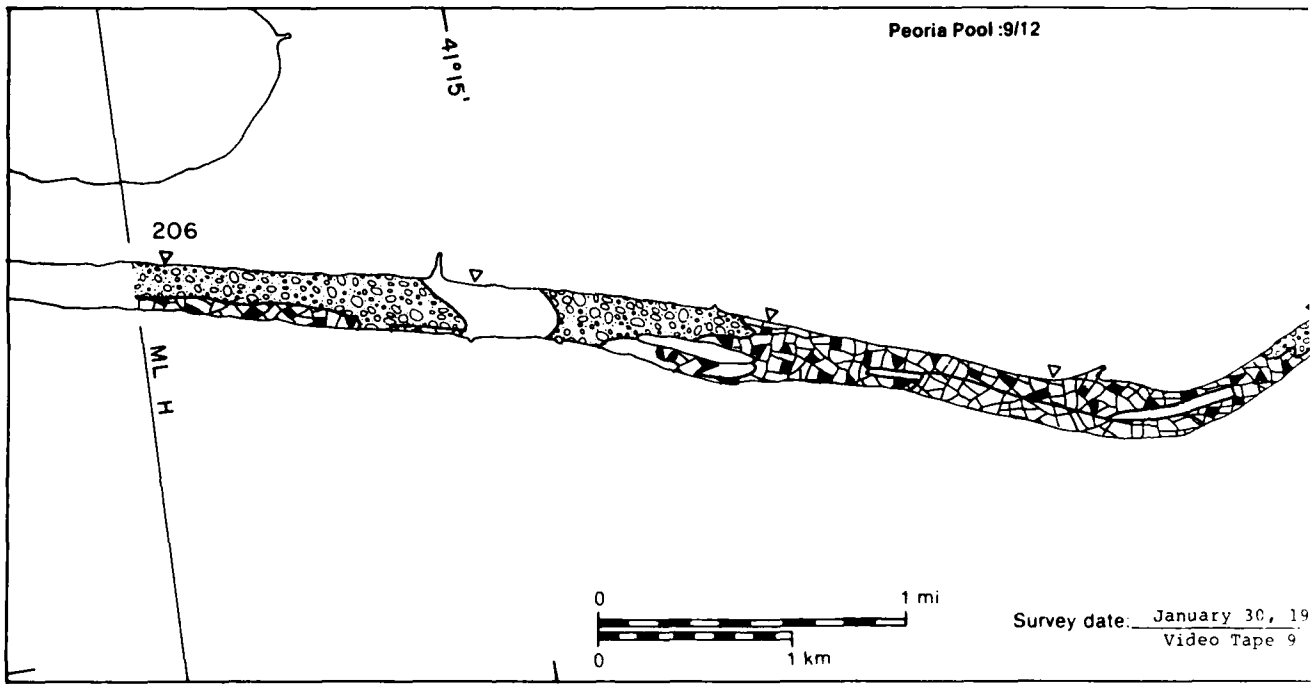
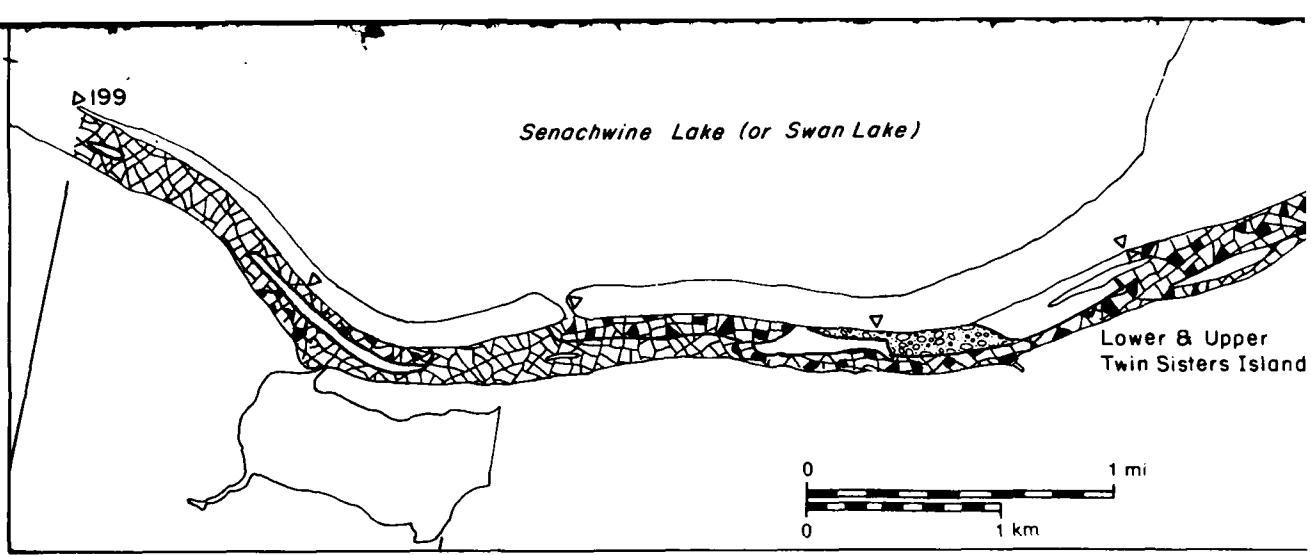


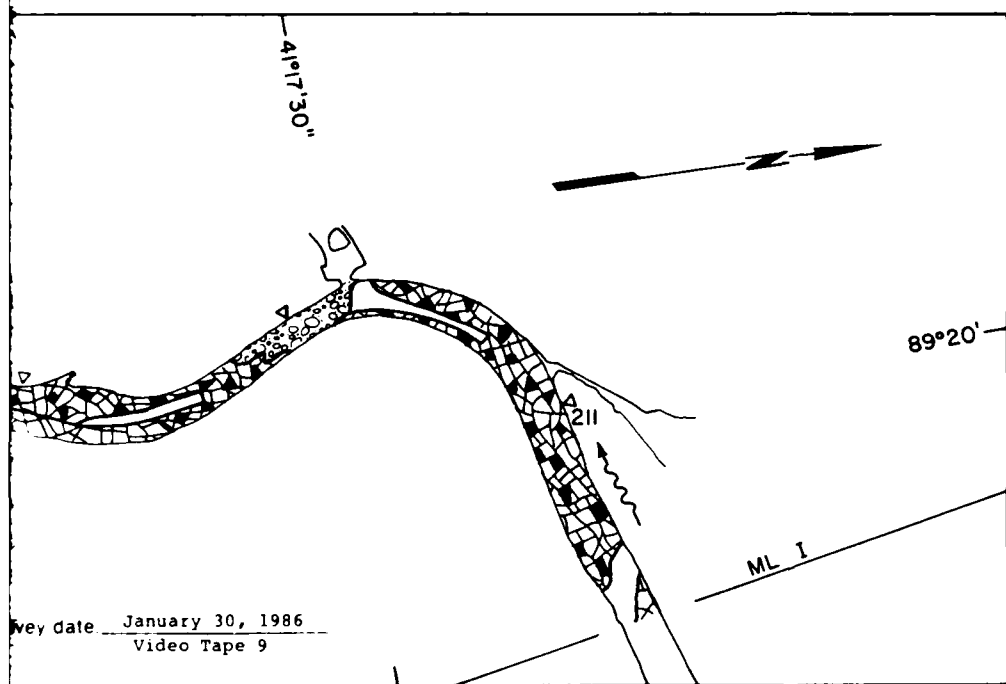
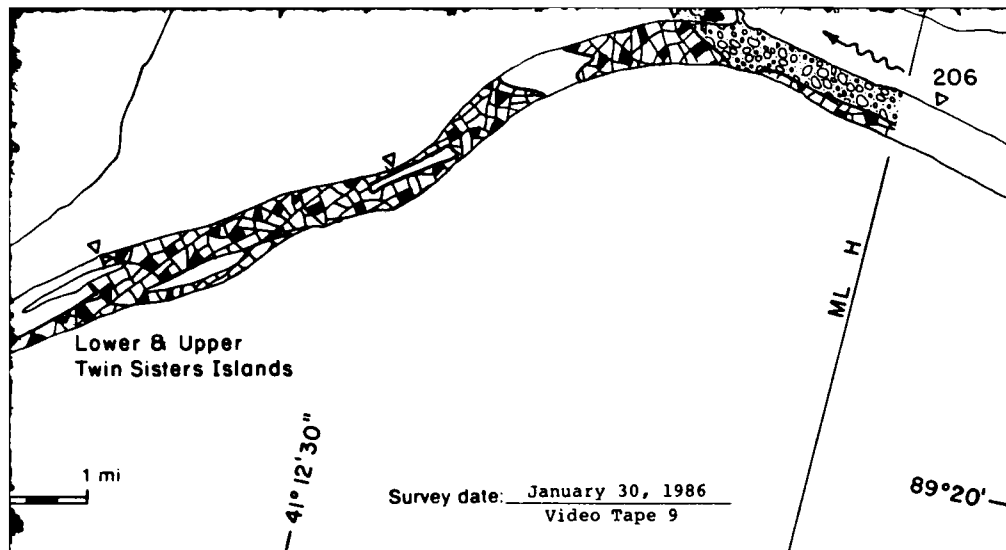




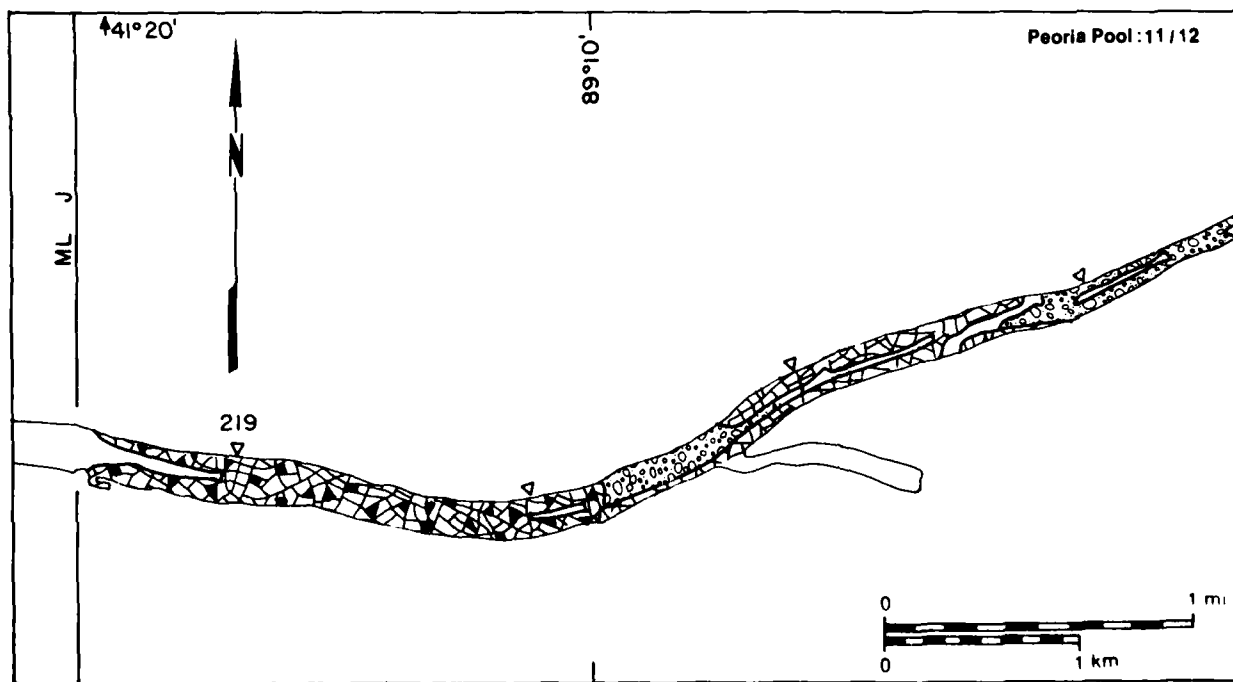
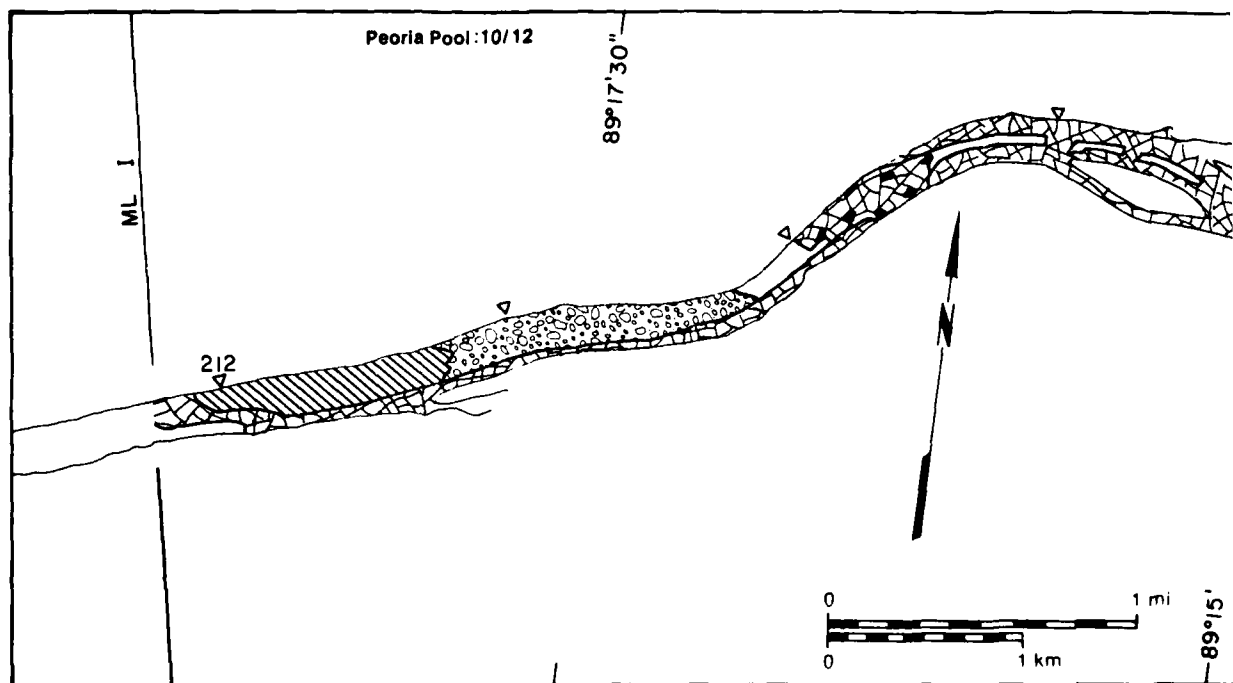
30 January 1986

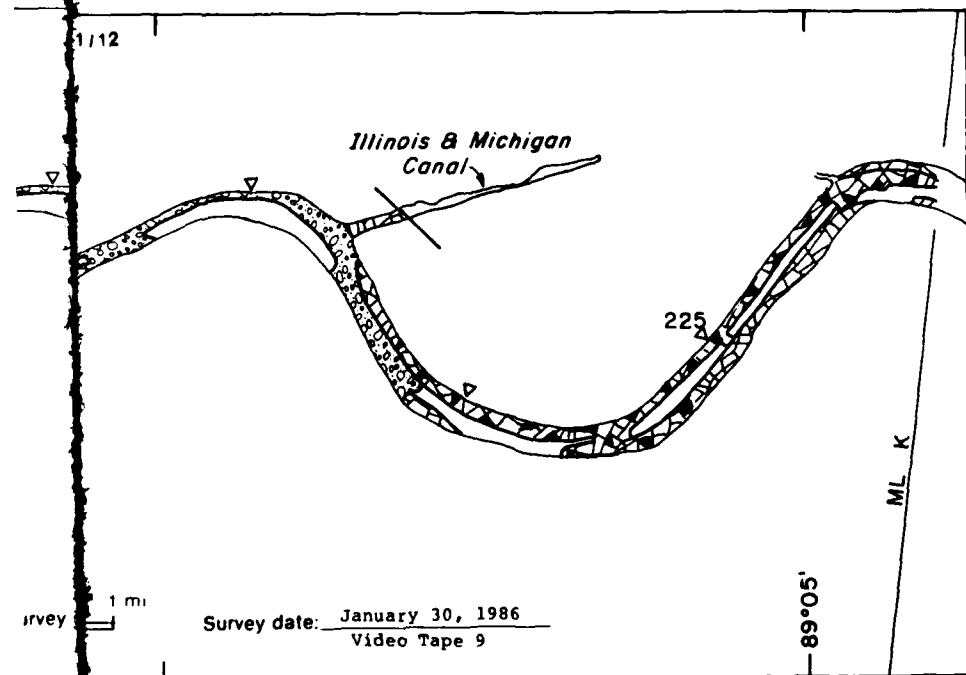
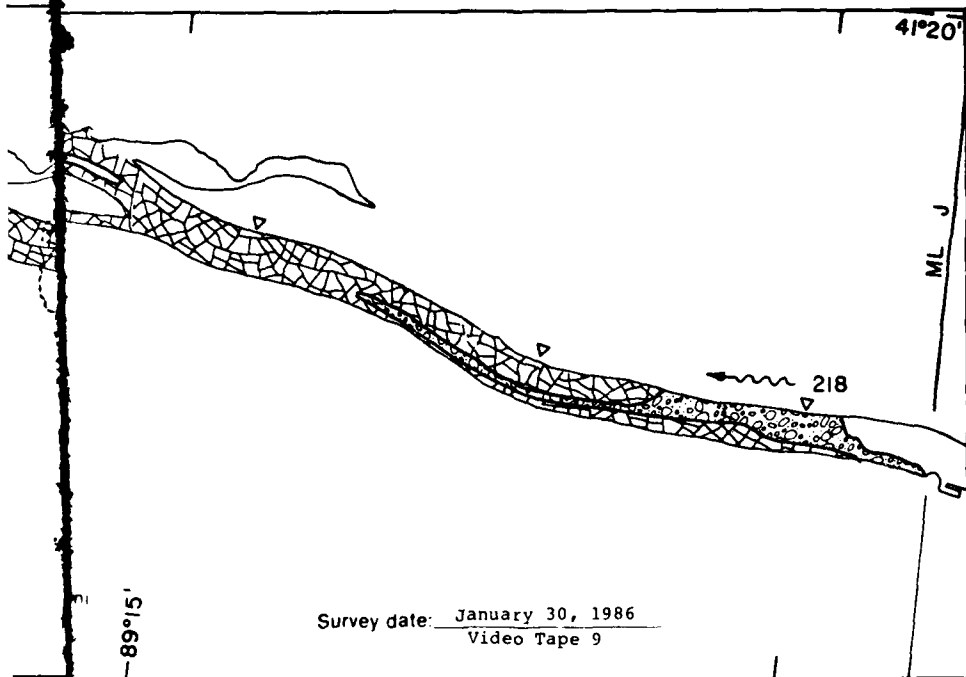


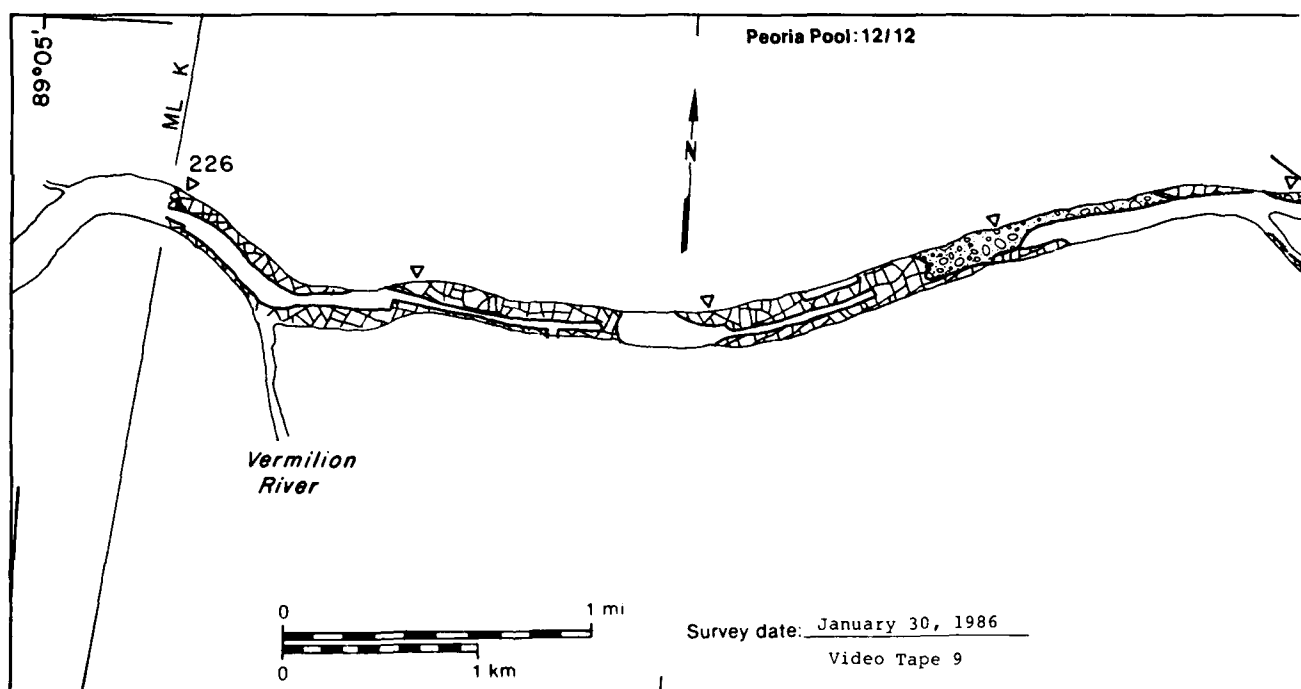
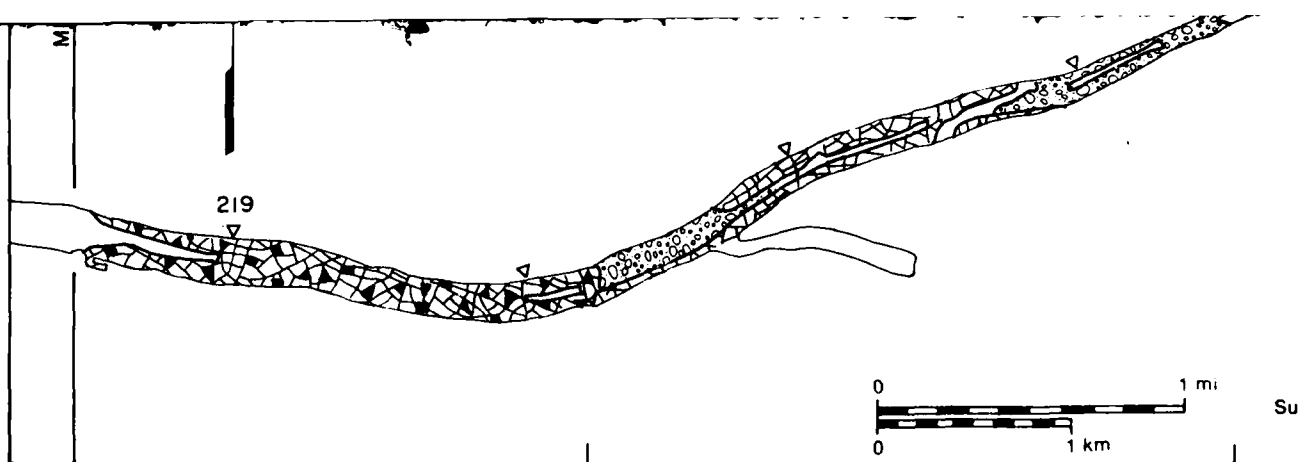




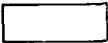
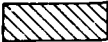




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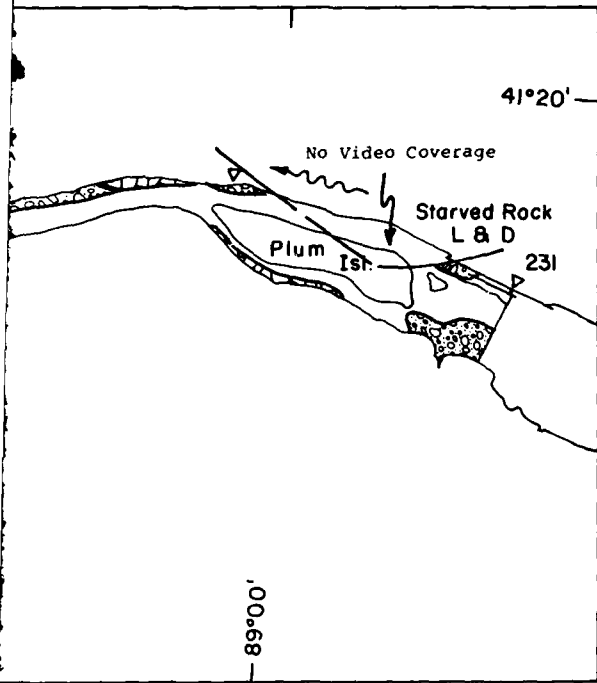
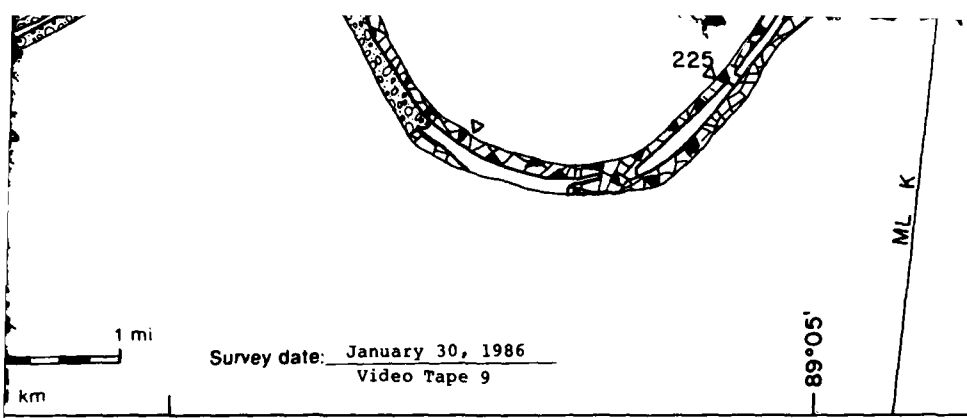


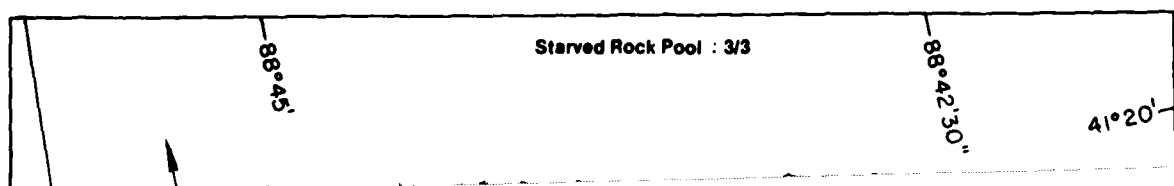
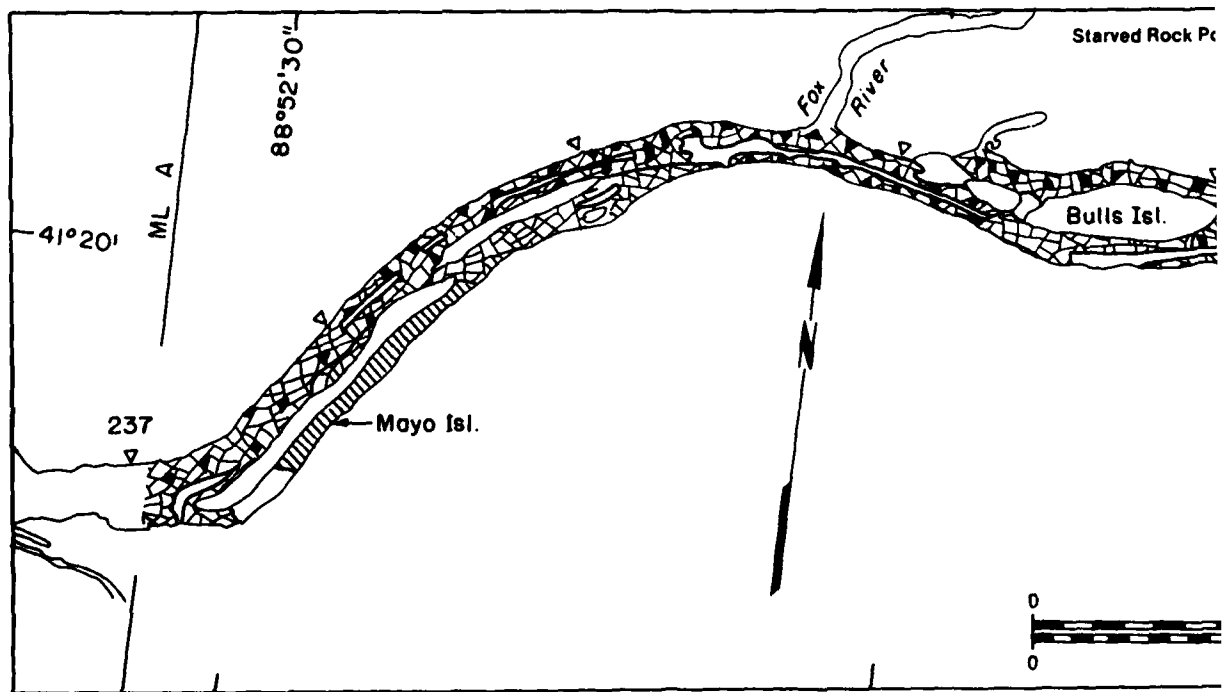
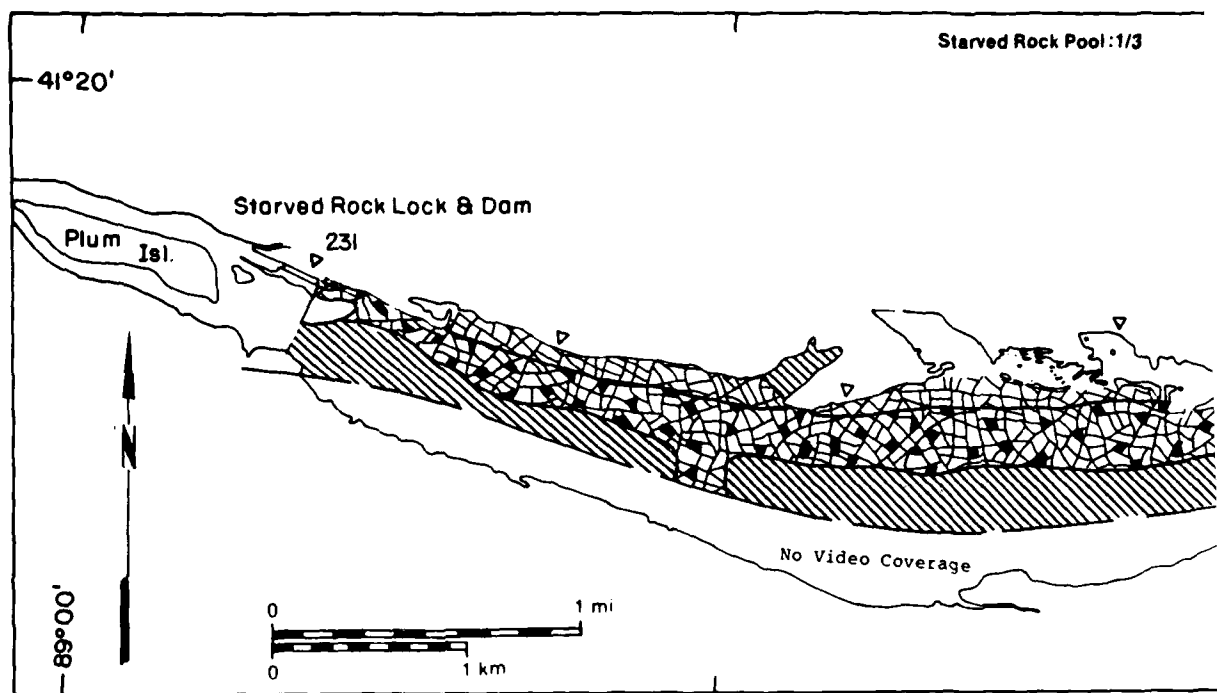


Peoria Pool

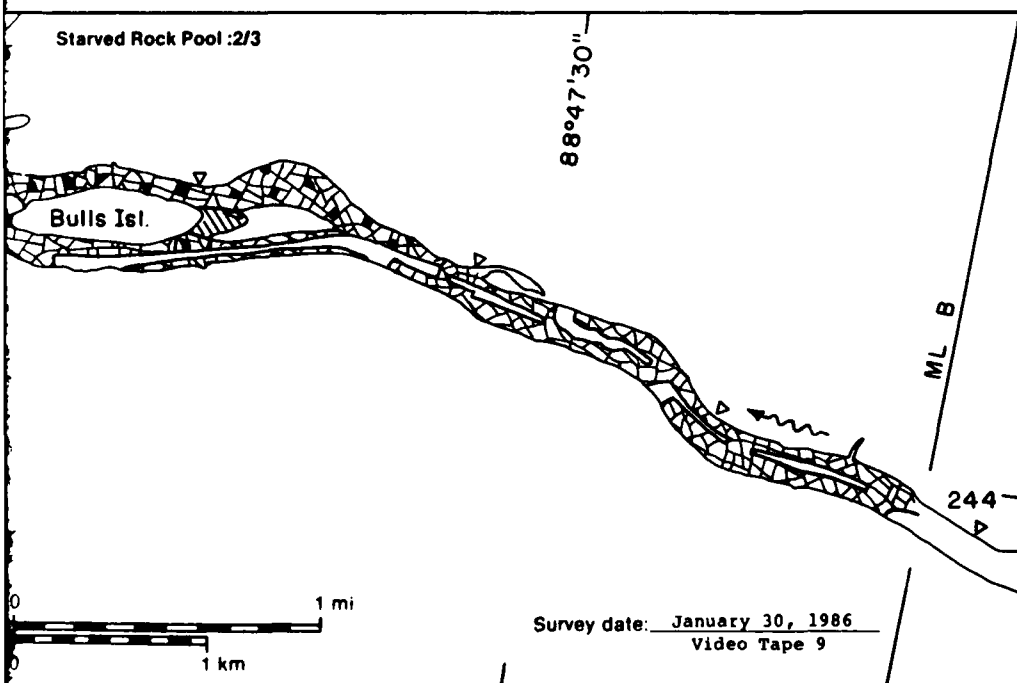
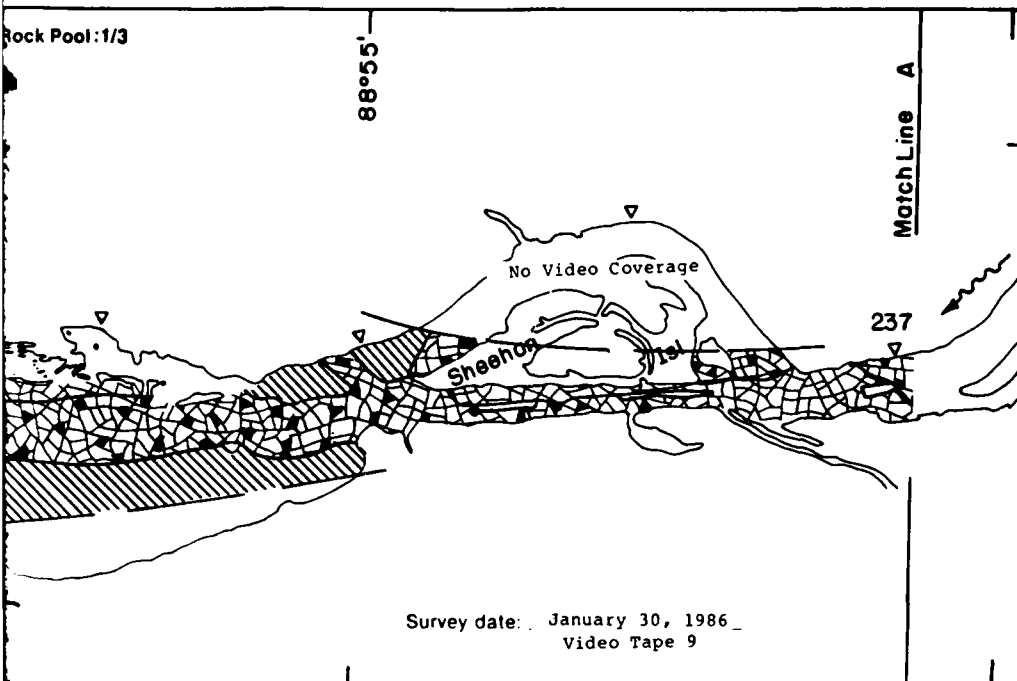
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
	3.69	NA
	18.51	NA
	0.00	—
	27.56	NA
	11.49	90
	2.30	40
Total area ($m^2 \times 10^6$)	81.33*	

* Includes $17.78 \times 10^6 m^2$
of no video coverage

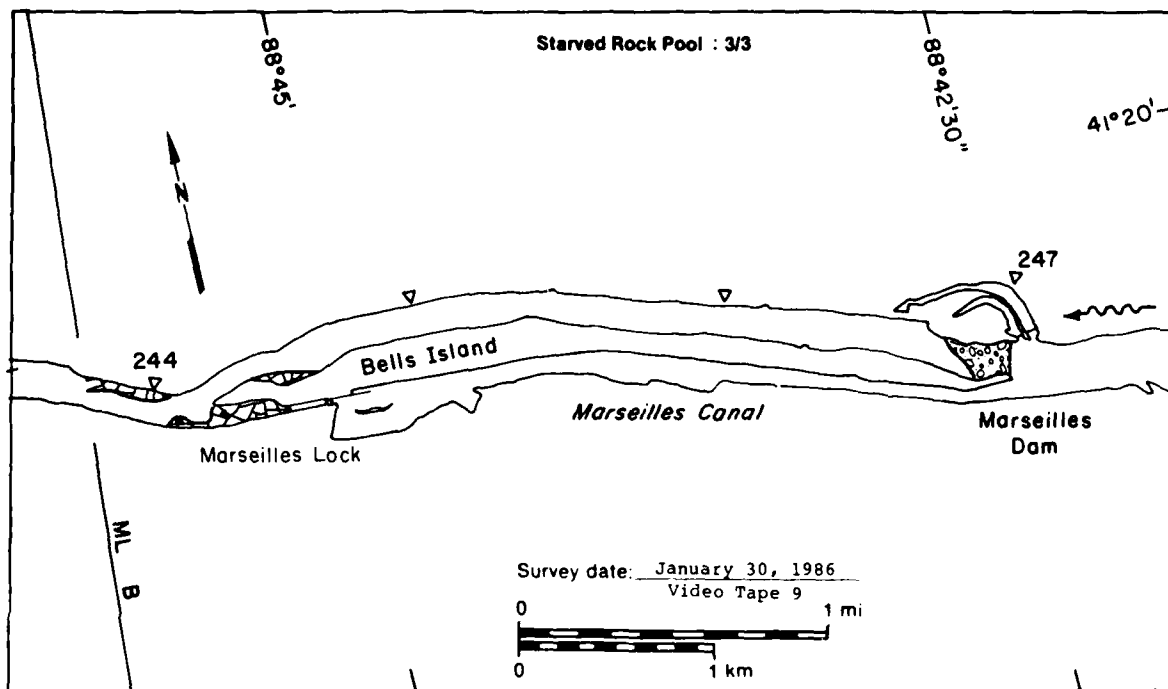
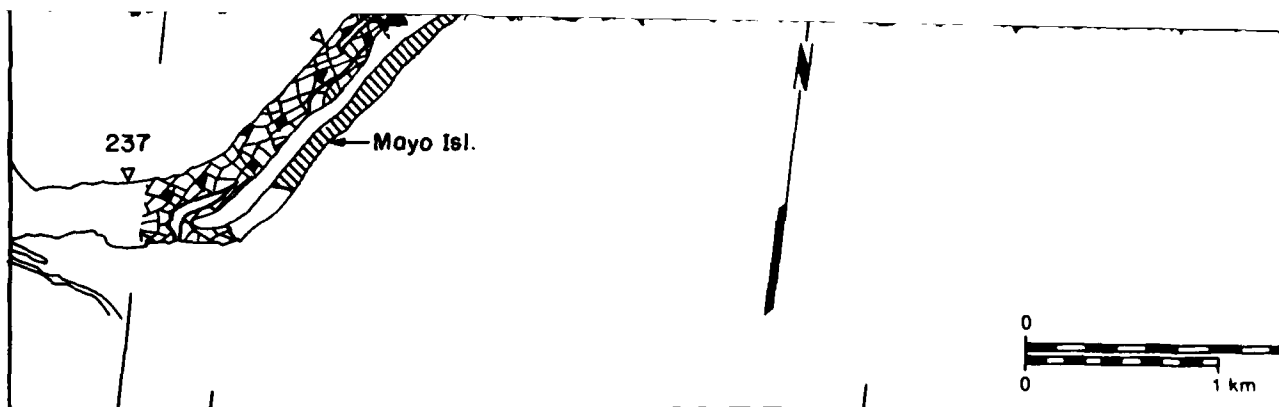




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41°20'	Starved Rock Pool	
	MAP UNITS	
	Open water	
	Area (m ² x 10 ⁶)	Surface concentration (%)
	1.35	NA





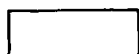

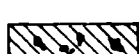

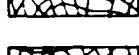

Survey date: January 30, 1986
Video Tape 9

ML B
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Starved Rock Pool

MAP UNITS

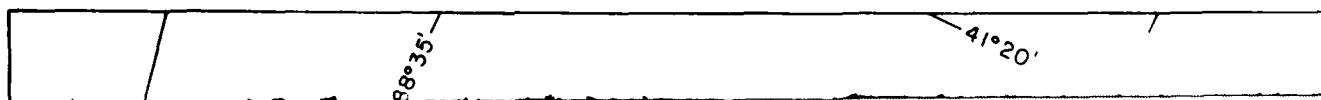
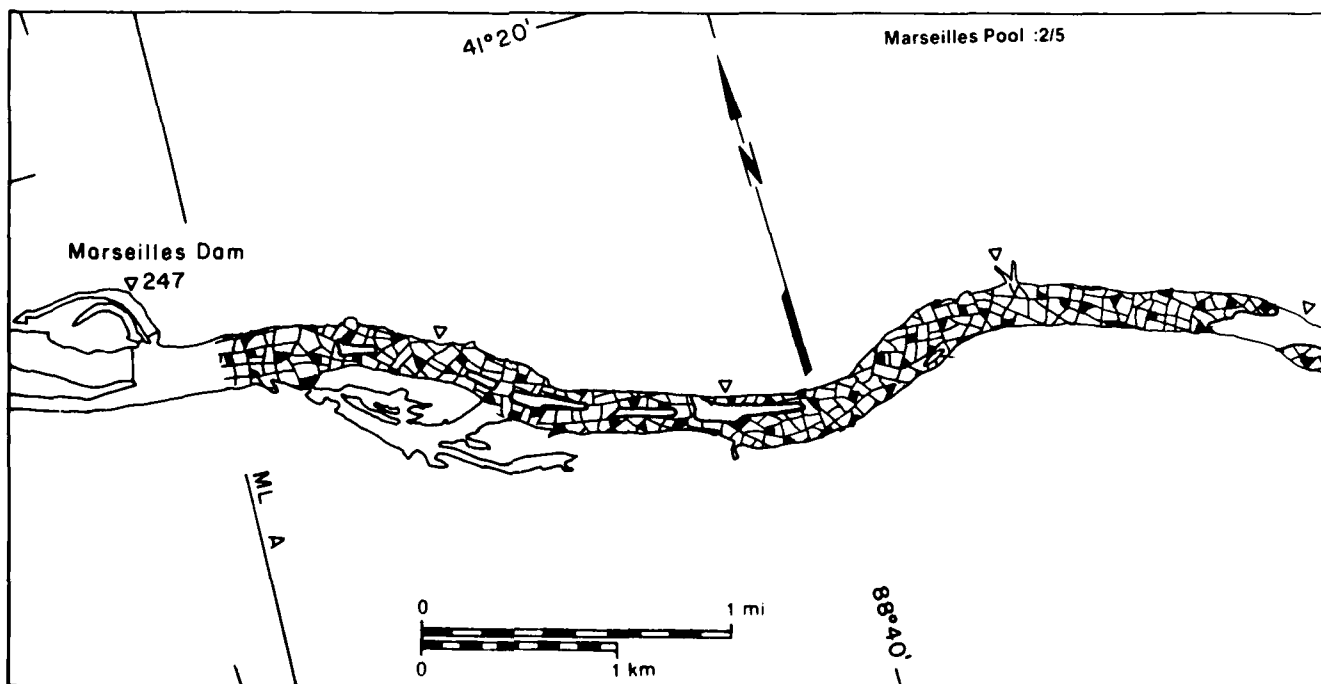
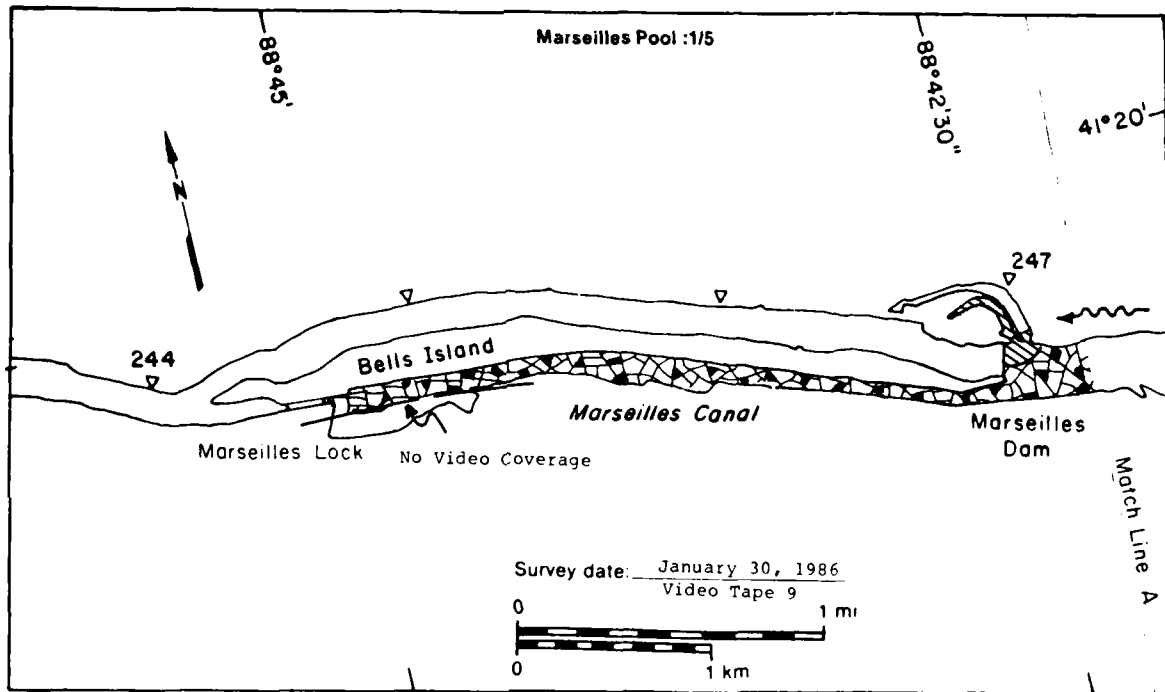
-  Open water
-  Solid ice cover
-  Solid ice cover with open-water areas
-  Fragmented ice cover
-  Fragmented ice cover with open-water areas
-  Ice floes or frazil slush and pans

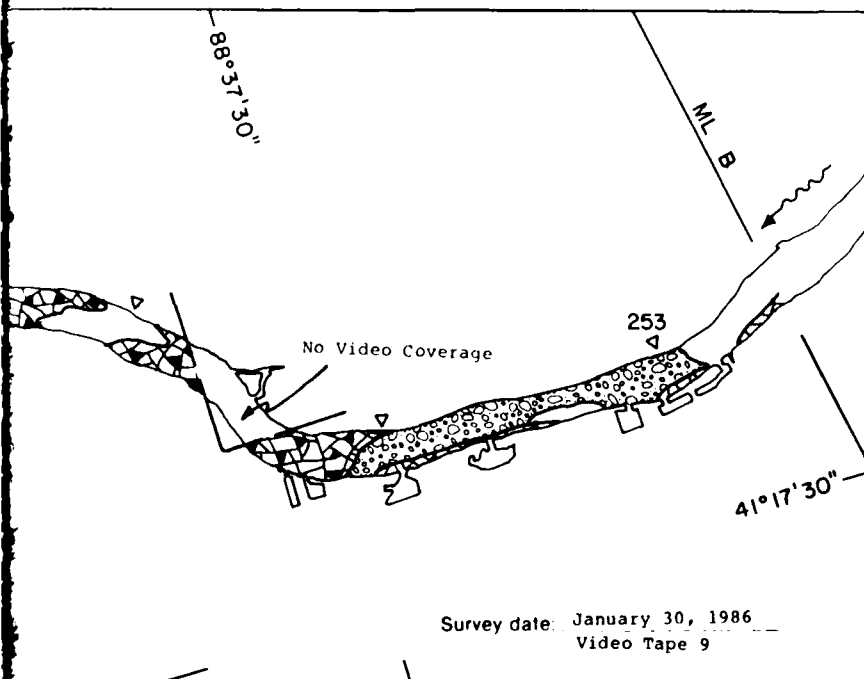
Total area ($m^2 \times 10^6$)

Area ($m^2 \times 10^6$)	Surface concentration (%)
1.35	NA
1.77	NA
0.00	—
1.75	NA
3.22	90
0.06	20
10.19*	

* Includes $2.04 \times 10^6 m^2$
of no video coverage

30 January 1986

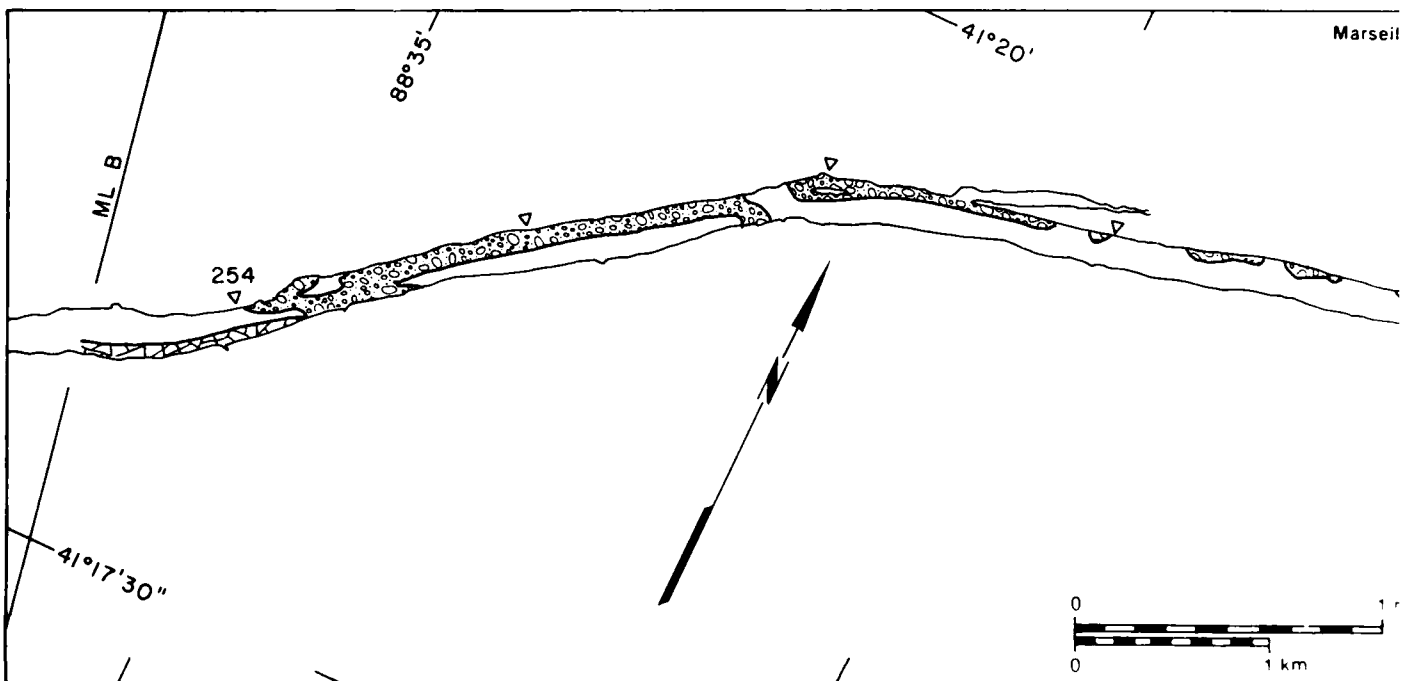
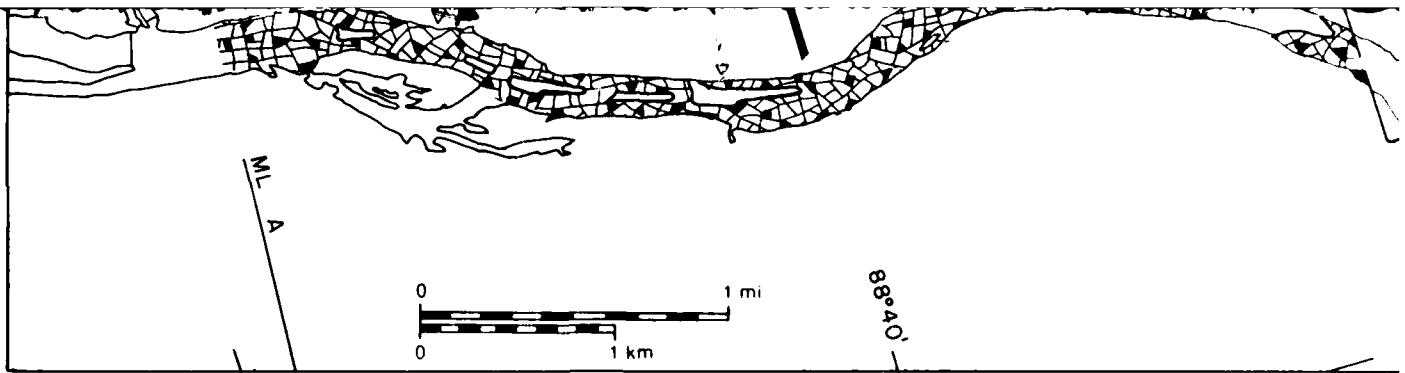


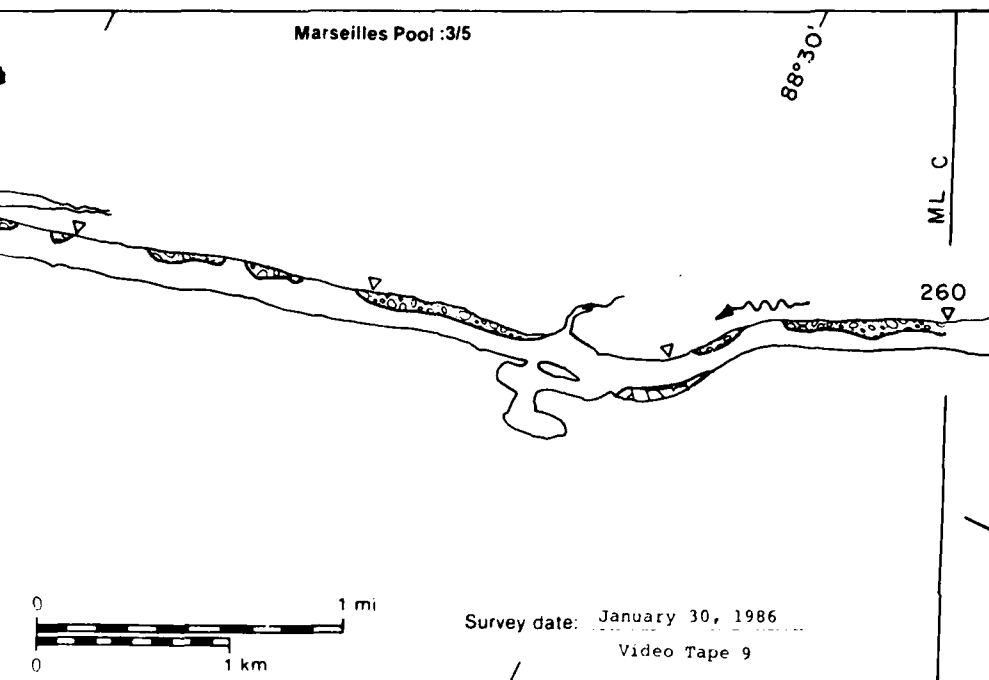
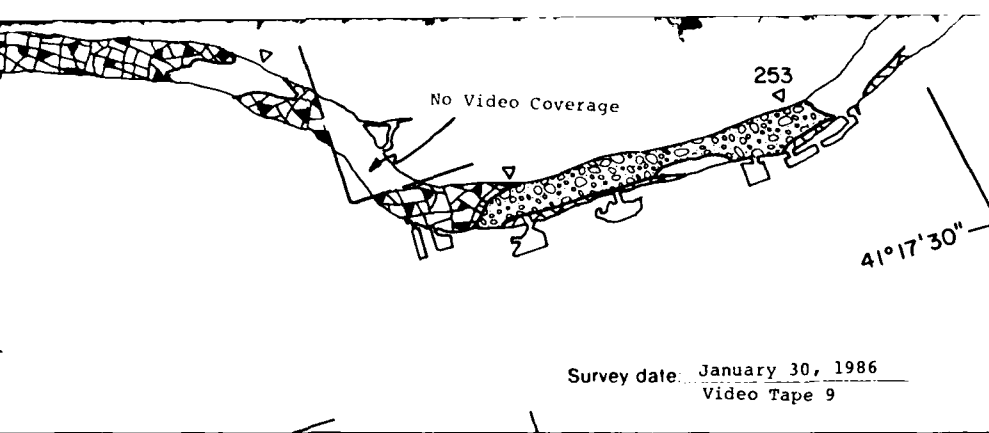


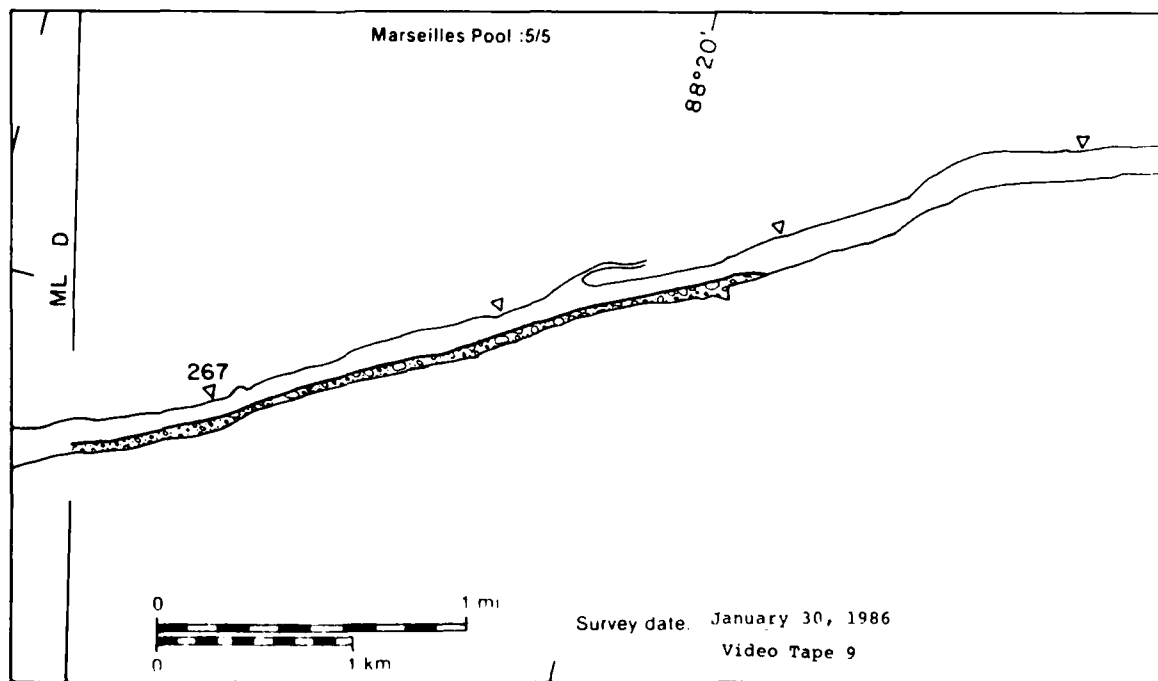
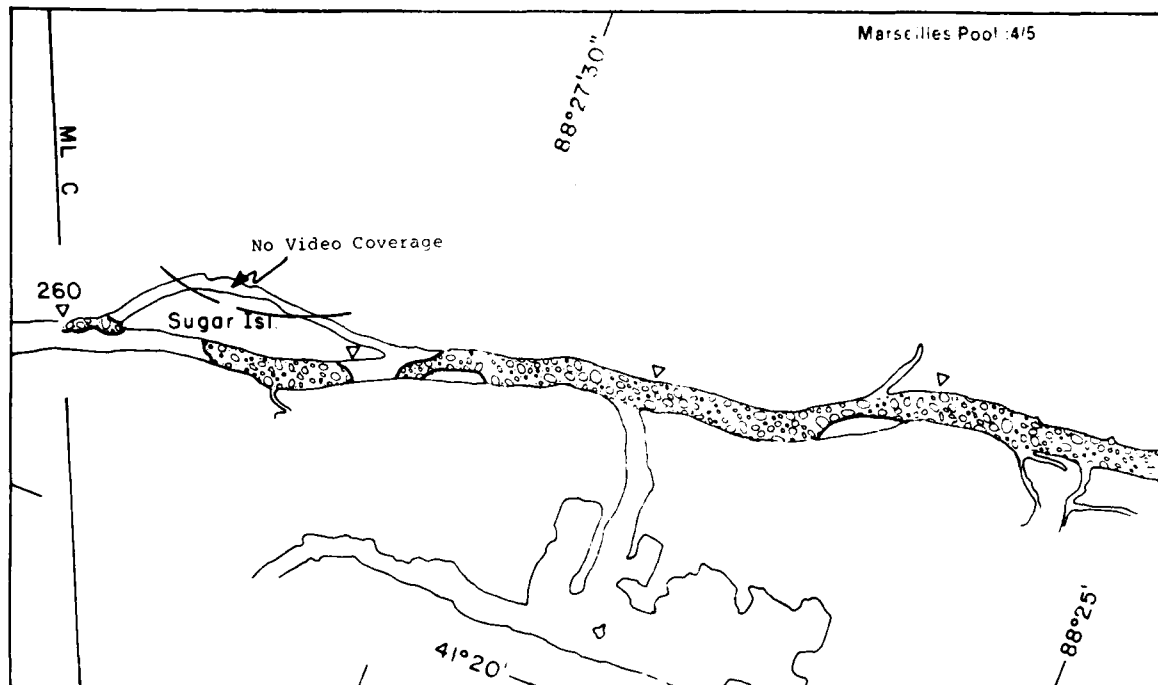
Marseilles Pool :3/5

88°30'

ML C

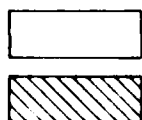






Marseilles Pool

MAP UNITS



Open water

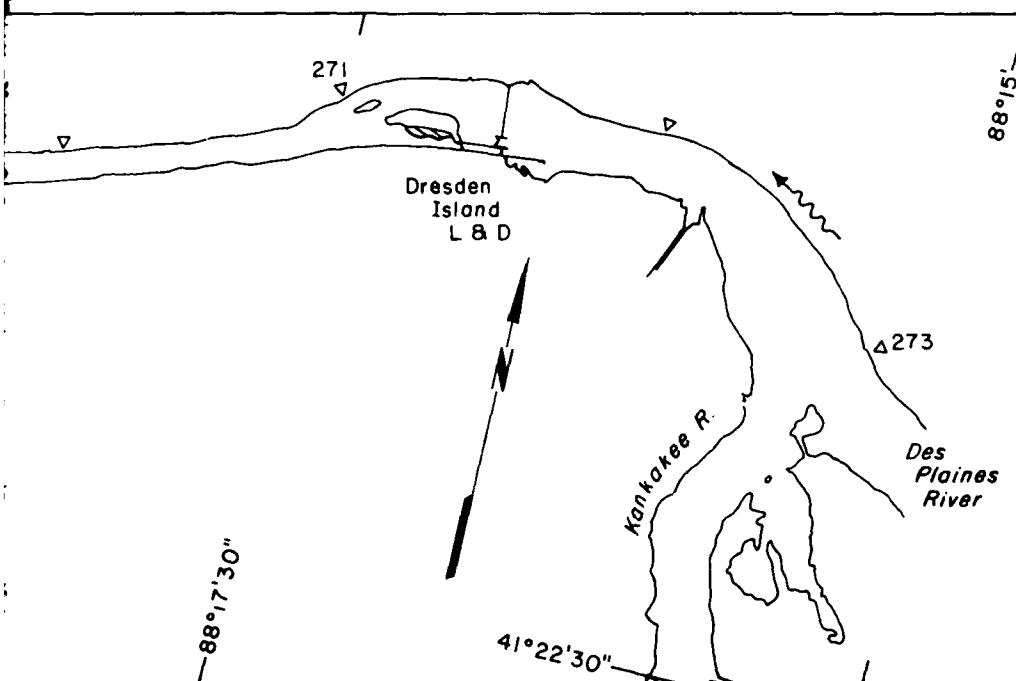
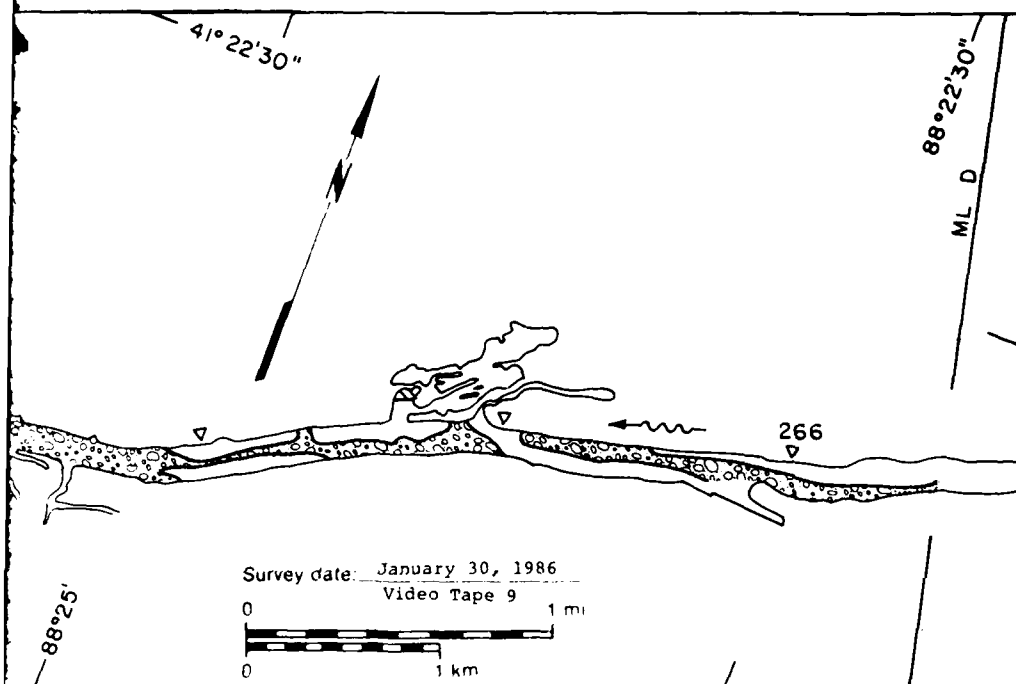
Solid ice cover

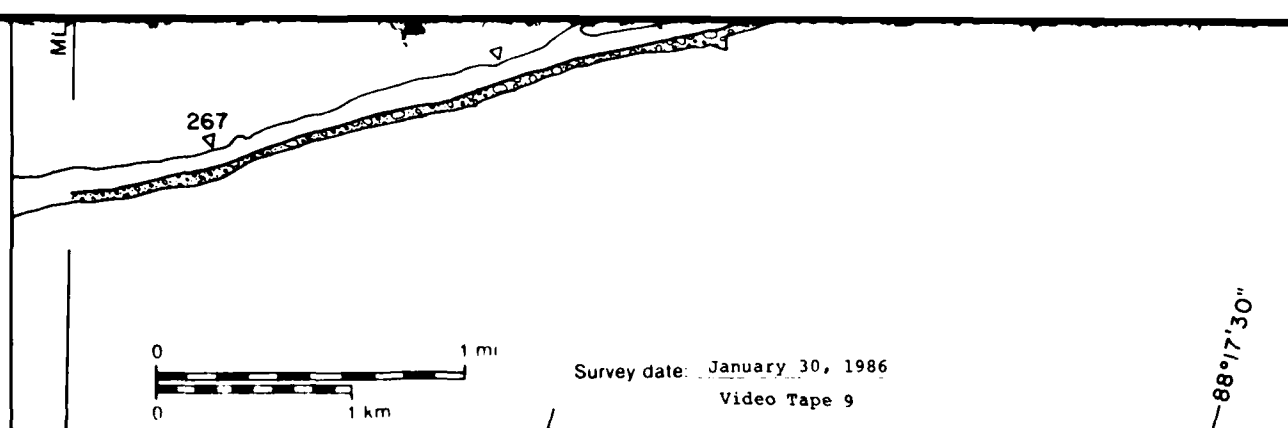
Area
(m² x 10⁶)

Surface
concentration
(%)

3.02	NA
0.08	NA

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Marseilles Pool

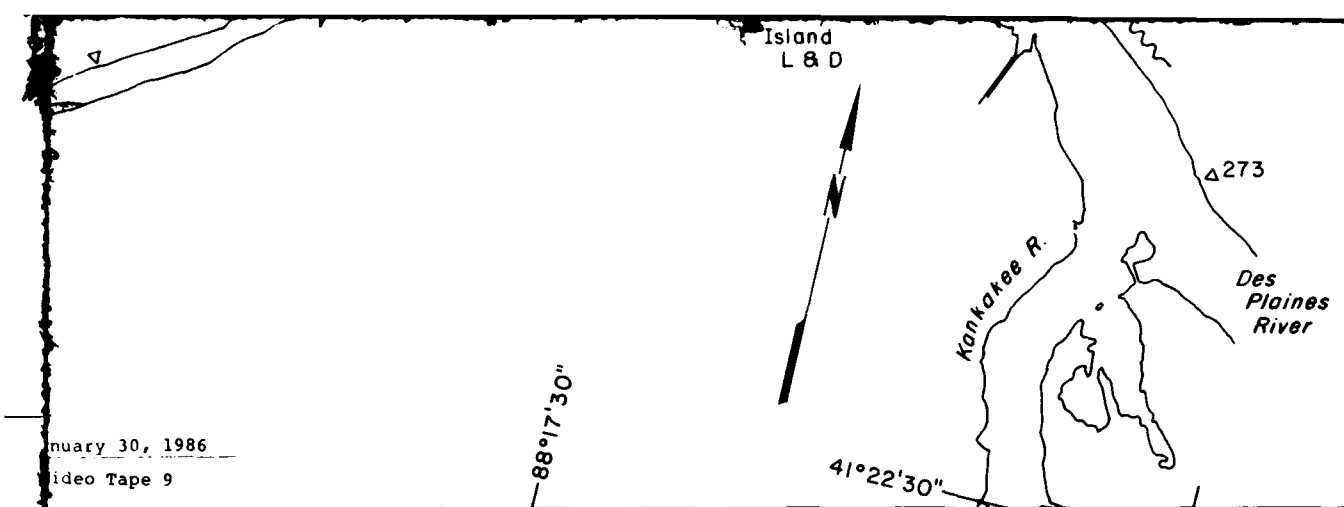
MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

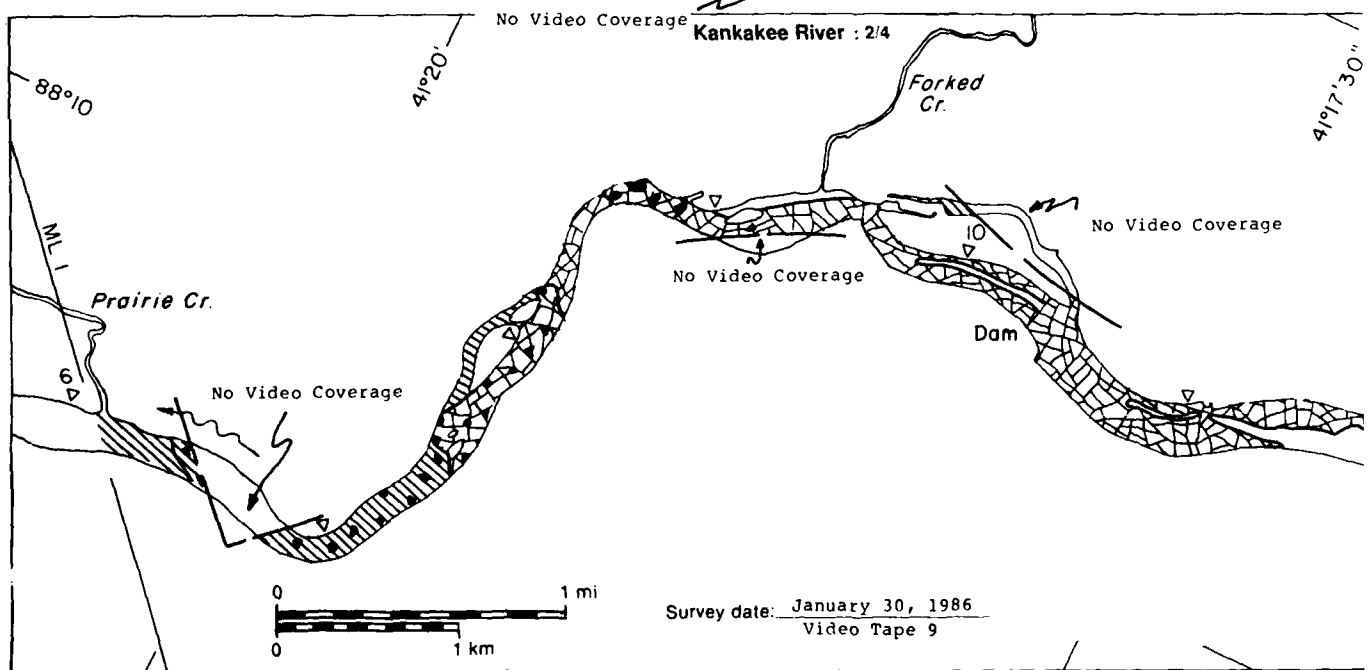
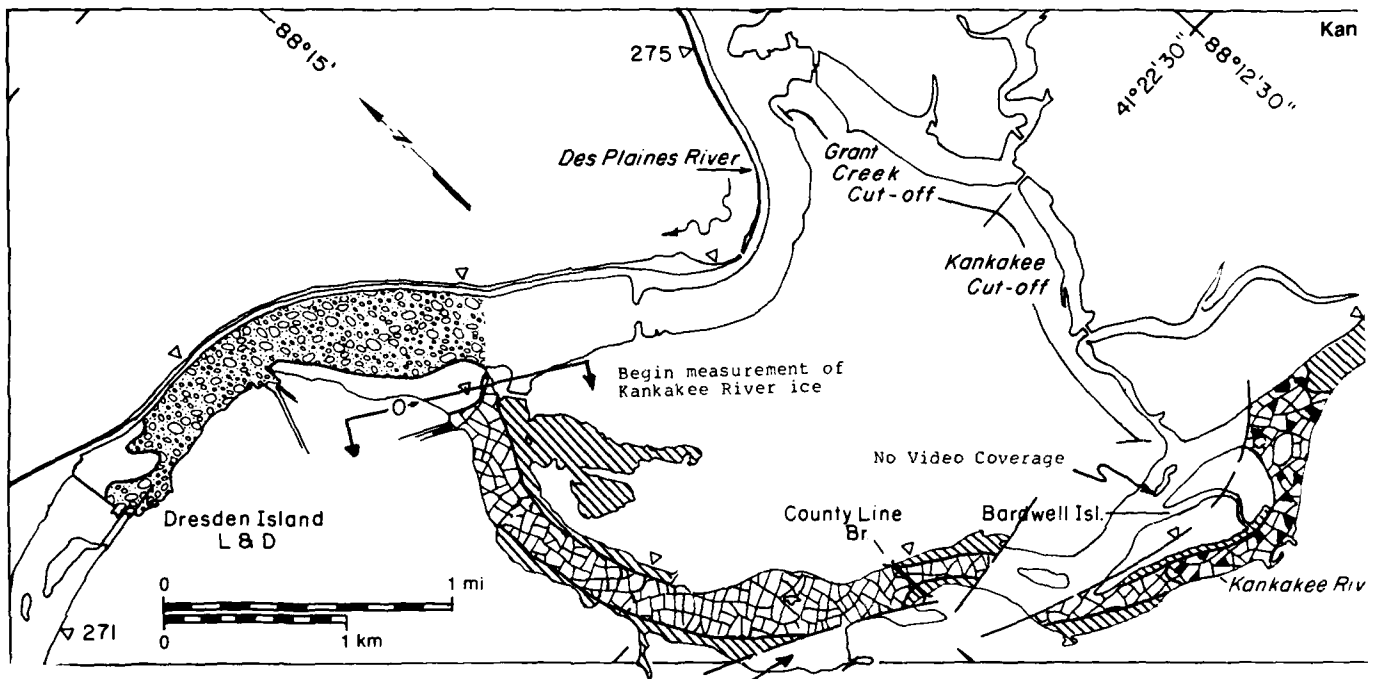
Area ($m^2 \times 10^6$)	Surface concentration (%)
3.02	NA
0.08	NA
0.00	—
0.23	NA
2.50	90
2.15	5
8.19*	

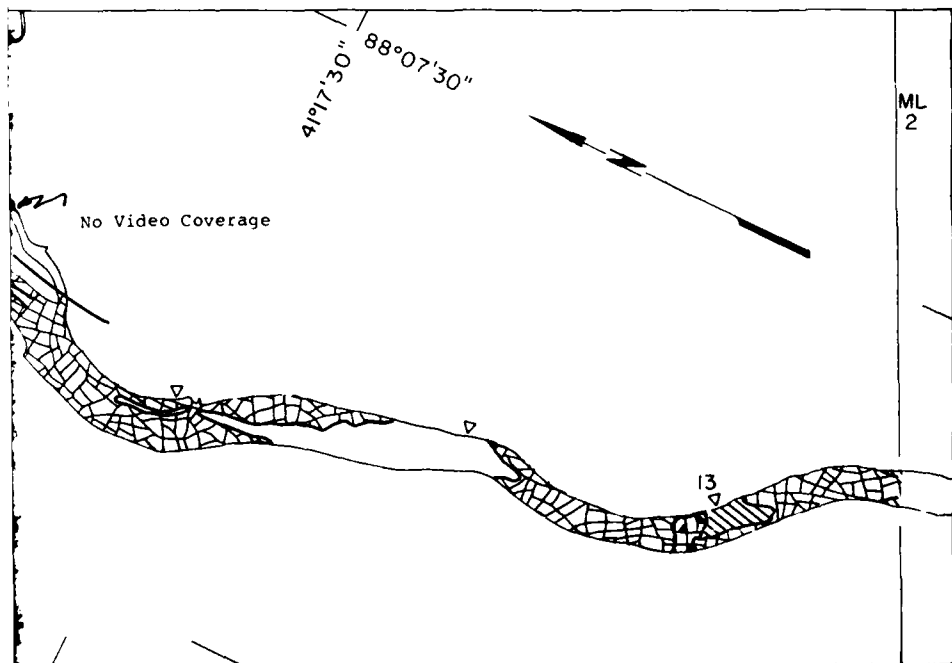
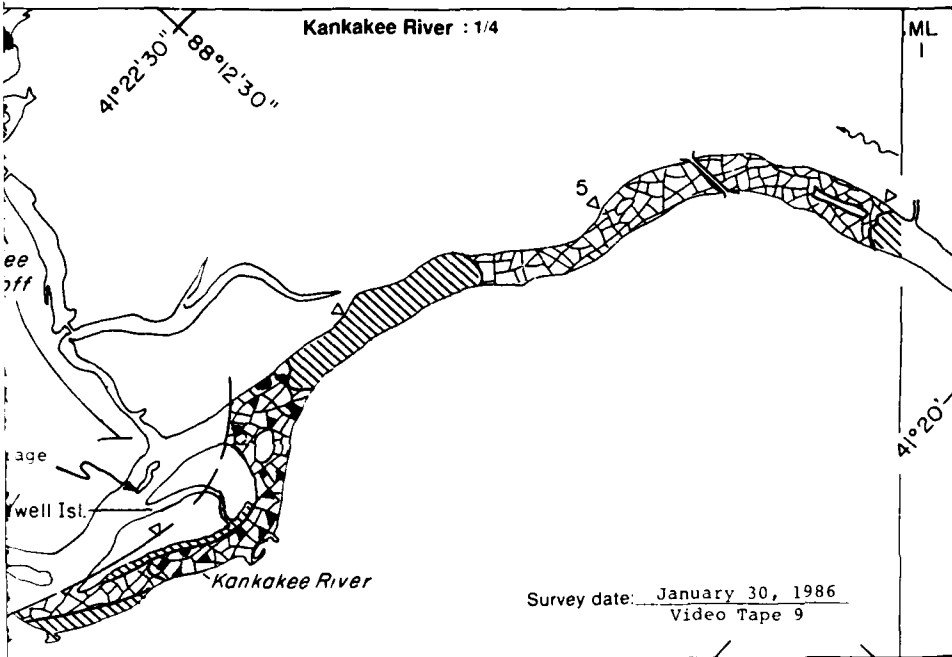
Total area ($m^2 \times 10^6$)

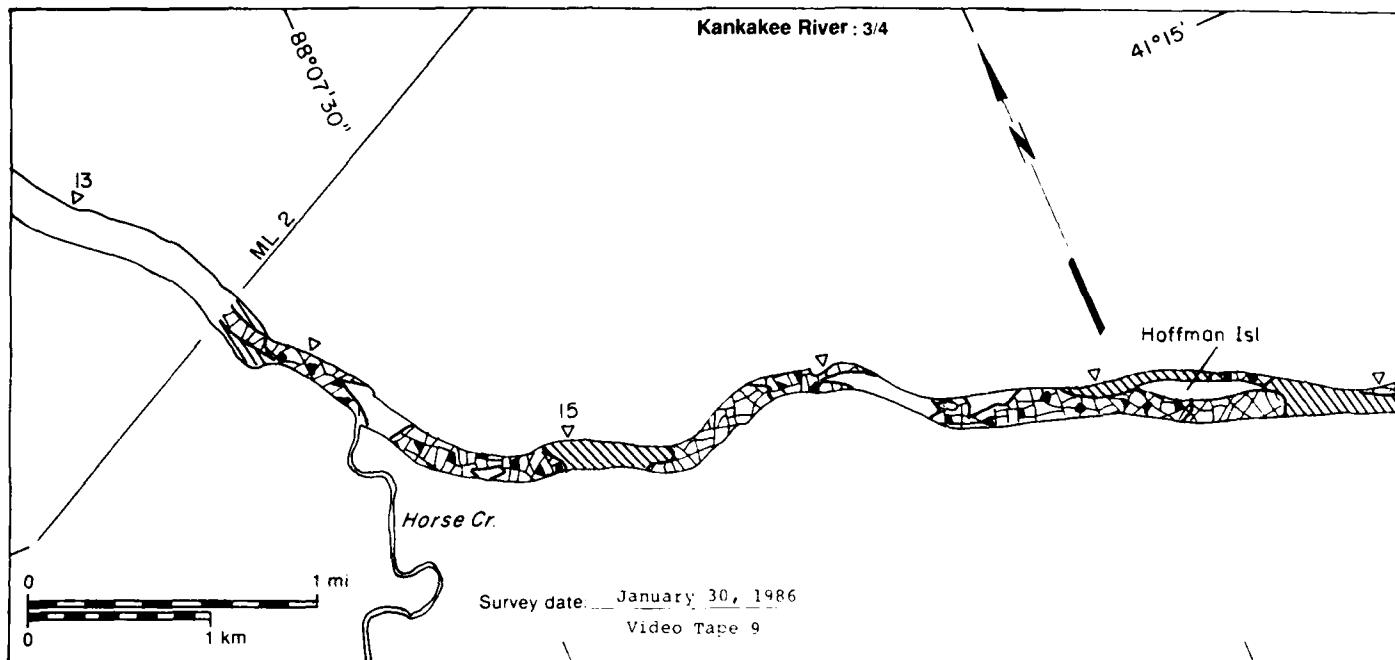
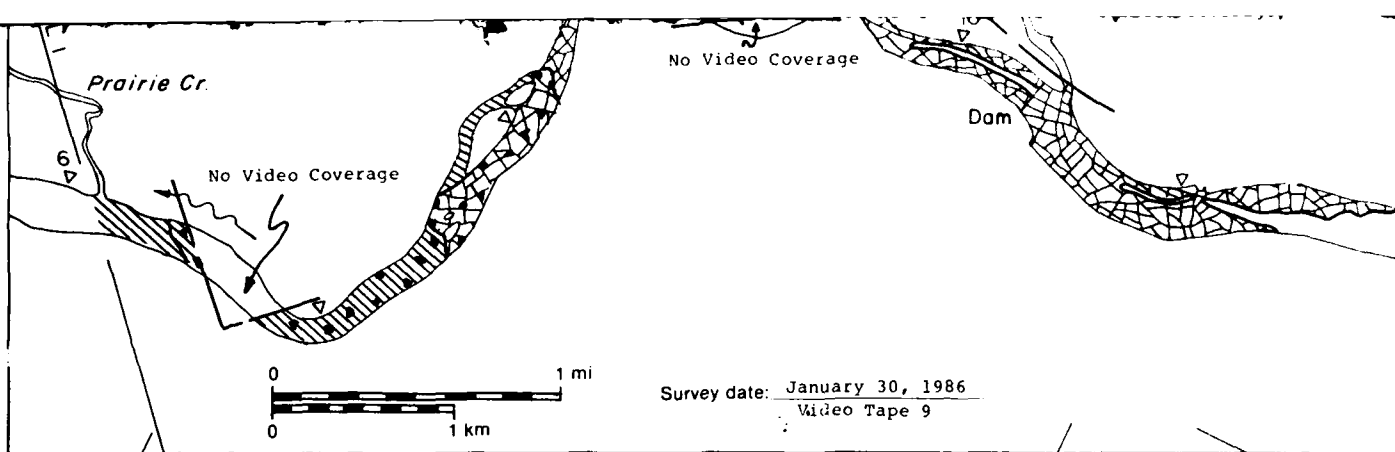
* Includes $0.21 \times 10^6 m^2$
of no video coverage

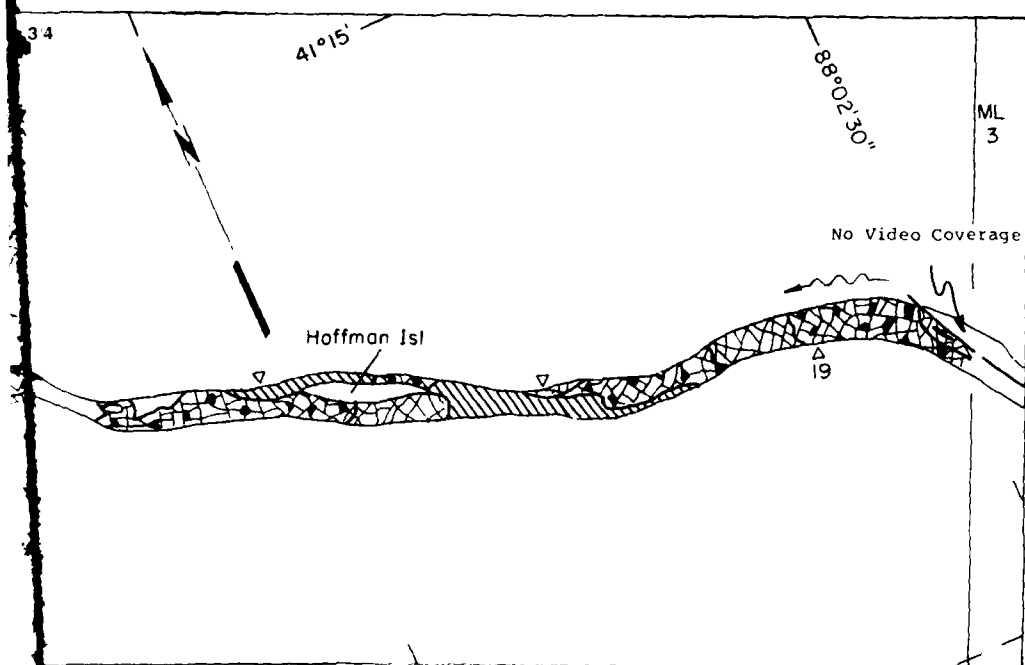
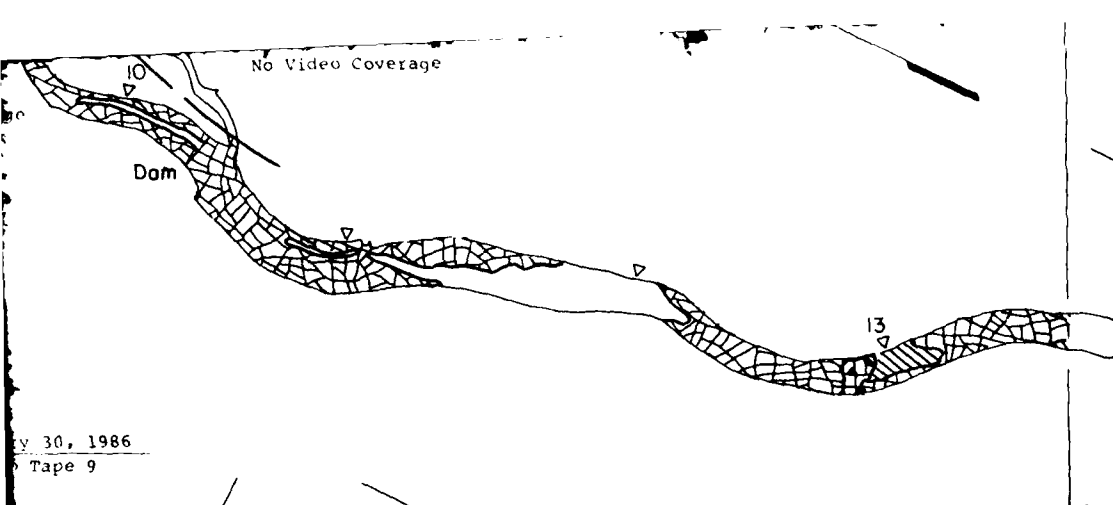


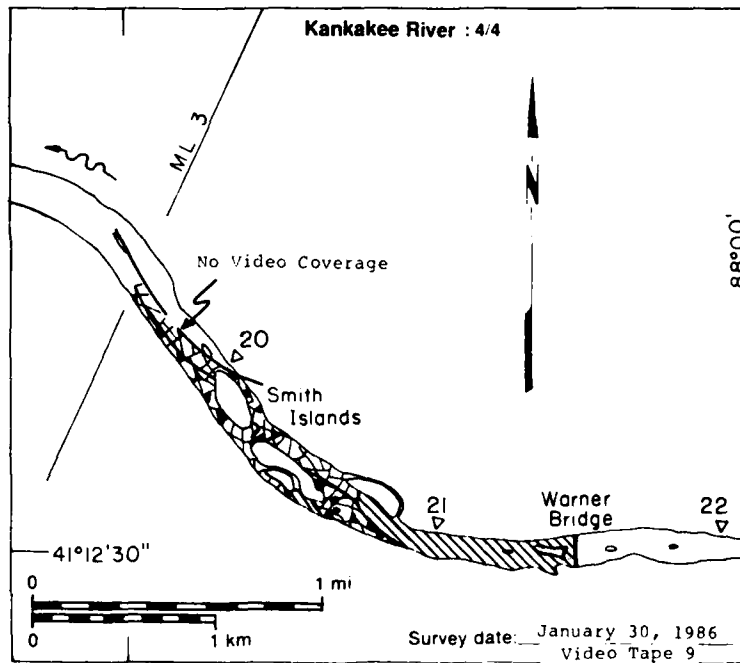
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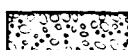






Kankakee River

MAP UNITS

-  Open water
-  Solid ice cover
-  Solid ice cover with open-water areas
-  Fragmented ice cover
-  Fragmented ice cover with open-water areas
-  Ice floes or frazil slus and pans

Total area (m² x







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7-

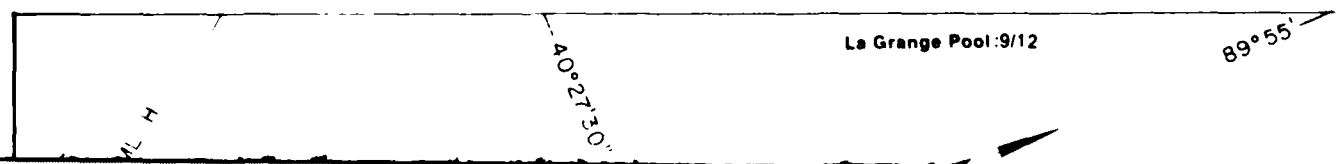
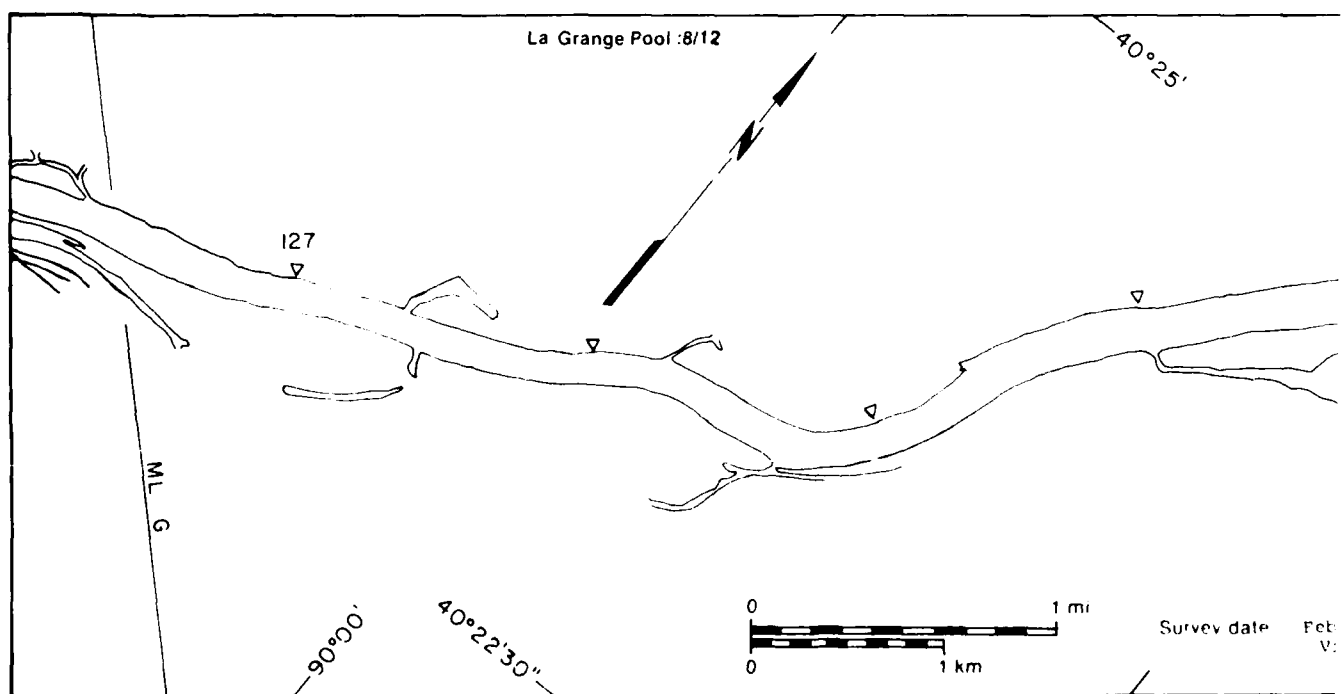
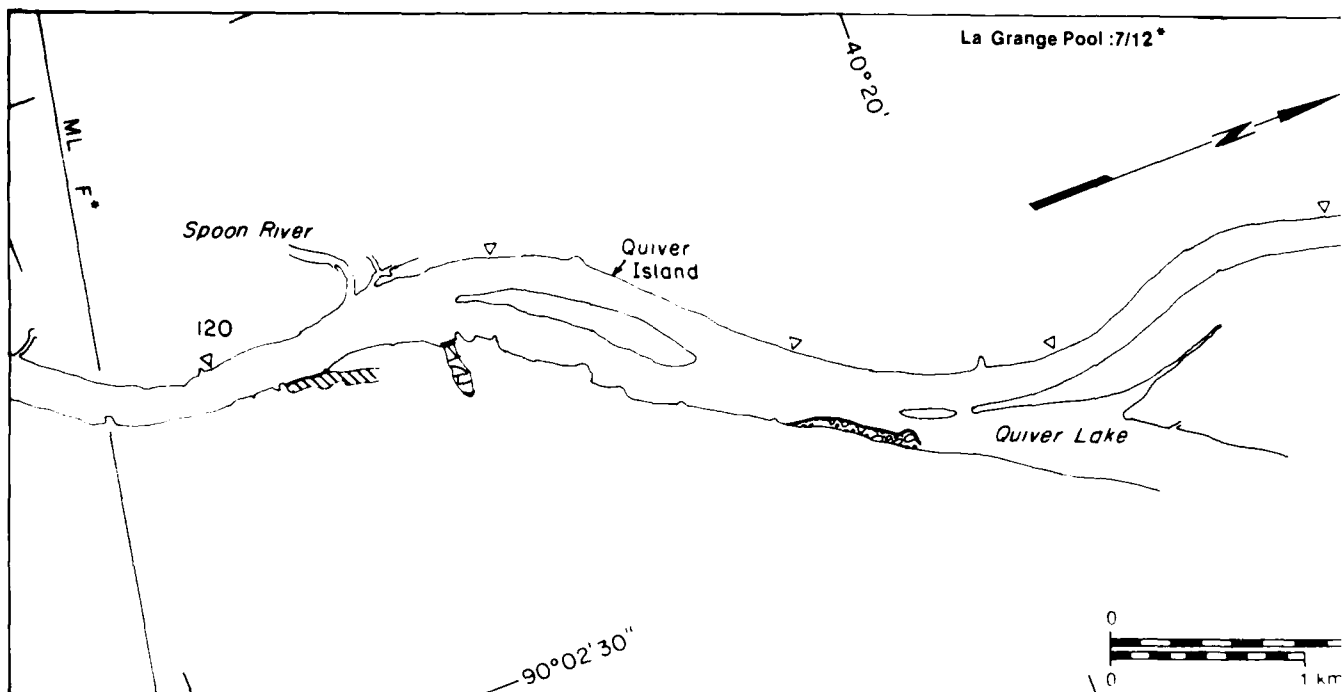
30 January 1986

Kankakee River

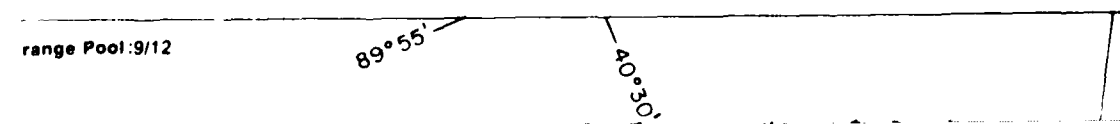
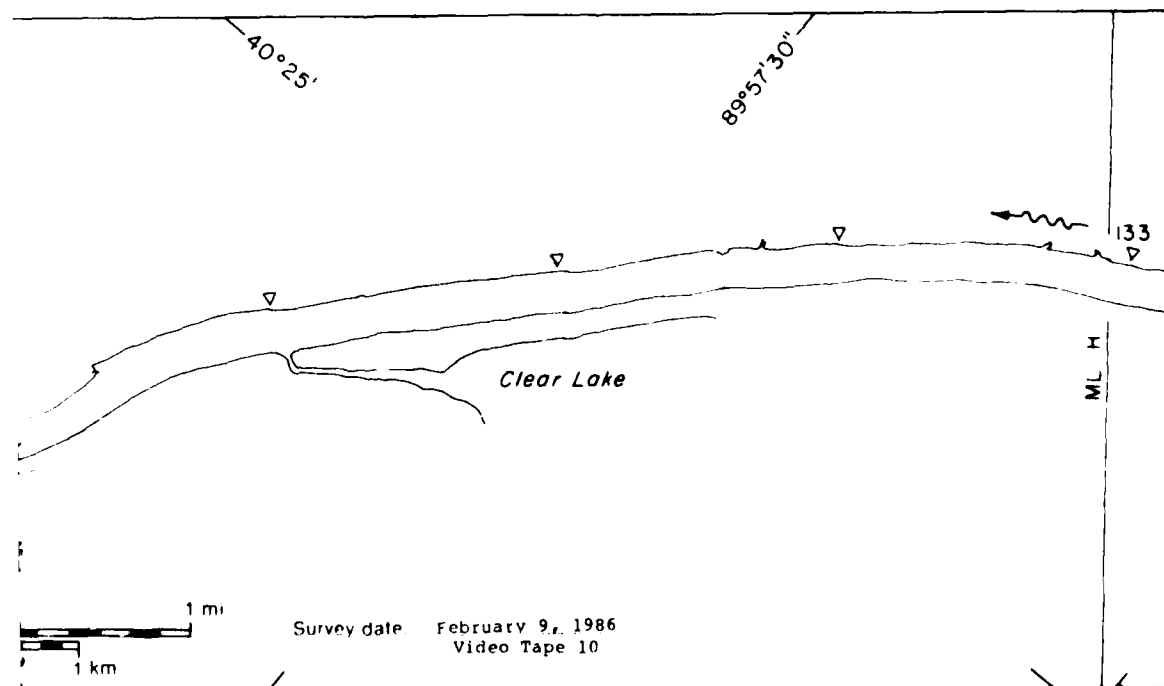
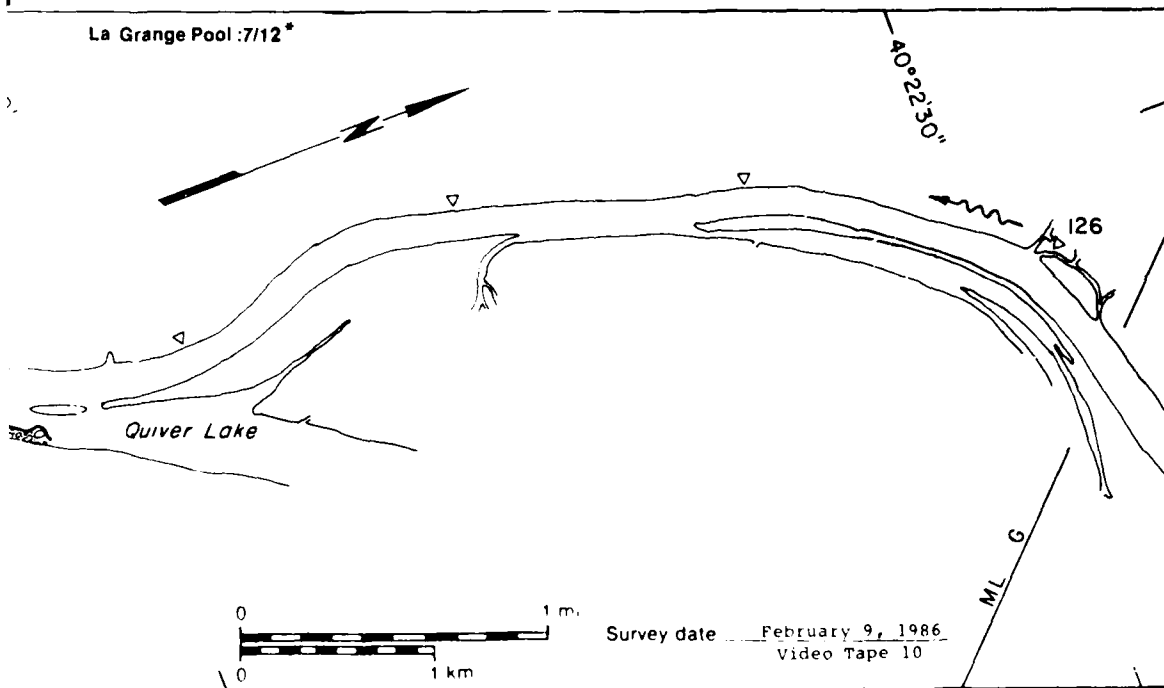
MAP UNITS

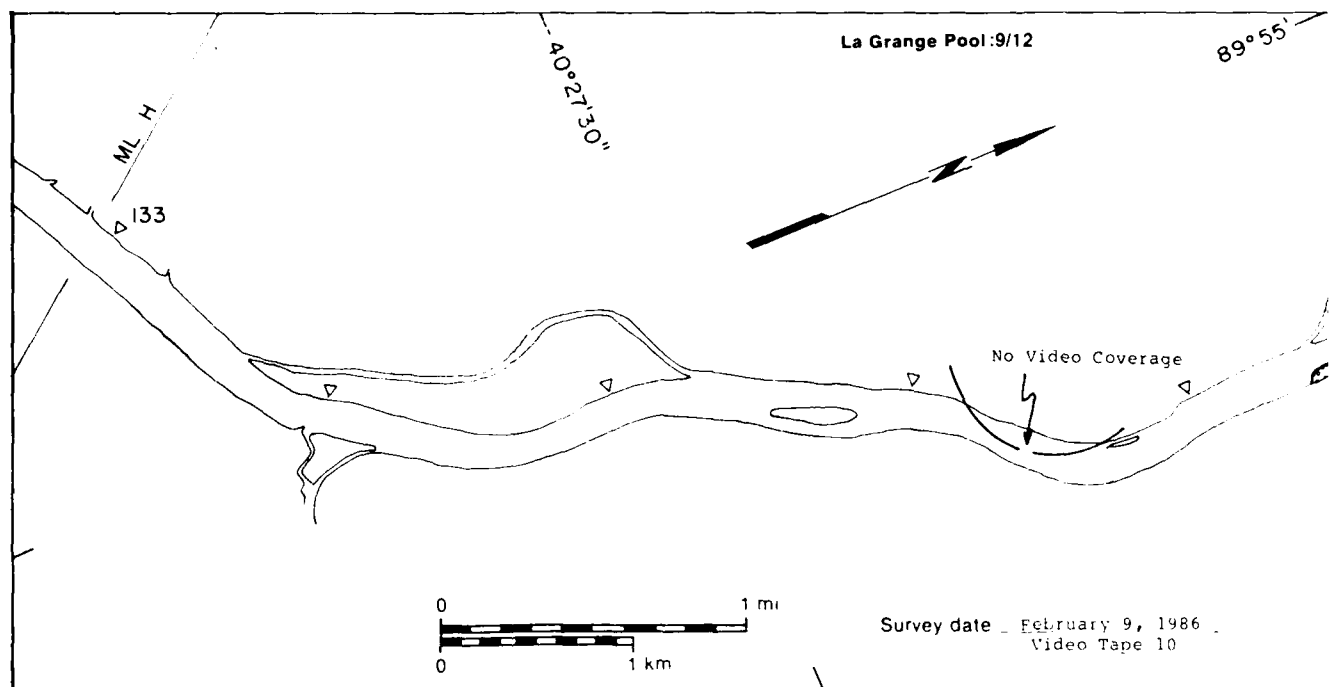
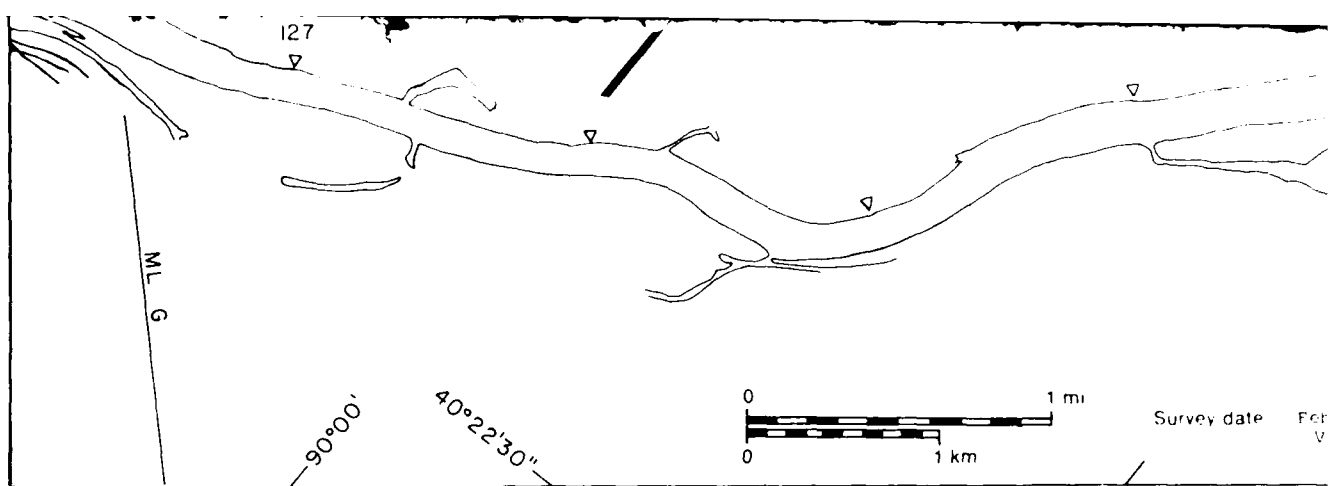
	Area ($m^2 \times 10^6$)	Surface concentration (%)
 Open water	0.51	NA
 Solid ice cover	1.51	NA
 Solid ice cover with open-water areas	0.21	95
 Fragmented ice cover	2.96	NA
 Fragmented ice cover with open-water areas	1.29	90
 Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)	7.30*	

* Includes $0.82 \times 10^6 m^2$
of no video coverage

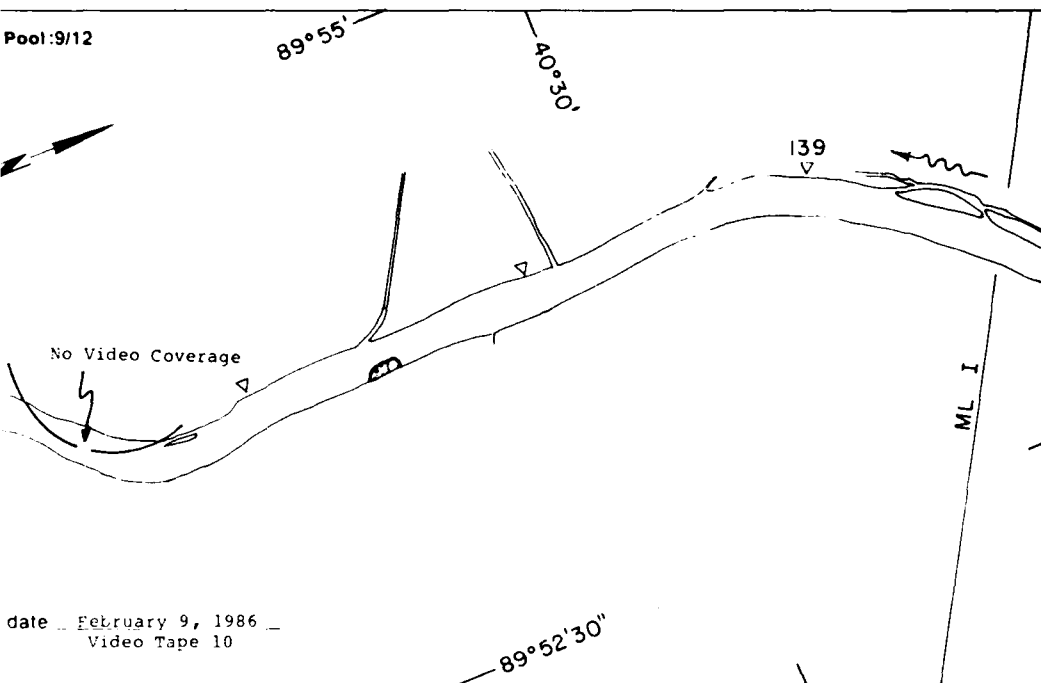
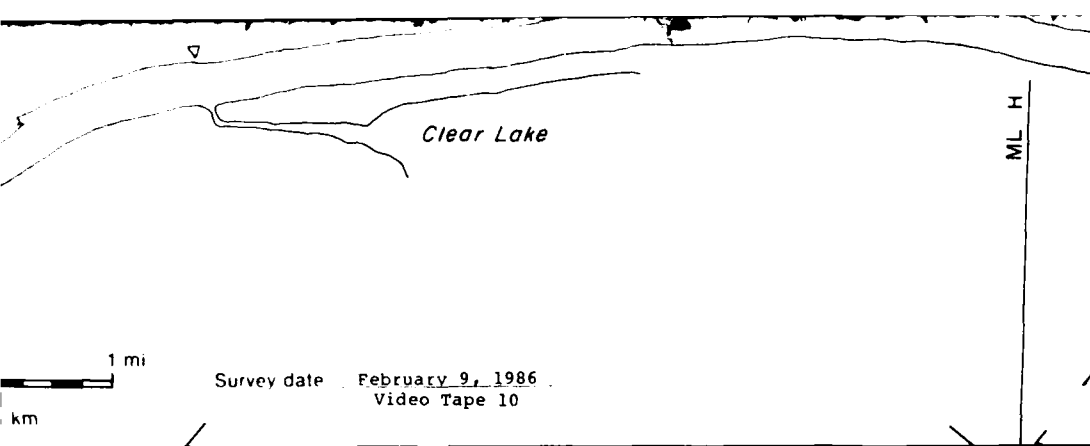


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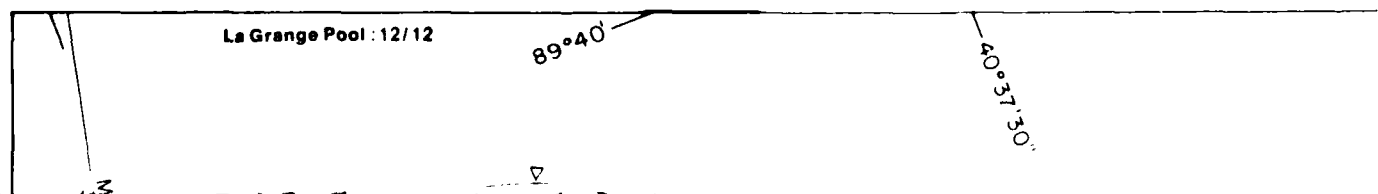
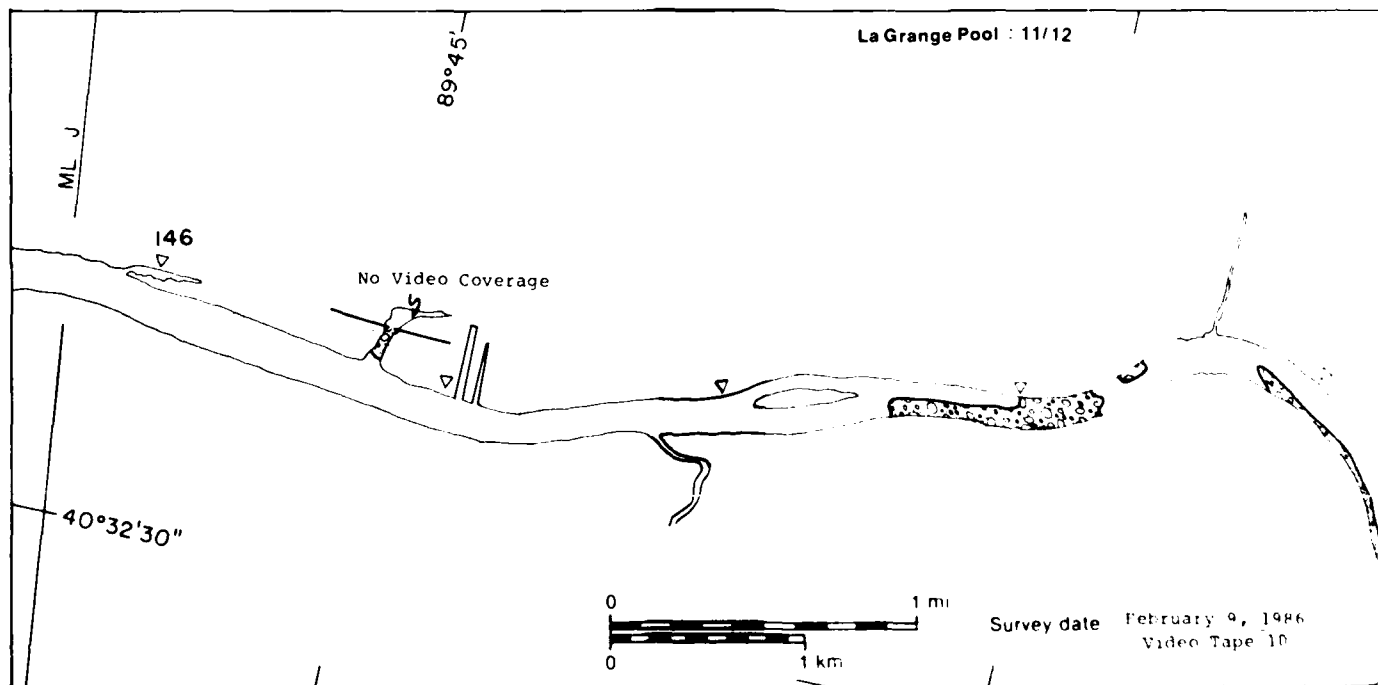
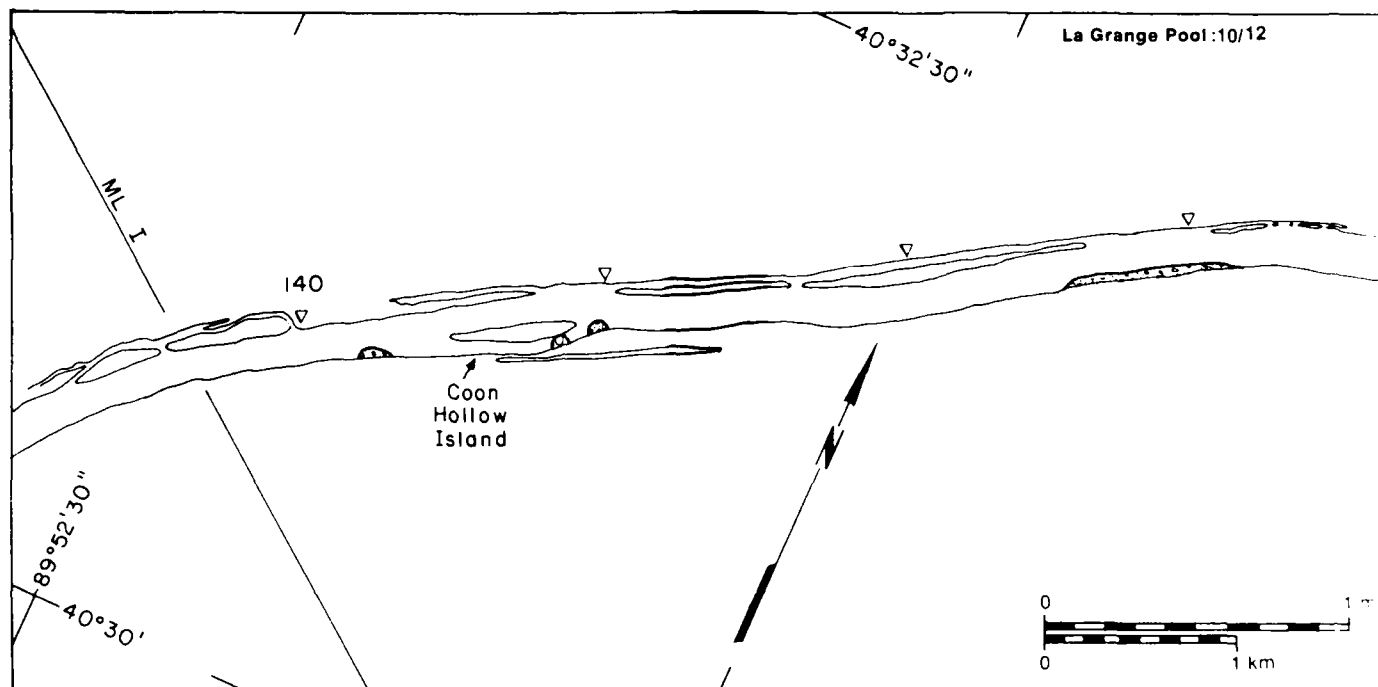


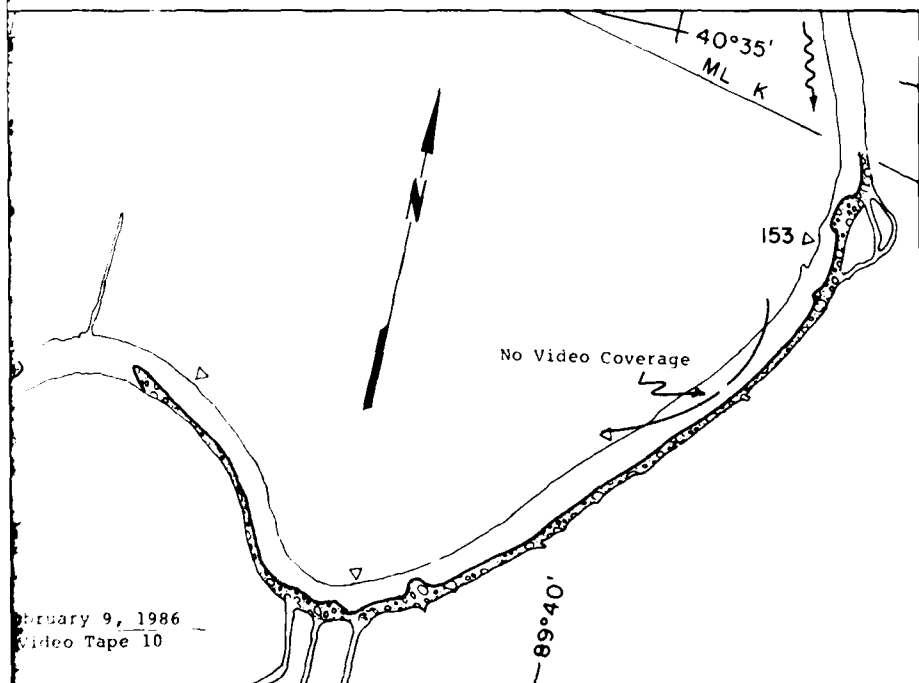
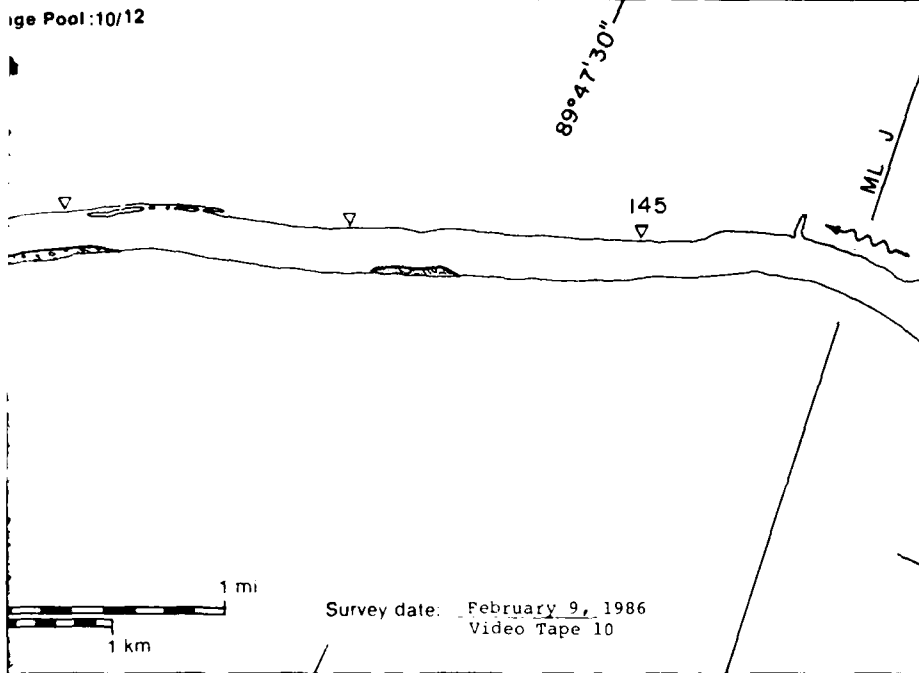


* The downstream limit of Illinois River video coverage was in the vicinity of mile 120 at Havana, Illinois, on all dates. There is no coverage of La Grange Pool maps 1/12 through 6/12 (match lines A through E).



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La Grange Pool

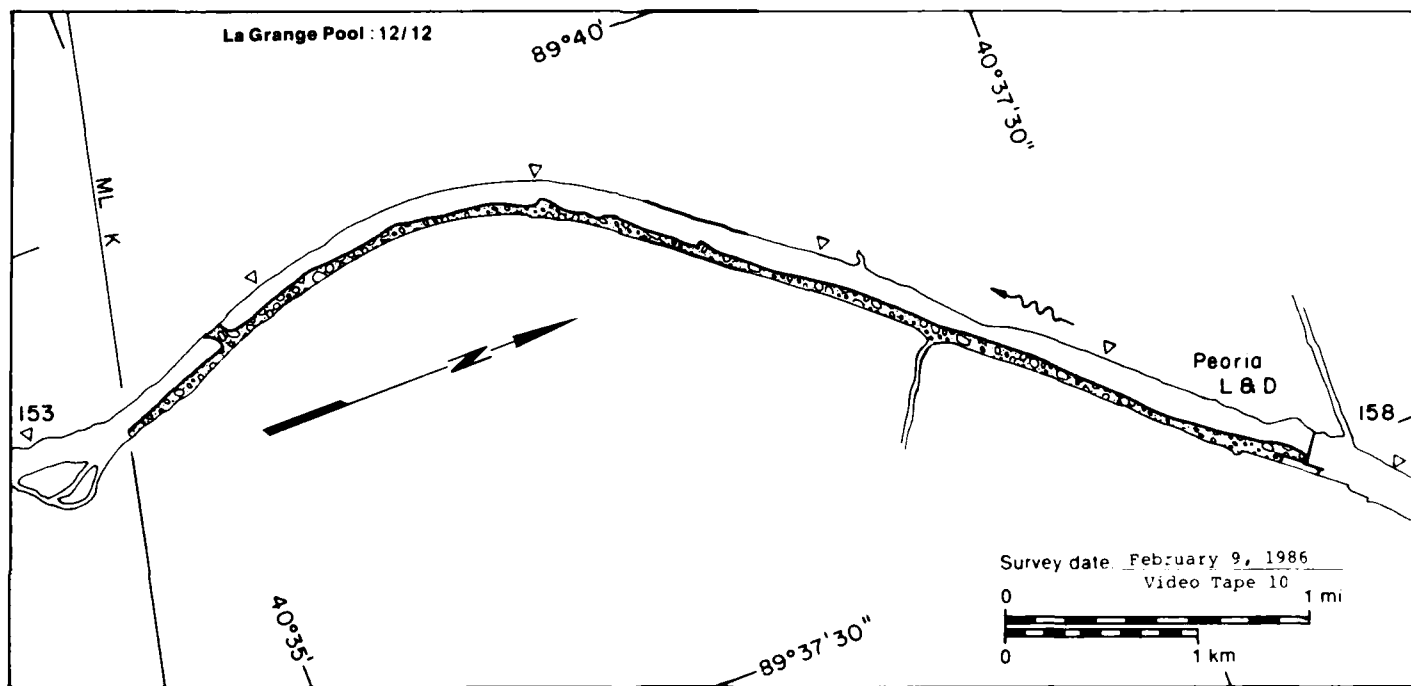
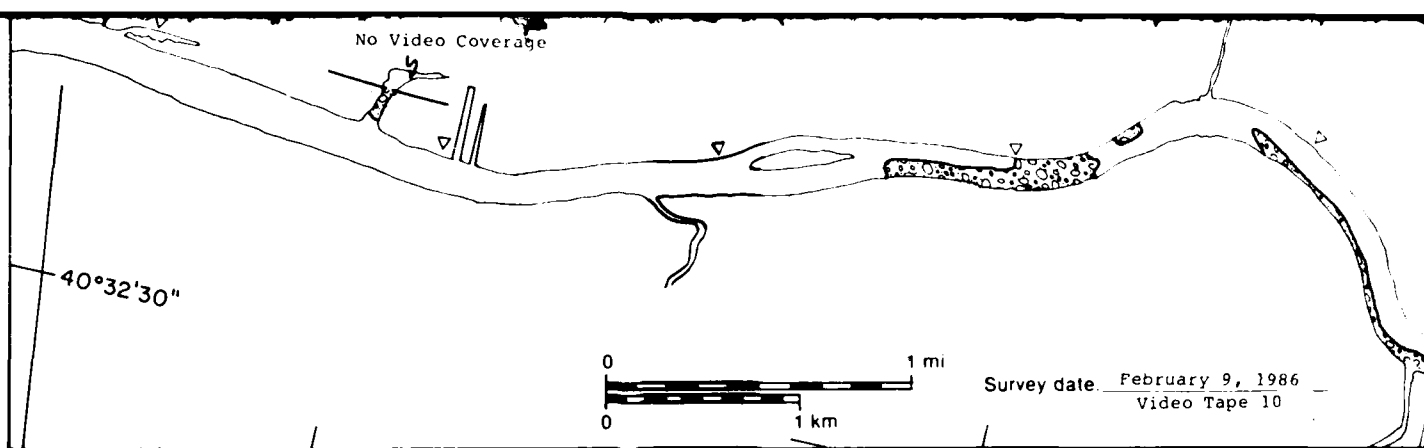
MAP UNITS

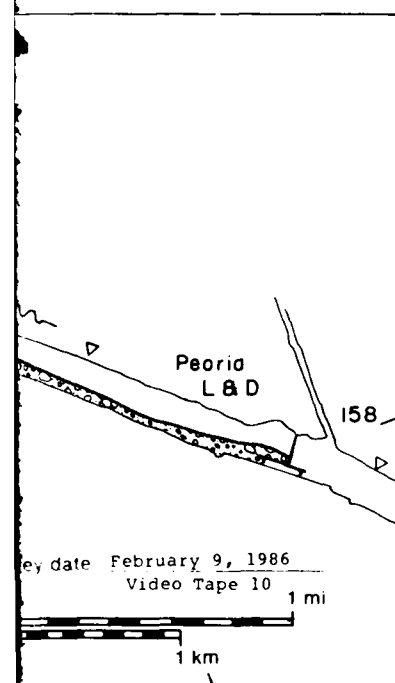
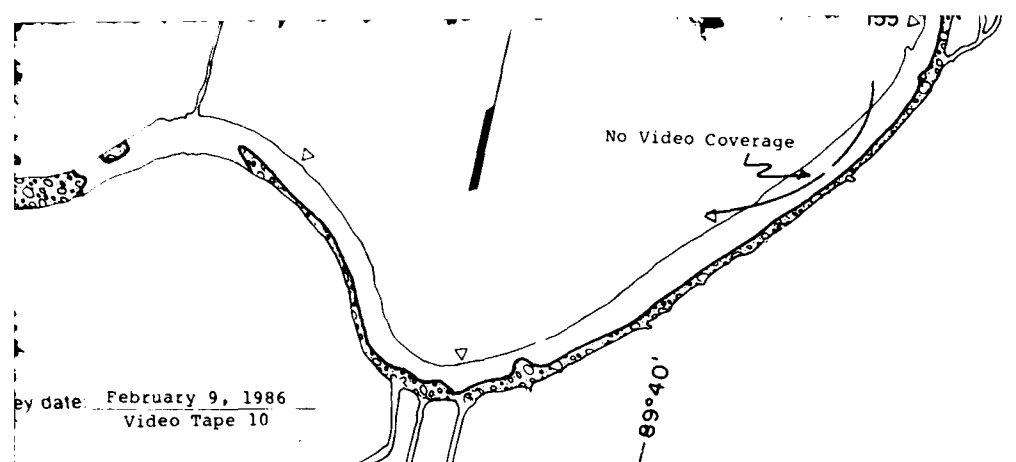
Area
(m² x 10⁶)

Surface
concentration
(%)

10.42	NA
-------	----







Open water





La Grange Pool

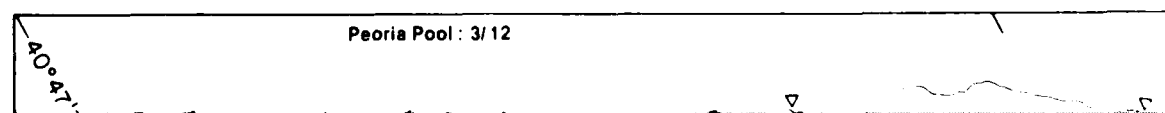
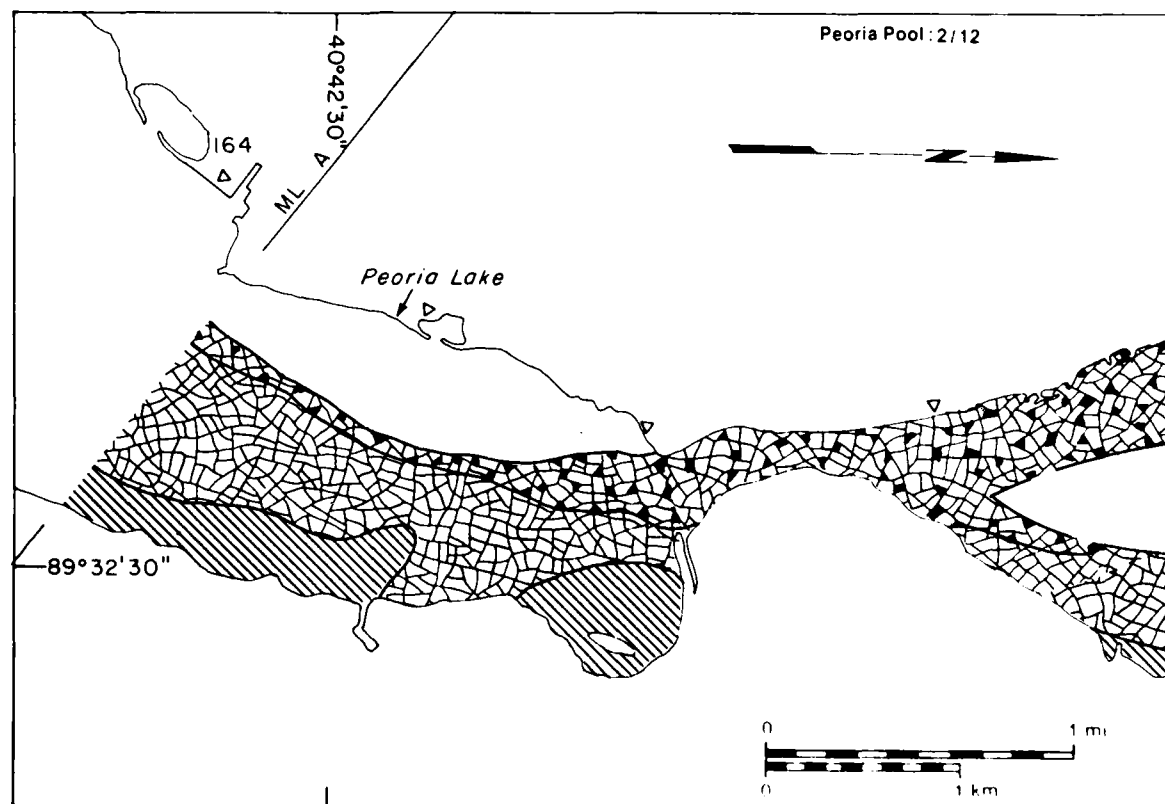
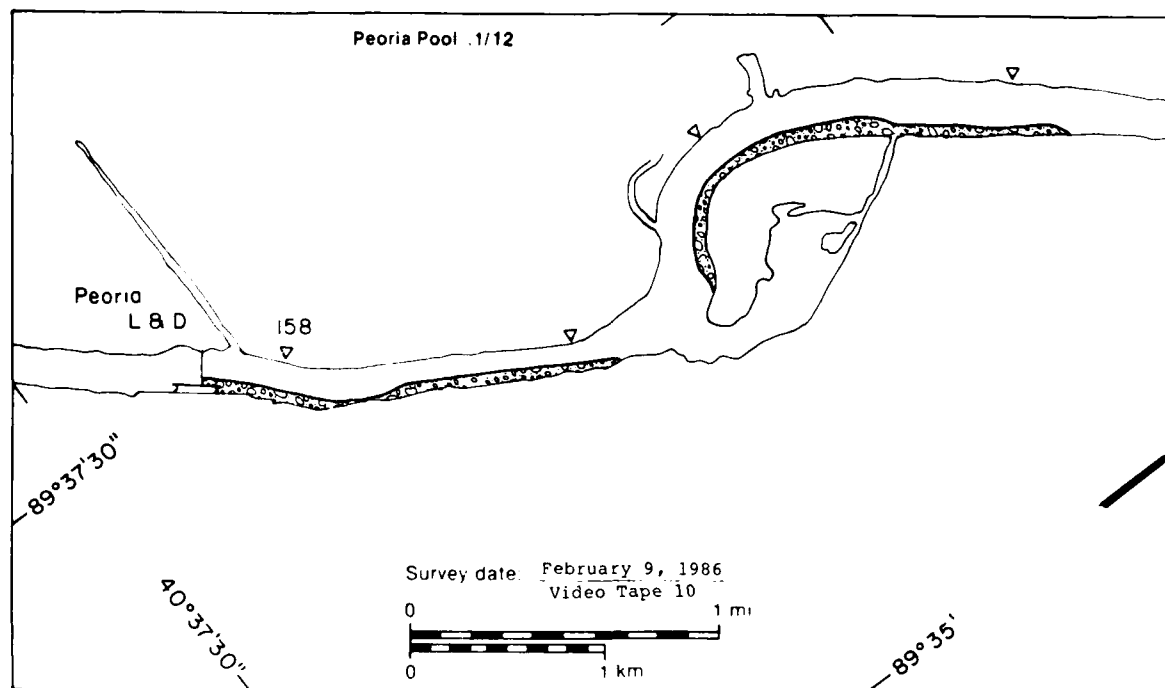
MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

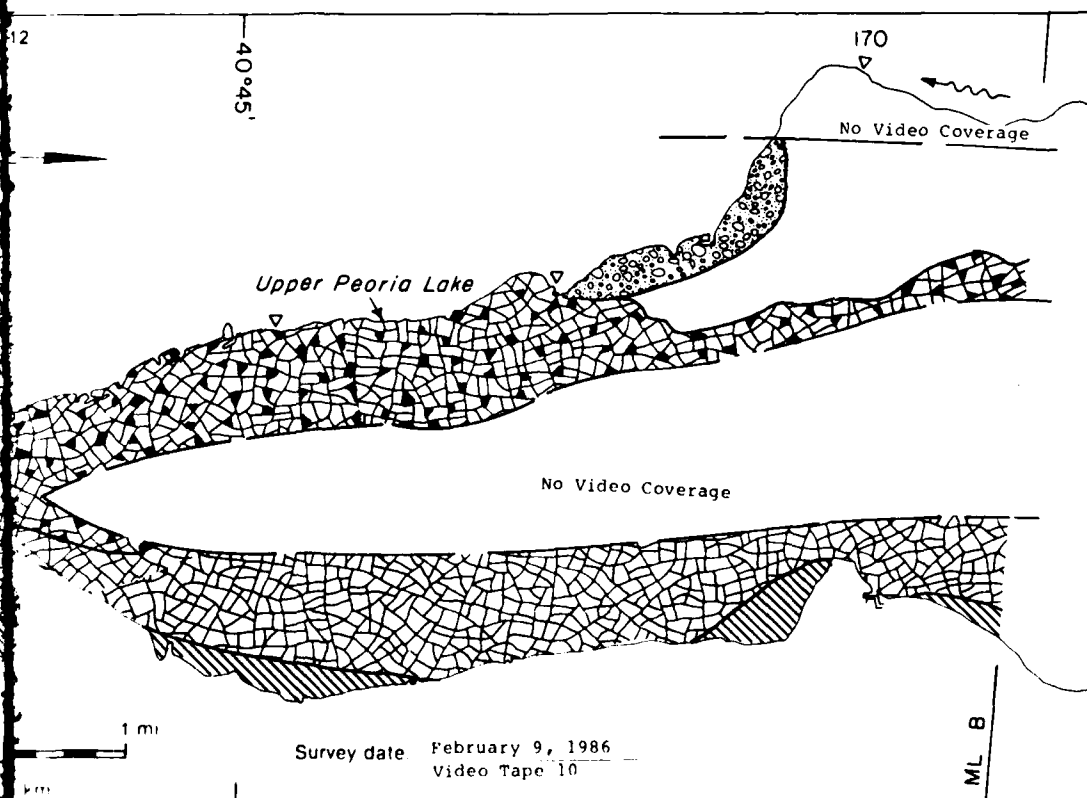
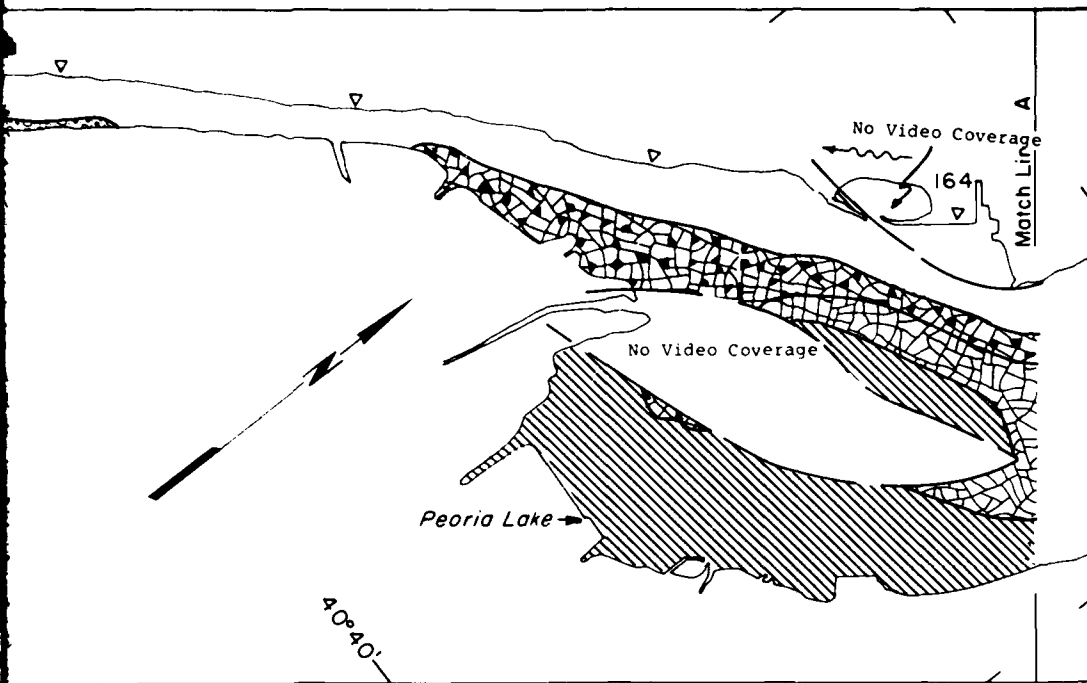
Total area ($m^2 \times 10^6$)

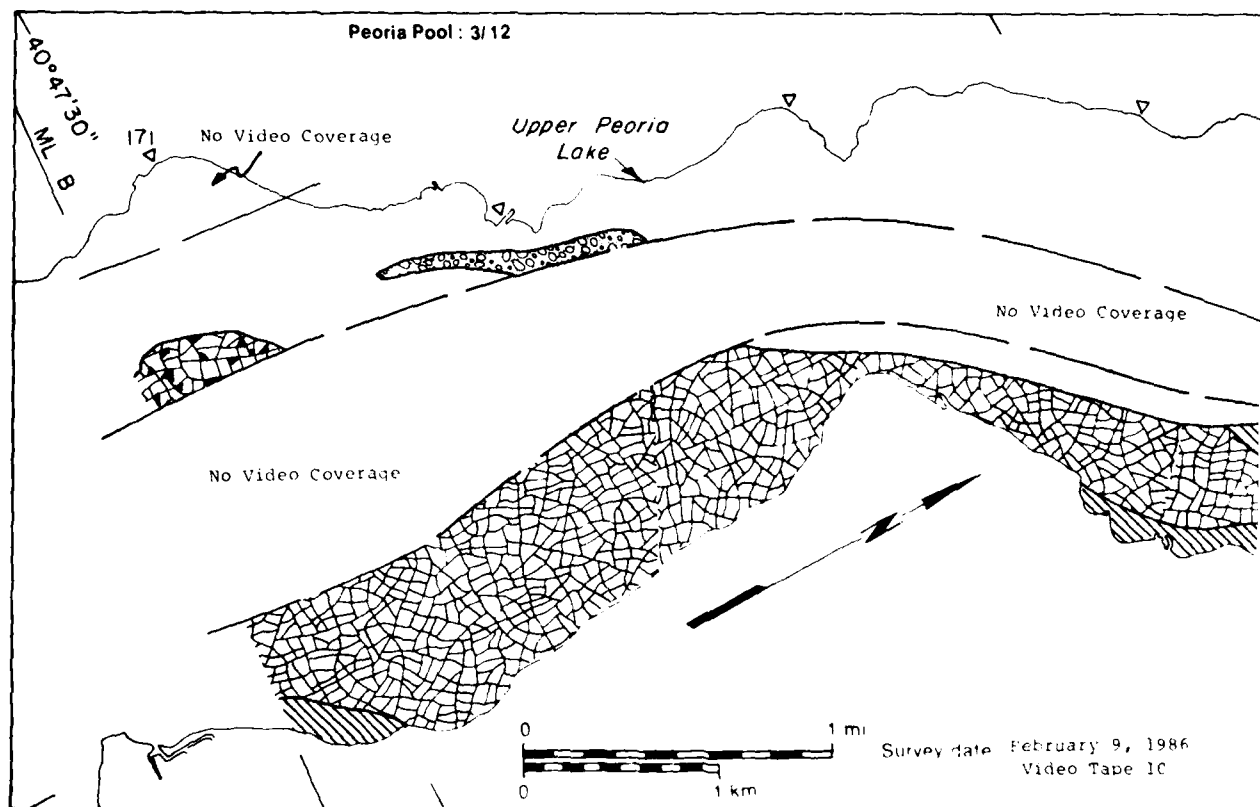
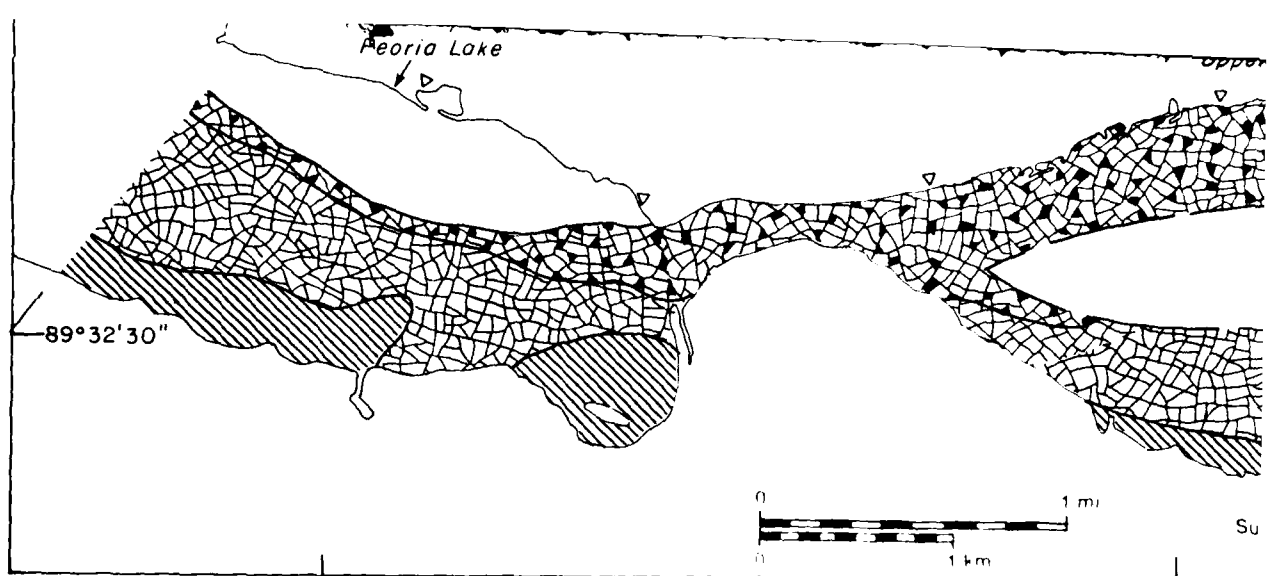
Area ($m^2 \times 10^6$)	Surface concentration (%)
10.42	NA
Trace	NA
0.00	—
0.03	NA
0.00	—
1.11	20
11.71*	

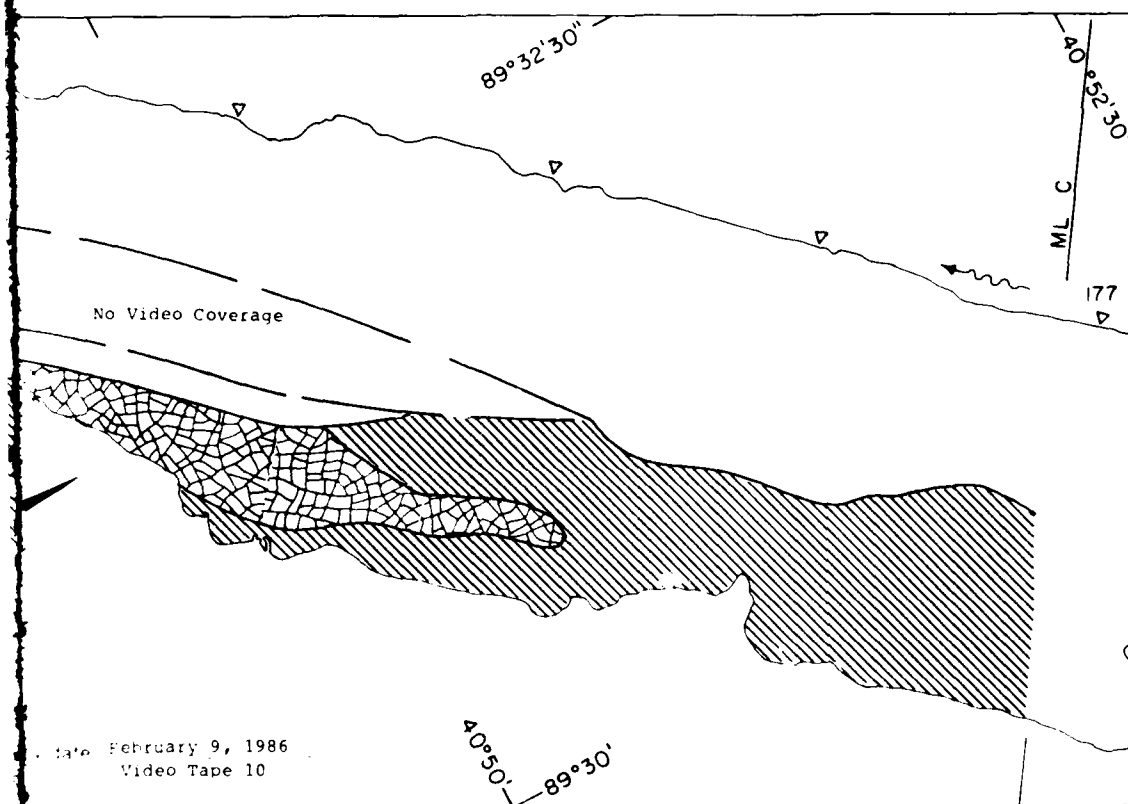
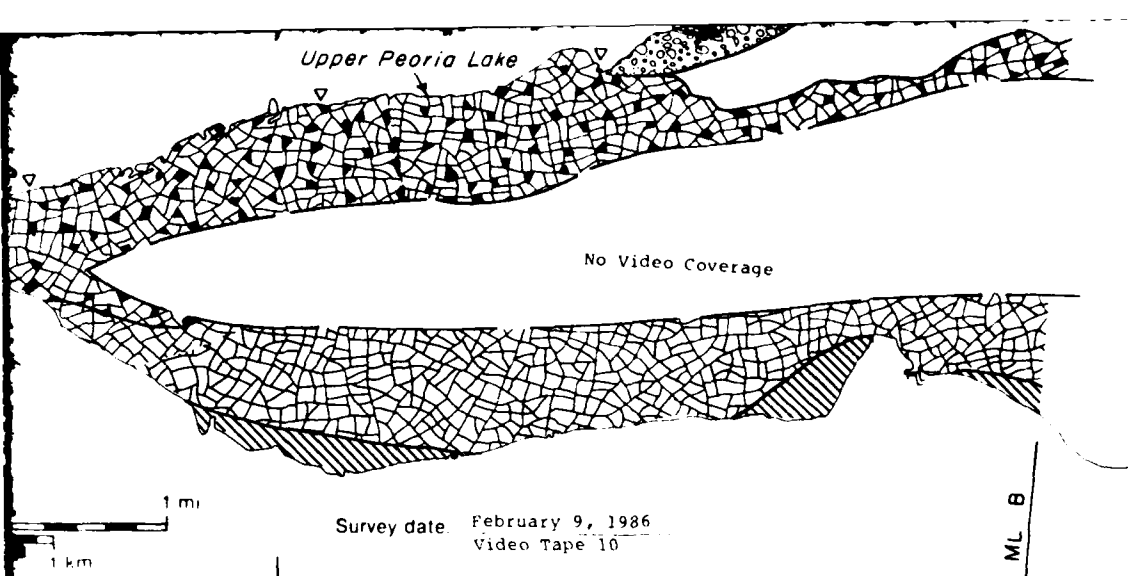
* Includes $0.15 \times 10^6 m^2$
of no video coverage



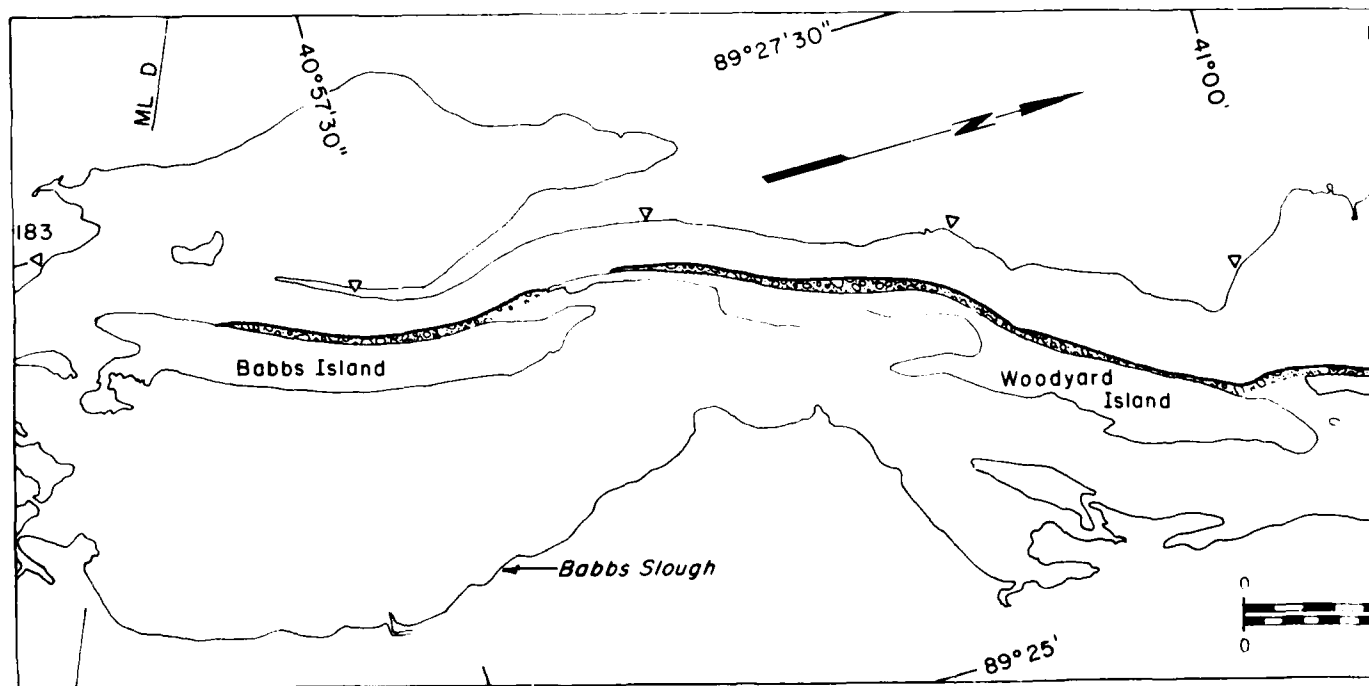
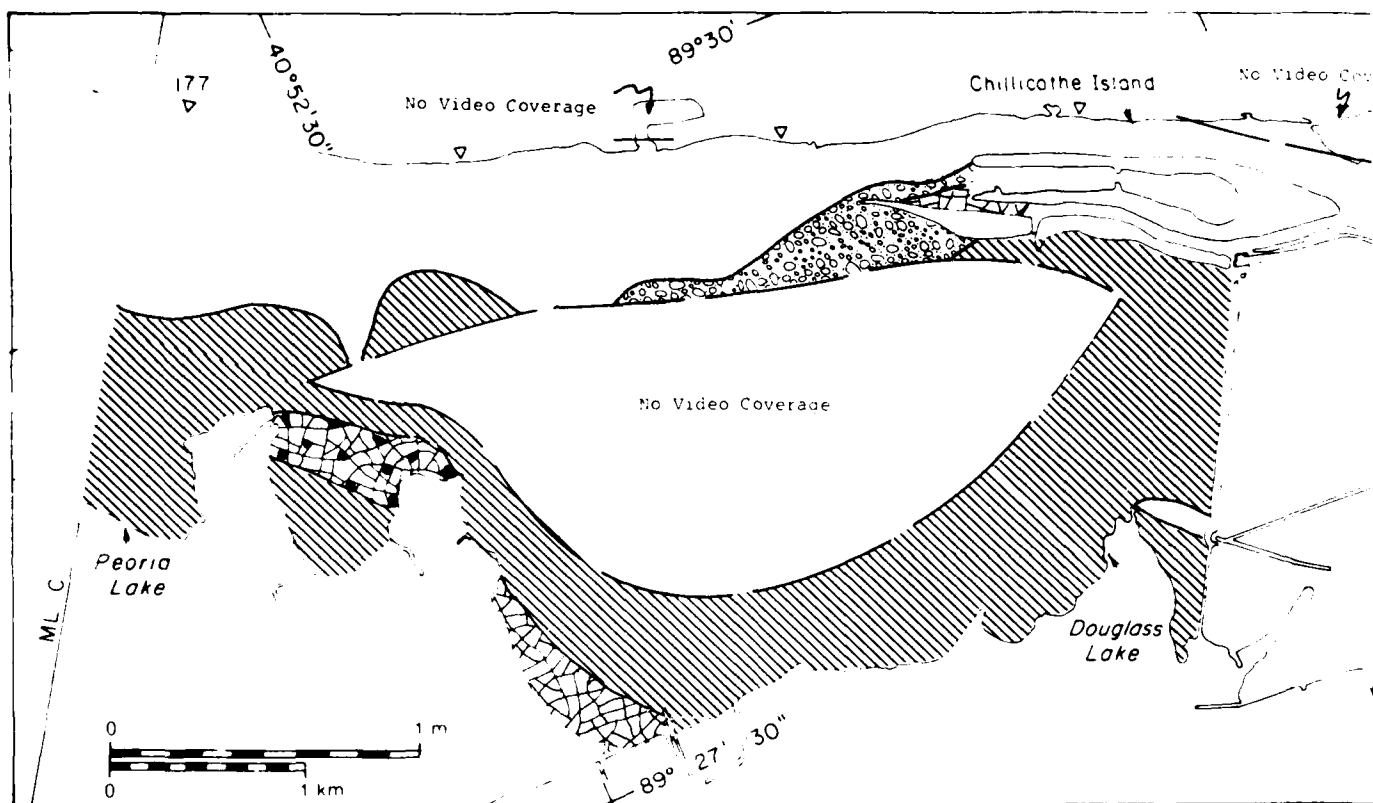
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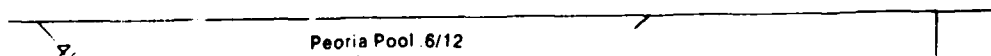
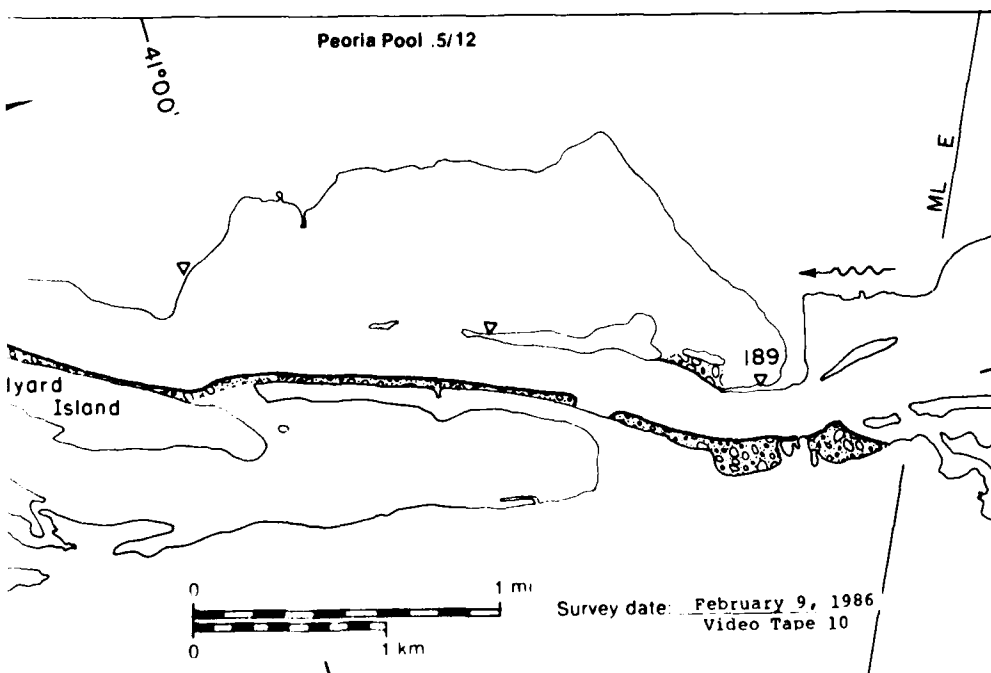
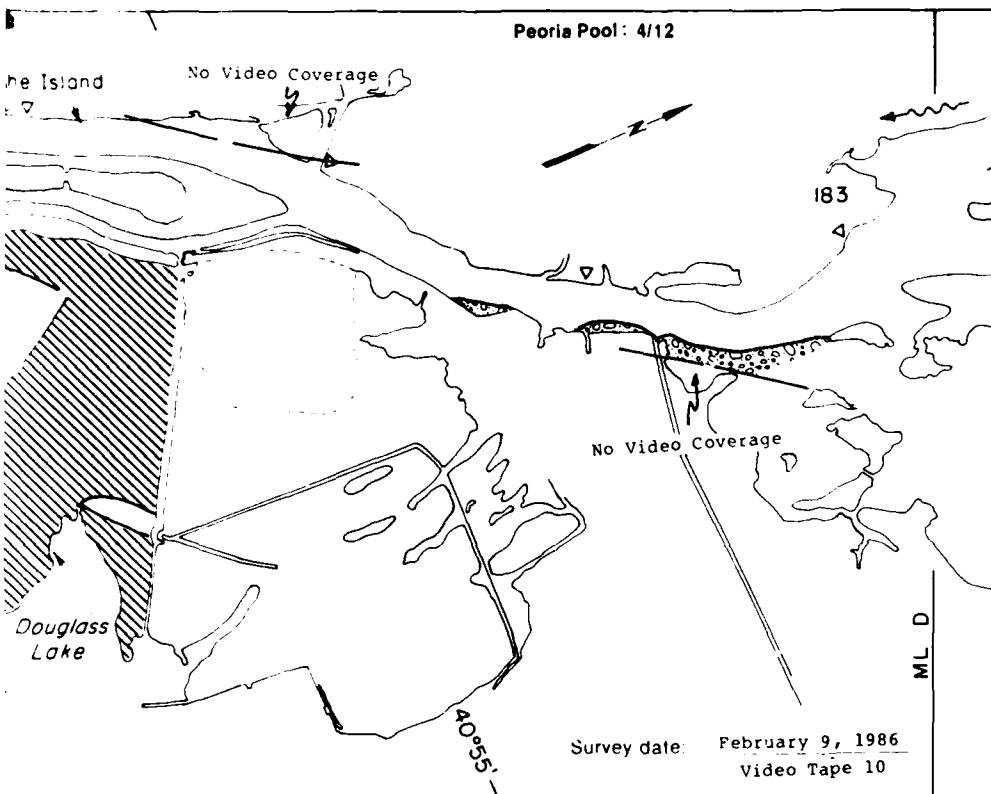


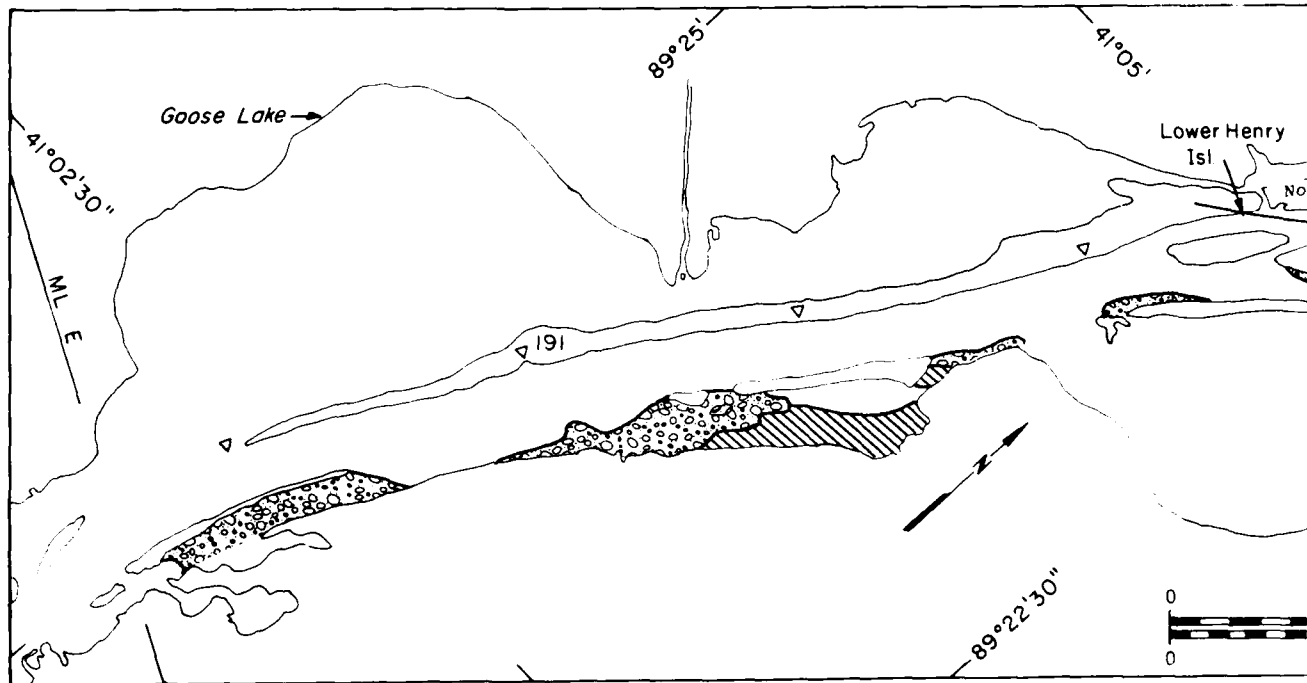
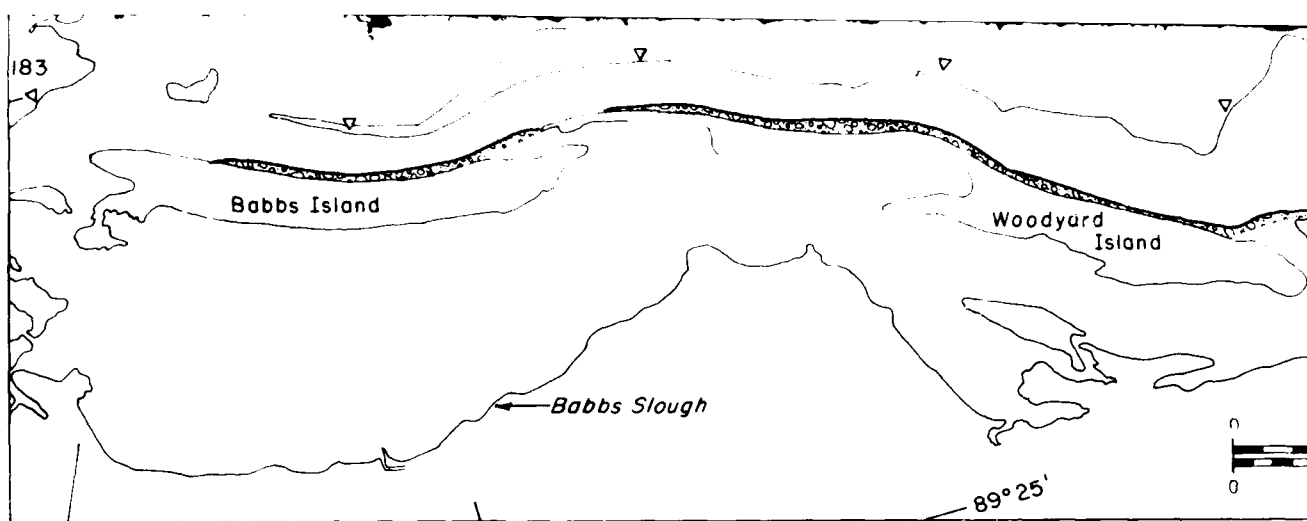


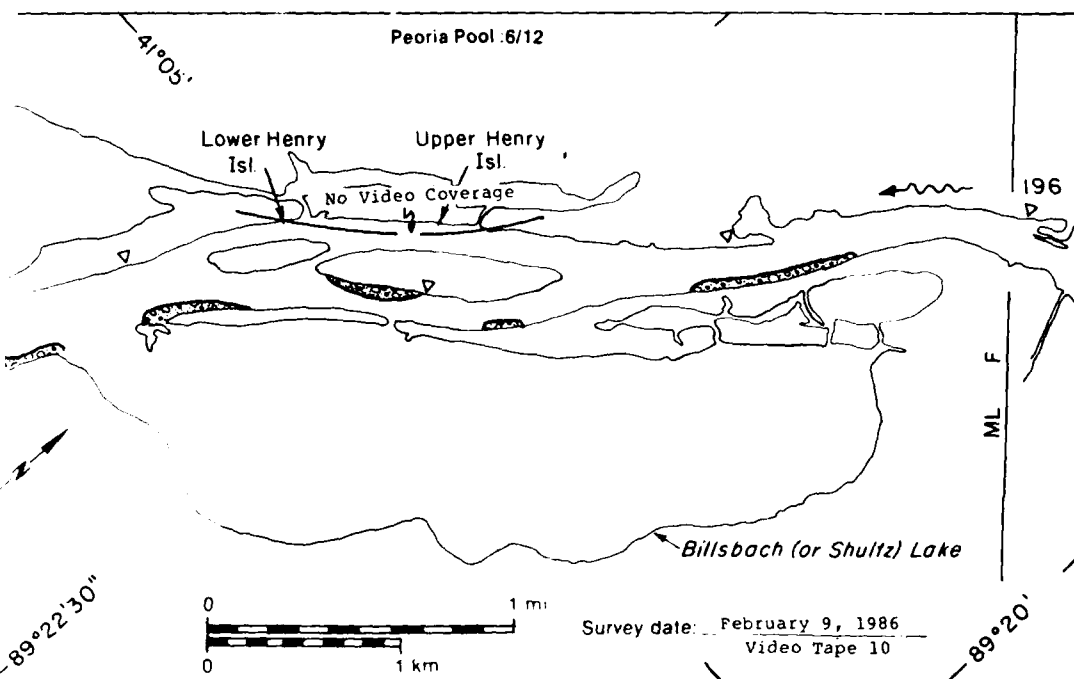
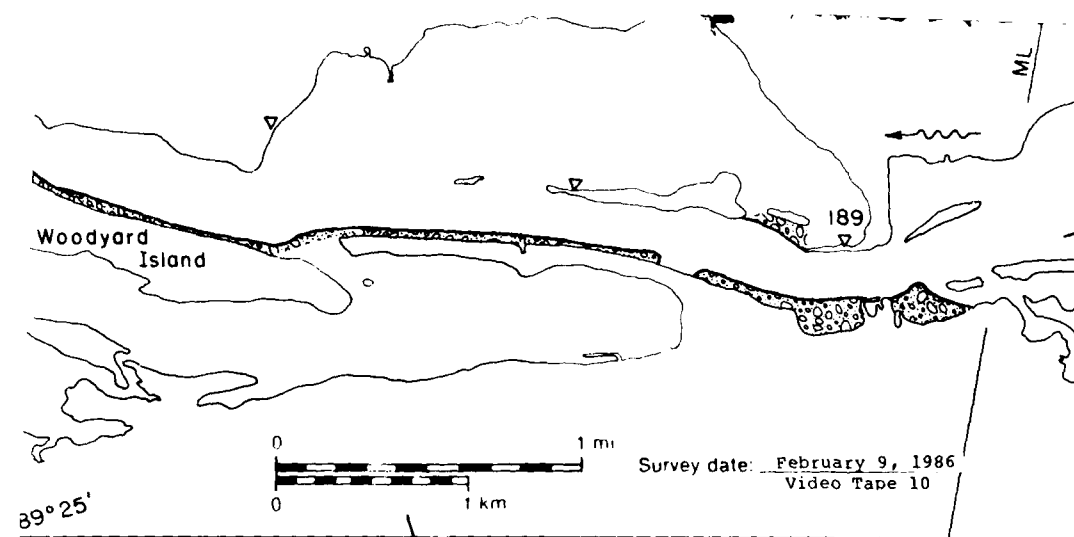


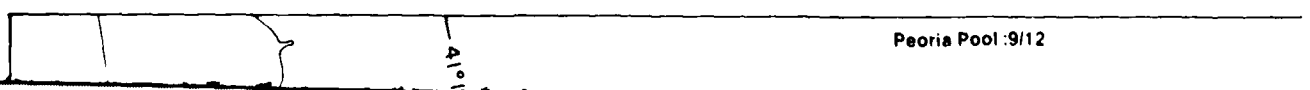
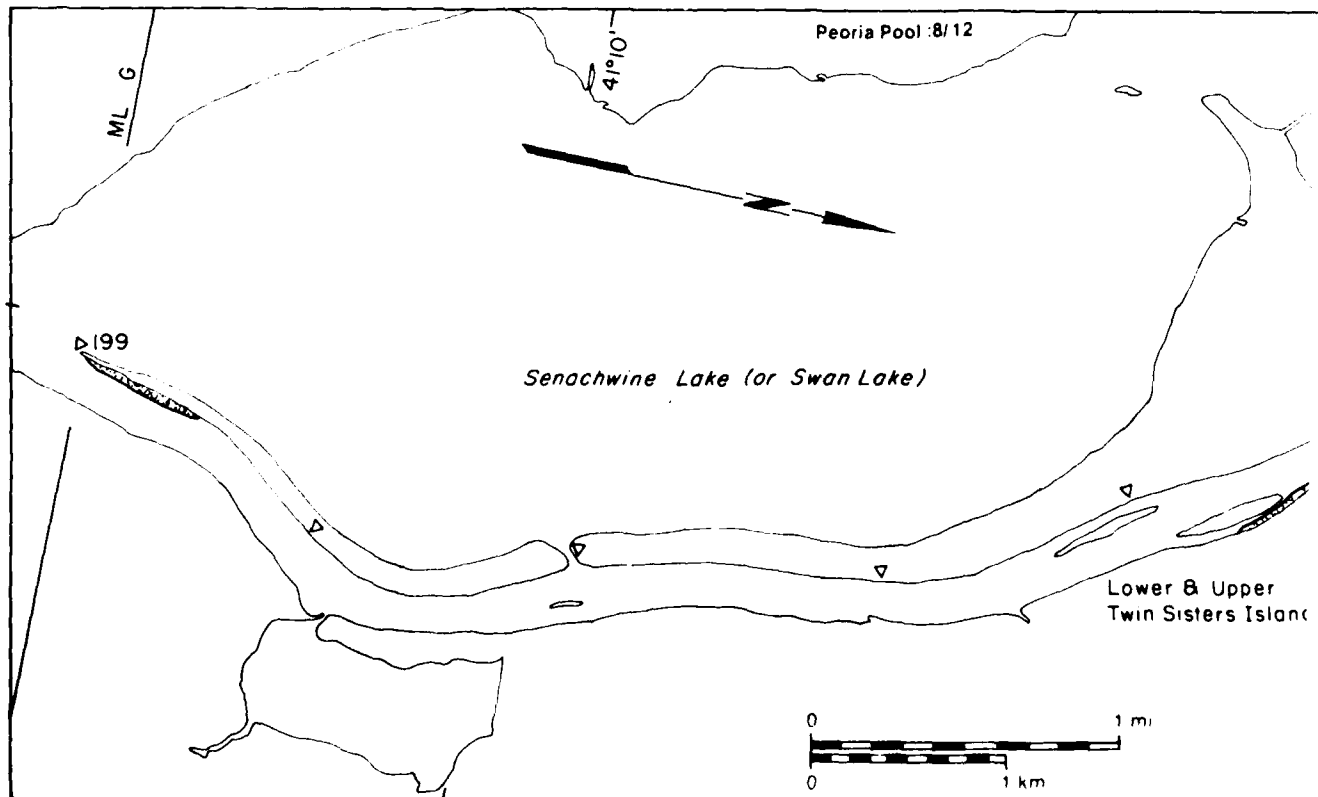
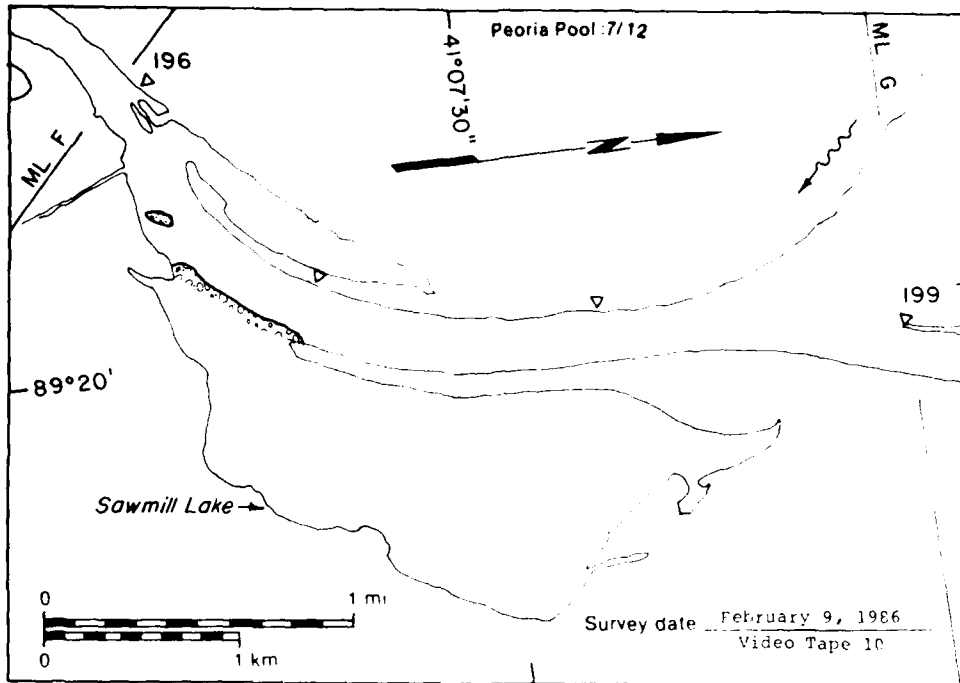
9 February 1986



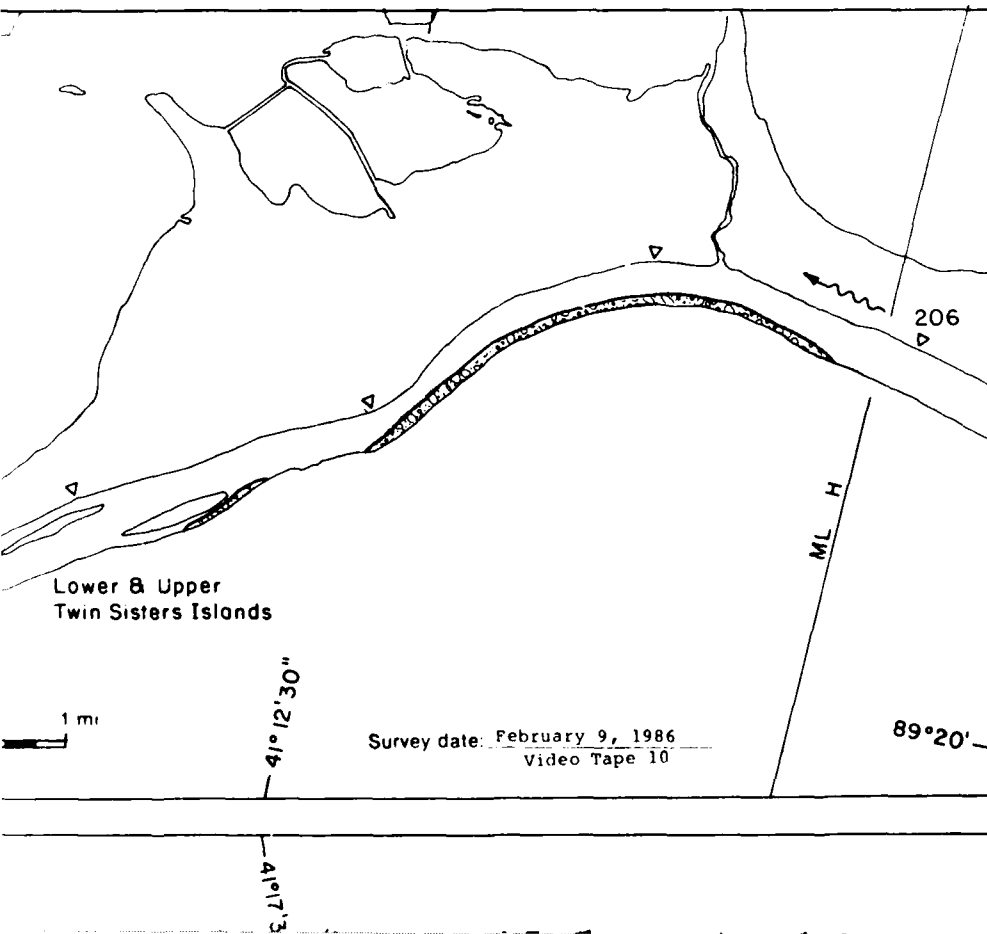


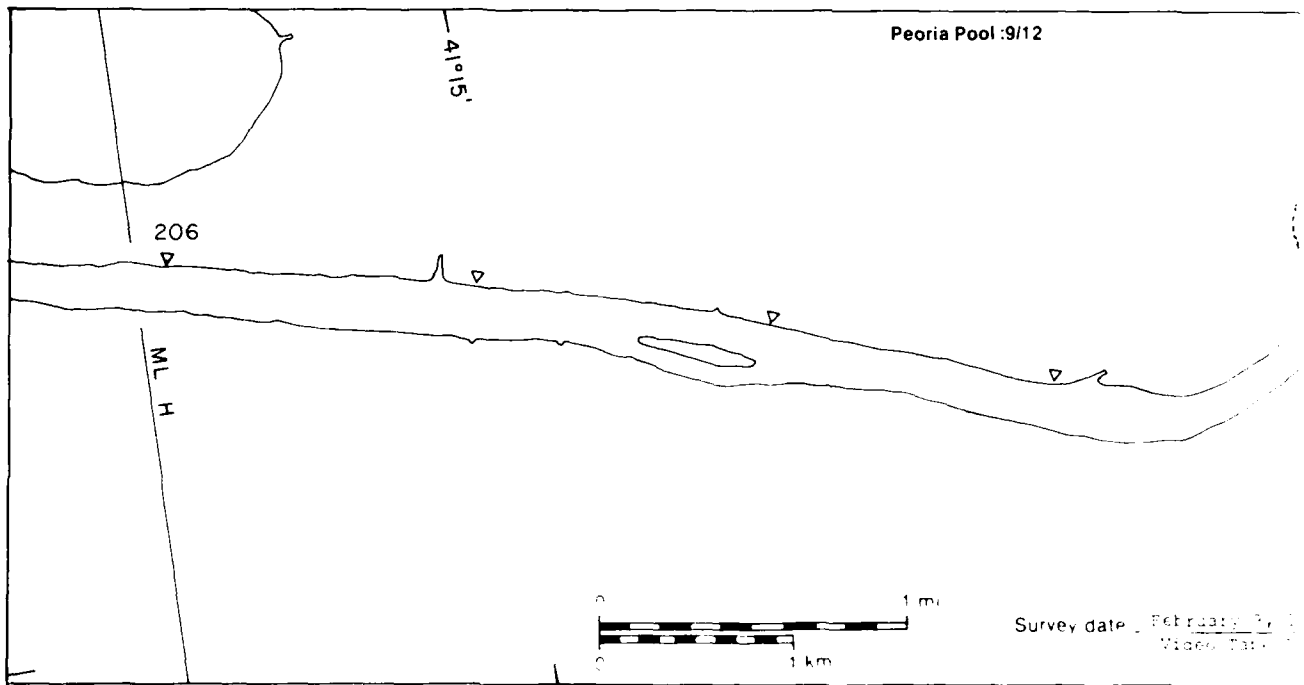
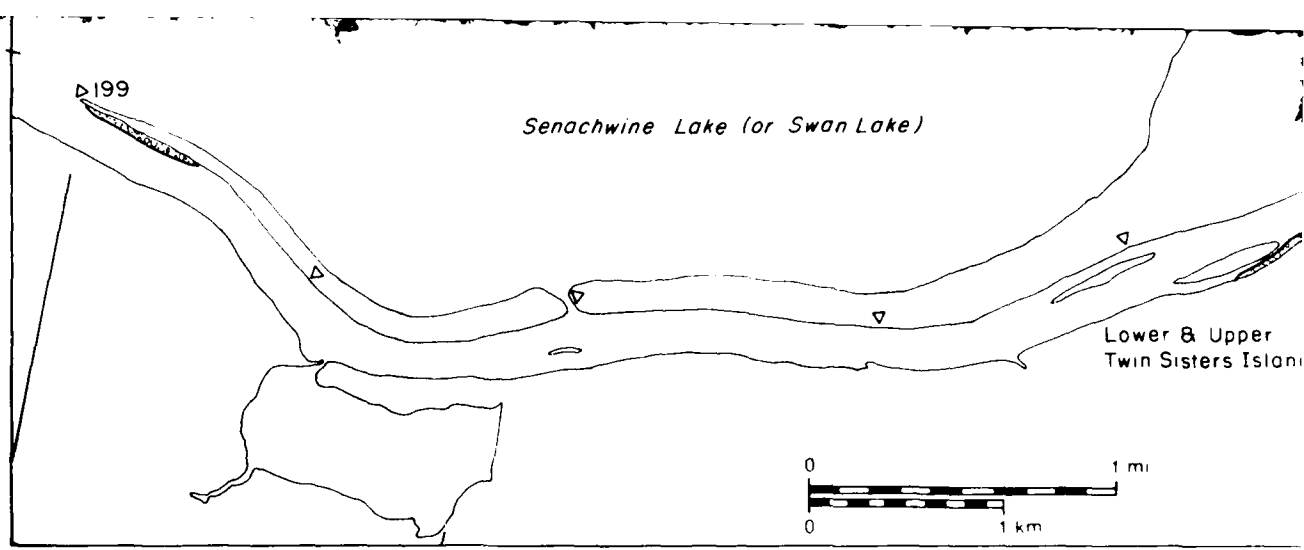


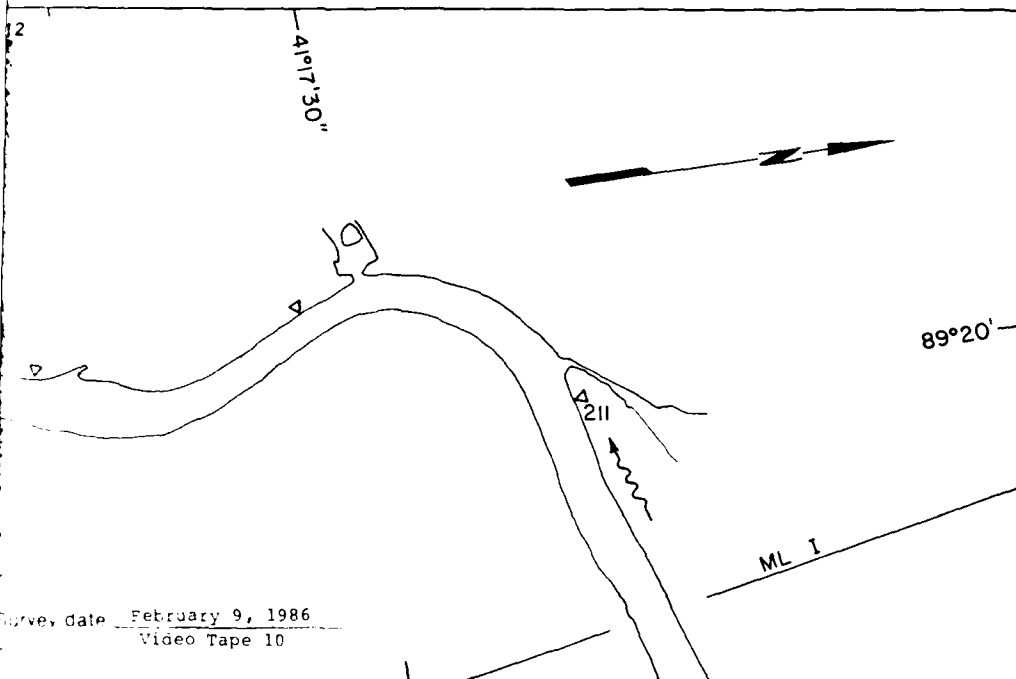
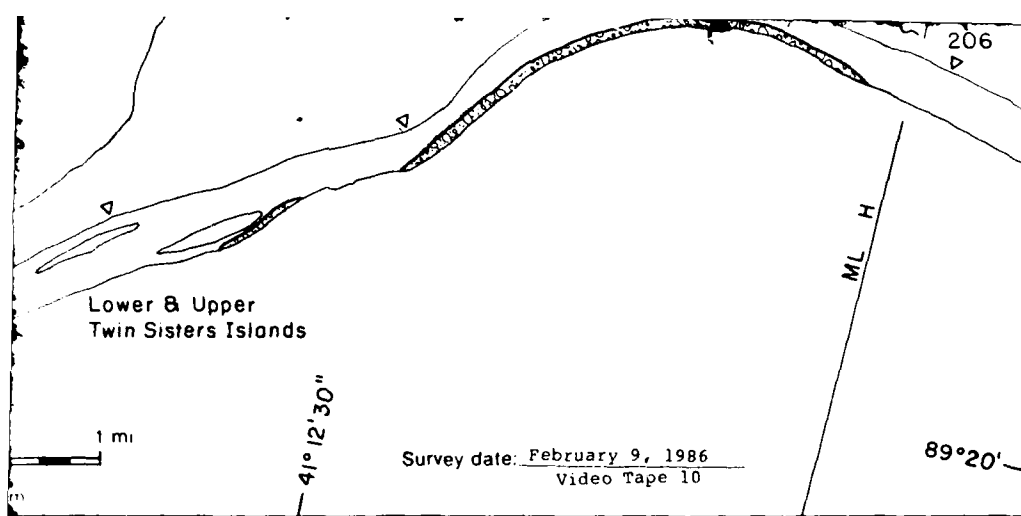




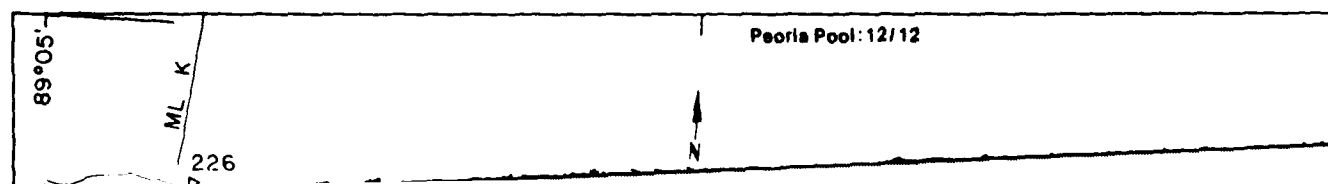
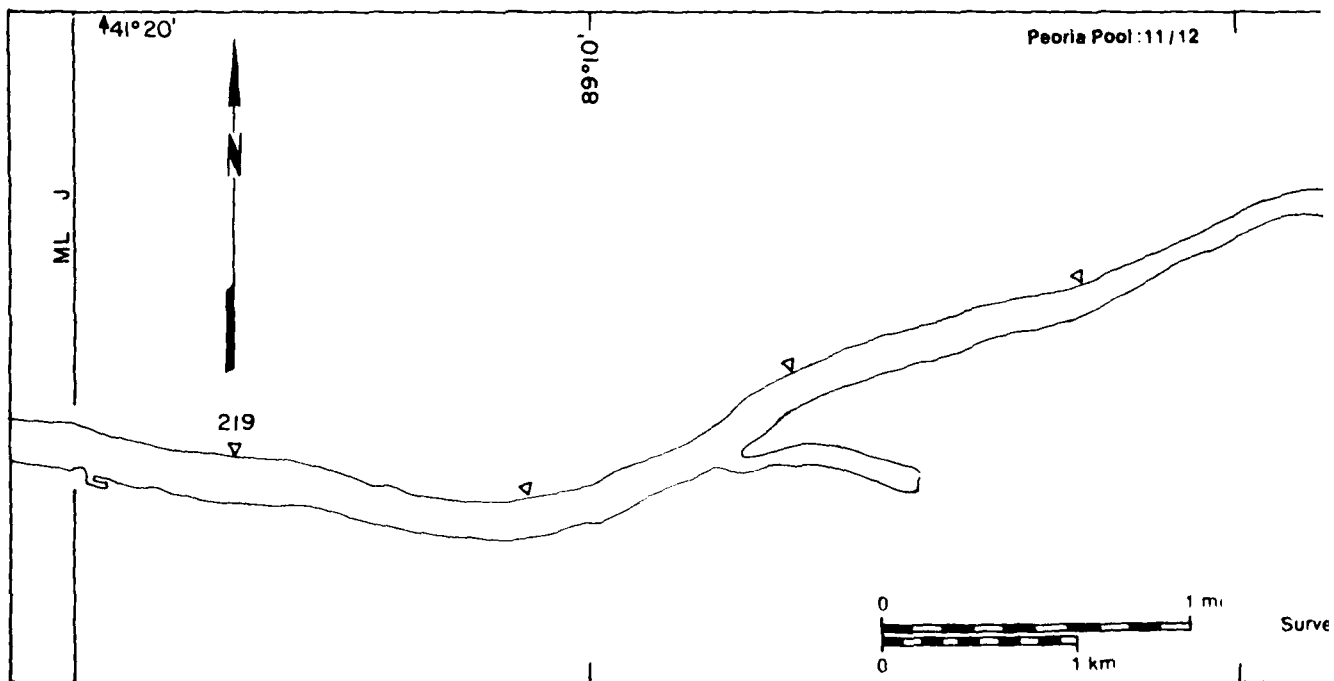
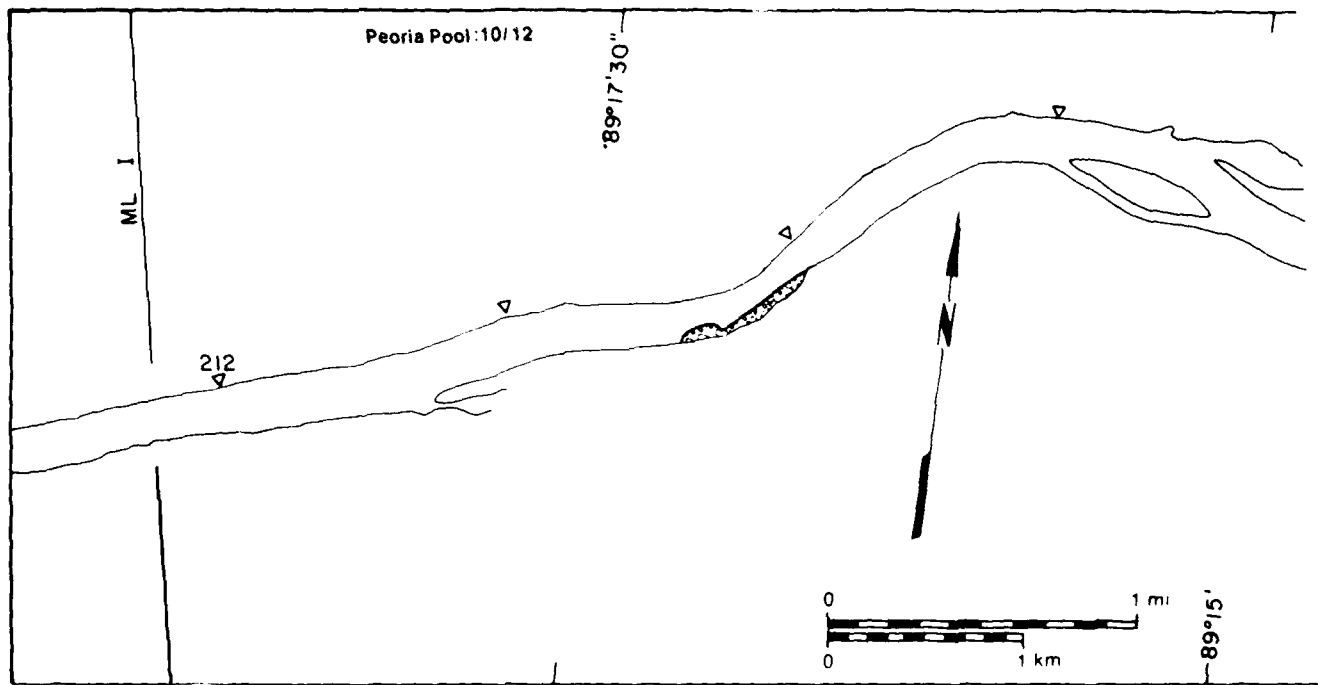
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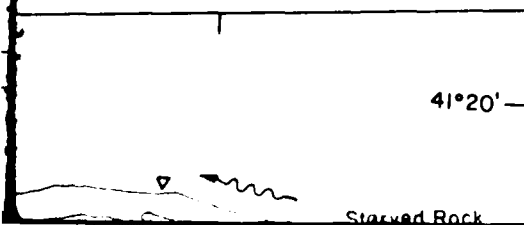
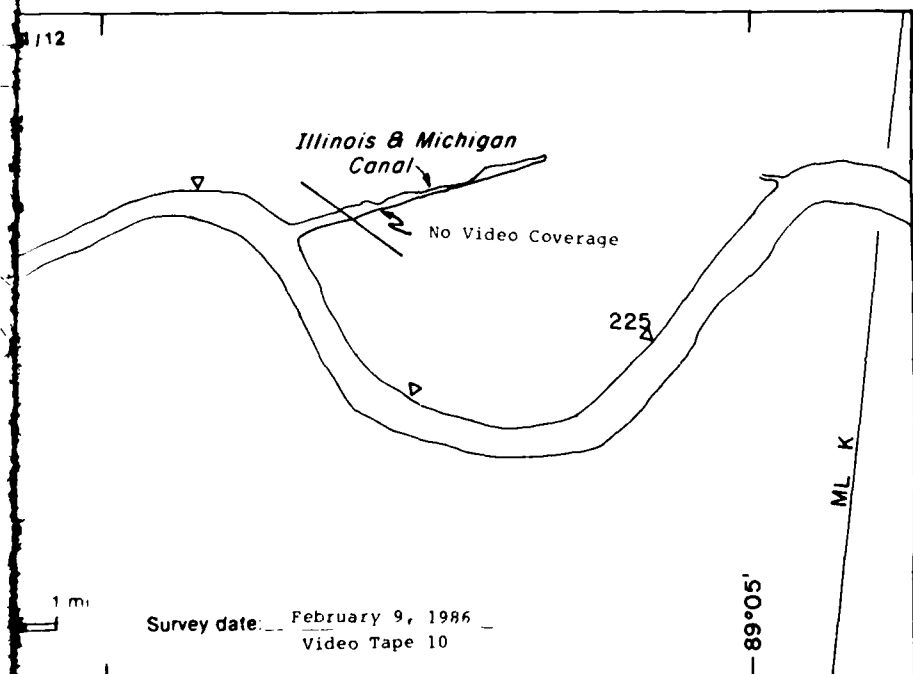
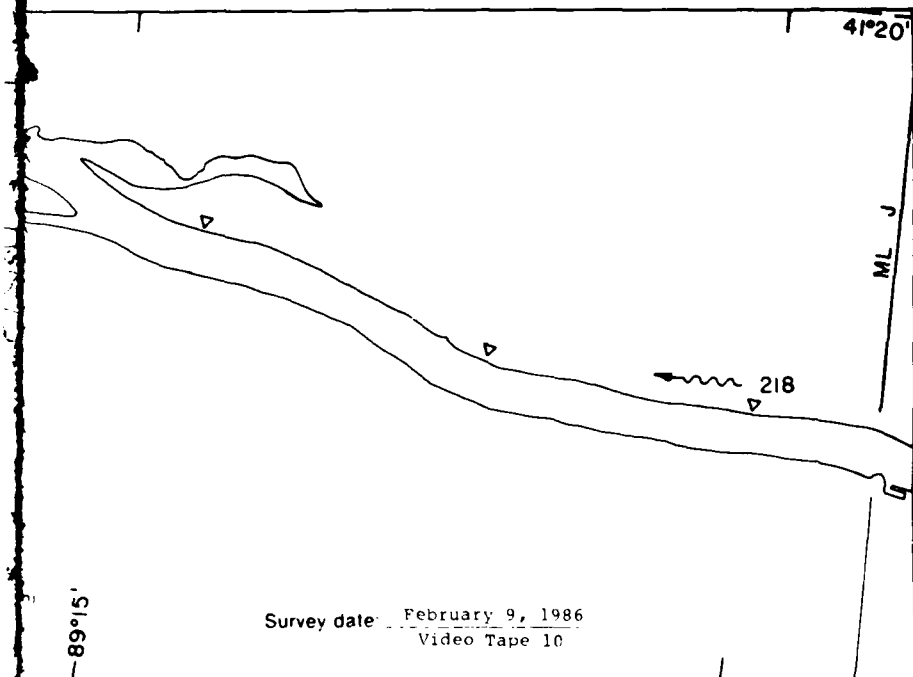


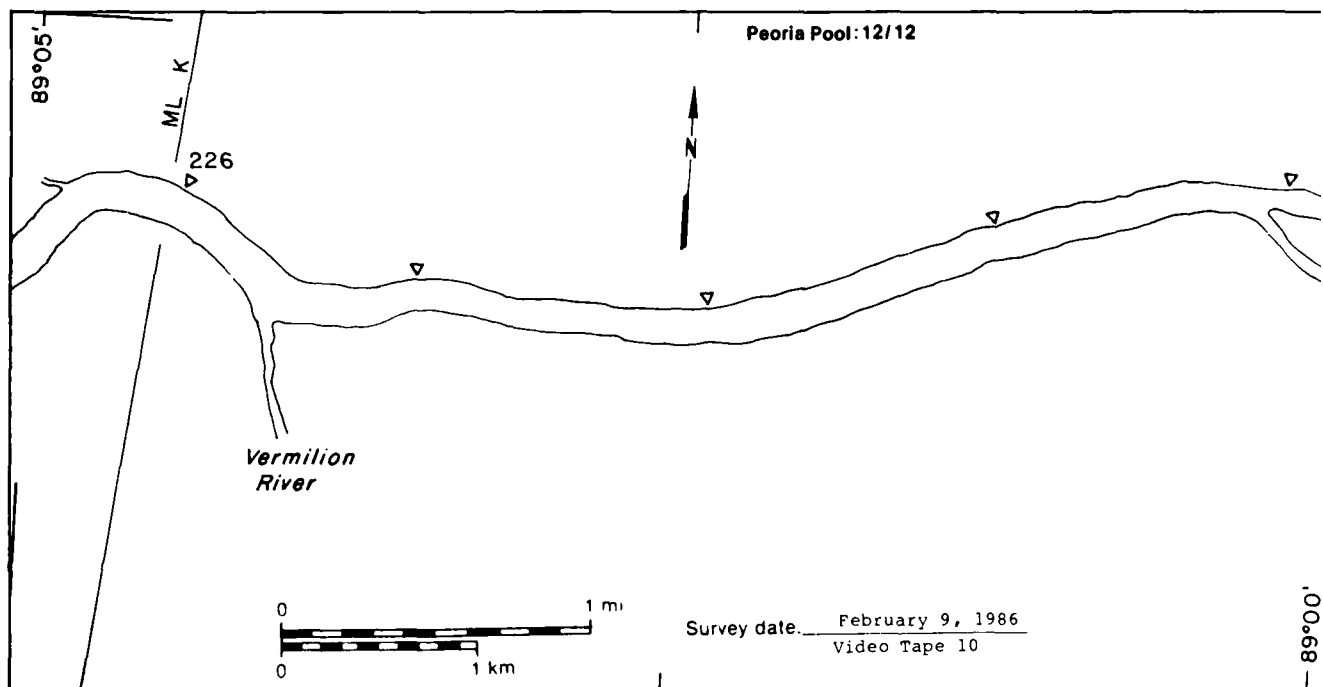
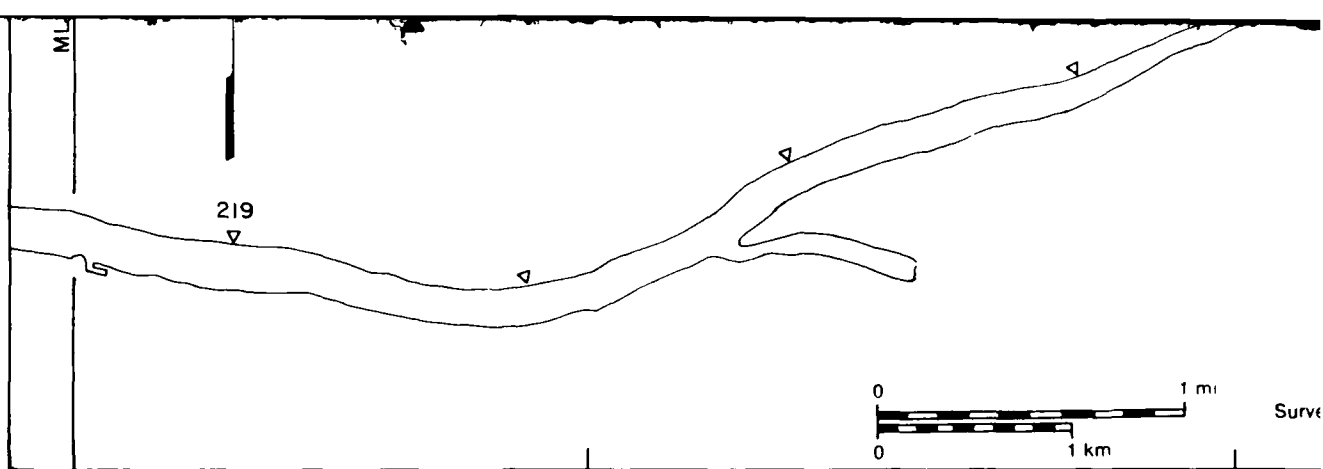





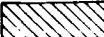


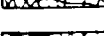
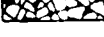
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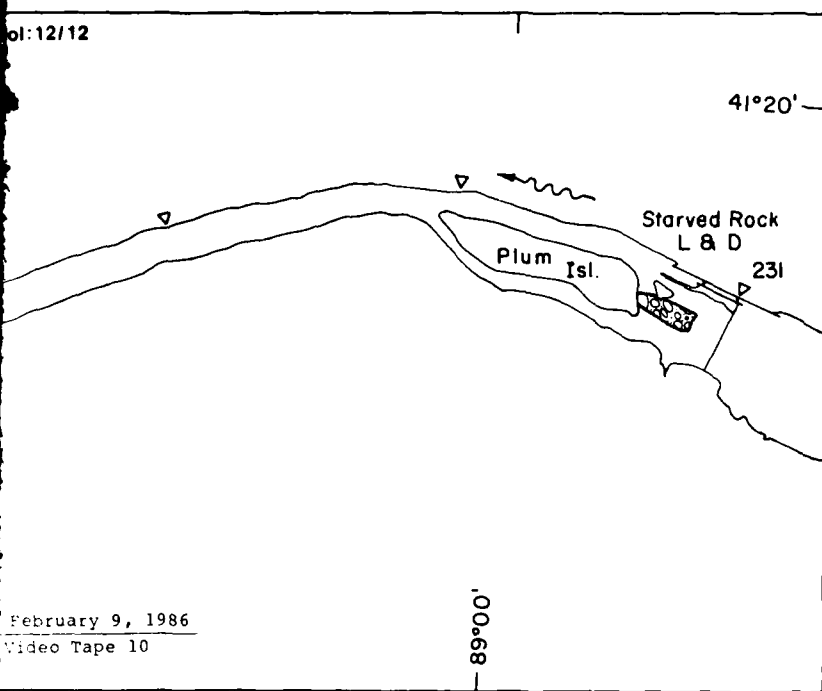
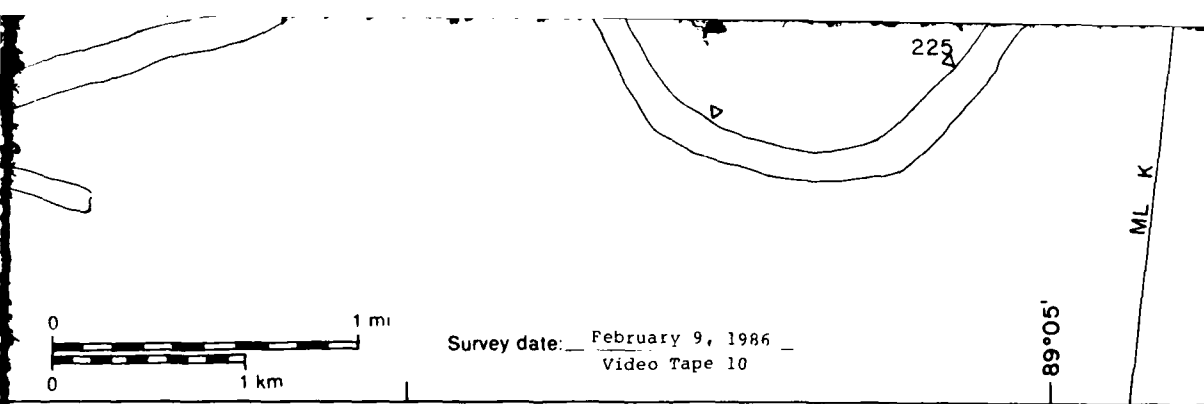


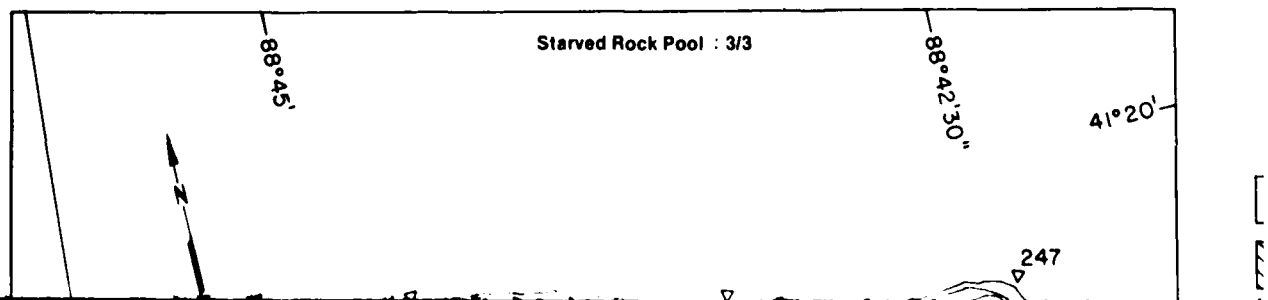
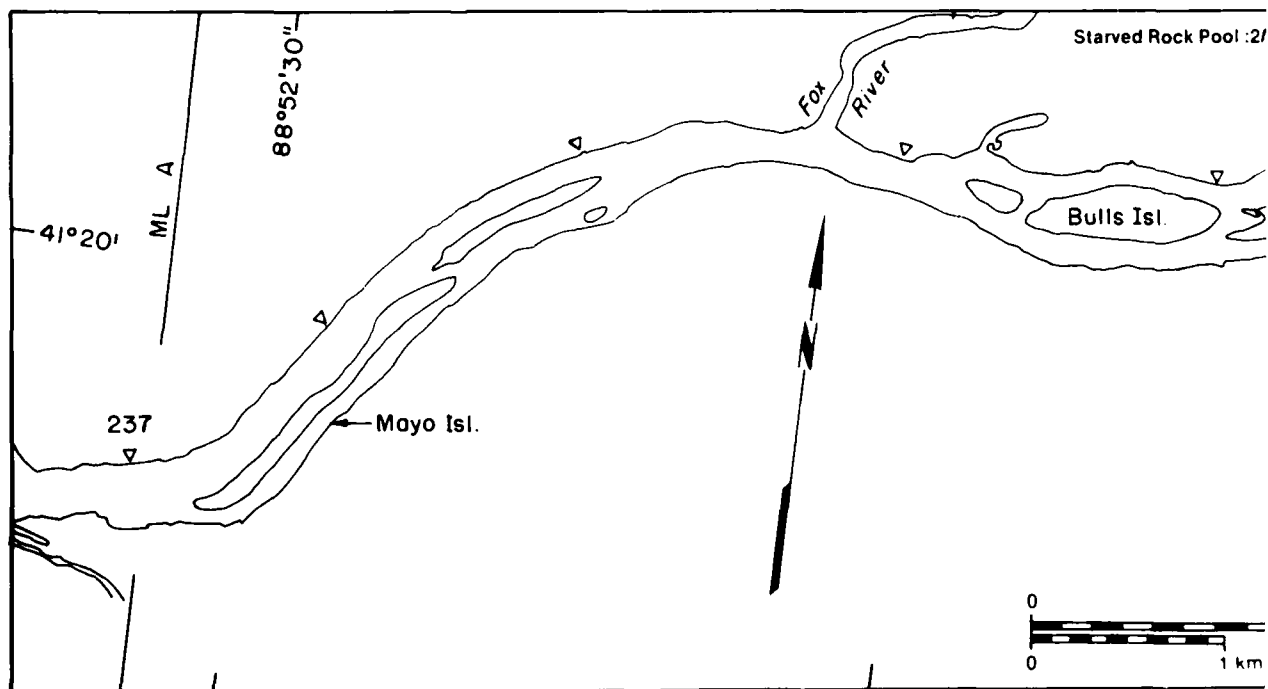
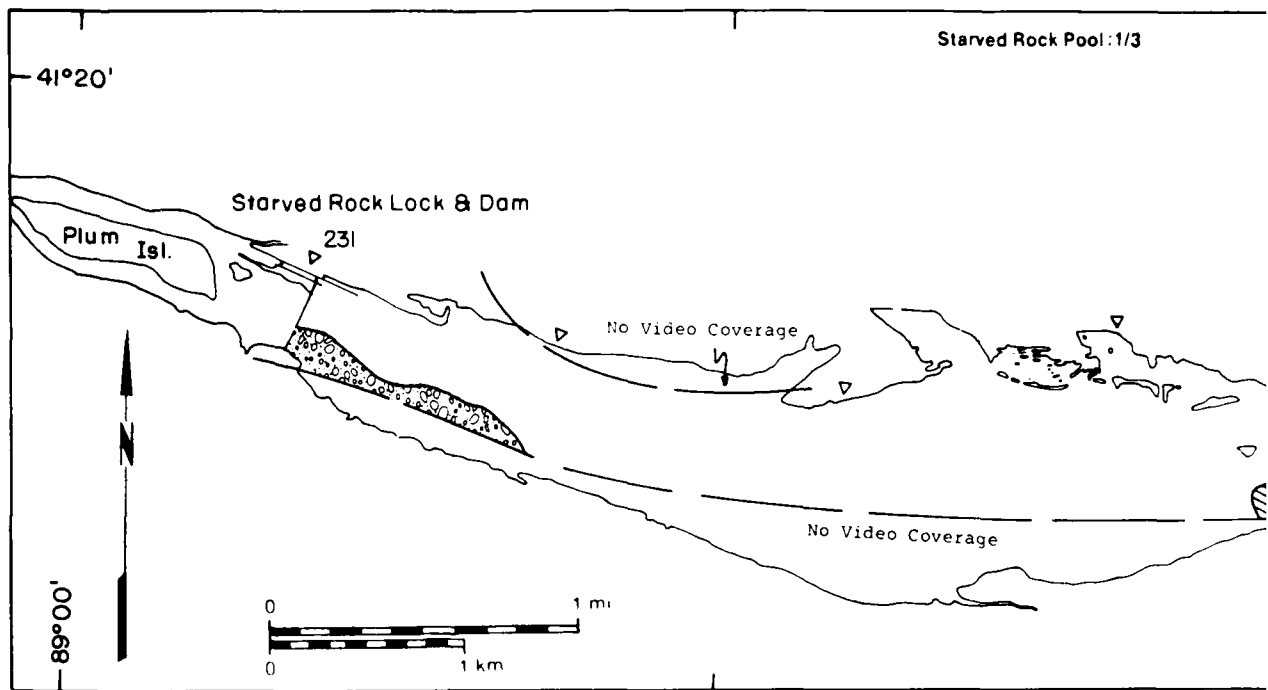


Peoria Pool

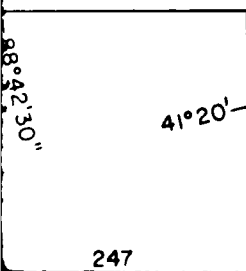
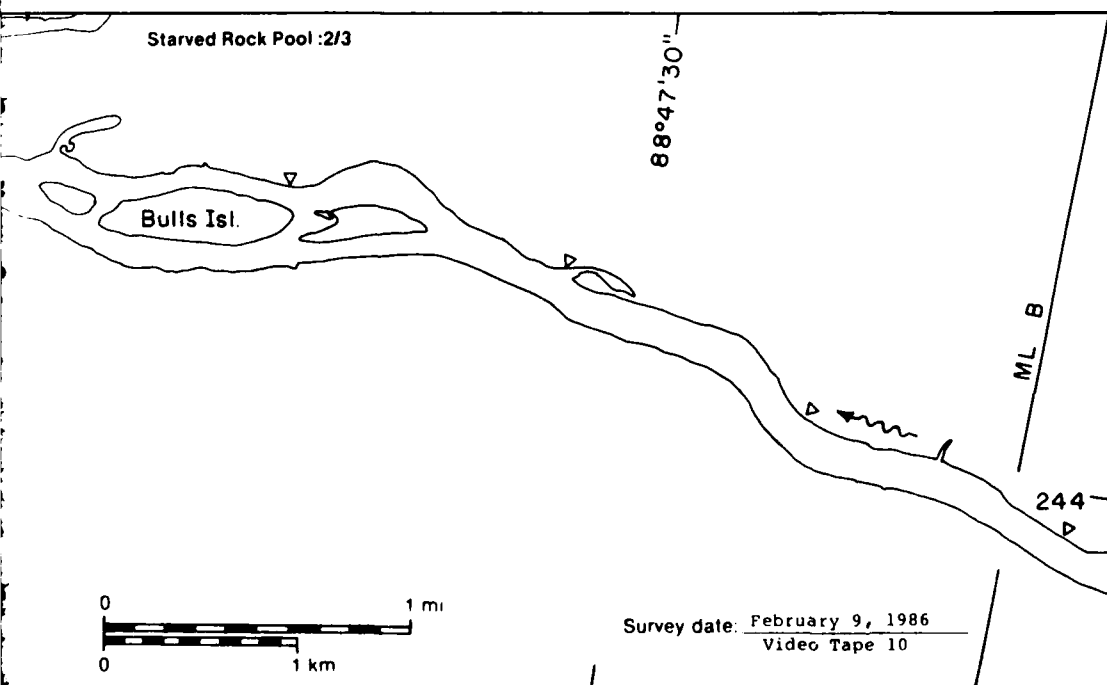
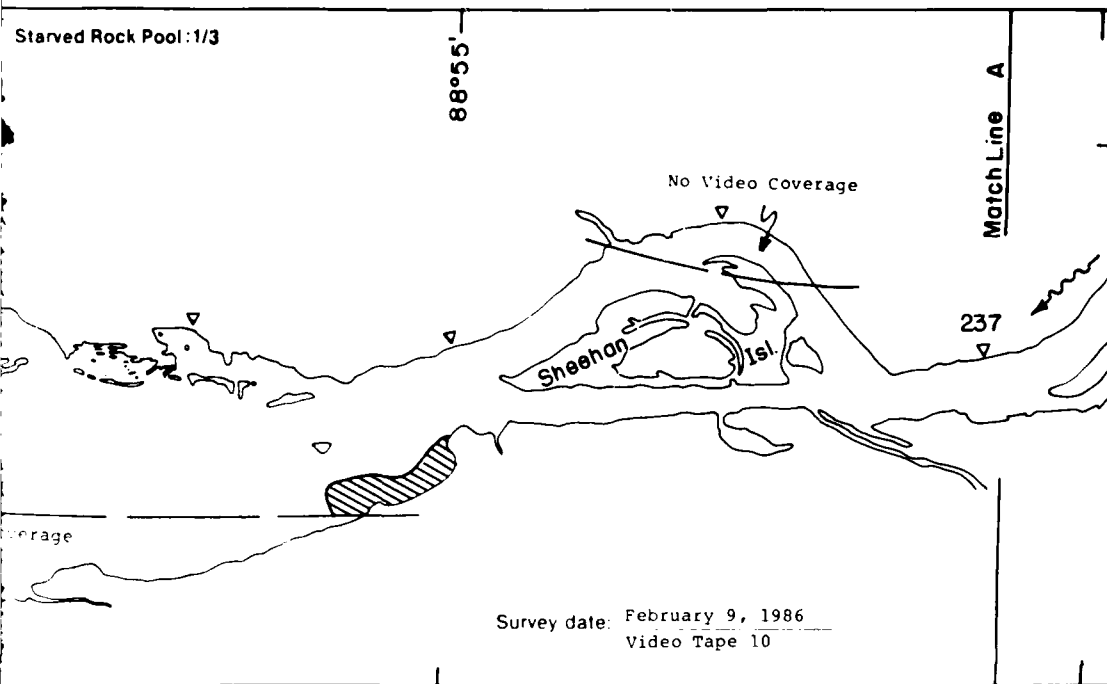
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration
	37.15	NA
	12.23	NA
	0.00	—
	8.55	NA
	4.63	70
	2.73	40
Total area ($m^2 \times 10^6$)	81.33*	

* Includes $16.04 \times 10^6 m^2$ of no video coverage



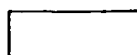


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Starved Rock Pool

MAP UNITS



Open water

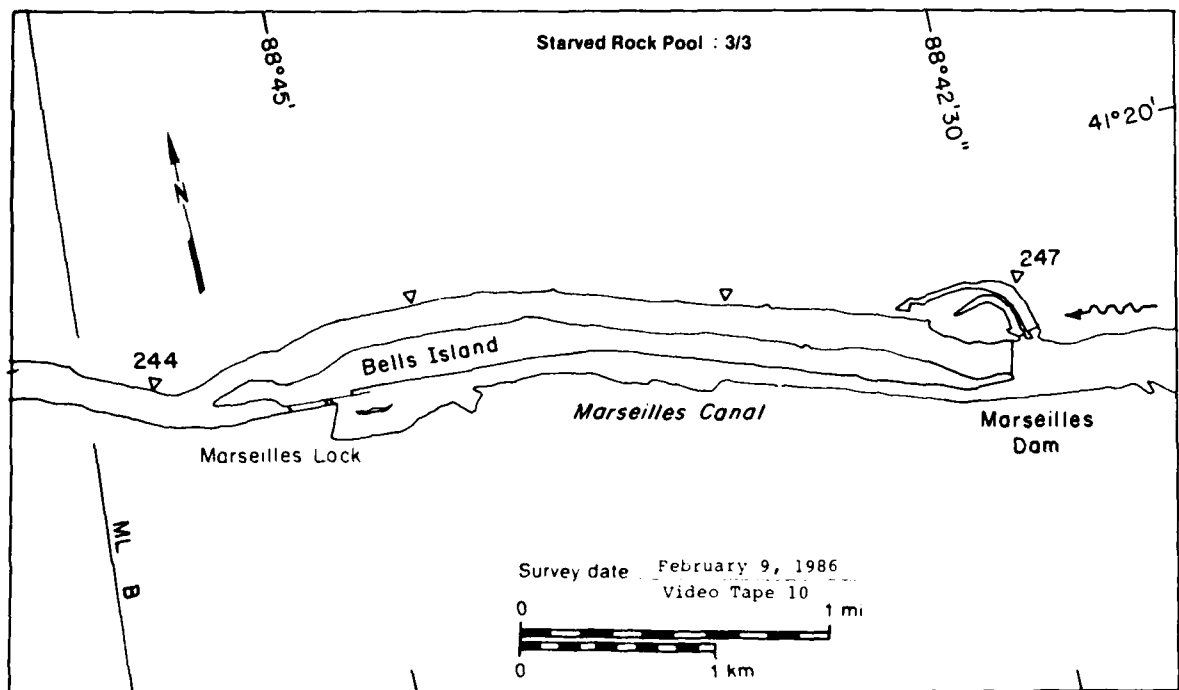
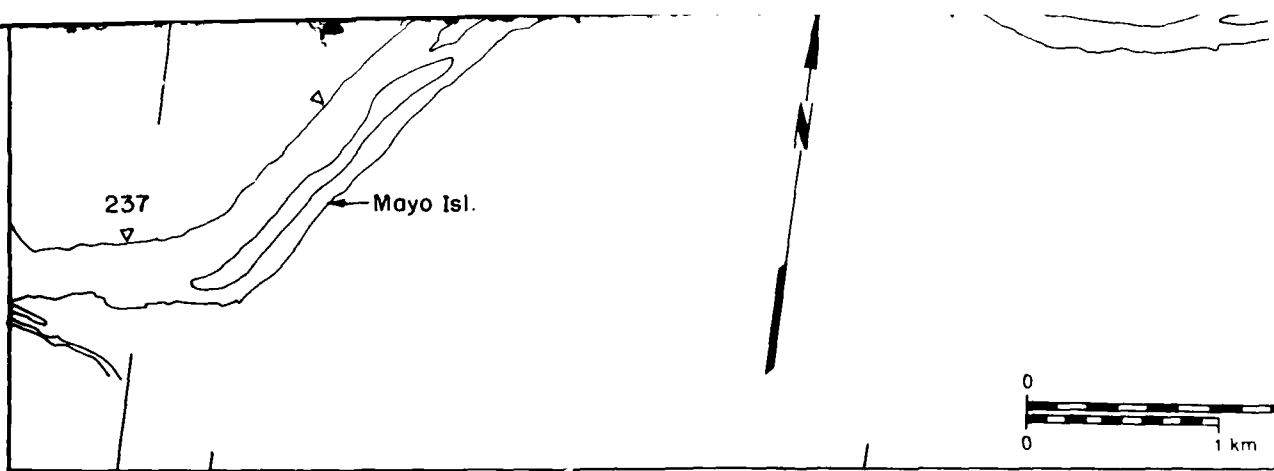


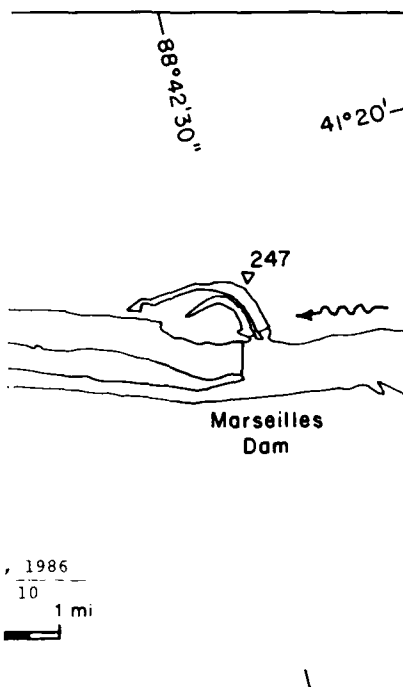
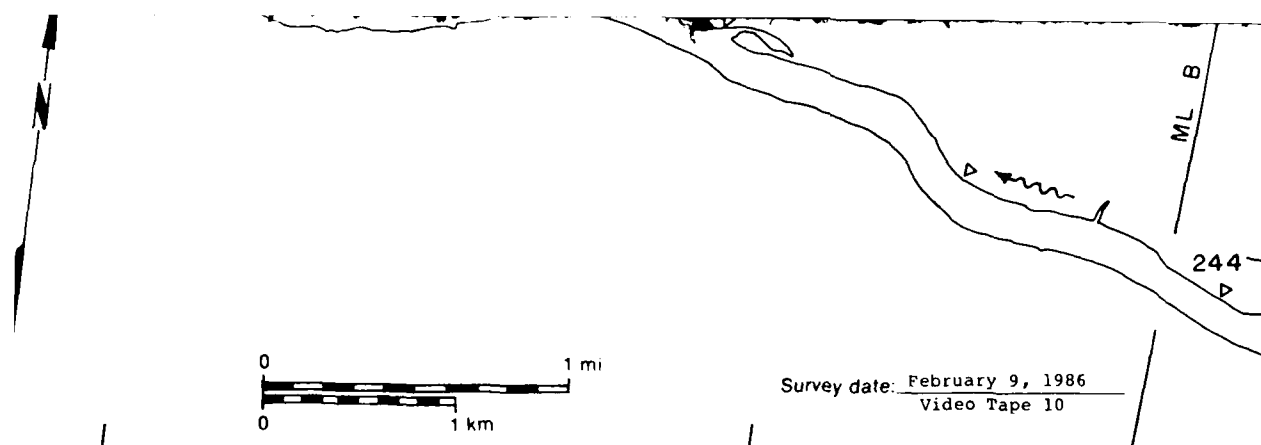
Shallow water

Area
(m² x 10⁶)

Surface
concentration
(%)





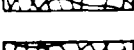

8.12	NA
6.12	NA





Starved Rock Pool

MAP UNITS

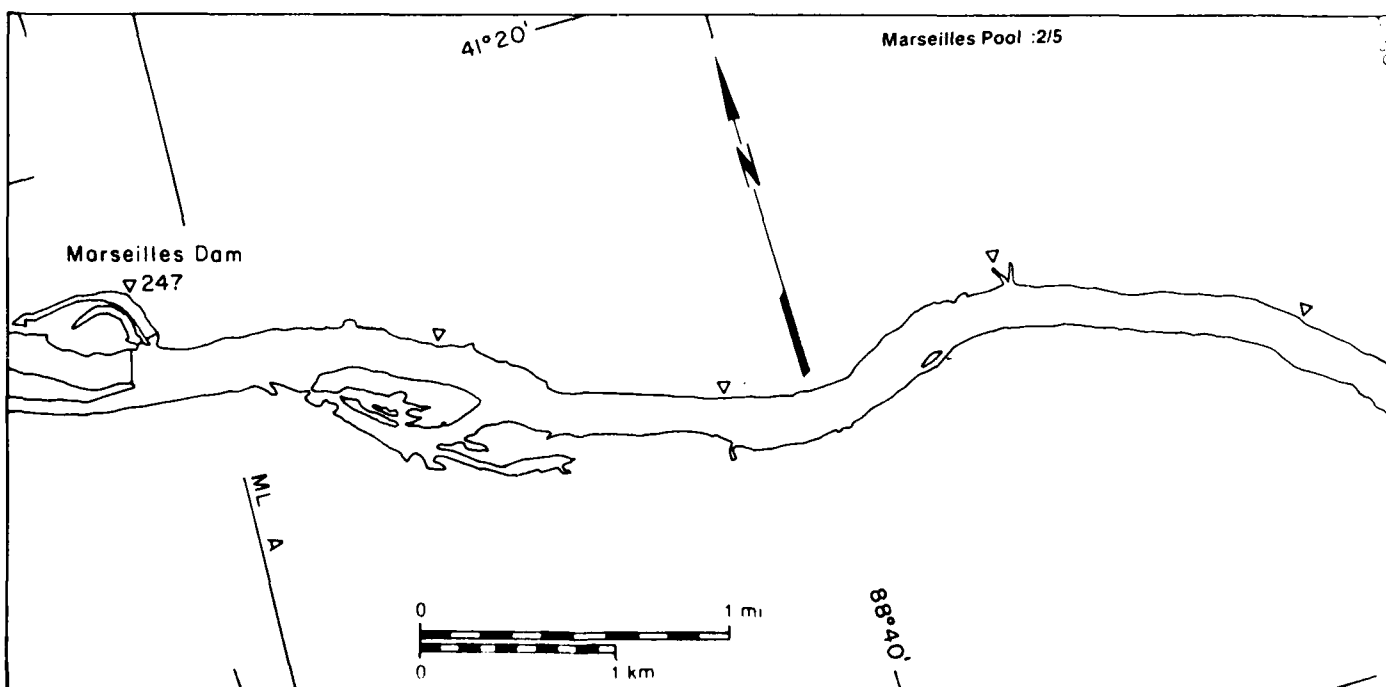
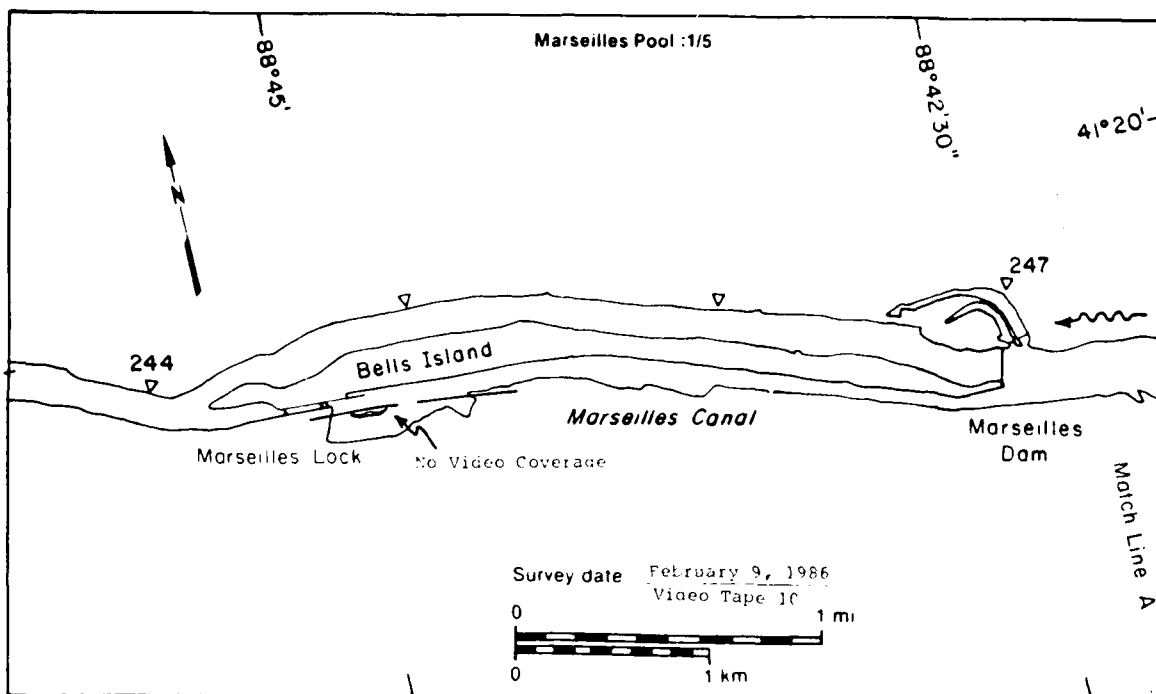
	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

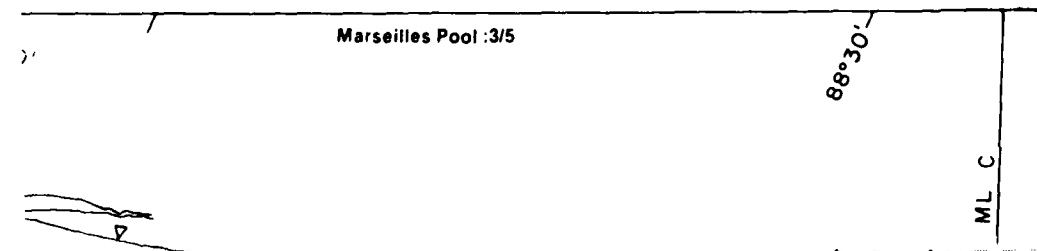
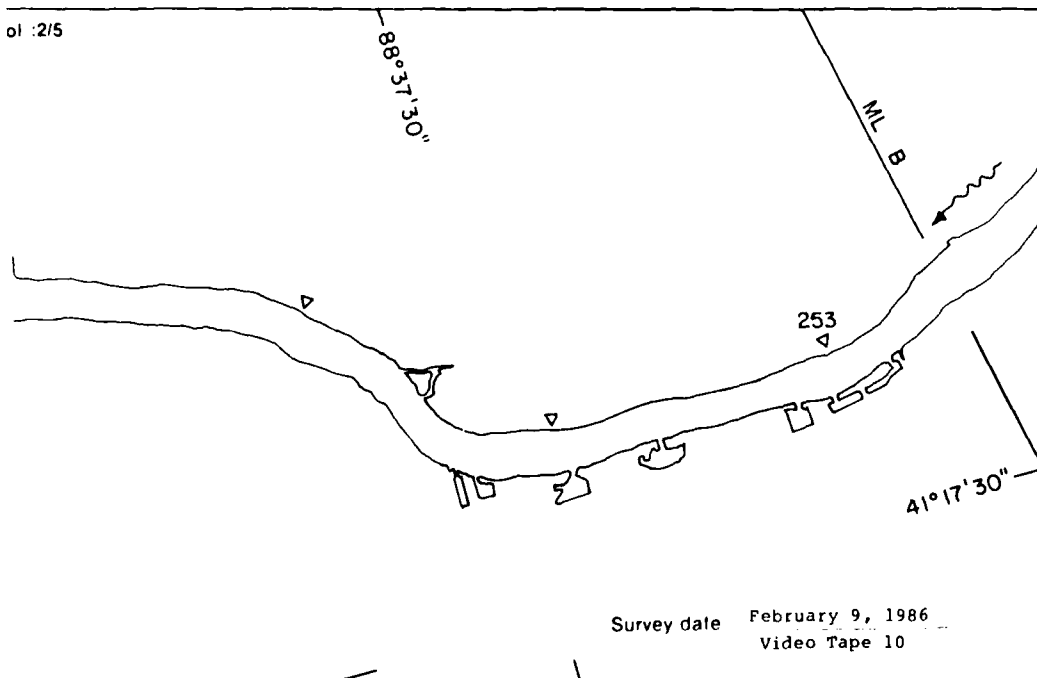
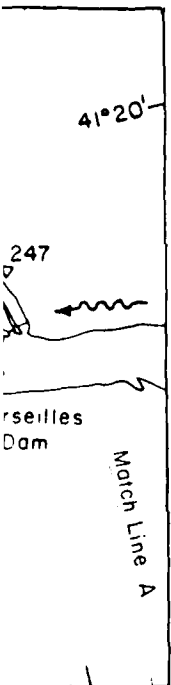
Total area ($m^2 \times 10^6$)

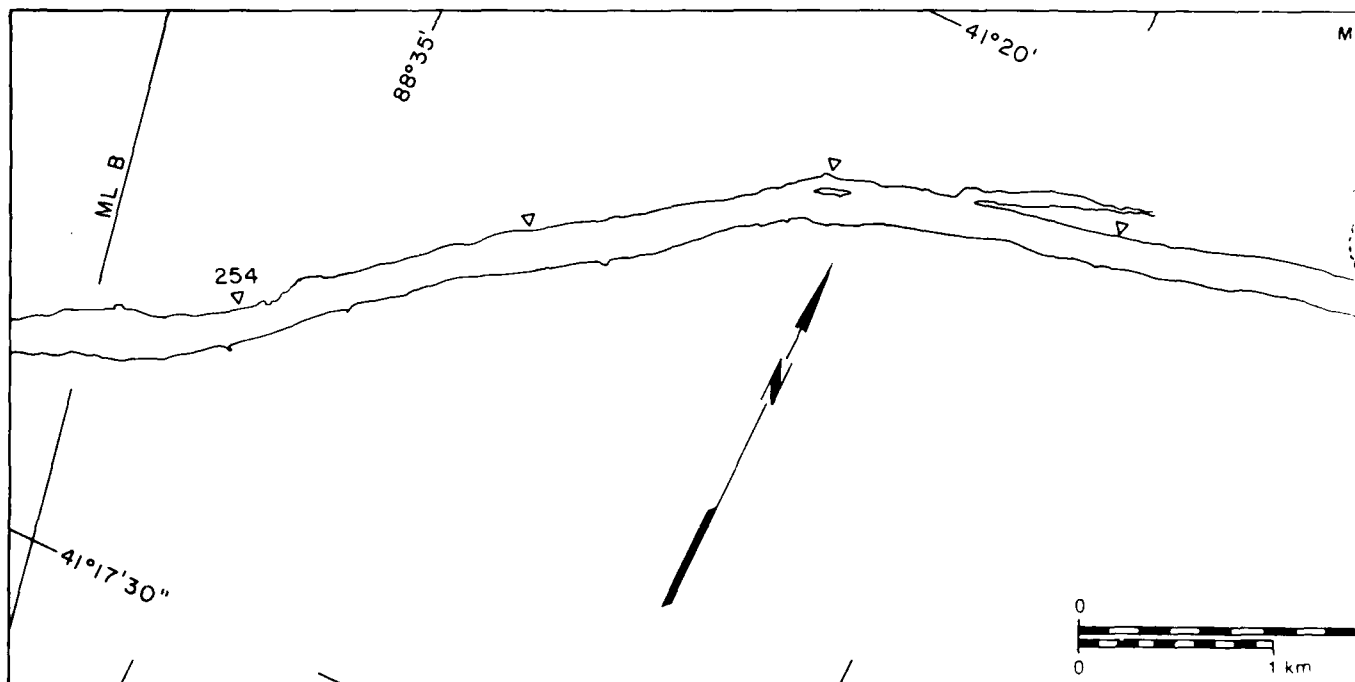
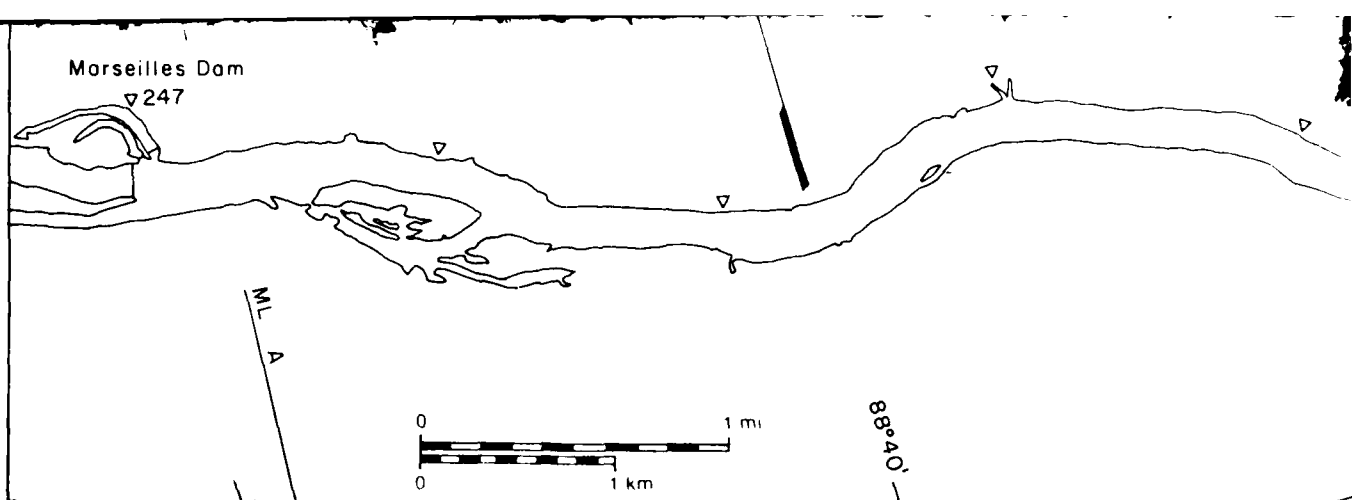
Area ($m^2 \times 10^6$)	Surface concentration (%)
8.12	NA
0.12	NA
0.00	—
0.00	NA
0.00	—
0.18	20
10.19*	

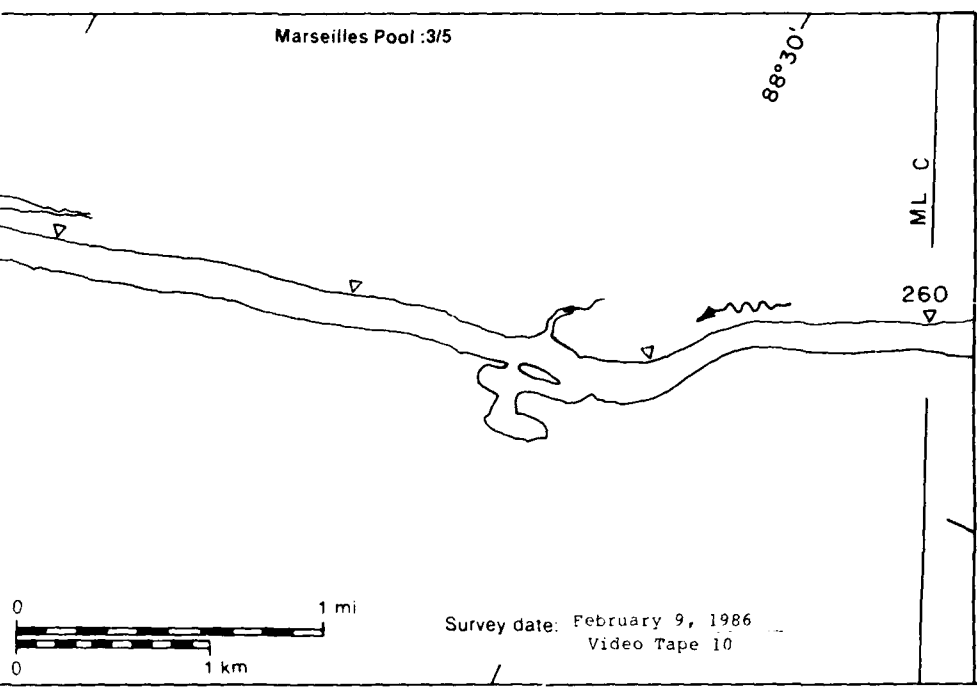
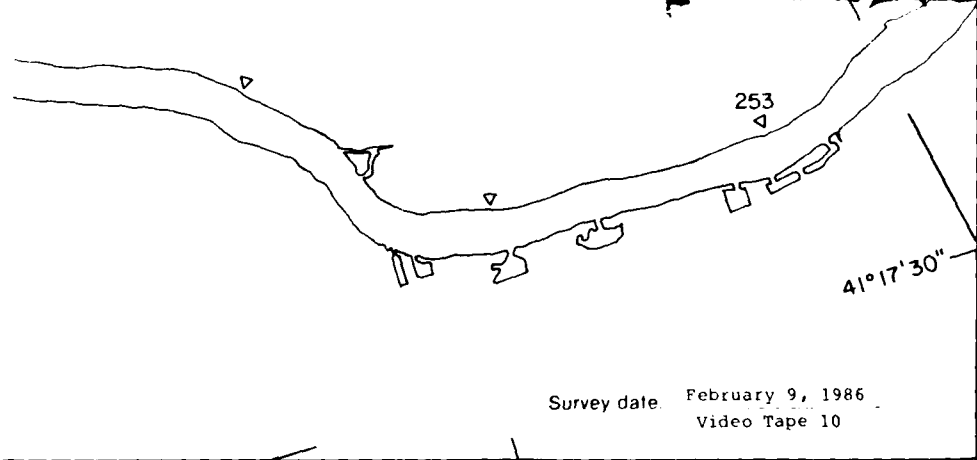
* Includes $1.77 \times 10^6 m^2$
of no video coverage

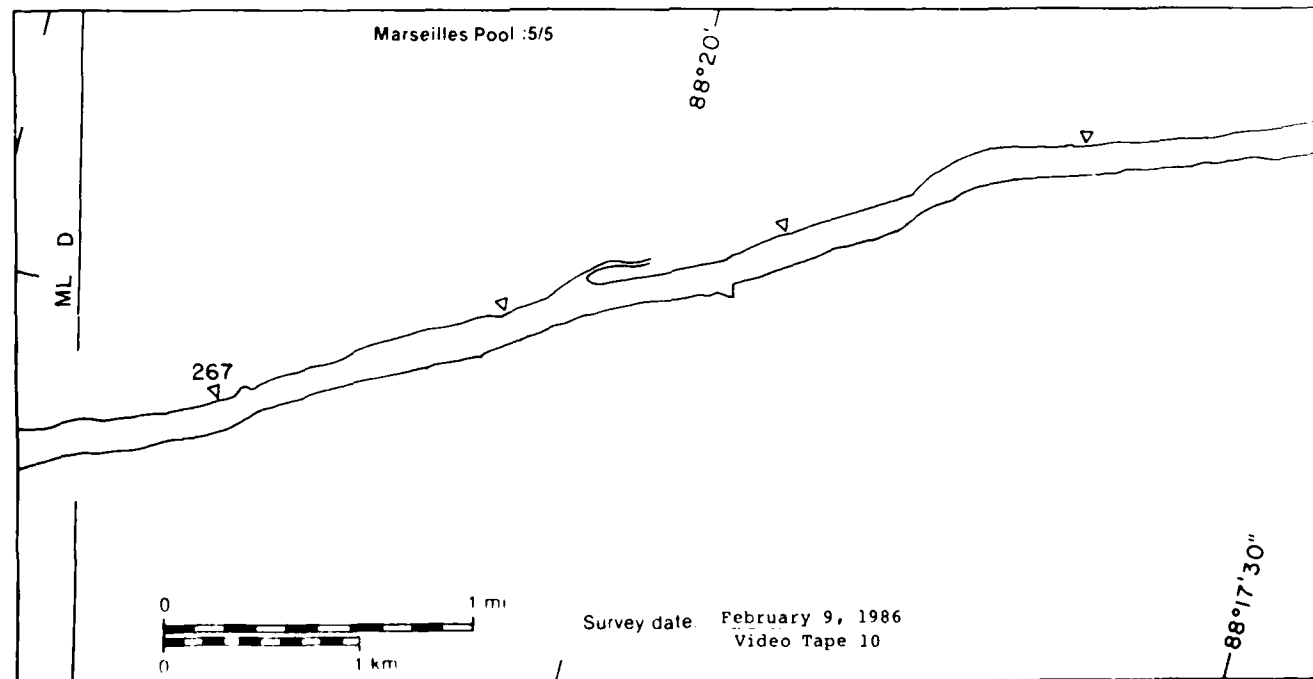
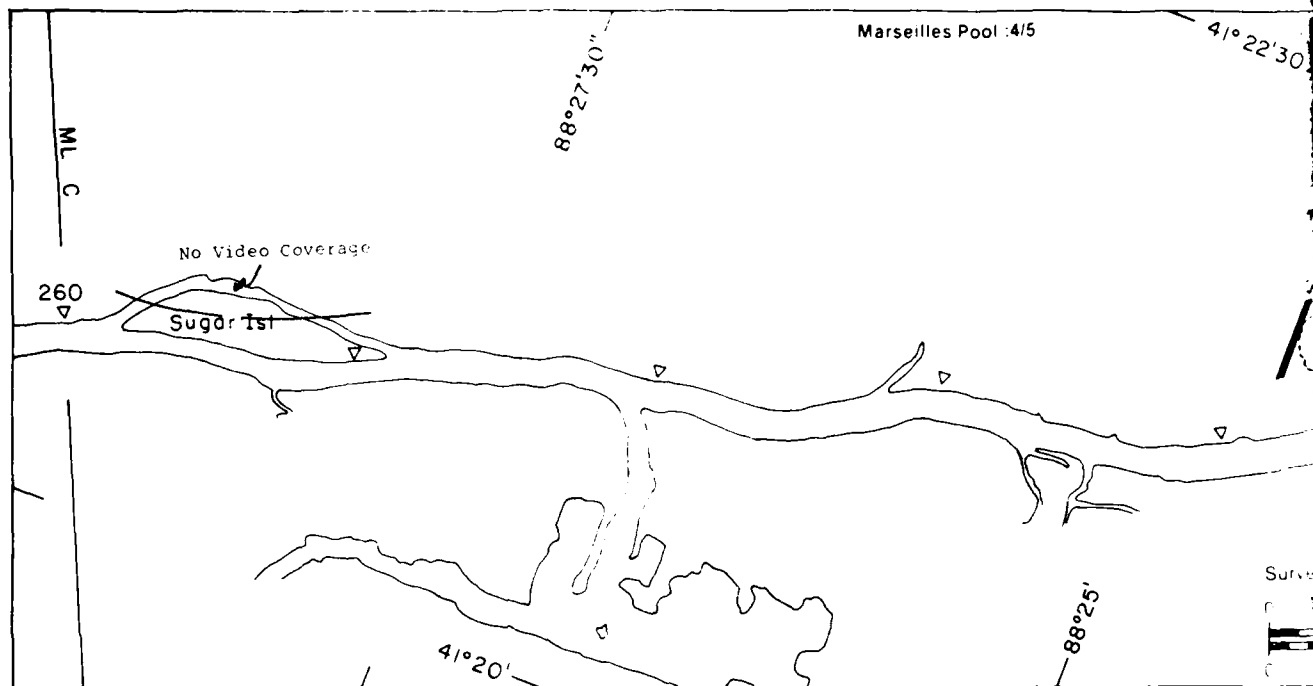
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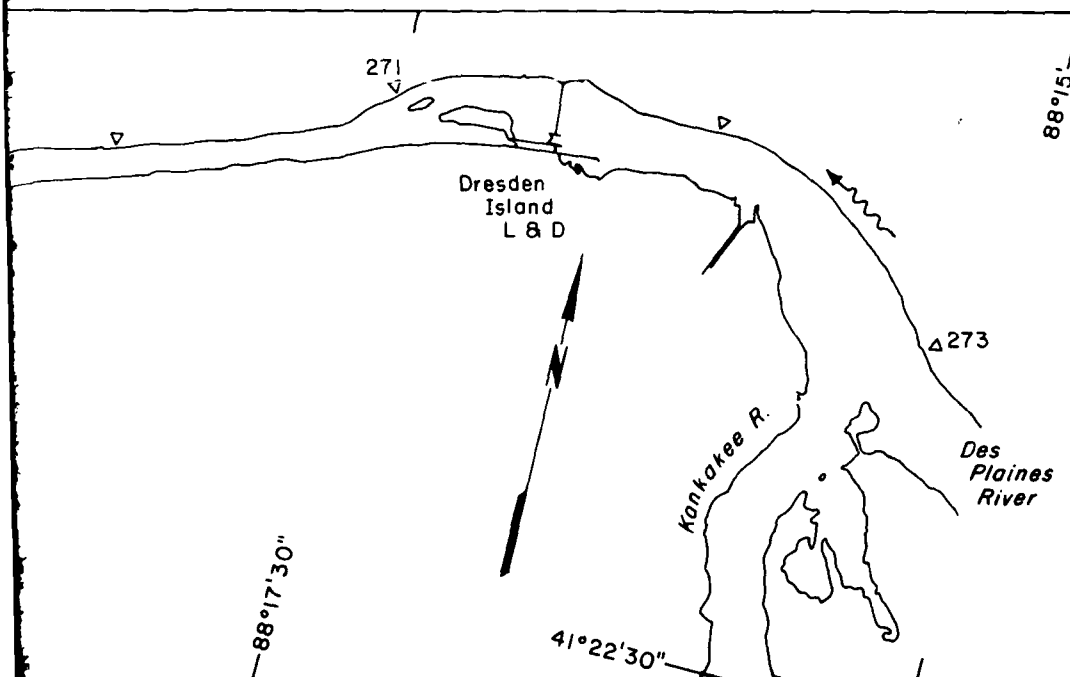
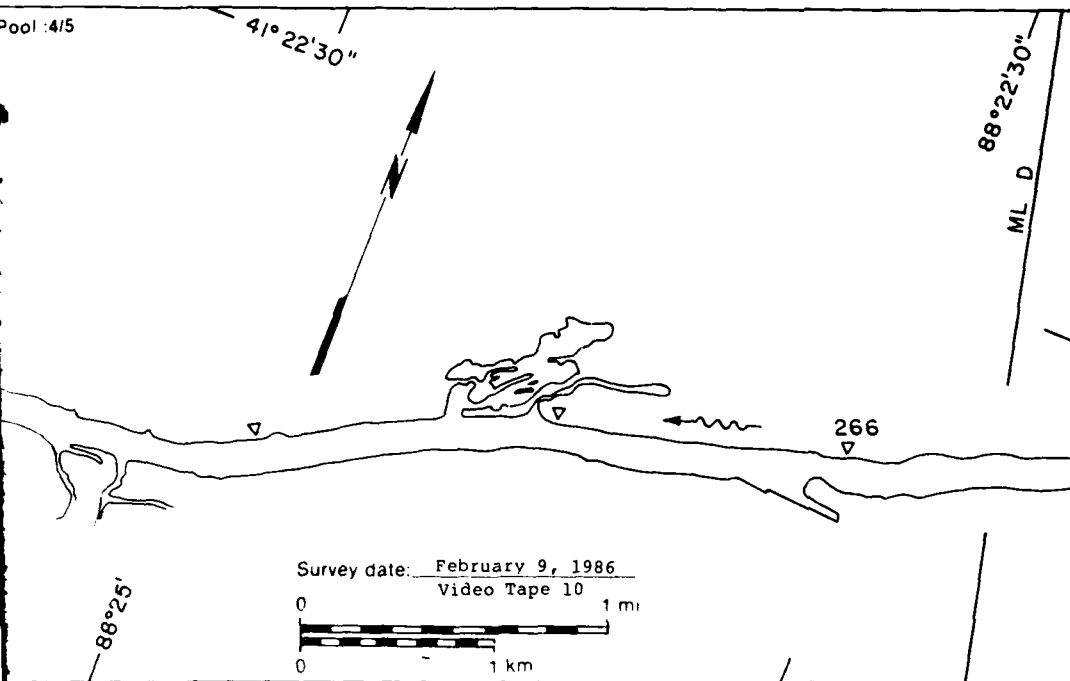


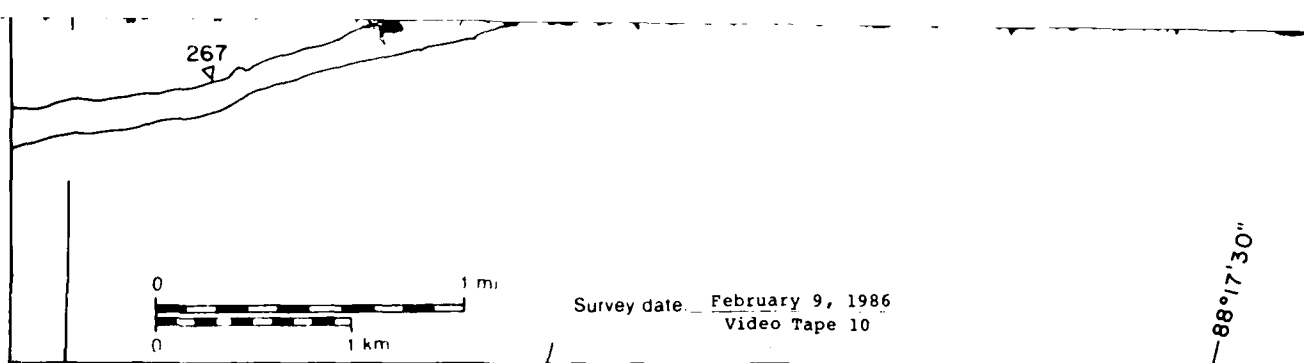









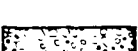
Marseilles Pool		Area	Surface
MAP UNITS		($m^2 \times 10^6$)	concentration
			($^{\circ}C$)
	Open water	8.06	NA
	Solid ice cover	0.00	NA

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Marseilles Pool

MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
 Open water	8.06	NA
 Solid ice cover	0.00	NA
 Solid ice cover with open-water areas	0.00	—
 Fragmented ice cover	0.00	NA
 Fragmented ice cover with open-water areas	0.00	—
 Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)	8.19*	

* Includes $0.13 \times 10^6 m^2$
of no video coverage

y 9, 1986
Tape 10

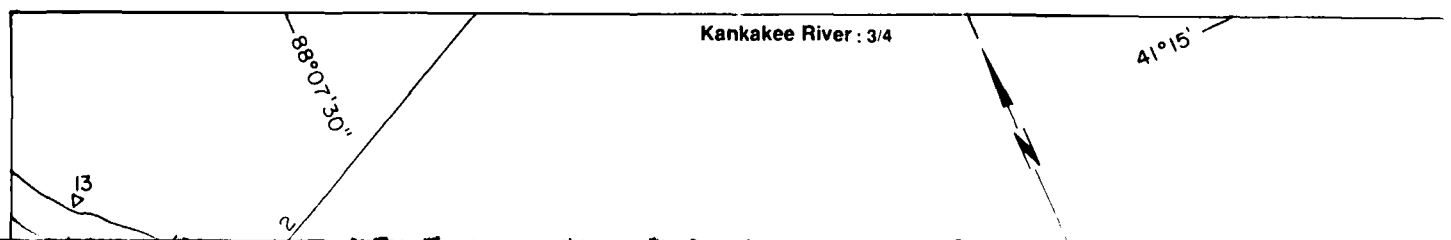
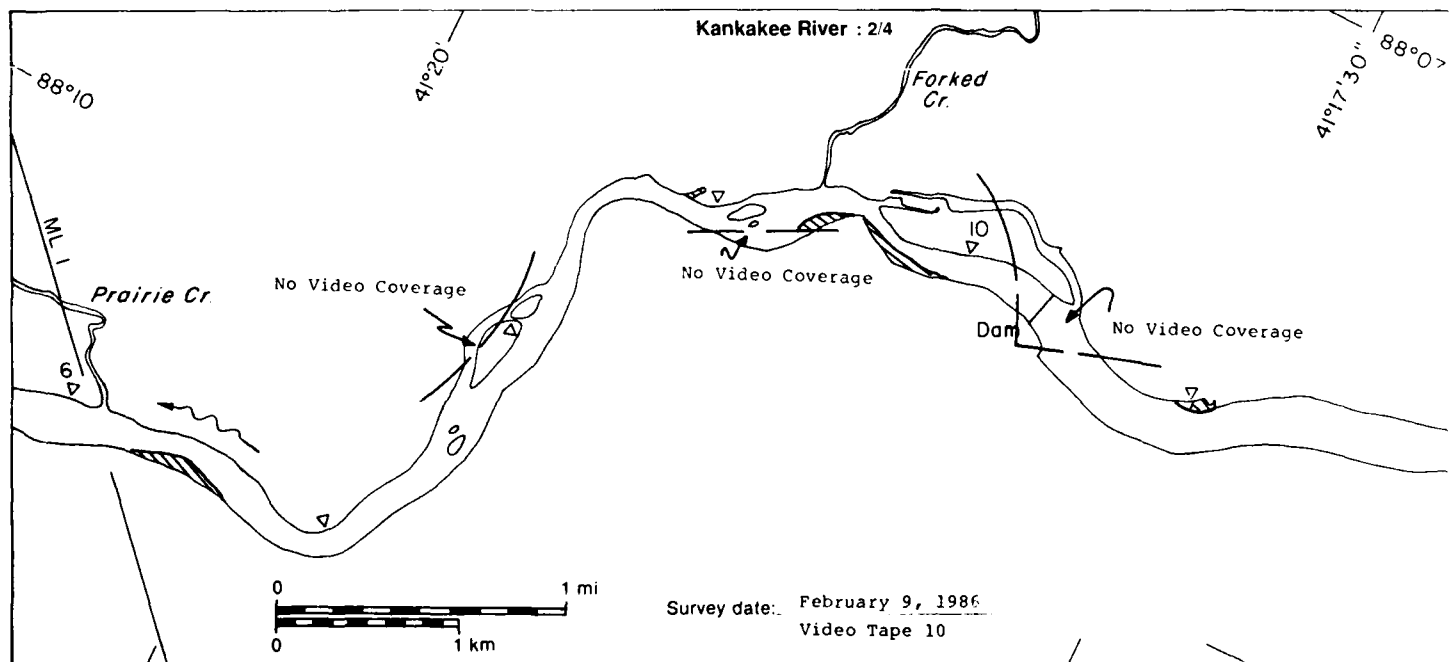
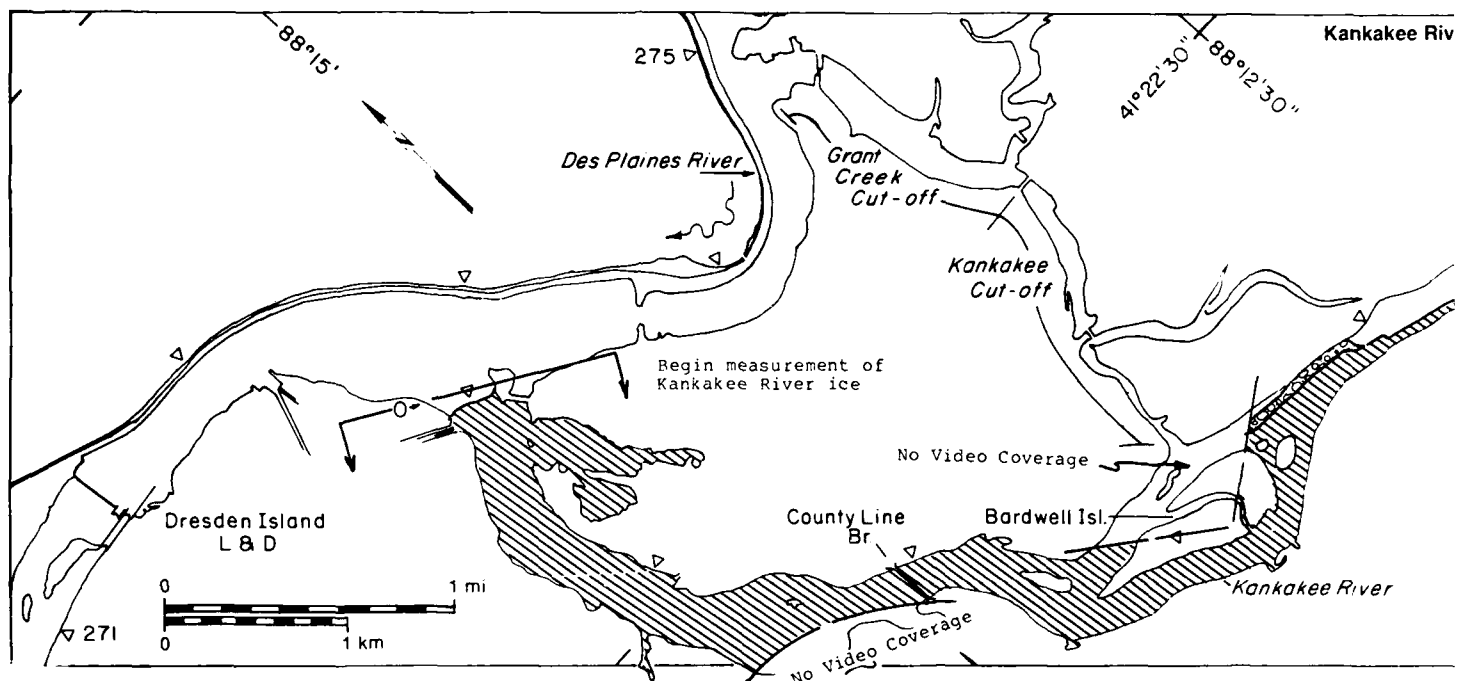
88°17'30"

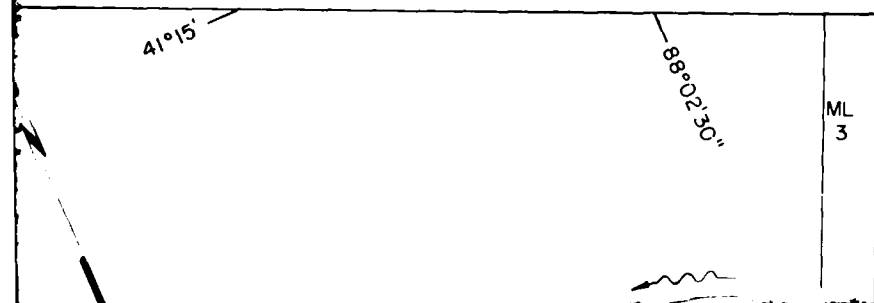
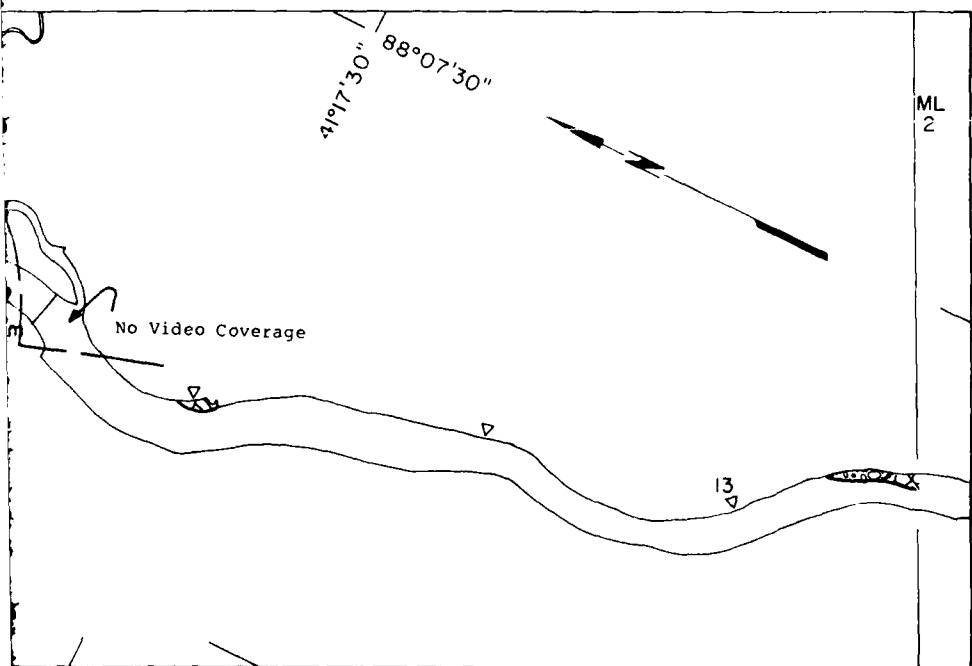
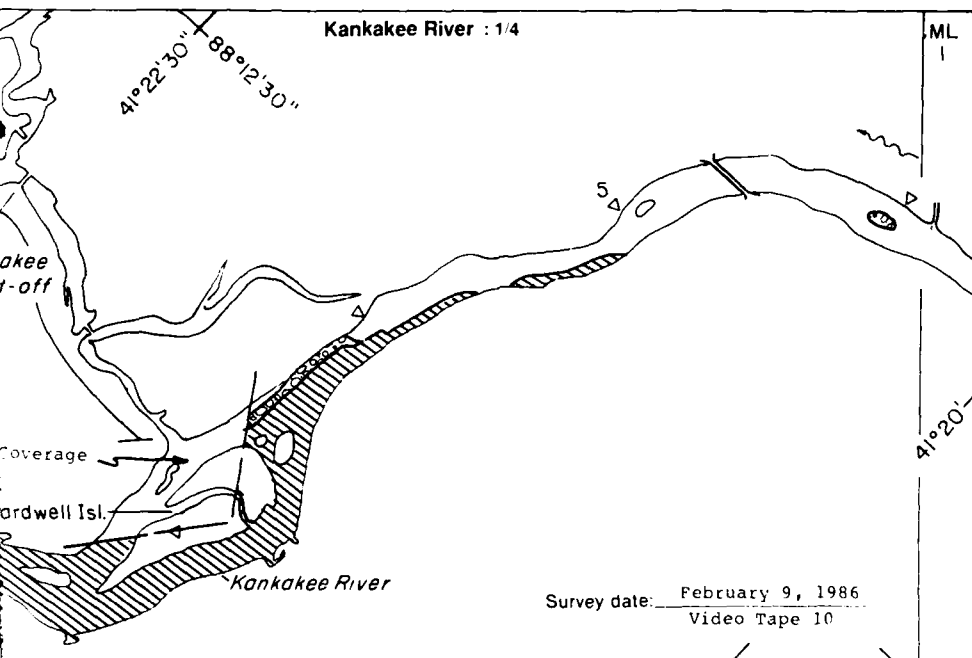
41°22'30"

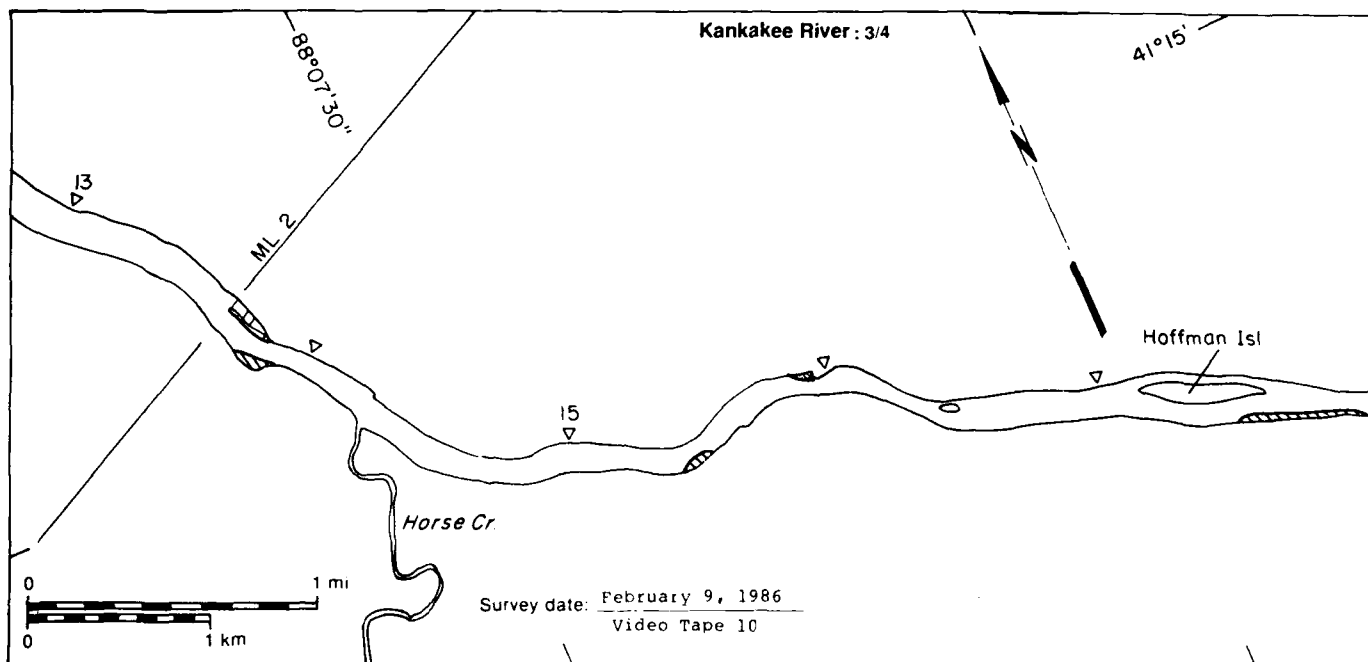
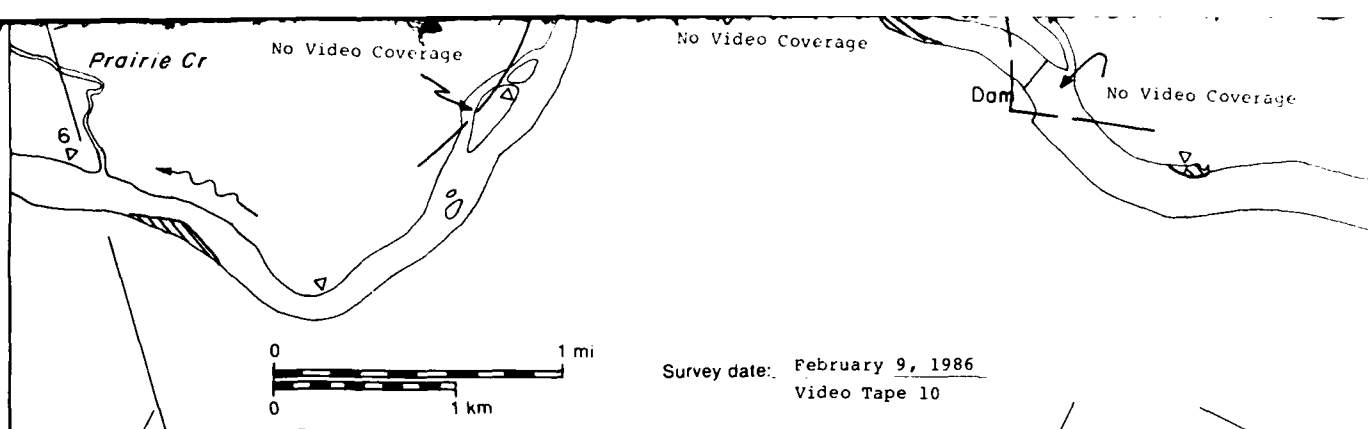
Kankakee R.

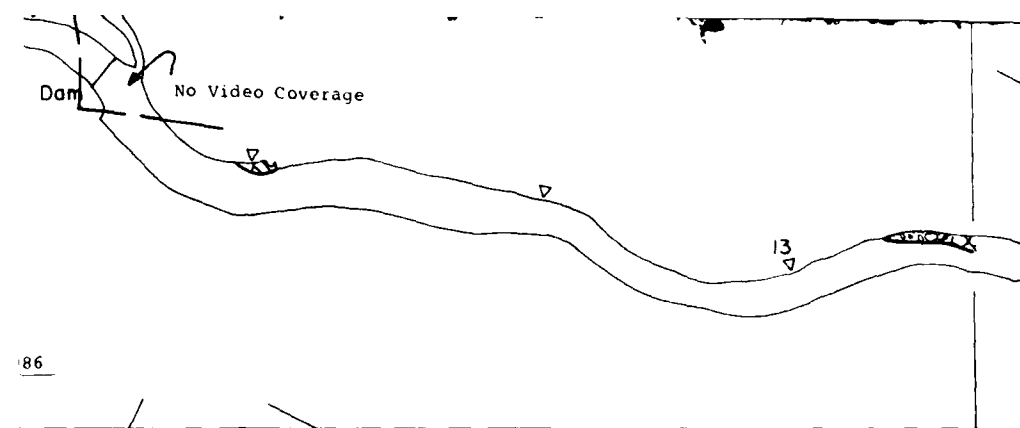
Des
Plaines
River

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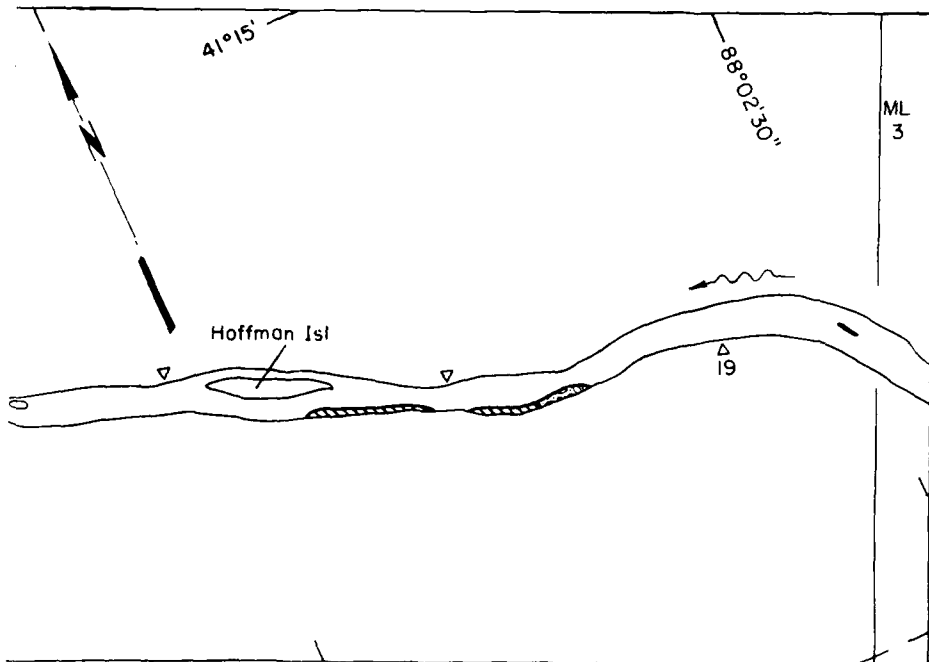


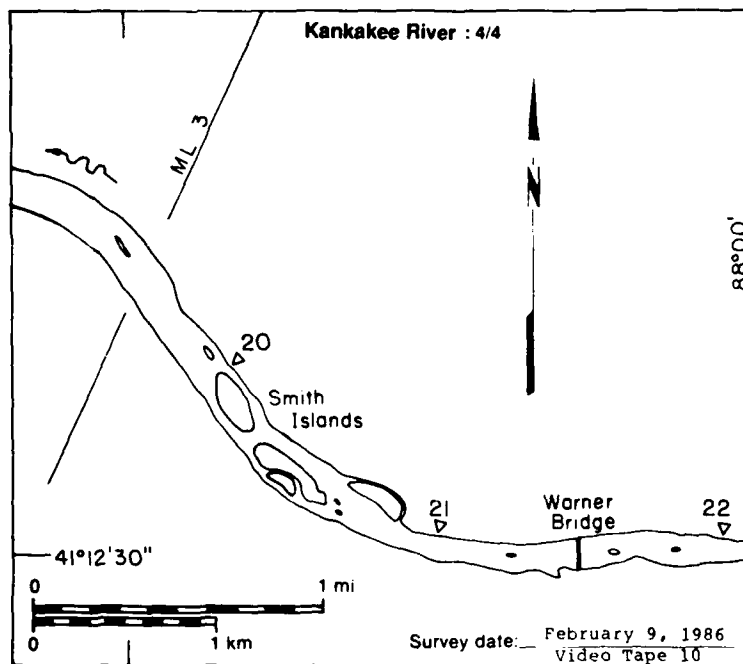












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Kankakee River

MAP UNITS

-  Open water
-  Solid ice cover
-  Solid ice cover with open-water areas
-  Fragmented ice cover
-  Fragmented ice cover with open-water areas
-  Ice floes or frazil slush and pans

Total area ($m^2 \times 10^6$)

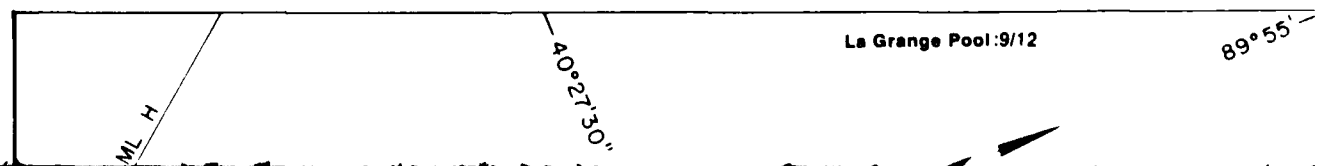
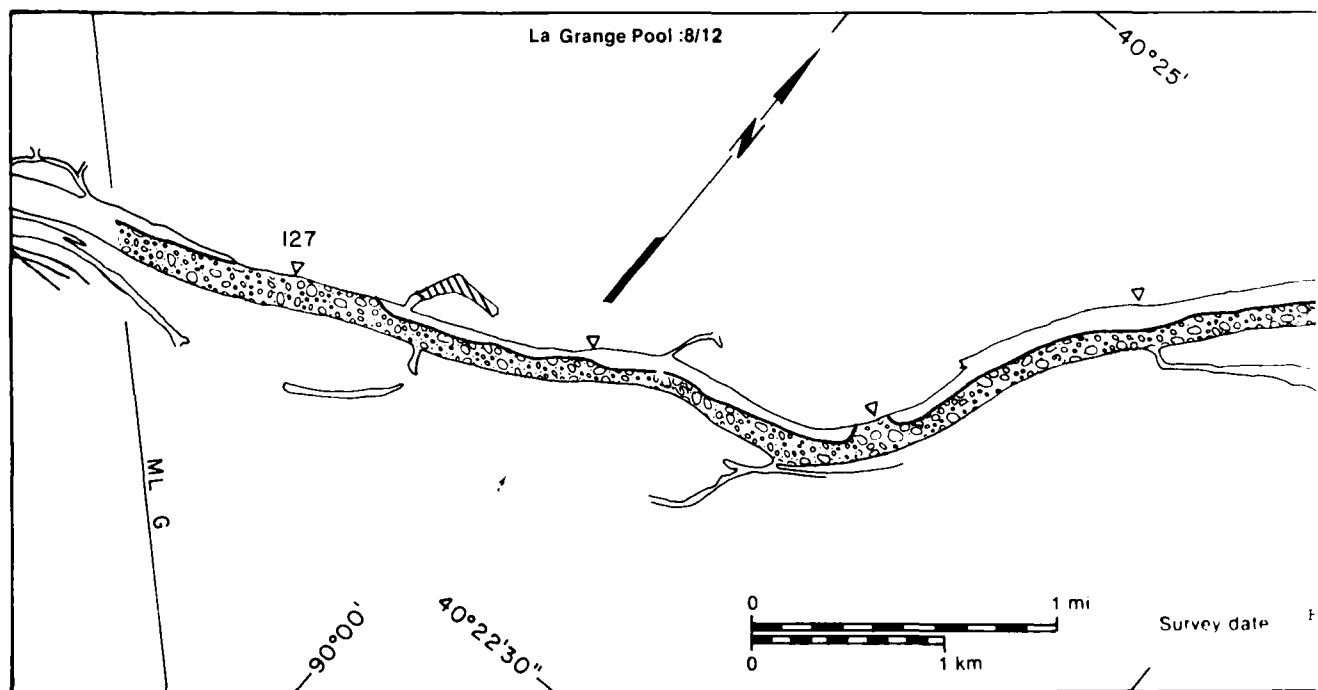
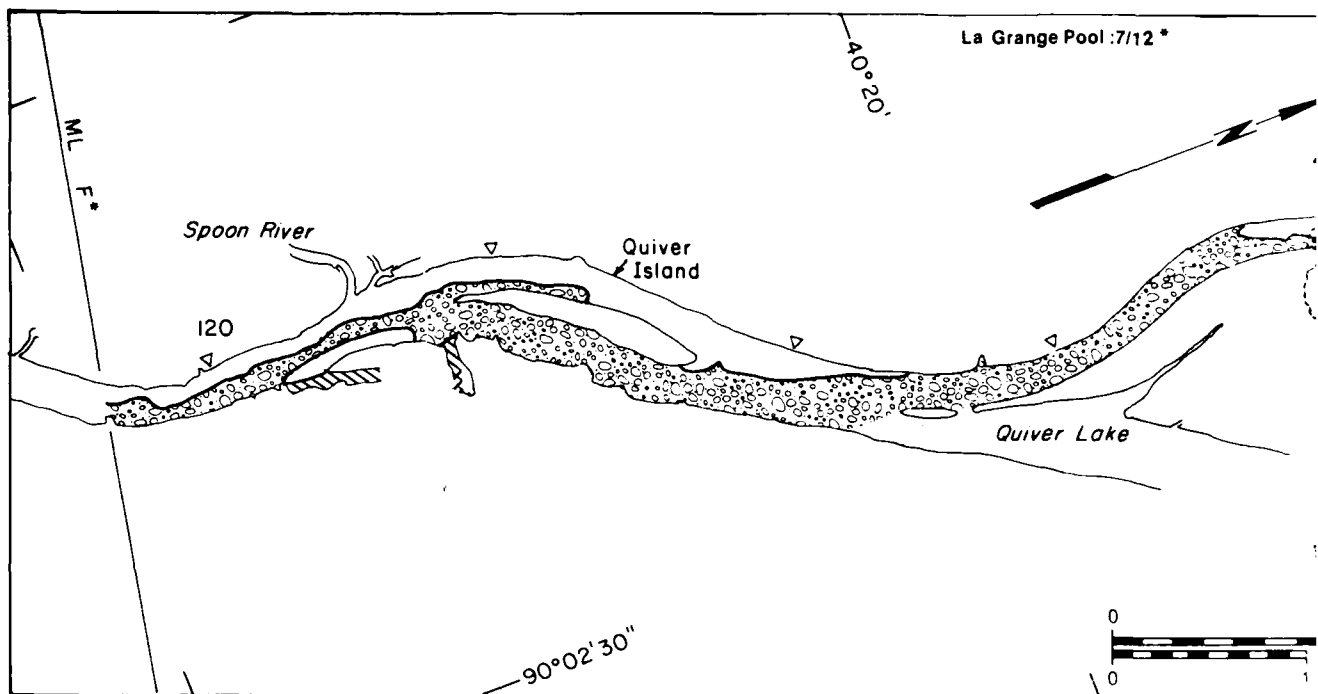
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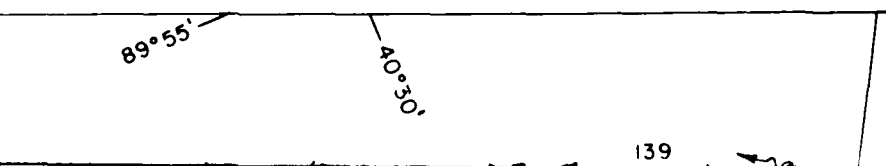
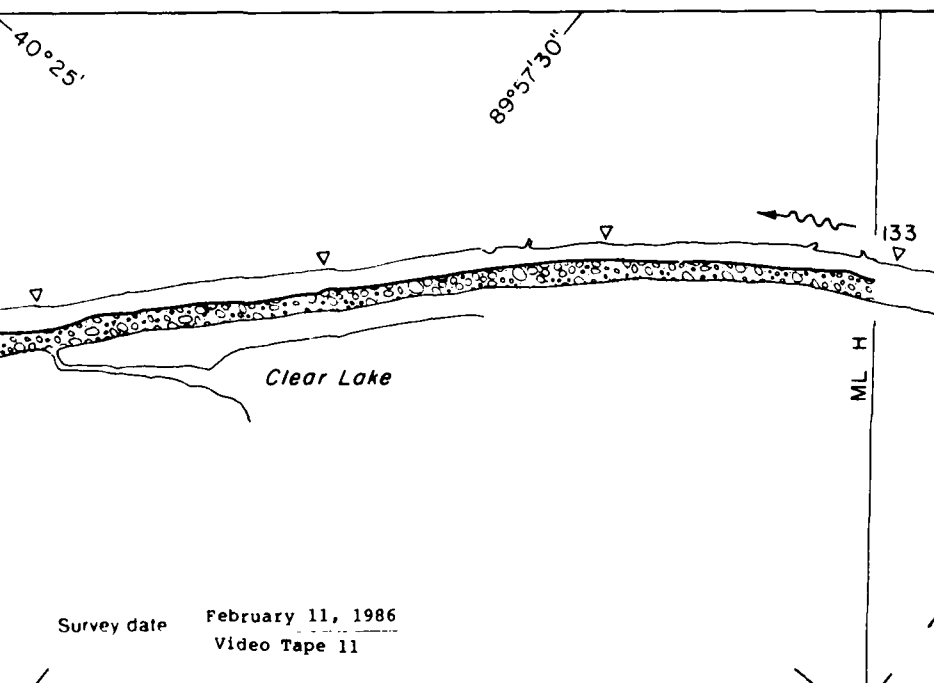
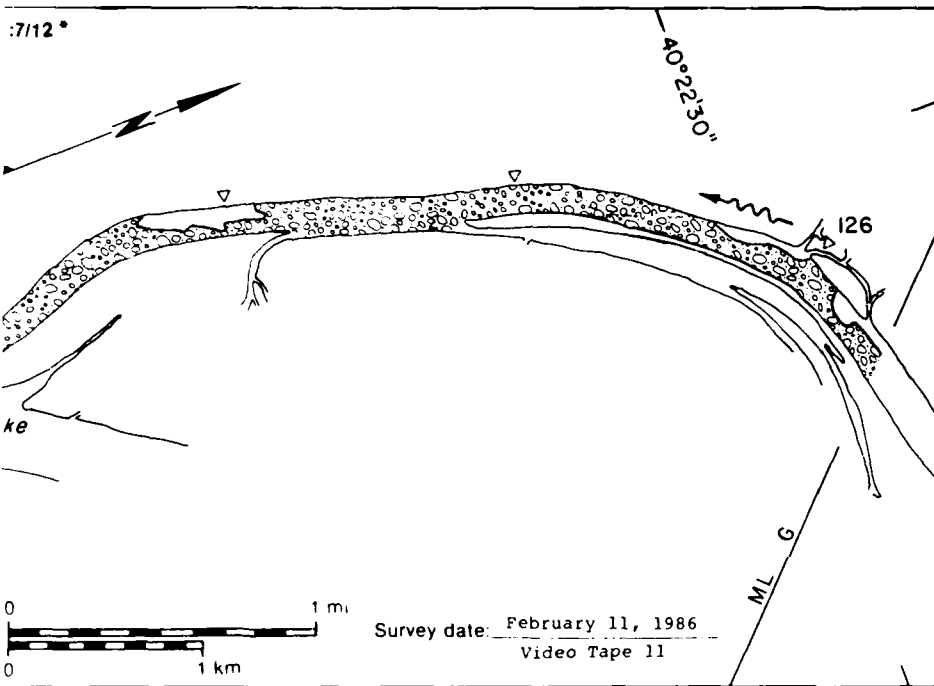
ankakee River

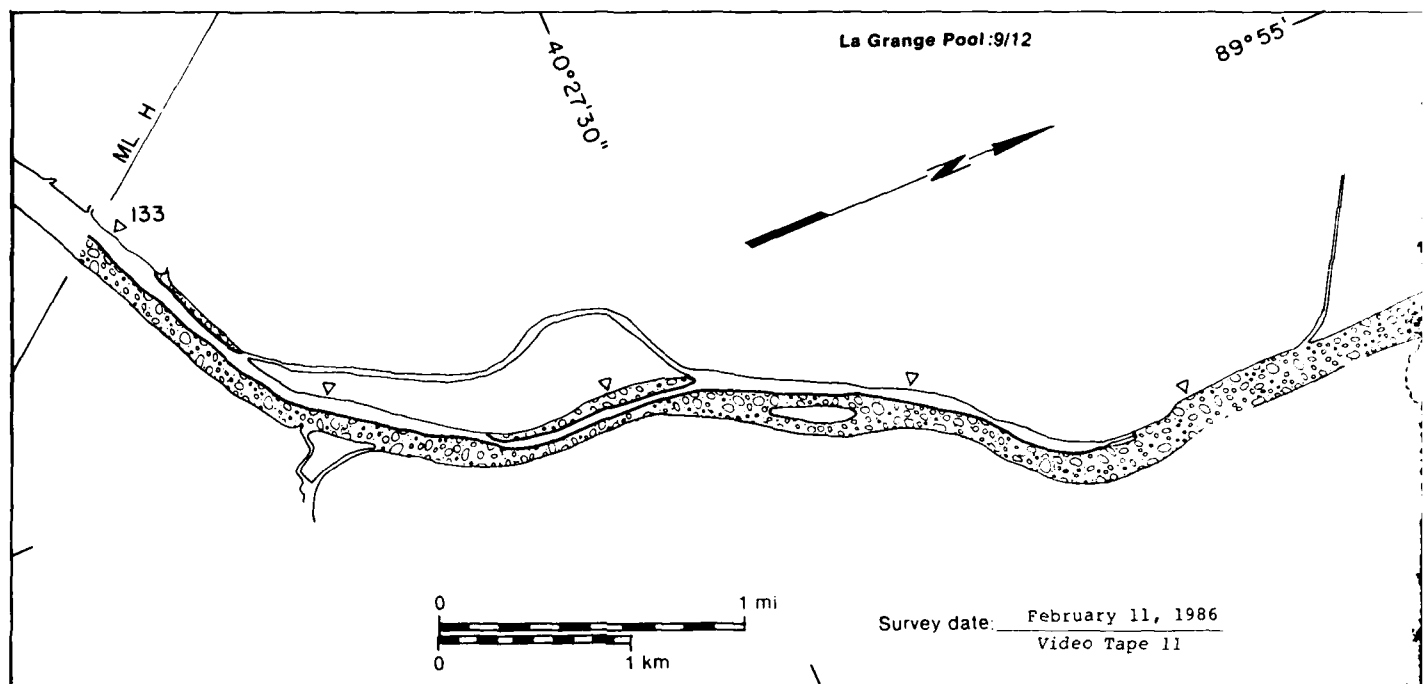
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	4.46	NA
Solid ice cover	2.12	NA
Solid ice cover with open-water areas	0.00	—
Fragmented ice cover	0.04	NA
Fragmented ice cover with open-water areas	0.00	—
Ice floes or frazil slush and pans	0.09	50
Total area ($m^2 \times 10^6$)	7.30*	

* Includes $0.59 \times 10^6 m^2$
of no video coverage

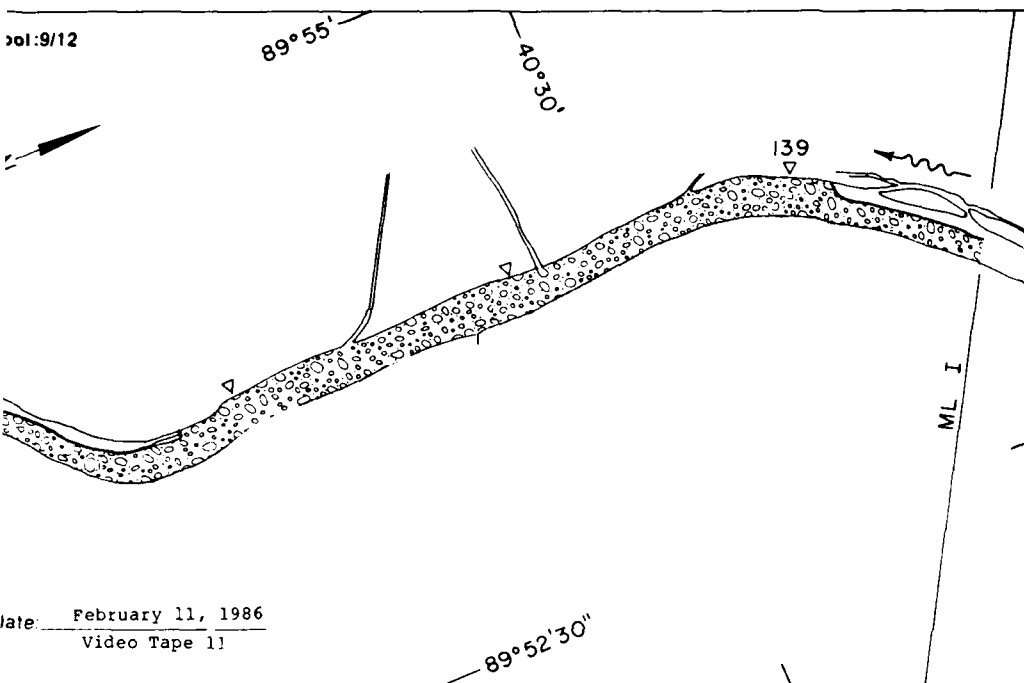
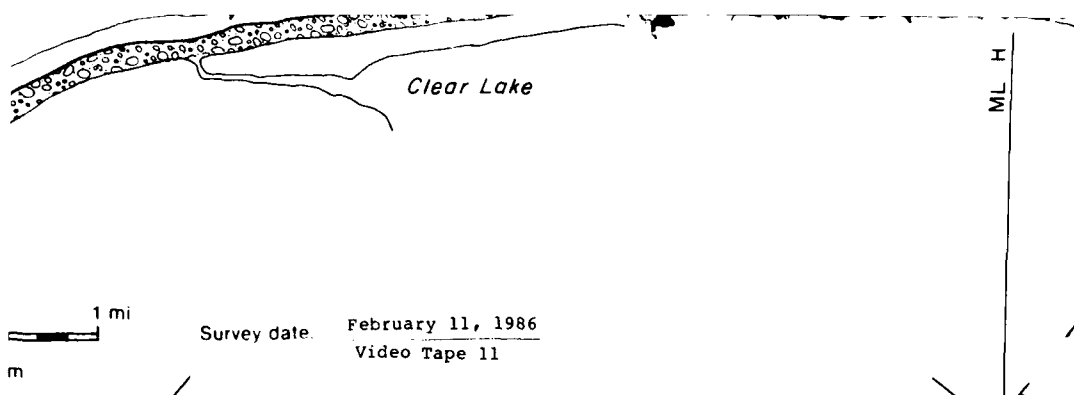


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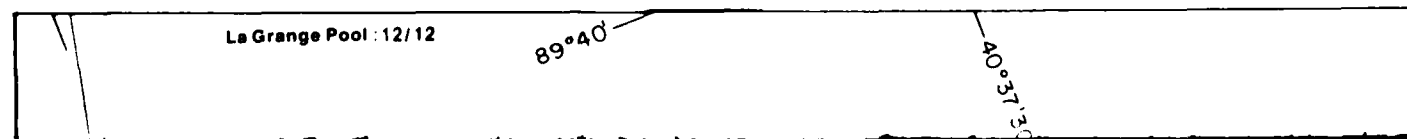
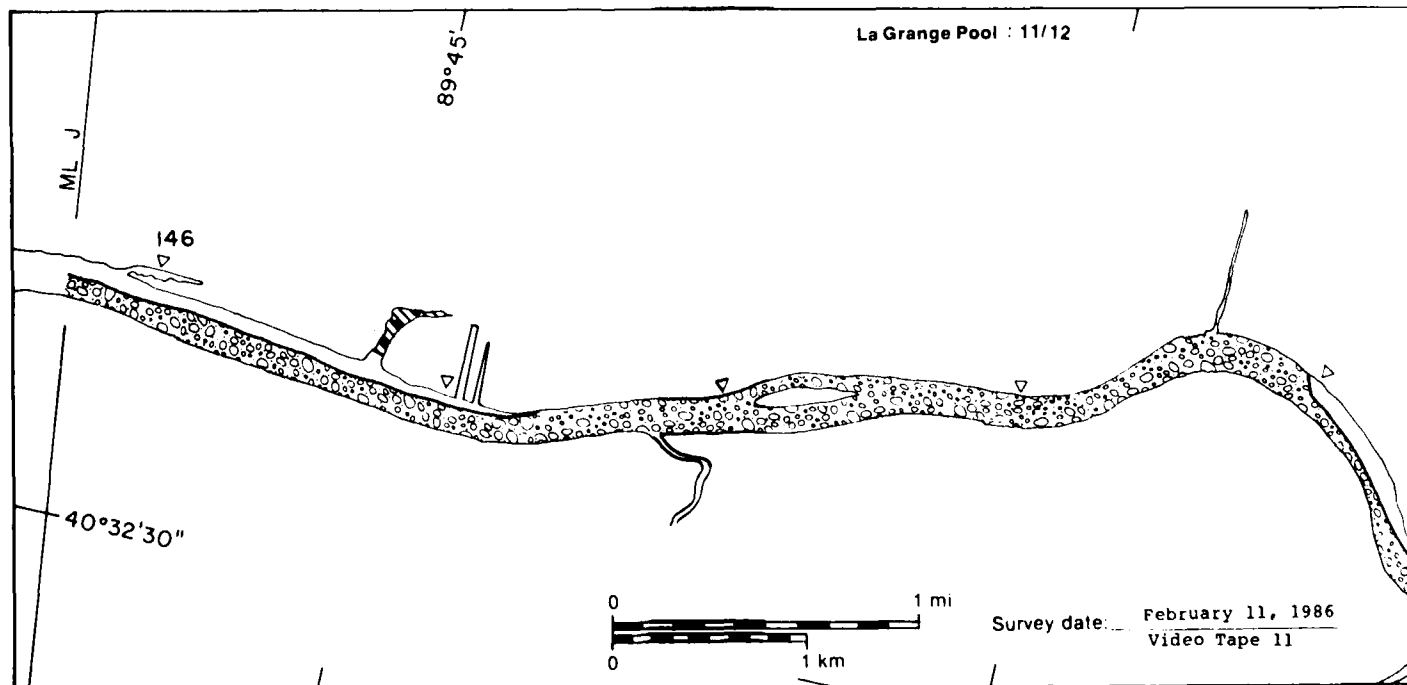
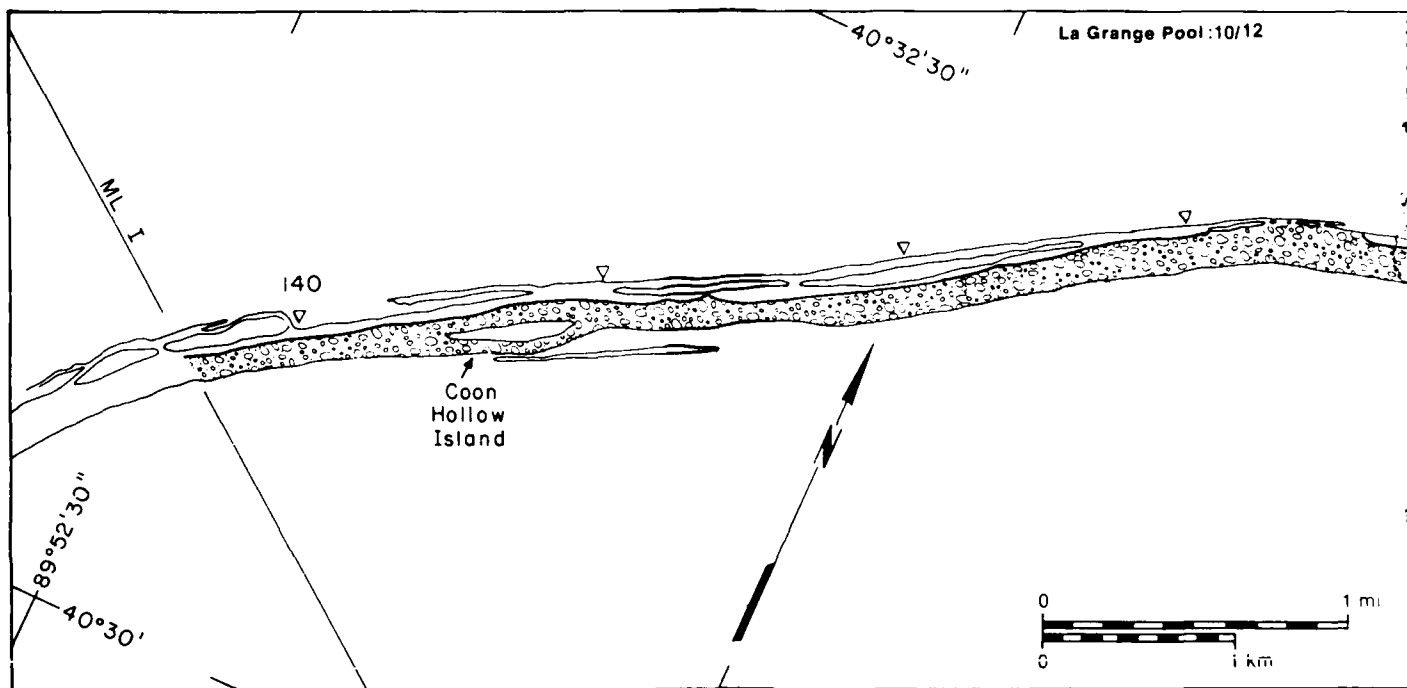


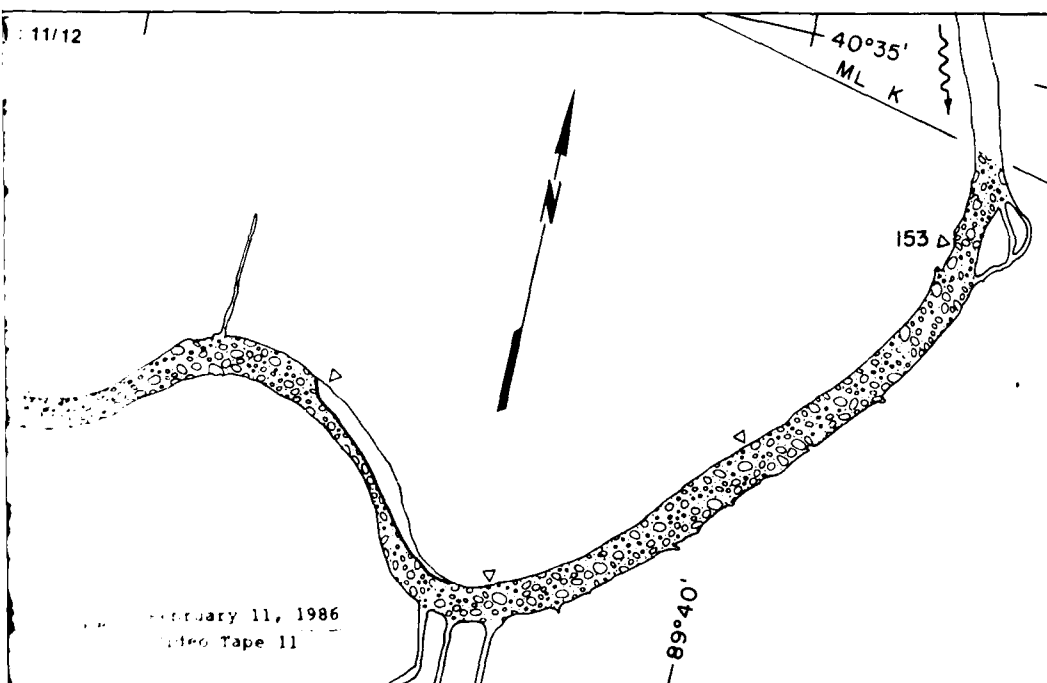
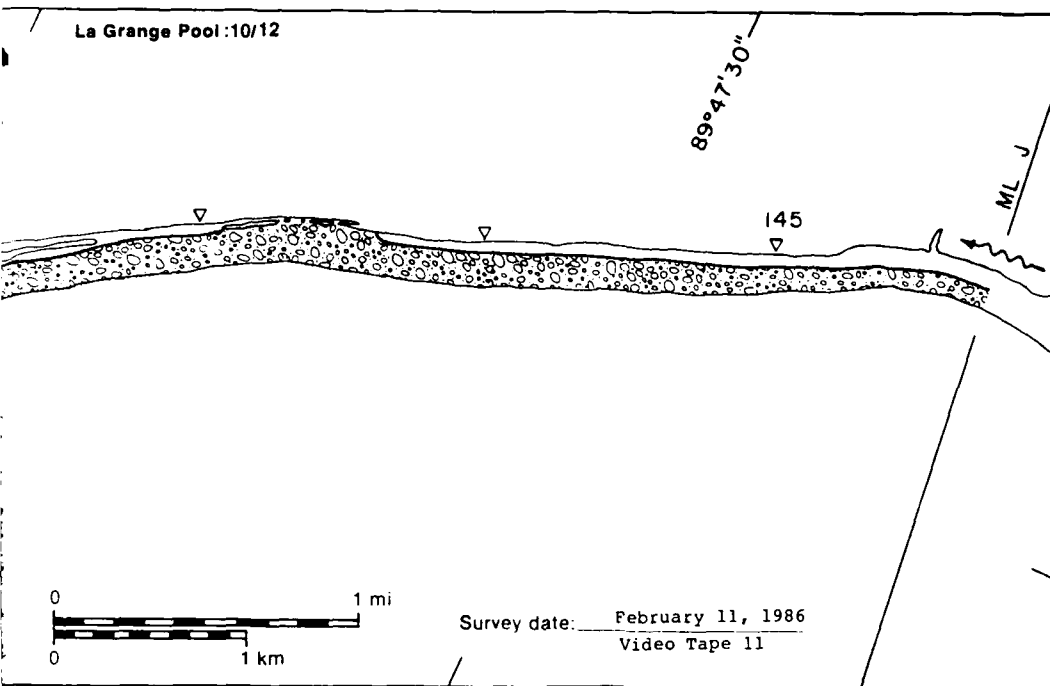


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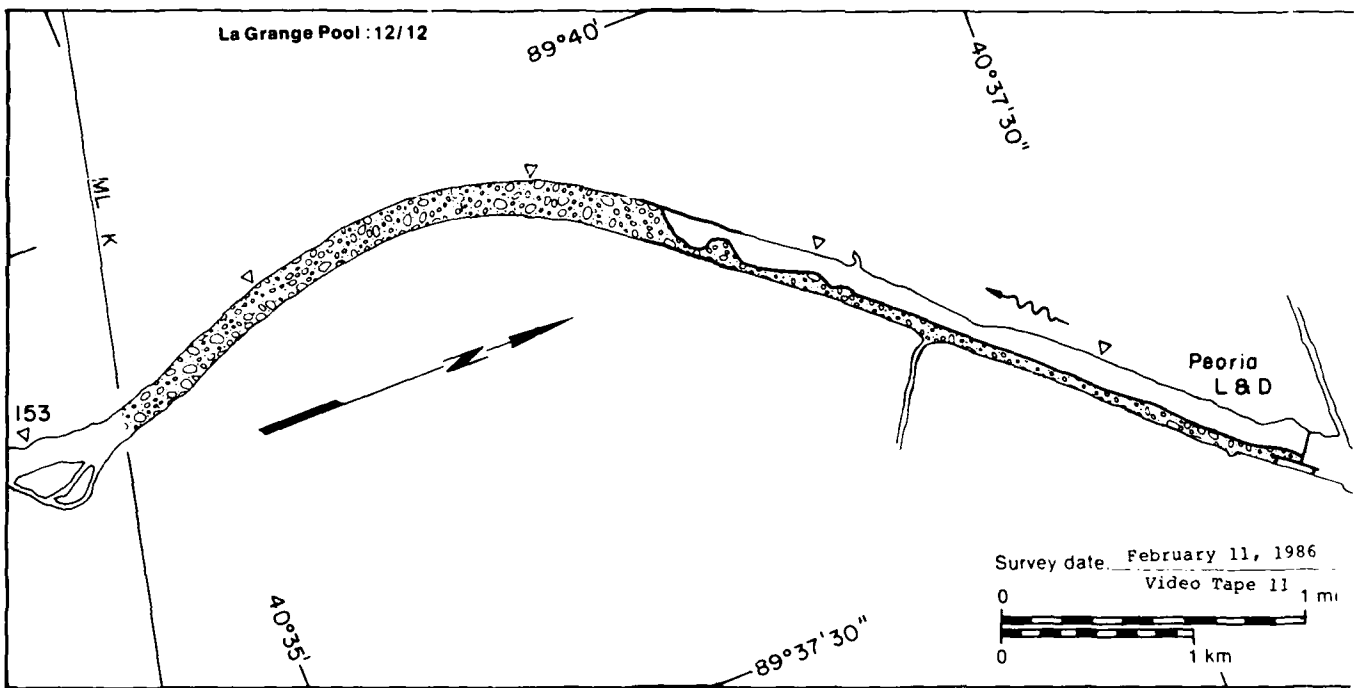
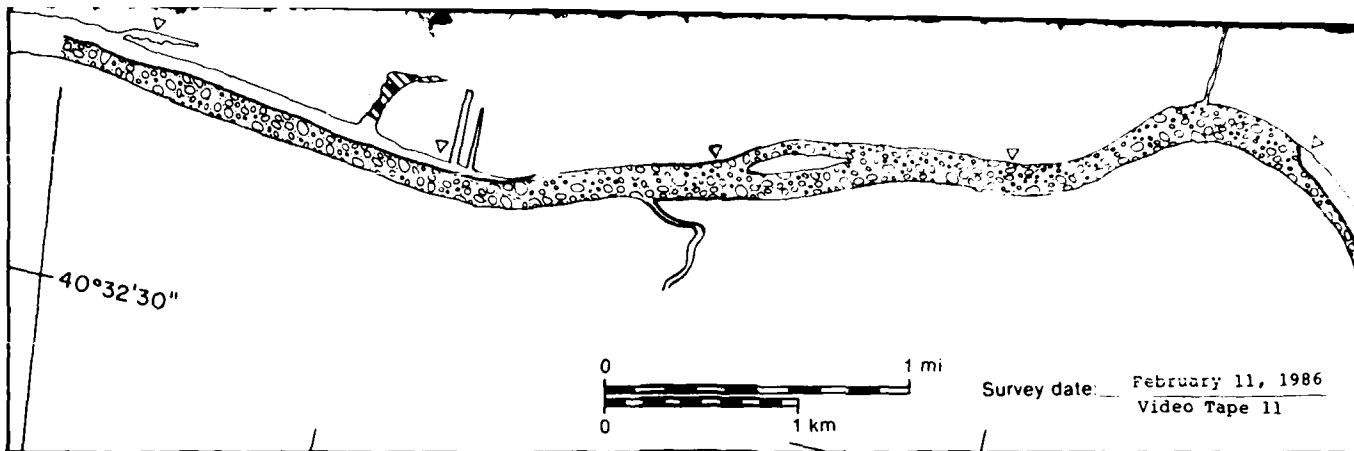
La Grange Pool

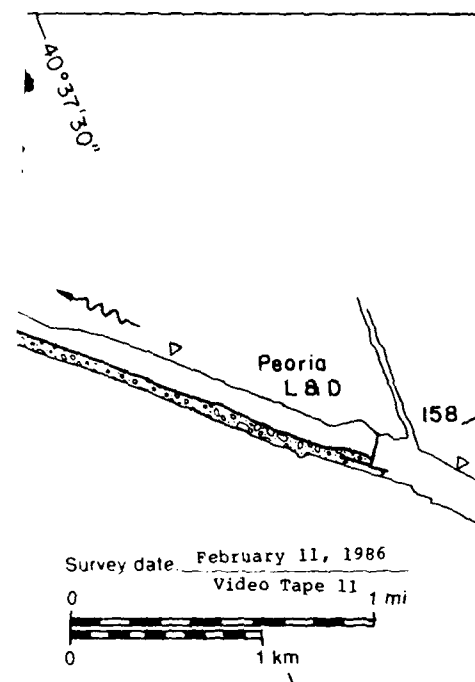
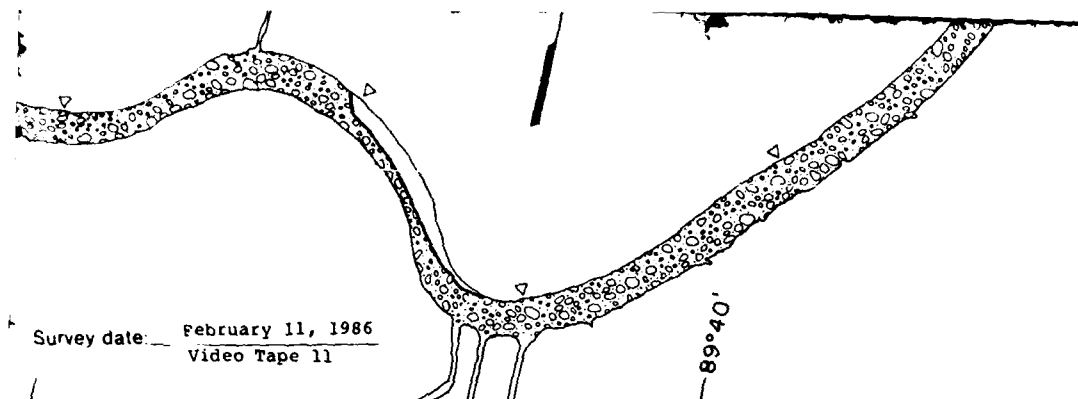
MAP UNITS

Area
(m² x 10⁶)

Surface
concentration
(%)

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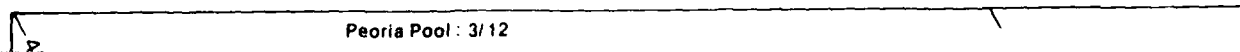
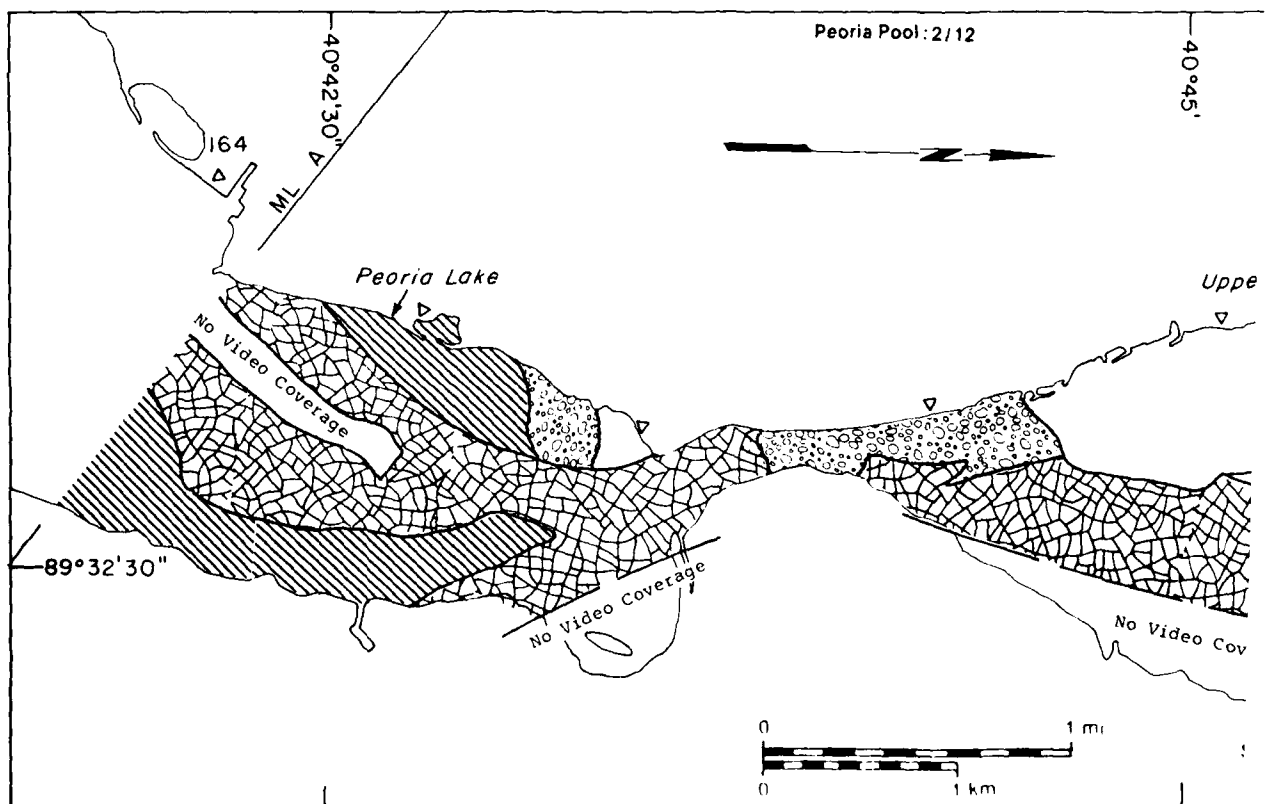
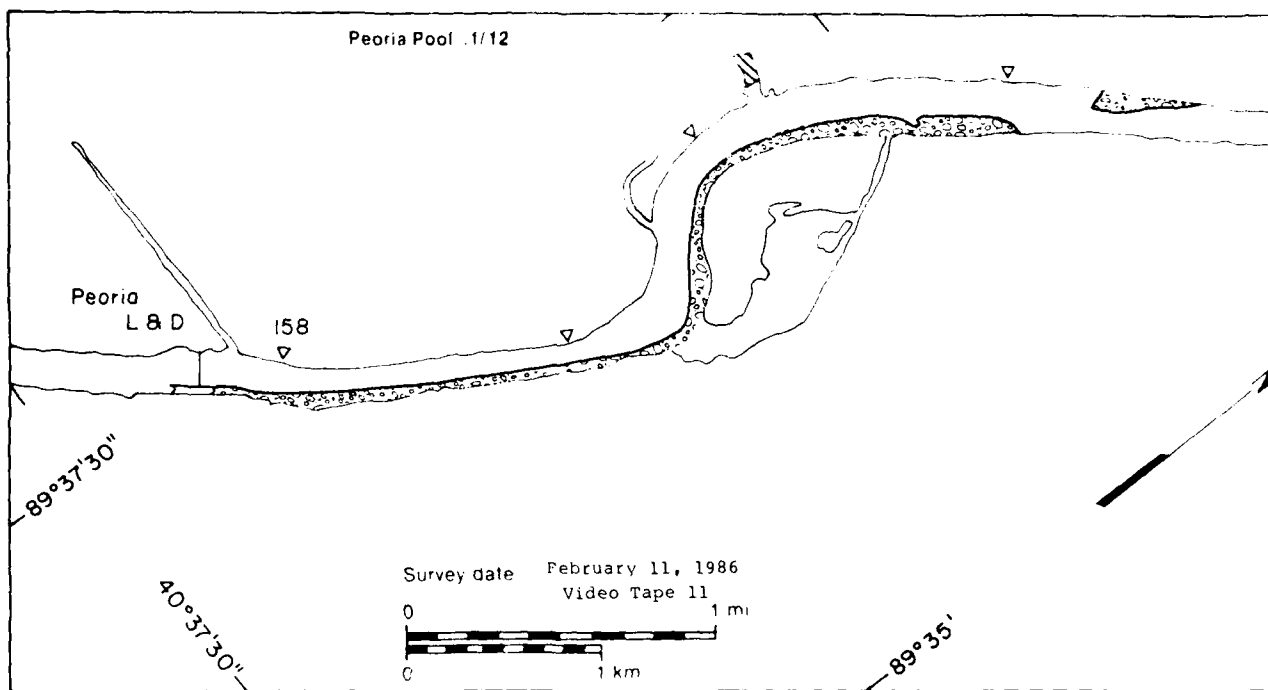


La Grange Pool

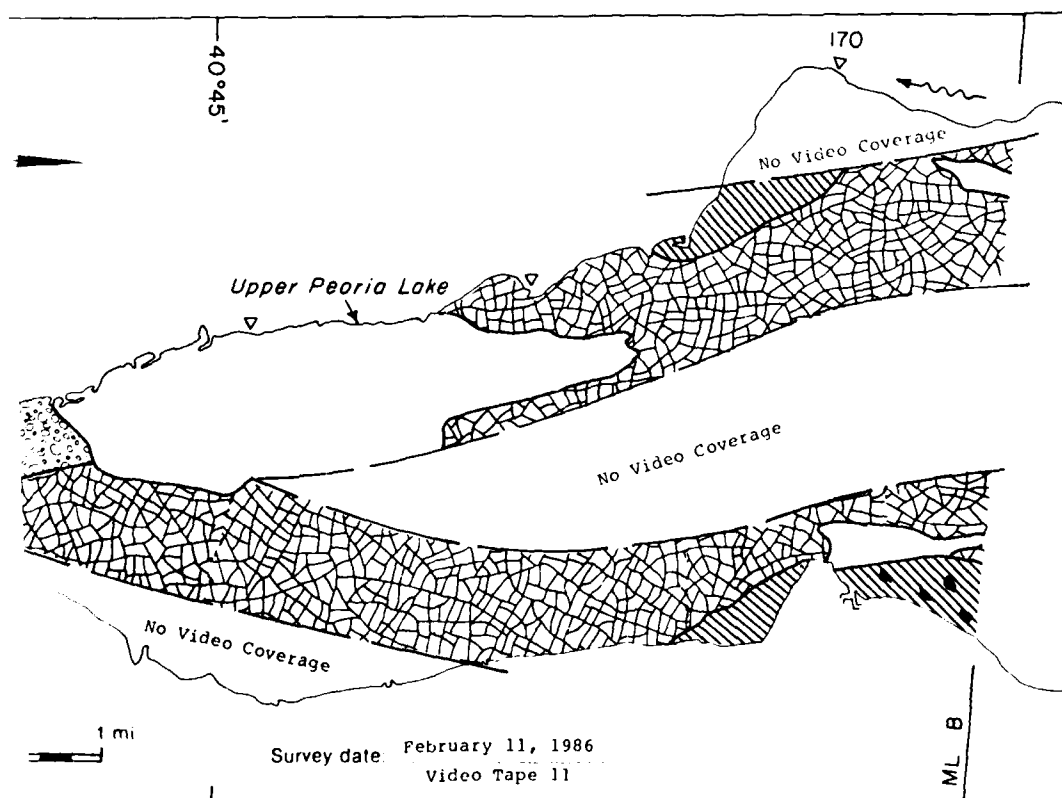
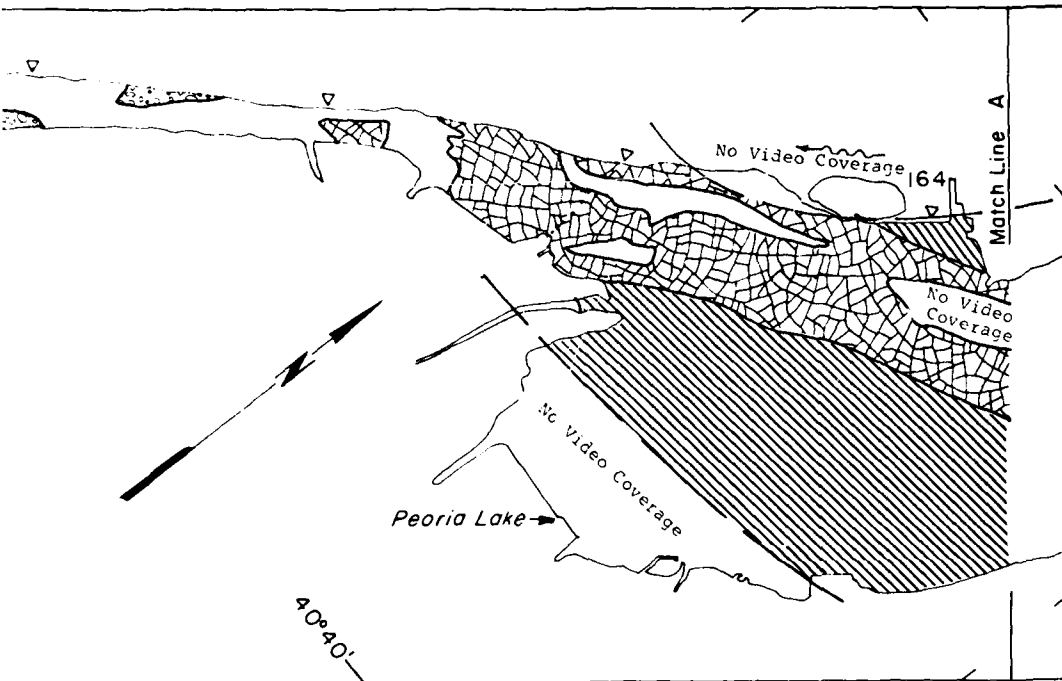
MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

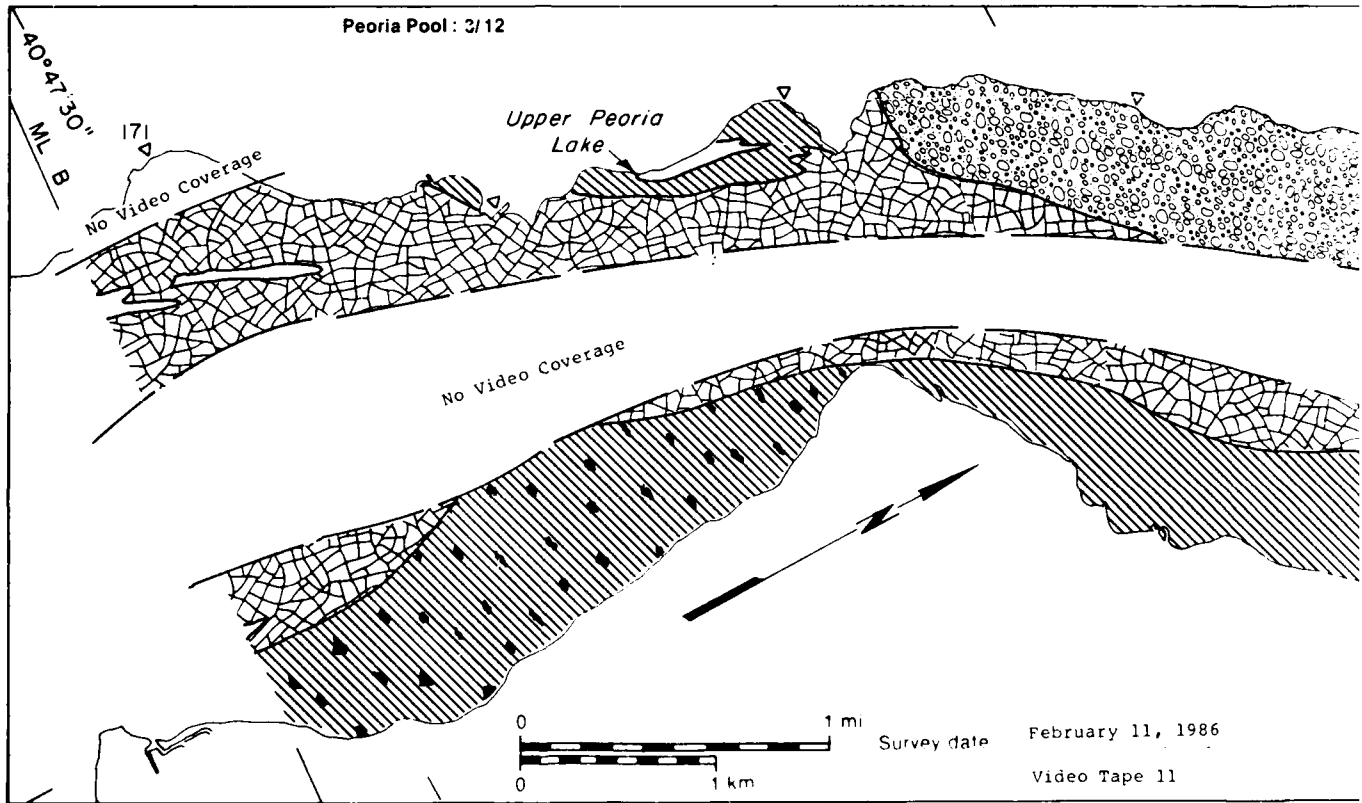
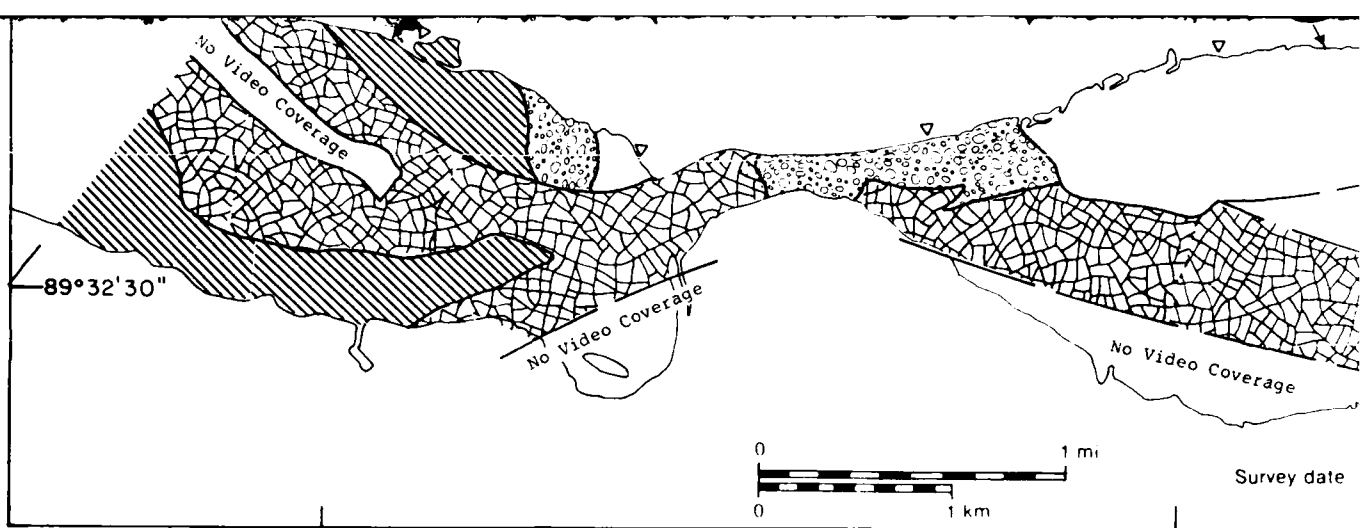
Area ($m^2 \times 10^6$)	Surface concentration (%)
3.73	NA
0.08	NA
0.03	70
0.00	NA
0.00	—
7.87	60
Total area ($m^2 \times 10^6$)	11.71

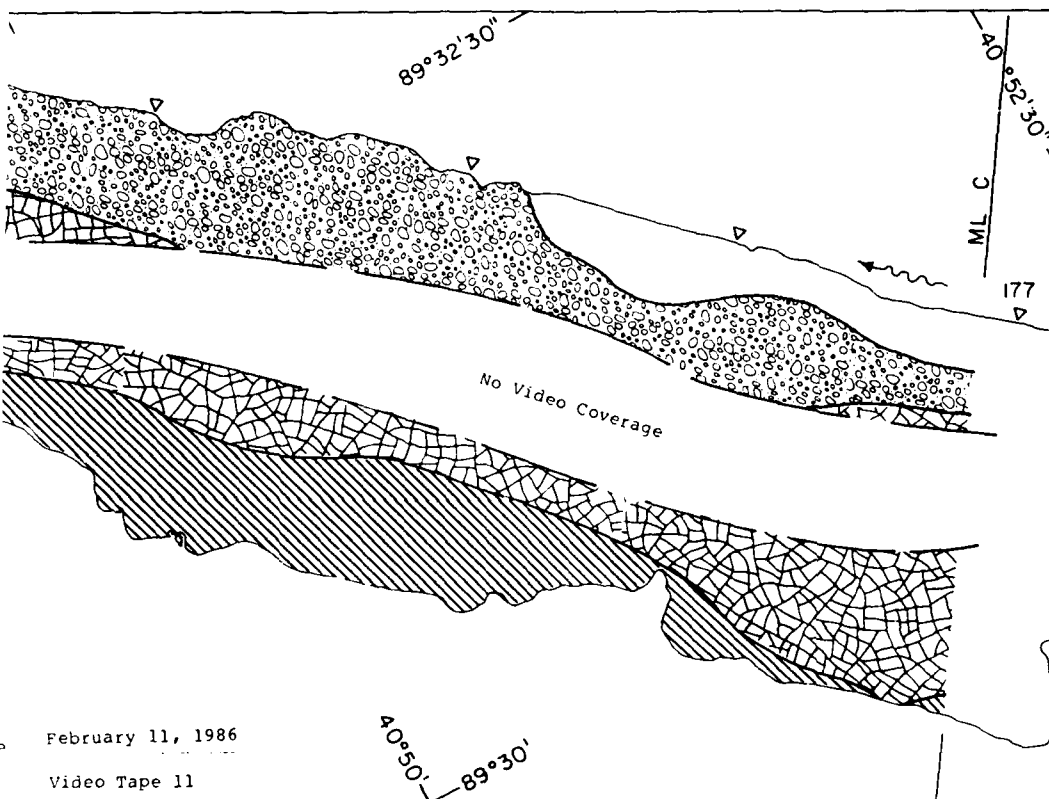
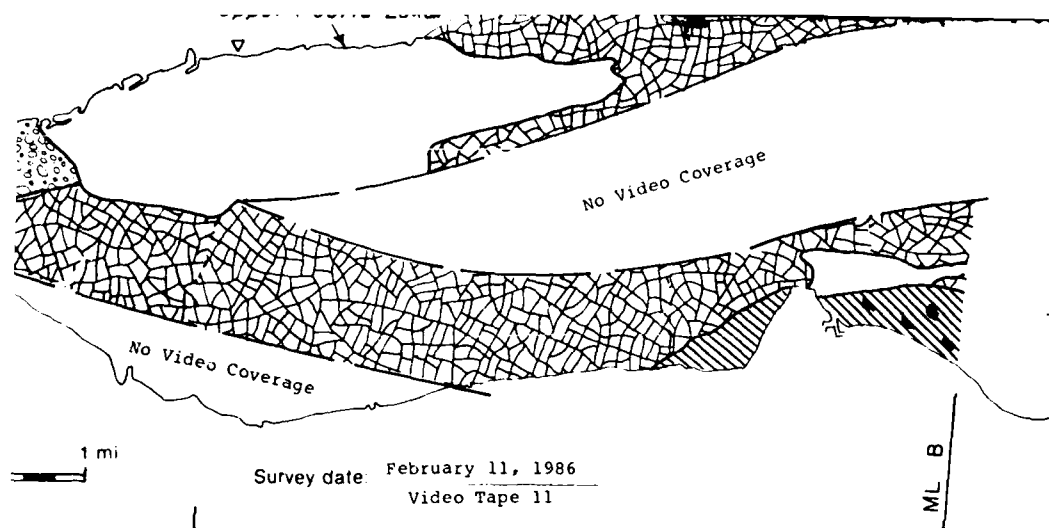


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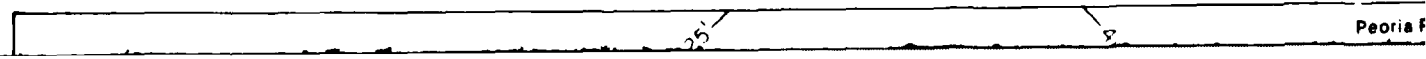
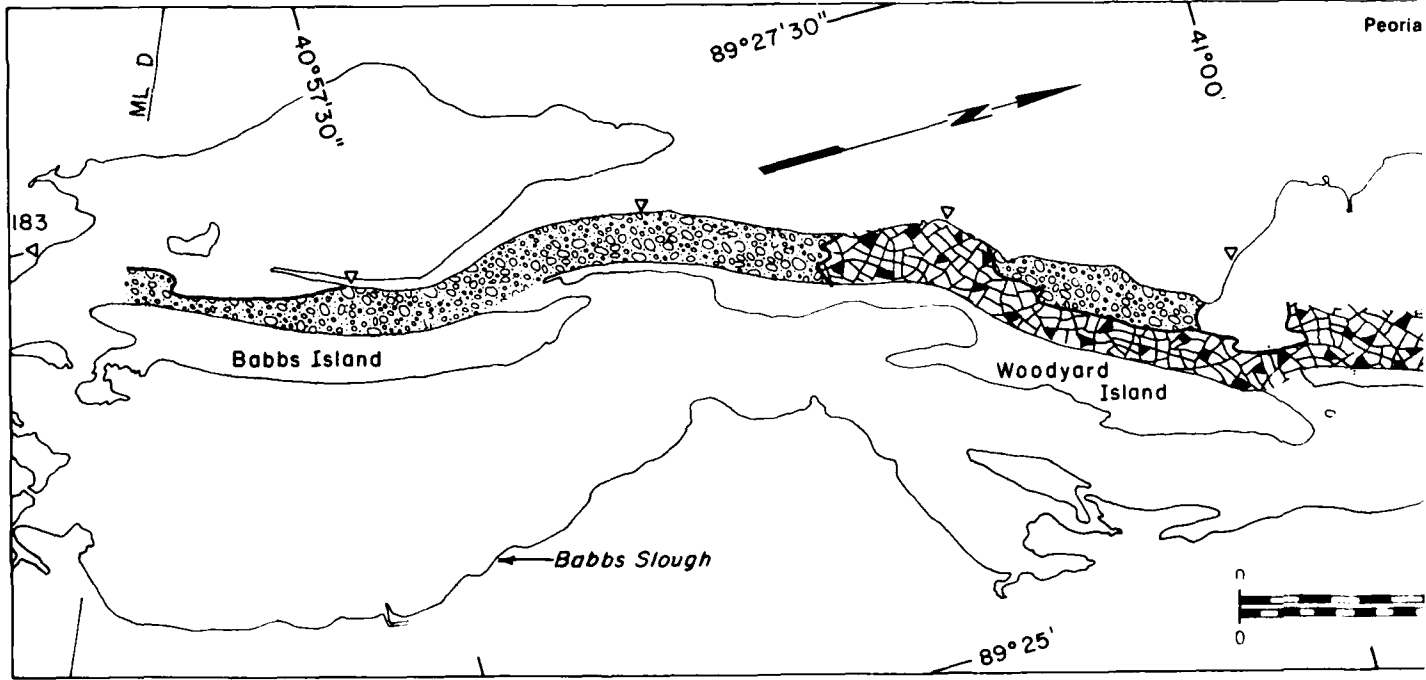
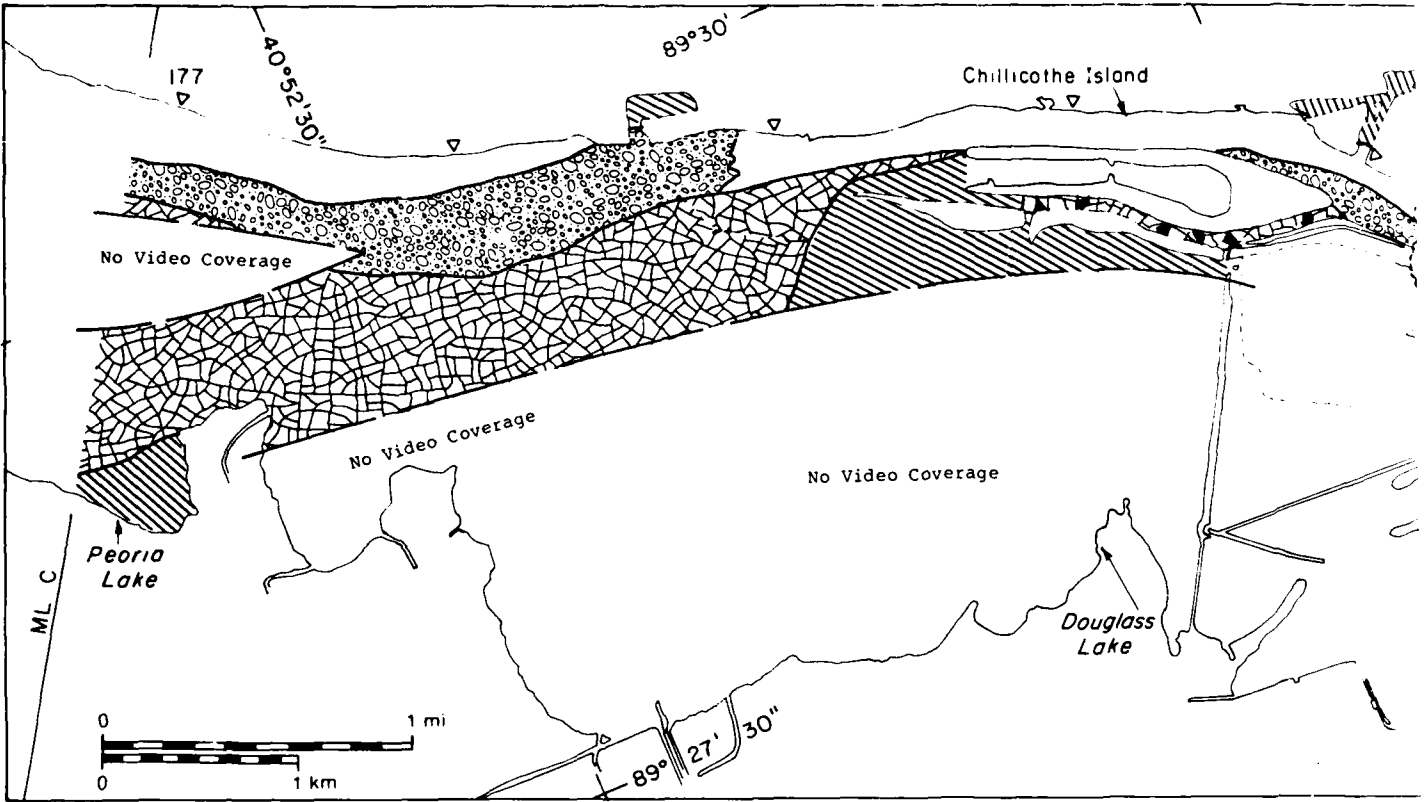


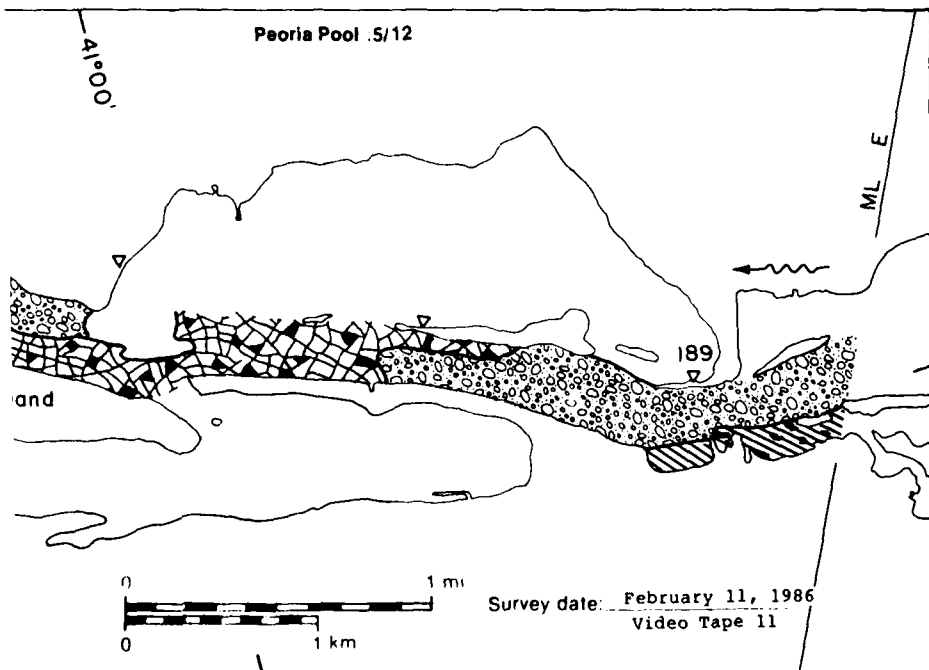
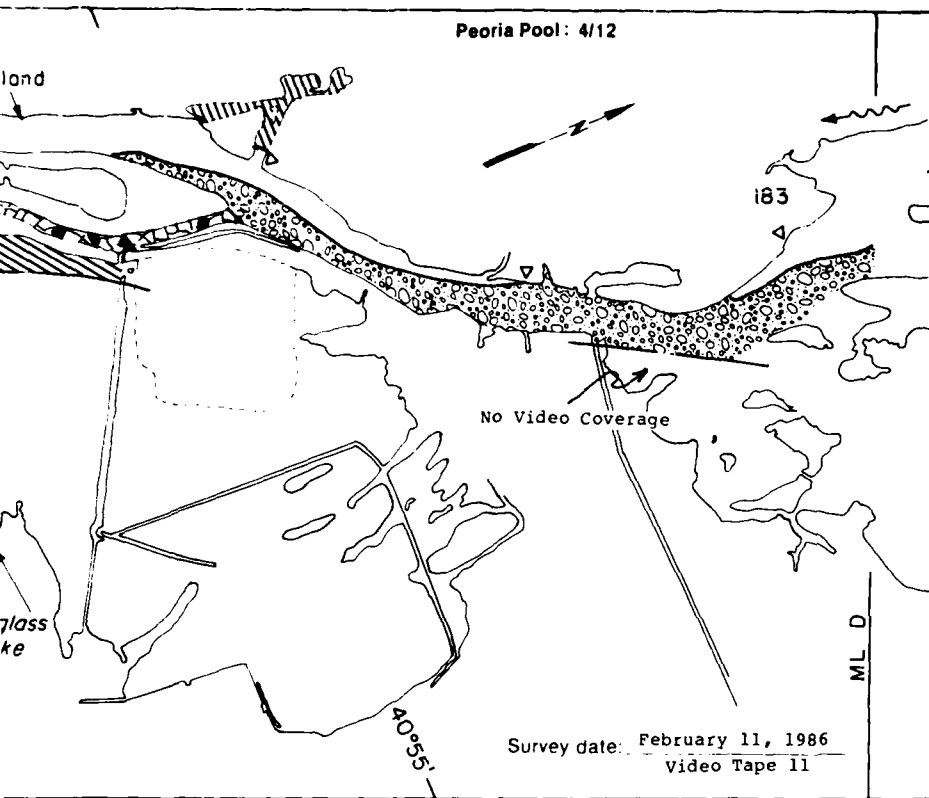
$32^{\circ}30'$



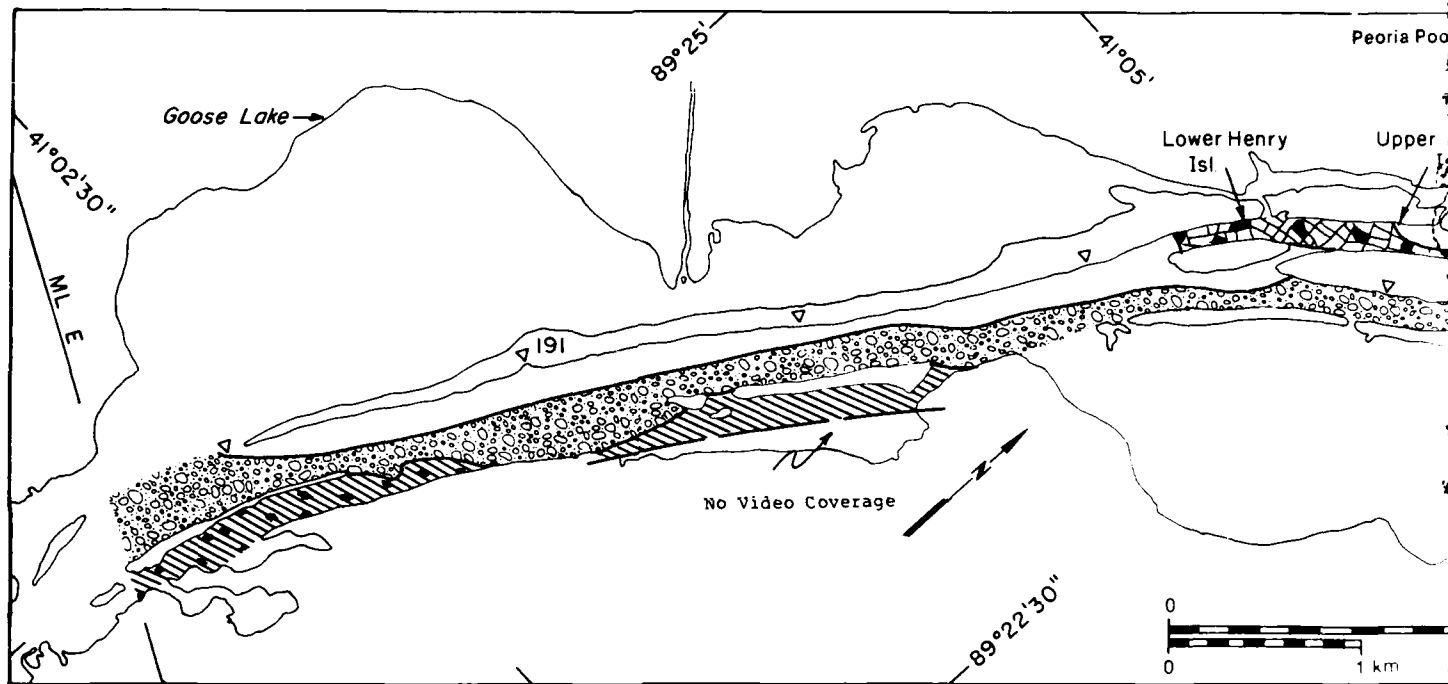
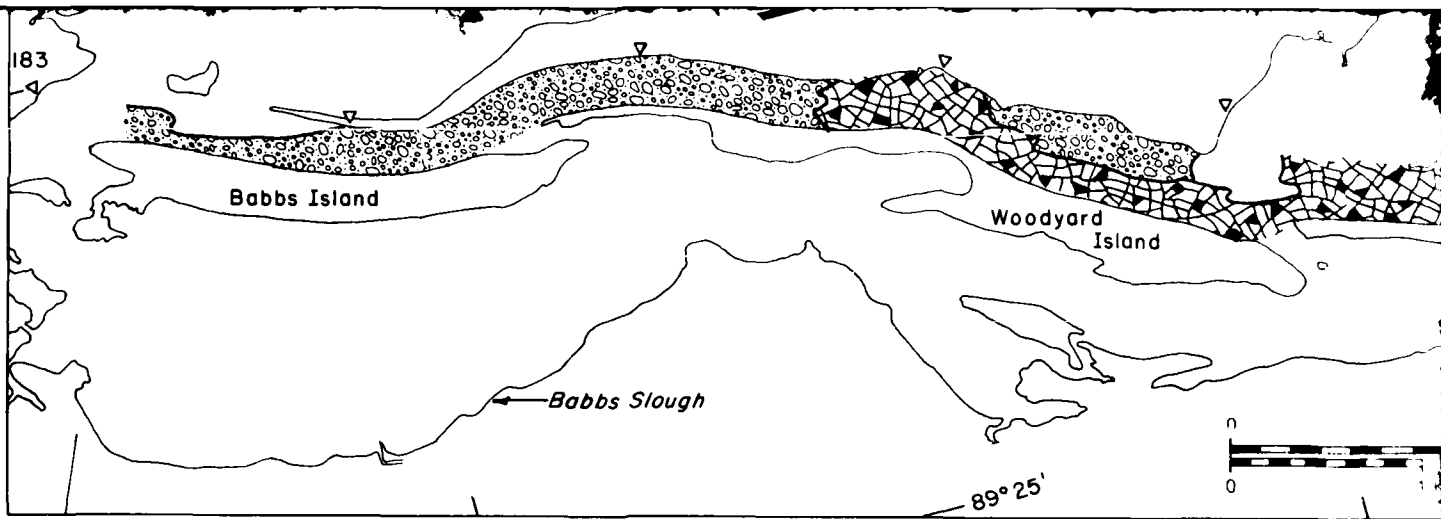


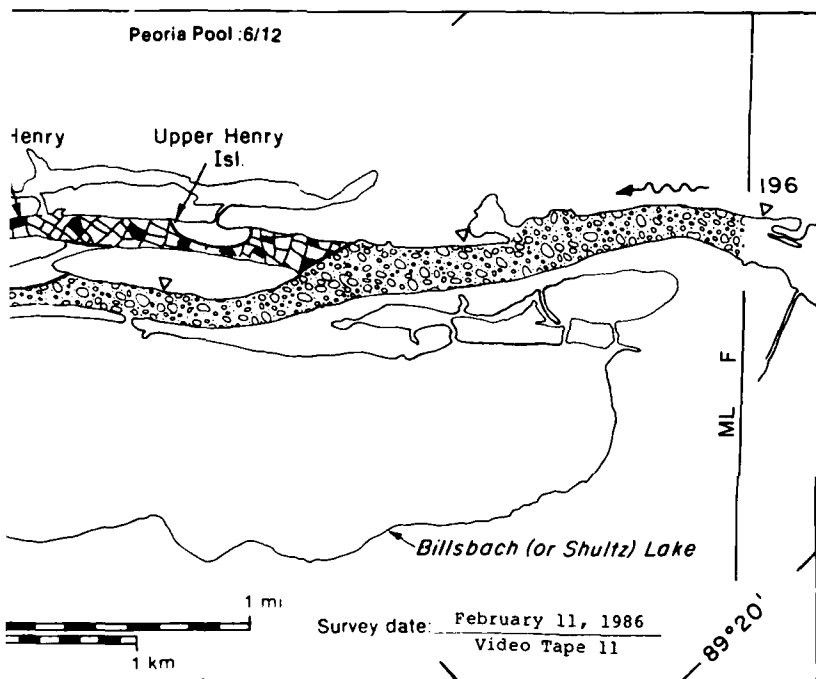
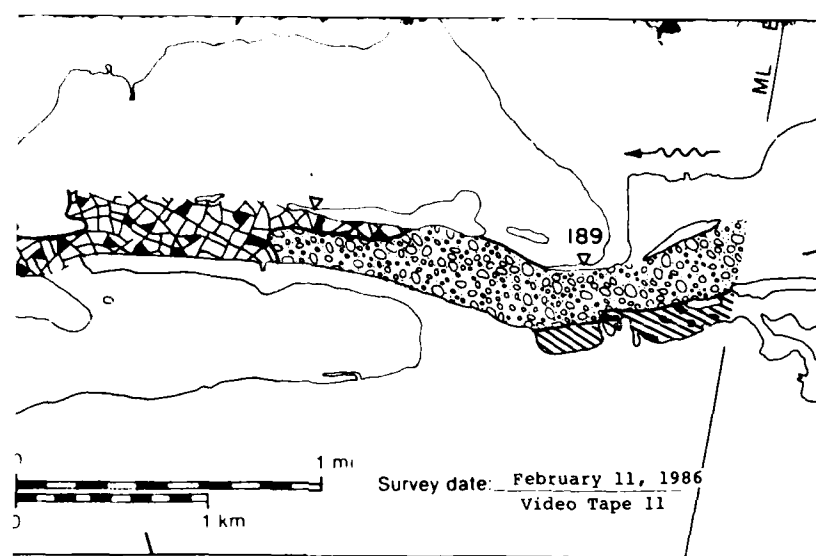
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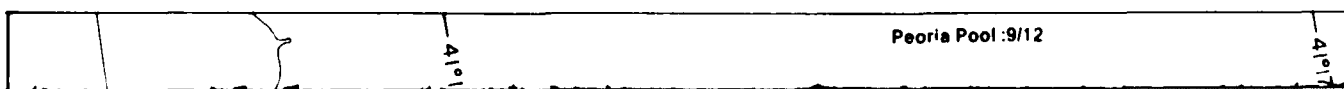
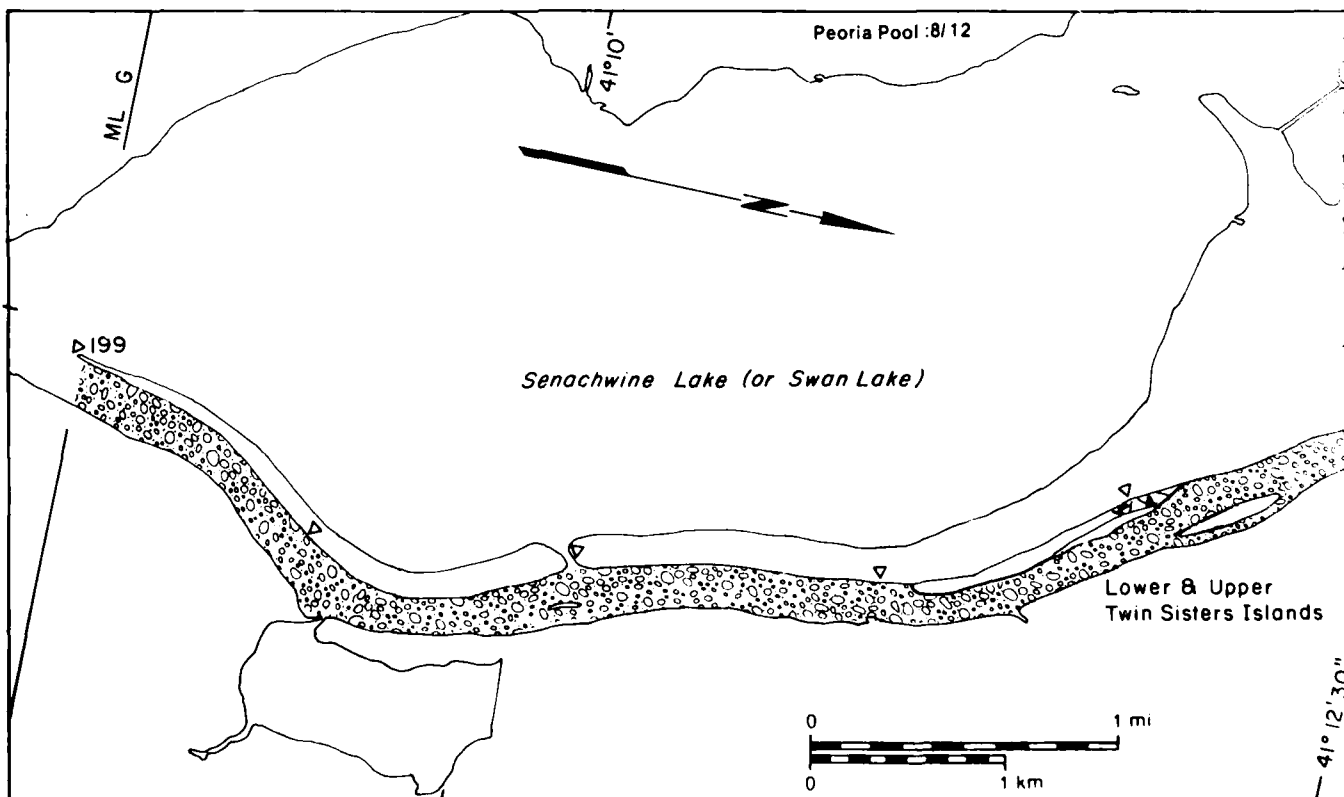
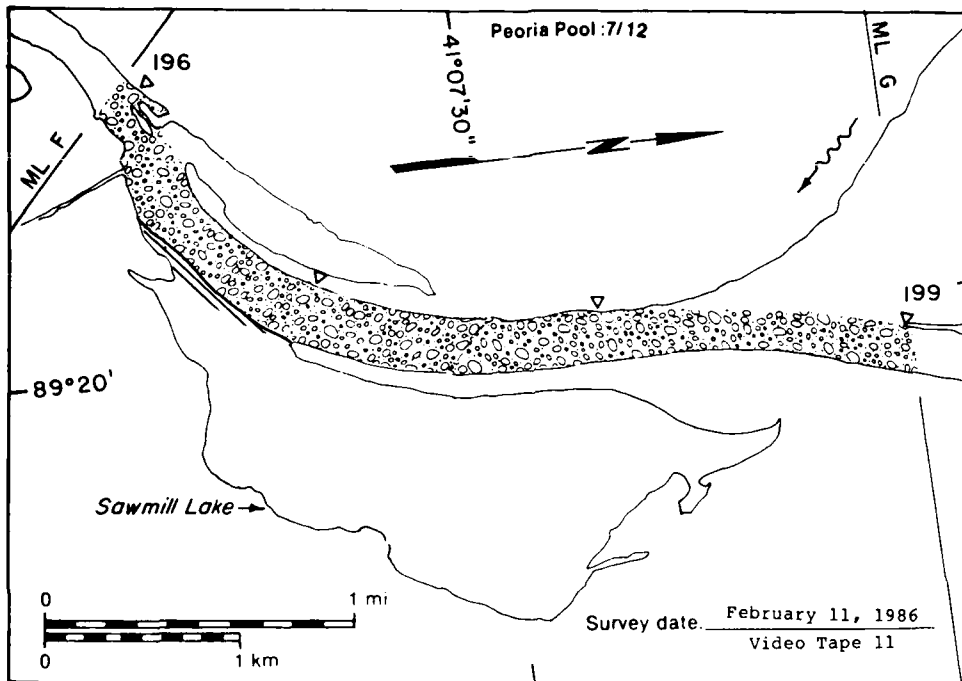




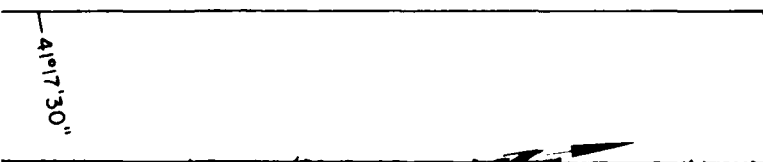
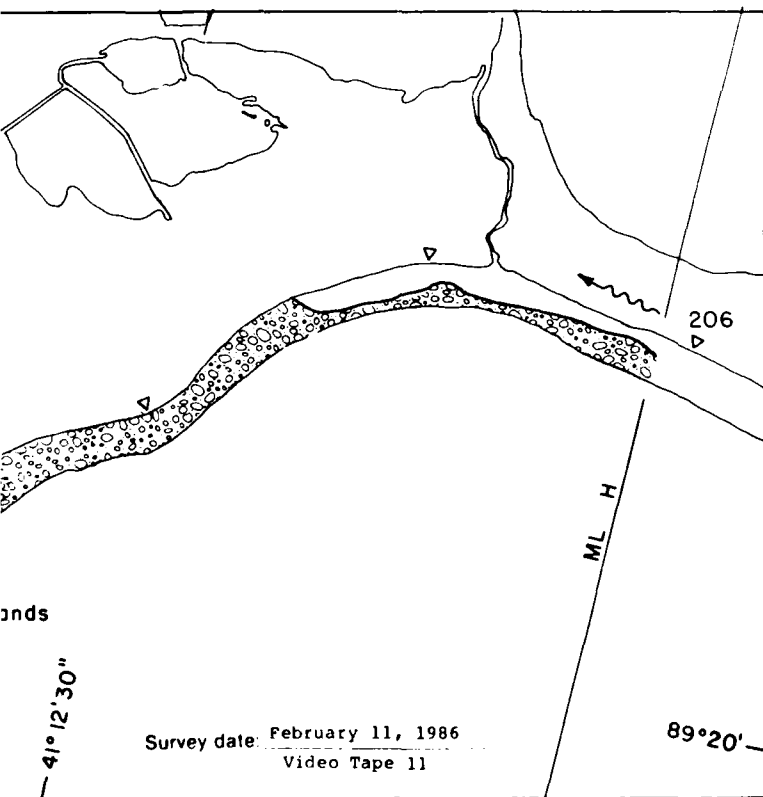
Peoria Pool: 6/12

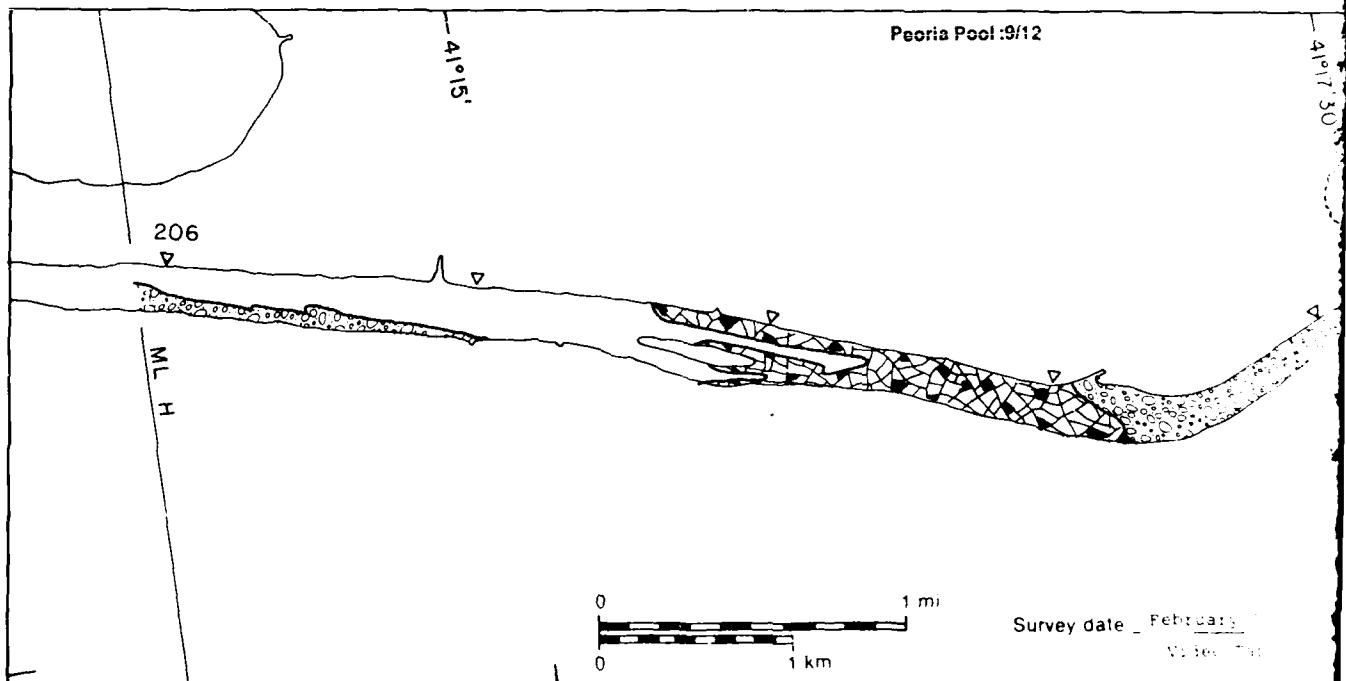
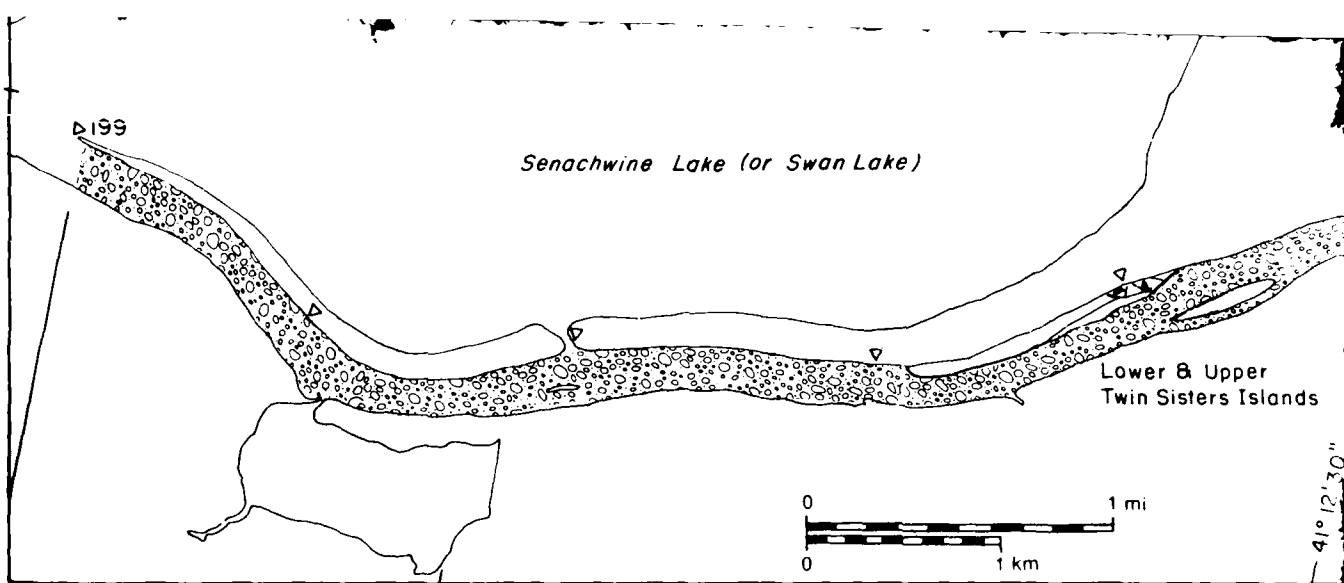






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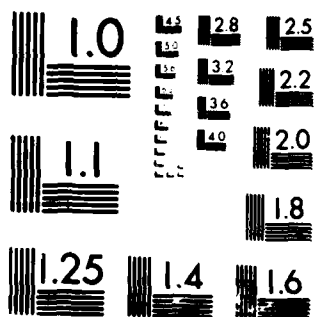
ICE ATLAS 1985 - 1986 MONONGAHELA RIVER ALLEGHENY RIVER 11/14

OHIO RIVER ILLINO. (U) COLD REGIONS RESEARCH AND

UNCLASSIFIED ENGINEERING LAB HANOVER NH L W CATTO ET AL. NOV 87

F/G 8/12

NL



(or Swan Lake)

Lower & Upper
Twin Sisters Islands



Survey date: February 11, 1986
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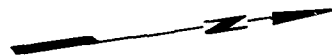
ML H

89°20'

41°12'30"

Peoria Pool: 9/12

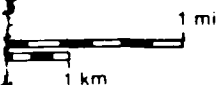
41°17'30"



89°20'

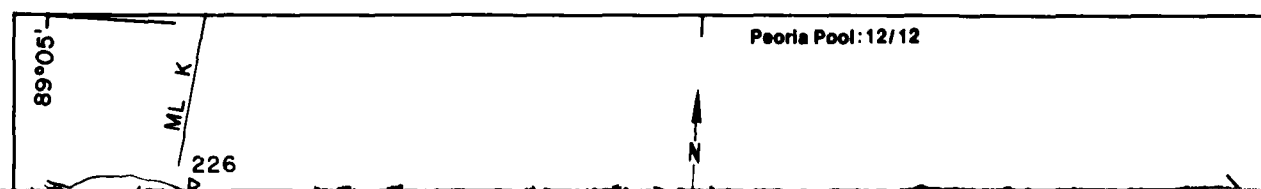
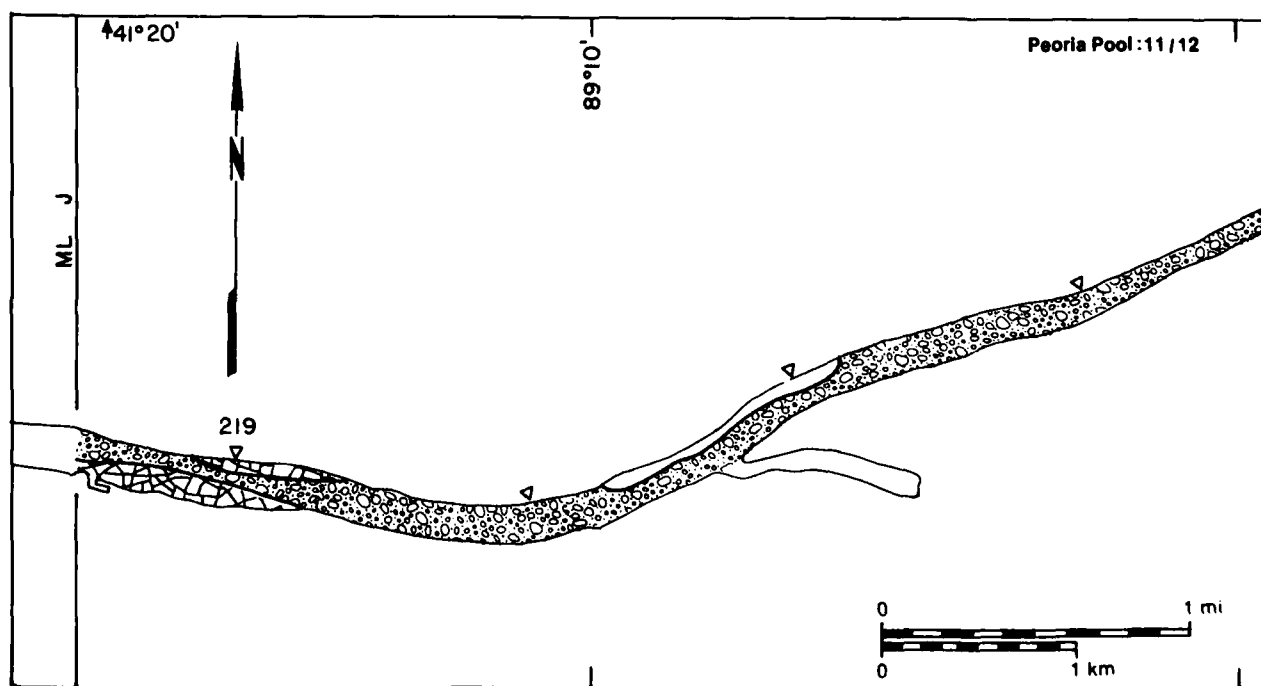
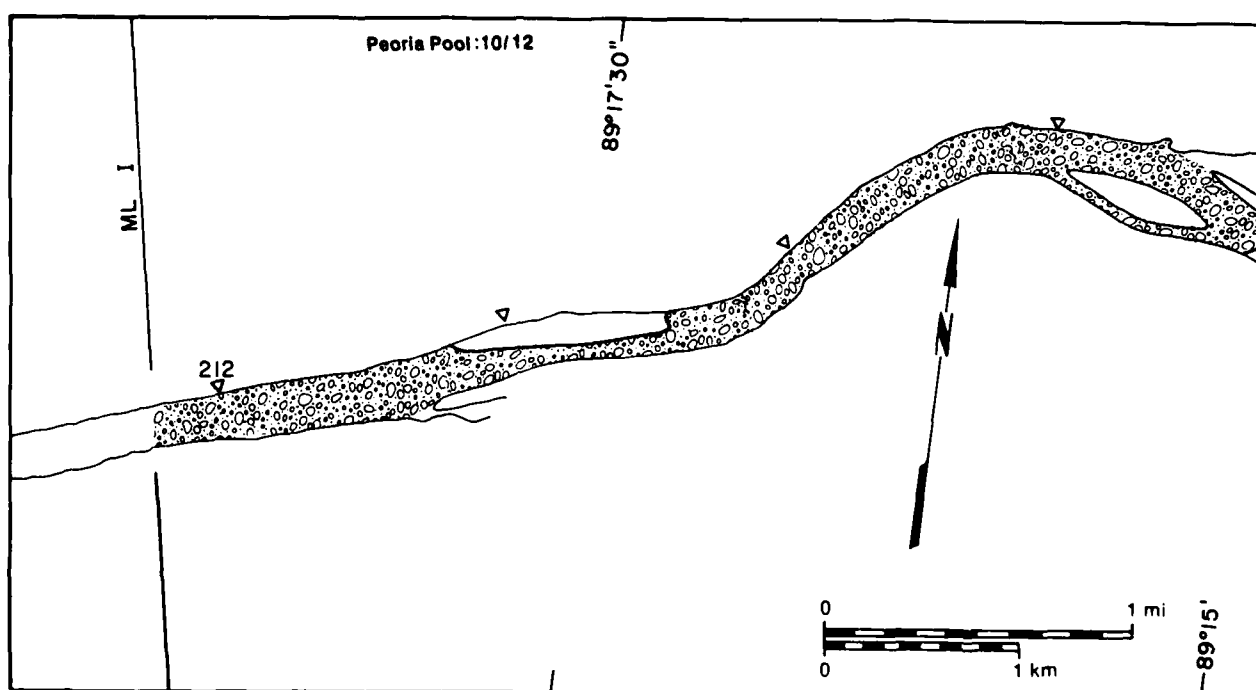
211

ML I

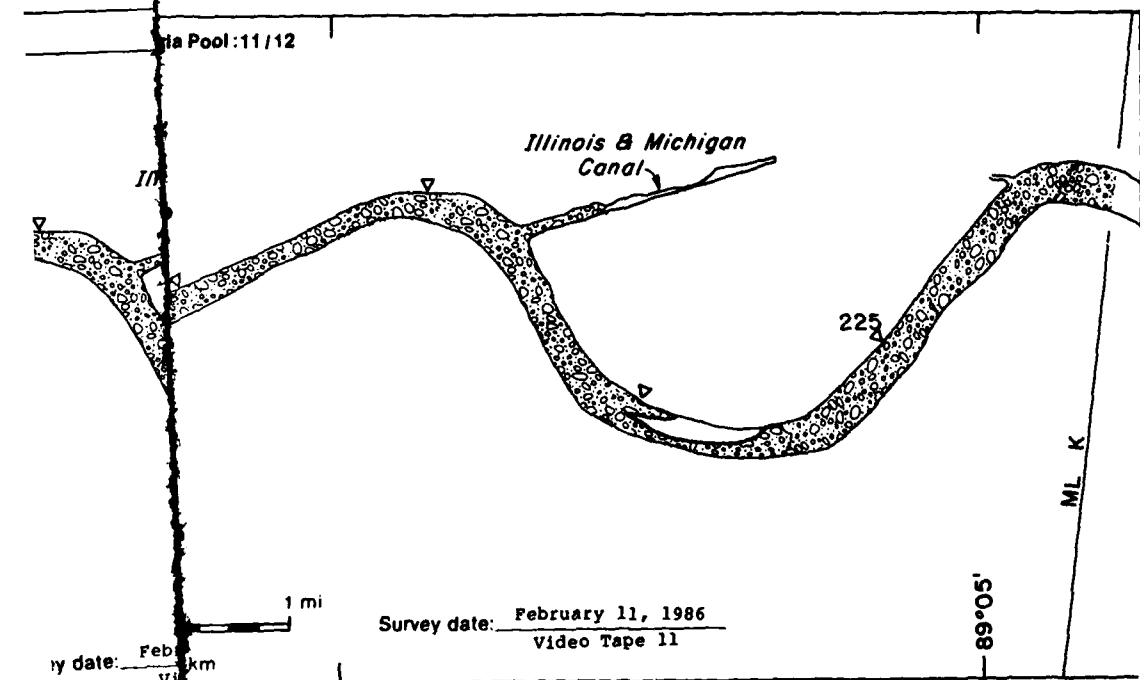
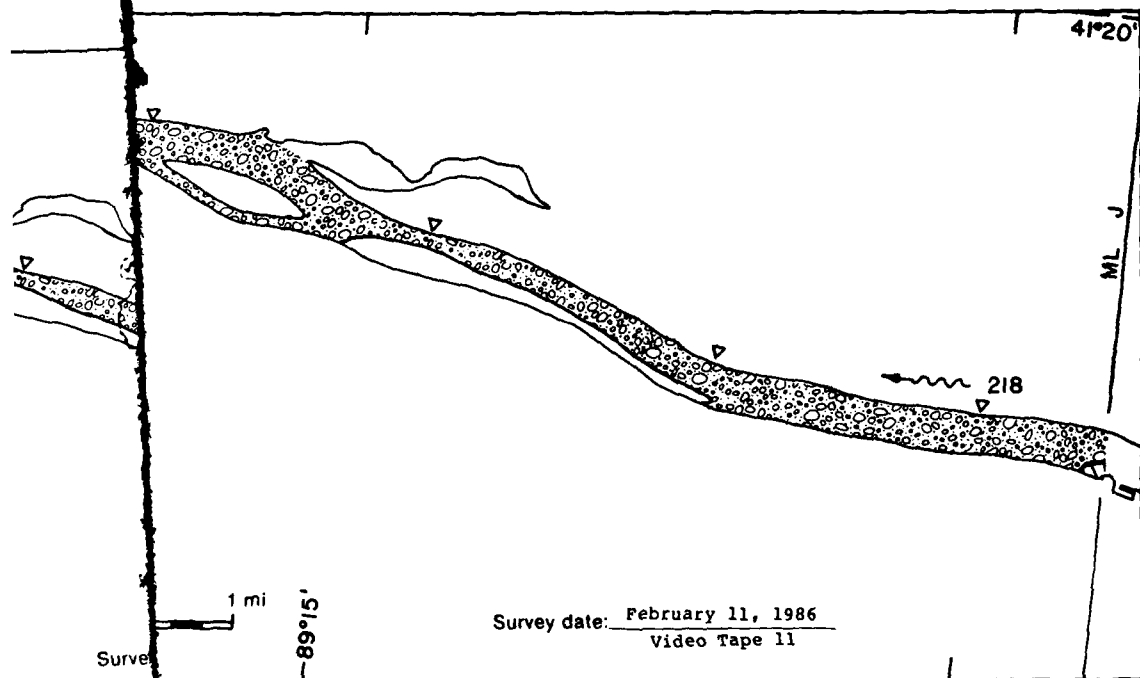


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Video Tape 11

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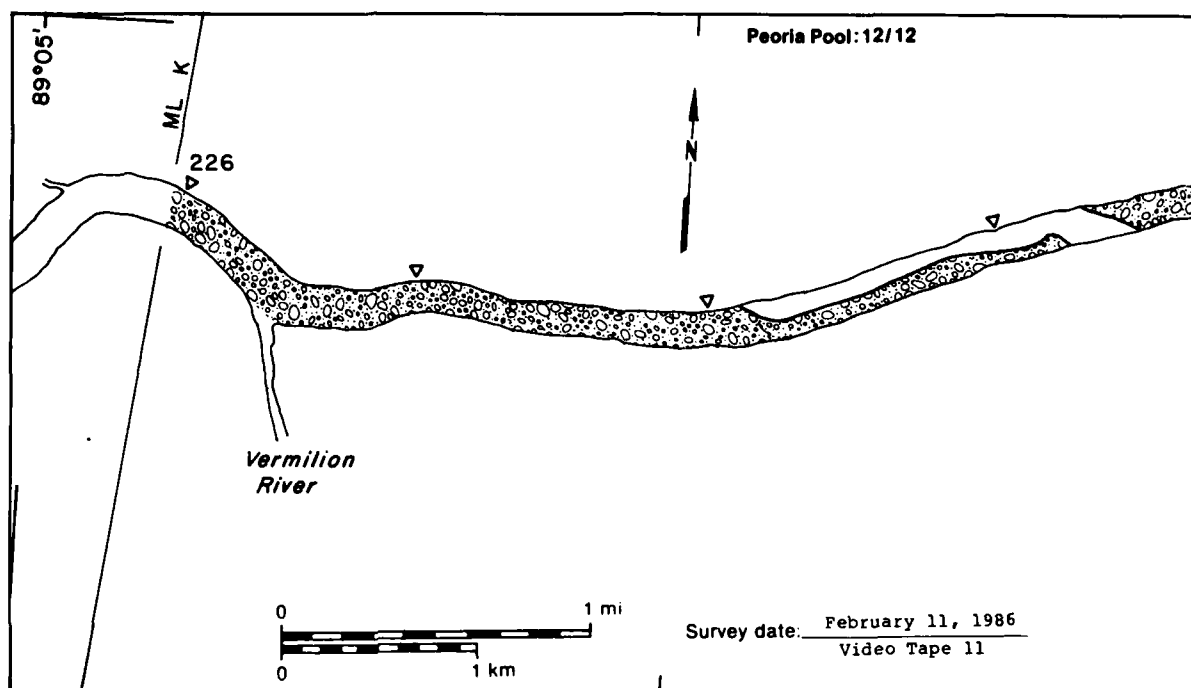
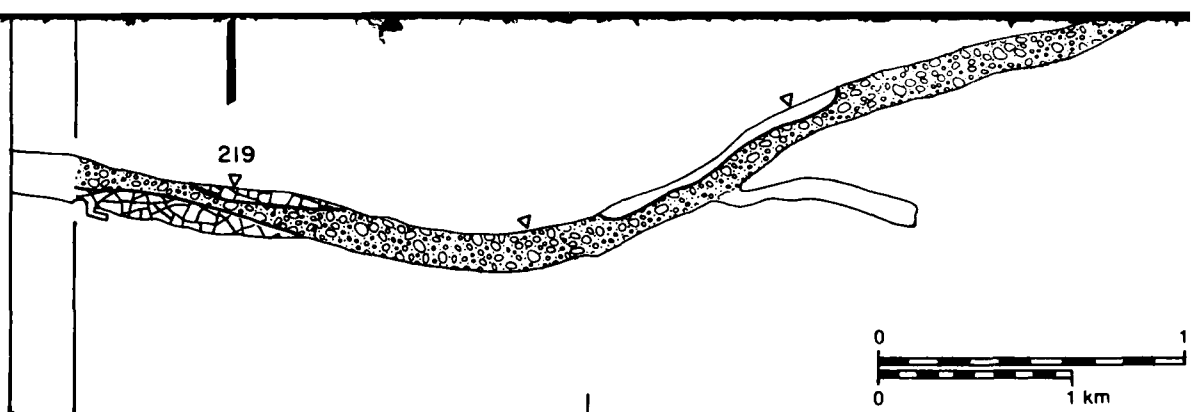


5



41°20'

No Video Coverage



Peoria Pool

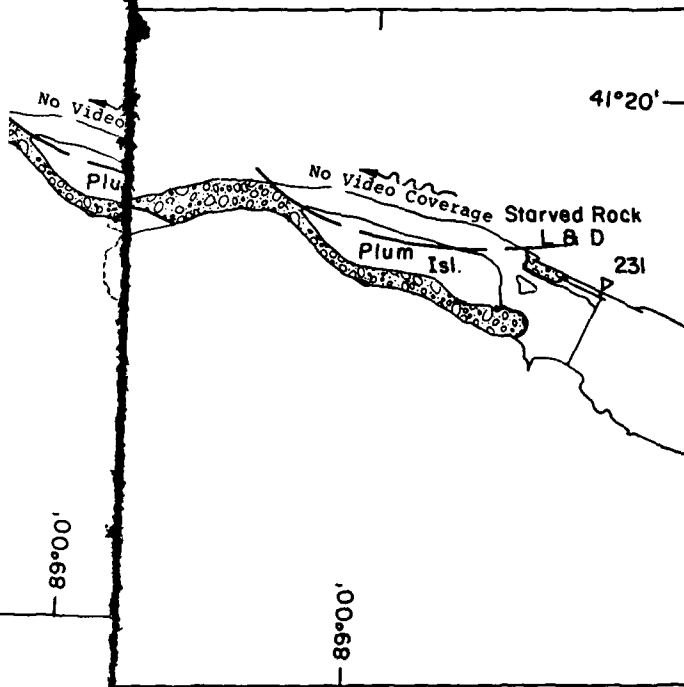
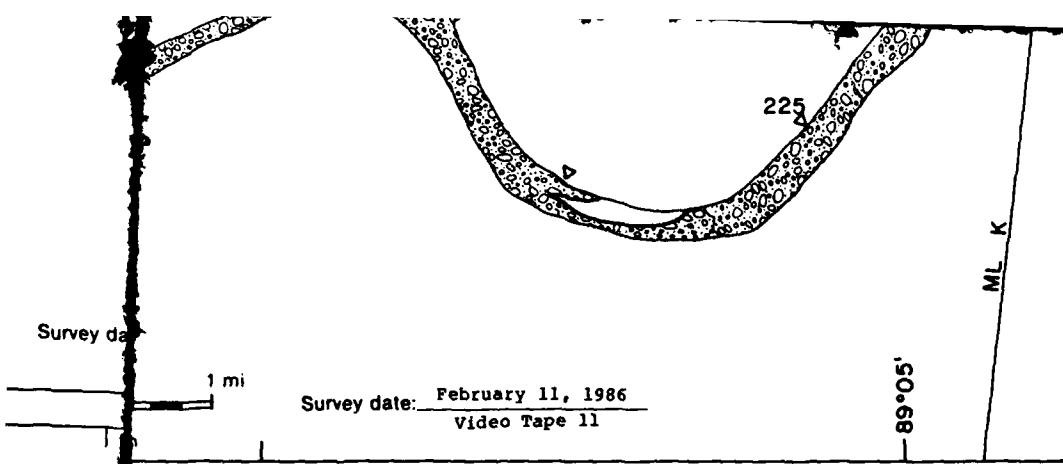
MAP UNITS

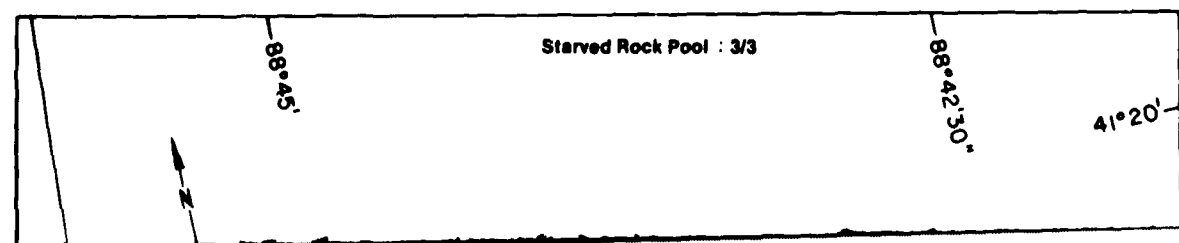
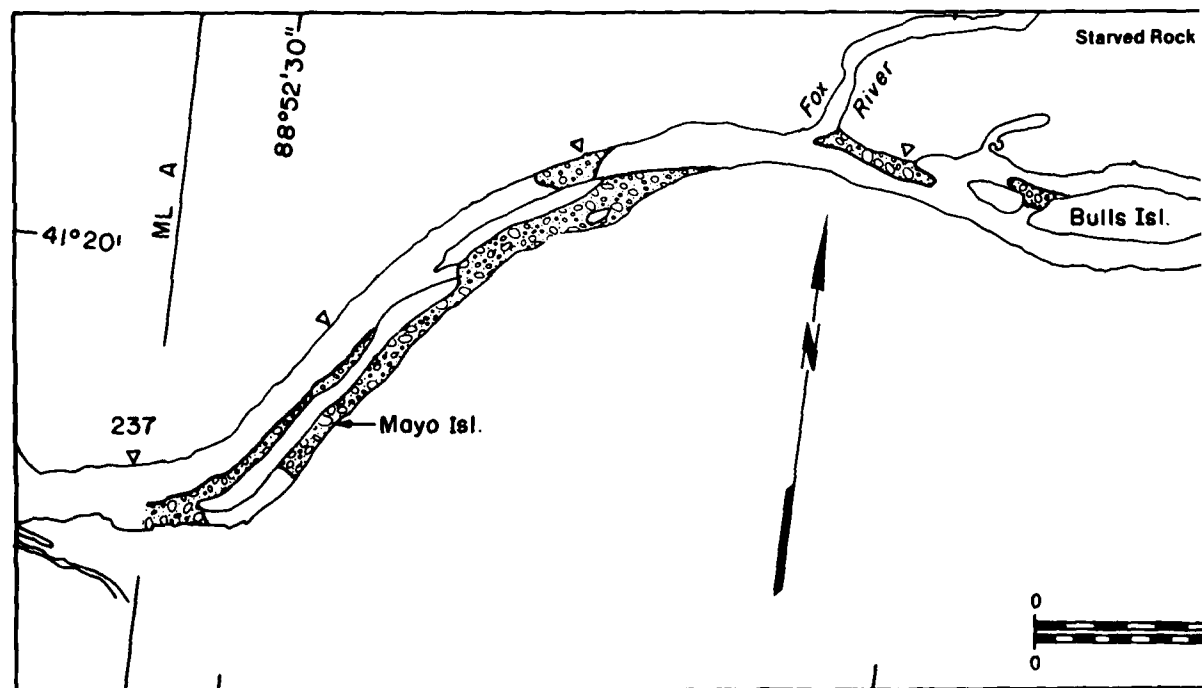
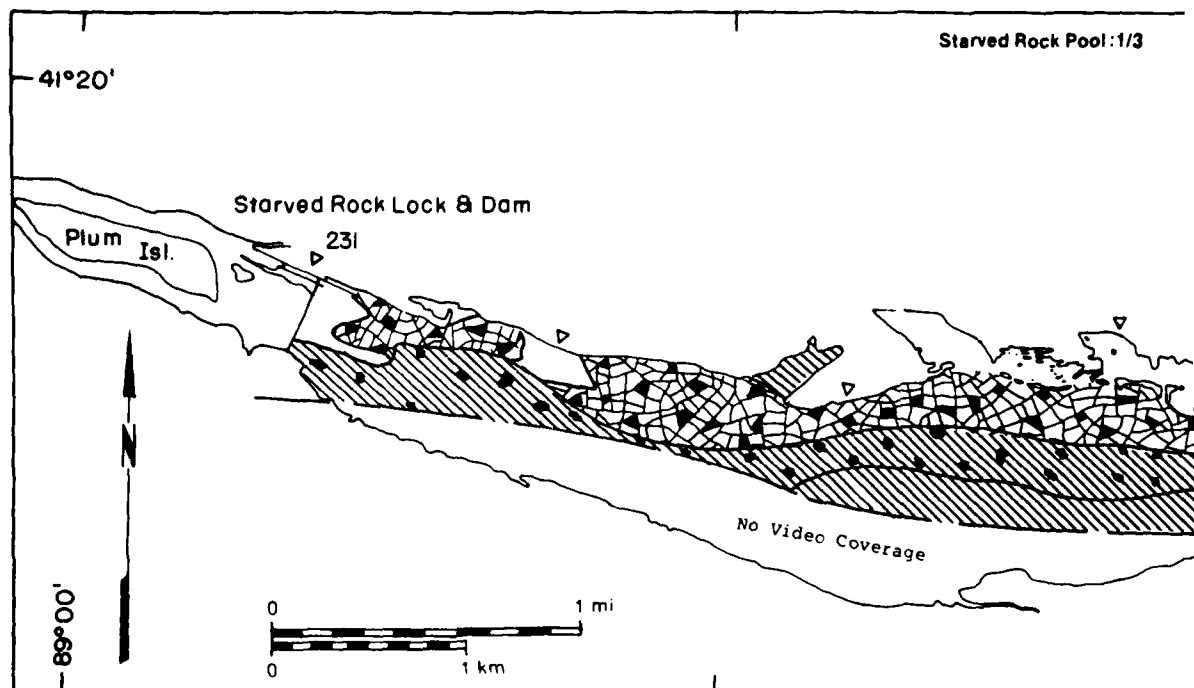
	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	10.18	NA
Solid ice cover	8.02	NA
Solid ice cover with open-water areas	2.97	90
Fragmented ice cover	17.25	NA
Fragmented ice cover with open-water areas	1.99	80
Ice floes or frazil slush and pans	19.58	70

Total area ($m^2 \times 10^6$)

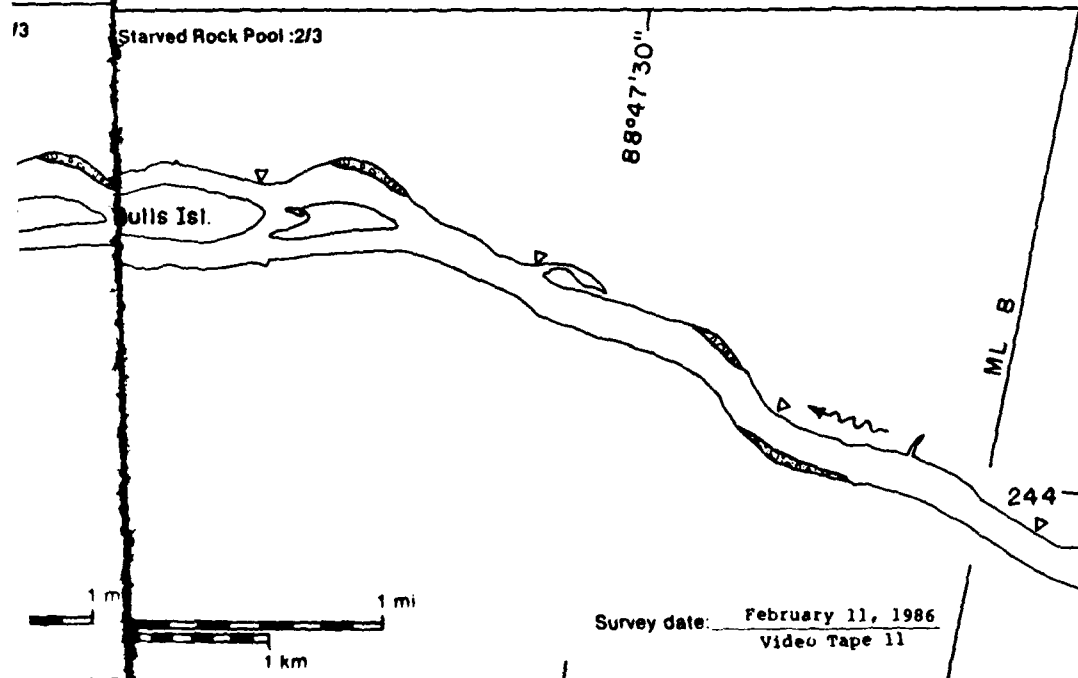
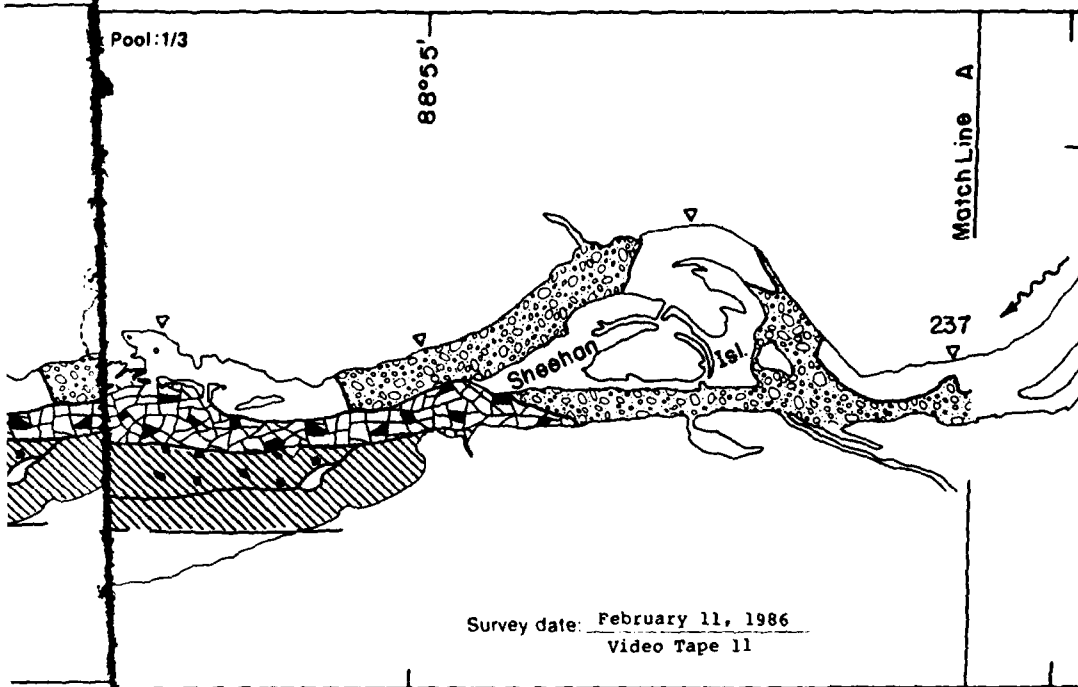
81.33*

* Includes $21.34 \times 10^6 m^2$
of no video coverage





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41°20'

Starved Rock Pool

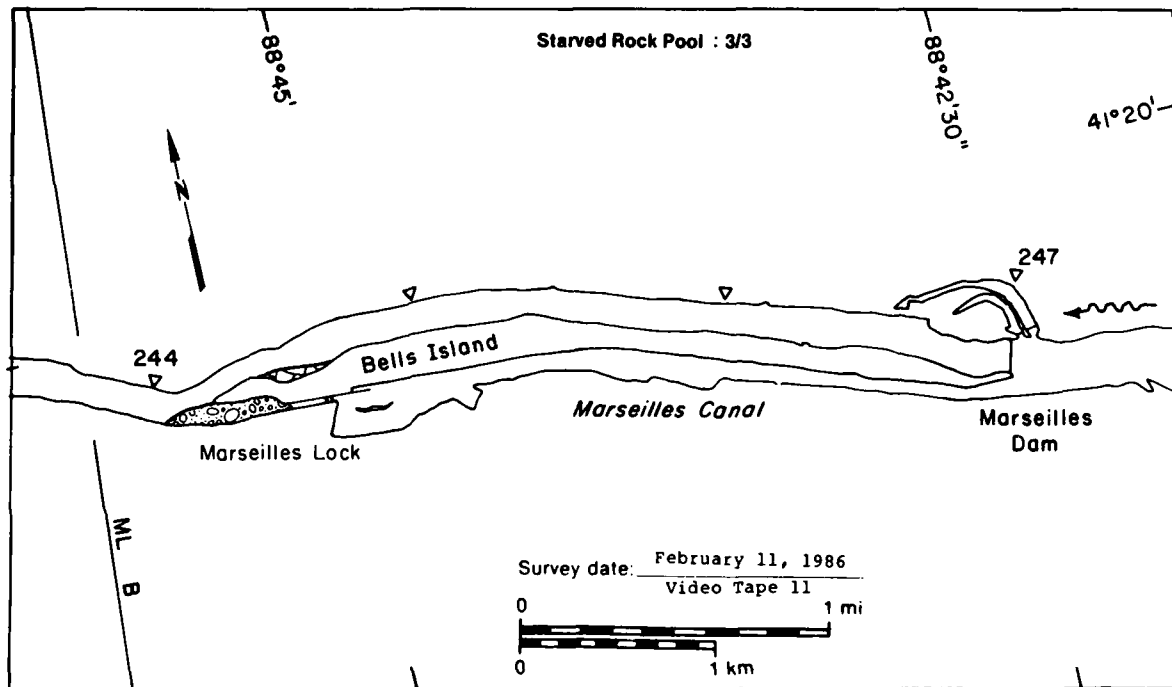
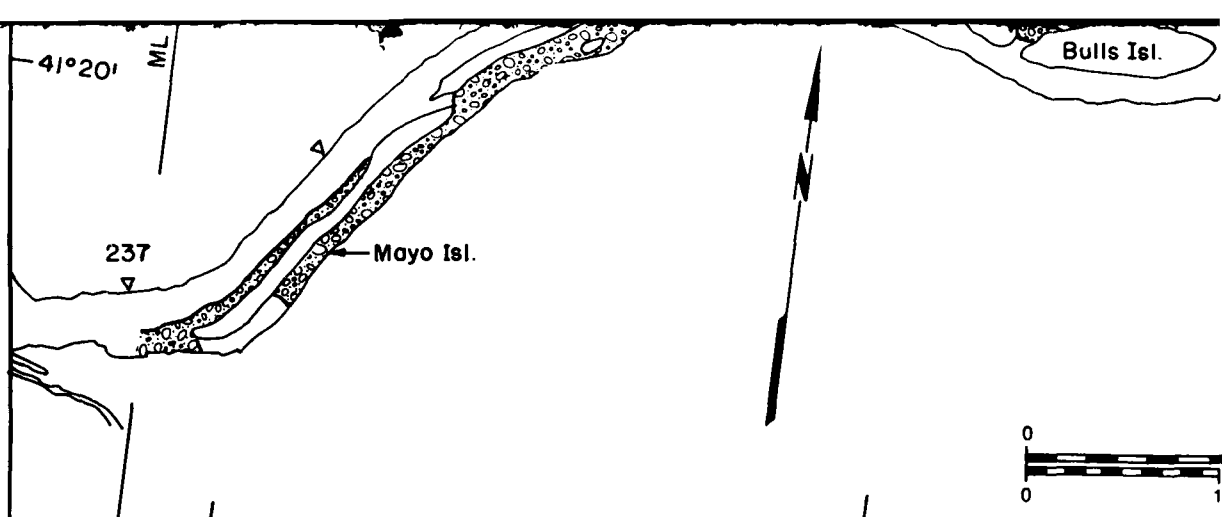
MAP UNITS

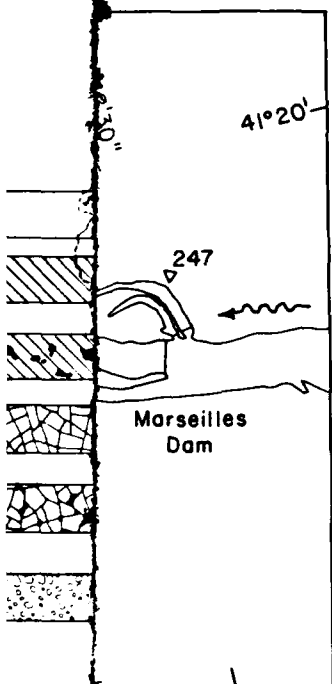
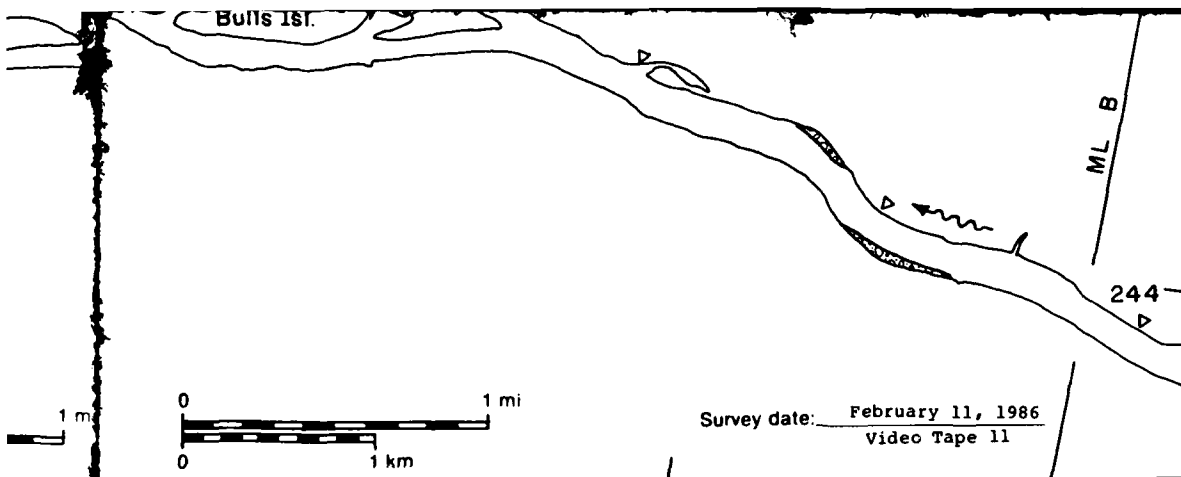
Area
(m² x 10⁶)

Surface
concentration
(%)

Open water

3.53





Starved Rock Pool

MAP UNITS

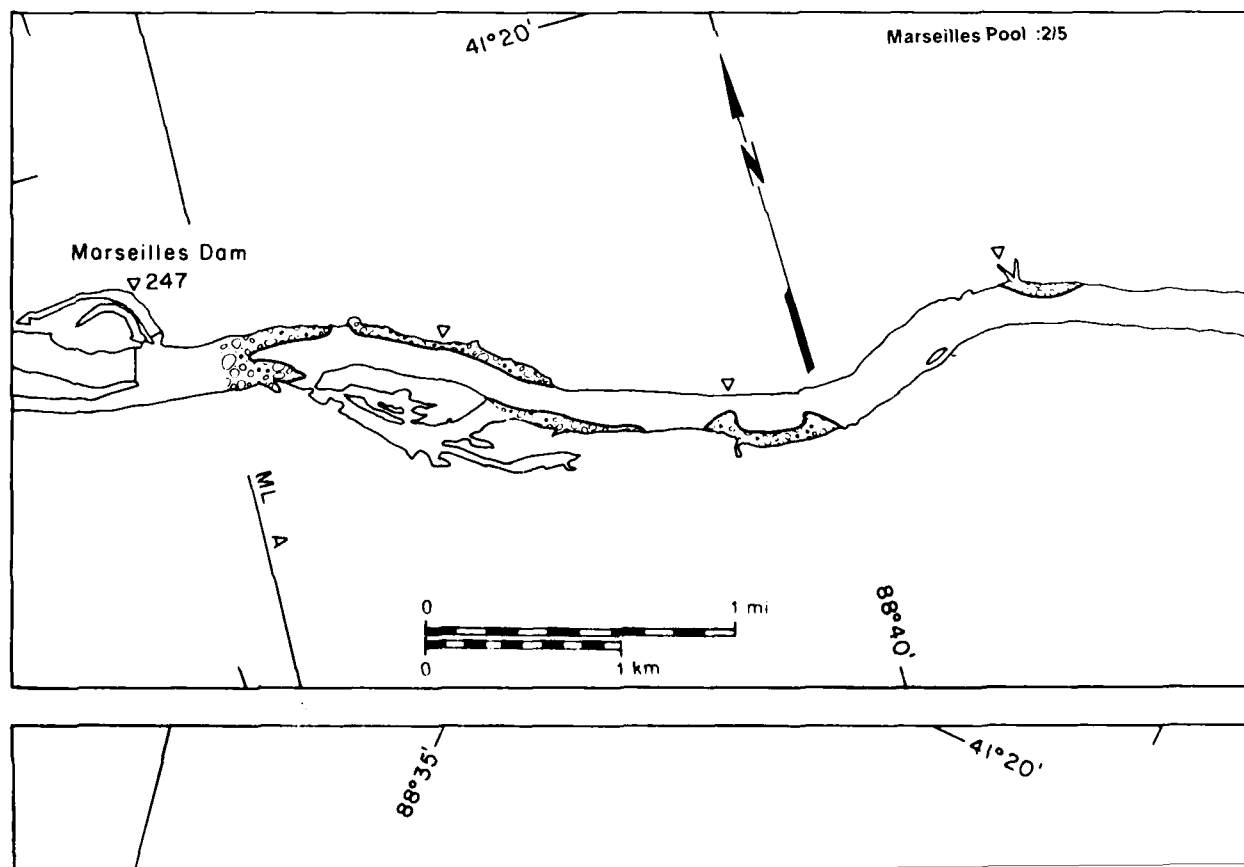
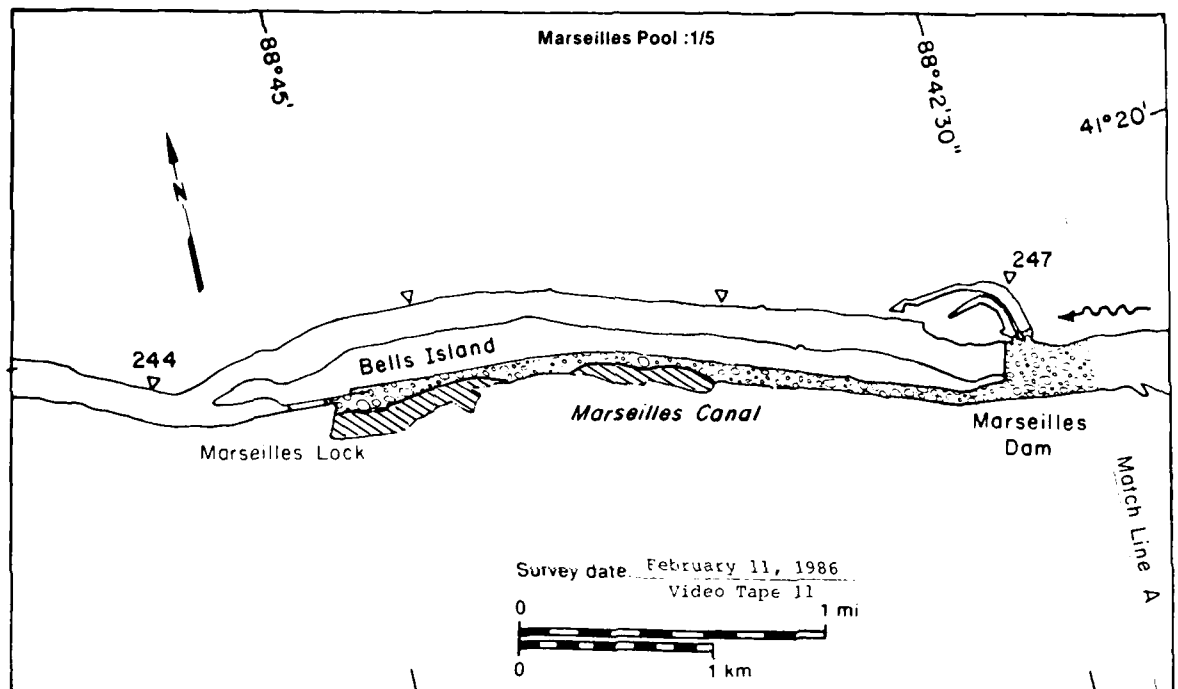
	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

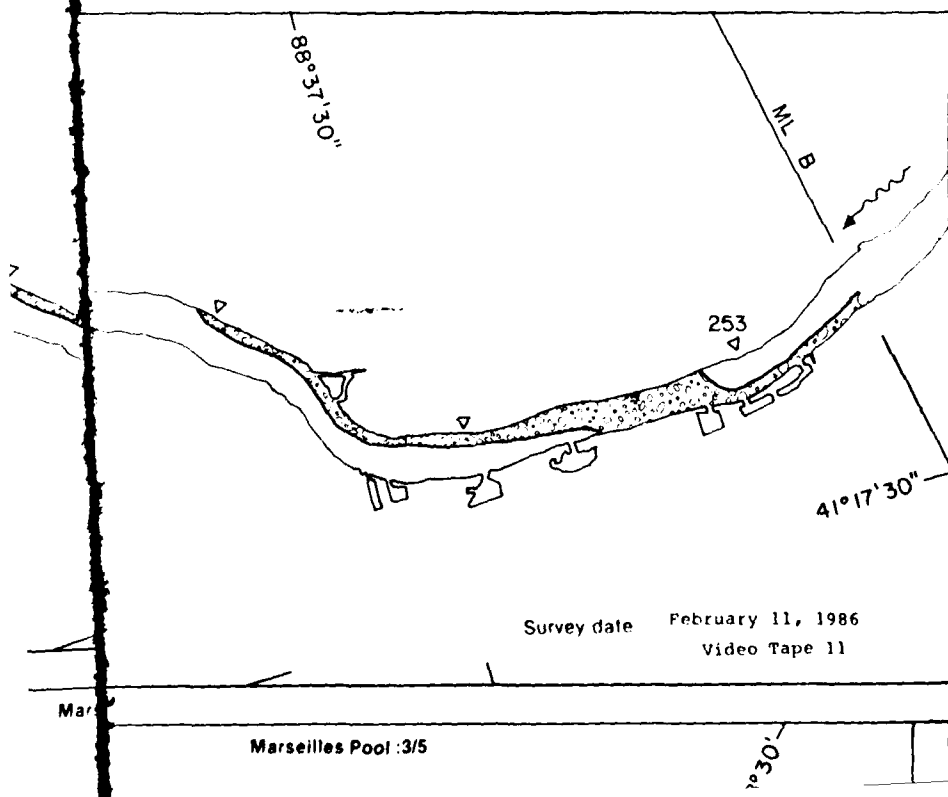
Total area ($m^2 \times 10^6$)

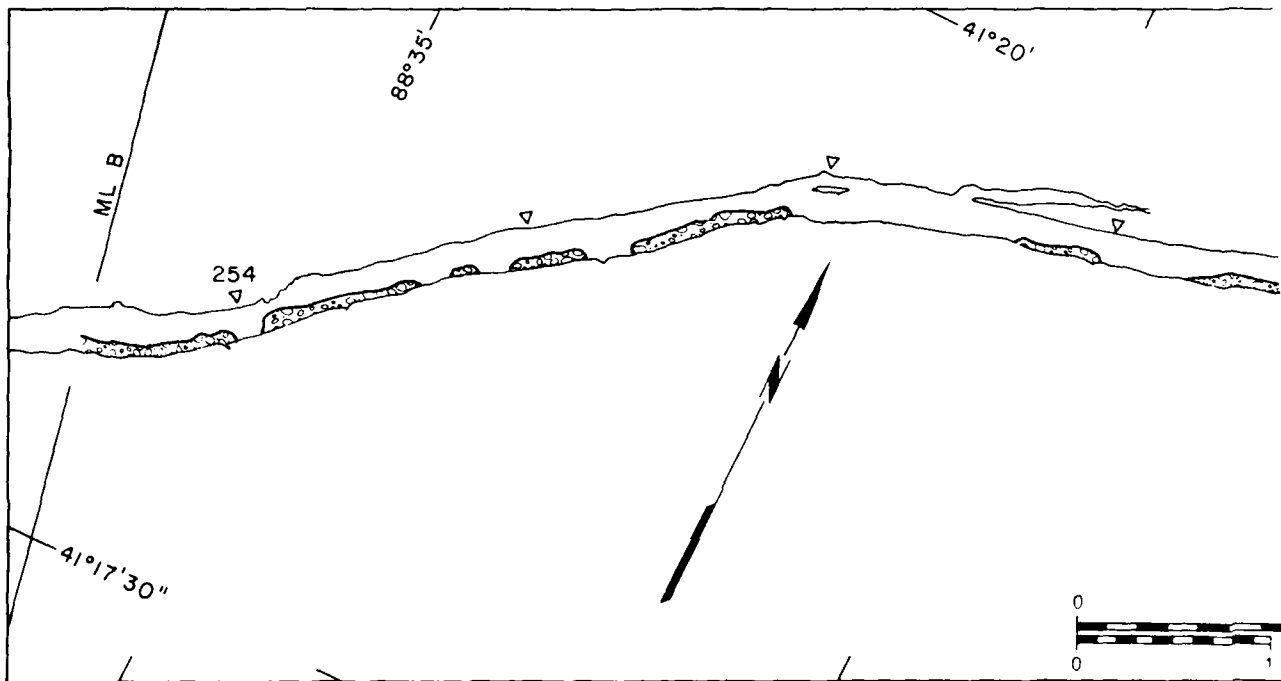
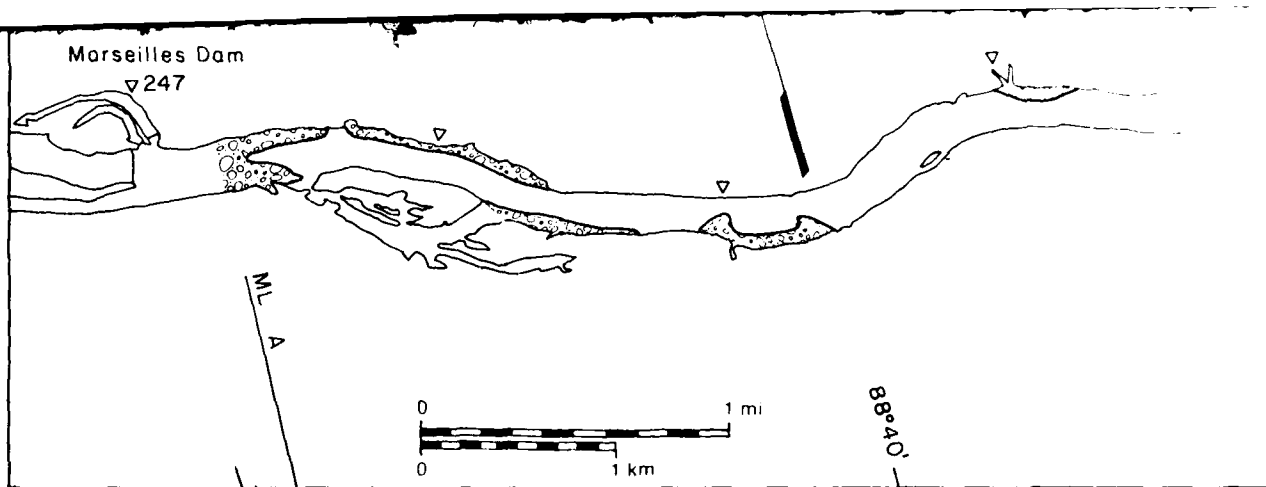
Area ($m^2 \times 10^6$)	Surface concentration (%)
3.53	NA
0.80	NA
1.20	90
0.02	NA
1.46	60
1.63	30
10.19*	

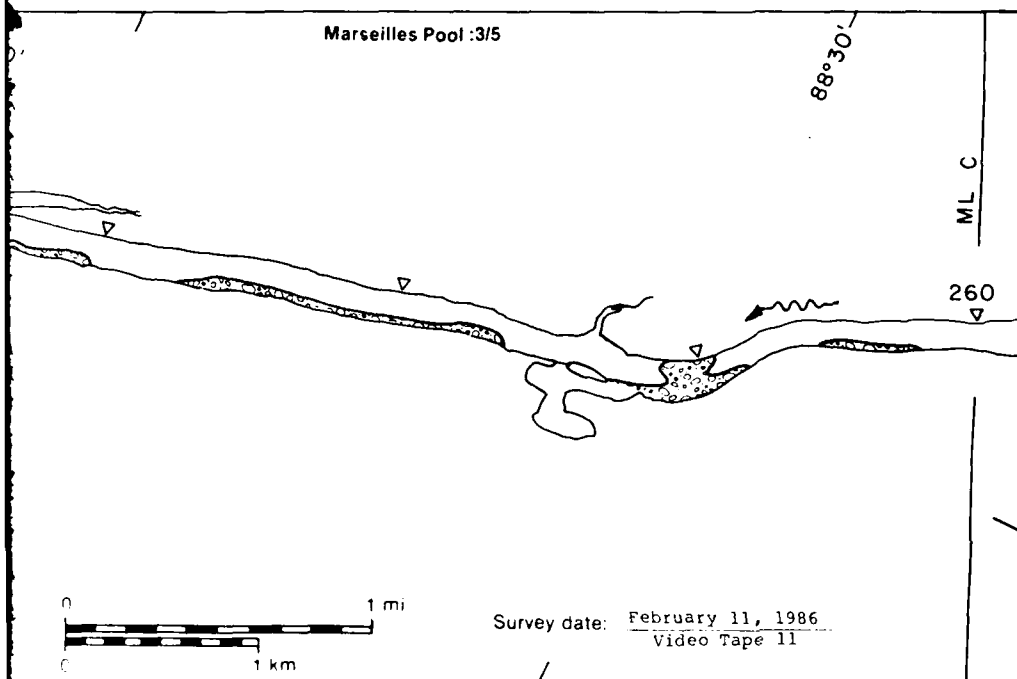
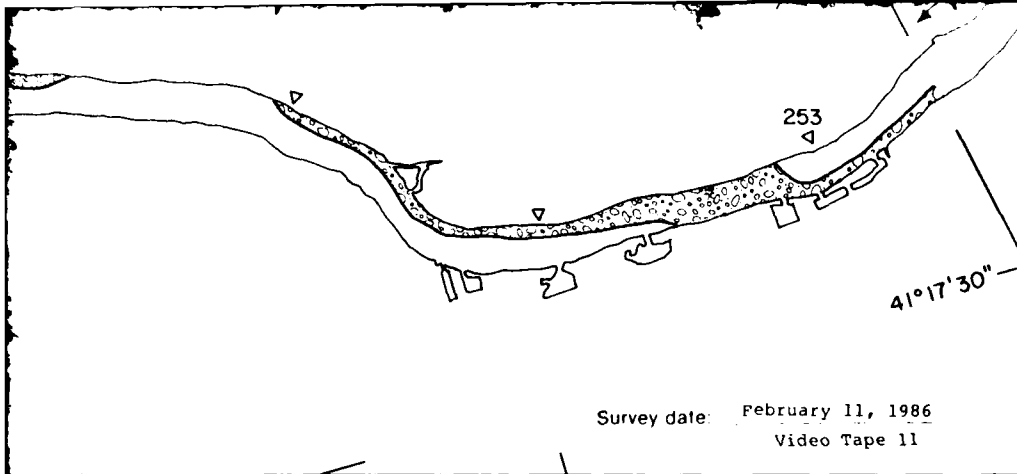
* Includes $1.55 \times 10^6 m^2$
of no video coverage

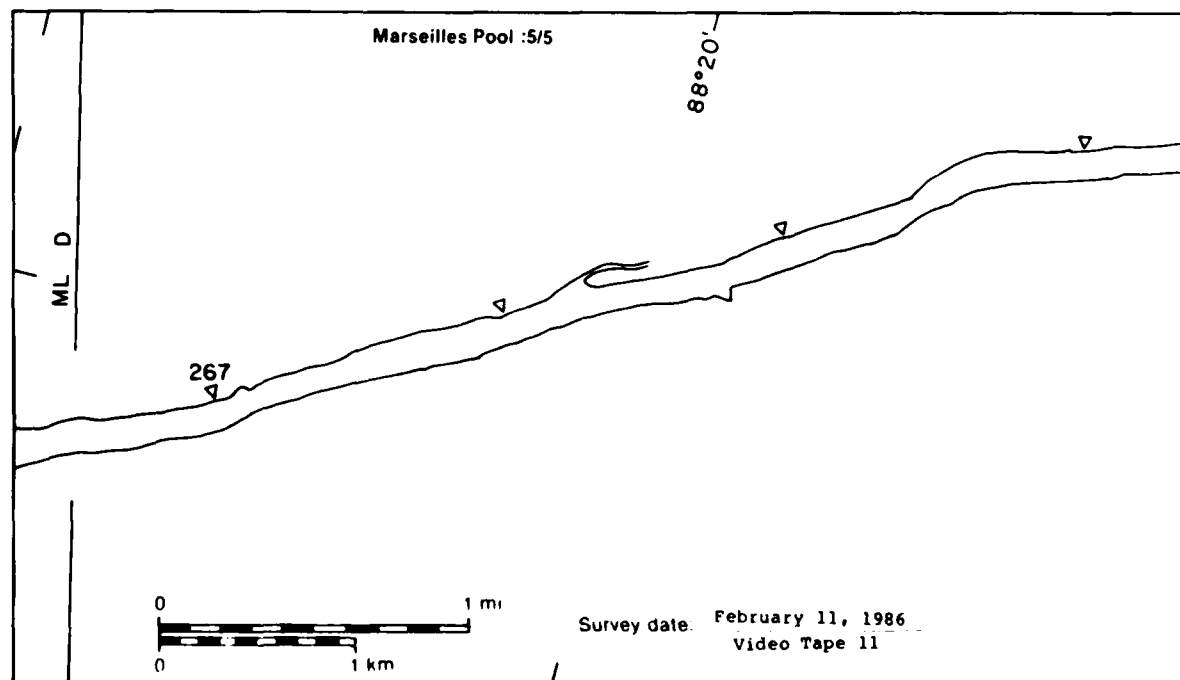
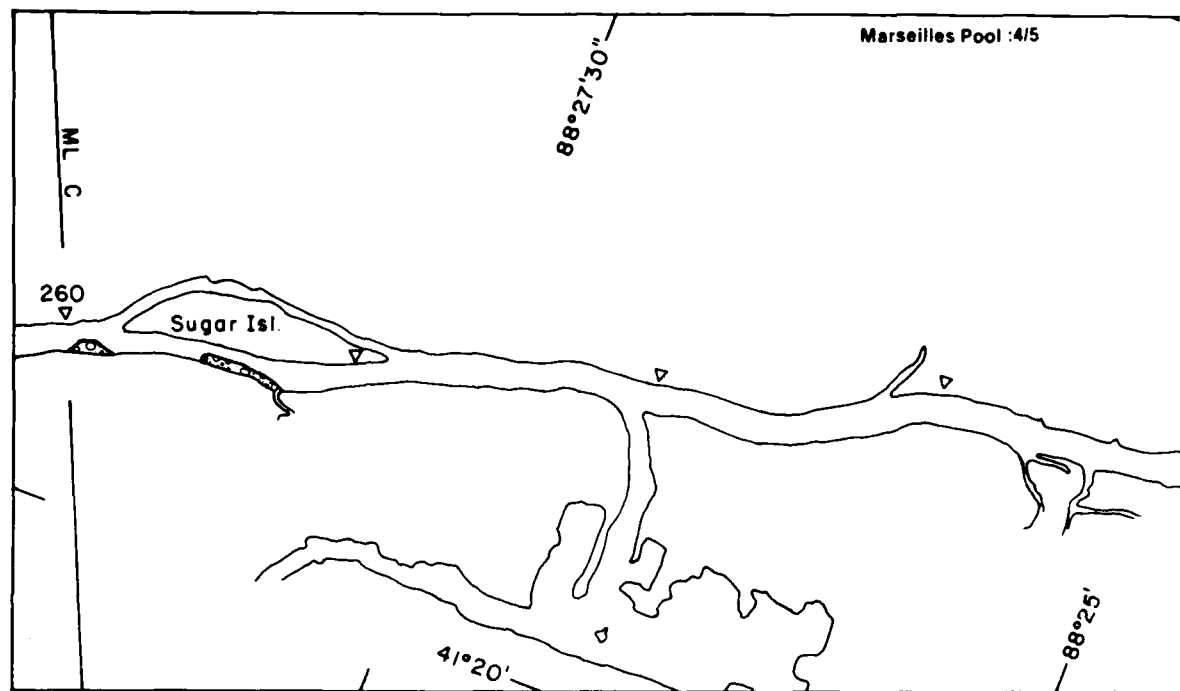
11 February 1986







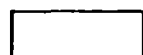




Survey date: February 11, 1986
Video Tape 11

Marseilles Pool

MAP UNITS



Open water

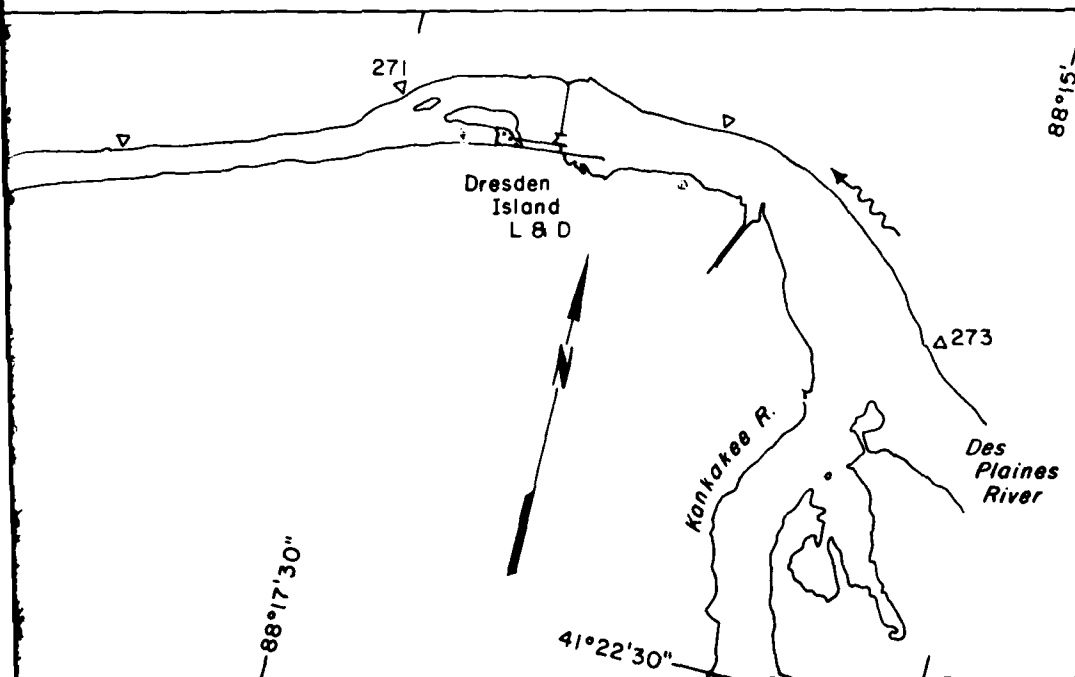
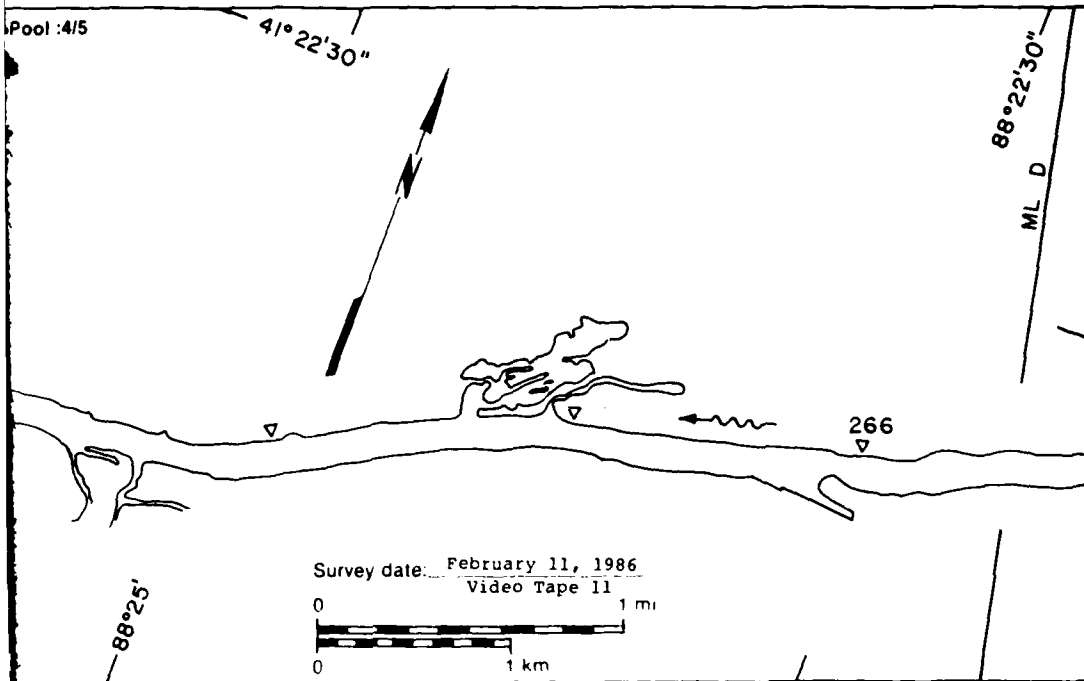


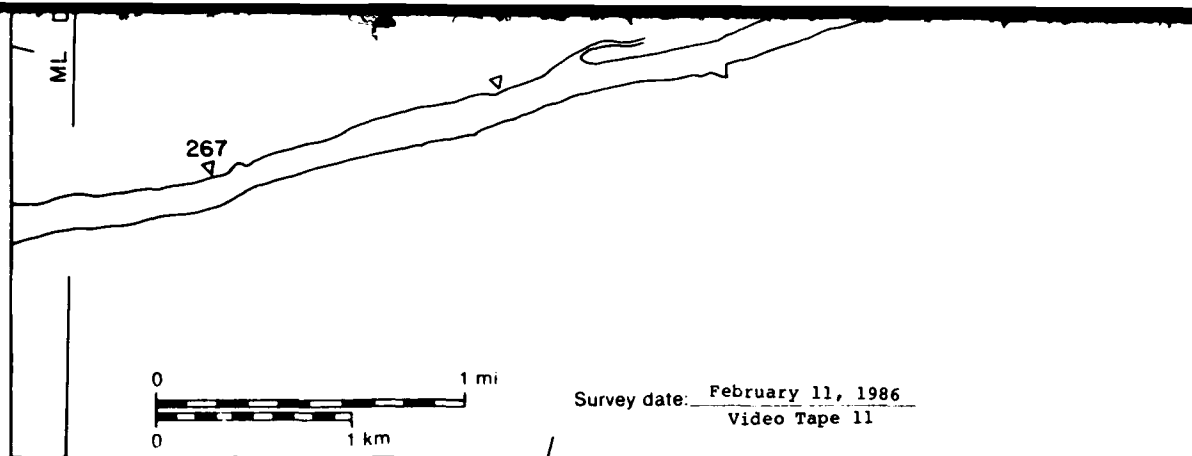
Area
(m² x 10⁶)

6.52	NA






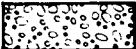
Surface
concentration
(%)

11 February 1986





Marseilles Pool

MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	6.52	NA
	Solid ice cover	0.15	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	1.52	10
Total area ($m^2 \times 10^6$)		8.19	

1986
11

88°17'30"

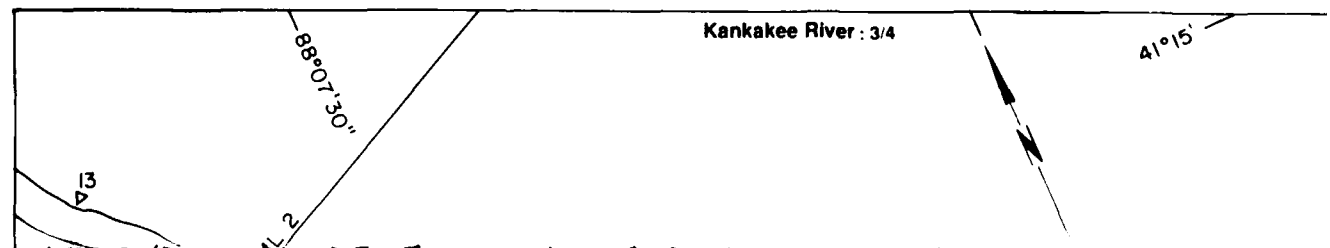
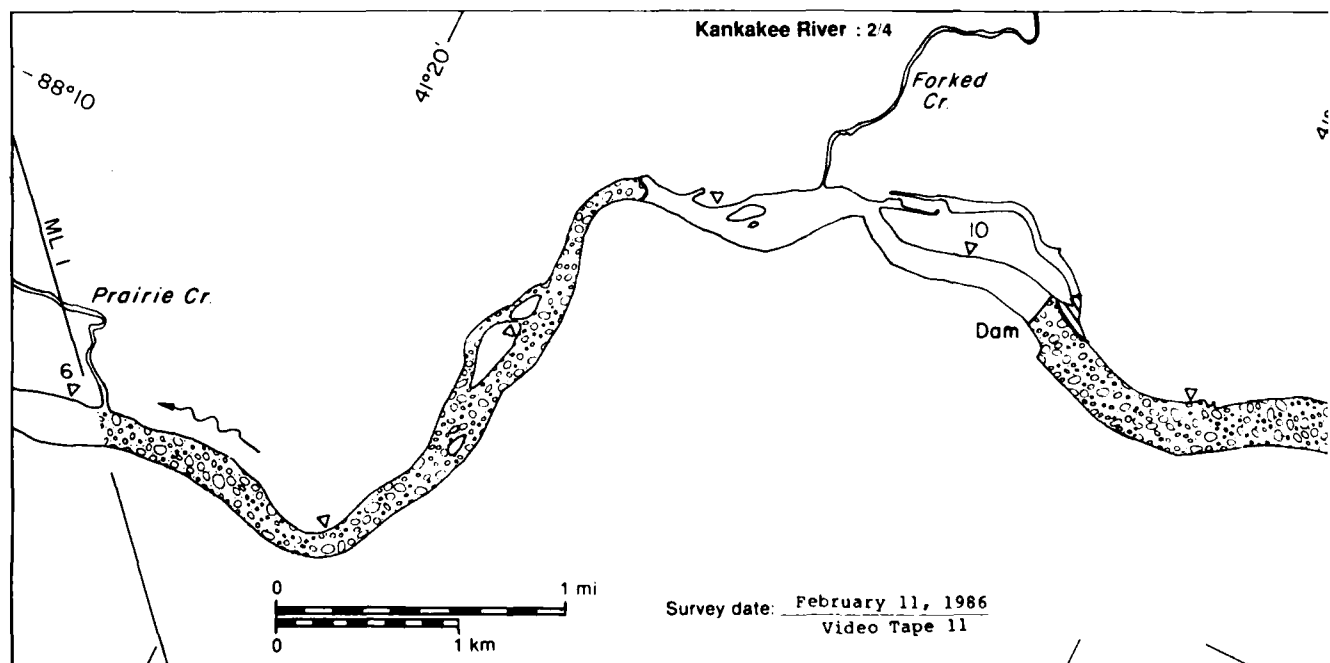
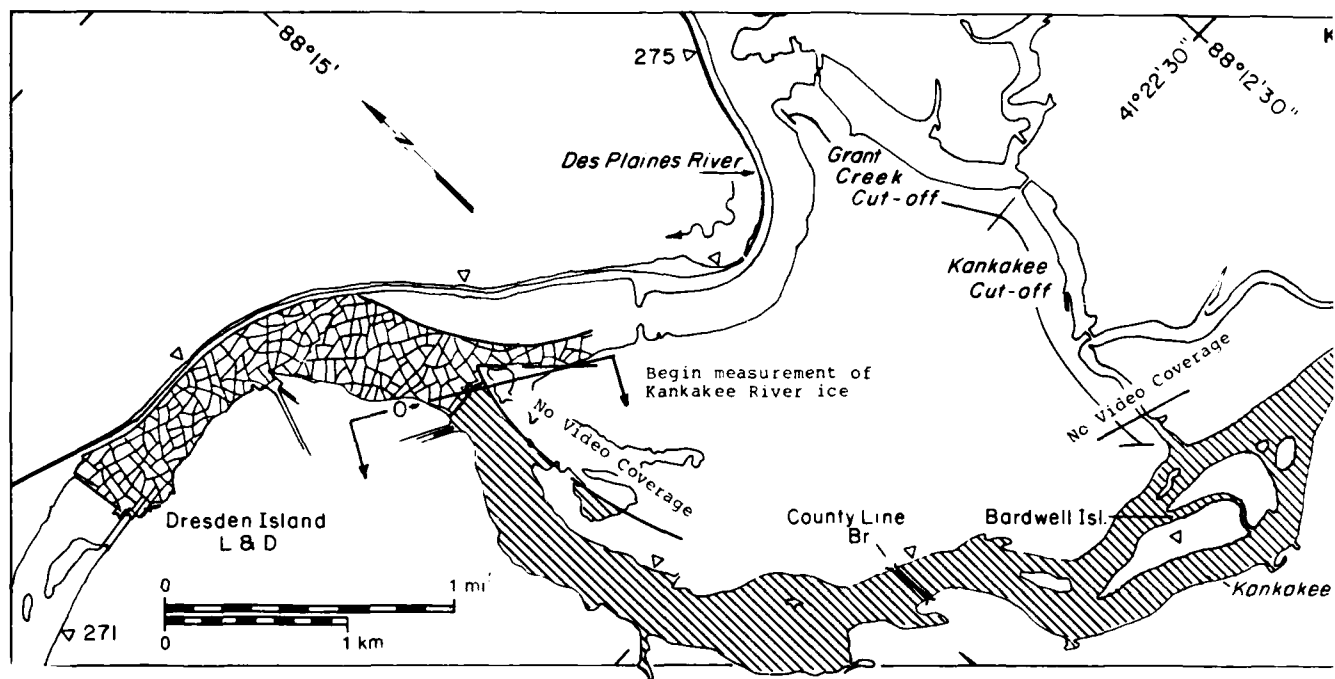
41°22'30"

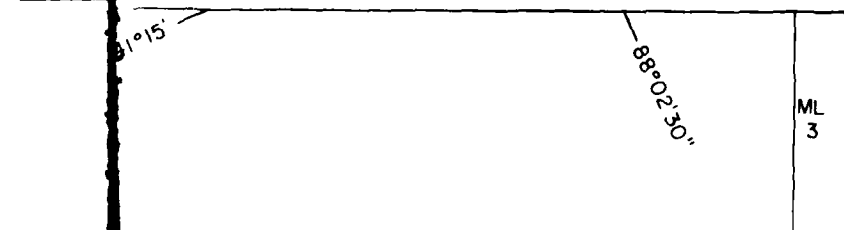
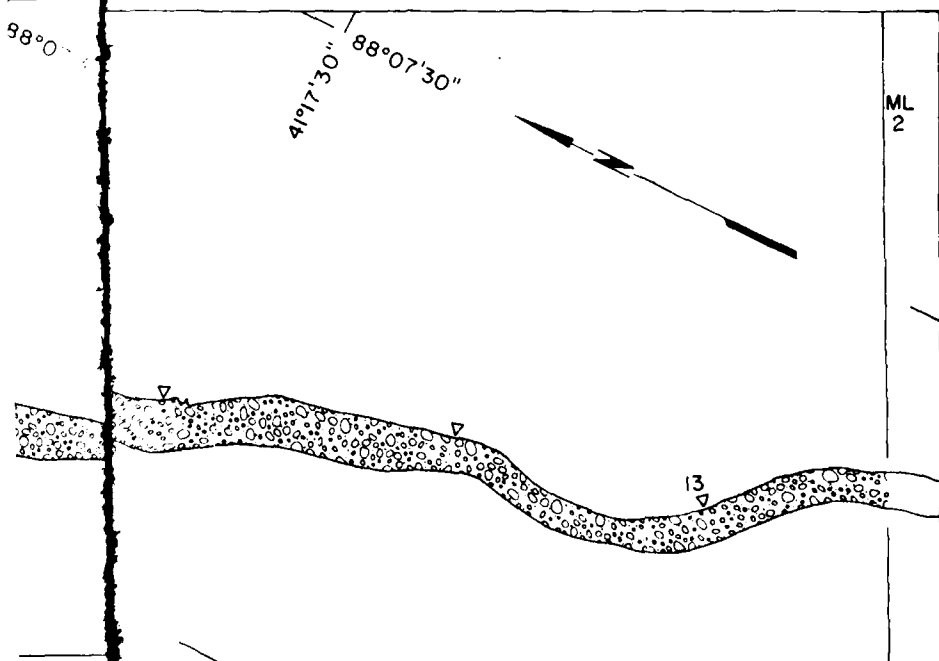
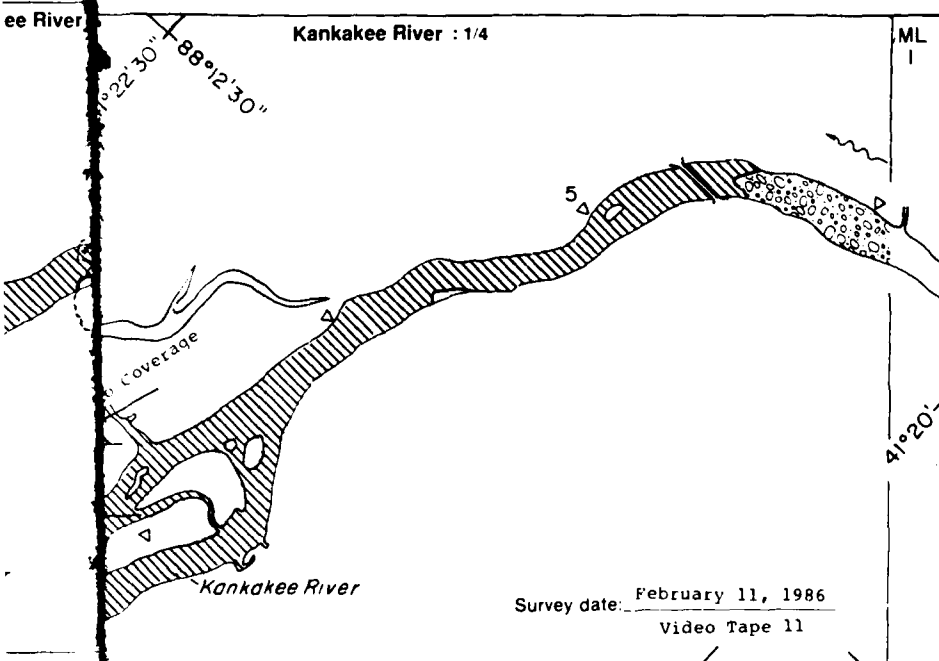
Kankakee R.

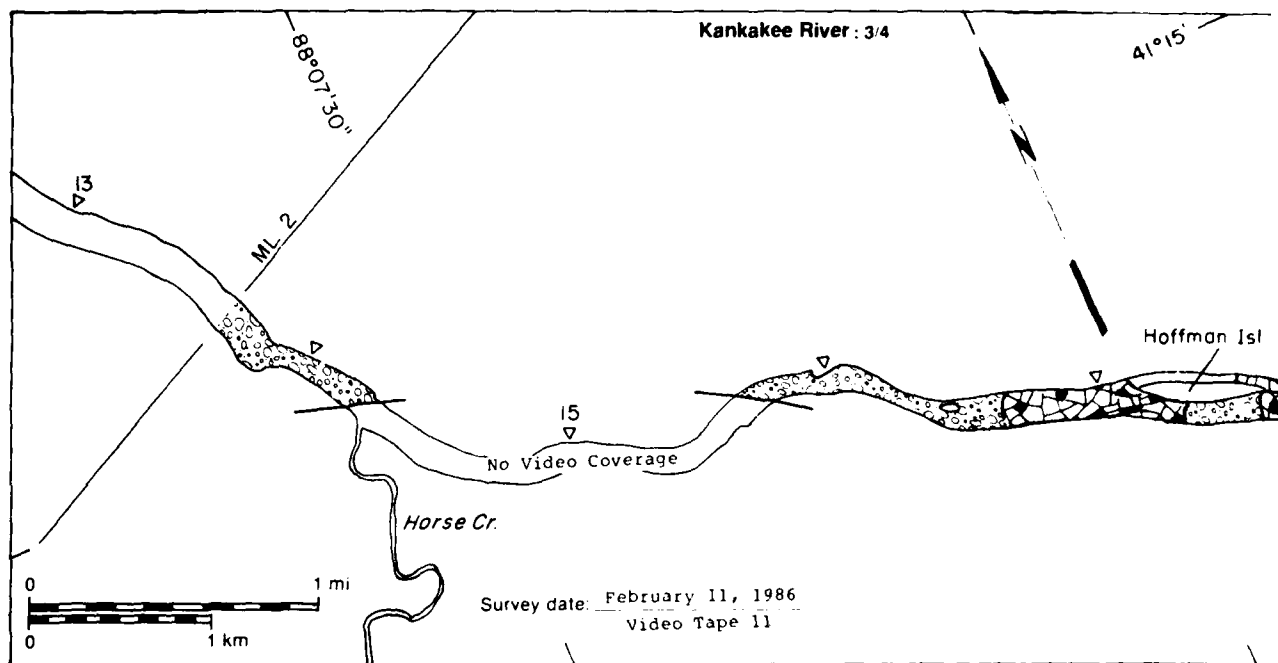
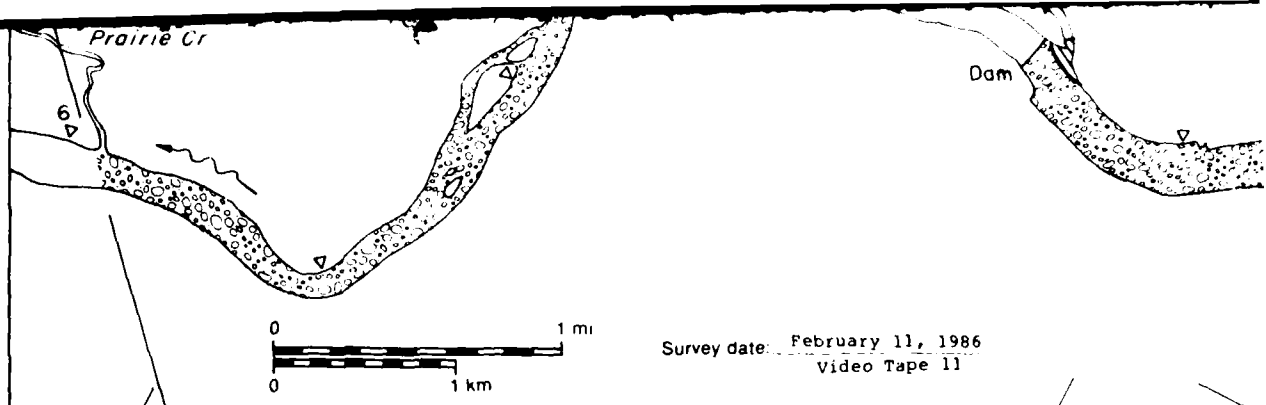
Δ273

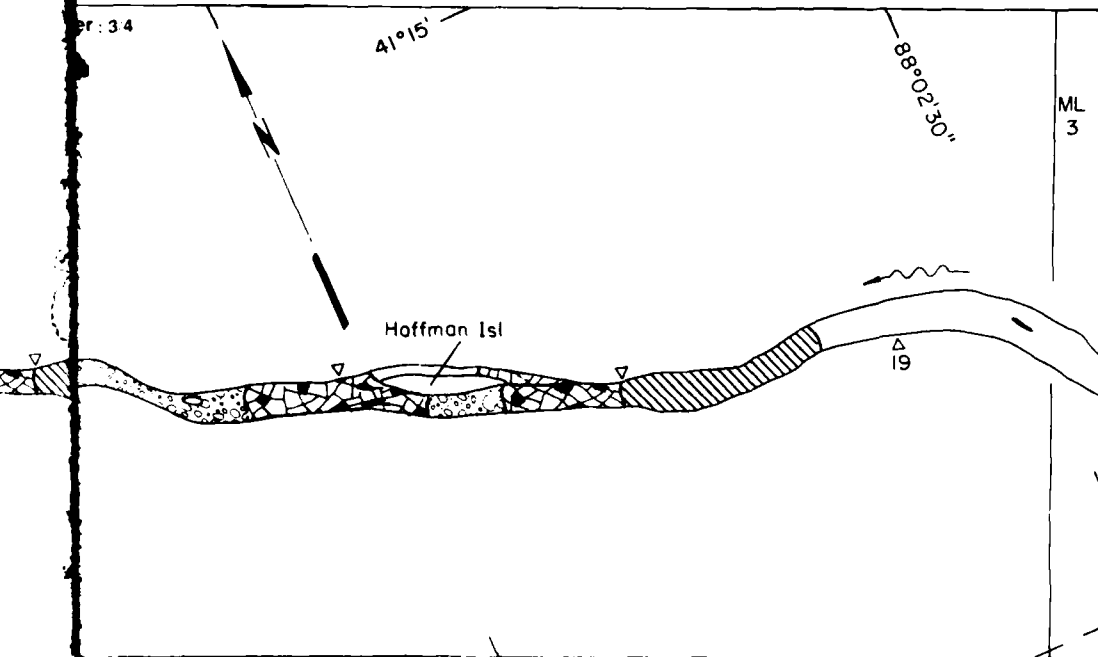
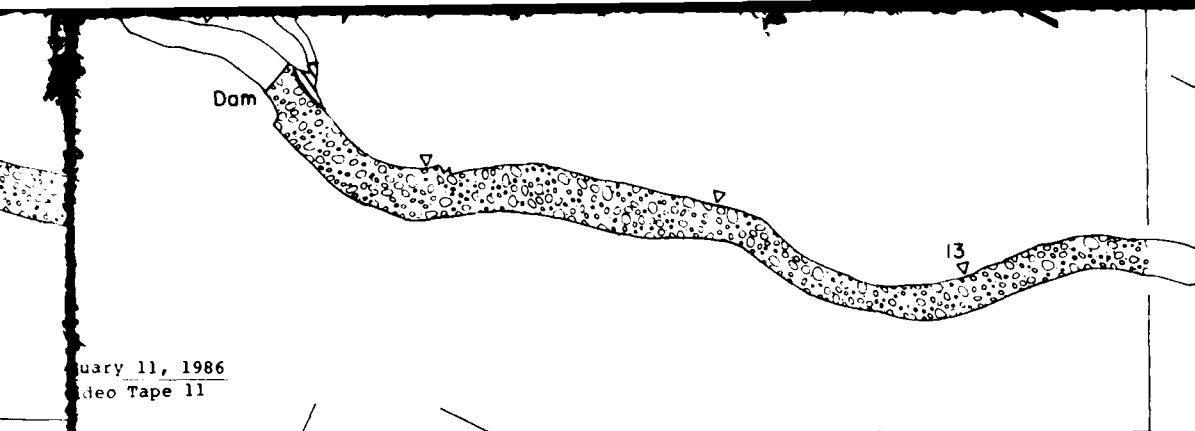
Des
Plaines
River

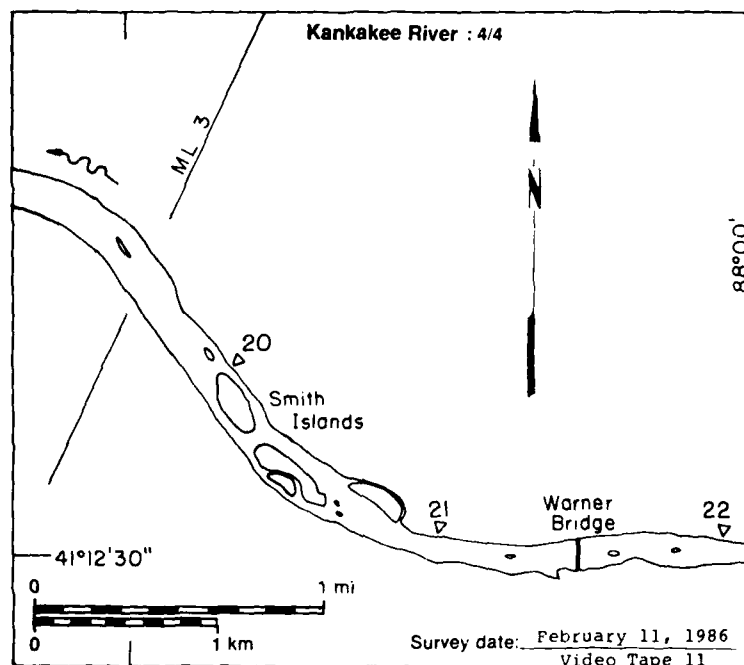
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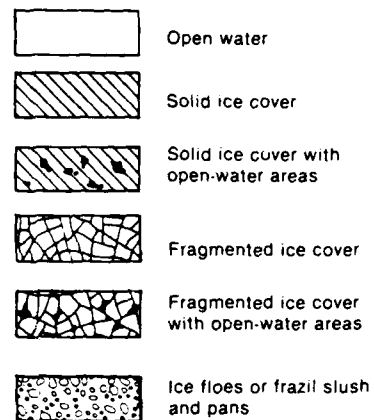






Kankakee River

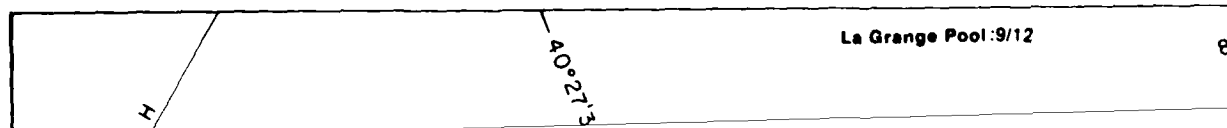
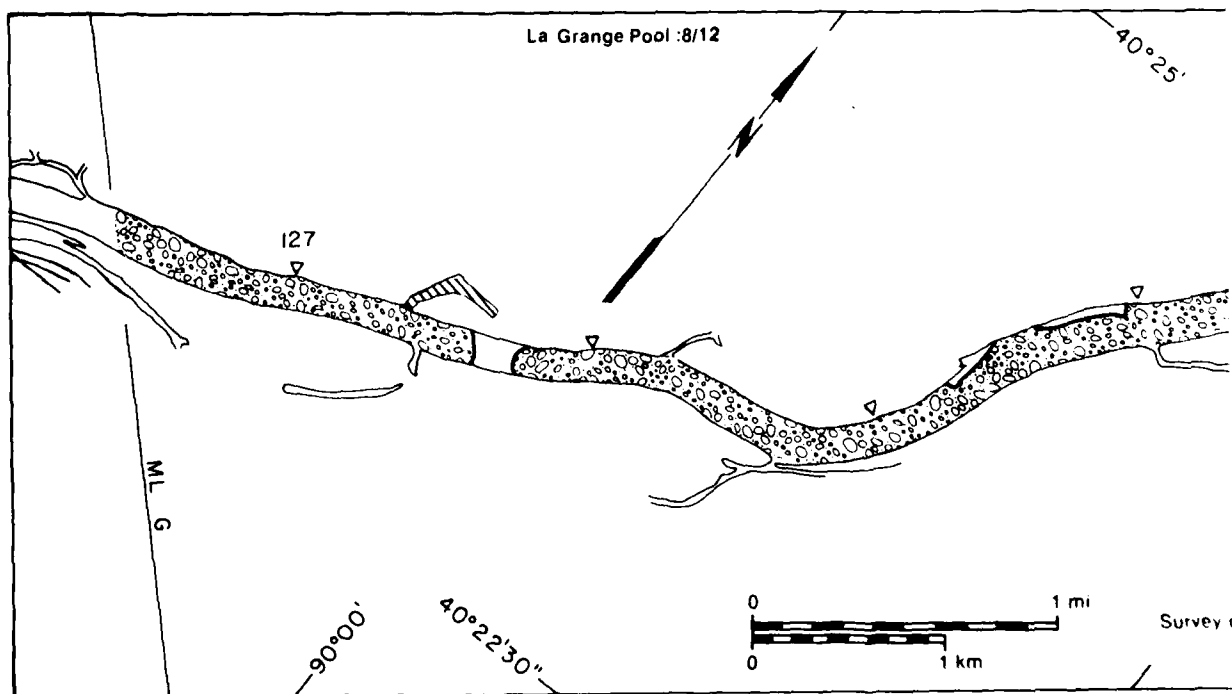
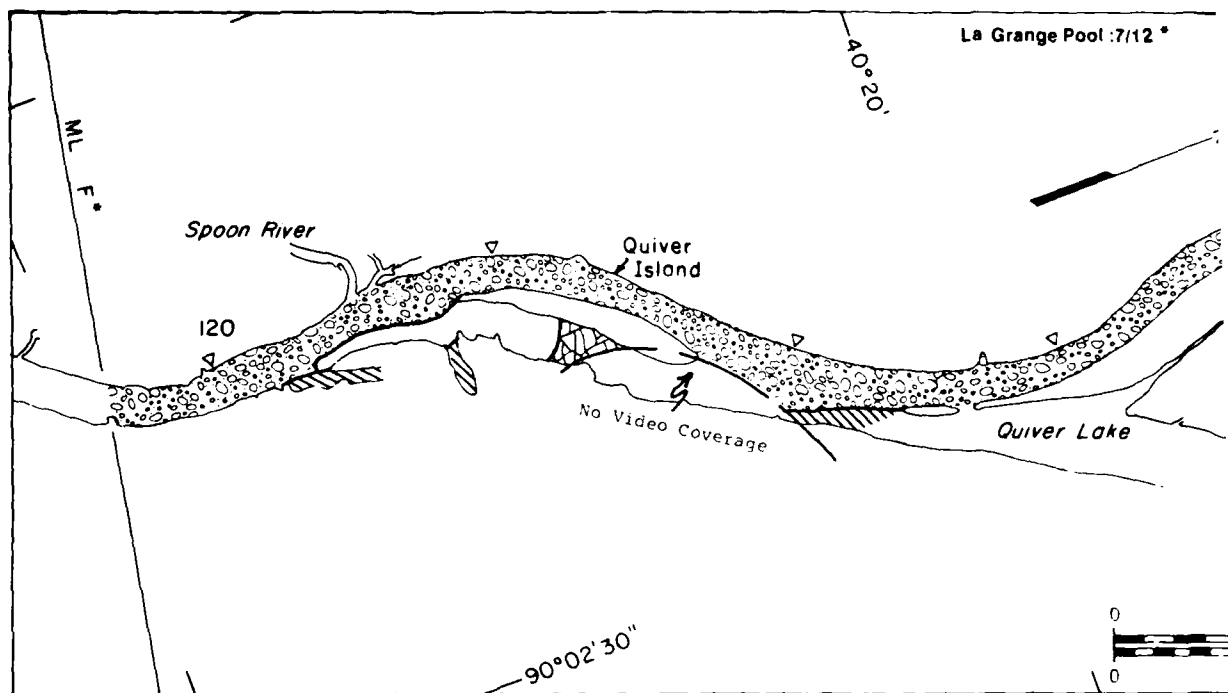
MAP UNITS



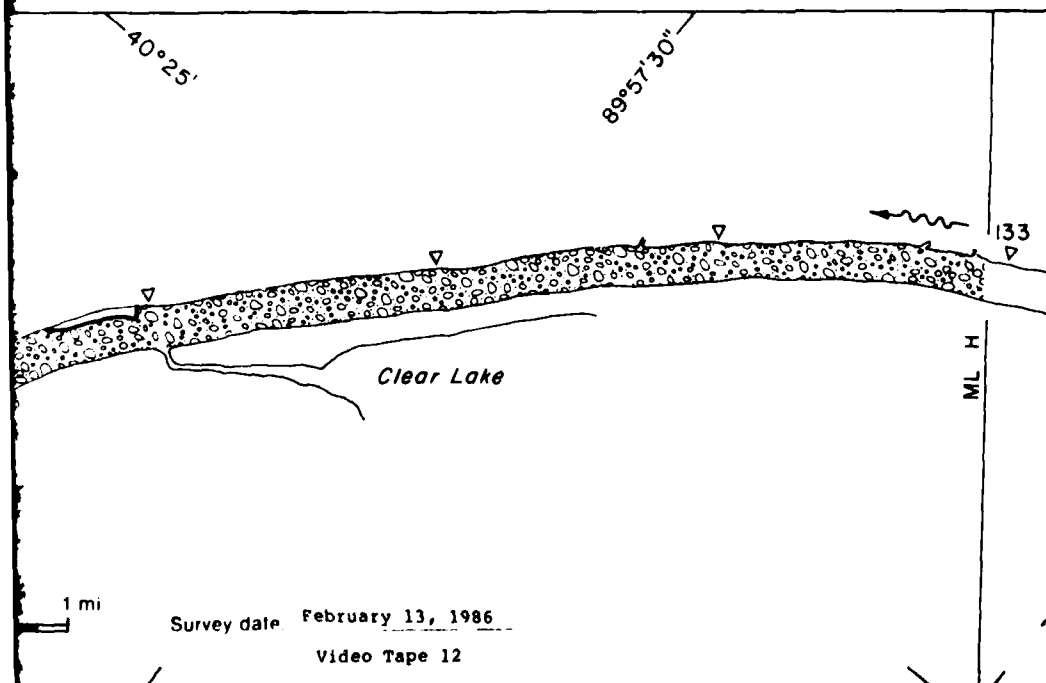
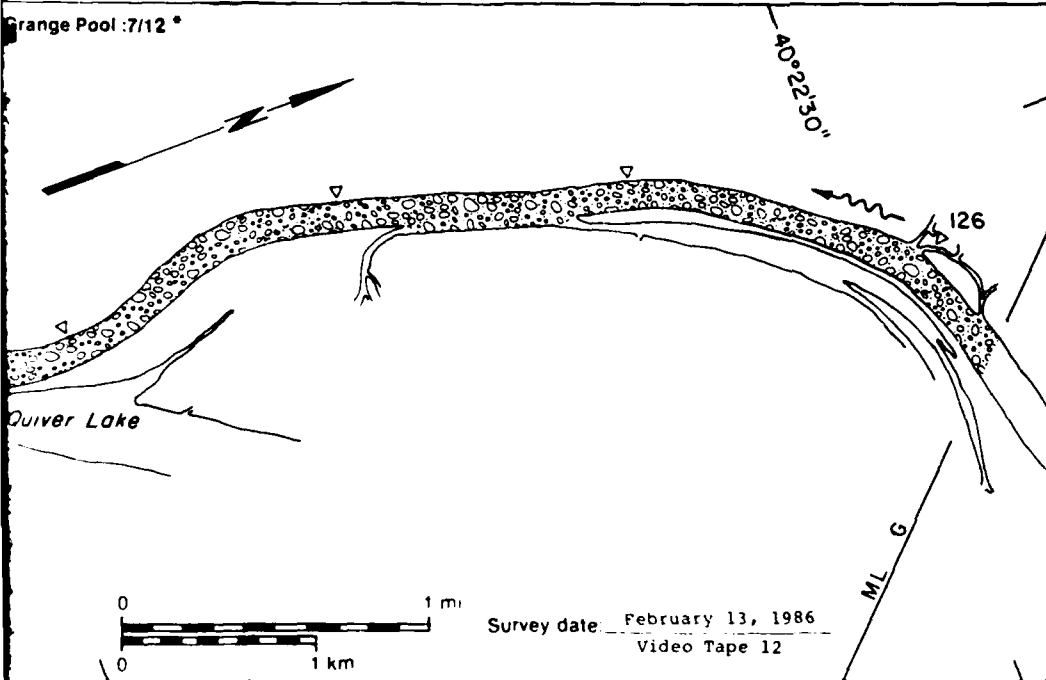
Total area (m² x 10⁶)

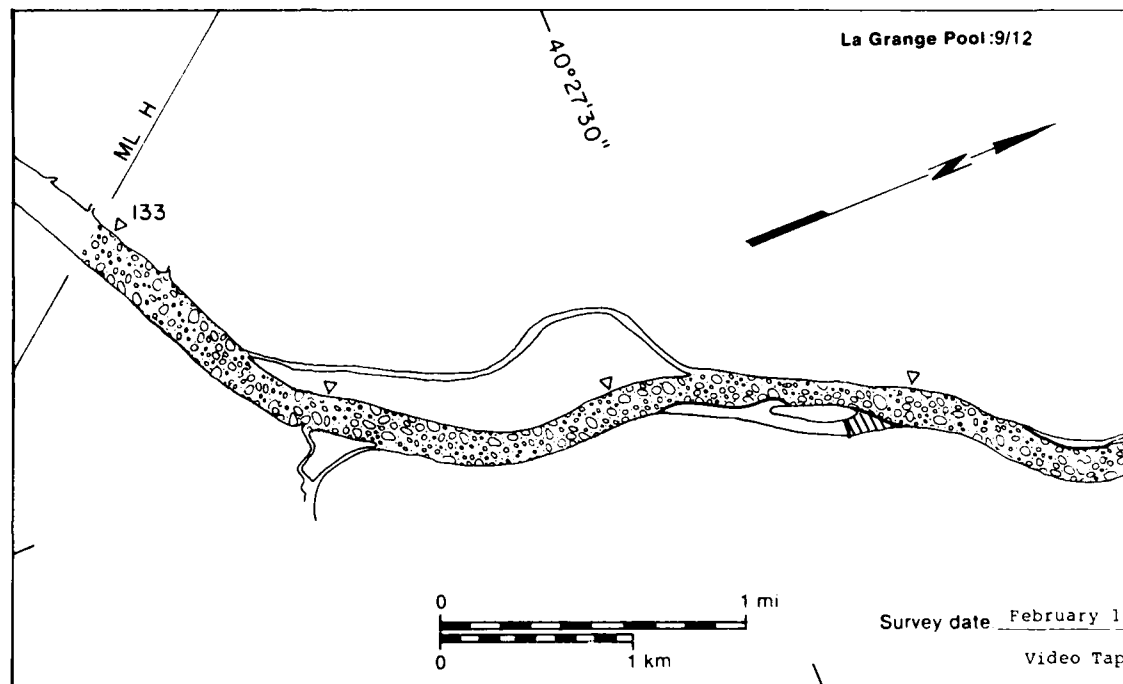
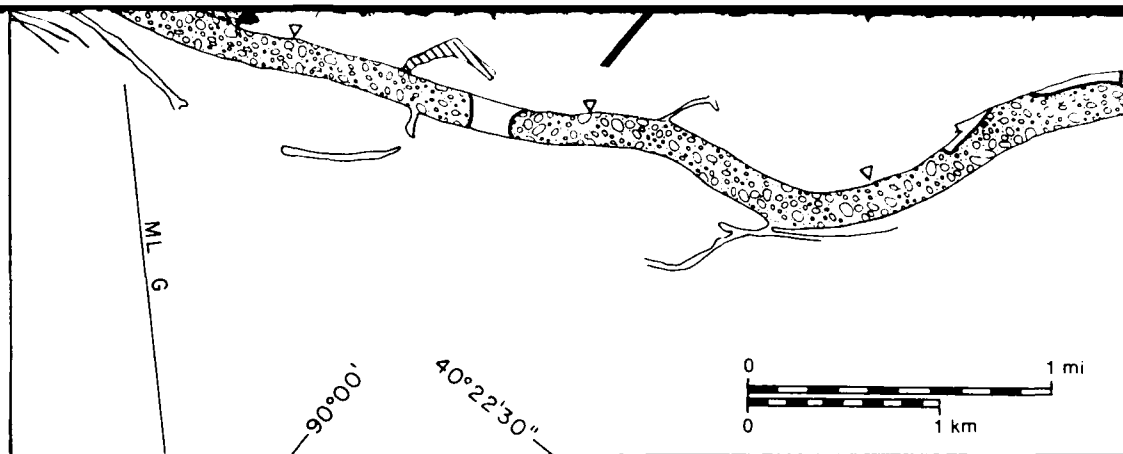
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Kankakee River		Area	Surface
MAP UNITS		($m^2 \times 10^6$)	concentration (%)
1.37	Open water	1.37	NA
2.71	Solid ice cover	2.71	NA
0.00	Solid ice cover with open-water areas	0.00	—
0.03	Fragmented ice cover	0.03	NA
0.25	Fragmented ice cover with open-water areas	0.25	60
2.31	Ice floes or frazil slush and pans	2.31	70
7.30*	Total area ($m^2 \times 10^6$)	7.30*	* Includes $0.63 \times 10^6 m^2$ of no video coverage

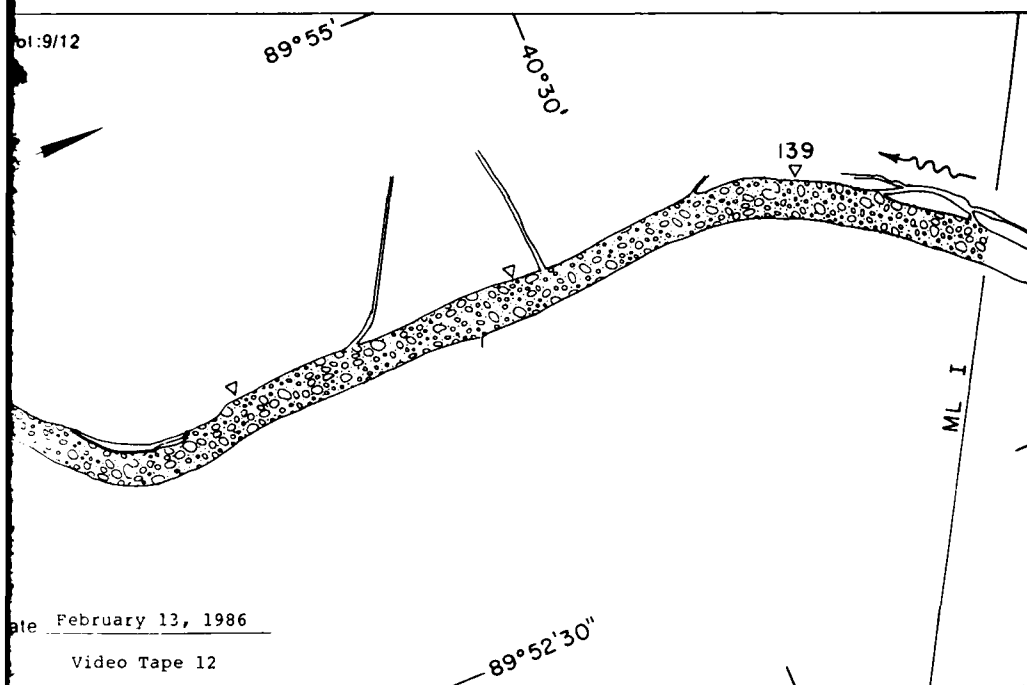
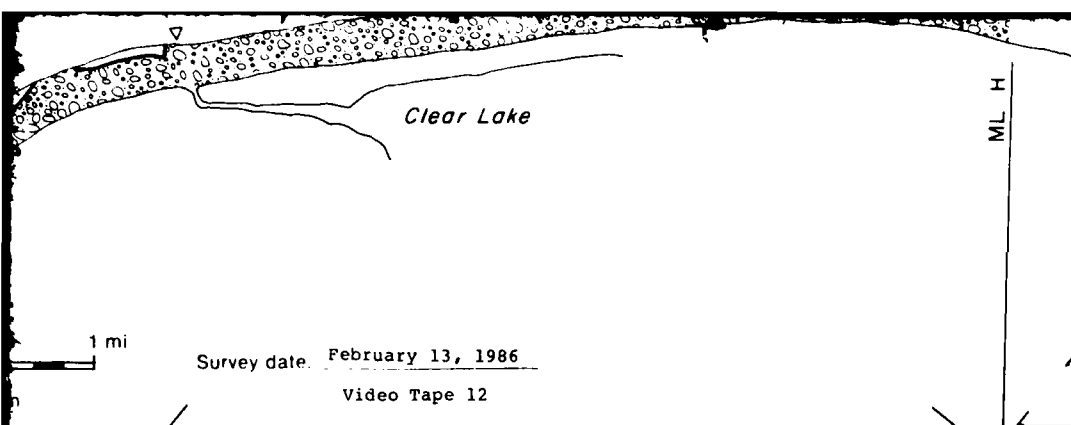


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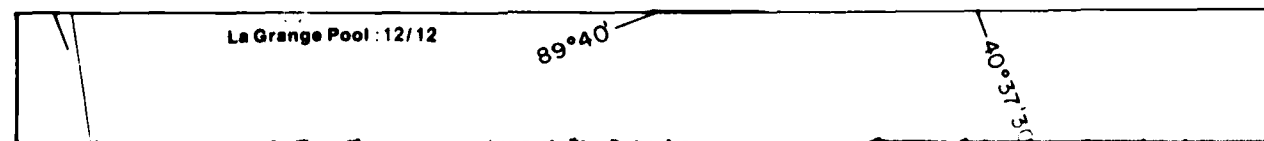
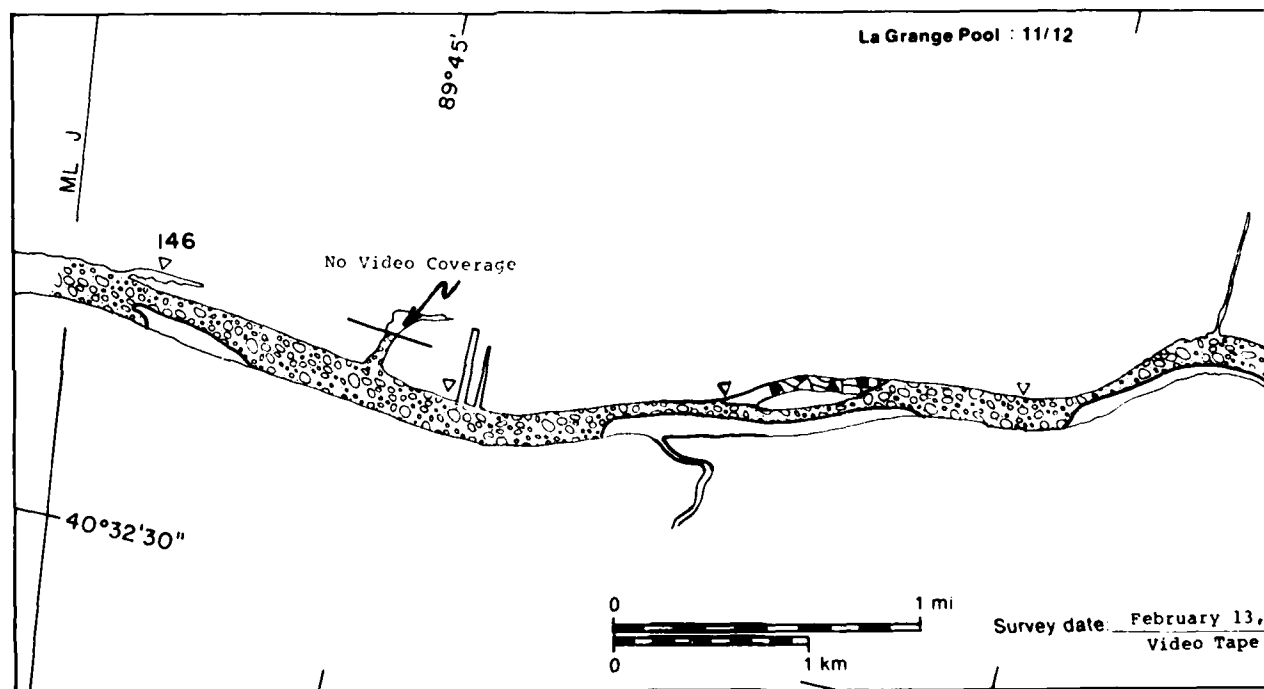
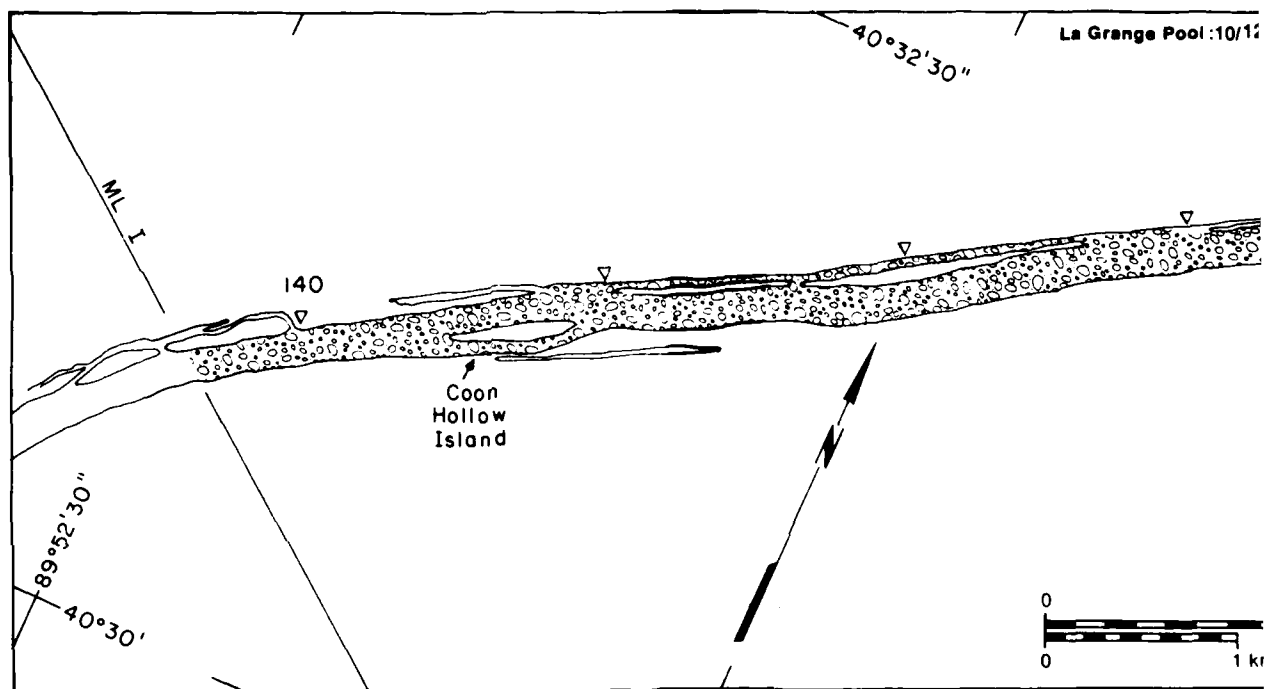


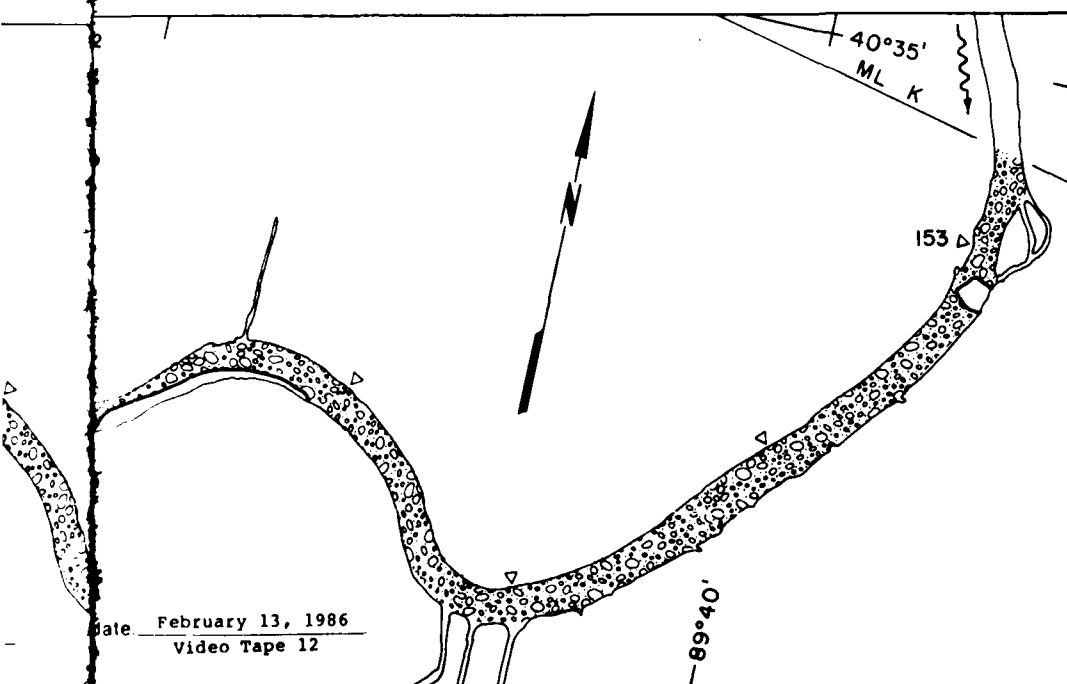
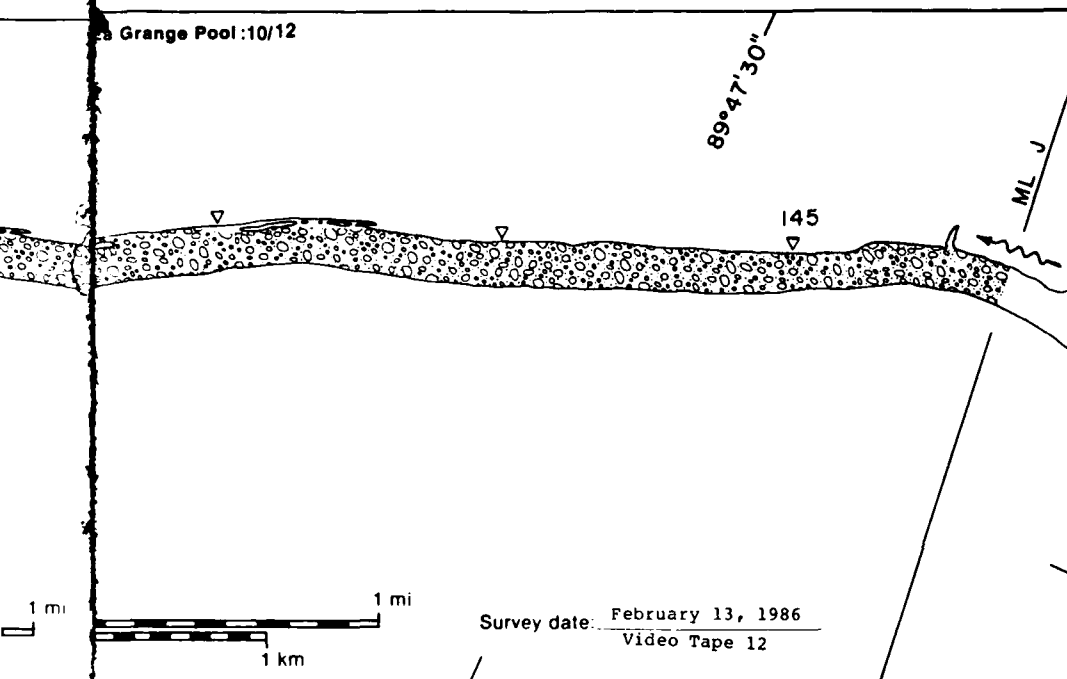


* The downstream limit of Illinois River video coverage was in the vicinity of mile 120 at Havana, Illinois, on all dates. There is no coverage of La Grange Pool maps 1/12 through 6/12 (match lines A through E).



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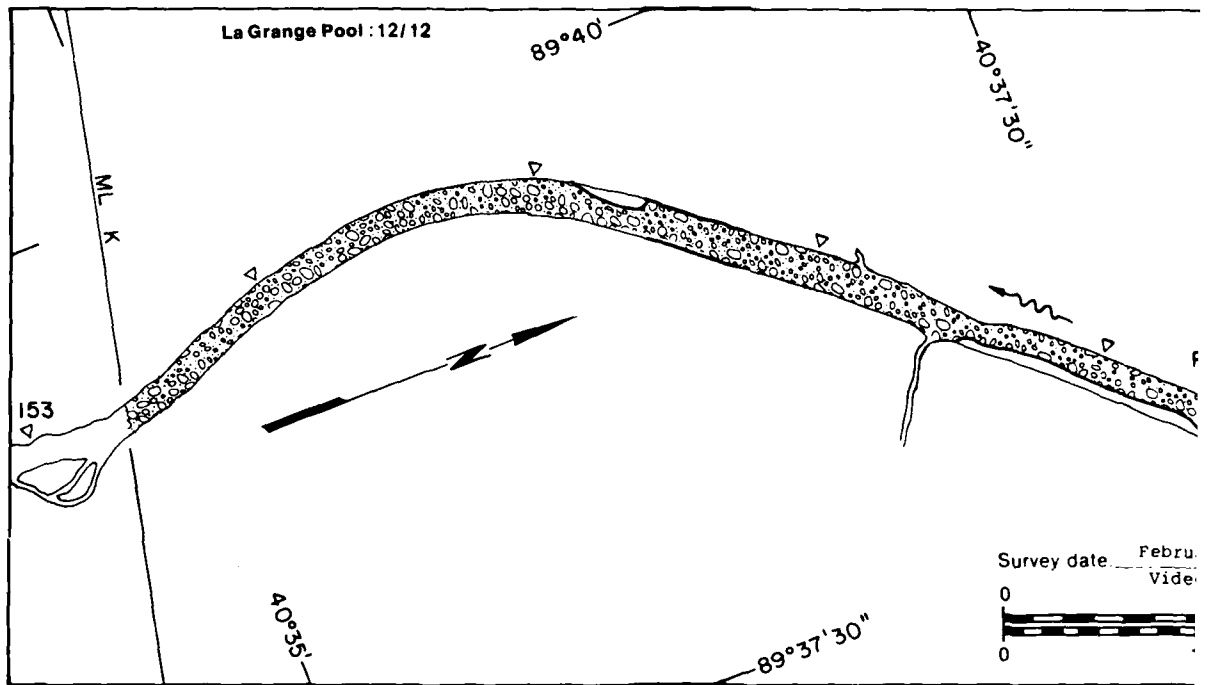
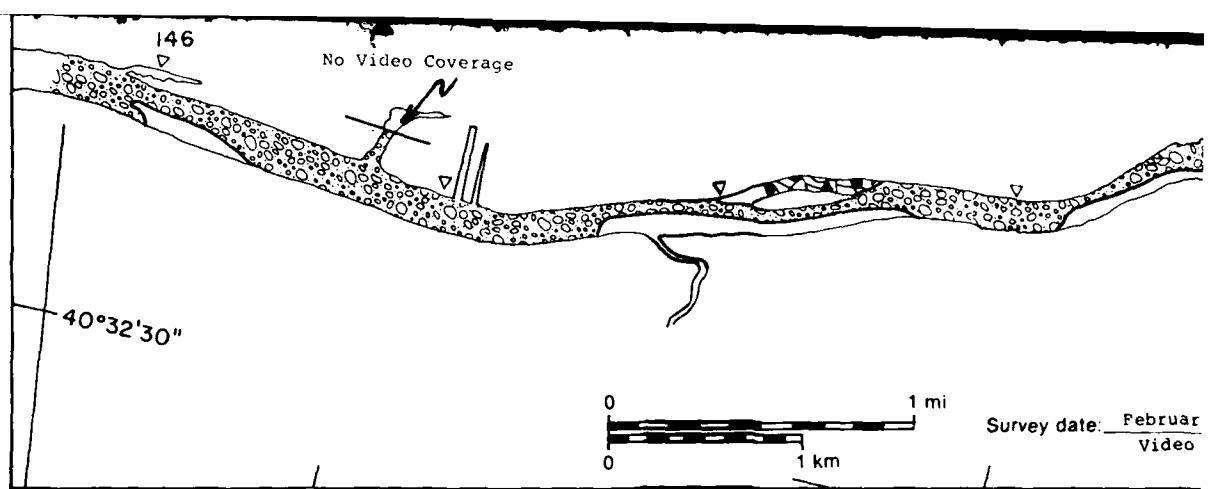


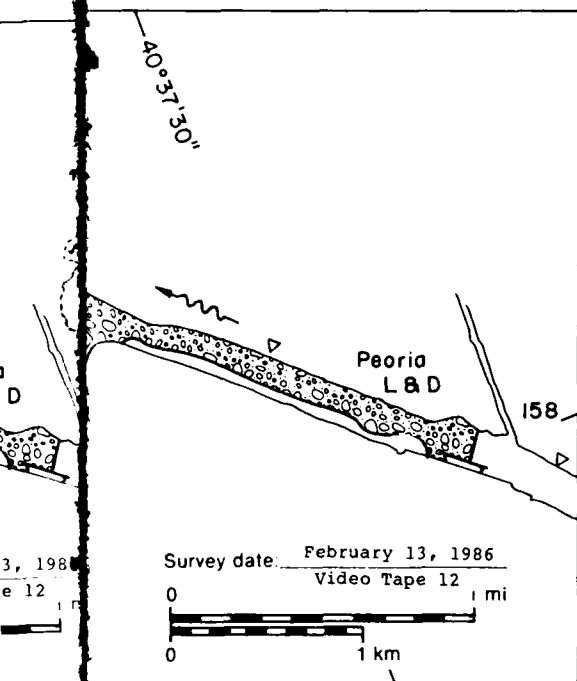
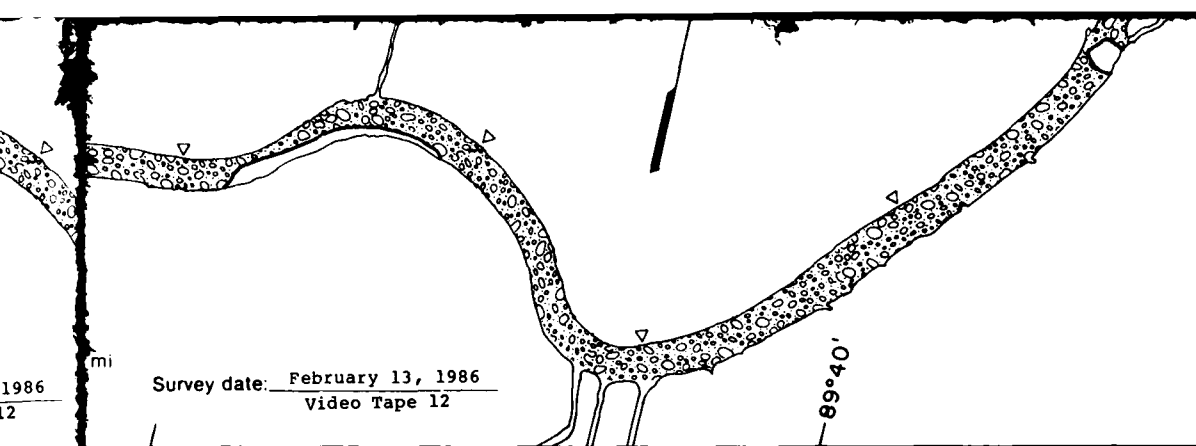
La Grange Pool

MAP UNITS

Area
(m² × 10⁶)

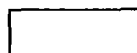
Surface
concentration
(%)





La Grange Pool

MAP UNITS



Open water



Solid ice cover



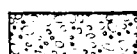
Solid ice cover with open-water areas



Fragmented ice cover



Fragmented ice cover with open-water areas

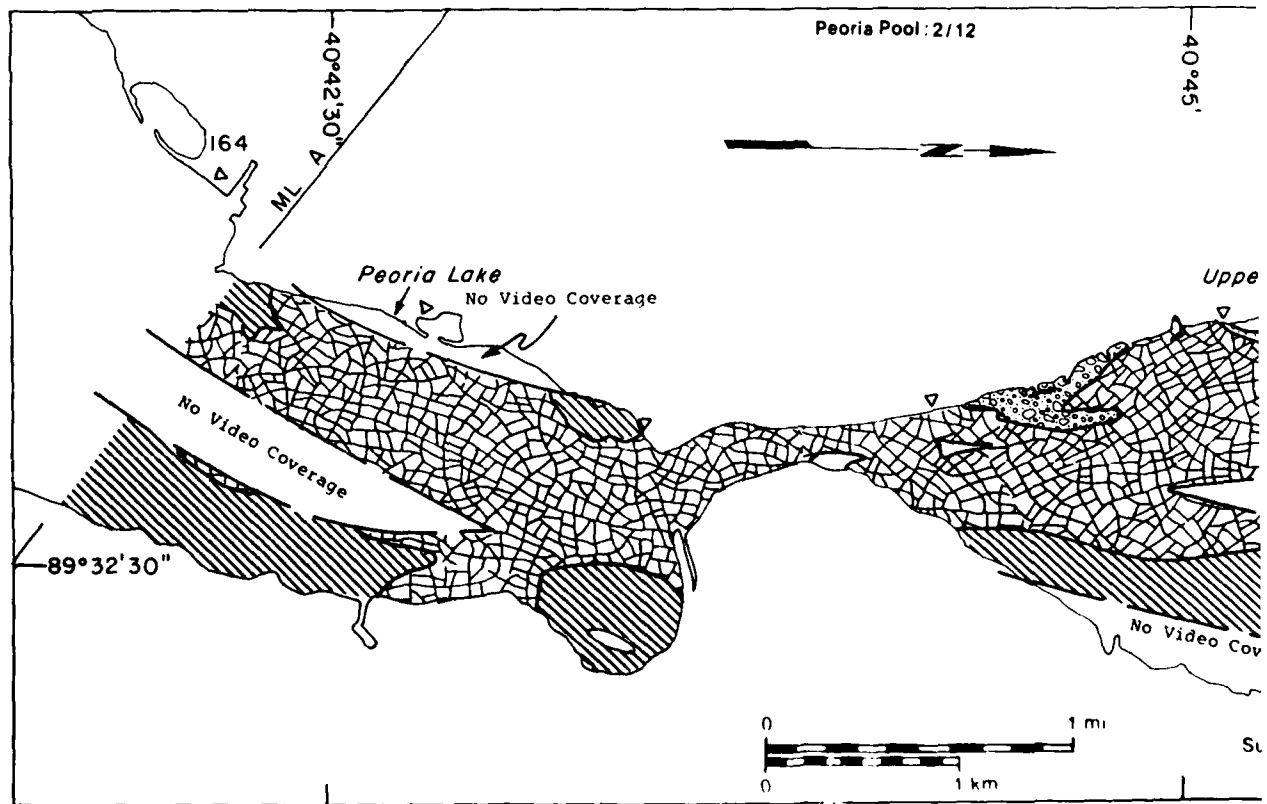
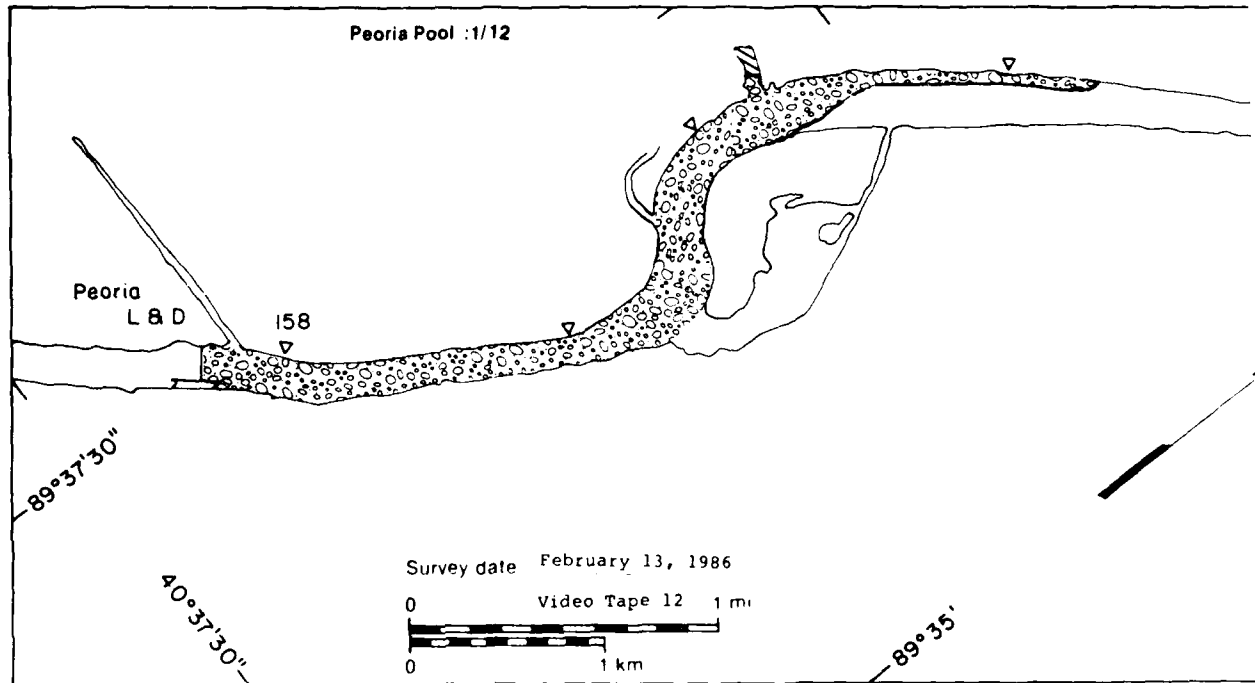


Ice floes or frazil slush and pans

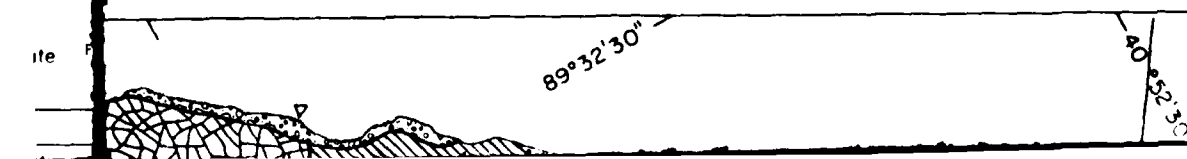
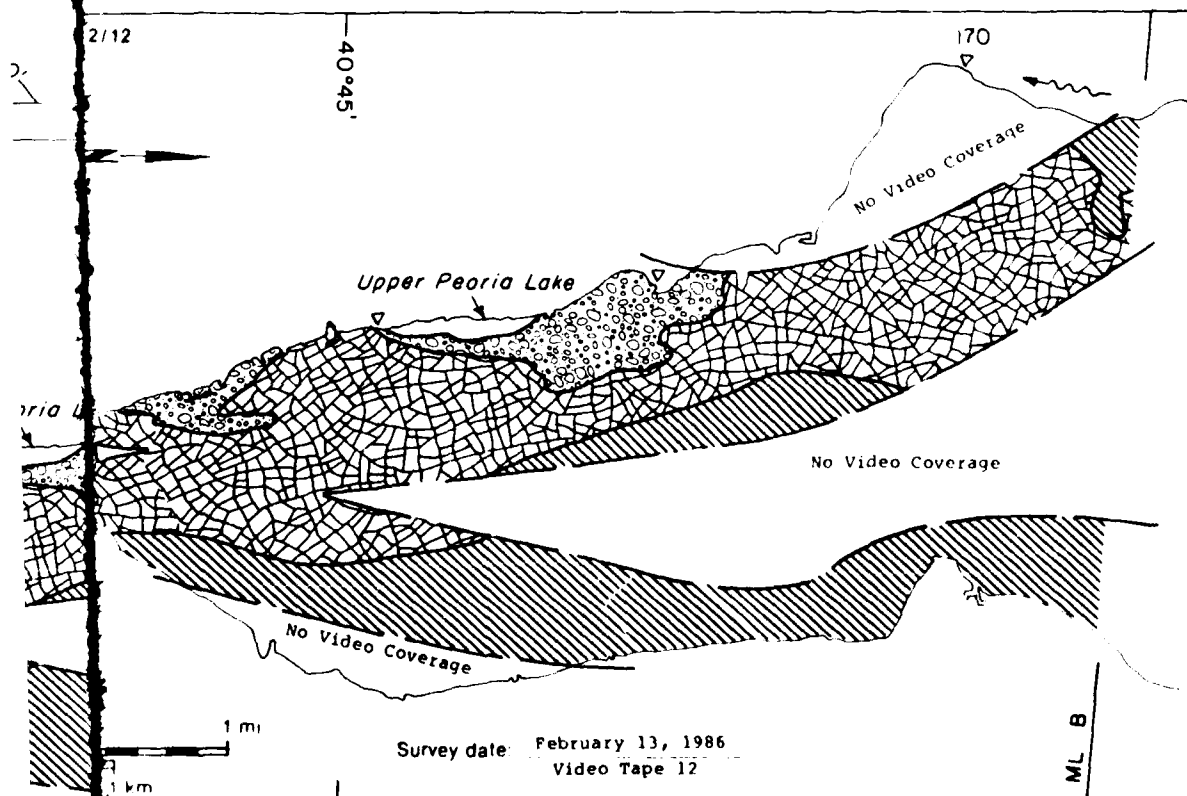
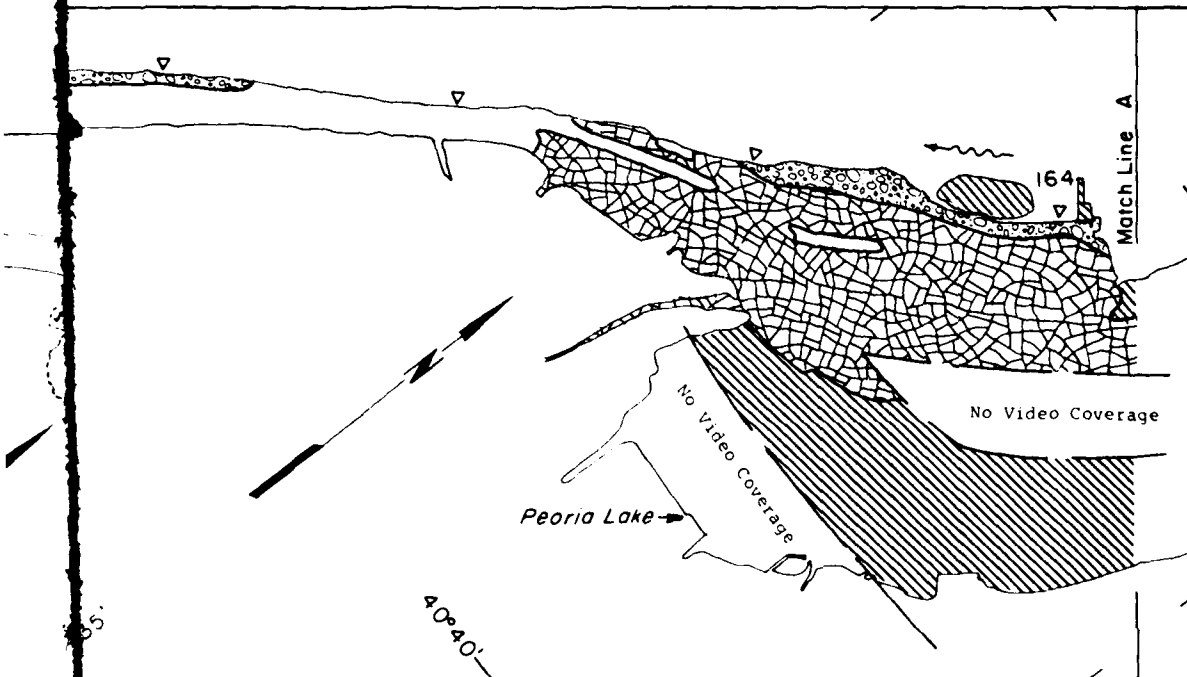
Total area ($m^2 \times 10^6$)

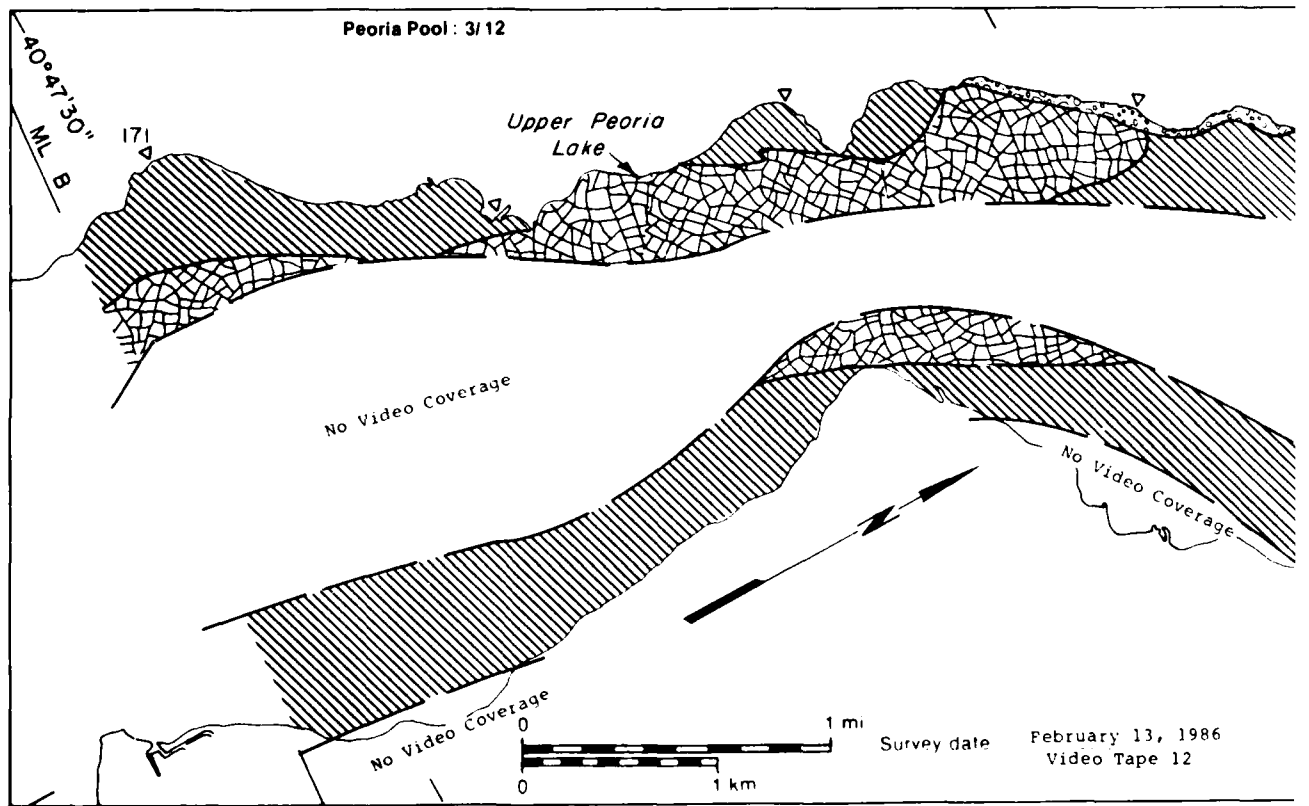
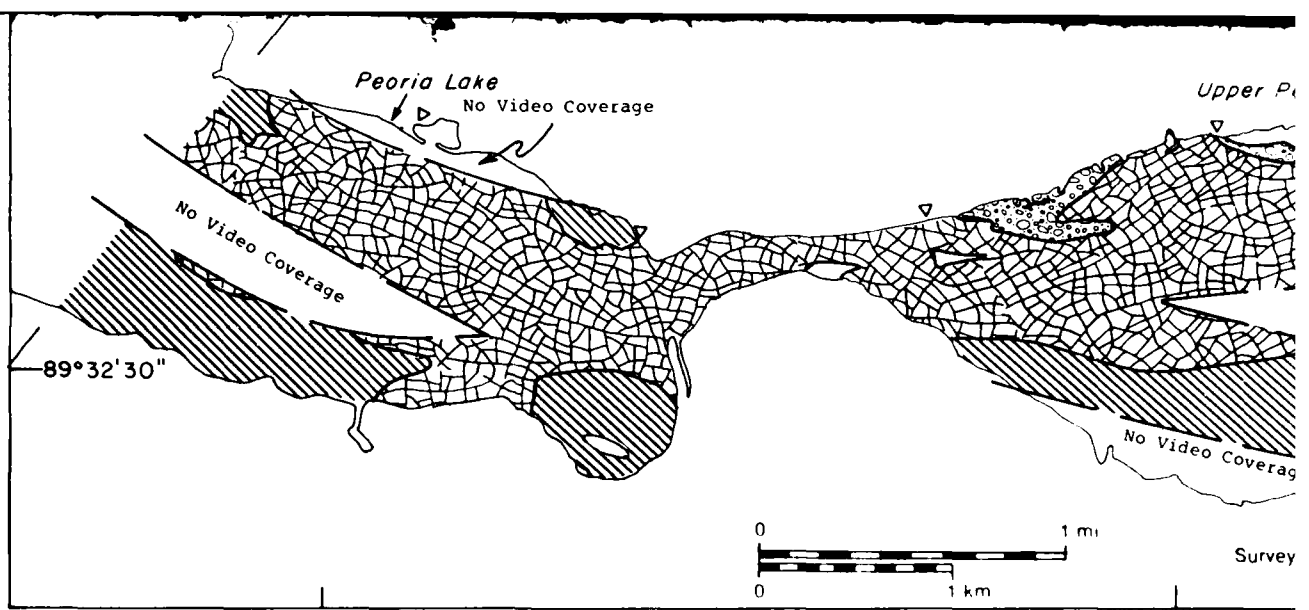
Area ($m^2 \times 10^6$)	Surface concentration (%)
0.87	NA
0.11	NA
0.00	—
0.05	NA
0.03	70
10.43	50
11.71*	

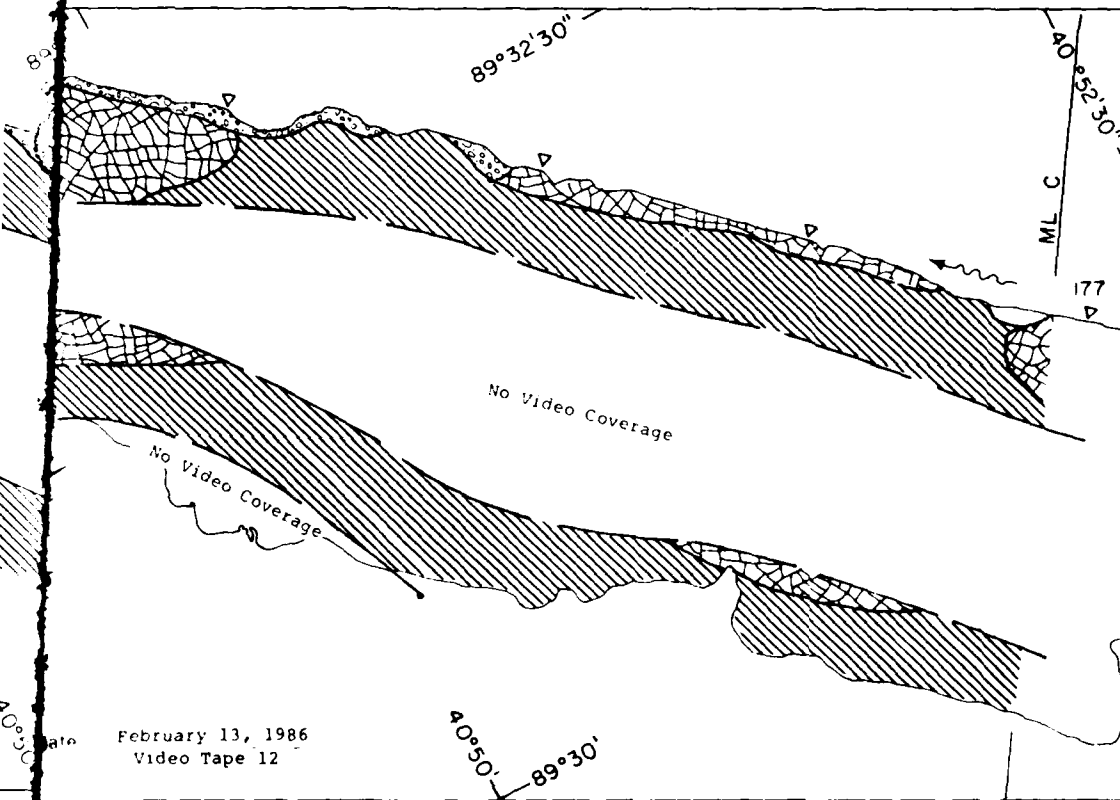
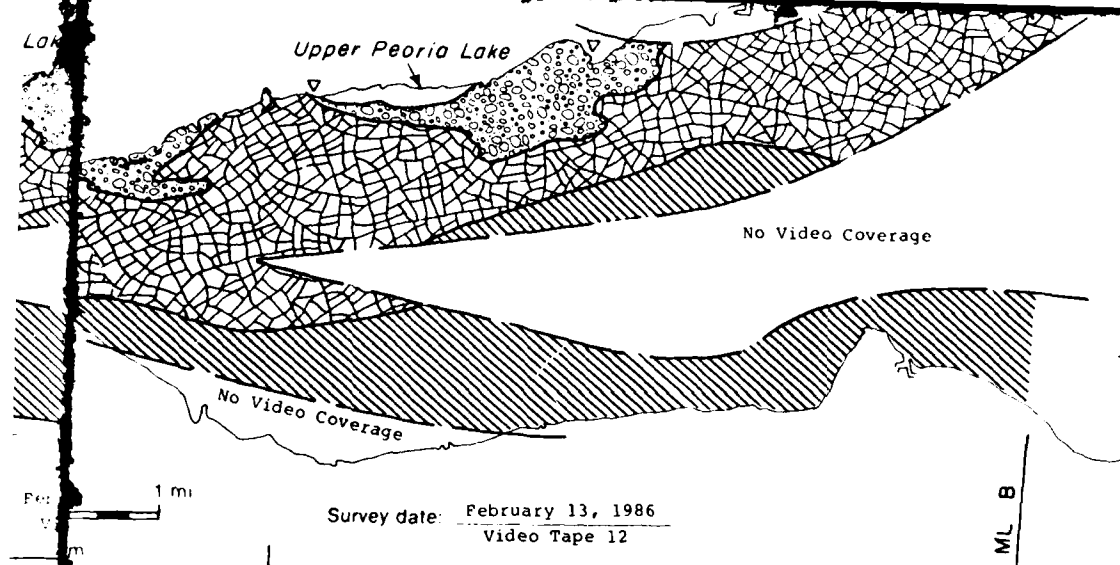
* Includes $0.22 \times 10^6 m^2$
of no video coverage



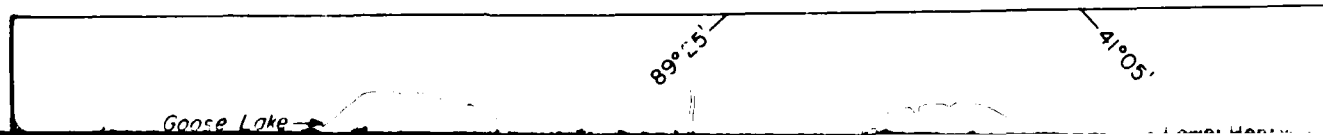
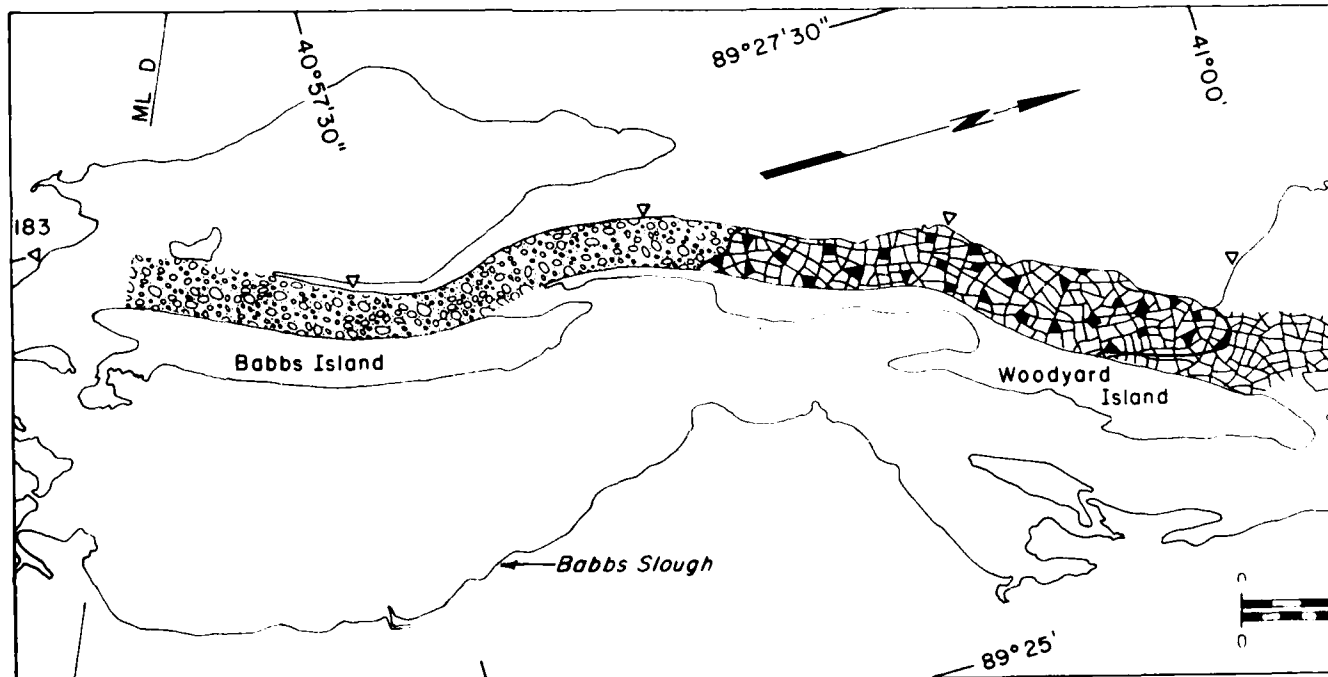
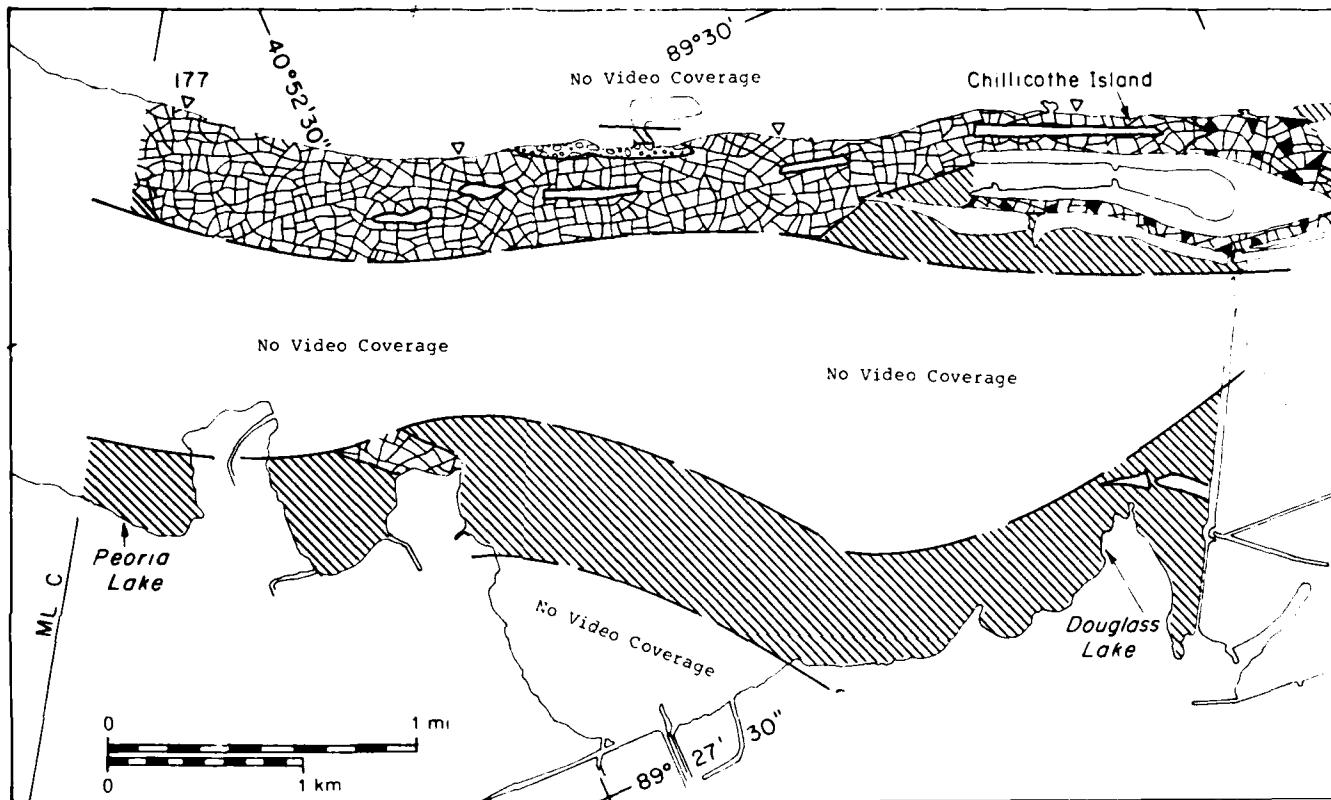
13 February 1986

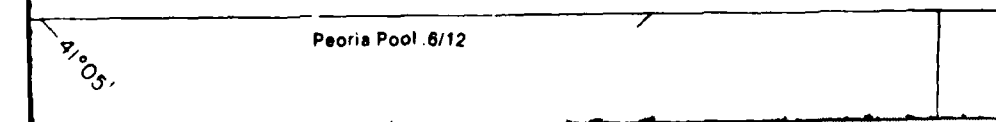
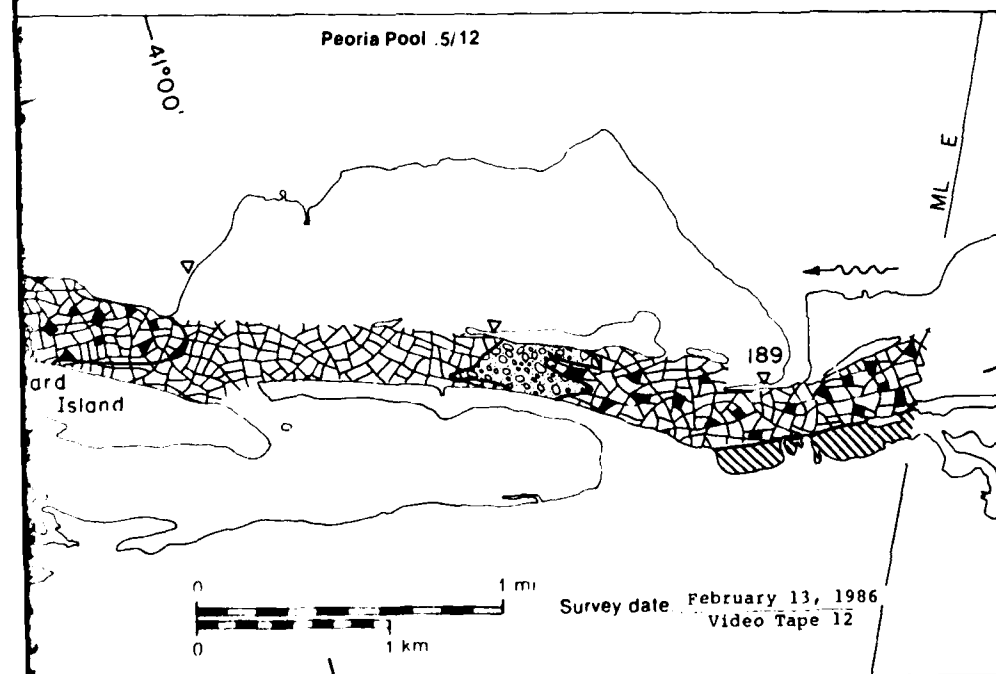
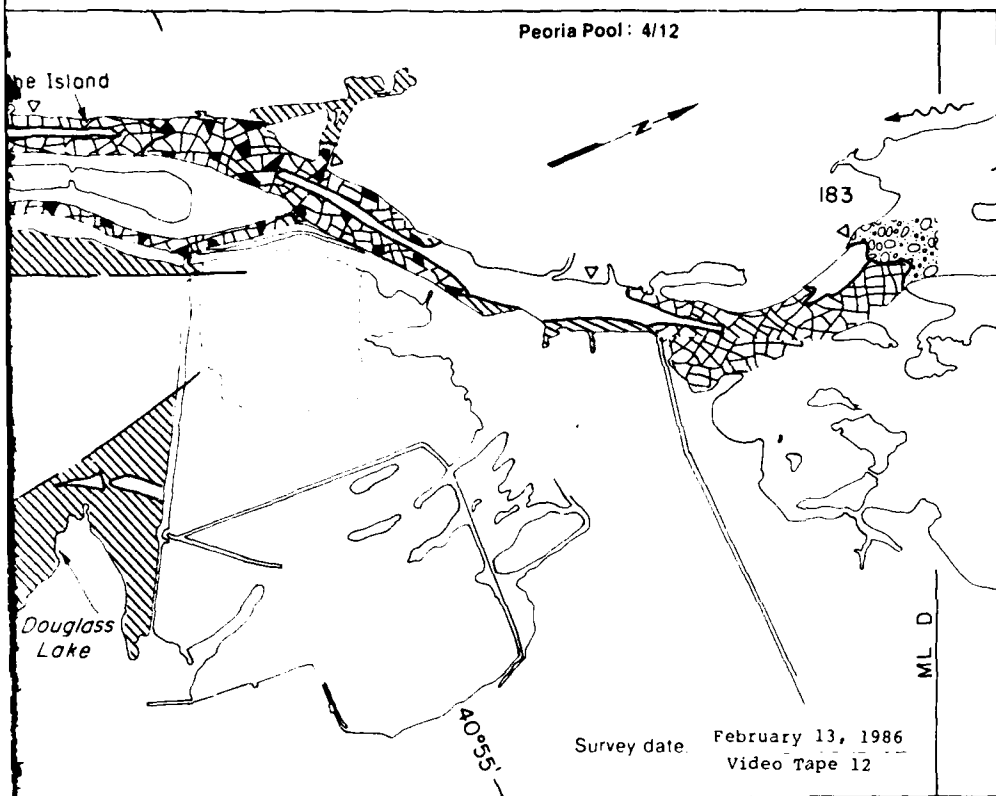


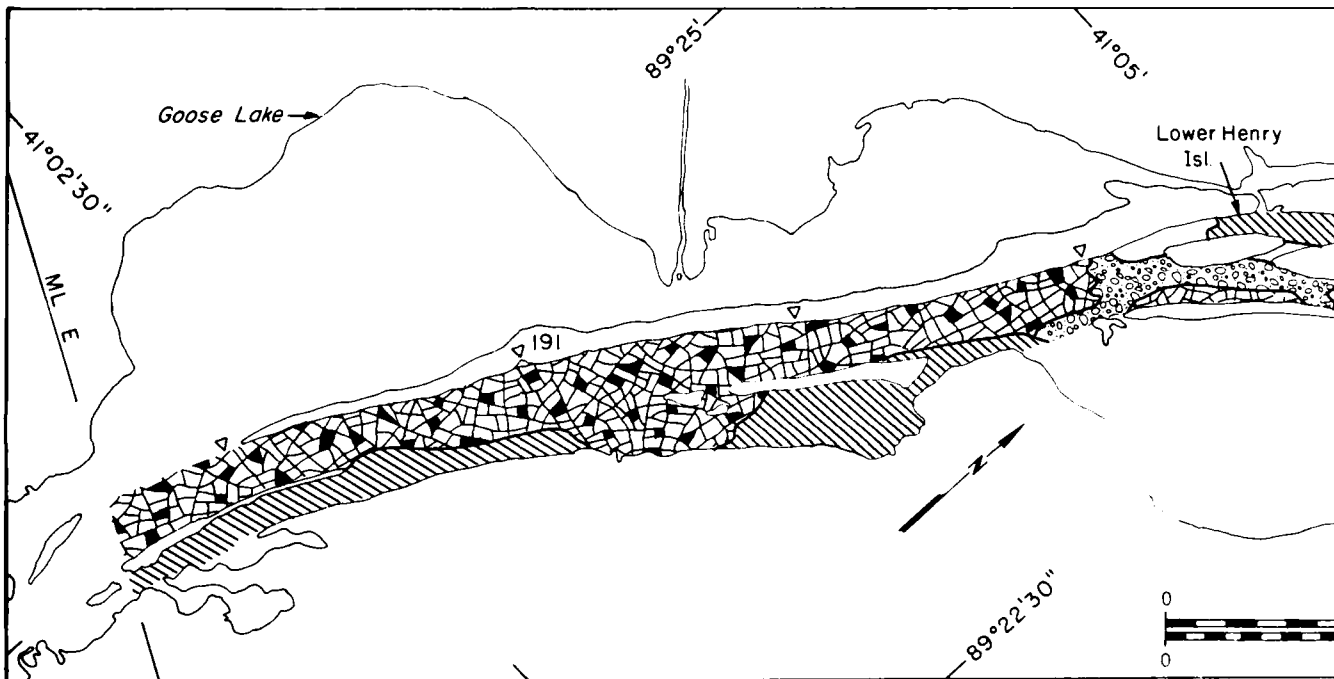
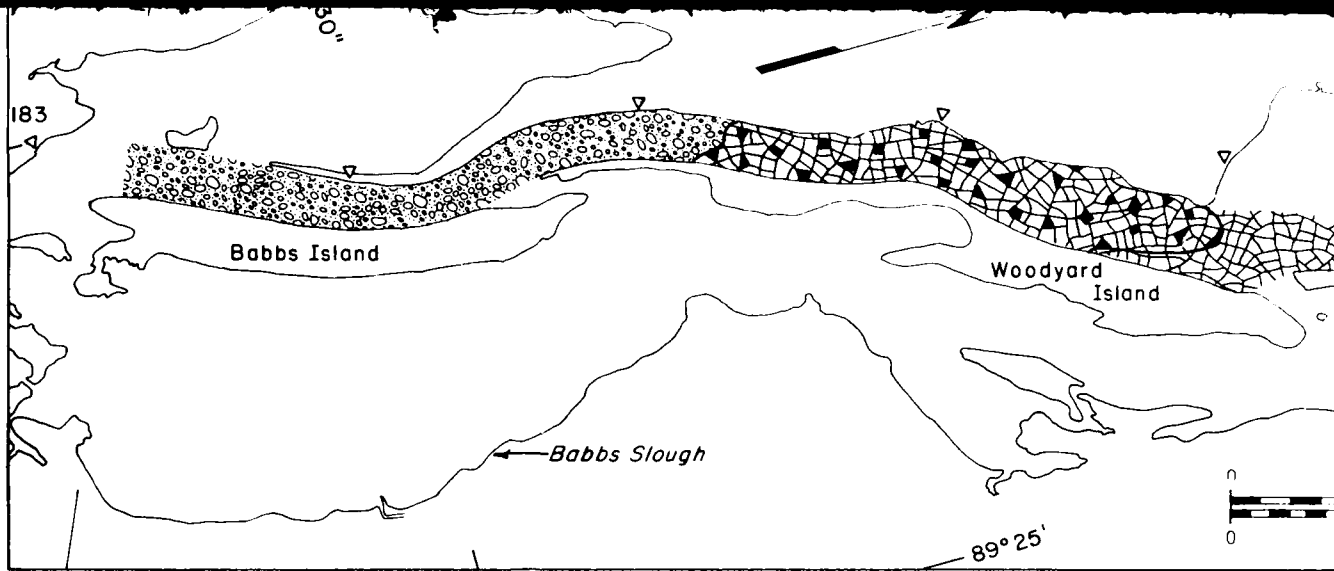


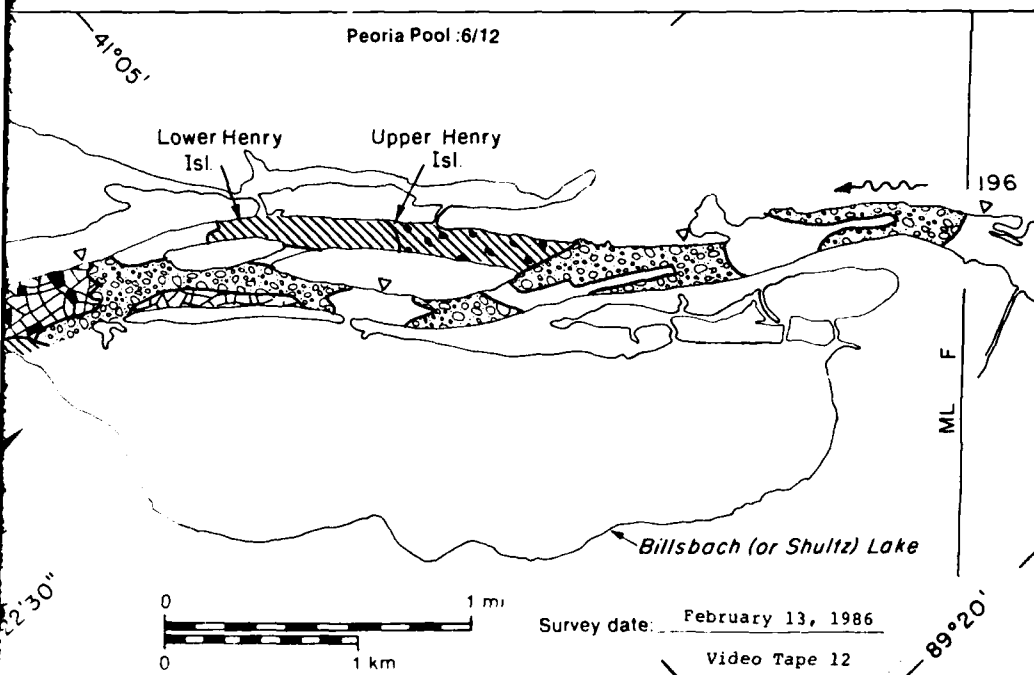
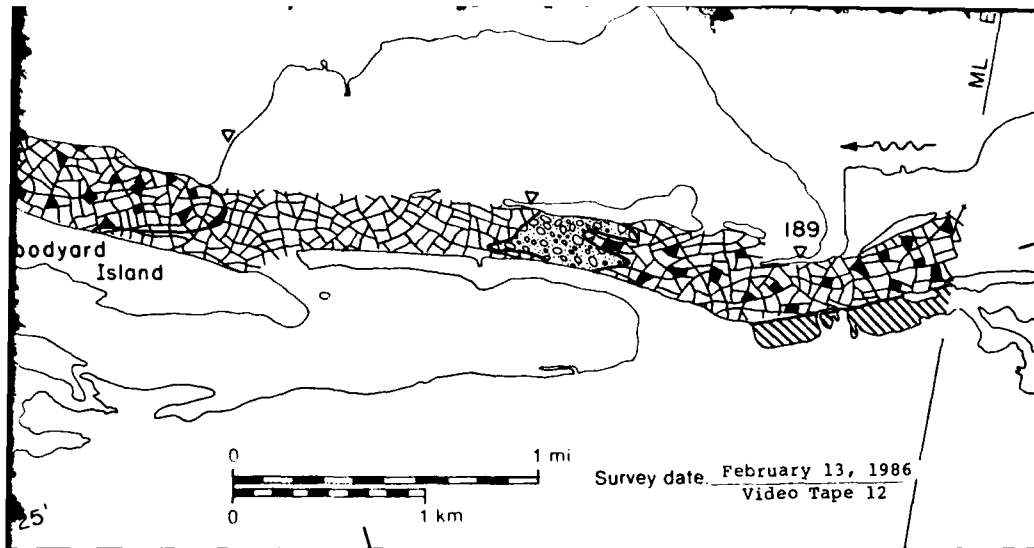


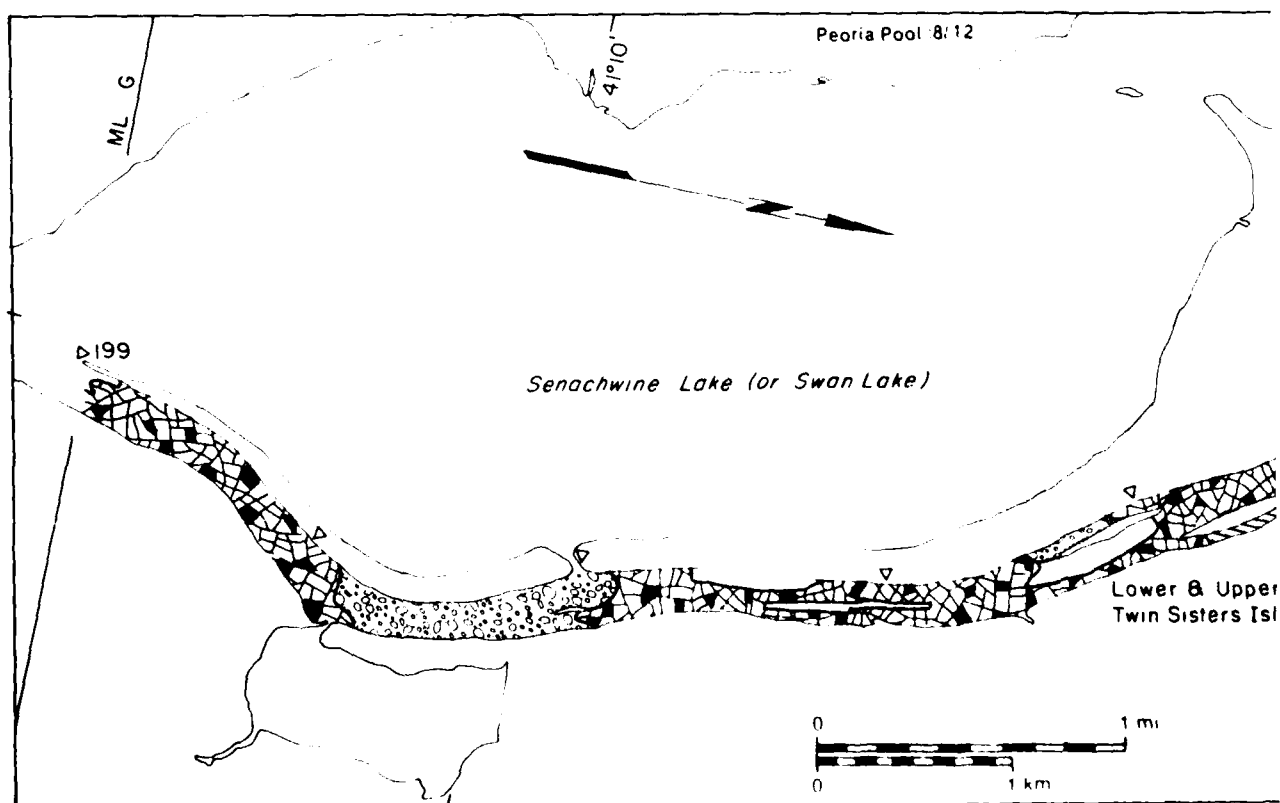
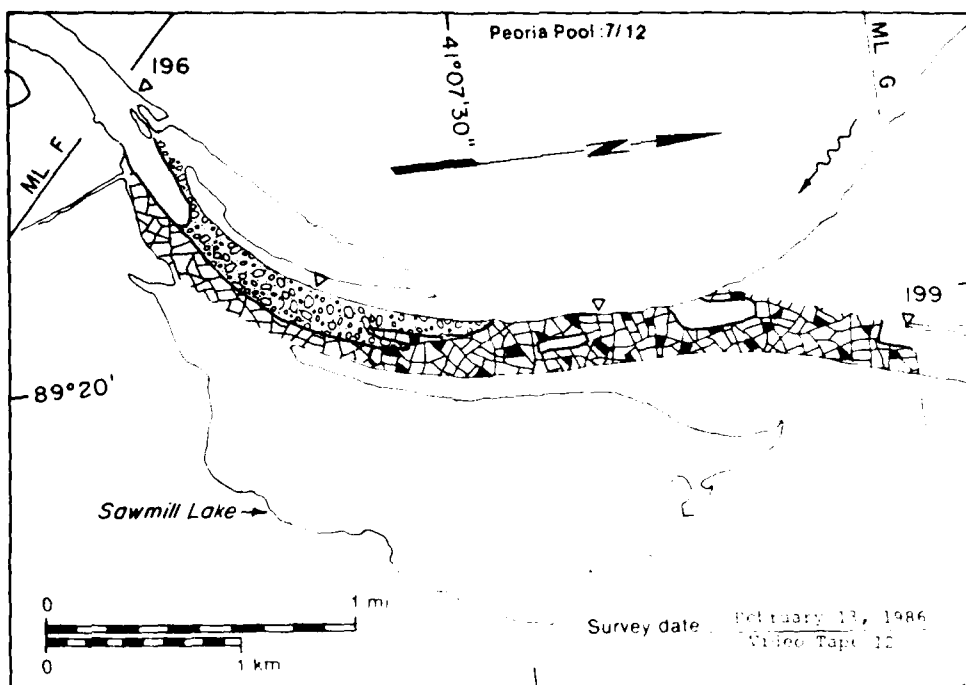
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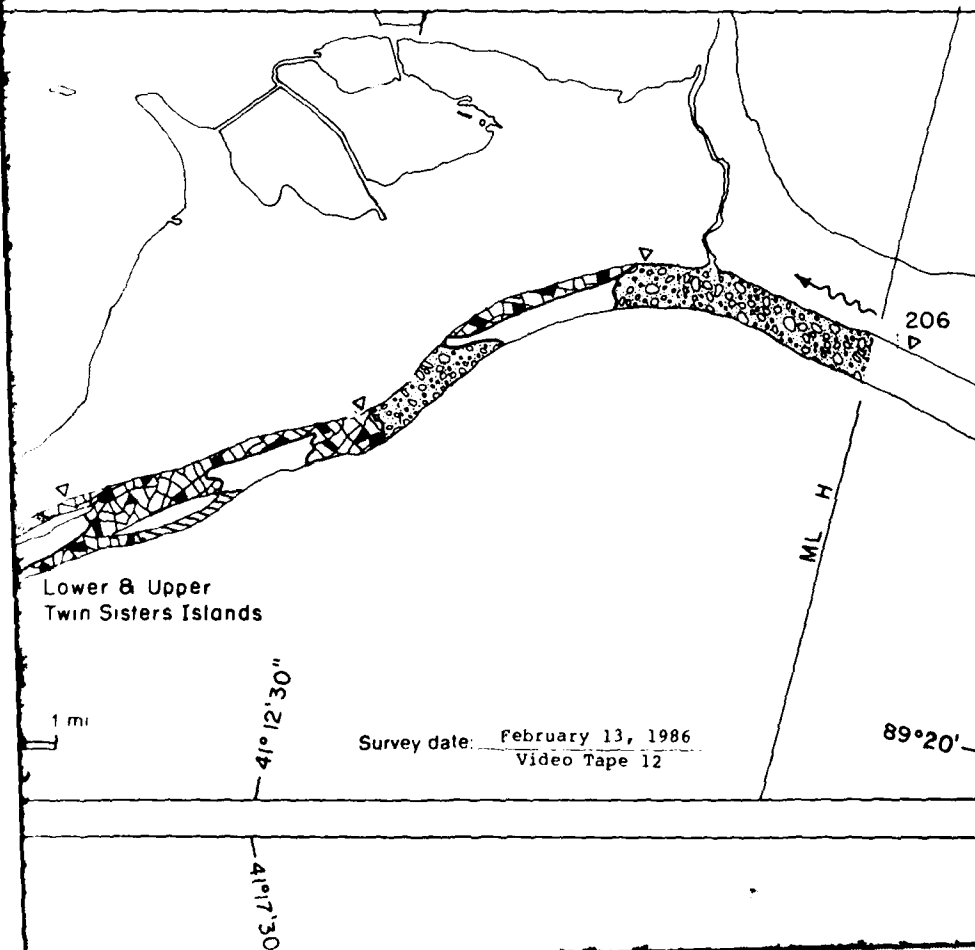


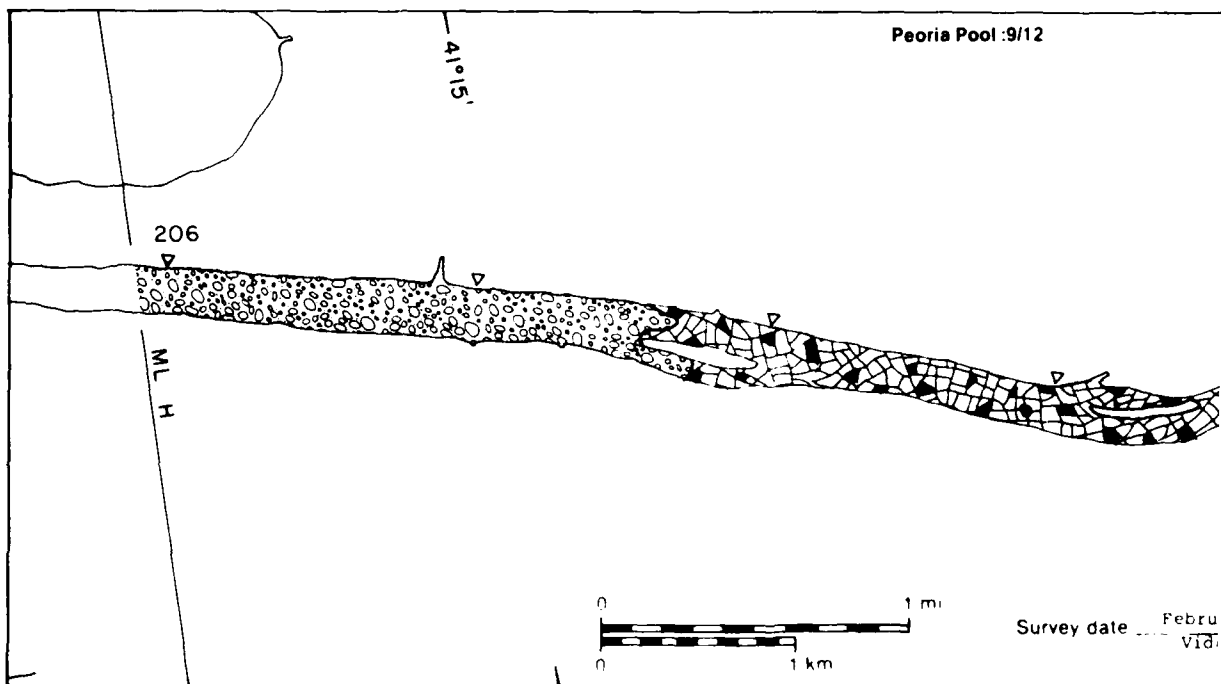
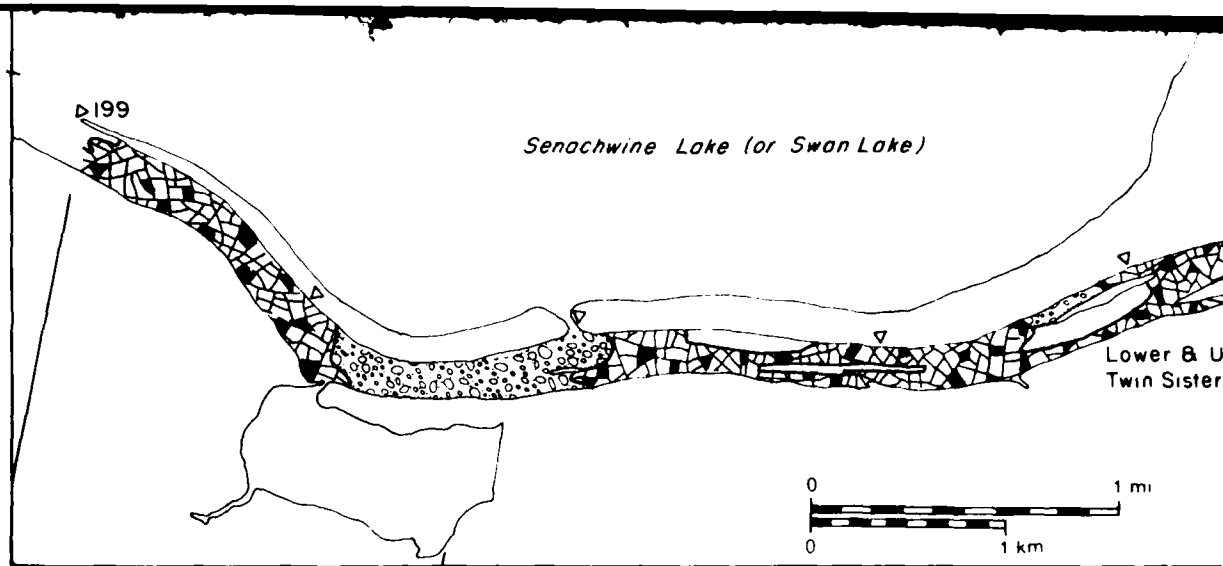


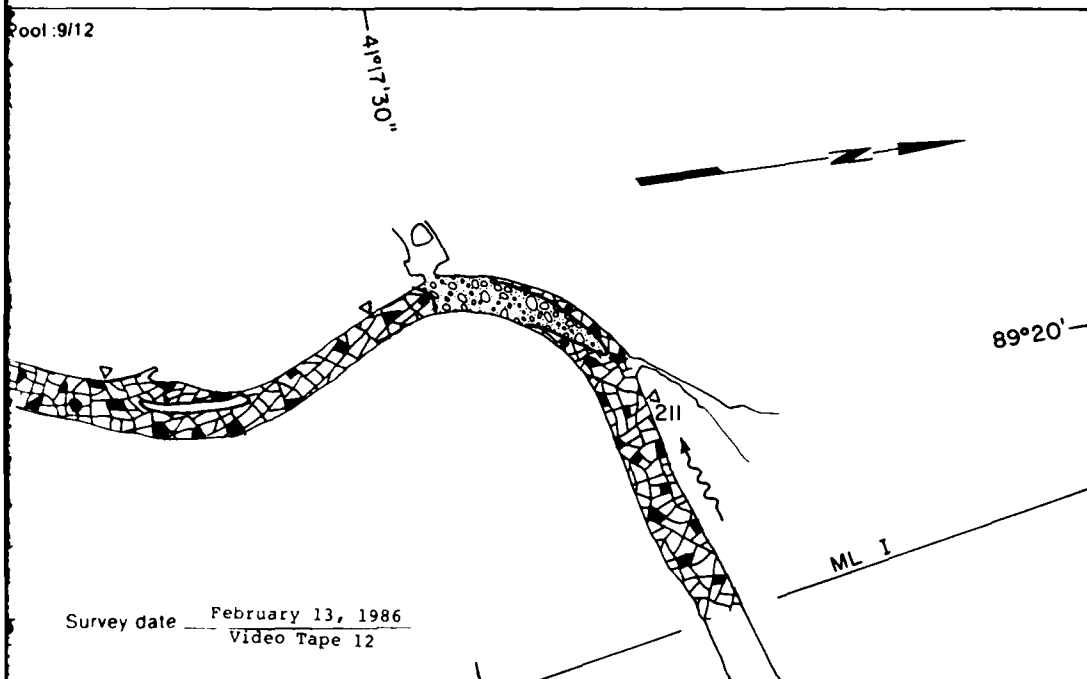
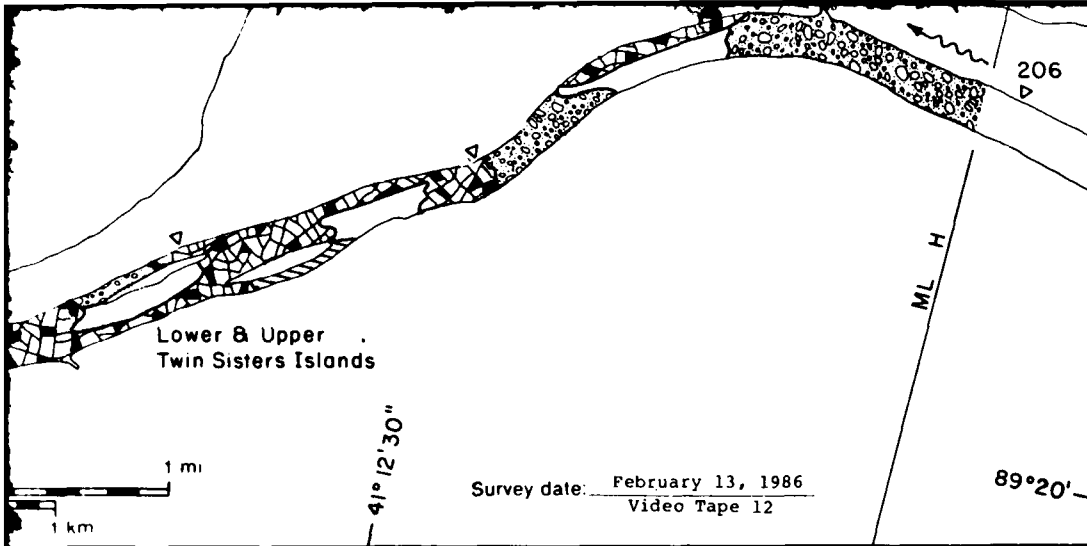




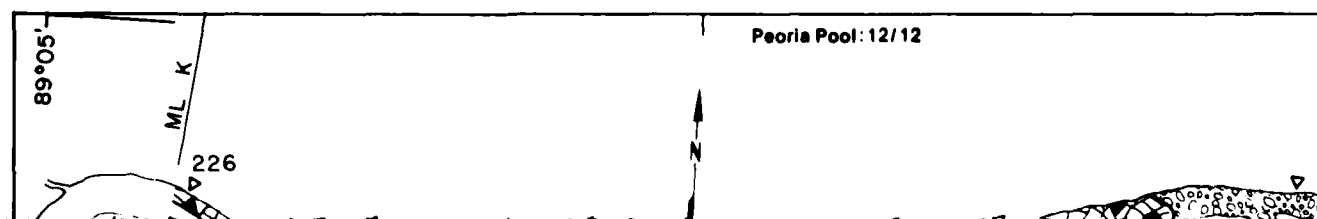
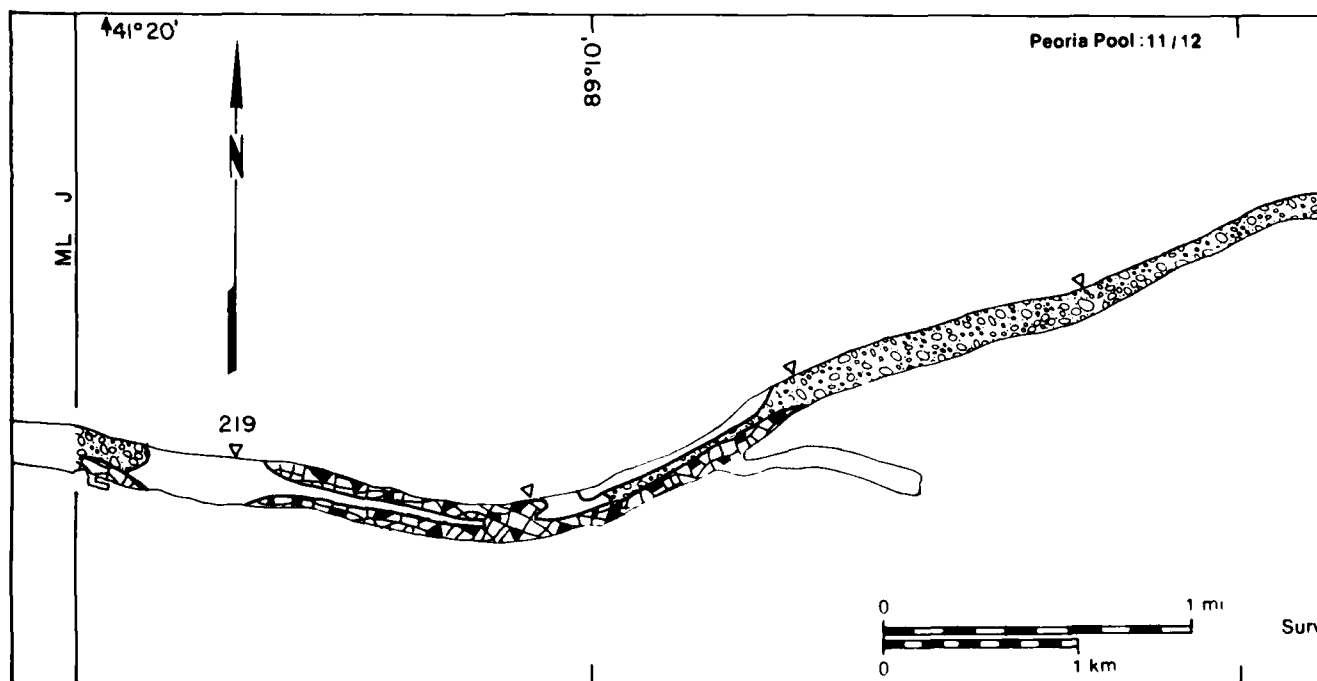
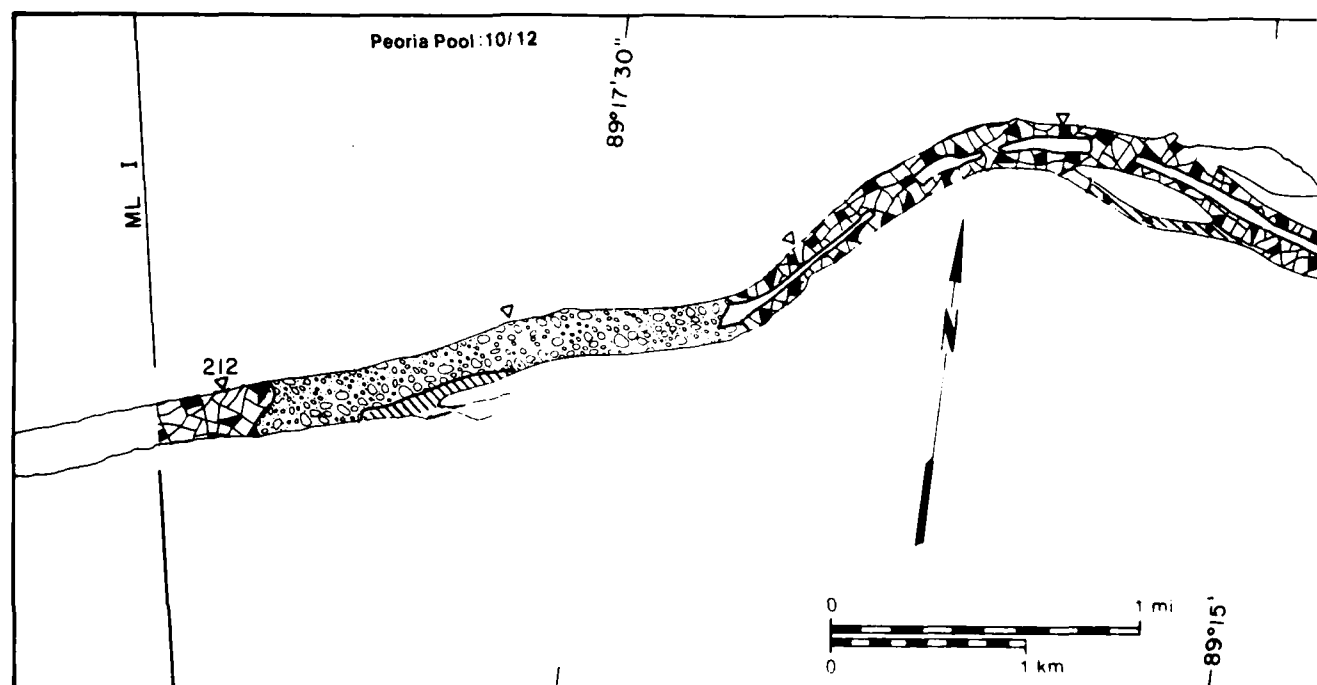
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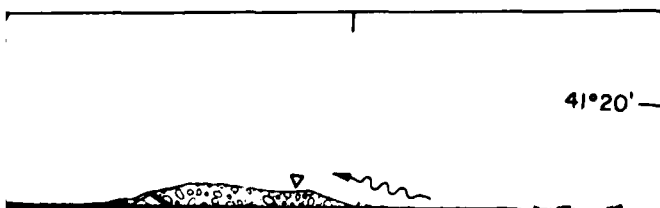
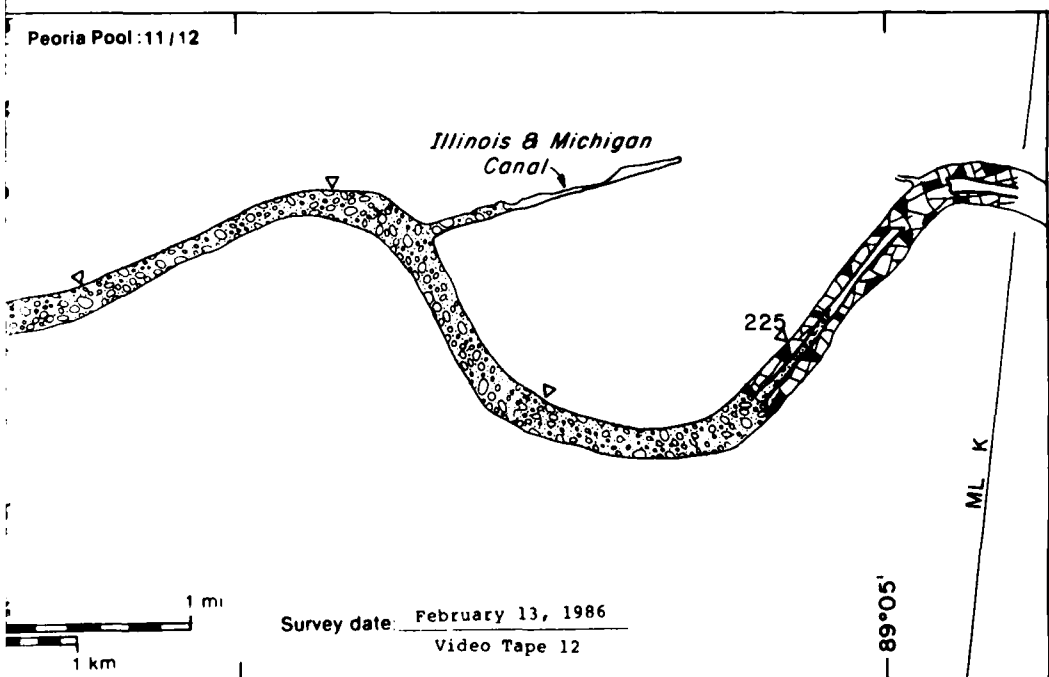
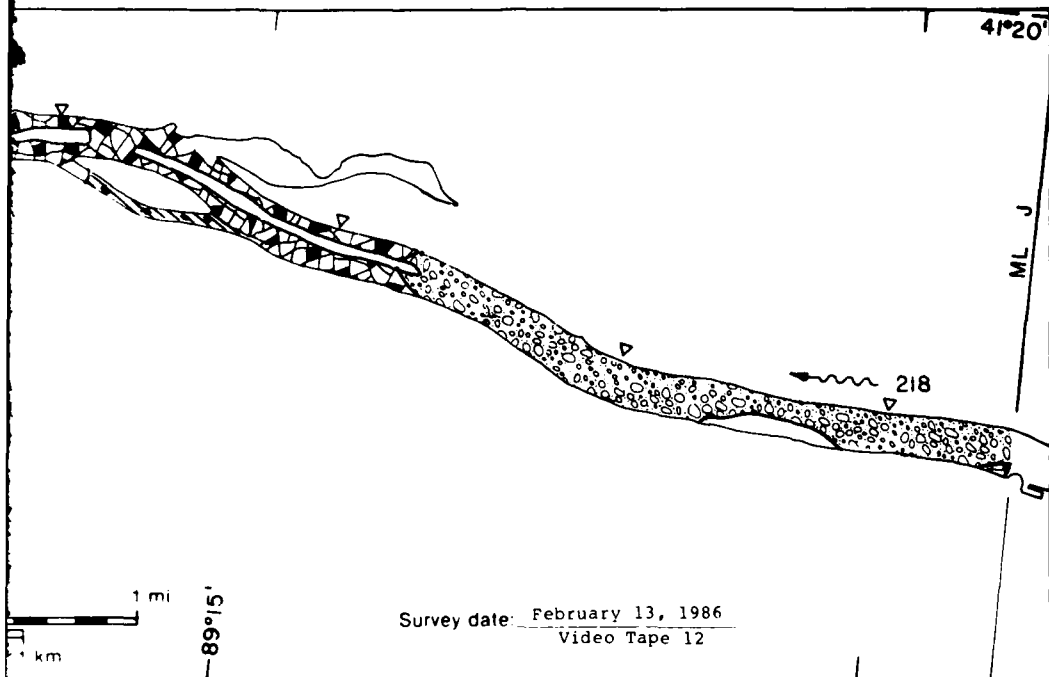


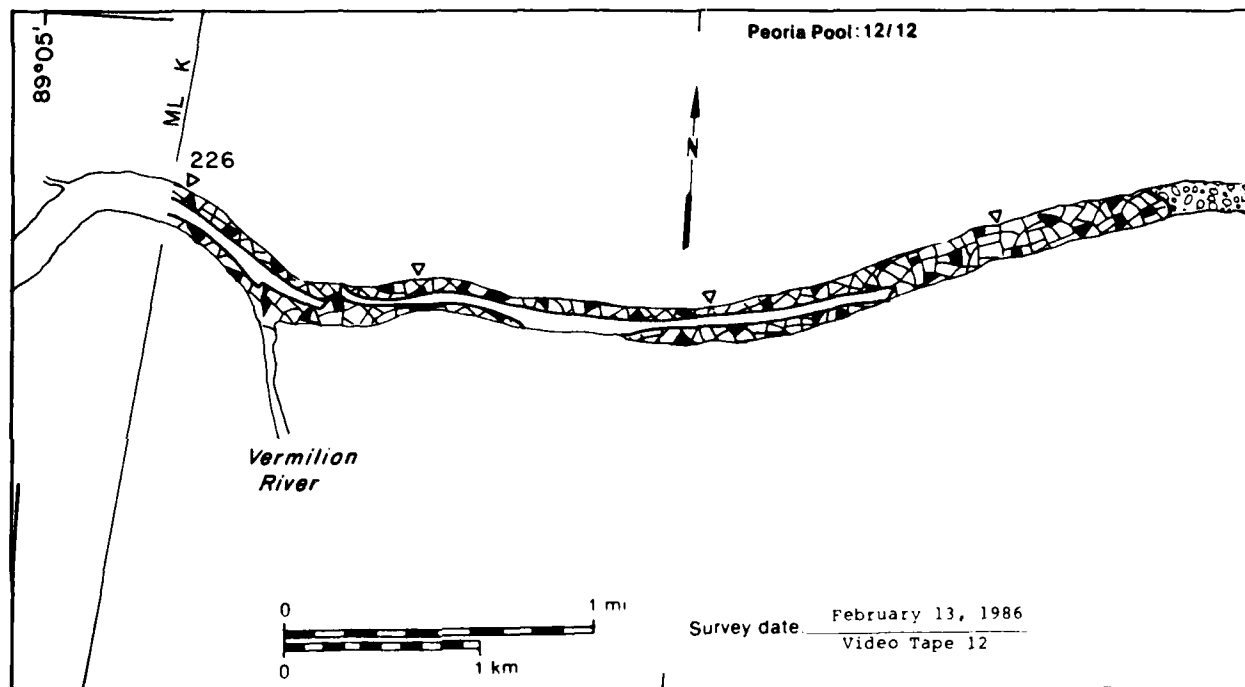
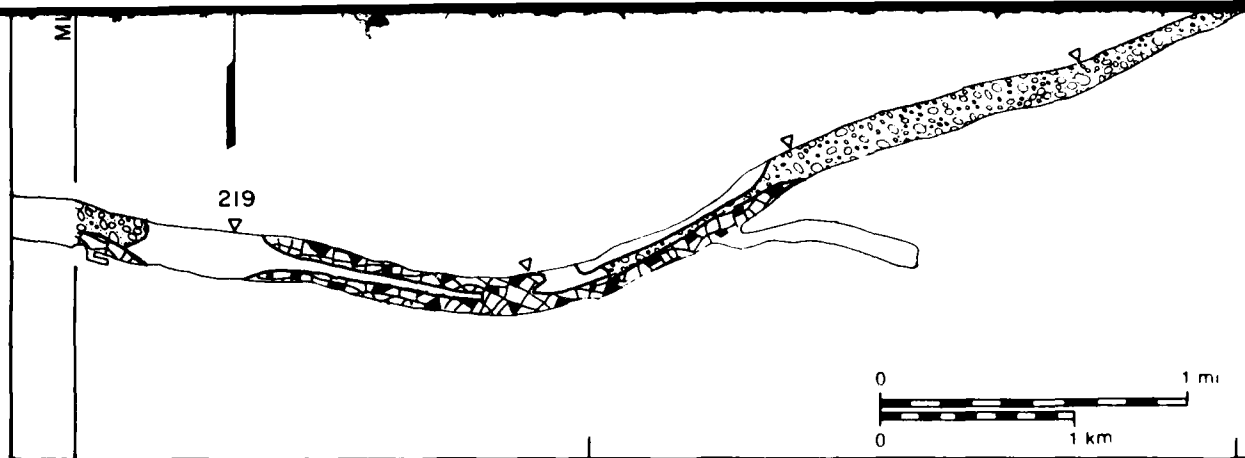




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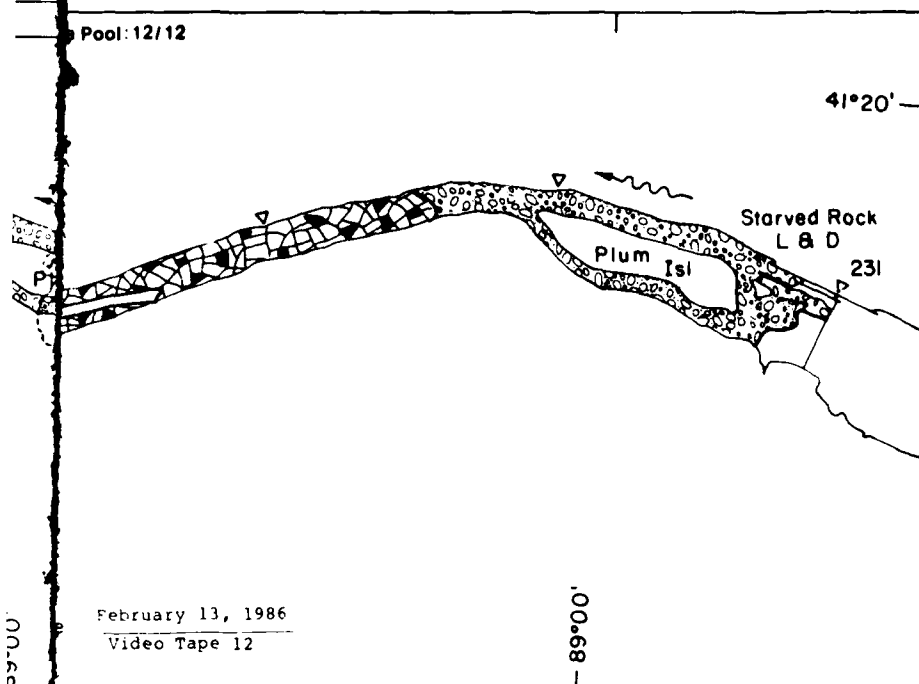
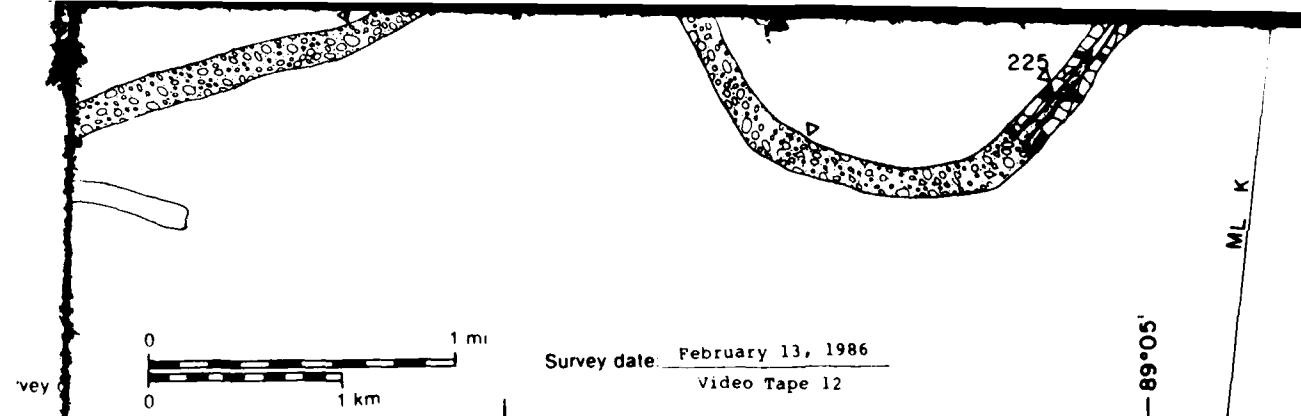


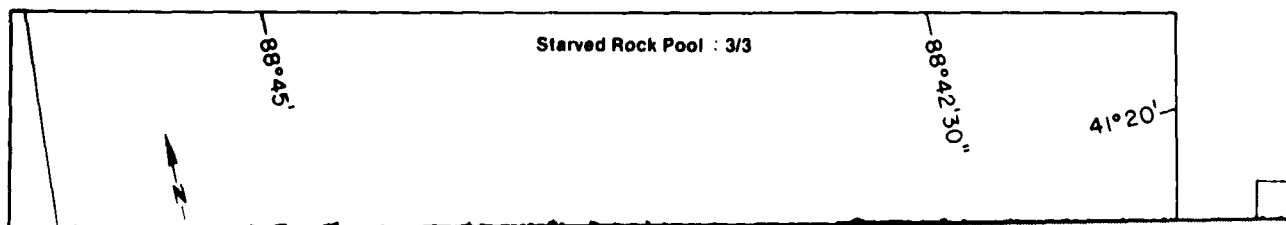
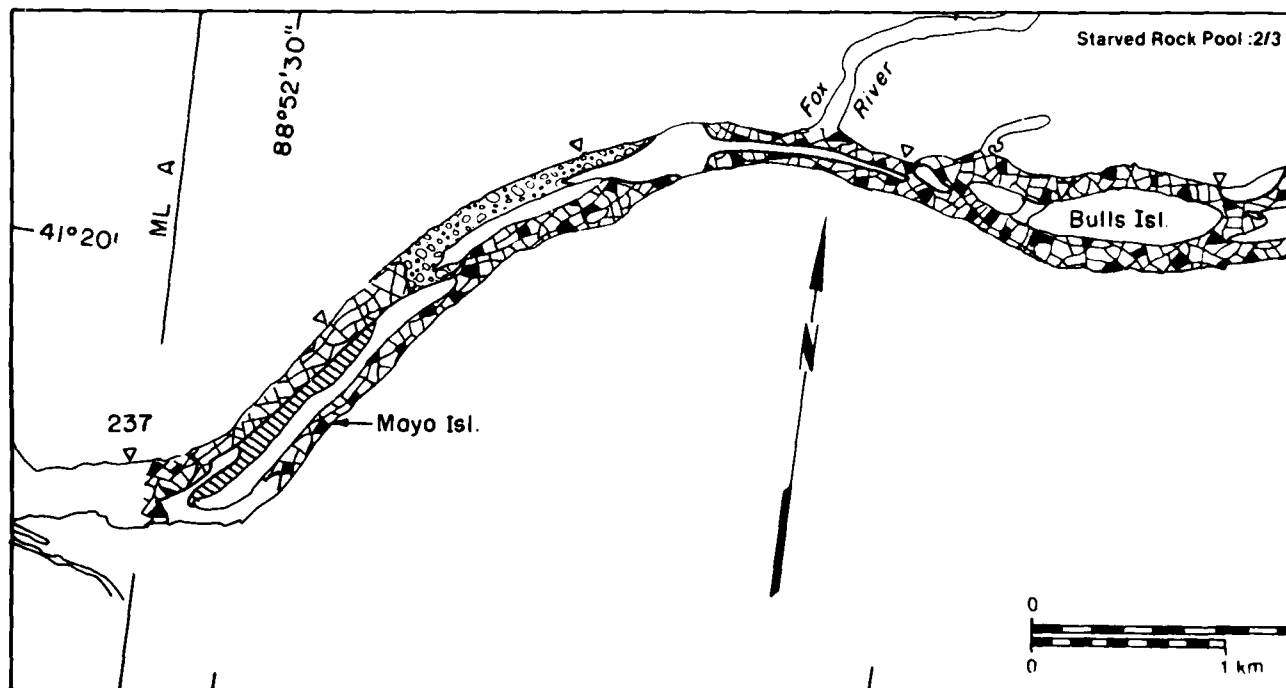
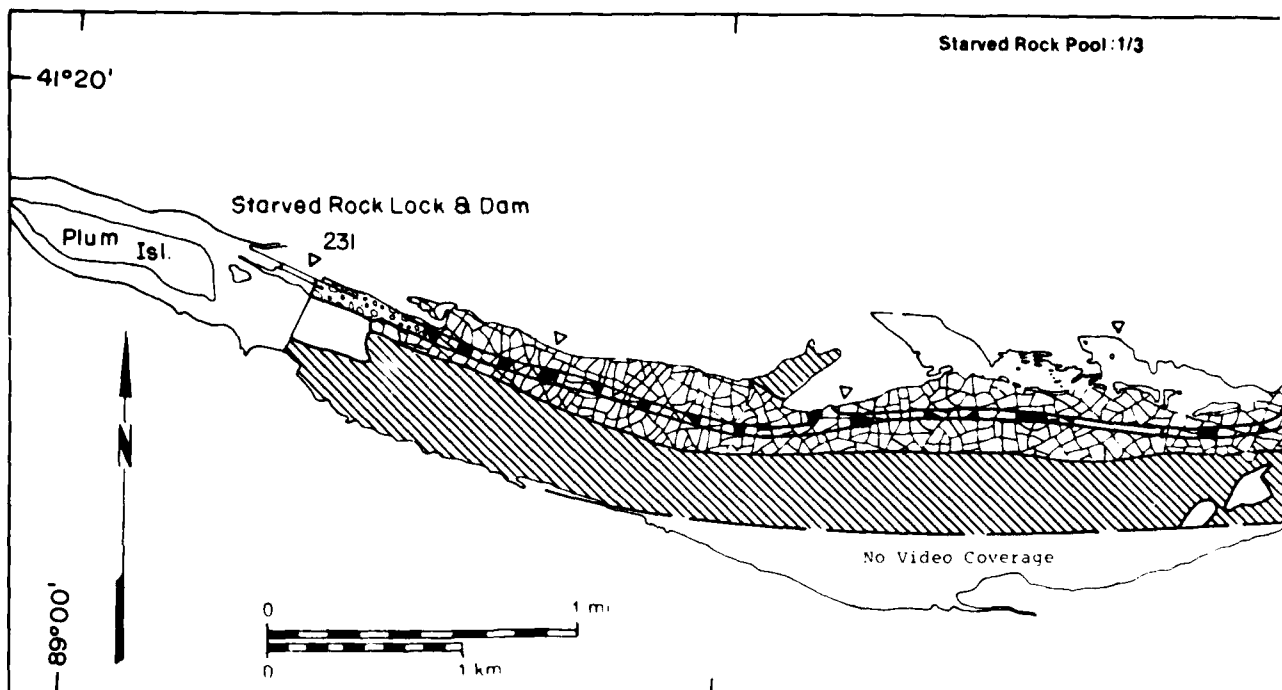


Peoria Pool

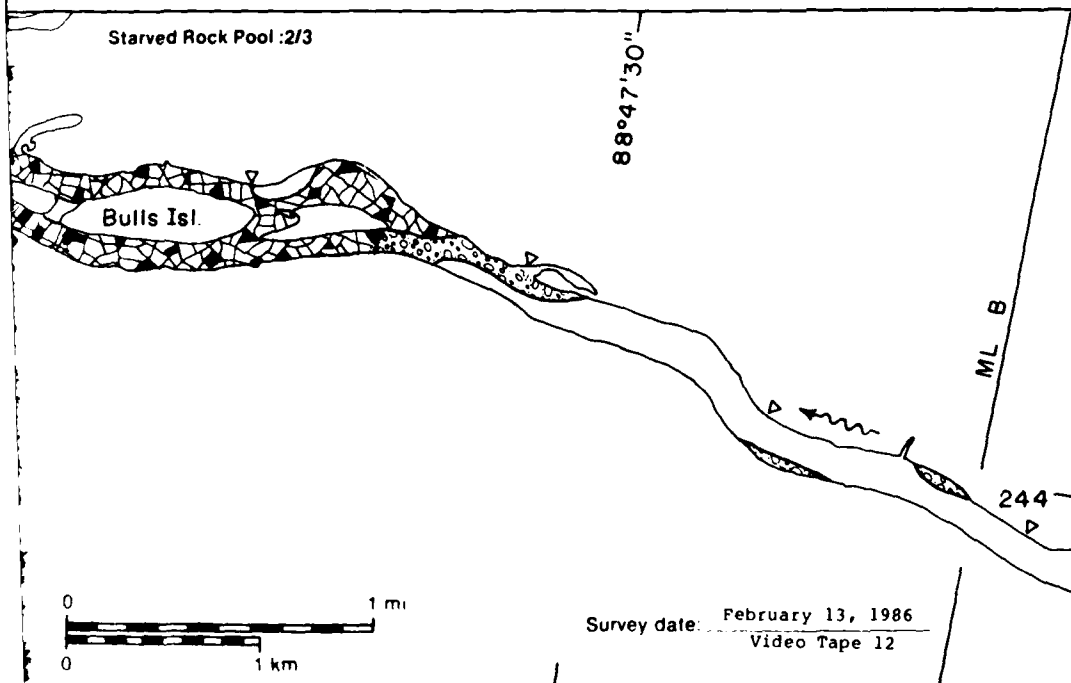
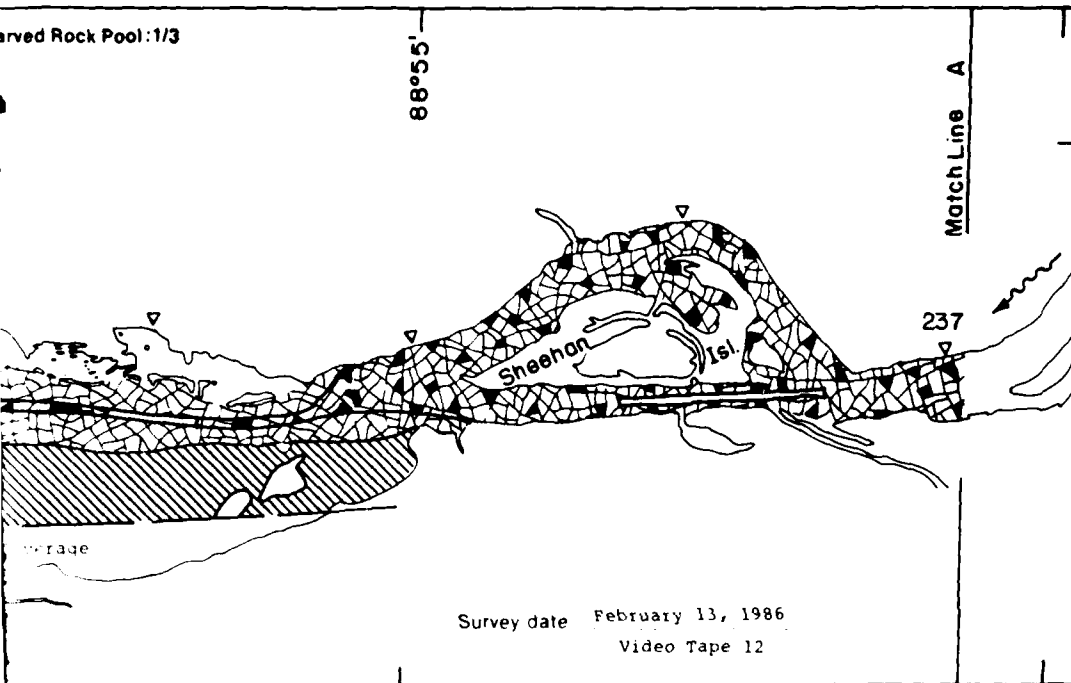
MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	3.29	NA
	Solid ice cover	17.93	NA
	Solid ice cover with open-water areas	0.16	80
	Fragmented ice cover	14.78	NA
	Fragmented ice cover with open-water areas	10.62	90
	Ice floes or frazil slush and pans	8.81	40
Total area ($m^2 \times 10^6$)		81.33*	

* Includes $25.74 \times 10^6 m^2$ of no video coverage





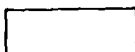
13 February 1986



41°20'

Starved Rock Pool

MAP UNITS



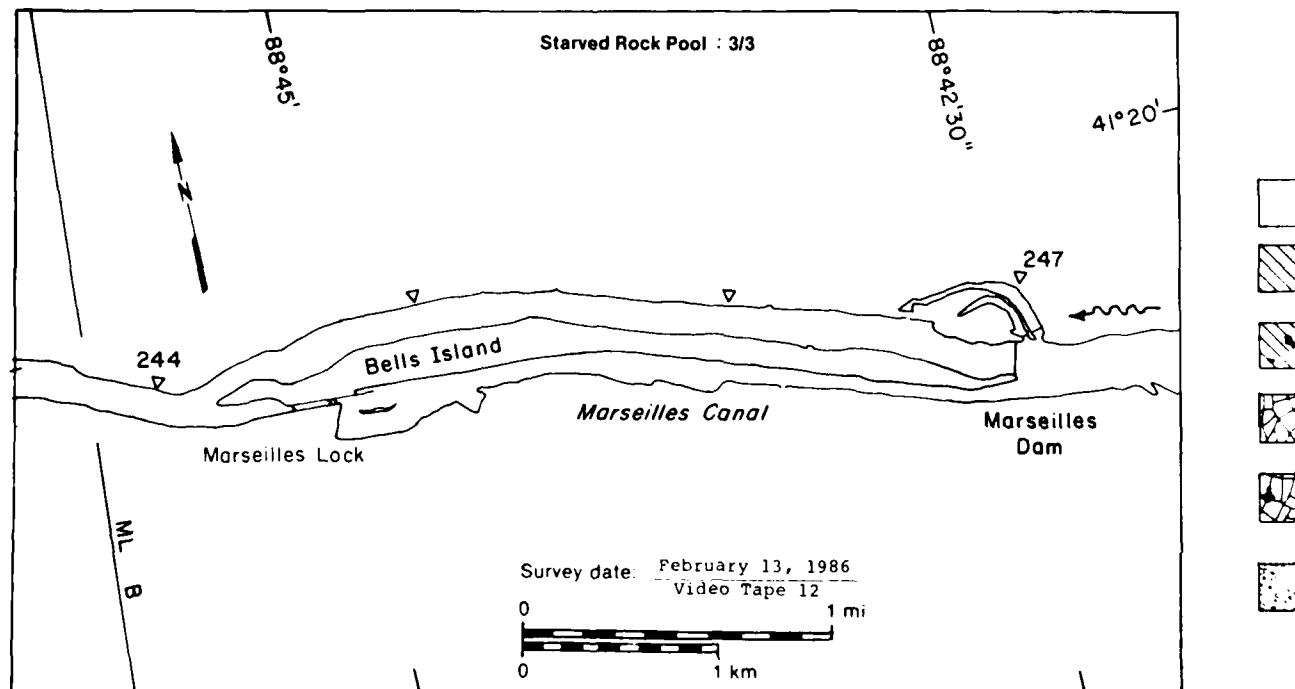
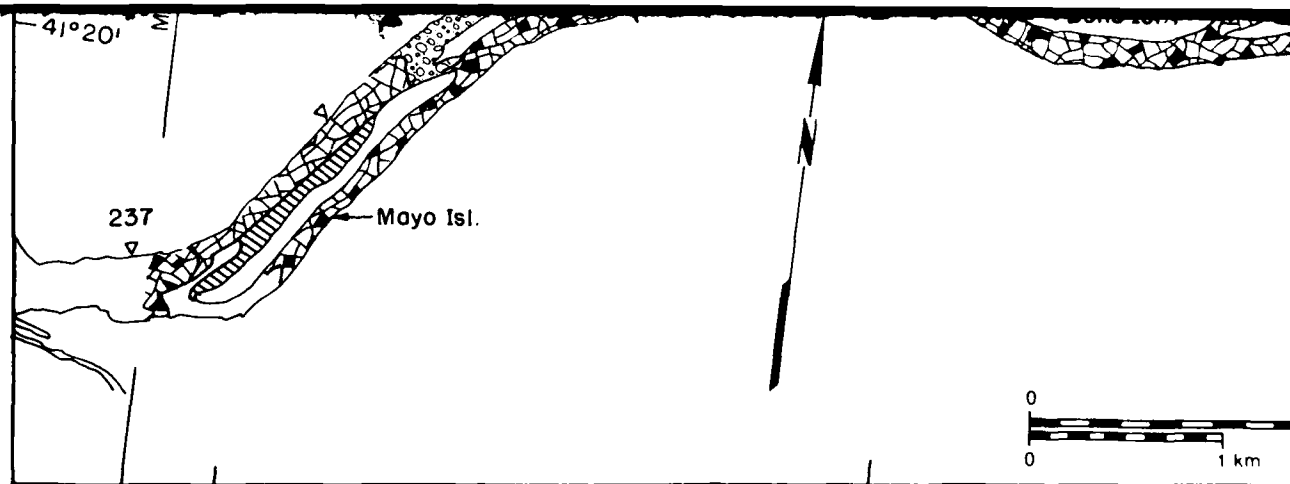
Open water

Area
(m² x 10⁶)

2.16

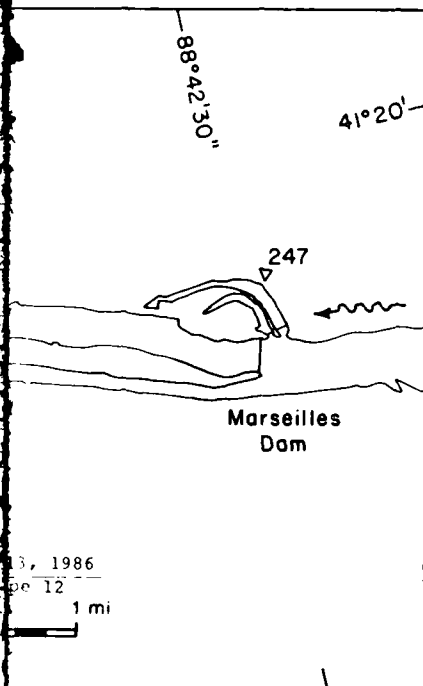
Surface
concentration
(%)

NA





Survey date: February 13, 1986
Video Tape 12



Starved Rock Pool

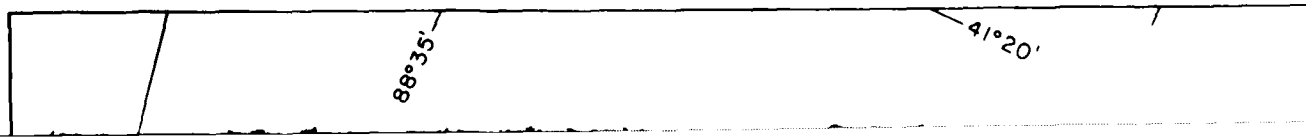
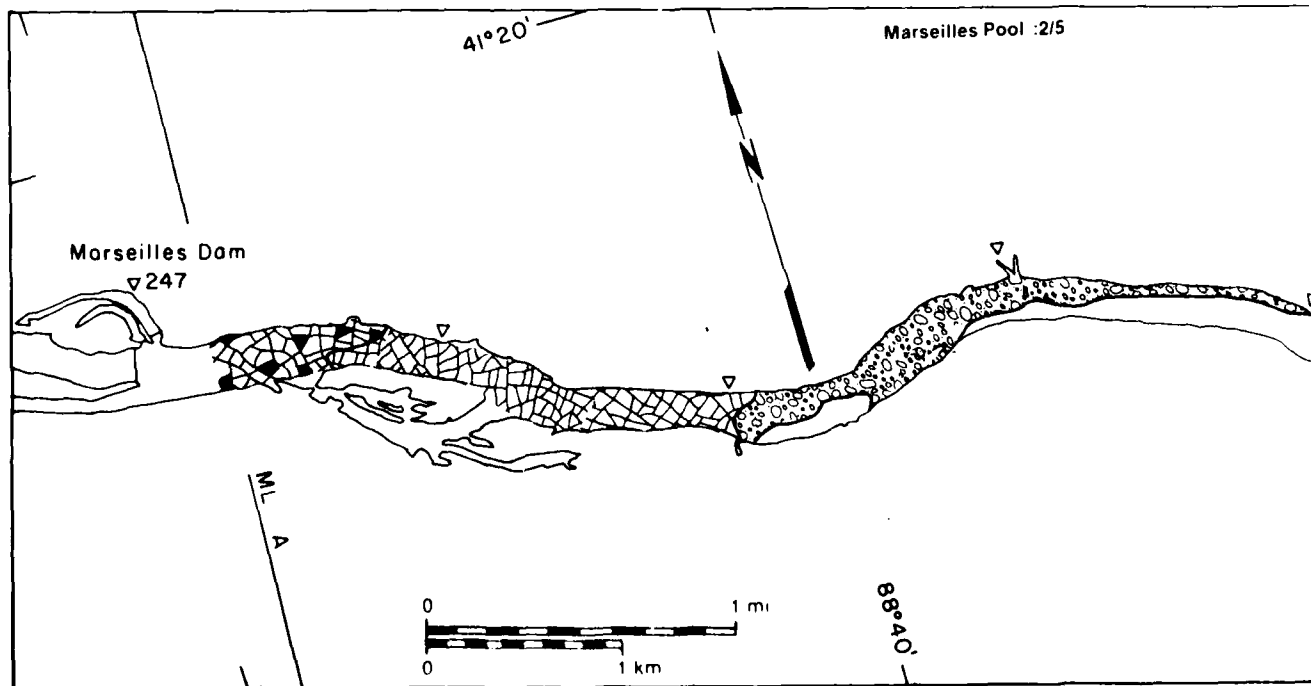
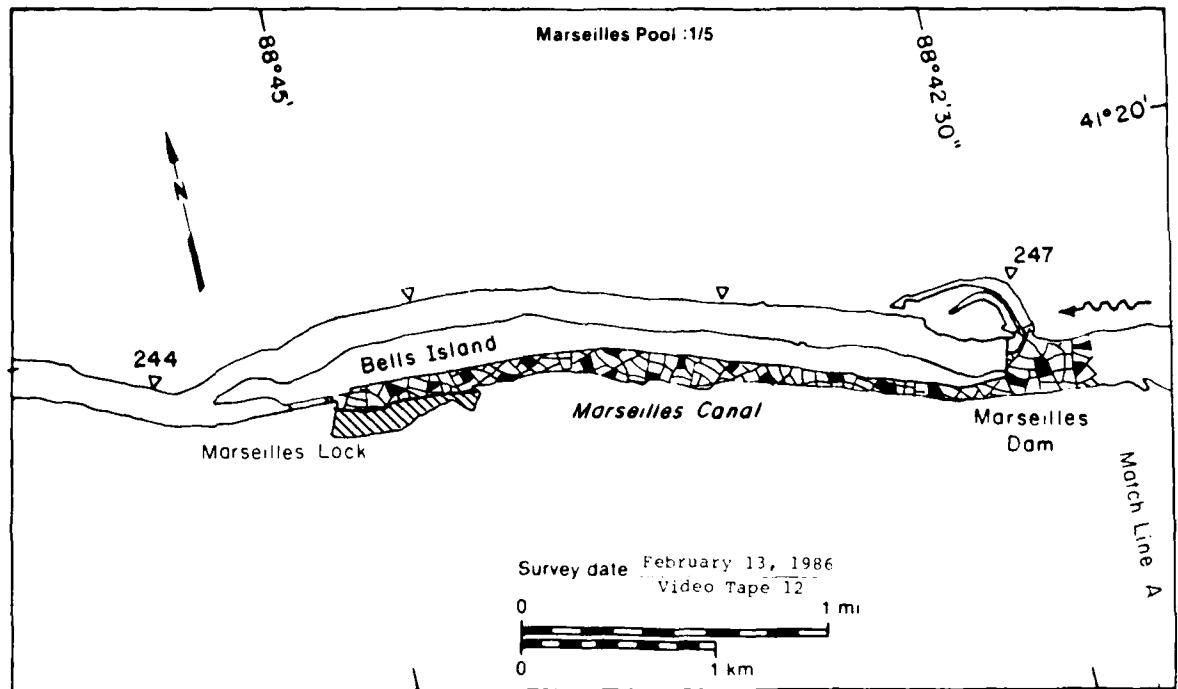
MAP UNITS

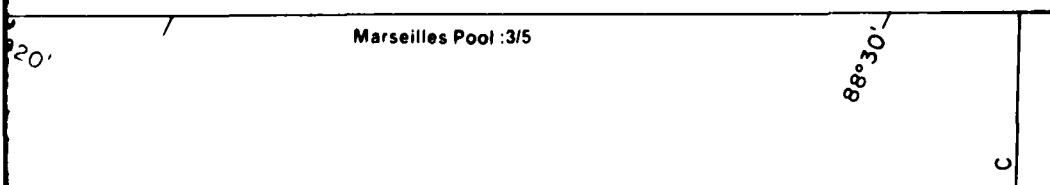
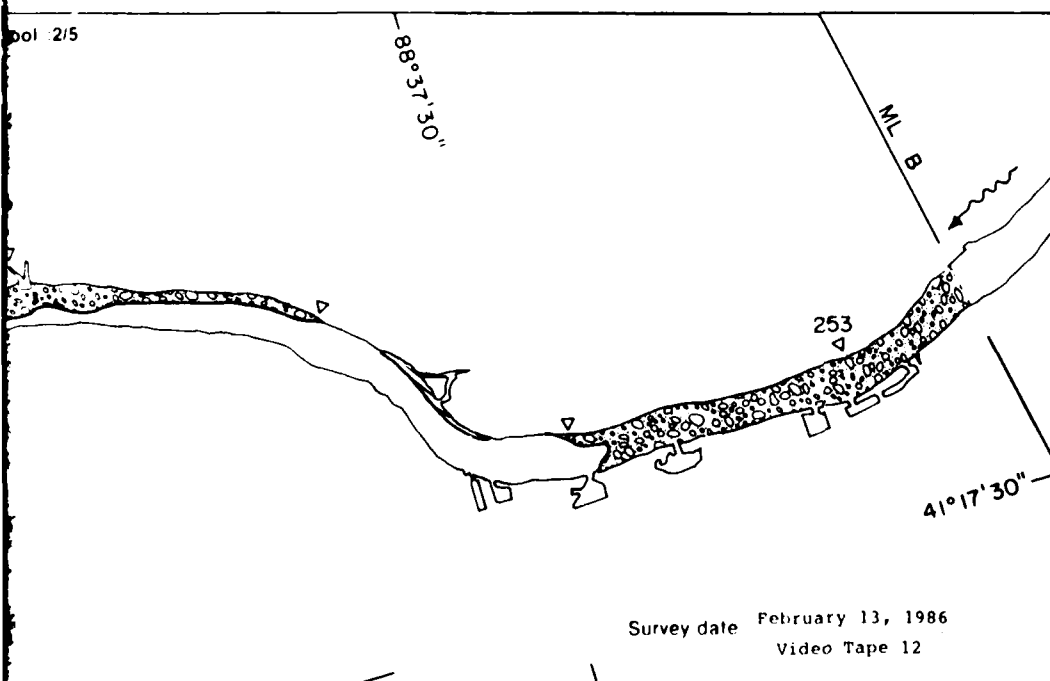
	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

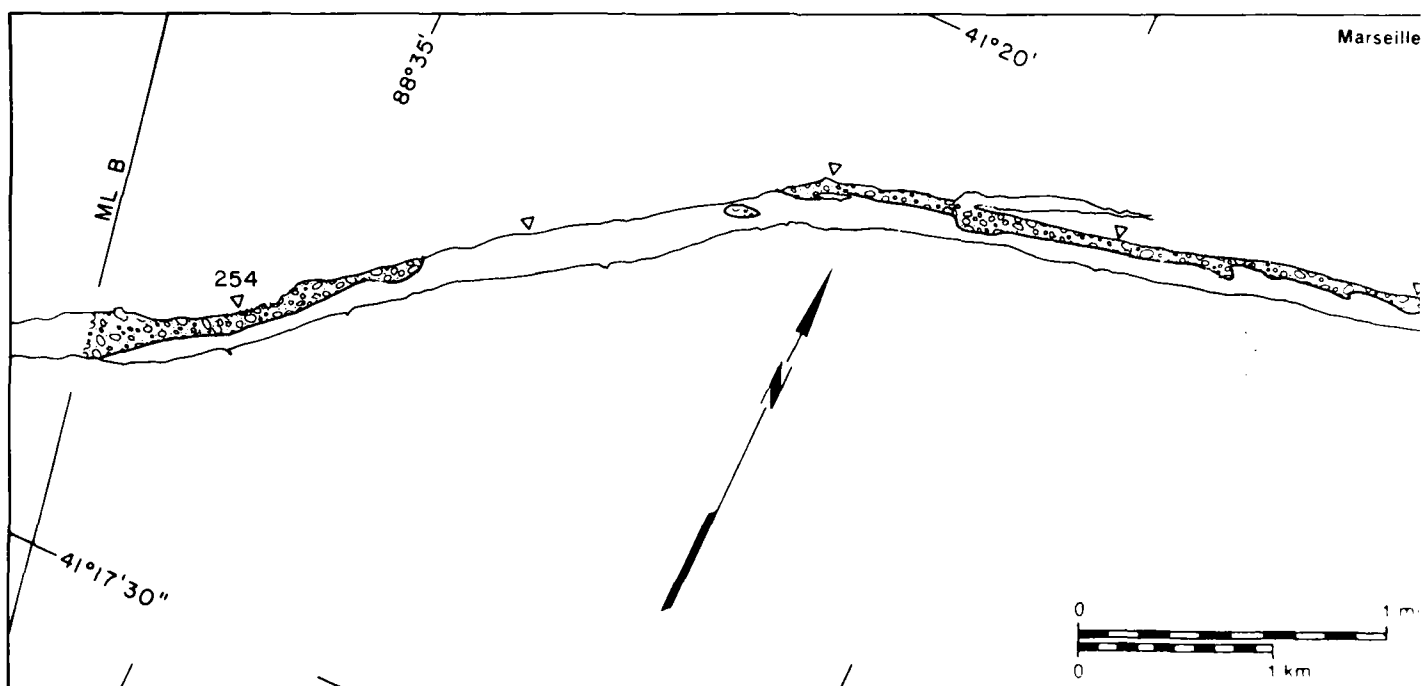
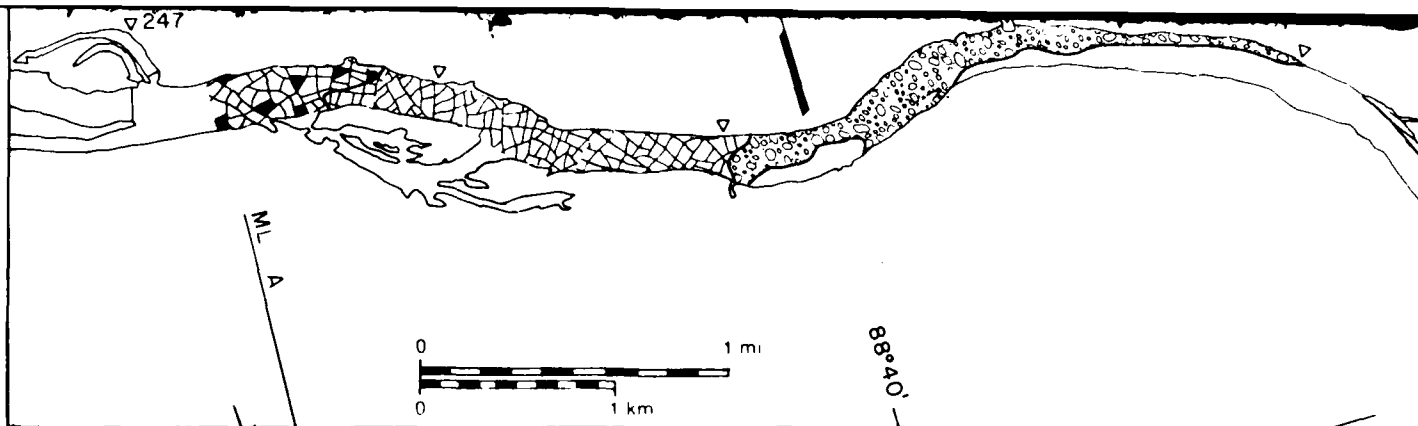
Area ($m^2 \times 10^6$)	Surface concentration (%)
2.16	NA
2.15	NA
0.00	—
1.54	NA
2.90	80
0.47	50
10.19*	* Includes $0.97 \times 10^6 m^2$ of no video coverage

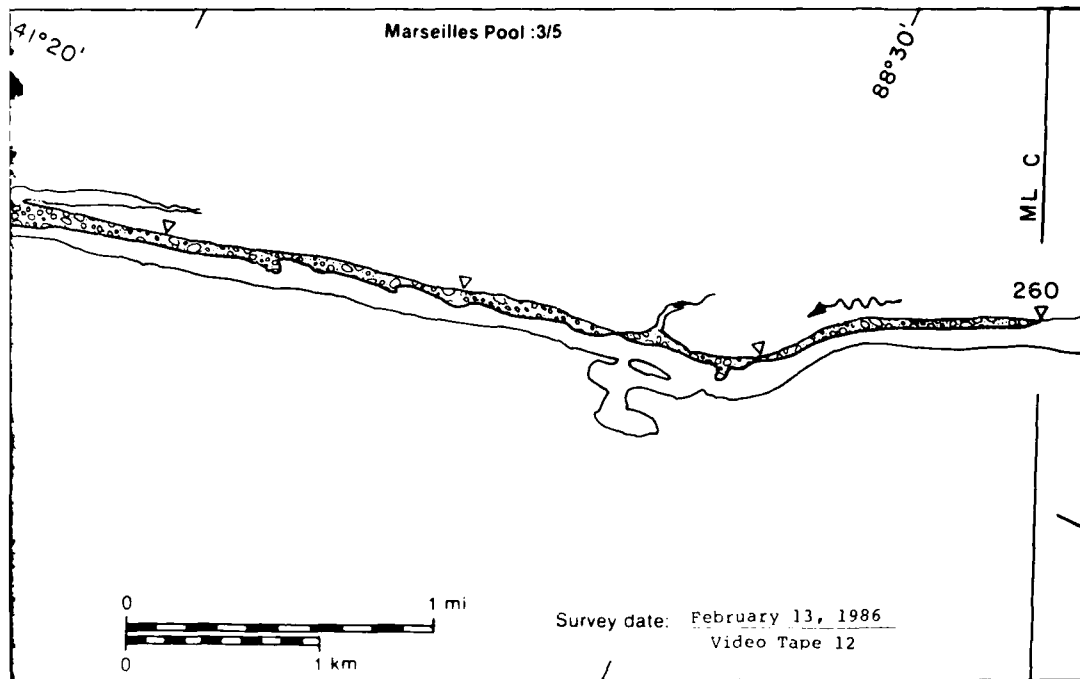
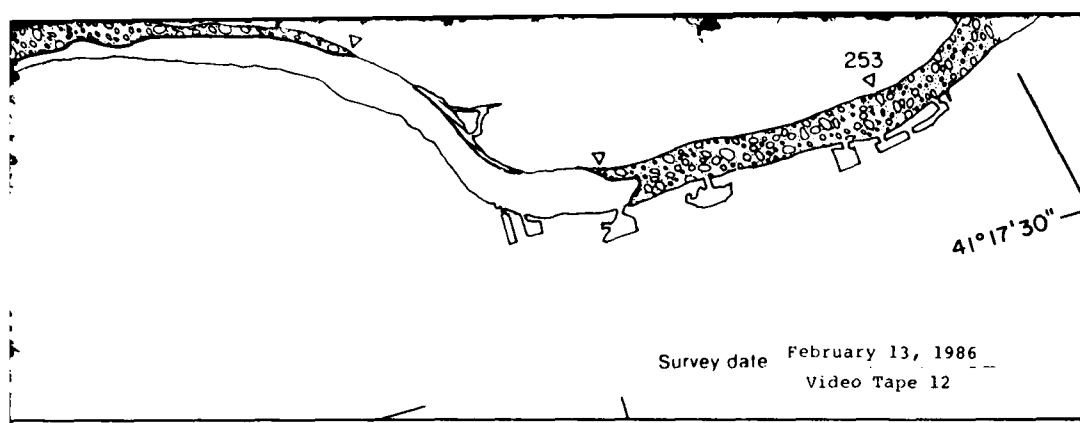
Total area ($m^2 \times 10^6$)

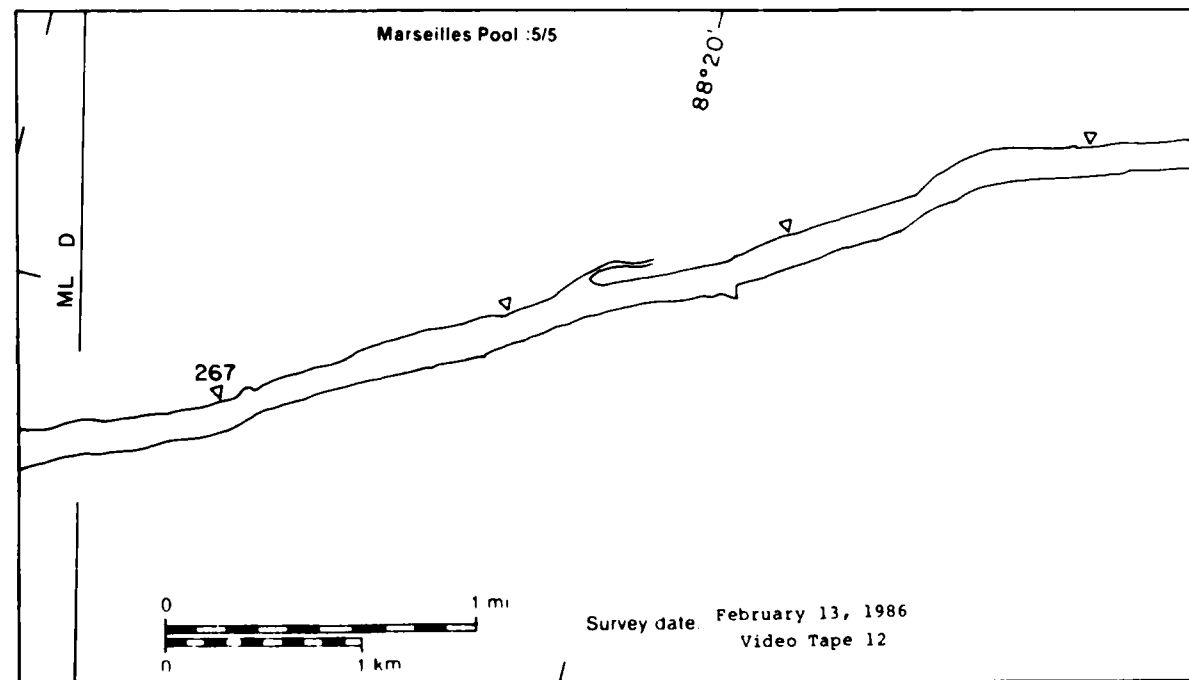
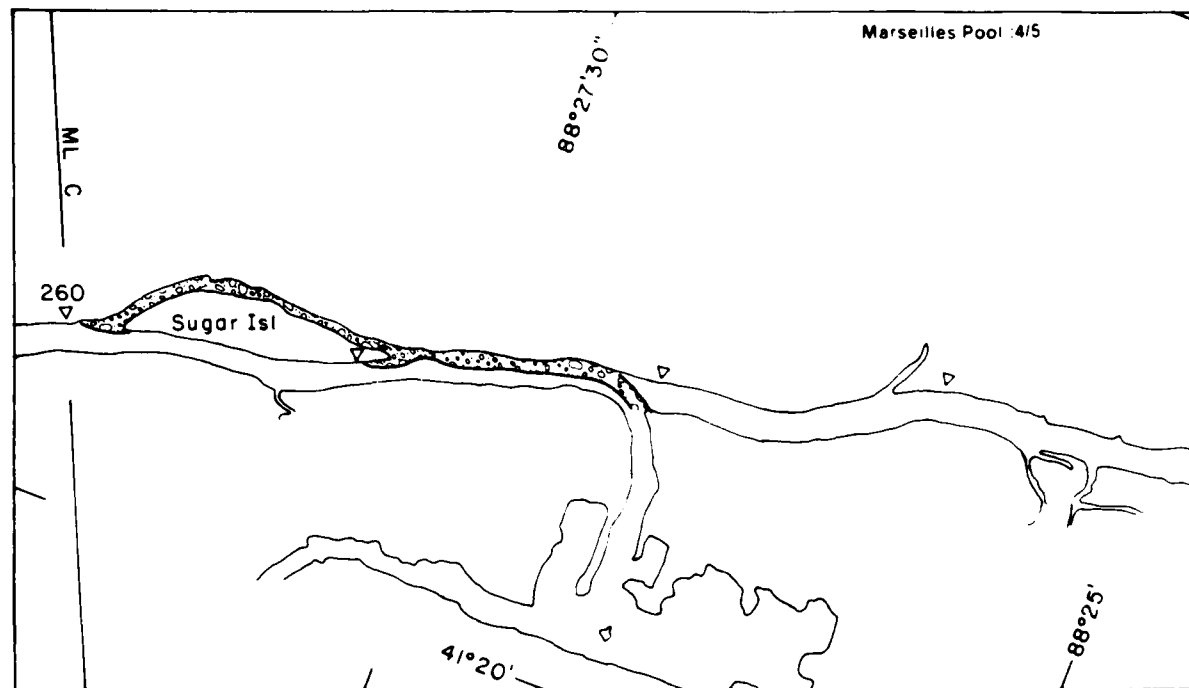
13 February 1986





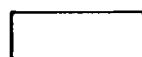






Marseilles Pool

MAP UNITS



Open water

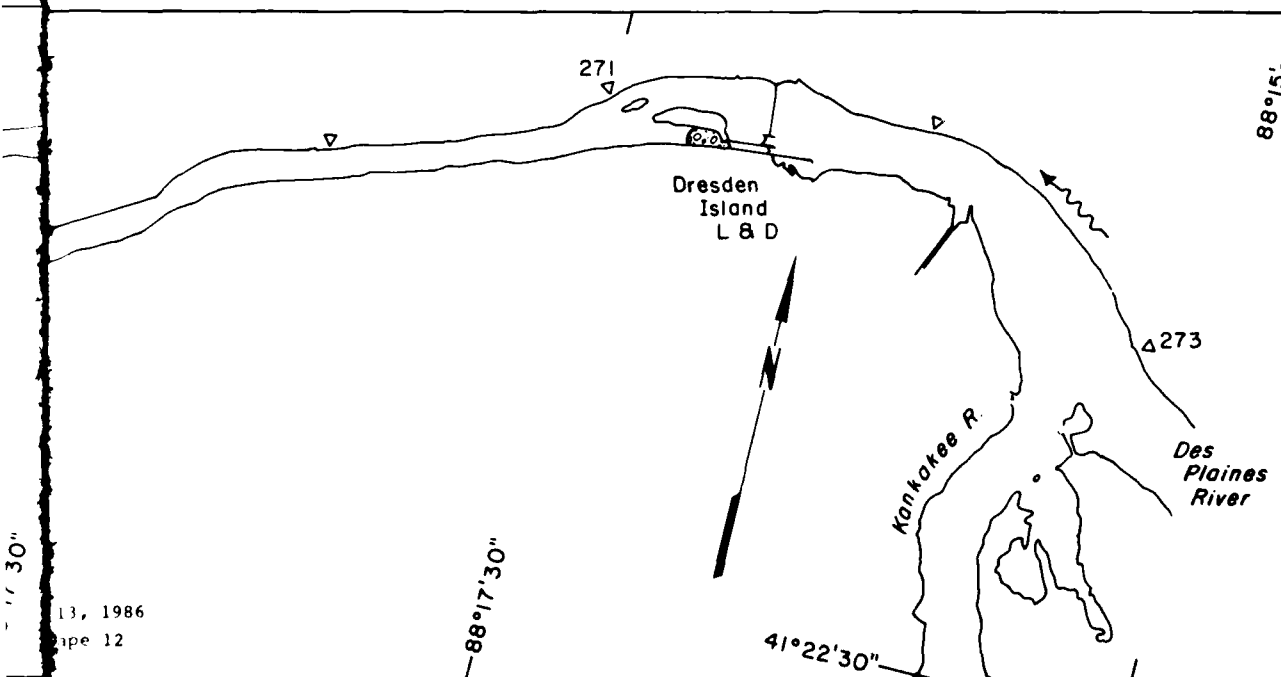
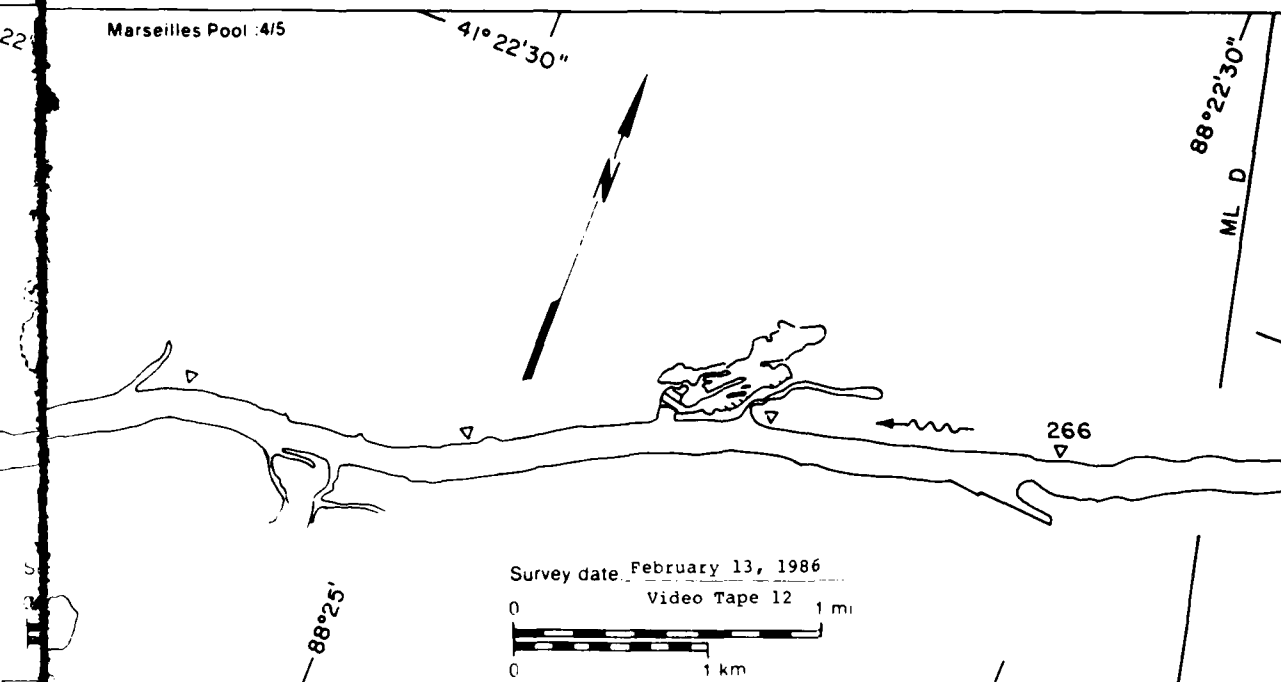
Solid ice cover

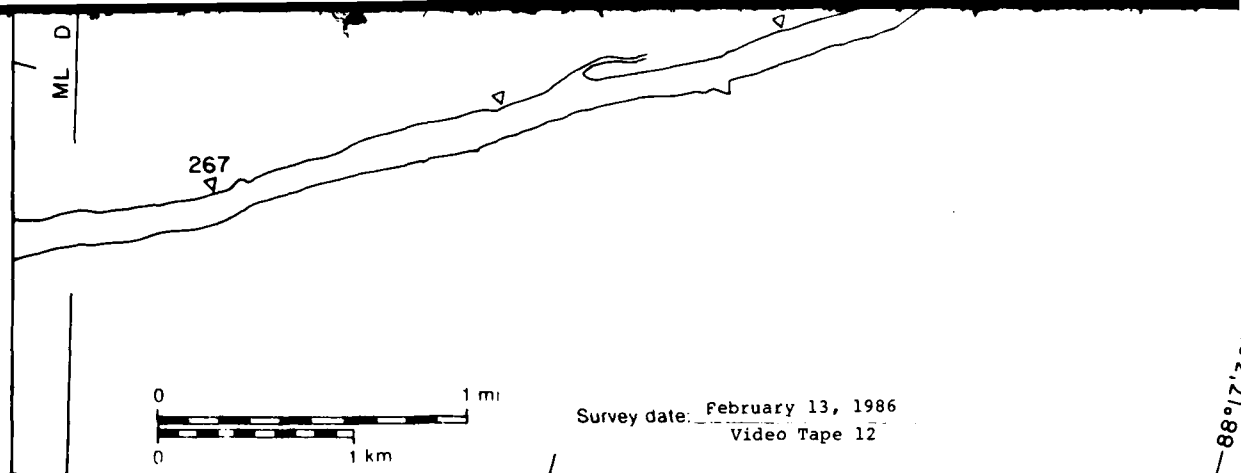
Area
($m^2 \times 10^6$)

Surface
concentration
(%)

4.70	NA
0.28	NA

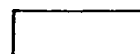
13 February 1986





Marseilles Pool

MAP UNITS



Open water



Solid ice cover



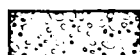
Solid ice cover with open-water areas



Fragmented ice cover



Fragmented ice cover with open-water areas



Ice floes or frazil slush and pans

Total area ($m^2 \times 10^6$)

Area ($m^2 \times 10^6$)	Surface concentration (%)
4.70	NA
0.28	NA
0.00	—
0.88	NA
0.70	90
1.63	20
8.19	

88°17'30"

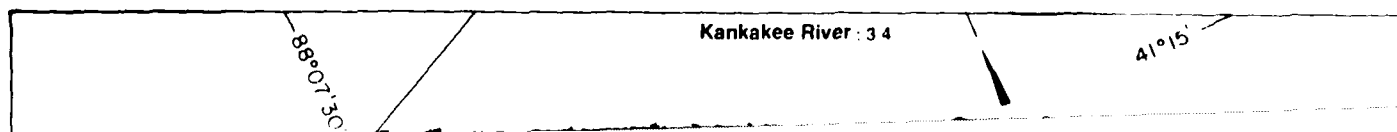
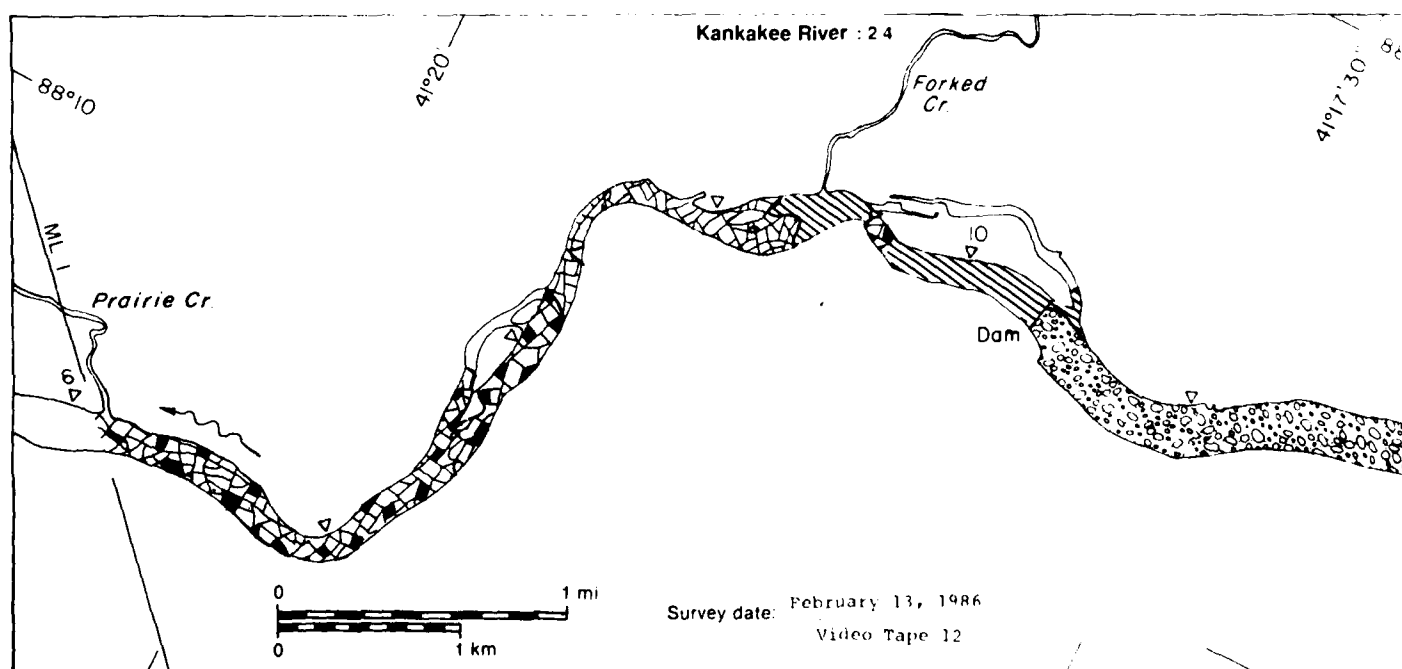
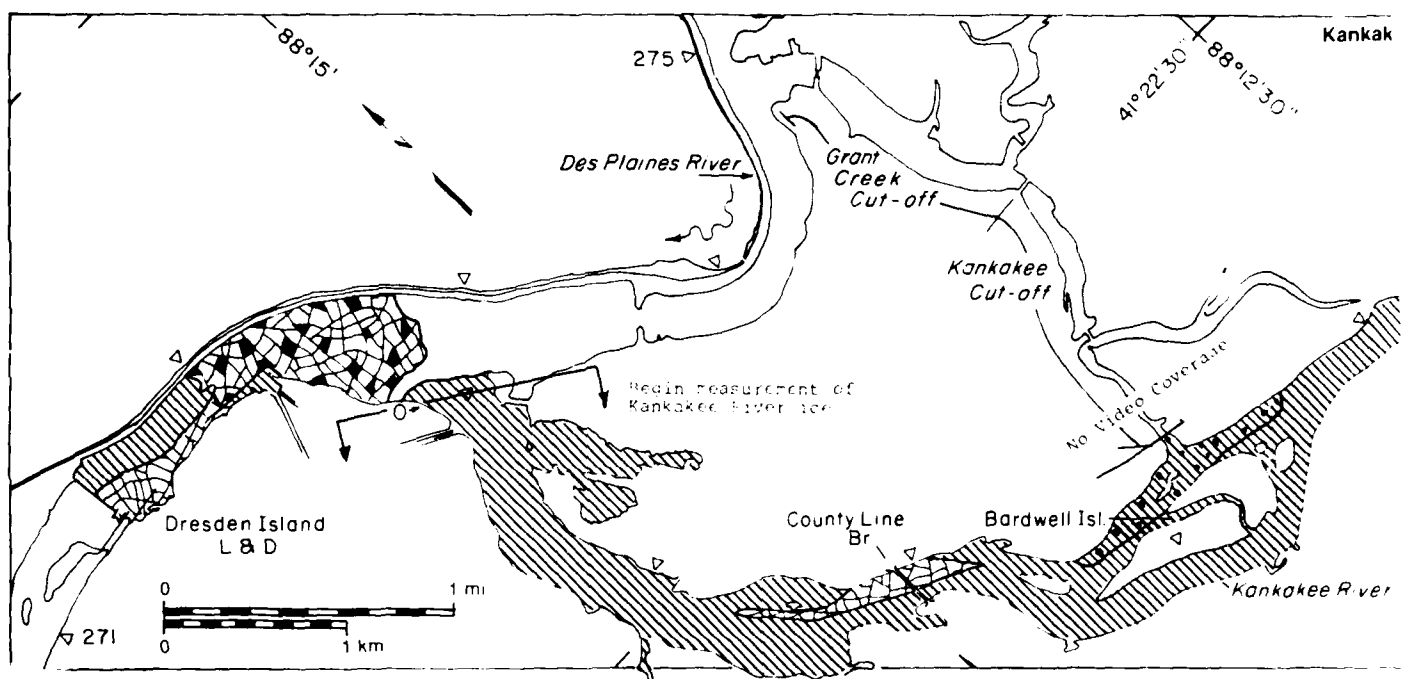
41°22'30"

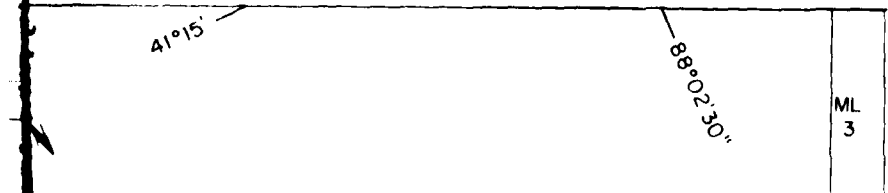
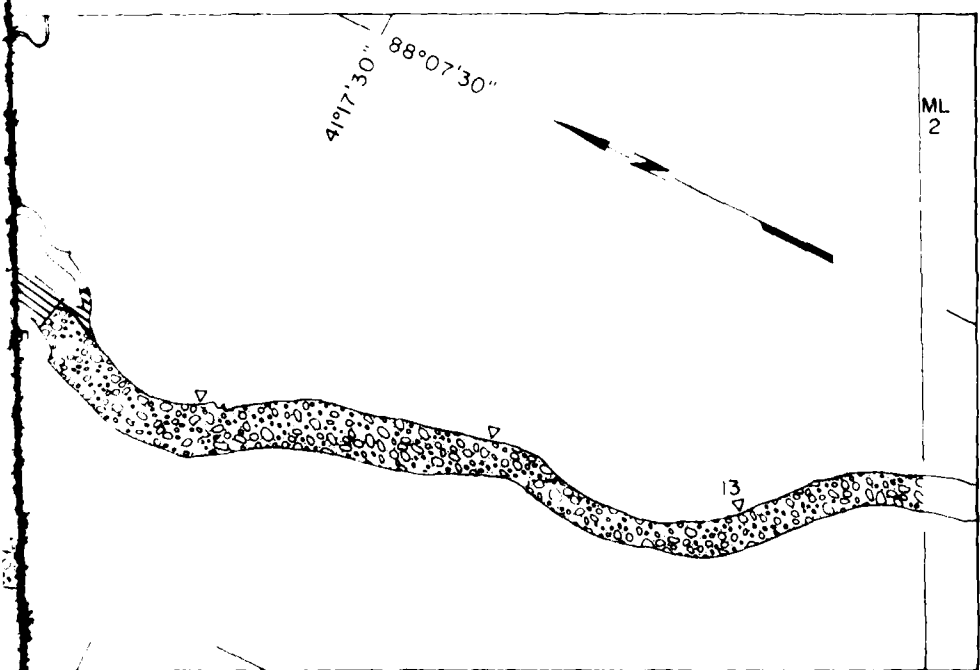
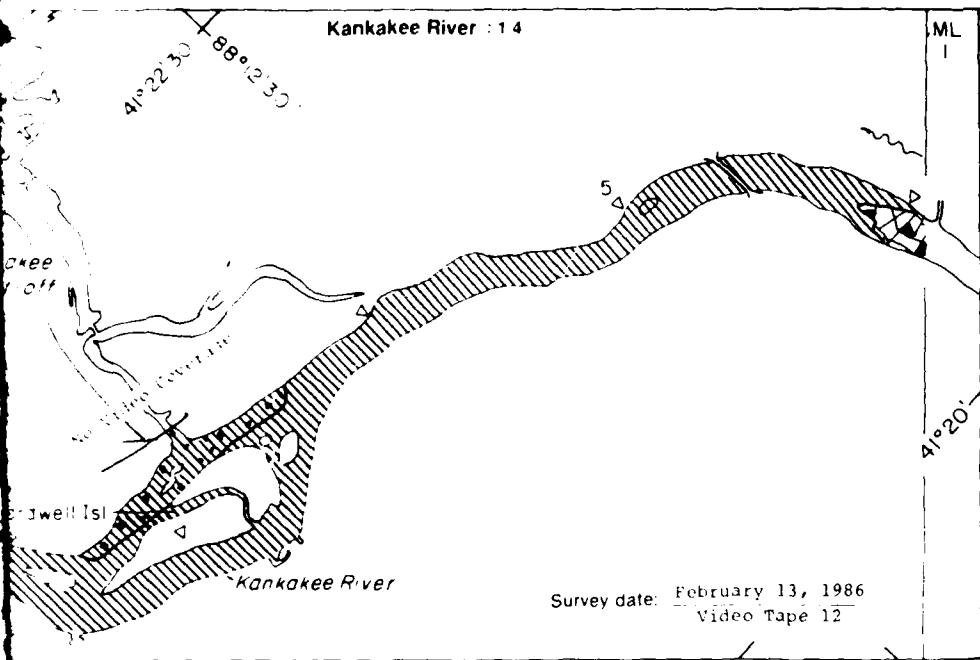
Kankakee R.

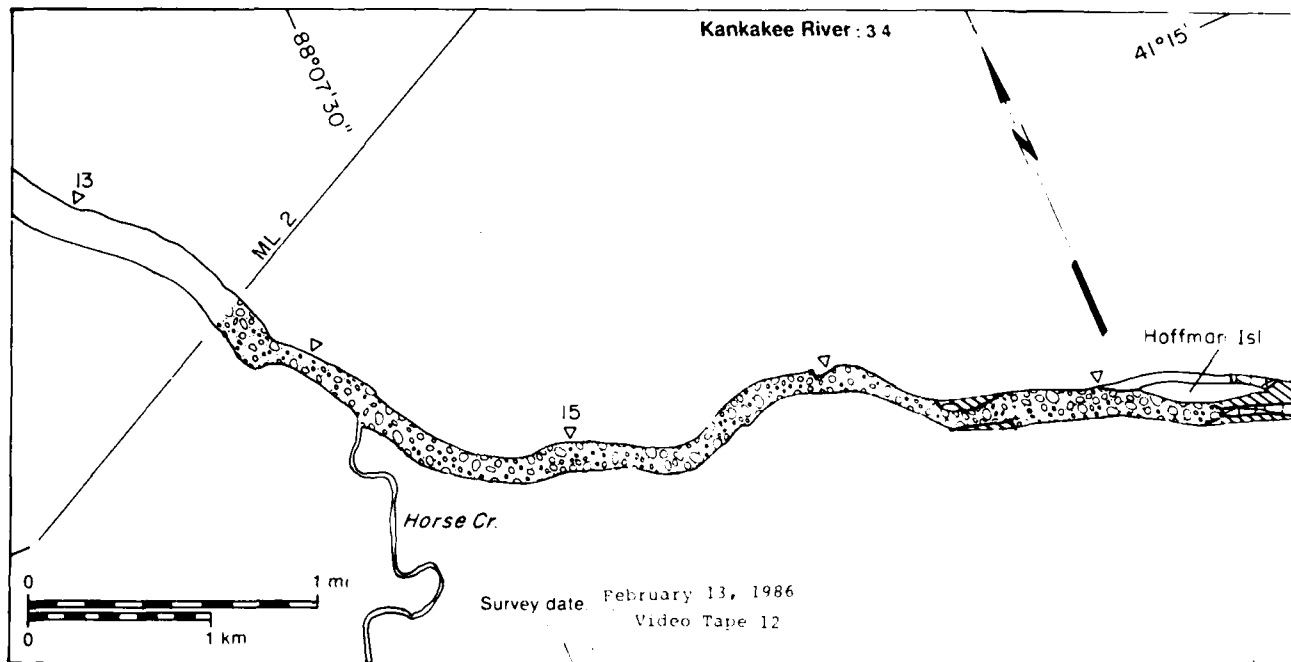
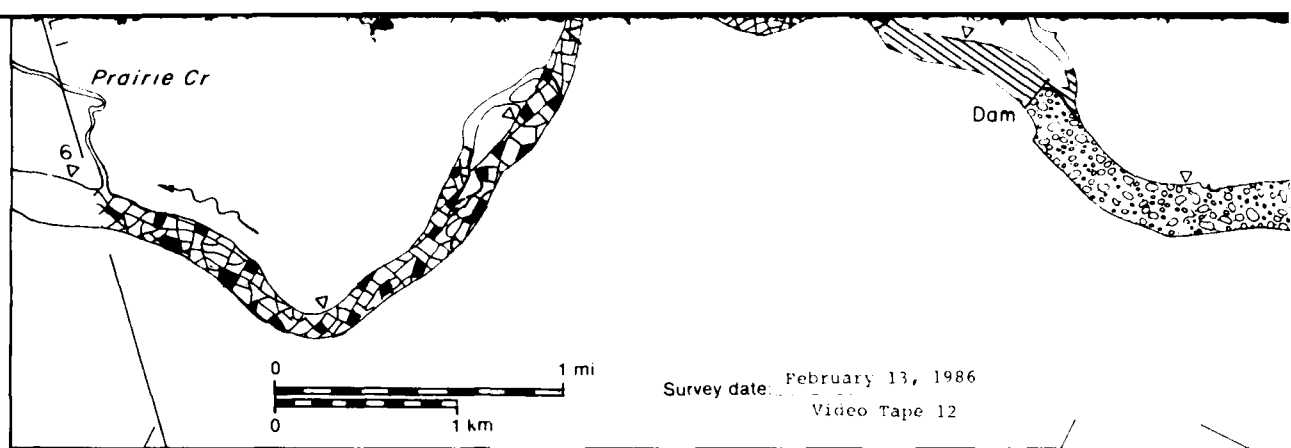
Δ273

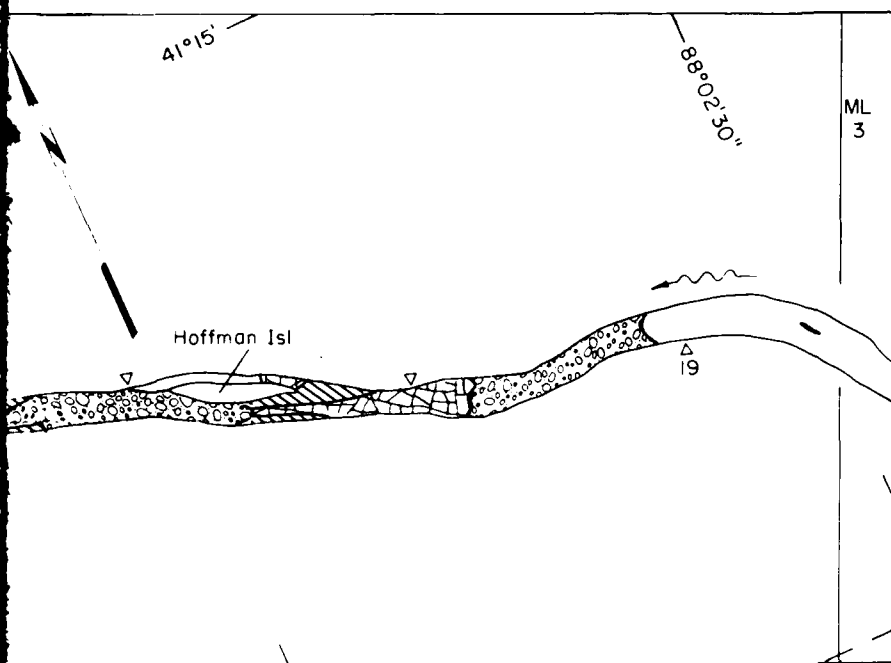
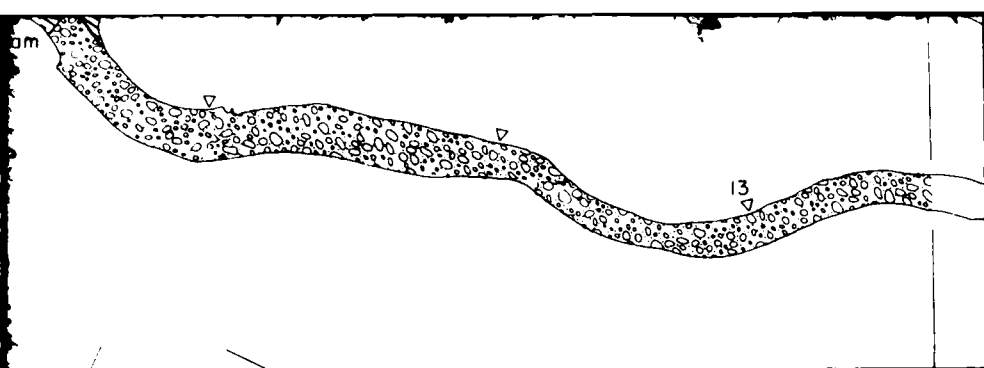
Des
Plaines
River

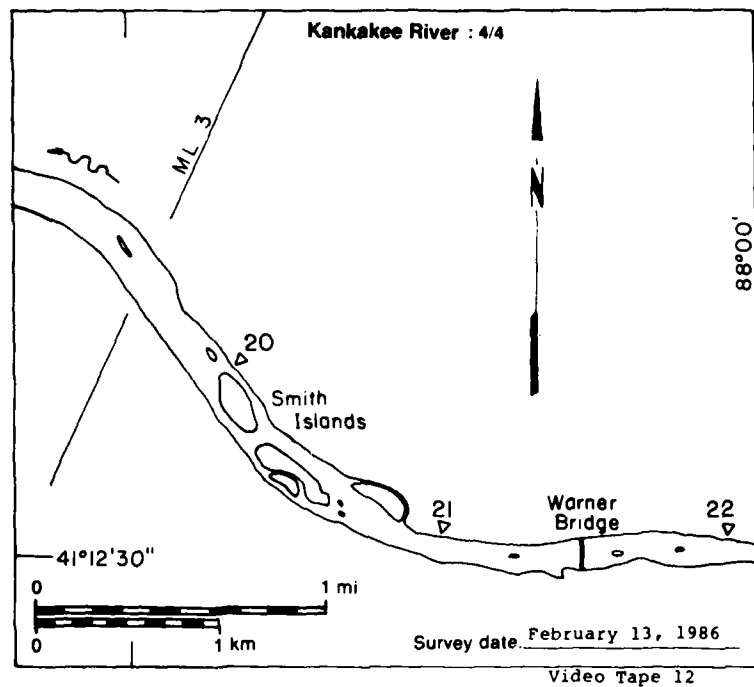
13 February 1986








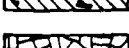








Kankakee River

MAP UNITS

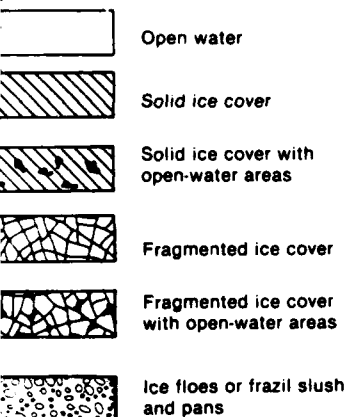
-  Open water
-  Solid ice cover
-  Solid ice cover with open-water areas
-  Fragmented ice cover
-  Fragmented ice cover with open-water areas
-  Ice floes or frazil slush and pans

Total area (m² x 10⁶)

13 February 1986

Kankakee River

MAP UNITS



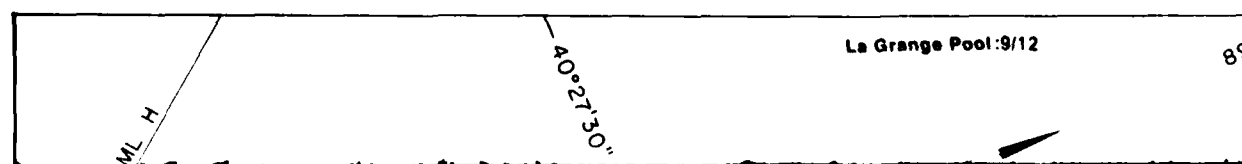
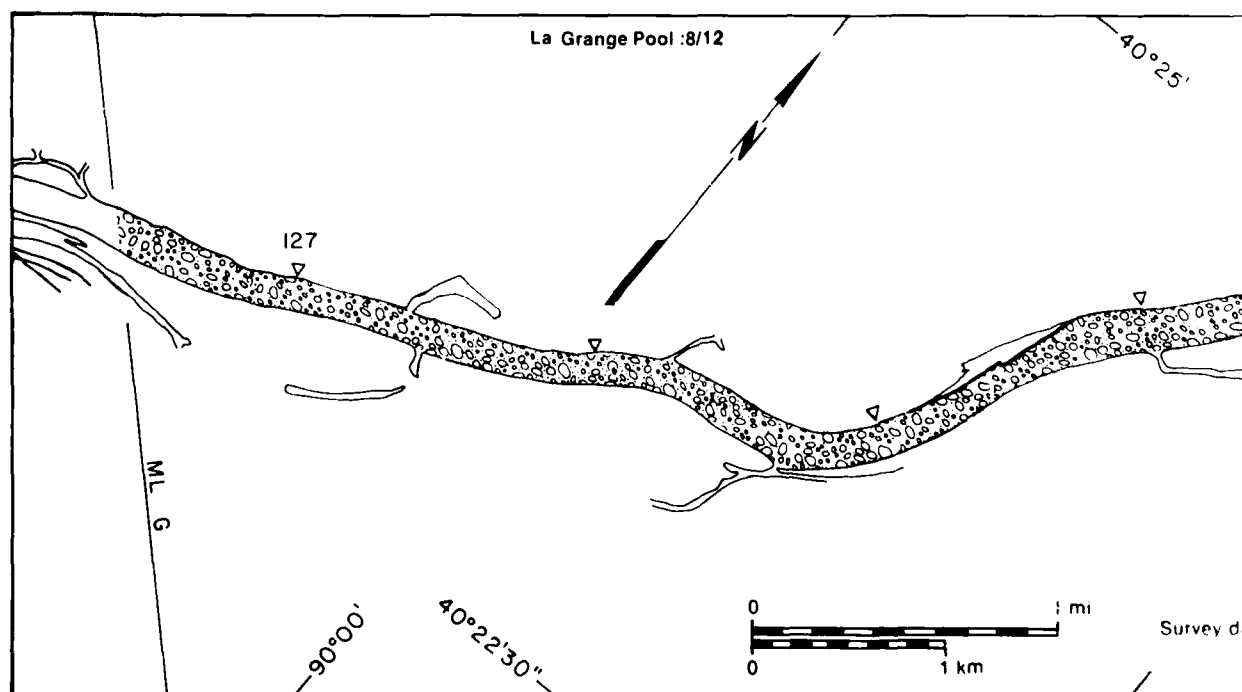
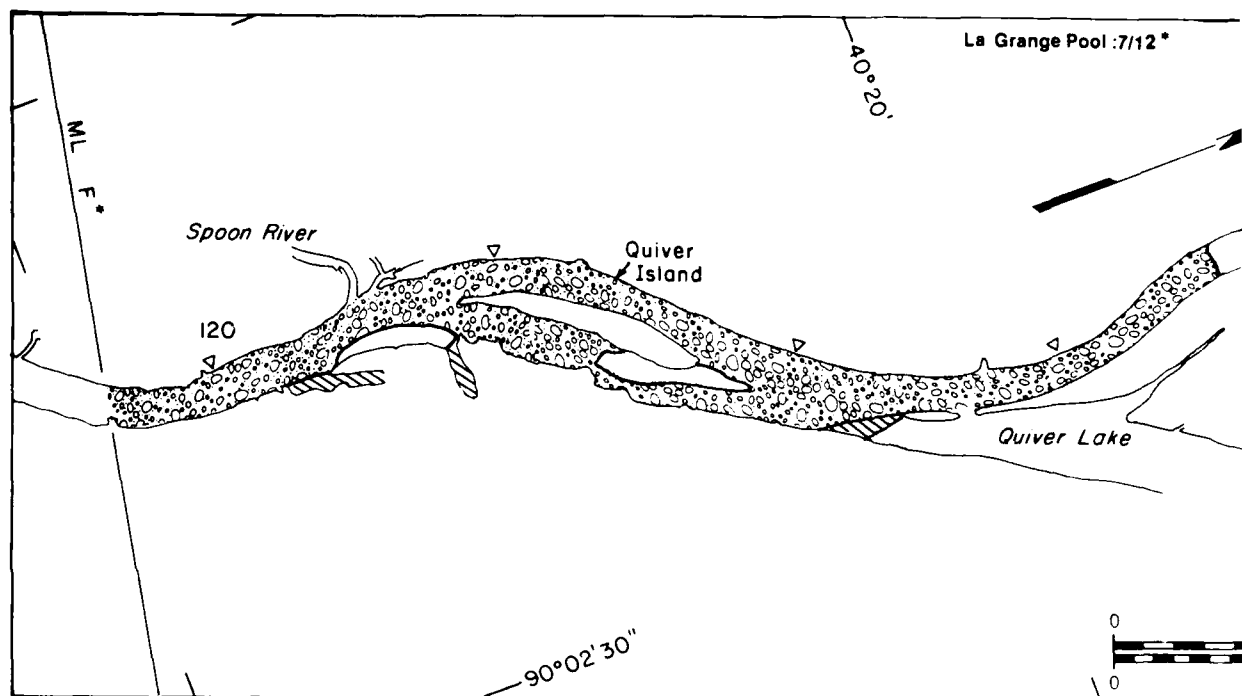
Area
($m^2 \times 10^6$)

Surface
concentration
(%)

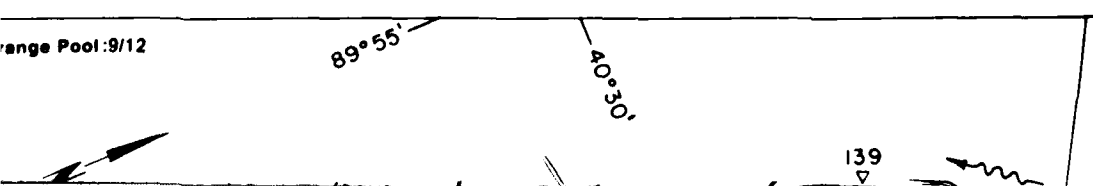
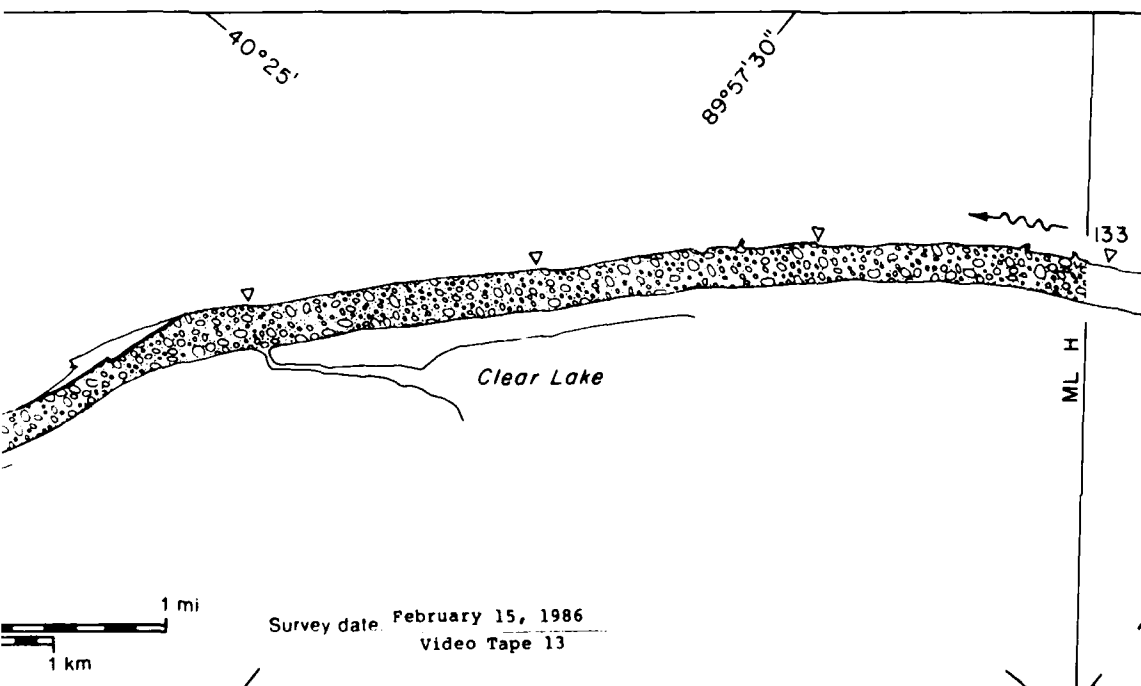
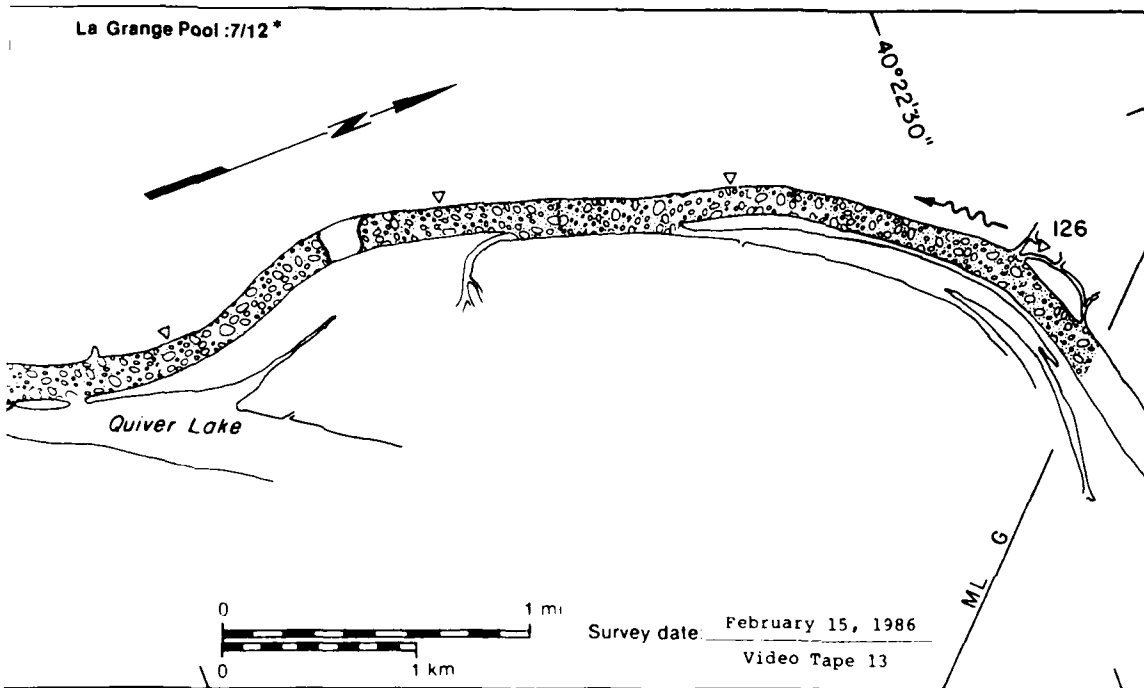
0.90	NA
2.59	NA
0.17	95
0.46	NA
0.65	90
2.48	50
7.30*	

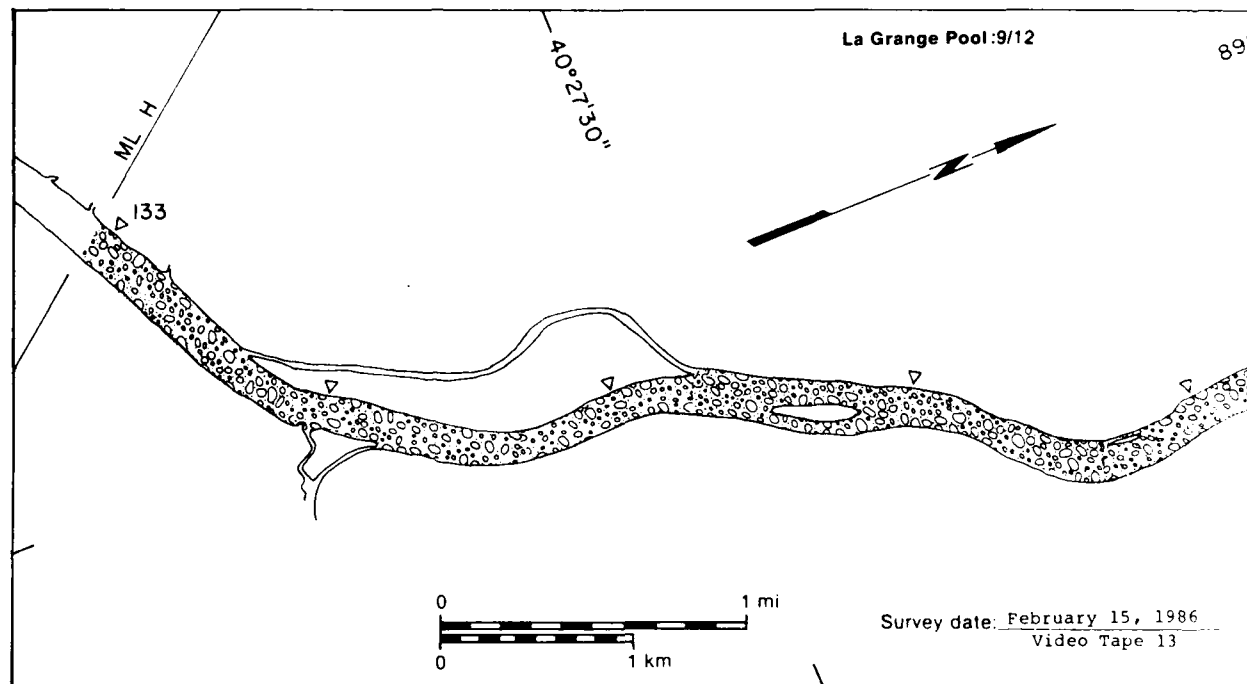
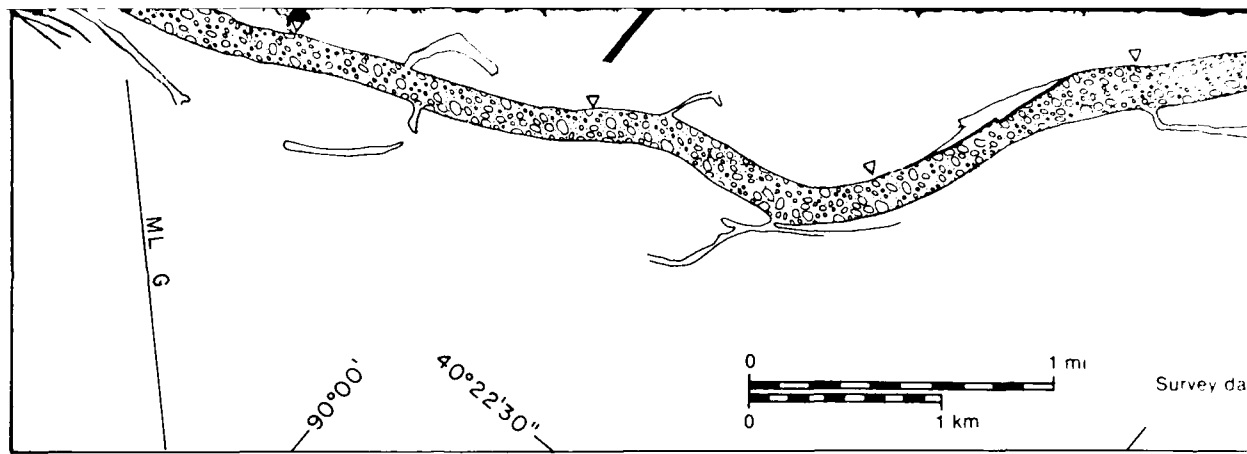
* Includes $0.05 \times 10^6 m^2$
of no video coverage

Total area ($m^2 \times 10^6$)

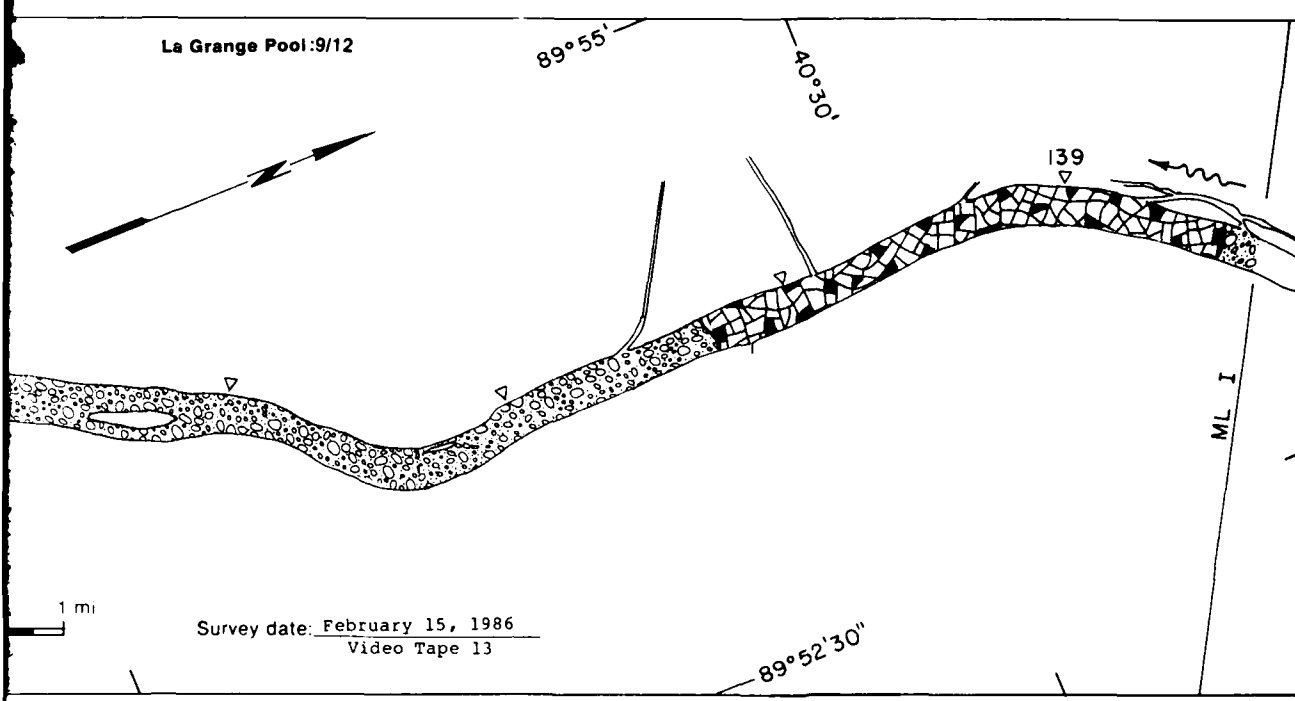
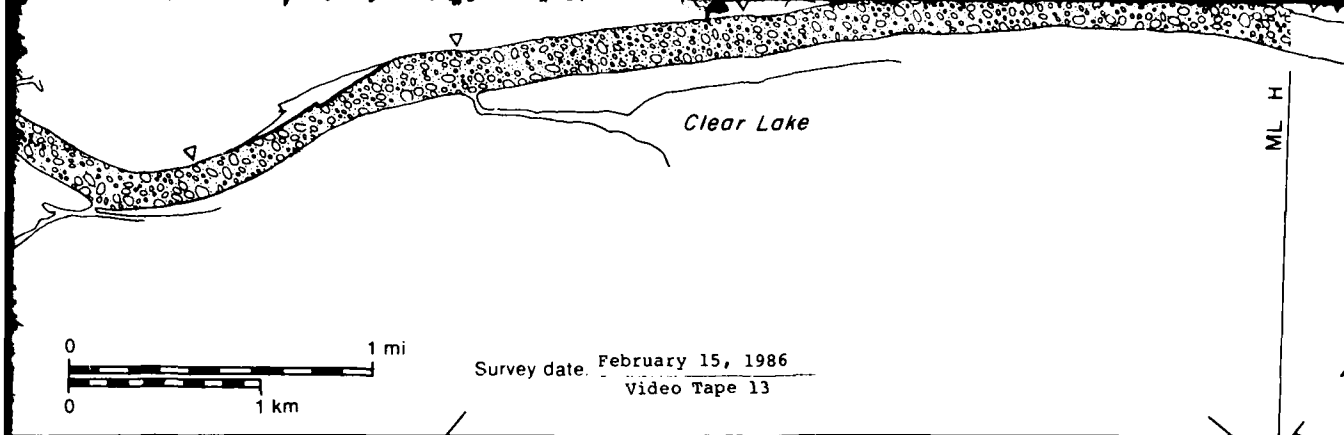


15 February 1986



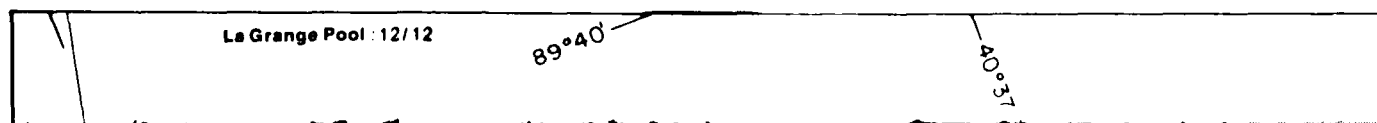
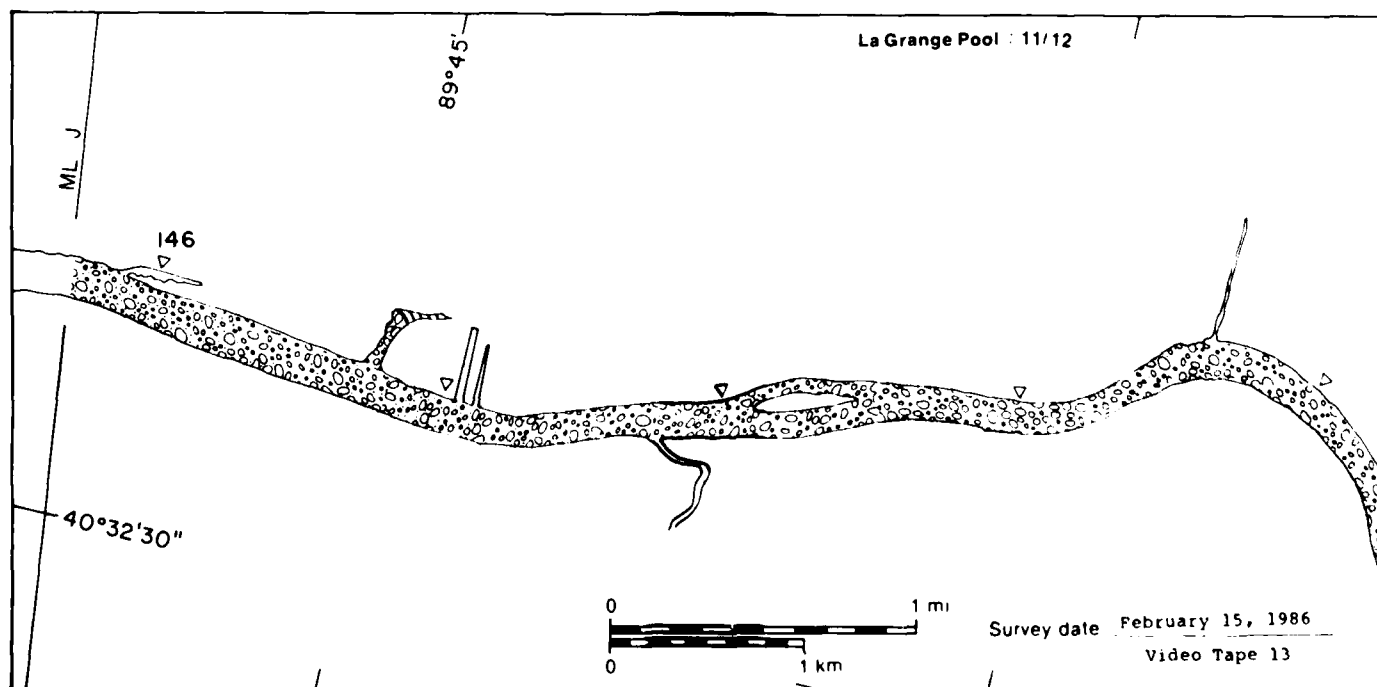
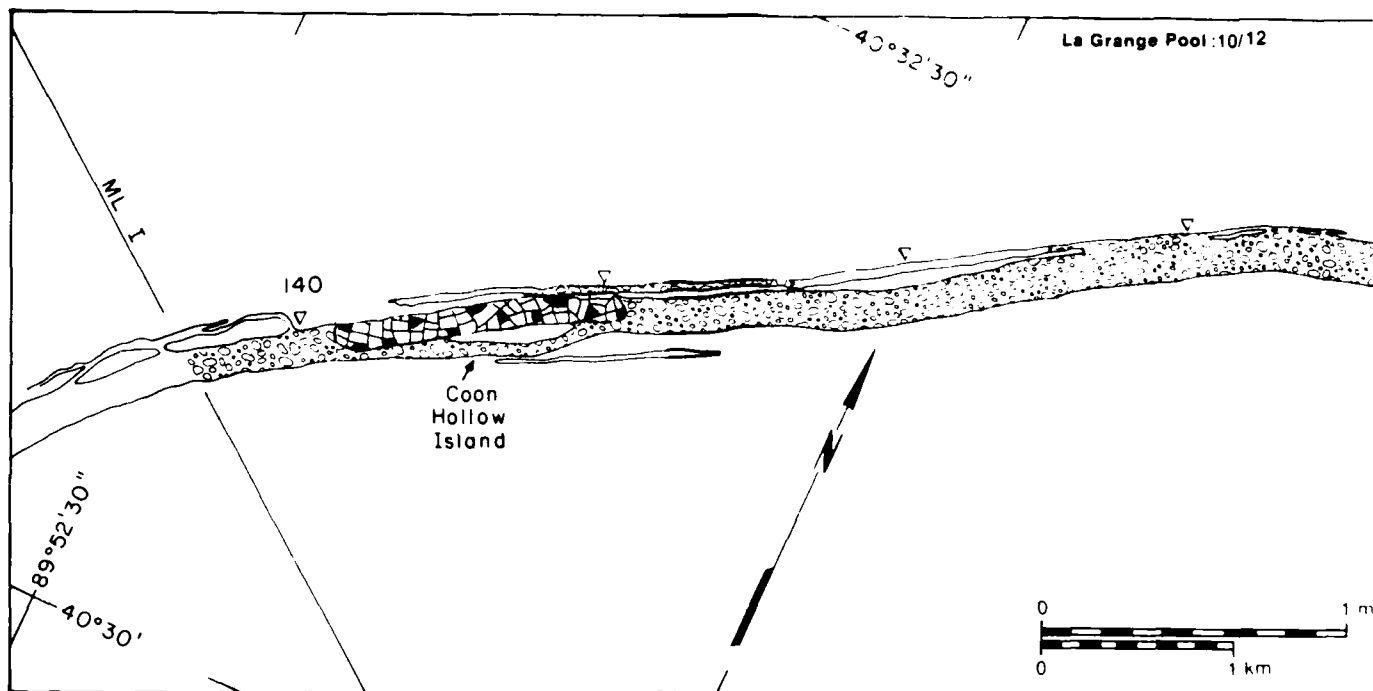


* The downstream limit of Illinois River video coverage was in the vicinity of mile 120 at Havana, Illinois, on all dates. There is no coverage of La Grange Pool maps 1/12 through 6/12 (match lines A through E).



ity of mile 120 at
aps 1/12 through

15 February 1986



La Grange Pool: 10/12

89°47'30"

ML J

145

1 mi

1 km

Survey date: February 15, 1986
Video Tape 13

2

40°35'

ML K

153

ate February 15, 1986
Video Tape 13

89°40'

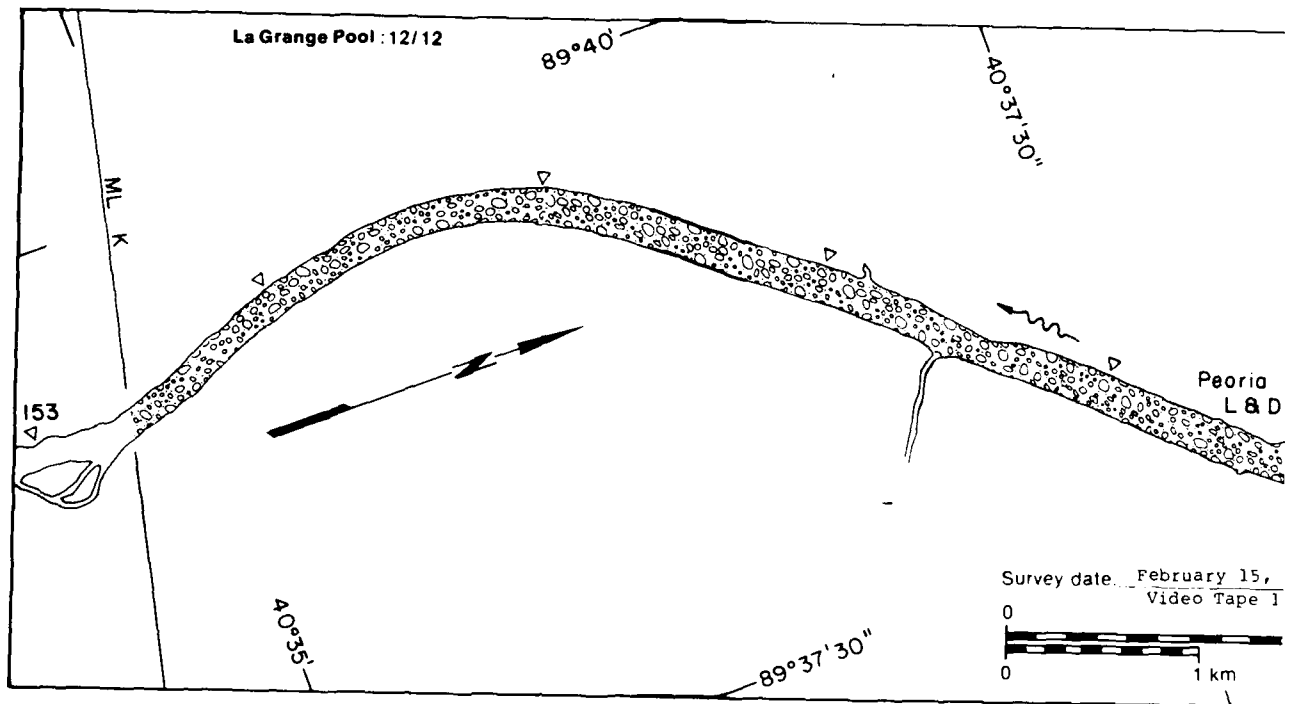
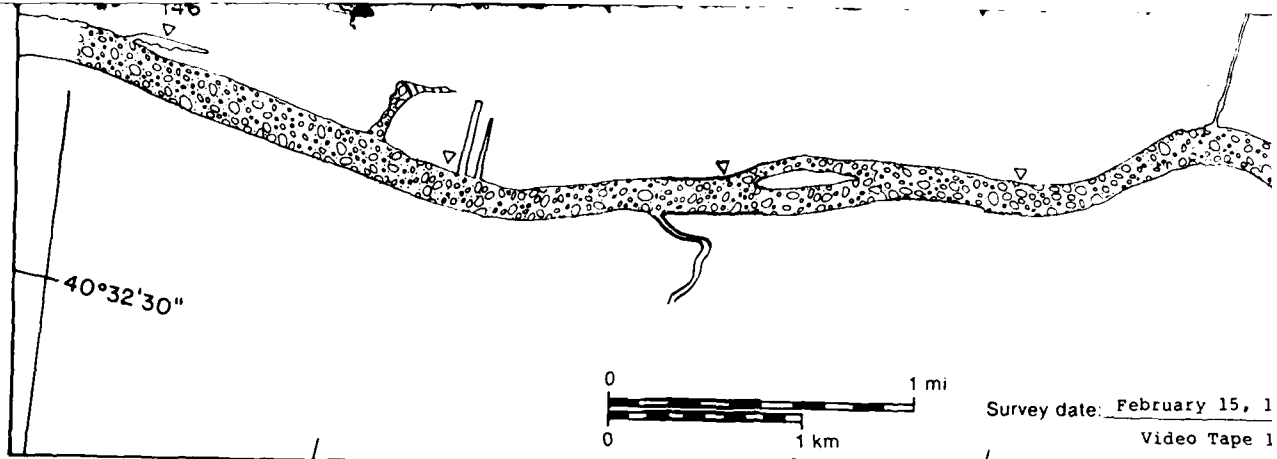
La Grange Pool

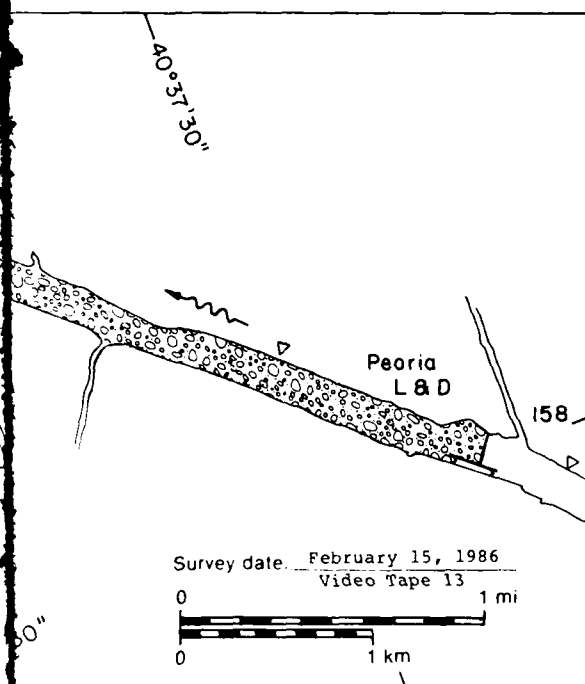
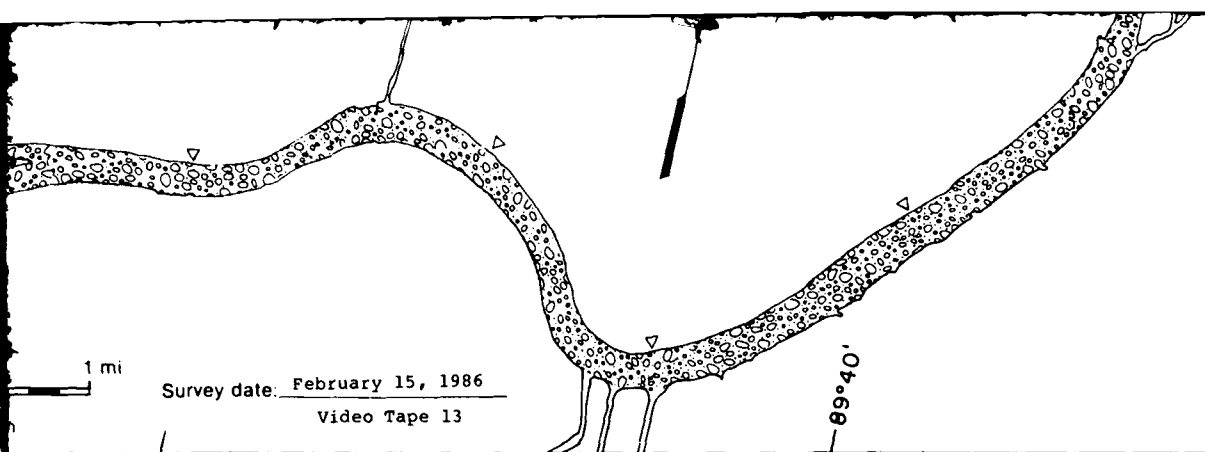
Area

Surface concentration

MAP UNITS

(m² × 10⁶)



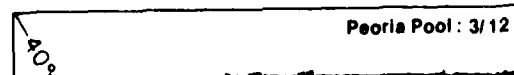
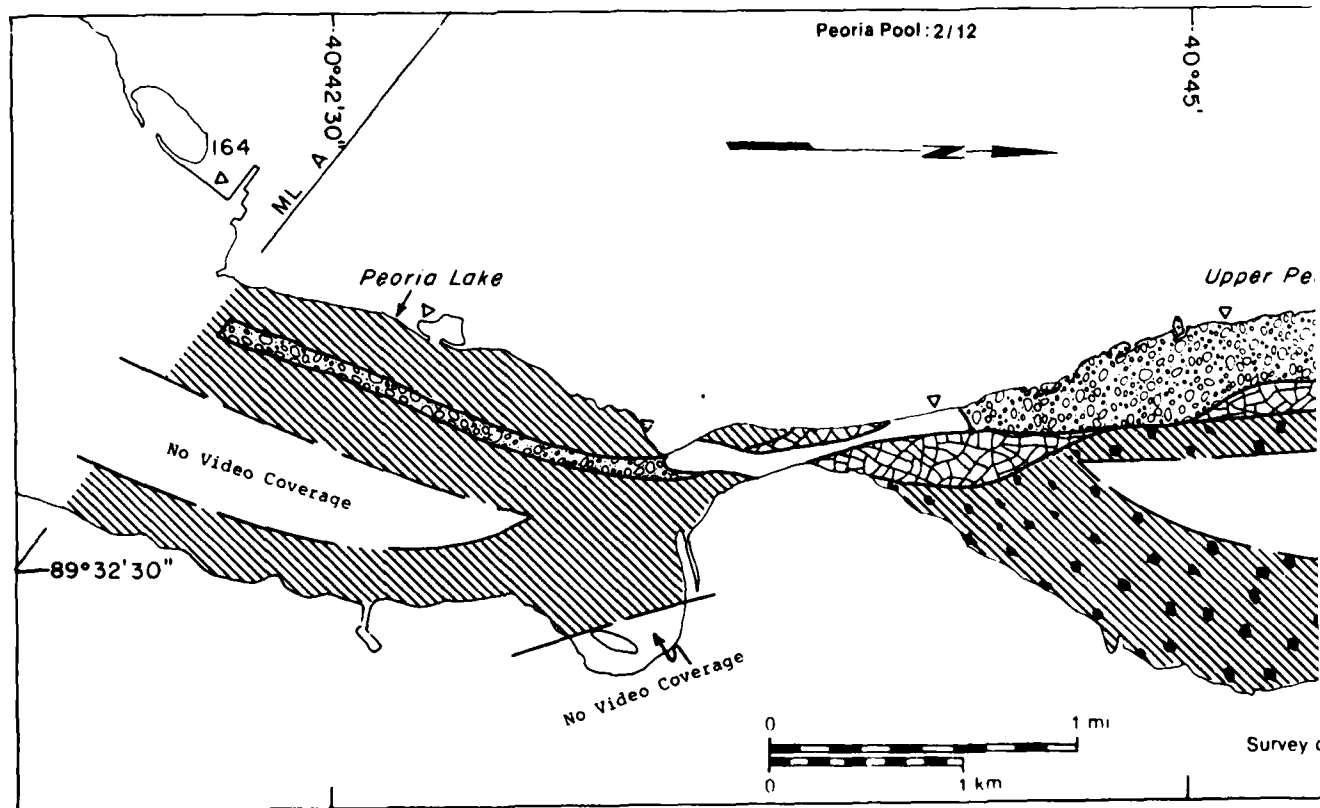
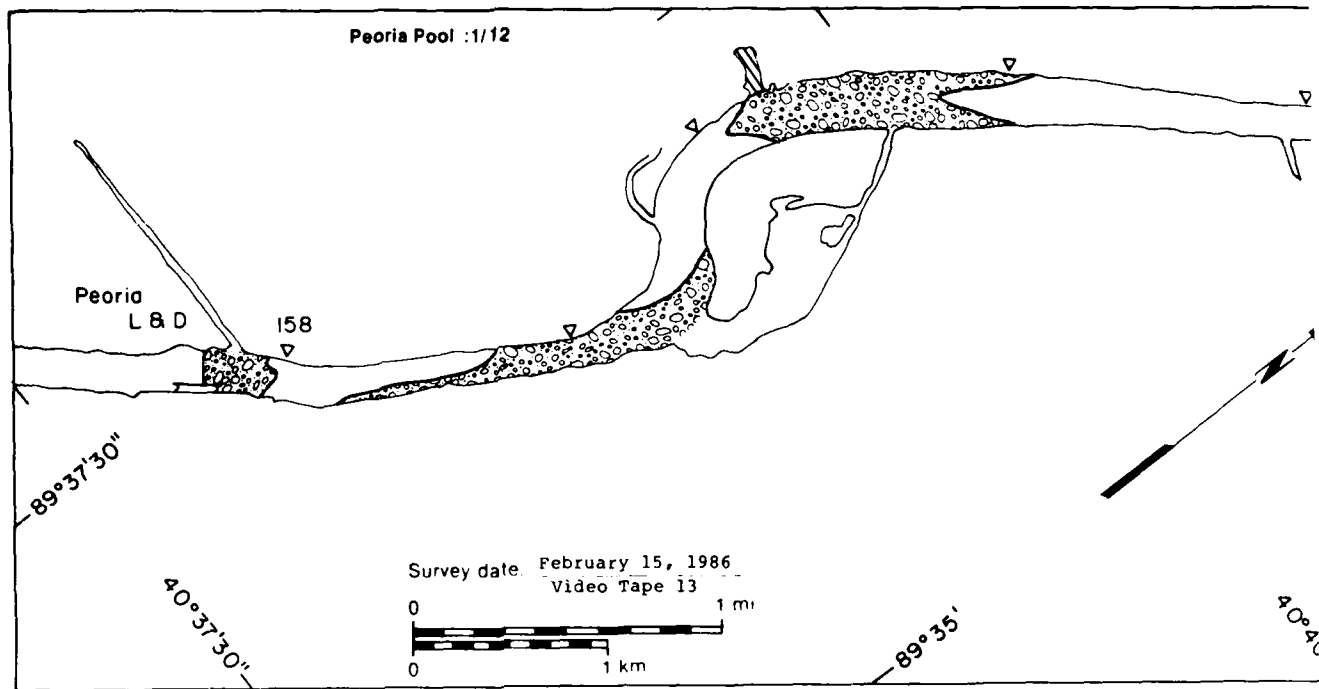


La Grange Pool

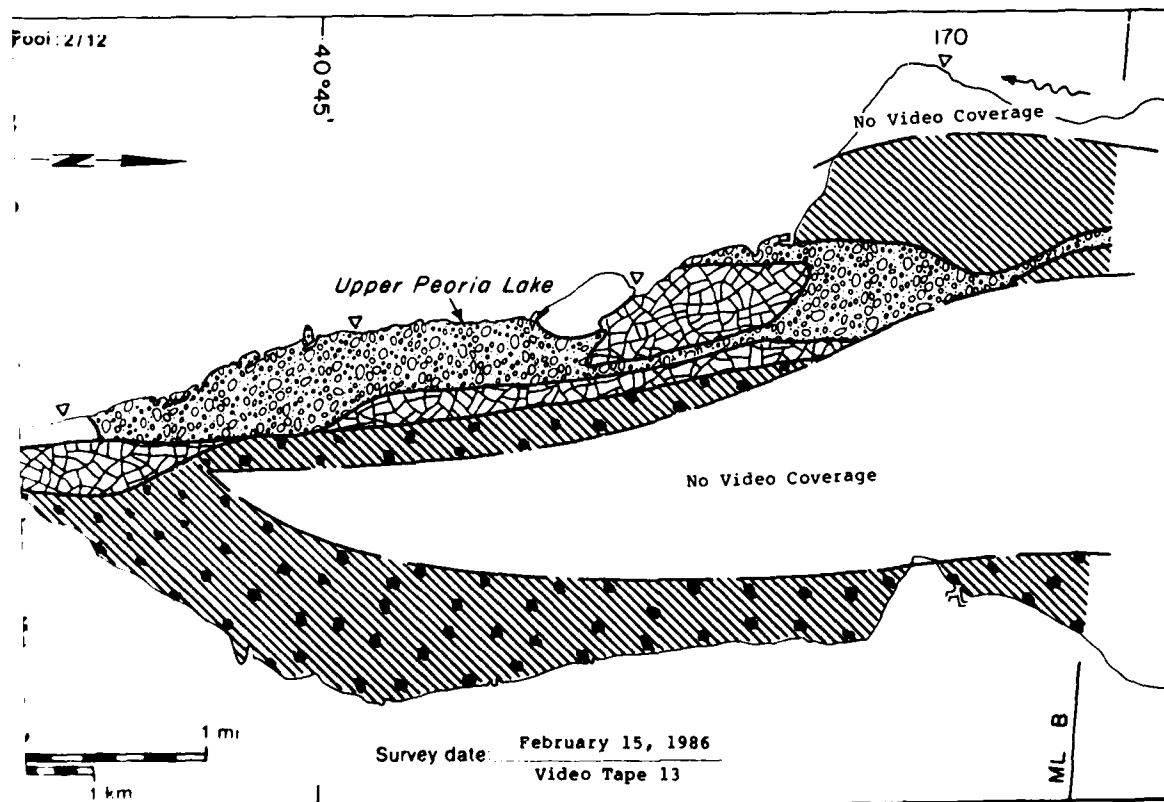
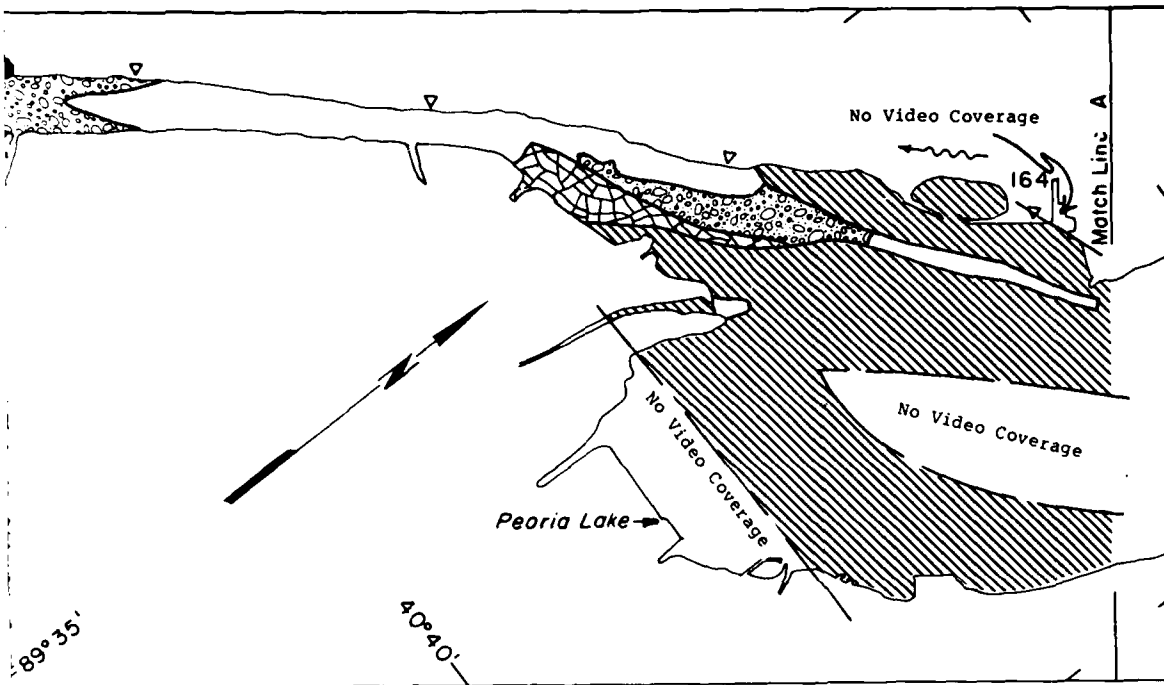
MAP UNITS

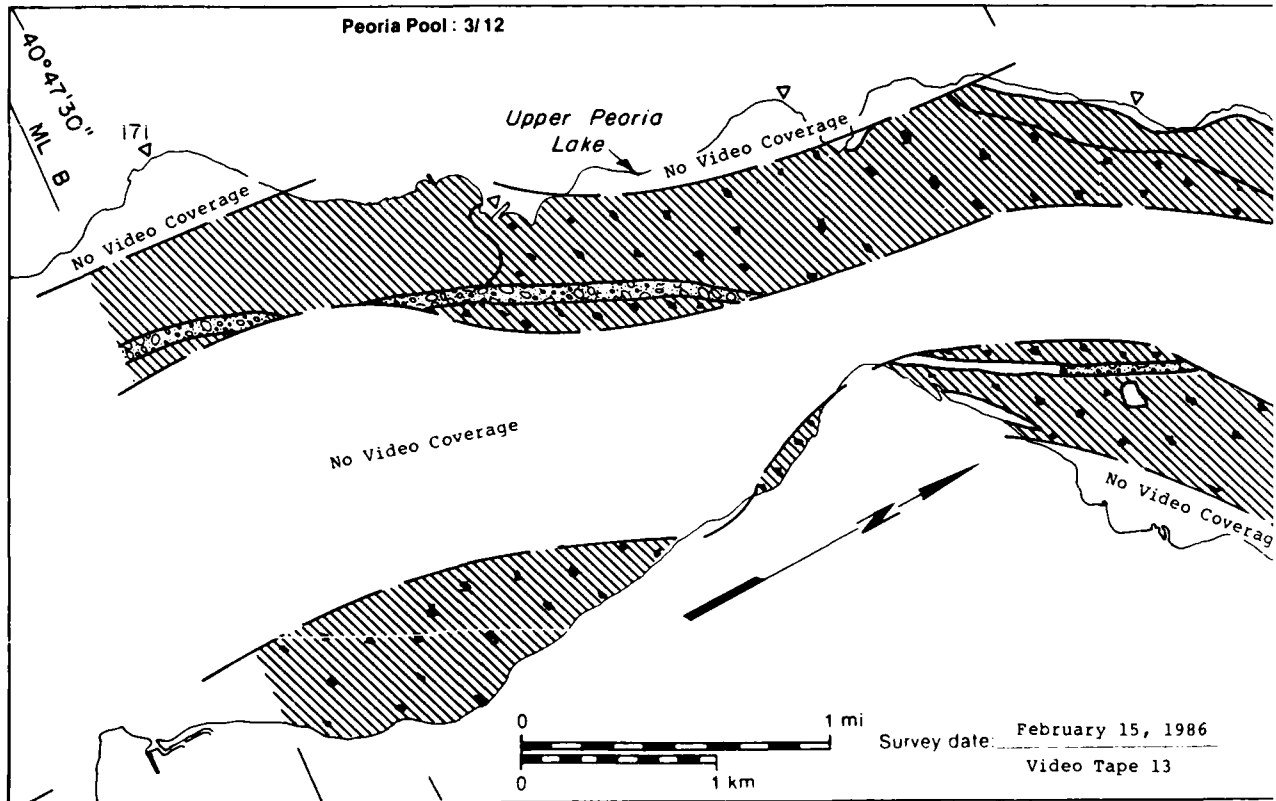
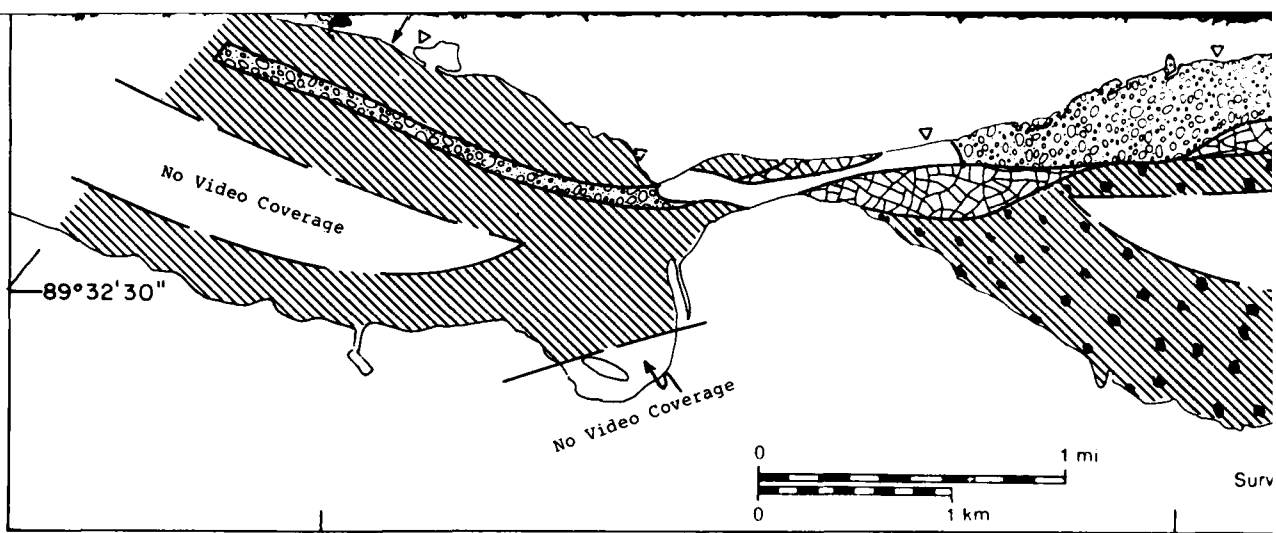
	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

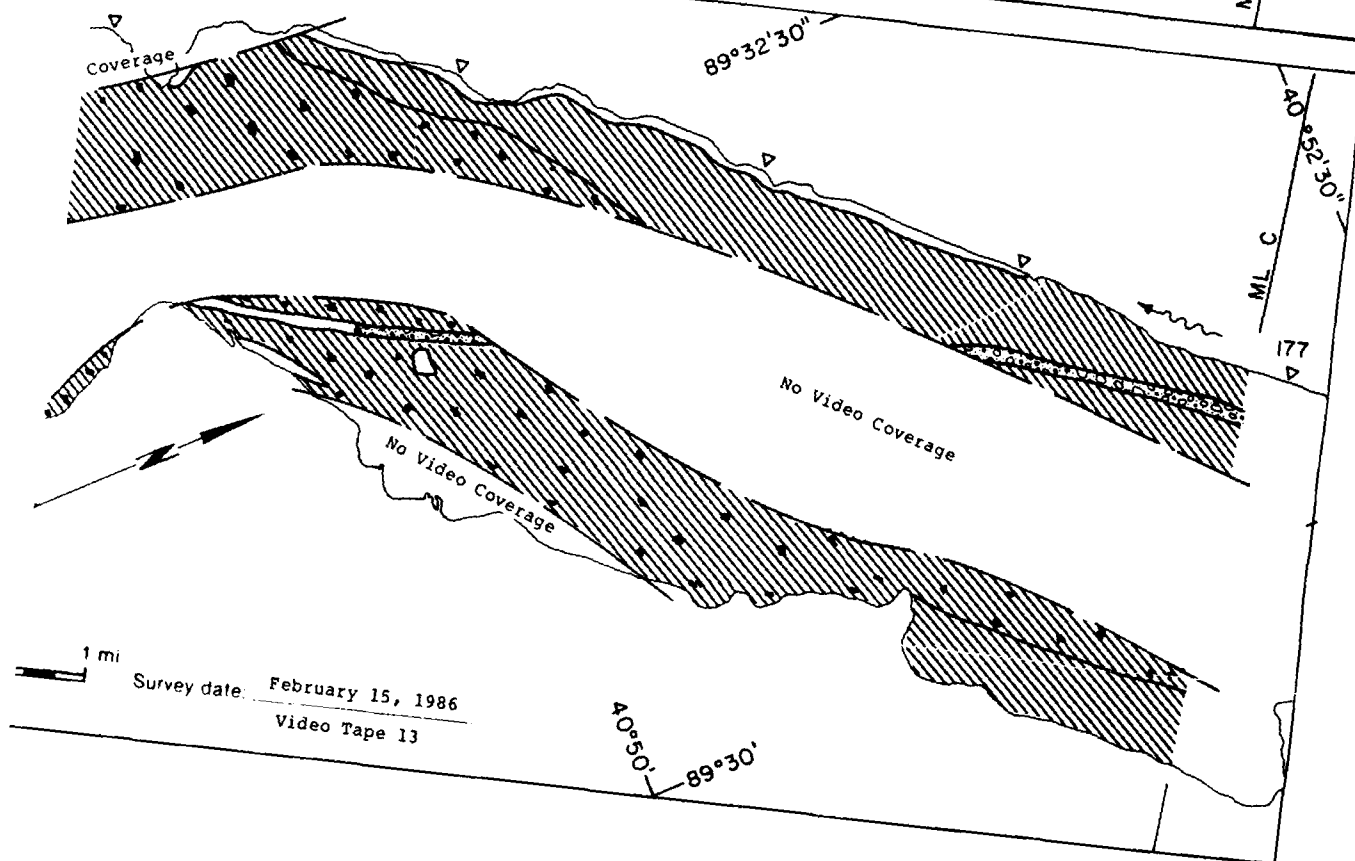
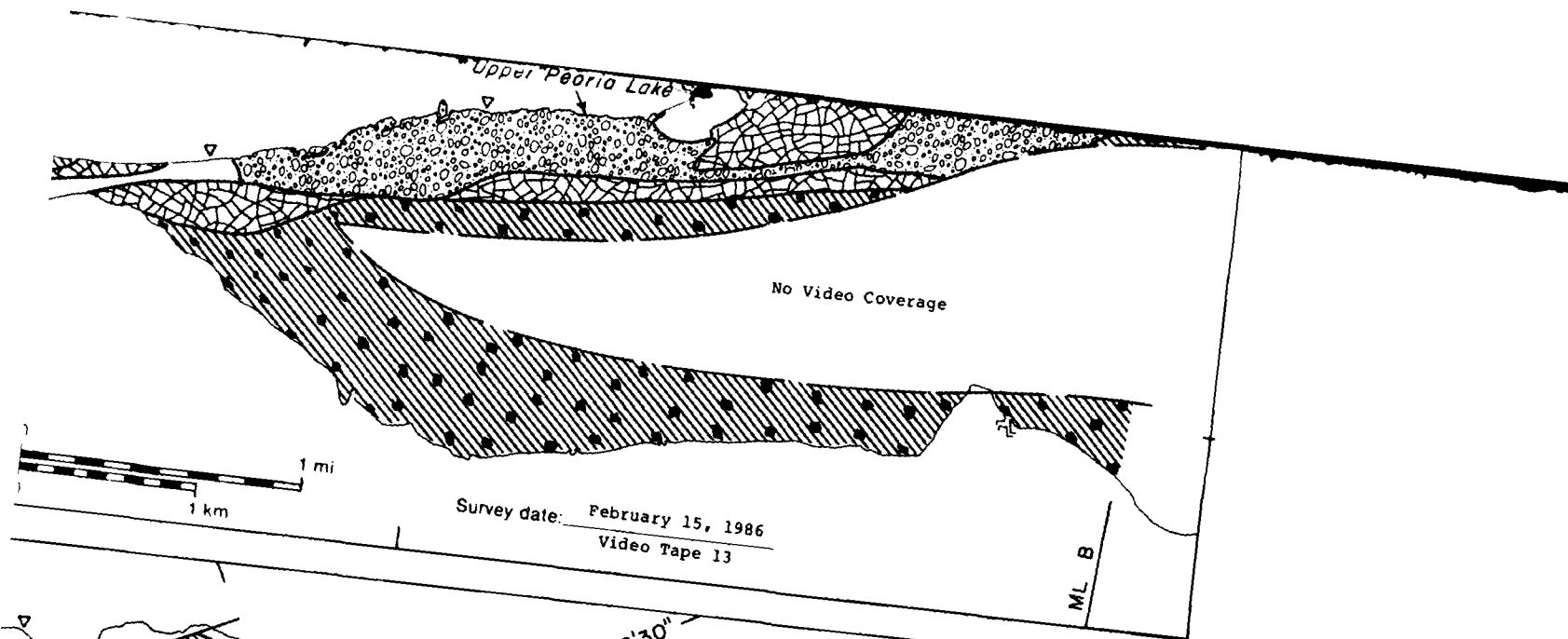
Area (m ² x 10 ⁶)	Surface concentration (%)
0.31	NA
0.10	NA
0.00	—
0.00	NA
0.78	70
10.52	30
Total area (m ² x 10 ⁶)	11.71



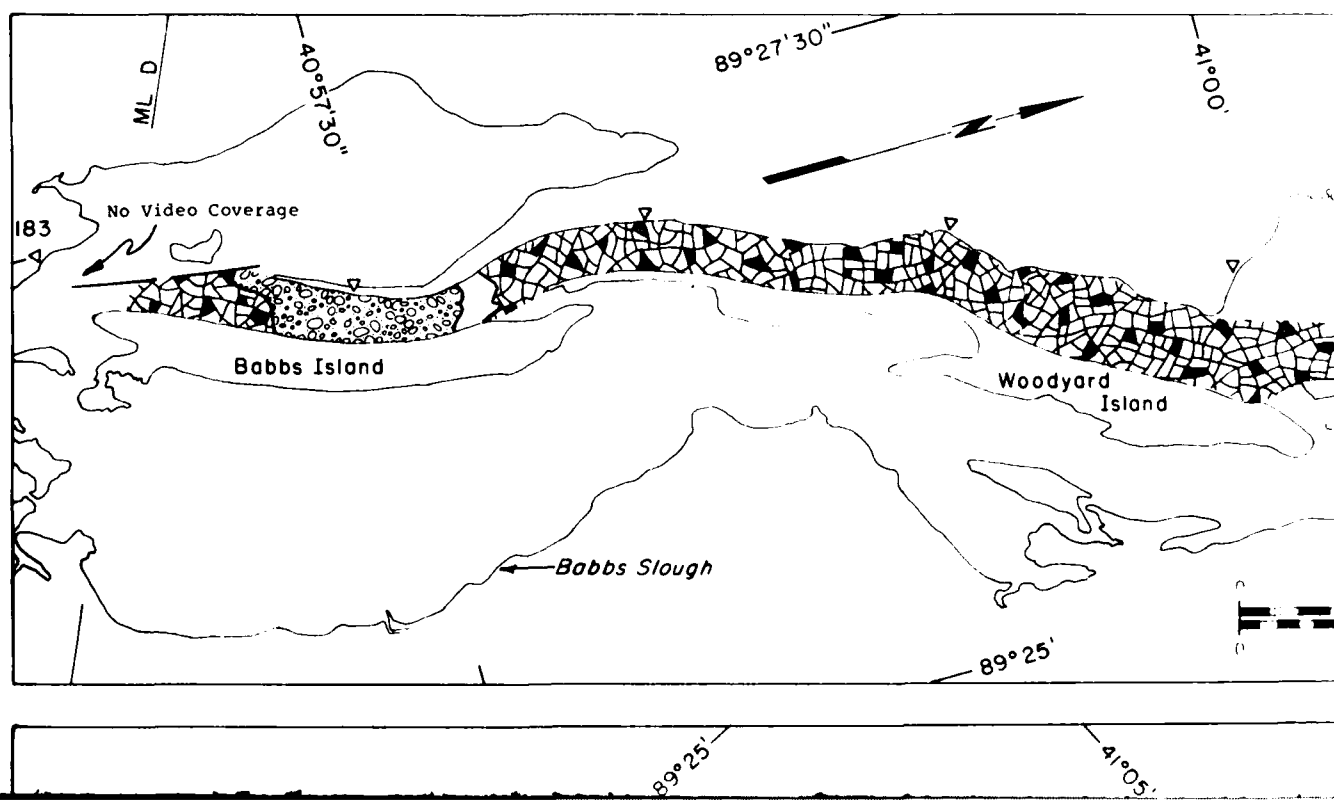
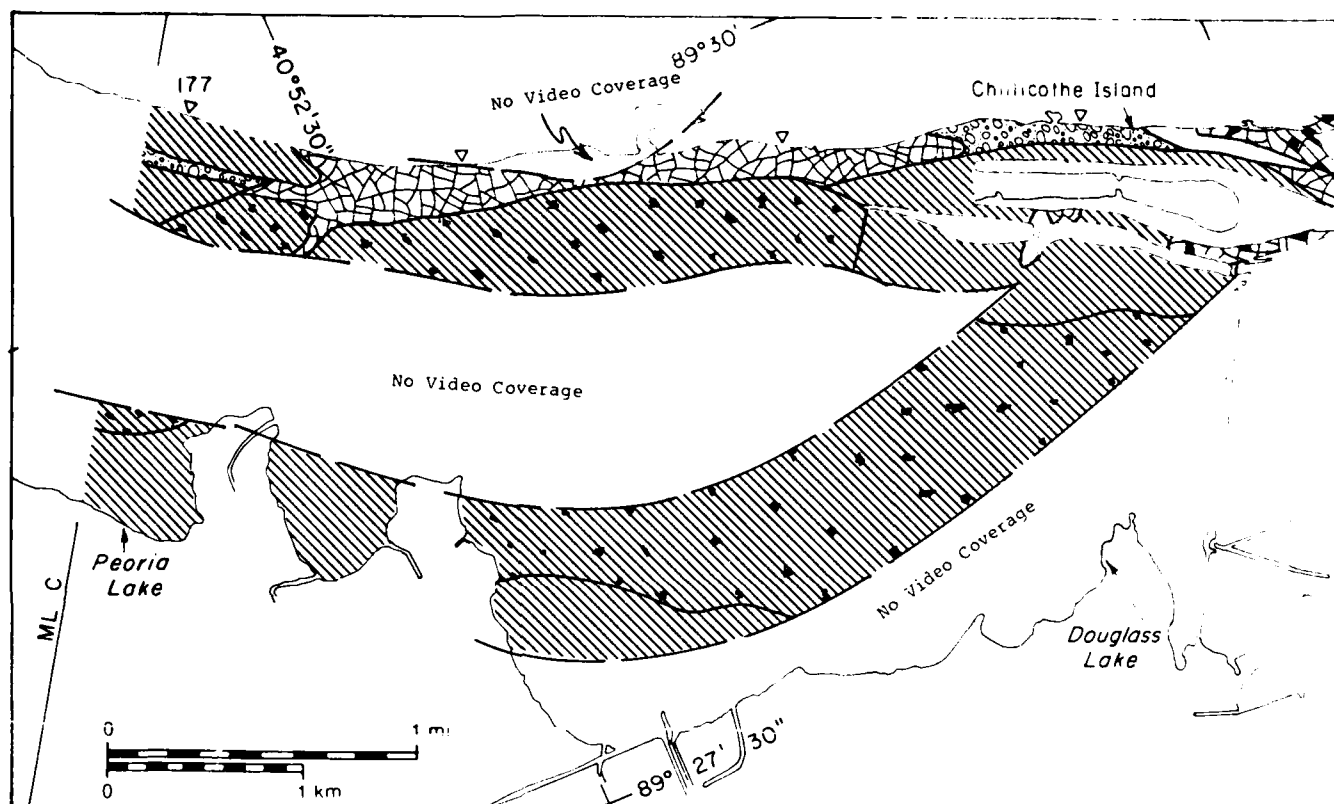
15 February 1986

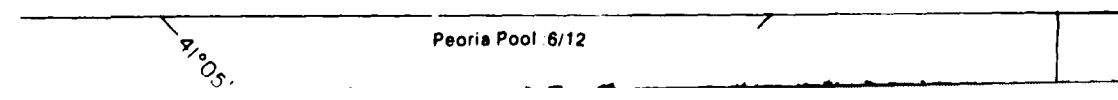
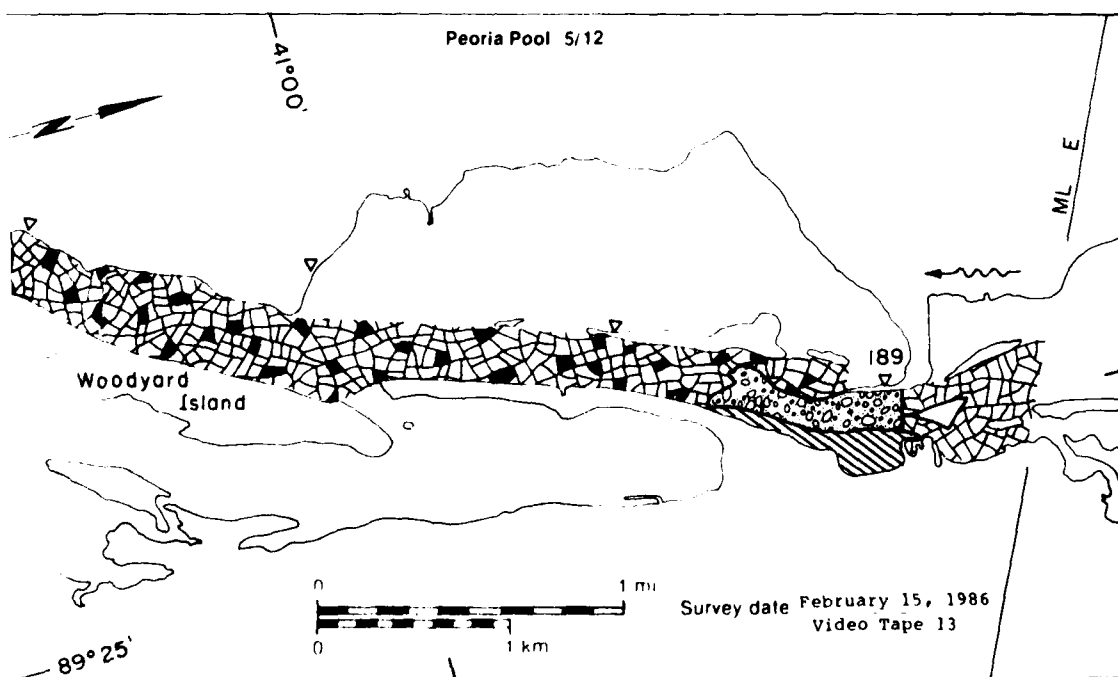
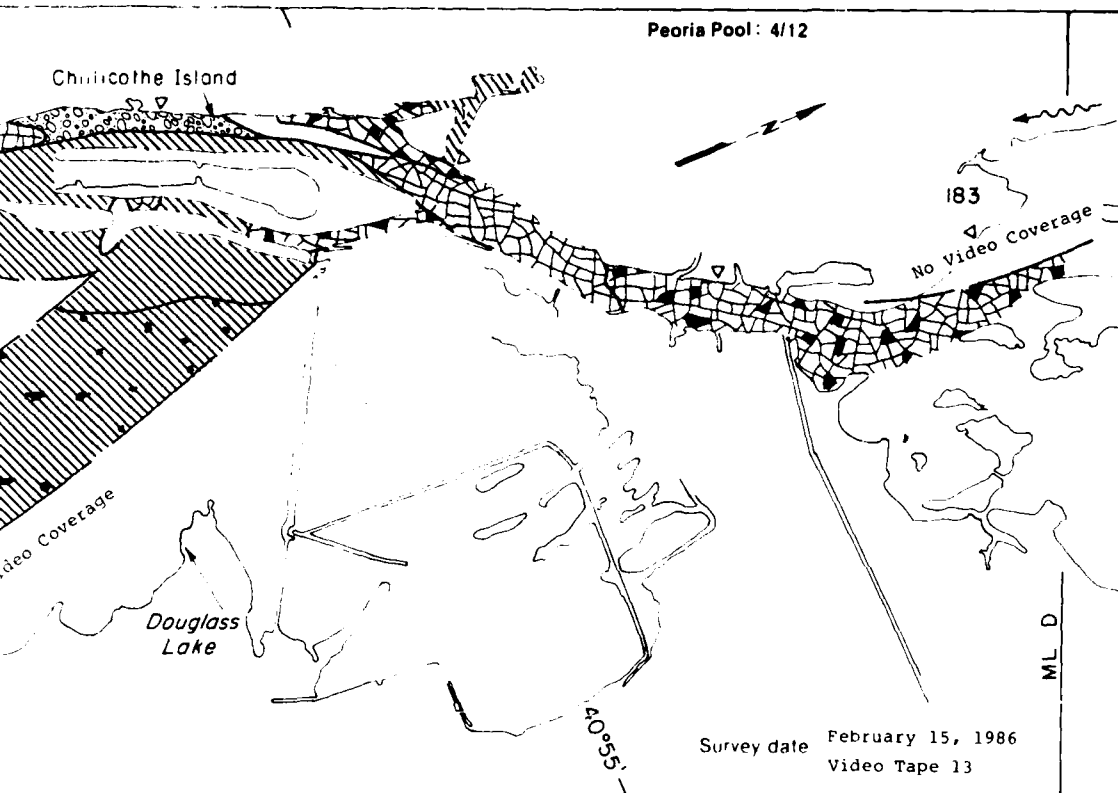


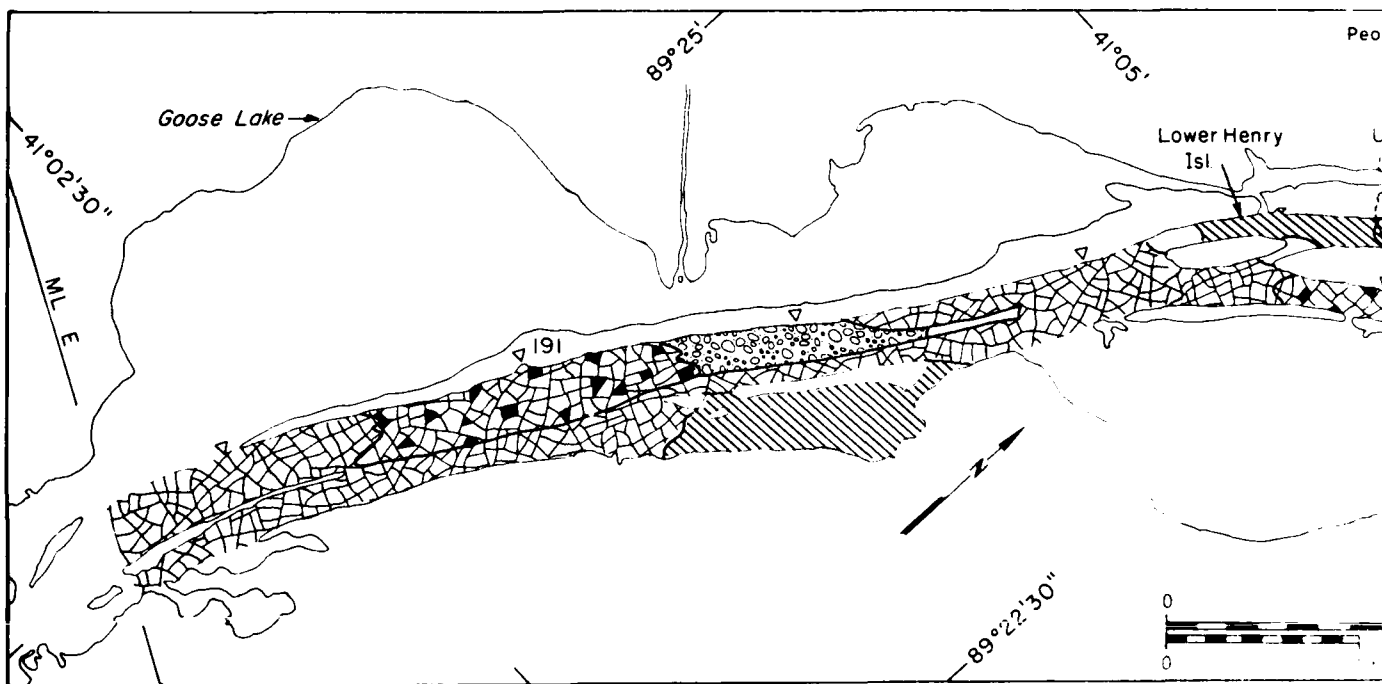
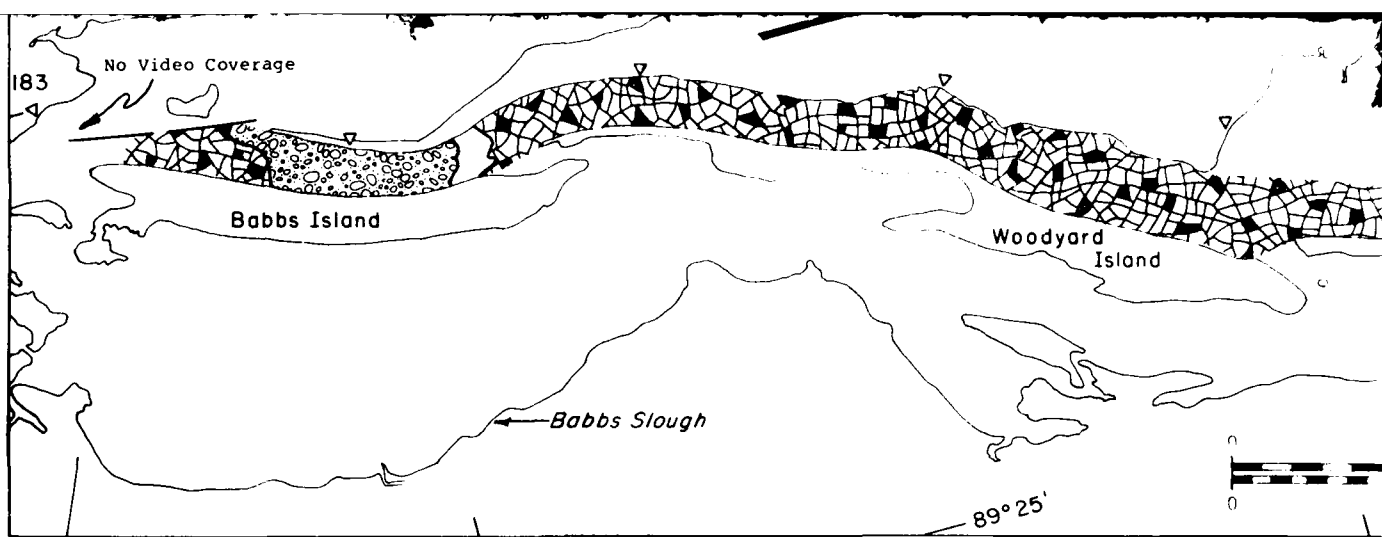


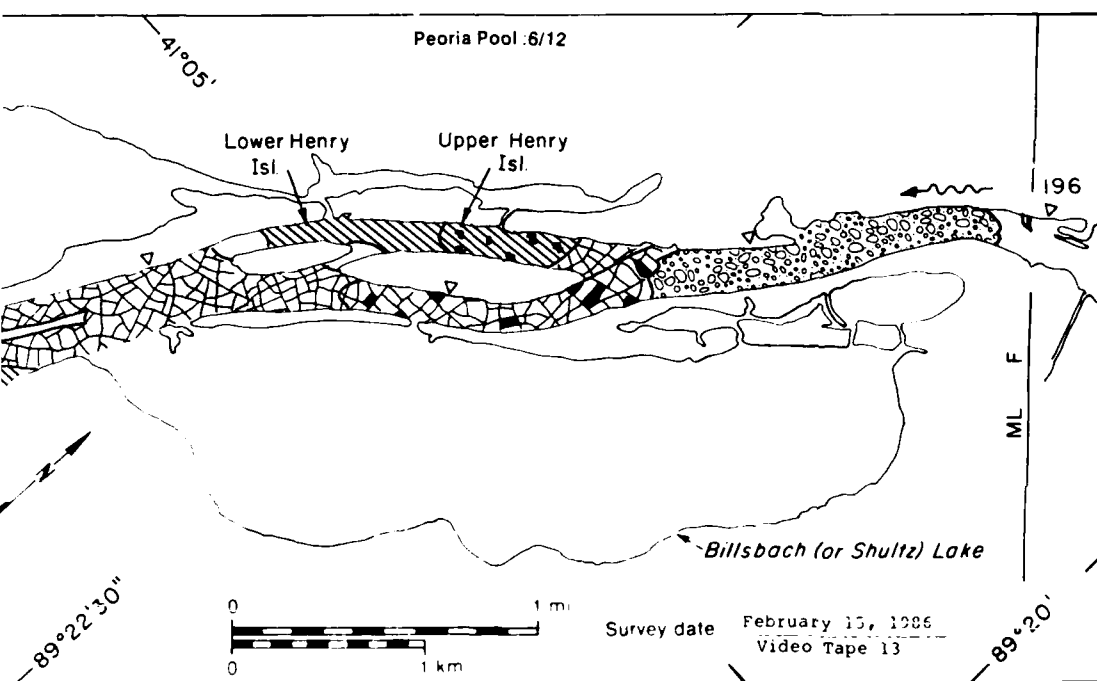
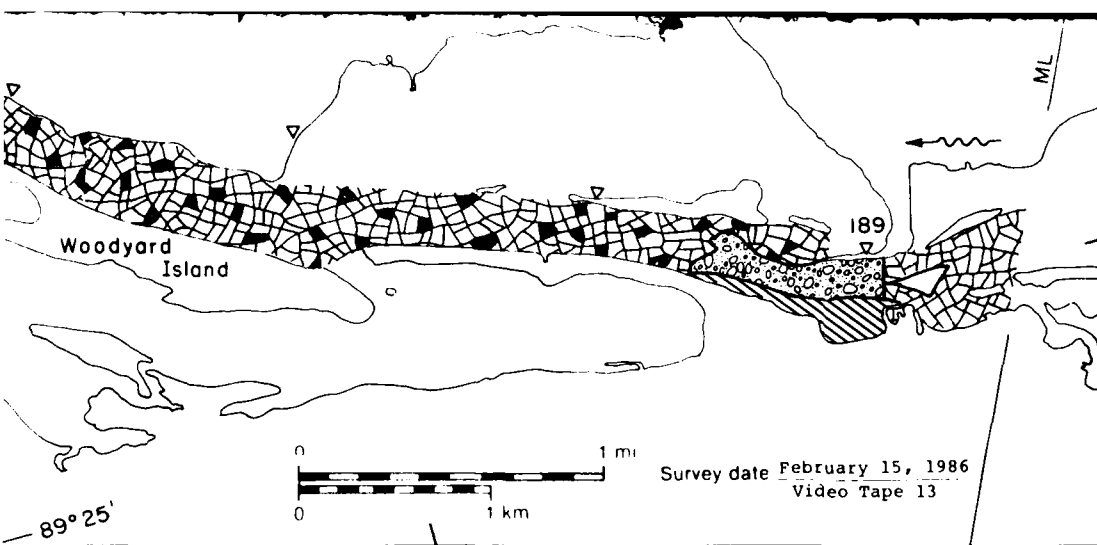


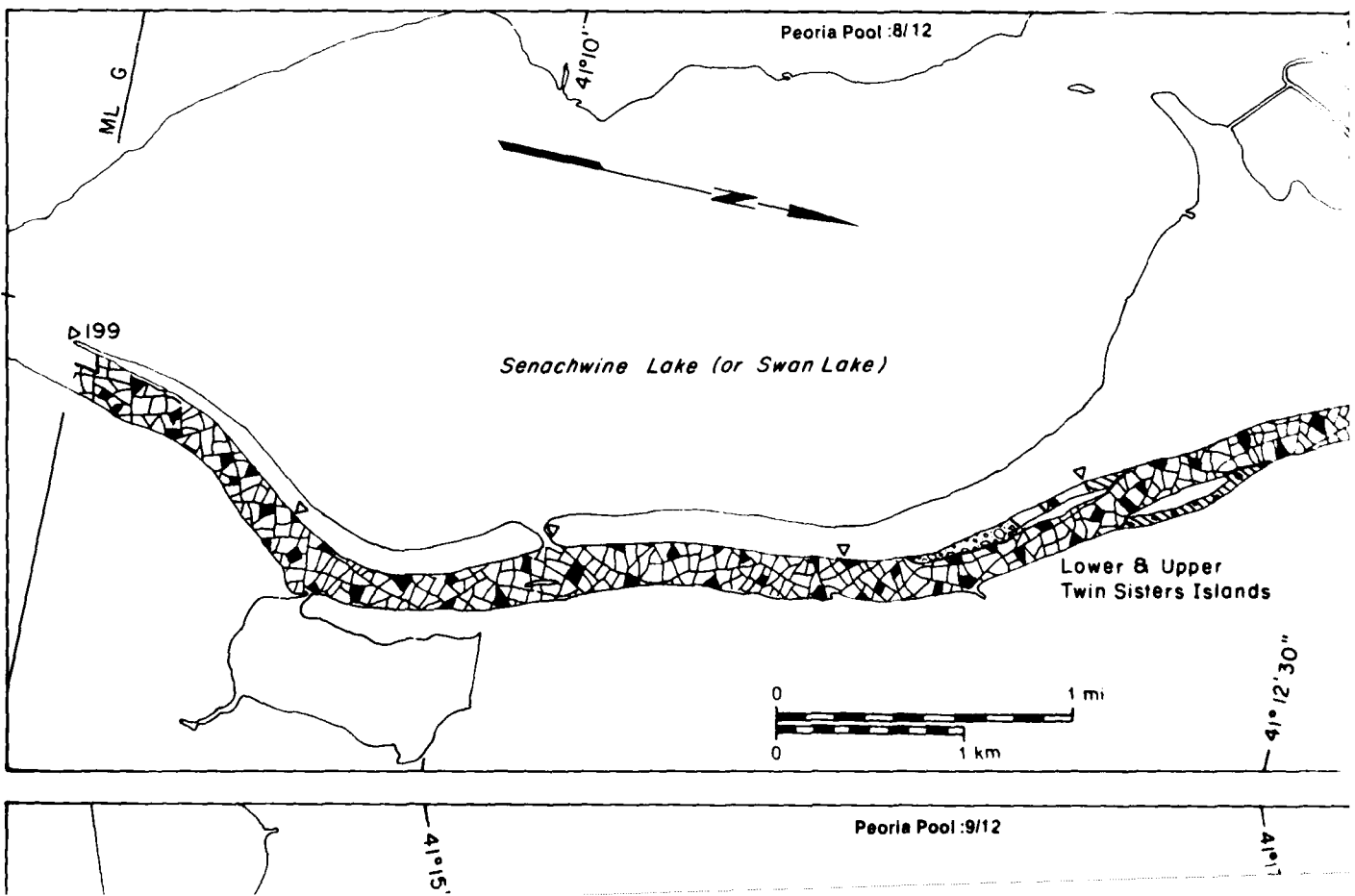
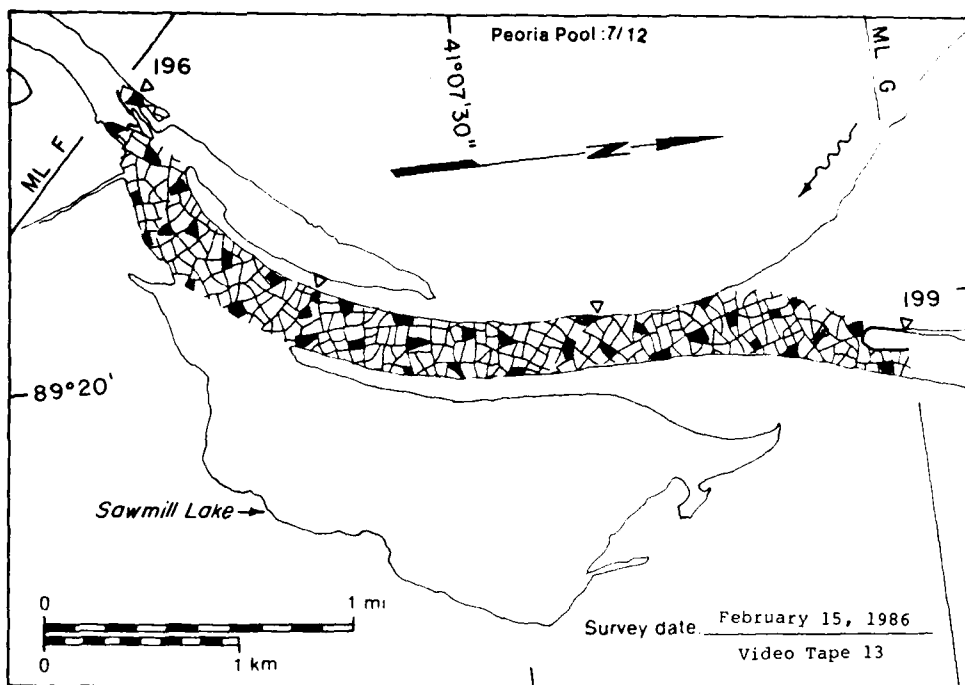
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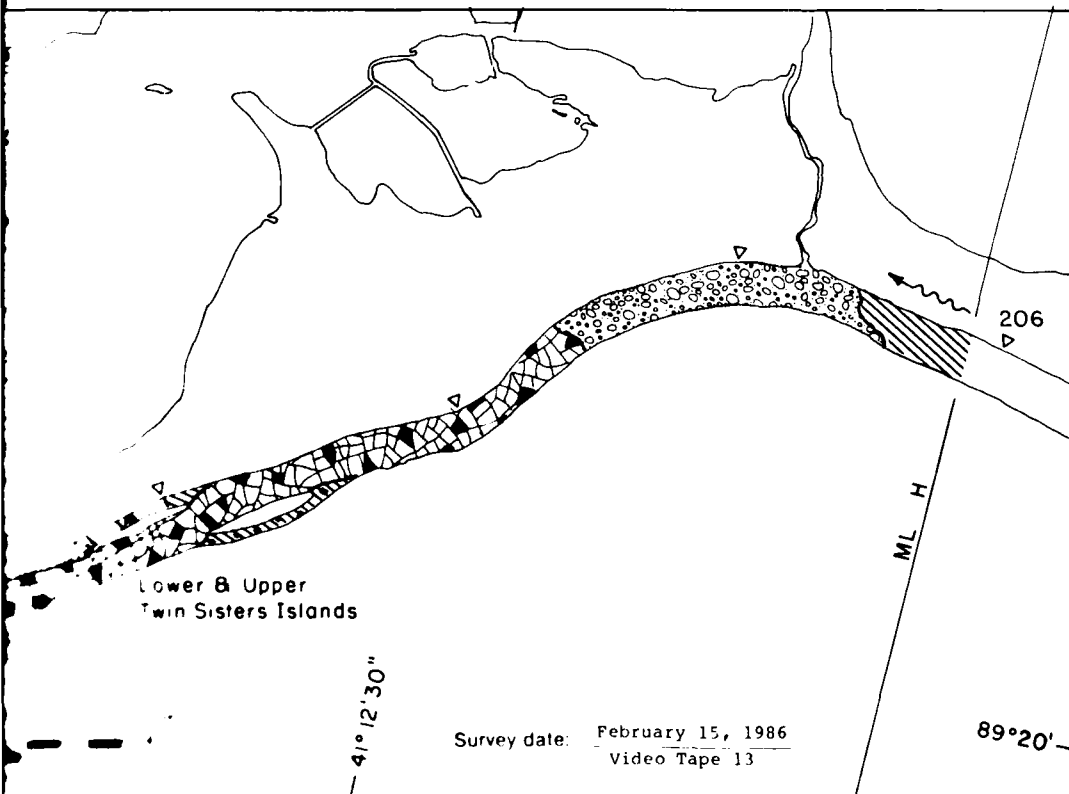


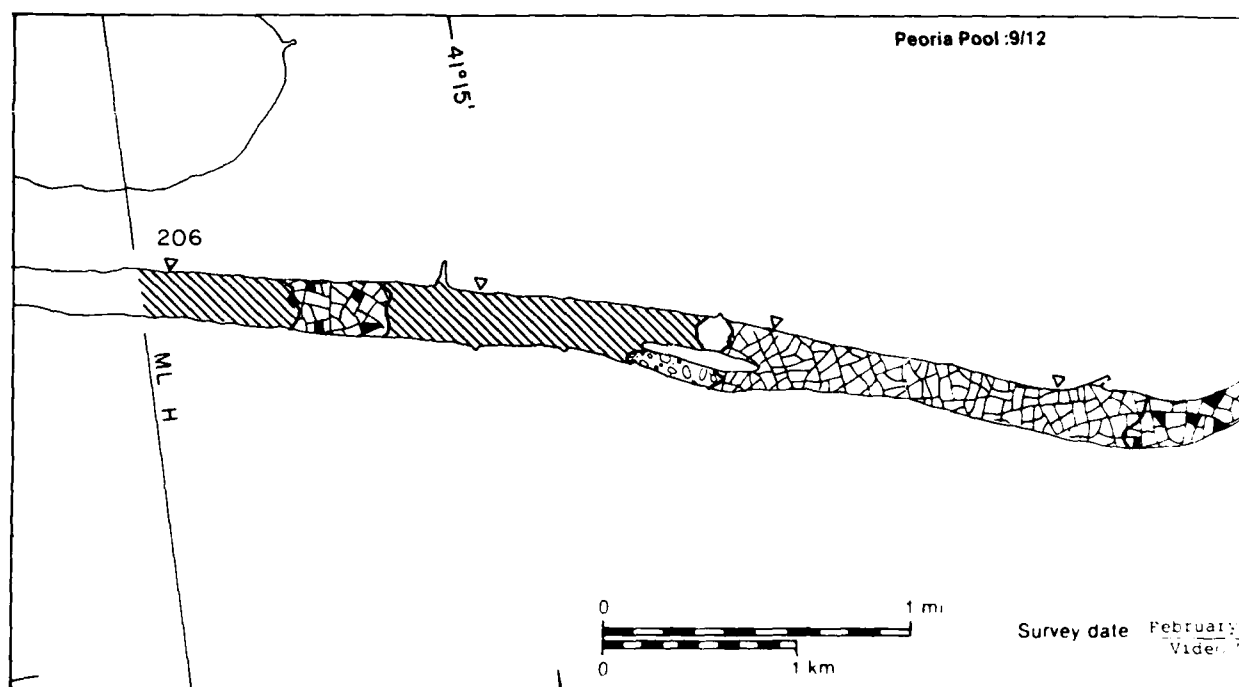
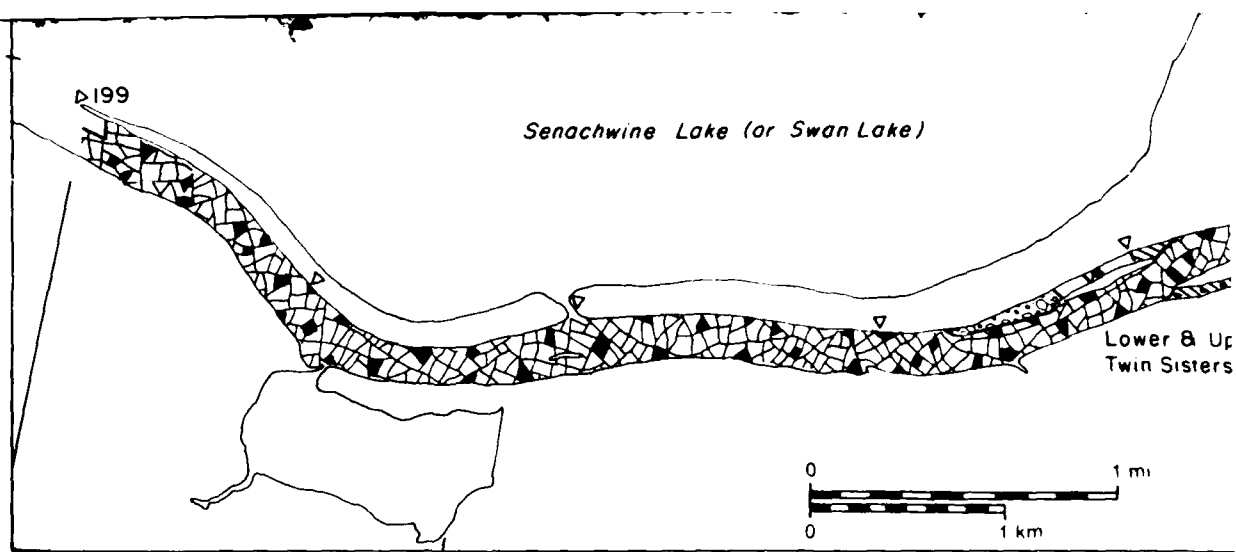


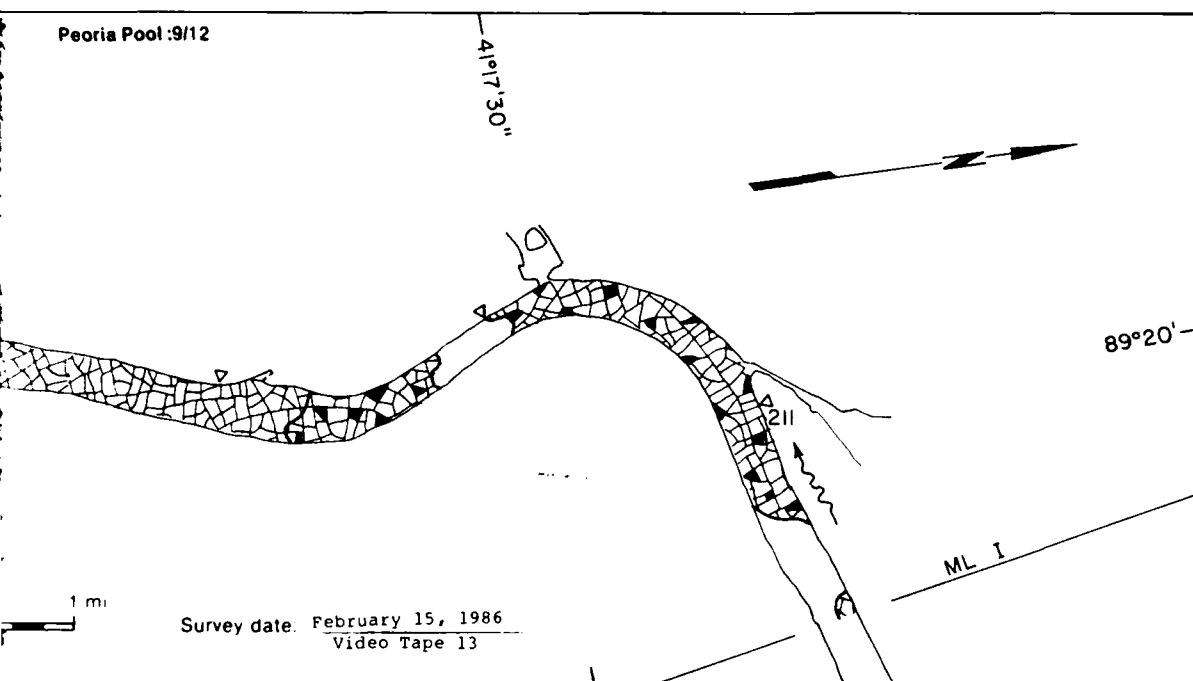
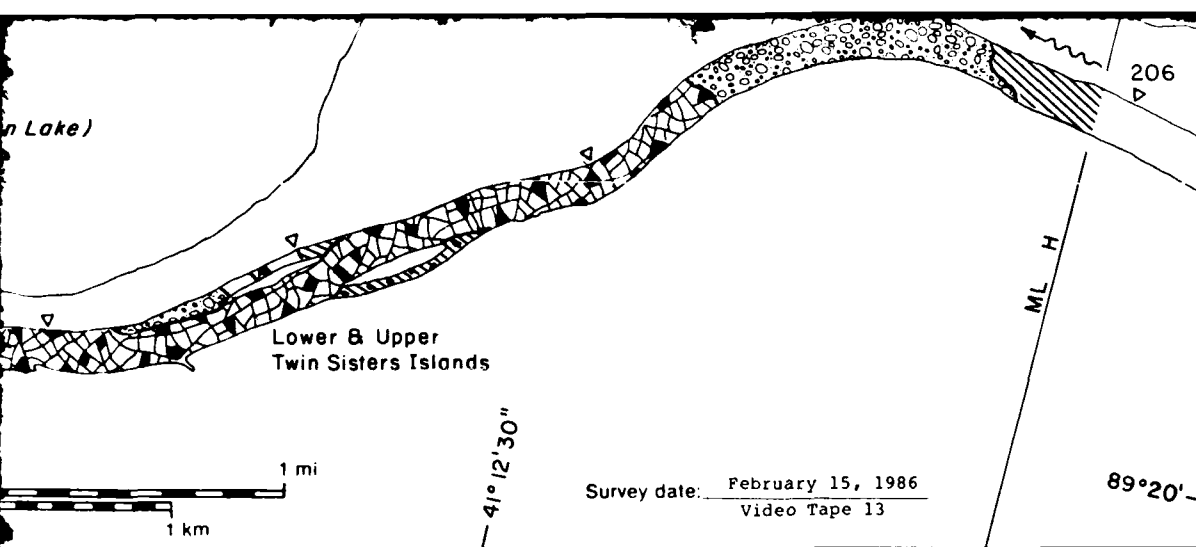




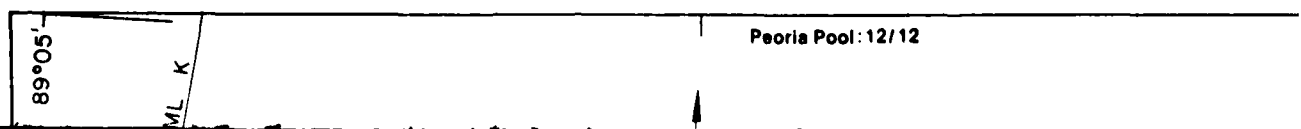
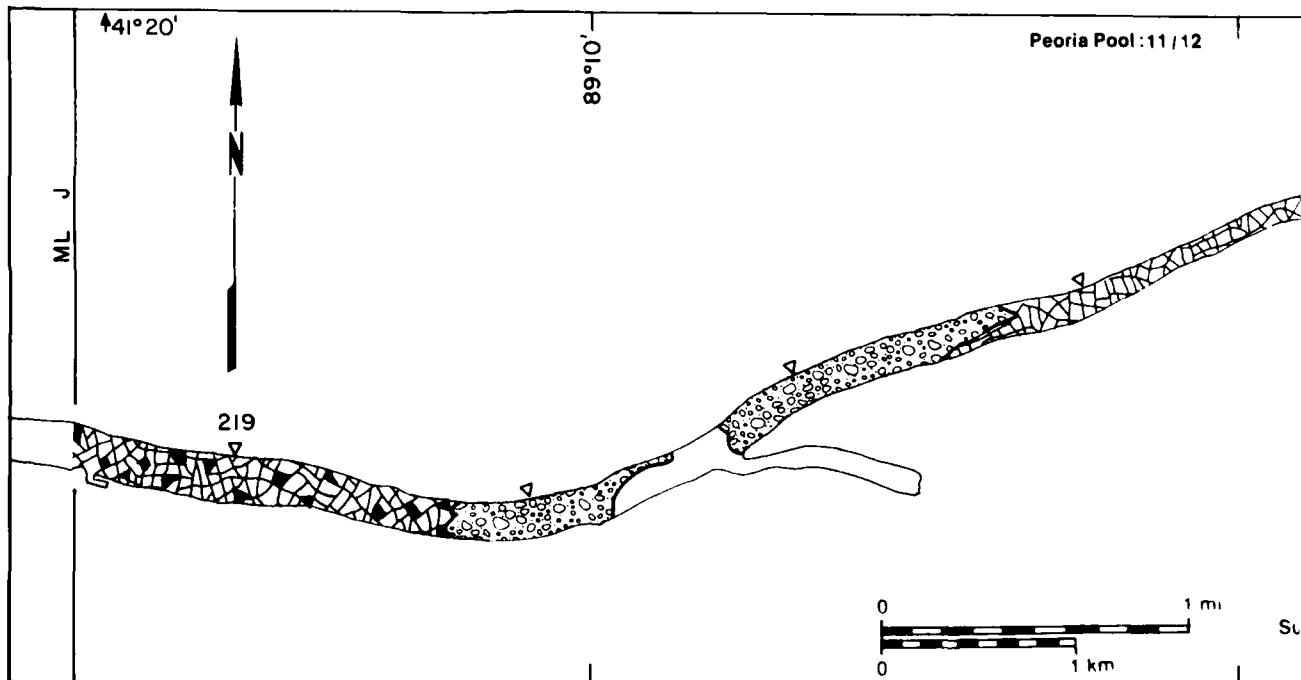
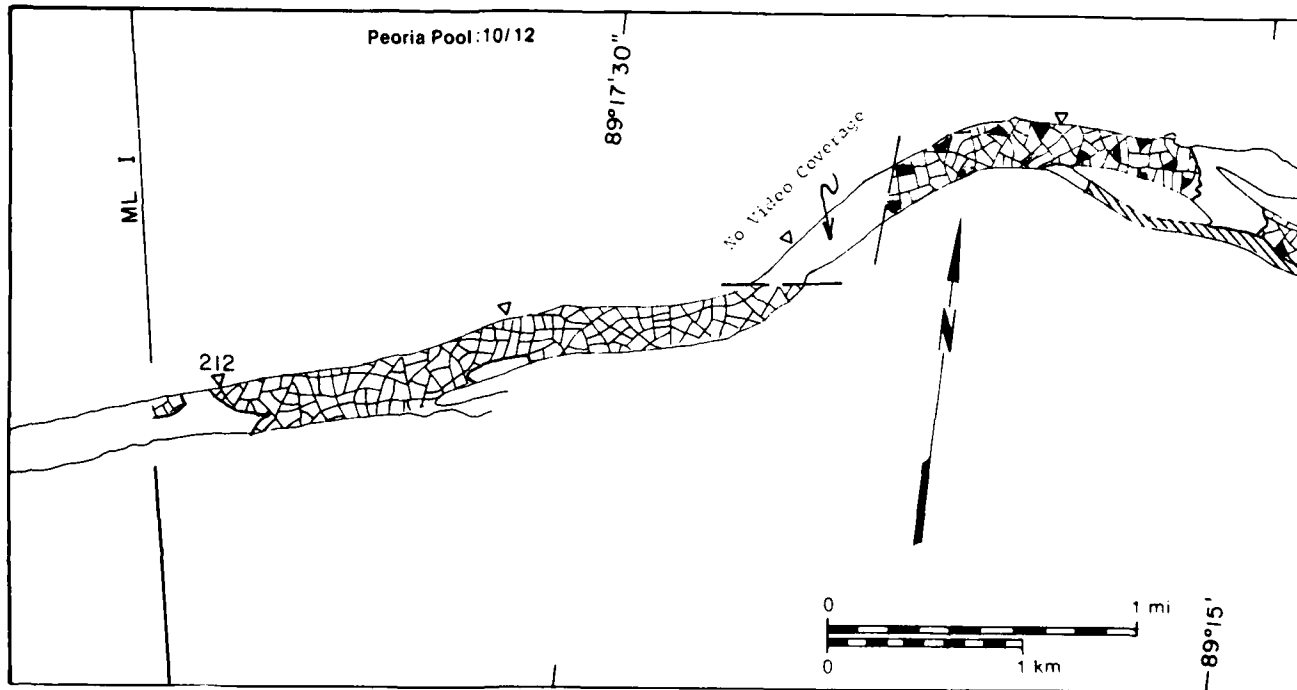
15 February 1986

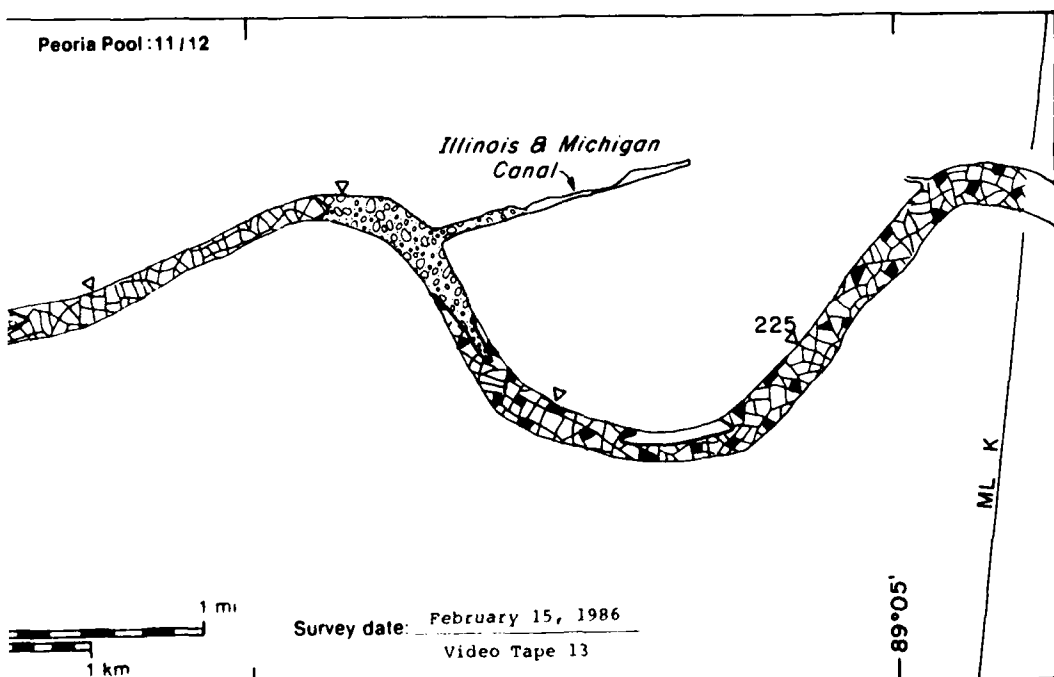
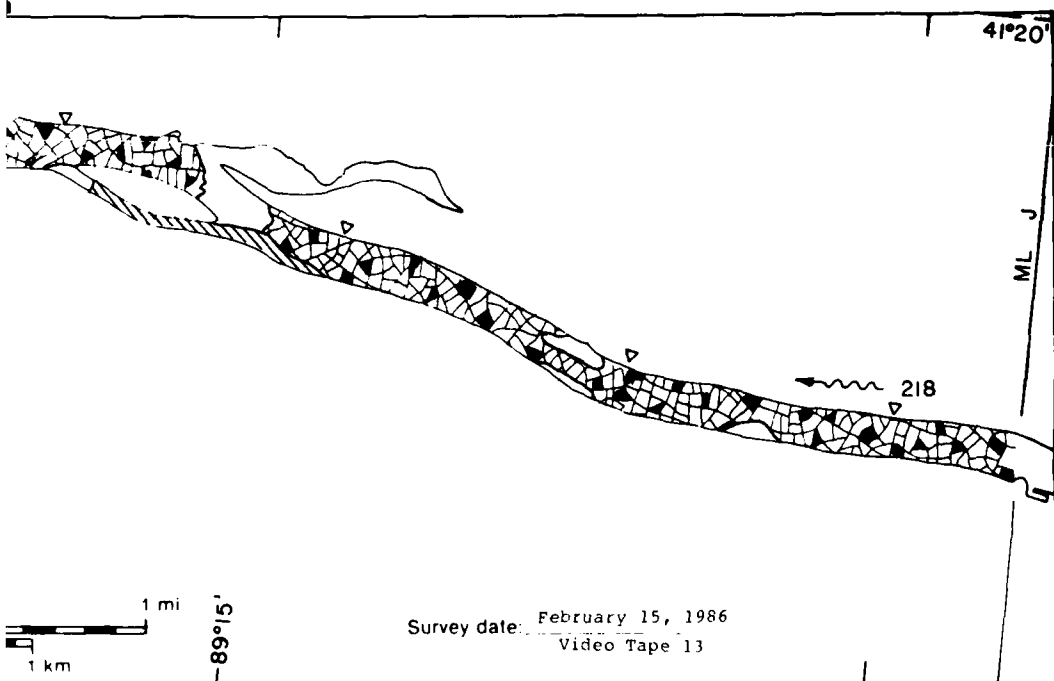




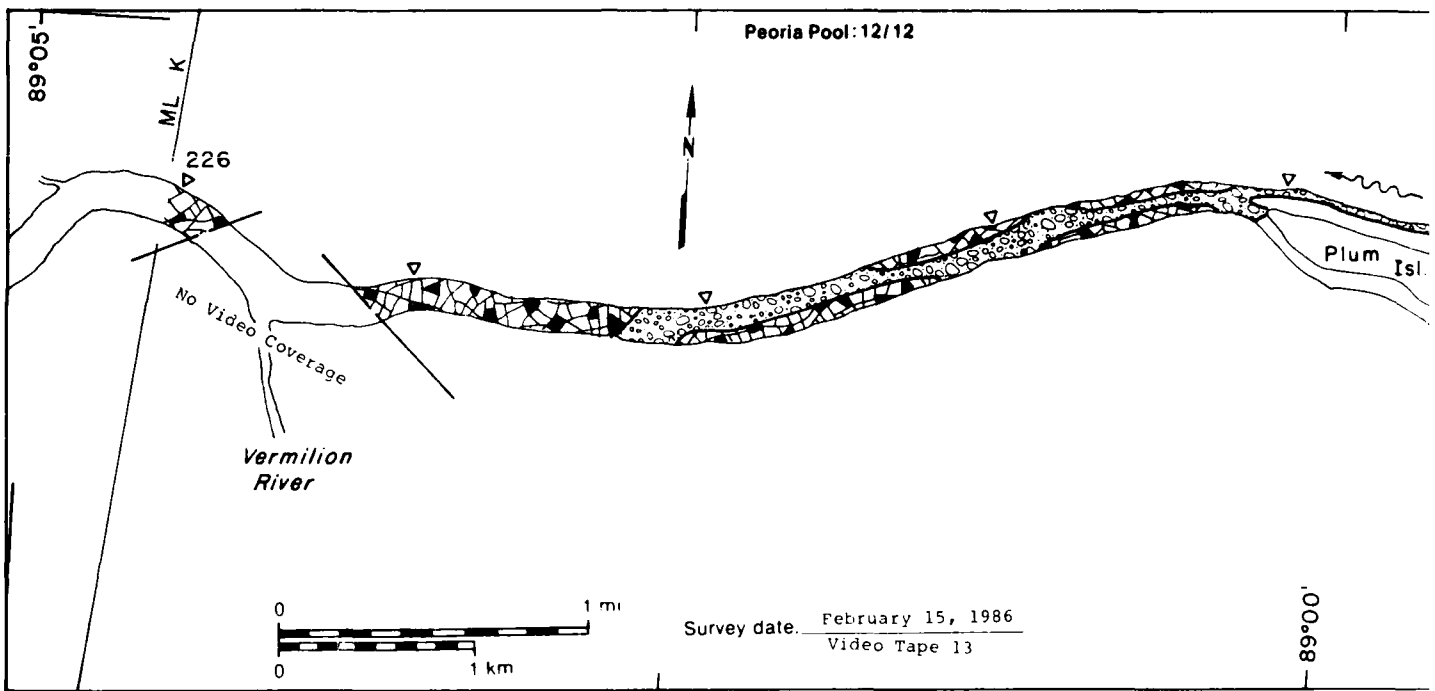
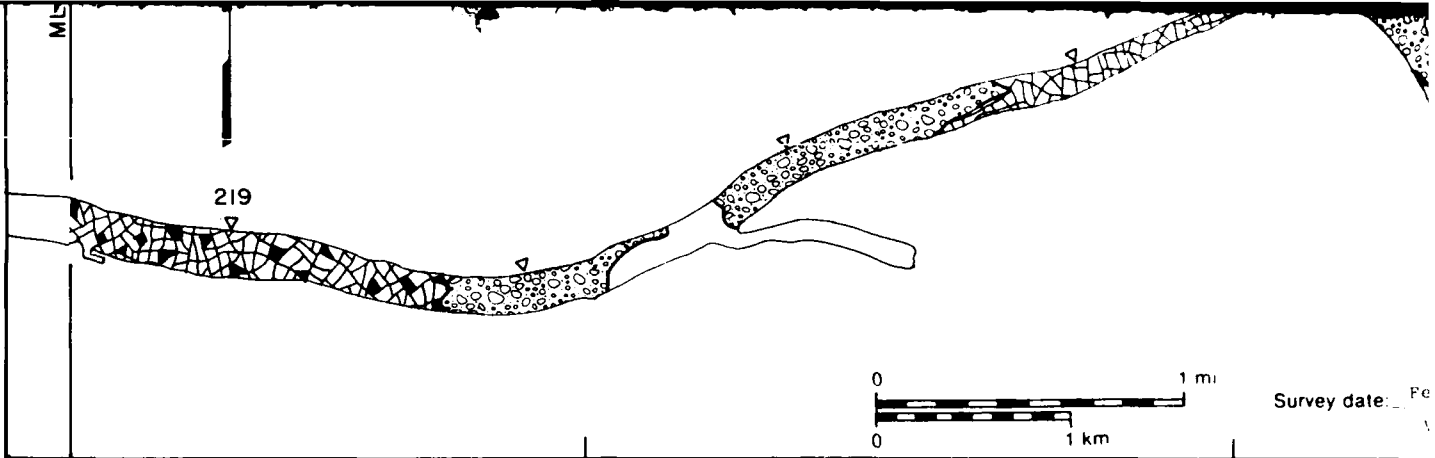


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41°20'



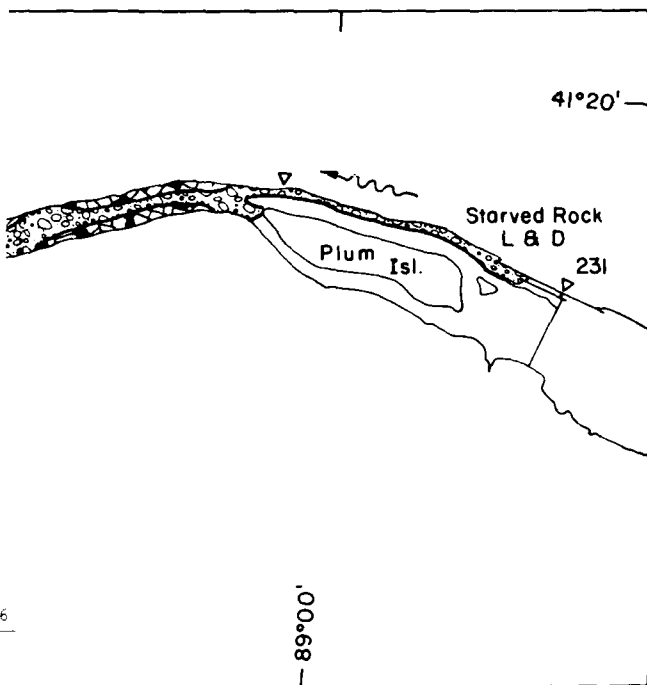
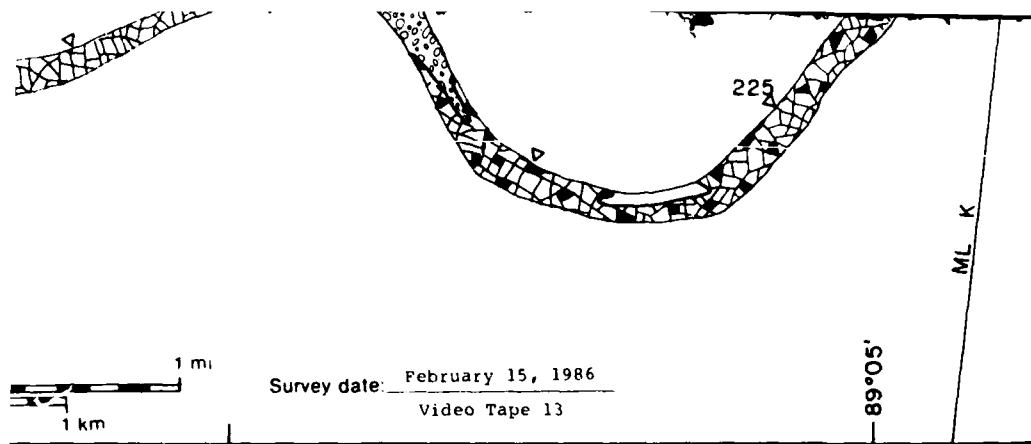
Peoria Pool

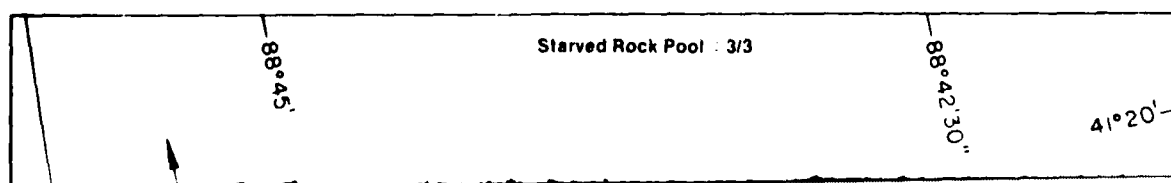
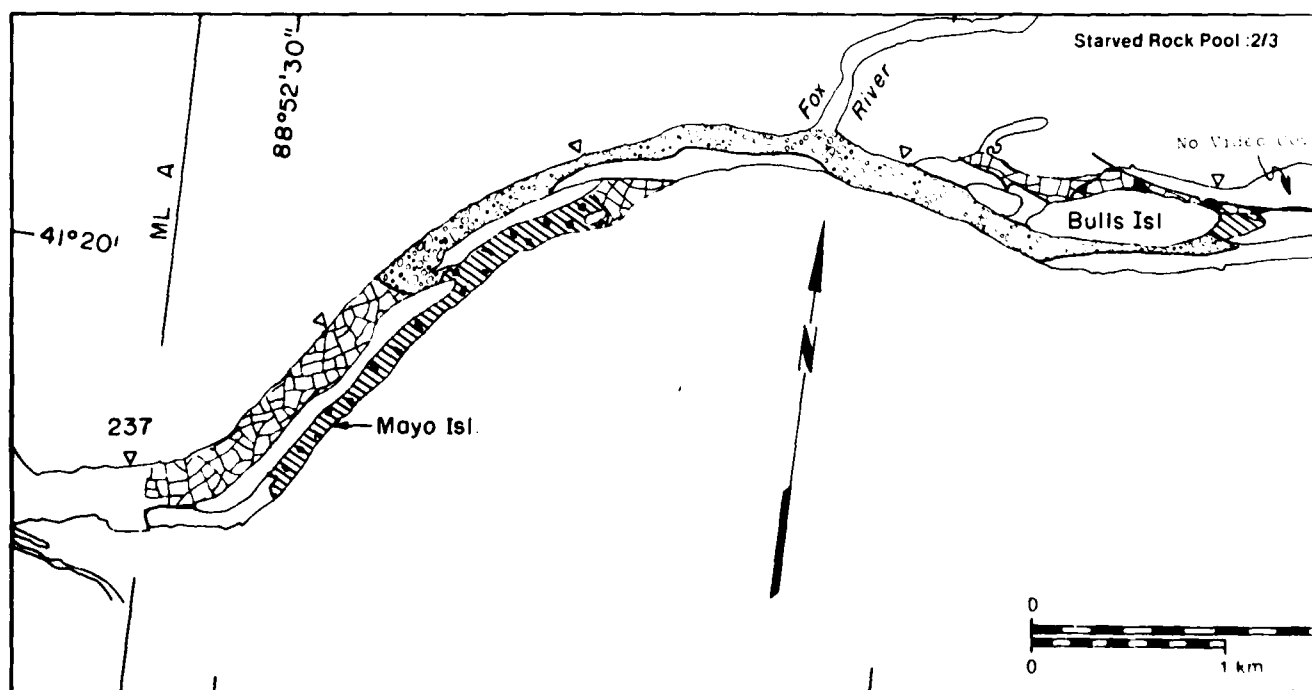
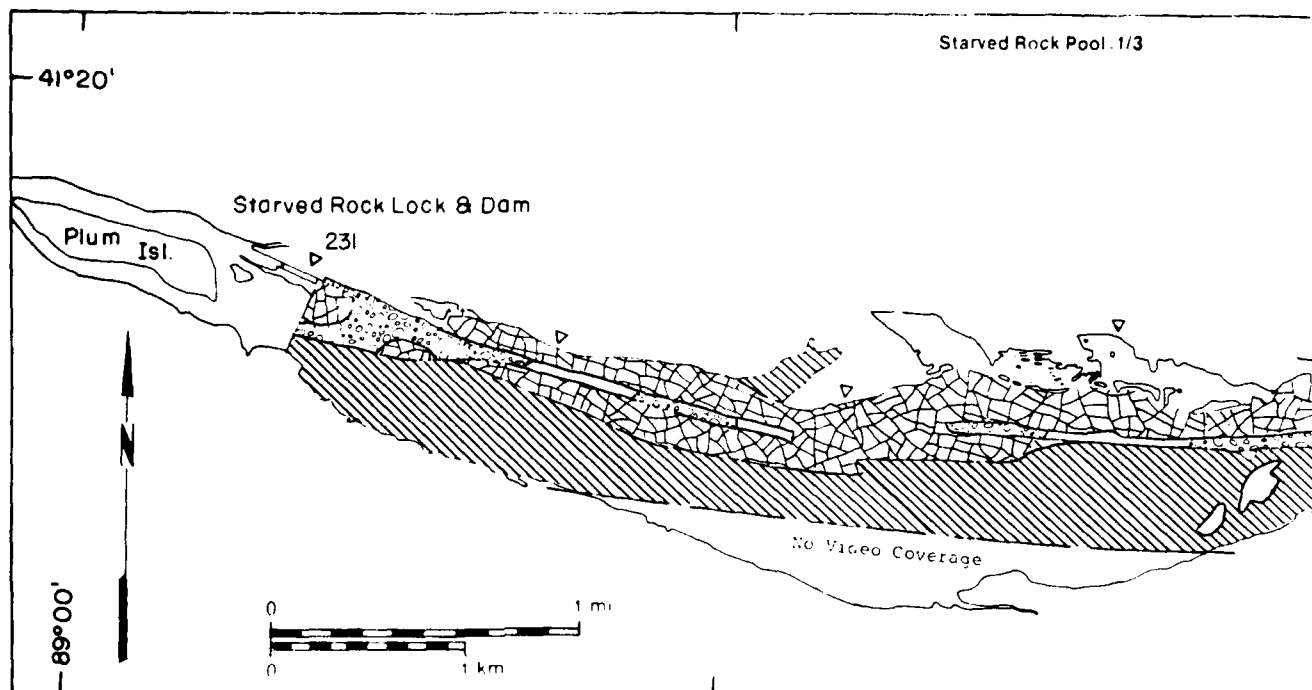
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration
Open water	3.26	NA
Solid ice cover	14.41	NA
Solid ice cover with open-water areas	12.39	95
Fragmented ice cover	5.94	NA
Fragmented ice cover with open-water areas	12.80	80
Ice floes or frazil slush and pans	6.24	40

Total area ($m^2 \times 10^6$)

81.33*

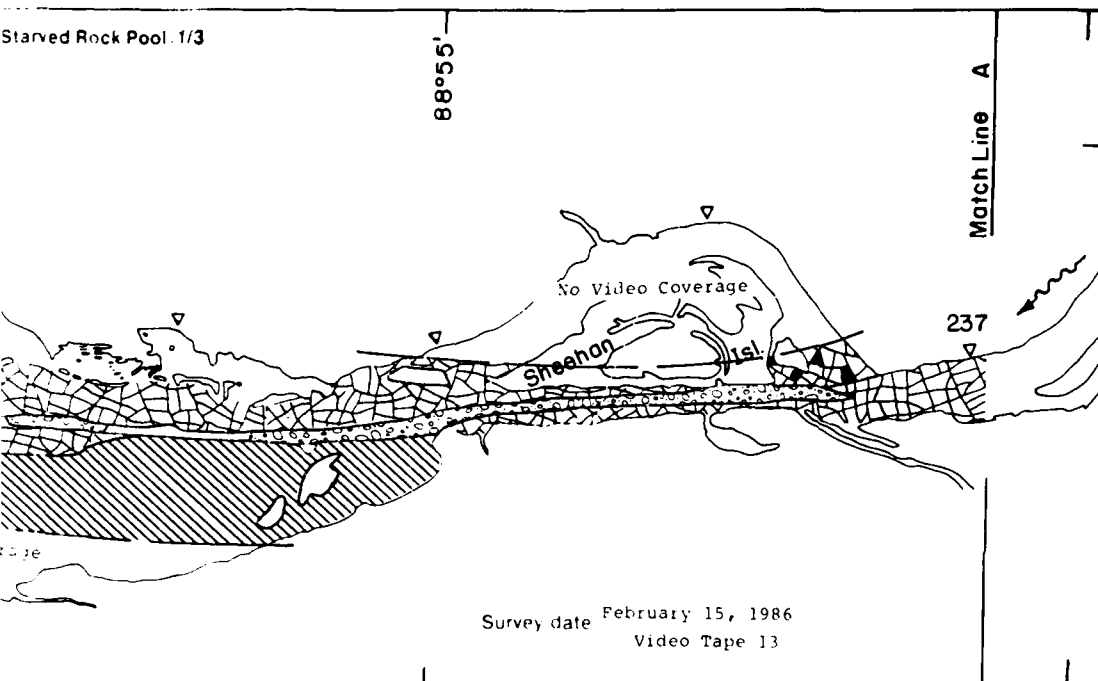
* Includes $26.29 \times 10^6 m^2$ of no video coverage



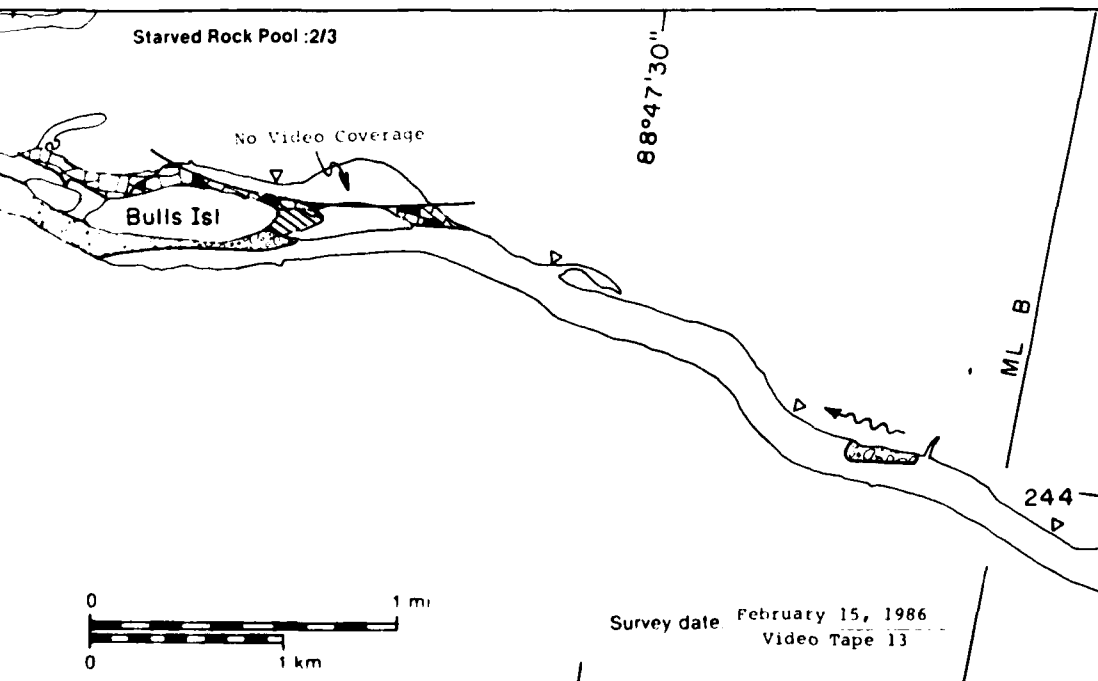


15 February 1986

Starved Rock Pool: 1/3



Starved Rock Pool: 2/3



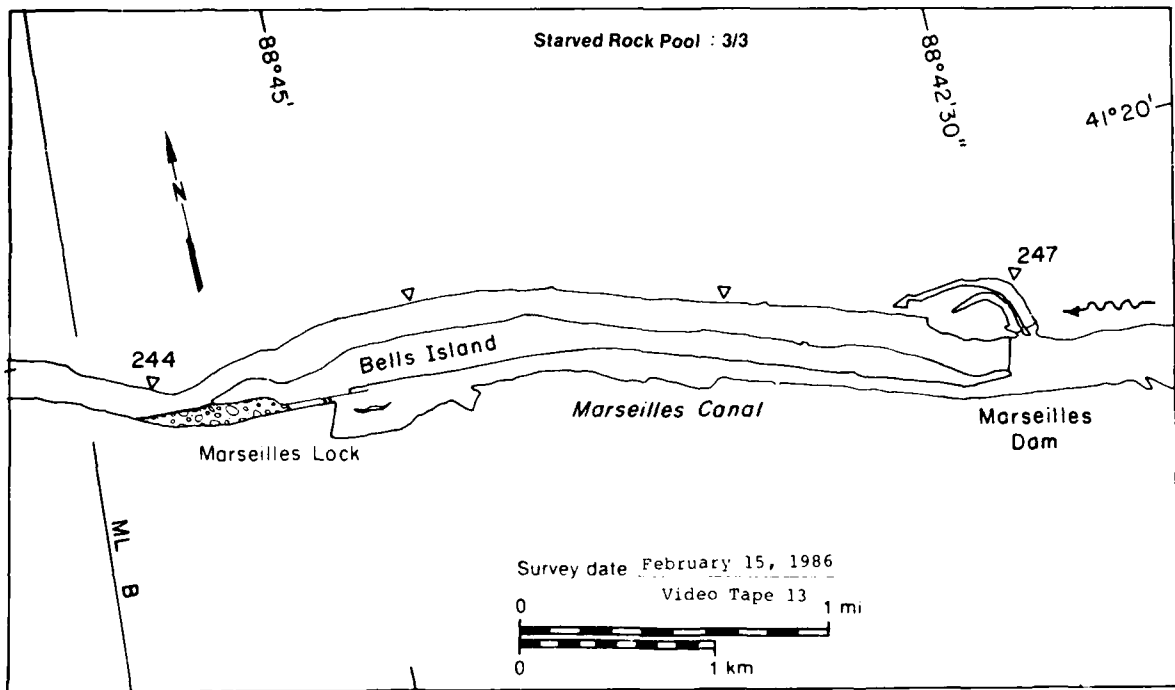
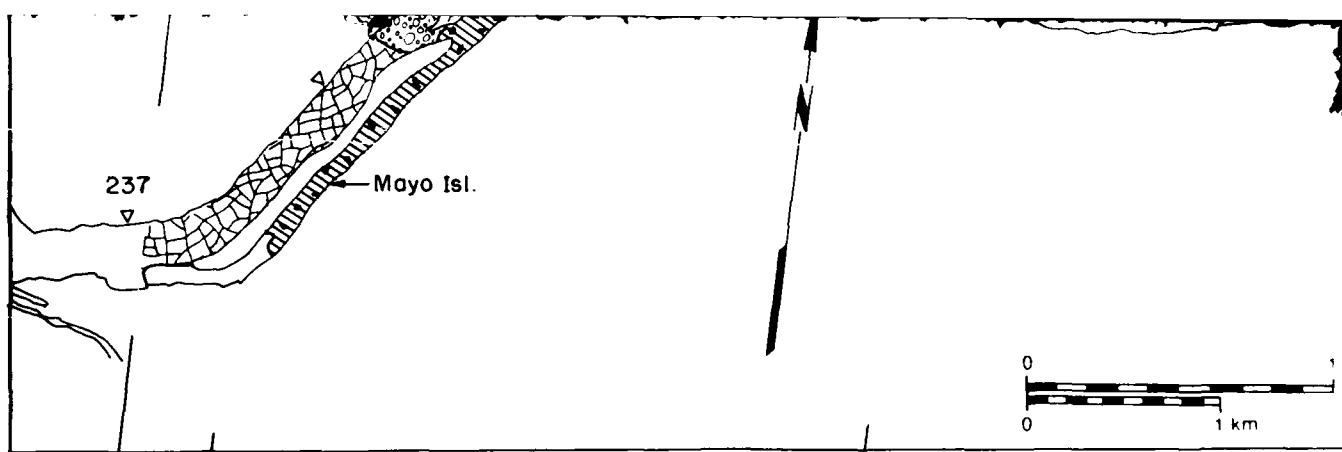
88°42'30"

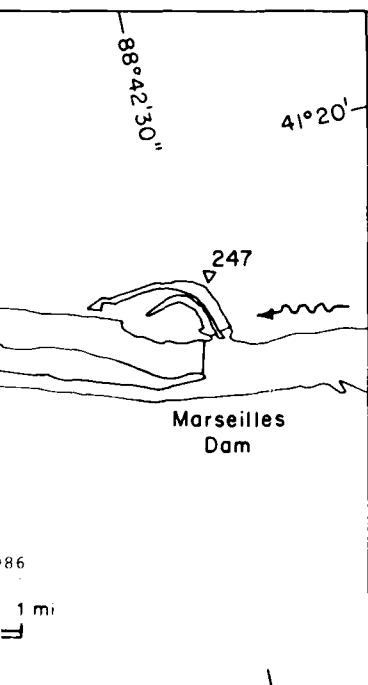
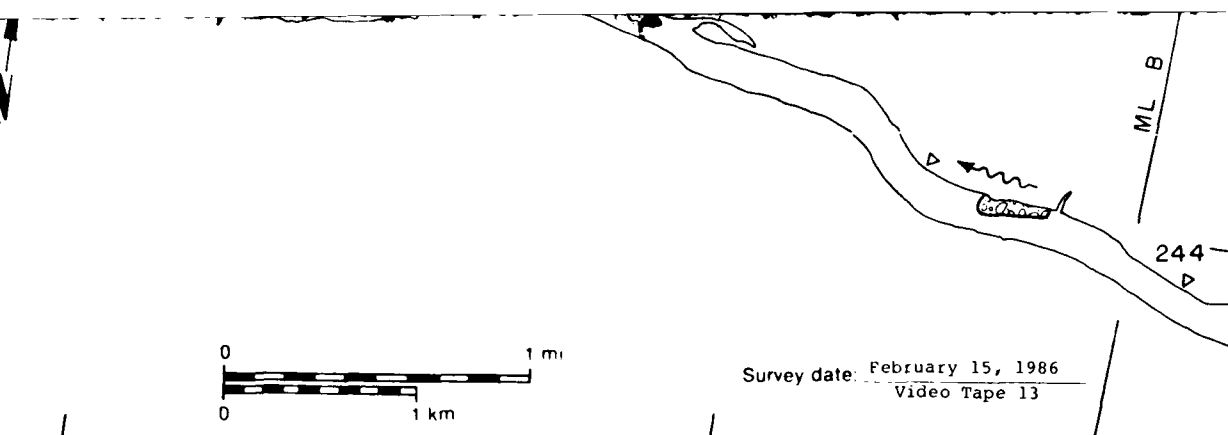
Starved Rock Pool

MAP UNITS

Area
($m^2 \times 10^6$)

Surface
concentration
(%)





Starved Rock Pool

MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Area
($m^2 \times 10^6$)

Surface
concentration
(%)

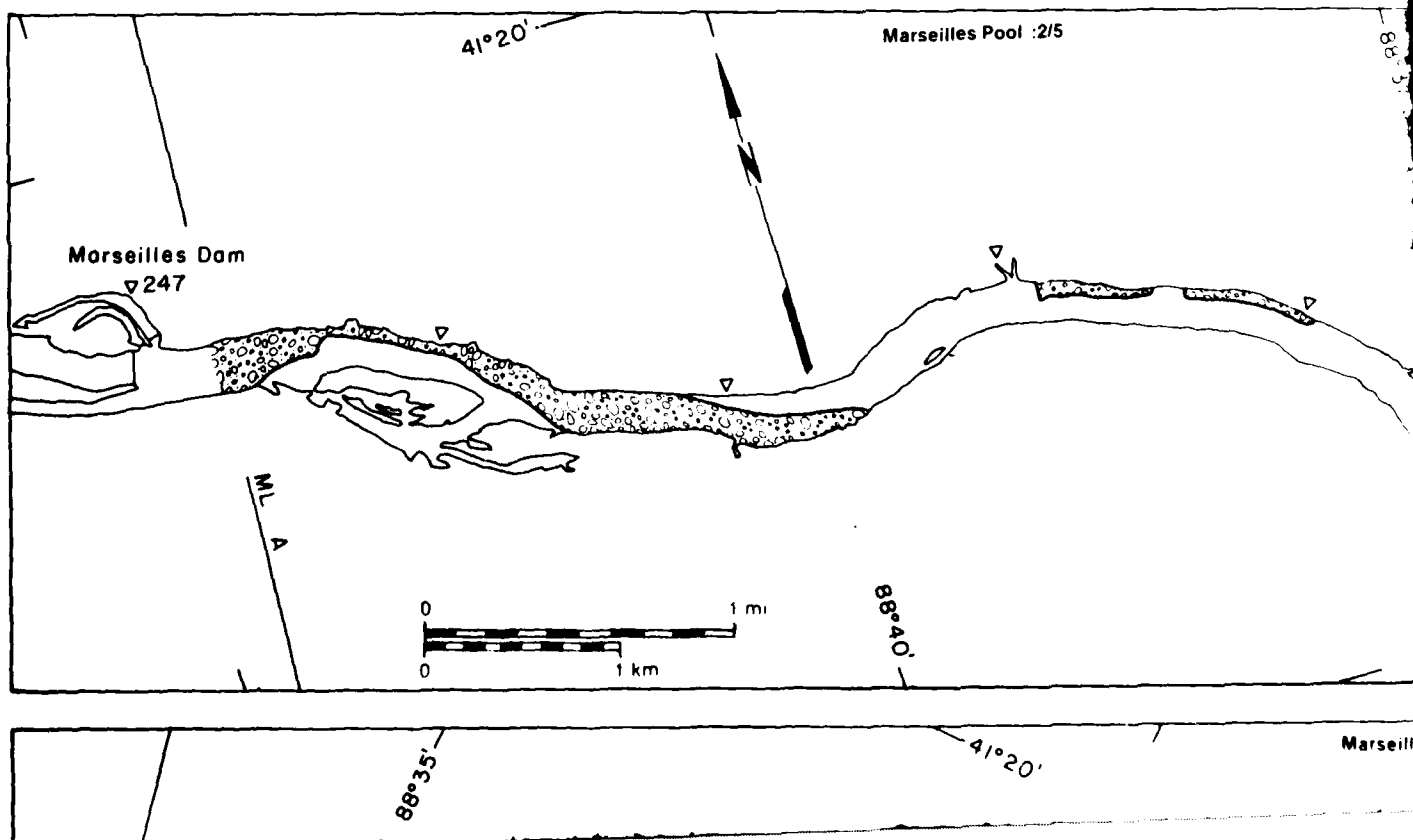
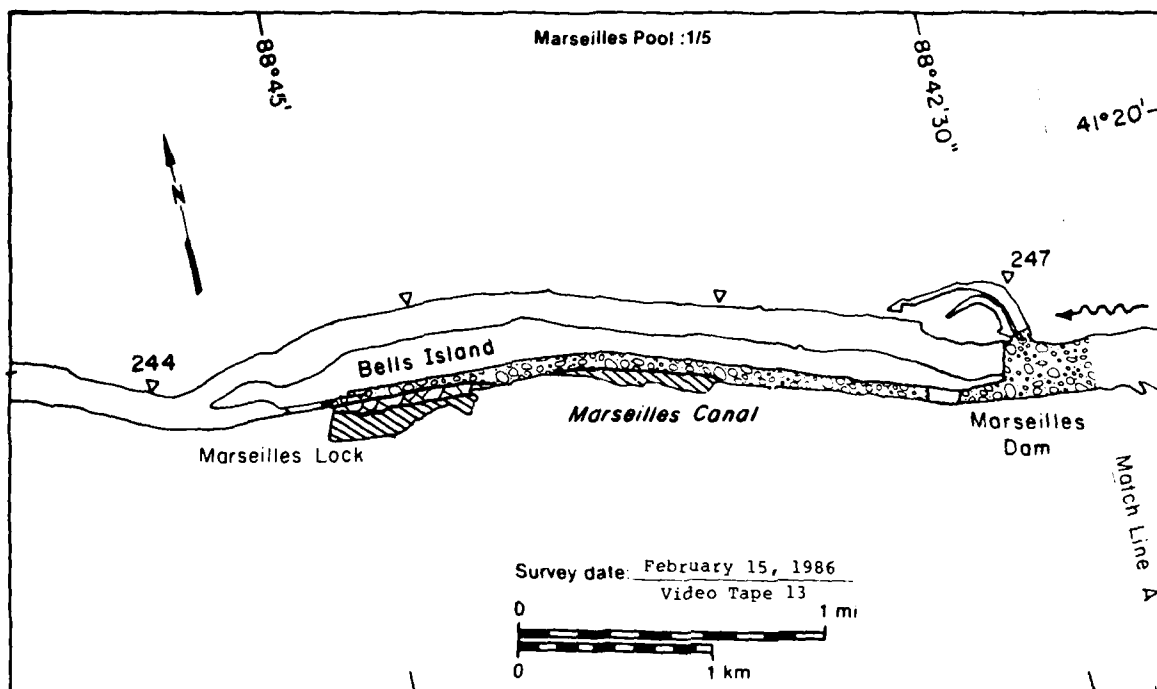
2.16	NA
2.49	NA
0.29	80
3.10	NA
0.18	80
1.11	20

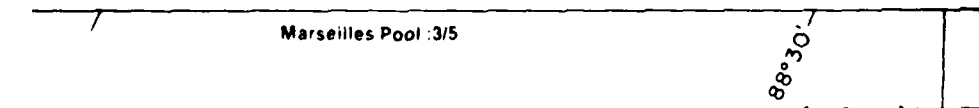
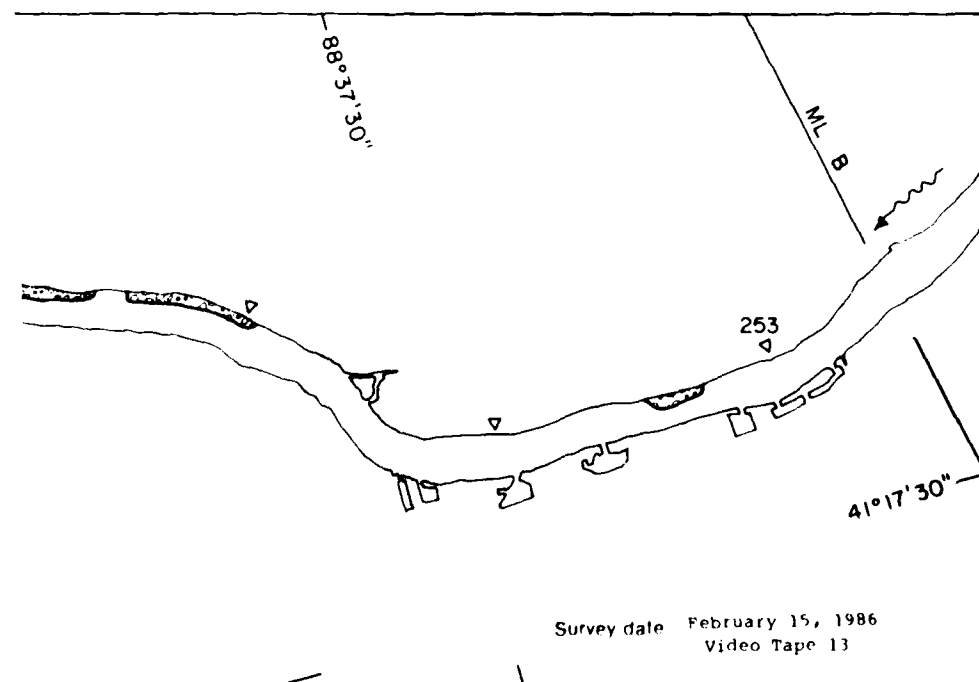
Total area ($m^2 \times 10^6$)

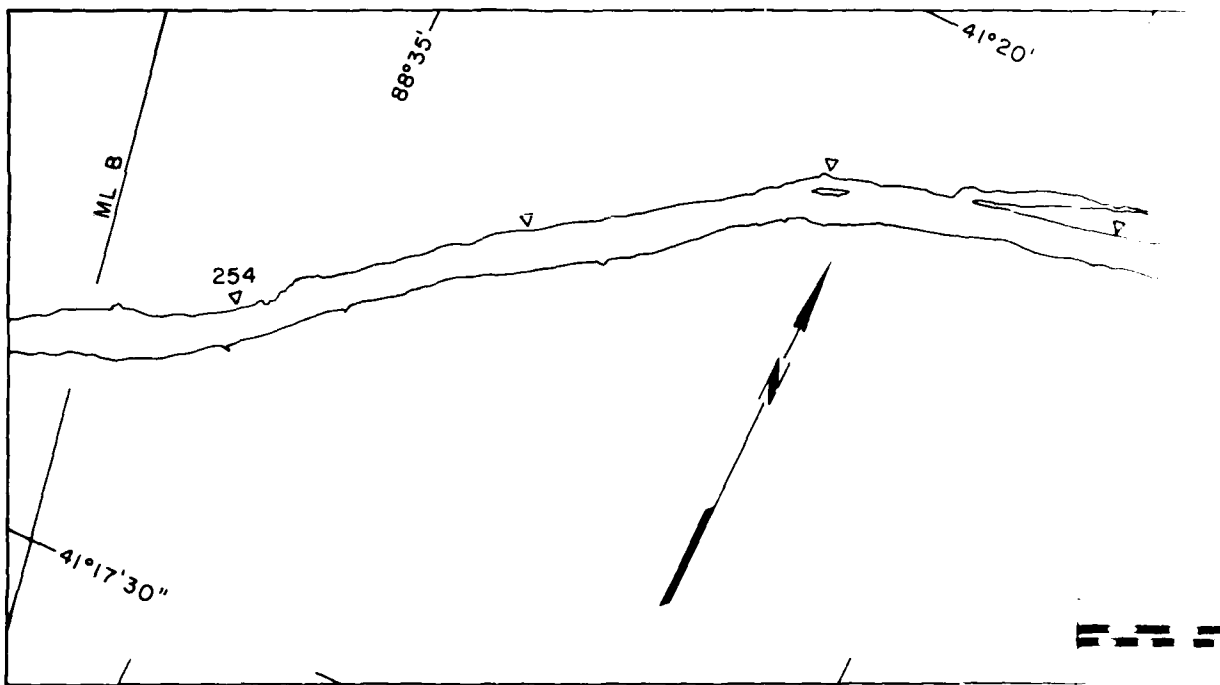
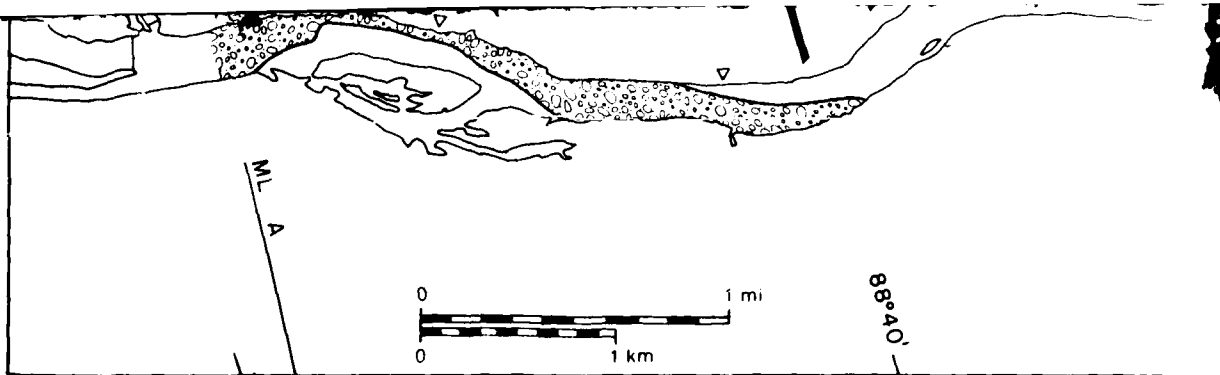
10.19*

* Includes $0.86 \times 10^6 m^2$
of no video coverage

15 February 1986







AD-A191 865

ICE ATLAS 1985 - 1986 MONONGAHELA RIVER ALLEGHENY RIVER 12/14

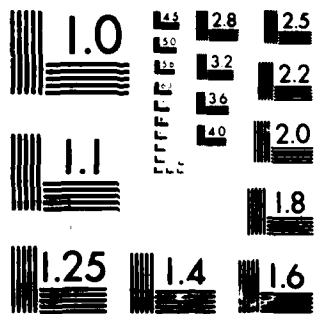
OHIO RIVER ILLINOIS (U) COLD REGIONS RESEARCH AND

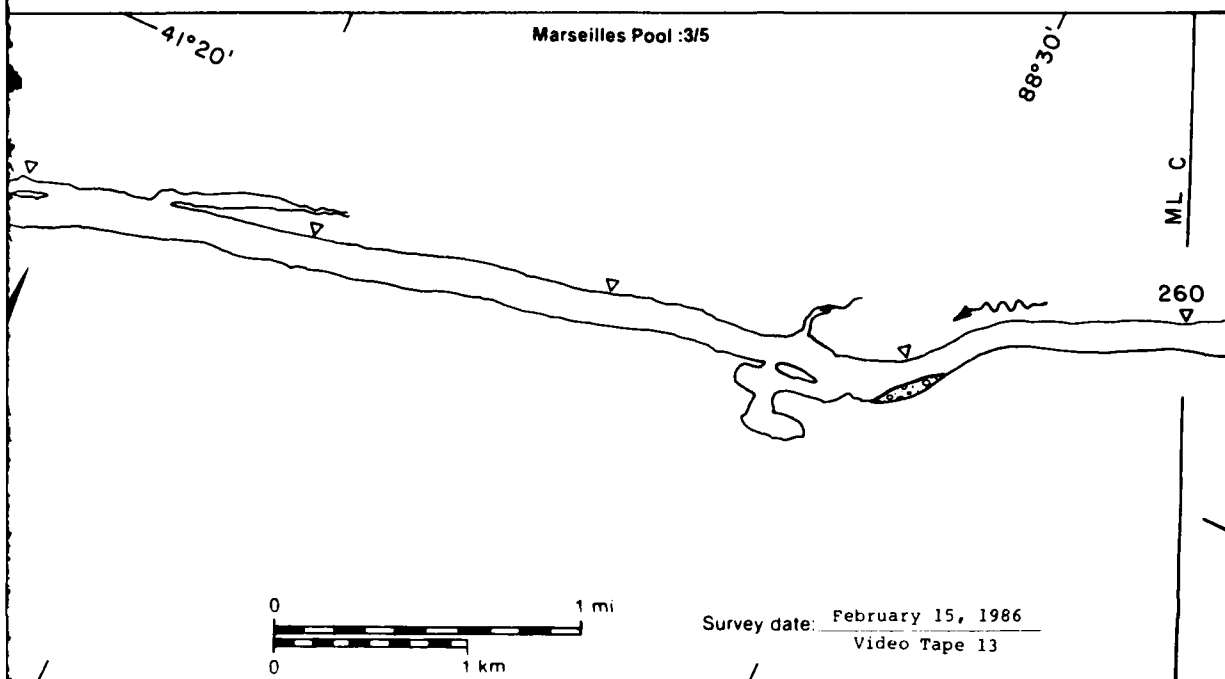
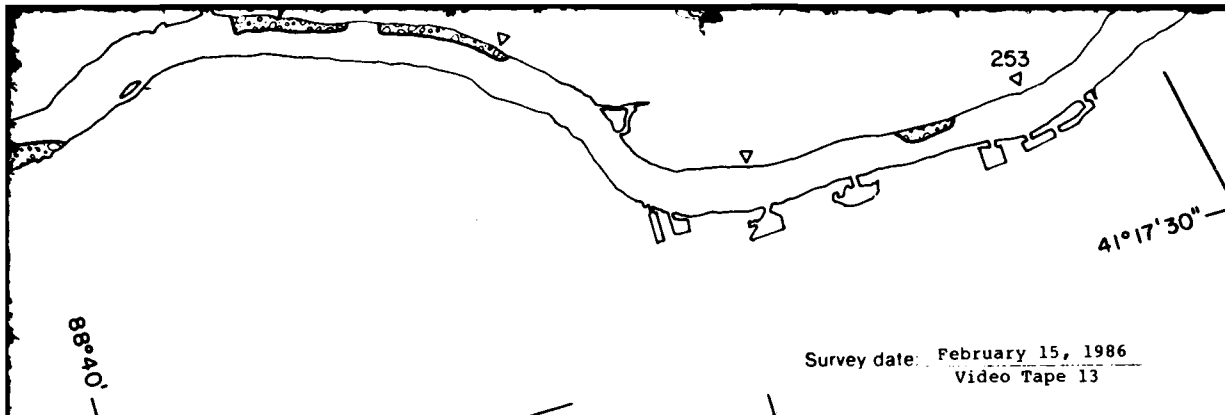
ENGINEERING LAB HANOVER NH L W CATTO ET AL. NOV 87

UNCLASSIFIED CRREL-SP-87-28

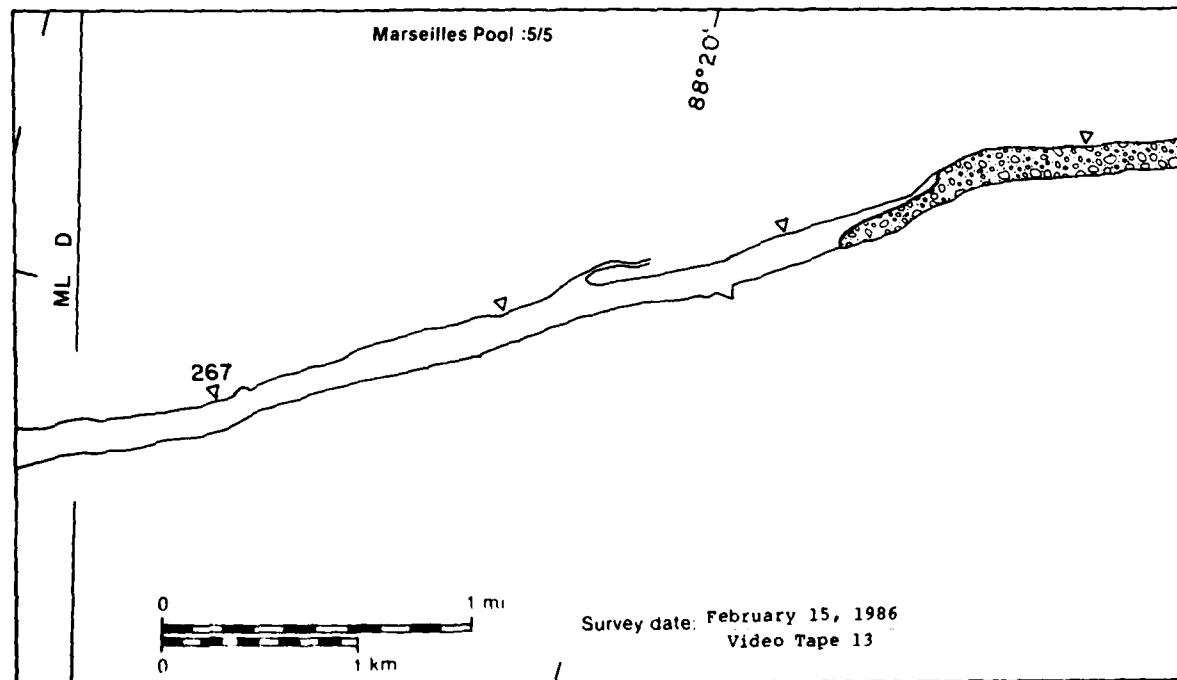
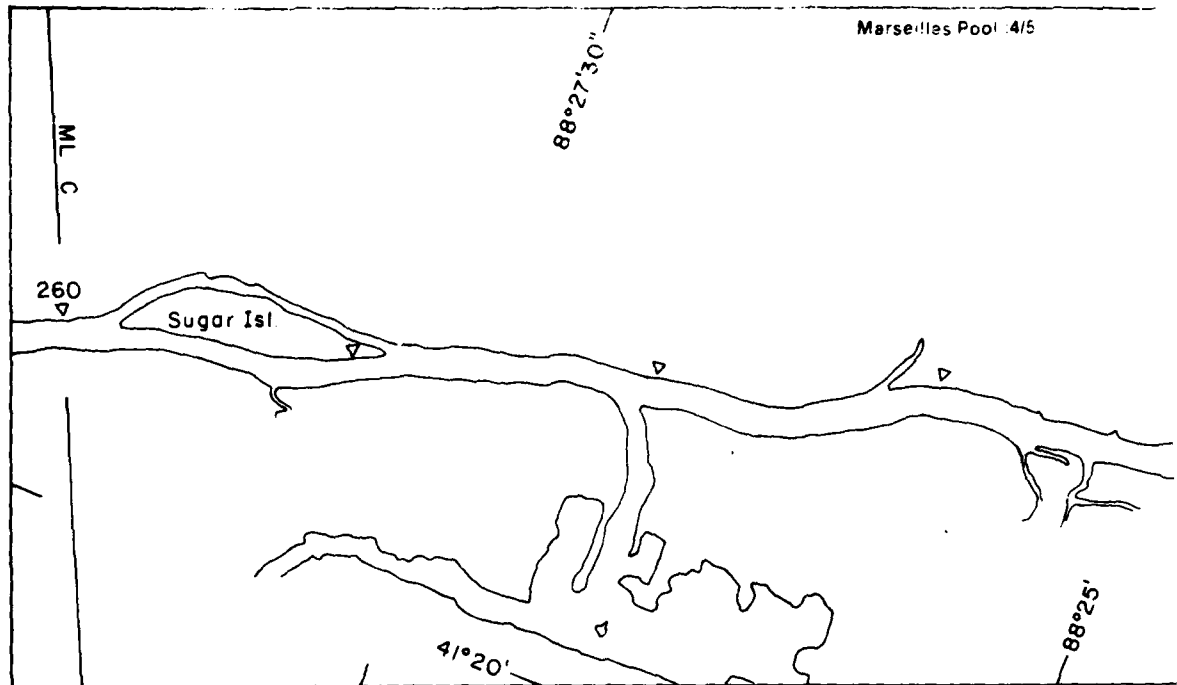
F/G 8/12

NL





A



Survey date: February 15, 1986
Video Tape 13

Marseilles Pool

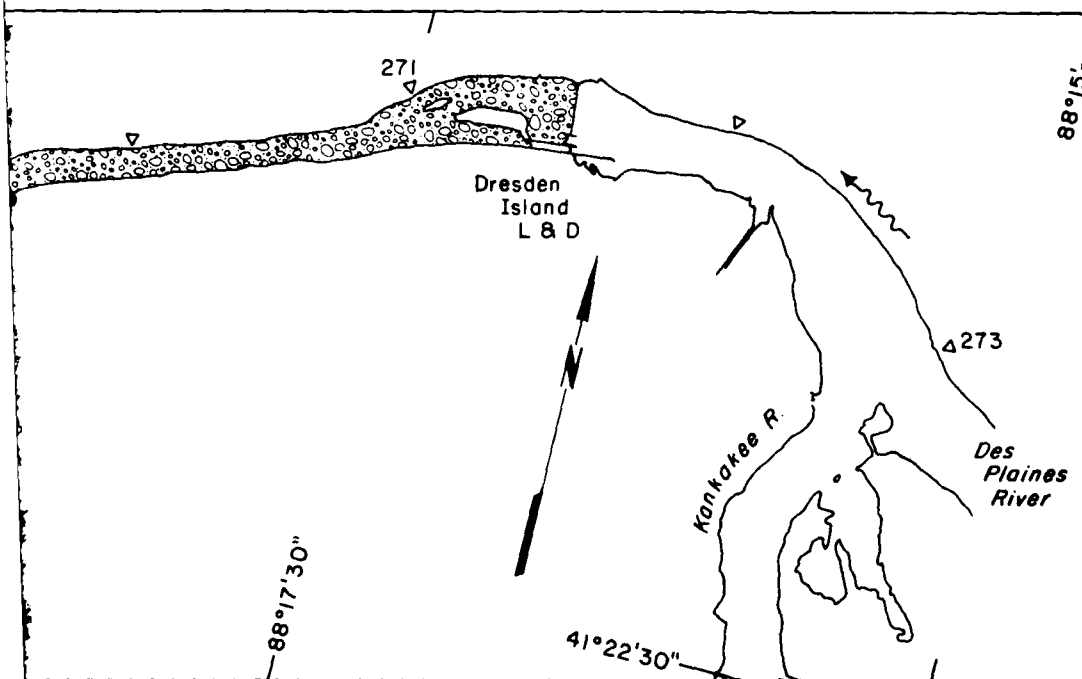
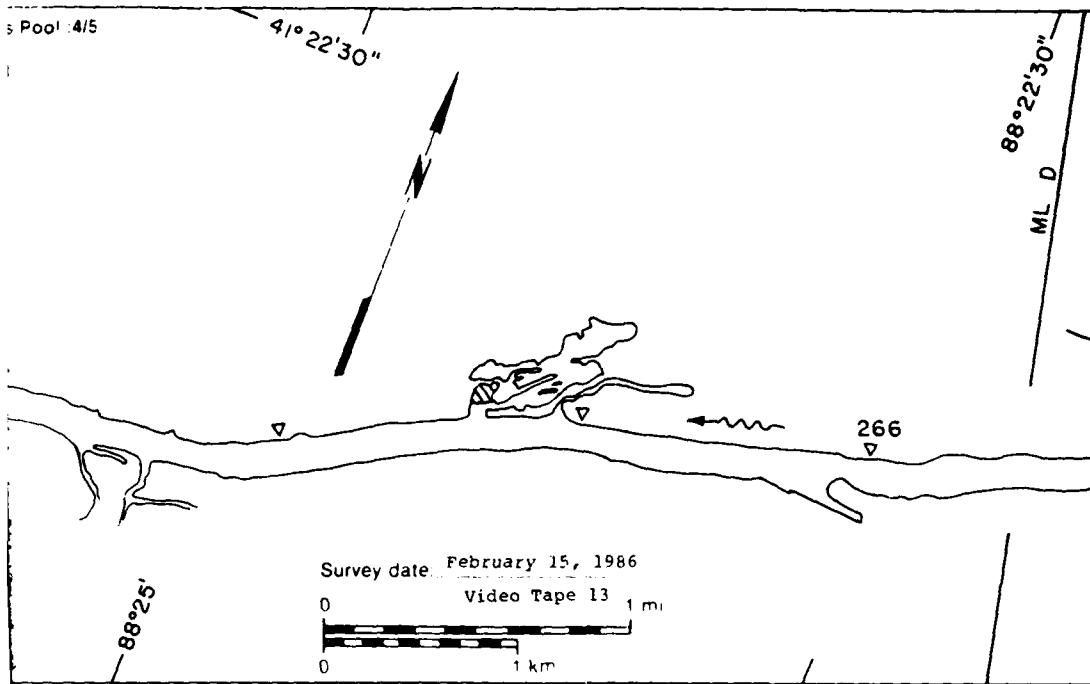
MAP UNITS

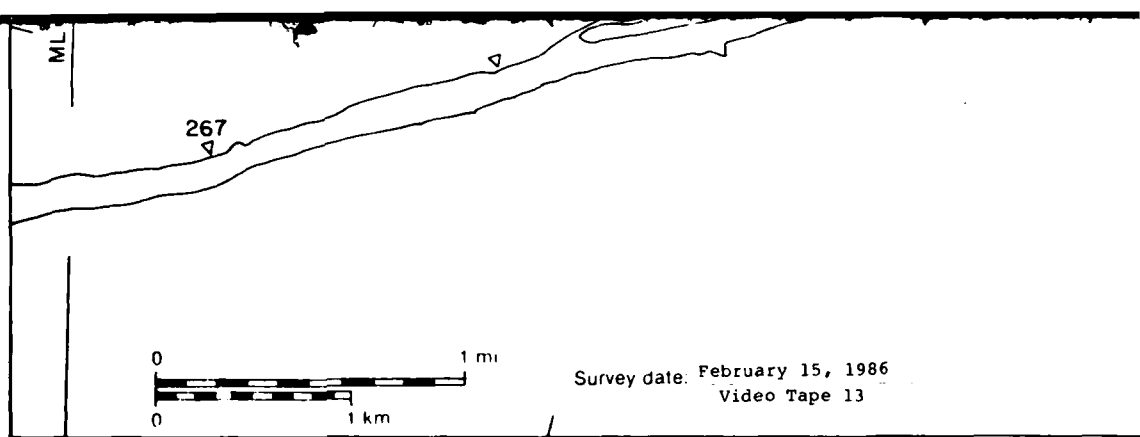
Area
($m^2 \times 10^6$)

Surface
concentration
(‰)

P

15 February 1986





Marseilles Pool

MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Area ($m^2 \times 10^6$)	Surface concentration (%)
6.15	NA
0.16	NA
0.00	—
0.05	NA
0.00	—
1.83	10
Total area ($m^2 \times 10^6$)	8.19

88°17'30"

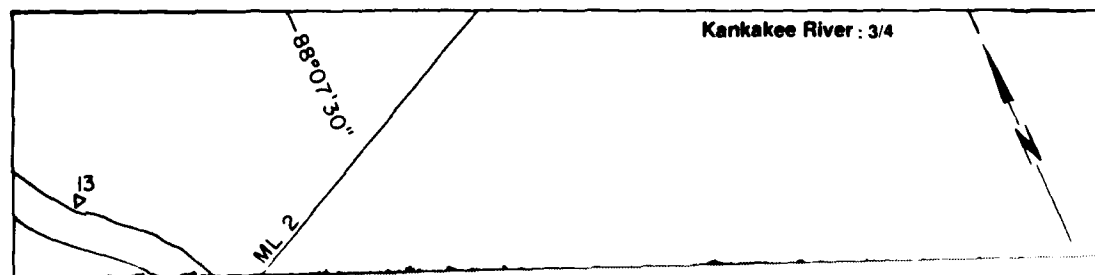
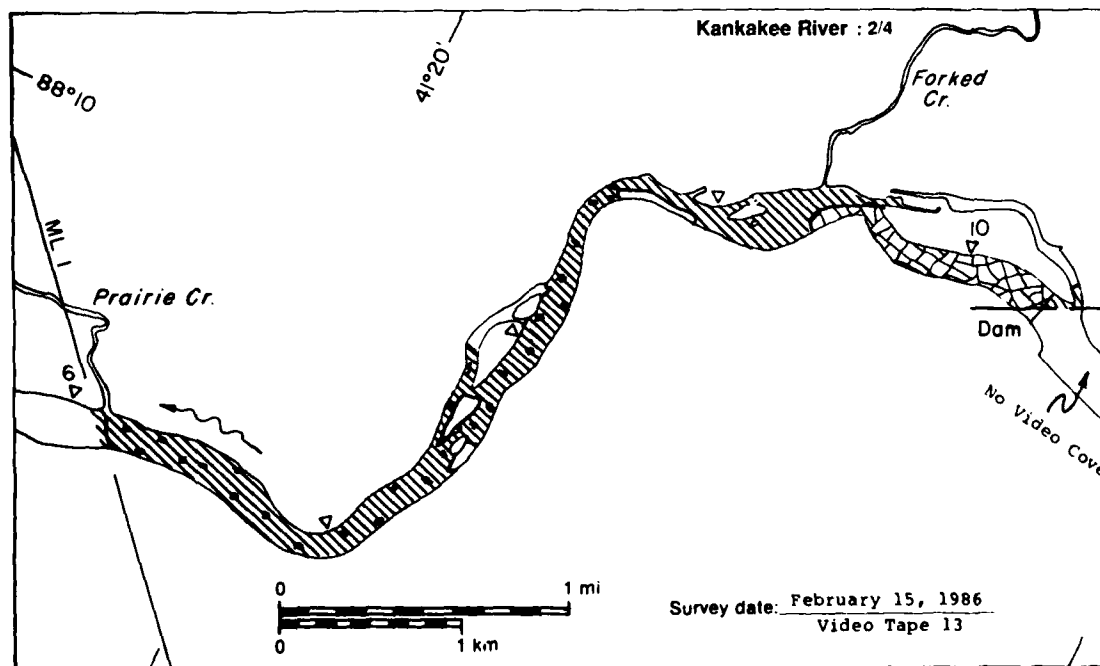
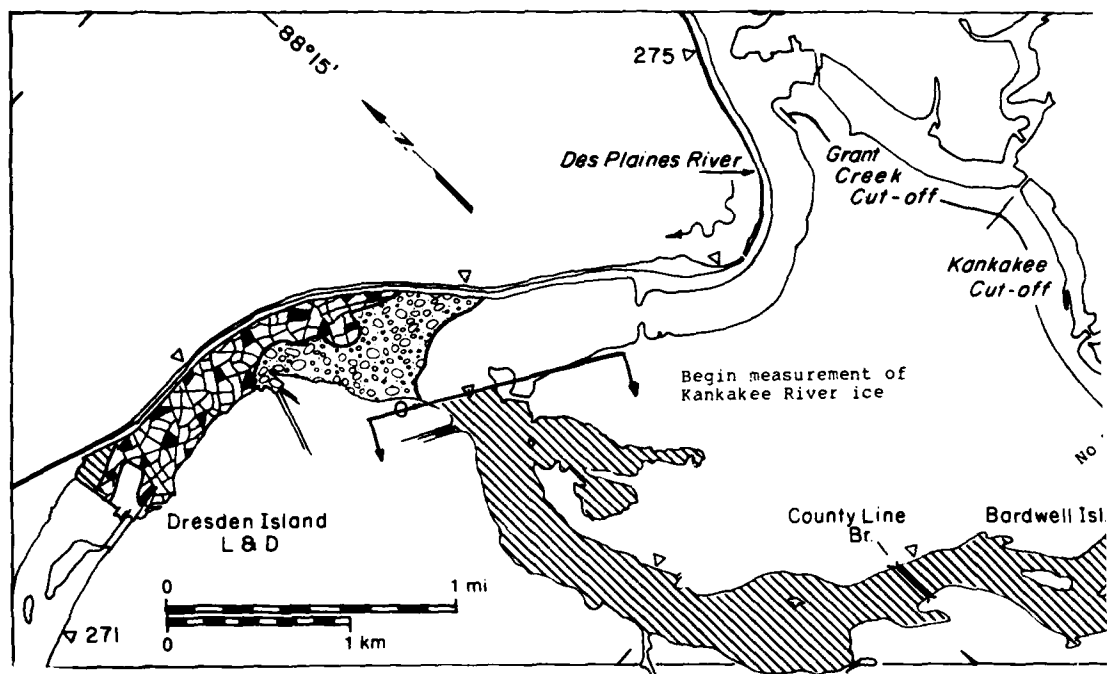
41°22'30"

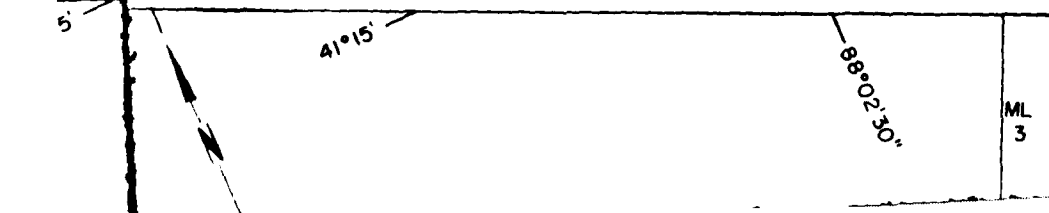
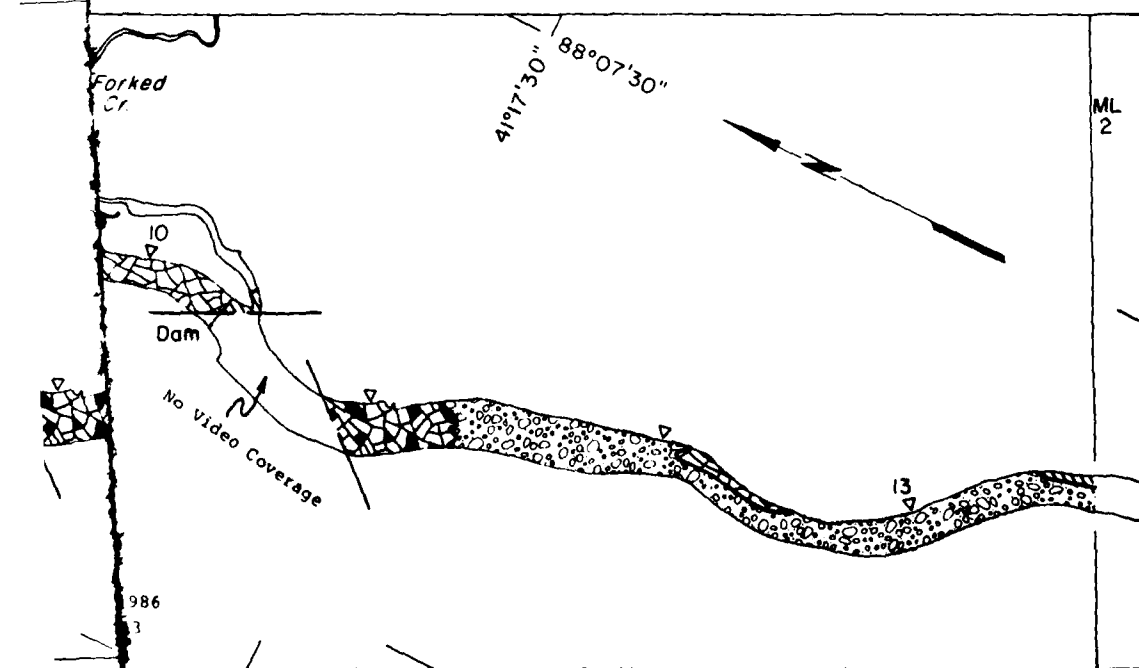
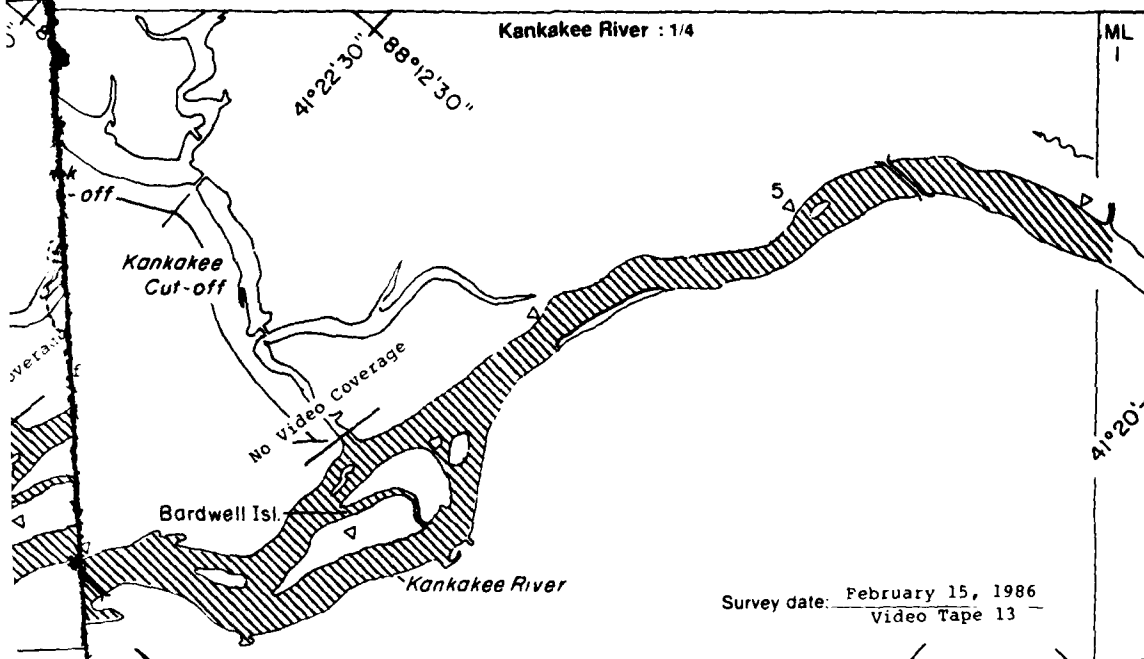
Kankakee R.

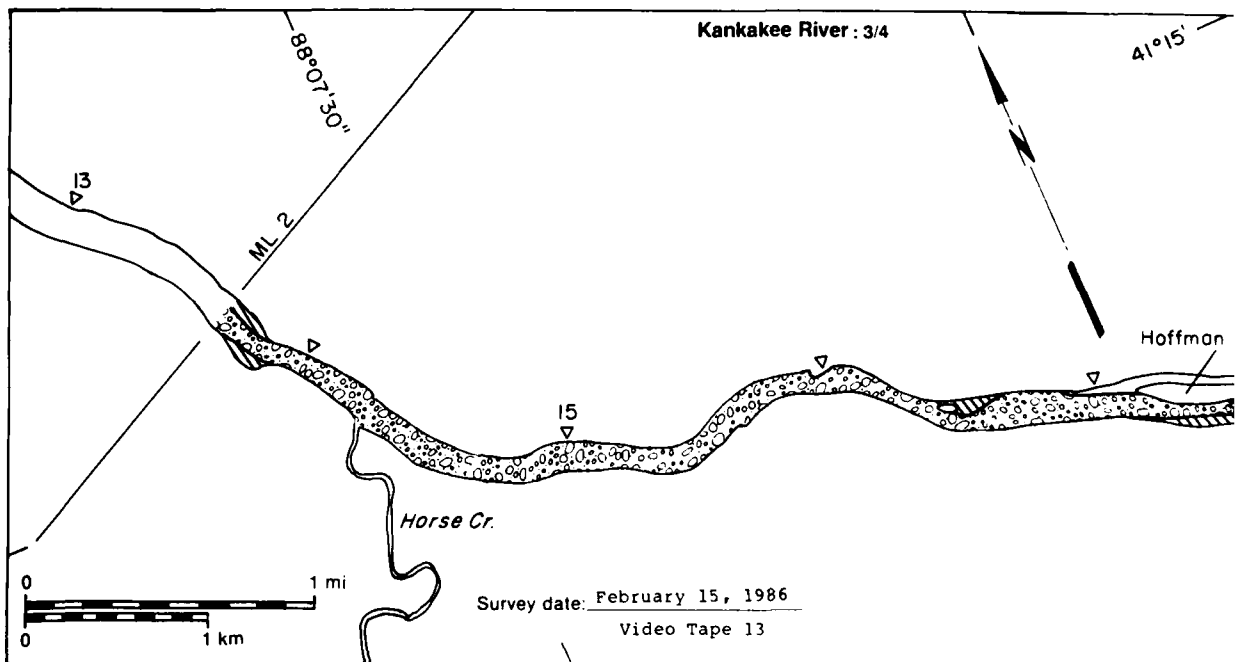
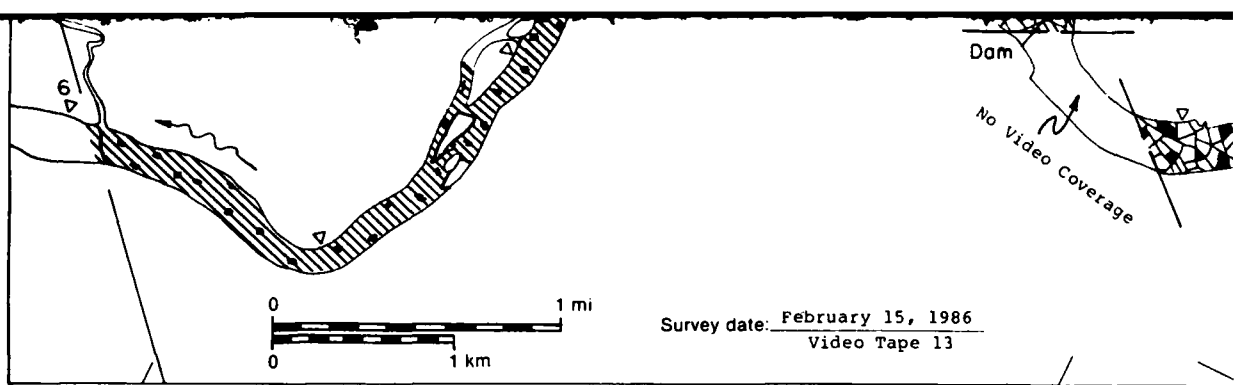
Δ273

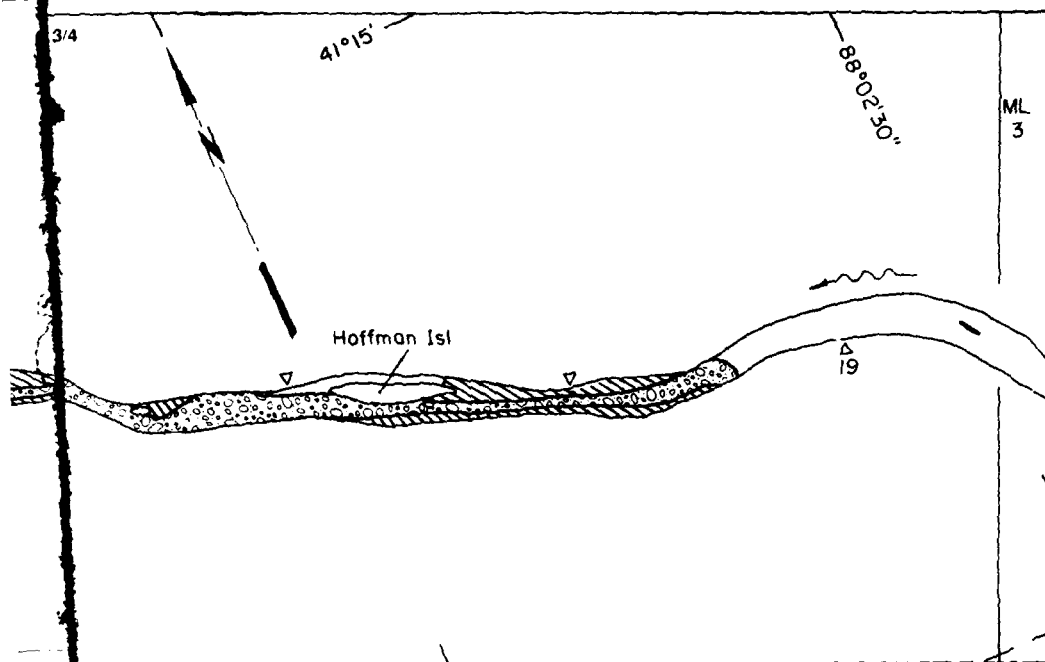
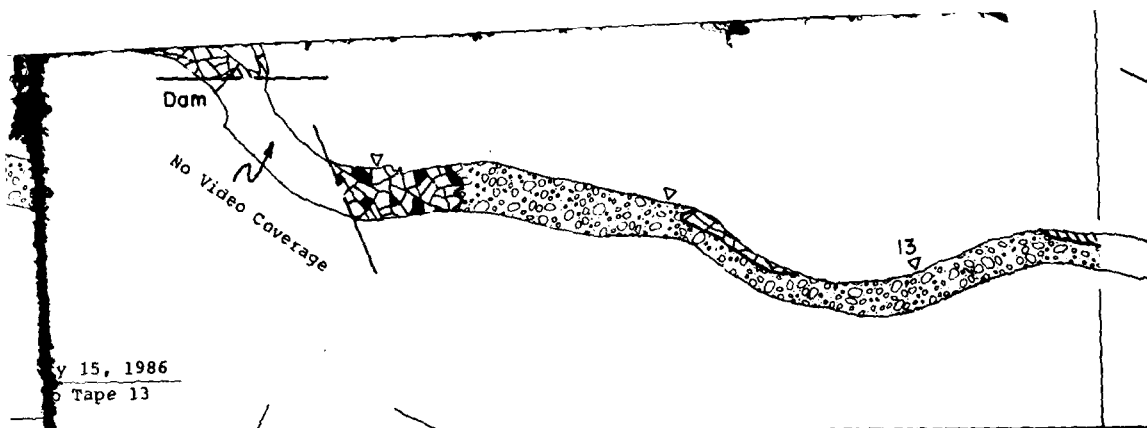
Des
Plaines
River

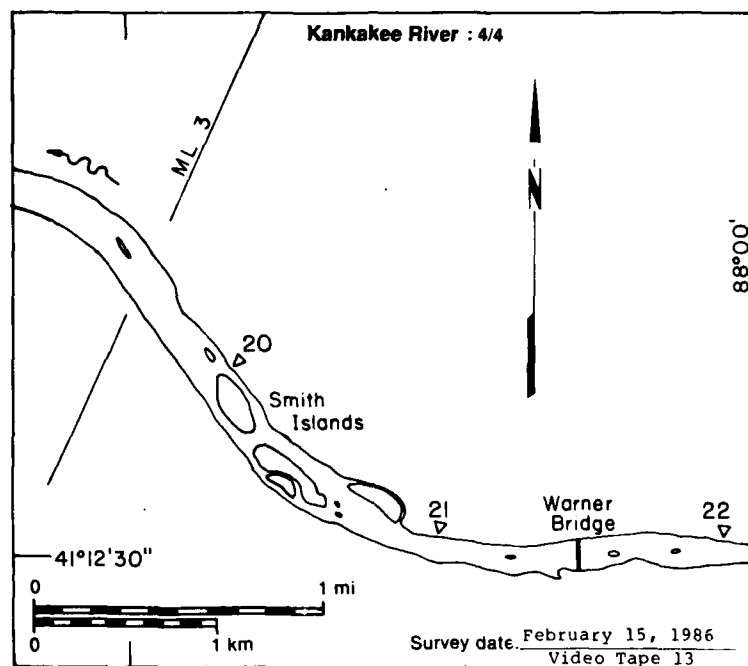
15 February 1986










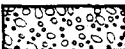






Kankakee River

MAP UNITS

-  Open water
-  Solid ice cover
-  Solid ice cover with open-water areas
-  Fragmented ice cover
-  Fragmented ice cover with open-water areas
-  Ice floes or frazil slush and pans

Total area (m² x 10

203

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Area
x
1.0
3
0.5
0.2
0.1
1
7.3

Kankakee River

MAP UNITS

Area
($m^2 \times 10^6$) Surface
concentration
(%)

Open water

1.00

NA

Solid ice cover

3.70

NA

Solid ice cover with
open-water areas

0.58

90

Fragmented ice cover

0.22

NA

Fragmented ice cover
with open-water areas

0.17

90

Ice floes or frazil slush
and pans

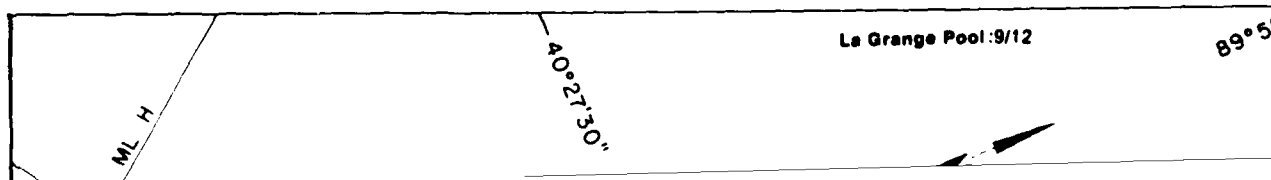
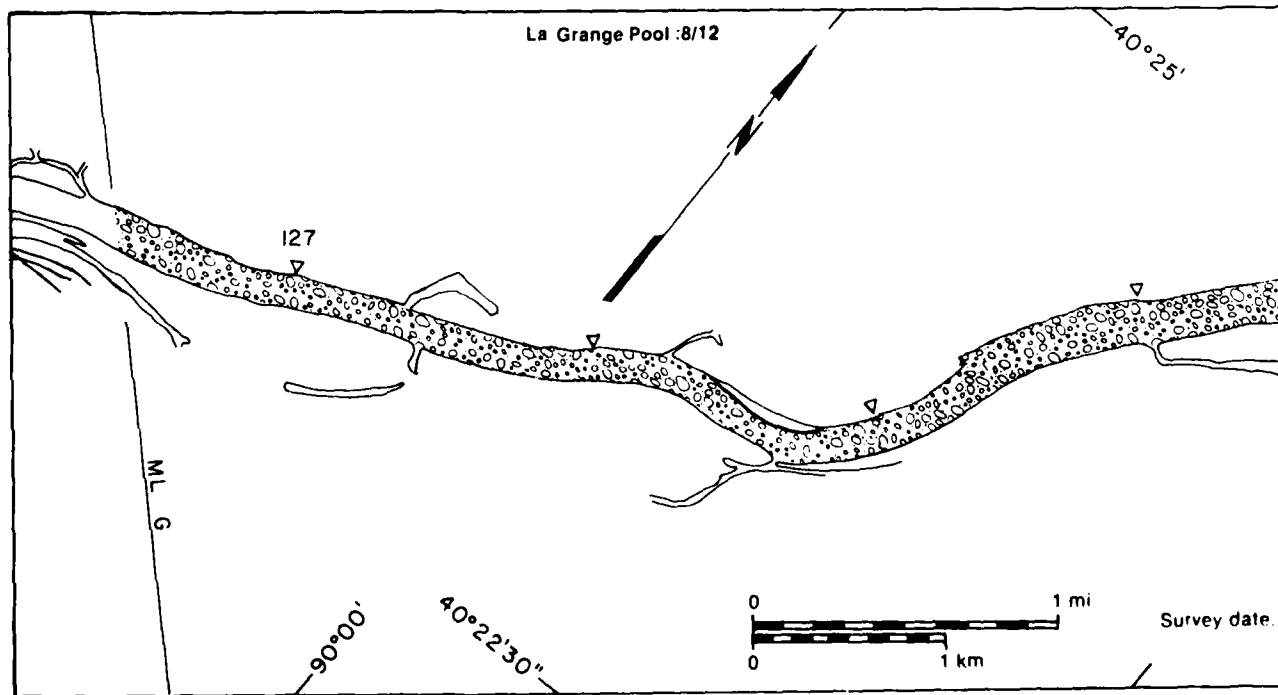
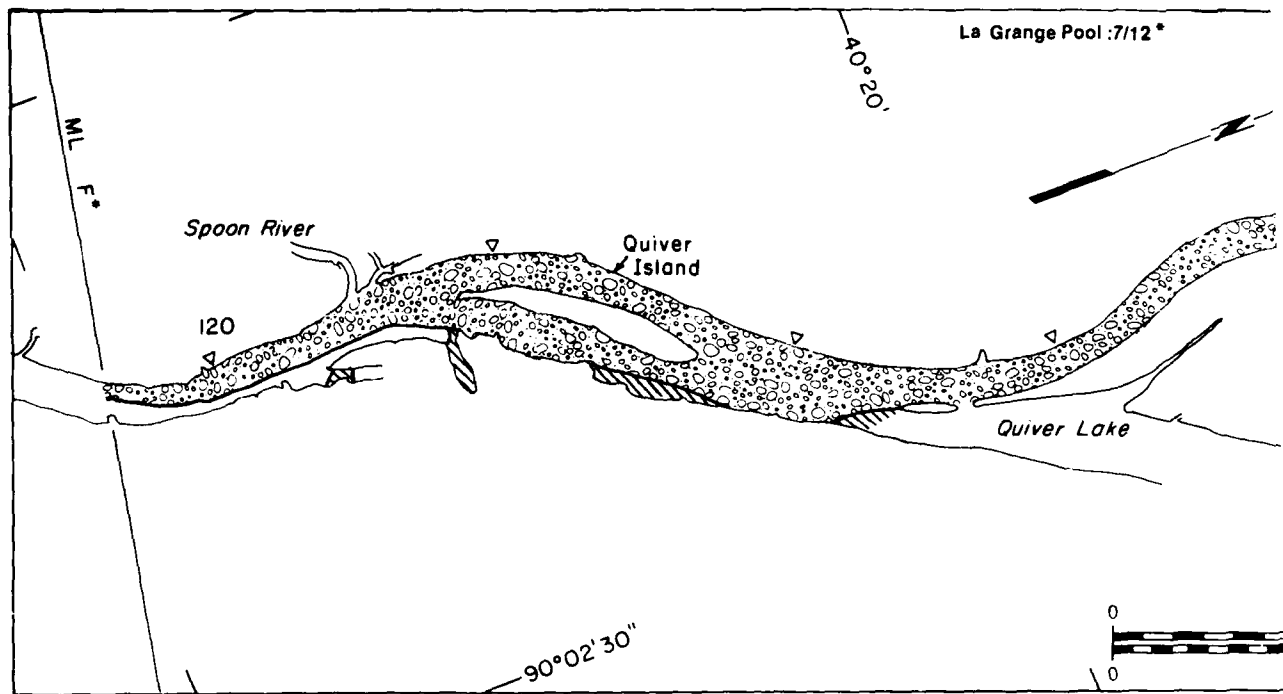
1.33

30

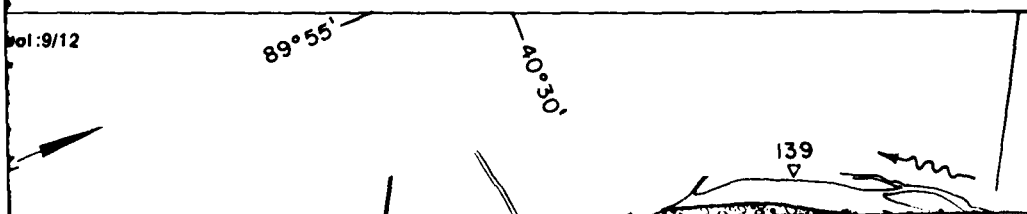
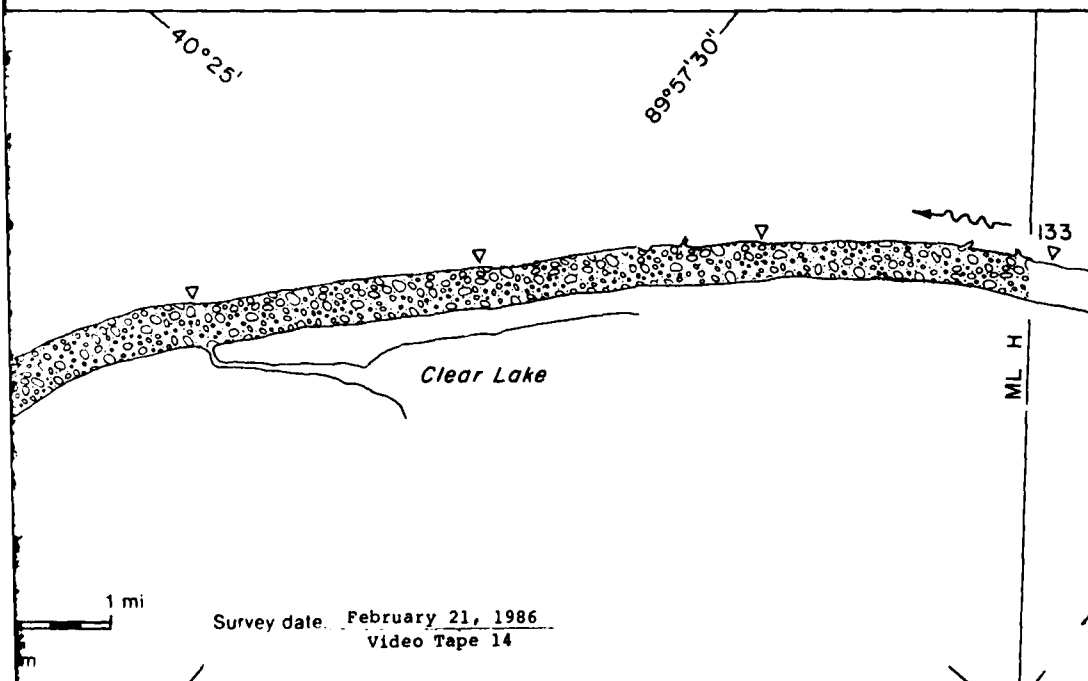
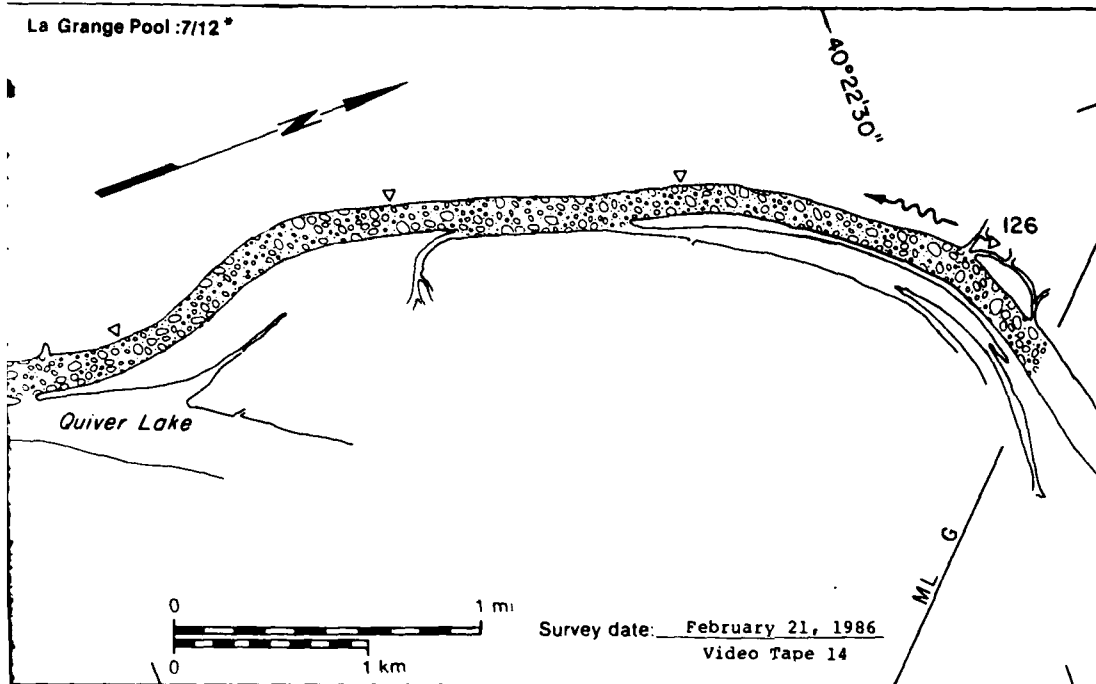
Total area: 7.30×10^6

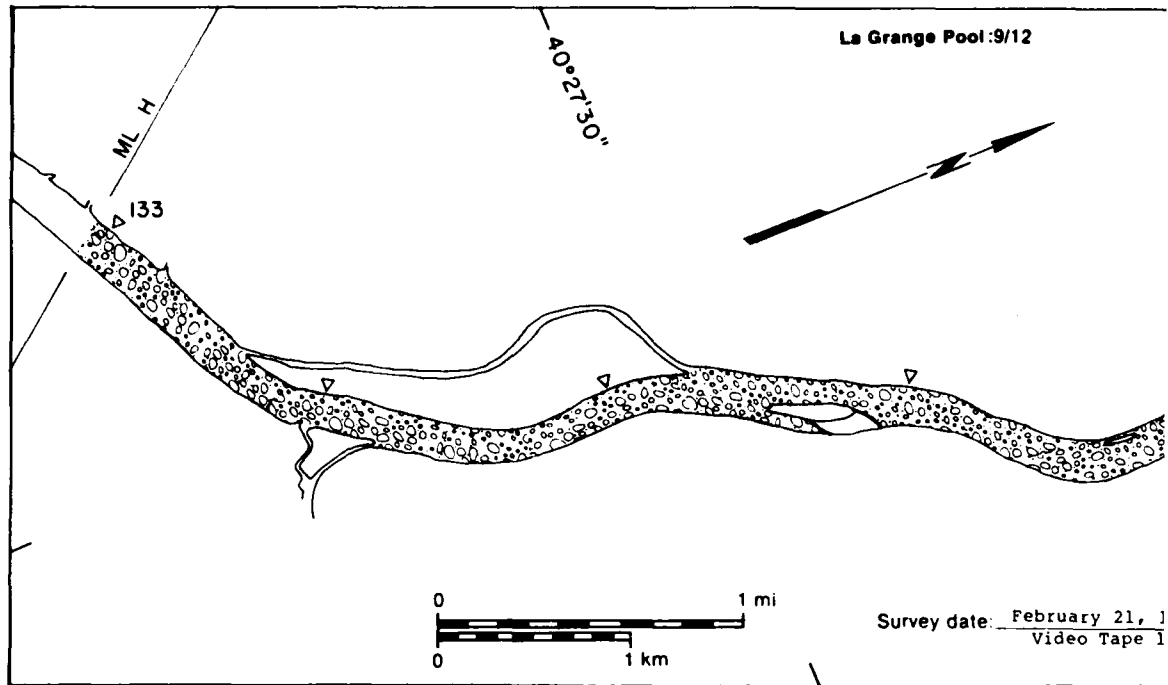
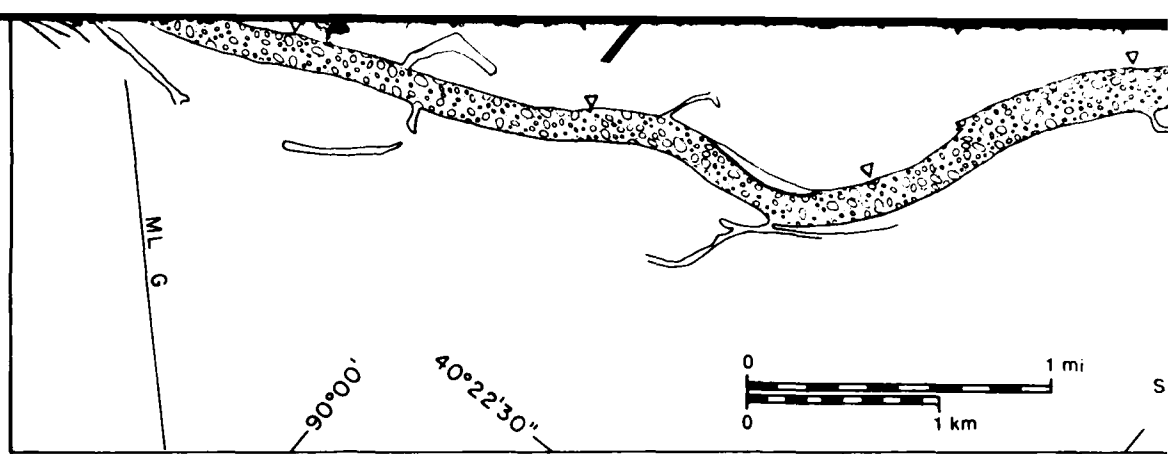
7.30*

* Includes $0.30 \times 10^6 m^2$
of no video coverage

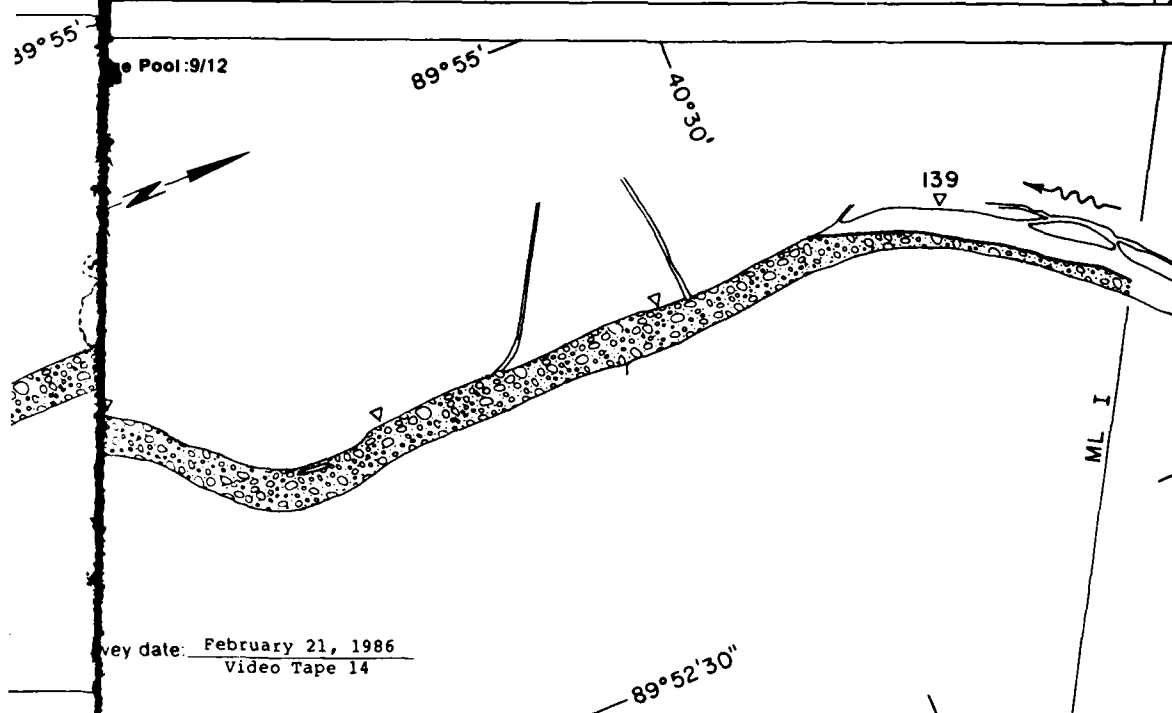
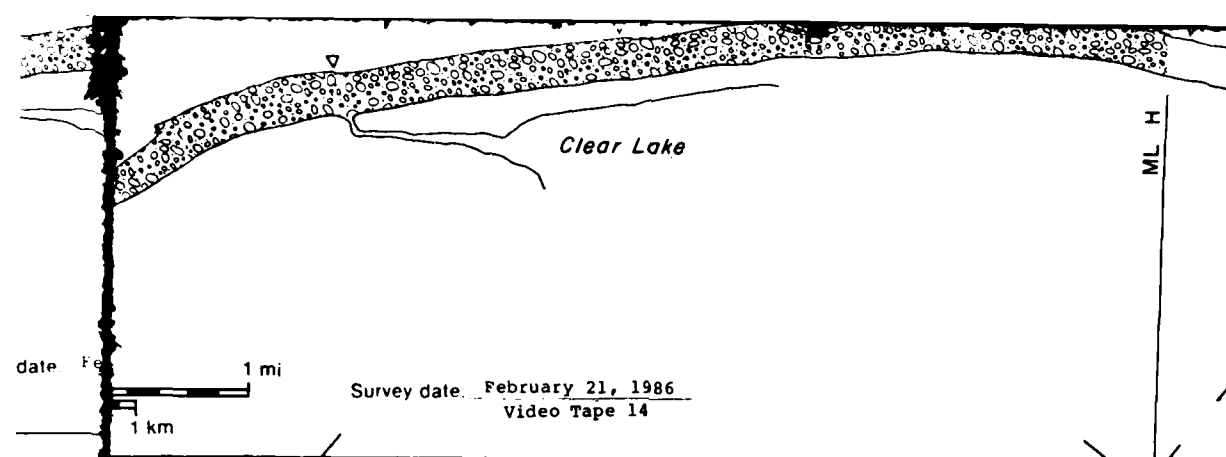


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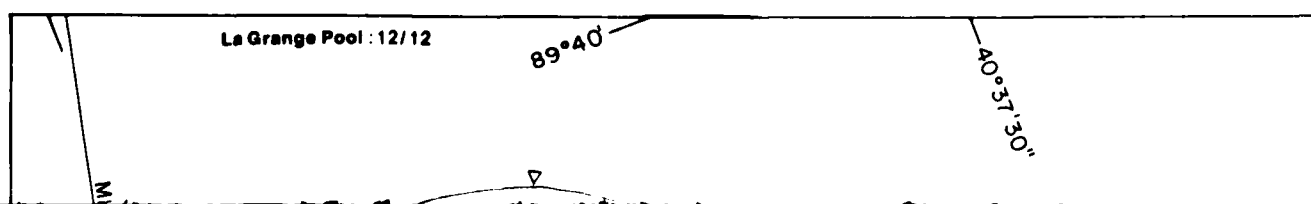
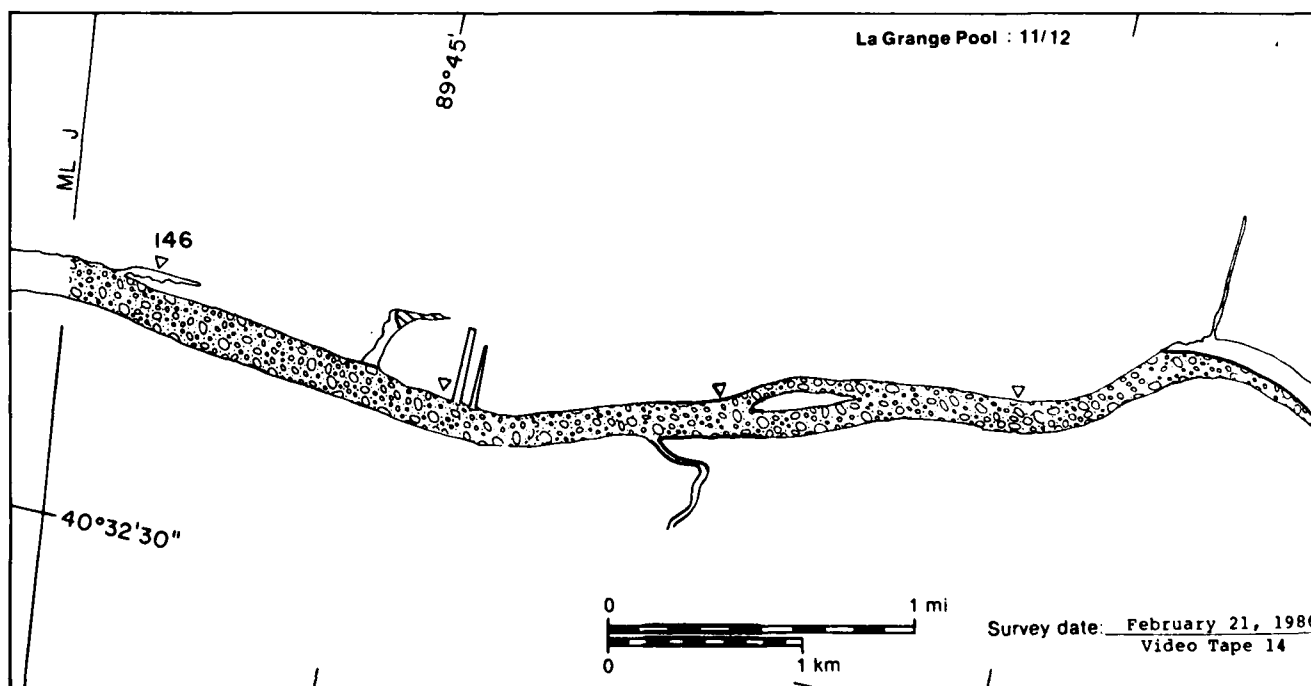
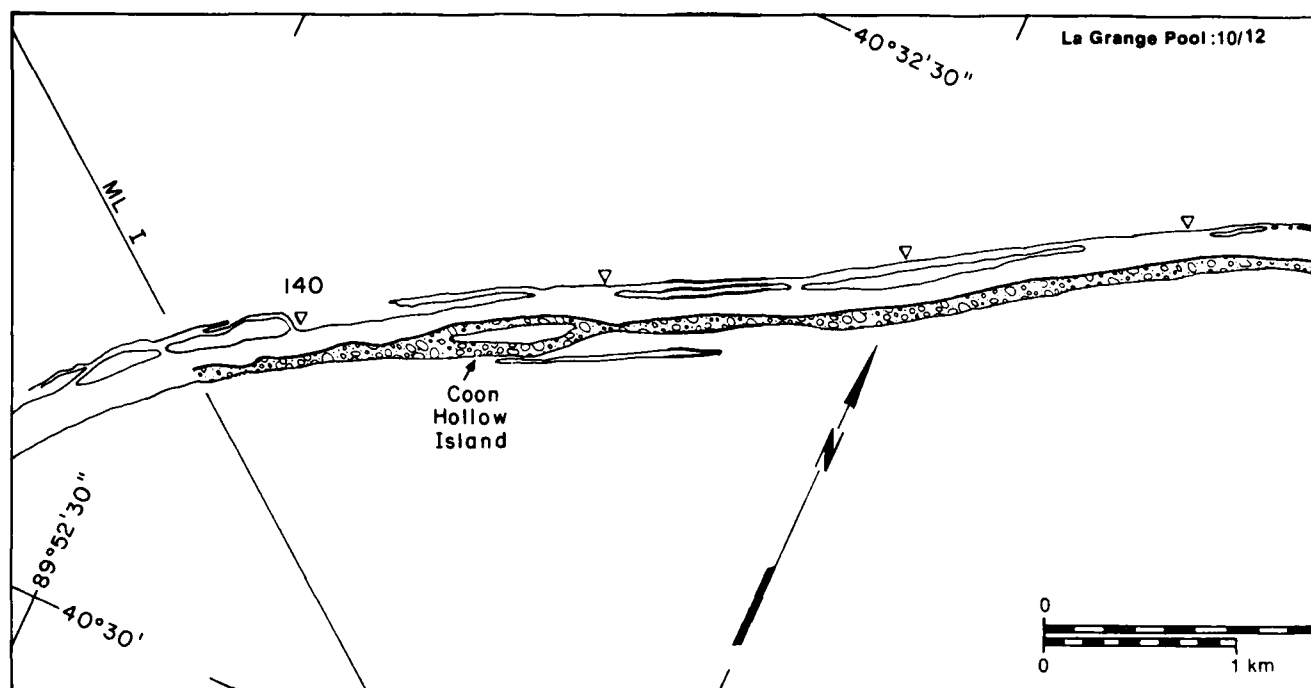


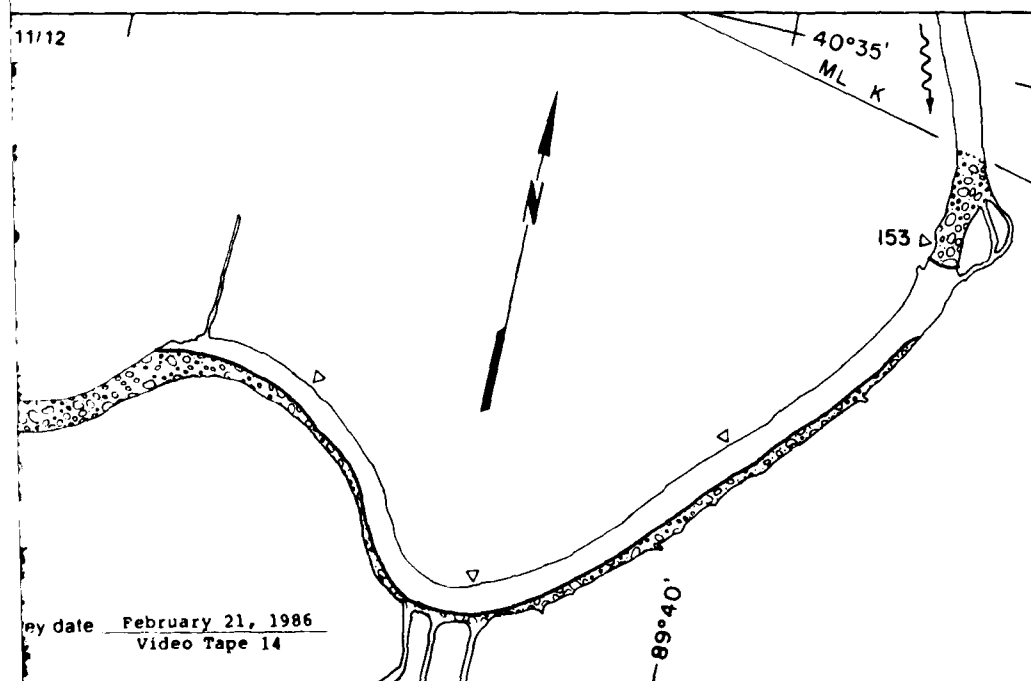
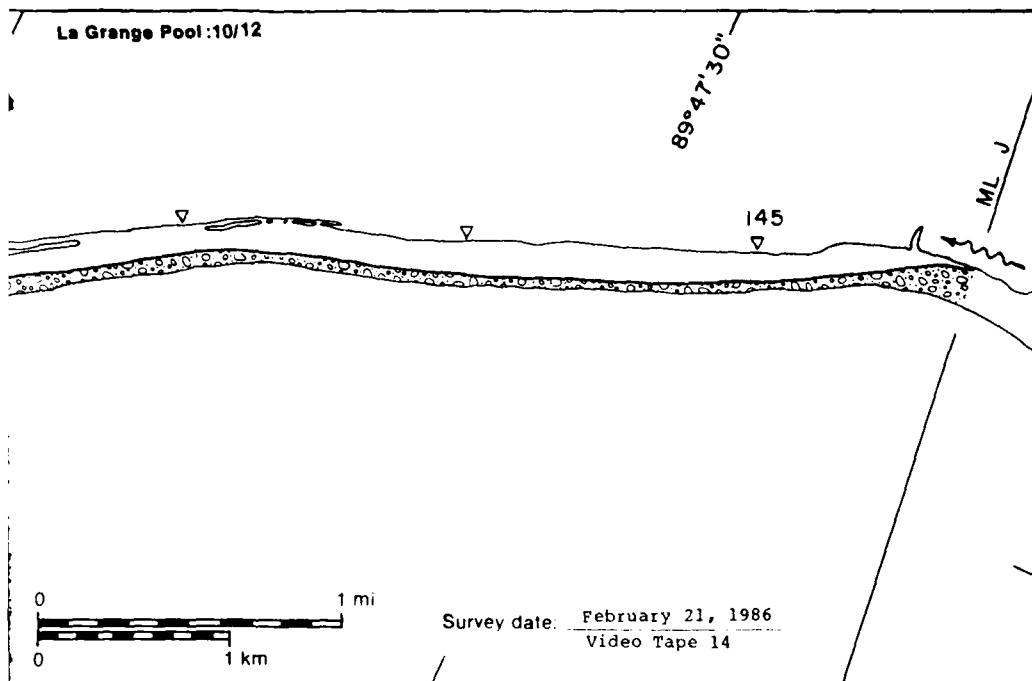


* The downstream limit of Illinois River video coverage was in the vicinity of mile 120 at Havana, Illinois, on all dates. There is no coverage of La Grange Pool maps 1/12 through 6/12 (match lines A through E).



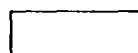
21 February 1986





La Grange Pool

MAP UNITS



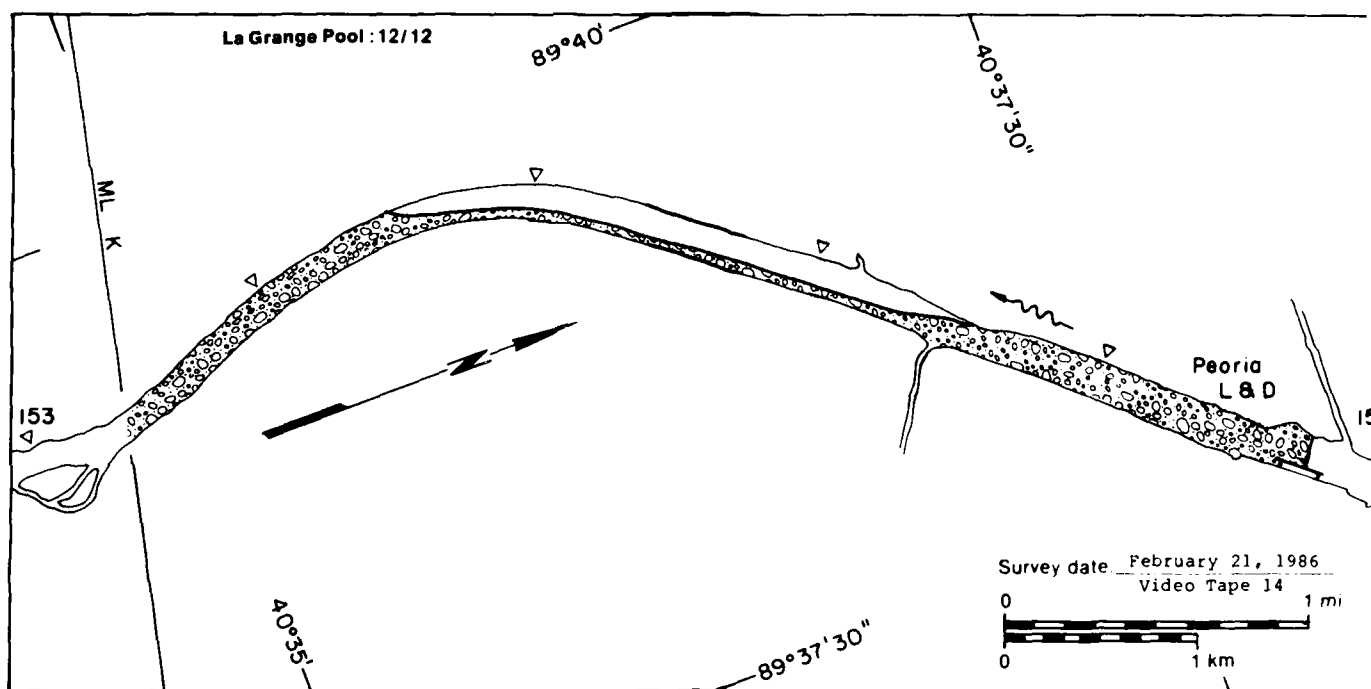
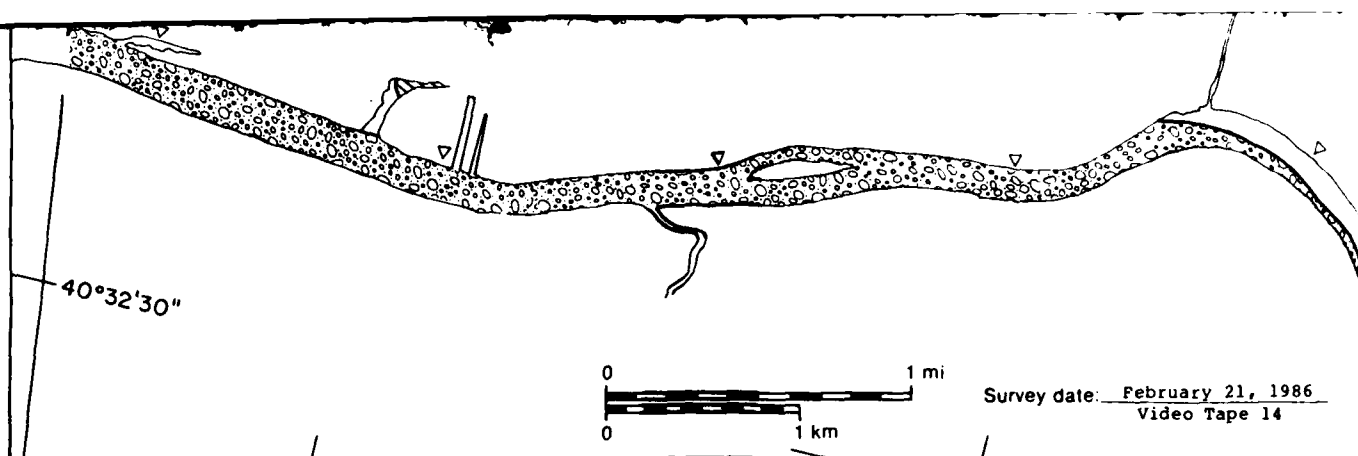
Open water

Area
(m² x 10⁶)

2.71

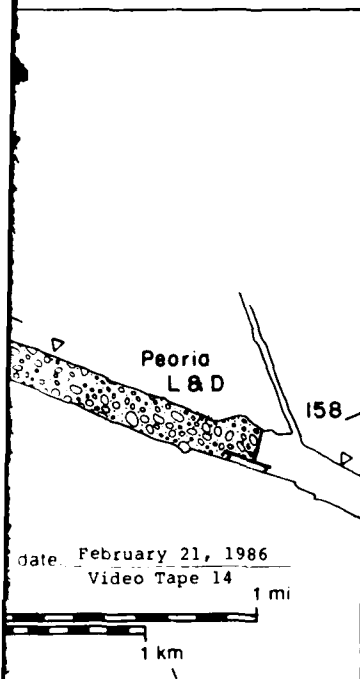
Surface
concentration
(%)

NA



date: February 21, 1986
Video Tape 14

89°40'

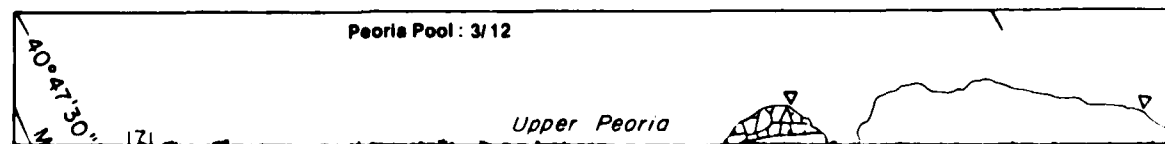
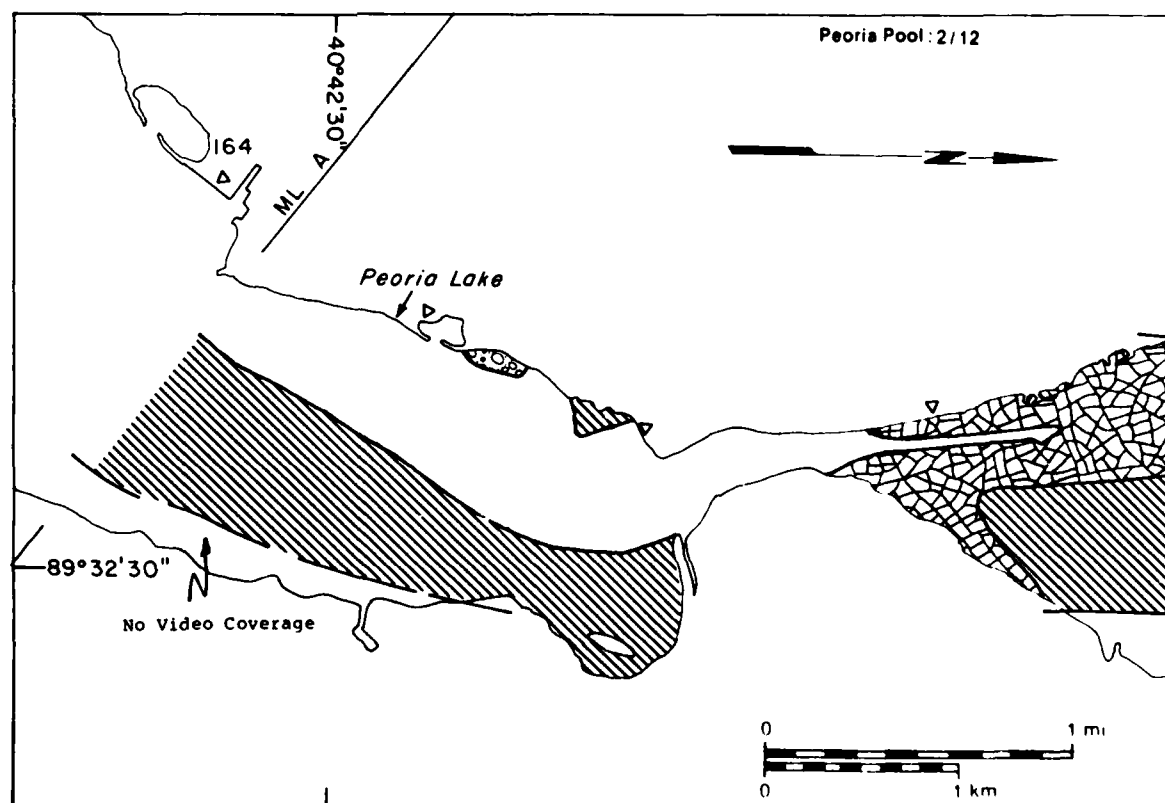
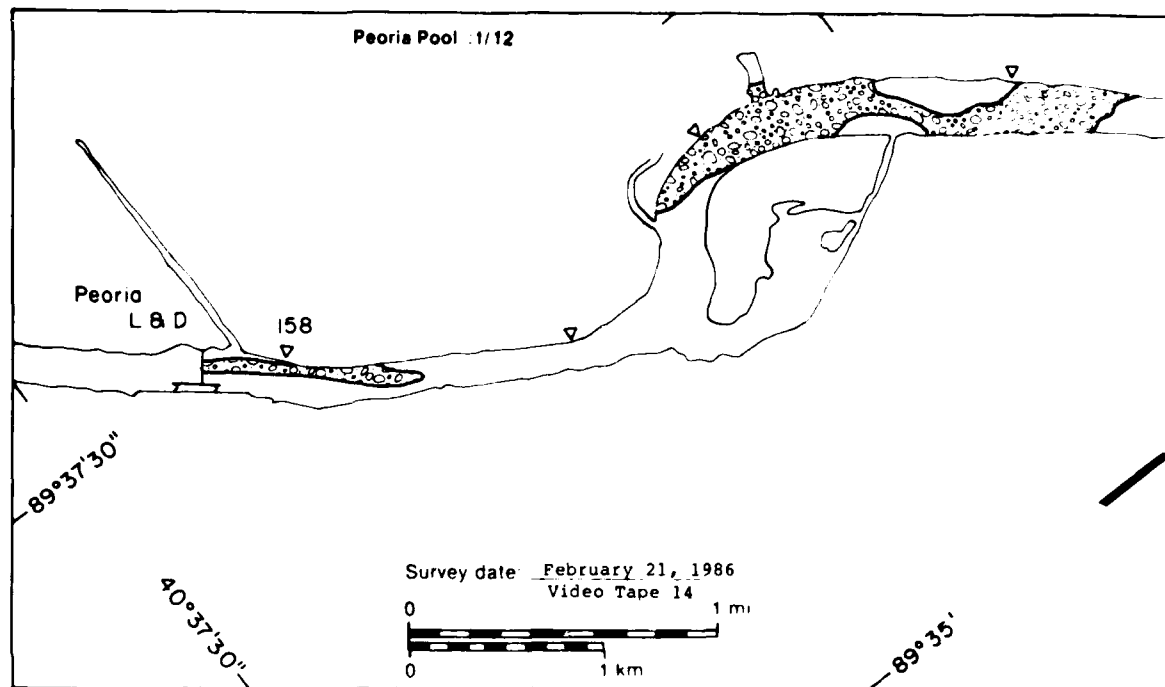


La Grange Pool

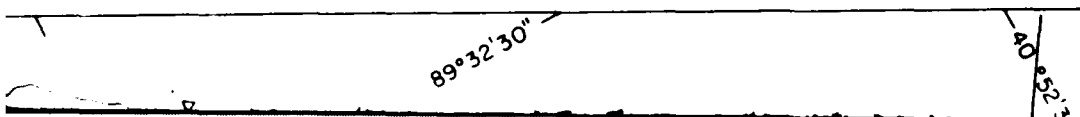
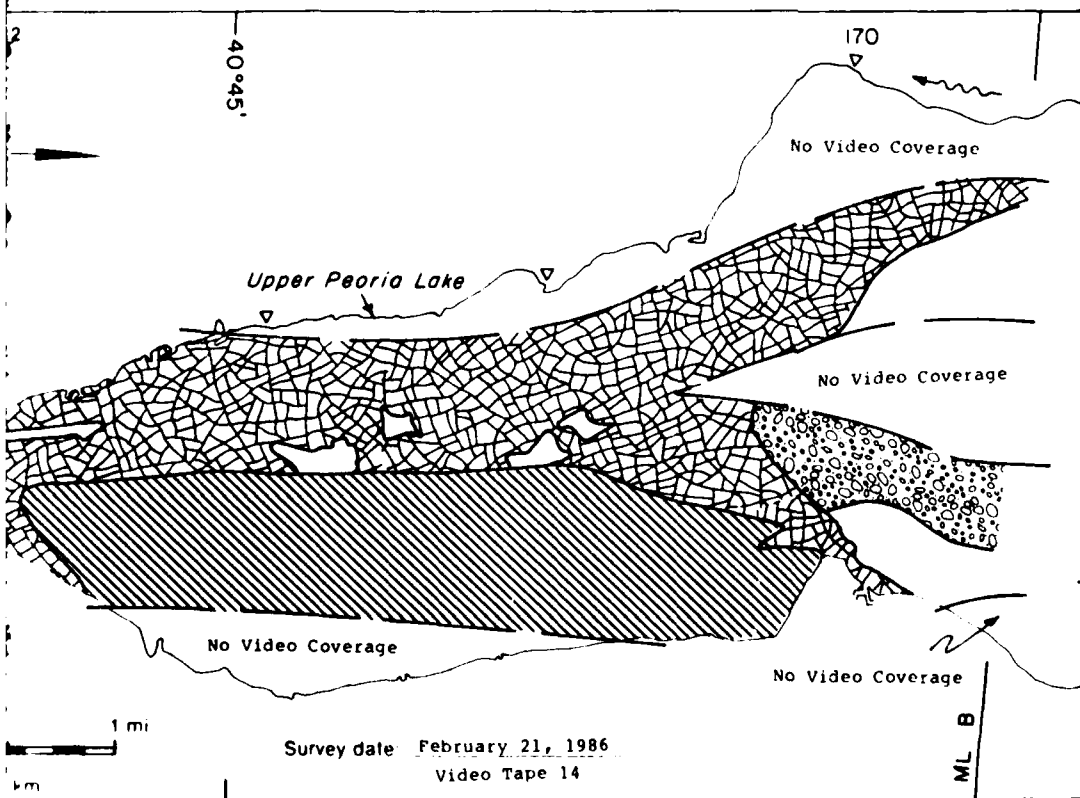
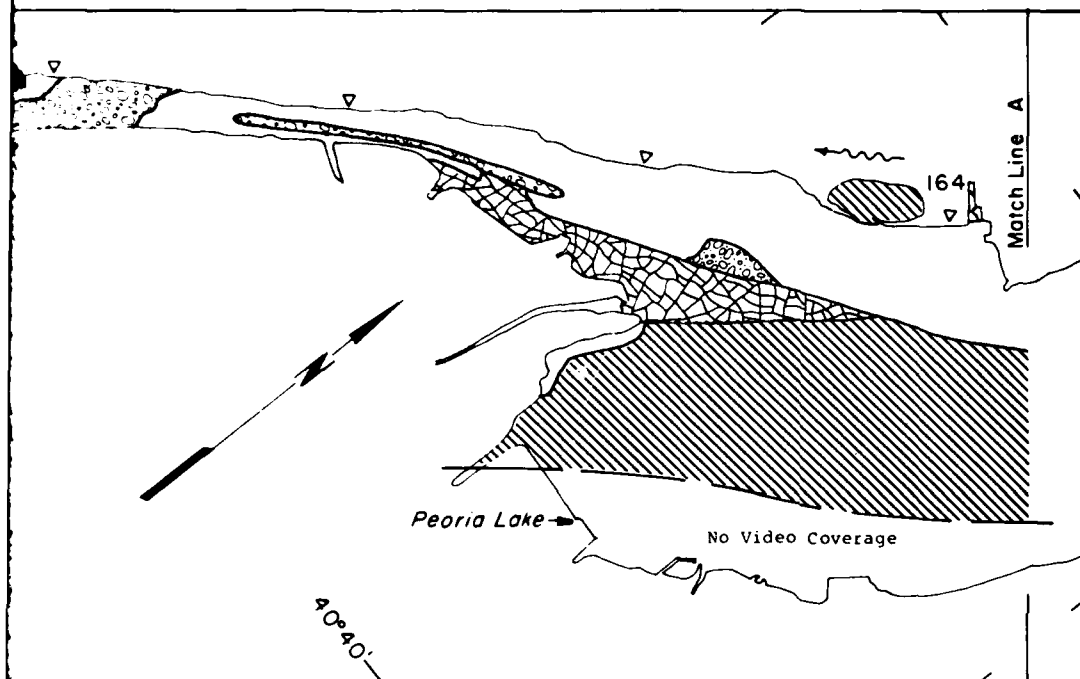
MAP UNITS

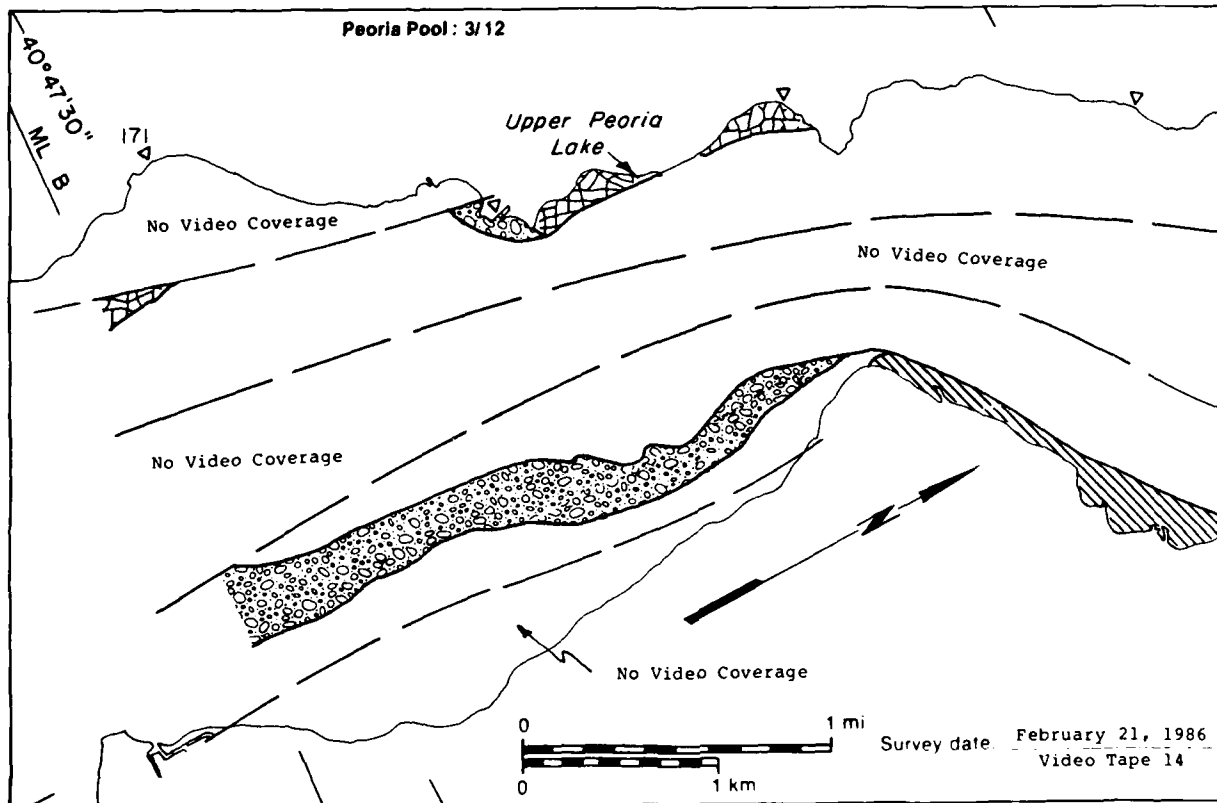
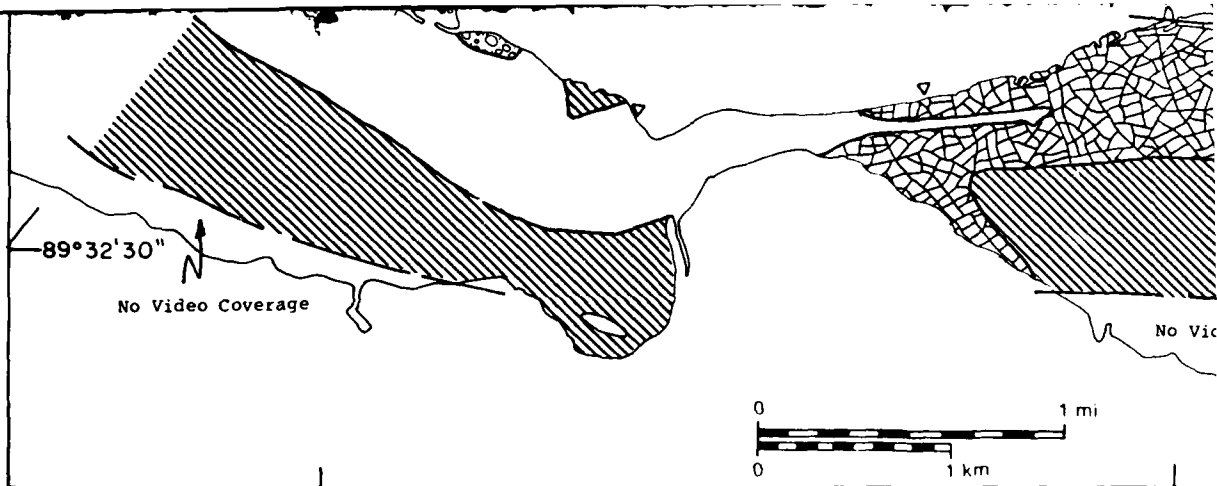
	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

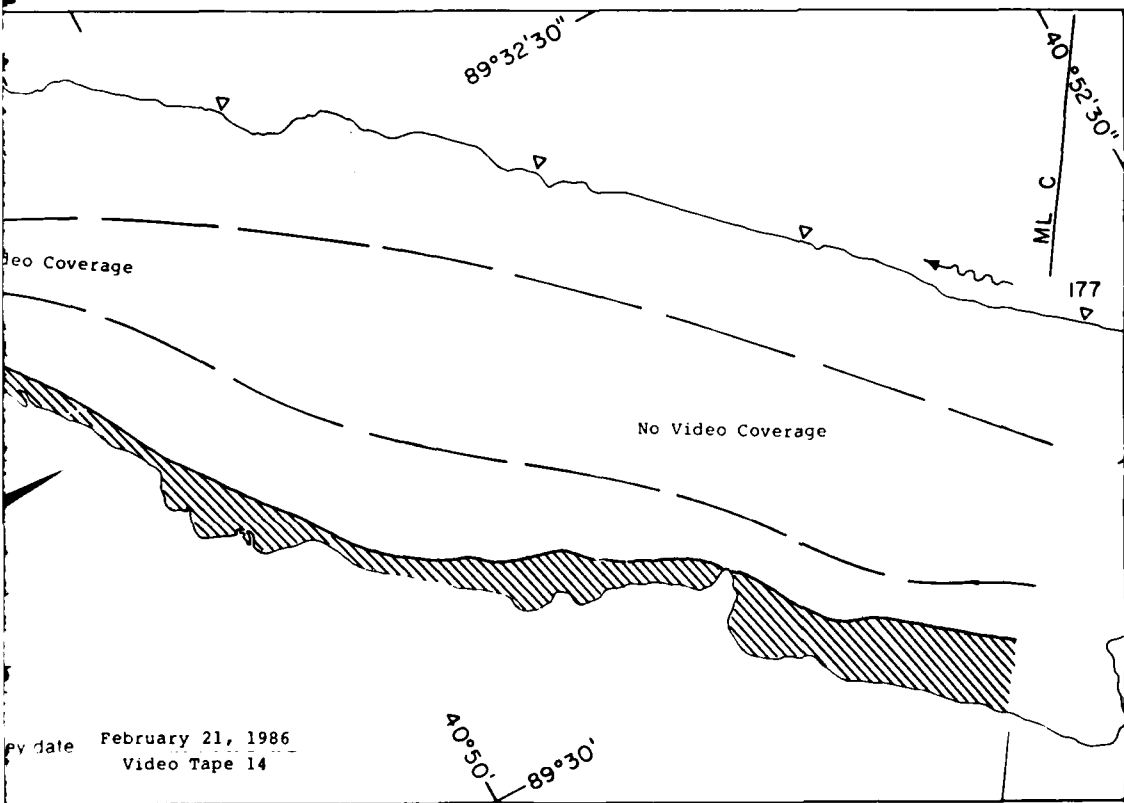
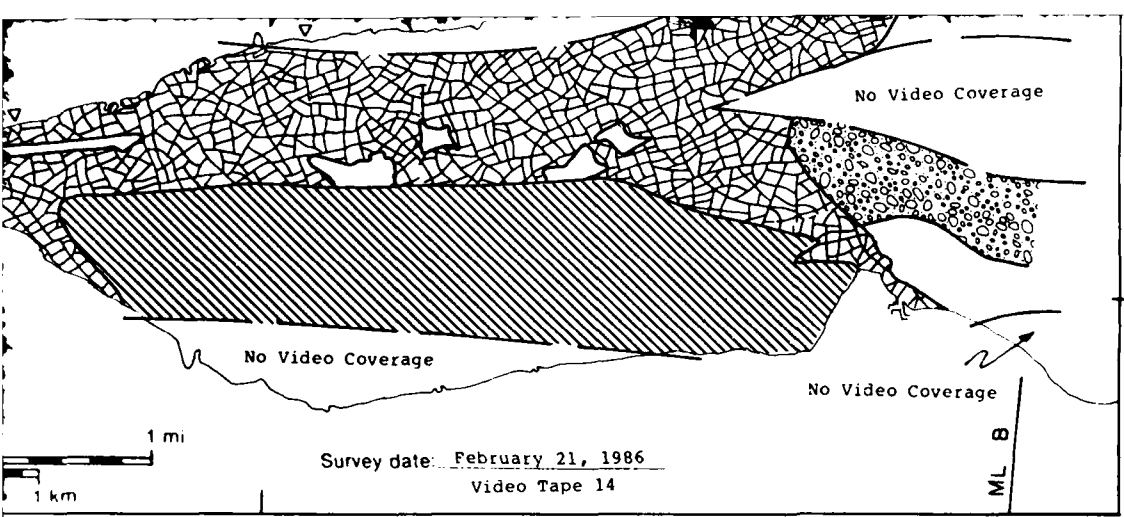
Area ($m^2 \times 10^6$)	Surface concentration (%)
2.71	NA
0.15	NA
0.00	—
0.00	NA
0.00	—
8.85	40
Total area ($m^2 \times 10^6$)	11.71



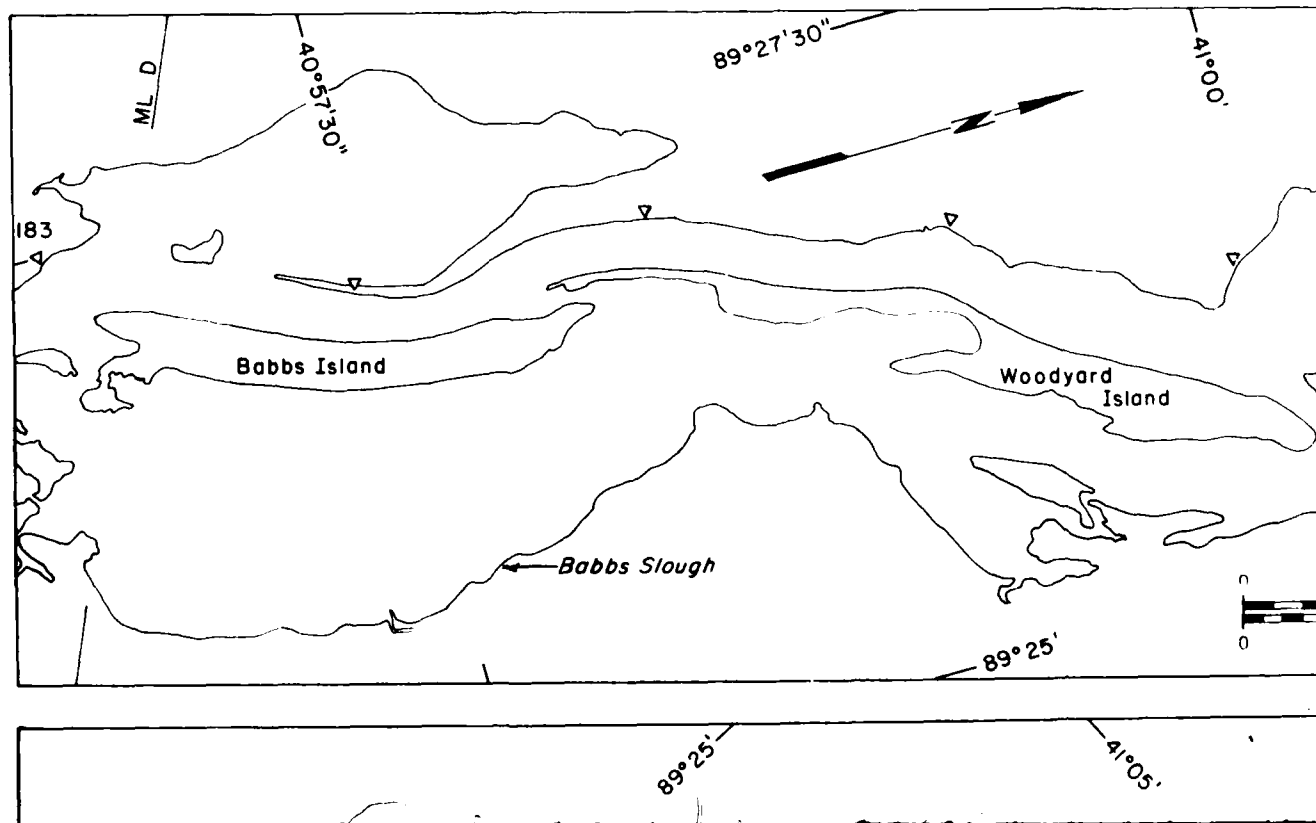
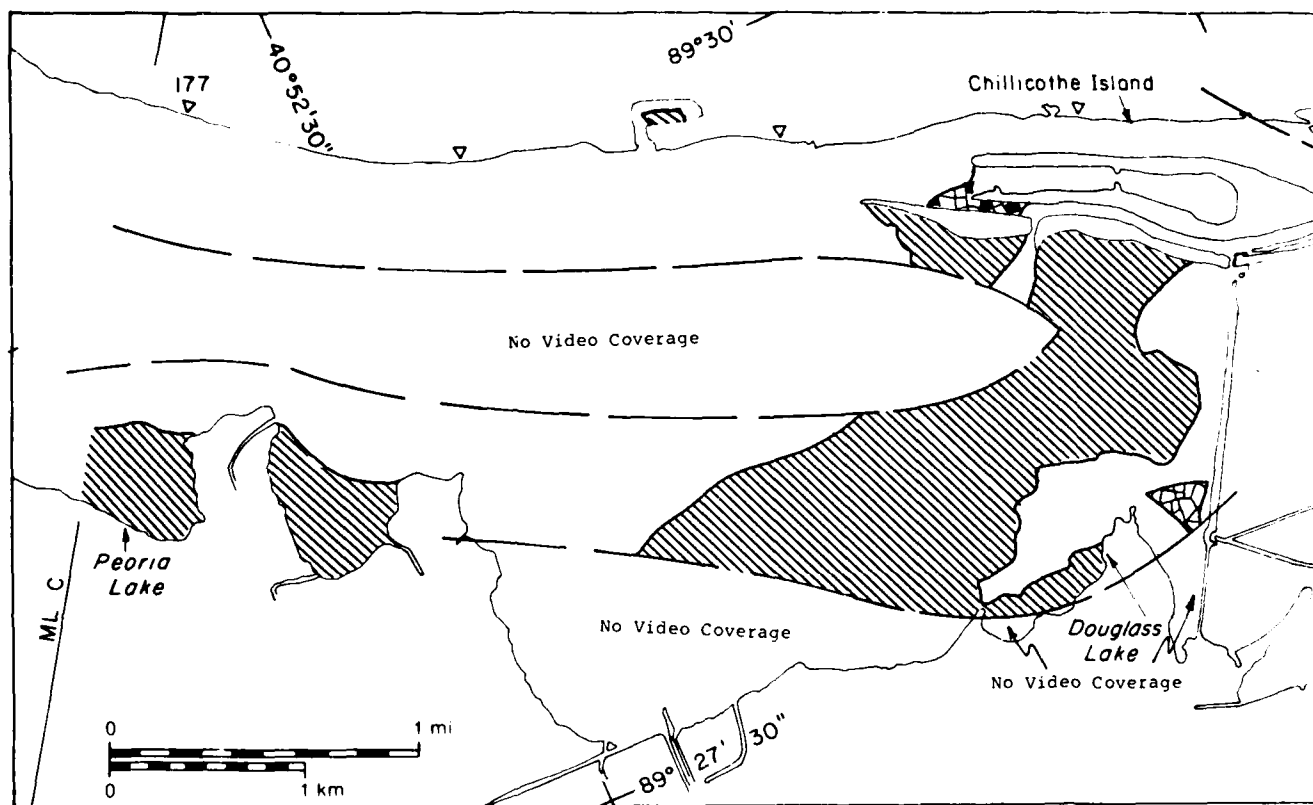
21 February 1986



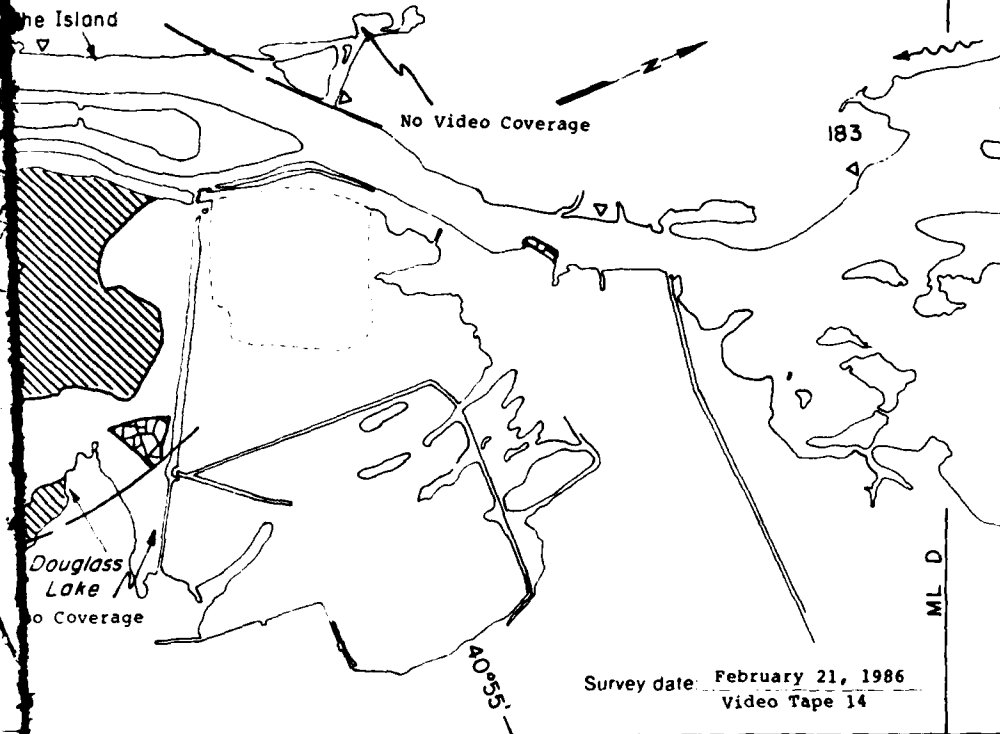




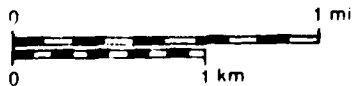
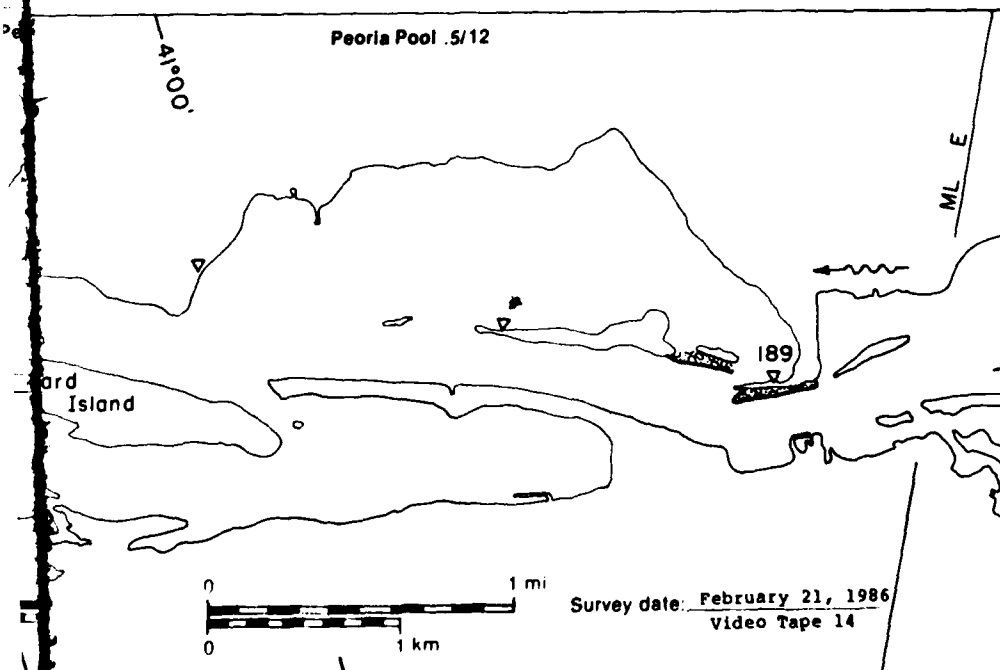
21 February 1986



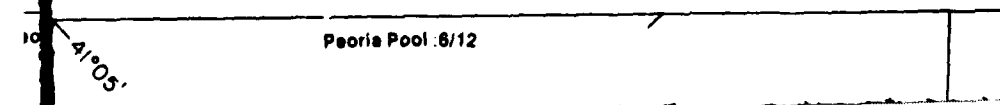
Peoria Pool: 4/12

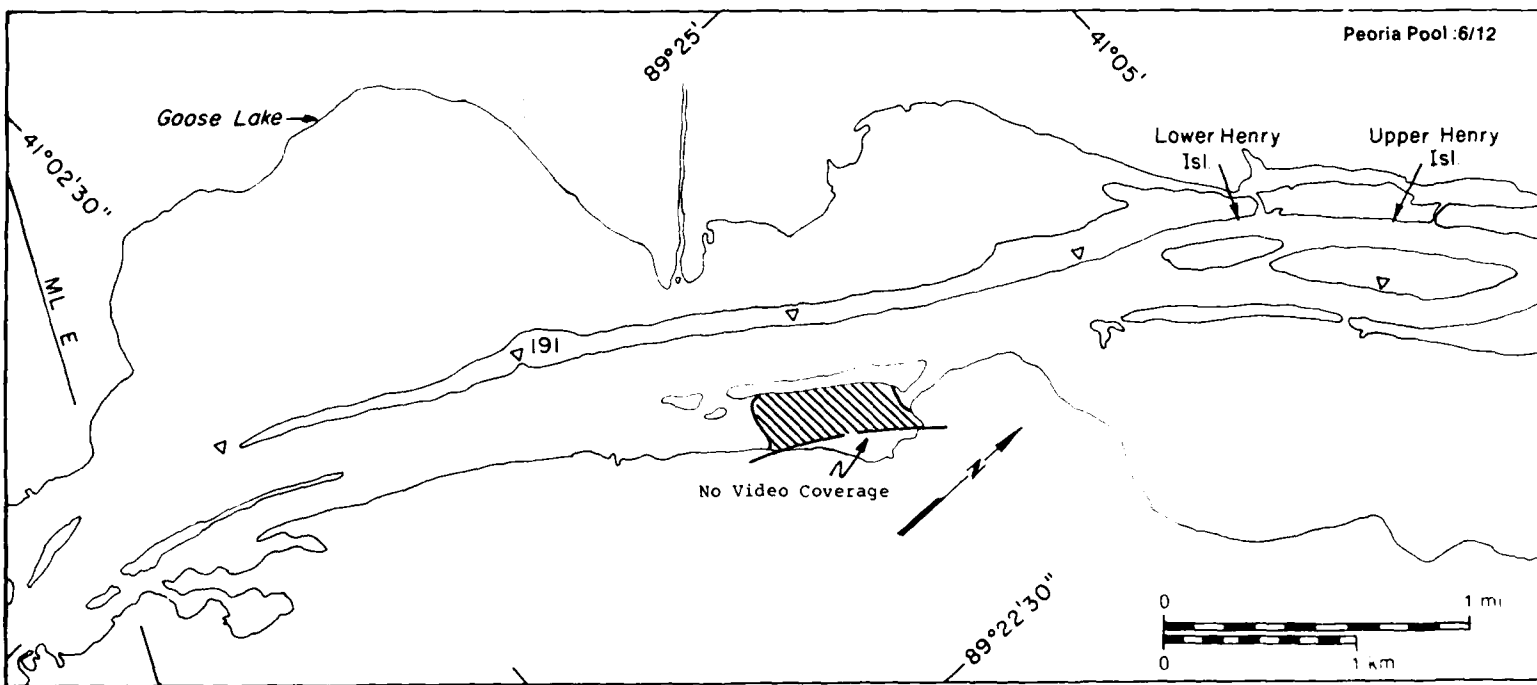
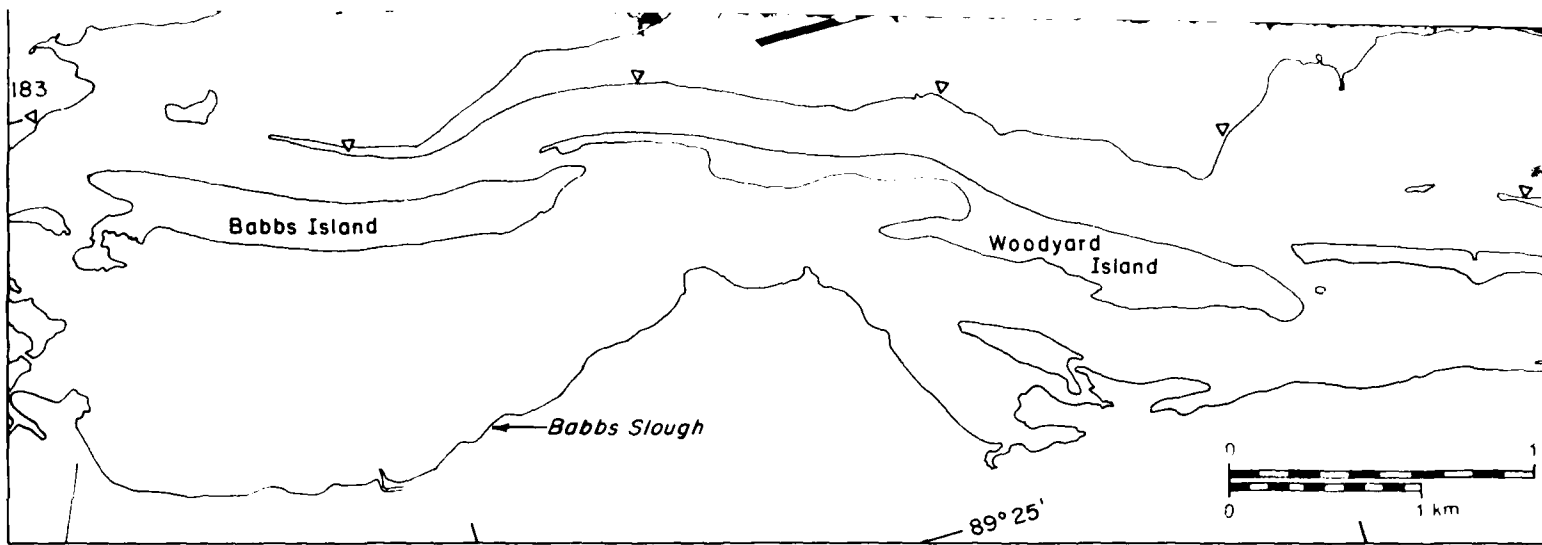


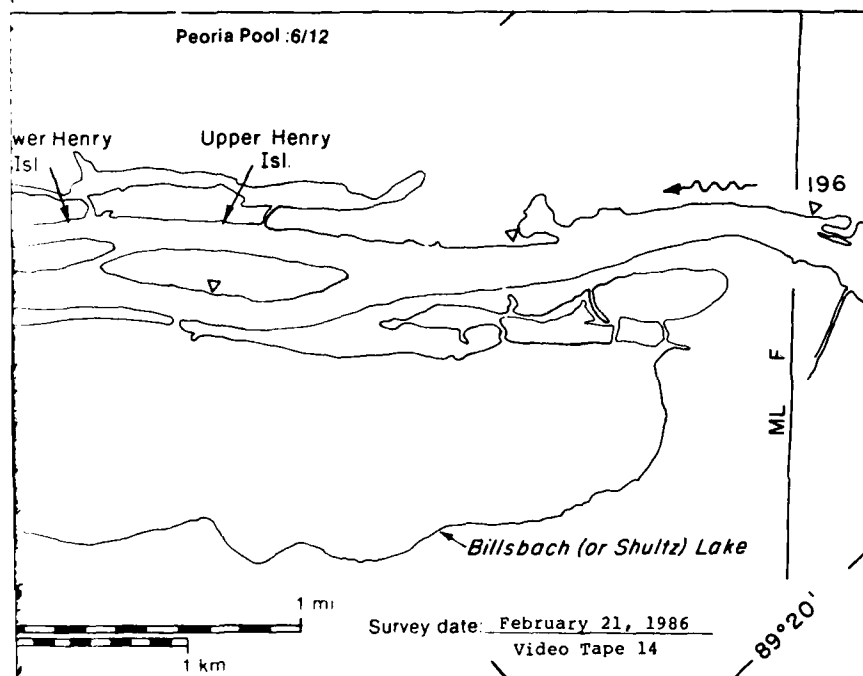
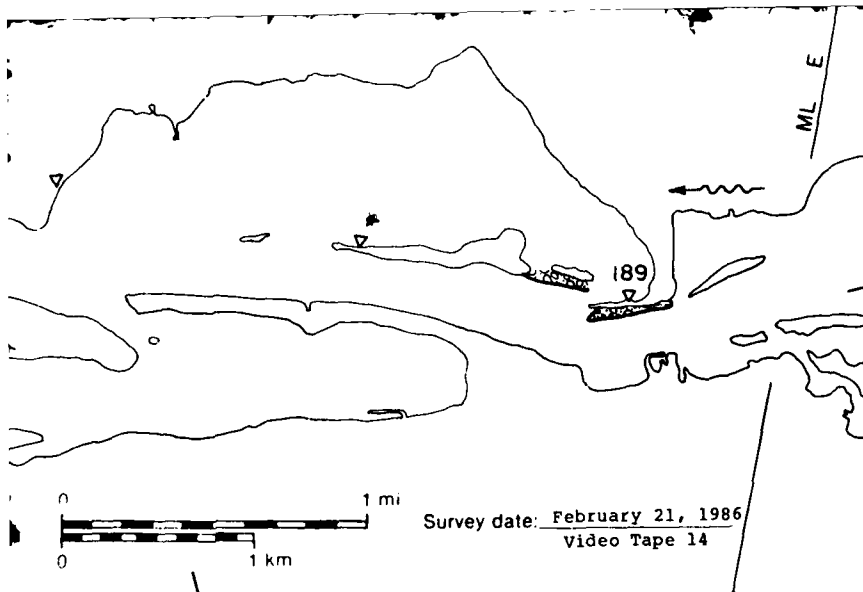
Peoria Pool: 5/12

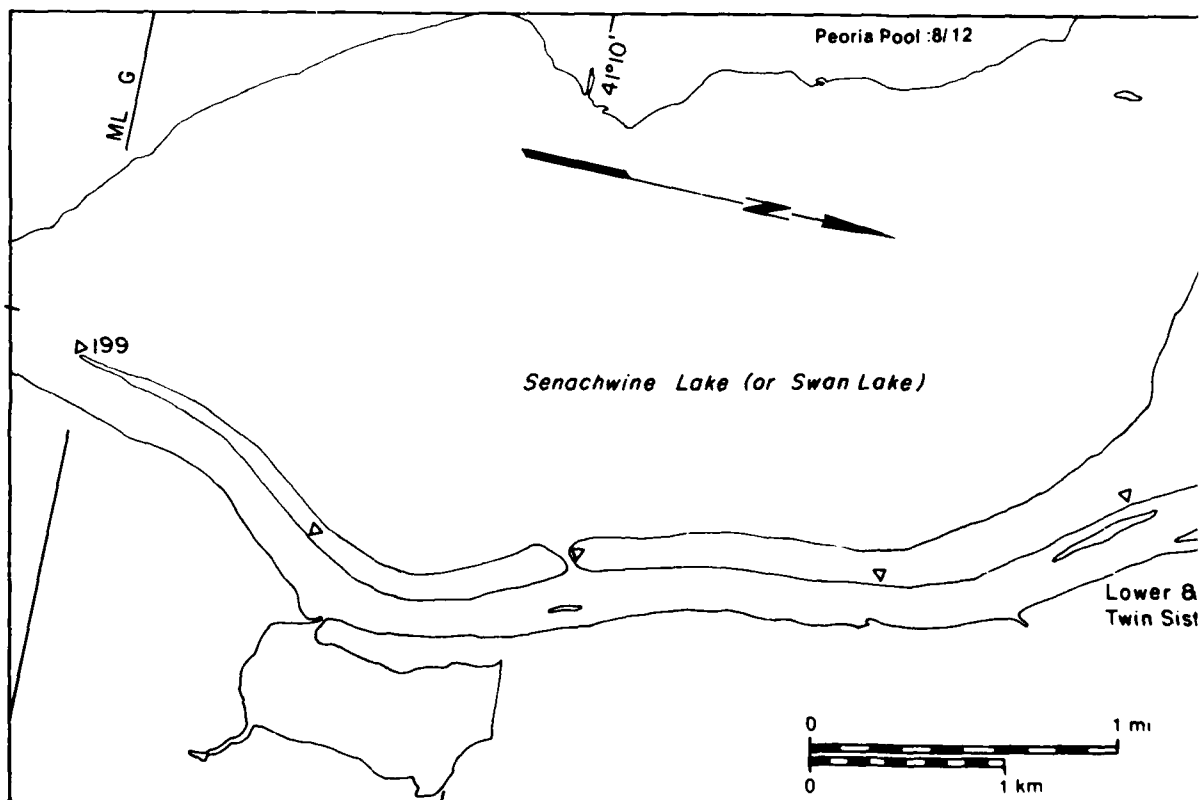
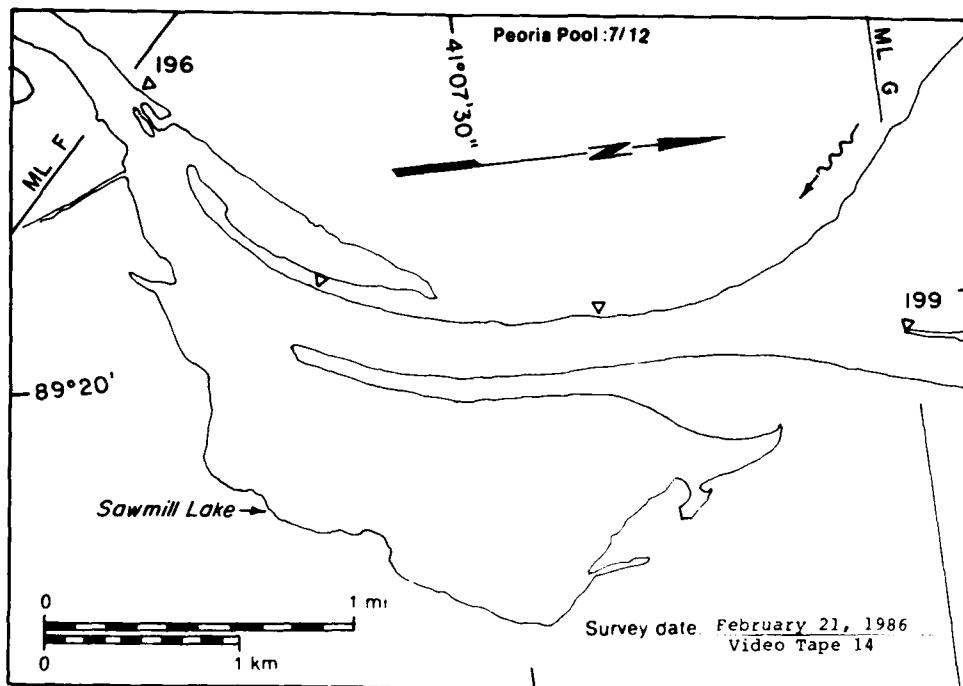


Peoria Pool: 6/12

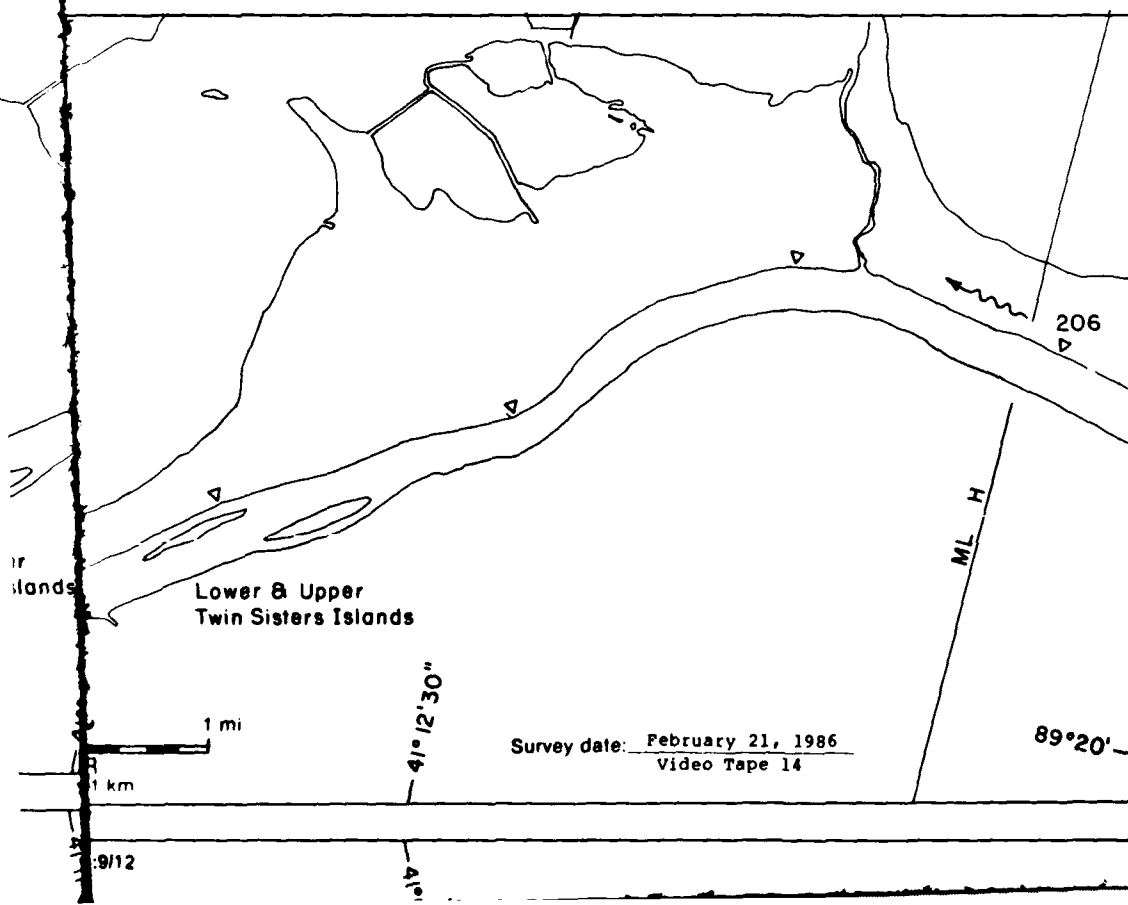


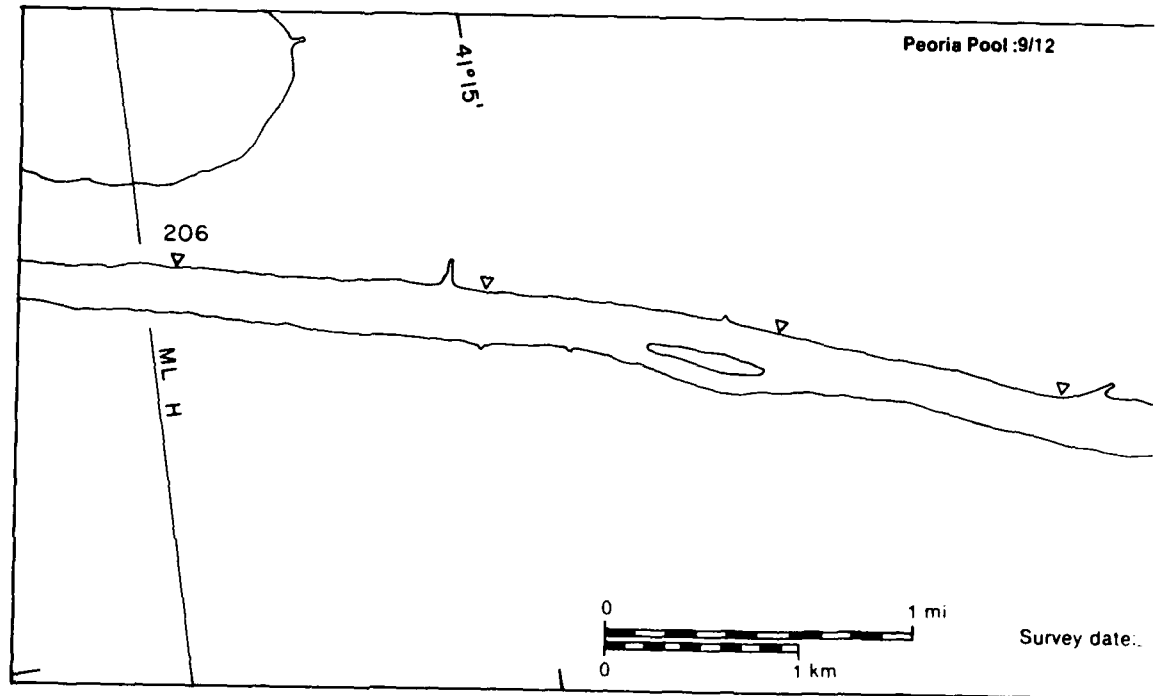
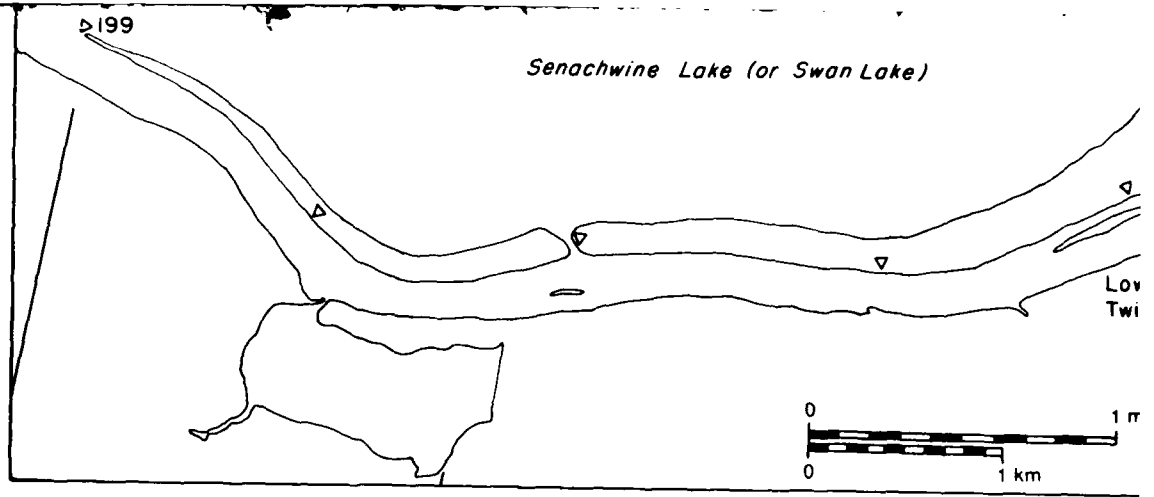


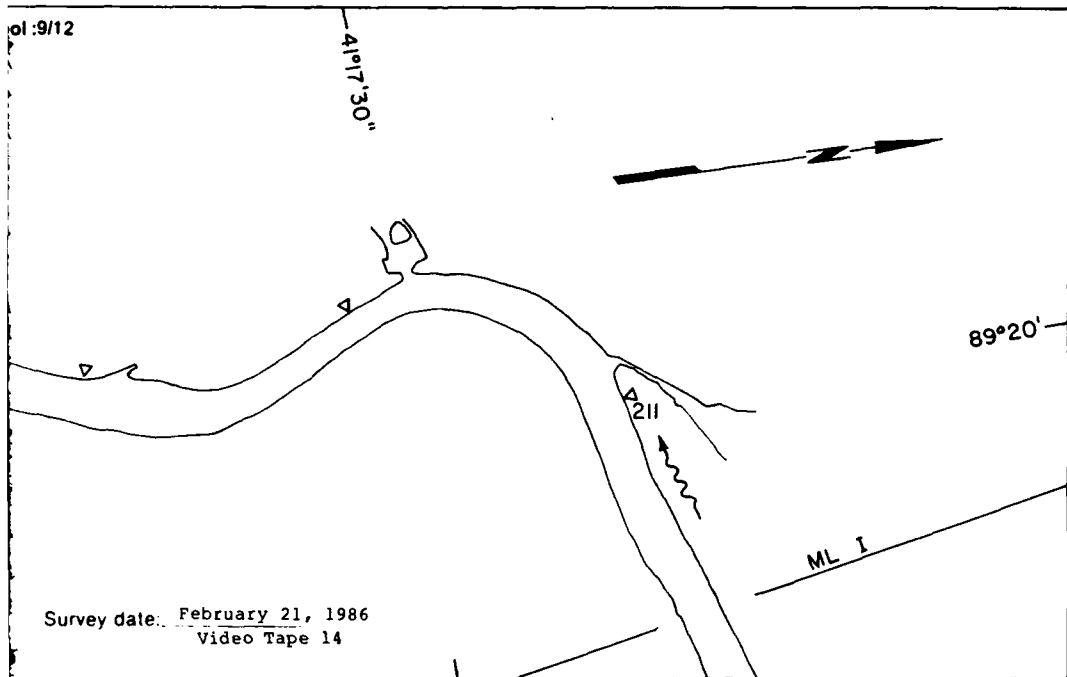
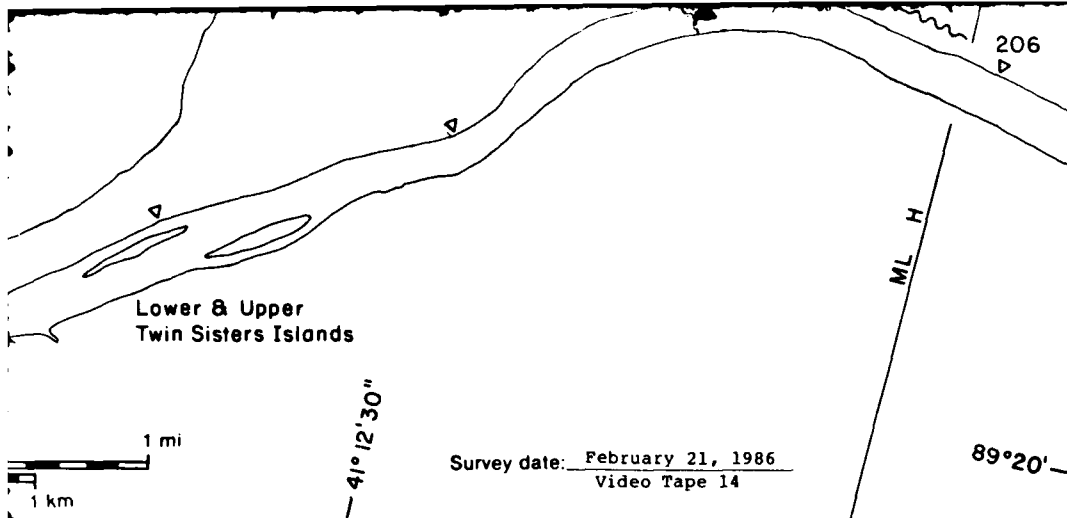




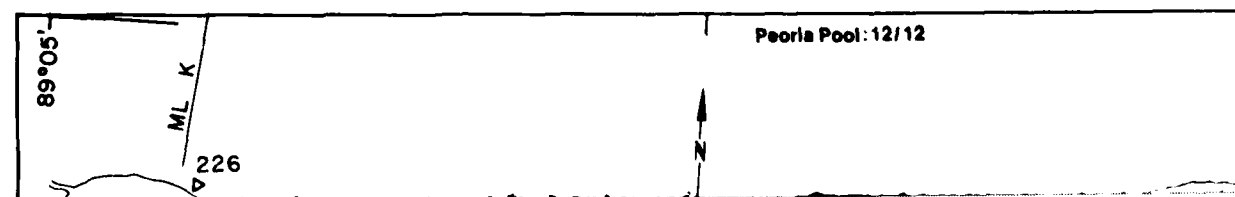
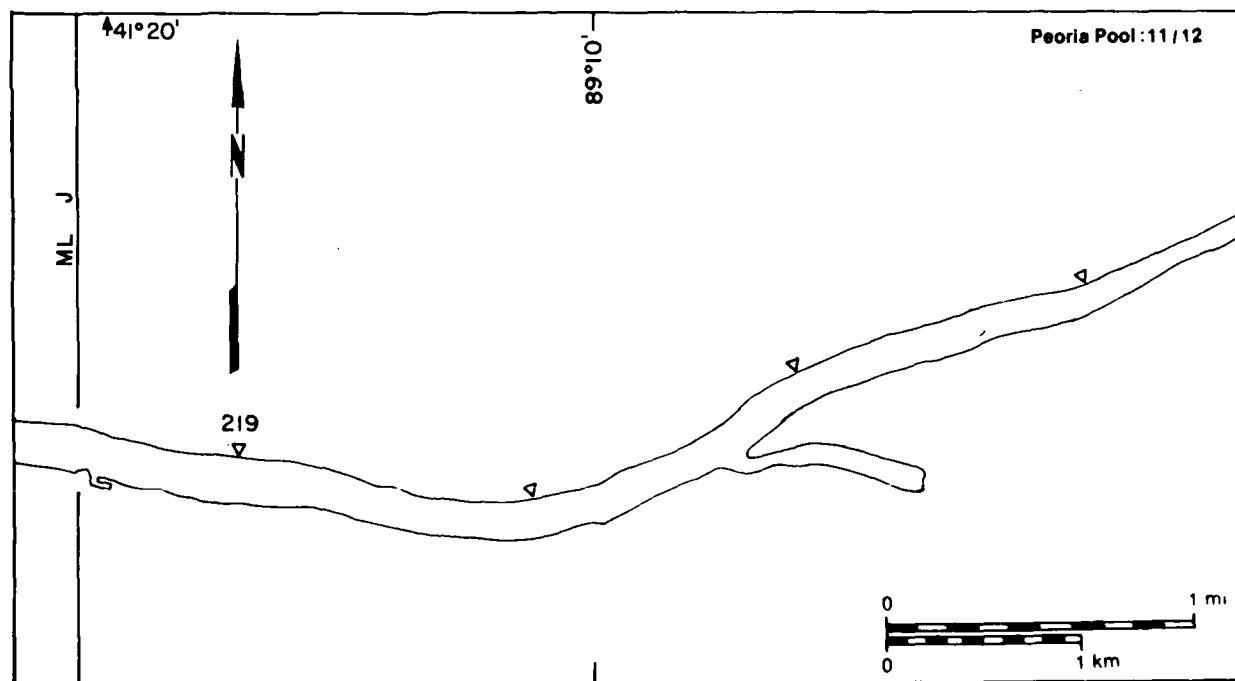
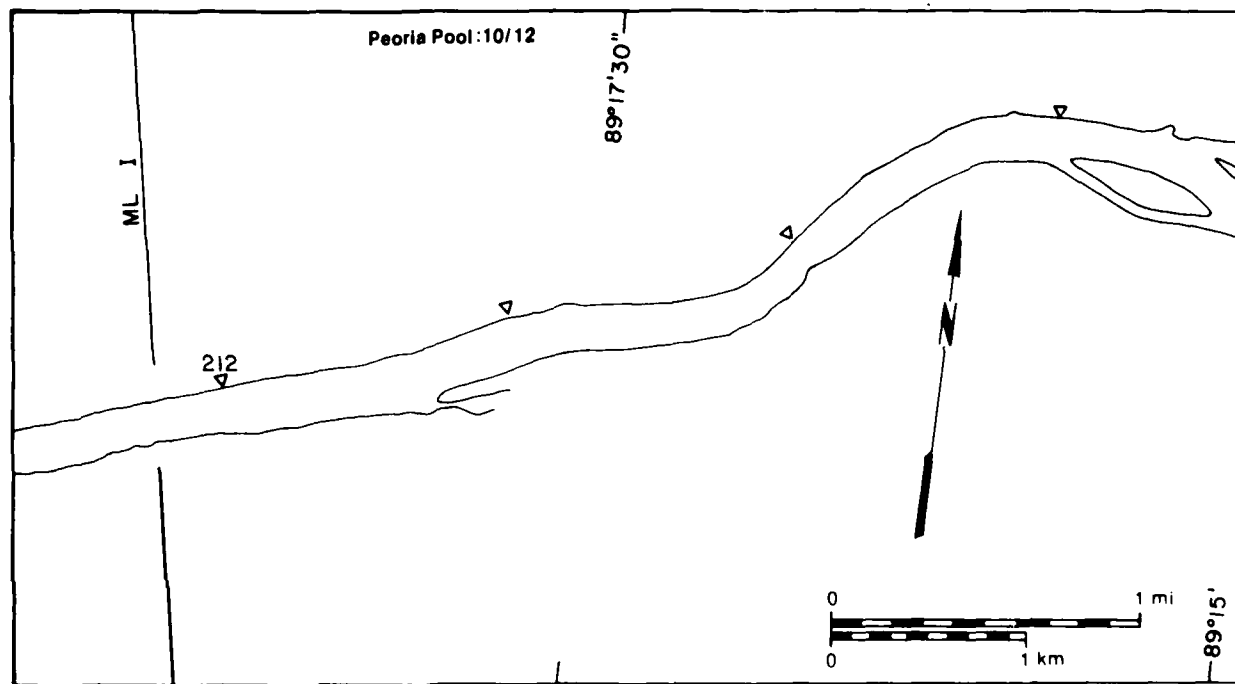
21 February 1986

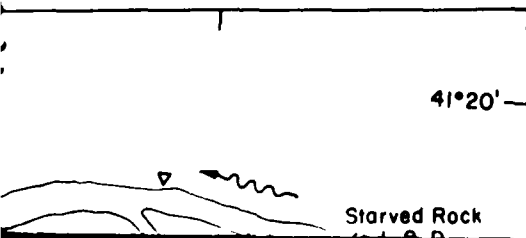
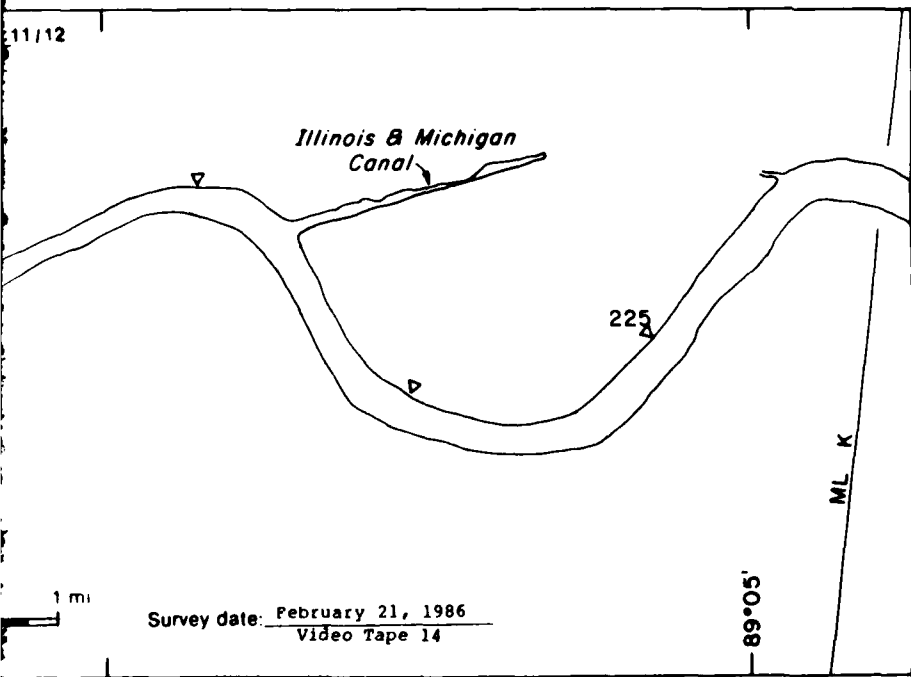
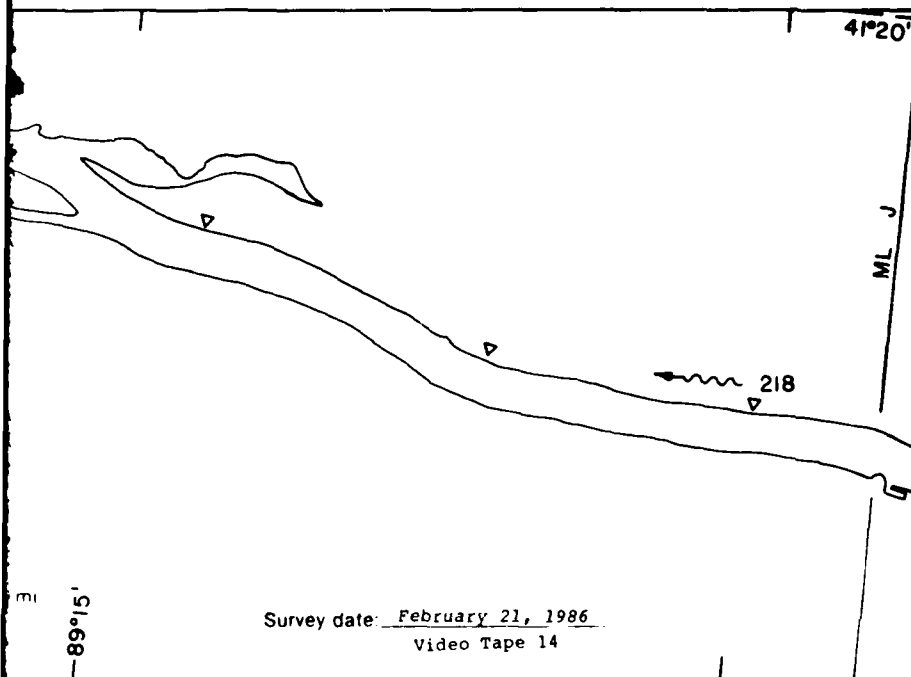


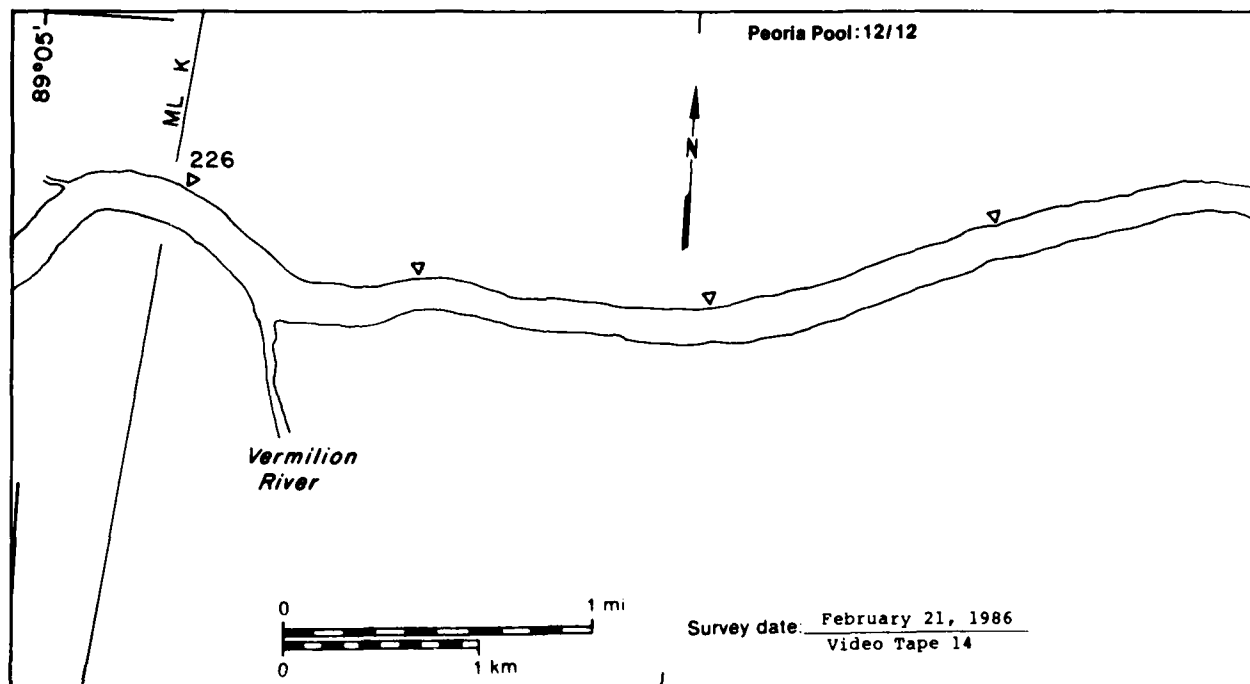
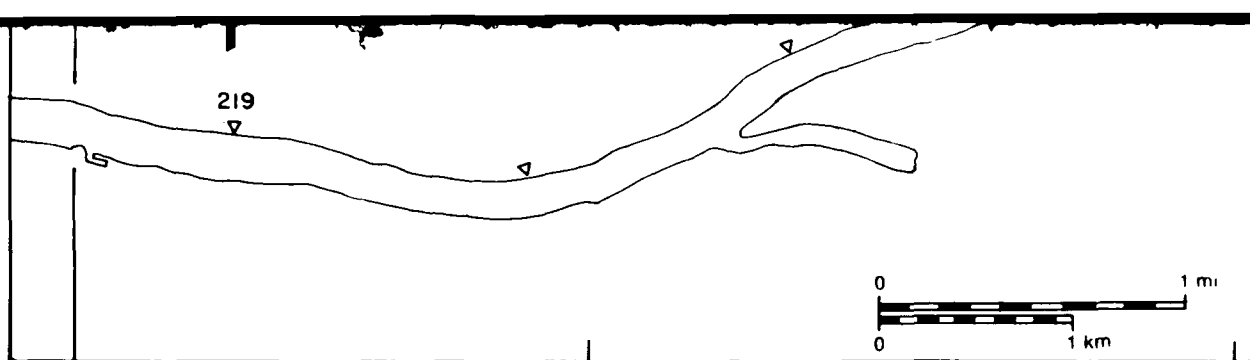




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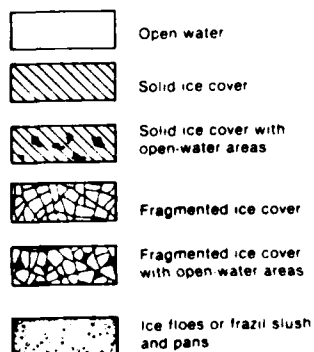






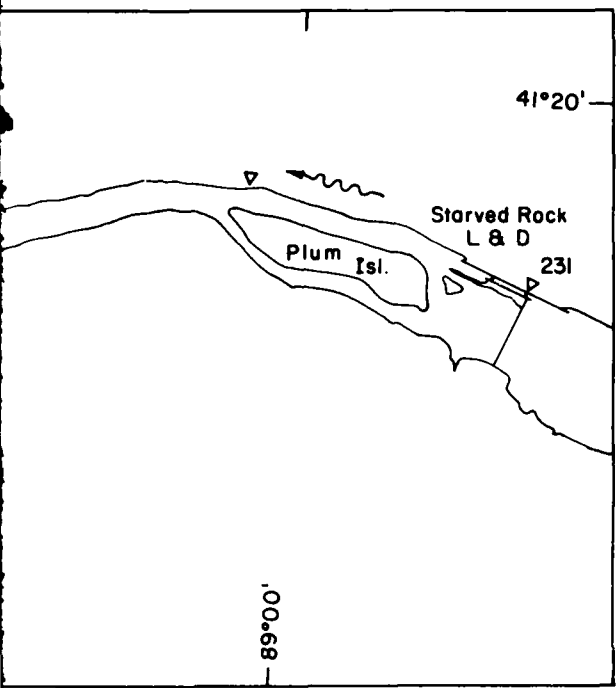
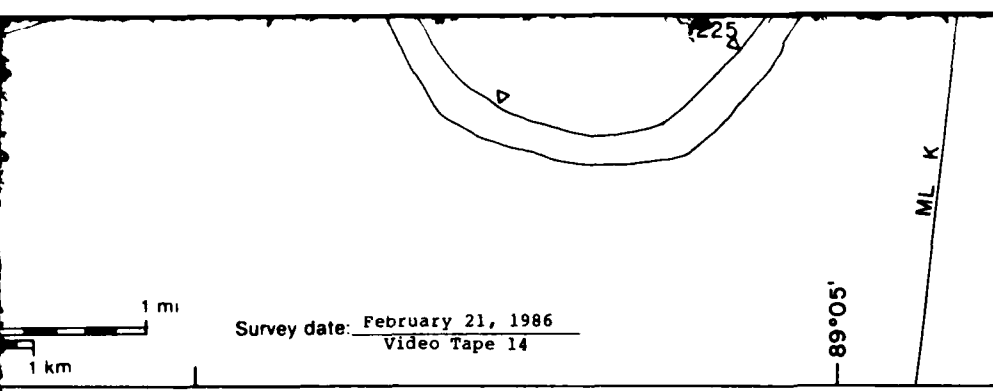
Peoria Pool

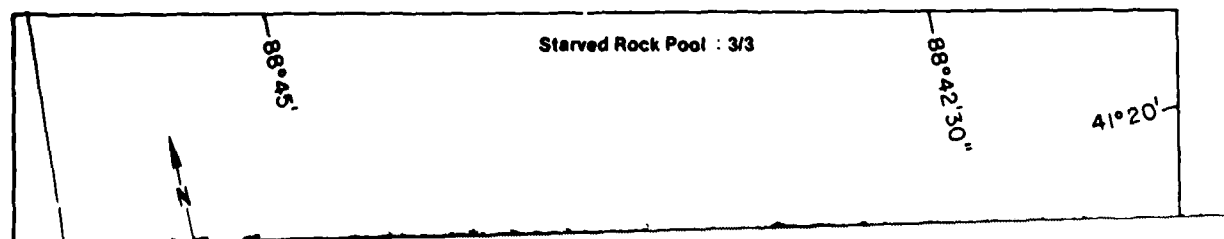
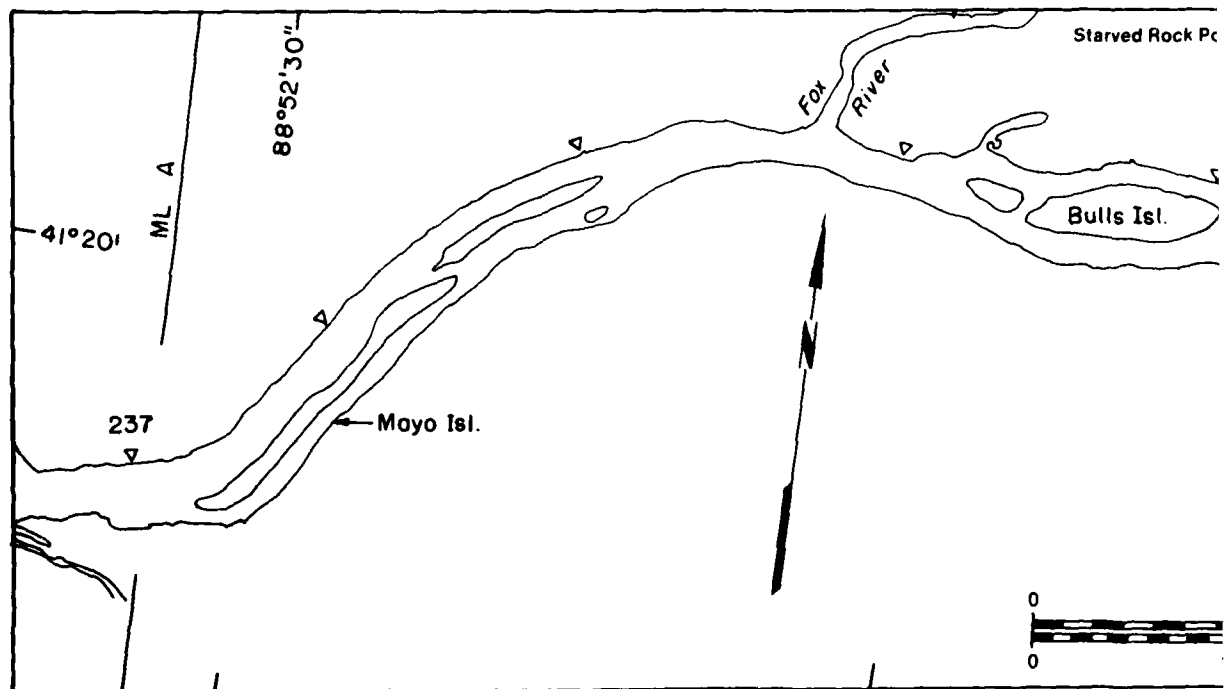
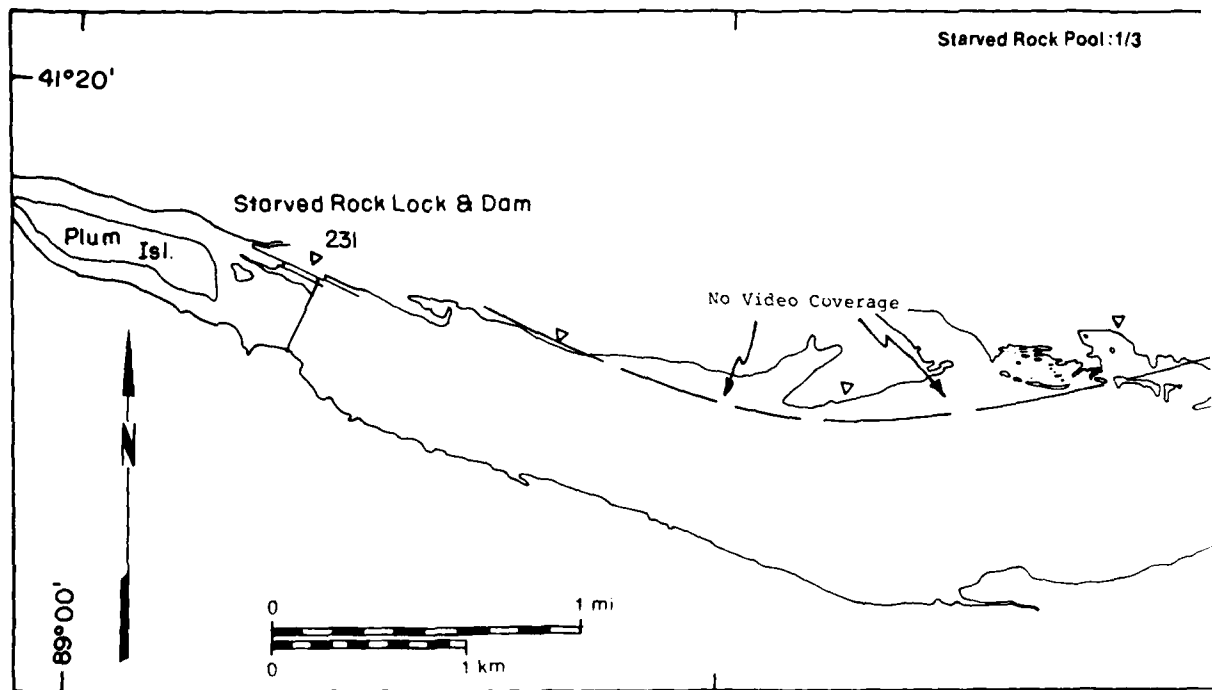
MAP UNITS



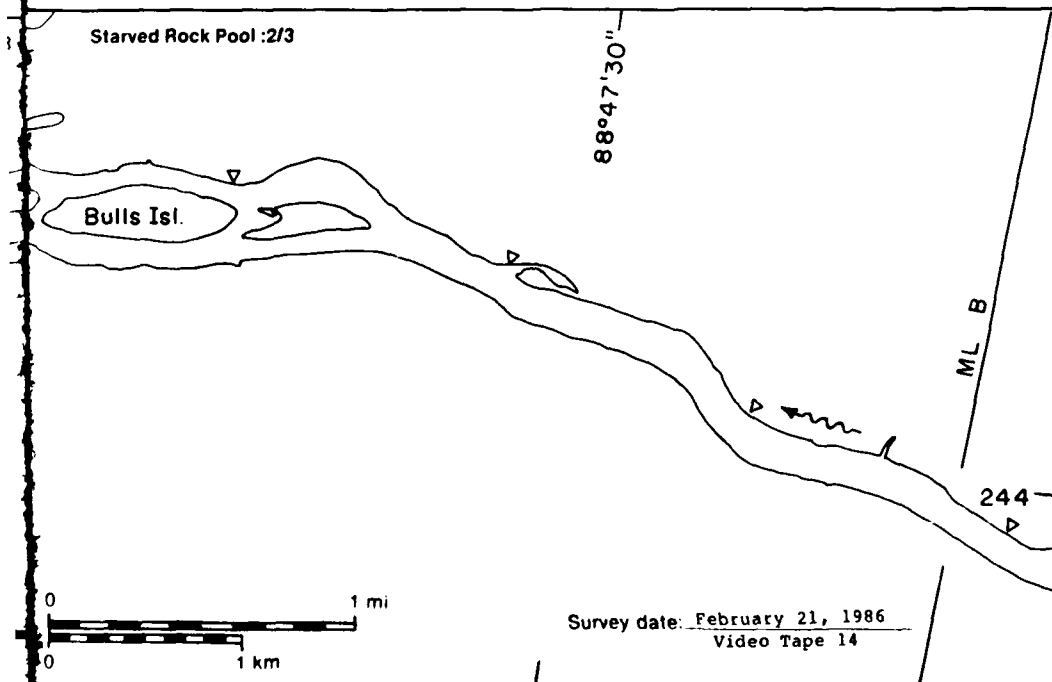
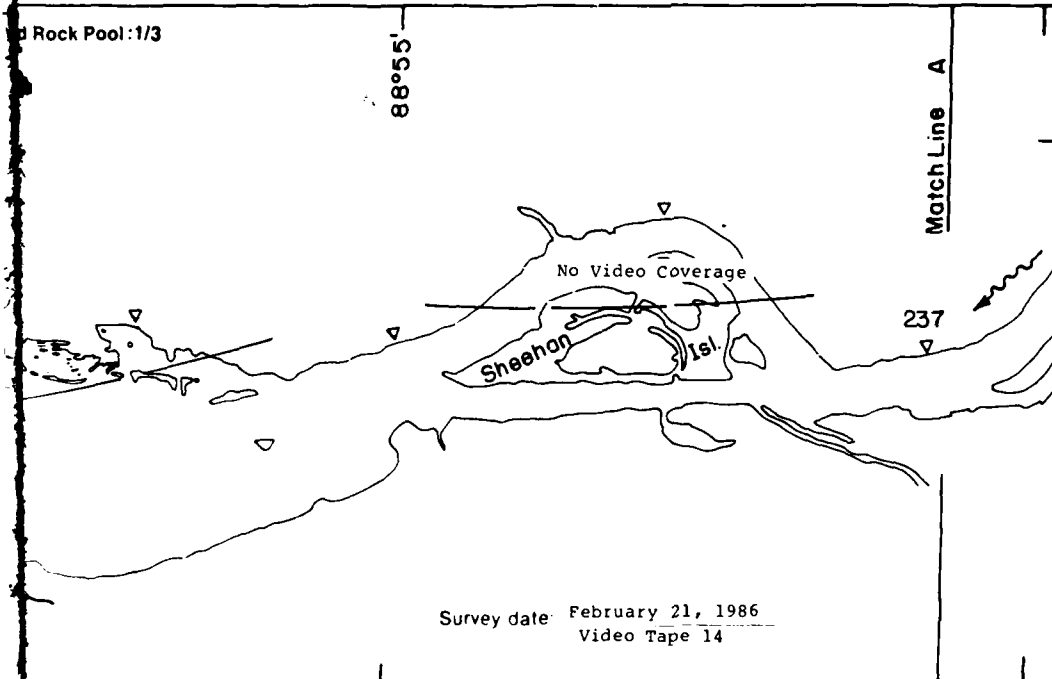
Area ($m^2 \times 10^6$)	Surface concentration (%)
43.77	NA
12.66	NA
0.00	—
4.86	NA
0.06	70
2.36	5
Total area ($m^2 \times 10^6$)	81.33*

* Includes $17.62 \times 10^6 m^2$ of no video coverage





21 February 1986



41°20'

Starved Rock Pool

MAP UNITS

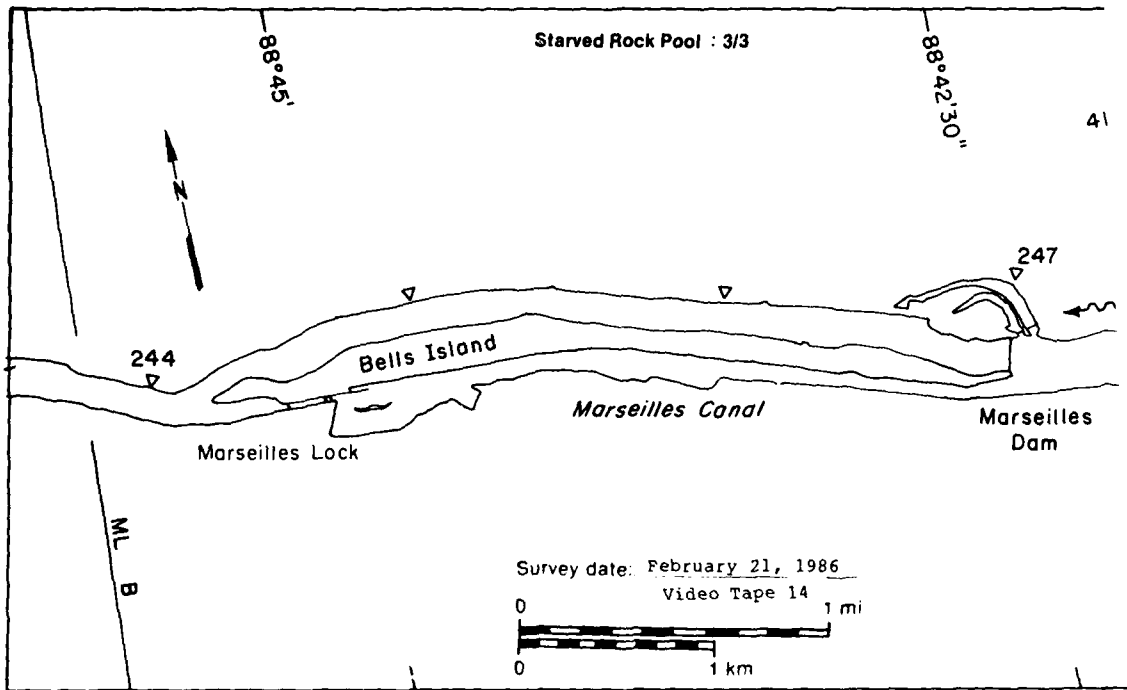
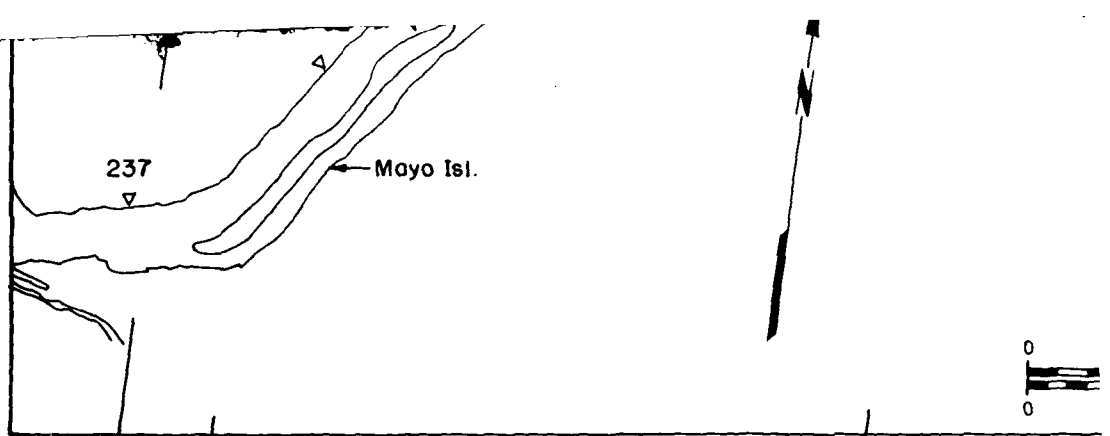
Area
(m² x 10⁶)

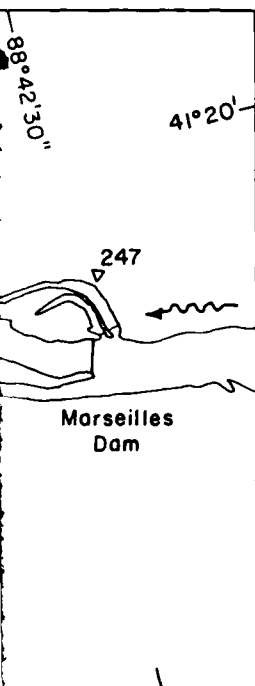
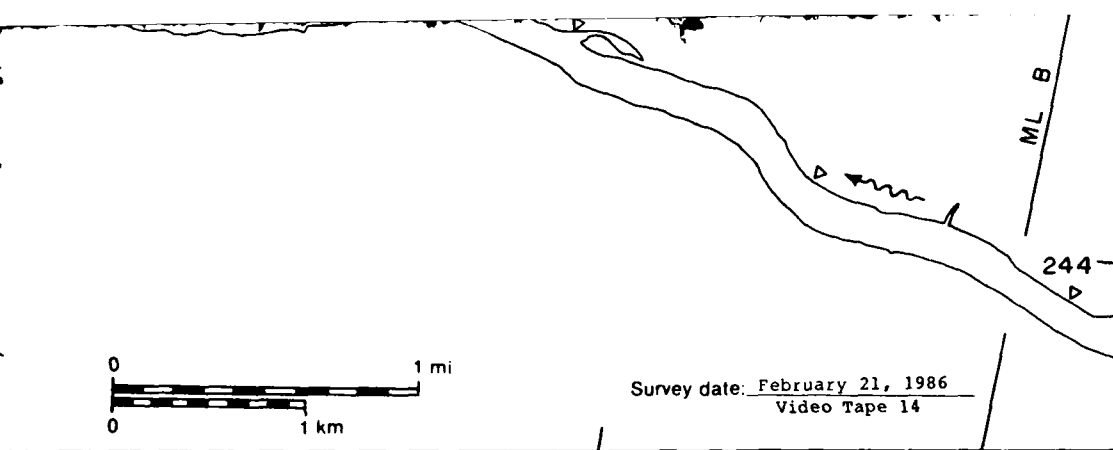
Surface
concentration
(%)

Open water

9.16

NA





Starved Rock Pool

MAP UNITS

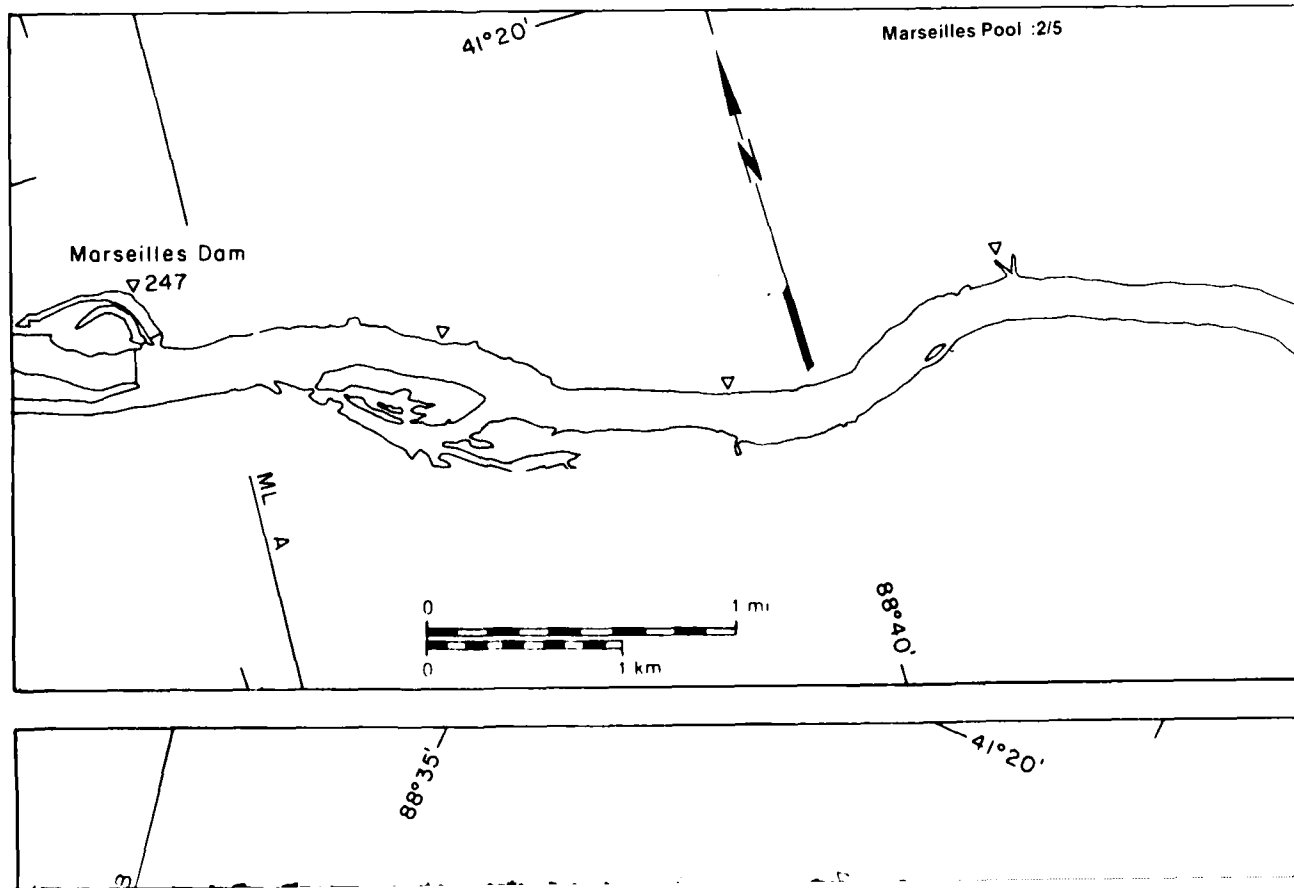
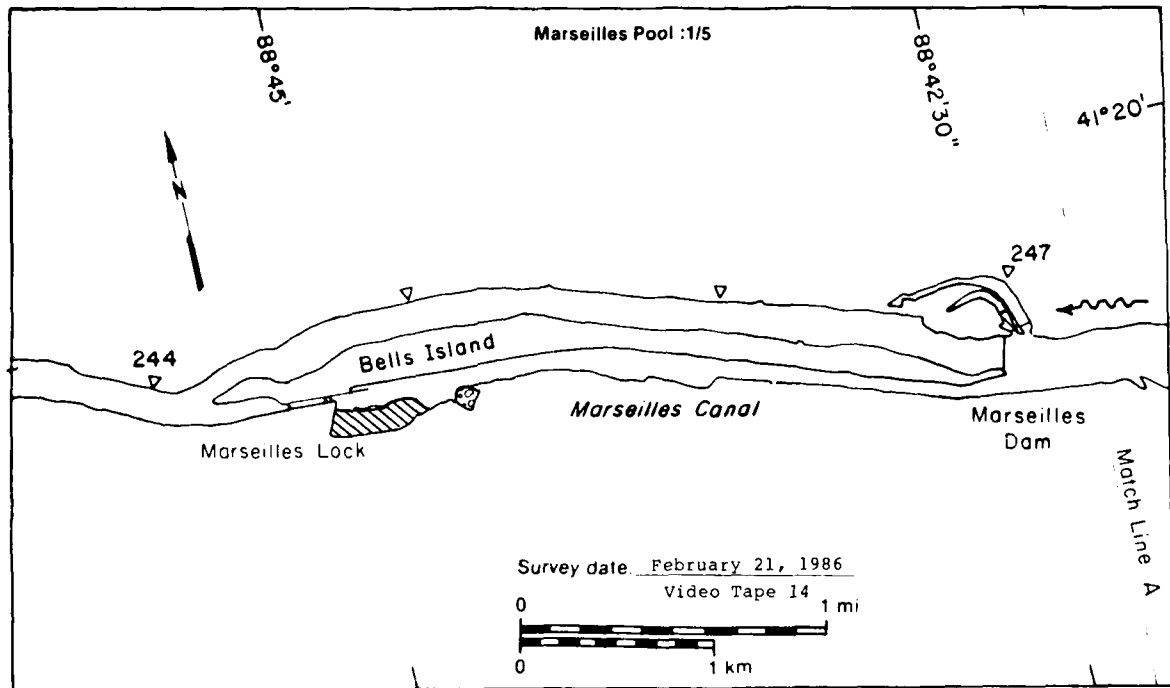
	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Total area ($m^2 \times 10^6$)

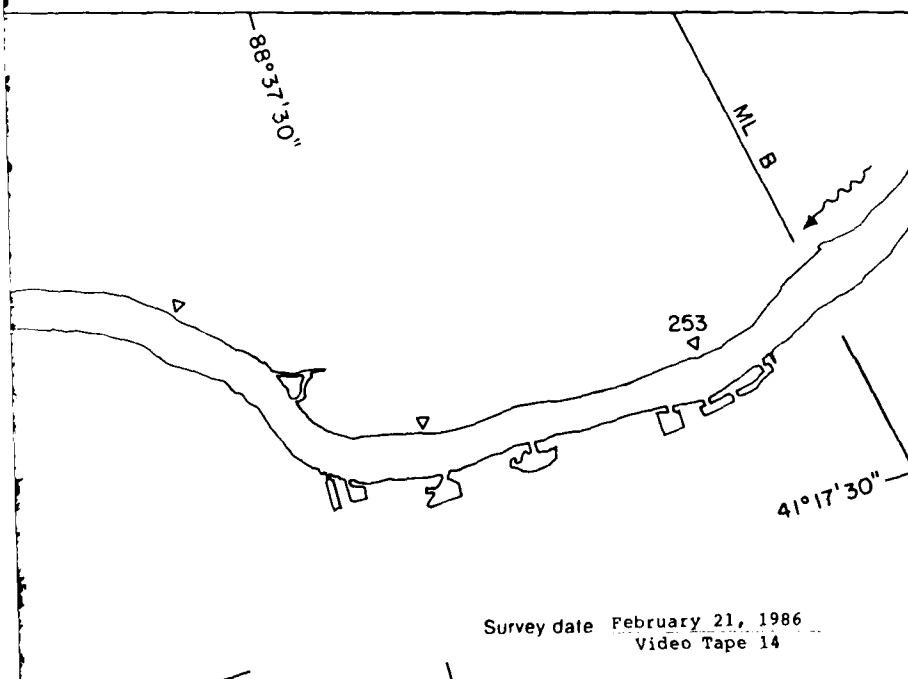
Area ($m^2 \times 10^6$)	Surface concentration (%)
9.16	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
0.00	—
10.19*	

* Includes $1.03 \times 10^6 m^2$
of no video coverage

21 February 1886

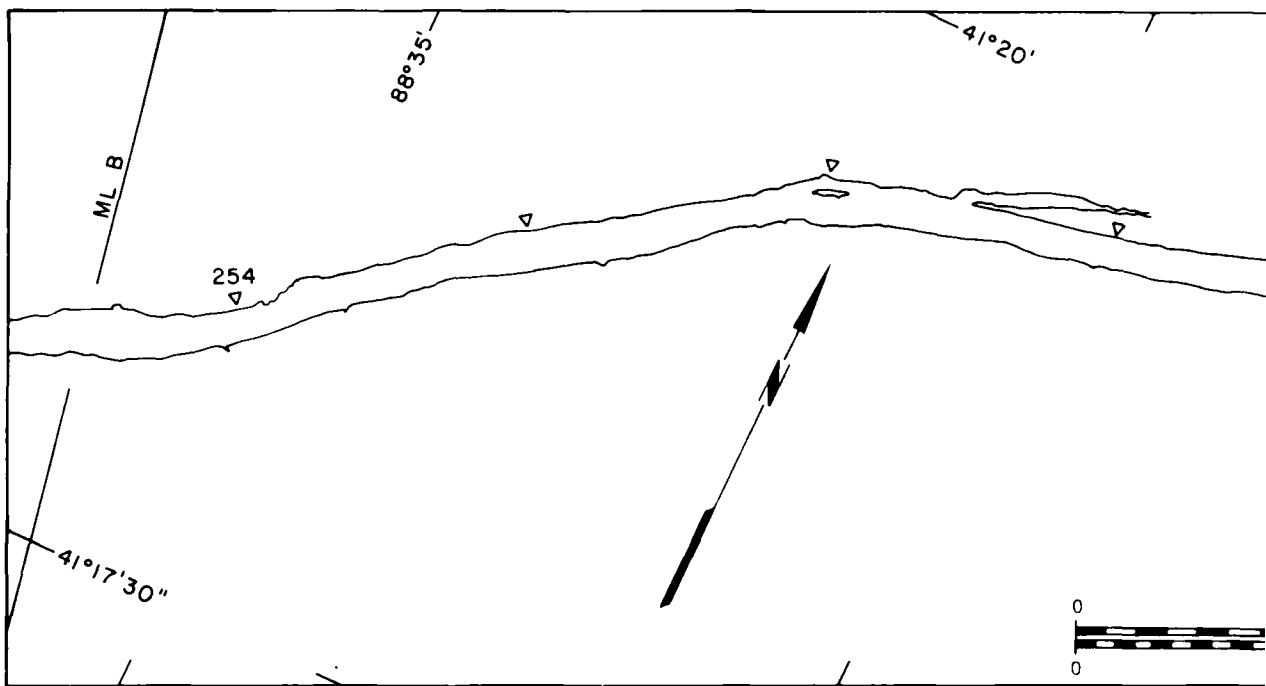
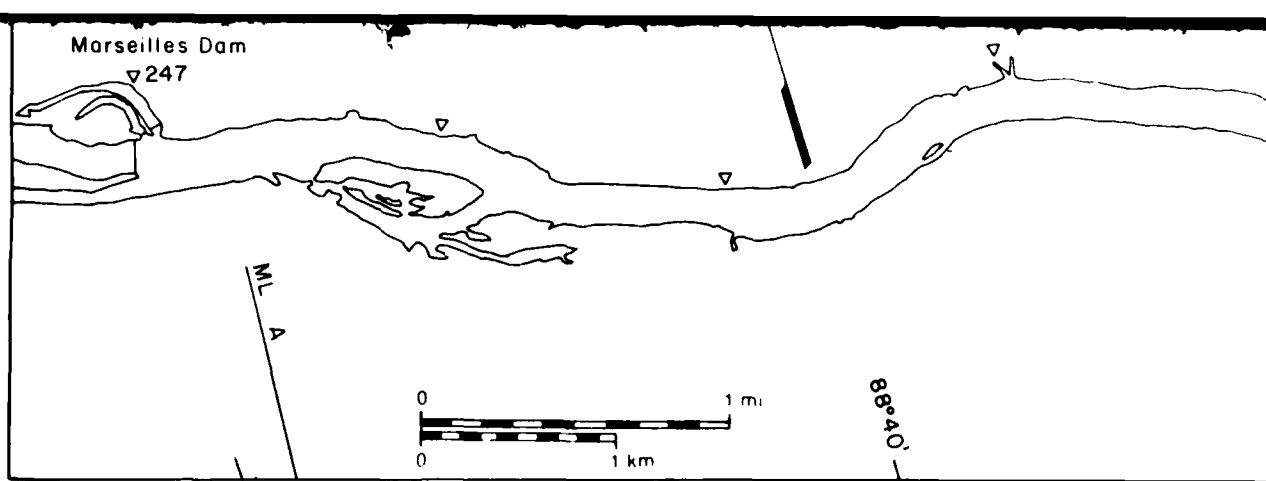


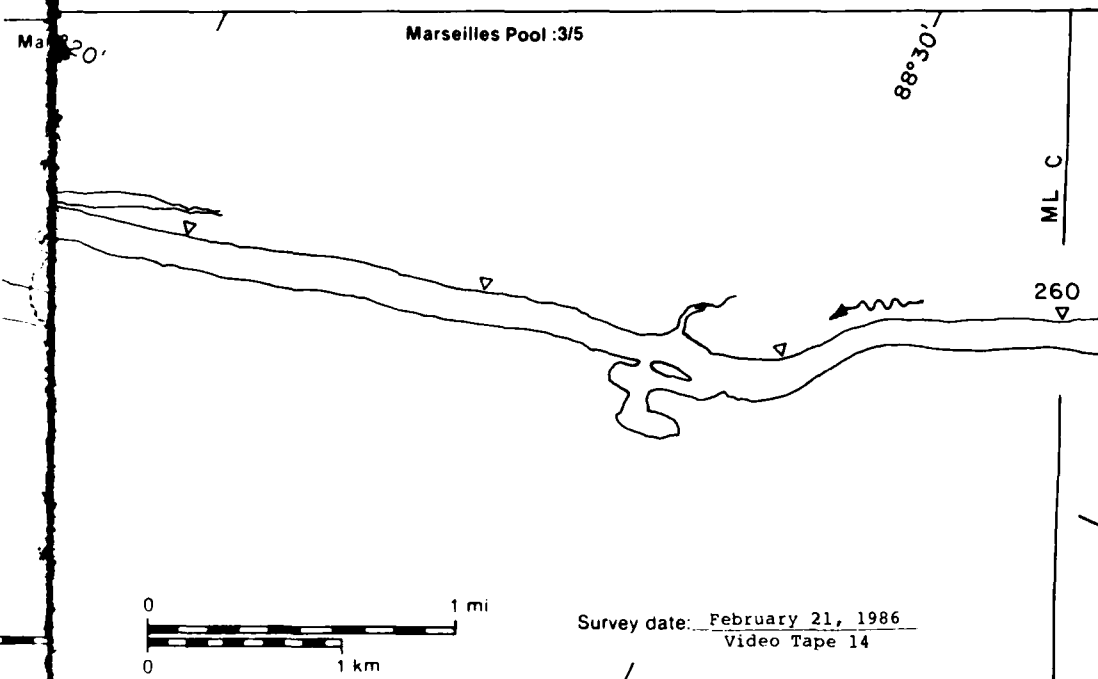
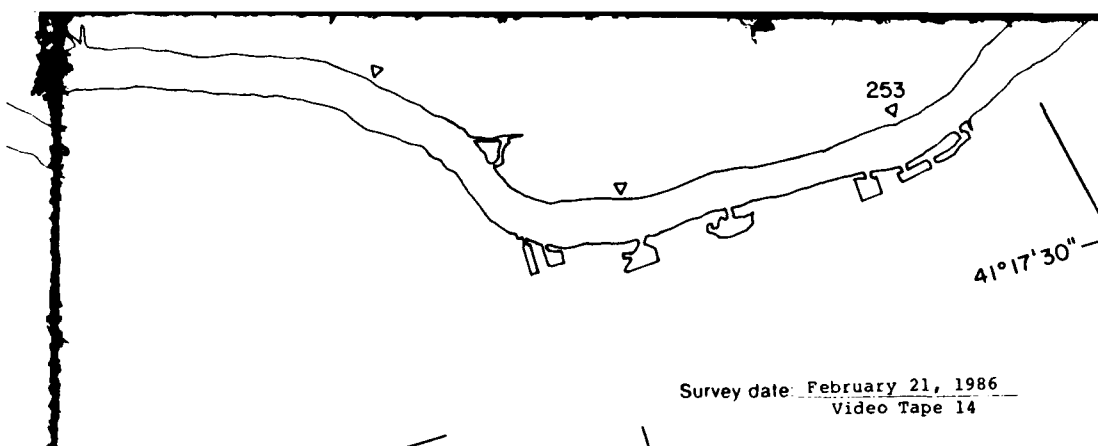
0
1
2
Line A

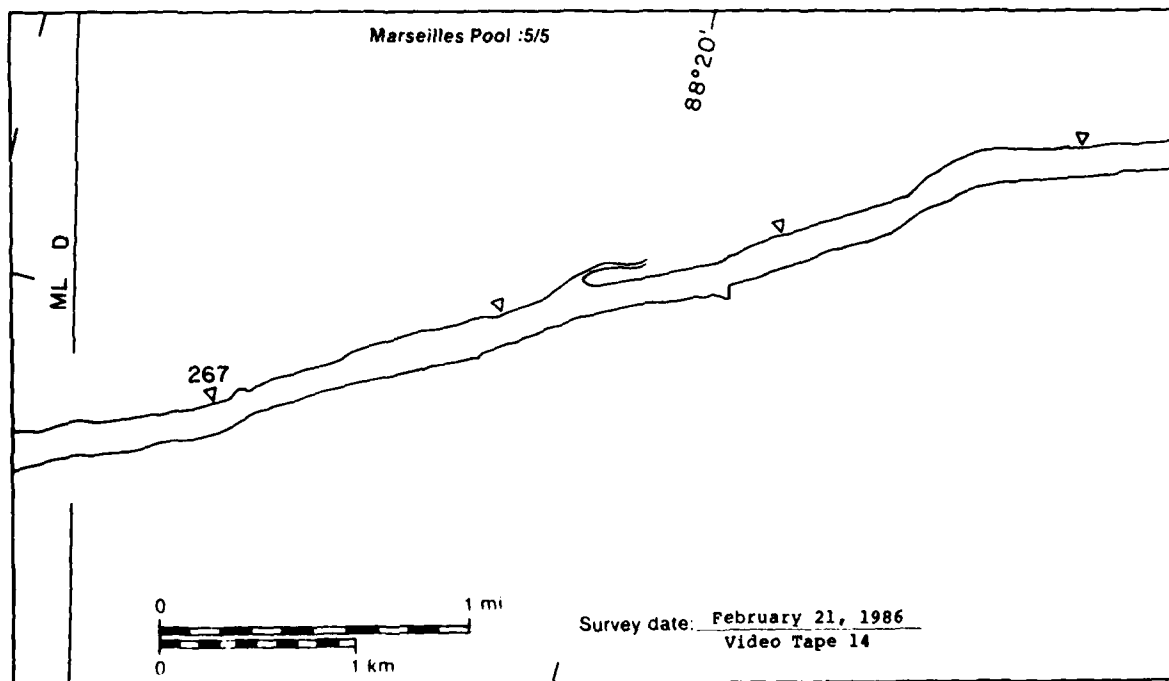
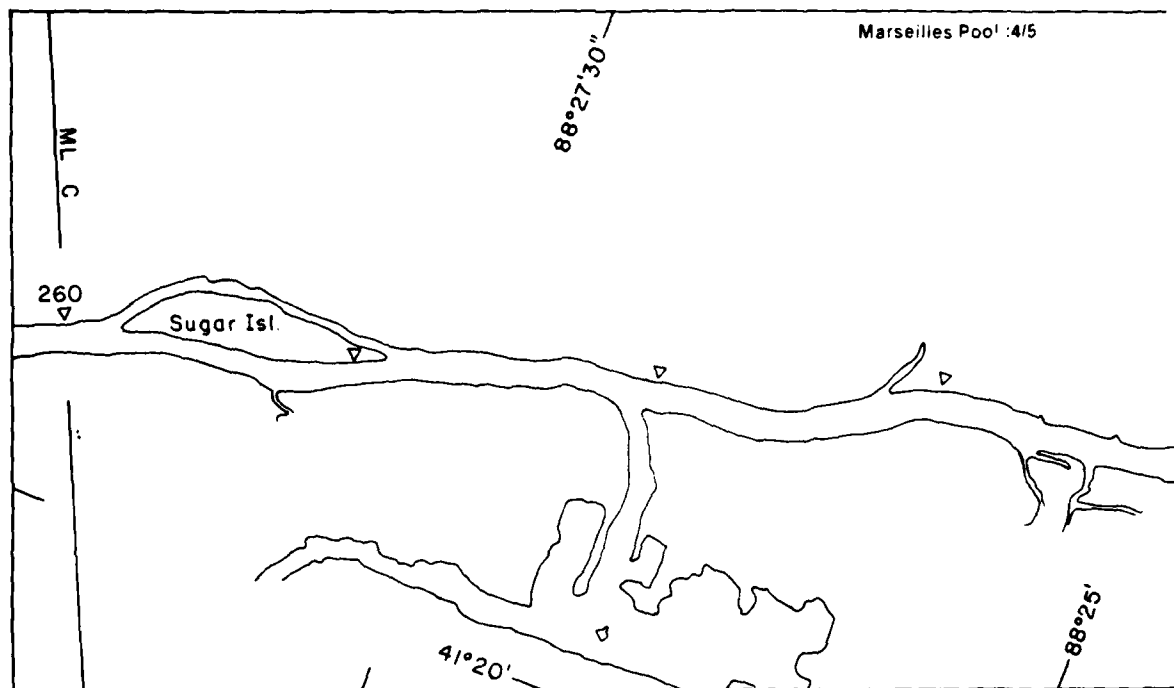


Marseilles Pool :3/5

$88^{\circ}30'$







Marseilles Pool

MAP UNITS

Area
(m² x 10⁶)

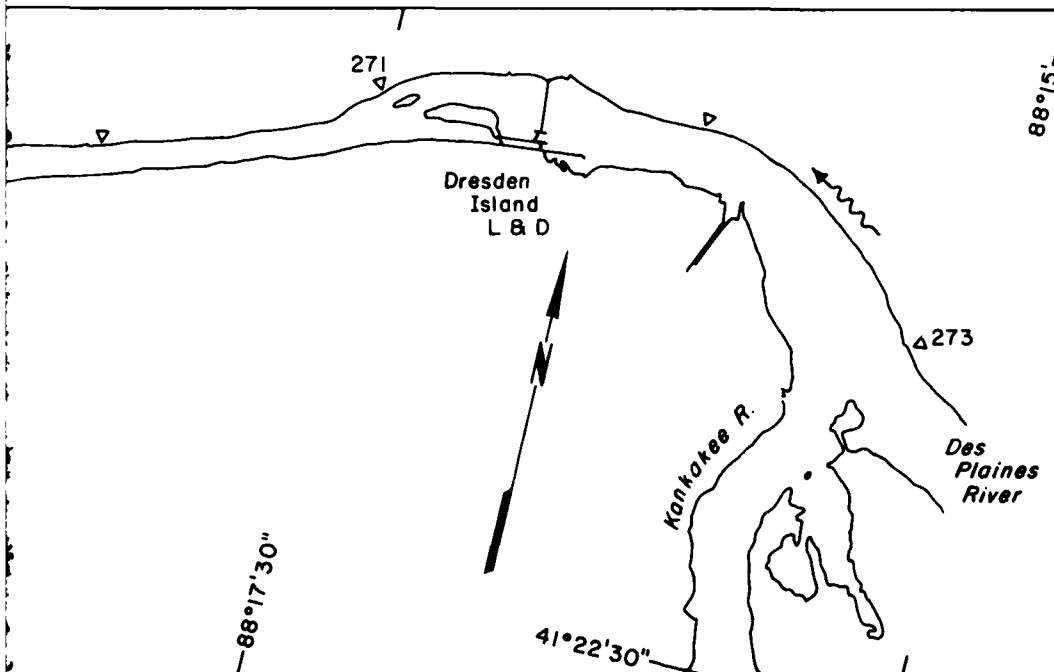
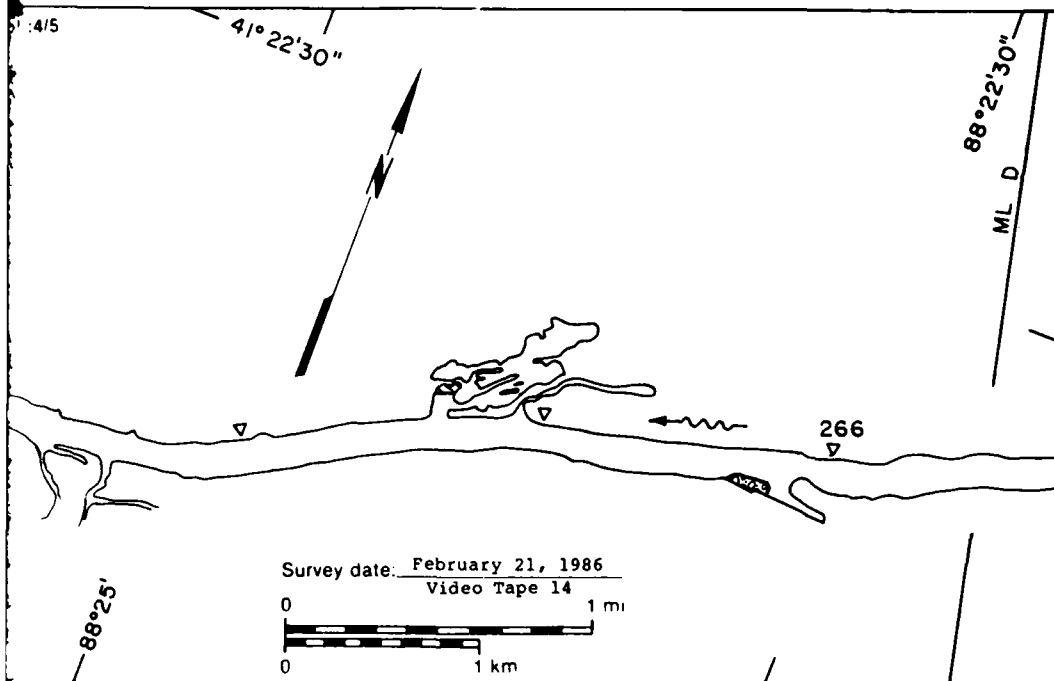
Surface
concentration
(‰)

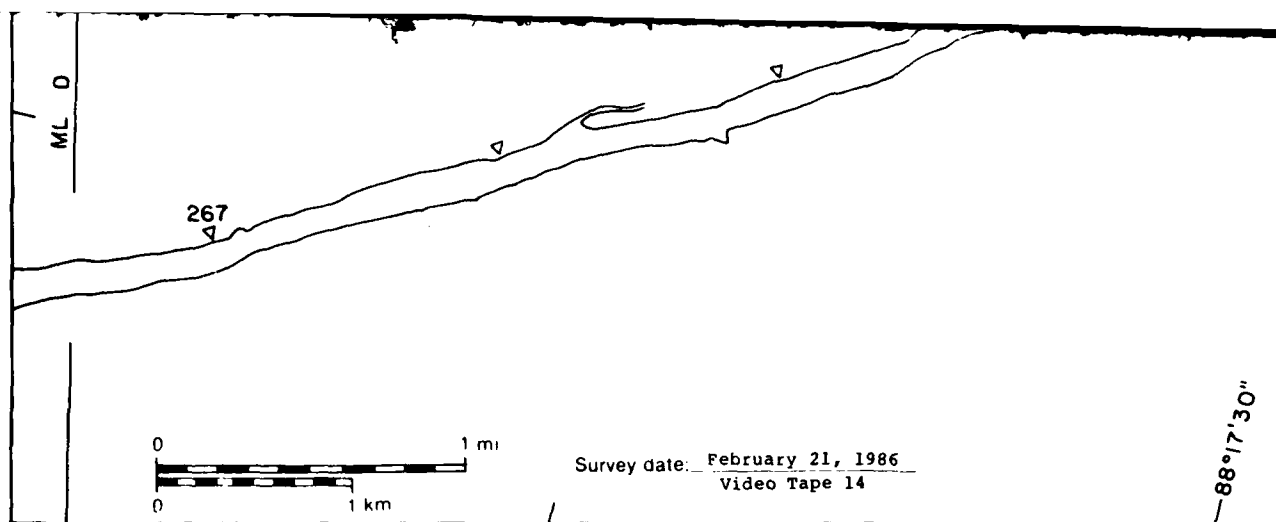
Open water

Survey date: February 21, 1986
Video Tape 14



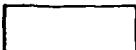




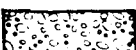
21 February 1986





Marseilles Pool

MAP UNITS

		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	8.11	NA
	Solid ice cover	0.07	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.01	10
Total area ($m^2 \times 10^6$)		8.19	

island
L & D

Δ273

Kankakee R.

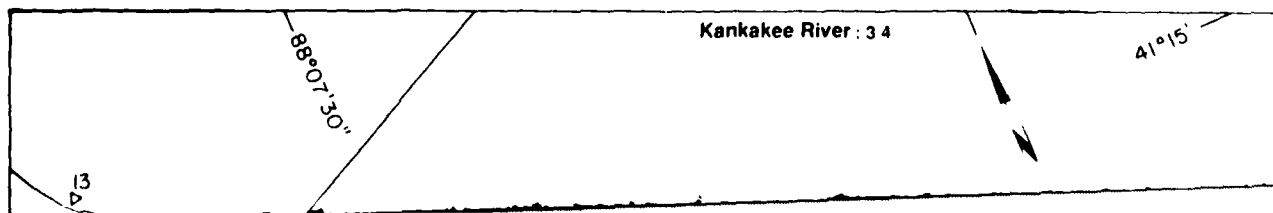
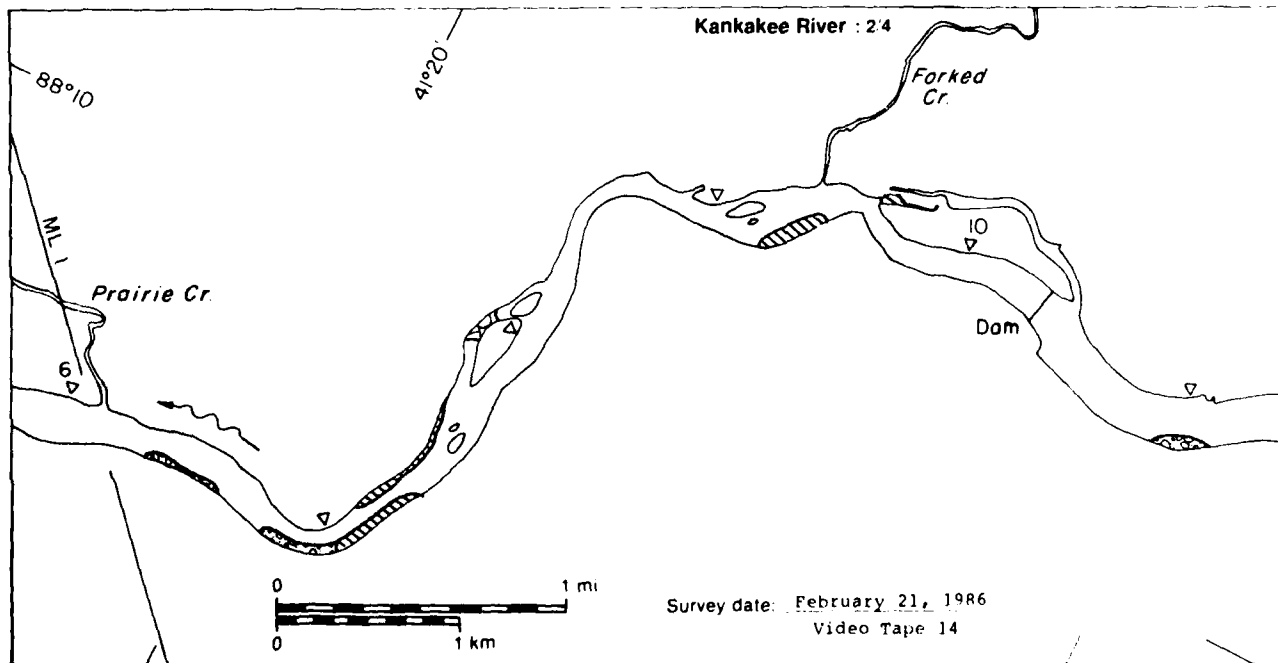
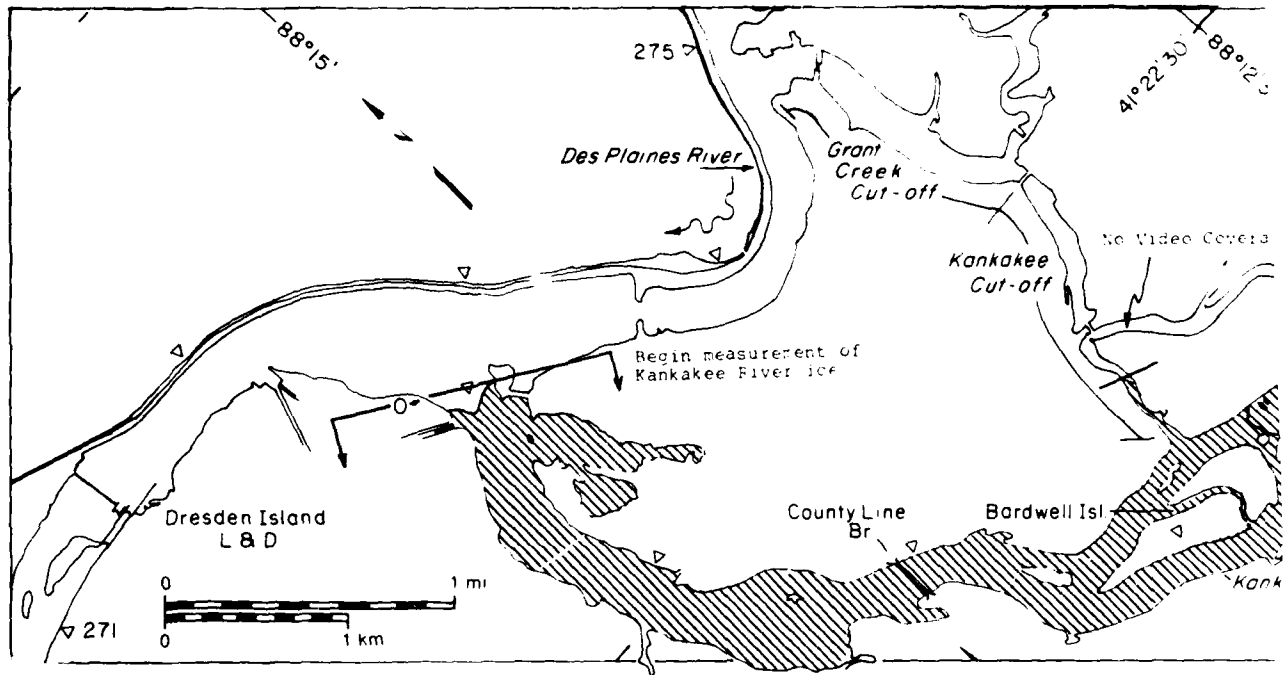
Des
Plaines
River

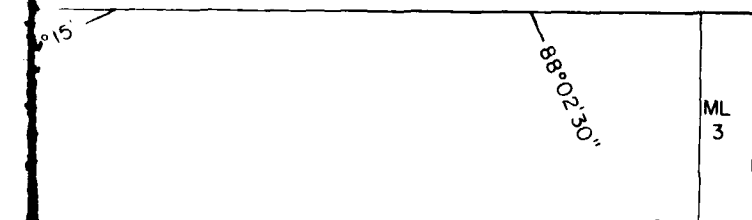
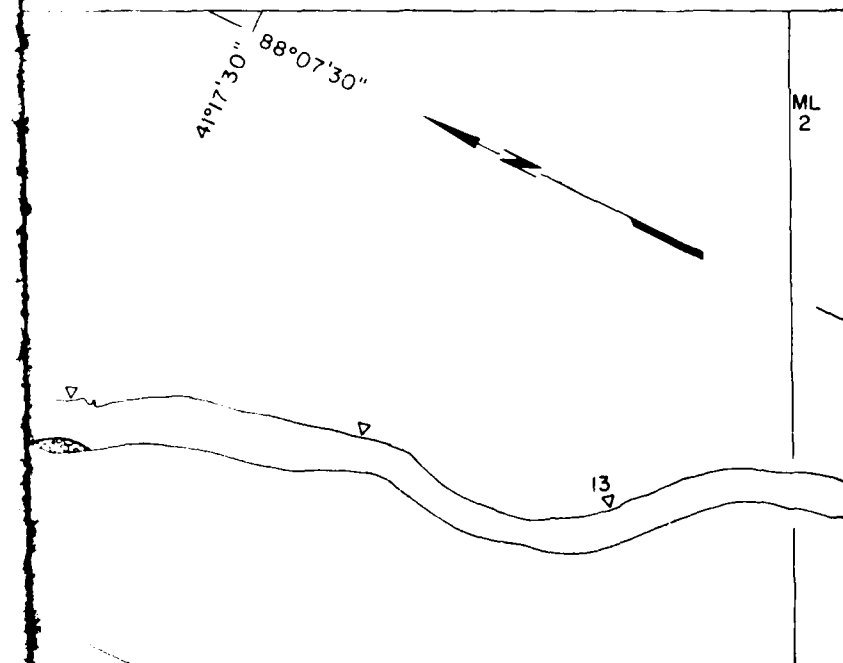
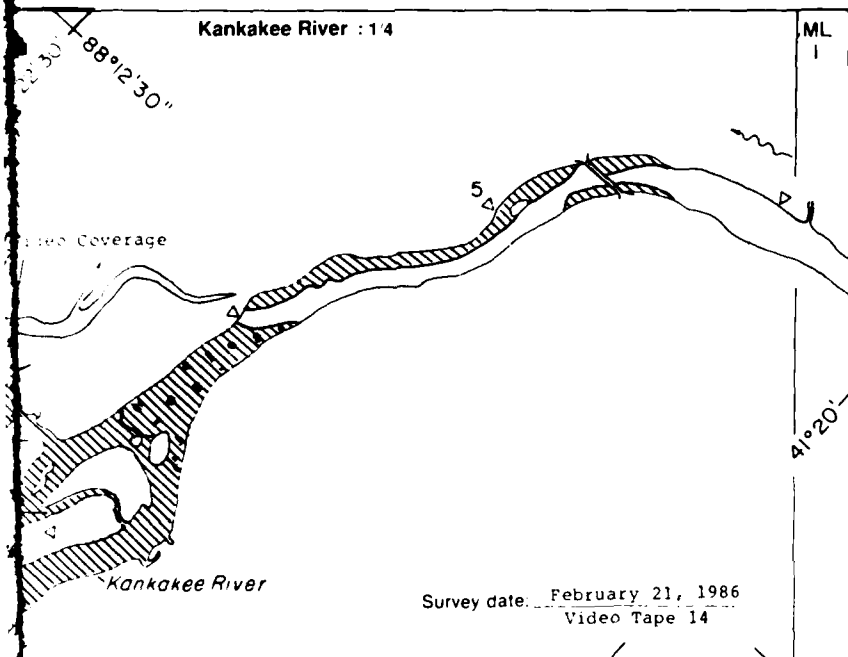
88°17'30"

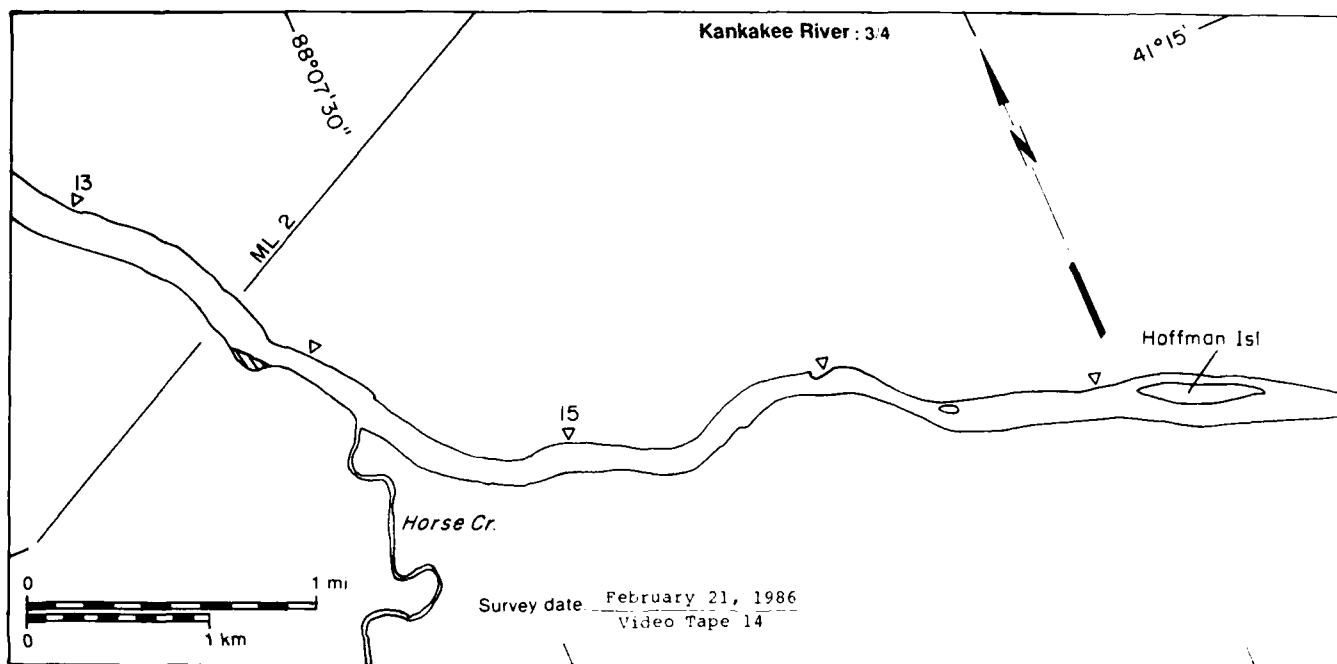
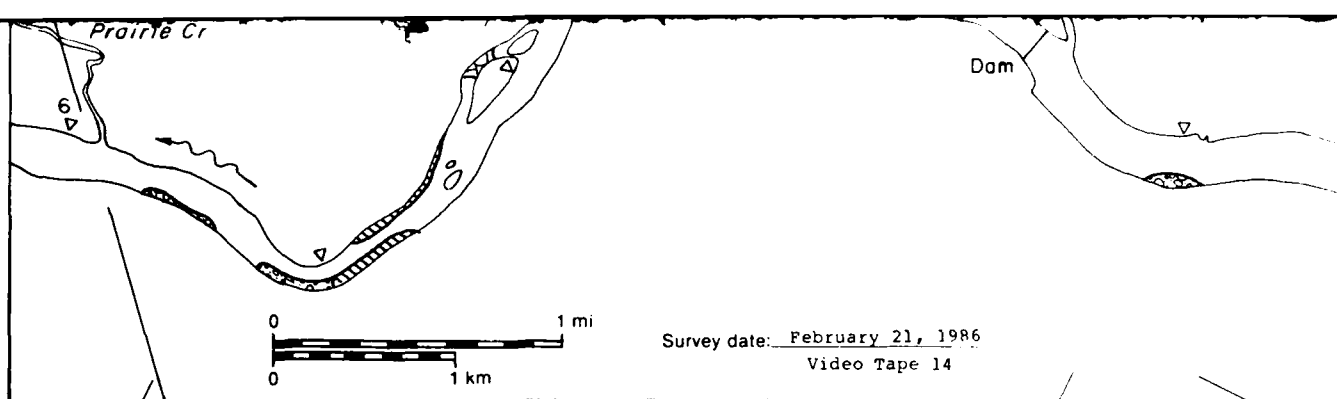
41°22'30"

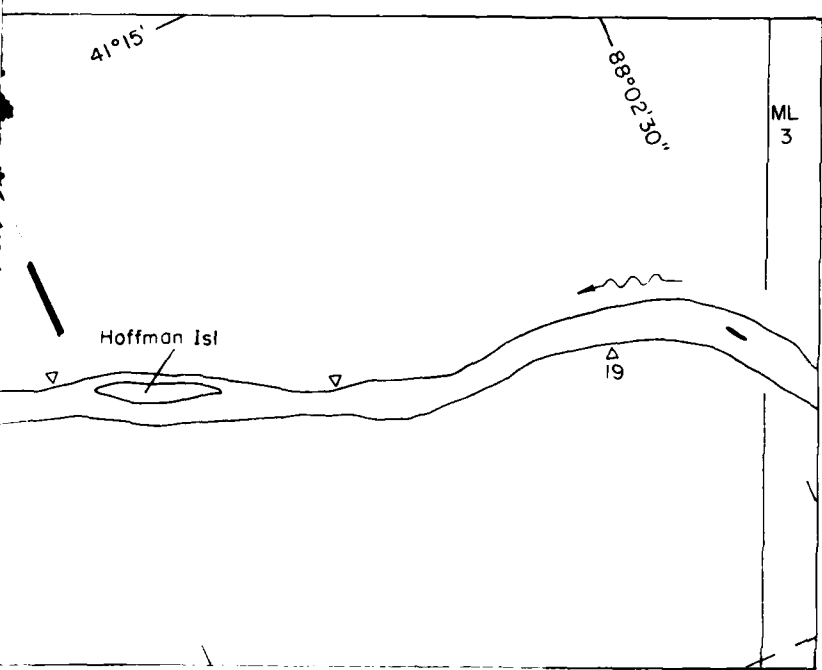
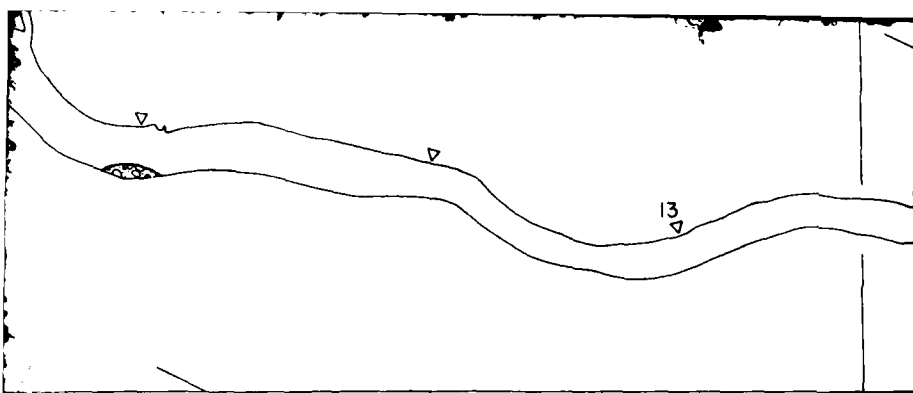


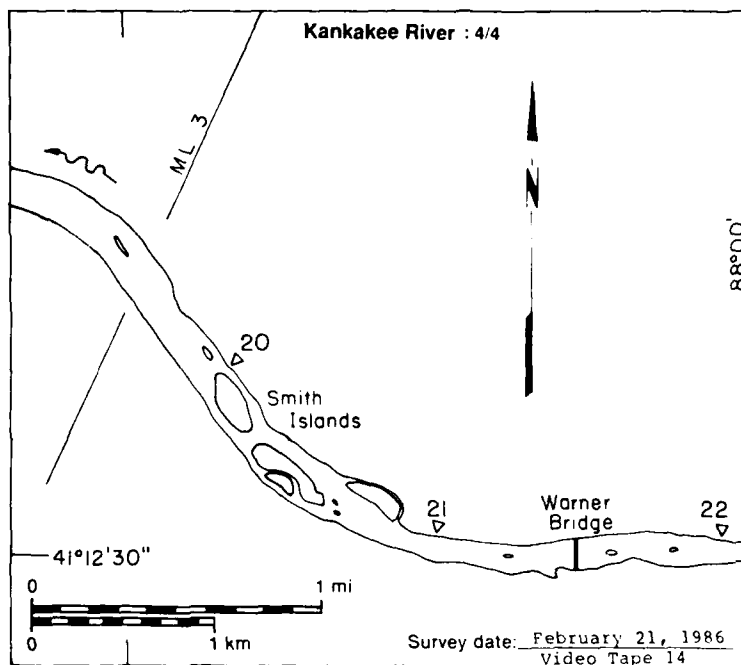
21 February 1986











Kankakee River







MAP UNITS

	Open water	4.
	Solid ice cover	2.
	Solid ice cover with open-water areas	0.
	Fragmented ice cover	0.
	Fragmented ice cover with open-water areas	0.0
	Ice floes or frazil slush and pans	0.
Total area ($m^2 \times 10^6$)		7.3

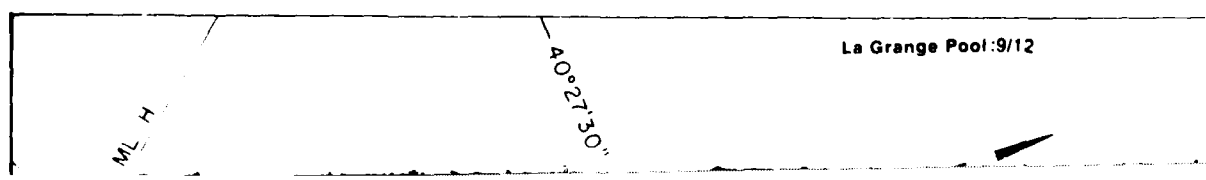
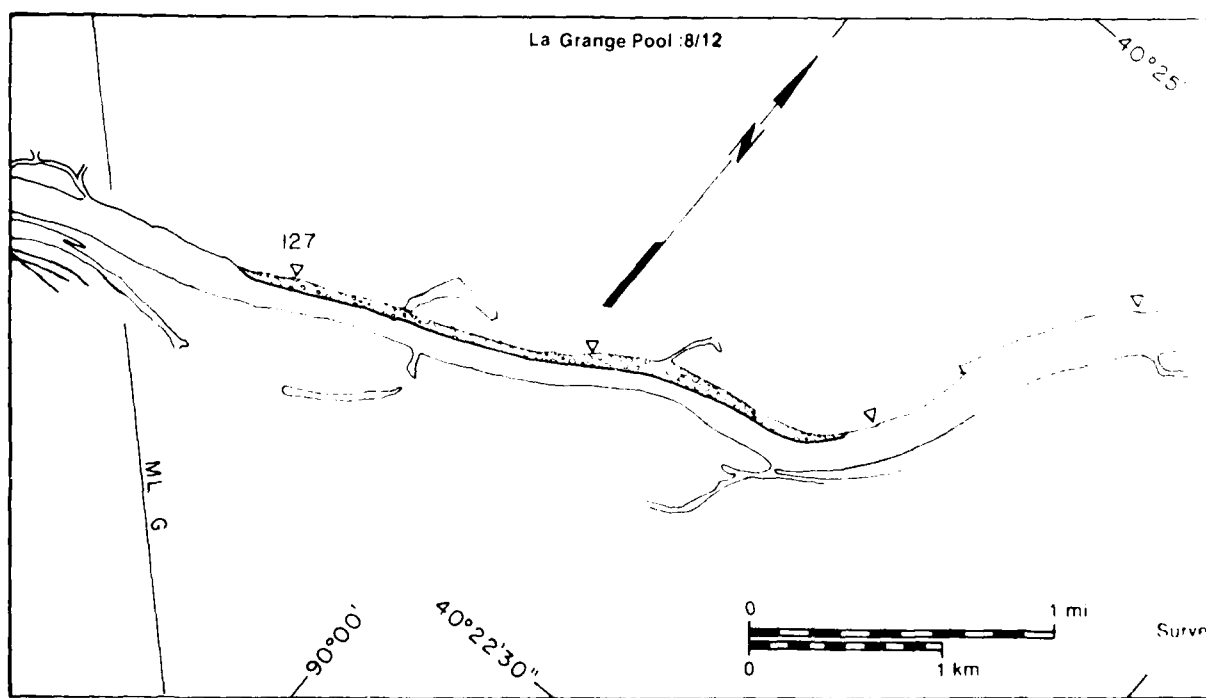
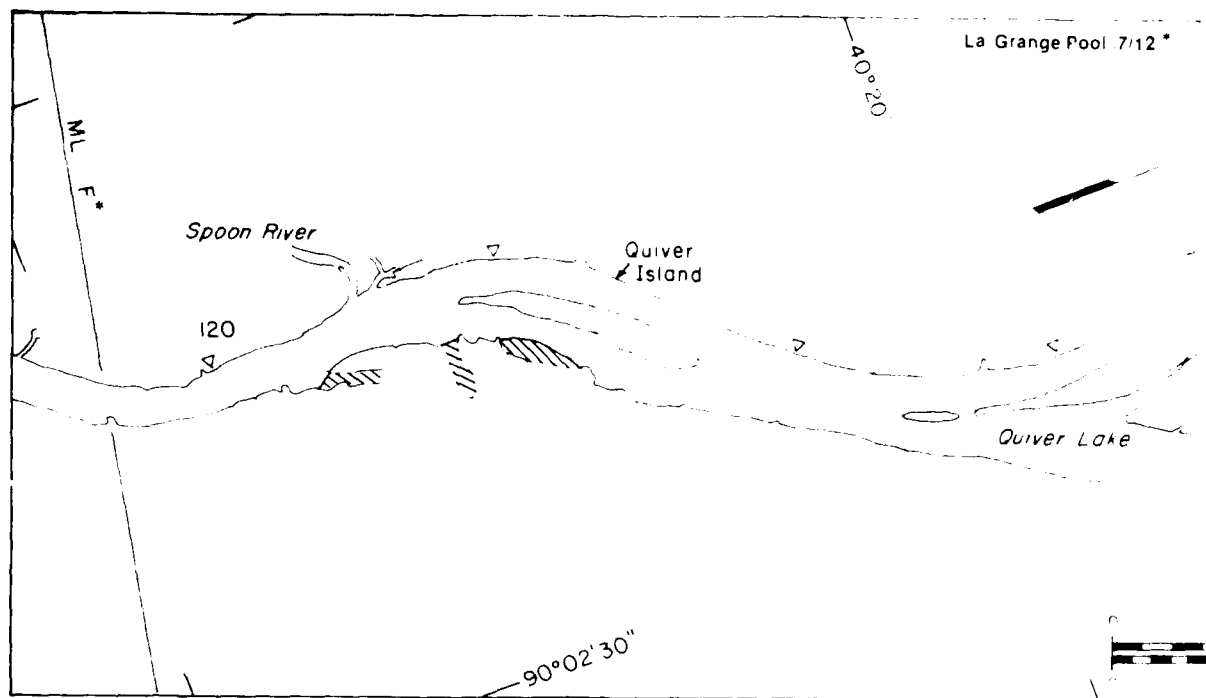
* Inc
of no

21 February 1986

Kankakee River

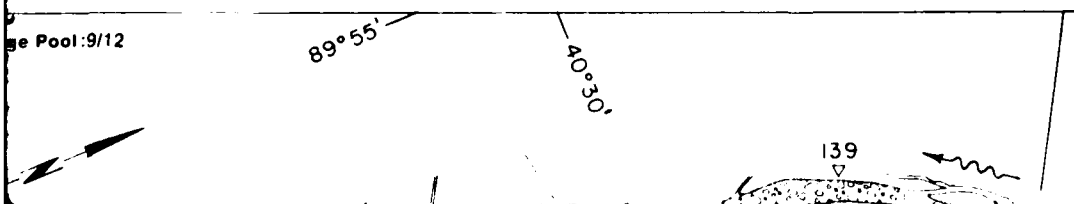
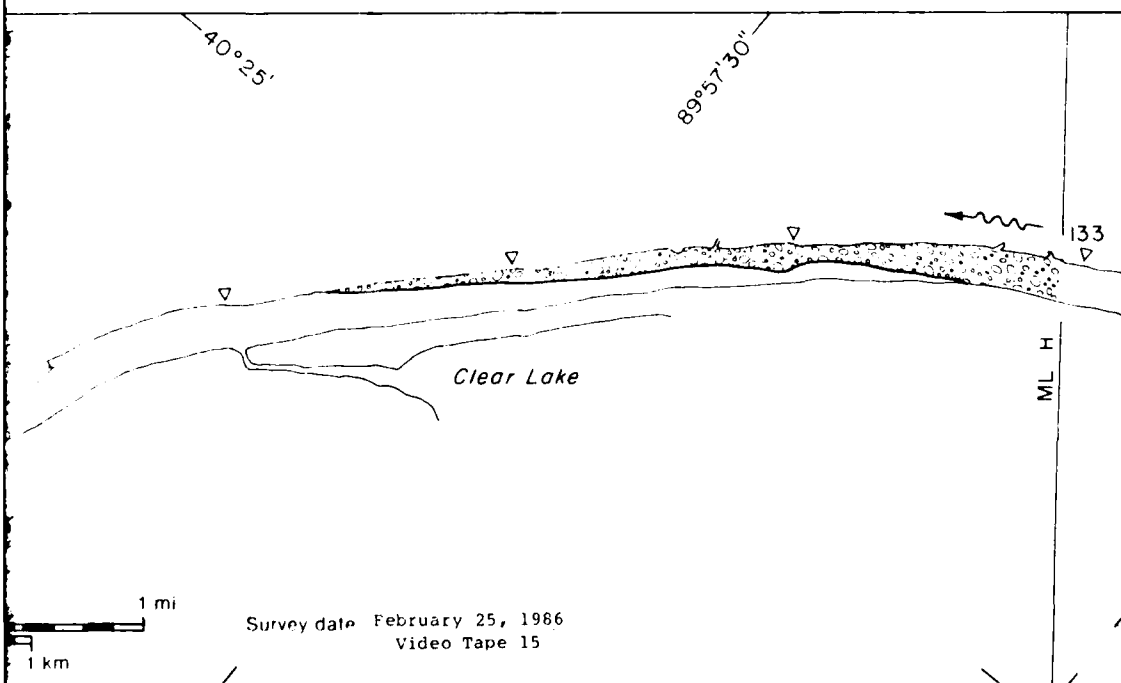
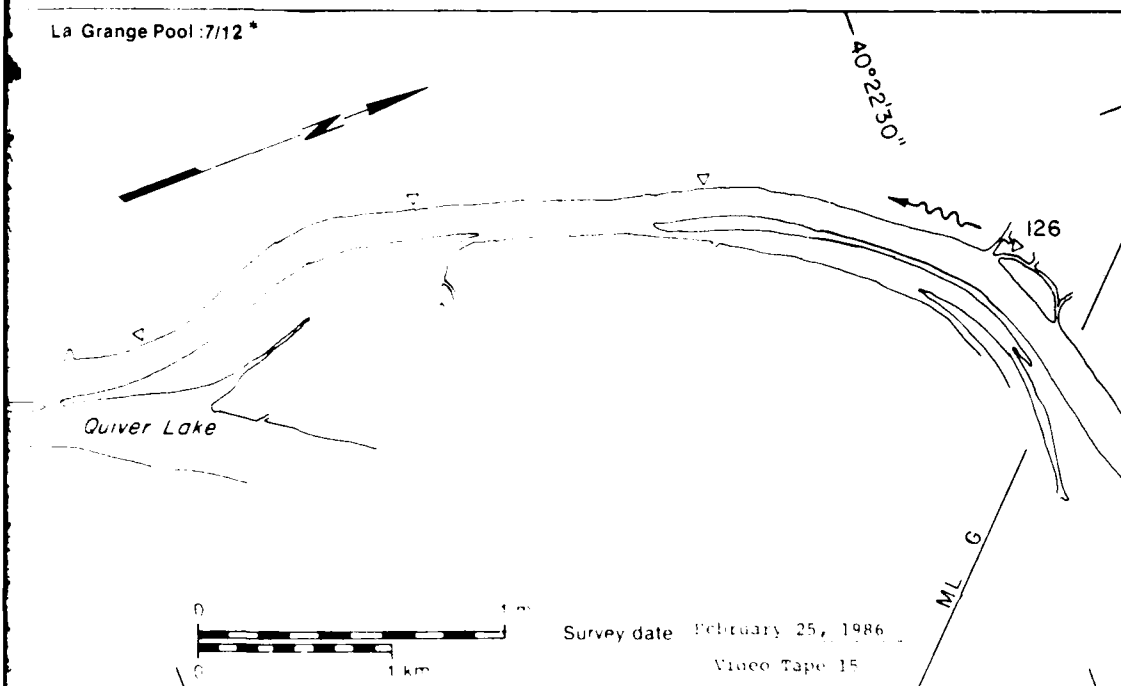
MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
 Open water	4.52	NA
 Solid ice cover	2.39	NA
 Solid ice cover with open-water areas	0.22	90
 Fragmented ice cover	0.02	NA
 Fragmented ice cover with open-water areas	0.00	—
 Ice floes or frazil slush and pans	0.09	10
Total area ($m^2 \times 10^6$)	7.30*	

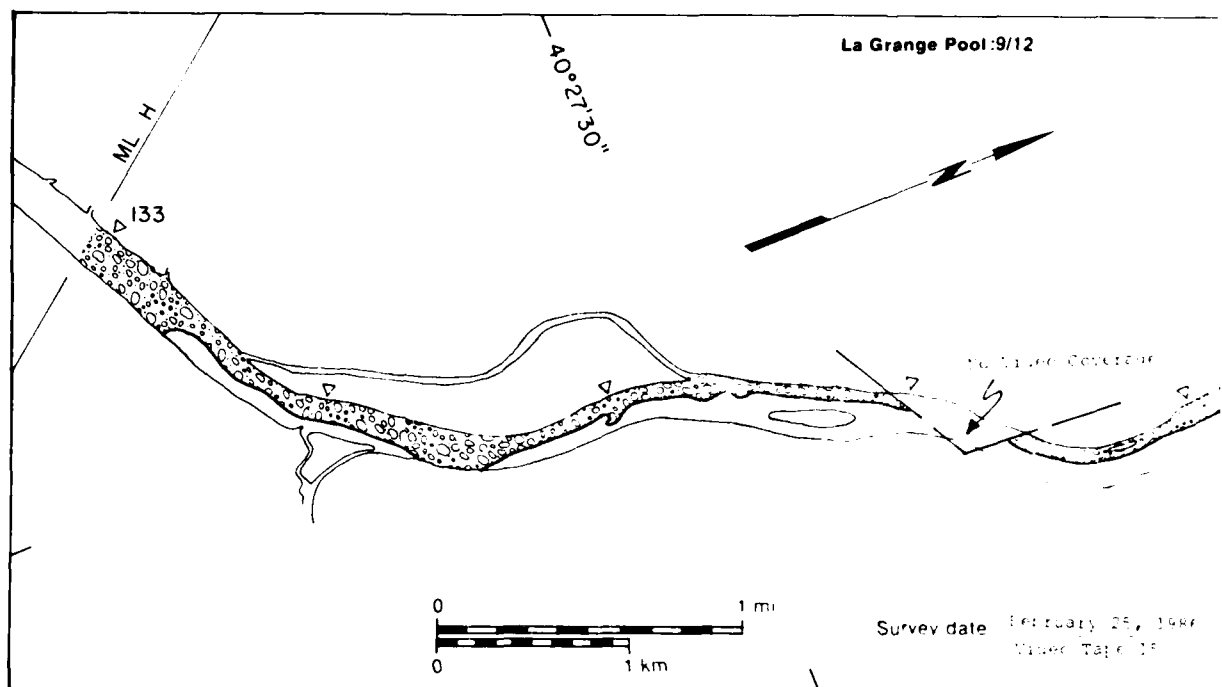
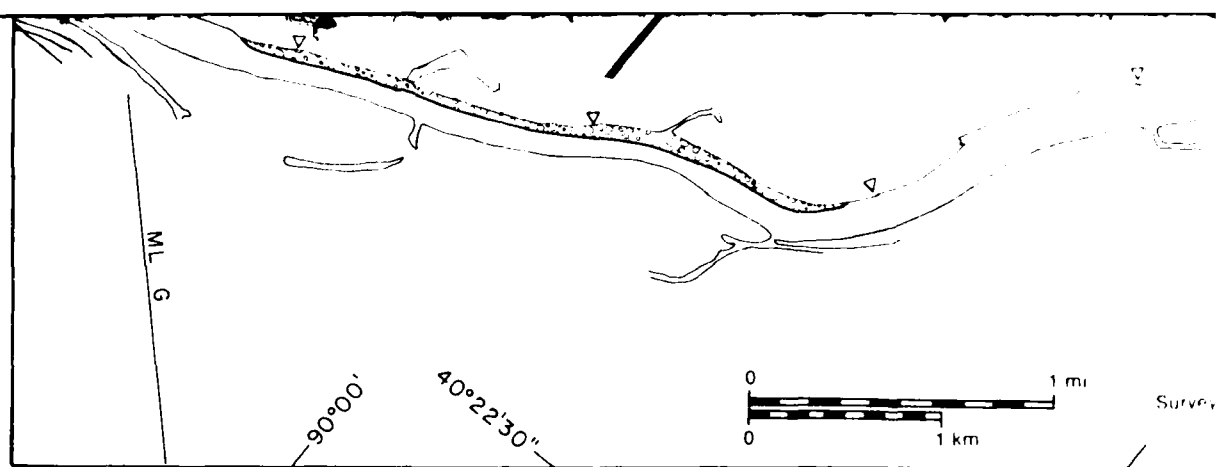
* Includes $0.06 \times 10^6 m^2$
of no video coverage



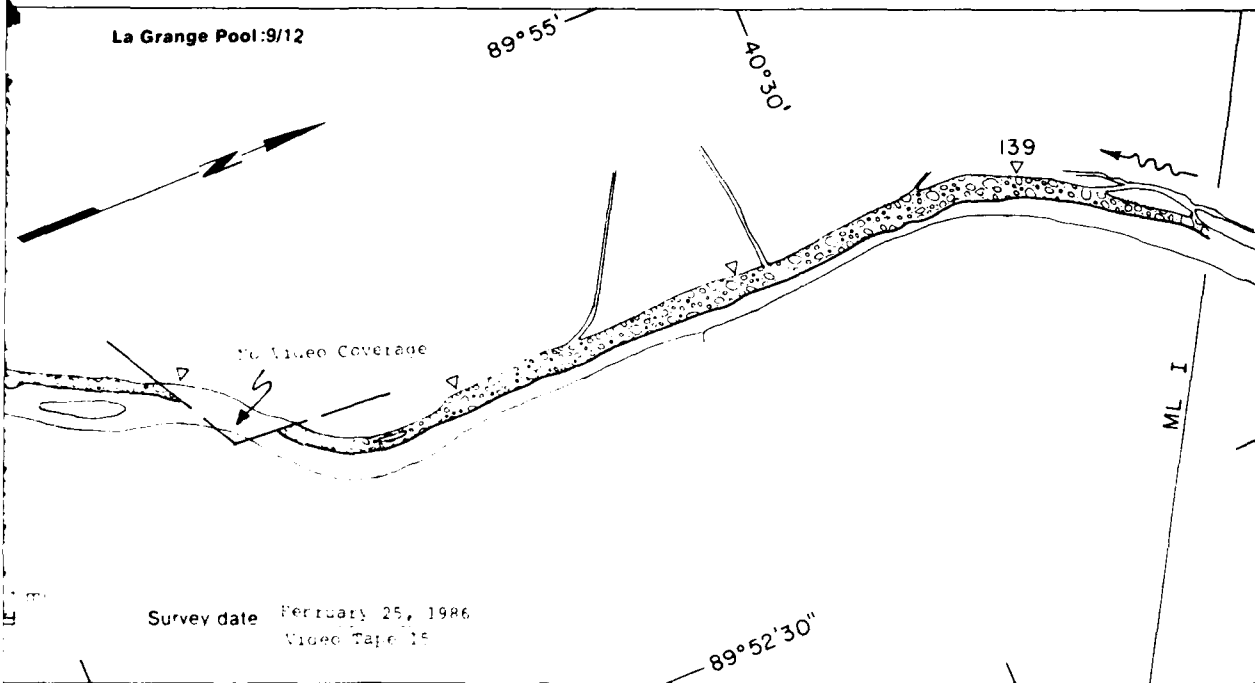
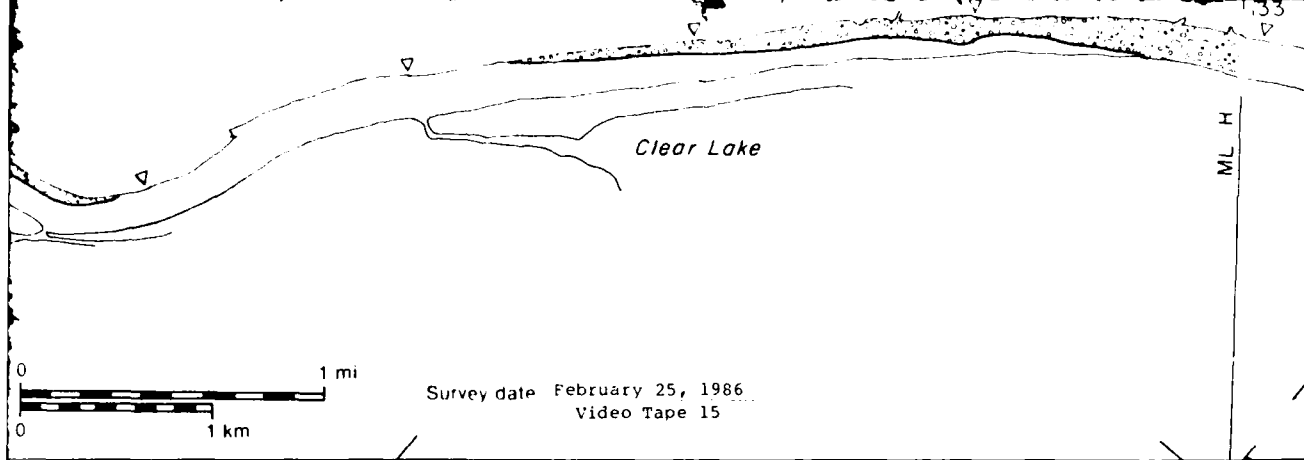
25 February 1986

La Grange Pool:7/12 *



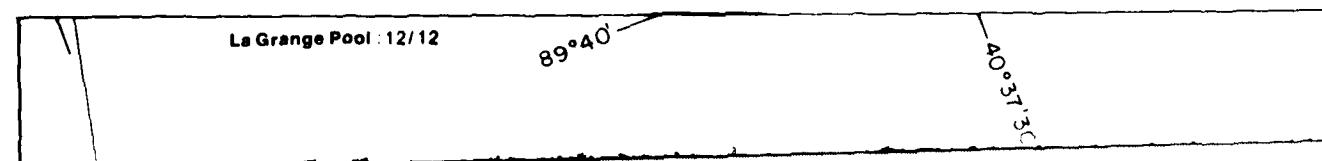
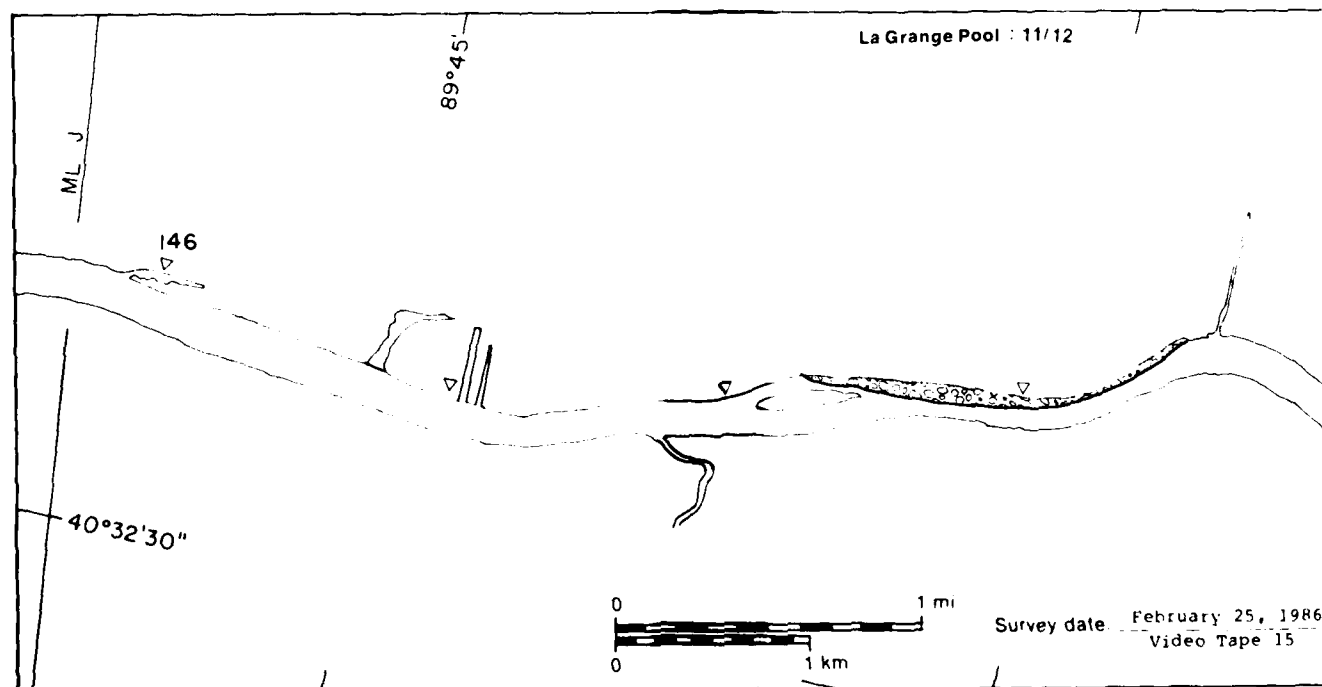
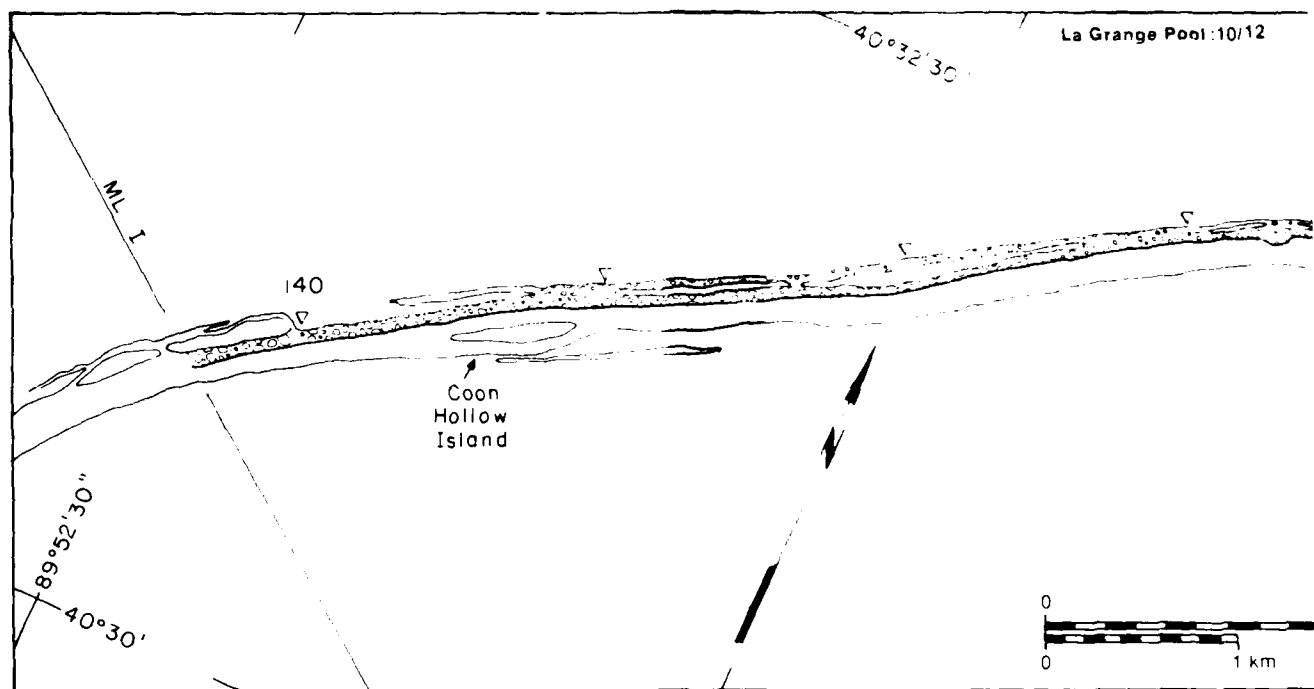


* The downstream limit of Illinois River video coverage was in the vicinity of mile 120 at Havana, Illinois, on all dates. There is no coverage of La Grange Pool maps 1/12 through 6/12 (match lines A through E).



at mile 120 at
12 through

25 February 1986



Grange Pool:10/12

89°47'30"

ML J

145

1 mi

1 km

Survey date February 25, 1986

Video Tape 15

40°35'

ML K

153

February 25, 1986

Video Tape 15

89°40'

La Grange Pool

MAP UNITS

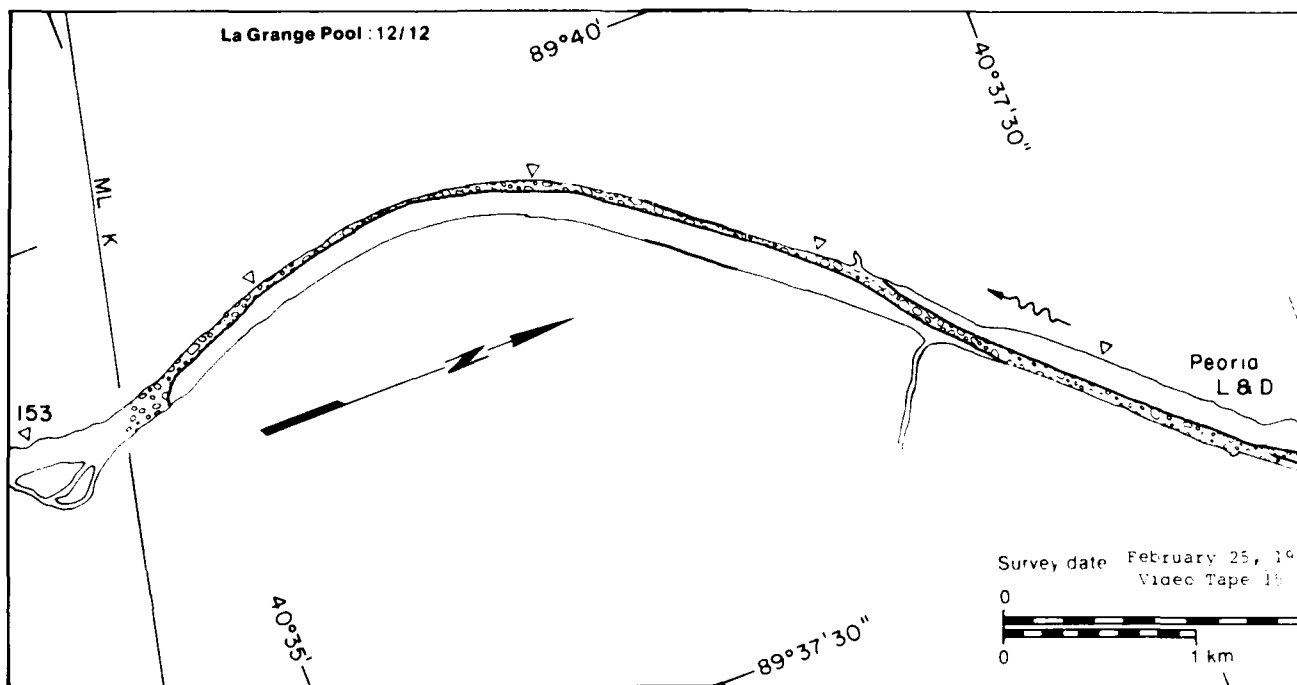
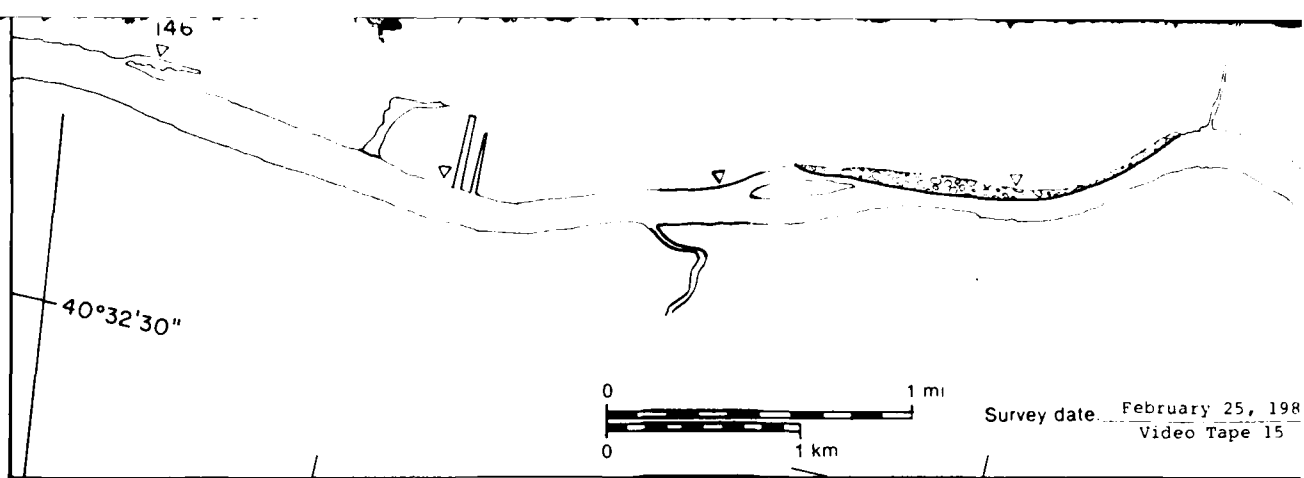
Area
(m² x 10⁶)

Surface
concentration
(%)

Open water

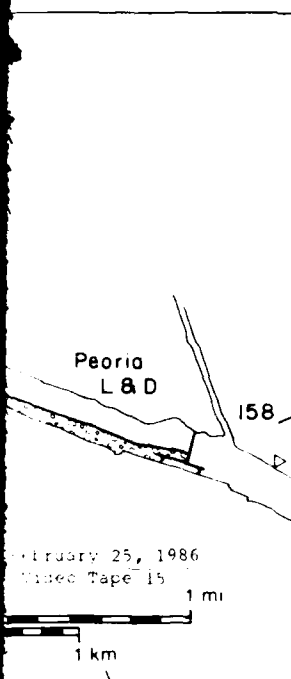
8.02

NA




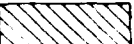

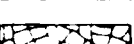
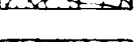

February 25, 1986
Video Tape 15

89°40'



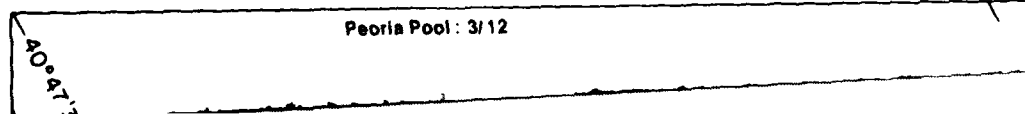
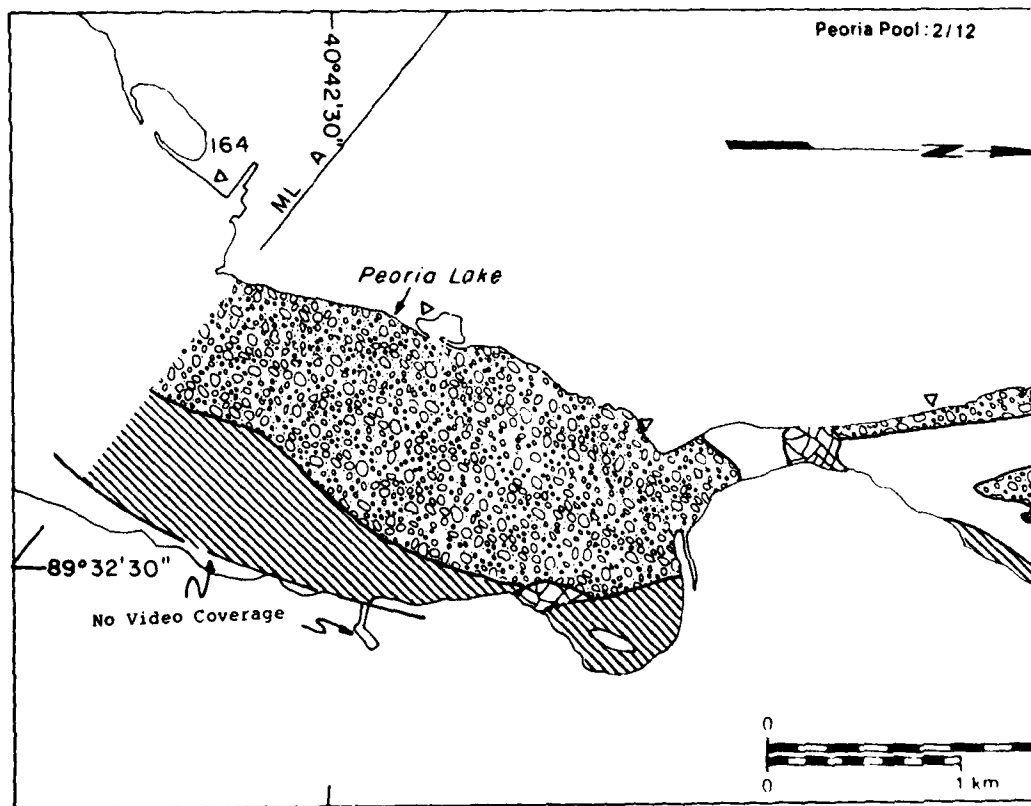
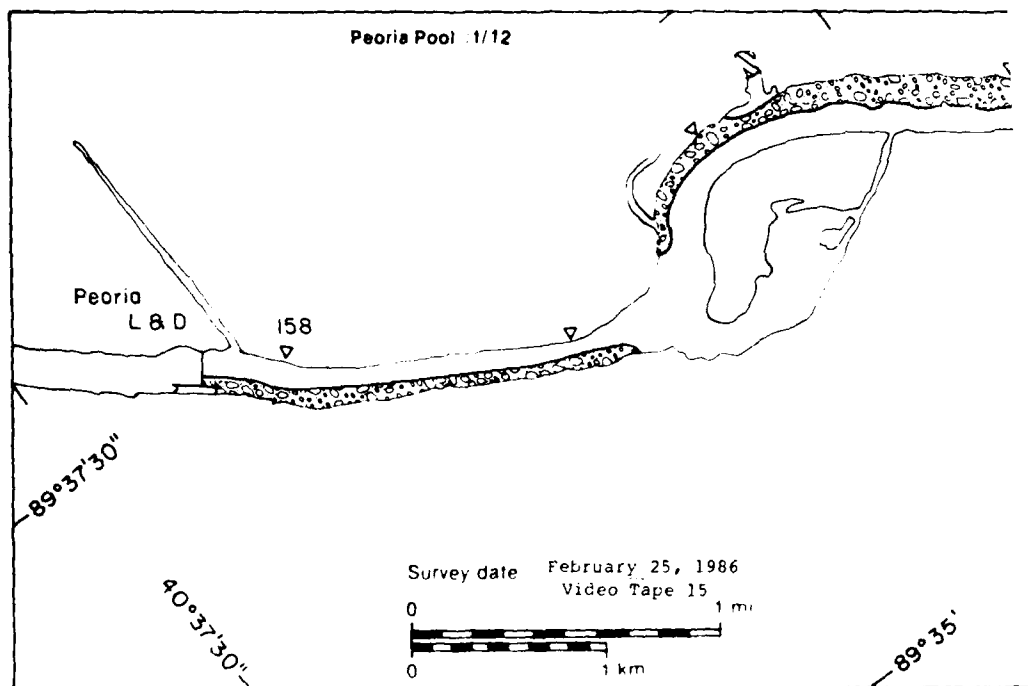
La Grange Pool

MAP UNITS

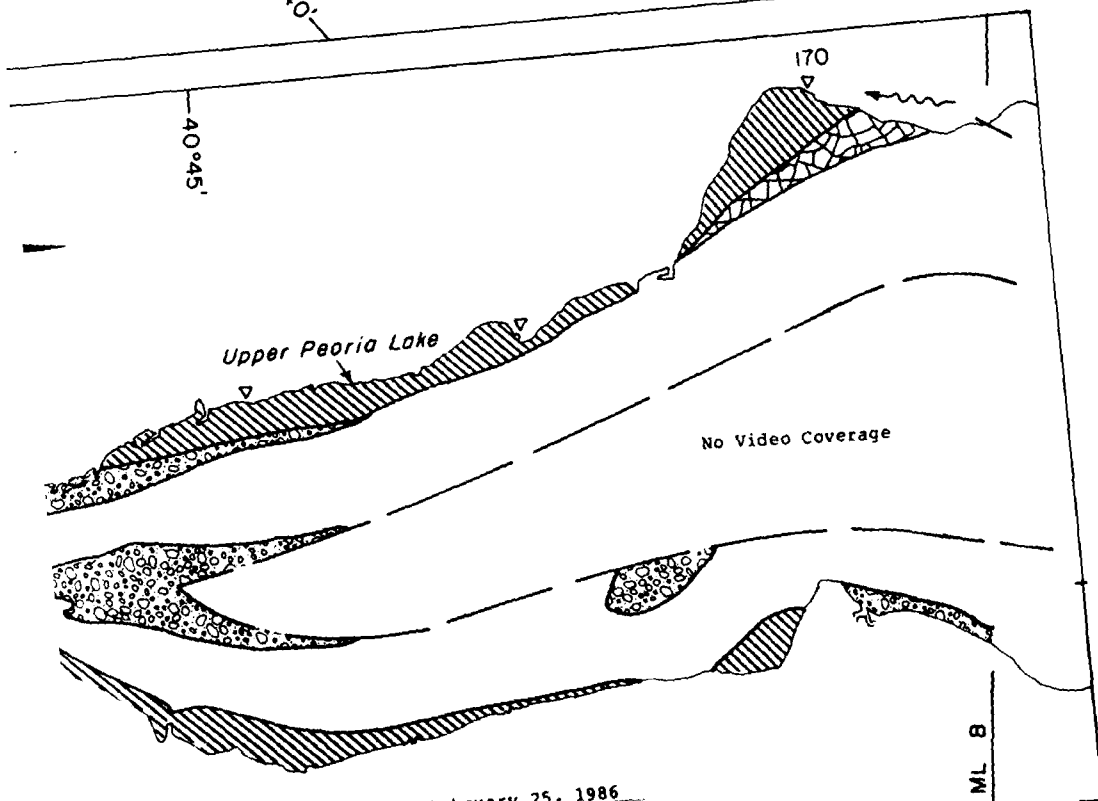
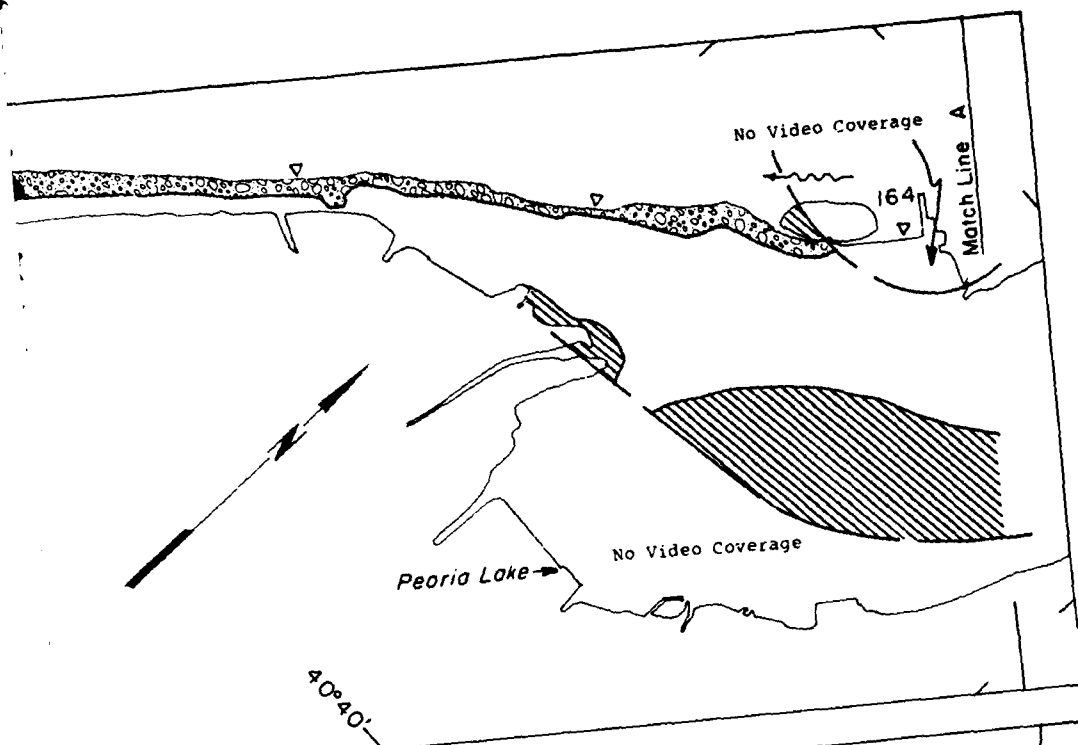
-  Open water
-  Solid ice cover
-  Solid ice cover with open water areas
-  Fragmented ice cover
-  Fragmented ice cover with open water areas
-  Ice floes or frazil slush and pans

Area (m ² x 10 ⁶)	Surface concentration (%)
8.02	NA
0.10	NA
0.00	—
0.04	NA
0.00	—
3.47	20
Total area (m ² x 10 ⁶)	11.71*

* Includes 0.08 x 10⁶ m² of no video coverage



25 February 1986

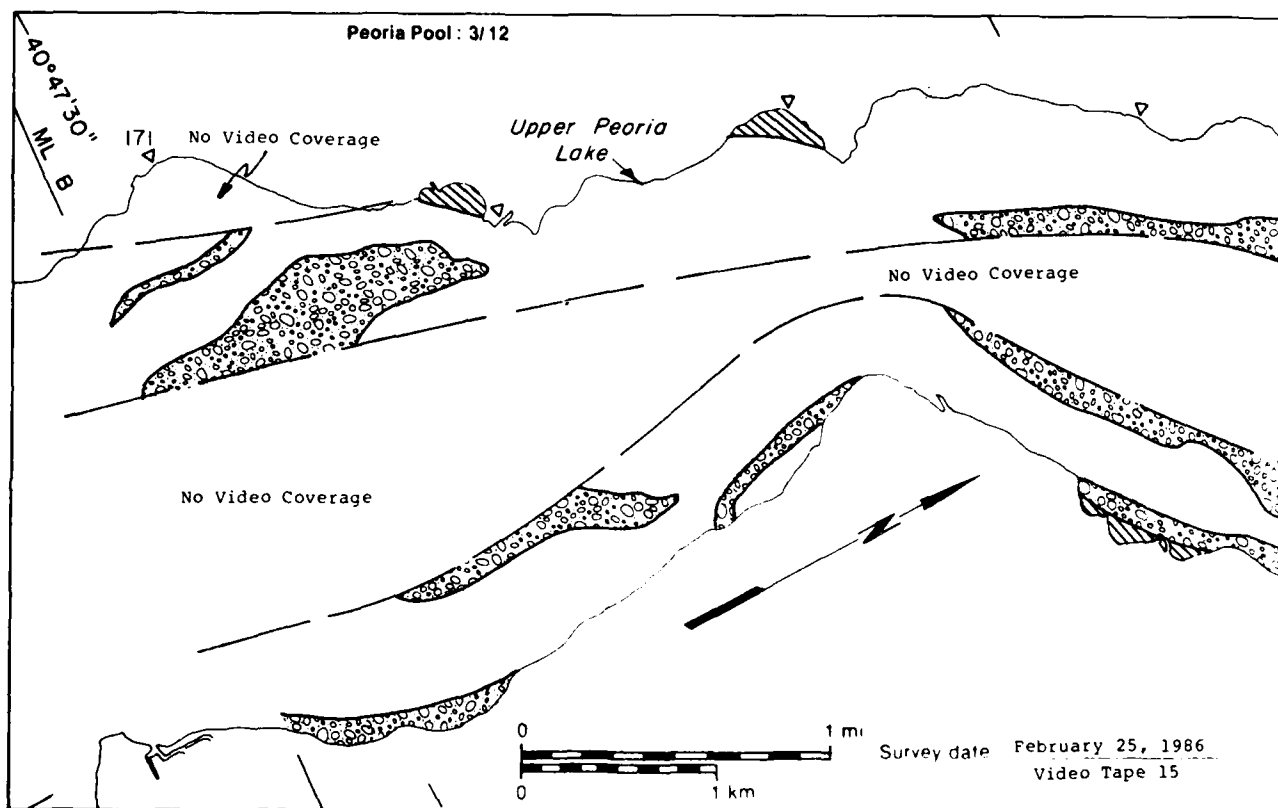
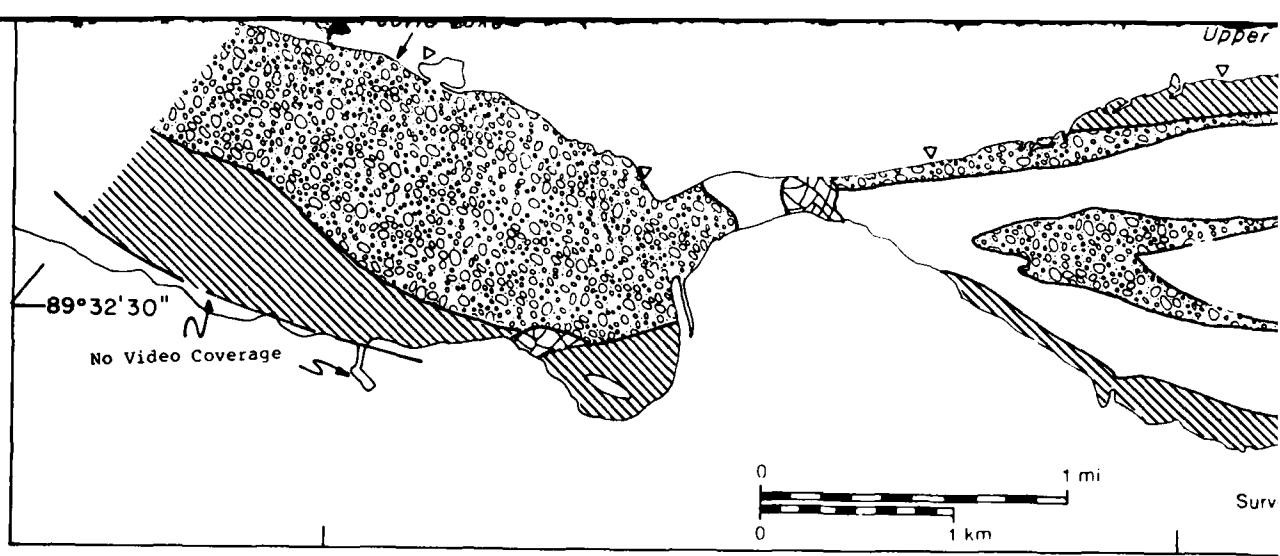


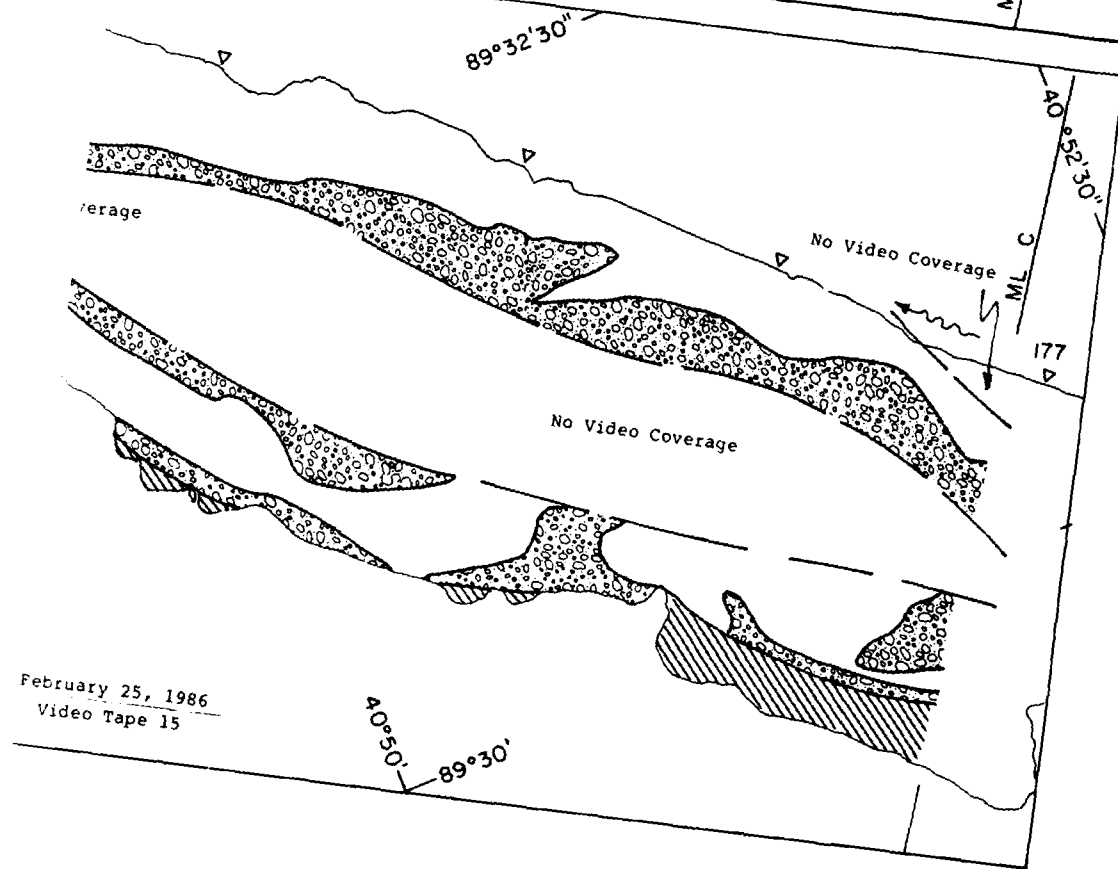
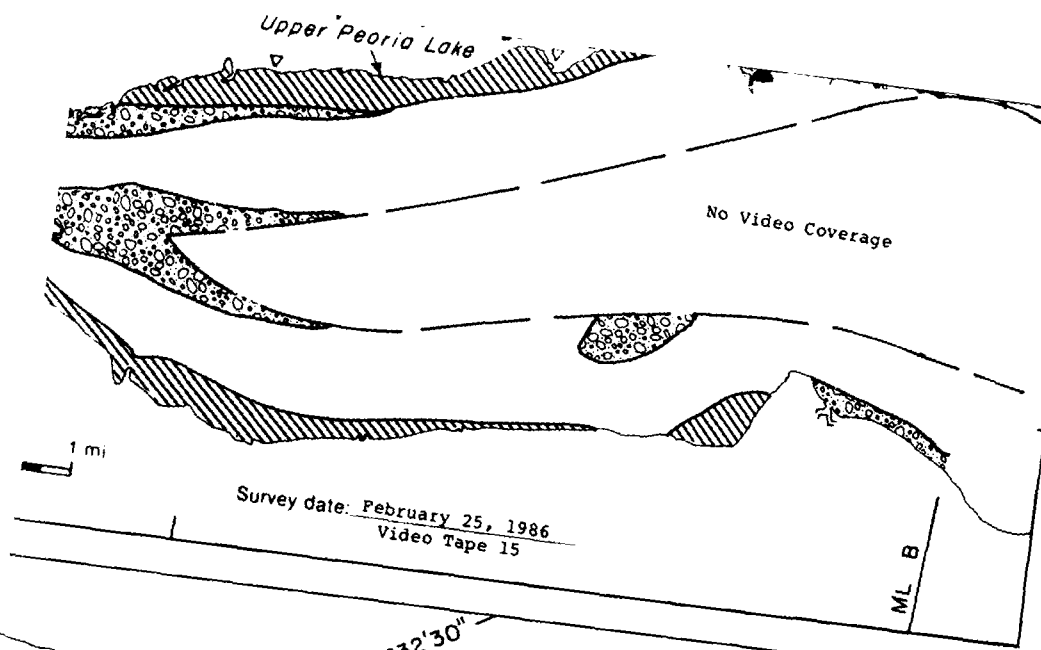
Survey date: February 25, 1986
Video Tape 15

1 mi

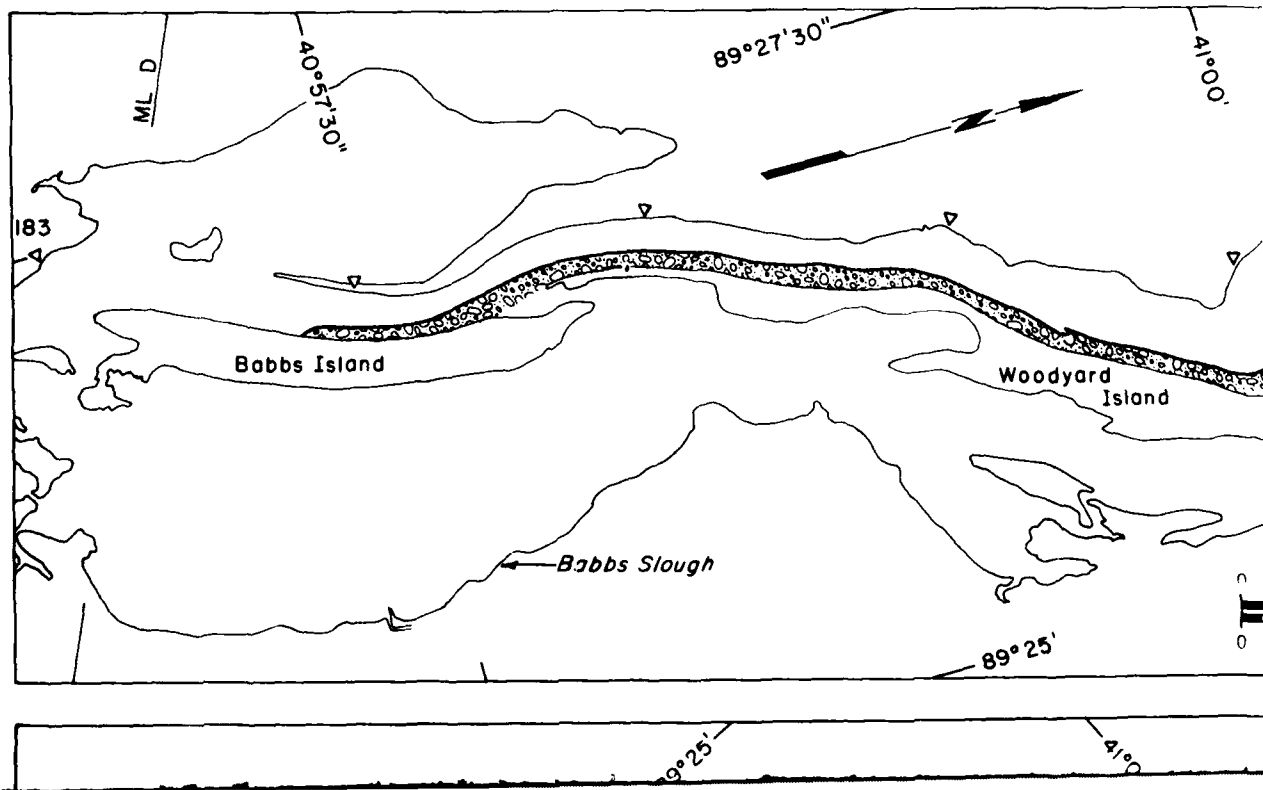
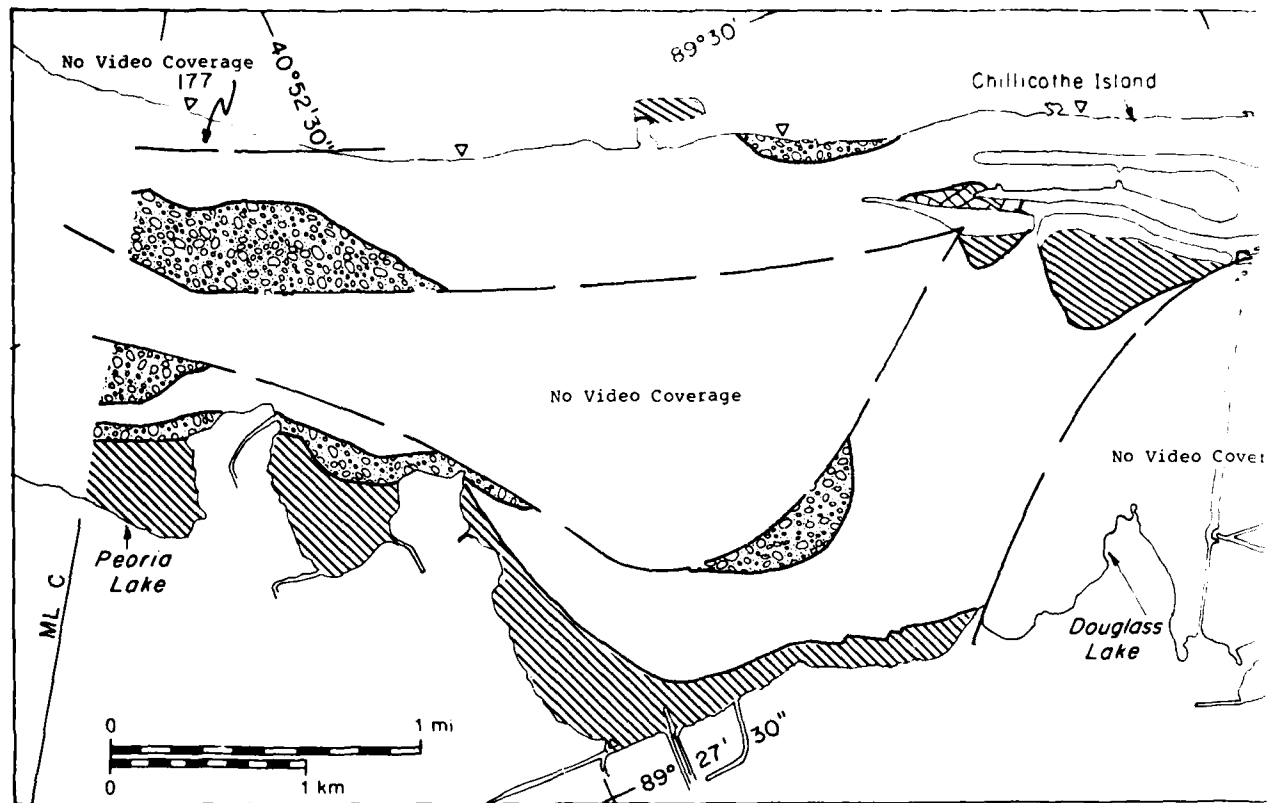
$89^{\circ}32'30''$

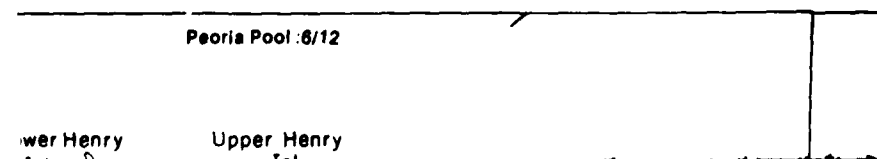
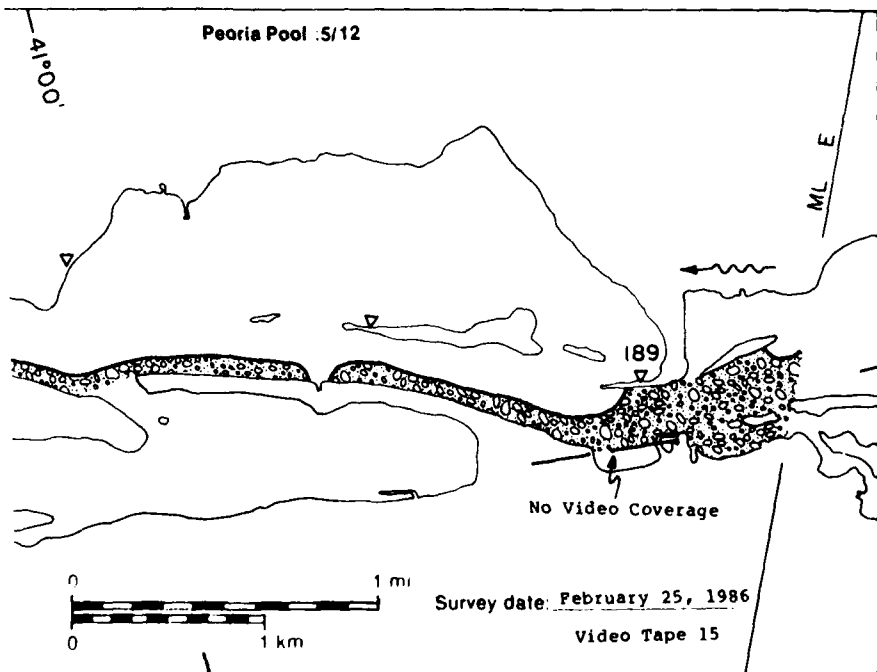
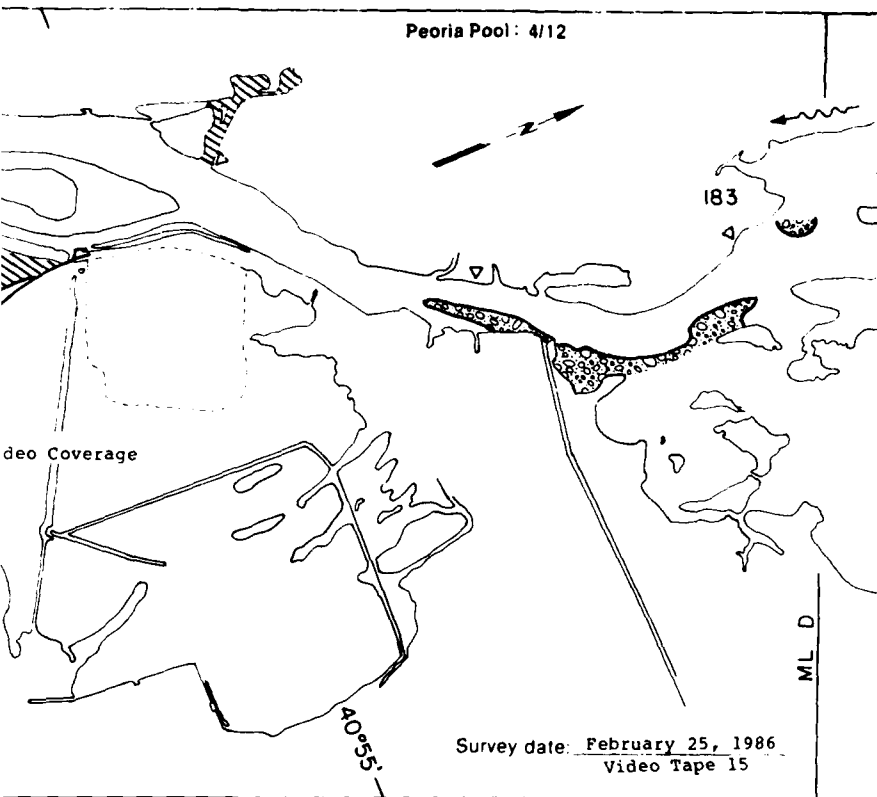
$40^{\circ}52'30''$

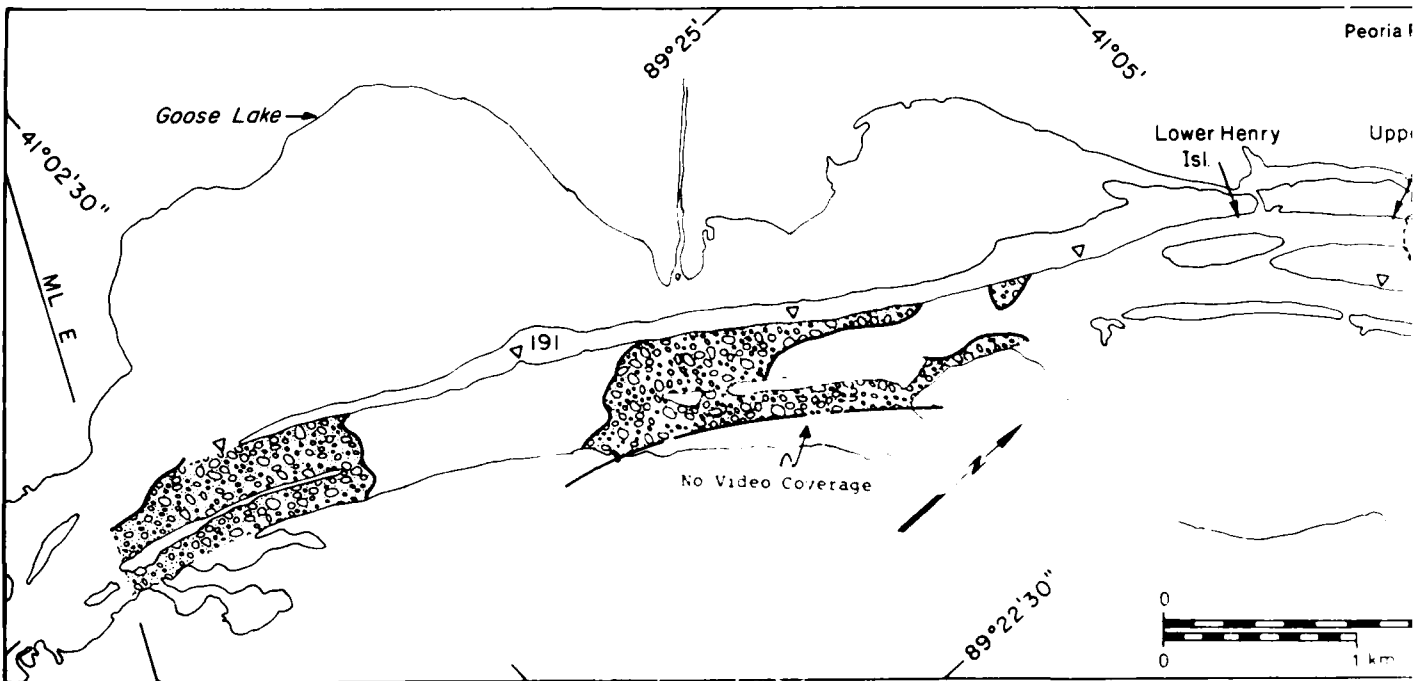
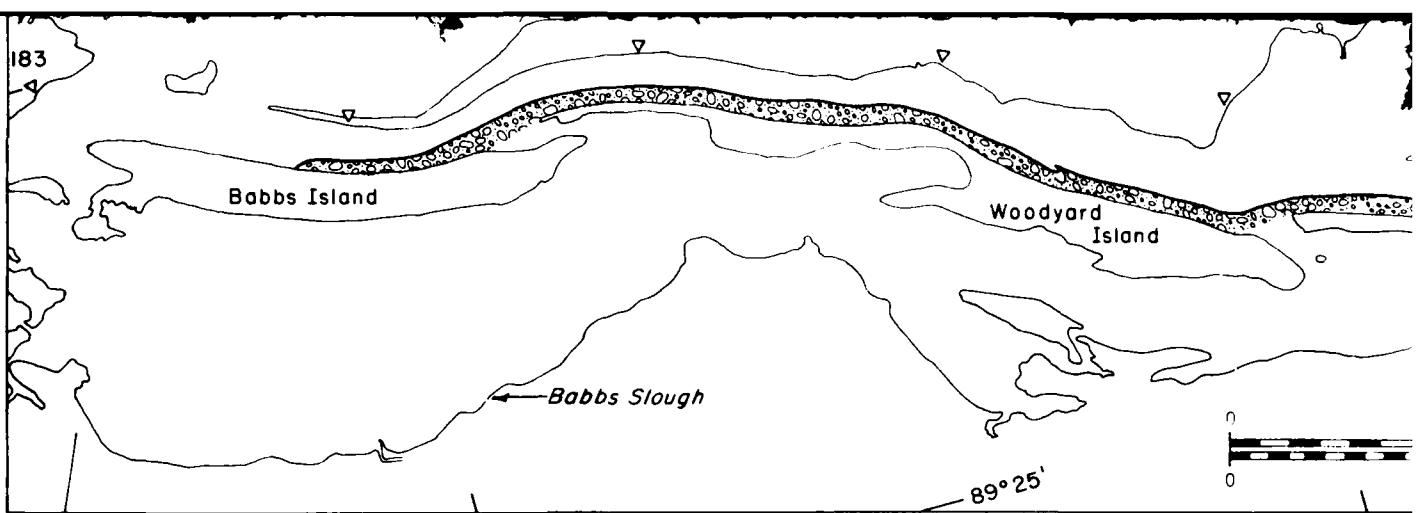


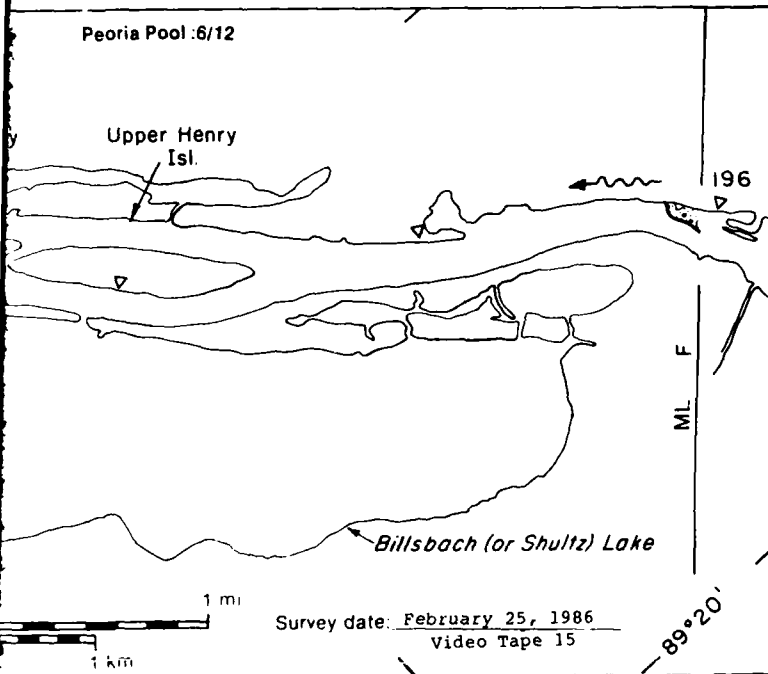
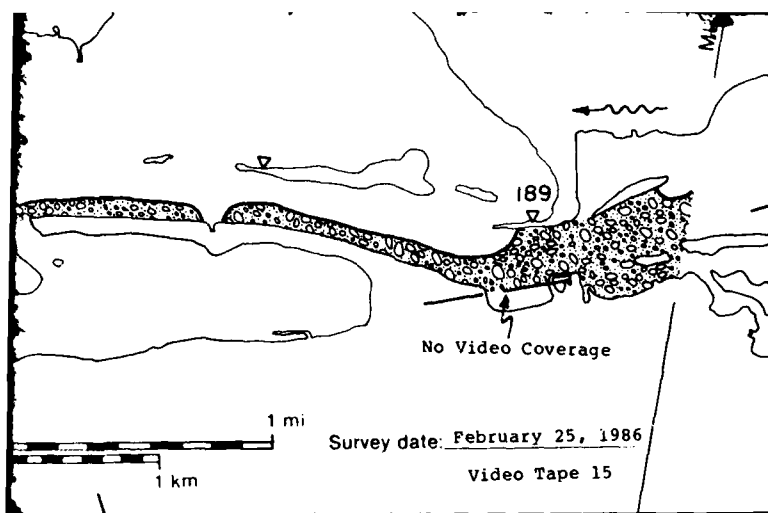


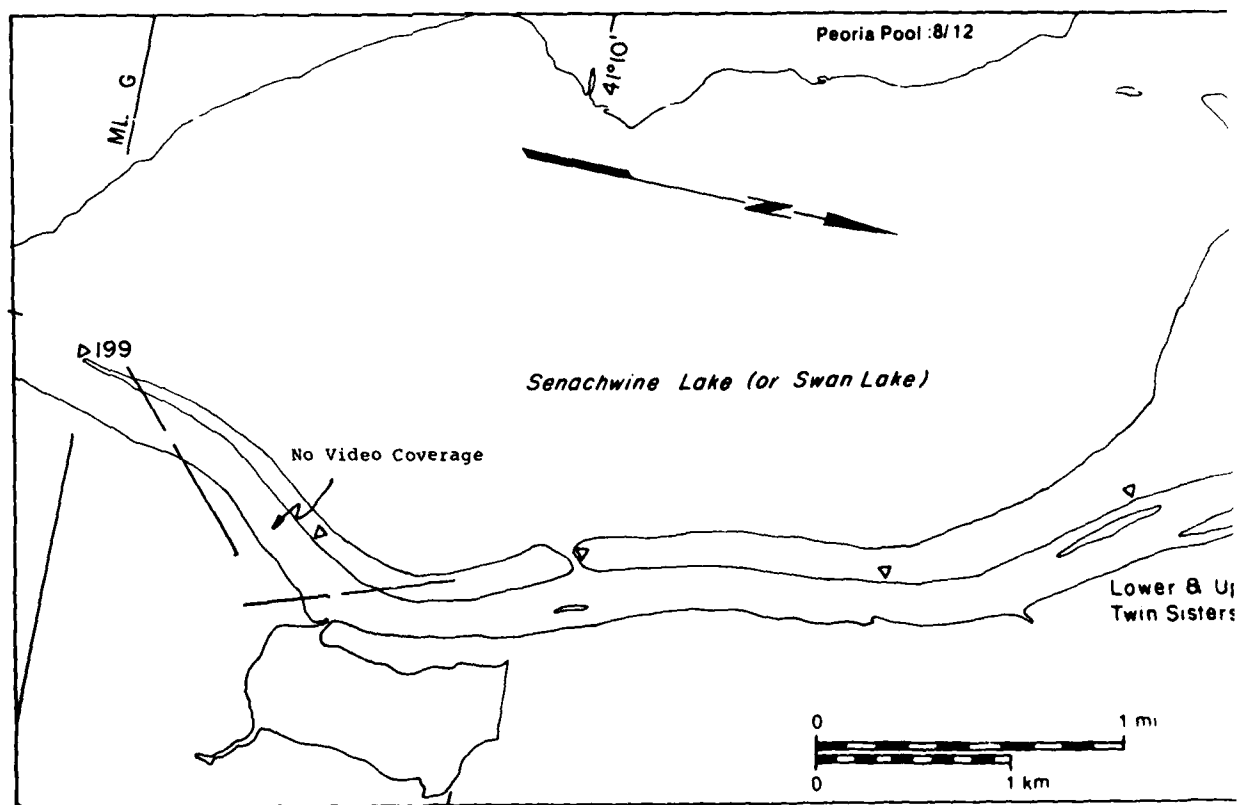
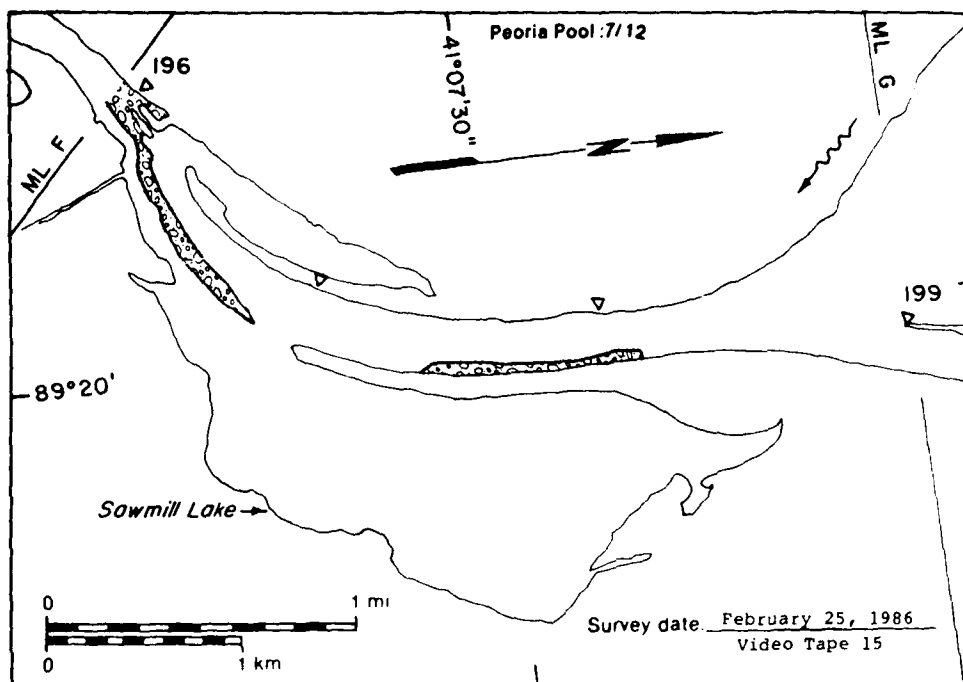
25 February 1986



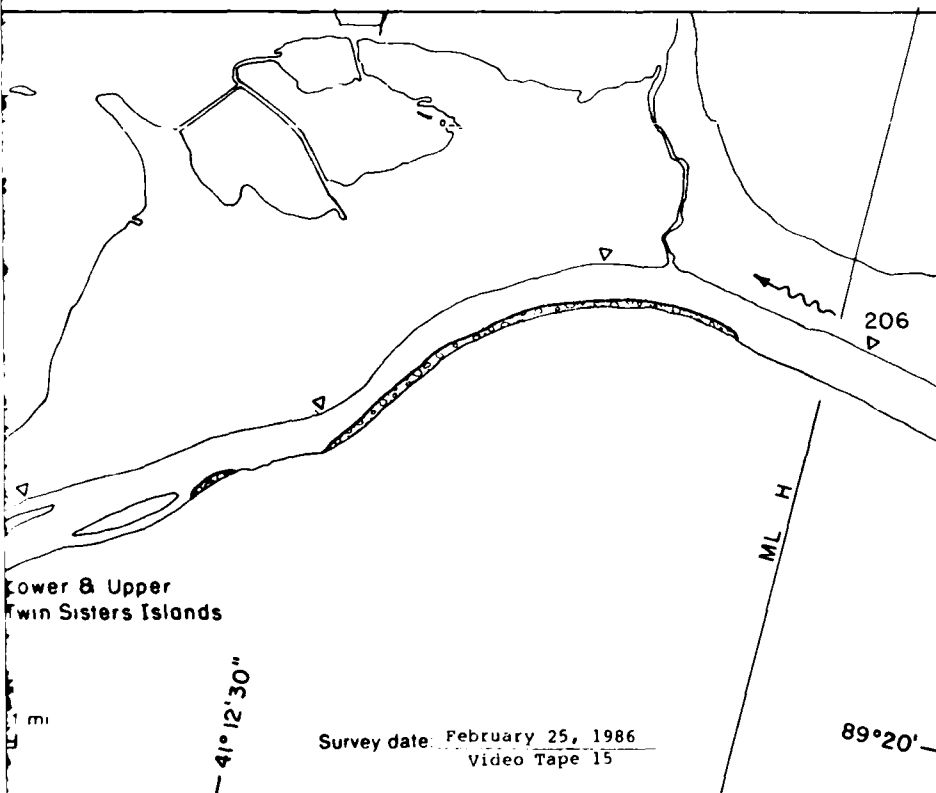




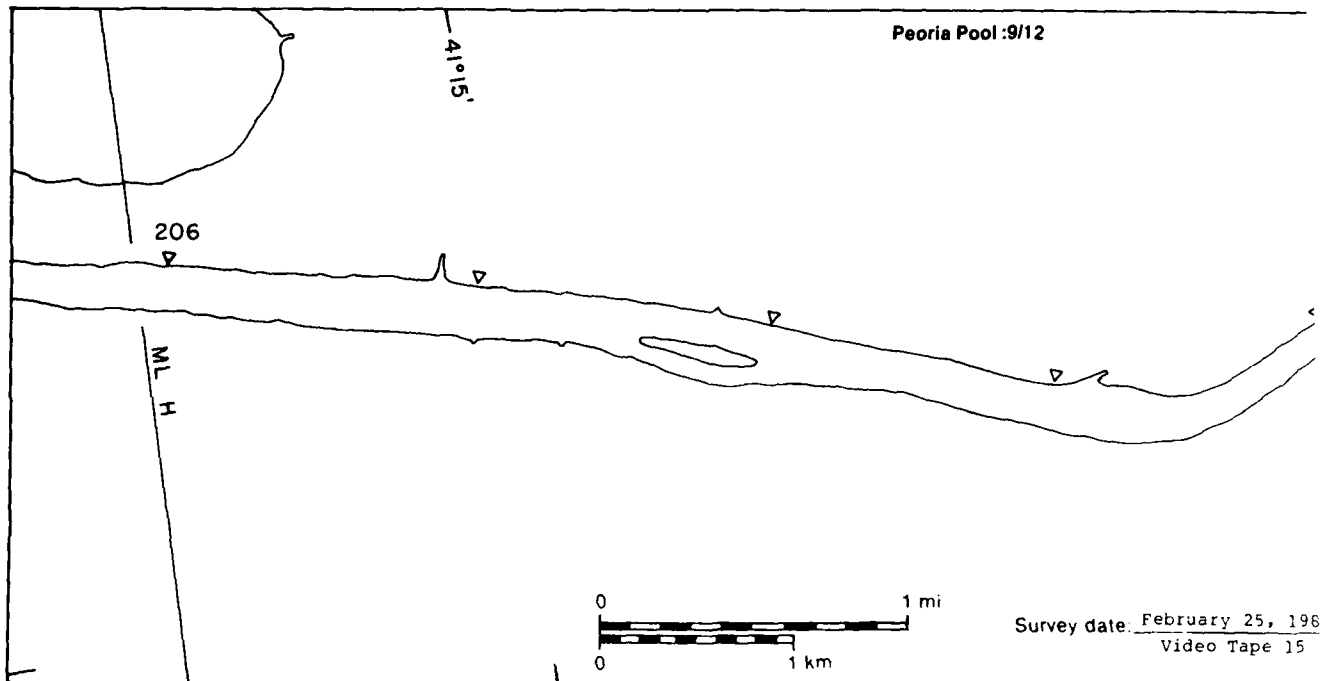
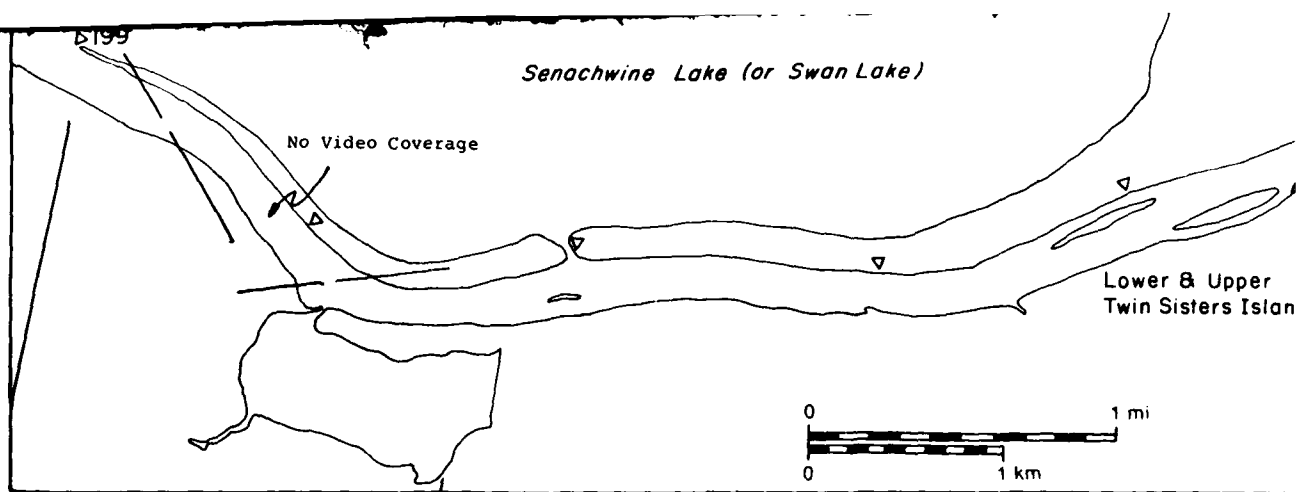


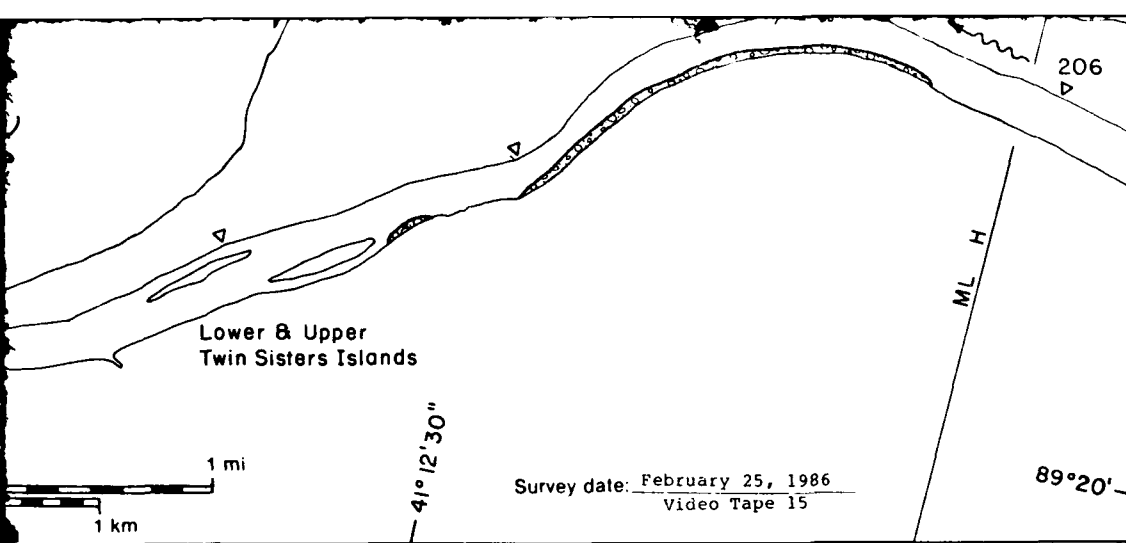


25 February 1986

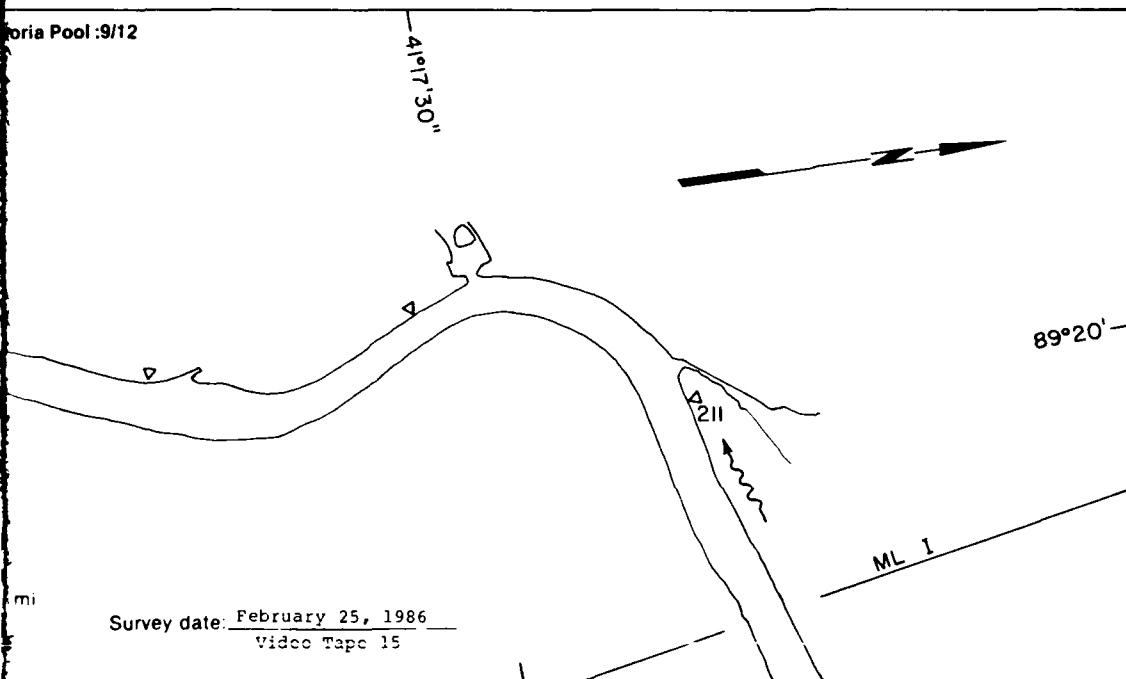


41°17'30"

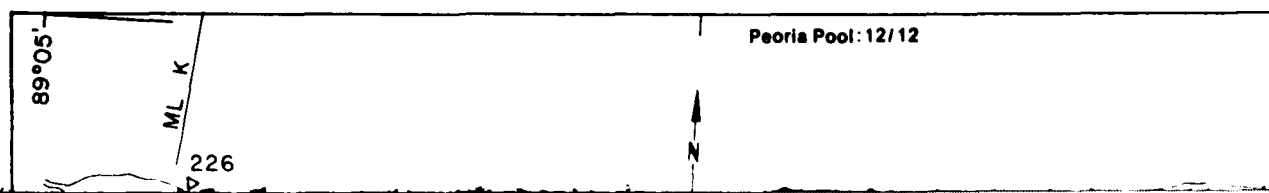
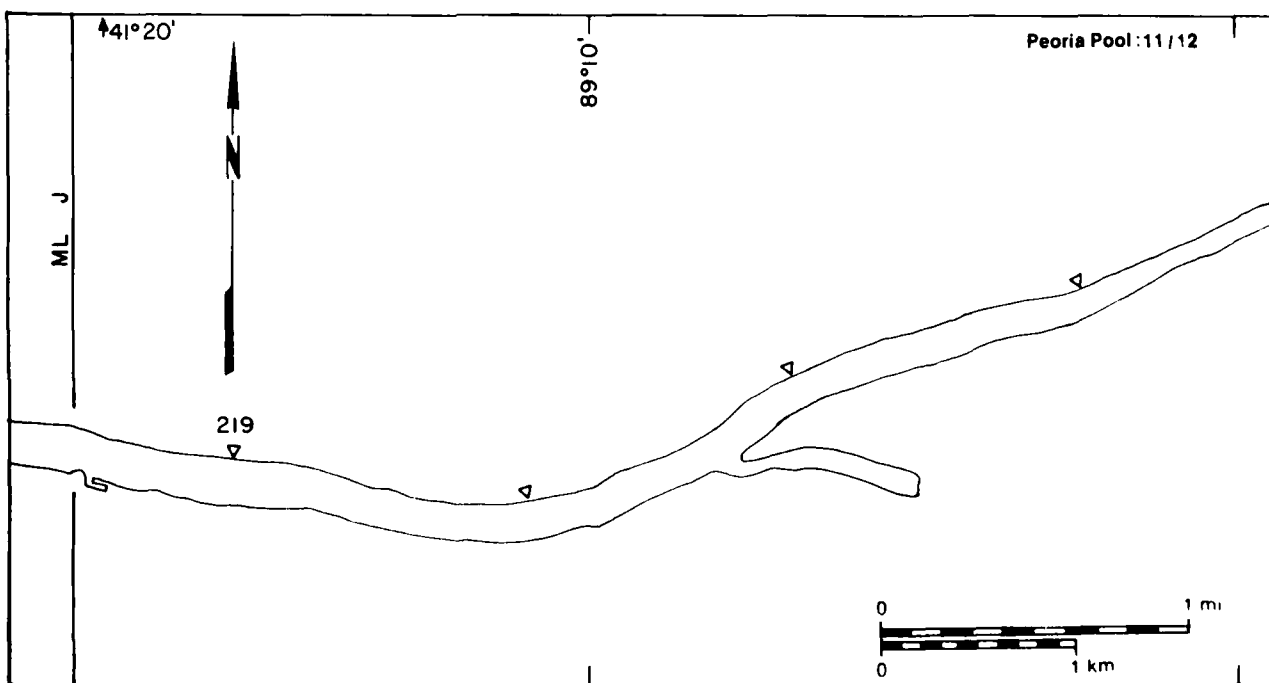
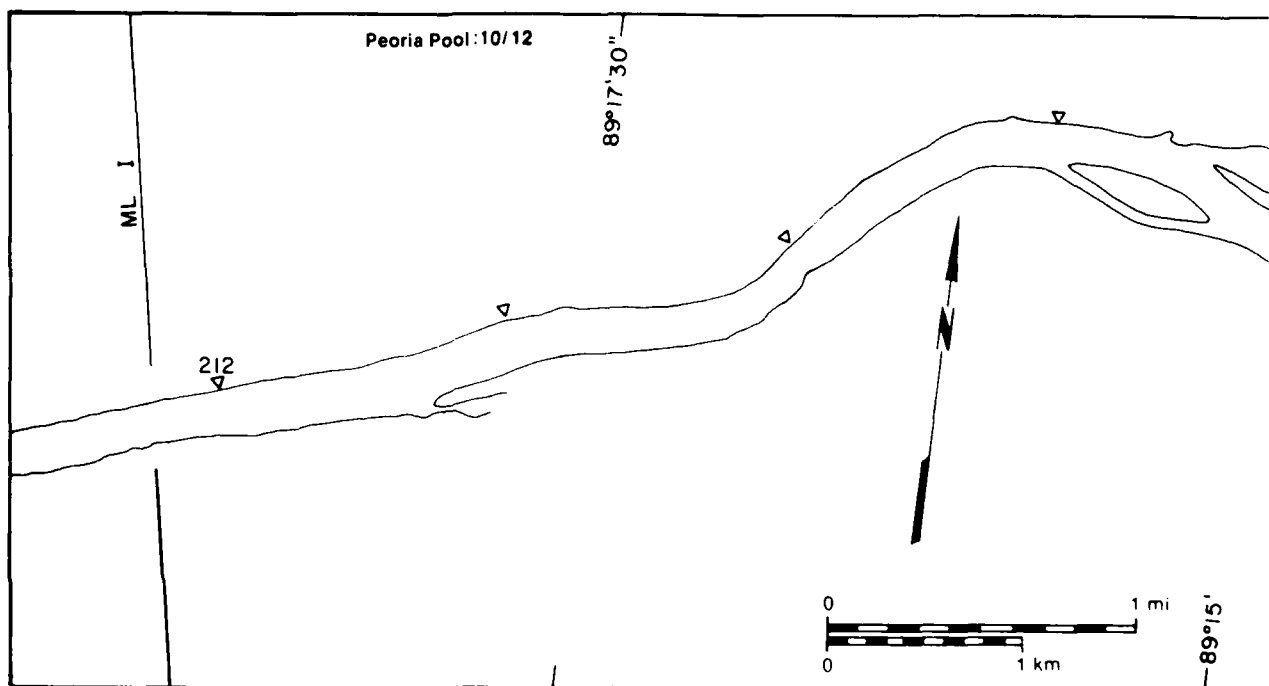


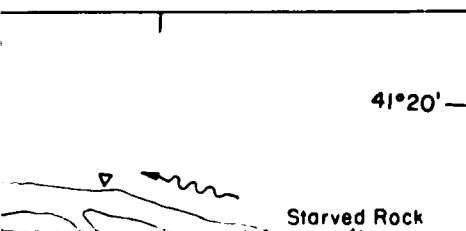
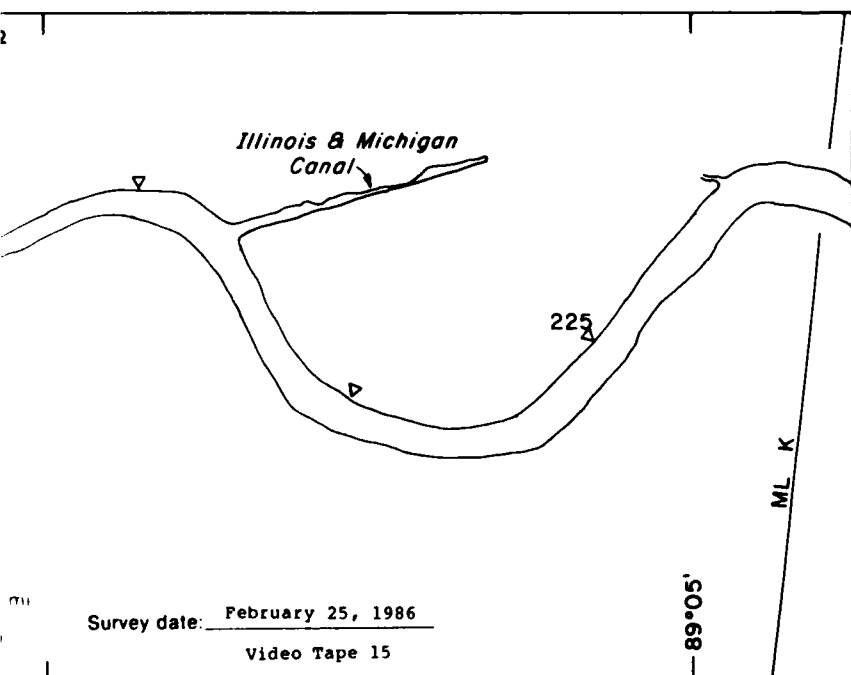
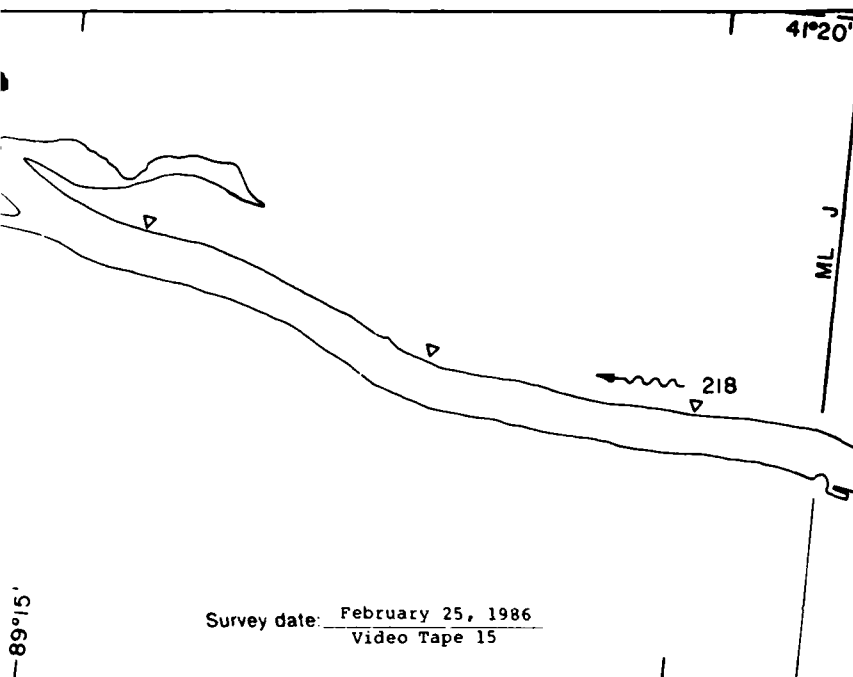


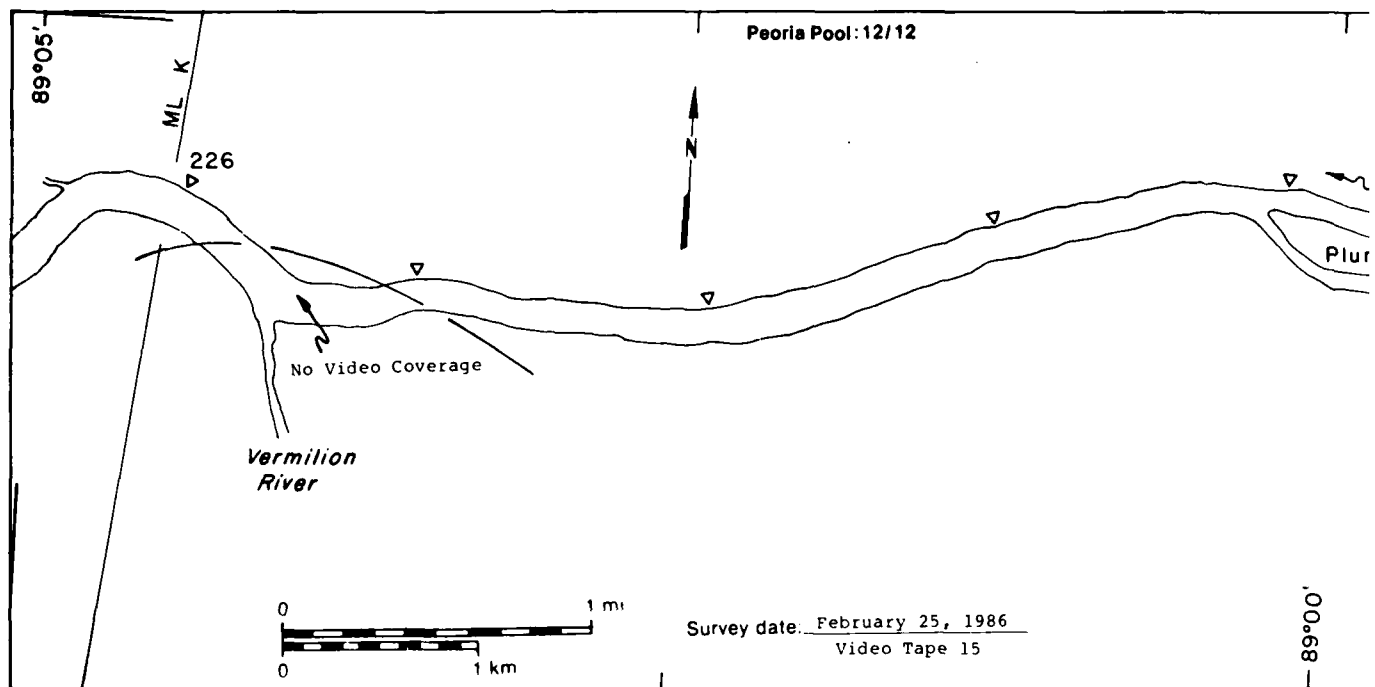
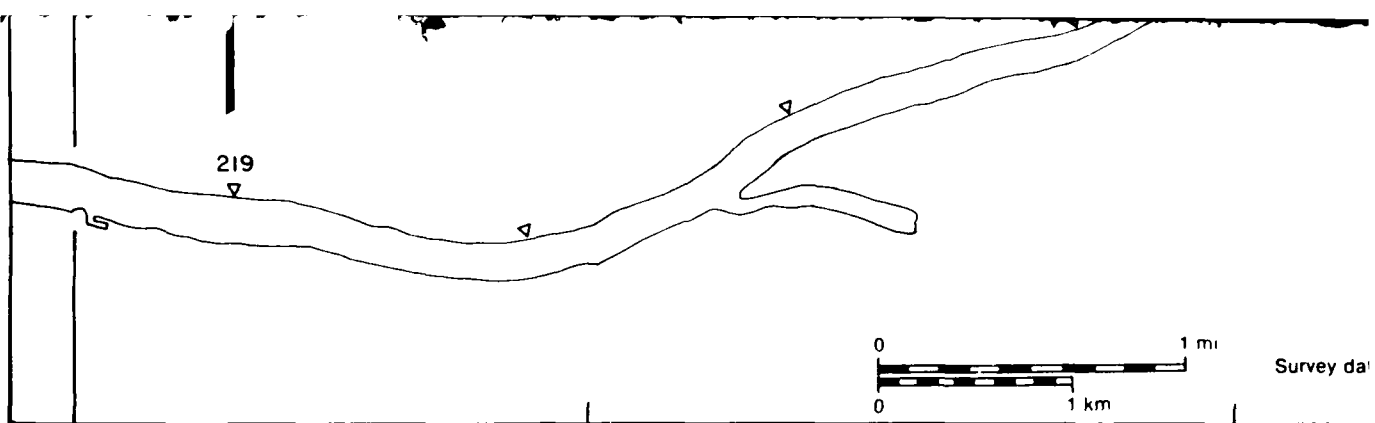
oria Pool :9/12



25 February 1986

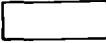











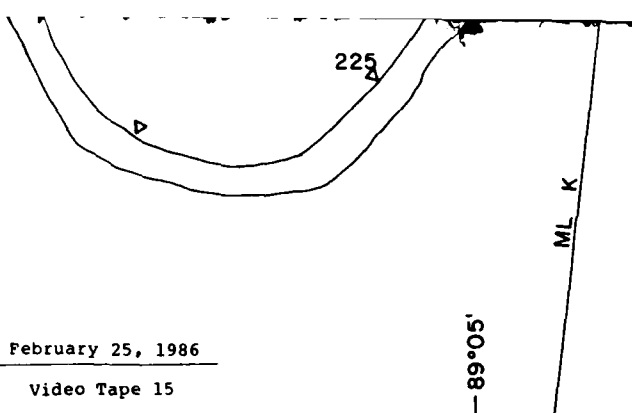
Peoria Pool

MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

Area ($m^2 \times 10^6$)	Surface concentration (%)
42.14	NA
6.05	NA
0.00	—
0.33	NA
0.00	—
12.38	5

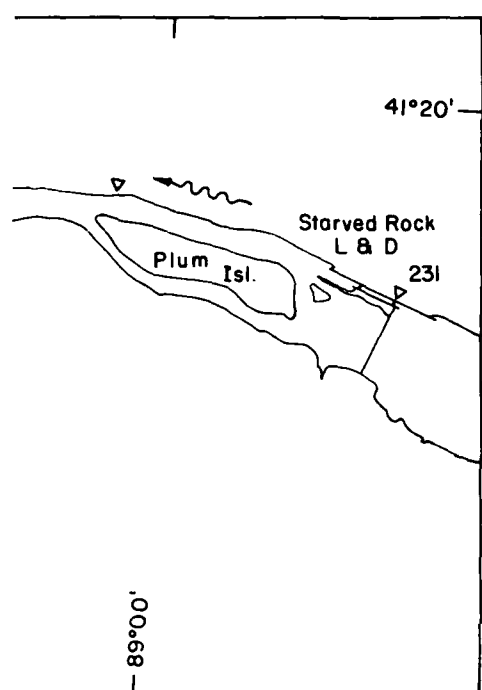
Total area ($m^2 \times 10^6$) 81.33* * Includes $20.43 \times 10^6 m^2$ of no video coverage

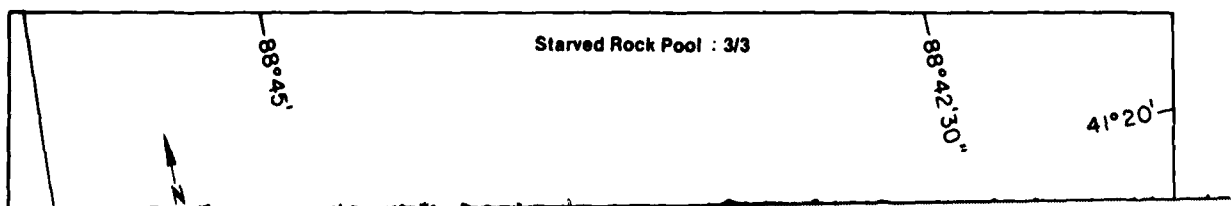
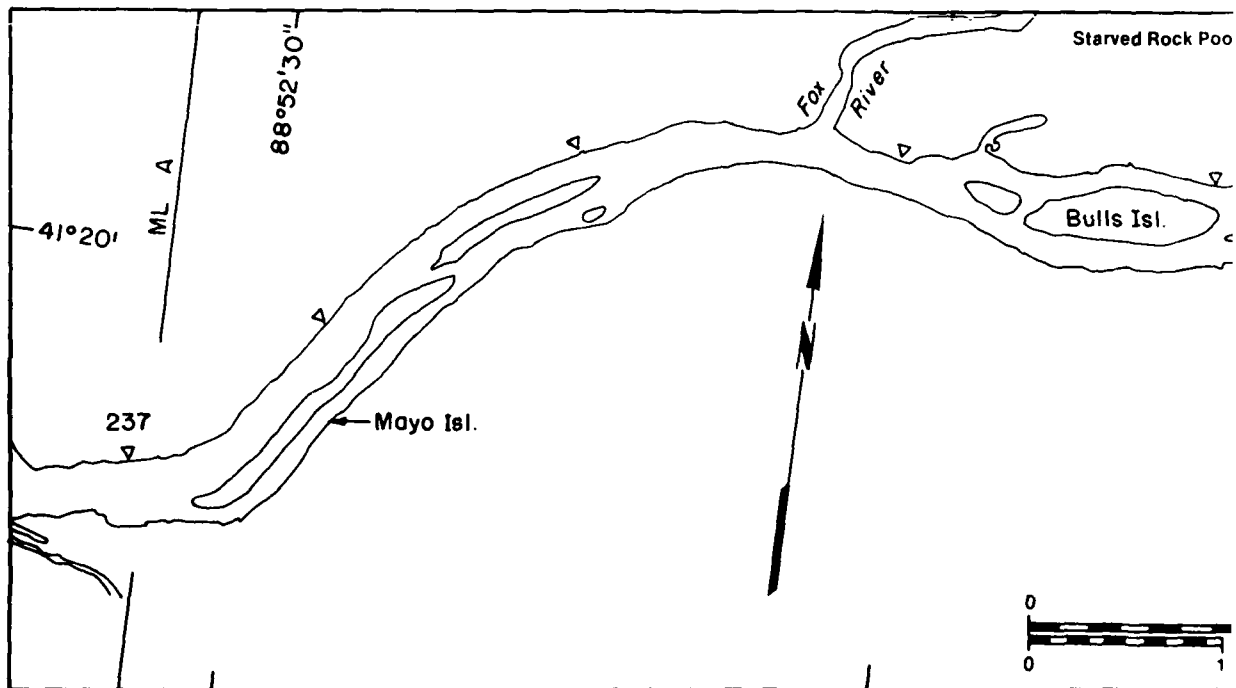
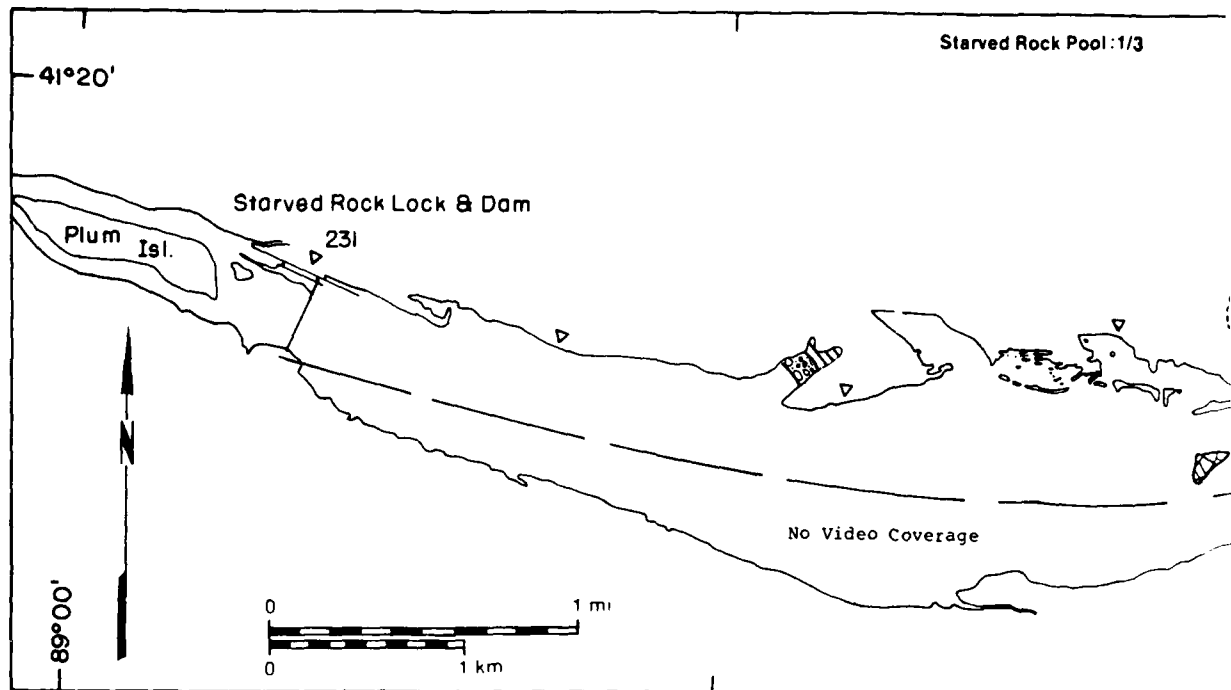


mi

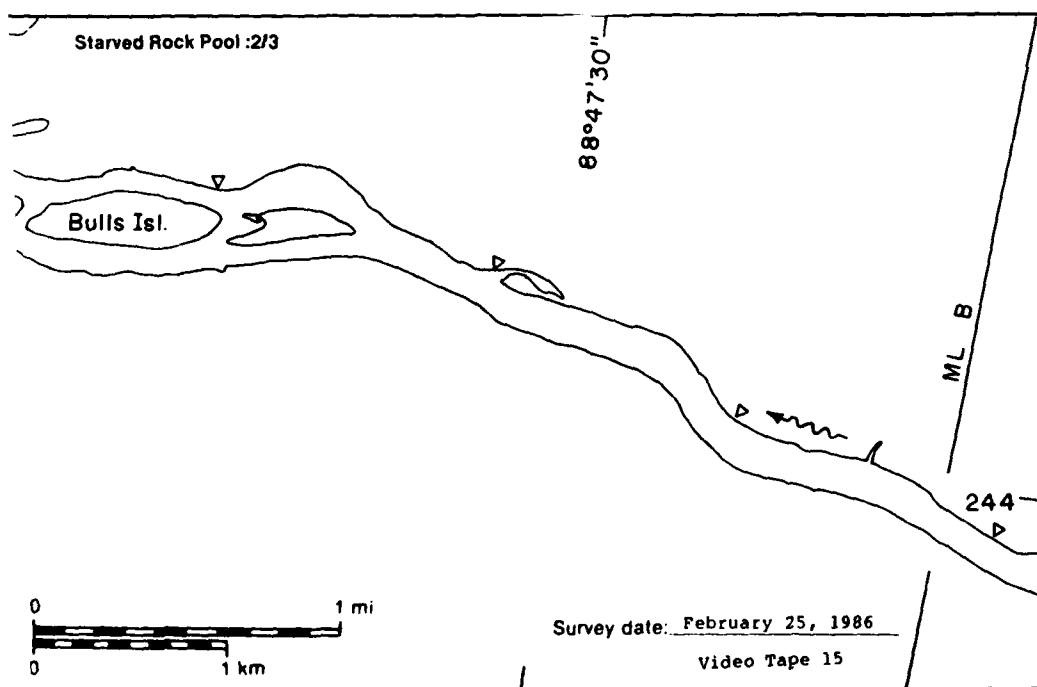
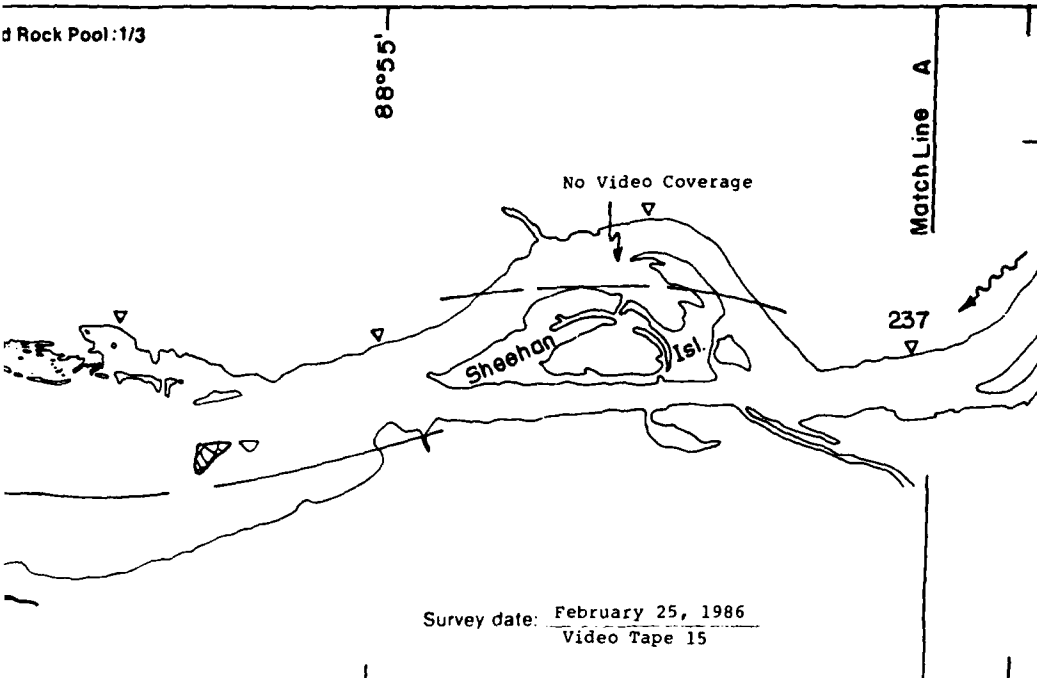
Survey date: February 25, 1986

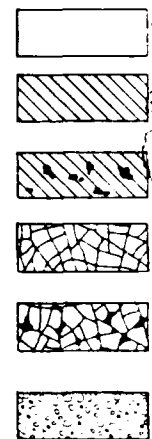
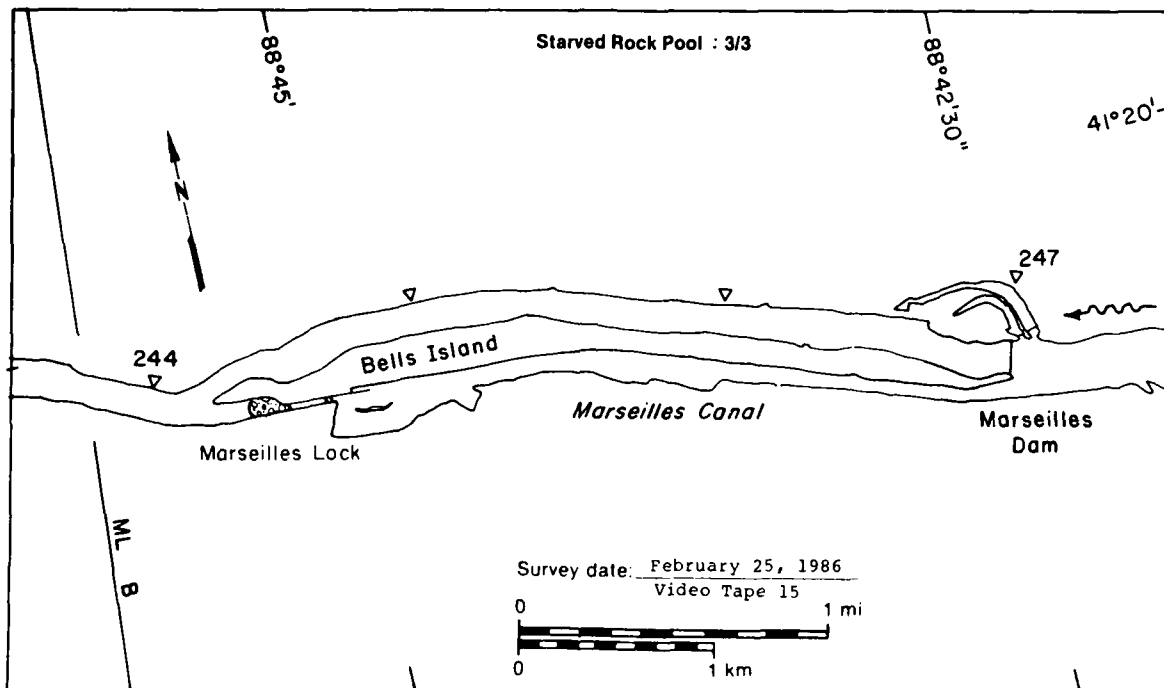
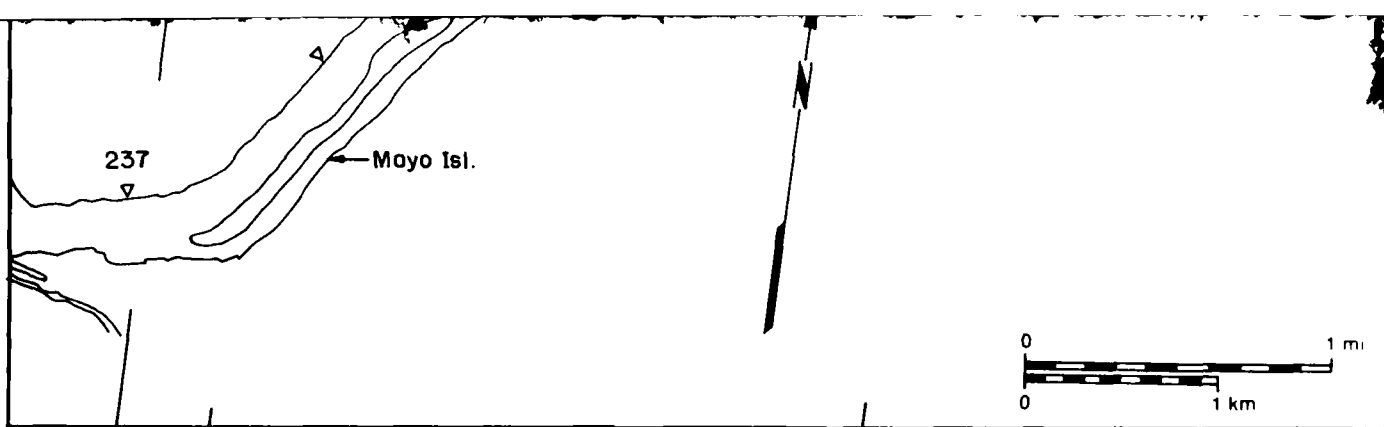
Video Tape 15

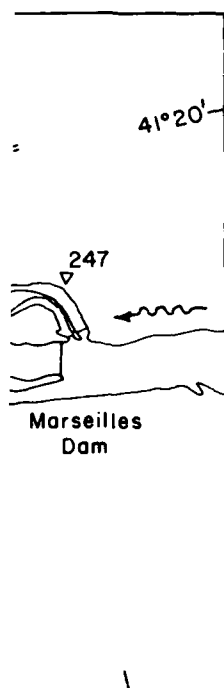
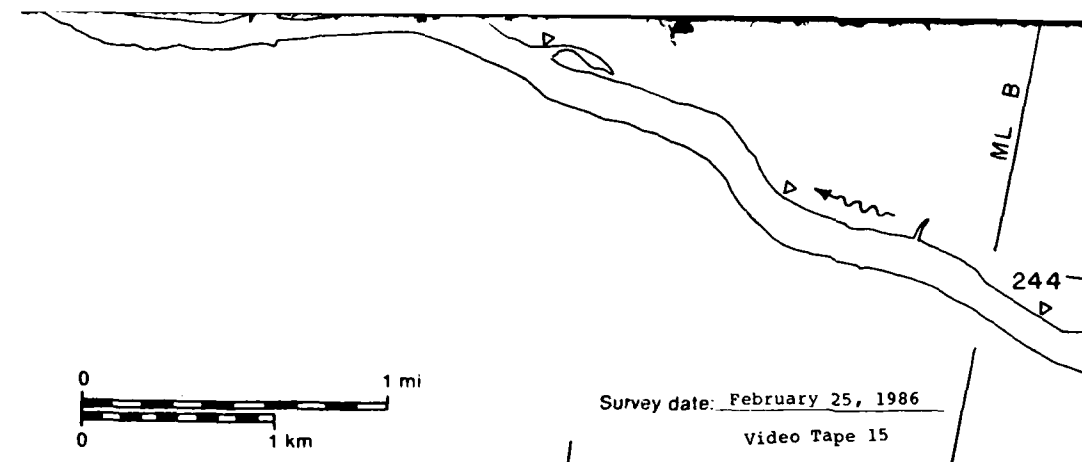




25 February 1986







Starved Rock Pool

MAP UNITS

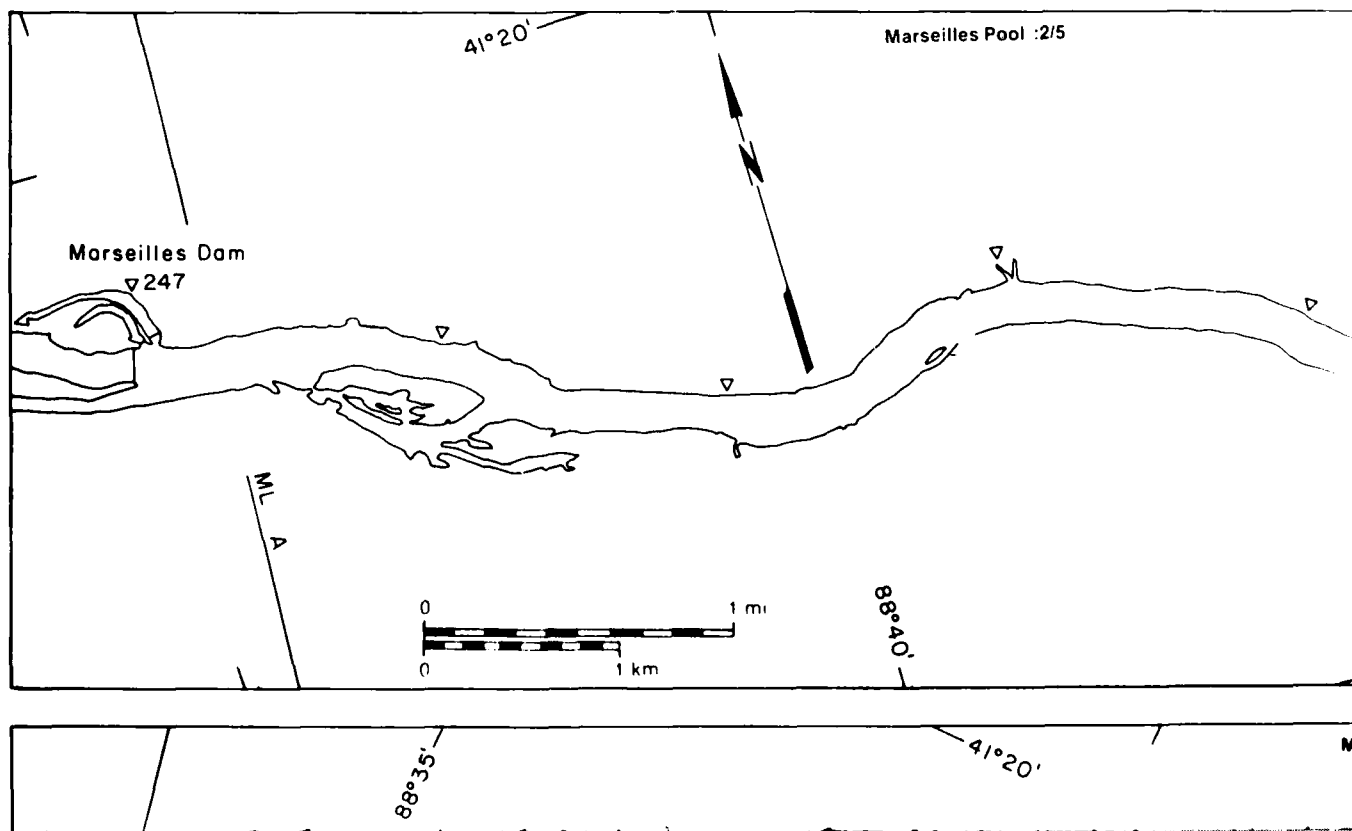
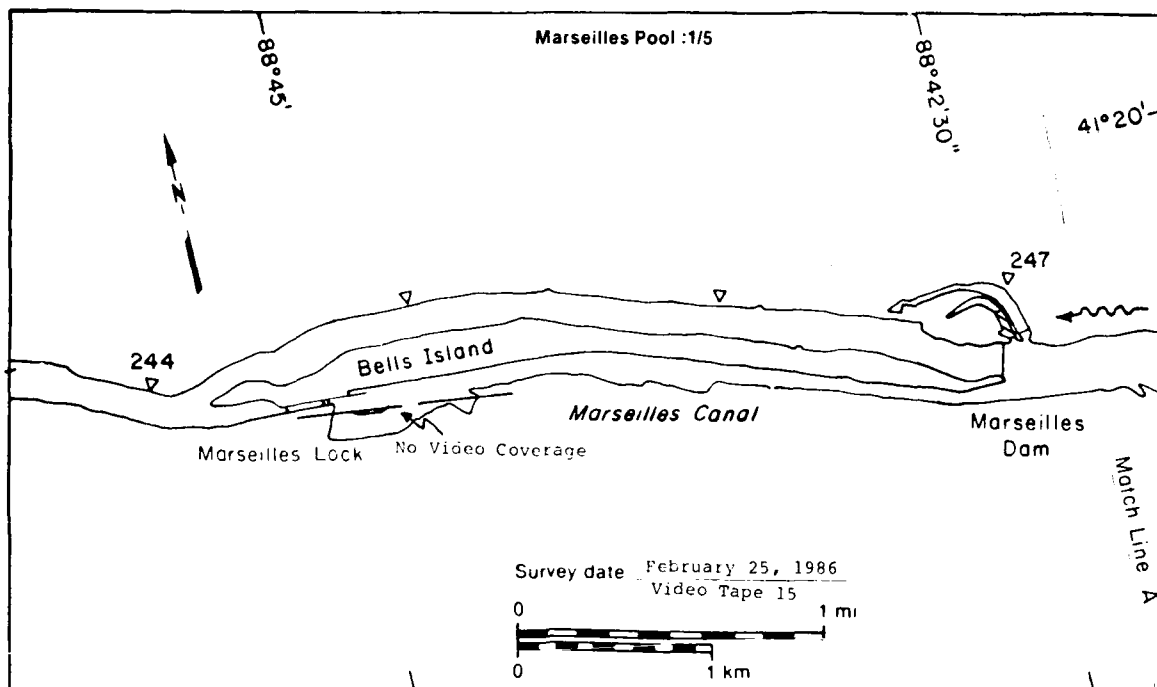
	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

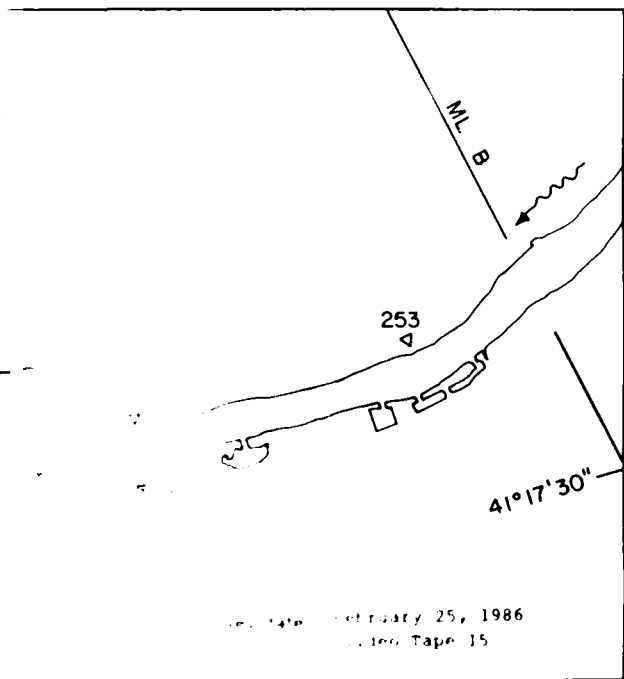
Total area ($m^2 \times 10^6$)

Area ($m^2 \times 10^6$)	Surface concentration (%)
7.93	NA
0.02	NA
0.00	—
0.00	NA
0.00	—
0.07	30
10.19*	

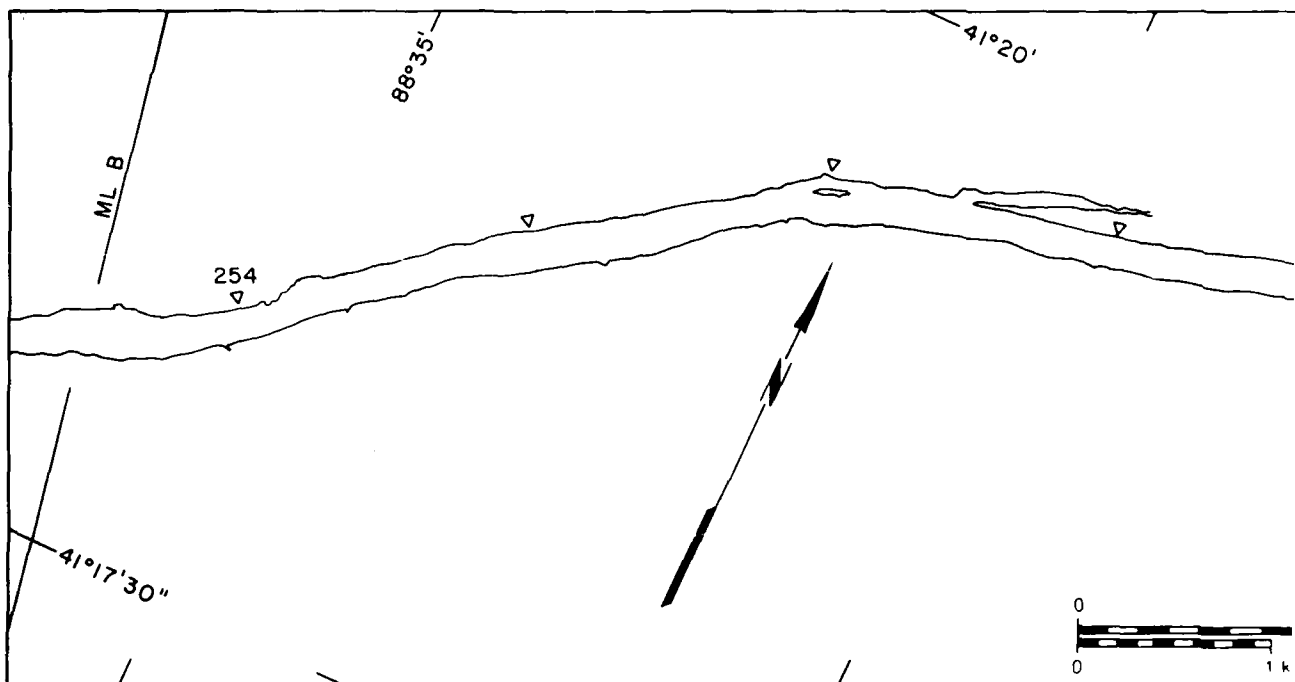
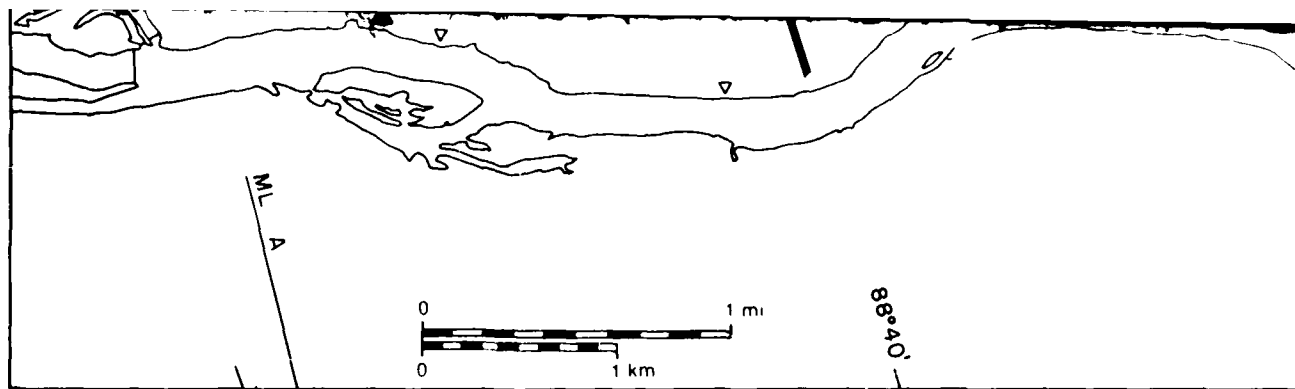
* Includes $2.17 \times 10^6 m^2$
of no video coverage

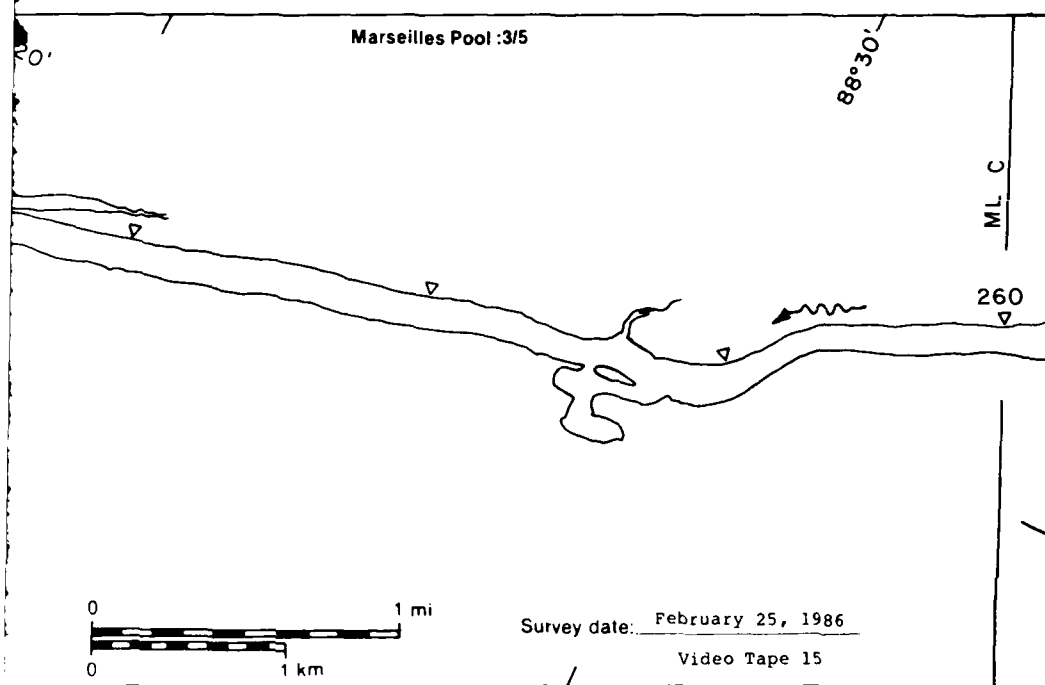
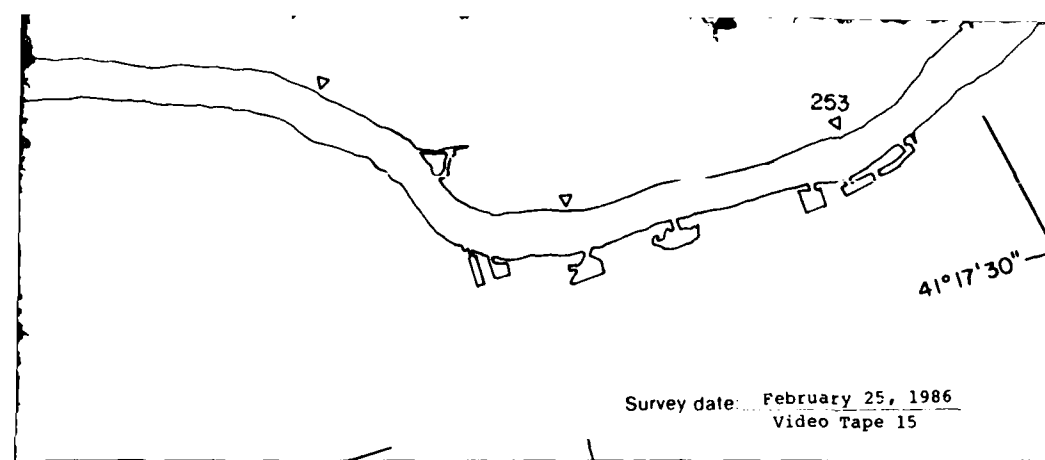
25 February 1986

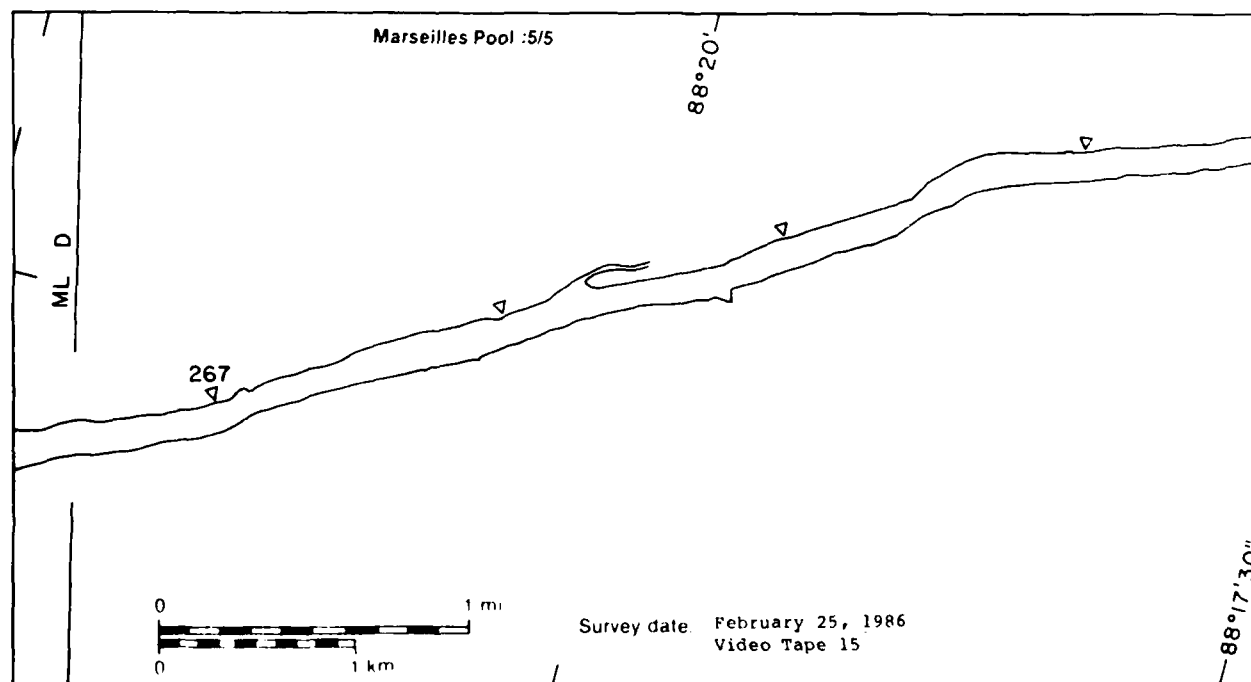
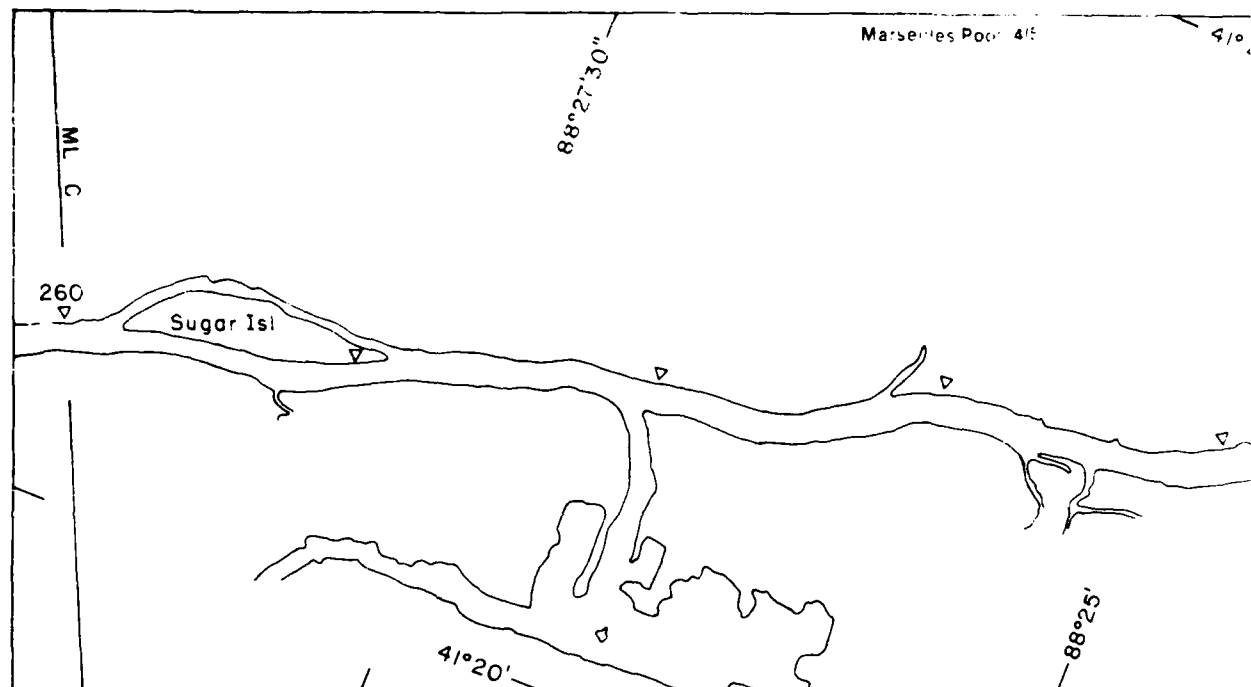




74°30'







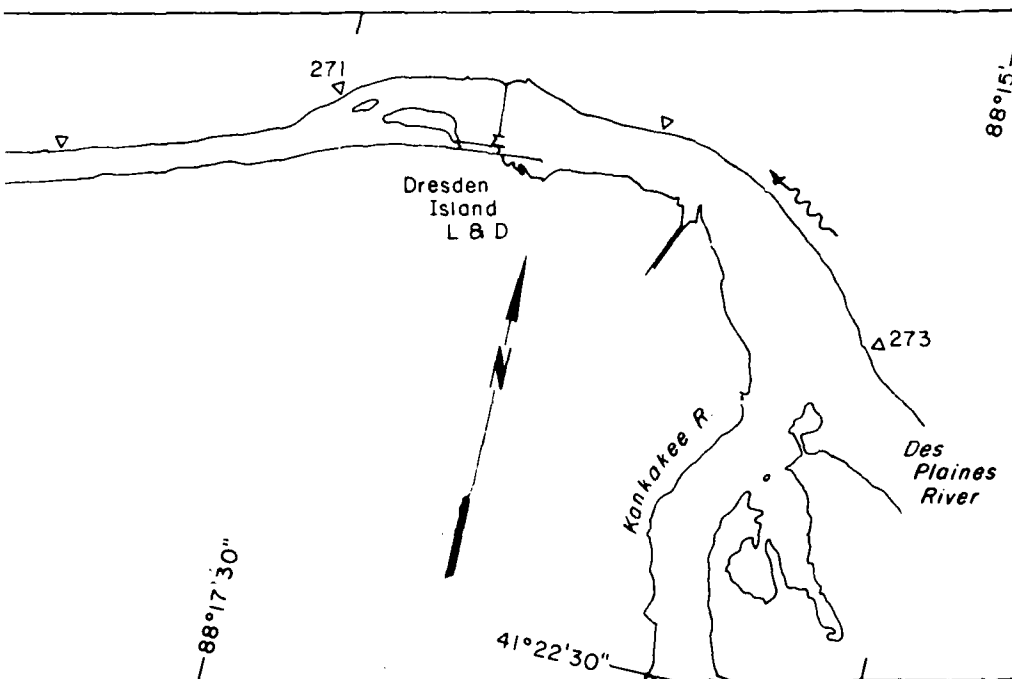
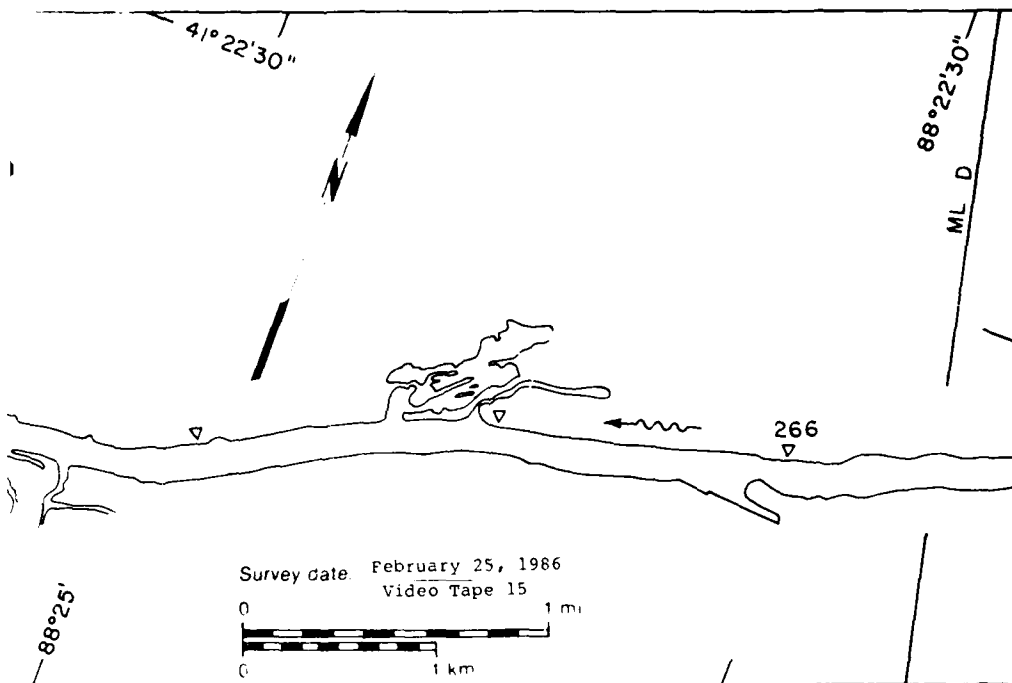
Marseilles Pool

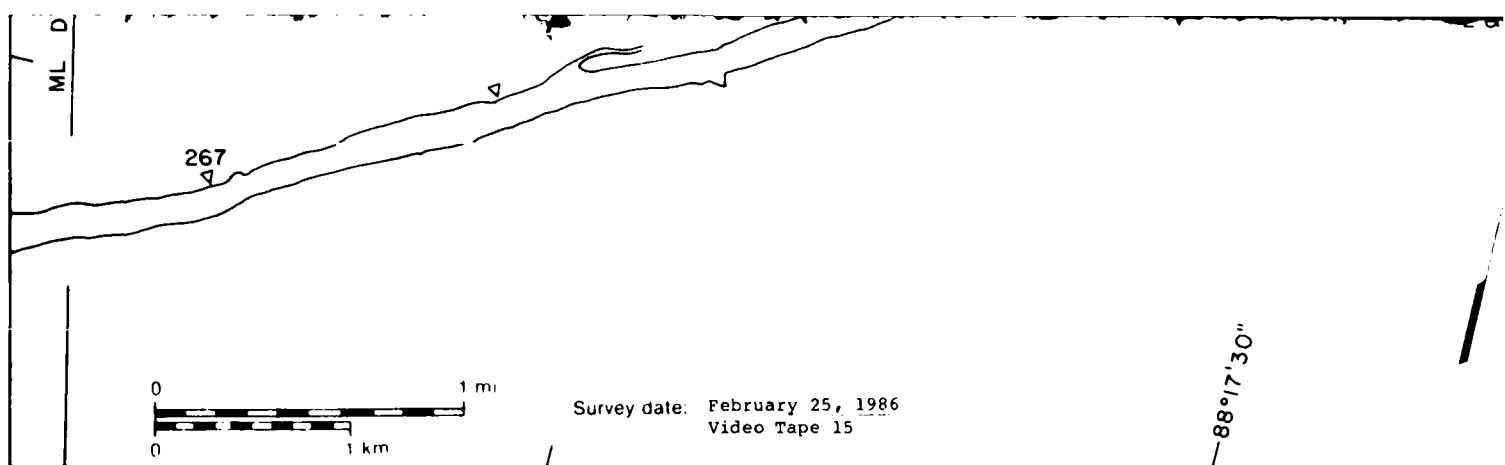
MAP UNITS

Area
(m² x 10⁶)

Surface
concentration
(%)

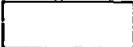




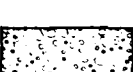
25 February 1986





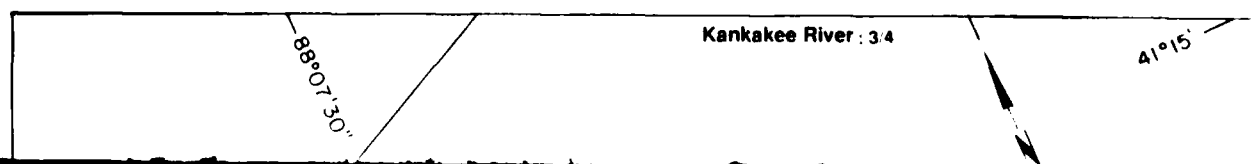
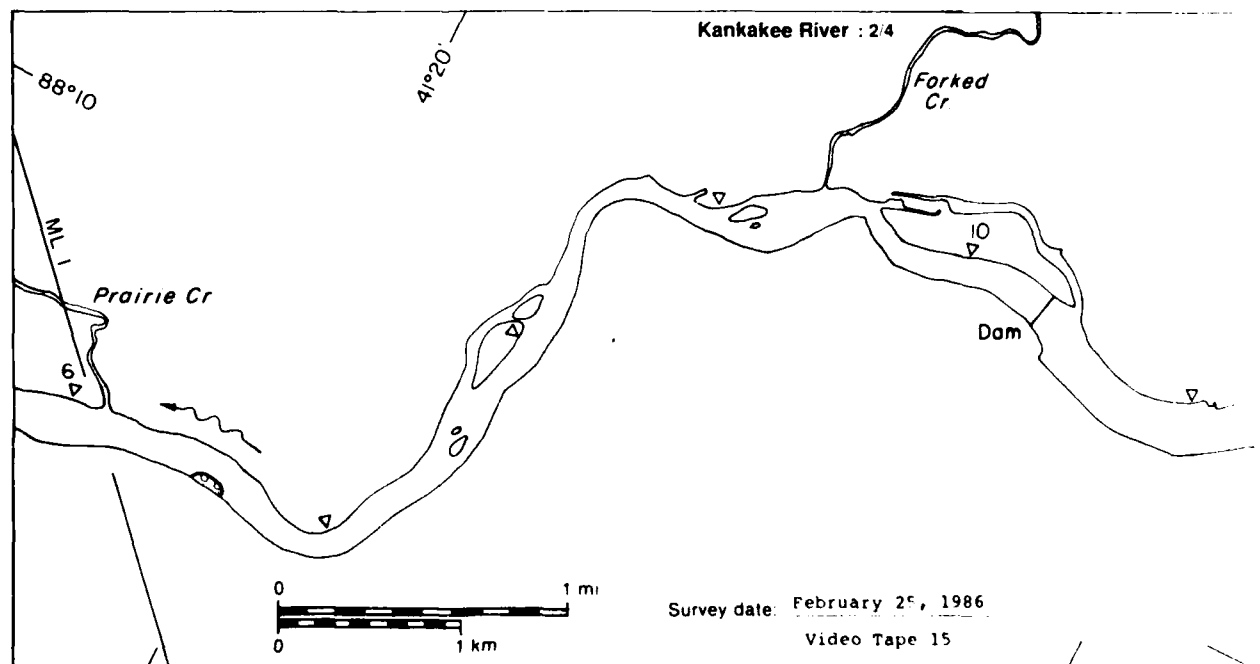
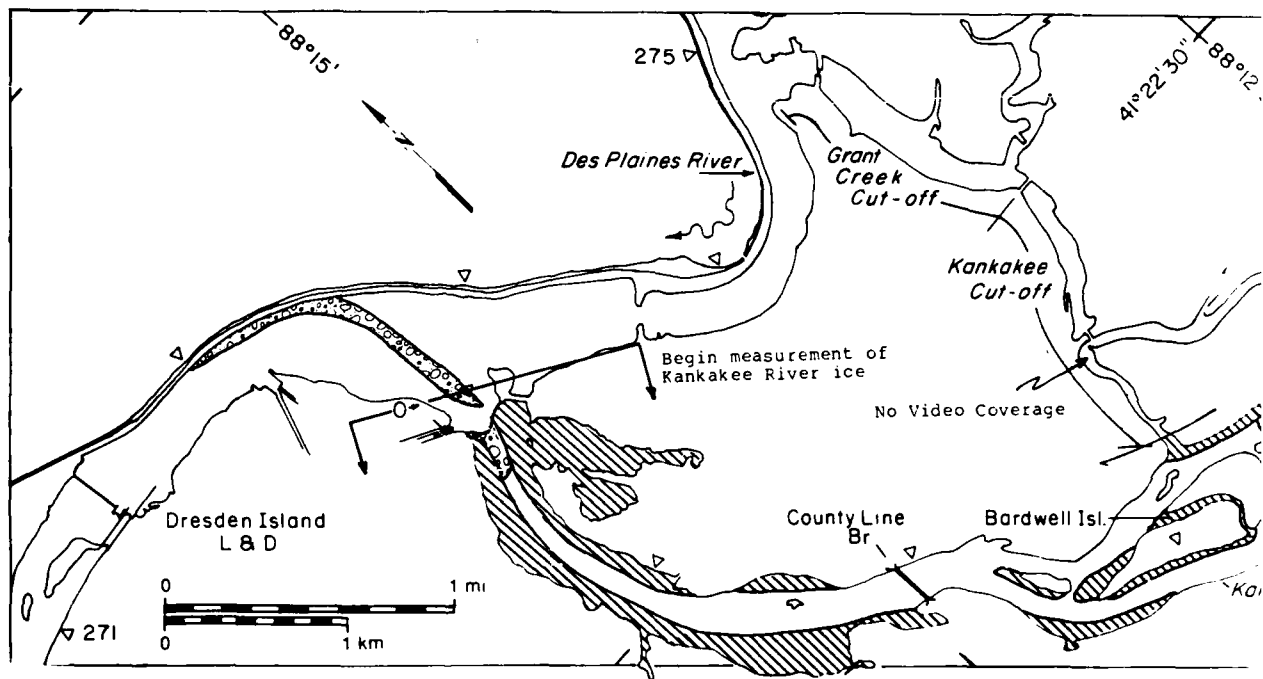
Marseilles Pool

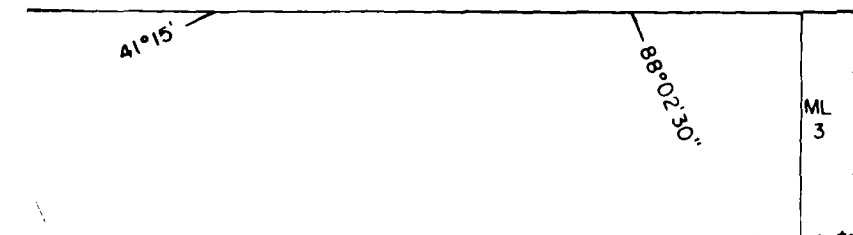
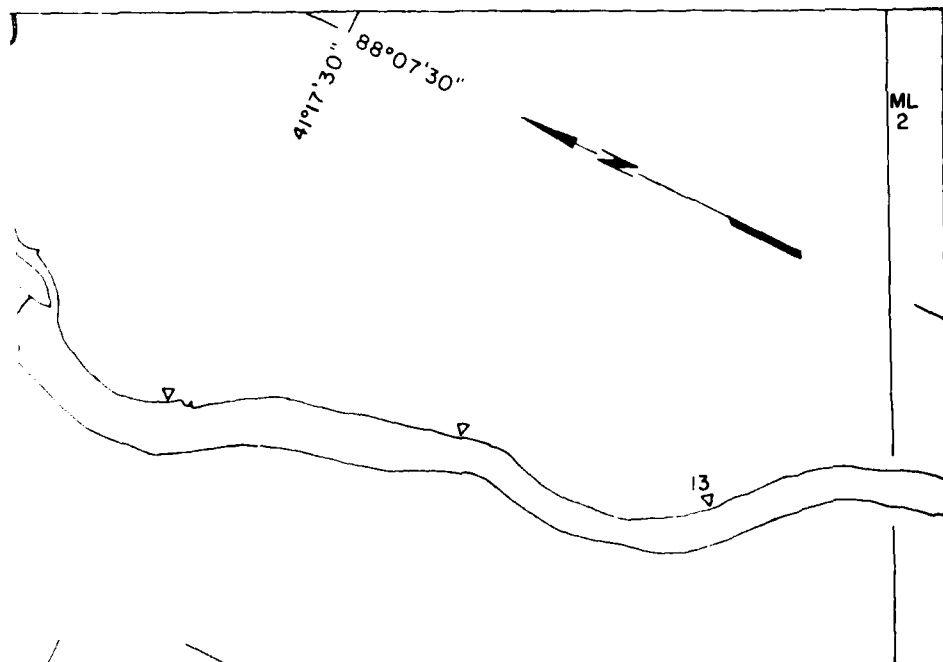
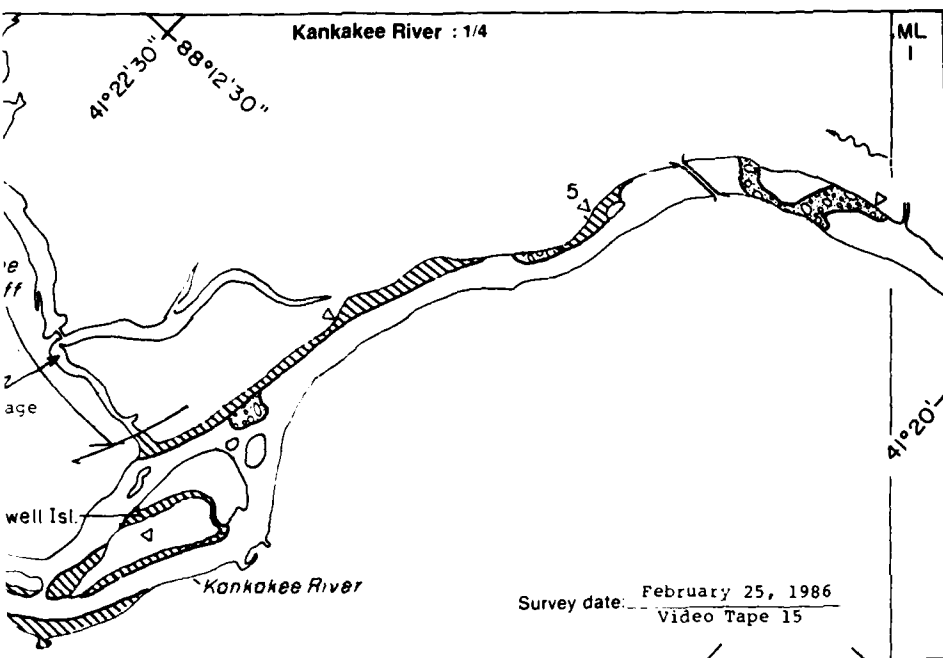
MAP UNITS

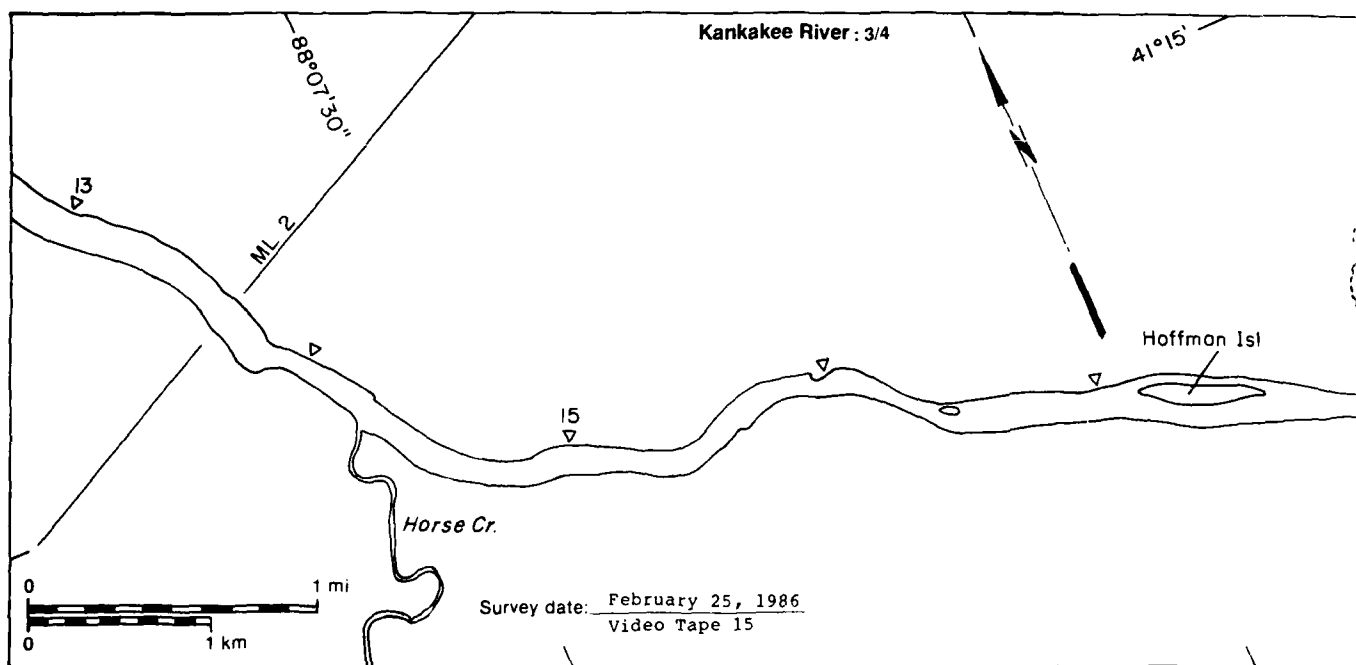
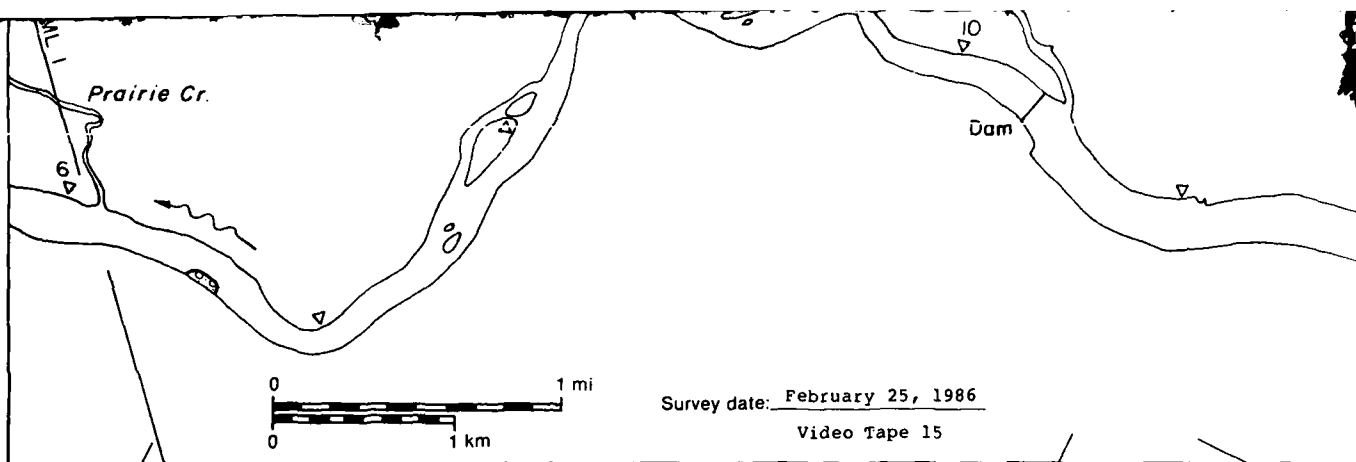
	Open water	8.10	NA
	Solid ice cover	Trace	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)		8.19*	

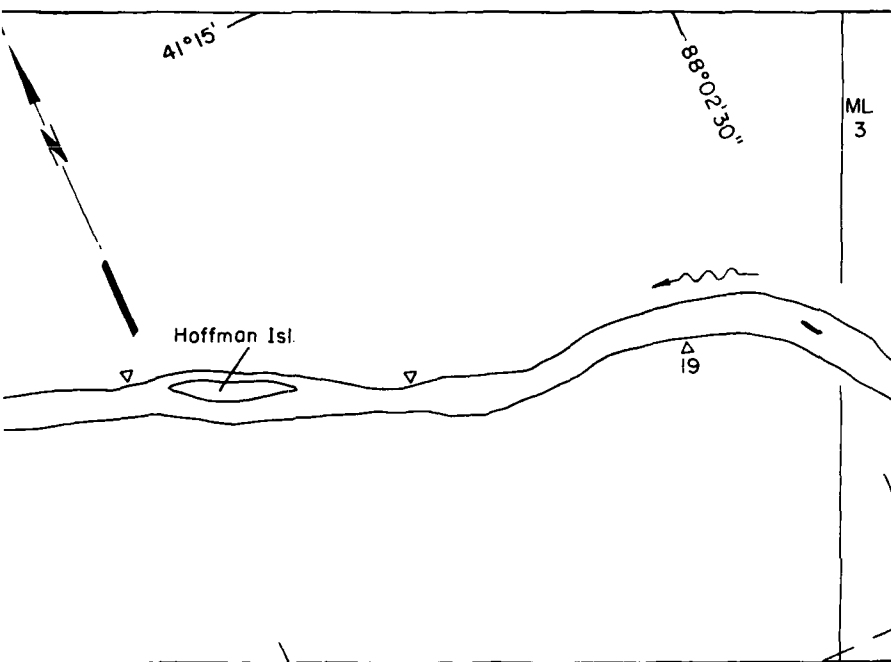
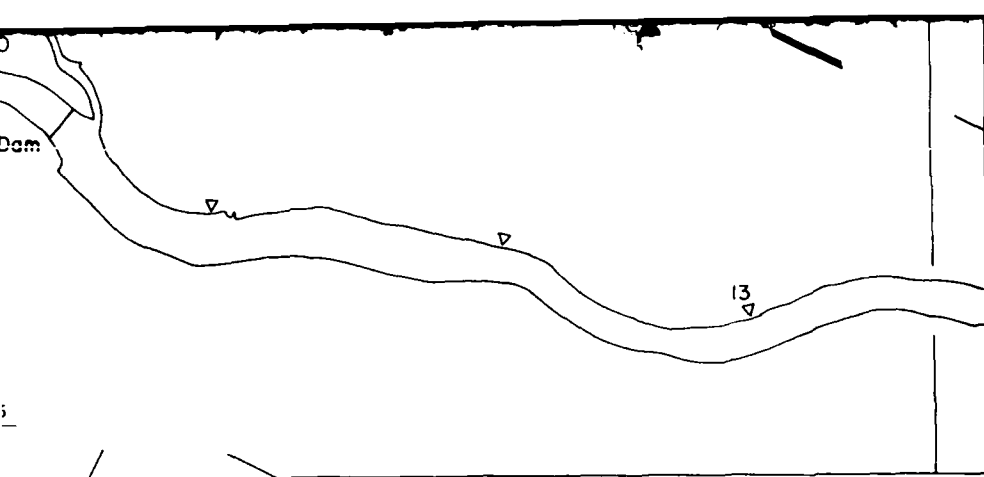
* Includes $0.09 \times 10^6 m^2$
of no video coverage

25 February 1986









25 February 1986

Free River

UNITS

Open water

Thin ice cover

Thin ice cover with
open-water areas

Segmented ice cover

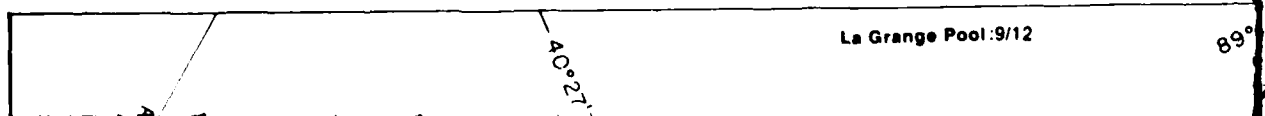
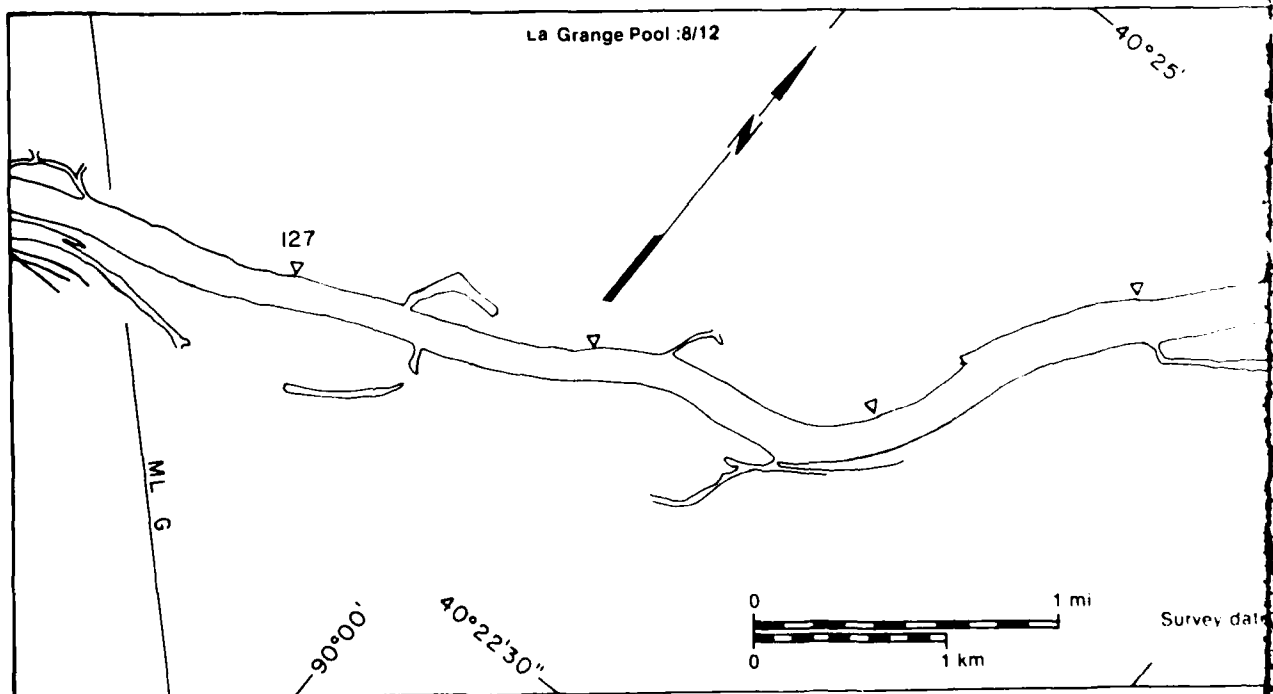
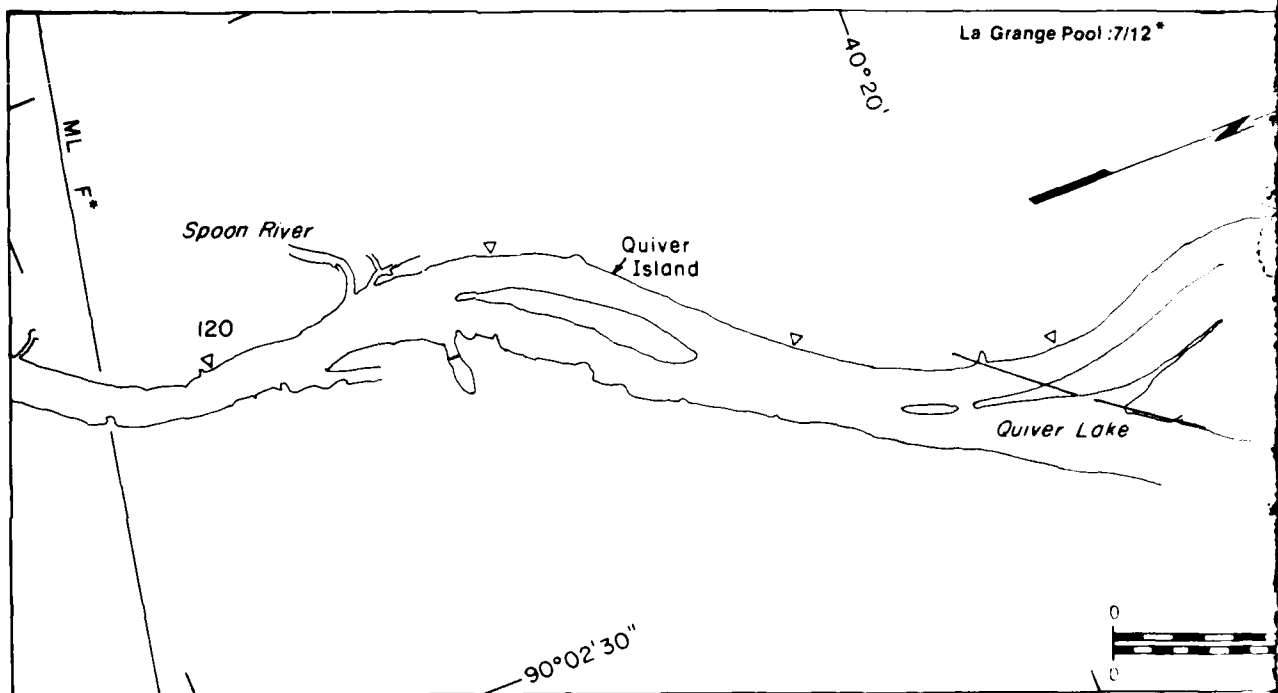
Segmented ice cover
open-water areas

Floes or frazil slush
pans

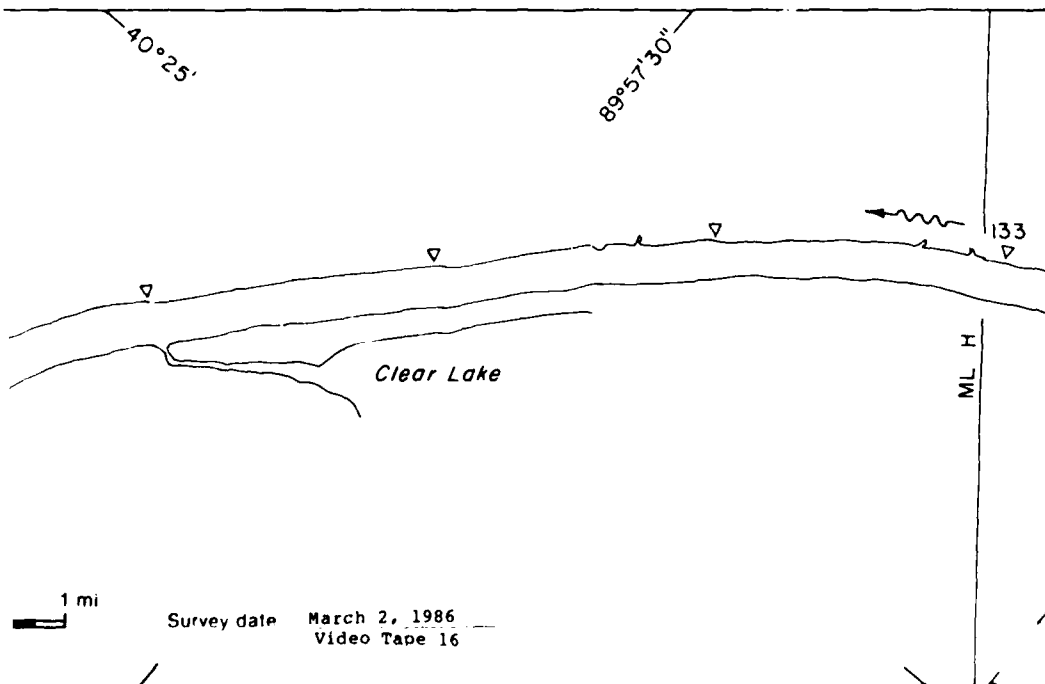
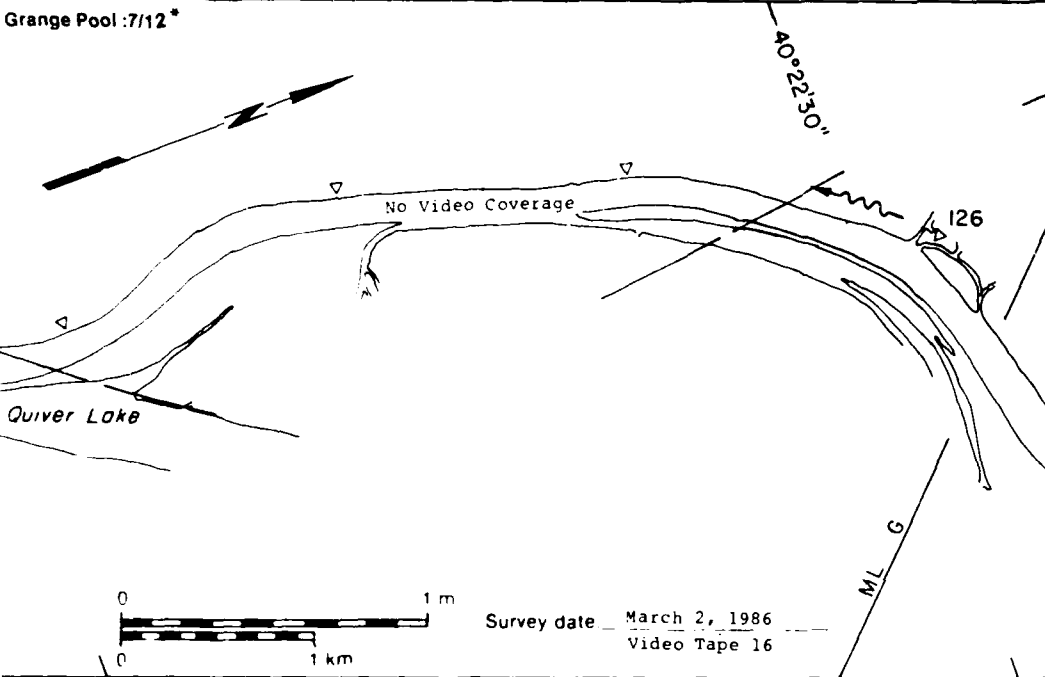
Total area ($m^2 \times 10^6$)

Area ($m^2 \times 10^6$)	Surface concentration (%)
5.85	NA
1.23	NA
0.00	—
0.00	NA
0.00	—
0.15	1
7.30*	

* Includes $0.07 \times 10^6 m^2$
of no video coverage



2 March 1986



AD- A191 863

ICE ATLAS 1985 - 1986 MONONGAHELA RIVER ALLEGHENY RIVER 13/14

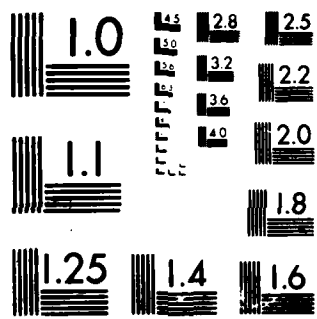
ONTO RIVER ILLINO. (U) COLD REGIONS RESEARCH AND

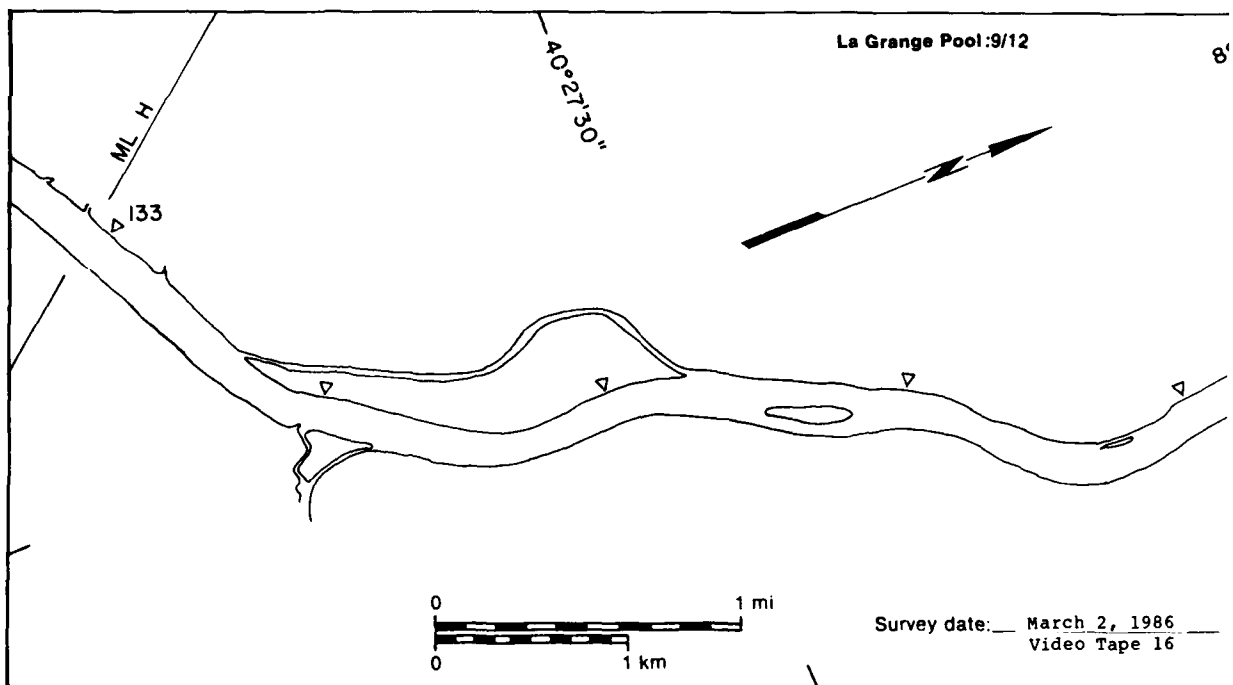
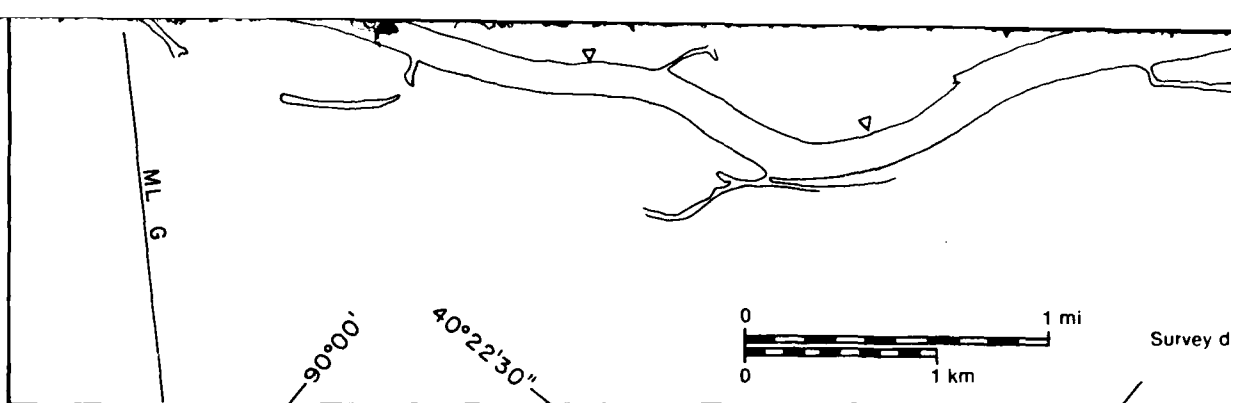
ENGINEERING LAB HANOVER NH L W GATTO ET AL. NOV 87

UNCLASSIFIED CRREL-SP-87-29

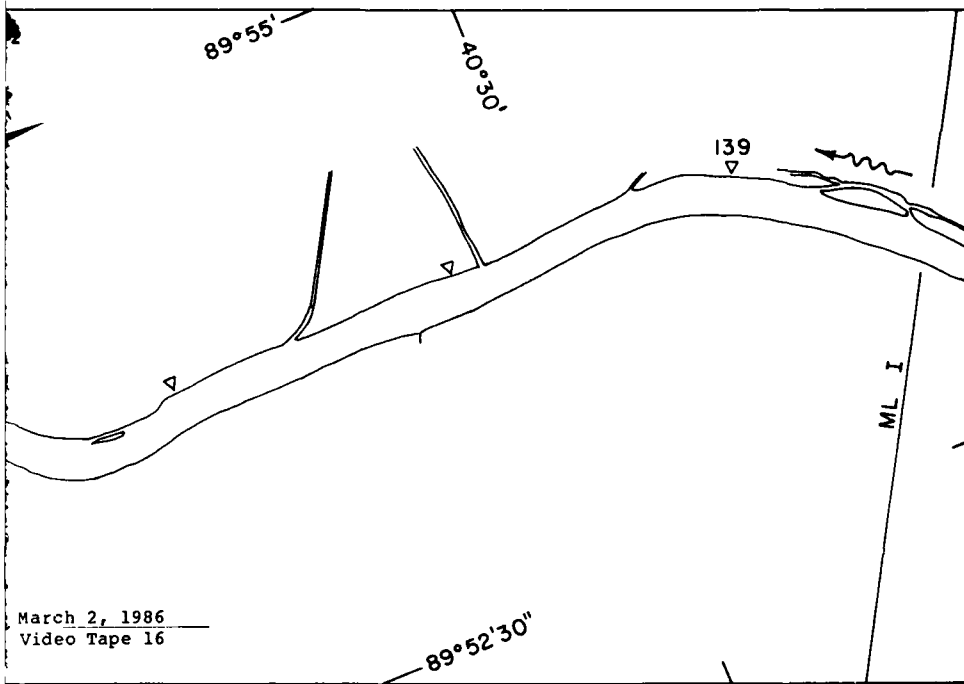
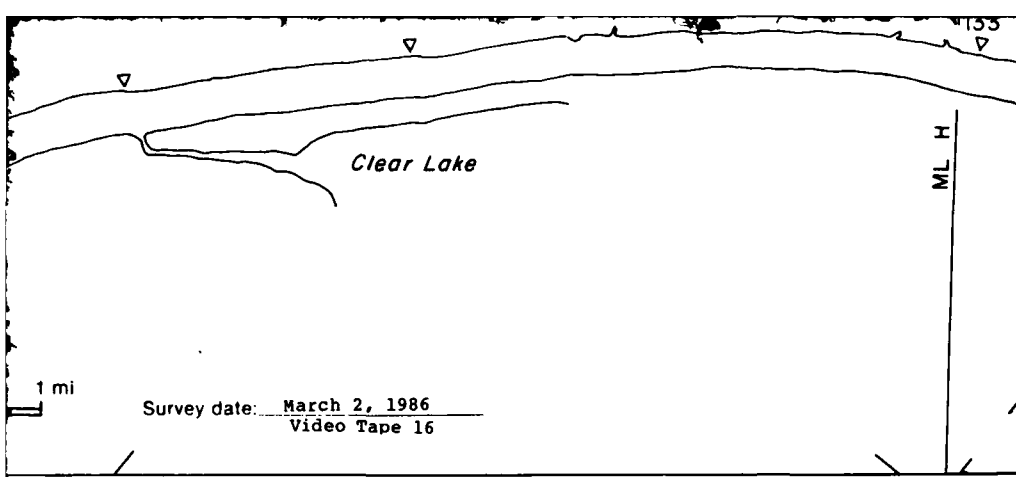
F/G 8/12

NL

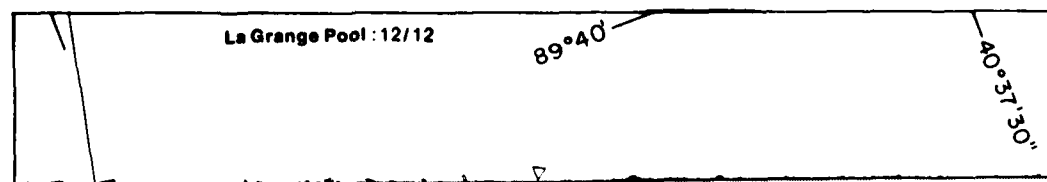
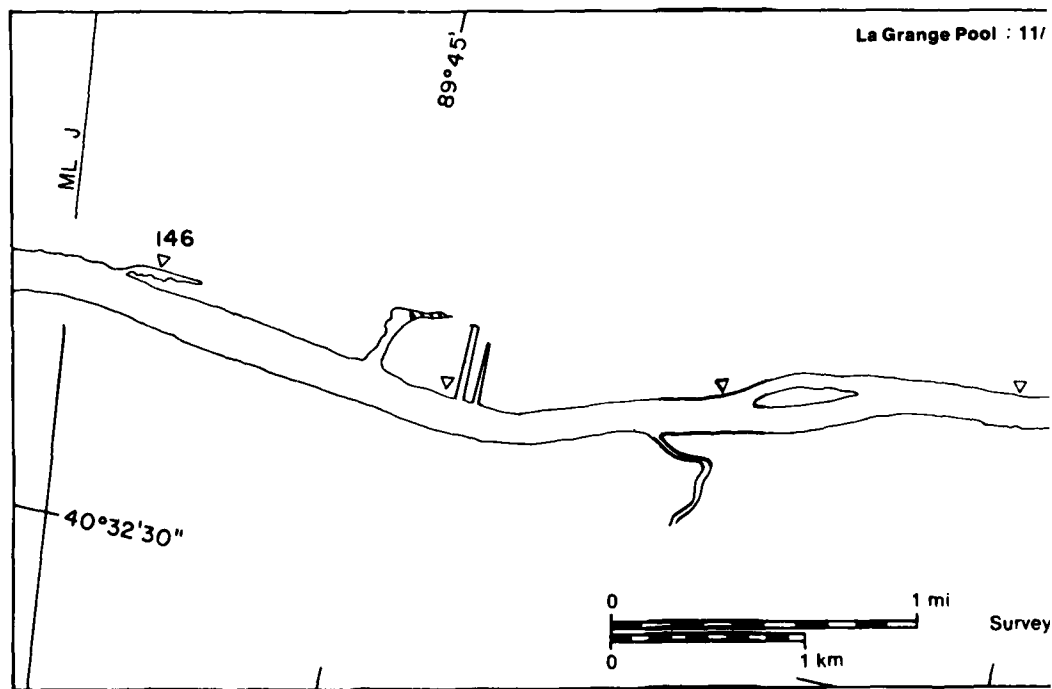
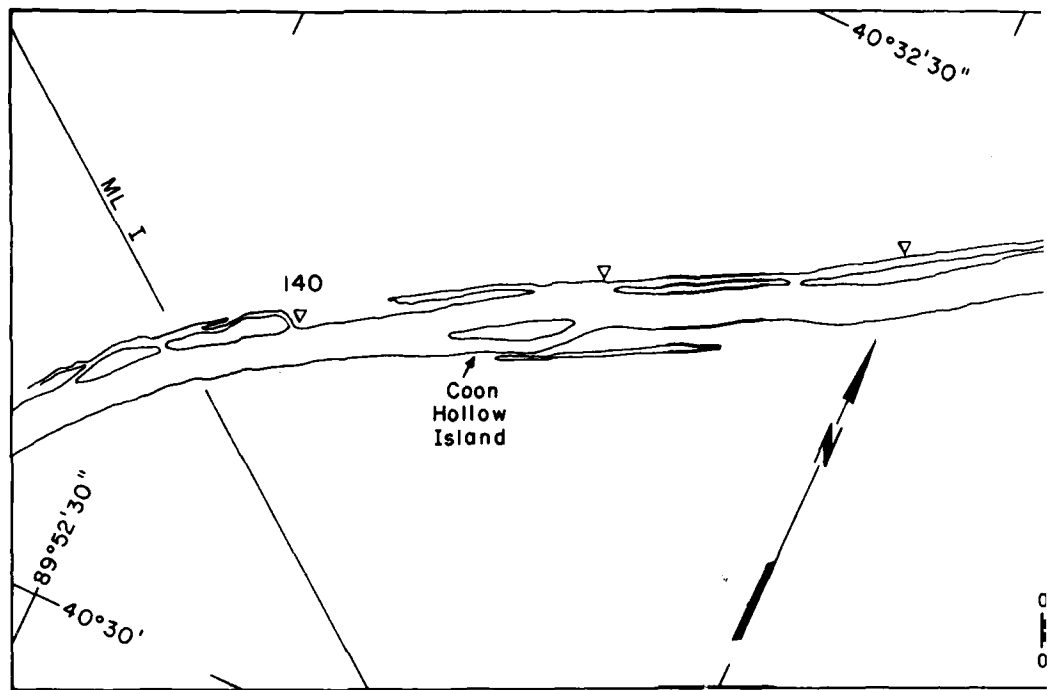




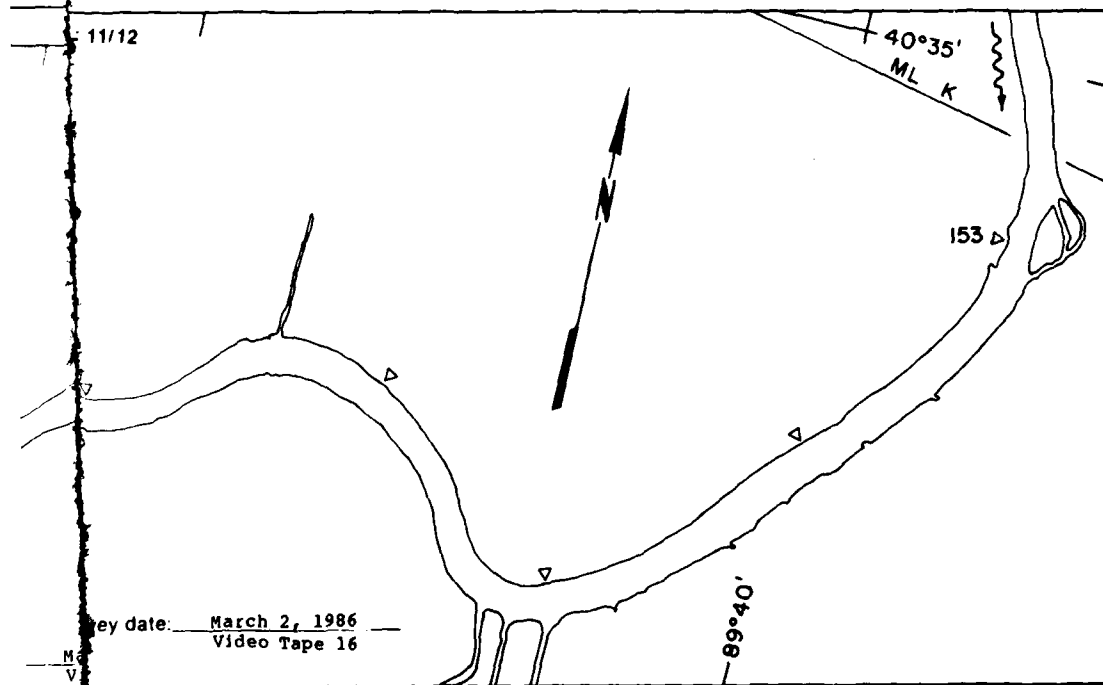
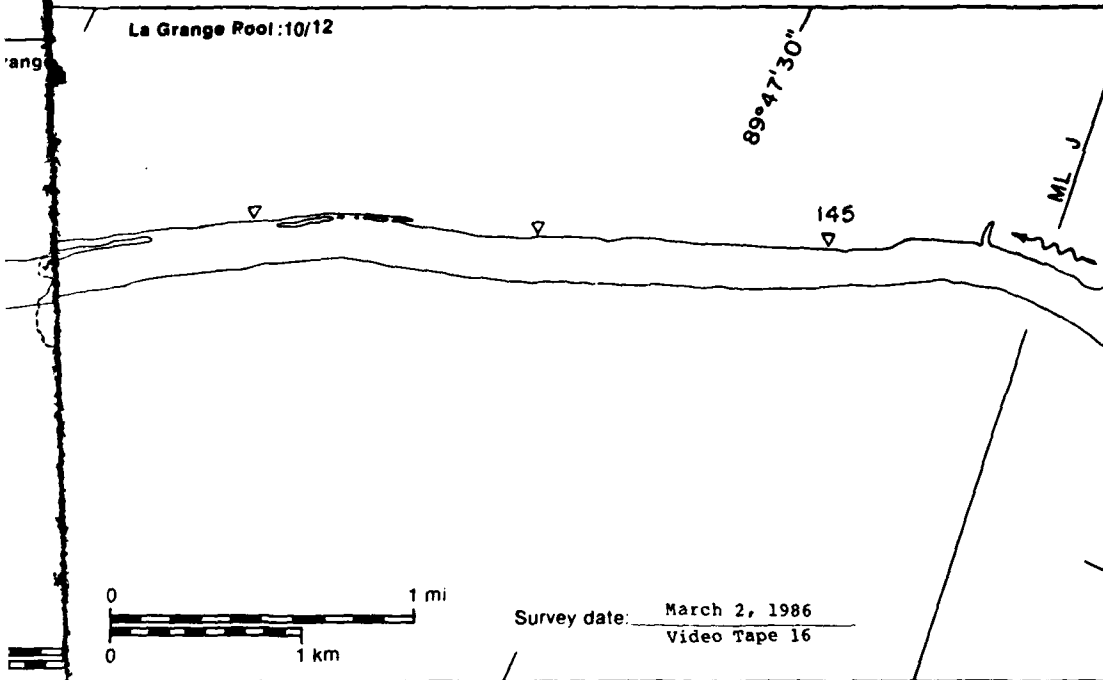
• The downstream limit of Illinois River video coverage was in the vicinity of mile 120 at Havana, Illinois, on all dates. There is no coverage of La Grange Pool maps 1/12 through 6/12 (match lines A through E).



2 March 1986



1



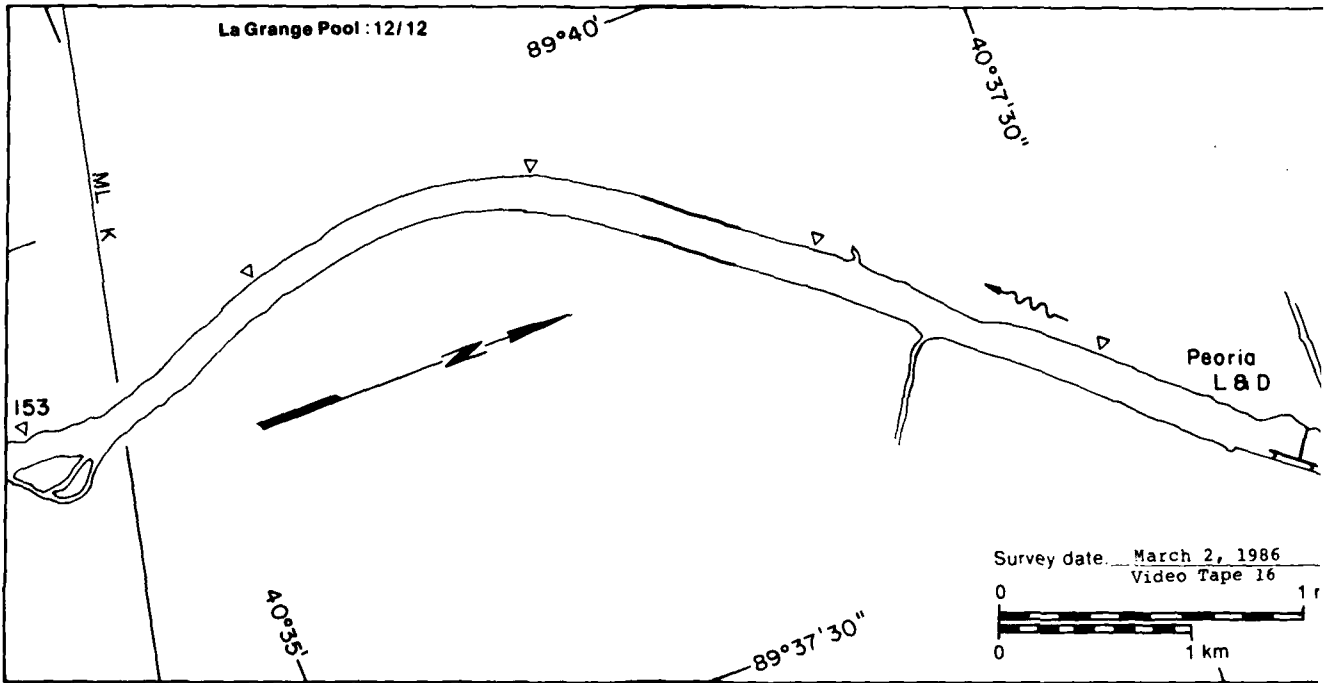
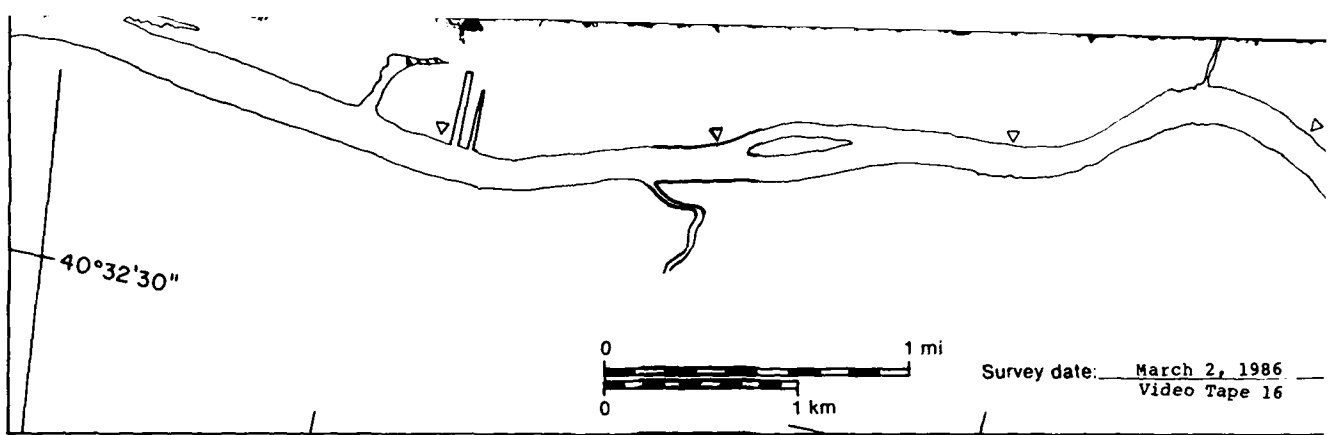
La Grange Pool

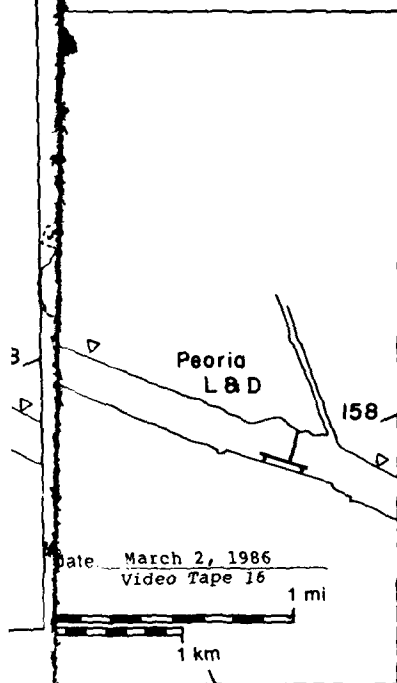
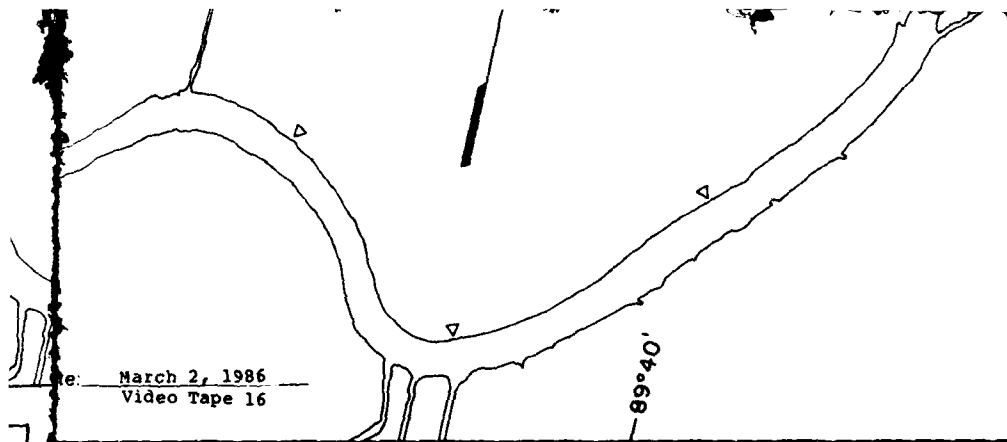
MAP UNITS

Area
(m² x 10⁶)

Surface
concentration
(%)






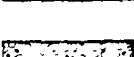
Open water





La Grange Pool

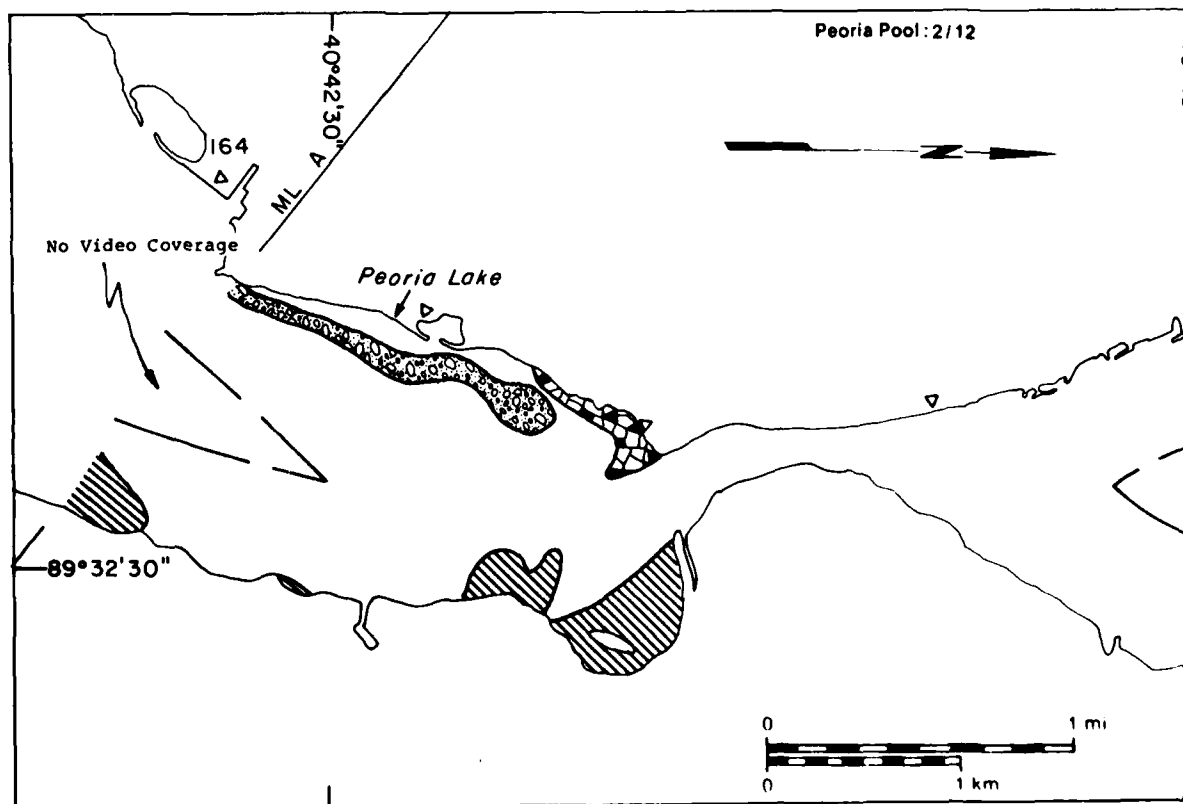
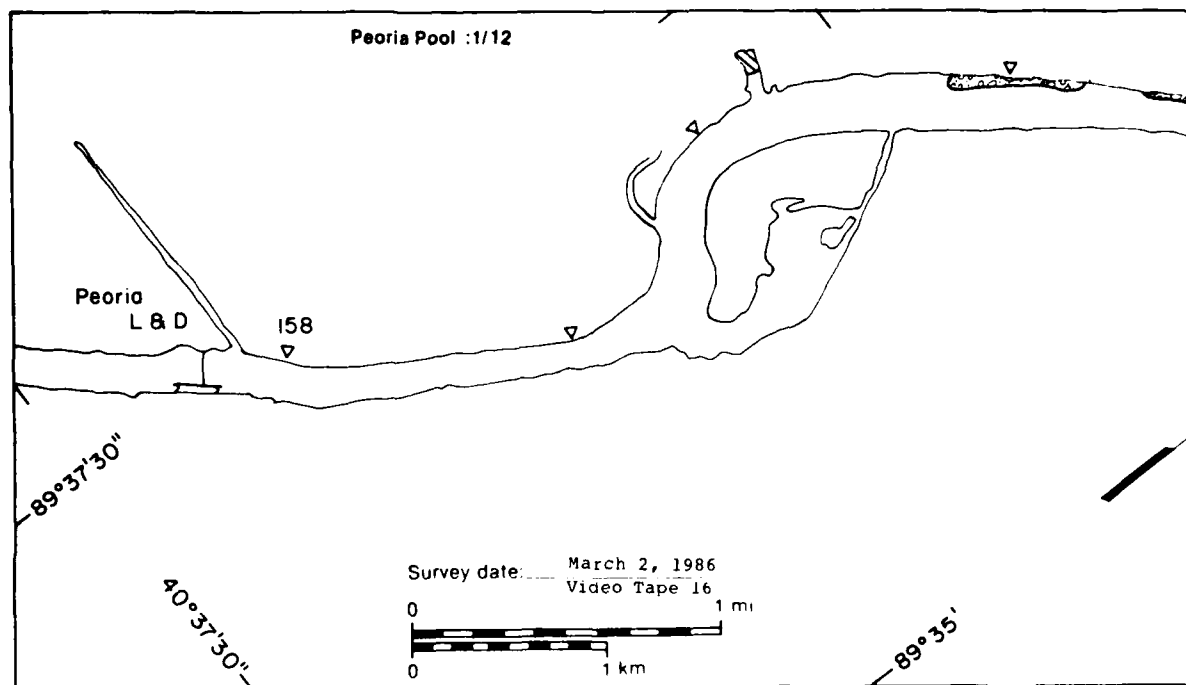
MAP UNITS

	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

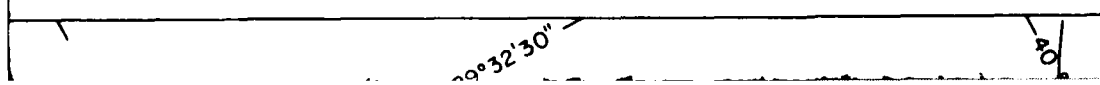
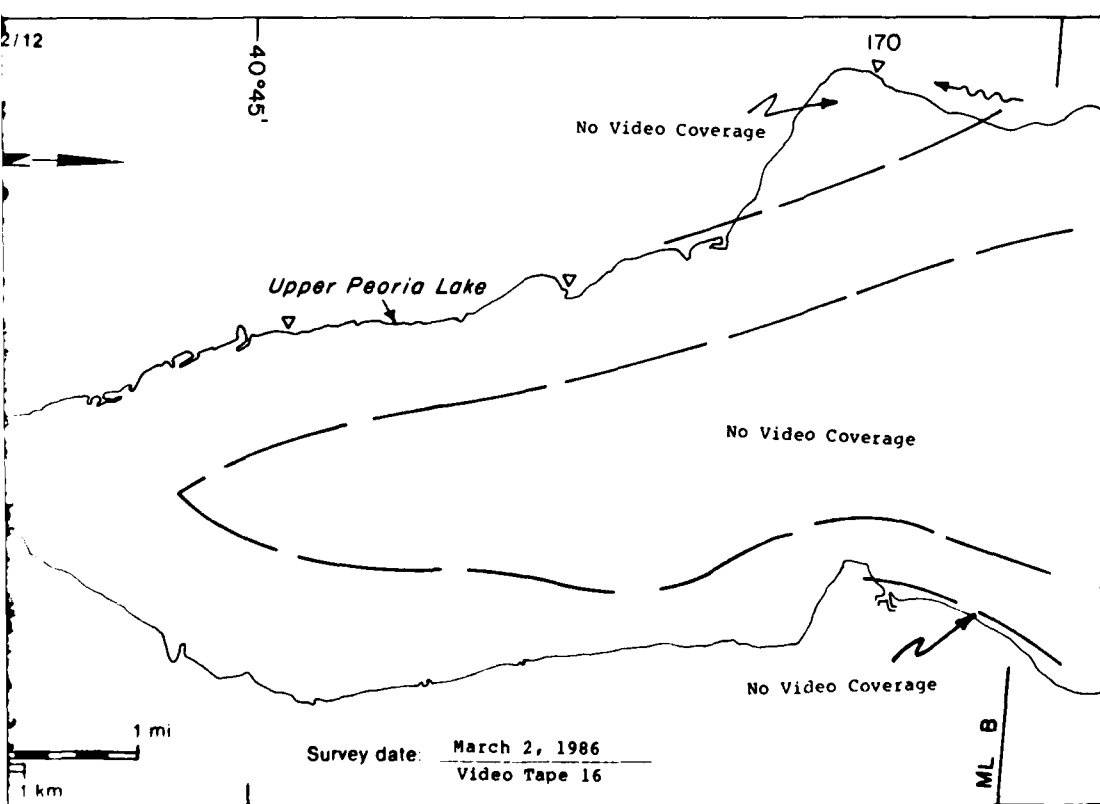
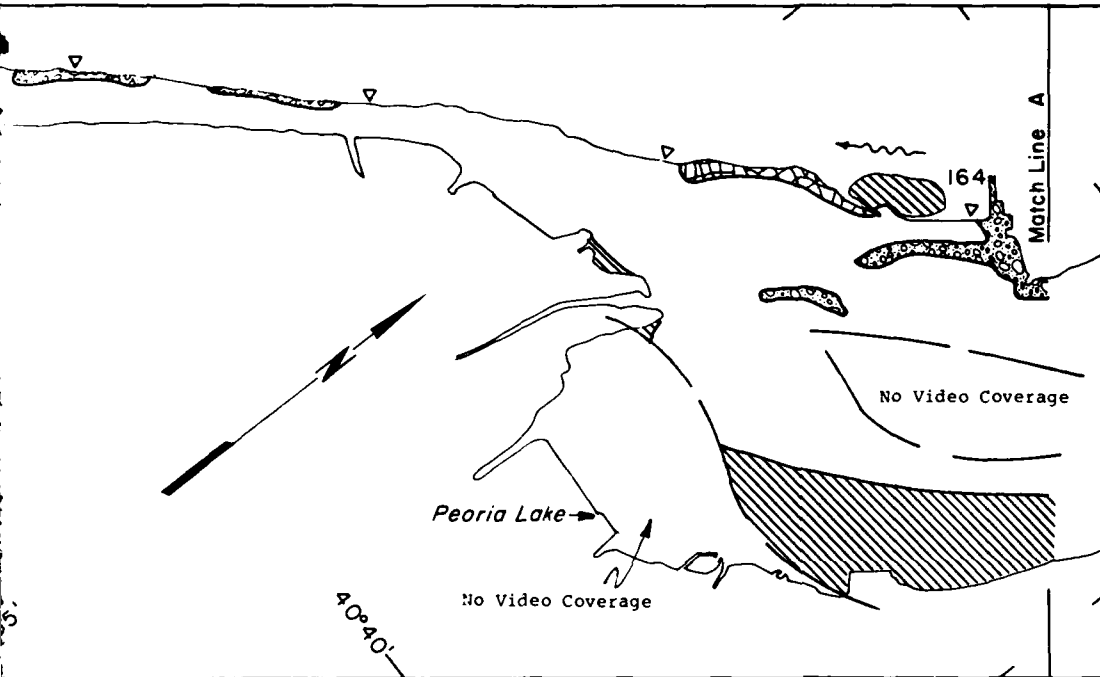
Total area ($m^2 \times 10^6$)

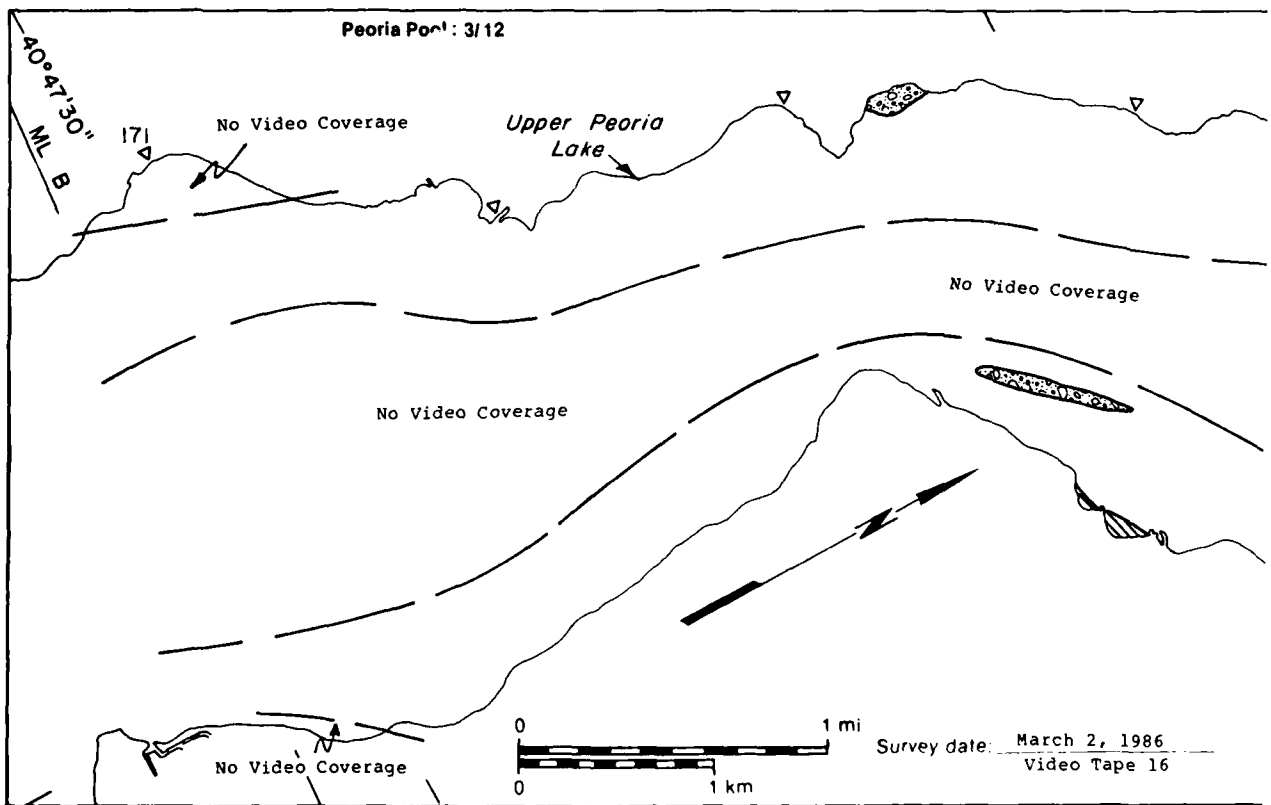
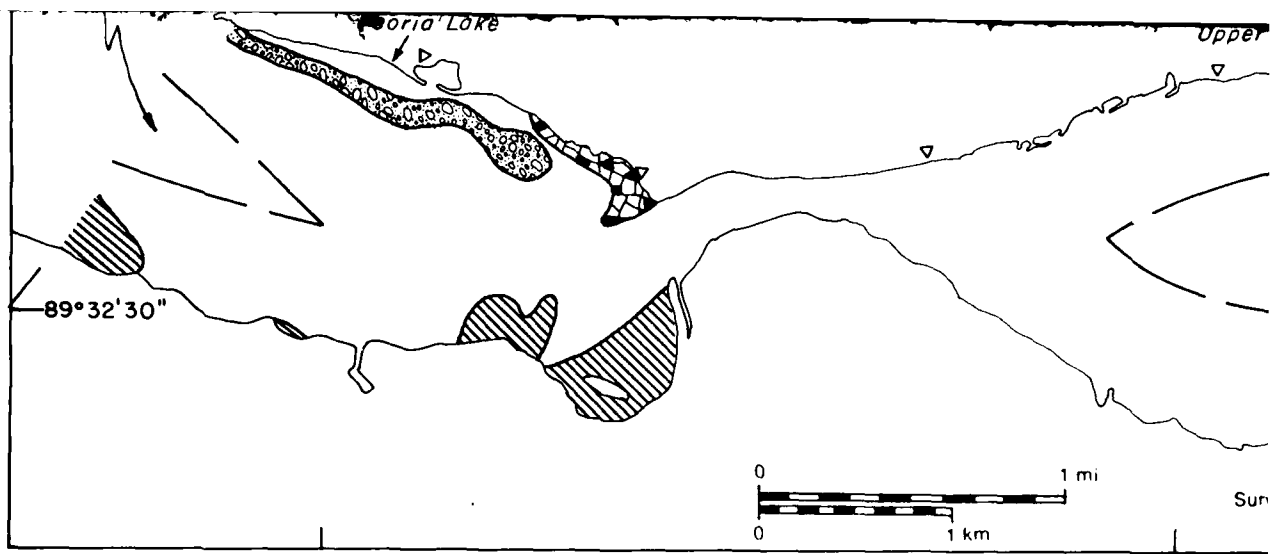
Area ($m^2 \times 10^6$)	Surface concentration (%)
10.81	NA
0.02	NA
0.00	—
0.00	NA
0.00	—
0.00	—
11.71*	

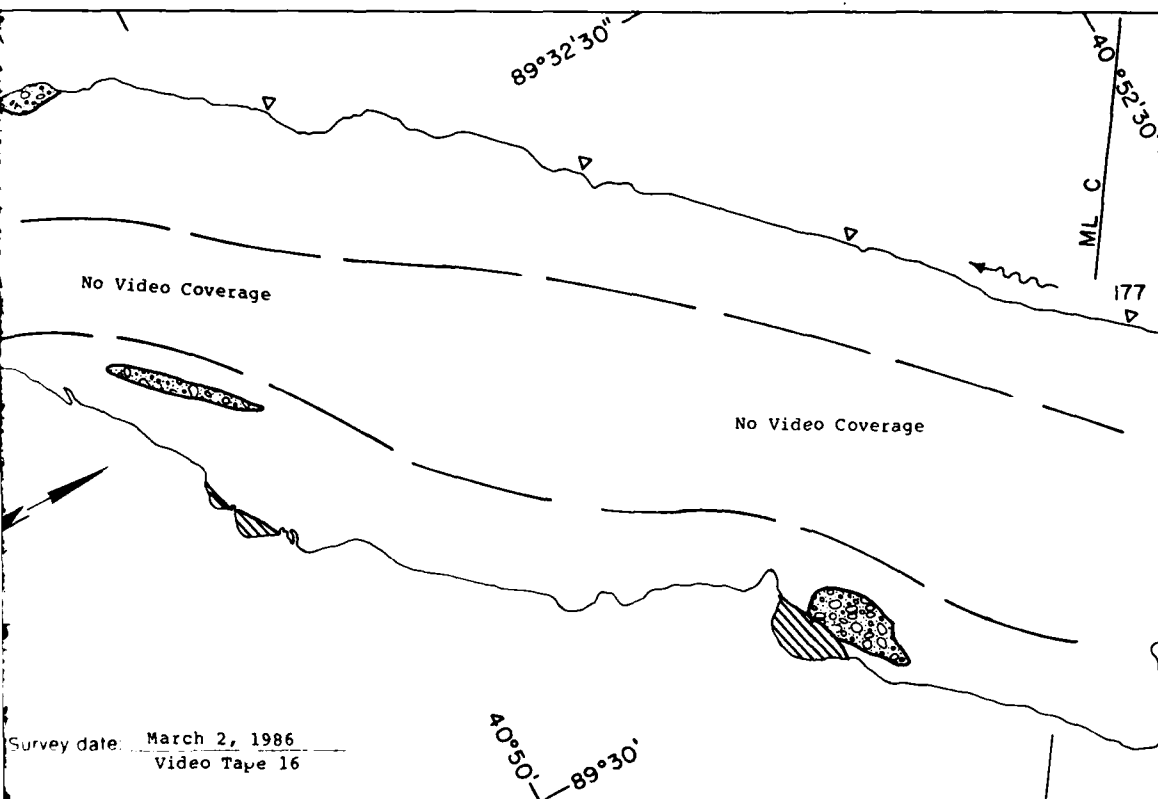
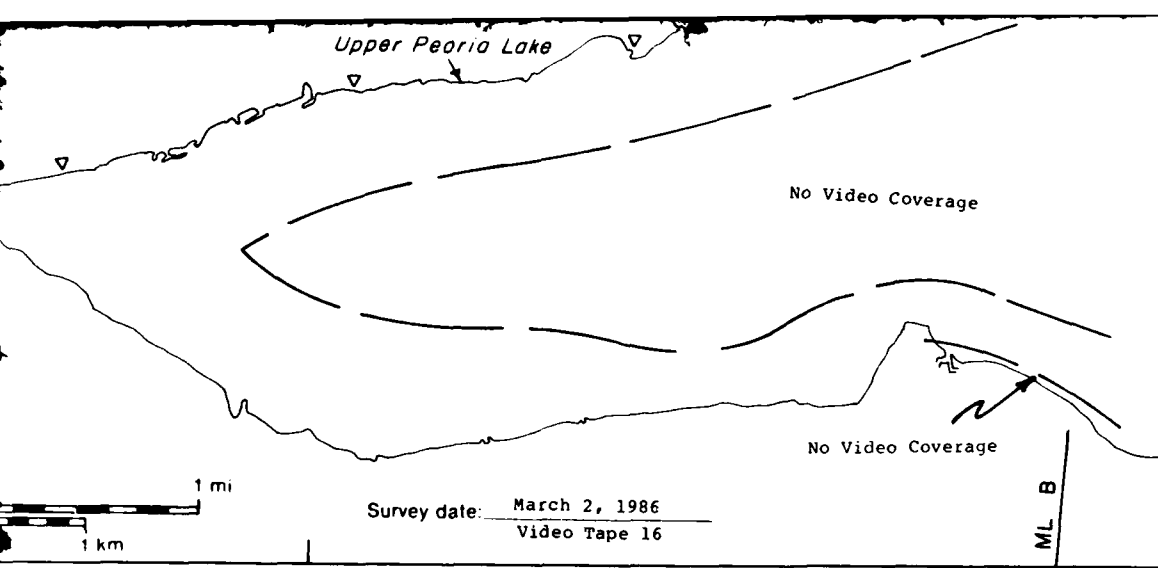
* Includes $0.88 \times 10^6 m^2$
of no video coverage



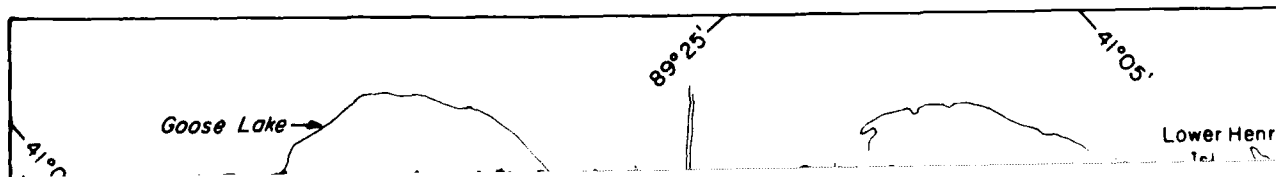
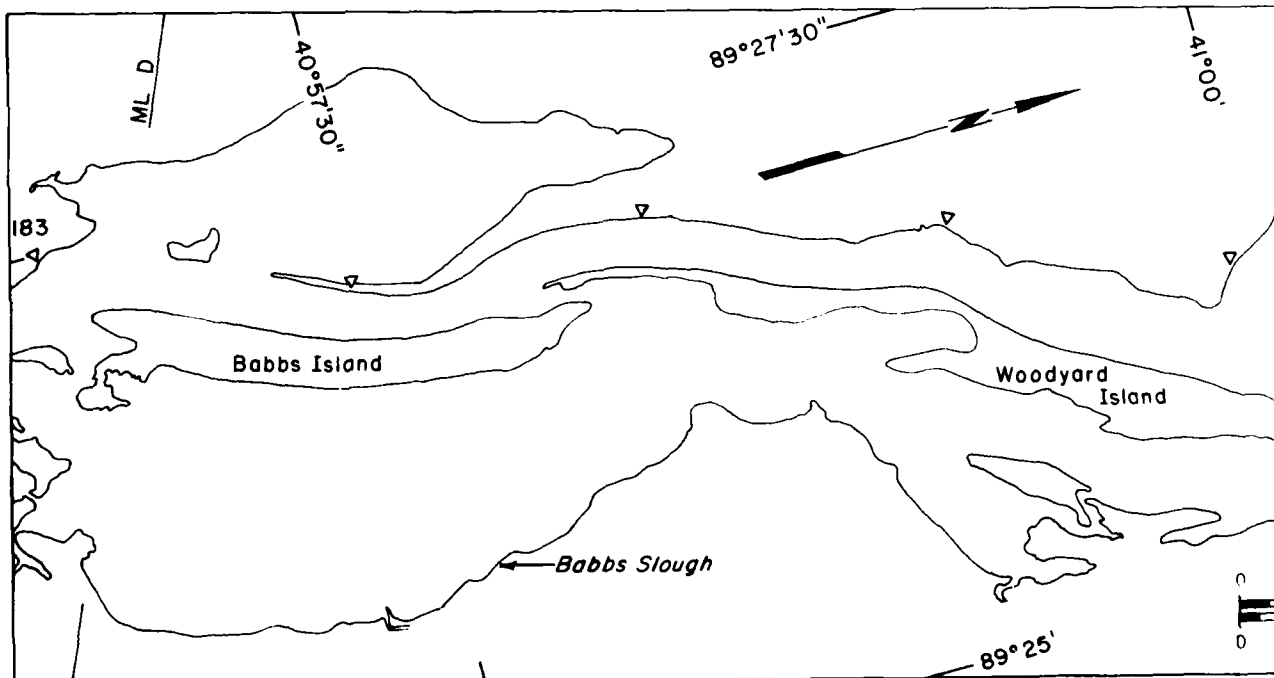
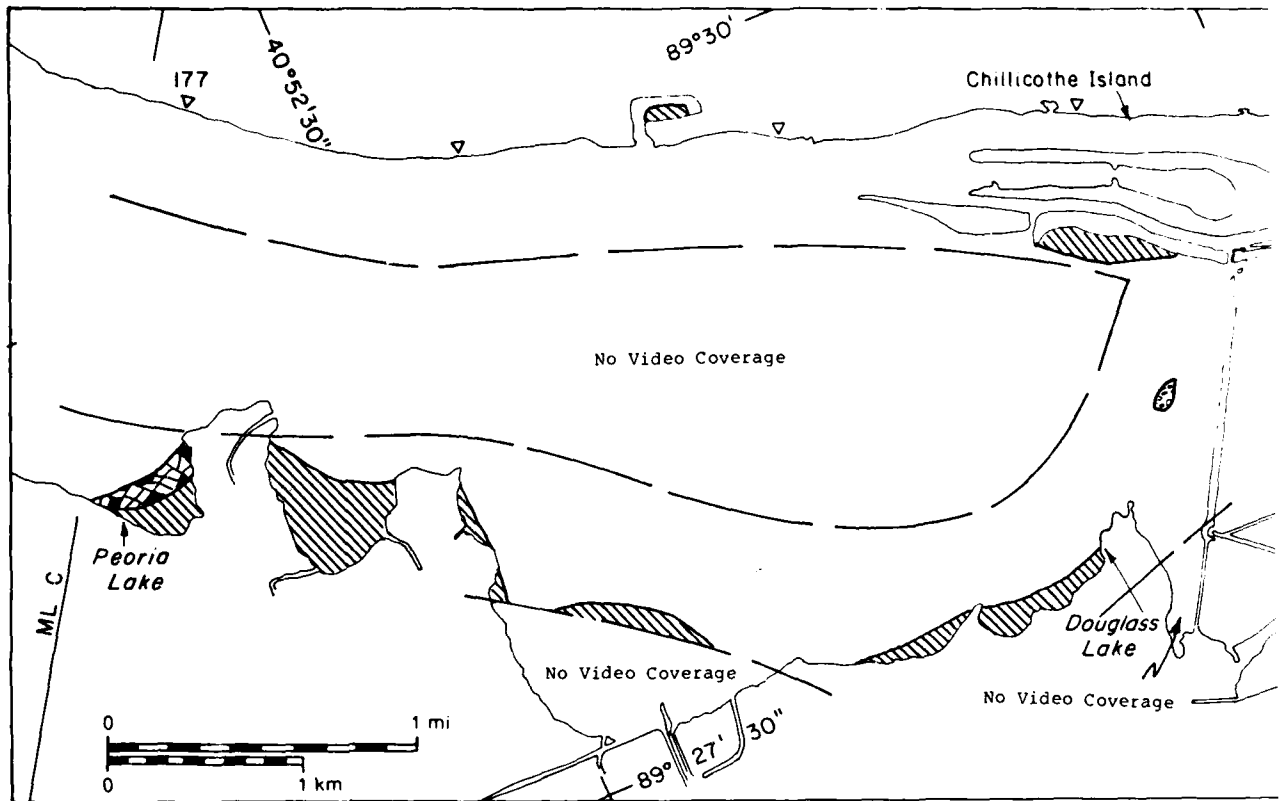
2 March 1986

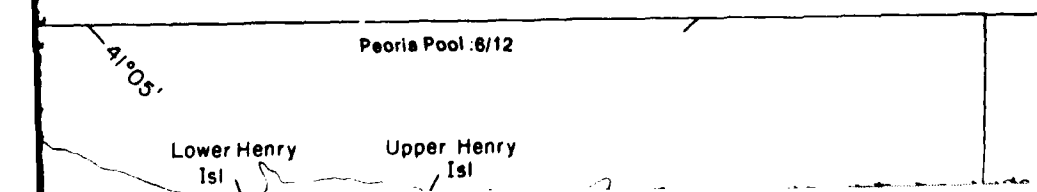
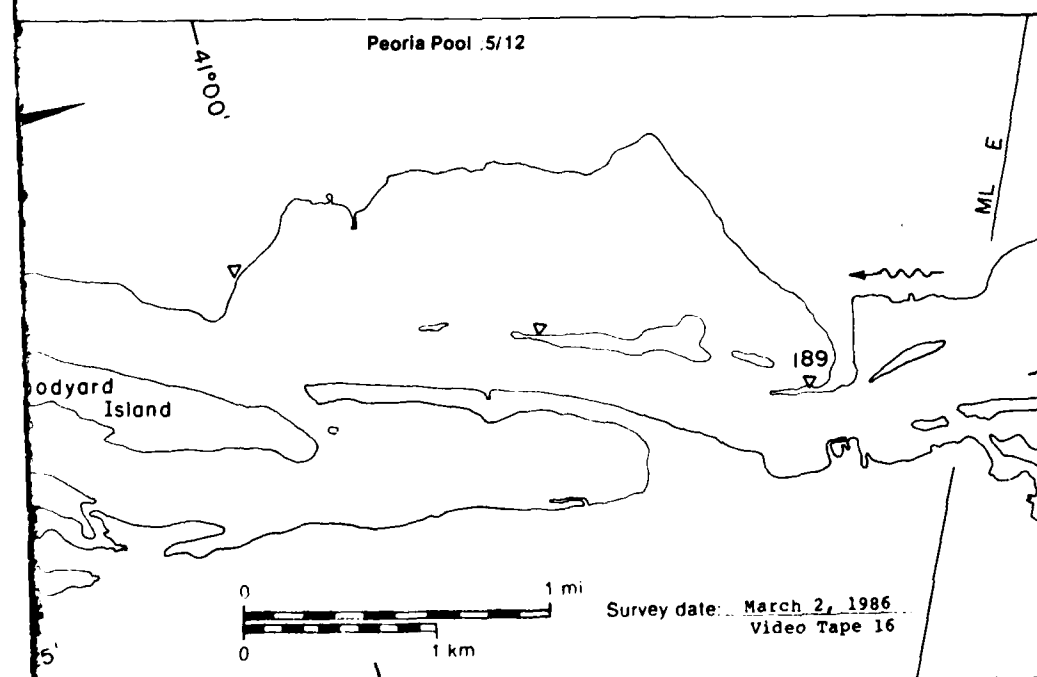
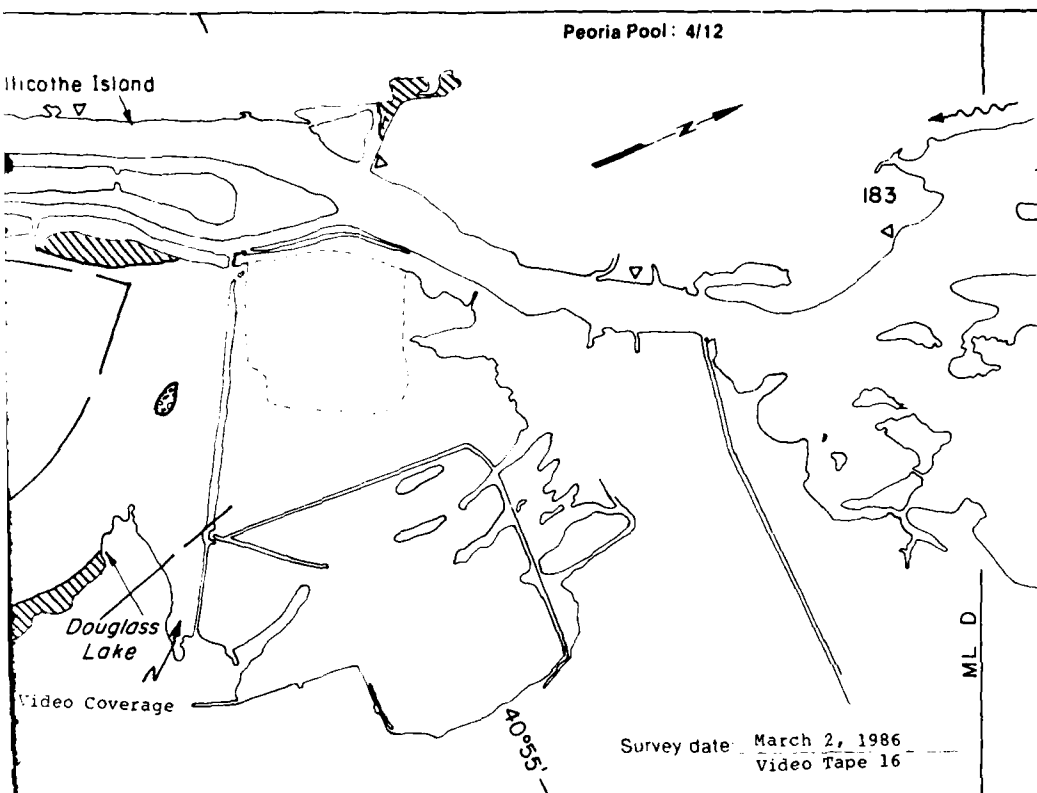


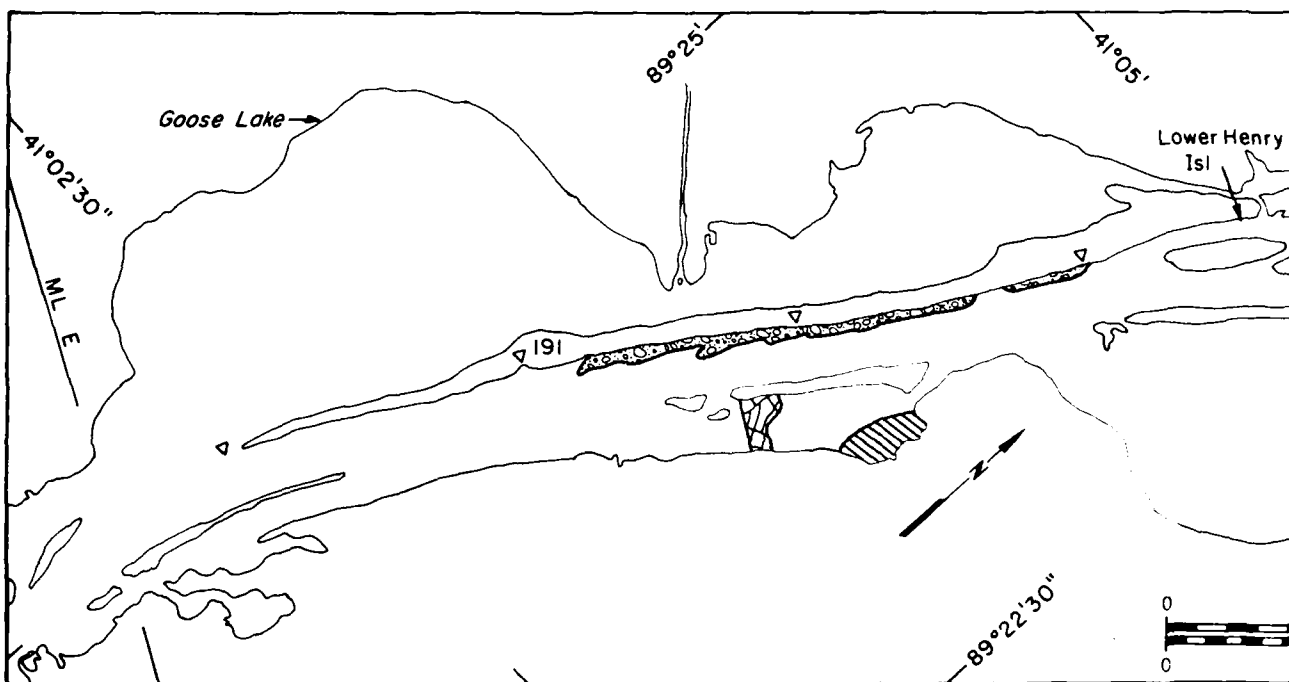
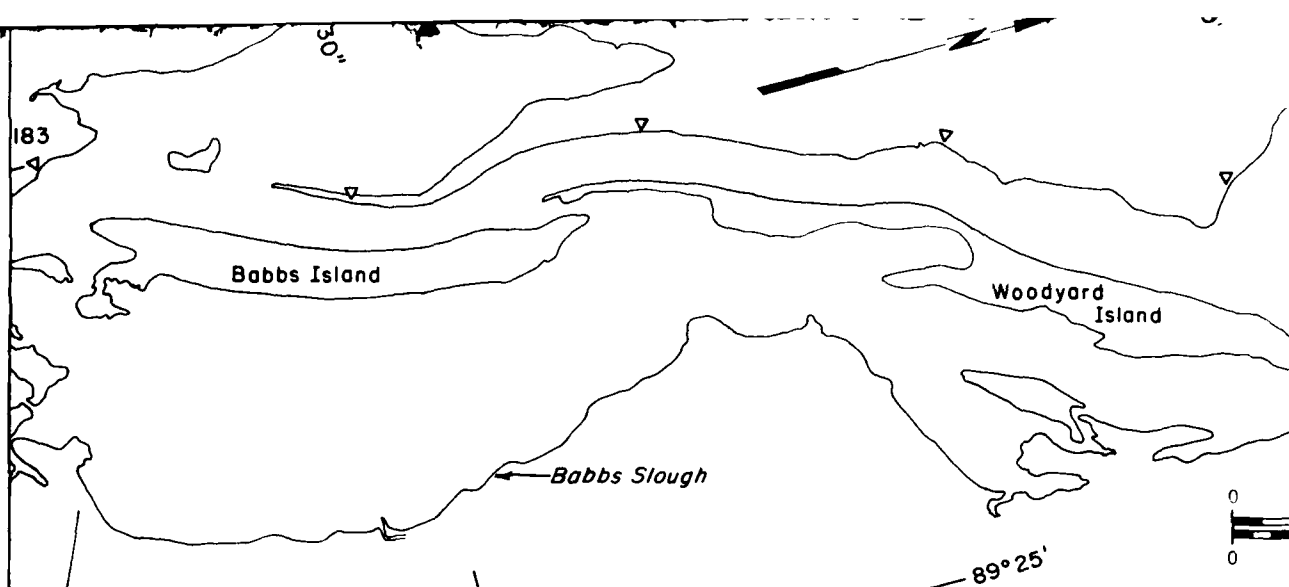


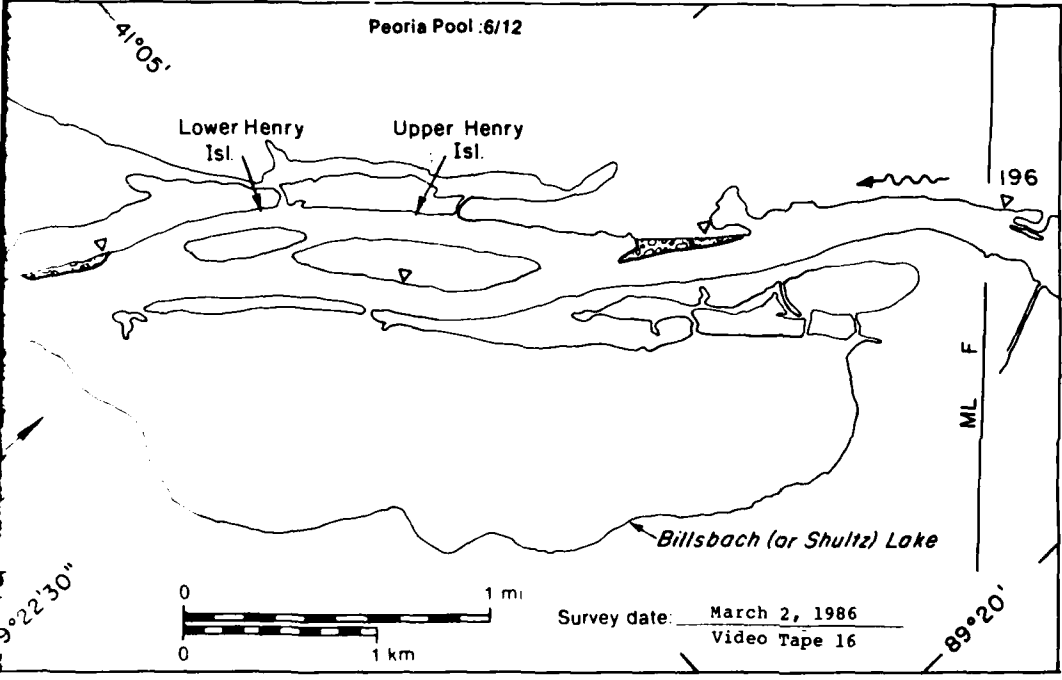
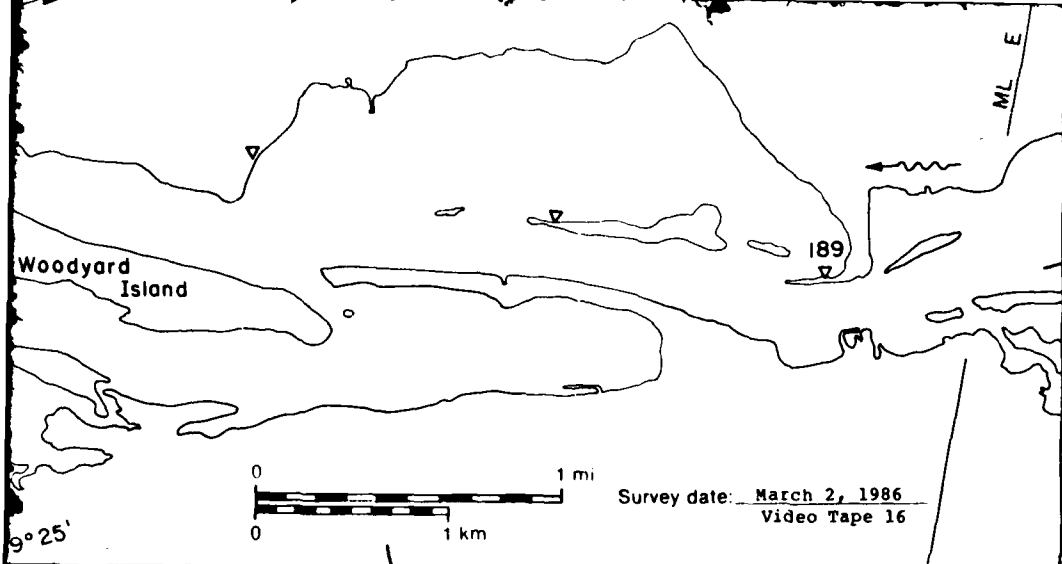


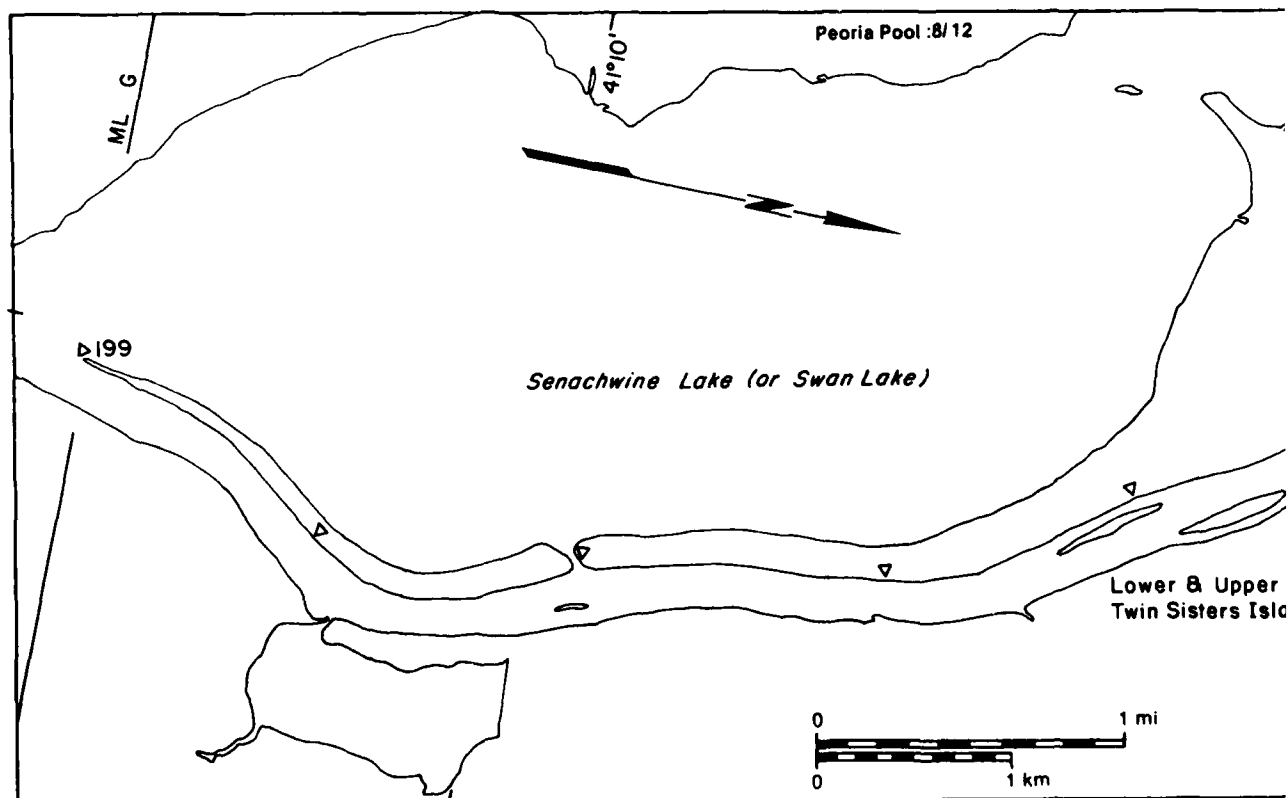
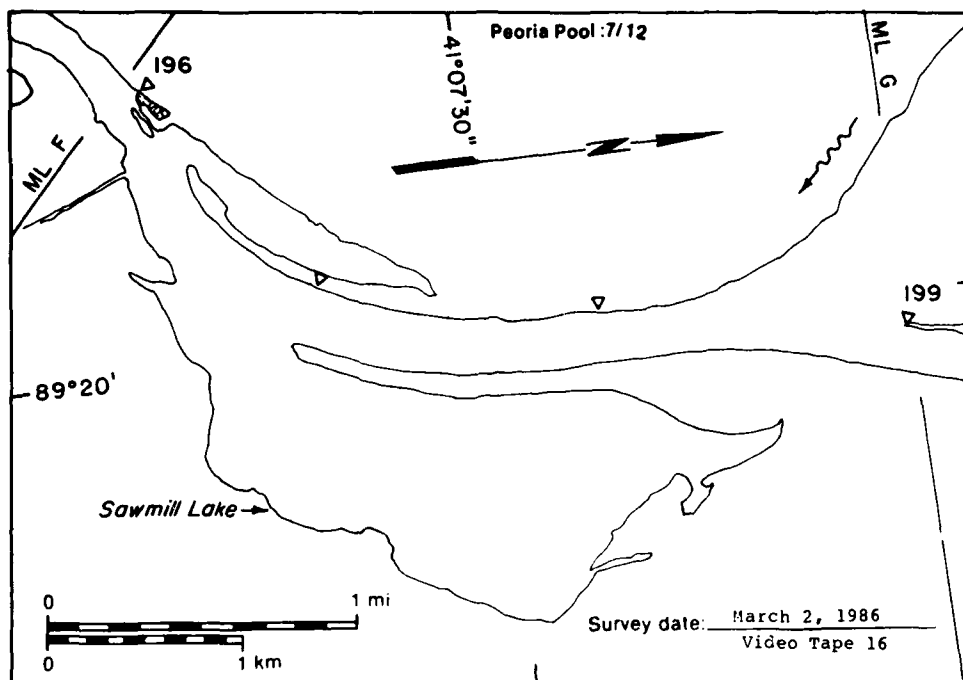
2 March 1986



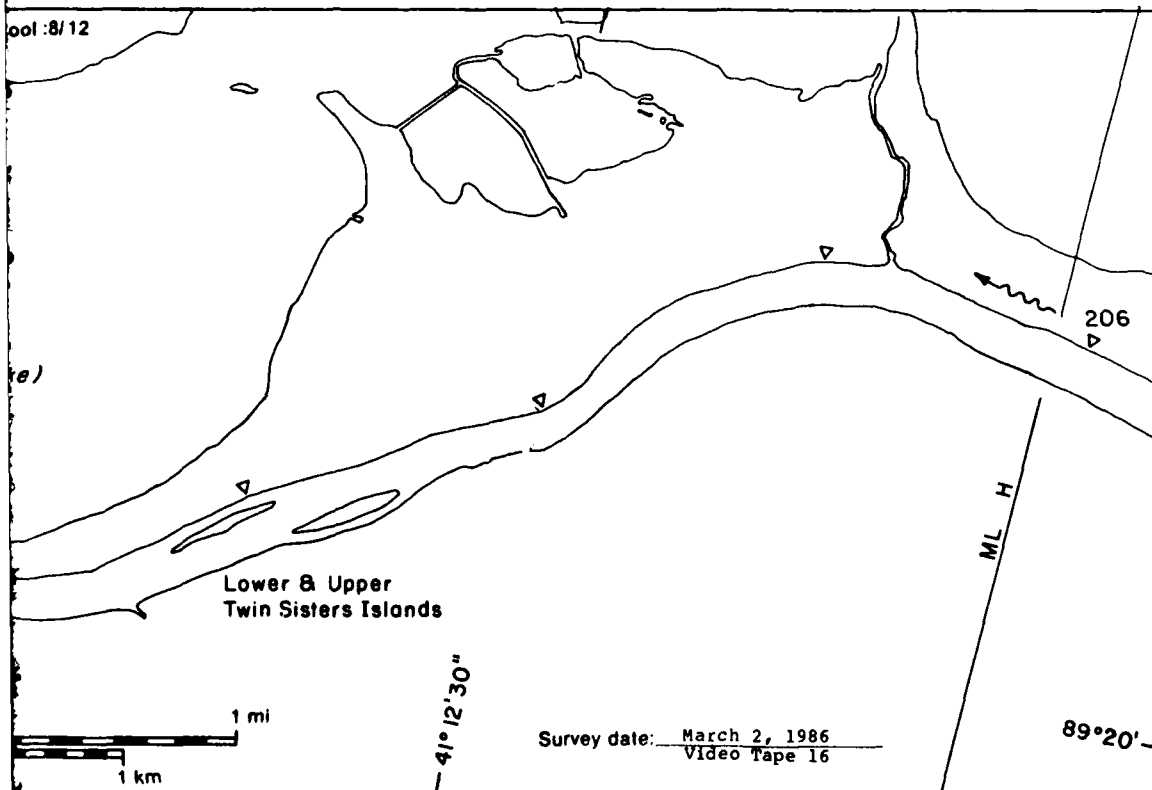
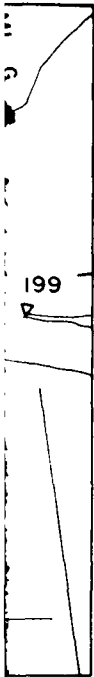






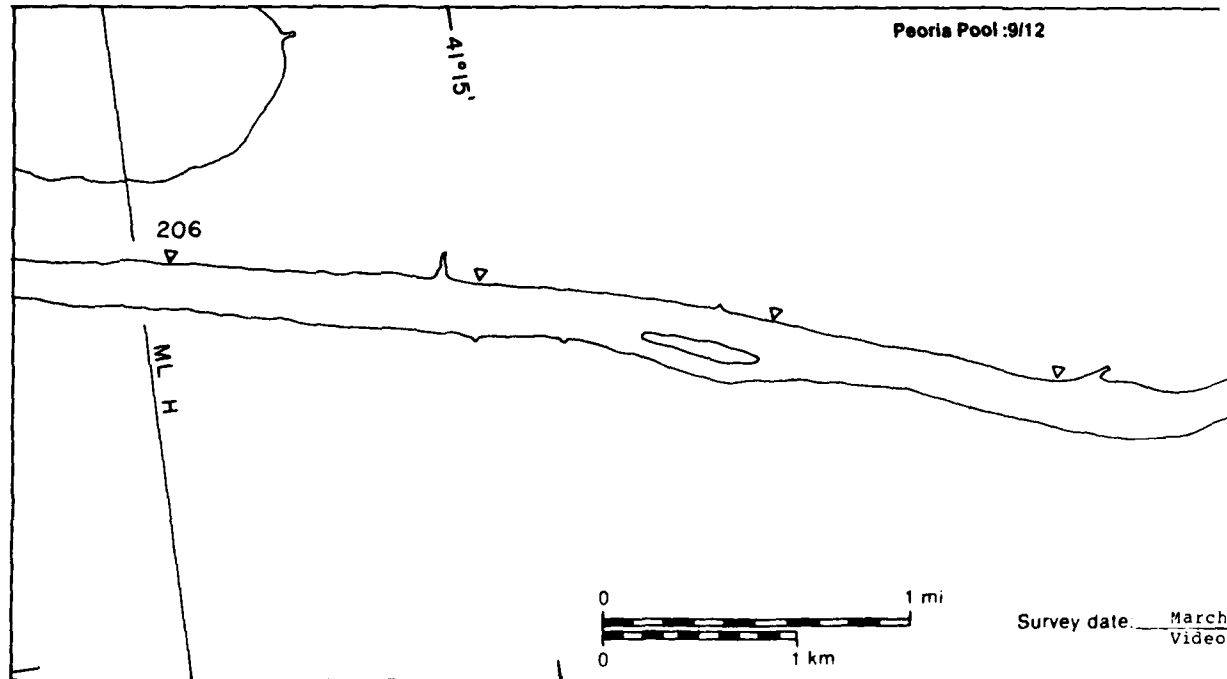
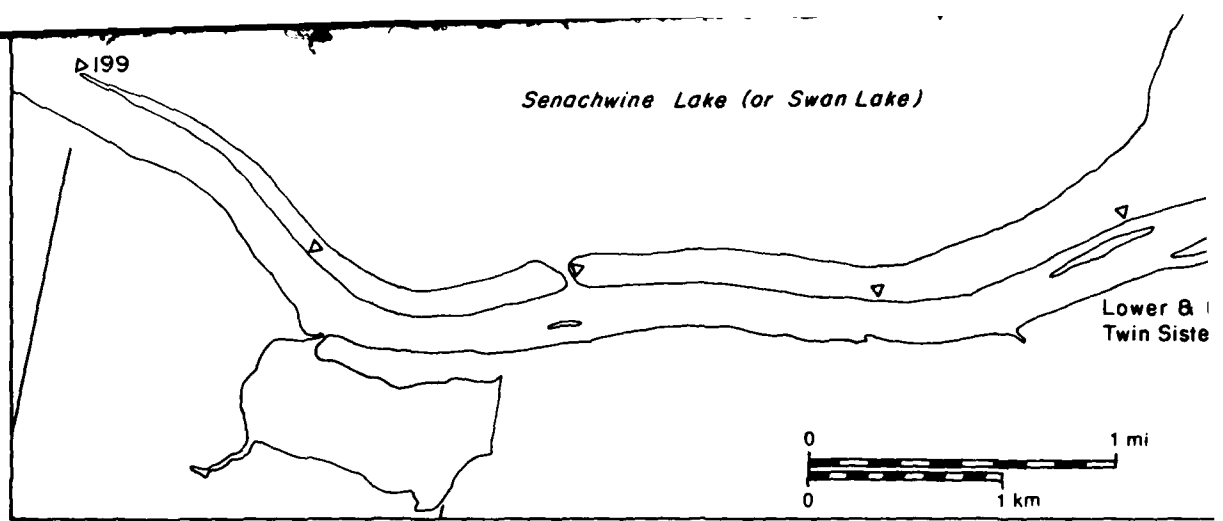


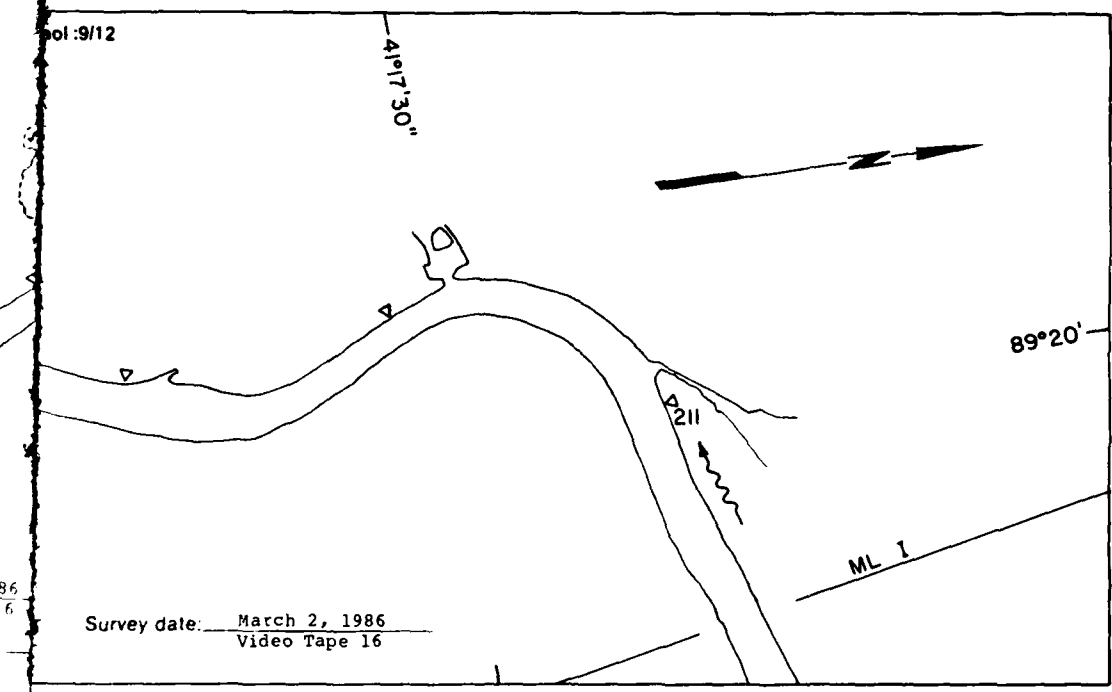
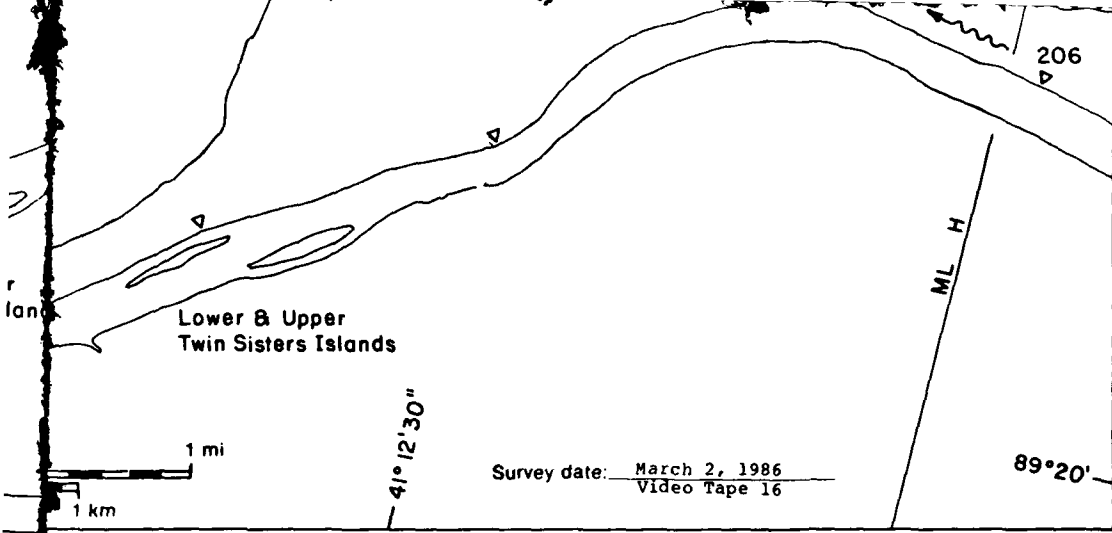
2 March 1986



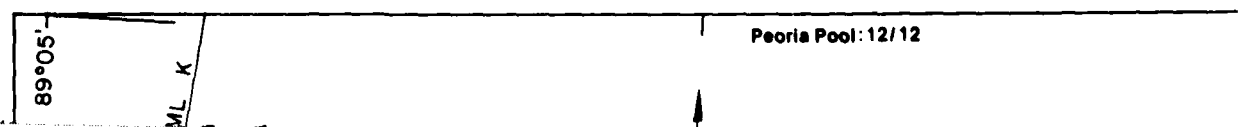
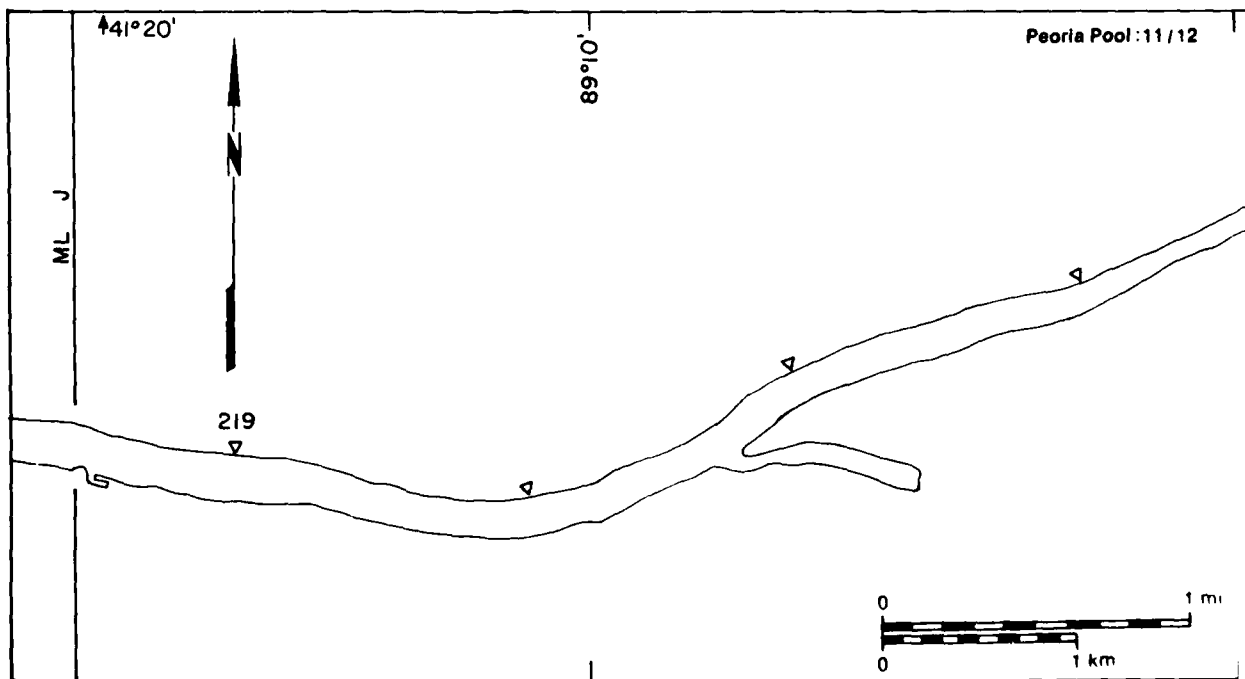
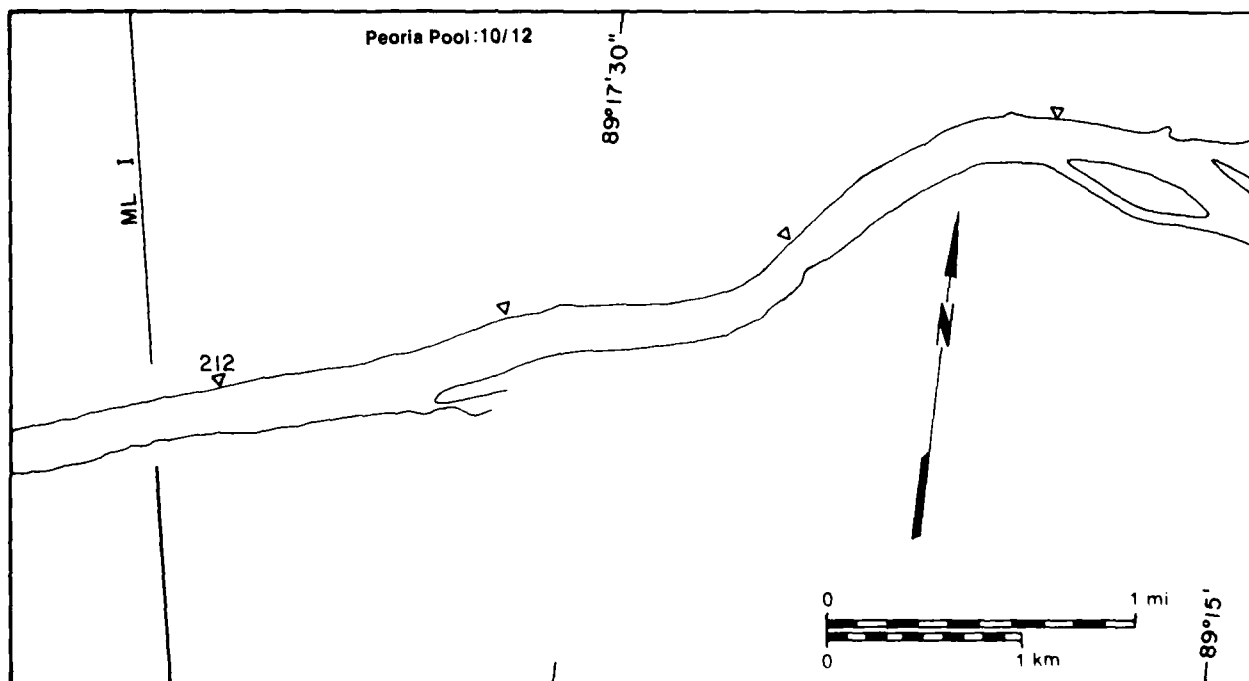
Peoria Pool: 9/12

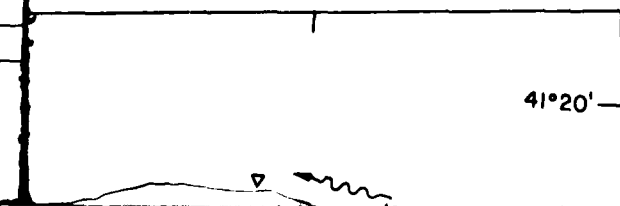
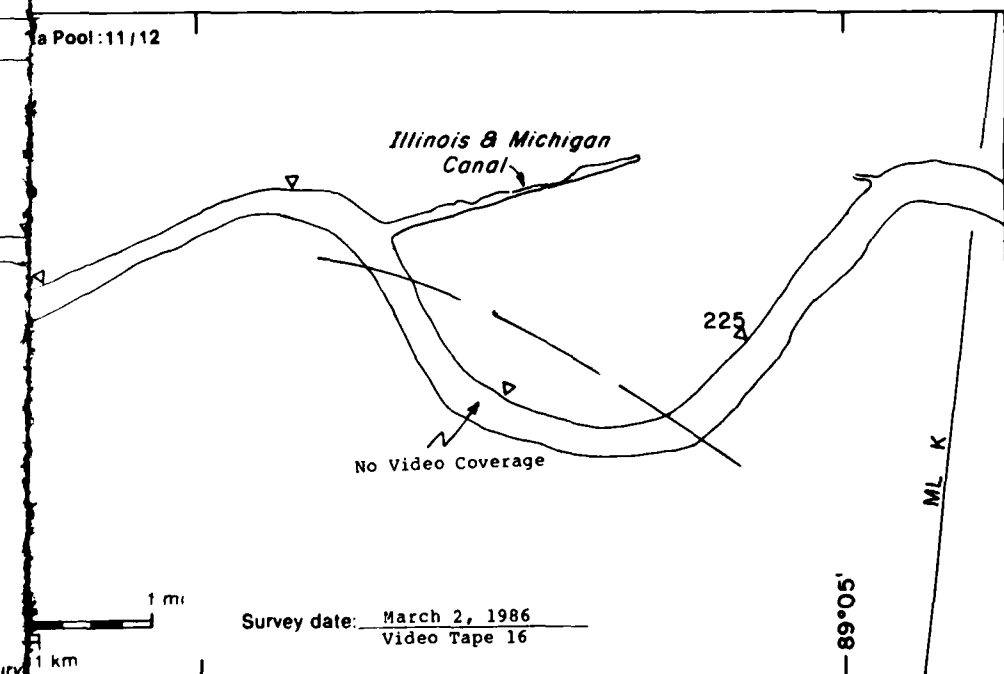
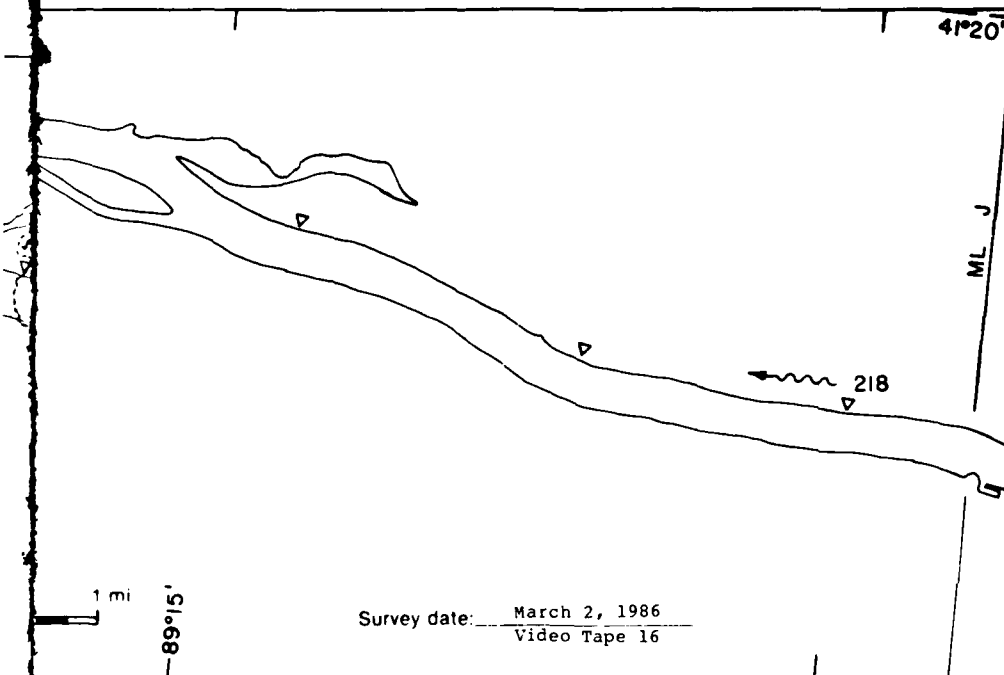
41°17'30"

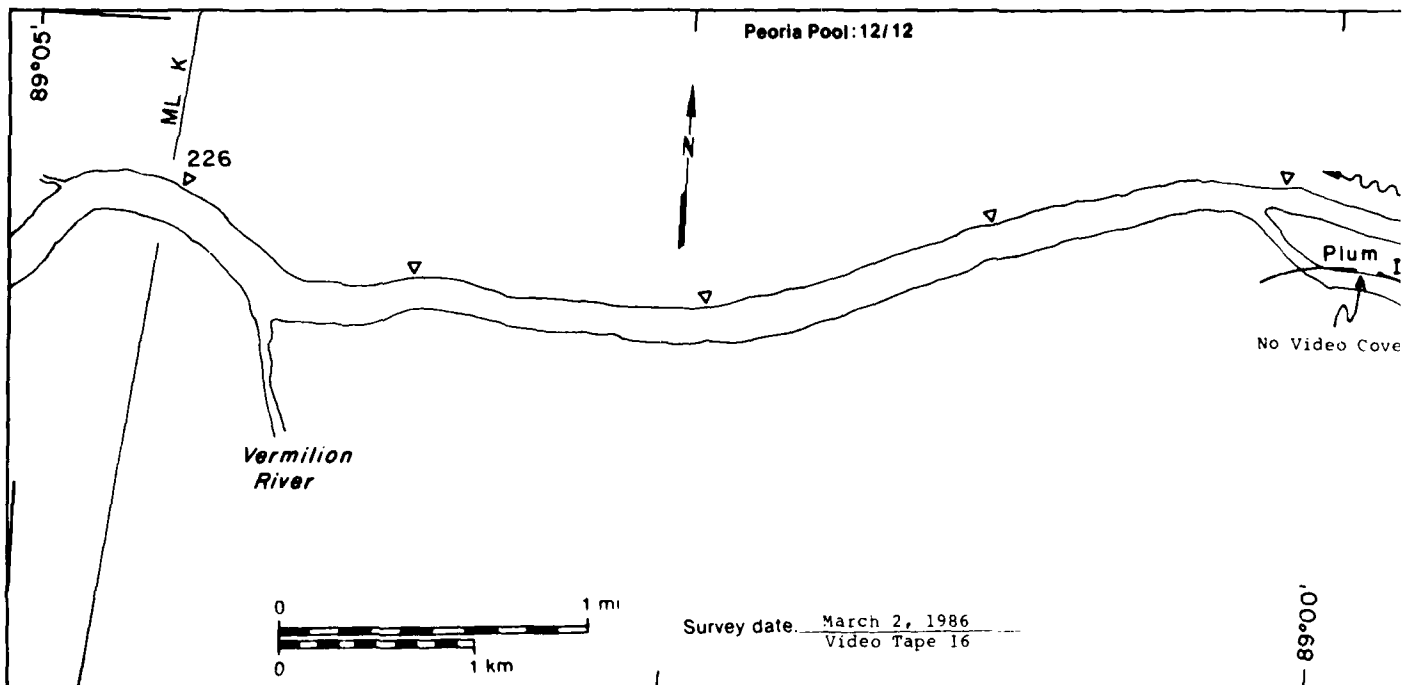
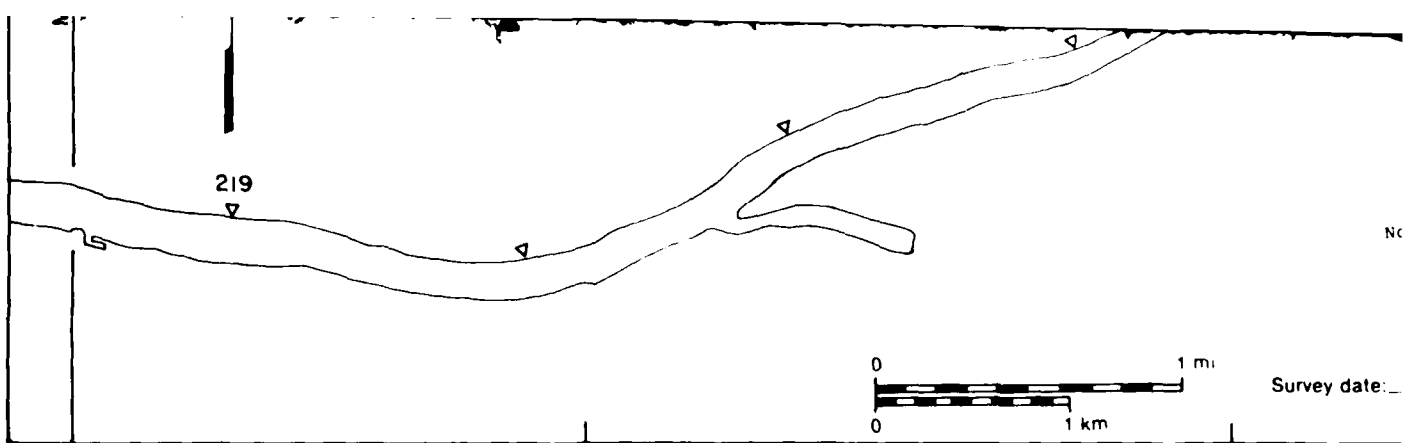




2 March 1986



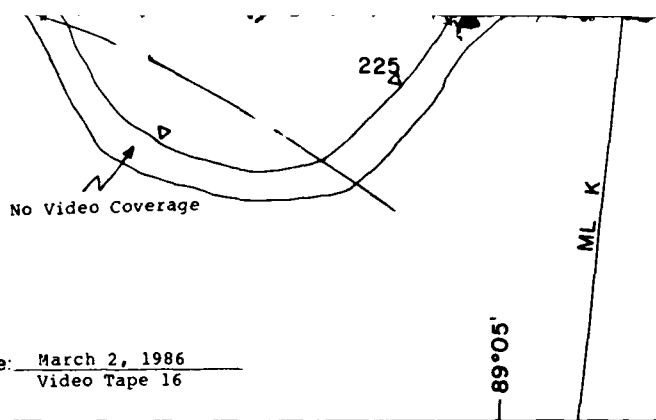




Peoria Pool

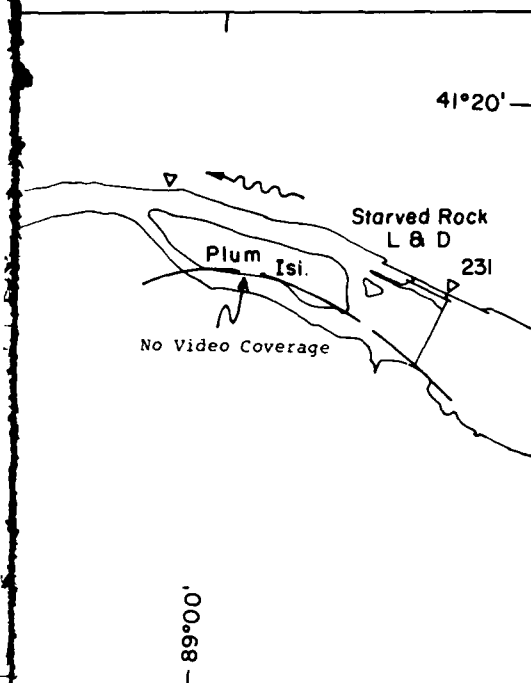
MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	52.89	NA
	Solid ice cover	2.31	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.15	NA
	Fragmented ice cover with open-water areas	0.14	70
	Ice floes or frazil slush and pans	0.88	5
Total area ($m^2 \times 10^6$)		81.33*	

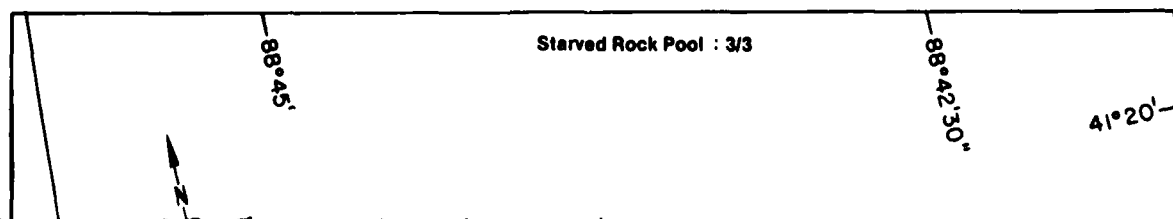
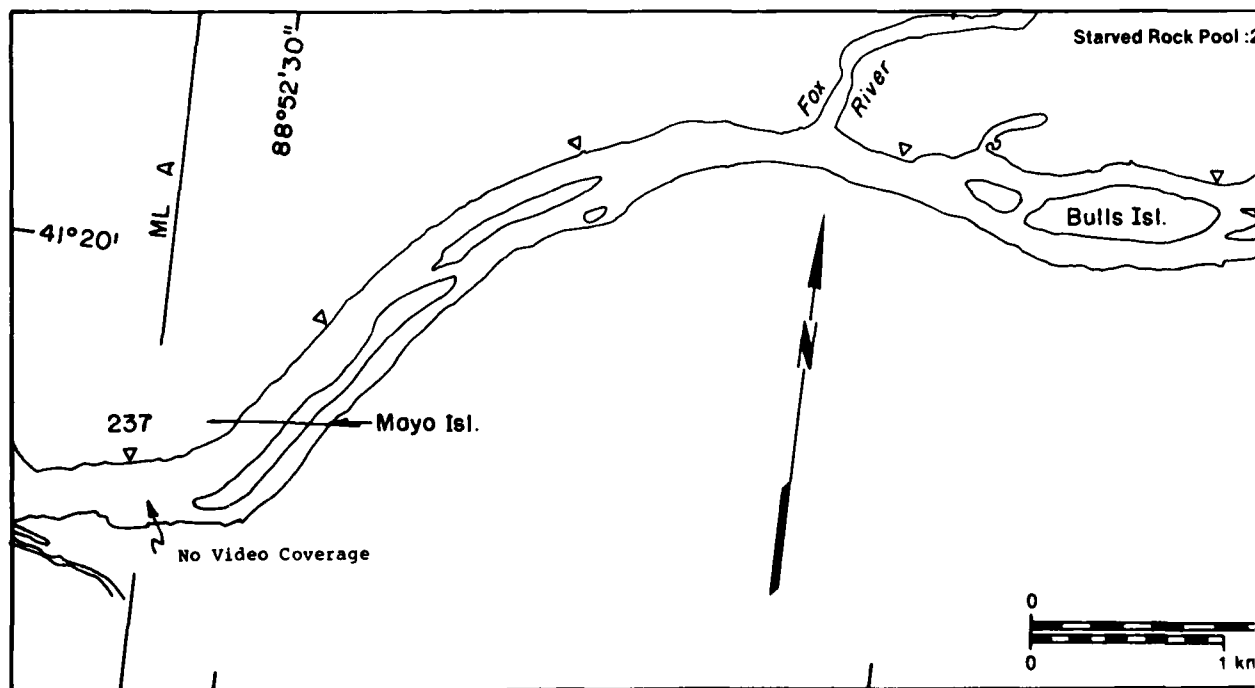
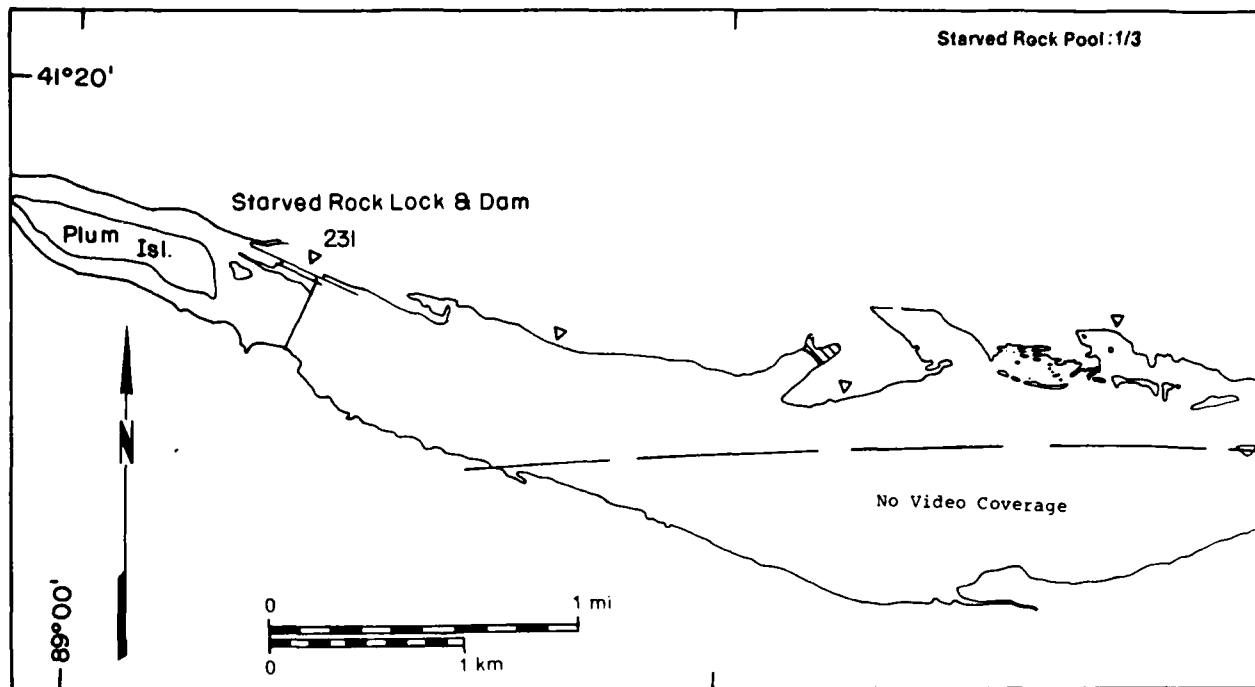
* Includes $24.96 \times 10^6 m^2$ of no video coverage



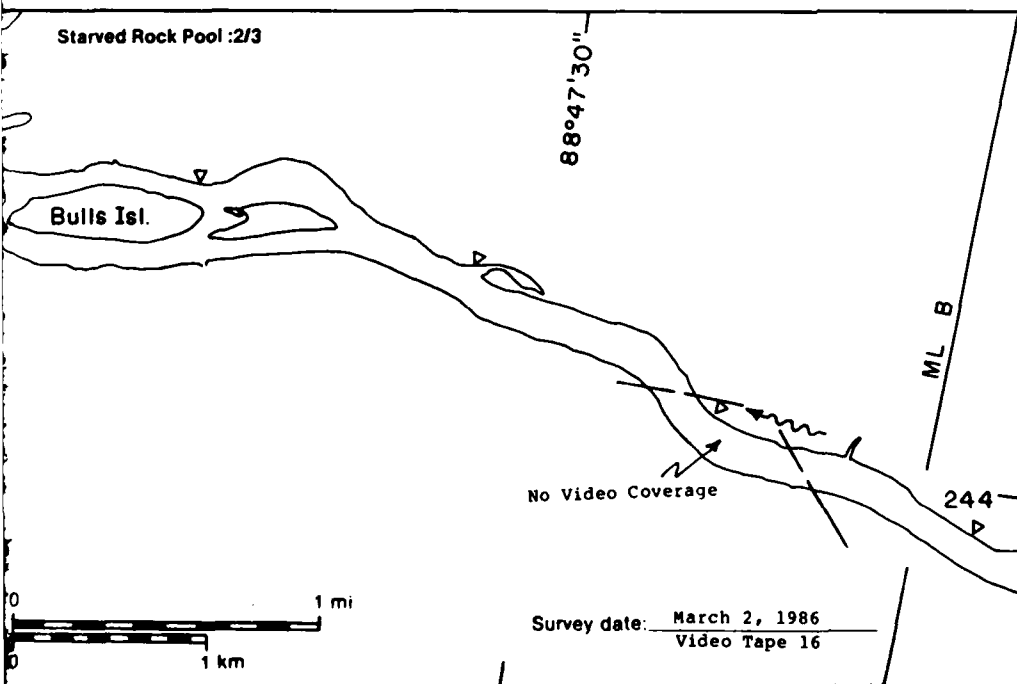
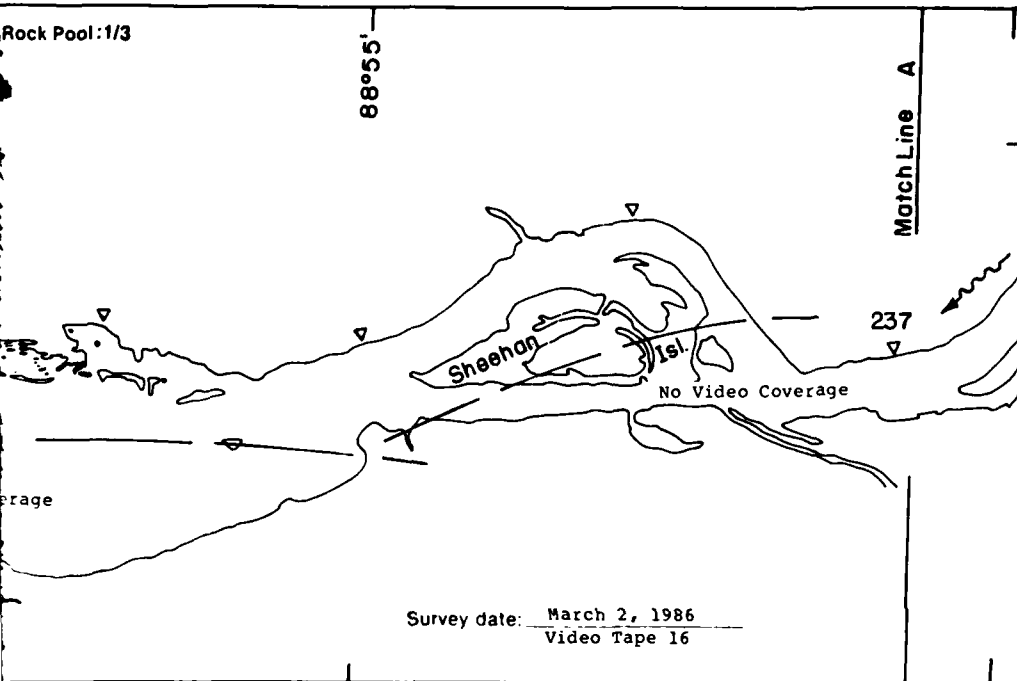
1 mi

Survey date: March 2, 1986
Video Tape 16

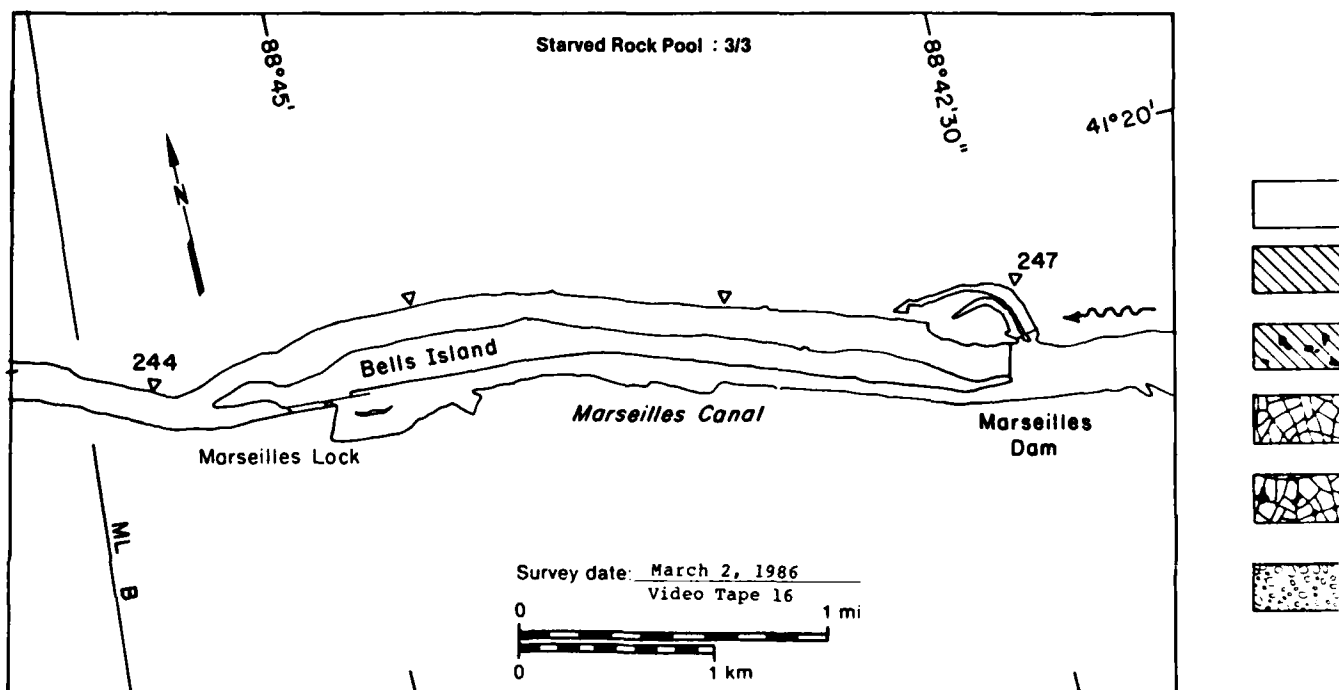
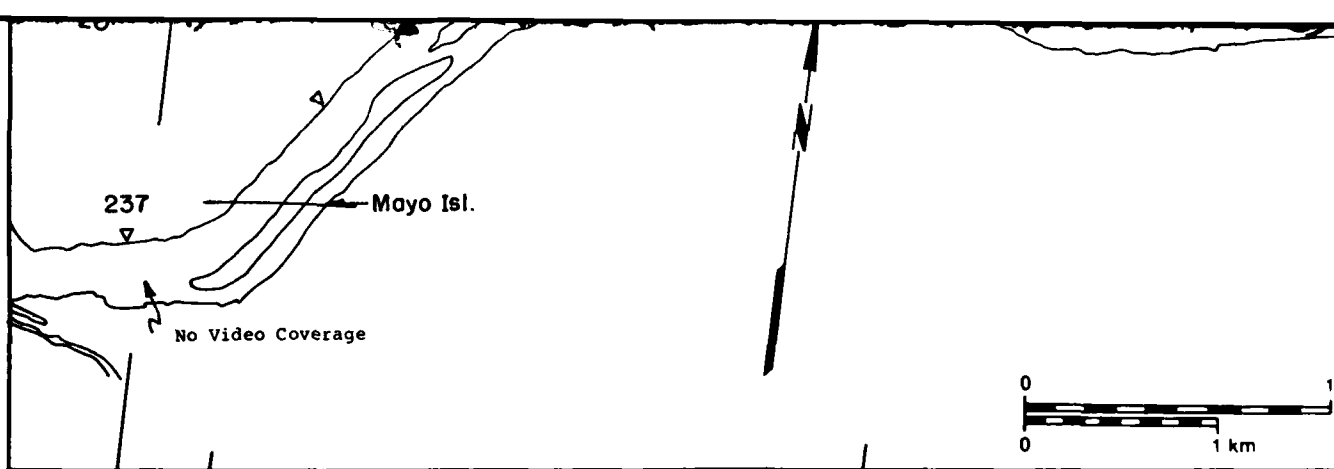


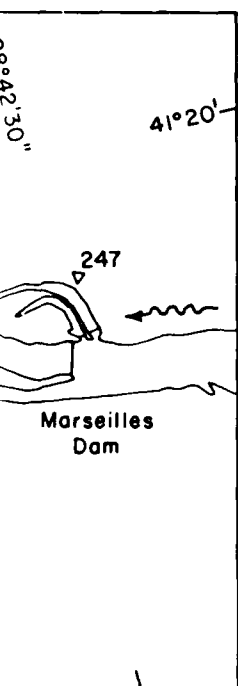
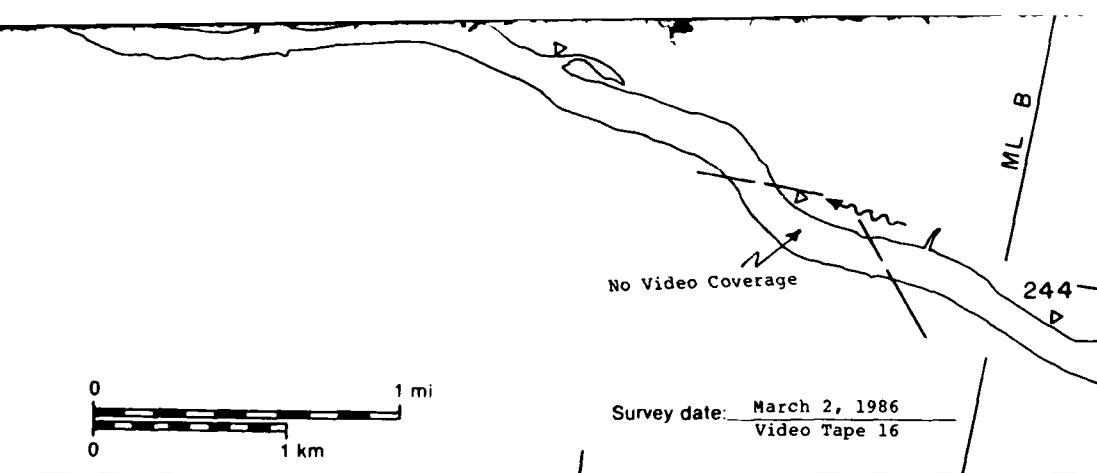


2 March 1986



41°20'	Starved Rock Pool		Area	Surface
	MAP UNITS		(m ² x 10 ⁶)	concentration
				(%)
	Open water	7.39	NA	





Starved Rock Pool

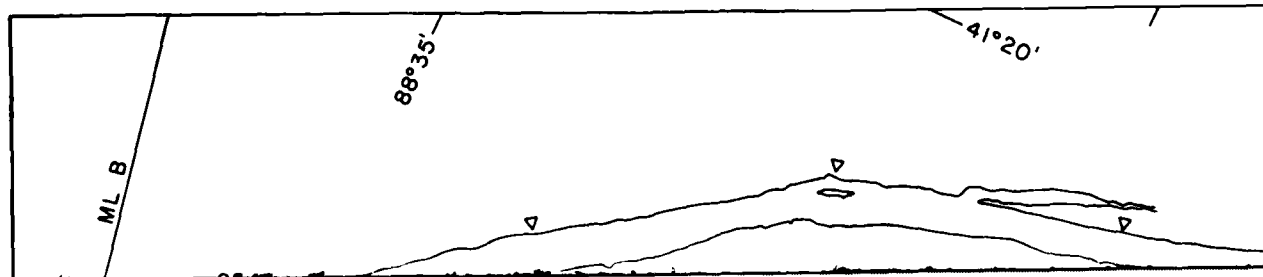
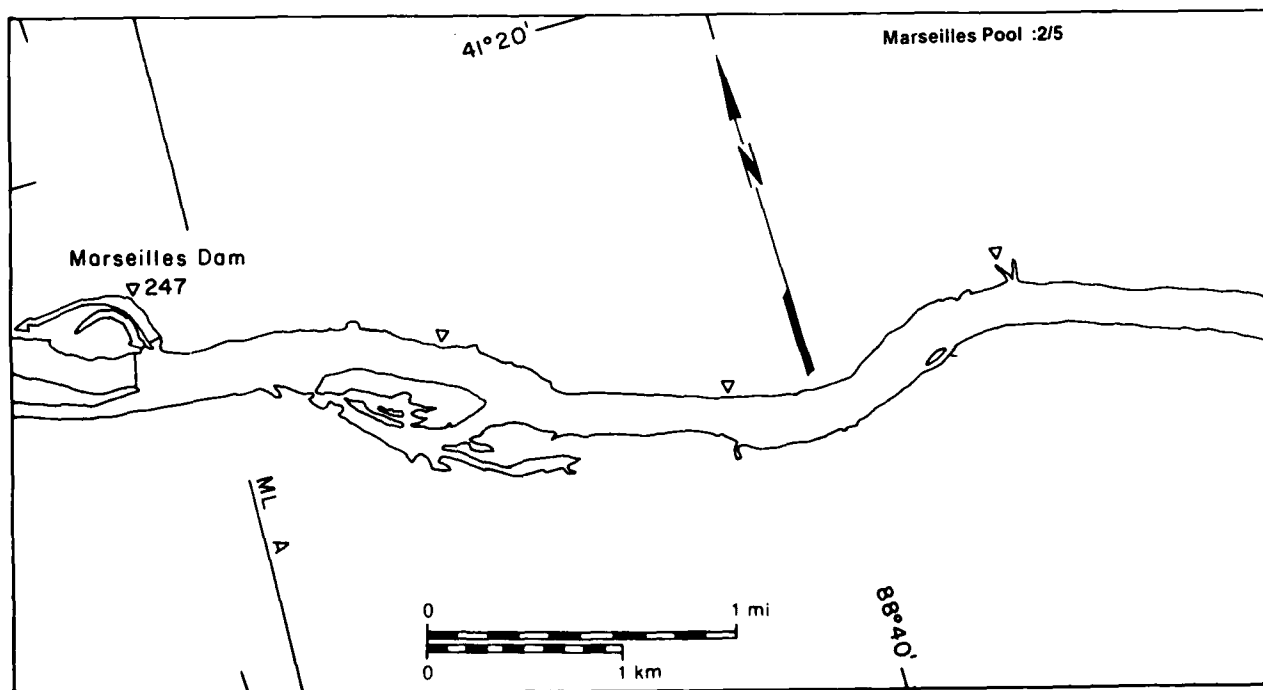
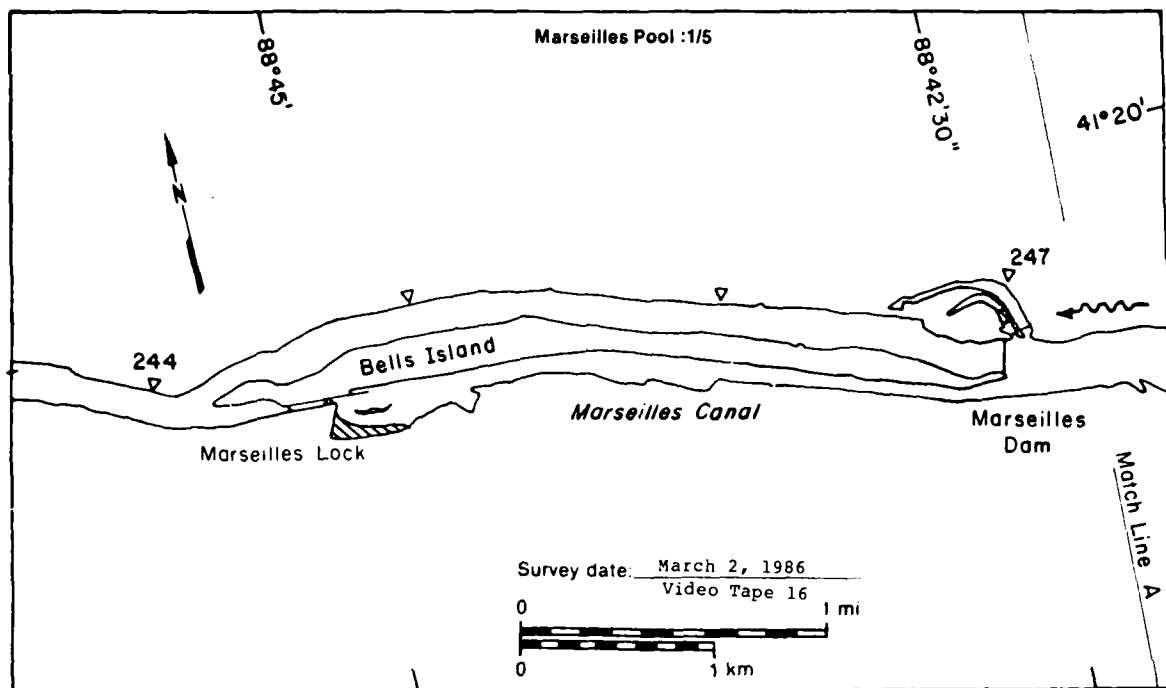
MAP UNITS

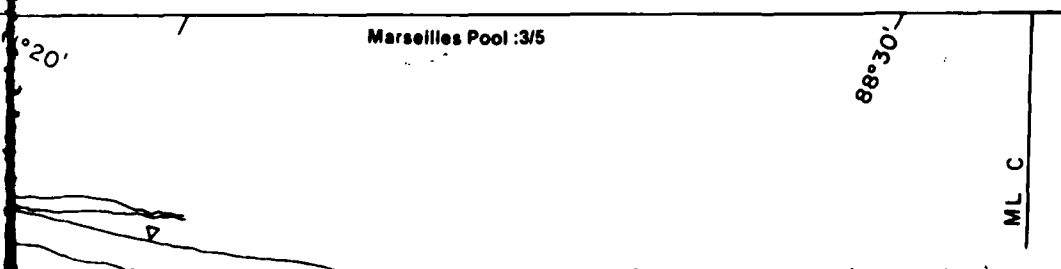
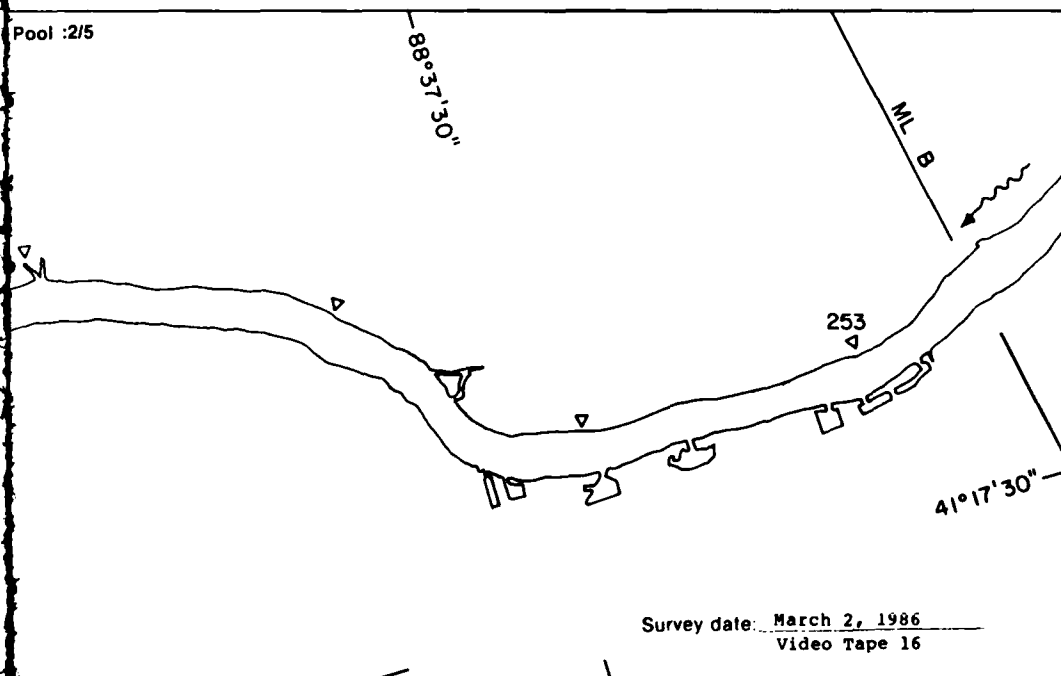
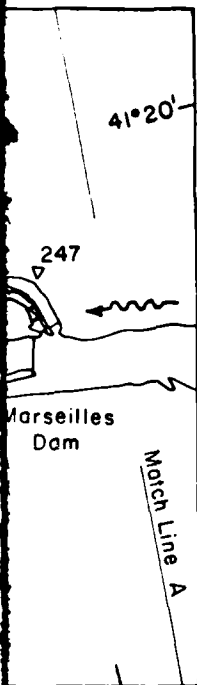
	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

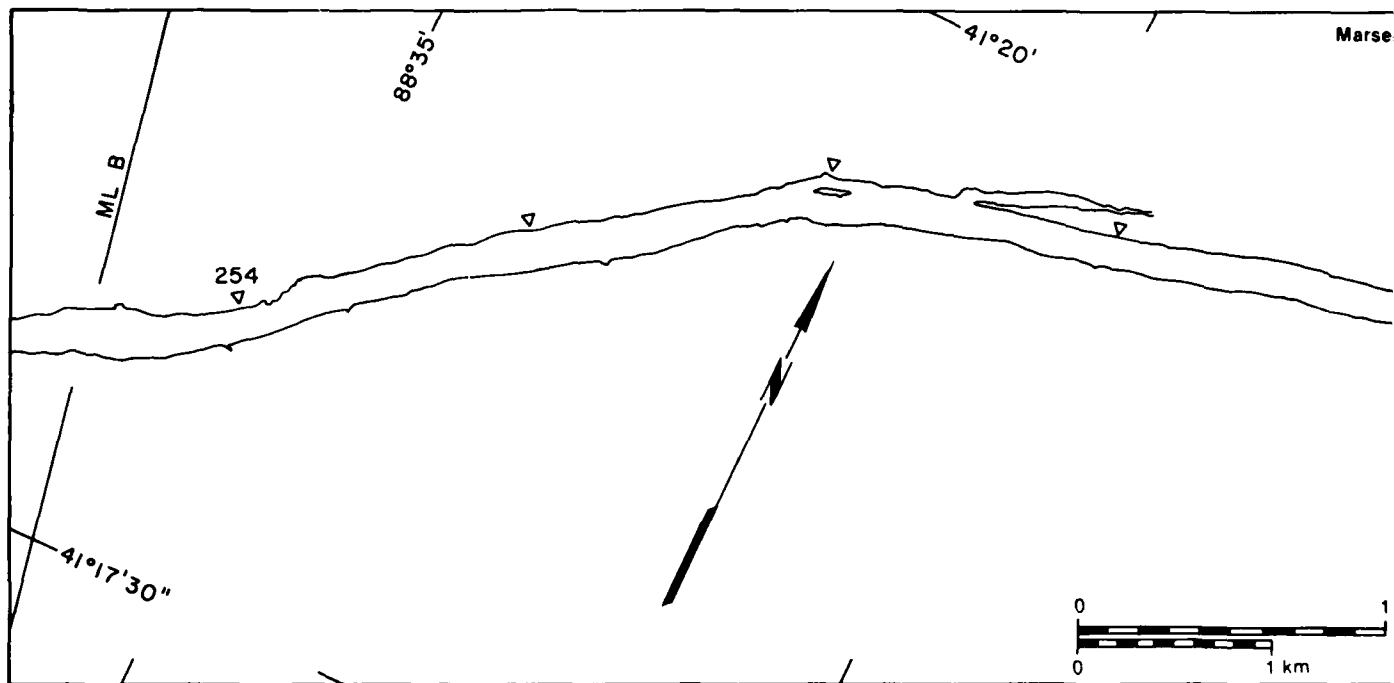
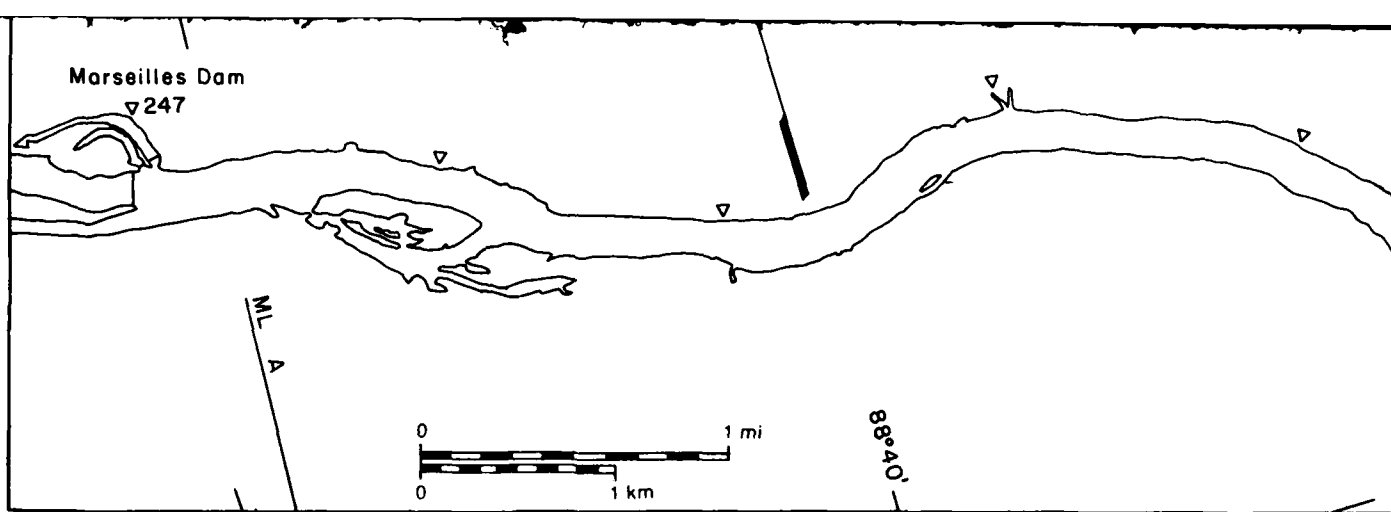
Area (m ² x 10 ⁶)	Surface concentration (%)
7.39	NA
0.02	NA
0.00	—
0.00	NA
0.00	—
0.00	—
Total area (m ² x 10 ⁶)	10.19*

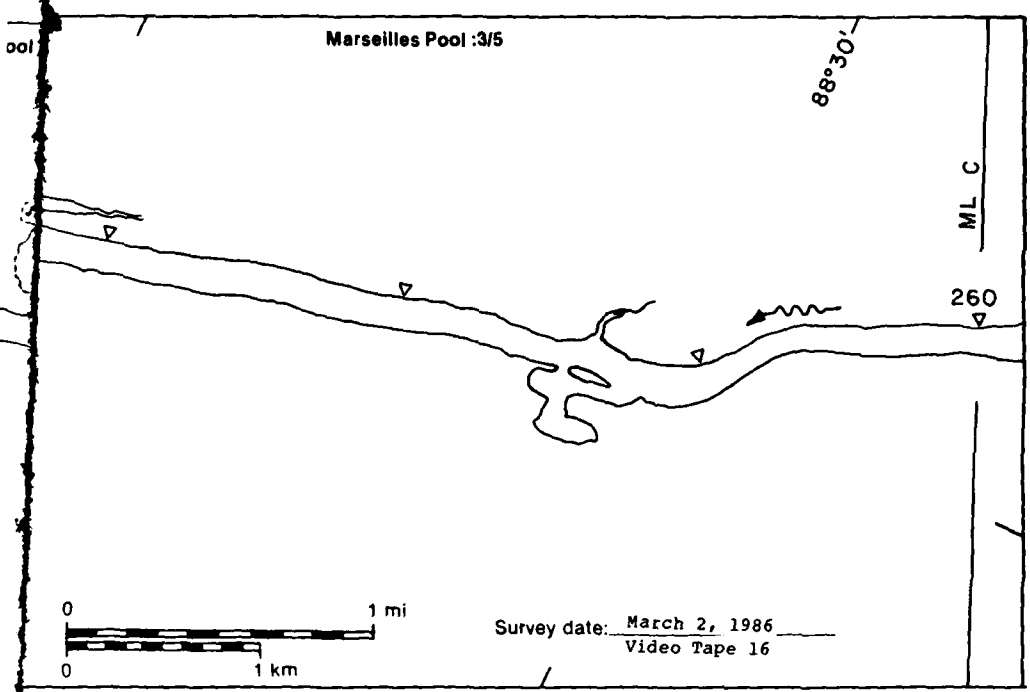
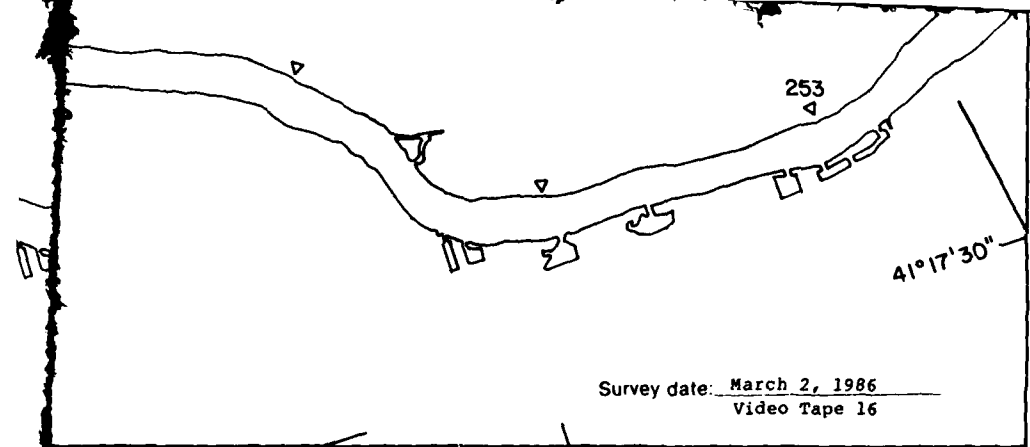
* Includes 2.78 x 10⁶ m² of no video coverage

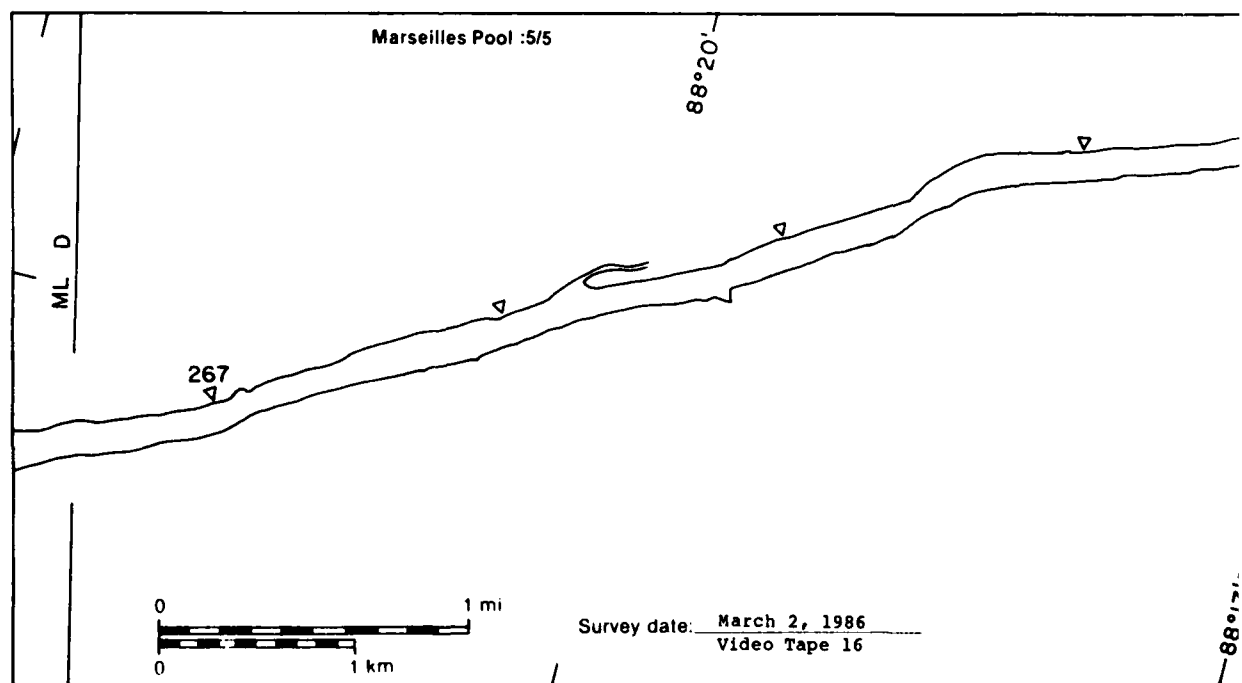
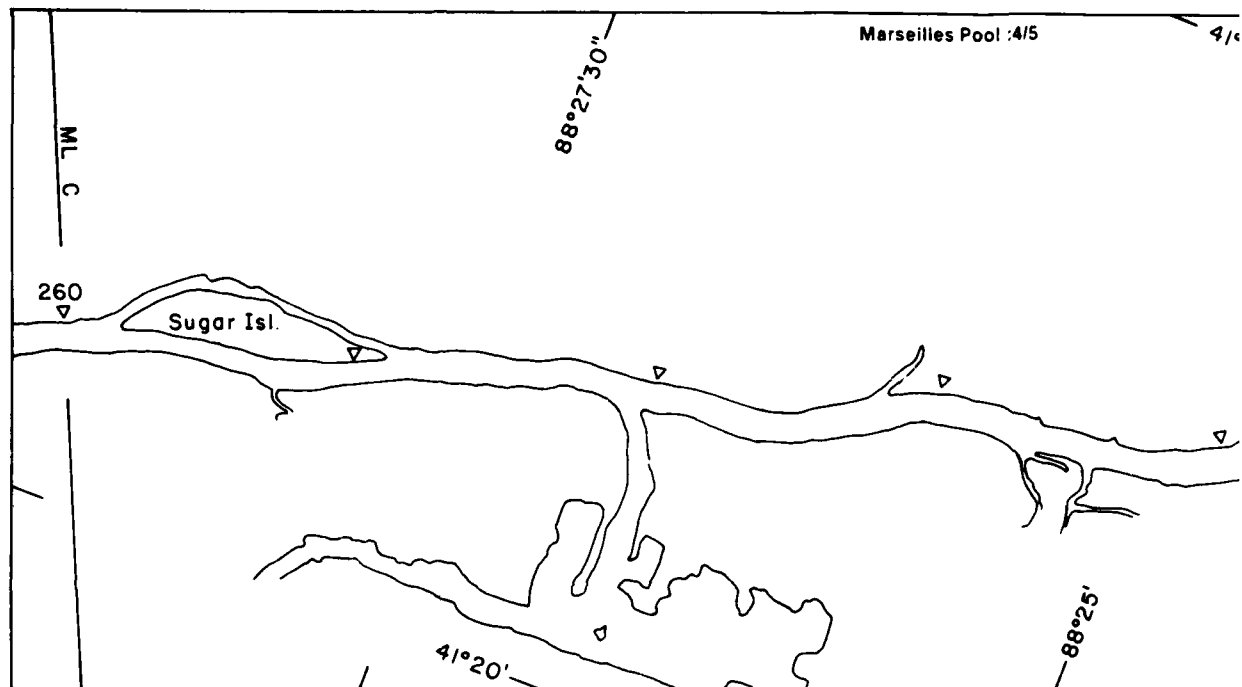
2 March 1986





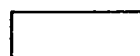






Marseilles Pool

MAP UNITS



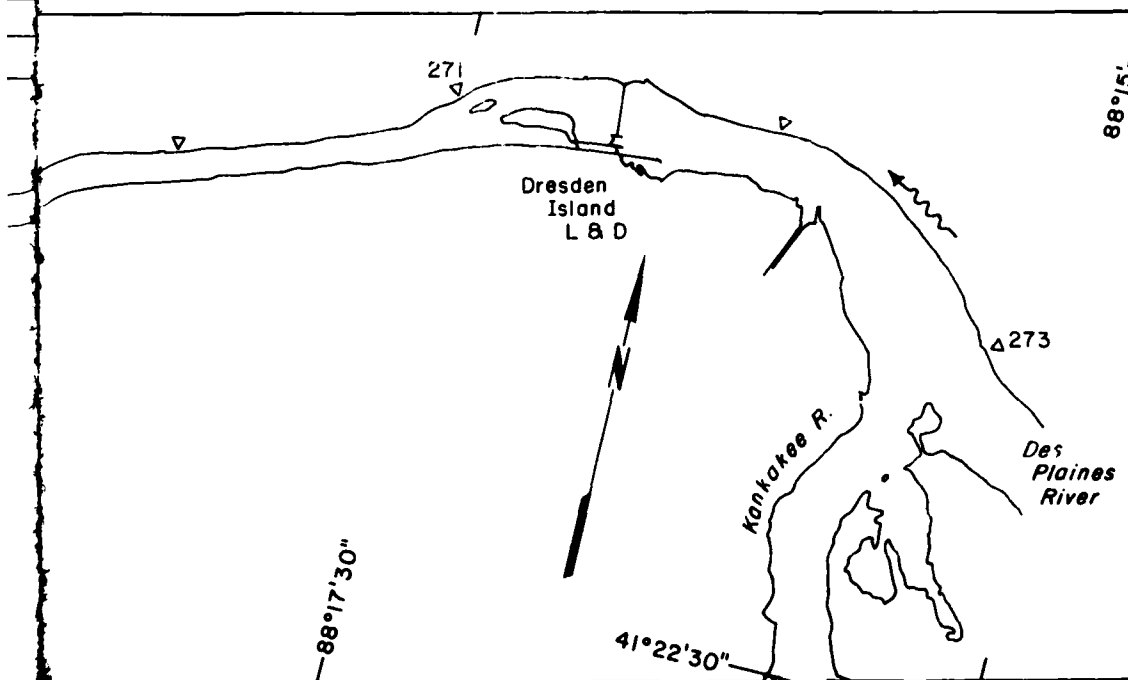
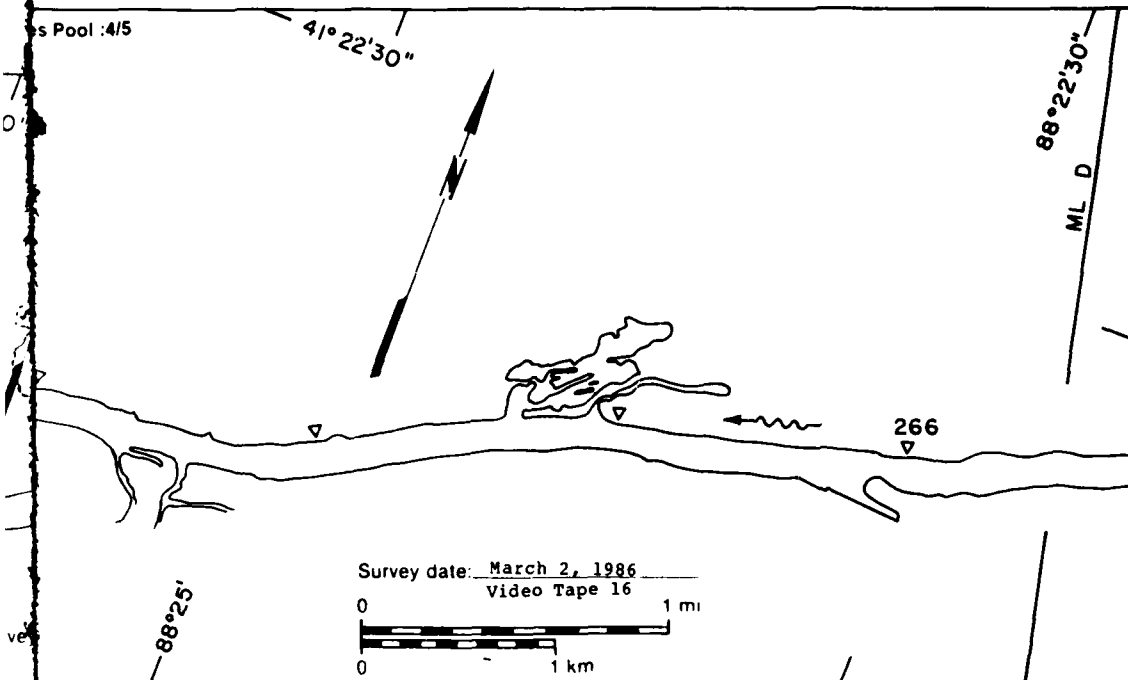
Open water

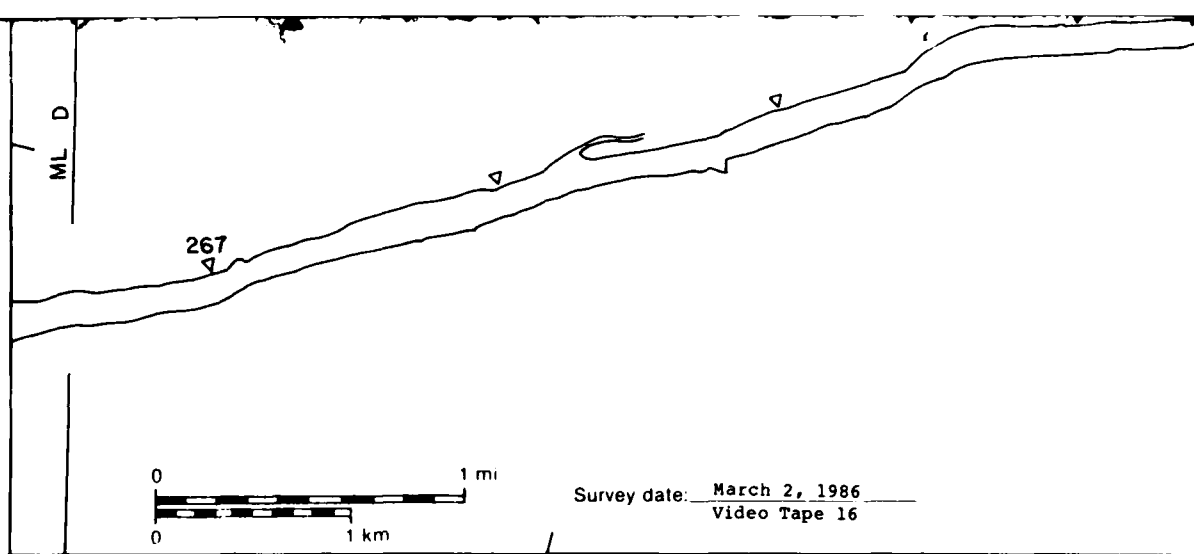
Area
(m² x 10⁶)

Surface
concentration
(%)

8.16	NA
------	----

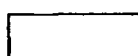
2 March 1986





Marseilles Pool

MAP UNITS



Open water



Solid ice cover



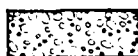
Solid ice cover with open-water areas



Fragmented ice cover



Fragmented ice cover with open-water areas



Ice floes or frazil slush and pans

Area
($m^2 \times 10^6$)

Surface
concentration
(%)

8.16	NA
0.03	NA
0.00	—
0.00	NA
0.00	—
0.00	—
8.19	

Total area ($m^2 \times 10^6$)

88°17'30"

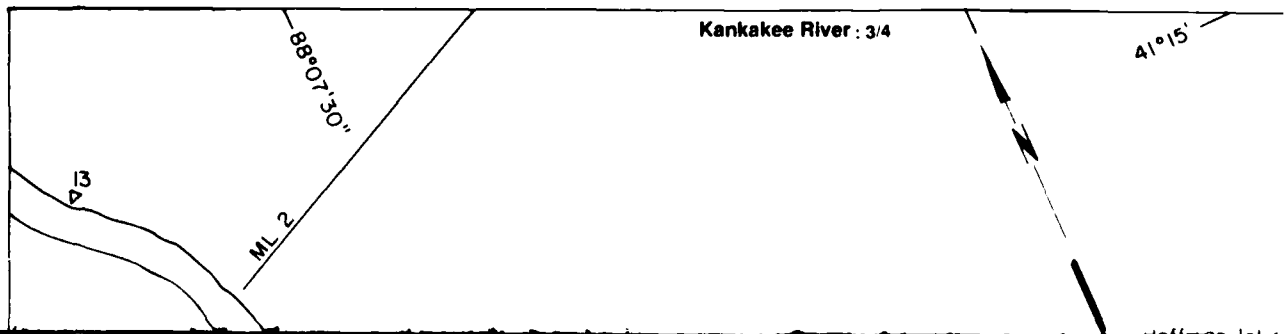
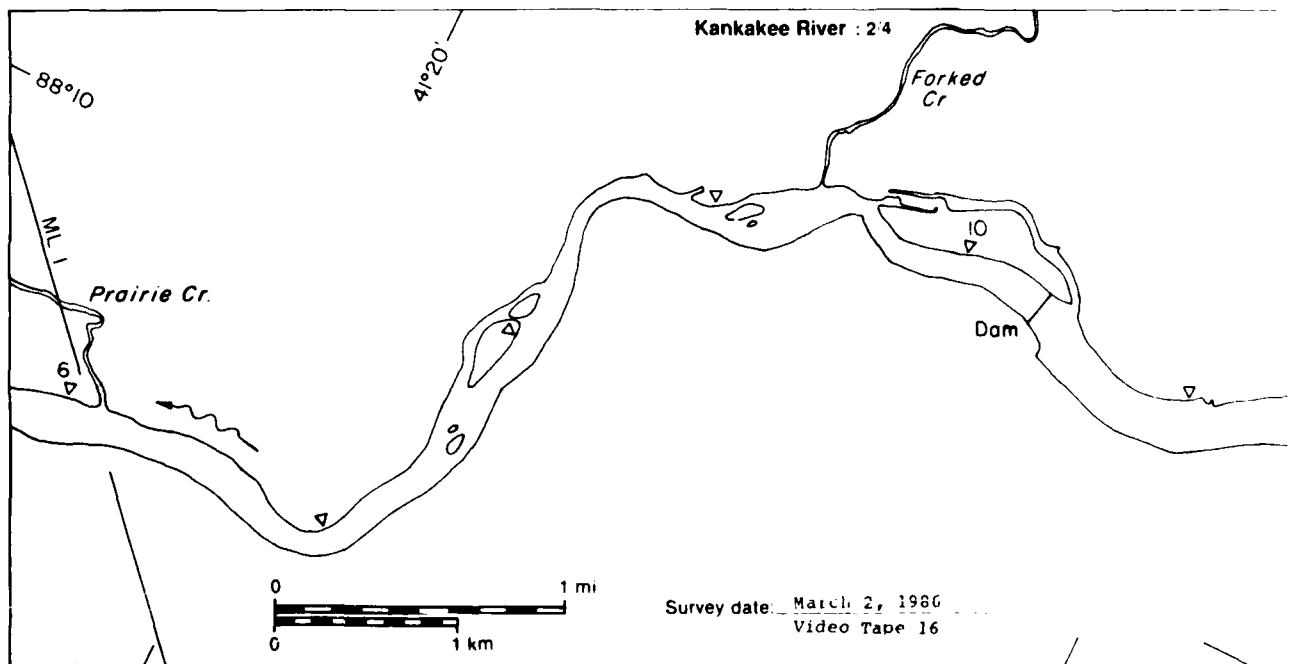
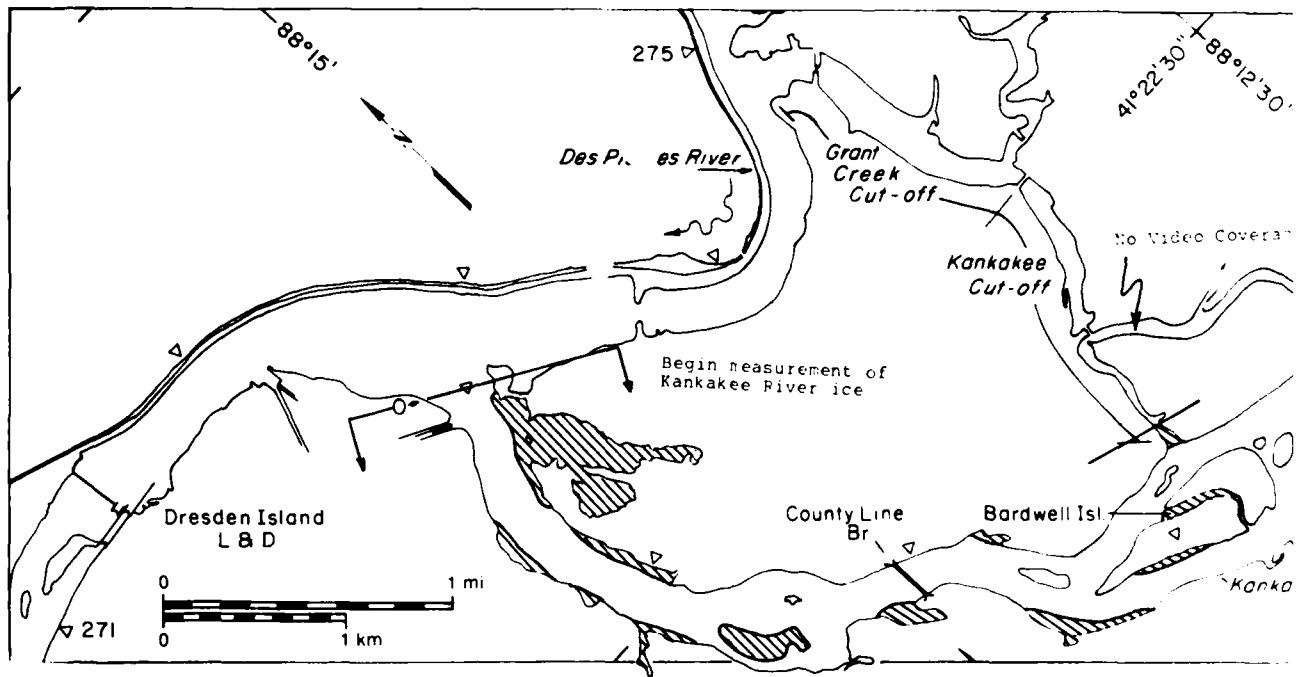
41°22'30"

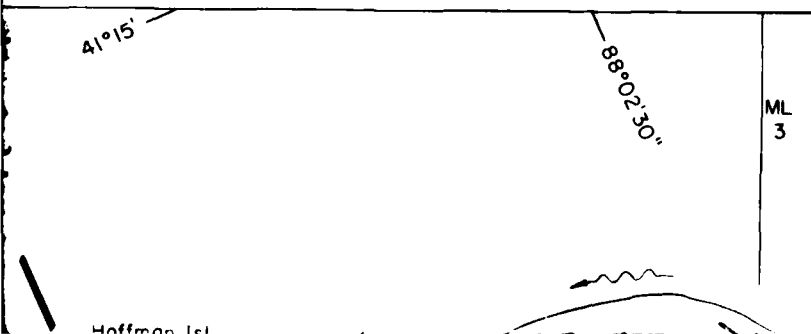
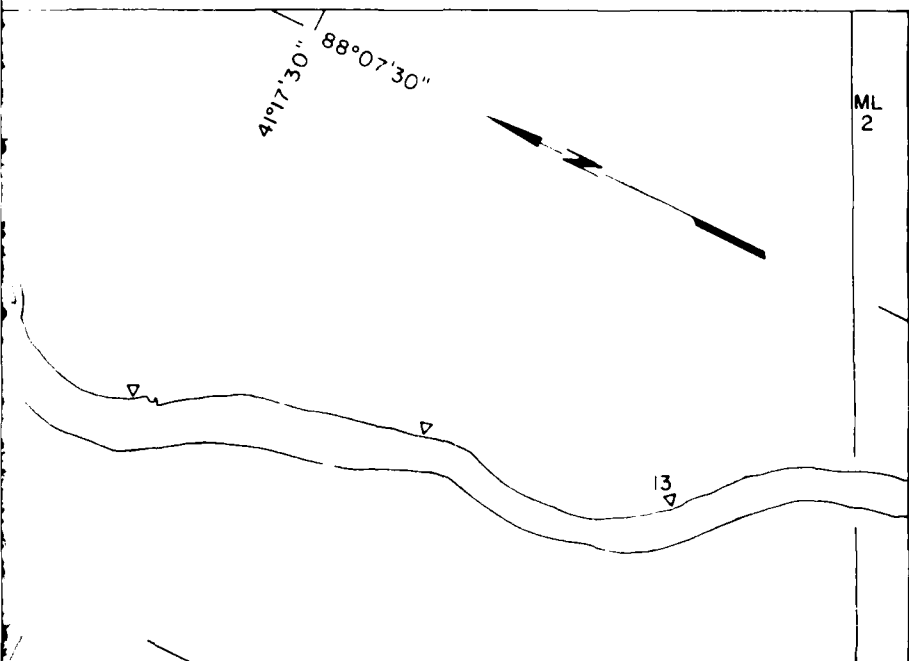
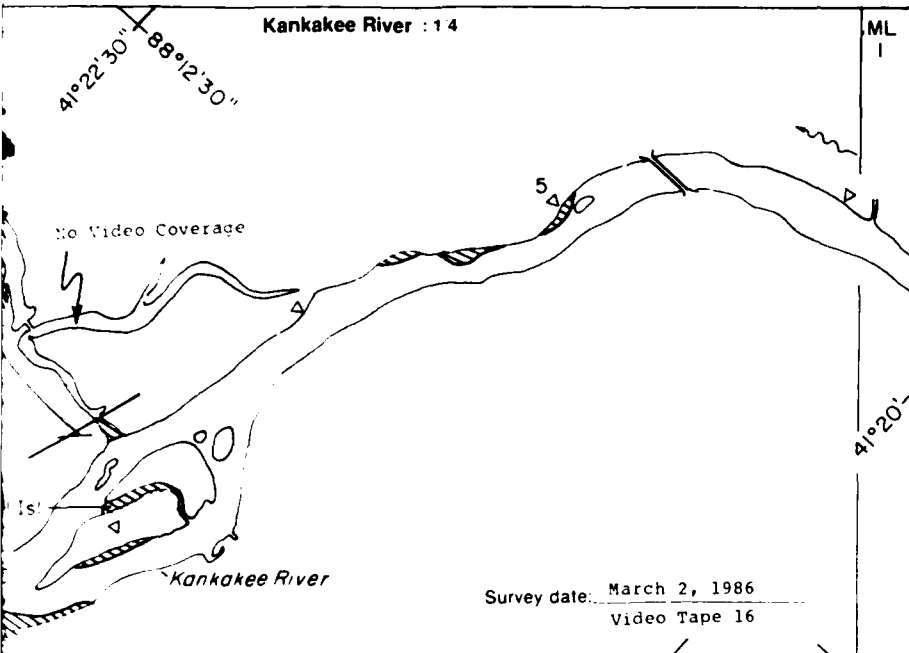
Kankakee R.

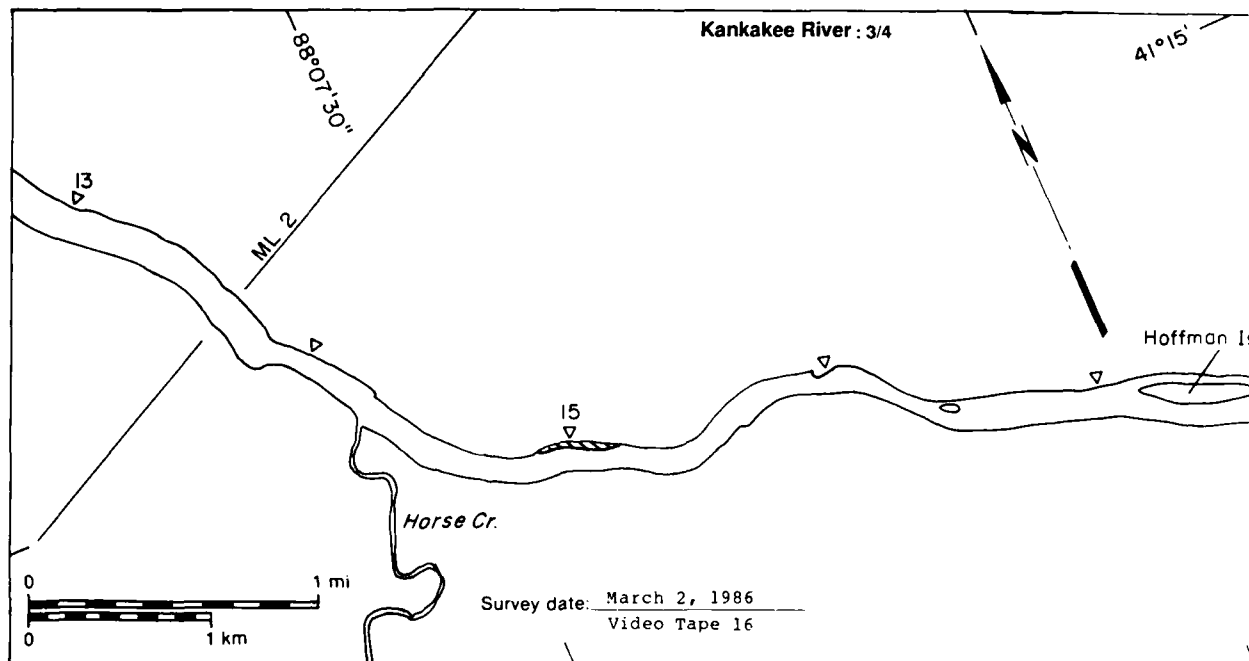
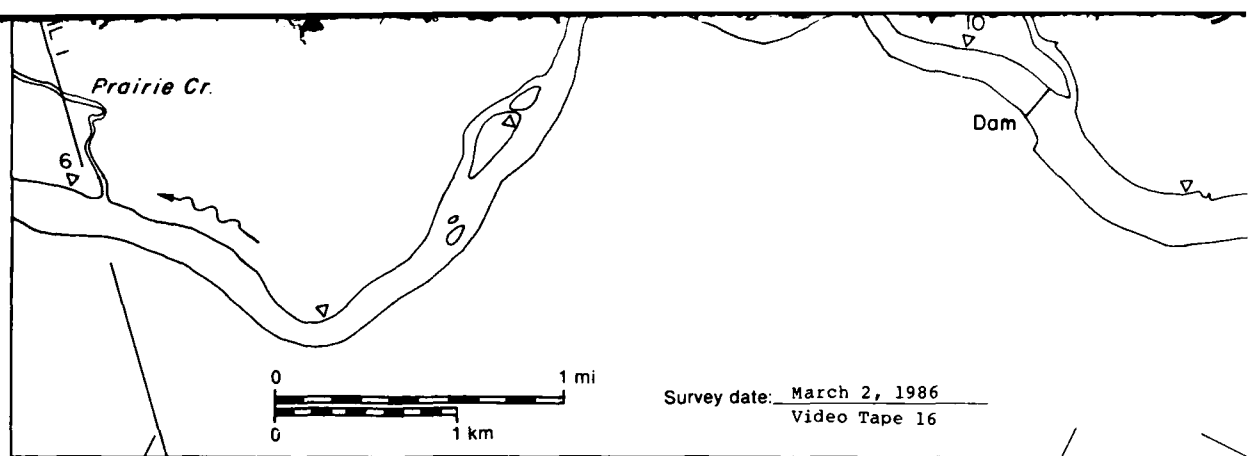
Δ273

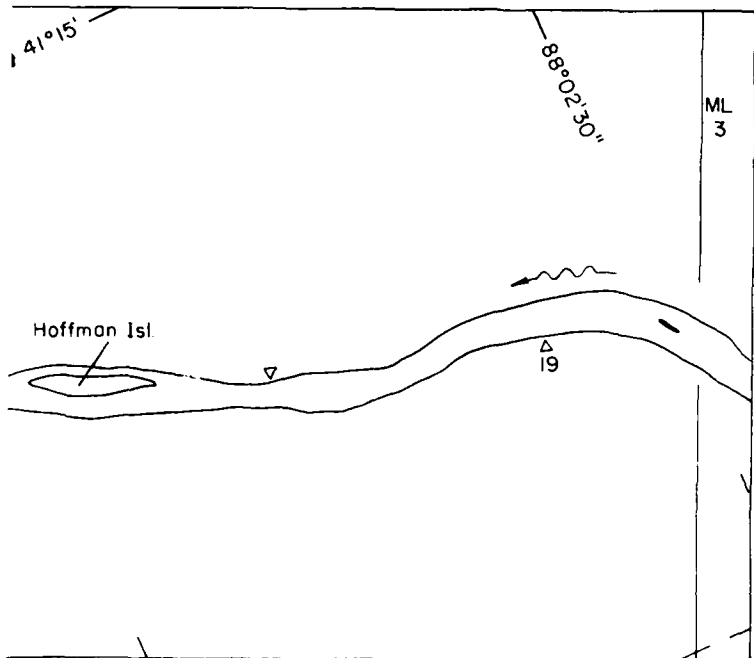
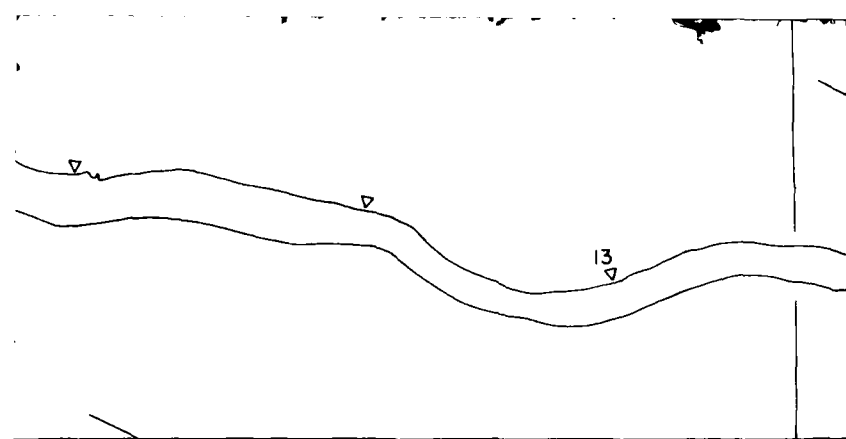
Des
Plaines
River

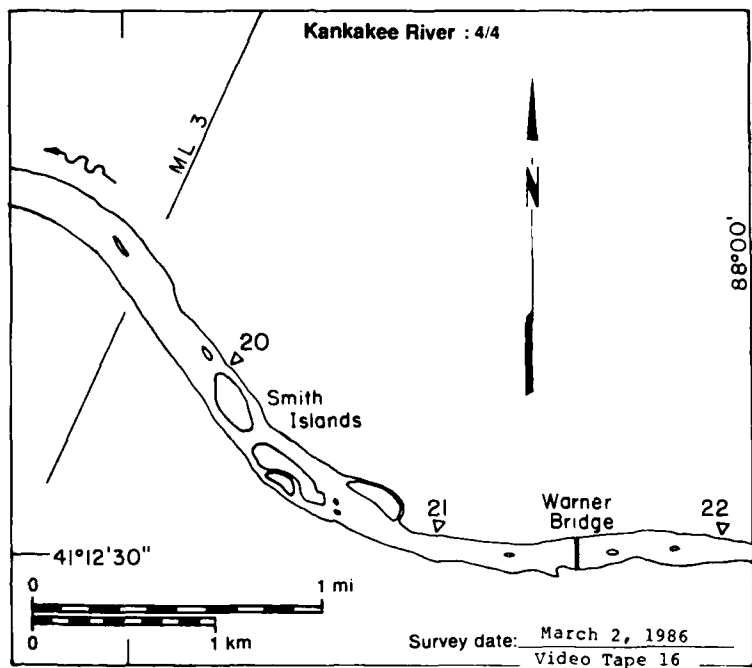
2 March 1986





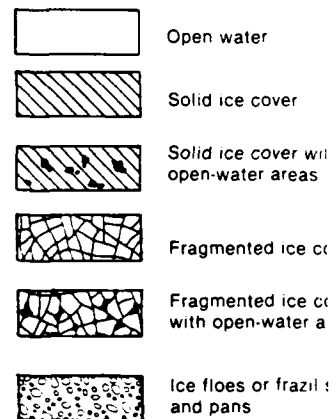






Kankakee River

MAP UNITS

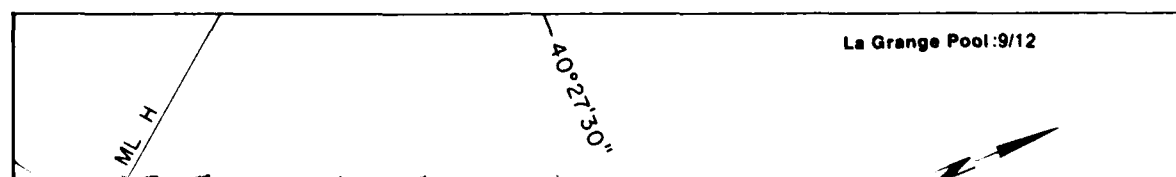
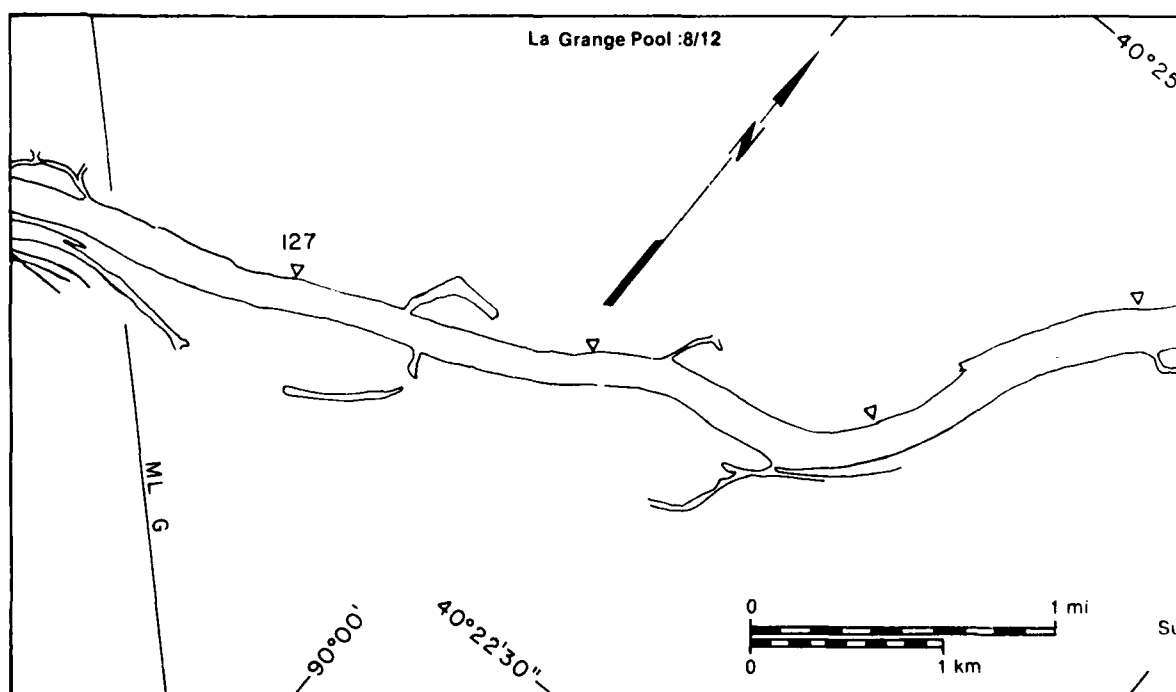
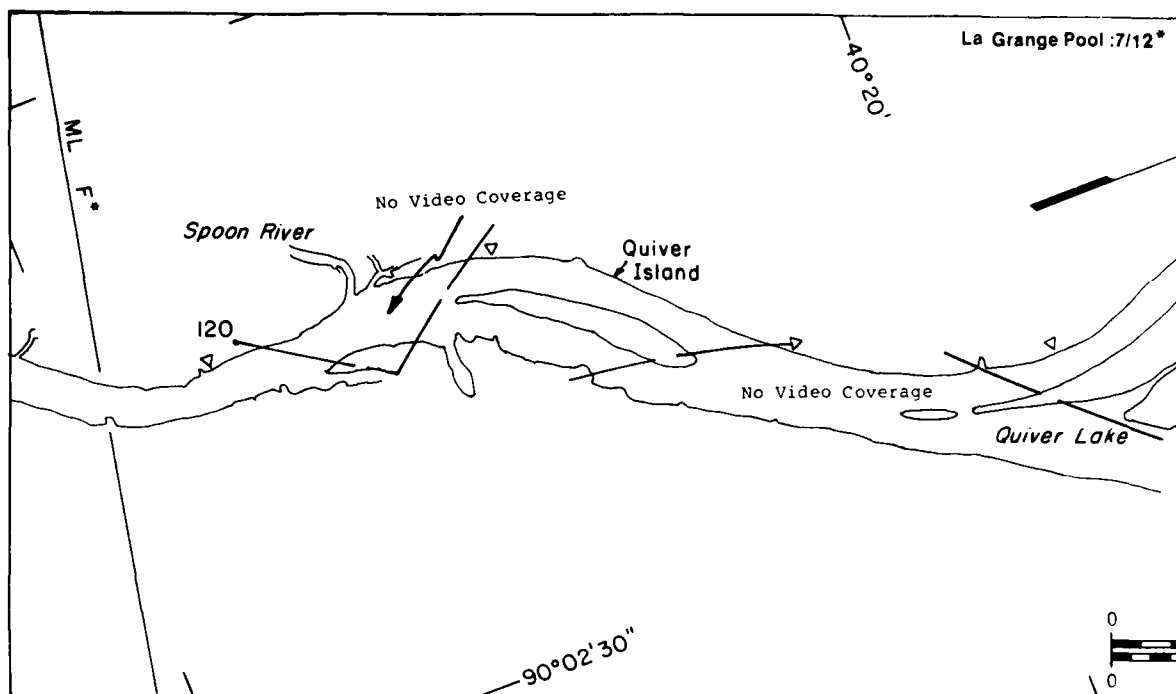


Total area (m²)

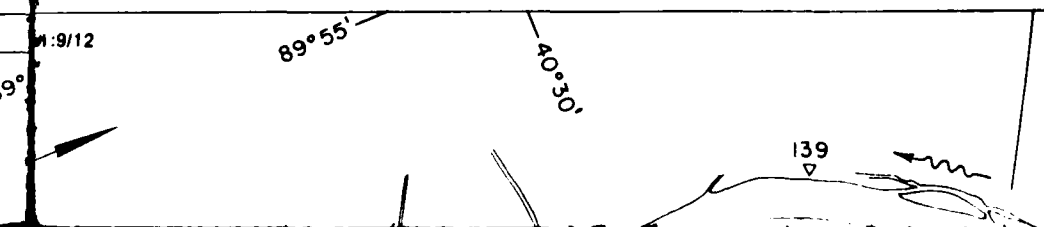
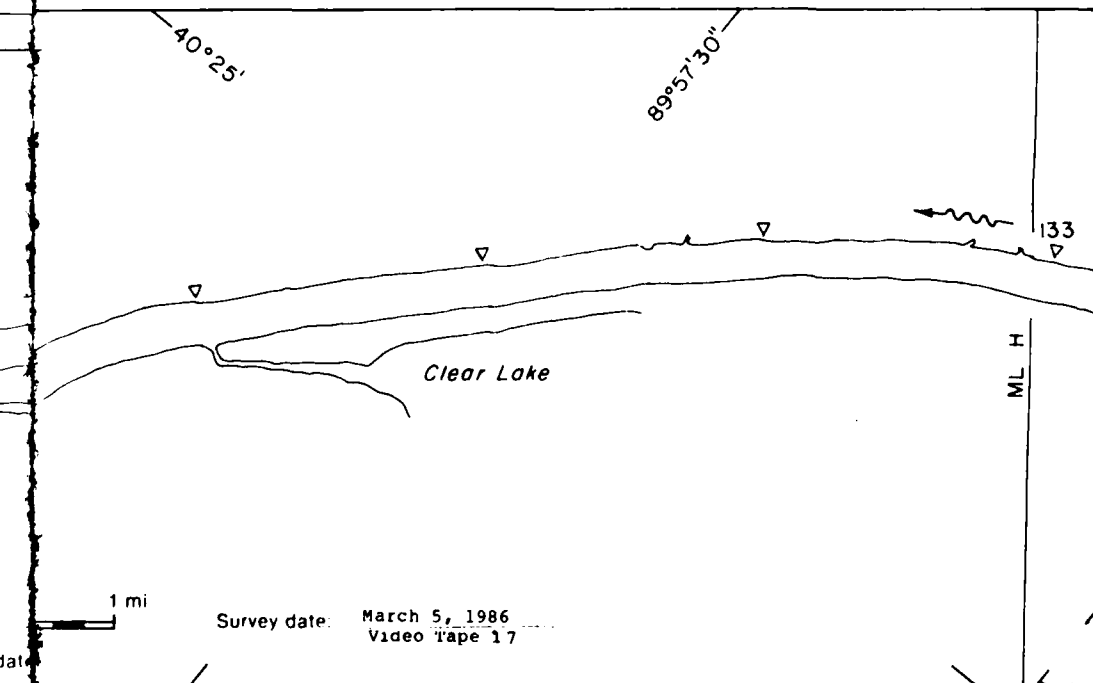
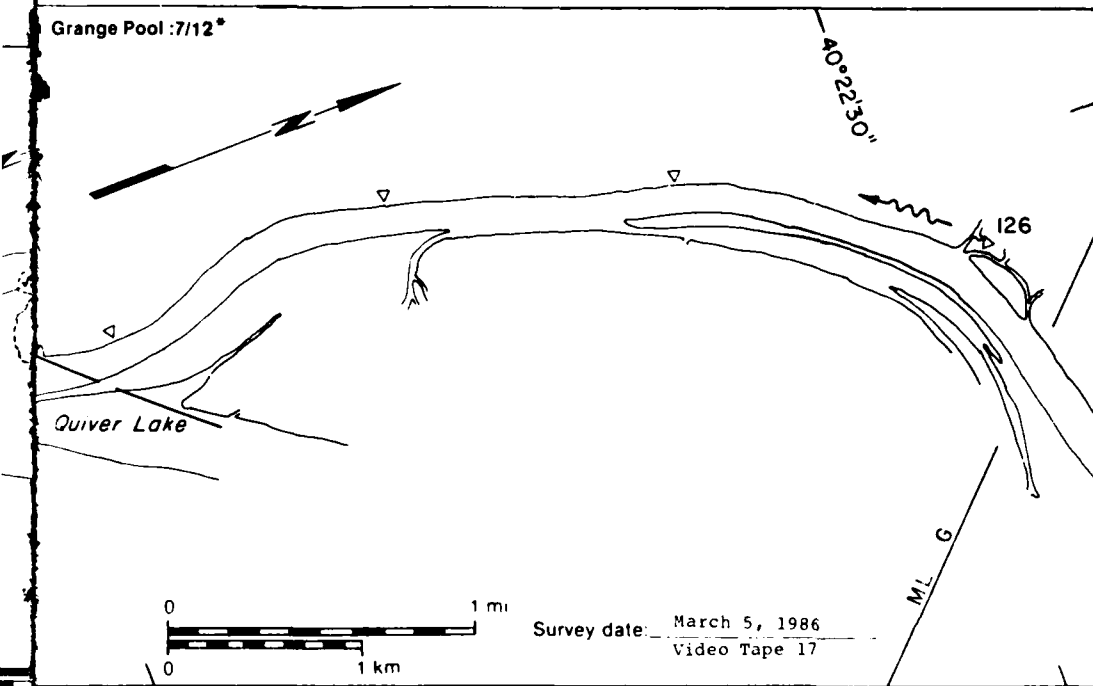
2 March 1986

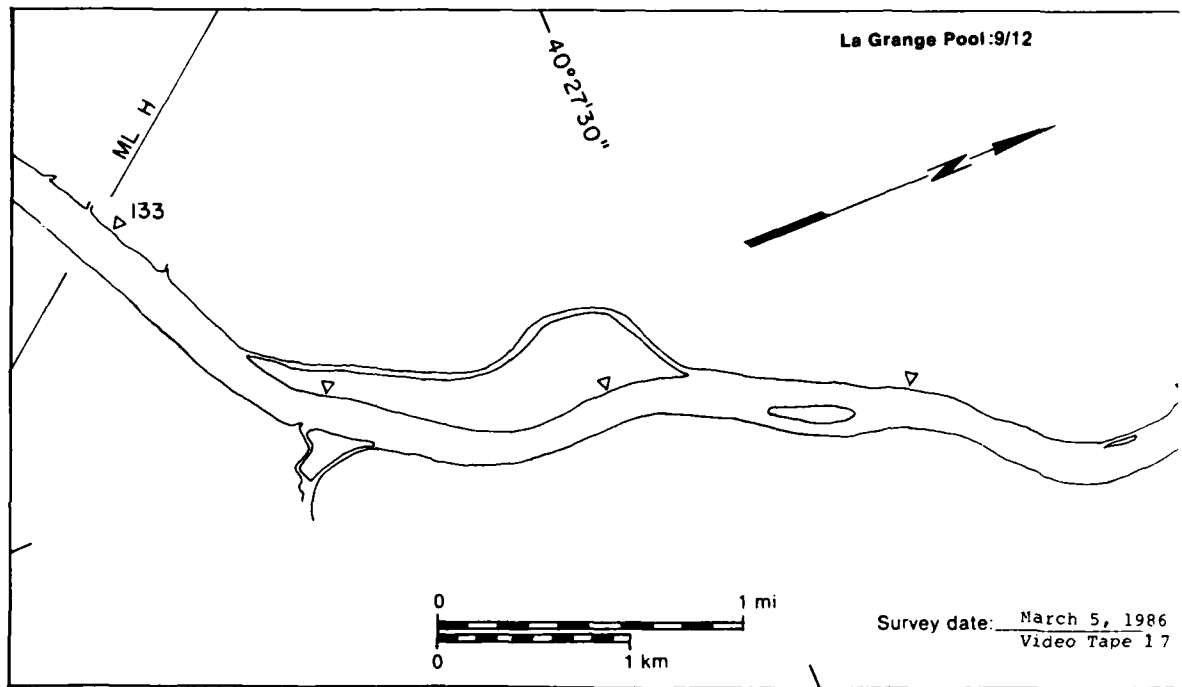
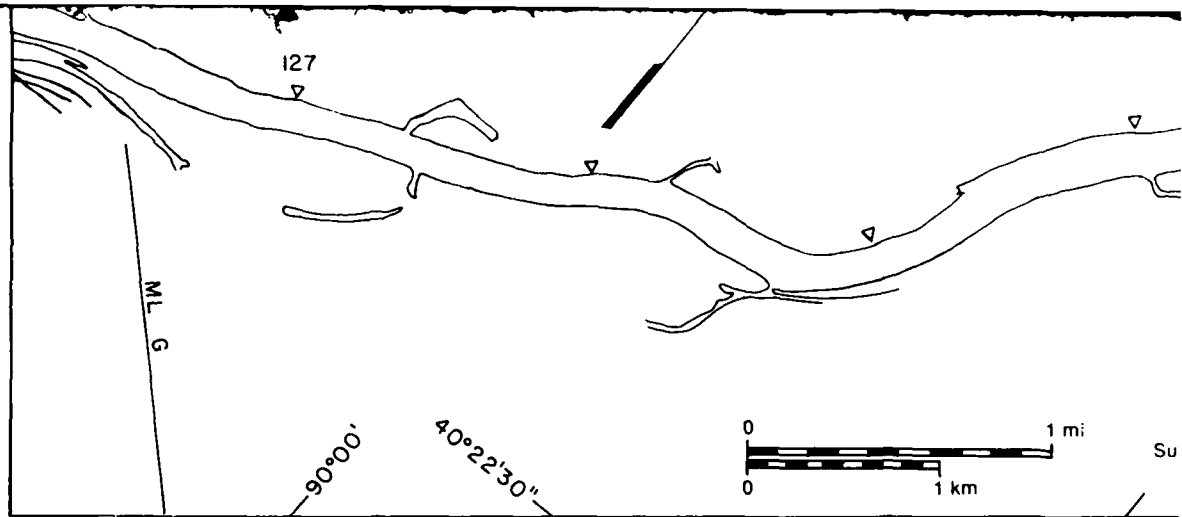
Kankakee River

MAP UNITS	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	6.82	NA
Solid ice cover	0.48	NA
Solid ice cover with open-water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open-water areas	0.00	—
Ice floes or frazil slush and pans	0.00	—
Total area ($m^2 \times 10^6$)	7.30	

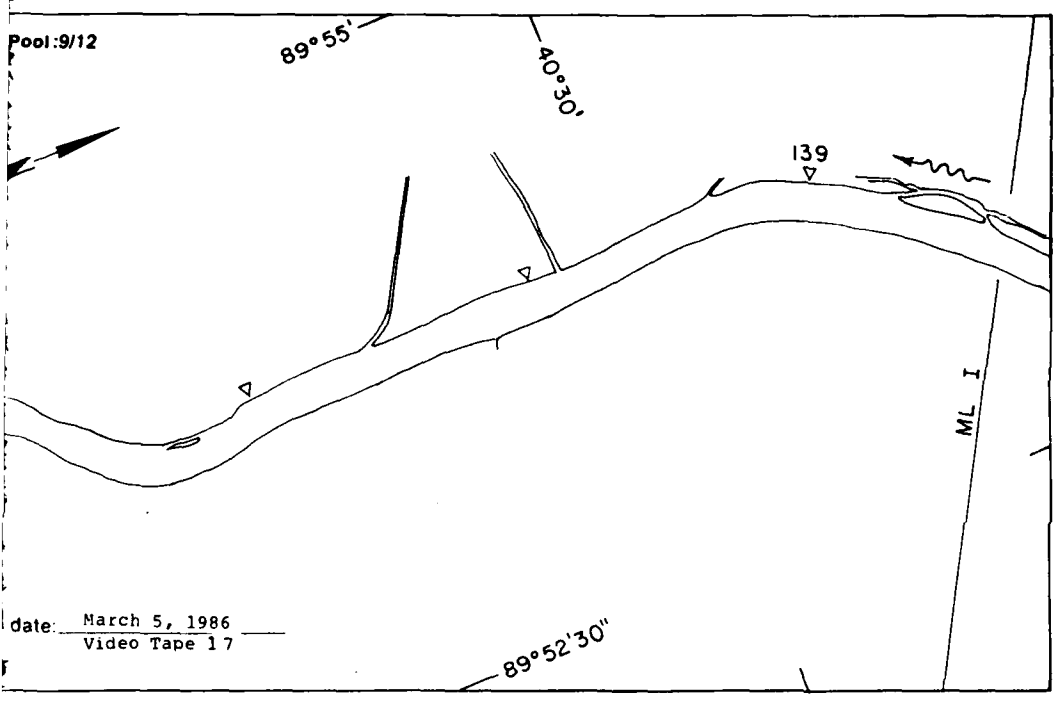
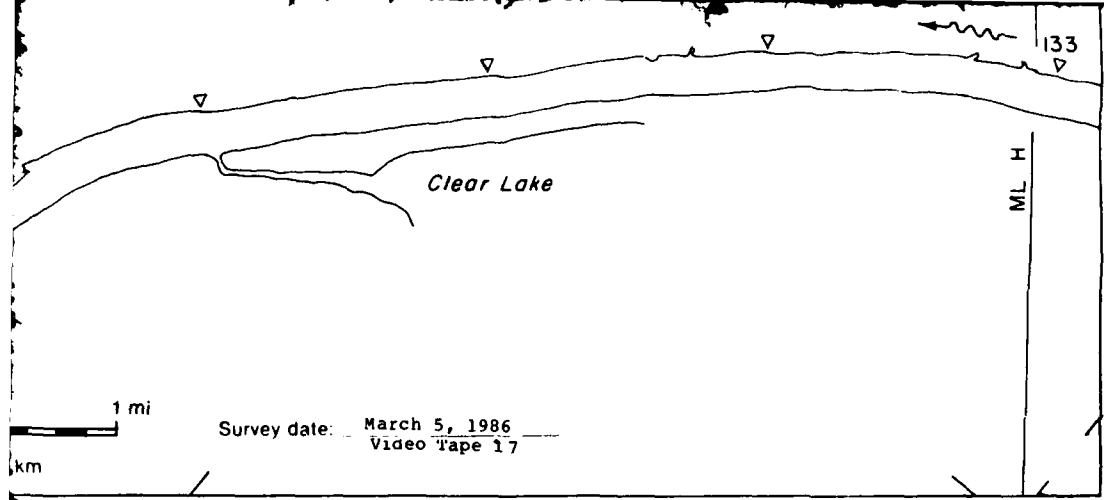


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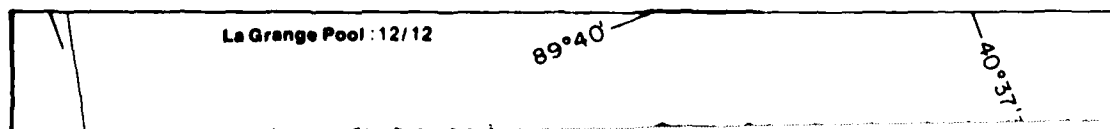
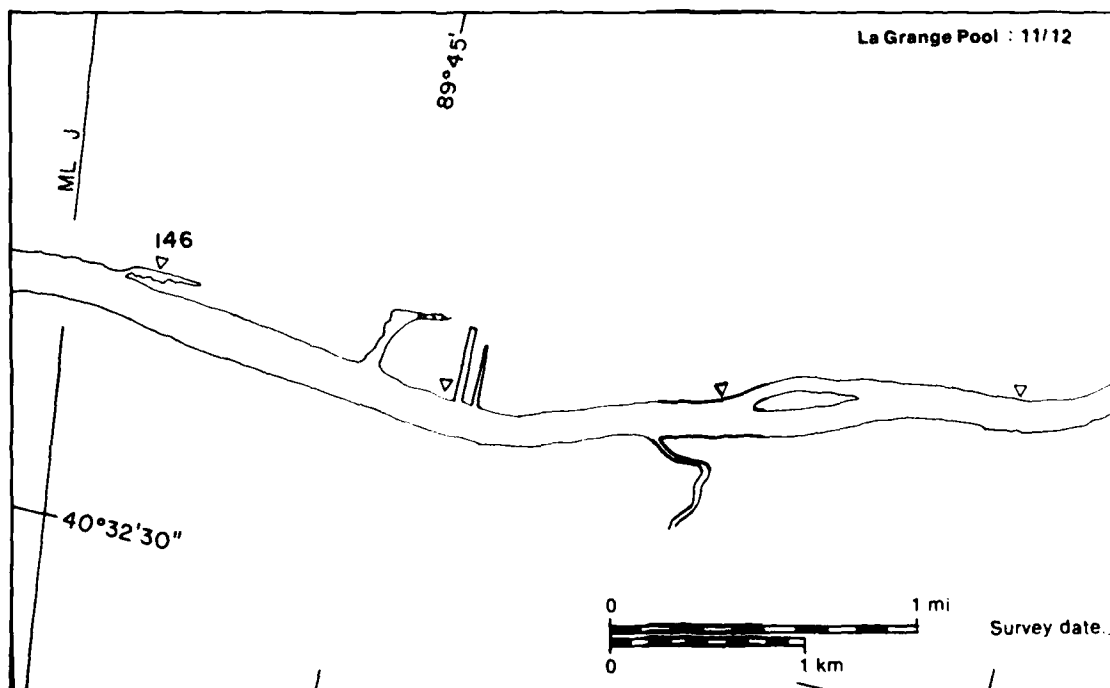
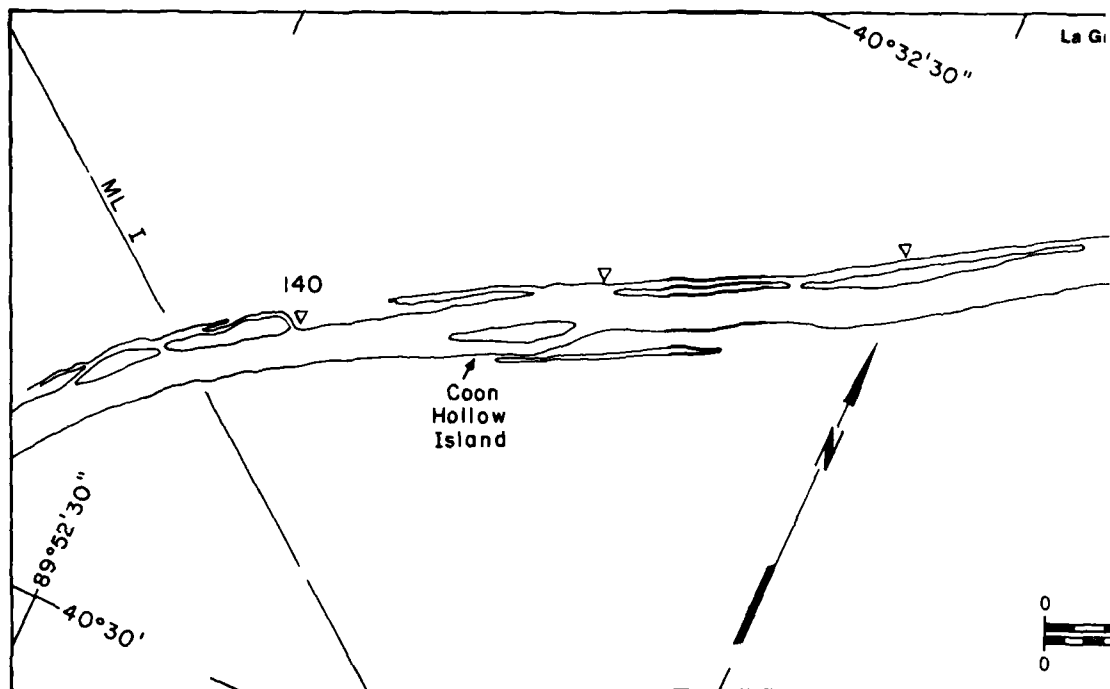


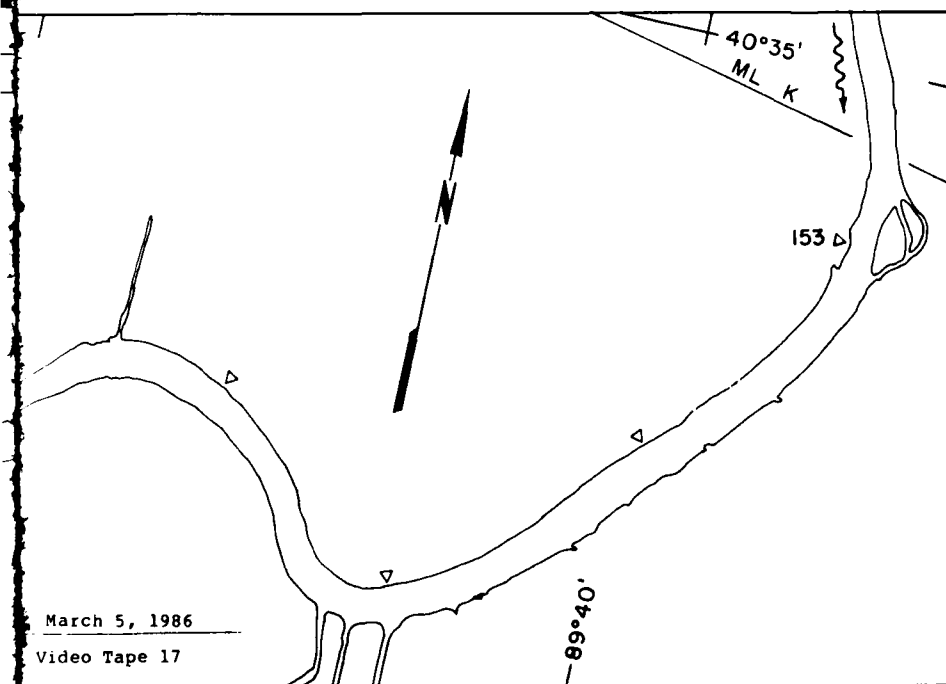
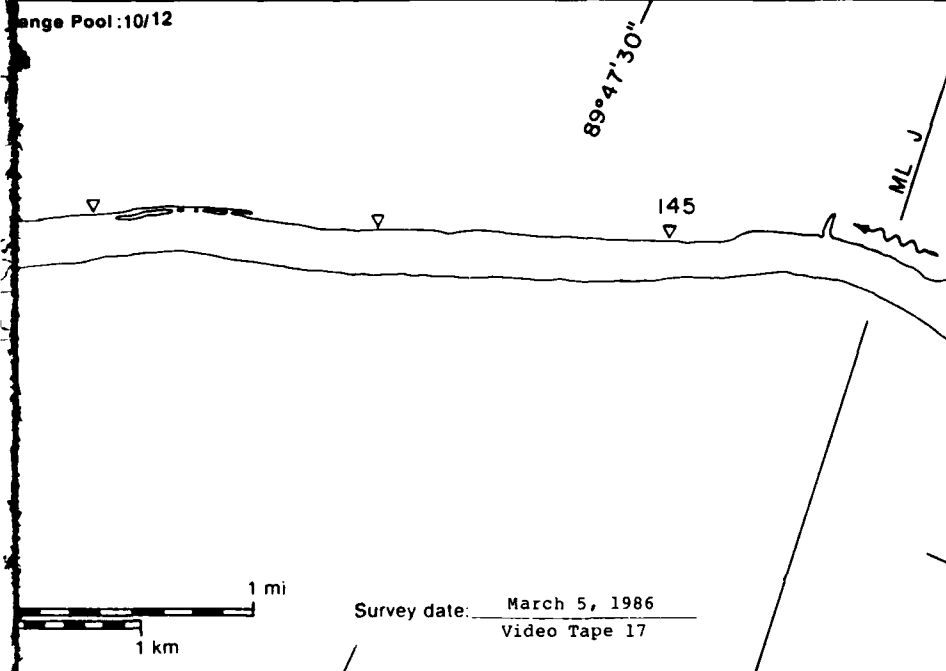


* The downstream limit of Illinois River video coverage was in the vicinity of mile 120 at Havana, Illinois, on all dates. There is no coverage of La Grange Pool maps 1/12 through 6/12 (match lines A through E).



5 March 1986



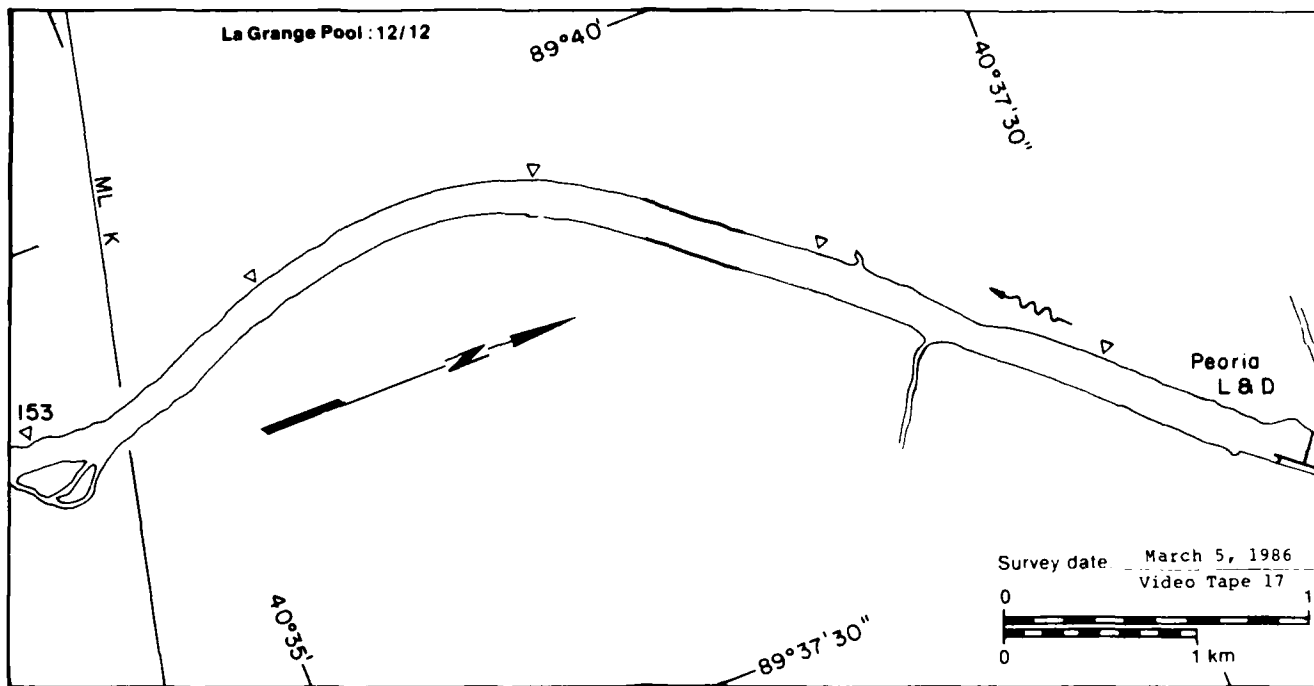
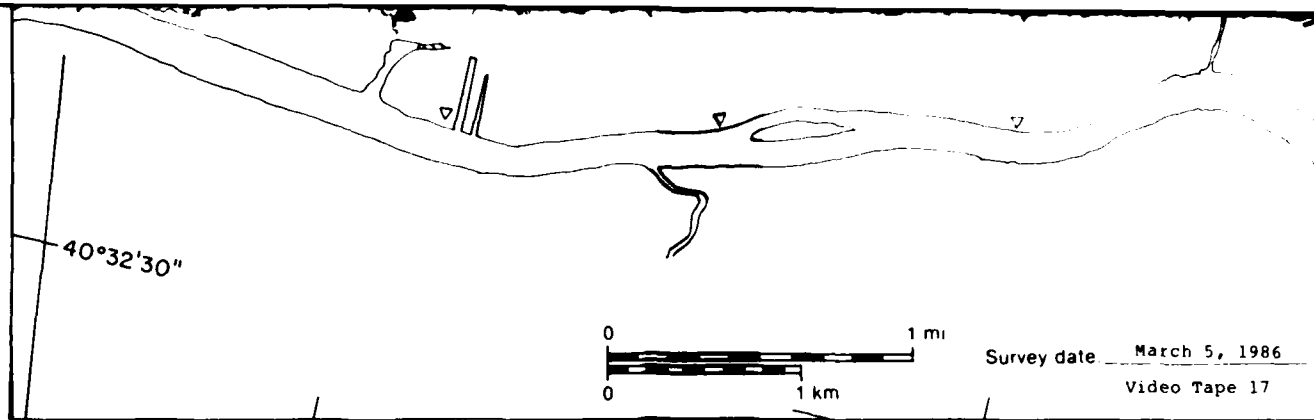


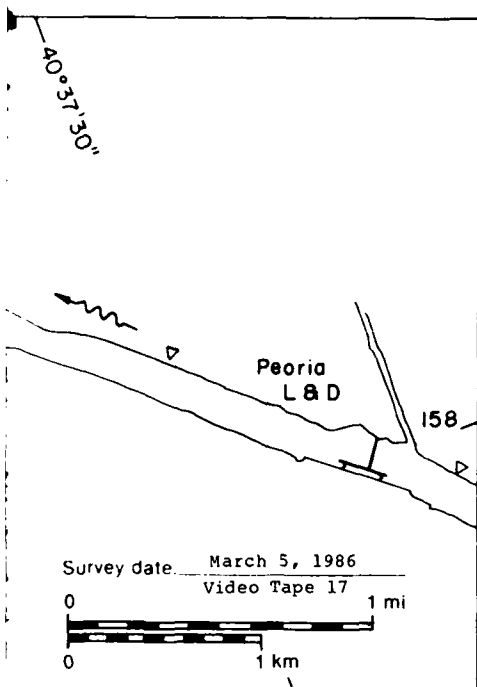
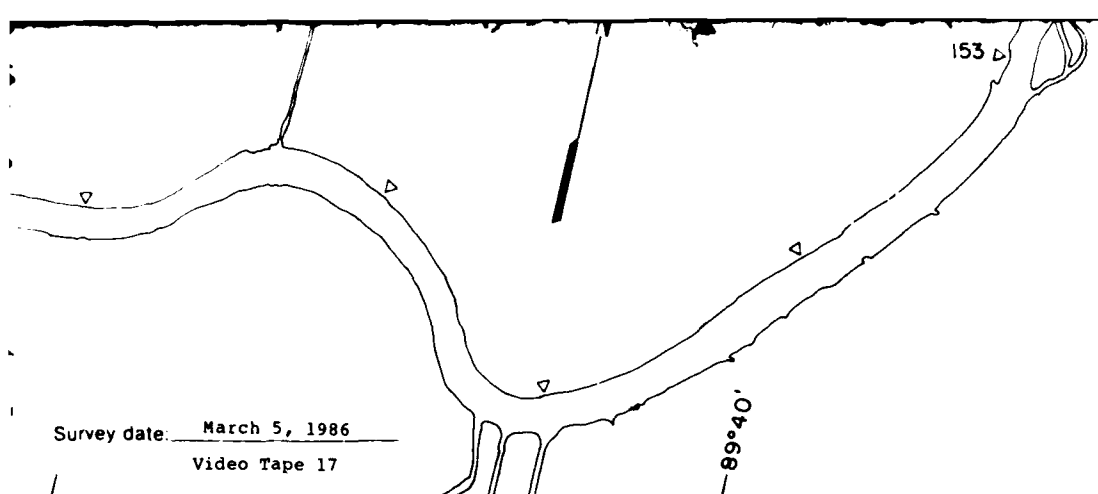
La Grange Pool

MAP UNITS

Open water

Area (m ² x 10 ⁶)	Surface concentration (%)
10.91	NA





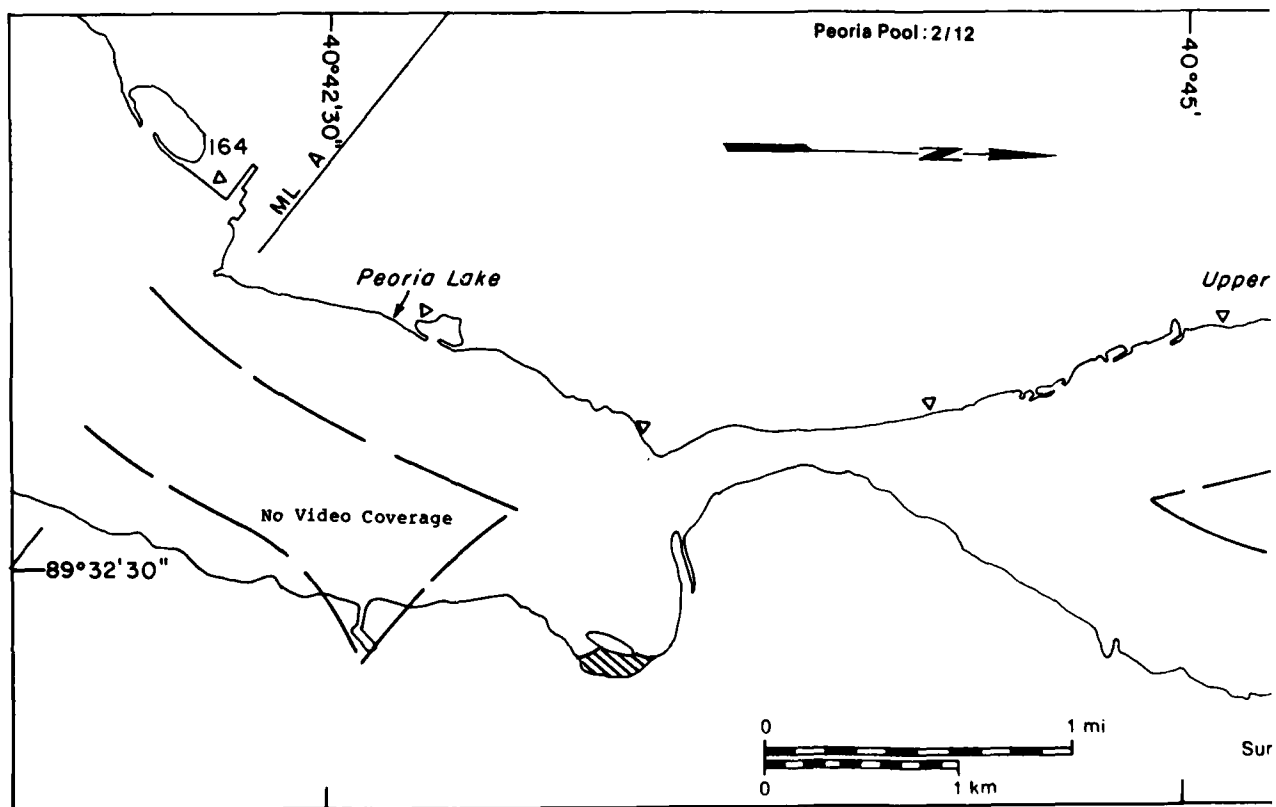
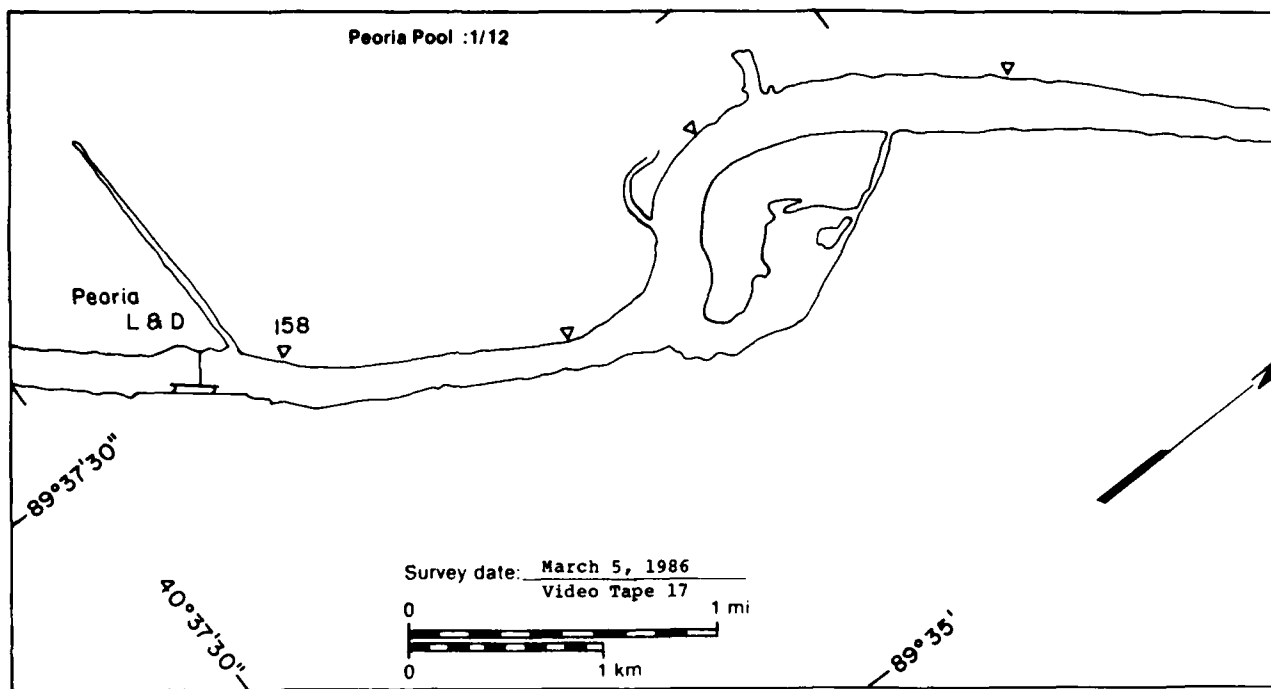
La Grange Pool

MAP UNITS

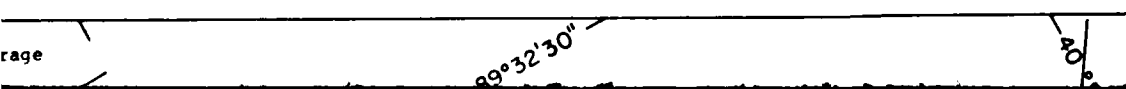
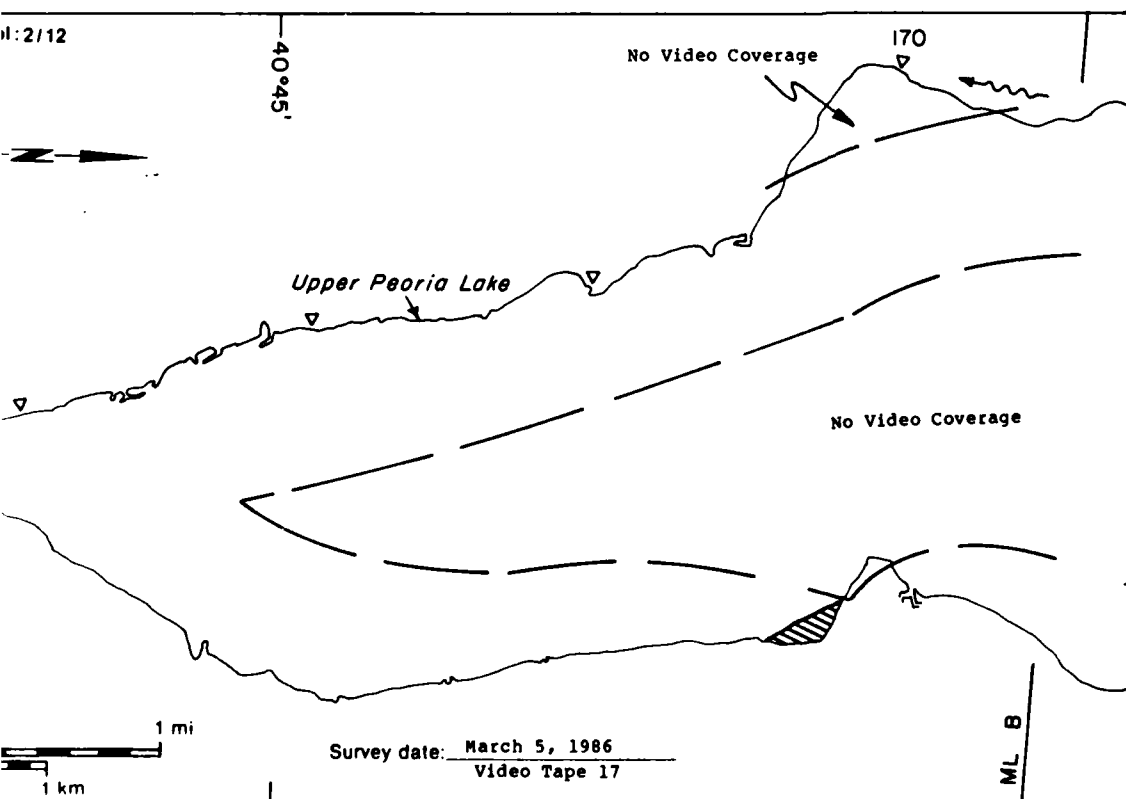
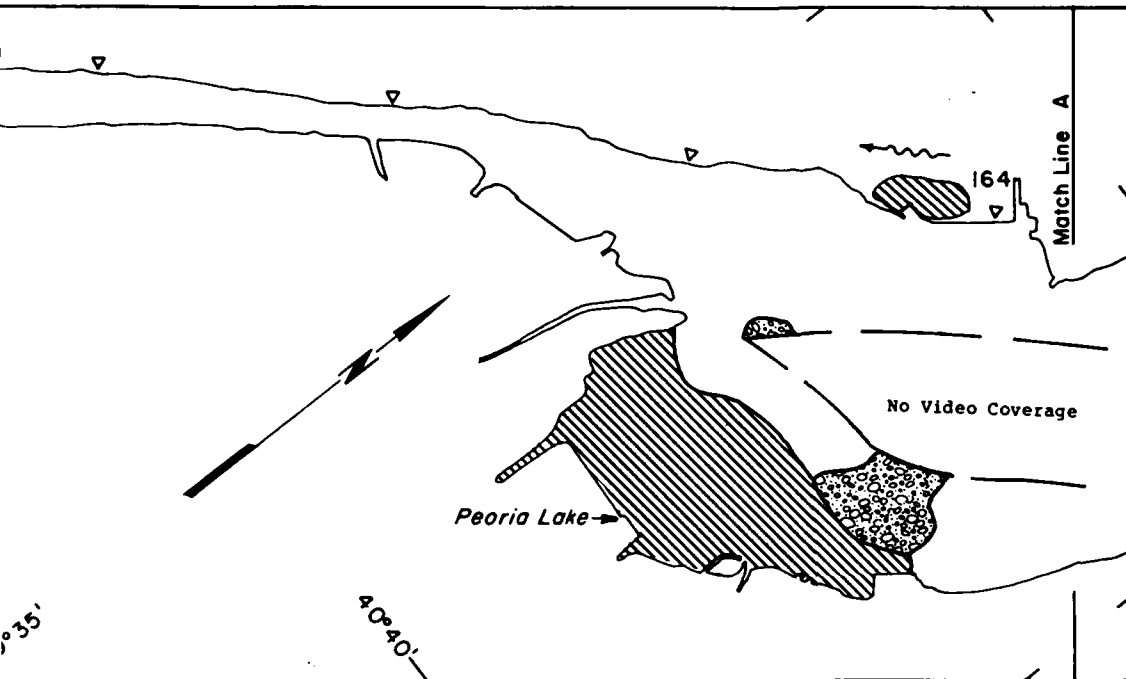
	Open water
	Solid ice cover
	Solid ice cover with open-water areas
	Fragmented ice cover
	Fragmented ice cover with open-water areas
	Ice floes or frazil slush and pans

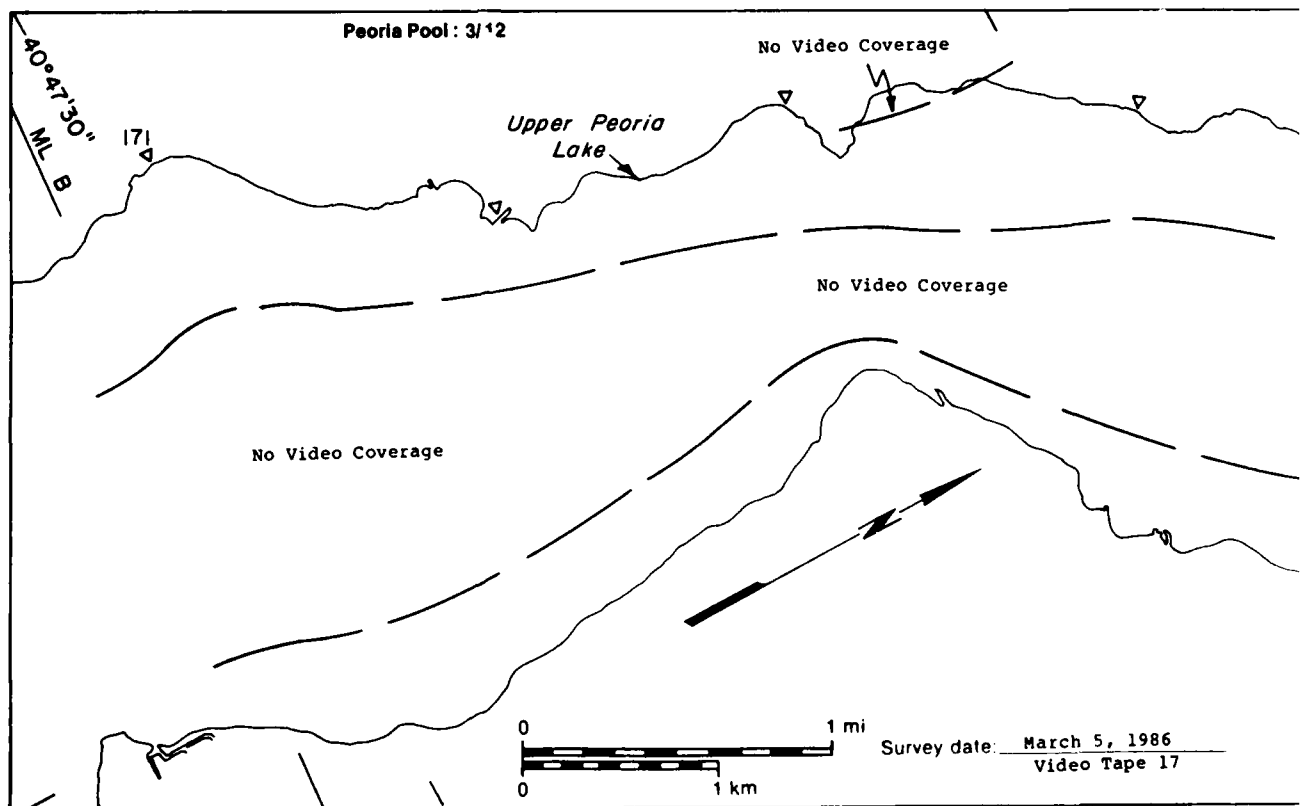
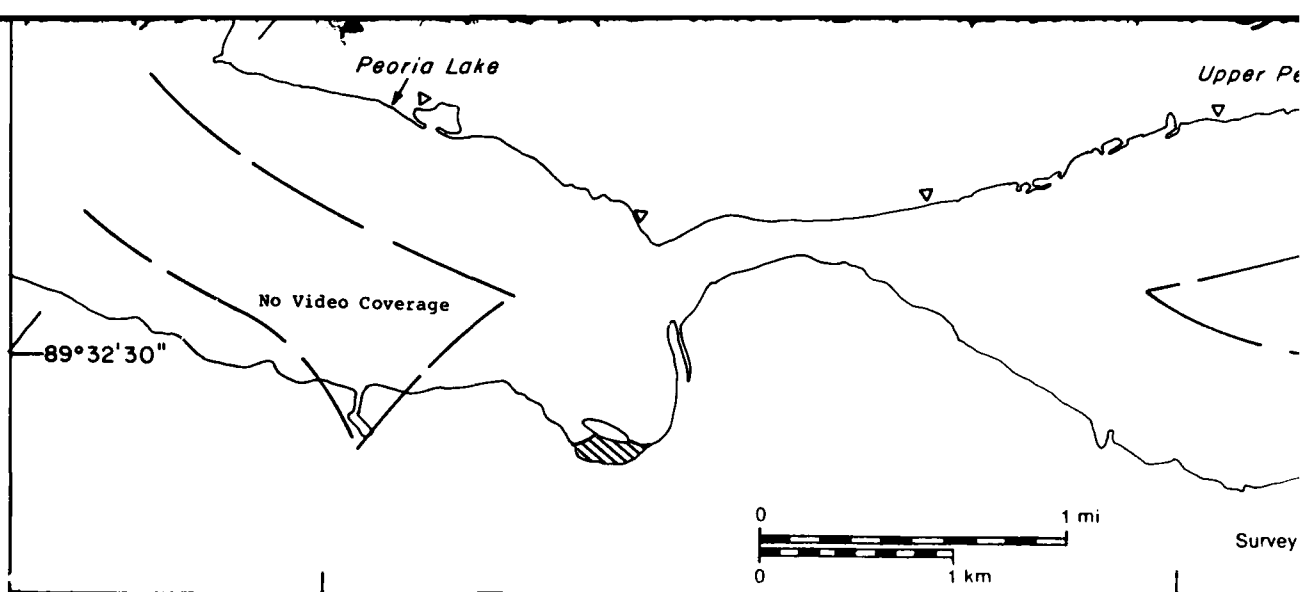
Area (m ² x 10 ⁶)	Surface concentration (%)
10.91	NA
Trace	NA
0.00	—
0.00	NA
0.00	—
0.00	—
0.00	—
Total area (m ² x 10 ⁶)	11.71*

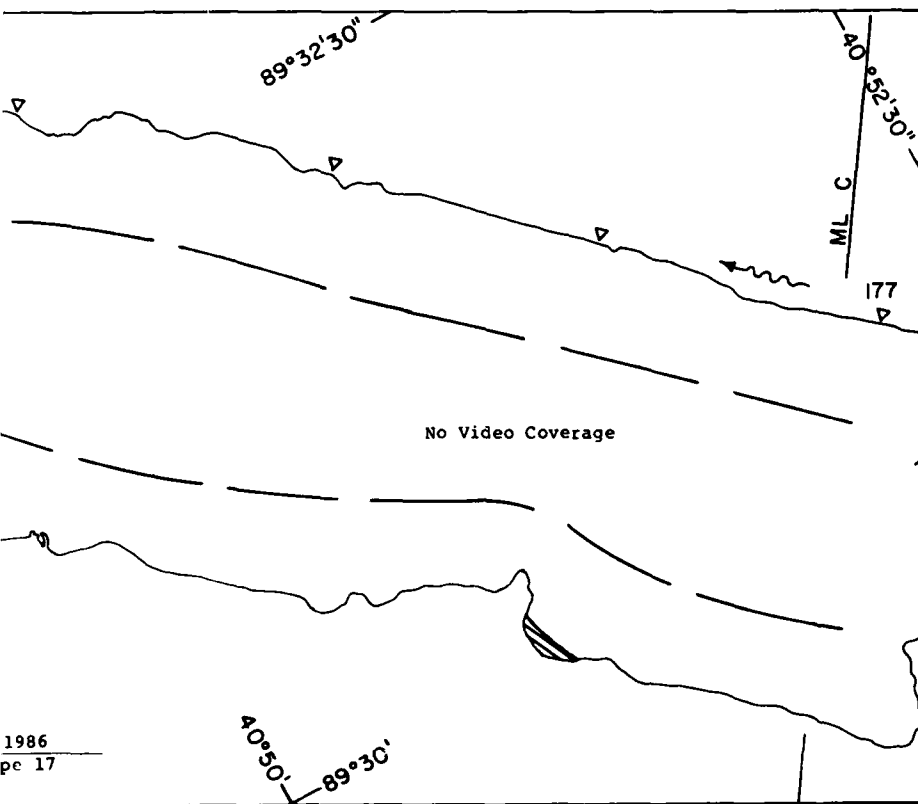
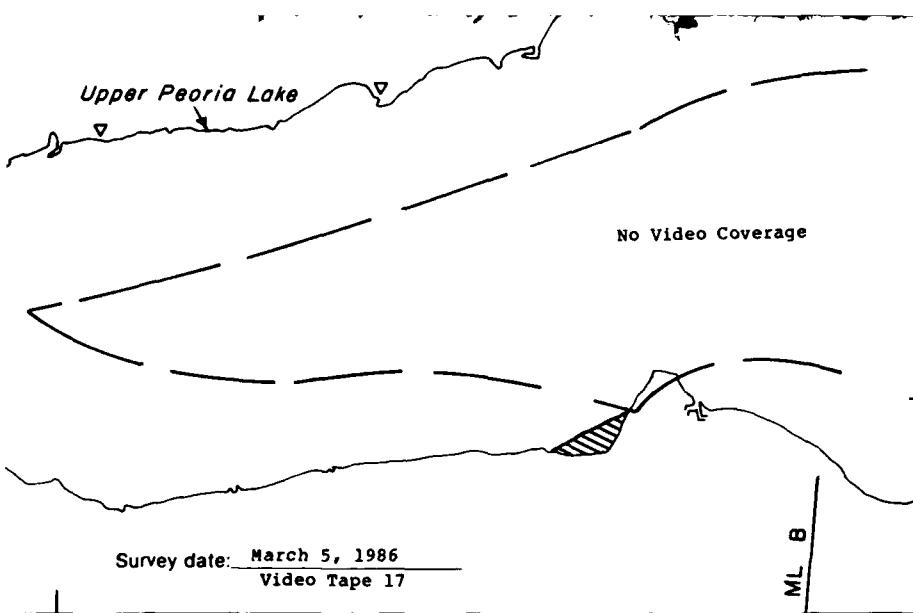
* Includes 0.80 x 10⁶ m² of no video coverage



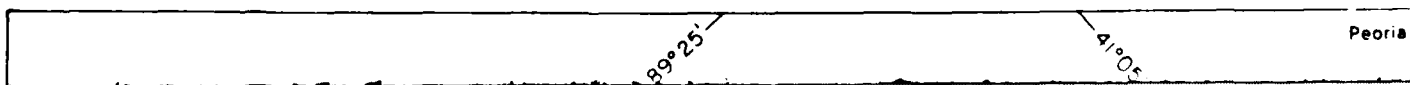
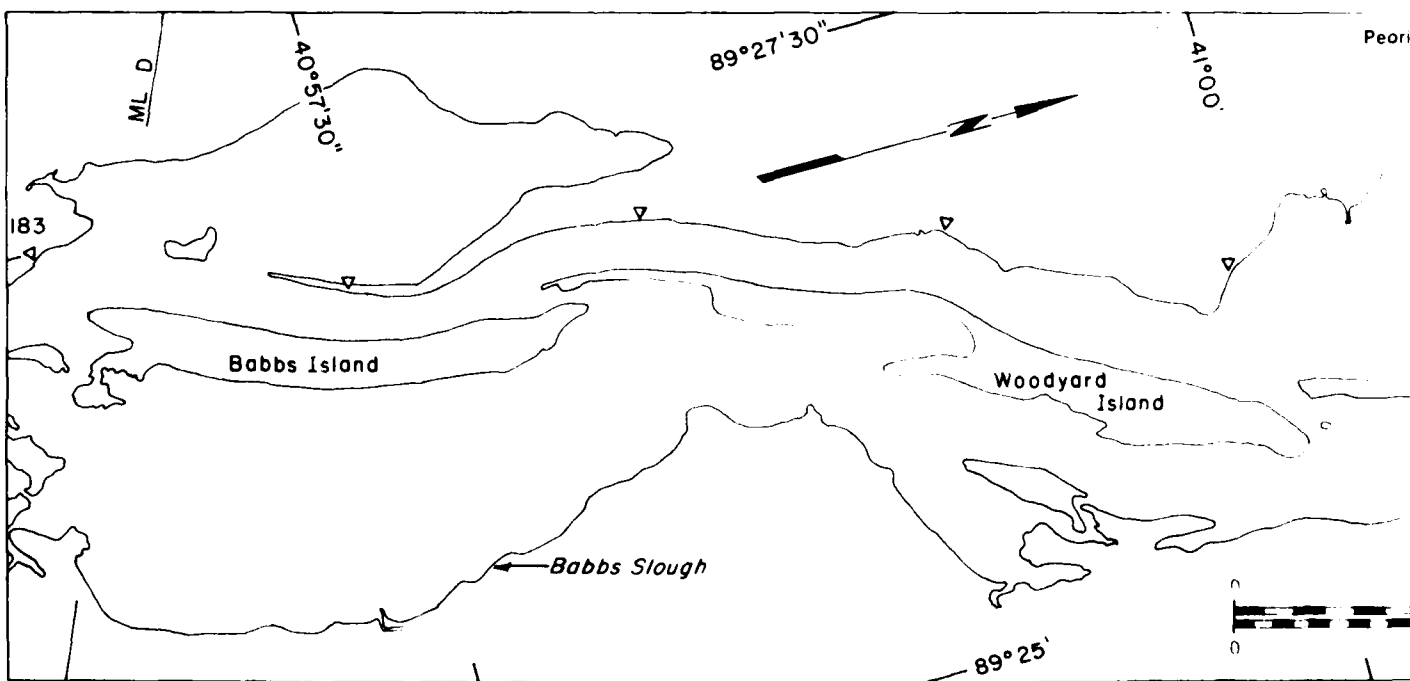
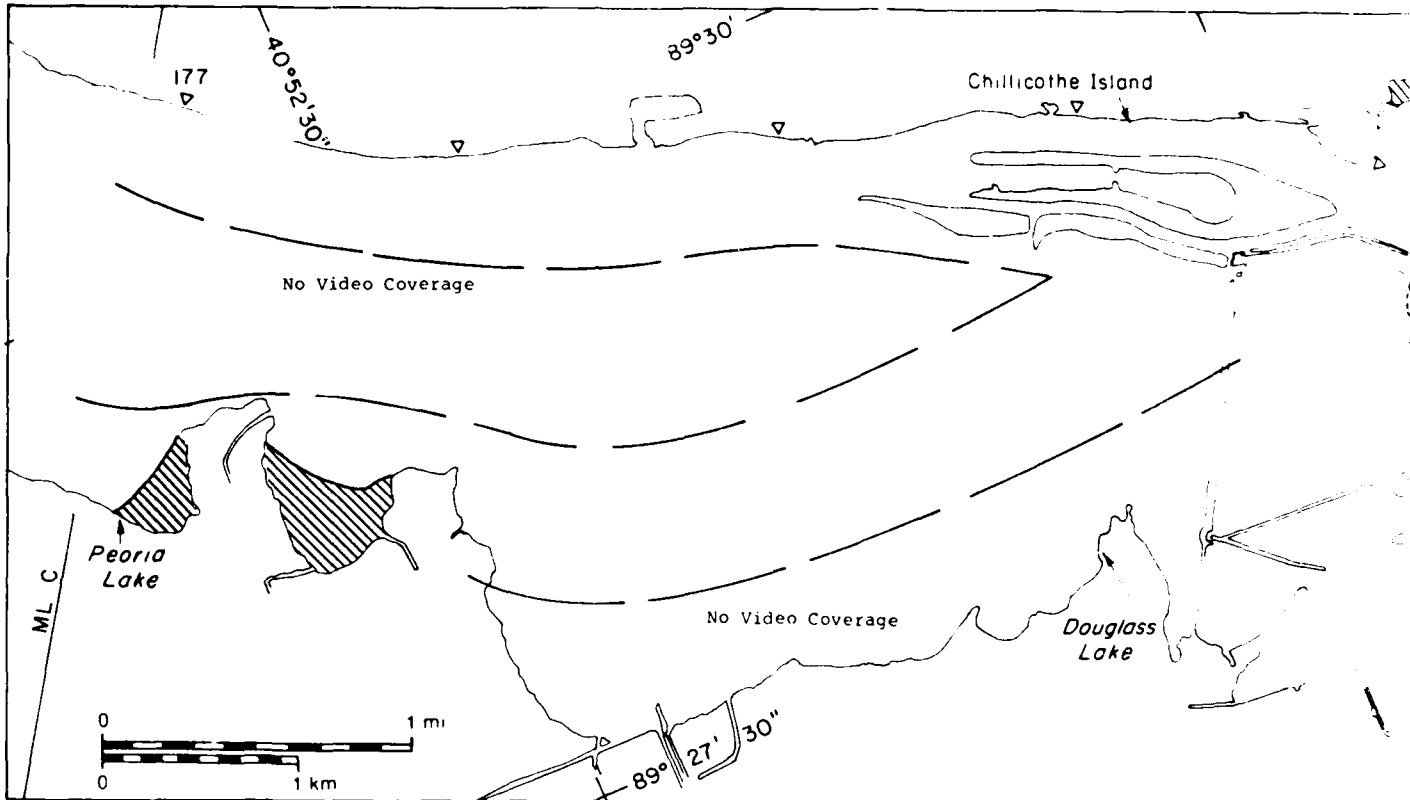
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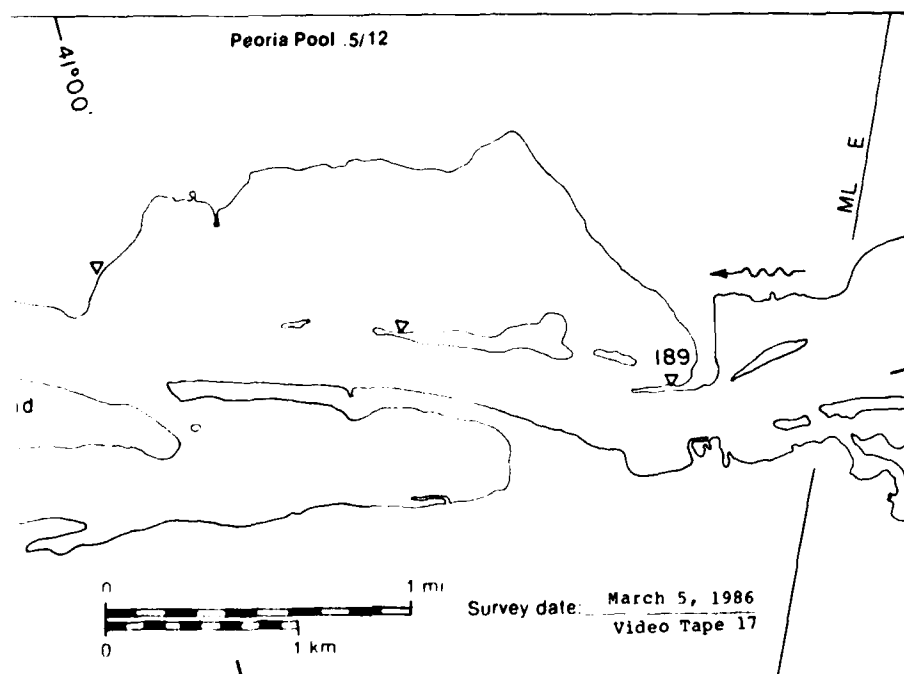
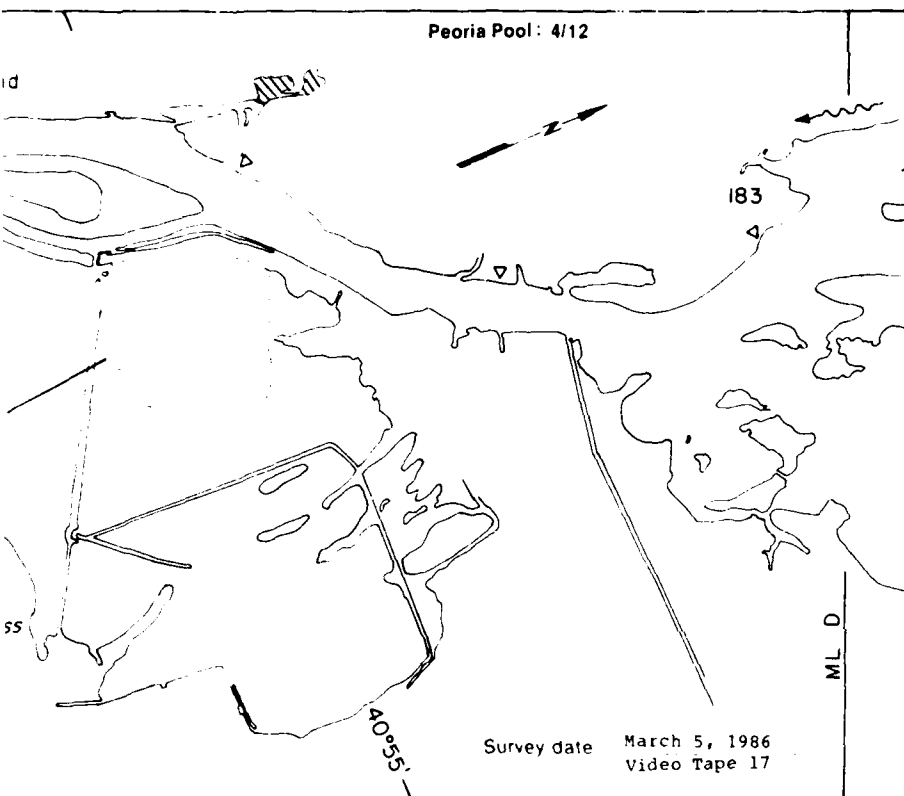


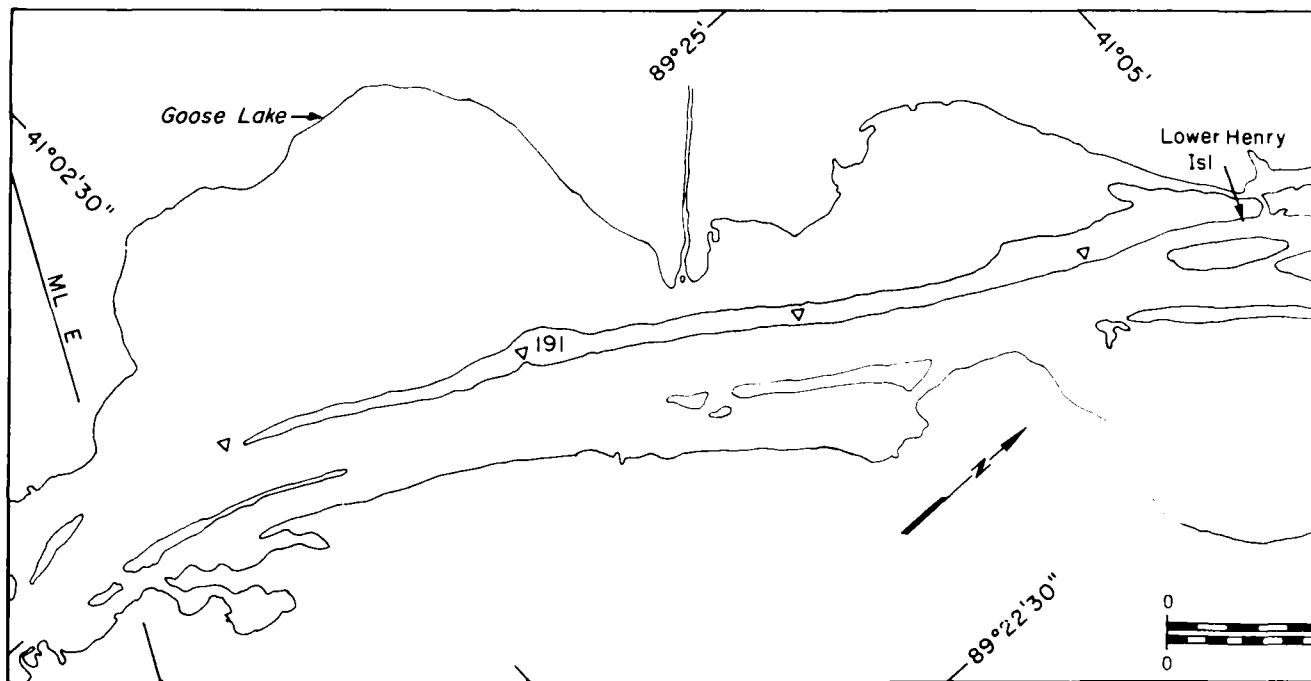
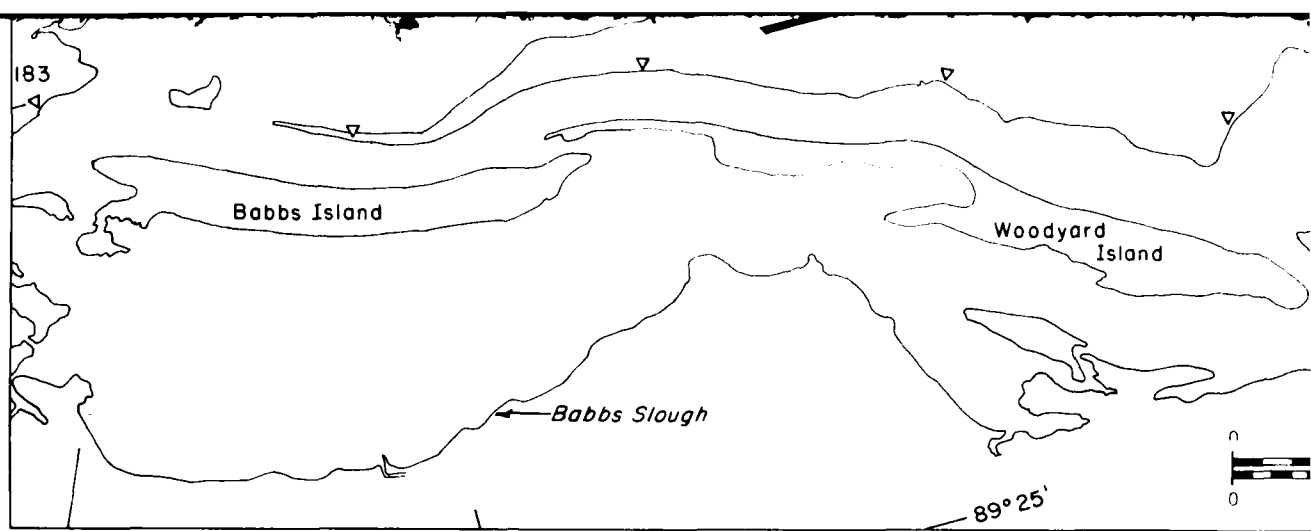


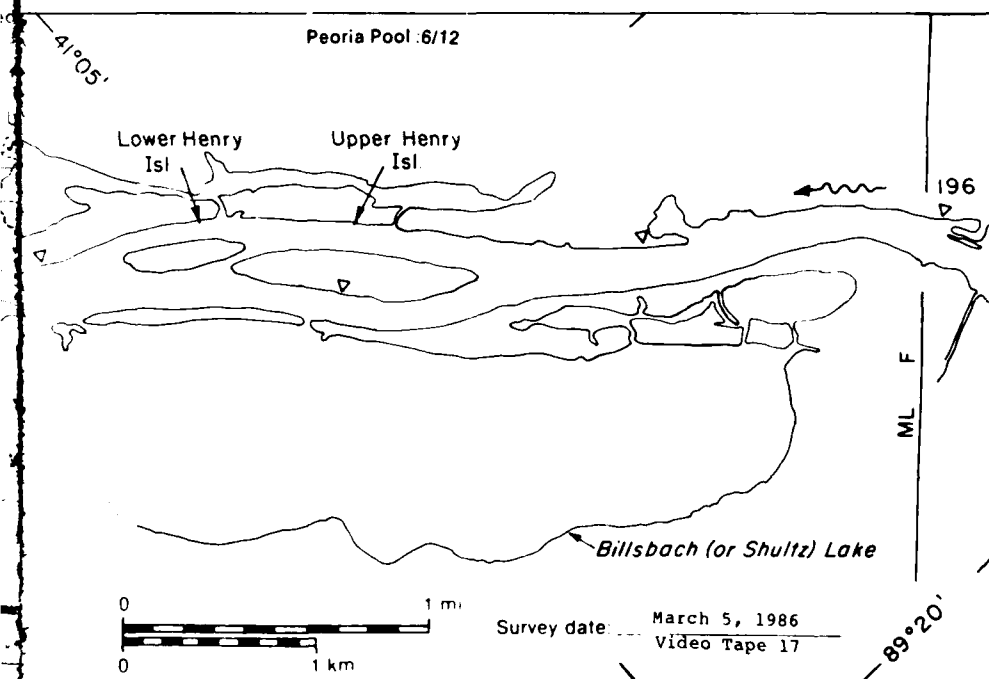
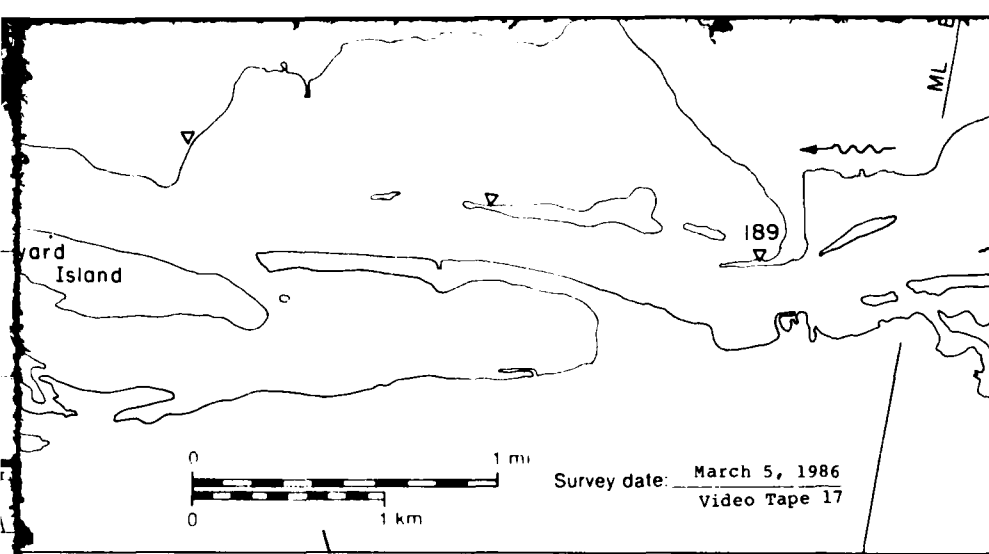


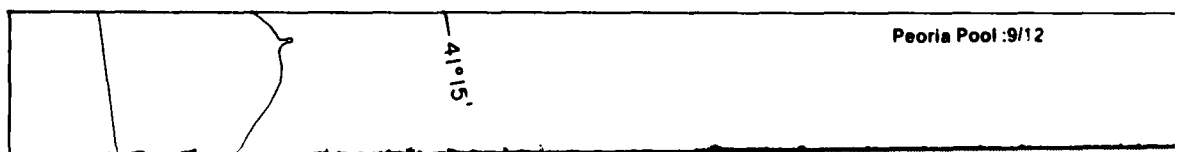
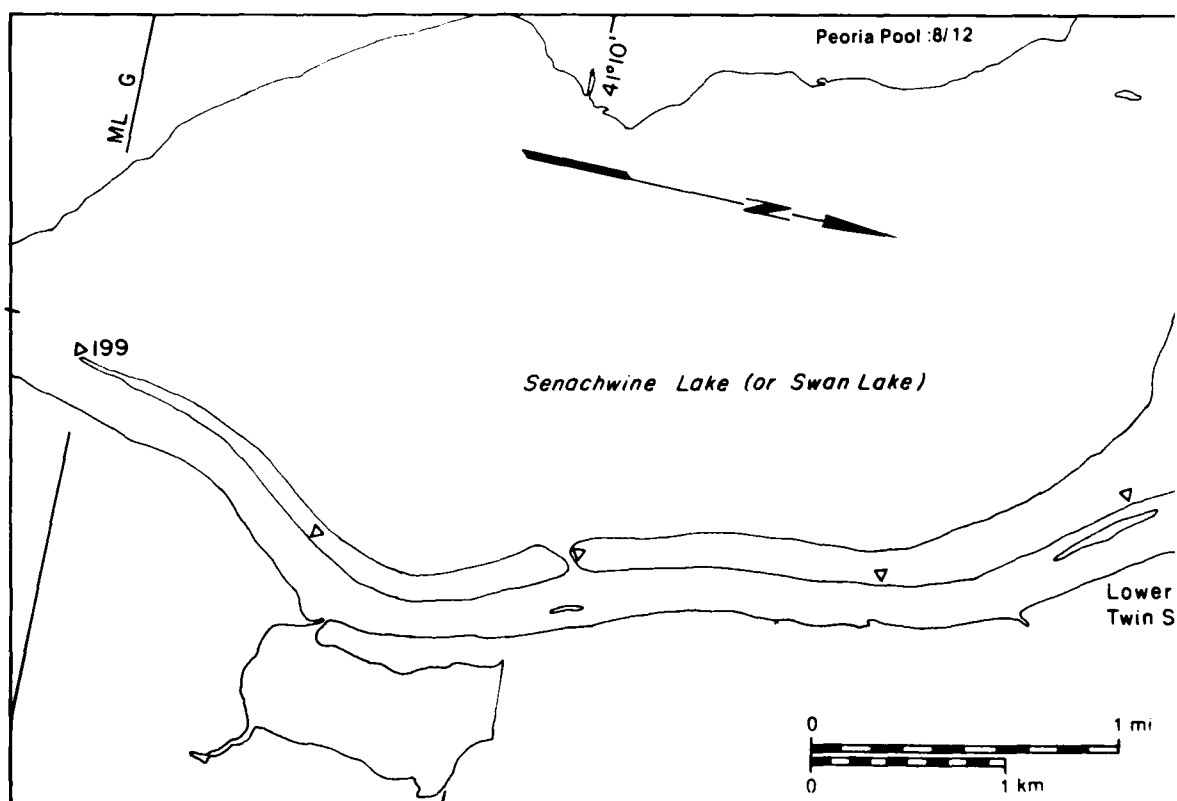
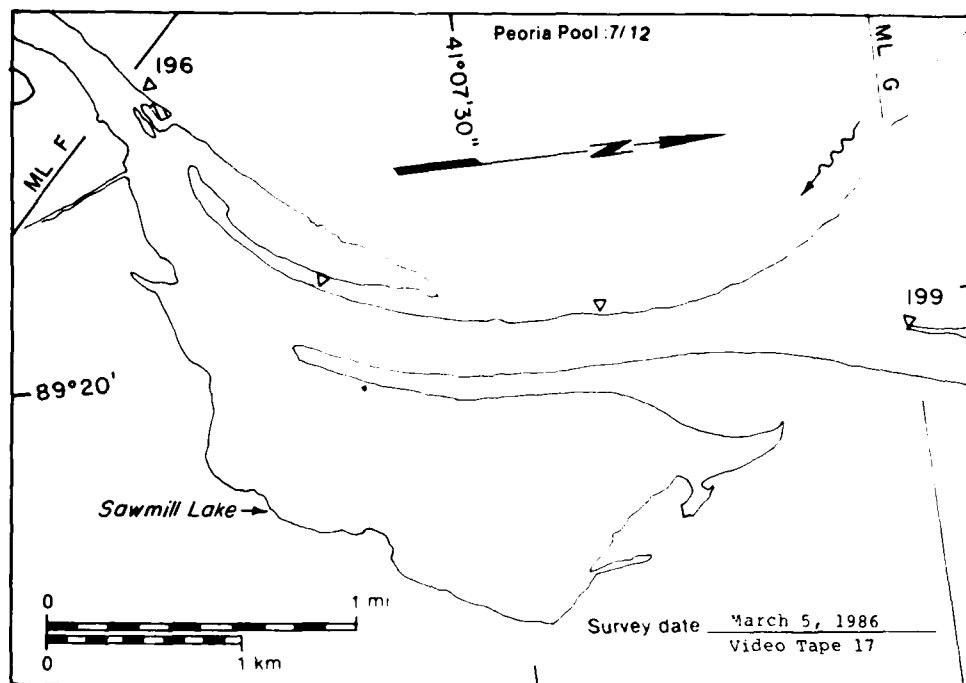
5 March 1986



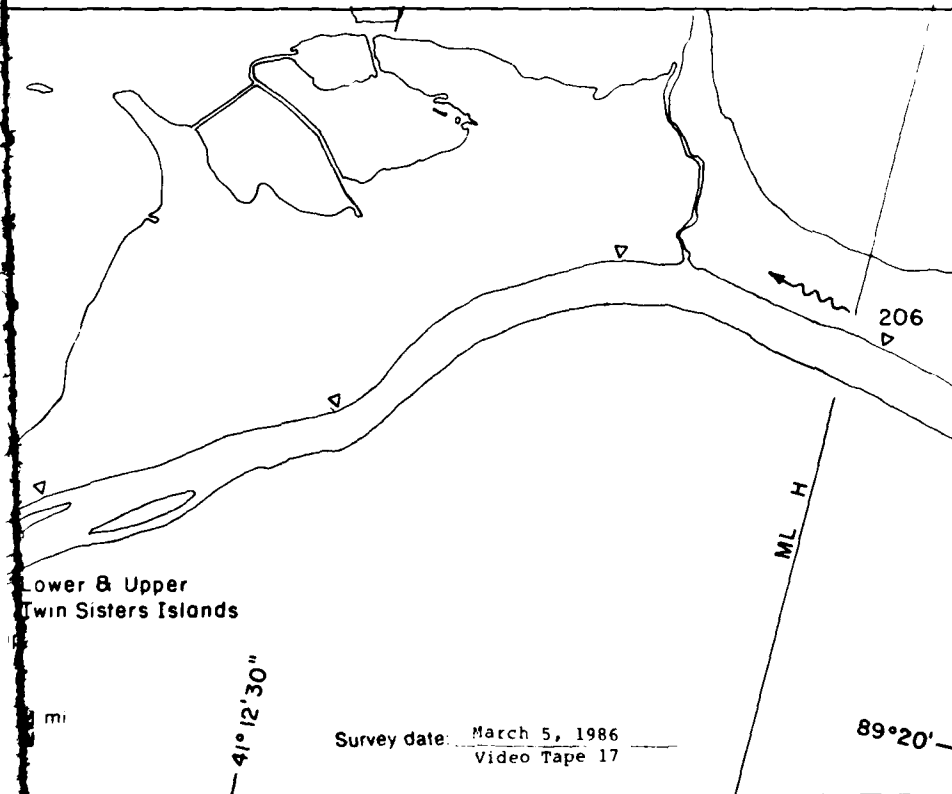






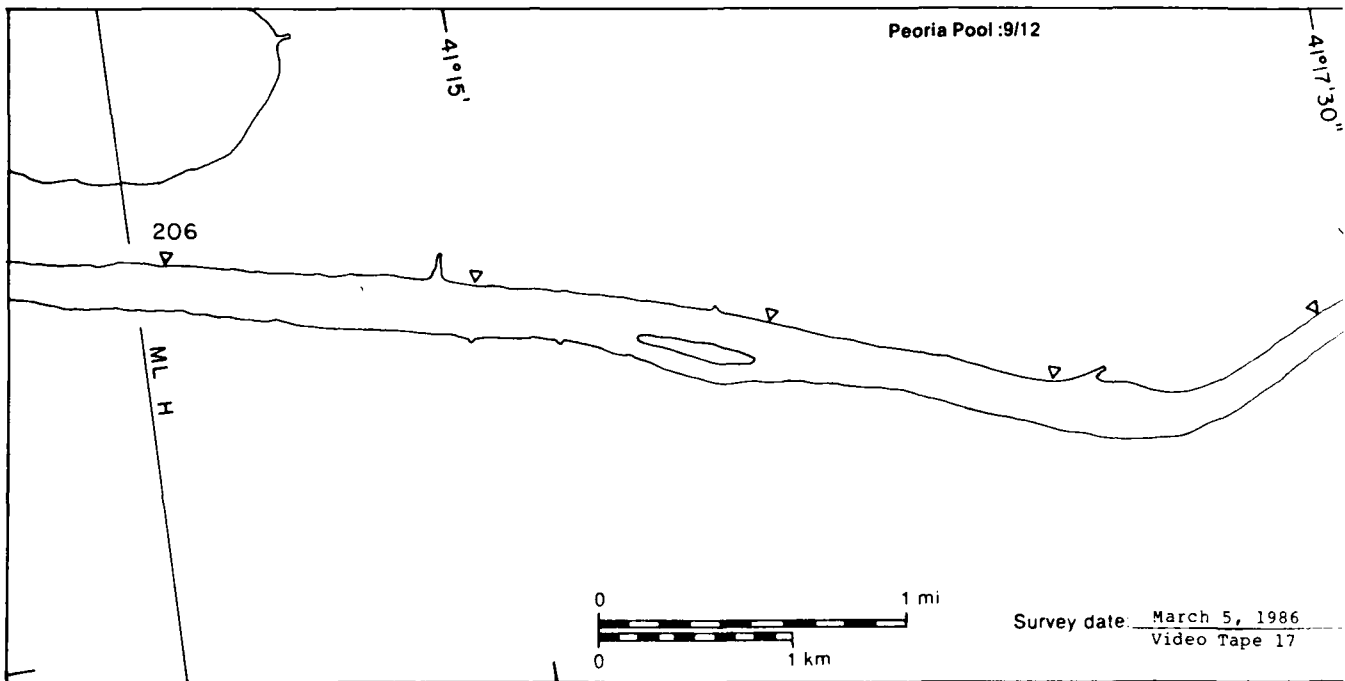
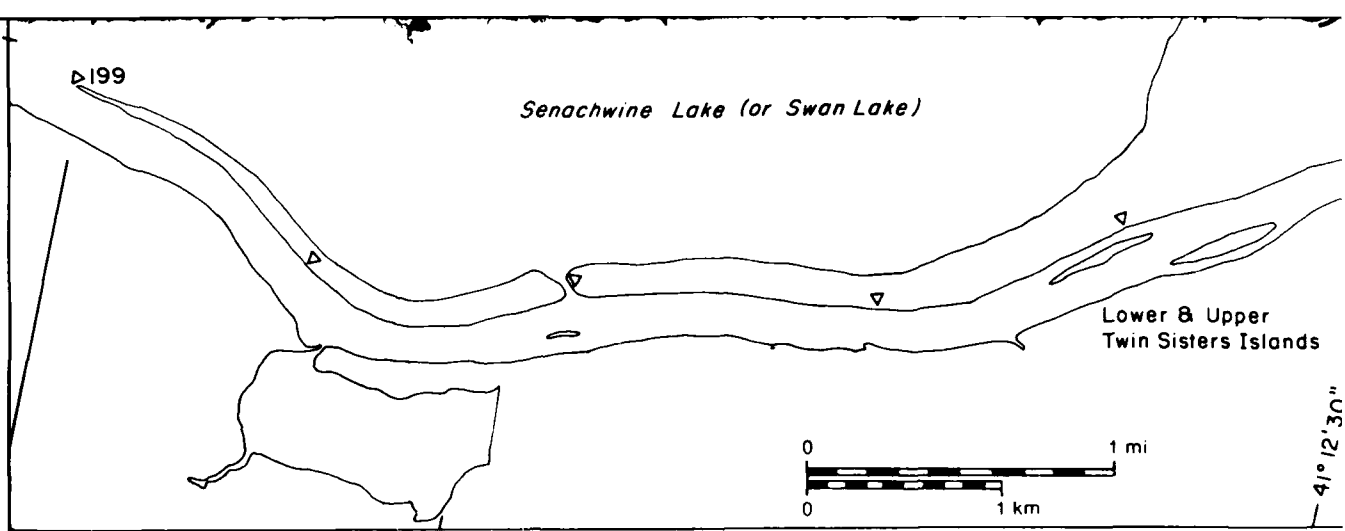


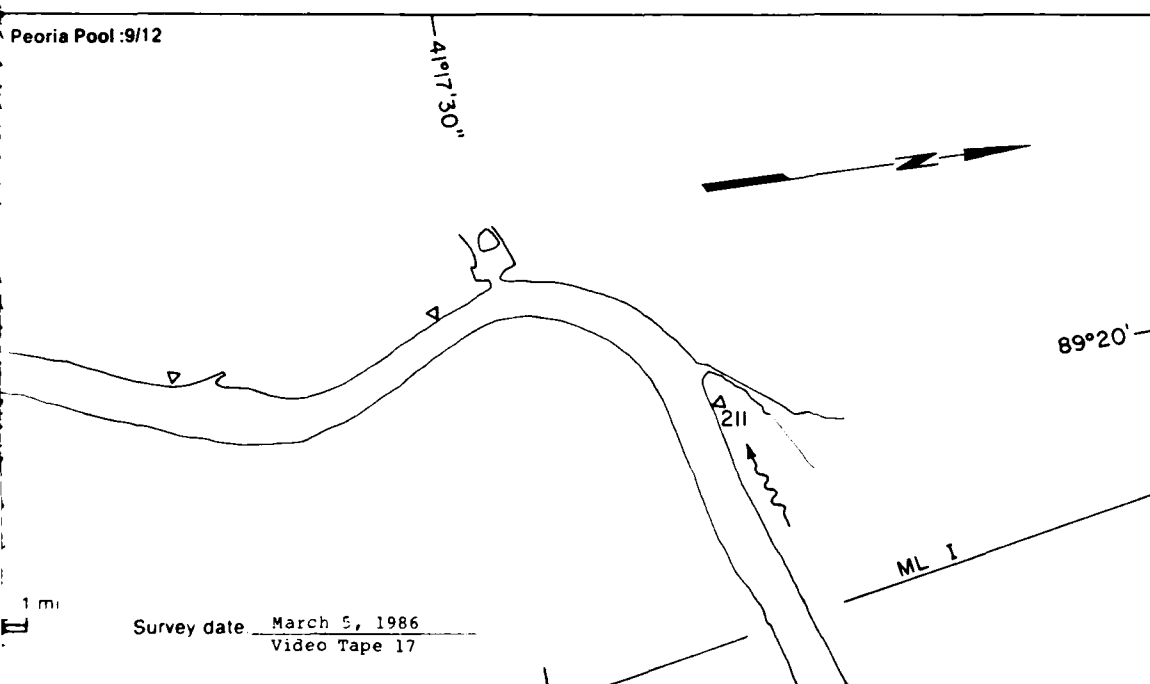
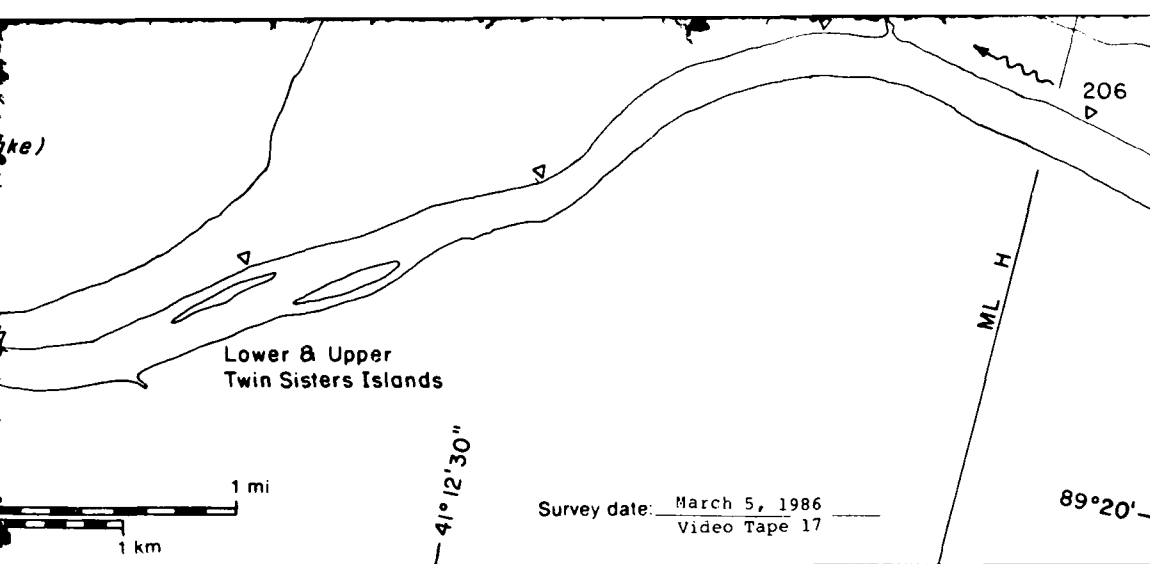
5 March 1986



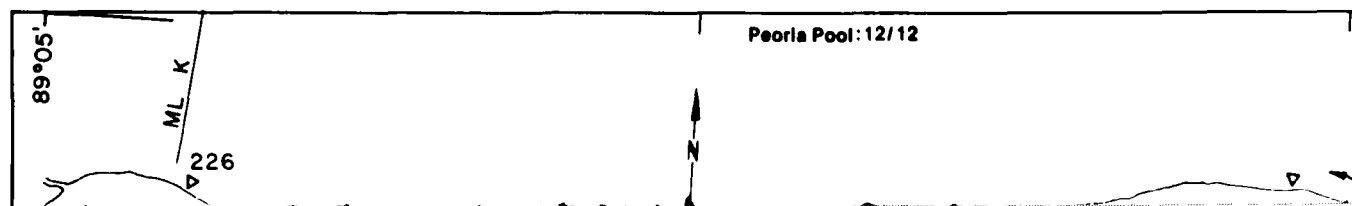
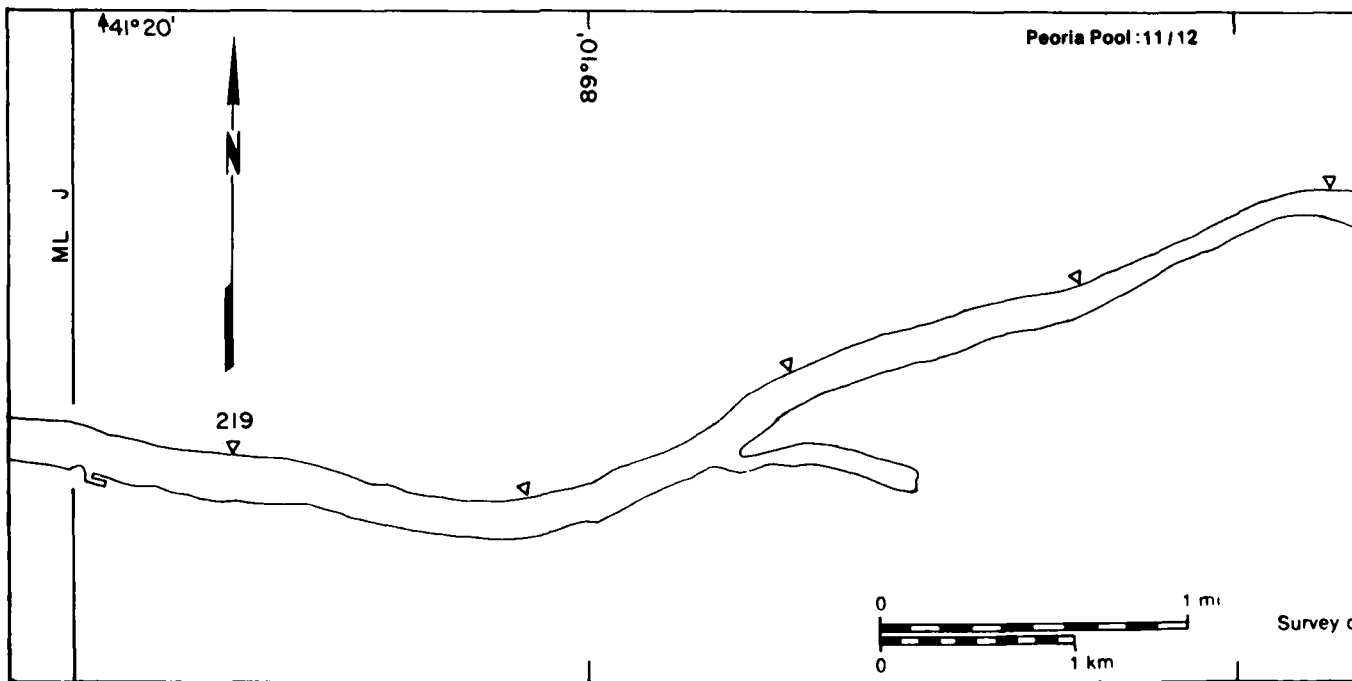
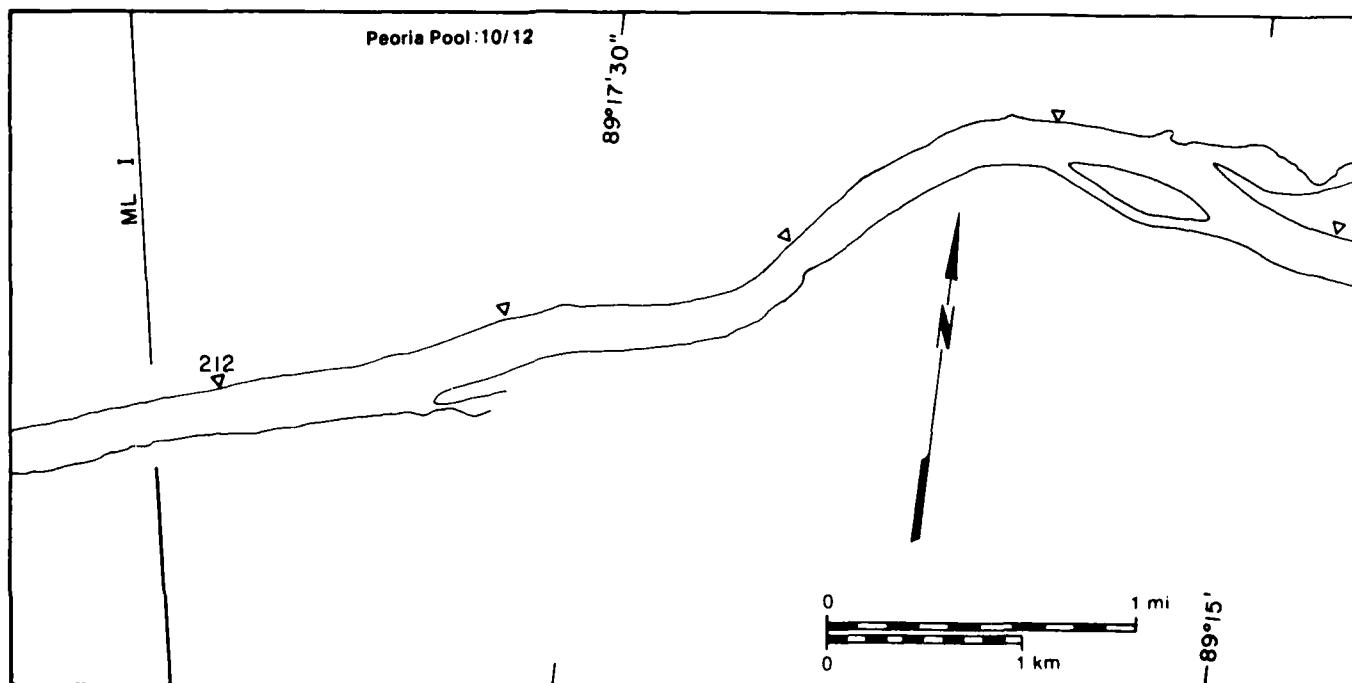
41°17'30"

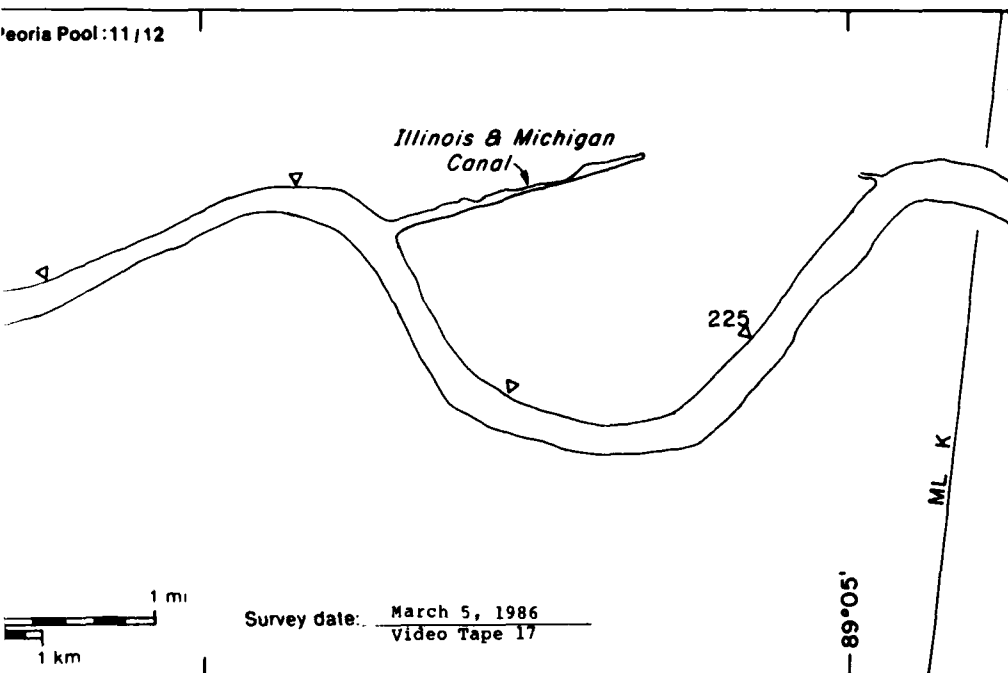
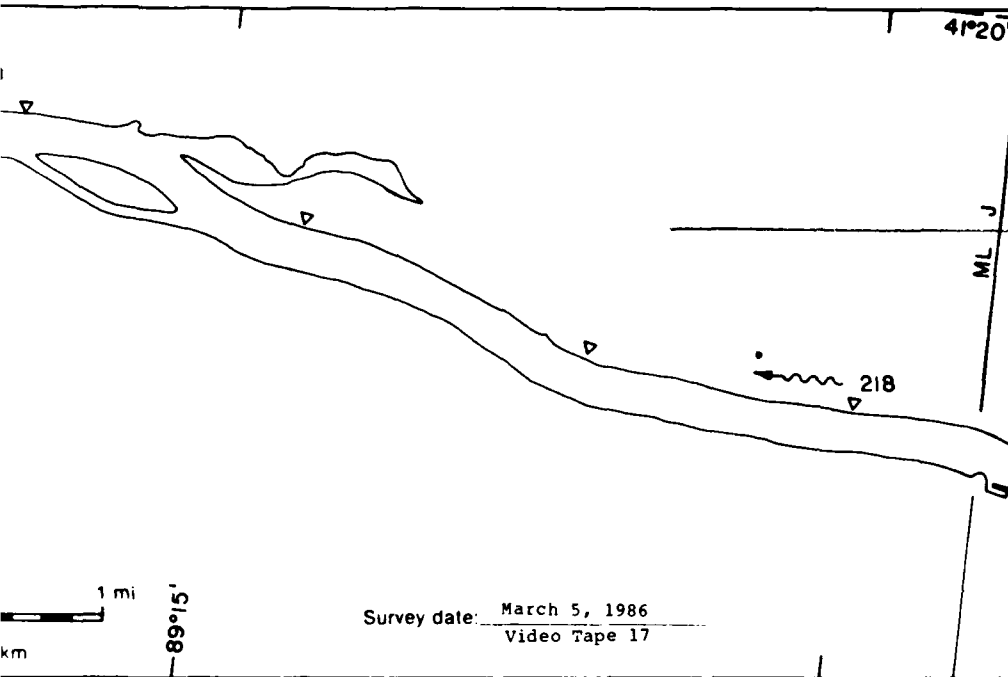


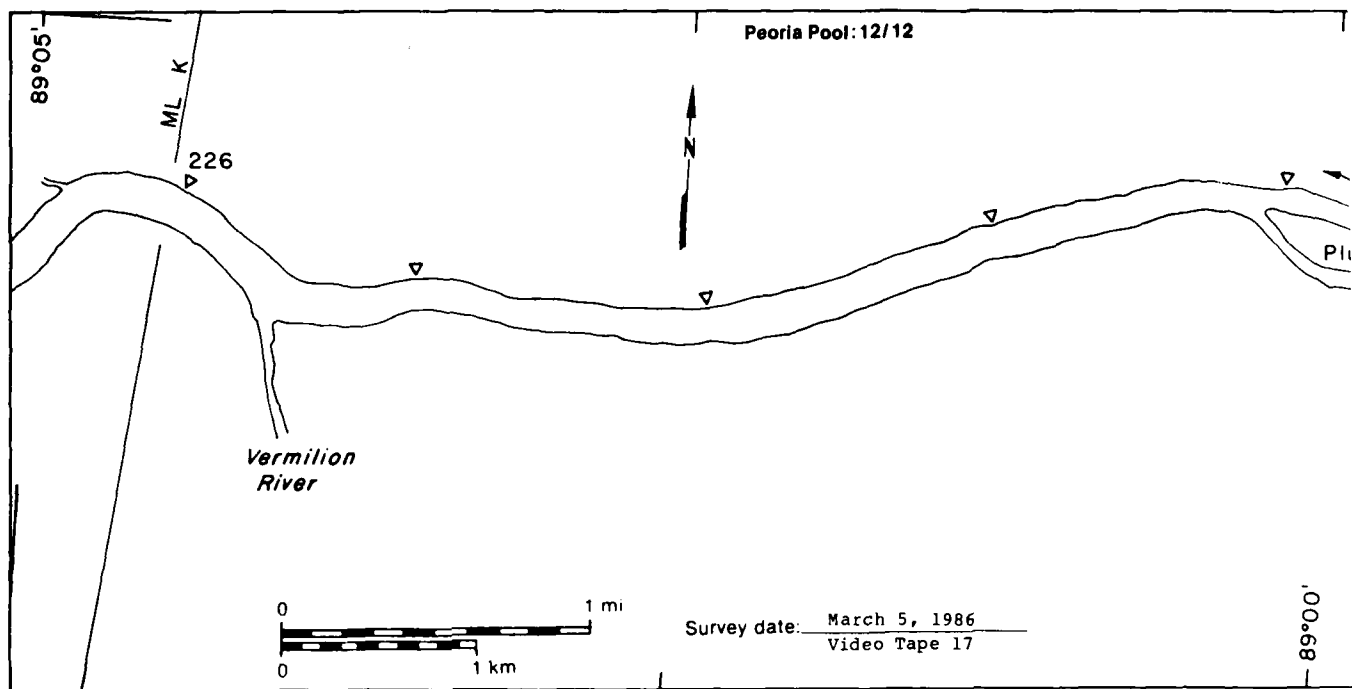
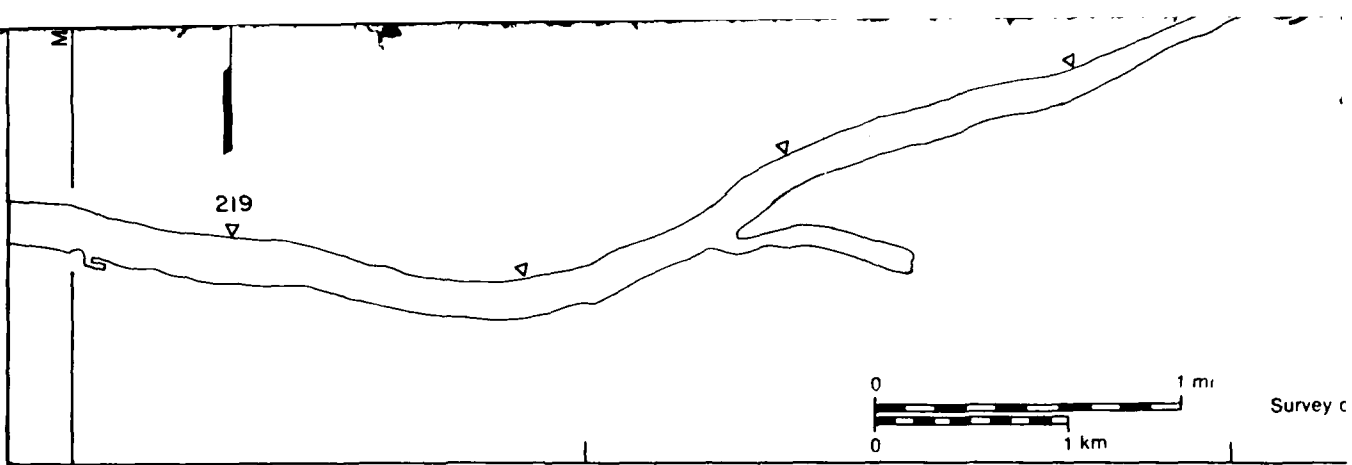




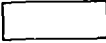

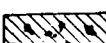

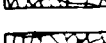
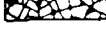
5 March 1986



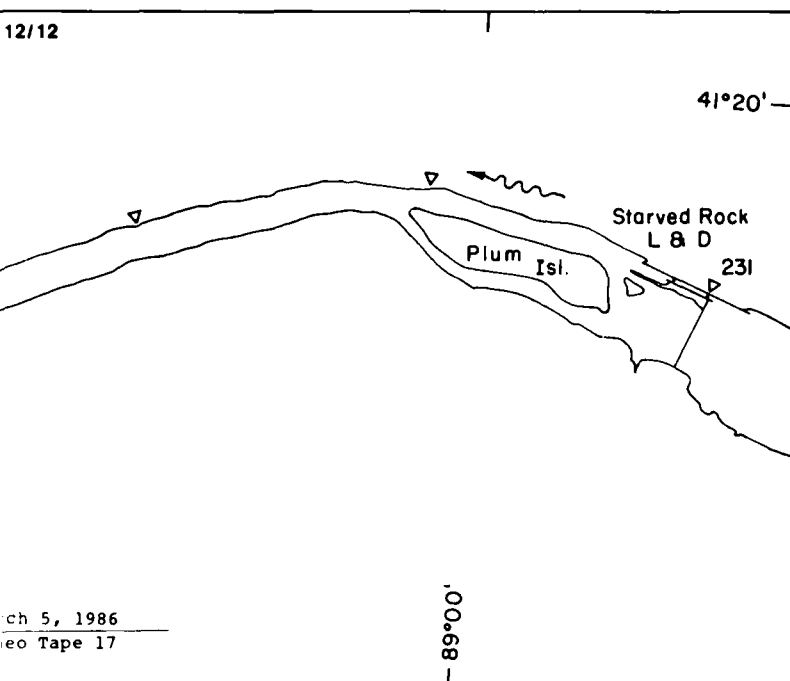
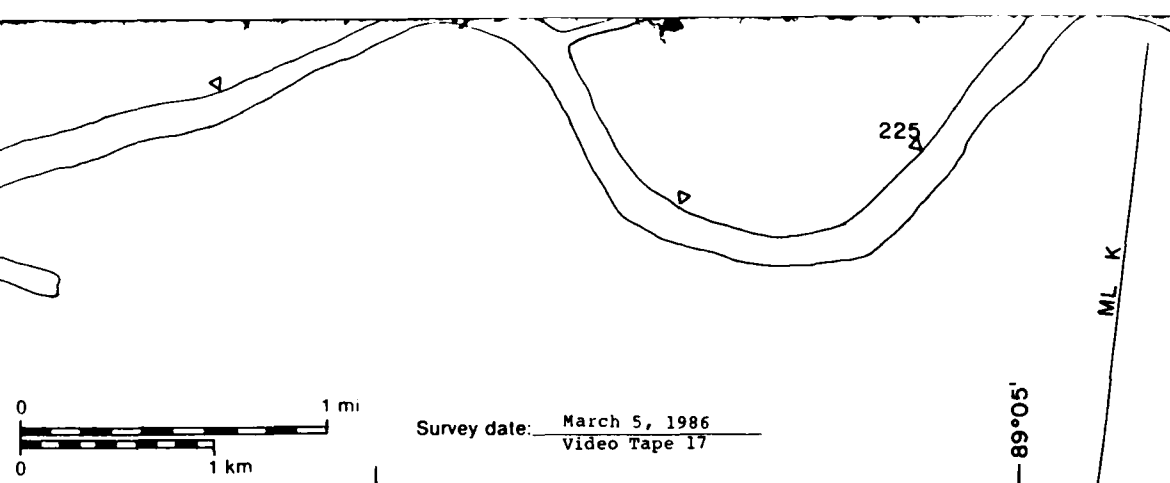


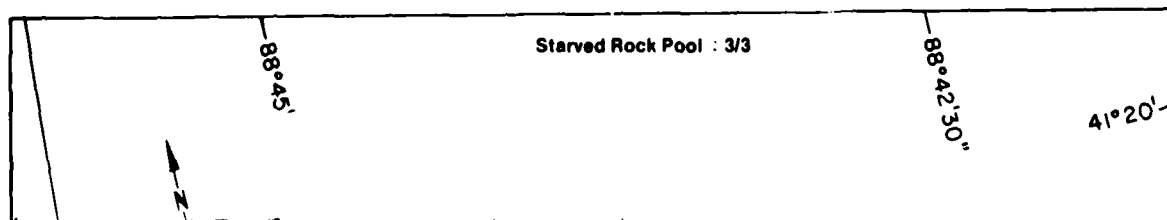
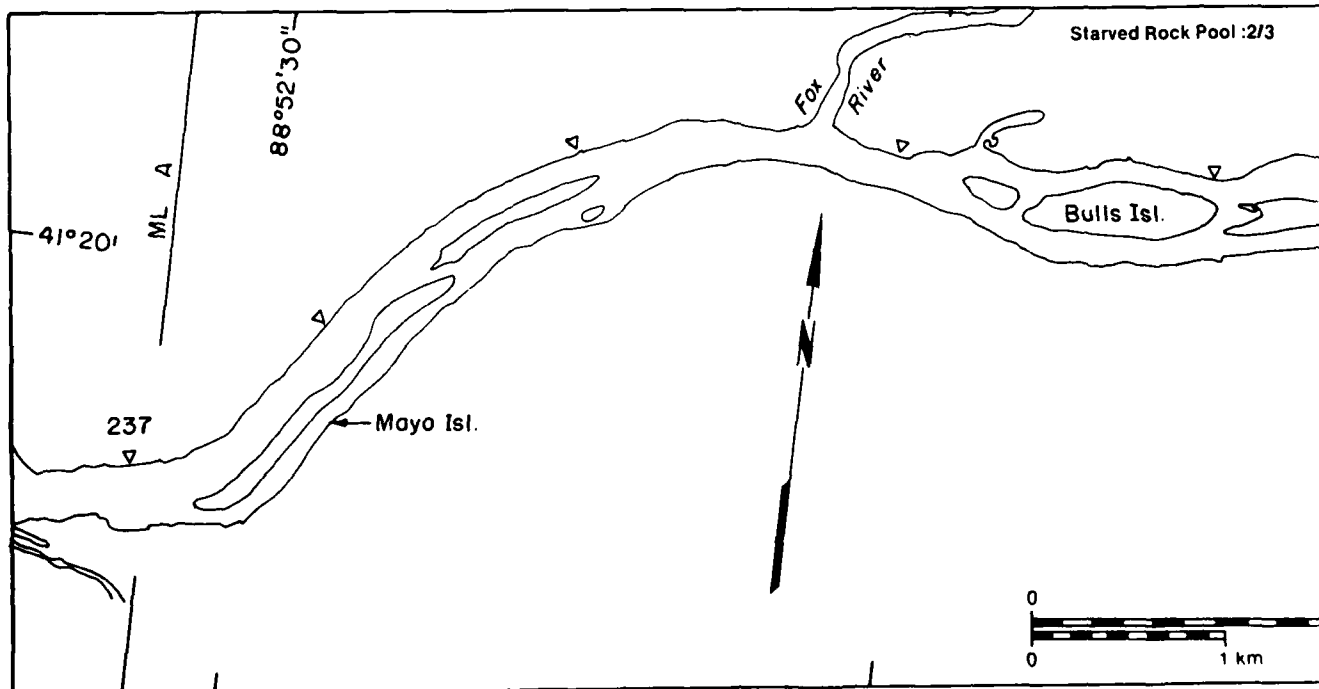
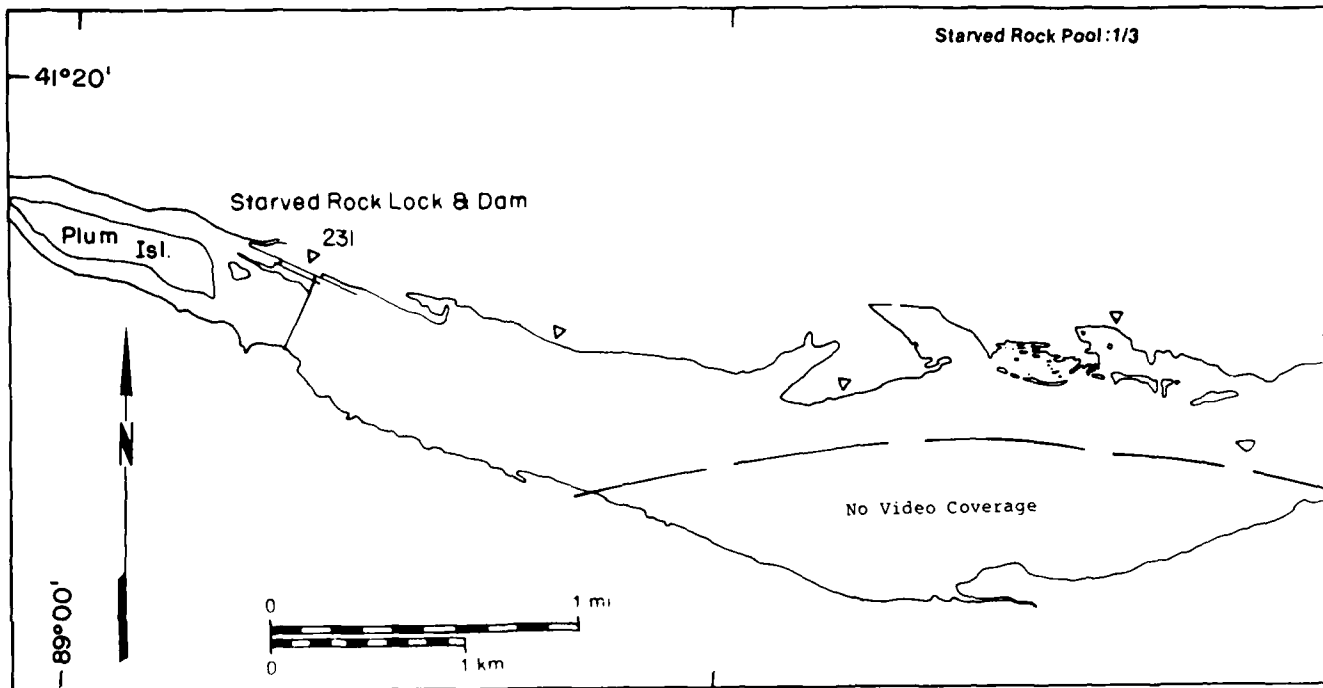


Peoria Pool

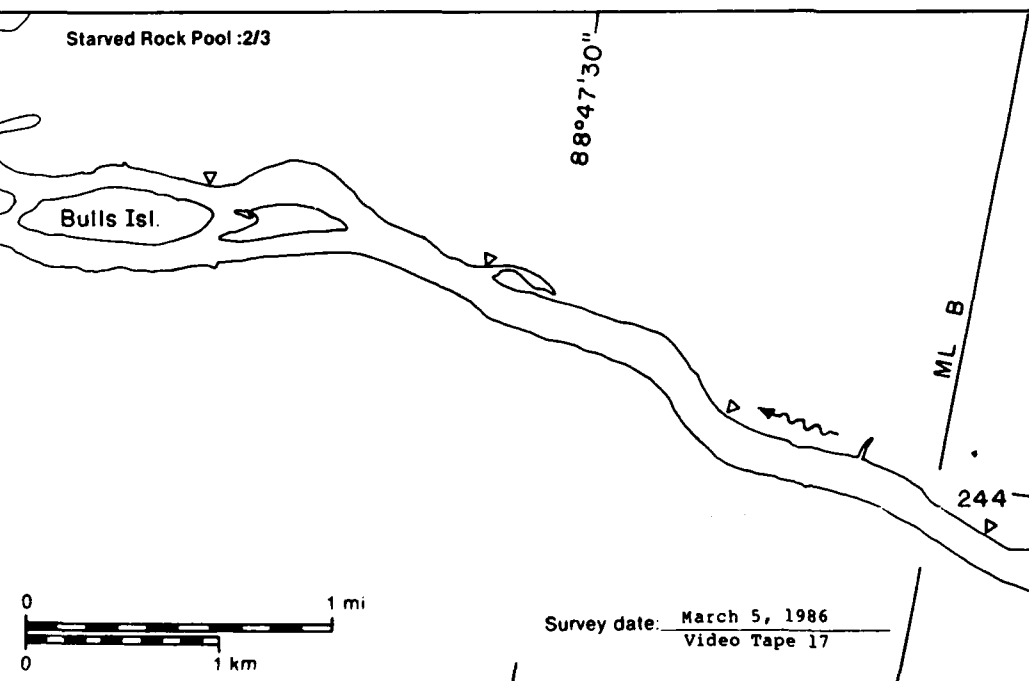
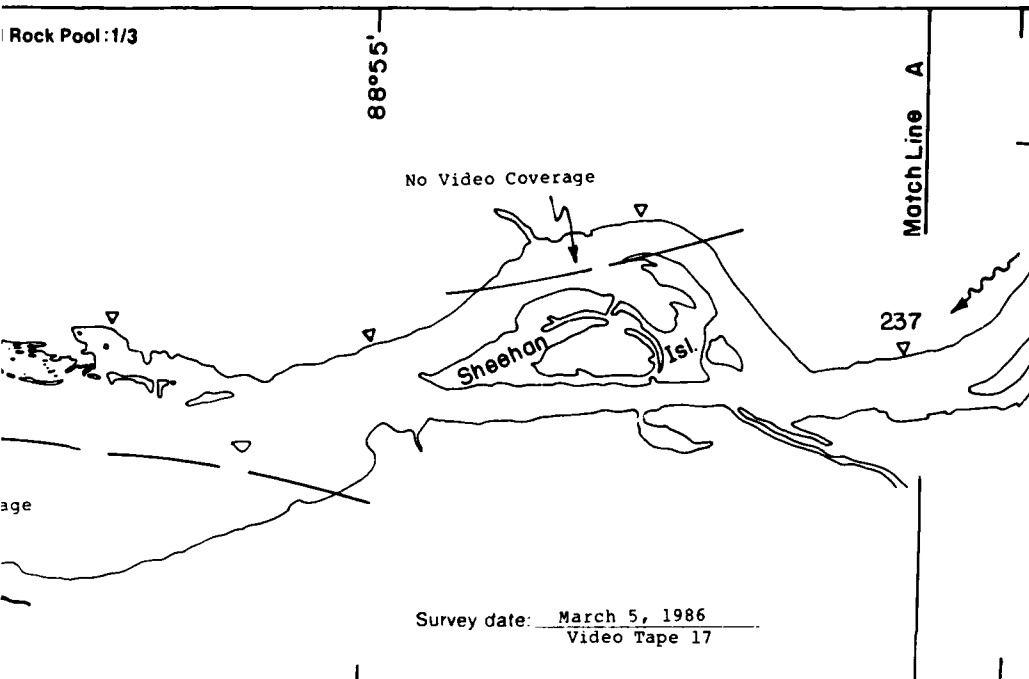
MAP UNITS		Area ($m^2 \times 10^6$)	Surface concentration (%)
	Open water	54.83	NA
	Solid ice cover	1.89	NA
	Solid ice cover with open-water areas	0.00	—
	Fragmented ice cover	0.00	NA
	Fragmented ice cover with open-water areas	0.00	—
	Ice floes or frazil slush and pans	0.28	5
Total area ($m^2 \times 10^6$)		81.33*	


* Includes $24.33 \times 10^6 m^2$ of no video coverage

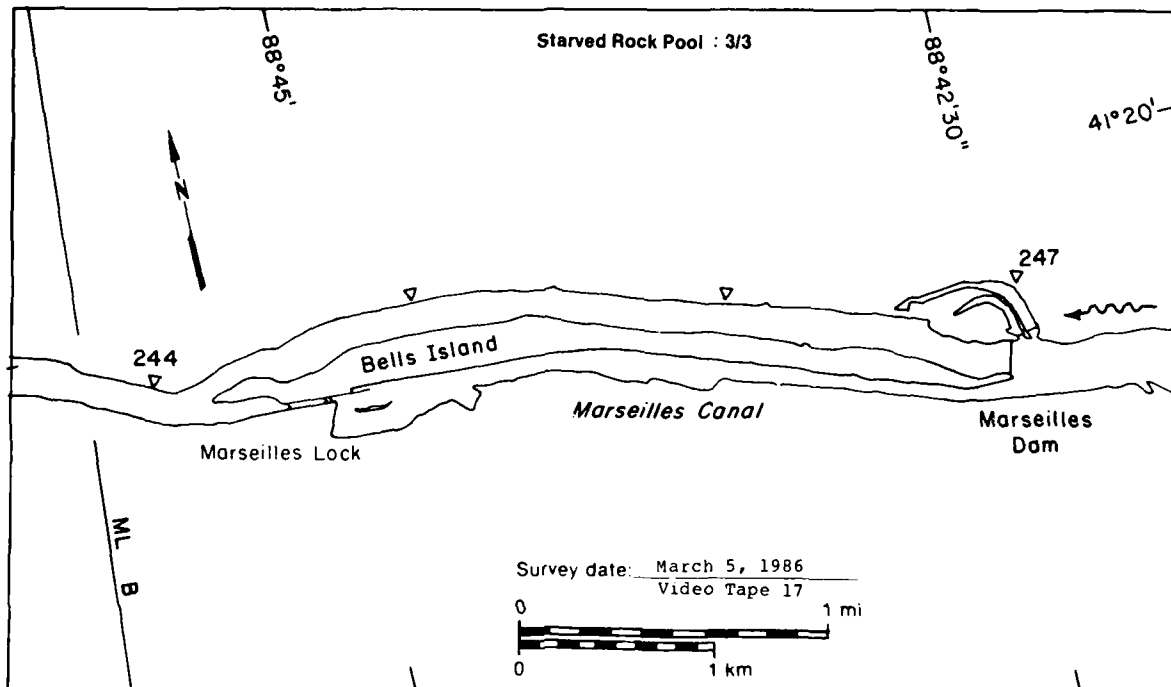
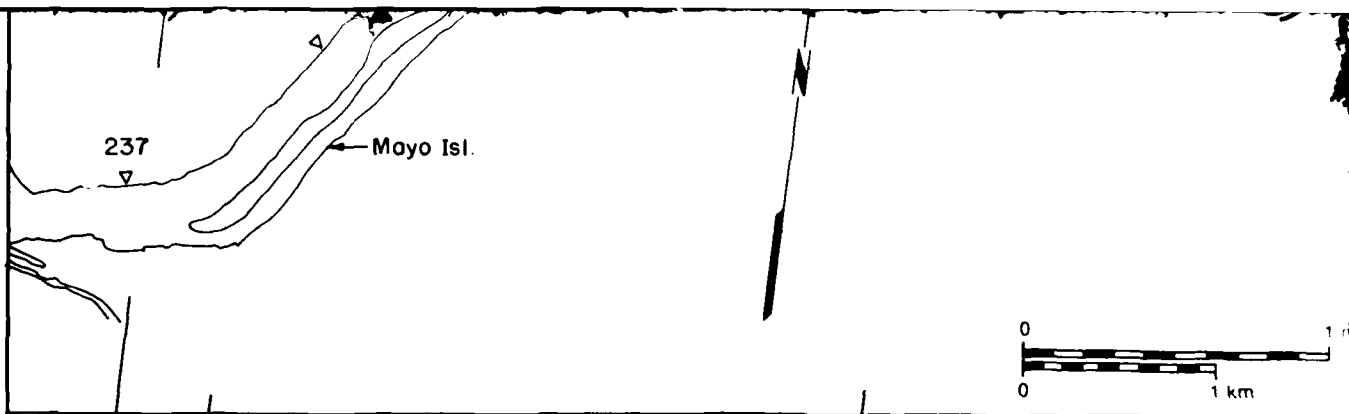




5 March 1986

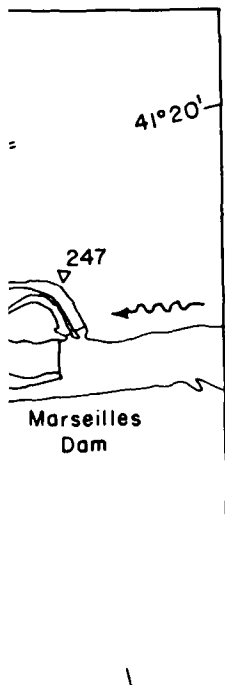


41°20'	Starved Rock Pool	
	MAP UNITS	
		Open water
	Area (m ² x 10 ⁶)	Surface concentration (%)
	7.97	NA





Survey date: March 5, 1986
Video Tape 17



Starved Rock Pool

MAP UNITS



Open water



Solid ice cover



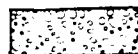
Solid ice cover with open-water areas



Fragmented ice cover



Fragmented ice cover with open-water areas



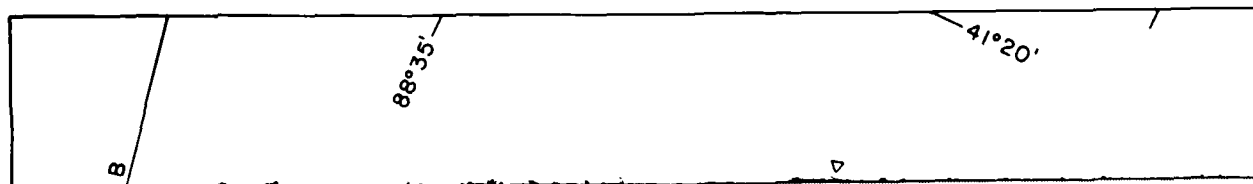
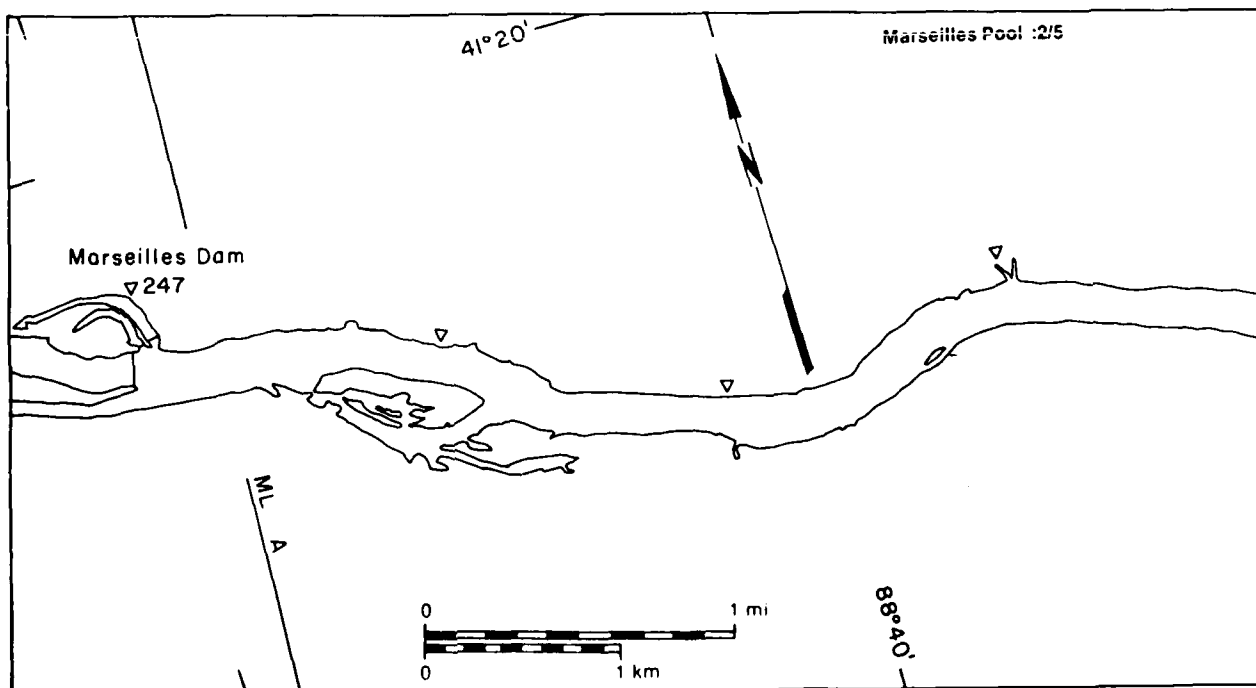
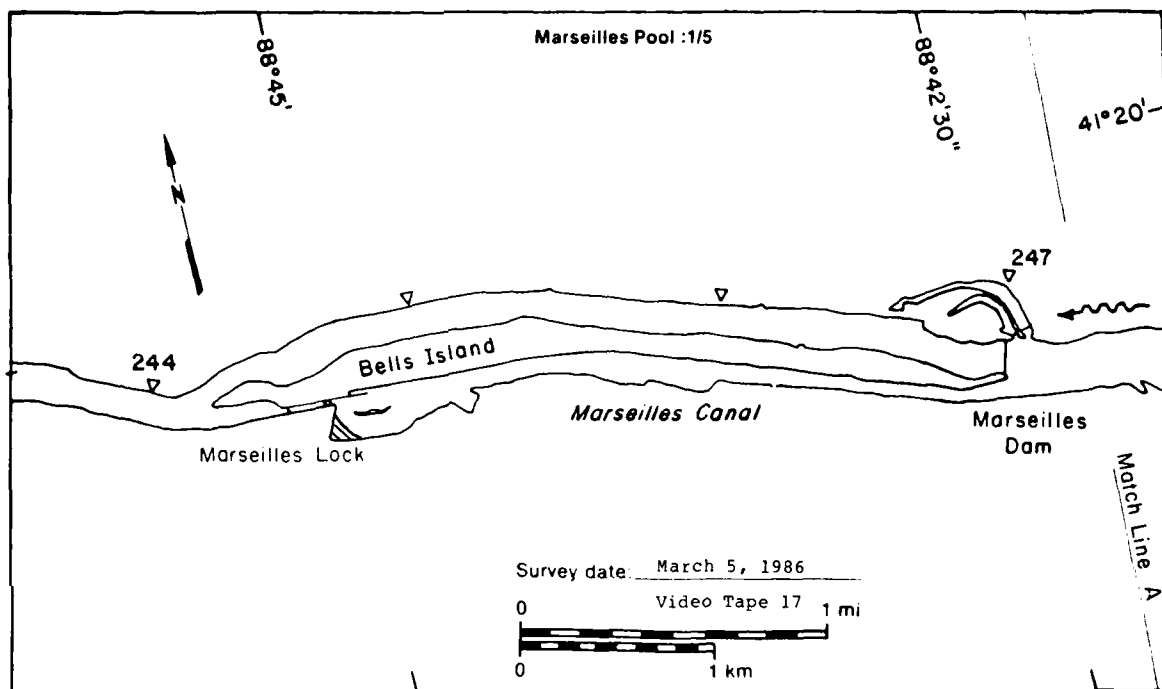
Ice floes or frazil slush and pans

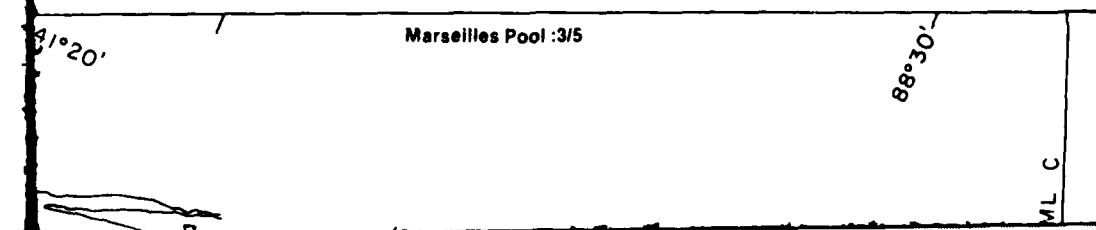
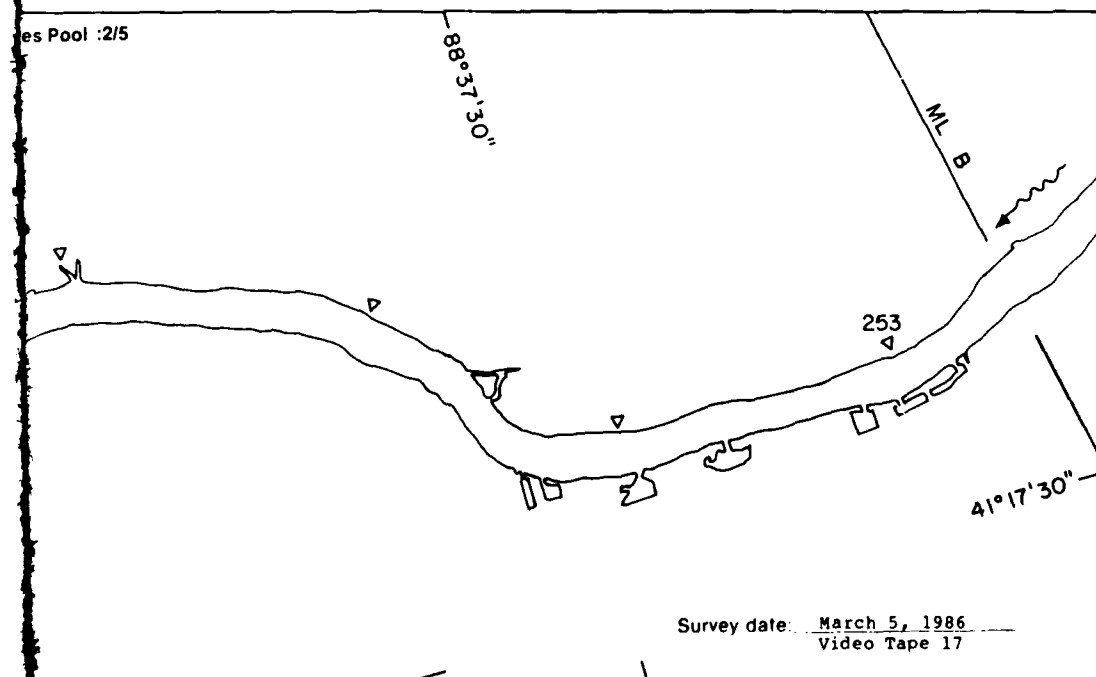
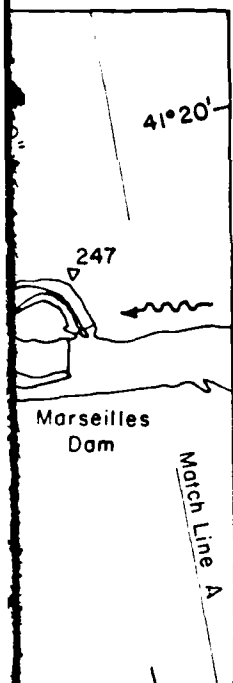
Total area ($m^2 \times 10^6$)

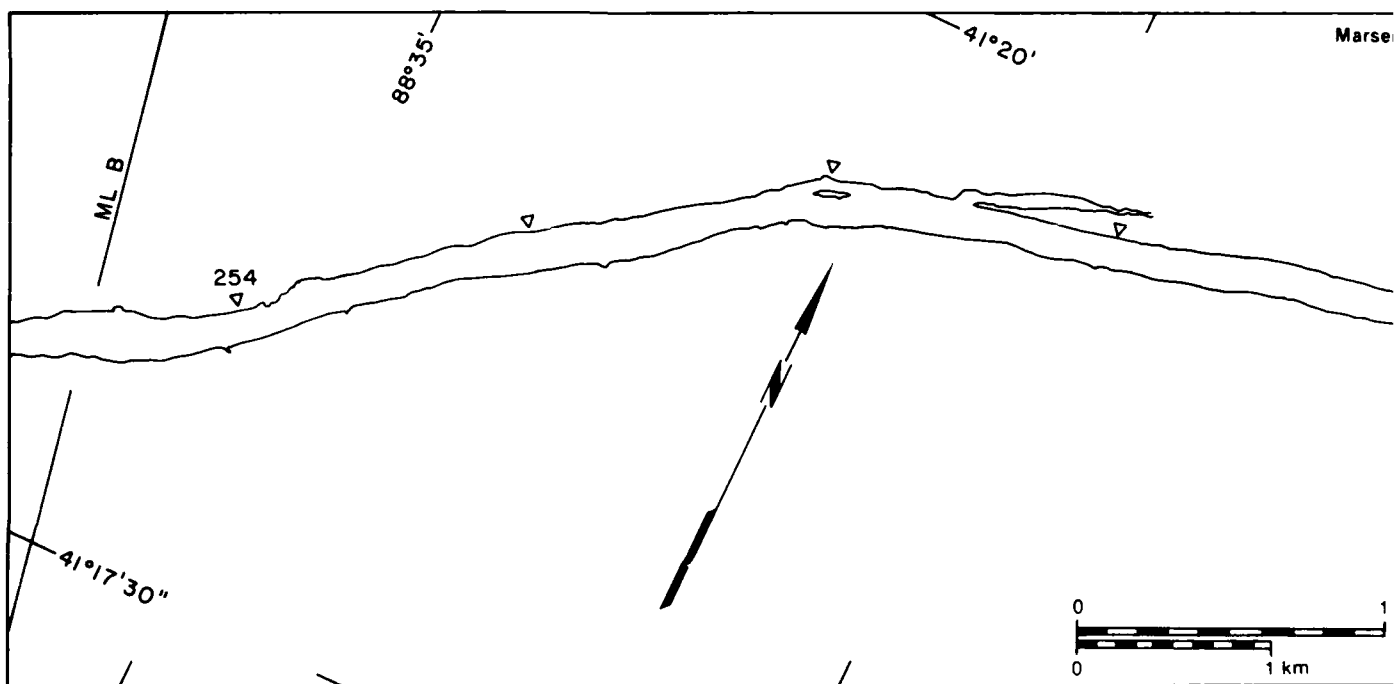
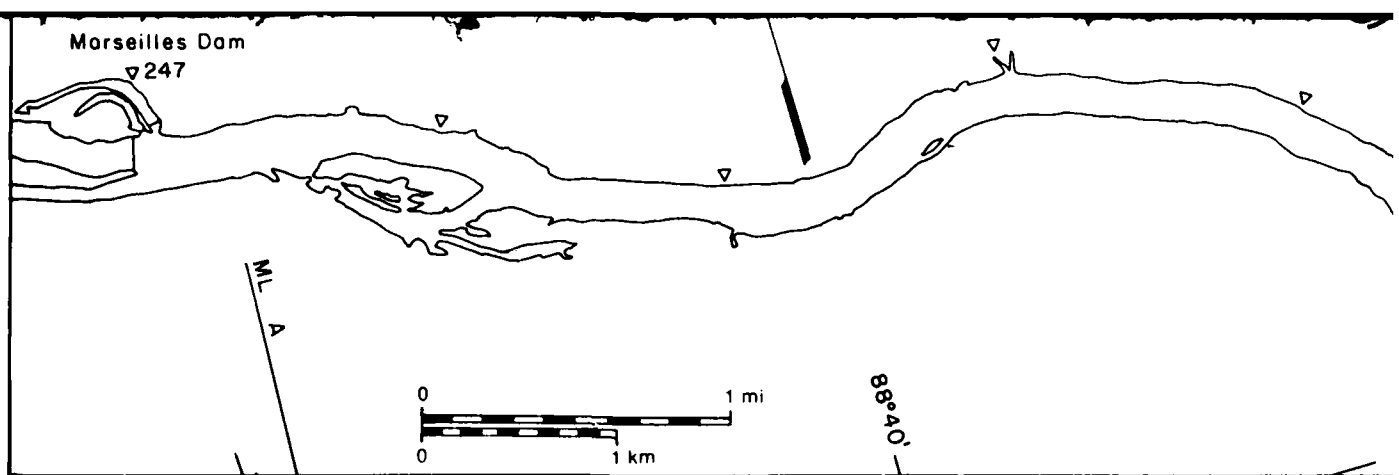
Area ($m^2 \times 10^6$)	Surface concentration (%)
7.97	NA
0.00	NA
0.00	—
0.00	NA
0.00	—
0.00	—
10.19*	

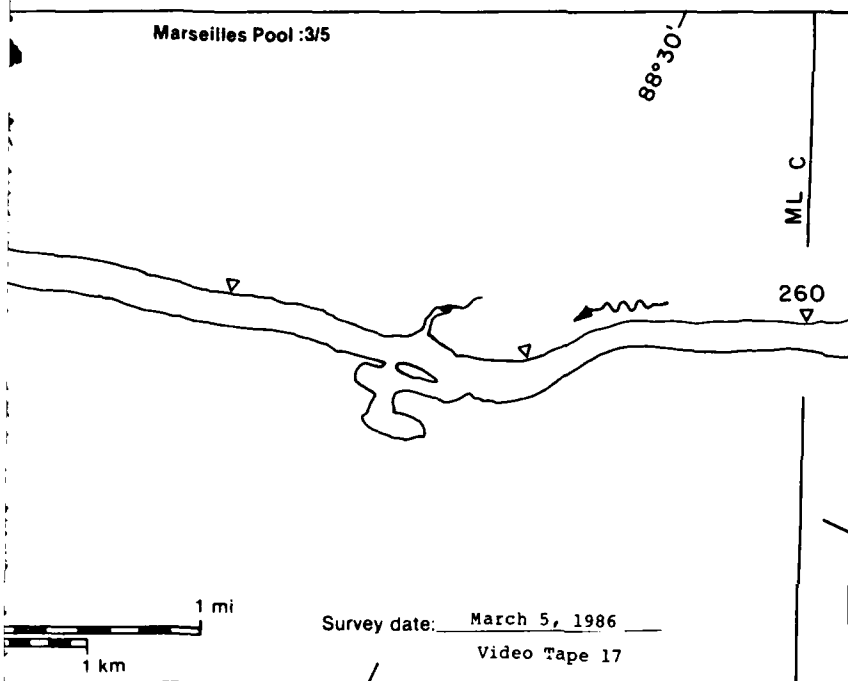
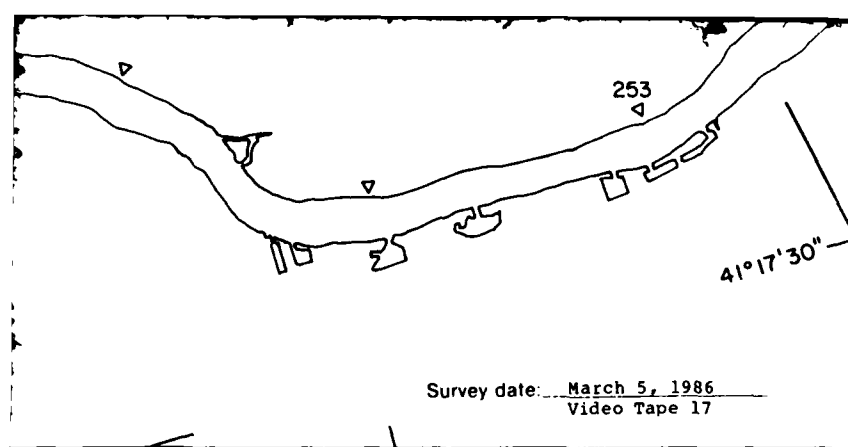
* Includes $2.22 \times 10^6 m^2$
of no video coverage

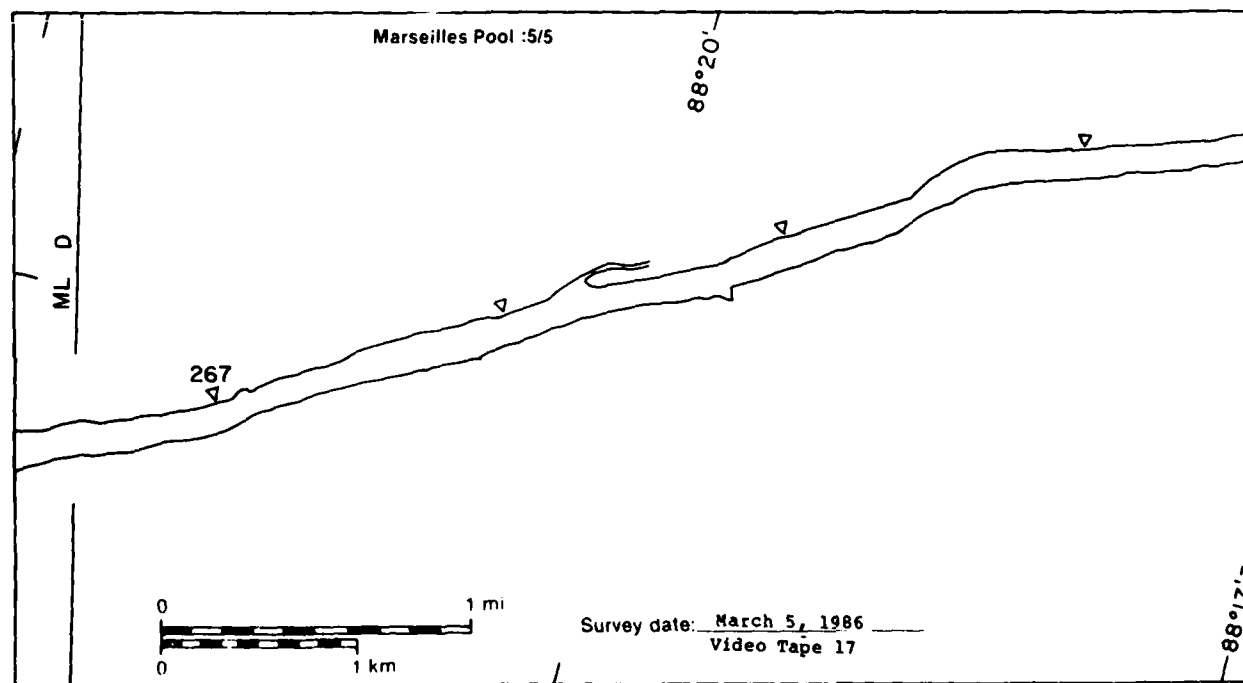
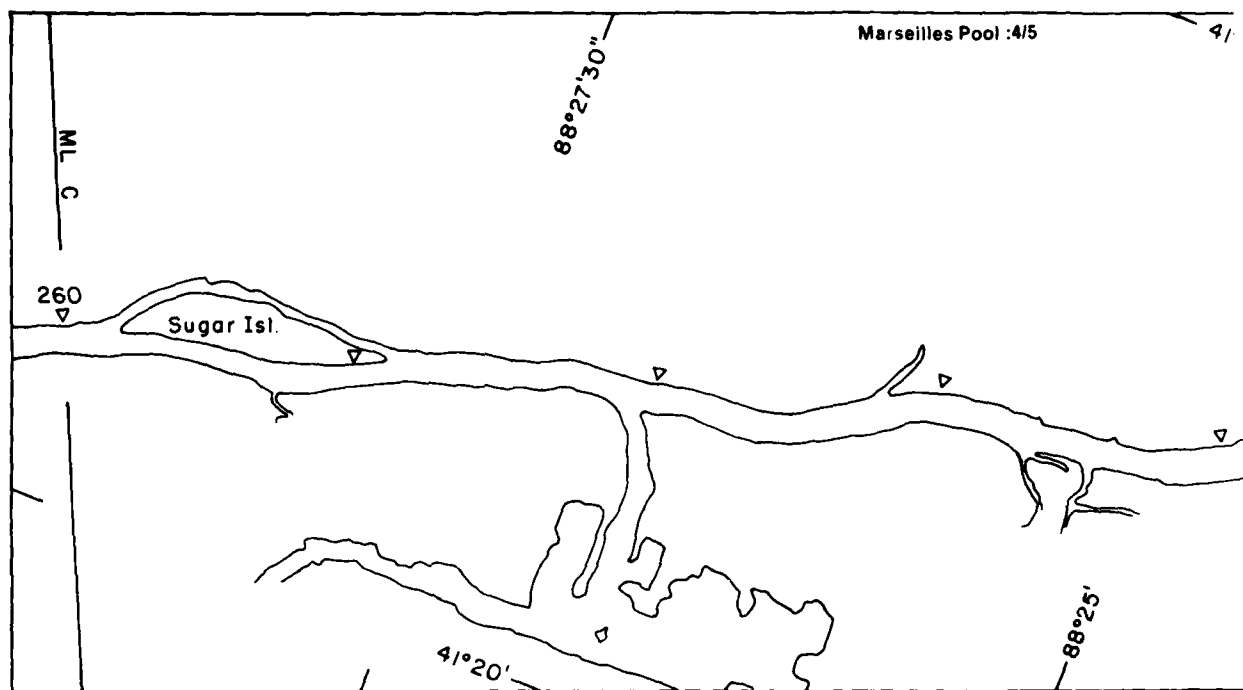
5 March 1986





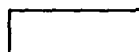






Marseilles Pool

MAP UNITS

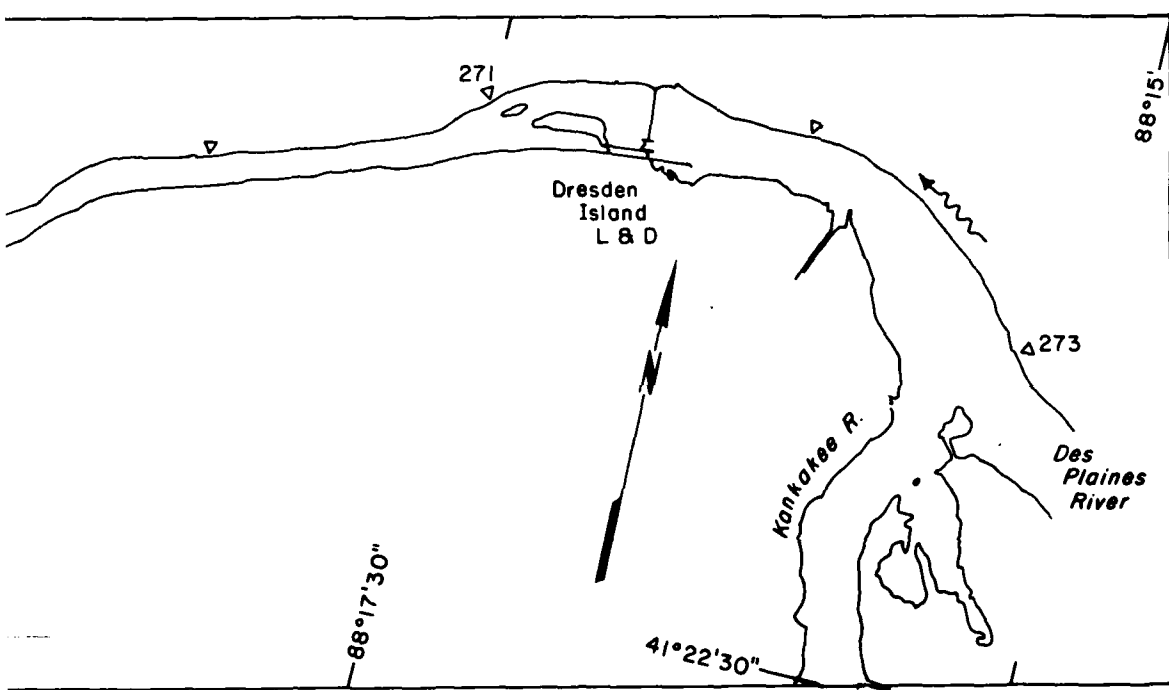
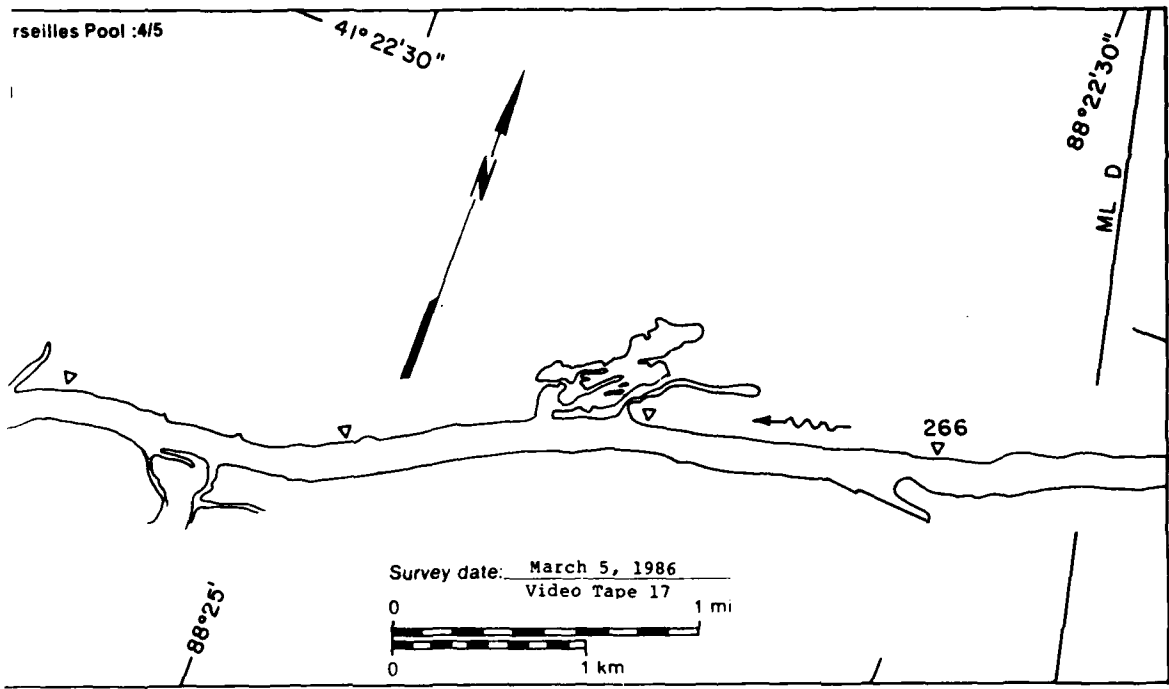


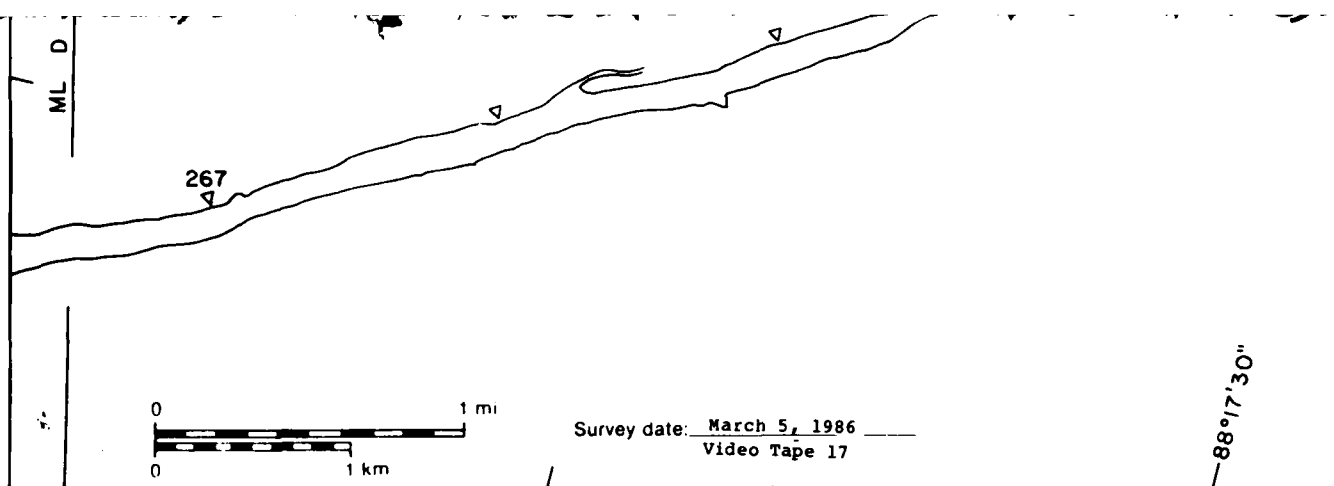
Open water

Area ($m^2 \times 10^6$)	Surface concentration (%)
8.17	NA

Survey date: March 5, 1986
Video Tape 17

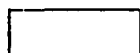
5 March 1986



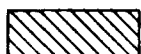


Marselles Pool

MAP UNITS



Open water



Solid ice cover



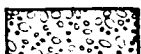
Solid ice cover with open-water areas



Fragmented ice cover



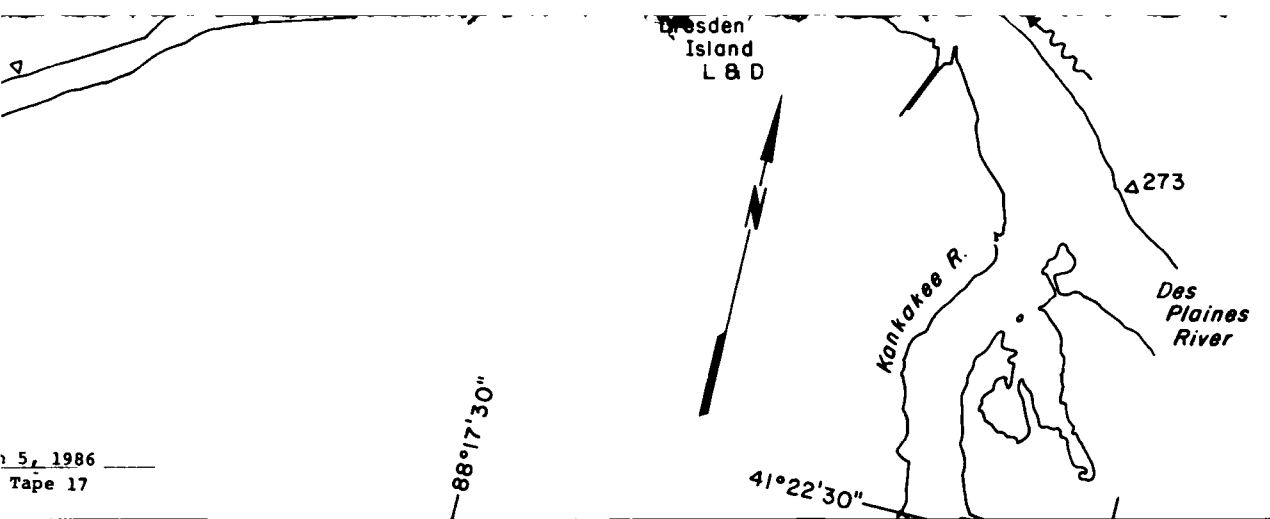
Fragmented ice cover with open-water areas



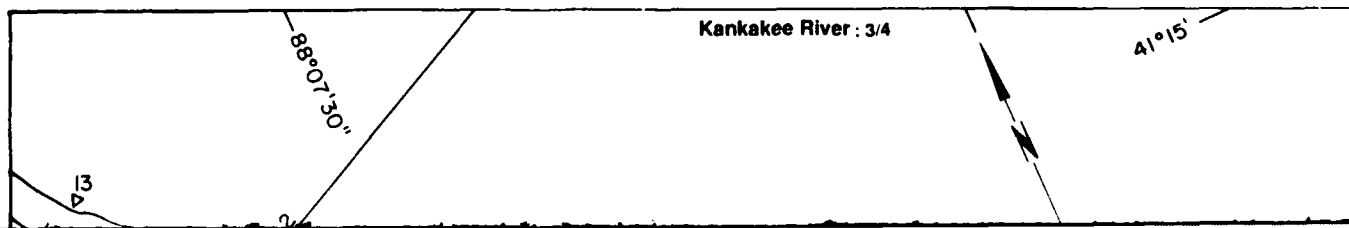
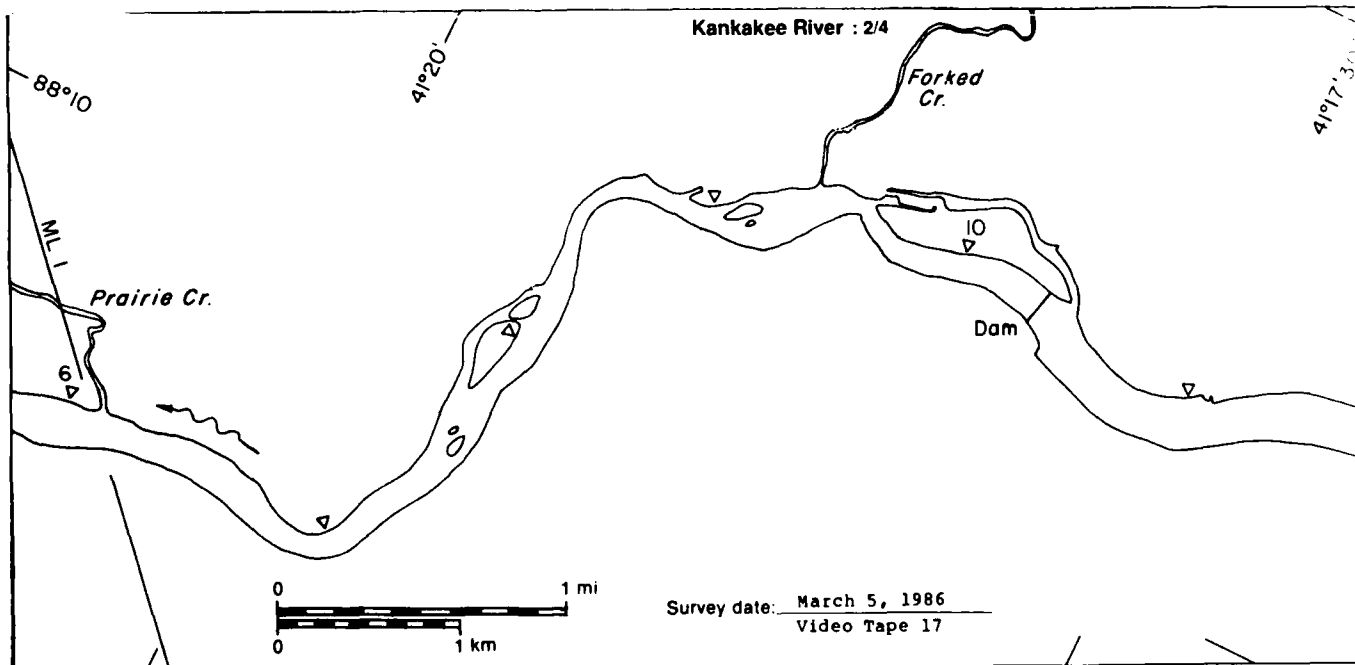
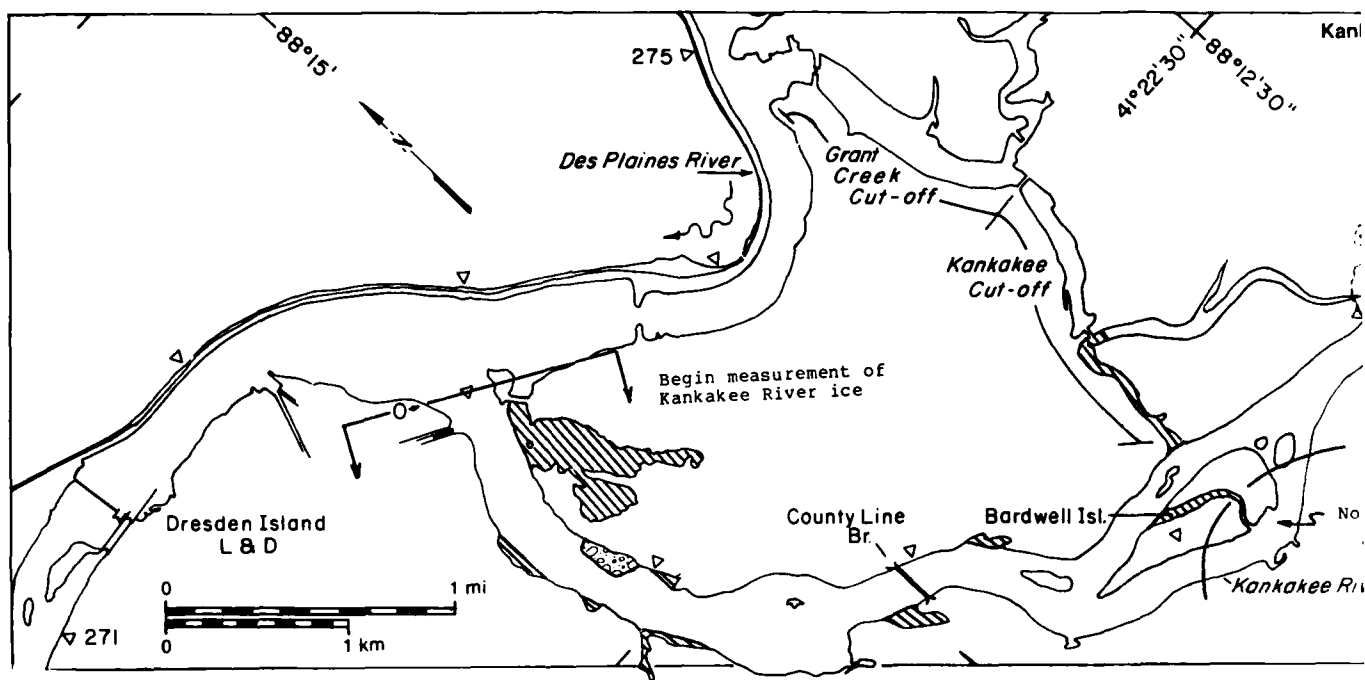
Ice floes or frazil slush and pans

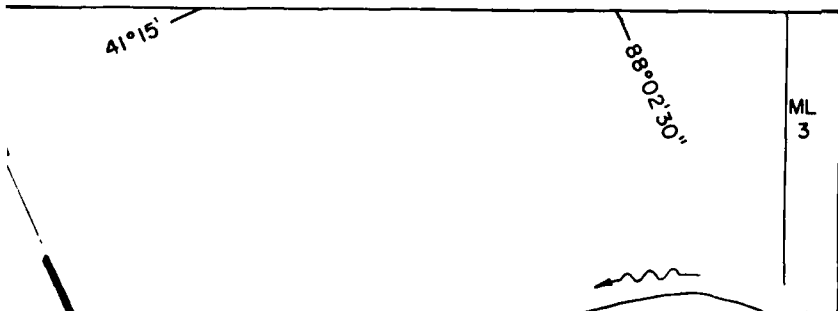
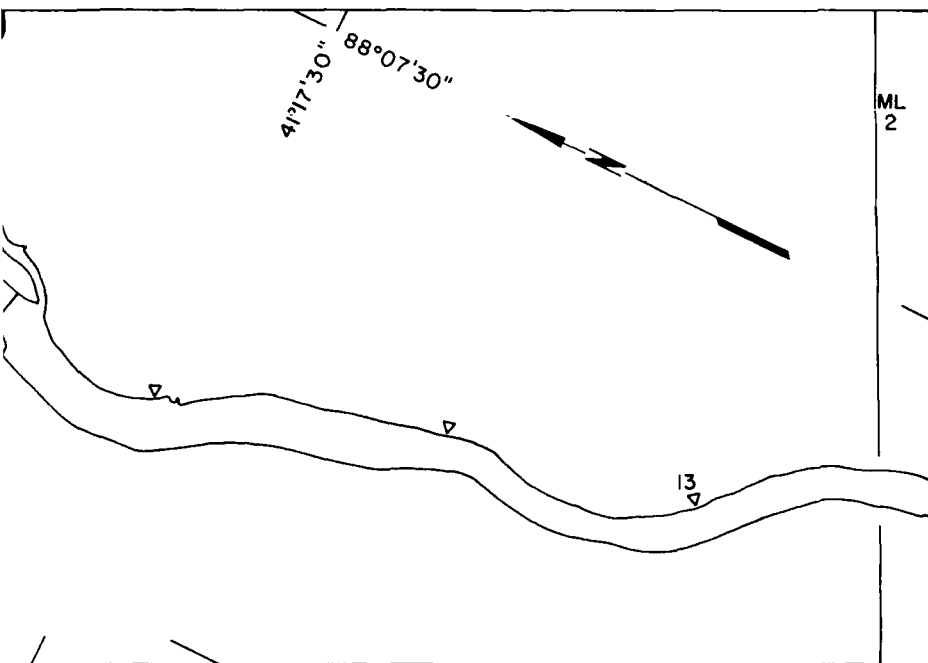
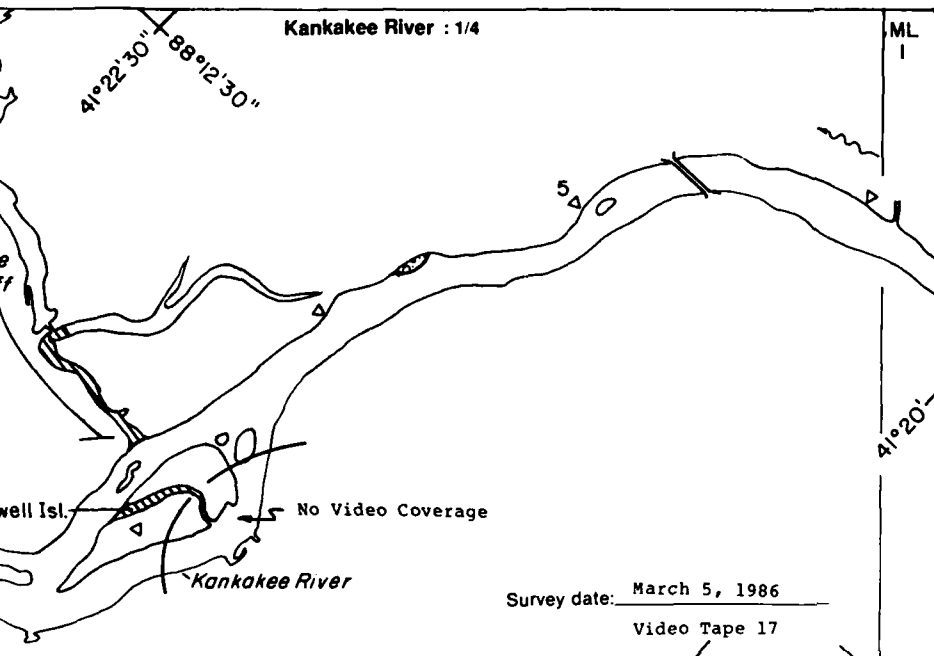
Total area ($m^2 \times 10^6$)

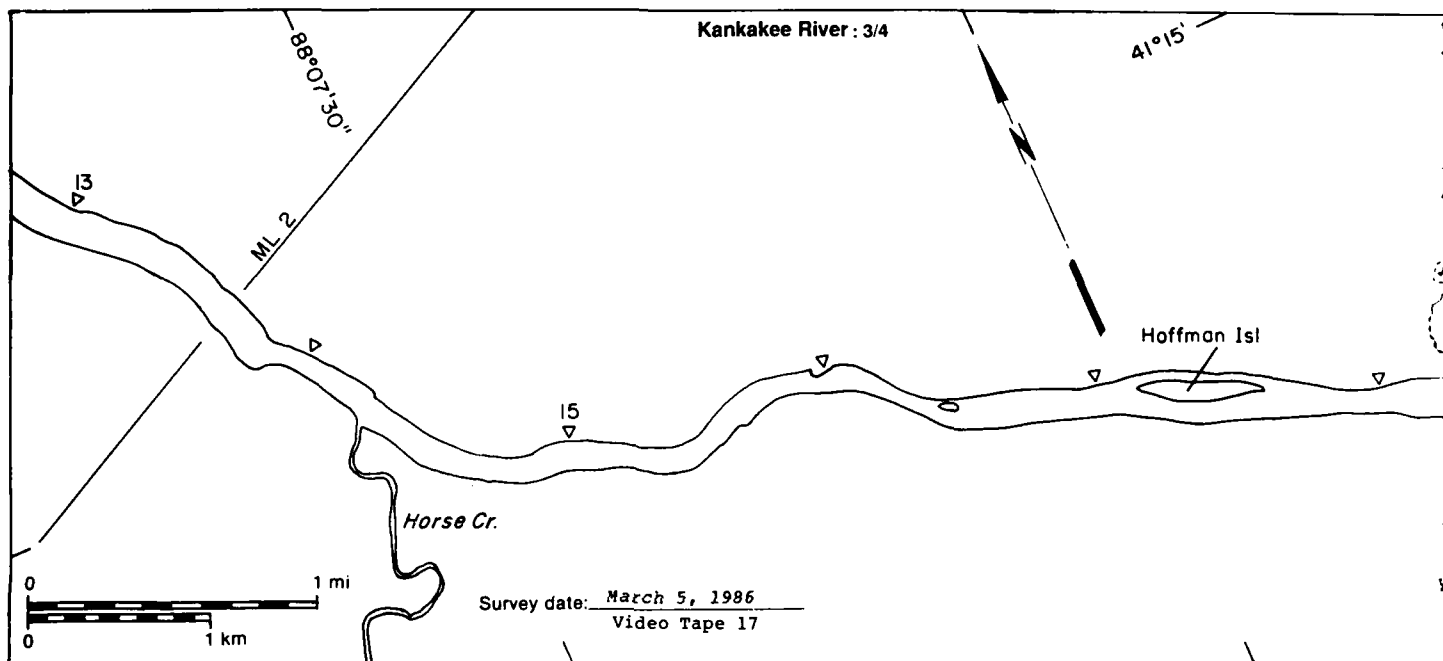
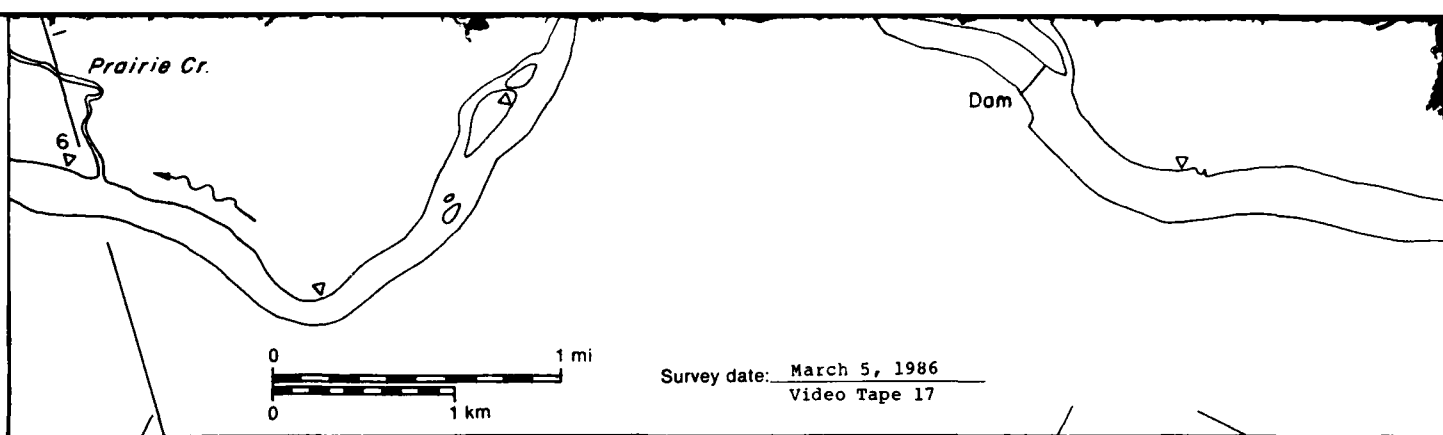
Area ($m^2 \times 10^6$)	Surface concentration (%)
8.17	NA
0.02	NA
0.00	—
0.00	NA
0.00	—
0.00	—
8.19	

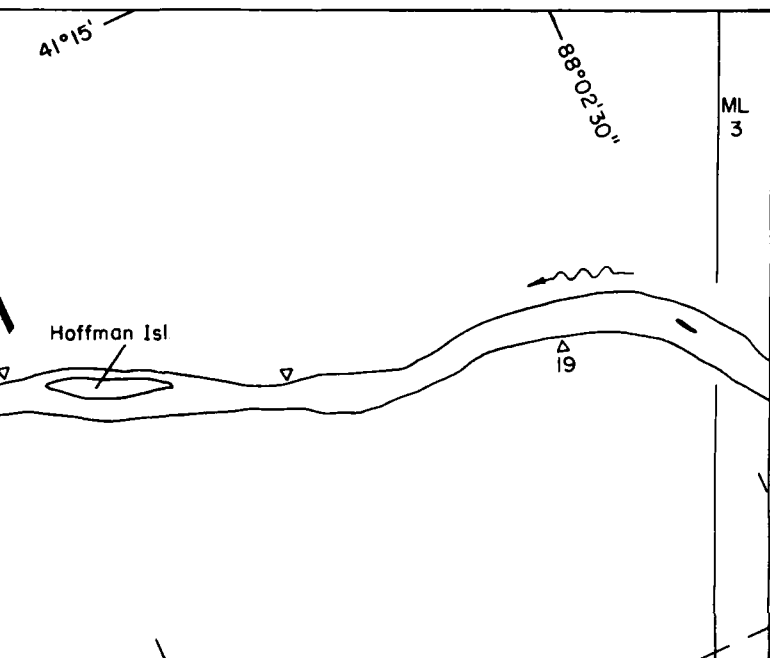
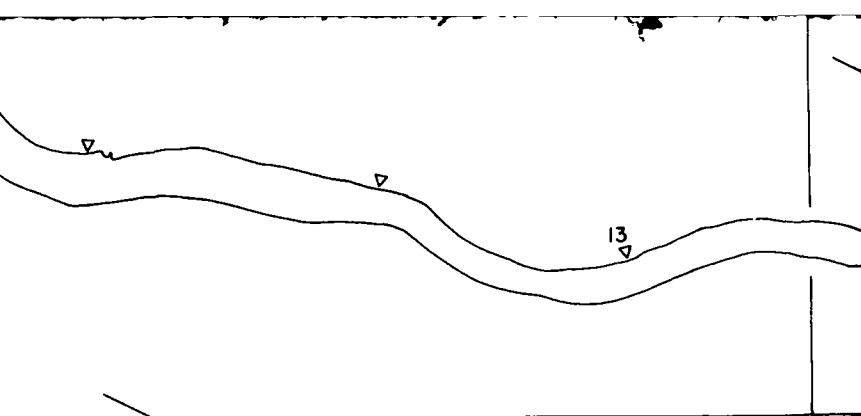


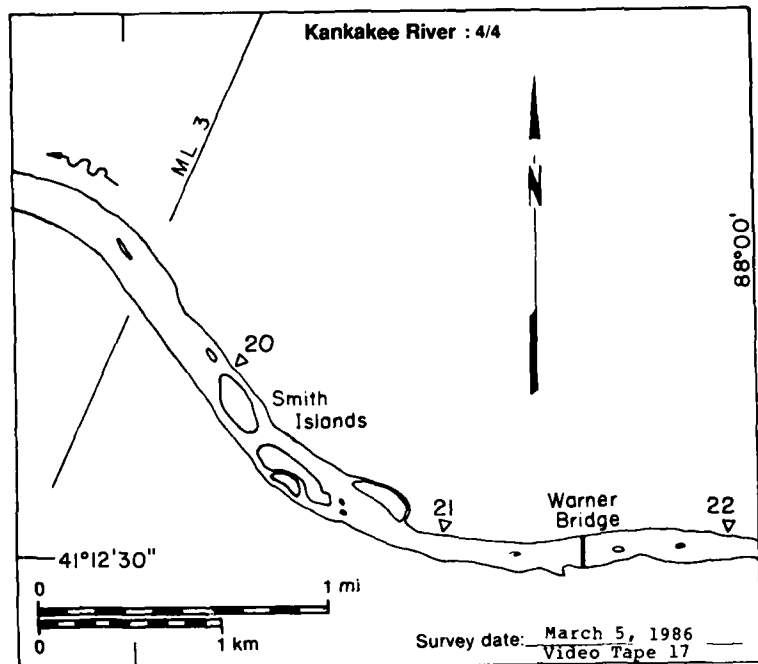
5 March 1986





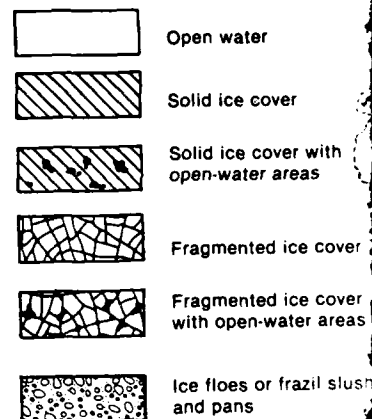






Kankakee River

MAP UNITS



Total area (m² x

341

5 March 1986

Kankakee River

MAP UNITS

	Area ($m^2 \times 10^6$)	Surface concentration (%)
Open water	6.73	NA
Solid ice cover	0.39	NA
Solid ice cover with open-water areas	0.00	—
Fragmented ice cover	0.00	NA
Fragmented ice cover with open-water areas	0.00	—
Ice floes or frazil slush and pans	0.05	30
Total area ($m^2 \times 10^6$)	7.30*	

* Includes $0.13 \times 10^6 m^2$
of no video coverage

APPENDIX A: AREAS OF MAPPED IC

Emsworth Pool - Monongahela River (area = 1

Video acquisition date	Open	Solid	Solid ice cover		Frag.	Fragmented	
	water	ice	with		ice	with	
	<u>area</u>	<u>cover</u>	<u>open</u>	<u>water areas</u>	<u>cover</u>	<u>open</u>	<u>water</u>
	Total	Total	Total	Ice	Ice	Total	Total
	area*	area*	area*	conc.	area	area*	area
	(10 ⁶ m ²)	(10 ⁶ m ²)	(10 ⁶ m ²)	(%)	(10 ⁶ m ²)	(10 ⁶ m ²)	(10 ⁶ m ²)
December 18, '85	0	0	0			0	0
December 28, '85	3.15	0	0			0	0
January 2, '86	5.16	0	0			0	0
January 7, '86	5.11	0	0			0.05	0
January 8, '86	5.06	0	0			0.03	0
January 10, '86	4.95	0	0			0	0
January 15, '86	4.34	0	0			0	0
January 22, '86	5.16	0	0			0	0
January 23, '86	5.16	0	0			0	0
January 28, '86	4.90	0	0			0	0
February 27, '86	5.16	0	0			0	0

*Total area equals ice area.

**Sum of all ice areas for all map units.

Emsworth Pool - Allegheny River (area = 3.07 x 1

Video acquisition date	Open	Solid	Solid ice cover		Frag.	Fragmented ice cov	
	water	ice	with		ice	with	
	<u>area</u>	<u>cover</u>	<u>open</u>	<u>water areas</u>	<u>cover</u>	<u>open</u>	<u>water areas</u>
	Total	Total	Total	Ice	Ice	Total	Total
	area*	area*	area*	conc.	area	area*	area
	(10 ⁶ m ²)	(10 ⁶ m ²)	(10 ⁶ m ²)	(%)	(10 ⁶ m ²)	(10 ⁶ m ²)	(10 ⁶ m ²)
December 18, '85	3.07	0	0			0	0
December 28, '85	0.91	0.41	0			0.16	1.45
January 2, '86	2.23	0	0			0.04	0.03
January 7, '86	0.58	0.06	0			0.02	0.47
January 8, '86	1.20	0.08	0			0.78	1.01
January 10, '86	2.02	0	0			0.16	0.48

AREAS OF MAPPED ICE UNITS

Shahela River (area = $5.16 \times 10^6 \text{ m}^2$)

Fragmented ice cover	Fragmented ice cover with open water areas			Ice floes or frazil slush and pans			Total ice area**	No Video Coverage
Total area* (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	(10^6 m^2)	(10^6 m^2)
	0			0			0	5.16
	0			2.01	40	0.80	0.80	-
	0			0			0	-
0.05	0			0			0.05	-
0.03	0			0.07	5	0.00	0.03	-
	0			0.21	60	0.13	0.13	-
	0			0.82	40	0.33	0.33	-
	0			0			0	-
	0			0			0	-
	0			0.26	20	0.05	0.05	-
	0			0			0	-

ver (area = $3.07 \times 10^6 \text{ m}^2$)

Fragmented ice cover with open water areas			Ice floes or frazil slush and pans			Total ice area**	No Video Coverage
Total area 10^6 m^2	Ice conc. (%)	Ice area 10^6 m^2	Total area 10^6 m^2	Ice conc. (%)	Ice area 10^6 m^2	10^6 m^2	10^6 m^2
0			0			0	-
1.45	80	1.16	0.14	20	0.03	1.76	-
0.03	50	0.02	0.77	10	0.08	0.14	-
0.47	70	0.33	1.94	40	0.77	1.18	-
1.01	90	0.91	0			1.77	-
0.48	90	0.43	0.41	60	0.25	0.84	-
1.42	80	1.14	0.14	10	0.01	1.27	-

Emsworth Pool - Allegheny River (area = $3.07 \times 10^6 \text{ m}^2$)

Video acquisition date	Open water	Solid ice cover	Solid ice cover with open water areas			Frag. ice cover	Fragmented ice cover with open water areas		
	Total area (10 ⁶ m ²)	Total area* (10 ⁶ m ²)	Total area (10 ⁶ m ²)	Ice conc. (%)	Ice area (10 ⁶ m ²)	Total area* (10 ⁶ m ²)	Total area (10 ⁶ m ²)	Ice conc. (%)	Ice area (10 ⁶ m ²)
December 18, '85	3.07	0	0			0	0		
December 28, '85	0.91	0.41	0			0.16	1.45	80	1.16
January 2, '86	2.23	0	0			0.04	0.03	50	0.02
January 7, '86	0.58	0.06	0			0.02	0.47	70	0.33
January 8, '86	1.20	0.08	0			0.78	1.01	90	0.91
January 10, '86	2.02	0	0			0.16	0.48	90	0.43
January 15, '86	1.39	0.10	0			0.02	1.42	80	1.14
January 22, '86	0.80	0	0			0	0		
January 25, '86	2.54	0	0			0	0		
January 28, '86	3.01	0	0			0	0		
February 27, '86	3.07	0	0			0	0		

*Total area equals ice area.

**Sum of all ice areas for all map units.

Lock and Dam 2 Pool - Allegheny River (area = $4.02 \times 10^6 \text{ m}^2$)

Video acquisition date	Open water	Solid ice cover	Solid ice cover with open water areas			Frag. ice cover	Fragmented ice cover with open water areas		
	Total area (10 ⁶ m ²)	Total area* (10 ⁶ m ²)	Total area (10 ⁶ m ²)	Ice conc. (%)	Ice area (10 ⁶ m ²)	Total area* (10 ⁶ m ²)	Total area (10 ⁶ m ²)	Ice conc. (%)	Ice area (10 ⁶ m ²)
December 18, '85	1.90	0	0			0	0		
December 28, '85	2.47	0.09	0.28	90	0.25	0.44	0.74	80	0.60
January 2, '86	2.02	0.16	0			0	0		
January 7, '86	2.02	0.82	0			0.03	0.20	70	0.14
January 8, '86	1.83	0.23	0			0.09	1.82	90	1.64
January 10, '86	3.07	0.14	0			0.15	0.05	90	0.04
January 15, '86	1.51	0.03	0.23	80	0.18	0.05	1.42	70	1.00
January 22, '86	1.50	0.03	0			0	0		
January 23, '86	1.99	0	0			0	0		
January 28, '86	3.86	0.03	0			0	0		
February 27, '86	4.02	0	0			0	0		

*Total area equals ice area.

**Sum of all ice areas for all map units.

ny River (area = $3.07 \times 10^6 \text{ m}^2$)

	Fragmented ice cover with open water areas			Ice floes or frazil slush and pans			Total Ice area**	No Video Coverage
al	Total area* (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	(10^6 m^2)	(10^6 m^2)
	0			0			0	-
16	1.45	80	1.16	0.14	20	0.03	1.76	-
04	0.03	50	0.02	0.77	10	0.08	0.14	-
02	0.47	70	0.33	1.94	40	0.77	1.18	-
78	1.01	90	0.91	0			1.77	-
16	0.48	90	0.43	0.41	60	0.25	0.84	-
02	1.42	80	1.14	0.14	10	0.01	1.27	-
	0			2.27	10	0.23	0.23	-
	0			0.53	5	0.03	0.03	-
	0			0.06	50	0.03	0.03	-
	0			0			0	-

- Allegheny River (area = $4.02 \times 10^6 \text{ m}^2$)

Frag. ice cover	Fragmented ice cover with open water areas			Ice floes or frazil slush and pans			Total Ice area**	No Video Coverage
Total area* (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	(10^6 m^2)	(10^6 m^2)
0	0			0			0	2.12
0.44	0.74	80	0.59	0			1.37	-
0	0			1.84	40	0.74	0.90	-
0.03	0.20	70	0.14	0.95	40	0.38	1.37	-
0.09	1.82	90	1.64	0.05	50	0.03	1.99	-
0.15	0.05	90	0.05	0.61	40	0.24	0.58	-
0.05	1.42	70	0.99	0.78	30	0.23	1.48	-
0	0			2.49	5	0.12	0.15	-
0	0			2.03	5	0.10	0.10	-
0	0			0.13	10	0.01	0.04	-
0	0			0			0	-

Lock and Dam 3 Pool[†] - Allegheny River (area =

	Open water	Solid ice cover	Solid ice cover with open water areas		Frag. ice cover	Fragmented ice with open water		
Video acquisition date	Total area (10 ⁶ m ²)	Total area* (10 ⁶ m ²)	Total area (10 ⁶ m ²)	Ice conc. (%)	Ice area (10 ⁶ m ²)	Total area* (10 ⁶ m ²)	Total area (10 ⁶ m ²)	Ice conc. (%)
December 18, '85	0	0	0			0	0	
December 28, '85	0.17	0	0.93	80	0.74	0	0	
January 2, '86	0.75	0	0			0.03	0.36	60
January 7, '86	0.20	0.04	0			0	0.90	90
January 8, '86	0.30	0.04	0			0.38	0.42	95
January 10, '86	0.39	0	0			0.40	0.35	90
January 15, '86	0.49	0.28	0.30	80	0.24	0	0	
January 22, '86	0.69	0	0			0	0	
January 23, '86	0.41	0	0			0	0	
January 28, '86	1.09	0	0			0	0	
February 27, '86	1.14	0	0			0	0	

*Total area equals ice area.

**Sum of all ice areas for all map units.

[†] Up to mile 17 only.

Emsworth Pool - Ohio River (area = 4.49 x

	Open water	Solid ice cover	Solid ice cover with open water areas		Frag. ice cover	Fragmented ice with open water		
Video acquisition date	Total area (10 ⁶ m ²)	Total area* (10 ⁶ m ²)	Total area (10 ⁶ m ²)	Ice conc. (%)	Ice area (10 ⁶ m ²)	Total area* (10 ⁶ m ²)	Total area (10 ⁶ m ²)	Ice conc. (%)
December 19, '85	4.01	0	0			0	0	
December 30, '85	0.16	0	0			0	0	
January 8, '86	1.20	0.07	0.15	90	0.14	0	0.39	80
January 10, '86	2.53	0.14	0			0.53	0.06	80
January 16, '86	0.30	0.99	0			0.30	1.20	90
January 22, '86	0	0	0			0	0	
January 23, '86	0	0	0			0	0	

Legheny River (area = $1.14 \times 10^6 \text{ m}^2$)

g.	Fragmented ice cover with open water areas			Ice floes or frazil slush and pans			Total ice area**	No Video Coverage
ce ver								
tal	Total	Ice	Ice	Total	Ice	Ice		
area*	area	conc.	area	area	conc.	area		
(10^6 m^2)	(10^6 m^2)	(%)	(10^6 m^2)	(10^6 m^2)	(%)	(10^6 m^2)	(10^6 m^2)	(10^6 m^2)
	0			0			0	1.14
	0			0.04	10	0.00	0.74	-
03	0.36	60	0.22	0			0.25	-
	0.90	90	0.81	0			0.85	-
38	0.42	95	0.40	0			0.82	-
40	0.35	90	0.32	0			0.72	-
	0			0.07	50	0.04	0.56	-
	0			0.45	10	0.05	0.05	-
	0			0.73	5	0.04	0.04	-
	0			0.05	10	0.01	0.01	-
	0			0			0	-

River (area = $4.49 \times 10^6 \text{ m}^2$)

g.	Fragmented ice cover with open water areas			Ice floes or frazil slush and pans			Total ice area**	No Video Coverage
e ar								
al	Total	Ice	Ice	Total	Ice	Ice		
area*	area	conc.	area	area	conc.	area		
(10^6 m^2)	(10^6 m^2)	(%)	(10^6 m^2)	(10^6 m^2)	(%)	(10^6 m^2)	(10^6 m^2)	(10^6 m^2)
	0			0			0	0.48
	0			0.10	1	0.00	0.00	4.23
	0.39	80	0.31	0.65	40	0.26	0.78	2.03
53	0.06	80	0.05	0.38	10	0.04	0.76	0.85
50	1.20	90	1.08	0.86	55	0.47	2.84	0.84
	0			0			0	4.49
	0			0			0	4.49
	0			0			0	4.49

Emsworth Pool - Ohio River (area = $4.49 \times 10^6 \text{ m}^2$)

Video acquisition date	Open water	Solid ice cover	Solid ice cover with open water areas		Frag. ice cover	Fragmented ice cover with open water areas		Ice conc. (%)	Ice area (10^6 m^2)	Total area (10^6 m^2)
	Total area (10^6 m^2)	Total area* (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)		Total area* (10^6 m^2)	Total area (10^6 m^2)			
December 19, '85	4.01	0	0		0	0				0
December 30, '85	0.16	0	0		0	0				0.
January 8, '86	1.20	0.07	0.15	90	0	0.39	80	0.31		0.
January 10, '86	2.53	0.14	0		0.53	0.06	80	0.05		0.
January 16, '86	0.30	0.99	0		0.30	1.20	90	1.08		0.
January 22, '86	0	0	0		0	0				0
January 23, '86	0	0	0		0	0				0
February 28, '86	0	0	0		0	0				0

*Total area equals ice area.

**Sum of all ice areas for all map units.

Dashields Pool - Ohio River (area = $5.00 \times 10^6 \text{ m}^2$)

Video acquisition date	Open water	Solid ice cover	Solid ice cover with open water areas		Frag. ice cover	Fragmented ice cover with open water areas		Ice conc. (%)	Ice area (10^6 m^2)	Total area (10^6 m^2)
	Total area (10^6 m^2)	Total area* (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)		Total area* (10^6 m^2)	Total area (10^6 m^2)			
December 19, '85	5.00	0	0		0	0				0
December 30, '85	0	0	0		0	0				0
January 8, '86	0	0	0		0	0				0
January 10, '86	1.24	0.02	0		0	0				0
January 16, '86	0.93	0.43	0		0.05	0				0.
January 22, '86	0	0	0		0	0				0
January 23, '86	0	0	0		0	0				0
February 28, '86	0	0	0		0	0				0

*Total area equals ice area.

**Sum of all ice areas for all map units.

Ohio River (area = $4.49 \times 10^6 \text{ m}^2$)

Frag. ice cover	Fragmented ice cover with open water areas			Ice floes or frazil slush and pans			Total ice area**	No Video Coverage
Total area* (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	(10^6 m^2)	(10^6 m^2)
0	0			0			0	0.48
0	0			0.10	1	0.00	0.00	4.23
0	0.39	80	0.31	0.65	40	0.26	0.78	2.03
0.53	0.06	80	0.05	0.38	10	0.04	0.76	0.85
0.30	1.20	90	1.08	0.86	55	0.47	2.84	0.84
0	0			0			0	4.49
0	0			0			0	4.49
0	0			0			0	4.49

Ohio River (area = $5.00 \times 10^6 \text{ m}^2$)

Frag. ice cover	Fragmented ice cover with open water areas			Ice floes or frazil slush and pans			Total ice area**	No Video Coverage
Total area* (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	(10^6 m^2)	(10^6 m^2)
0	0			0			0	-
0	0			0			0	5.00
0	0			0			0	5.00
0	0			0			0.02	3.74
0.05	0			0.41	50	0.21	0.69	3.18
0	0			0			0	5.00
0	0			0			0	5.00
0	0			0			0	5.00

Montgomery Pool - Ohio River (area = 11.5)

	Open water	Solid ice cover	Solid ice cover with open water areas			Frag. ice cover	Fragmented with open water	
Video acquisition date	Total area (10^6 m^2)	Total area* (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	Total area* (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)
December 19, '85	10.99	0	0			0	0	
December 30, '85	0.53	0.28	0			2.74	1.73	
January 10, '86	0	0	0			0	0	
January 16, '86	0.38	1.14	0			0	3.20	
January 22, '86	1.43	0	0			0	0	
January 23, '86	2.78	0	0			0	0	
February 28, '86	5.76	0	0			0	0	

*Total area equals ice area.

**Sum of all ice areas for all map units.

New Cumberland Pool - Ohio River (area = 14)

	Open water	Solid ice cover	Solid ice cover with open water areas		Frag. ice cover	Fragmented i with open water		
Video acquisition date	Total area 10^6 m^2	Total area* 10^6 m^2	Total area 10^6 m^2	Ice conc. (%)	Ice area 10^6 m^2	Total area* 10^6 m^2	Total area 10^6 m^2	Ice con
December 19, '85	13.16	0	0			0	0	
December 30, '85	2.19	0.46	0			5.83	2.17	90
January 10, '86	5.37	0	0			0	1.32	90
January 16, '86	4.61	2.86	0			0	2.42	90
January 22, '86	5.13	0	0			0	0	
January 23, '86	14.44	0	0			0	0	
February 28, '86	14.87	0	0			0	0	

*Total area equals ice area.

Ohio River (area = $11.27 \times 10^6 \text{ m}^2$)

<u>Frag. ice cover</u>	<u>Fragmented ice cover with open water areas</u>			<u>Ice floes or frazil slush and pans</u>			<u>Total ice area**</u>	<u>No Video Coverage</u>
<u>Total area* (10^6 m^2)</u>	<u>Total area (10^6 m^2)</u>	<u>Ice conc. (%)</u>	<u>Ice area (10^6 m^2)</u>	<u>Total area (10^6 m^2)</u>	<u>Ice conc. (%)</u>	<u>Ice area (10^6 m^2)</u>	<u>(10^6 m^2)</u>	<u>(10^6 m^2)</u>
0	0			0			0	0.28
2.74	1.73	80	1.38	0.43	40	0.17	4.57	5.56
0	0			0			0	11.27
0	3.20	70	2.24	0			3.38	6.55
0	0			5.82	80	4.66	4.66	4.02
0	0			1.53	1	0.02	0.02	6.96
0	0			0			0	5.51

Ohio River (area = $14.87 \times 10^6 \text{ m}^2$)

<u>frag. ice cover</u>	<u>Fragmented ice cover with open water areas</u>			<u>Ice floes or frazil slush and pans</u>			<u>Total ice area**</u>	<u>No Video Coverage</u>
<u>Total area* (10^6 m^2)</u>	<u>Total area (10^6 m^2)</u>	<u>Ice conc. (%)</u>	<u>Ice area (10^6 m^2)</u>	<u>Total area (10^6 m^2)</u>	<u>Ice conc. (%)</u>	<u>Ice area (10^6 m^2)</u>	<u>(10^6 m^2)</u>	<u>(10^6 m^2)</u>
0	0			0			0	1.71
5.83	2.17	90	1.95	3.18	30	0.95	9.19	1.04
0	1.32	90	1.19	1.43	20	0.29	1.48	6.75
0	2.42	90	2.18	4.98	50	2.49	7.53	-
0	0			9.74	20	1.95	1.95	-
0	0			0.43	1	0.00	0.00	-
0	0			0			0	-

Video acquisition date	Open water	Solid ice cover	Solid ice cover with open water areas			Fraq. ice cover	Fragmented ice cover with open water areas		
	Total area (10^6 m^2)	Total area* (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	Total area* (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)
December 19, '85	13.16	0	0			0	0		
December 30, '85	2.19	0.46	0			5.83	2.17	90	1.95
January 10, '86	5.37	0	0			0	1.32	90	1.19
January 16, '86	4.61	2.86	0			0	2.42	90	2.18
January 22, '86	5.13	0	0			0	0		
January 23, '86	14.44	0	0			0	0		
February 28, '86	14.87	0	0			0	0		

*Total area equals ice area.

**Sum of all ice areas for all map units.

Pike Island Pool - Ohio River (area = $18.92 \times 10^6 \text{ m}^2$)

Video acquisition date	Open water	Solid ice cover	Solid ice cover with open water areas			Frag. ice cover	Fragmented ice cover with open water areas		
	Total area (10 ⁶ m ²)	Total area* (10 ⁶ m ²)	Total area (10 ⁶ m ²)	Ice conc. (%)	Ice area (10 ⁶ m ²)	Total area* (10 ⁶ m ²)	Total area (10 ⁶ m ²)	Ice conc. (%)	Ice area (10 ⁶ m ²)
December 19, '85	18.92	0	0			0	0		
December 30, '85	0.90	0	0			0	0		
January 10, '86	18.74	0	0			0	0		
January 16, '86	17.34	0	0			0	0		
January 22, '86	12.21	0	0			0	0		
January 23, '86	8.96	0	0			0.33	0		
February 28, '86	18.92	0	0			0	0		

*Total area equals ice area.

**Sum of all ice areas for all map units.

Pool - Ohio River (area = $14.87 \times 10^6 \text{ m}^2$)

Frag. ice cover	Fragmented ice cover with open water areas			Ice floes or frazil slush and pans			Total ice area**	No Video Coverage
Total area* (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	(10^6 m^2)	(10^6 m^2)
0	0			0			0	1.71
5.83	2.17	90	1.95	3.18	30	0.95	9.19	1.04
0	1.32	90	1.19	1.43	20	0.29	1.48	6.75
0	2.42	90	2.18	4.98	50	2.49	7.53	-
0	0			9.74	20	1.95	1.95	-
0	0			0.43	1	0.00	0.00	-
0	0			0			0	-

Pool - Ohio River (area = $18.92 \times 10^6 \text{ m}^2$)

Frag. ice cover	Fragmented ice cover with open water areas			Ice floes or frazil slush and pans			Total ice area**	No Video Coverage
Total area* (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	(10^6 m^2)	(10^6 m^2)
0	0			0			0	-
0	0			0			0	18.02
0	0			0.18	10	0.02	0.02	-
0	0			1.58	10	0.16	0.16	-
0	0			6.71	10	0.67	0.67	-
0.33	0			9.63	20	1.93	2.26	-
0	0			0			0	-

Hannibal Pool - Ohio River (area = 22.46 x 10⁶)

Video acquisition date	Open water	Solid ice cover	Solid ice cover with open water areas		Frag. ice cover	Fragmented ice cover with open water areas		
	Total area ^{6 2} (10 ⁶ m ²)	Total area* ^{6 2} (10 ⁶ m ²)	Total area ^{6 2} (10 ⁶ m ²)	Ice conc. (%)	Ice area ^{6 2} (10 ⁶ m ²)	Total area* ^{6 2} (10 ⁶ m ²)	Total area ^{6 2} (10 ⁶ m ²)	Ice conc. (%)
December 19, '85	22.46	0	0			0	0	
December 30, '85	3.34	0	0			0	0	
January 10, '86	22.38	0.04	0			0	0	
January 16, '86	22.44	0.02	0			0	0	
January 22, '86	22.46	0	0			0	0	
January 23, '86	22.31	0	0			0	0	
February 28, '86	22.46	0	0			0	0	

*Total area equals ice area.

**Sum of all ice areas for all map units.

Willow Island Pool - Ohio River (area = 21.24 x 10⁶)

Video acquisition date	Open water	Solid ice cover	Solid ice cover with open water areas			Frag. ice cover	Fragmented ice cover with open water areas		
	Total area* _{6 2} (10 m)	Total area* _{6 2} (10 m)	Total area* _{6 2} (10 m)	Ice conc. (%)	Ice area* _{6 2} (10 m)	Total area* _{6 2} (10 m)	Total area* _{6 2} (10 m)	Ice conc. (%)	Ice area* _{6 2} (10 m)
December 19, '85	21.24	0	0			0	0		
December 30, '85	8.08	0	0			0	0		
January 16, '86	21.02	0.03	0.03	70	0.06	0	0.10	50	0.06
February 28, '86	10.21	0	0			0	0		

*Total area equals ice area.

**Sum of all ice areas for all map units.

<u>m²</u>					
	Ice floes or frazil slush and pans			Total ice area**	No Video Coverage
e	Total area (10 ⁶ m ²)	Ice conc. (%)	Ice area (10 ⁶ m ²)	(10 ⁶ m ²)	(10 ⁶ m ²)
	0			0	-
	0.12	20	0.02	0.02	19.00
	0.04	40	0.02	0.06	-
	0			0.02	-
	0			0	-
	0.15	20	0.03	0.03	-
	0			0	-

<u>m²</u>					
	Ice floes or frazil slush and pans			Total ice area**	No Video Coverage
a	Total area (10 ⁶ m ²)	Ice conc. (%)	Ice area (10 ⁶ m ²)	(10 ⁶ m ²)	(10 ⁶ m ²)
	0			0	-
	0.66	10	0.07	0.07	12.50
05	0			0.14	-
	0			0	11.03

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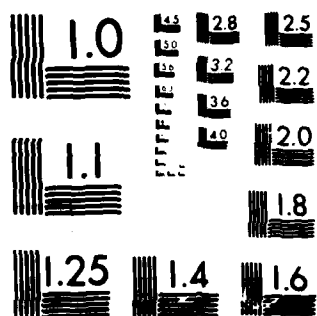
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Video acquisition date	Open water	Solid ice cover	Solid ice cover with open water areas		Frag. ice cover	Fragmented ice cover with open water areas			
	Total area* (10^6 m^2)	Total area* (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	Total area* (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)
December 19, '85	21.24	0	0			0	0		
December 30, '85	8.08	0	0			0	0		
January 16, '86	21.02	0.03	0.09	70	0.06	0	0.10	50	0.05
February 28, '86	10.21	0	0			0	0		

*Total area equals ice area.

**Sum of all ice areas for all map units.

Belleville Pool - Ohio River (area = 27.28 x 10⁶ m²)

Video acquisition date	Open water	Solid ice cover	Solid ice cover with open water areas		Frag. ice cover	Fragmented ice cover with open water areas			
	Total area ^{6 2} _(10⁶ m)	Total area* ^{6 2} _(10⁶ m)	Total area ^{6 2} _(10⁶ m)	Ice conc. (%)	Ice area ^{6 2} _(10⁶ m)	Total area* ^{6 2} _(10⁶ m)	Total area ^{6 2} _(10⁶ m)	Ice conc. (%)	Ice area ⁶ _(10⁶ m)
December 19, '85	27.28	0	0			0	0		
December 30, '85	25.01	0	0			0	0		
January 16, '86	24.97	0	0			0	0		

*Total area equals ice area.

**Sum of all ice areas for all map units.

$\times 10^6 \text{ m}^2$

cover	Ice floes or frazil		Total	No
areas	slush and pans		Ice	Video
			area**	Coverage
Ice	Total	Ice	Ice	
area	area	conc.	area	
(10^6 m^2)	(10^6 m^2)	(%)	(10^6 m^2)	(10^6 m^2)
	0		0	-
	0.66	10	0.07	12.50
0.05	0		0.14	-
	0		0	11.03

$8 \times 10^6 \text{ m}^2$

ice cover	Ice floes or frazil		Total	No
areas	slush and pans		Ice	Video
			area**	Coverage
Ice	Total	Ice	Ice	
area	area	conc.	area	
(10^6 m^2)	(10^6 m^2)	(%)	(10^6 m^2)	(10^6 m^2)
	0		0	-
	2.27	10	0.23	-
	2.31	5	0.12	-

Racine Pool - Ohio River (area = 19.89 x

	Open water	Solid ice cover	Solid ice cover with open water areas			Frag. Ice cover	Fragmented ice with open water a	
Video acquisition date	Total area ^{6 2} (10 ⁶ m ²)	Total area* ^{6 2} (10 ⁶ m ²)	Total area ^{6 2} (10 ⁶ m ²)	Ice conc. (%)	Ice area ^{6 2} (10 ⁶ m ²)	Total area* ^{6 2} (10 ⁶ m ²)	Total area ^{6 2} (10 ⁶ m ²)	Ice conc. (%)
December 19, '85	19.89	0	0			0	0	
December 30, '85	16.18	0	0			0	0	
January 16, '86	18.52	0	0			0	0	

*Total area equals ice area.

**Sum of all ice areas for all map units.

Gallipolis Pool - Ohio River (area = 24.65

	Open water	Solid ice cover	Solid ice cover with open water areas		Frag. ice cover	Fragmented ice with open water areas		
Video acquisition date	Total area ⁶ ₂ (10 ⁶ m ²)	Total area* ⁶ ₂ (10 ⁶ m ²)	Total area ⁶ ₂ (10 ⁶ m ²)	Ice conc. (%)	Ice area ⁶ ₂ (10 ⁶ m ²)	Total area* ⁶ ₂ (10 ⁶ m ²)	Total area ⁶ ₂ (10 ⁶ m ²)	Ice conc. (%)
December 19, '85	24.26	0	0			0	0	
December 30, '85	24.36	0	0			0	0	
January 16, '86	24.65	0	0			0	0	

*Total area equals ice area.

**Sum of all ice areas for all map units.

Greenup Pool - Ohio River (area = 41.19 x

	Open	Solid ice	Solid ice cover with		Frag. ice	Fragmented ice with	
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1 River (area = $19.89 \times 10^6 \text{ m}^2$)

ag. ce ver	Fragmented ice cover with open water areas			Ice floes or frazil slush and pans			Total ice area**	No Video Coverage
al ea* m ²	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	(10^6 m^2)	(10^6 m^2)
	0			0			0	-
	0			3.17	20	0.74	0.74	-
	0			1.37	10	0.14	0.14	-

2 River (area = $24.65 \times 10^6 \text{ m}^2$)

ag. ce ver	Fragmented ice cover with open water areas			Ice floes or frazil slush and pans			Total ice area**	No Video Coverage
al ea* m ²	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	(10^6 m^2)	(10^6 m^2)
	0			0			0	0.39
	0			0.29	10	0.03	0.03	-
	0			0			0	-

3 River (area = $41.19 \times 10^6 \text{ m}^2$)

ag. ce ver	Fragmented ice cover with open water areas			Ice floes or frazil slush and pans			Total ice area**	No Video Coverage
al ea* m ²	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	(10^6 m^2)	(10^6 m^2)

Video acquisition date	water cover		open water areas		cover		open water areas	
	Total area 10^6 m^2	Total area* 10^6 m^2	Total area 10^6 m^2	Ice conc. (%)	Ice area 10^6 m^2	Total area* 10^6 m^2	Total area 10^6 m^2	Ice conc. (%)
December 19, '85	24.26	0	0			0	0	
December 30, '85	24.36	0	0			0	0	
January 16, '86	24.65	0	0			0	0	

*Total area equals ice area.

**Sum of all ice areas for all map units.

Greenup Pool - Ohio River (area = 41.19×10^6)

Video acquisition date	Open water		Solid ice cover		Solid ice cover with open water areas		Frag. ice cover		Fragmented ice cover with open water areas	
	Total area 10^6 m^2	Total area* 10^6 m^2	Total area 10^6 m^2	Ice conc. (%)	Ice area 10^6 m^2	Total area* 10^6 m^2	Total area 10^6 m^2	Ice conc. (%)	Total area 10^6 m^2	Ice conc. (%)
December 19, '85	41.19	0	0			0	0		0	
December 30, '85	41.19	0	0			0	0		0	
January 16, '86	41.19	0	0			0	0		0	

*Total area equals ice area.

**Sum of all ice areas for all map units.

Maldahl Pool - Ohio River (area = 73.77×10^6)

Video acquisition date	Open water		Solid ice cover		Solid ice cover with open water areas		Frag. ice cover		Fragmented ice cover with open water areas	
	Total area 10^6 m^2	Total area* 10^6 m^2	Total area 10^6 m^2	Ice conc. (%)	Ice area 10^6 m^2	Total area* 10^6 m^2	Total area 10^6 m^2	Ice conc. (%)	Total area 10^6 m^2	Ice conc. (%)
December 19, '85	73.77	0	0			0	0		0	
December 30, '85	43.44	0	0			0	0		0	
January 16, '86	73.77	0	0			0	0		0	

*Total area equals ice area.

**Sum of all ice areas for all map units.

ice cover in er areas		ice floes or frazil slush and pans		Total ice area**	No Video Coverage
ice conc. (%)	ice area (10^6 m^2)	Total area (10^6 m^2)	ice conc. (%)	ice area (10^6 m^2)	(10^6 m^2)
		0		0	0.39
		0.29	10	0.03	-
		0		0	-

$\times 10^6 \text{ m}^2$

ice cover in er areas		ice floes or frazil slush and pans		Total ice area**	No Video Coverage
ice conc. (%)	ice area (10^6 m^2)	Total area (10^6 m^2)	ice conc. (%)	ice area (10^6 m^2)	(10^6 m^2)
		0		0	-
		0		0	-
		0		0	-

$7 \times 10^6 \text{ m}^2$

ice cover in er areas		ice floes or frazil slush and pans		Total ice area**	No Video Coverage
ice conc. (%)	ice area (10^6 m^2)	Total area (10^6 m^2)	ice conc. (%)	ice area (10^6 m^2)	(10^6 m^2)
		0		0	-
		0		0	30.33
		0		0	-

La Grange Pool[†] - Illinois River (area = 11.71×10^6 m²)

Video acquisition date	Open water	Solid ice cover	Solid ice cover with open water areas			Frag. ice cover	Fragmented ice cover with open water areas		
	Total area (10 ⁶ m ²)	Total area* (10 ⁶ m ²)	Total area (10 ⁶ m ²)	Ice conc. (%)	Ice area (10 ⁶ m ²)	Total area* (10 ⁶ m ²)	Total area (10 ⁶ m ²)	Ice conc. (%)	Ice area (10 ⁶ m ²)
January 7, '86	3.53	0	0			0.52	0		
January 10, '86	8.24	0	0			0.24	0		
January 15, '86	5.26	0.04	0			0.04	0		
January 17, '86	8.63	0.02	0			0.03	0		
January 21, '86	10.26	0	0			0.02	0		
January 24, '86	10.14	0.02	0			0	0		
January 27, '86	3.88	0.02	0			0.73	0.41	80	0.33
January 30, '86	4.94	0.04	0			0.27	0.04	80	0.03
February 9, '86	10.42	trace	0			0.03	0		
February 11, '86	5.73	0.08	0.03	70	0.02	0	0		
February 13, '86	0.87	0.11	0			0.05	0.03	70	0.02
February 15, '86	0.31	0.10	0			0	0.78	70	0.55
February 21, '86	2.71	0.15	0			0	0		
February 25, '86	8.02	0.10	0			0.04	0		
March 2, '86	10.81	0.02	0			0	0		
March 5, '86	10.91	trace	0			0	0		

*Total area equals ice area.

**Sum of all ice areas for all map units.

[†] Starts at mile 120.

Miss River (area = $11.71 \times 10^6 \text{ m}^2$)

Fig. No. Year	Fragmented ice cover with open water areas			Ice floes or frazil slush and pans			Total Ice area**	No Video Coverage
	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	(10^6 m^2)	(10^6 m^2)
52	0			7.46	40	2.98	3.50	0.20
24	0			3.06	60	1.84	2.08	0.17
04	0			6.06	30	1.82	1.90	0.31
03	0			2.49	10	0.25	2.54	0.54
02	0			0.69	50	0.35	0.37	0.74
	0			0.08	10	0.01	0.03	1.47
73	0.41	80	0.33	6.67	30	2.00	3.08	-
27	0.04	80	0.03	6.39	40	2.56	2.90	0.03
33	0			1.11	20	0.22	0.25	0.15
	0			7.87	60	4.72	4.82	-
15	0.03	70	0.02	10.43	50	5.22	5.40	0.22
	0.78	70	0.55	10.52	30	3.16	3.81	-
	0			8.85	40	3.54	3.69	-
4	0			3.47	20	0.69	0.83	0.08
	0			0			0.02	0.88
	0			0			0	0.80

*Total area equals ice area.

**Sum of all ice areas for all map units.

† Starts at mile 120.

Peoria Pool - Illinois River (area = 81.33×10^6)

Video acquisition date	Open water		Solid ice cover		Solid ice cover with open water areas		Frag. ice cover		Fragmented ice cover with open water areas	
	Total area (10^6 m^2)	Total area* (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	Total area* (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	
January 7, '86	2.72	20.61	0			29.71	11.92	90	10.7	
January 9, '86	1.34	26.04	0			25.96	9.00	90	8.1	
January 10, '86	5.25	23.10	0			26.41	4.24	80	3.4	
January 15, '86	5.73	18.35	0			34.24	6.81	80	5.4	
January 17, '86	9.47	16.16	0			26.93	3.18	75	2.4	
January 21, '86	32.13	8.45	0			11.69	2.46	70	1.7	
January 24, '86	43.53	4.52	0			2.41	1.44	70	1.0	
January 27, '86	4.58	15.84	0			9.40	29.63	80	23.8	
January 30, '86	3.69	18.51	0			27.56	11.49	90	10.5	
February 9, '86	37.15	12.23	0			8.55	4.63	70	3.2	
February 11, '86	10.18	8.02	2.97	90	2.67	17.25	1.99	80	1.6	
February 13, '86	3.29	17.93	0.16	80	0.13	14.78	10.62	90	9.7	
February 15, '86	3.26	14.41	12.39	95	11.77	5.94	12.80	80	10.0	
February 21, '86	43.77	12.66	0			4.86	0.06	70	0.4	
February 25, '86	42.14	6.05	0			0.33	0			
March 2, '86	52.89	2.31	0			0.15	0.14	70	0.1	
March 5, '86	54.83	1.89	0			0	0			

*Total area equals ice area.

**Sum of all ice areas for all map units.

0	0	0	0.02	0.88
0	0	0	0	0.80

Illinois River (area = $81.33 \times 10^6 \text{ m}^2$)

Frag. ice cover	Fragmented ice cover with open water areas			Ice floes or frazil slush and pans			Total ice area**	No Video Coverage
Total area* (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	(10^6 m^2)	(10^6 m^2)
29.71	11.92	90	10.73	0.40	80	0.32	61.37	15.97
25.96	9.00	90	8.10	0.29	50	0.15	60.25	18.70
26.41	4.24	80	3.39	1.27	20	0.25	53.15	21.06
34.24	6.81	80	5.45	2.85	20	0.57	49.11	12.85
26.93	3.18	75	2.39	5.16	30	1.55	47.03	20.43
11.69	2.46	70	1.72	1.83	70	1.28	23.14	24.77
2.41	1.44	70	1.01	1.01	30	0.30	8.24	28.42
9.40	29.63	80	23.70	0.82	40	0.33	49.27	21.06
27.56	11.49	90	10.34	2.30	40	0.92	57.33	17.78
8.55	4.63	70	3.24	2.73	40	1.09	25.11	16.04
17.25	1.99	80	1.59	19.58	70	13.71	43.24	21.43
14.78	10.62	90	9.56	8.81	40	3.52	45.92	25.74
5.94	12.80	80	10.24	6.24	40	2.50	44.86	26.29
4.86	0.06	70	0.04	2.36	5	0.12	17.68	17.62
0.33	0			12.38	5	0.62	7.00	20.43
0.15	0.14	70	0.10	0.88	5	0.04	2.60	24.96
0	0			0.28	5	0.01	1.90	24.33

Starved Rock Pool - Illinois River (area = 10.

Video acquisition date	Open water	Solid ice cover	Solid ice cover with open water areas		Frag. ice cover		Fragmented ice with open water	
	Total area (10 ⁶ m ²)	Total area* (10 ⁶ m ²)	Total area (10 ⁶ m ²)	Ice conc. (%)	Ice area (10 ⁶ m ²)	Total area* (10 ⁶ m ²)	Total area (10 ⁶ m ²)	Ice conc. (%)
January 7, '86	1.50	2.03	0.85	90	0.77	1.06	0.72	90
January 9, '86	0.63	2.01	0			3.25	0.61	80
January 10, '86	1.73	3.28	0			1.65	0.31	90
January 15, '86	5.20	0.40	0			2.10	0.98	80
January 17, '86	7.30	1.46	0			1.03	0	
January 21, '86	9.75	0.09	0			0	0	
January 24, '86	9.91	0.04	0			0	0	
January 27, '86	1.86	1.14	0			0.37	5.04	75
January 30, '86	1.35	1.77	0			1.75	3.22	90
February 9, '86	8.12	0.12	0			0	0	
February 11, '86	3.53	0.80	1.20	90	1.08	0.02	1.46	60
February 13, '86	2.16	2.15	0			1.54	2.90	80
February 15, '86	2.16	2.49	0.29	80	0.23	3.10	0.18	80
February 21, '86	9.16	0	0			0	0	
February 25, '86	7.93	0.02	0			0	0	
March 2, '86	7.39	0.02	0			0	0	
March 5, '86	7.97	0	0			0	0	

*Total area equals ice area.

**Sum of all ice areas for all map units.

s River (area = $10.19 \times 10^6 \text{ m}^2$)

Fragmented ice cover with open water areas			Ice floes or frazil slush and pans			Total ice area**	No Video Coverage
Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	(10^6 m^2)	(10^6 m^2)
0.72	90	0.65	1.28	80	1.02	5.53	2.75
0.61	80	0.49	1.10	60	0.66	6.41	2.59
0.31	90	0.28	1.65	60	0.99	6.20	1.57
0.98	80	0.78	0.07	50	0.04	3.32	1.44
0			0.04	20	0.01	2.50	0.36
0			0			0.09	0.35
0			0			0.04	0.24
5.04	75	3.78	0.15	40	0.06	5.35	1.63
3.22	90	2.90	0.06	20	0.01	6.43	2.04
0			0.18	20	0.04	0.16	1.77
1.46	60	0.88	1.63	30	0.49	3.27	1.55
2.90	80	2.32	0.47	50	0.24	6.25	0.97
0.18	80	0.14	1.11	20	0.22	6.18	0.86
0			0			0	1.03
0			0.07	30	0.02	0.04	2.17
0			0			0.02	2.78
0			0			0	2.22

tiver (area = $8.19 \times 10^6 \text{ m}^2$)

March 2, '86 7.54 0.02 0 0 0 0
 March 5, '86 7.97 0 0 0 0

*Total area equals ice area.

**Sum of all ice areas for all map units.

Marseilles Pool - Illinois River (area = $8.19 \times 10^6 \text{ m}^2$)

Video acquisition date	Open water	Solid ice cover	Solid ice cover with open water areas		Frag. ice cover	Fragmented ice cover with open water areas		Ice conc. (%)	Ice area (10^6 m^2)
			Total area (10^6 m^2)	Ice conc. (%)		Total area (10^6 m^2)	Total area (10^6 m^2)		
January 7, '86	5.40	0	0.21	70	0.15	0.04	0.07	90	0.06
January 9, '86	5.66	0	0			0	0		
January 10, '86	7.30	trace	0			0	0		
January 15, '86	7.32	trace	0			0.40	0		
January 17, '86	7.96	0.14	0			0	0		
January 21, '86	8.13	0.06	0			0	0		
January 24, '86	8.00	0.03	0			0	0		
January 27, '86	6.44	0.21	0			0.84	0.39	80	0.31
January 30, '86	3.02	0.08	0			0.23	2.50	90	2.25
February 9, '86	8.06	0	0			0	0		
February 11, '86	6.52	0.15	0			0	0		
February 13, '86	4.70	0.28	0			0.88	0.70	90	0.63
February 15, '86	6.15	0.16	0			0.05	0		
February 21, '86	8.11	0.07	0			0	0		
February 25, '86	8.10	trace	0			0	0		
March 2, '86	8.16	trace	0			0	0		
March 5, '86	8.17	0.02	0			0	0		

*Total area equals ice area.

**Sum of all ice areas for all map units.

0	0	0	0.04	2.17
0	0	0	0.02	2.78
0	0	0	0	2.22

Illinois River (area = $8.19 \times 10^6 \text{ m}^2$)

Station	Frag. ice cover	Fragmented ice cover with open water areas		Ice floes or frazil slush and pans			Total ice area**	No Video Coverage
	Total area* (10^6 m^2)	Total area* (10^6 m^2)	Ice conc. (%)	Ice area* (10^6 m^2)	Total area* (10^6 m^2)	Ice conc. (%)	Ice area* (10^6 m^2)	(10^6 m^2)
36								
33	0.04	0.07	90	0.06	1.86	50	0.93	1.18
34	0	0			2.03	60	1.22	1.22
21	0	0			0.84	60	0.50	0.50
36	0.40	0			0.21	30	0.06	0.46
	0	0			0.06	30	0.02	0.16
1	0	0			0		0.06	-
23	0	0			0.16	1	0.00	0.03
15	0.84	0.39	80	0.31	0.23	40	0.09	1.45
	0.23	2.50	90	2.25	2.15	5	0.11	2.67
52	0	0			0		0	0.13
63	0	0			1.52	10	0.15	0.30
83	0.88	0.70	90	0.63	1.63	20	0.33	2.12
101	0.05	0			1.83	10	0.18	0.39
	0	0			0.01	10	0.00	0.07
	0	0			0		0	0.09
	0	0			0		0.03	-
	0	0			0		0.02	-

Kankakee River[†] (area = 7.30 x 10

Video acquisition date	Open water	Solid ice cover	Solid ice cover with open water areas		Frag. ice cover	Fragmented ice with open water		Ice con- c. (%)
	Total area (10 ⁶ m ²)	Total area* (10 ⁶ m ²)	Total area (10 ⁶ m ²)	Ice area (10 ⁶ m ²)	Total area* (10 ⁶ m ²)	Total area (10 ⁶ m ²)	Total area (10 ⁶ m ²)	
January 7, '86	0.38	1.07	0.09	95	0.09	1.65	2.94	90
January 10, '86	0.24	0.75	0			3.37	2.38	80
January 15, '86	0.26	1.07	0			3.18	2.67	90
January 17, '86	0.29	1.05	0			3.39	2.45	80
January 21, '86	0.44	0.68	0			3.72	2.43	90
January 24, '86	1.42	1.54	0			1.81	2.21	80
January 27, '86	0.39	1.28	0.10	90	0.09	2.79	2.24	90
January 30, '86	0.51	1.51	0.21	95	0.20	2.96	1.29	90
February 9, '86	4.46	2.12	0			0.04	0	
February 11, '86	1.37	2.71	0			0.03	0.25	60
February 13, '86	0.90	2.59	0.17	95	0.16	0.46	0.65	90
February 15, '86	1.00	3.70	0.58	90	0.52	0.22	0.17	90
February 21, '86	4.52	2.39	0.22	90	0.20	0.02	0	
February 25, '86	5.85	1.23	0			0	0	
March 2, '86	6.82	0.48	0			0	0	
March 5, '86	6.73	0.39	0			0	0	

*Total area equals ice area.

**Sum of all ice areas for all map units.

[†]Up to mile 21, Warner Bridge.

350

7

Kee River[†] (area = $7.30 \times 10^6 \text{ m}^2$)

	Frag. ice cover	Fragmented ice cover with open water areas		Ice floes or frazil slush and pans			Total ice area**	No Video Coverage
	Total area* (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	Total area (10^6 m^2)	Ice conc. (%)	Ice area (10^6 m^2)	(10^6 m^2)
10	1.65	2.94	90	2.65	0		5.46	1.17
	3.37	2.38	80	1.90	0		6.02	0.56
2	3.18	2.67	90	2.40	0		6.65	0.12
	3.39	2.45	80	1.96	0		6.40	0.12
2	3.72	2.43	90	2.19	0		6.59	0.03
	1.81	2.21	80	1.77	0.18	1	0.00	5.12
2	2.79	2.24	90	2.02	0.13	20	0.03	6.21
1	2.96	1.29	90	1.16	0		5.83	0.82
2	0.04	0			0.09	50	0.05	2.21
	0.03	0.25	60	0.15	2.31	70	1.62	4.51
	0.46	0.65	90	0.59	2.48	50	1.24	5.04
0	0.22	0.17	90	0.15	1.33	30	0.40	4.99
0	0.02	0			0.09	10	0.01	2.62
0	0	0			0.15	1	0.00	1.23
	0	0			0		0.48	-
	0	0			0.05	30	0.02	0.41
								0.13

200

APPENDIX B: VIDEO TAPE COVER

Monongahela, Allegheny and Ohio Rivers

<u>Tape Number</u>	<u>River</u>	<u>River Miles</u>	<u>Date</u>	<u>Tape Number</u>
1	Allegheny	0-10	18 December 85	1
	Ohio	0-127	19 December 85	
2	Ohio	126-314	19 December 85	2
3	Ohio	311-437	19 December 85	3
4	Allegheny	0-18	28 December 85	4
	Monongahela	0-13	28 December 85	
	Ohio	22-173	30 December 85	
5	Ohio	172-374	30 December 85	5
6	Ohio	374-401	30 December 85	6
7	Allegheny	0-18	2 January 86	7
	Monongahela	0-12	2 January 86	
	Allegheny	0-18	7 January 86	
	Monongahela	0-13	7 January 86	
8	Allegheny	0-19	8 January 86	8
	Monongahela	0-13	8 January 86	
	Ohio	0-3	8 January 86	
	Ohio	0-10	10 January 86	
	Ohio	43-128	10 January 86	
	Allegheny	0-19	10 January 86	
	Monongahela	0-13	10 January 86	
9	Allegheny	0-19	15 January 86	9
	Monongahela	0-12	15 January 86	
	Ohio	0-9	16 January 86	
	Ohio	24-165	16 January 86	
10	Ohio	165-368	16 January 86	10
11	Ohio	369-436	16 January 86	11
12	Allegheny	0-19	22 January 86	12
	Monongahela	0-13	22 January 86	
	Ohio	21-127	22 January 86	
	Allegheny	0-18	23 January 86	

DIX B: VIDEO TAPE COVERAGE

Illinois and Kankakee Rivers

	<u>Tape Number</u>	<u>River</u>	<u>River Miles</u>	<u>Date</u>
ber 85	1	Kankakee	22-0	7 January 86
ber 85		Illinois	273-120	7 January 86
ber 85	2	Illinois	274-163	9 January 86
ber 85	3	Kankakee	22-0	10 January 86
		Illinois	274-119	10 January 86
ber 85	4	Illinois	118-273	15 January 86
ber 85		Kankakee	0-22	15 January 86
ber 85	5	Illinois	119-273	17 January 86
ber 85		Kankakee	0-22	17 January 86
ber 85	6	Illinois	119-273	21 January 86
ry 86		Kankakee	0-22	21 January 86
ry 86	7	Illinois	119-273	24 January 86
ry 86		Kankakee	0-22	24 January 86
ry 86	8	Kankakee	22-0	27 January 86
ry 86		Illinois	273-119	27 January 86
ry 86	9	Kankakee	22-0	30 January 86
ry 86		Illinois	273-119	30 January 86
ry 86	10	Kankakee	24-0	9 February 86
ry 86		Illinois	273-119	9 February 86
ry 86	11	Kankakee	24-0	11 February 86
ry 86		Illinois	273-119	11 February 86
ry 86	12	Illinois	119-273	13 February 86
ry 86		Kankakee	0-23	13 February 86
ry 86	13	Illinois	119-273	15 February 86
ry 86		Kankakee	0-23	15 February 86
ry 86	14	Kankakee	22-0	21 February 86
ry 86		Illinois	273-119	21 February 86
ry 86	15	Kankakee	22-0	25 February 86

	Monongahela	0-12	2 January 86		
	Allegheny	0-18	7 January 86	7	Illinois
	Monongahela	0-13	7 January 86		Kankakee
8	Allegheny	0-19	8 January 86	8	Kankakee
	Monongahela	0-13	8 January 86		Illinois
	Ohio	0-3	8 January 86		
	Ohio	0-10	10 January 86	9	Kankakee
	Ohio	43-128	10 January 86		Illinois
	Allegheny	0-19	10 January 86		
	Monongahela	0-13	10 January 86	10	Kankakee
					Illinois
9	Allegheny	0-19	15 January 86		
	Monongahela	0-12	15 January 86	11	Kankakee
	Ohio	0-9	16 January 86		Illinois
	Ohio	24-165	16 January 86		
				12	Illinois
10	Ohio	165-368	16 January 86		Kankakee
11	Ohio	369-436	16 January 86	13	Illinois
					Kankakee
12	Allegheny	0-19	22 January 86		
	Monongahela	0-13	22 January 86	14	Kankakee
	Ohio	21-127	22 January 86		Illinois
	Allegheny	0-18	23 January 86		
	Monongahela	0-13	23 January 86	15	Kankakee
					Illinois
13	Ohio	25-127	23 January 86		
				16	Illinois
14	Allegheny	0-18	28 January 86		Kankakee
	Monongahela	0-13	28 January 86		
				17	Illinois
15	Allegheny	0-19	27 February 86		Kankakee
	Monongahela	0-13	27 February 86		
	Ohio	22-144	28 February 86		

January 86		Kankakee	22-0	27 January 86
January 86		Illinois	273-119	27 January 86
January 86				
January 86	9	Kankakee	22-0	30 January 86
January 86		Illinois	273-119	30 January 86
January 86				
January 86	10	Kankakee	24-0	9 February 86
January 86		Illinois	273-119	9 February 86
January 86				
January 86	11	Kankakee	24-0	11 February 86
January 86		Illinois	273-119	11 February 86
January 86				
January 86	12	Illinois	119-273	13 February 86
January 86		Kankakee	0-23	13 February 86
January 86				
January 86	13	Illinois	119-273	15 February 86
January 86		Kankakee	0-23	15 February 86
January 86				
January 86	14	Kankakee	22-0	21 February 86
January 86		Illinois	273-119	21 February 86
January 86				
January 86	15	Kankakee	22-0	25 February 86
January 86		Illinois	273-119	25 February 86
January 86				
January 86	16	Illinois	119-273	2 March 86
January 86		Kankakee	0-22	2 March 86
January 86				
January 86	17	Illinois	119-273	5 March 86
January 86		Kankakee	0-22	5 March 86
January 86				

APPENDIX C: ICE CONDITIONS AS OBSERVED ON

Landsat images

Ice conditions on the Monongahela, Allegheny, Ohio and Illinois Rivers (Fig. C1; Table C1) were also observed using Landsat-5 images. Landsat-5 has two imaging sensors, a Multispectral Scanner (MSS) and a Thematic Mapper (TM). Based on a previous visual comparison of Landsat images, MSS band 2 images (0.6-0.7 μ m, visible red) and TM band 3 images (0.63-0.69 μ m, visible red) were used because they show more gray tones in river ice than the other spectral bands available from each sensor.

Each Landsat image covers about 114 miles on a side, is designated by a path and row number (Table C2) that corresponds to a particular geographic location, is taken of the same location every 16 days (Table C3) and has a specific identification number (Fig. C4, C6, C8 and C9). One image covers the area of interest on the Allegheny River (Table C2), three cover the Monongahela River, eleven cover the Ohio River and six cover the Illinois River. Not all images taken during the winter are useful because clouds obscure the river (Table C3).

Image interpretation

Black and white film positives, 9 by 9 in. in size, were analyzed using traditional photographic interpretation techniques. No special computer enhancements or analytical techniques were used. The images were viewed on a light table with a 7-10 power magnifier, but the spatial and spectral resolutions of Landsat imagery are insufficient to differentiate as many river-ice types as are apparent on the low-altitude, aerial video tapes. Only three general ice conditions could be observed with confidence, ice-free (black), gray ice, and white ice with textures and patterns sometimes apparent.

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Ice mapping

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converted

Table C1. River pools monitored with Landsat

Pool start to stop points (river miles) -----

Ohio River

Pittsburgh Point (0) to Emsworth (6.2)
Emsworth to Dashields (13.3)
Dashields to Montgomery (31.7)
Montgomery to New Cumberland (54.4)
New Cumberland to Pike Island (84.2)
Pike Island to Hannibal (126.4)
Hannibal to Willow Island (161.7)
Willow Island to Belleville (203.9)
Belleville to Racine (237.5)
Racine to Cairo (270.2)

CTIONS AS OBSERVED ON LANDSAT IMAGERY

If the river appeared black on the images and had no discernible textures or patterns, the river was classified as open, i.e., ice-free. It was possible that black ice (thin, transparent ice) was present at the time but was not discernible on Landsat images.

Gray ice on Landsat images could vary from thin, solid ice or thin fragmented ice with a few large open-water areas or many small areas to ice floes or slush. The gray tone was often patchy or mottled or showed textures or patterns.

White ice on the images could vary from solid or fragmented ice (usually thicker than gray ice) with no open areas to open areas that are smaller or occur less often than those that occur when a gray tone is produced. A white tone could also mean that the river ice was snow-covered. A navigation track in a complete ice cover occasionally appeared black because the track was ice-free. More often, the track appeared gray on the Landsat images because it was filled with slush, floes or brash ice.

Ice mapping and measurements

The upstream and downstream limits of reaches with gray ice and white ice as observed on Landsat images were transferred to base maps (Fig. C2, C3, C5 and C7). Since the distinction between the three conditions was frequently subtle and they usually grade one into another, a "best-guess" based on experience was required to map the limits of the ice-covered reaches. Consequently, ice at specific locations within a reach could have been different than shown on the maps. The lengths of open water gray ice and white ice within each pool were measured and converted to percentages of each pool (Tables C4, C5, C6 and C7).

monitored with Landsat imagery, 1985-1986.

ver miles)	Length (mi)	Pool surface area (10 ⁶ ft ²)(10 ⁶ m ²)	
<u>Ohio River</u>			
orth (6.2)	6.2	48.33	4.49
	7.1	53.82	5.00
	18.4	121.31	11.27
(54.4)	22.7	160.06	14.87
(84.2)	29.8	203.65	18.92
4)	42.2	241.76	22.46
1.7)	35.3	228.63	21.24
(203.9)	42.2	293.64	27.28
	33.6	214.10	19.89

as many river-ice types are apparent on the low-altitude, aerial video tapes. Only three general ice conditions could be observed with confidence, ice-free (black), gray ice, and white ice with textures and patterns sometimes apparent.

open water gray ice and white, converted to percentages of ea

Table C1. River pools monitored with Landsat imagery, 1985-

Pool start to stop points (river miles)	Length (mi)	Pool su (10 ⁶ ft ²)
<u>Ohio River</u>		
Pittsburgh Point (0) to Emsworth (6.2)	6.2	48.33
Emsworth to Dashields (13.3)	7.1	53.82
Dashields to Montgomery (31.7)	18.4	121.31
Montgomery to New Cumberland (54.4)	22.7	160.06
New Cumberland to Pike Island (84.2)	29.8	203.65
Pike Island to Hannibal (126.4)	42.2	241.76
Hannibal to Willow Island (161.7)	35.3	228.63
Willow Island to Belleville (203.9)	42.2	293.64
Belleville to Racine (237.5)	33.6	214.10
Racine to Gallipolis (279.2)	41.7	265.33
Gallipolis to Greenup (341.0)	61.8	443.37
Greenup to Meldahl (436.2)	95.2	794.06
Meldahl to Markland (531.5)	95.3	828.44
Markland to McAlpine (606.8)	75.3	816.48
McAlpine to Cannelton (720.7)	113.9	1020.29
Cannelton to Newburgh (776.1)	55.4	724.84
Newburgh to Uniontown (846.0)	69.9	803.38
Uniontown to Smithland (918.5)	72.5	1073.13
Smithland to Dam 52 (938.9)	20.4	394.86
Dam 52 to Dam 53 (962.6)	23.7	492.60
Dam 53 to Ohio-Mississippi confluence (981)	18.4	276.64
<u>Allegheny River</u>		
River Mile 72 to Dam 9 (62.2)	9.8	38.81
Dam 9 to Dam 8 (52.6)	9.6	43.09
Dam 8 to Dam 7 (45.7)	6.9	34.61
Dam 7 to Dam 6 (36.3)	9.4	47.15
Dam 6 to Dam 5 (30.4)	5.9	24.92
Dam 5 to Dam 4 (24.2)	6.2	31.10
Dam 4 to Dam 3 (14.5)	9.7	56.34
Dam 3 to Dam 2 (6.7)	7.8	43.22
Dam 2 to Pittsburgh Point (0)	6.7	33.05
<u>Monongahela River</u>		
River mile 128.7 to Opekiska (115.4)	13.3	31.60
Opekiska to Hildebrand (108)	7.4	17.58
Hildebrand to Morgantown (102)	6.0	17.42
Morgantown to Dam 8 (90.8)	11.2	32.53
Dam 8 to Dam 7 (85)	5.8	19.91
Dam 7 to Maxwell (61.2)	23.8	81.68
Maxwell to Dam 4 (41.5)	19.7	71.04
Dam 4 to Dam 3 (23.8)	17.7	71.47
Dam 3 to Dam 2 (11.2)	12.6	51.34
Dam 2 to Pittsburgh Point (0)	11.2	50.91

Each could have been differentiated and the area of open water gray ice and white ice within each pool were measured and converted to percentages of each pool (Tables C4, C5, C6 and C7).

ored with Landsat imagery, 1985-1986.

miles)	Length (mi)	Pool surface area (10 ⁶ ft ²)(10 ⁶ m ²)	
<u>Ohio River</u>			
(6.2)	6.2	48.33	4.49
	7.1	53.82	5.00
	18.4	121.31	11.27
4)	22.7	160.06	14.87
.2)	29.8	203.65	18.92
	42.2	241.76	22.46
)	35.3	228.63	21.24
.9)	42.2	293.64	27.28
	33.6	214.10	19.89
	41.7	265.33	24.65
	61.8	443.37	41.19
	95.2	794.06	73.77
	95.3	828.44*	76.96*
	75.3	816.48*	75.85*
	113.9	1020.29*	94.79*
	55.4	724.84*	67.34*
	69.9	803.38*	74.64*
	72.5	1073.13*	99.70*
	20.4	394.86*	36.68*
	23.7	492.60*	45.76*
uence (981)	18.4	276.64*	25.70*
<u>Leghenny River</u>			
	9.8	38.81*	3.61*
	9.6	43.09*	4.00*
	6.9	34.61*	3.22*
	9.4	47.15*	4.38*
	5.9	24.92*	2.32*
	6.2	31.10*	2.89*
	9.7	56.34*	5.23*
	7.8	43.22	4.02
	6.7	33.05	3.07
<u>Longahela River</u>			
(5.4)	13.3	31.60*	2.94*
	7.4	17.58*	1.63*
	6.0	17.42*	1.62*
	11.2	32.53*	3.02*
	5.8	19.91*	1.85*
	23.8	81.68*	7.59*
	19.7	71.04	6.60
	17.7	71.47	6.64
	12.6	51.34	4.77
	11.2	50.91	4.73

Table C1 (cont'd).

<u>Illinois River</u>	
Lockport (291) to Brandon Road (286)	5.0
Brandon Road to Dresden Island (271.3)	14.7
Dresden Island to Marseilles Lock (244.3)	27.0
Marseilles Lock to Starved Rock (231.1)	13.2
Starved Rock to Peoria (157.6)	73.5
Peoria to LaGrange (80.1)	77.5
La Grange to Illinois-Mississippi confluence (0)	80.1

* Estimated

-- Areas not calculated

Table C2. Landsat-5 imagery coverage in 1985-1986.

<u>Landsat-5</u> <u>Path - Row</u>	<u>River</u>	<u>Approximate</u> <u>coverage</u> <u>(river miles)</u>
17 - 32	Ohio	0 to 116
	Allegheny	0 to 85
	Monongahela	0 to 103
17 - 33	Ohio	107 to 120
	Monongahela	95 to Tygart Lake
18 - 32	Ohio	0 to 140
	Monongahela	0 to 10
18 - 33	Ohio	130 to 320
19 - 33	Ohio	235 to 430
20 - 33	Ohio	420 to 626
20 - 34	Ohio	598 to 628
21 - 33	Ohio	543 to 623
21 - 34	Ohio	618 to 776
22 - 31	Illinois	Lake Michigan to 299
22 - 34	Ohio	748 to 981
23 - 31	Illinois	Lake Michigan to 198
23 - 32	Illinois	202 to 133
23 - 34	Ohio	950 to 981
24 - 31	Illinois	235 to 180
24 - 32	Illinois	183 to 53
24 - 33	Illinois	50 to Mississippi River

21 (cont'd).

nois River

	5.0	--	--
3)	14.7	--	--
244.3)	27.0	88.16	8.19
1.1)	13.2	109.69	10.19
	73.5	875.44	81.33
	77.5	--	--
onfluence (0)	80.1	--	--

Table C3 (cont'd).

Percent
cloud cover

Path 18-Row 32

23 November	10
9 December†	40
25 December	80
10 January*	90
26 January*	90
27 February*	90
15 March	70

Path 18-Row 33

23 November	20
9 December†	20
25 December	90
10 January†*	40
26 January	90
27 February*	90
15 March	80

Path 19-Row 33

30 November	90
16 December	80
1 January†*	0
17 January*	90
2 February	90
18 February	90
6 March	90
22 March	40

Path 20-Row 33

	Monongahela	0 to 10
18 - 33	Ohio	130 to 320
19 - 33	Ohio	235 to 430
20 - 33	Ohio	420 to 626
20 - 34	Ohio	598 to 628
21 - 33	Ohio	543 to 623
21 - 34	Ohio	618 to 776
22 - 31	Illinois	Lake Michigan to 299
22 - 34	Ohio	748 to 981
23 - 31	Illinois	Lake Michigan to 198
23 - 32	Illinois	202 to 133
23 - 34	Ohio	950 to 981
24 - 31	Illinois	235 to 180
24 - 32	Illinois	183 to 53
24 - 33	Illinois	59 to Mississippi River

Table C3. Landsat-5 imagery taken during the 1985-1986 winter.

	Percent cloud cover
<u>Path 17-Row 32</u>	
16 November	90
2 December	90
18 December†*	40
3 January*	90
19 January	90
4 February	90
20 February	90
8 March†	0
24 March†	30
<u>Path 17-Row 33</u>	
16 November	90
2 December	90
18 December†*	30
3 January	80
19 January	90
4 February	90
20 February	90
8 March†	40
24 March†	20

15 March 70

Path 18-Row 33

23 November	20
9 December†	20
25 December	90
10 January†*	40
26 January	90
27 February*	90
15 March	80

Path 19-Row 33

30 November	90
16 December	80
1 January†*	0
17 January*	90
2 February	90
18 February	90
6 March	90
22 March	40

Path 20-Row 33

21 November	60
7 December	90
23 December	90
8 January†	10
24 January†	40
13 March	90

Path 20-Row 34

21 November	70
7 December	90
23 December	90
8 January†	10
24 January†	60
13 March	90

Path 21-Row 33

28 November	90
14 December	90
30 December†	0
15 January†	10
31 January	90
16 February	90
20 March	90

Path 21-Row 34

28 November	90
14 December†	30
30 December†	0
15 January†	10
31 January	80
16 February†	40
20 March	90

Table C3 (cont'd).

Table

Percent cloud cover		Open Length (mi) Percer	
<u>Path 22-Row 31</u>			
5 December	80		
21 December†	50	18 December	9.8 100
6 January†	60	8 March	
22 January	90		
23 February	90	24 March	9.8 100
<u>Path 22-Row 34</u>			
5 December	80	18 December	9.6 100
21 December†	30	8 March	1.6 17
6 January	90		
22 January	90	24 March	9.6 100
23 February	80		
11 March	90		
<u>Path 23-Row 31</u>			
26 November	90	18 December	6.9 100
12 December†	10	8 March	6.9 100
28 December†	10	24 March	6.9 100
13 January†*	0		
29 January†*	60	18 December	9.4 100
14 February*	90	8 March	9.4 100
2 March*	90	24 March	9.4 100
18 March	90		
<u>Path 23-Row 32</u>			
26 November	90	18 December	5.9 100
12 December†	20	8 March	5.9 100
28 December†	10	24 March	5.9 100
13 January†*	0		
29 January*	90		
14 February*	90	18 December	6.2 100
2 March†*	40	8 March	4.2 68
18 March	90	24 March	6.2 100
<u>Path 23-Row 34</u>			
26 November	90		
12 December	90	18 December	9.7 100
28 December†	70	8 March	9.7 100
13 January†	50	24 March	9.7 100
29 January	90		
14 February	90		
2 March†	70		
18 March	90	18 December	7.8 100
<u>Path 24-Row 31</u>		8 March	7.8 100

Table C4. Lineal extent of ice as observed on Landsat-5 imagery of the Allegheny River, 1985-86.

Open		Gray ice		White ice		Remarks
Length	Percent††	Length	Percent††	Length	Percent††	
(mi)		(mi)		(mi)		
<u>Dam 9 Pool (9.8 mi)⁺</u>						
9.8	100	9.8	100			TM; individual floes and slush patches visible.
9.8	100					TM
<u>Dam 8 Pool (9.6 mi)</u>						
9.6	100					PC
1.6	17	8.0	83			TM; slush patches and stringers visible.
9.6	100					TM
<u>Dam 7 Pool (6.9 mi)</u>						
6.9	100					PC
6.9	100					TM
6.9	100					TM
<u>Dam 6 Pool (9.4 mi)</u>						
9.4	100					PC
9.4	100					TM
9.4	100					TM
<u>Dam 5 Pool (5.9 mi)</u>						
5.9	100					PC
5.9	100					TM
5.9	100					TM
<u>Dam 4 Pool (6.2 mi)</u>						
6.2	100					PC
4.2	68	2.0	32			TM; slush ice from the Kiskiminetas River.
6.2	100					TM
<u>Dam 3 Pool (9.7 mi)</u>						
9.7	100					PC
9.7	100					TM
9.7	100					TM
<u>Dam 2 Pool (7.8 mi)</u>						
7.8	100					PC
7.8	100					TM

Path 23-Row 32

26 November	90
12 December†	20
28 December†	10
13 January†*	0
29 January*	90
14 February*	90
2 March†*	40
18 March	90

Path 23-Row 34

26 November	90
12 December	90
28 December†	70
13 January†	50
29 January	90
14 February	90
2 March†	70
18 March	90

Path 24-Row 31

17 November	10
3 December	90
19 December†	10
4 January	90
20 January*	90
5 February	90
21 February†*	60
9 March	90

Path 24-Row 32

17 November	0
3 December	90
19 December†	60
4 January	90
20 January*	80
5 February	90
21 February†*	70
9 March	70

Path 24-Row 33

17 November	40
3 December	90
19 December	90
4 January	90
20 January†	10
5 February	90
21 February	90
9 March†	70

* Video tapes available within two days
of the date.

† Images analyzed.

18 December	5.9	100
8 March	5.9	100
24 March	5.9	100

18 December	6.2	100
8 March	4.2	68

24 March	6.2	100
----------	-----	-----

18 December	9.7	100
8 March	9.7	100
24 March	9.7	100

18 December	7.8	100
8 March	7.8	100
24 March	7.8	100

18 December	6.7	100
8 March	6.7	100
24 March	6.7	100

* CC - cloud-covered; PC - part
NT - navigation track visible

+ Only to the end of the naviga

†† Rounded to nearest percent.

ch	9.4	100			TM
<u>Dam 5 Pool (5.9 mi)</u>					
ember	5.9	100			PC
ch	5.9	100			TM
ch	5.9	100			TM
<u>Dam 4 Pool (6.2 mi)</u>					
ember	6.2	100			PC
ch	4.2	68	2.0	32	TM; slush ice from the Kiskiminetas River.
ch	6.2	100			TM
<u>Dam 3 Pool (9.7 mi)</u>					
ember	9.7	100			PC
ch	9.7	100			TM
ch	9.7	100			TM
<u>Dam 2 Pool (7.8 mi)</u>					
ember	7.8	100			PC
ch	7.8	100			TM
ch	7.8	100			TM
<u>Emsworth Pool (6.7 mi)</u>					
ember	6.7	100			PC
ch	6.7	100			TM
ch	6.7	100			TM

cloud-covered; PC - partly cloudy; NOI - not on image; TM - Thematic Mapper;
navigation track visible.

to the end of the navigation channel at river mile 72.

ded to nearest percent.

Table C5. Lineal extent of ice as observed from
imagery of the Monongahela R.

	Open		Gray ice		White ice	
	Length (mi)	Percent††	Length (mi)	Percent††	Length (mi)	Percent††
<u>Opekiska Pool (13.3 mi)+</u>						
18 December	13.3	100				
8 March	13.3	100				
24 March	13.3	100				
<u>Hildebrand Pool (7.4 mi)</u>						
18 December	7.4	100				
8 March	7.4	100				
24 March	7.4	100				
<u>Morgantown Pool (6.0 mi)</u>						
18 December	6.0	100				
8 March	6.0	100				
24 March	6.0	100				
<u>Dam 8 Pool (11.2 mi)</u>						
18 December	11.2	100				
8 March	11.2	100				
24 March	11.2	100				
<u>Dam 7 Pool (5.8 mi)</u>						
18 December	5.8	100				
8 March	5.8	100				
24 March	5.8	100				
<u>Maxwell Pool (23.8 mi)</u>						
18 December	23.8	100				
8 March	23.8	100				
24 March	23.8	100				
<u>Dam 4 Pool (19.7 mi)</u>						
18 December	19.7	100				
8 March	19.7	100				
24 March	19.7	100				
<u>Dam 3 Pool (17.7 mi)</u>						
18 December	17.7	100				

Extent of ice as observed on Landsat-5
 ery of the Monongahela R., 1985-86.

Gray ice	White ice		Remarks
	Length	Percent††	
Percent††	(mi)	Percent††	
<u>Opekiska Pool (13.3 mi)+</u>			
		PC	
		TM	
		TM	
<u>Hildebrand Pool (7.4 mi)</u>			
		PC	
		TM	
		TM	
<u>Morgantown Pool (6.0 mi)</u>			
		PC	
		TM	
		TM	
<u>Dam 8 Pool (11.2 mi)</u>			
		PC	
		TM	
		TM	
<u>Dam 7 Pool (5.8 mi)</u>			
		TM	
		TM	
<u>Maxwell Pool (23.8 mi)</u>			
		TM	
		TM	
<u>Dam 4 Pool (19.7 mi)</u>			
		TM	
		TM	
<u>Dam 3 Pool (17.7 mi)</u>			

18 December	11.2	100
8 March	11.2	100
24 March	11.2	100

Dam 7 Pool (5.8 mi)

18 December	5.8	100
8 March	5.8	100
24 March	5.8	100

Maxwell Pool (23.8 mi)

18 December	23.8	100
8 March	23.8	100
24 March	23.8	100

Dam 4 Pool (19.7 mi)

18 December	19.7	100
8 March	19.7	100
24 March	19.7	100

Dam 3 Pool (17.7 mi)

18 December	17.7	100
8 March	17.7	100
24 March	17.7	100

Dam 2 Pool (12.6 mi)

18 December	12.6	100
8 March	11.2	89
24 March	12.6	100

1.4 11

Emsworth Pool (11.2 mi)

9 December	2.6	23
18 December	11.2	100
8 March	11.2	100
24 March	11.2	100

* CC - cloud-covered; PC - partly cloudy; NOI - not on image; TM - NT - navigation track visible.

* Only to the end of the navigation channel at river mile 128.7.

†† Rounded to nearest percent.

TM
TM

Dam 7 Pool (5.8 mi)

TM
TM

Maxwell Pool (23.8 mi)

TM
TM

Dam 4 Pool (19.7 mi)

TM
TM

Dam 3 Pool (17.7 mi)

TM
TM

Dam 2 Pool (12.6 mi)

11

TM; slush ice from
Youghiogheny River
TM

Emsworth Pool (11.2 mi)

upper 8.6 mi-NOI
PC
TM
TM

udy; NOI - not on image; TM - Thematic Mapper;

channel at river mile 128.7.

Table C6. Lineal extent of ice as observed from aerial imagery of the Ohio River, 1963-64

	Open		Gray ice		White ice	
	Length (mi)	Percent††	Length (mi)	Percent††	Length (mi)	Percent††
<u>Emsworth Pool (6.2 mi)</u>						
9 December	6.2	100				
18 December	6.2	100				
8 March	6.2	100				
24 March	6.2	100				
<u>Dashields Pool (7.1 mi)</u>						
9 December	7.1	100				
18 December	7.1	100				
8 March	7.1	100				
24 March	7.1	100				
<u>Montgomery Pool (18.4 mi)</u>						
9 December	18.4	100				
18 December	18.4	100				
8 March	18.4	100				
24 March	18.4	100				
<u>New Cumberland Pool (22.7 mi)</u>						
9 December	22.7	100				
18 December	14.7	65				
8 March	13.7	60				
24 March	17.7	78				
<u>Pike Island Pool (29.8 mi)</u>						
9 December	29.8	100				
18 December	29.8	100				
8 March	29.8	100				
24 March	29.8	100				
<u>Hannibal Pool (42.2 mi)</u>						
9 December	16.2	38				
18 December	39.7	94				
8 March	39.7	94				
24 March	42.2	100				
<u>Willow Island Pool (35.3 mi)</u>						
9 December	9.2	26				
18 December	4.6	13				
10 January						
8 March	4.6	13				
24 March	6.0	17				

at of ice as observed on Landsat-5
the Ohio River, 1985-86.

Length	White ice	
Percent†† (mi)	Percent††	Remarks

North Pool (6.2 mi)

TM
PC
TM
TM

Olds Pool (7.1 mi)

TM
PC
TM
TM

Very Pool (18.4 mi)

TM

TM
TM

Farland Pool (22.7 mi)

TM
8 mi-NOI
TM; 9 mi-NOI
TM; 5 mi-NOI

Land Pool (29.8 mi)

TM

TM
TM; PC

Small Pool (42.2 mi)

TM; middle 26 mi-CC
PC; 2.5 mi-NOI
TM; 2.5 mi-NOI
TM

Island Pool (35.3 mi)

TM; middle 26.1 mi-CC
low. 30.7 mi-NOI; PC
TM; upper 8.6 mi-NOI;
26.7 mi-CC
TM; lower 30.7 mi-NOI
TM; lower 29.3 mi-NOI

Pike Island Pool (29.8 mi)

9 December	29.8	100
18 December	29.8	100
8 March	29.8	100
24 March	29.8	100

Hannibal Pool (42.2 mi)

9 December	16.2	38
18 December	39.7	94
8 March	39.7	94
24 March	42.2	100

Willow Island Pool (35.3 mi)

9 December	9.2	26
18 December	4.6	13
10 January		
8 March	4.6	13
24 March	6.0	17

Belleville Pool (42.2 mi)

9 December	42.2	100
10 January		

Racine Pool (33.6 mi)

9 December	33.6	100
10 January		

Gallipolis Pool (41.7 mi)

9 December	41.7	100
1 January	32.7	78
10 January		

Greenup Pool (61.8 mi)

9 December	51.8	84
1 January	61.8	100
10 January		

Meldahl Pool (95.2 mi)

1 January	95.2	100
8 January		
24 January	34.2	36

34.2 36

Markland Pool (95.3 mi)

1 January	3.3	4
8 January	72.8	76
24 January	95.3	100

22.5 24

ke Island Pool (29.8 mi)

TM

TM
TM; PC

annibal Pool (42.2 mi)

TM; middle 26 mi-CC
PC; 2.5 mi-NOI
TM; 2.5 mi-NOI
TM

low Island Pool (35.3 mi)

TM; middle 26.1 mi-CC
low. 30.7 mi-NOI; PC
TM; upper 8.6 mi-NOI;
26.7 mi-CC
TM; lower 30.7 mi-NOI
TM; lower 29.3 mi-NOI

lleville Pool (42.2 mi)

TM
TM; CC

Racine Pool (33.6 mi)

TM
TM; CC

llipolis Pool (41.7 mi)

TM
upper 9 mi-NOI
TM; CC

Greenup Pool (61.8 mi)

TM; lower 10 mi-NOI
TM; lower 10 mi-NOI; CC

feldahl Pool (95.2 mi)

36

TM; upper 61 mi-NOI; slush
patches and stringers visible
TM; upper 61 mi-NOI; hazy

rkland Pool (95.3 mi)

24

lower 92 mi-NOI
TM; slush patches and
stringers visible
TM; hazy

Table C6 (cont'd).

	Open		Gray ice		White	
	Length (mi)	Percent††	Length (mi)	Percent††	Length (mi)	P
<u>McAlpine Pool (75.3 mi)</u>						
30 December	61.8	82				
8 January	75.3	100				
15 January	61.8	82				
24 January	75.3	100				
<u>Cannelton Pool (113.9 m)</u>						
14 December	101.7	89				
30 December	101.7	89				
8 January	26.2	23				
15 January	101.7	89				
24 January	26.2	23				
16 February						
<u>Newburgh Pool (55.4 mi)</u>						
14 December	55.4	100				
21 December	35.1	63				
30 December	55.4	100				
15 January	55.4	100				
16 February	55.4	100				
<u>Uniontown Pool (69.9 m)</u>						
14 December	12.0	17				
21 December	69.9	100				
30 December	12.0	17				
15 January	12.0	17				
16 February	-	-				
<u>Smithland Pool (72.5 m)</u>						
21 December	72.5	100				
<u>Dam 52 Pool (20.4 mi)</u>						
21 December	20.4	100				
<u>Dam 53 Pool (23.7 mi)</u>						
21 December	23.7	100				
28 December	18.6	79				
13 January	18.6	79				
2 March	18.6	79				
<u>Ohio-Mississippi confluence Poo</u>						
21 December	18.6	100				

e C6 (cont'd).

White ice		Remarks
Length	Percent††	
ent†† (mi)		
<u>nt e Pool (75.3 mi)</u>		
	upper 13.5 mi-NOI	
	TM	
	TM; upper 13.5 mi-NOI	
	TM; hazy	
<u>h Pool (113.9 mi)</u>		
	upper 12.2 mi-NOI	
	upper 12.2 mi-NOI	
	TM; lower 87.7mi-NOI	
	TM; upper 12.2 mi-NOI	
	TM; lower 87.7 mi-NOI; hazy	
	TM; upper 12.2 mi-NOI; CC	
<u>h Pool (55.4 mi)</u>		
	PC	
	upper 20.3 mi-NOI; PC	
	TM	
	TM; PC	
<u>wn Pool (69.9 mi)</u>		
	lower 57.8 mi-NOI; PC	
	PC	
	lower 57.9 mi-NOI	
	TM; lower 57.9 mi-NOI	
	TM; lower 57.9 mi-NOI; CC	
<u>nd Pool (72.5 mi)</u>		
	PC	
<u>Pool (20.4 mi)</u>		
	PC	
<u>Pool (23.7 mi)</u>		
	PC	
	upper 5.1 mi-NOI; PC	
	TM; upper 5.1 mi-NOI; PC	
	TM; upper 5.1 mi-NOI	
<u>confluence Pool (18.4 mi)</u>		
	PC	
	CC	

16 February 55.4 100

Uniontown Pool (69.9

14 December 12.0 17
21 December 69.9 100
30 December 12.0 17
15 January 12.0 17
16 February - -

Smithland Pool (72.5

21 December 72.5 100

Dam 52 Pool (20.4 m

21 December 20.4 100

Dam 53 Pool (23.7 m

21 December 23.7 100
28 December 18.6 79
13 January 18.6 79
2 March 18.6 79

Ohio-Mississippi confluence P

21 December 18.4 100
28 December
13 January 18.4 100
2 March 18.4 100

* CC - cloud-covered; PC - partly cloudy; NOI - not on im
NT - navigation track visible.
†† Rounded to nearest percent.

TM
TM; PC

Uniontown Pool (69.9 mi)

lower 57.8 mi-NOI; PC
PC
lower 57.9 mi-NOI
TM; lower 57.9 mi-NOI
TM; lower 57.9 mi-NOI; CC

Smithland Pool (72.5 mi)

PC

Dam 52 Pool (20.4 mi)

PC

Dam 53 Pool (23.7 mi)

PC
upper 5.1 mi-NOI; PC
TM; upper 5.1 mi-NOI; PC
TM; upper 5.1 mi-NOI

(1) Ohio-Mississippi confluence Pool (18.4 mi)

PC
CC
TM; hazy
TM

partly cloudy; NOI - not on image; TM - Thematic Mapper;
ble.
nt.

Table C7. Lineal extent of ice as imagery of the Illinois

	Open		Gray ice		Wh
	Length (mi)	Percent††	Length (mi)	Percent††	Length (mi)
<u>Brandon Road Pool (5</u>					
12 December	5	100			
28 December	5	100			
13 January	4	80	1	20	
29 January	5	100			
<u>Dresden Island Pool (1</u>					
12 December	14.7	100			
28 December	14.7	100			
13 January	14.7	100			
29 January	14.7	100			
<u>Marseilles Lock Pool (</u>					
12 December	27	100			
28 December	5.3	20	21.7	80	
13 January			27.0	100	
29 January	18.8	70	8.2	30	
<u>Starved Rock Pool (13</u>					
12 December	13.2	100			
19 December					2.4
			13.2	100	
13 January			7.8	59	5.4
29 January	2.3	17	4.0	30	6.9
21 February	2.4	19			
<u>Peoria Pool (73.5</u>					
12 December	39.1	53	34.4	47	
19 December			25.0	34	48.5
28 December					73.5
13 January			29.5	40	44
29 January			14.8	20	
21 February	70.0	95	3.5	5	
2 March	44.4	60			

Extent of ice as observed on Landsat-5
 of the Illinois River, 1985-86.

Gray ice	White ice		Remarks
Percent††	Length (mi)	Percent††	
<u>London Road Pool (5.0 mi)</u>			
20			TM TM; PC
<u>Island Pool (14.7 mi)</u>			
			TM TM; PC
<u>Illes Lock Pool (27.0 mi)</u>			
80			
100			TM
30			TM; PC
<u>Red Rock Pool (13.2 mi)</u>			
12	2.4	19	upper 10.8 mi-NOI28 December
59	5.4	41	TM
30	6.9	52	TM; PC
			TM; upper 10.8 mi-NOI; hazy
<u>Loria Pool (73.5 mi)</u>			
47			
34	48.5	66	
66	73.5	100	
40	44	60	TM; open areas scattered throughout ice
20			TM; lower 40.4 mi-NOI; 18.3 mi-CC
5			TM; PC; solid ice on adjoining lakes
			TM; upper 29.1 mi-NOI; PC; solid ice on portions of

12 December	13.2	100			
19 December					2.4
			13.2	100	
13 January			7.8	59	5.4
29 January	2.3	17	4.0	30	6.9
21 February	2.4	19			

Peoria Pool (73.5 m)

12 December	39.1	53	34.4	47	
19 December			25.0	34	48.5
28 December					73.5
13 January			29.5	40	44
29 January			14.8	20	
21 February	70.0	95	3.5	5	
2 March	44.4	60			

La Grange Pool (77.5 m)

12 December			24.6	32	
19 December			68.0	88	9.5
28 December					24.6
13 January	3.6	5	21.0	27	
21 February			77.5	100	
2 March	24.6	32			

Illinois-Mississippi confluence

19 December			17.1	21	
20 January	57.0	71			
21 February			34.9	44	
9 March	57.0	71			

* CC - cloud-covered; PC - partly cloudy; NOI - not on in
 NT - navigation track visible.
 †† Rounded to nearest percent.

2	100	2.4	19	upper 10.8 mi-NOI 28 December
59		5.4	41	TM
30		6.9	52	TM; PC
				TM; upper 10.8 mi-NOI; hazy

Loria Pool (73.5 mi)

47				
34	48.5	66		
	73.5	100		
40	44	60		TM; open areas scattered throughout ice
20				TM; lower 40.4 mi-NOI; 18.3 mi-CC
5				TM; PC; solid ice on adjoining lakes
				TM; upper 29.1 mi-NOI; PC; solid ice on portions of adjoining lakes

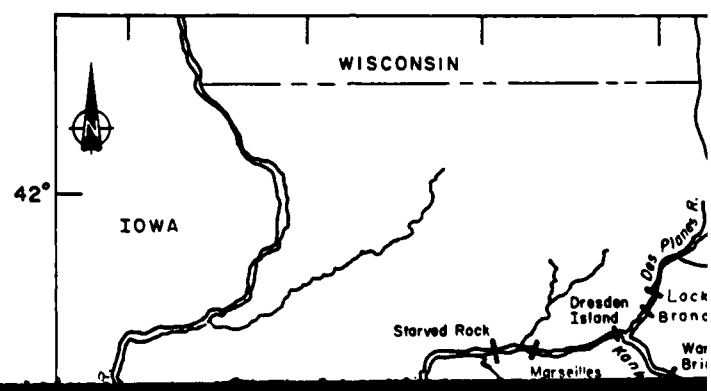
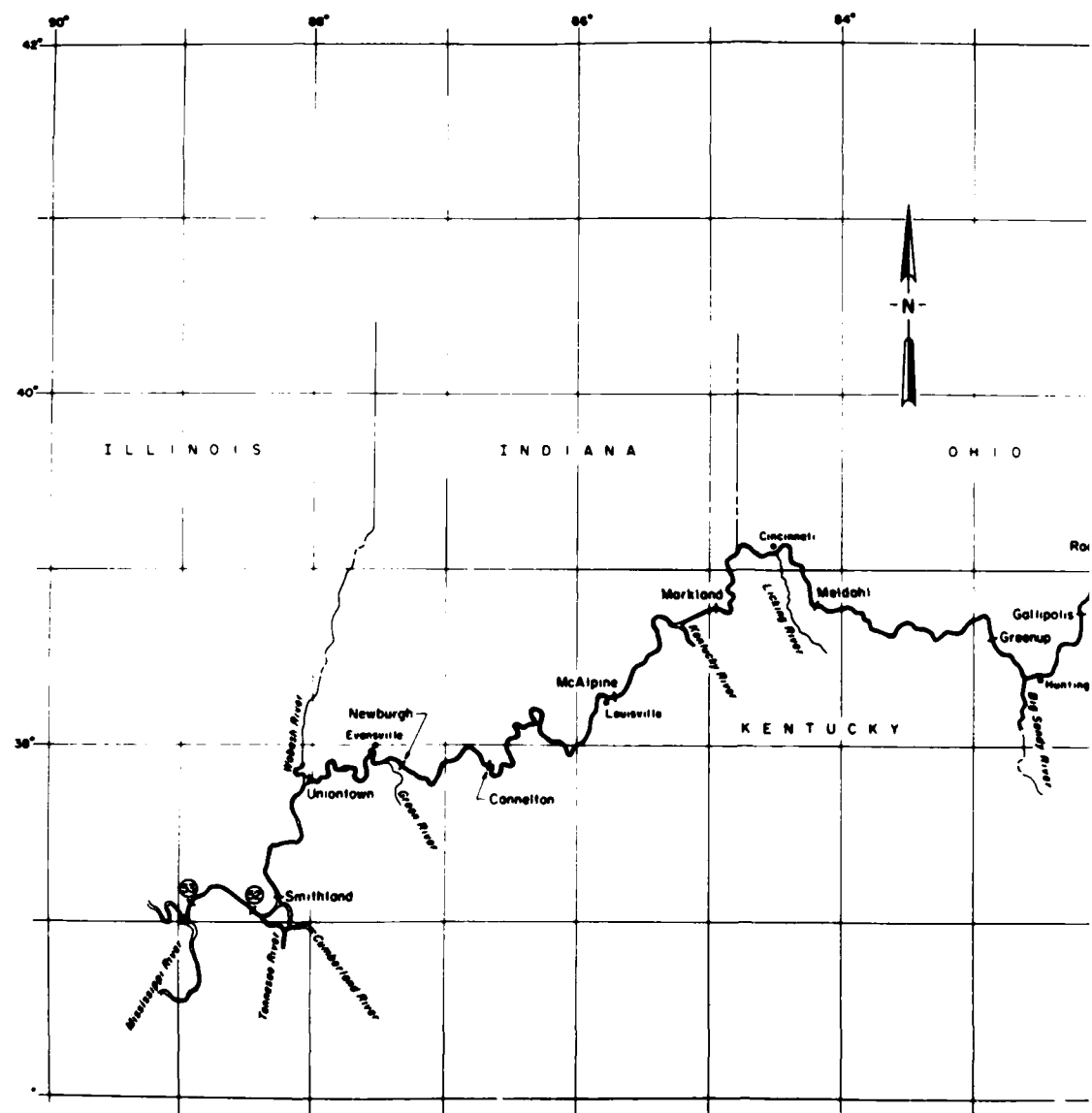
Grange Pool (77.5 mi)

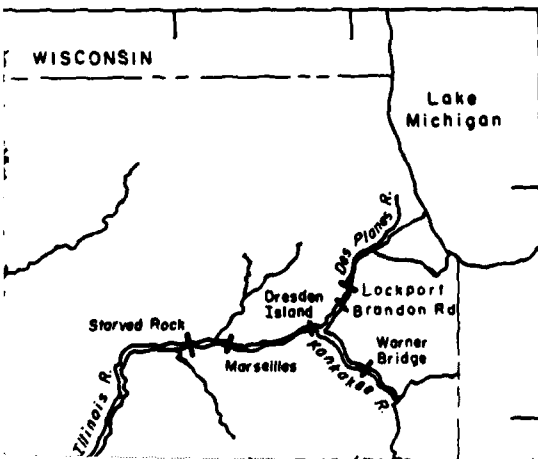
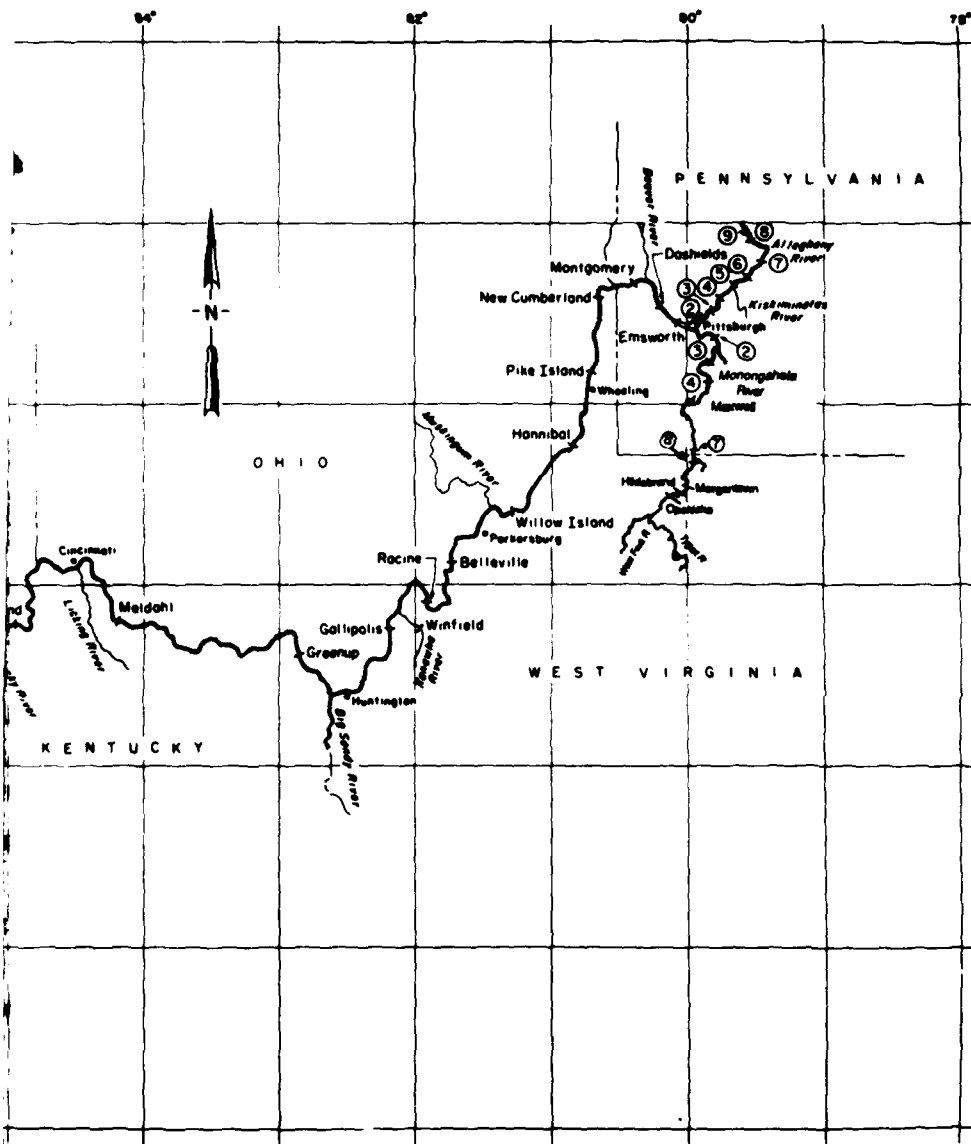
32				lower 52.9 mi-NOI
88	9.5	12		lower 23.9 mi-PC
	24.6	32		lower 52.9 mi-NOI
27				TM; lower 52.9 mi-NOI
100				TM; PC
				TM; lower 52.9 mi-NOI; PC

Mississippi confluence Pool (80.1 mi)

21				lower 55 mi-NOI; 8 mi-CC
				TM; upper 23.1 mi-NOI
44				TM; lower 55 mi-NOI; PC
				TM; upper 23.1 mi-NOI; PC

v; NOI - not on image; TM - Thematic Mapper;





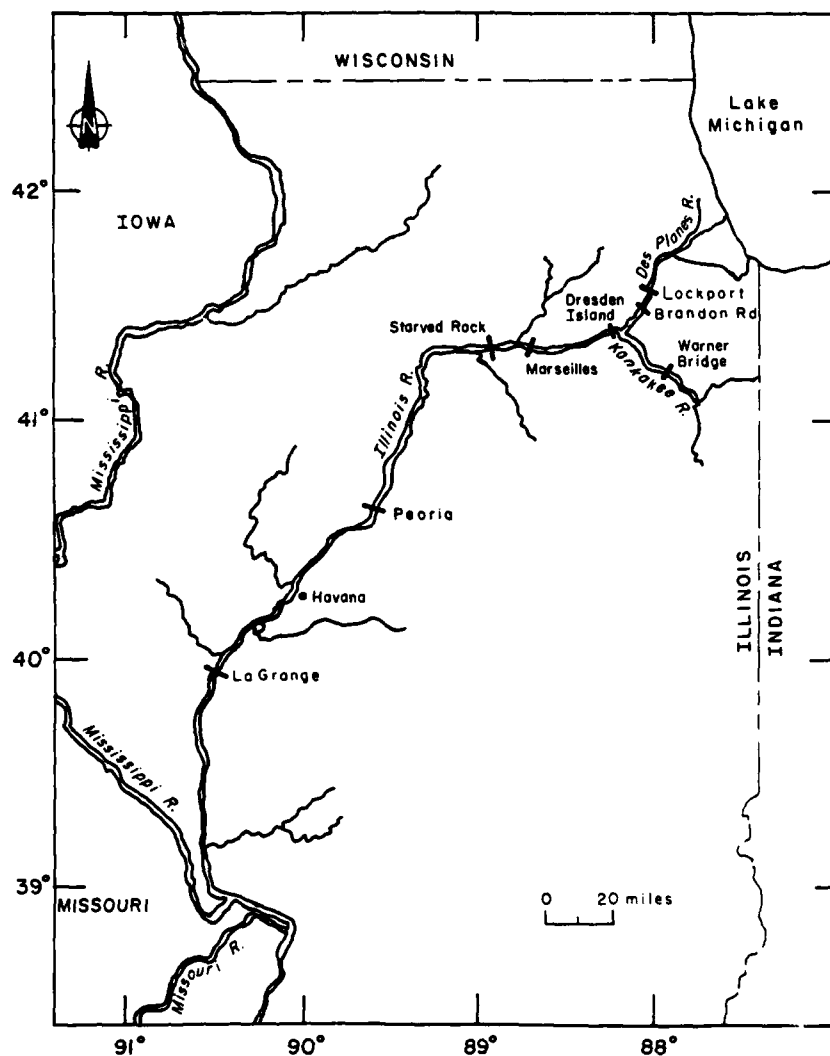


Figure C1. River areas for which Landsat-5 imagery was obtained.

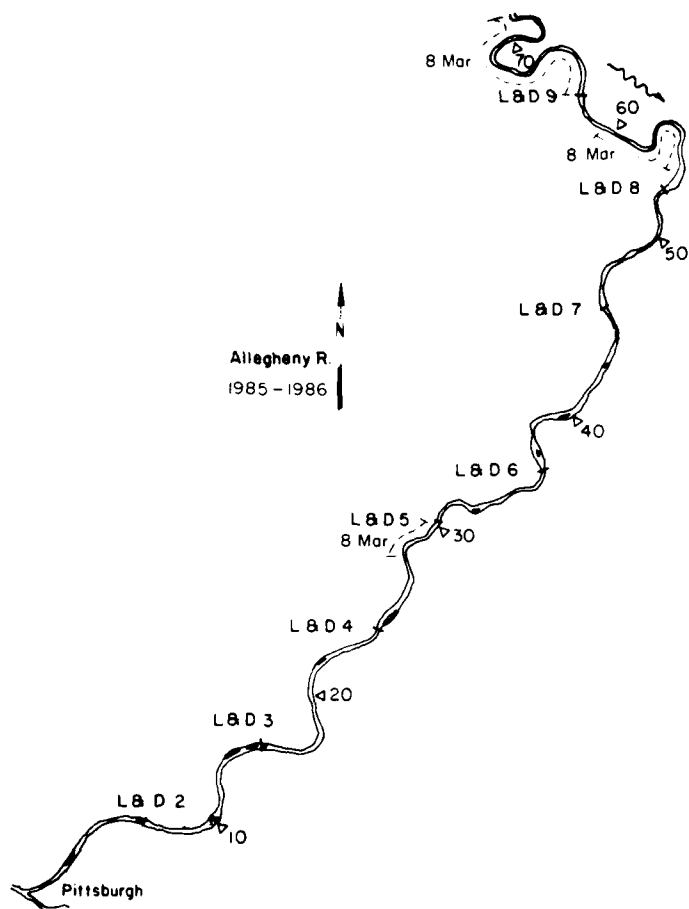


Figure C2. Ice observed on the Allegheny River with Landsat-5 imagery (dashed line indicates gray ice, solid line white ice).





Figure C2. Ice observed on the Allegheny River with Landsat-5 imagery (dashed line indicates gray ice, solid line white ice).

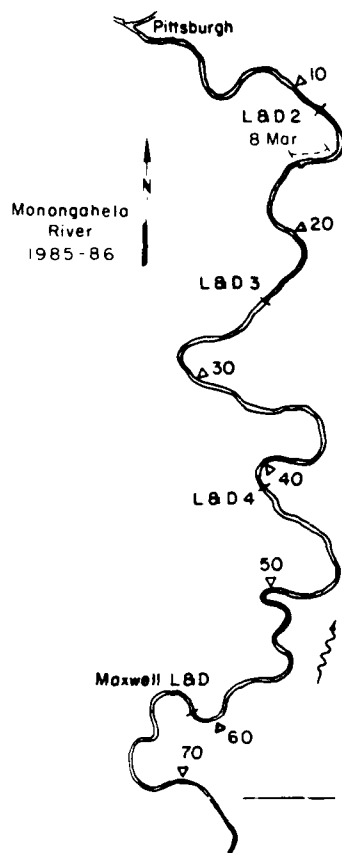


Figure C3. Ice observed on the Monongahela River with Landsat-5 imagery (dashed line indicates gray ice, solid line white ice).



Figure C4. Landsat-5 TM band 3 im (A) and Monongahela (B) Rivers; no ice



Figure C4. Landsat-5 TM band 3 image 50737-15243, 8 March 1986. Arrows show ice on the Allegheny (A) and Monongahela (B) Rivers; no ice is on the Ohio (C).

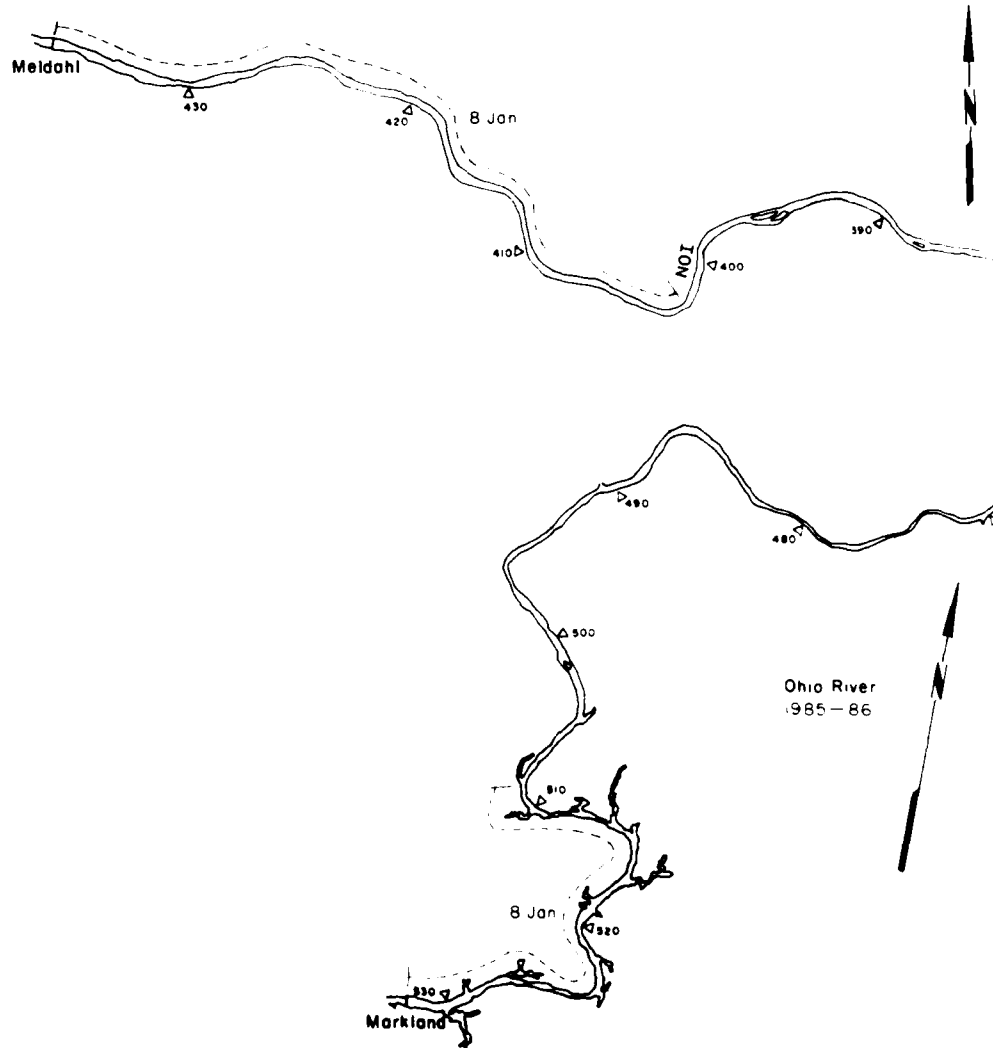
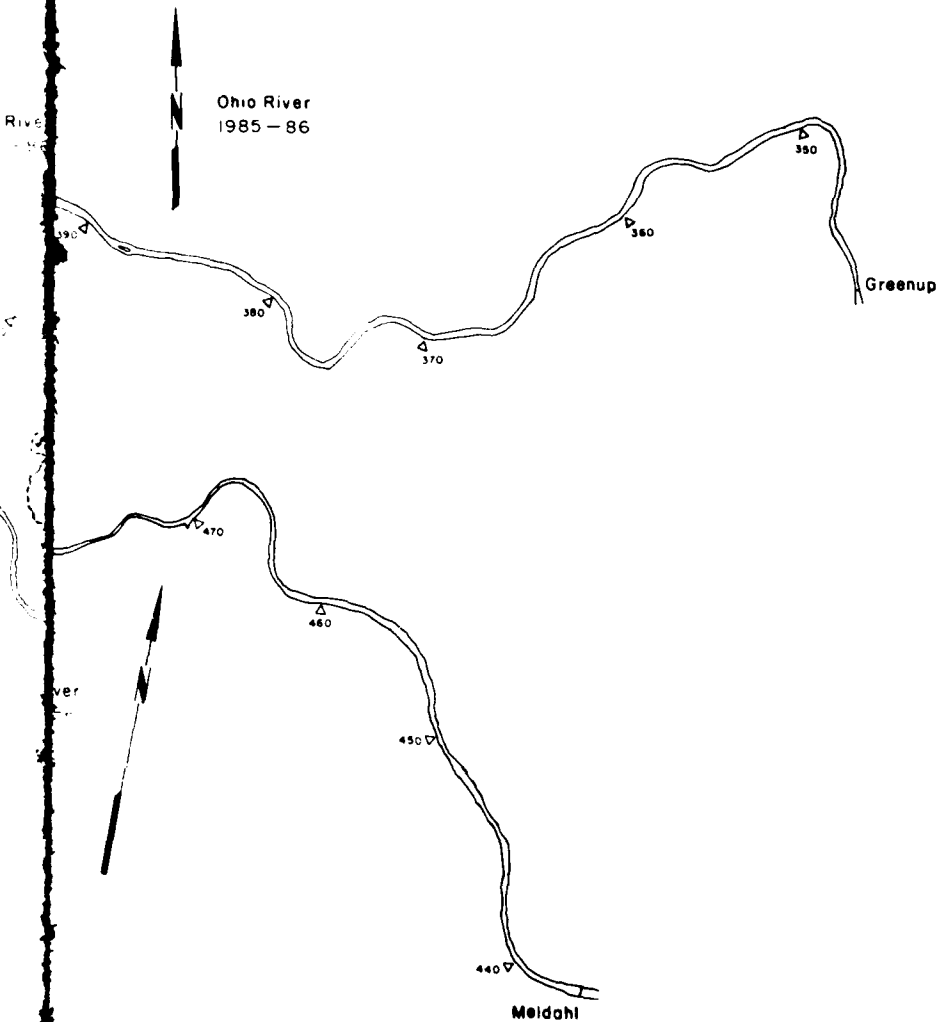


Figure C5. Ice observed on the Ohio River with Landsat-5 imagery (dc



line imagery (dashed line indicates gray ice, solid line white ice).

Figure C5. Ice observed on the Ohio River with Landsat-5 imagery (dashed

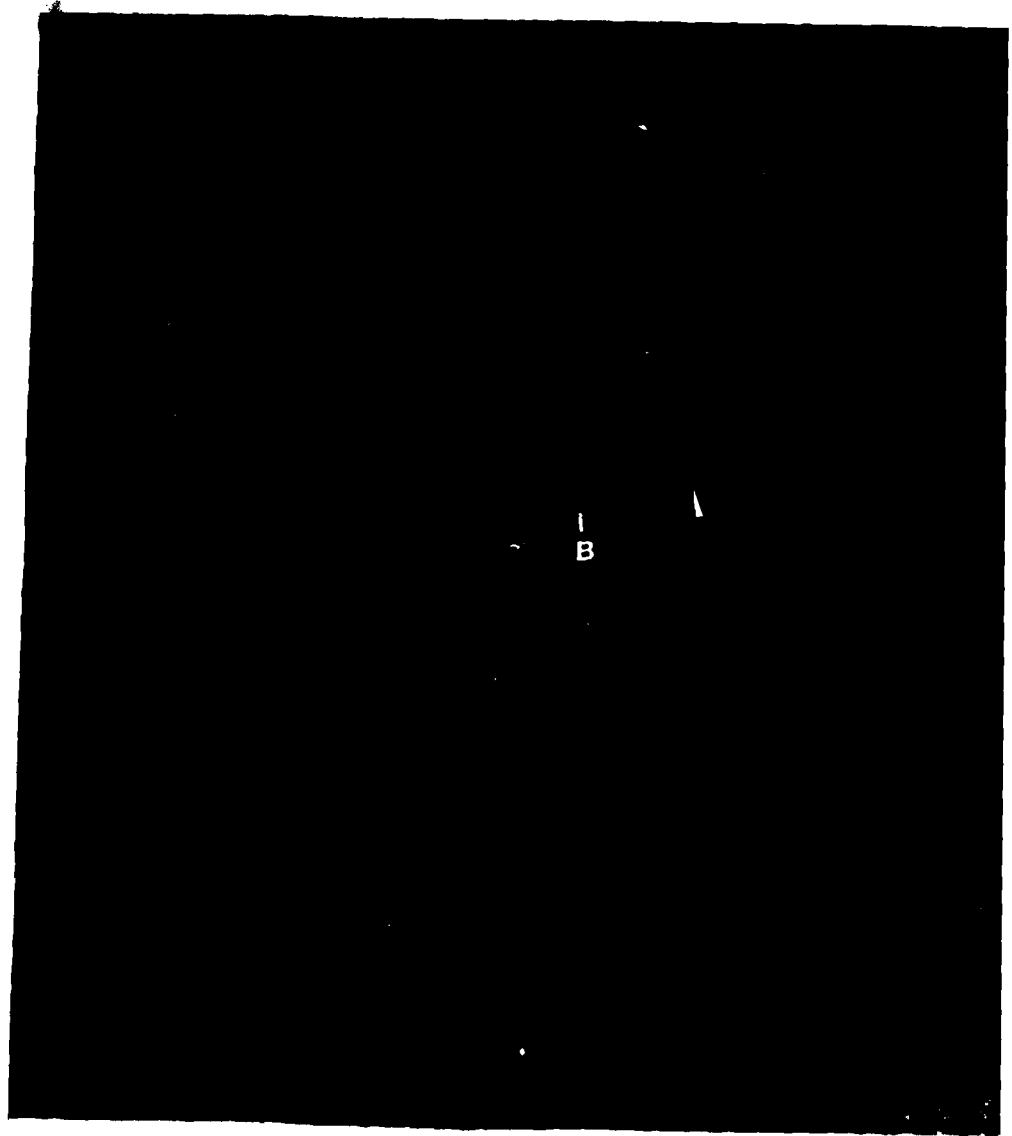
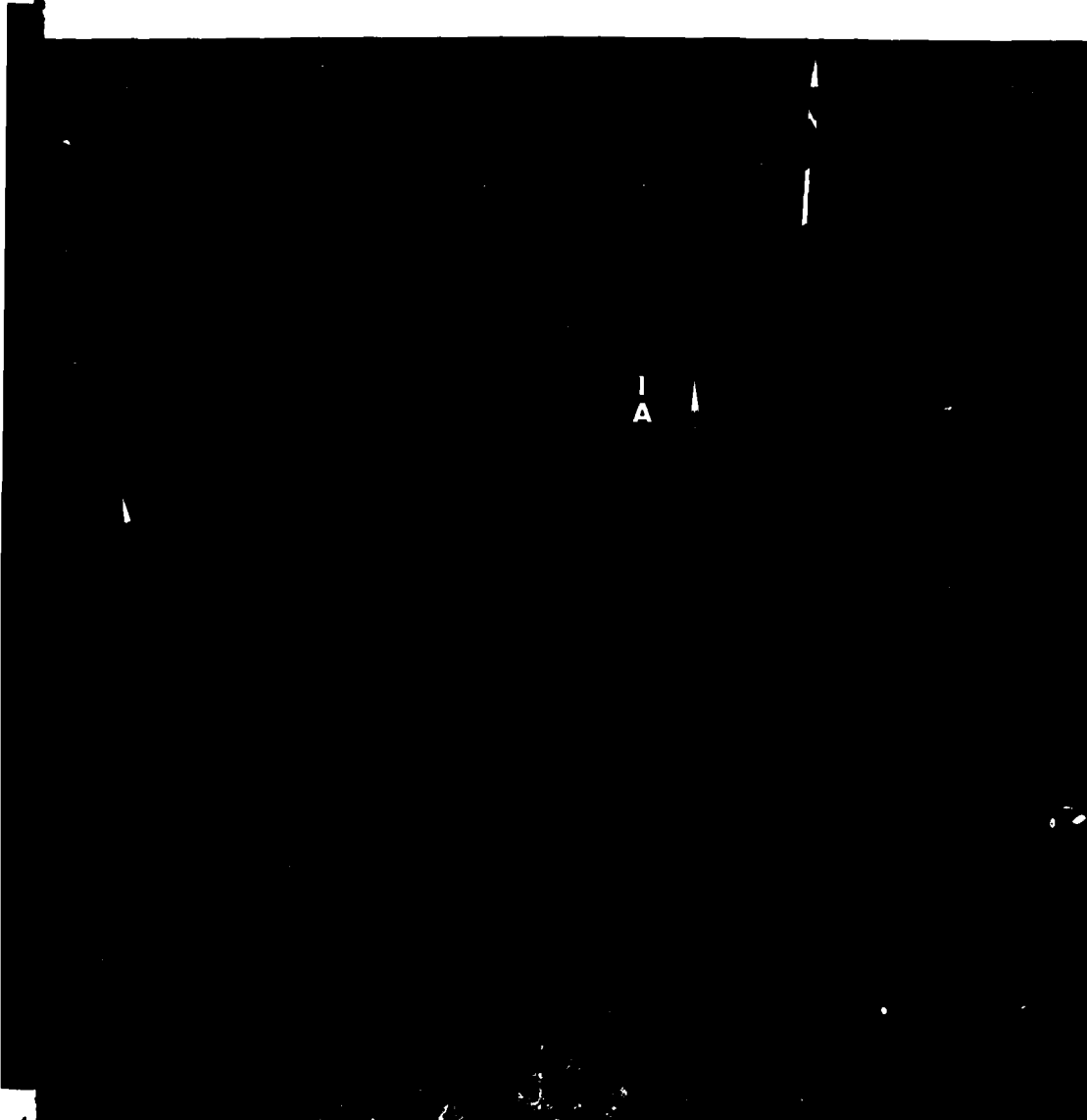


Figure C6. Landsat-5 TM band 3 image 50678-15445, 8 January upstream of Meldahl Dam (A) and Markland Dam (B) on the Ohio River.

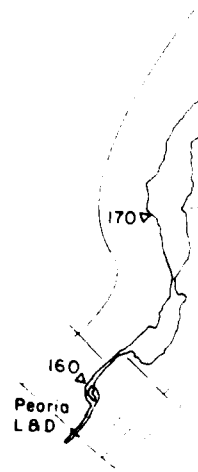
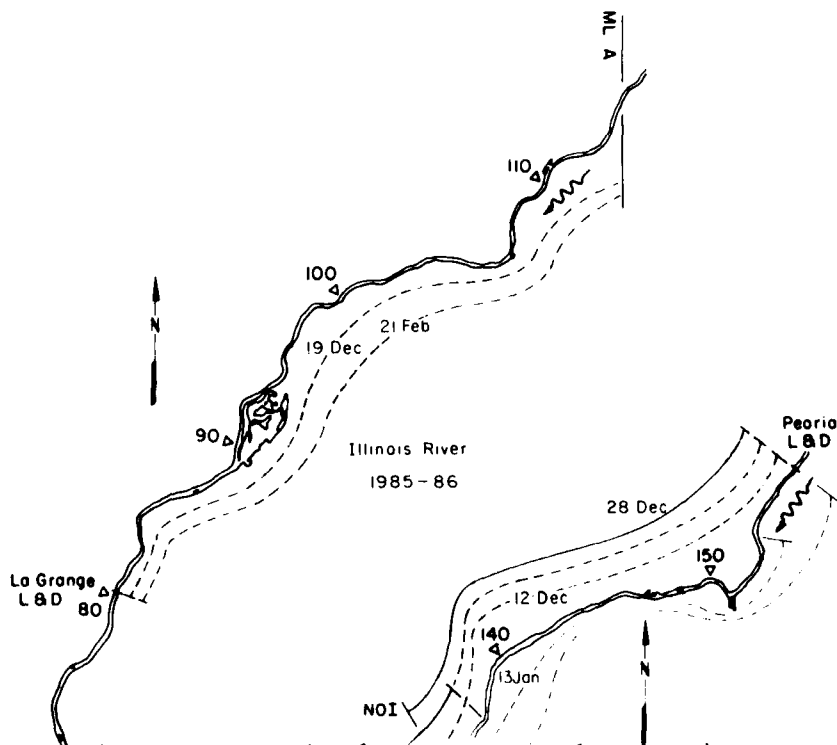
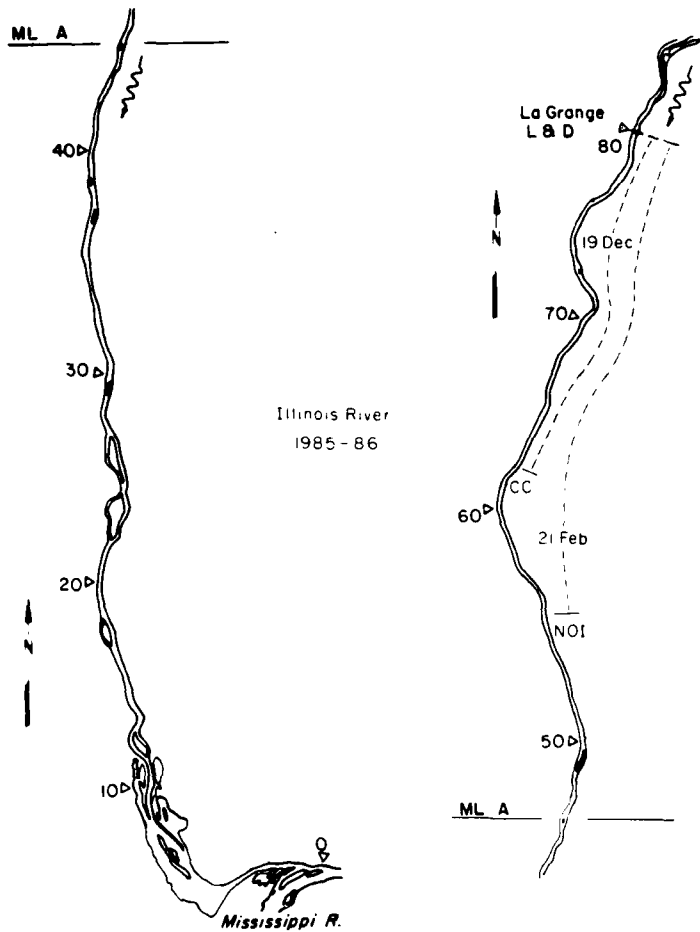
19 January	23.5	40
29 January	14.8	20
21 February	70.0	95
2 March	44.4	60

Meldahl

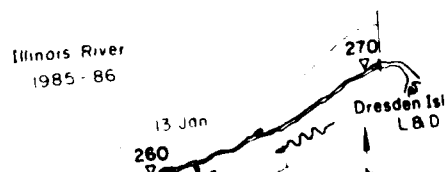
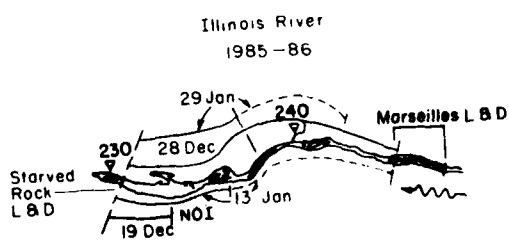
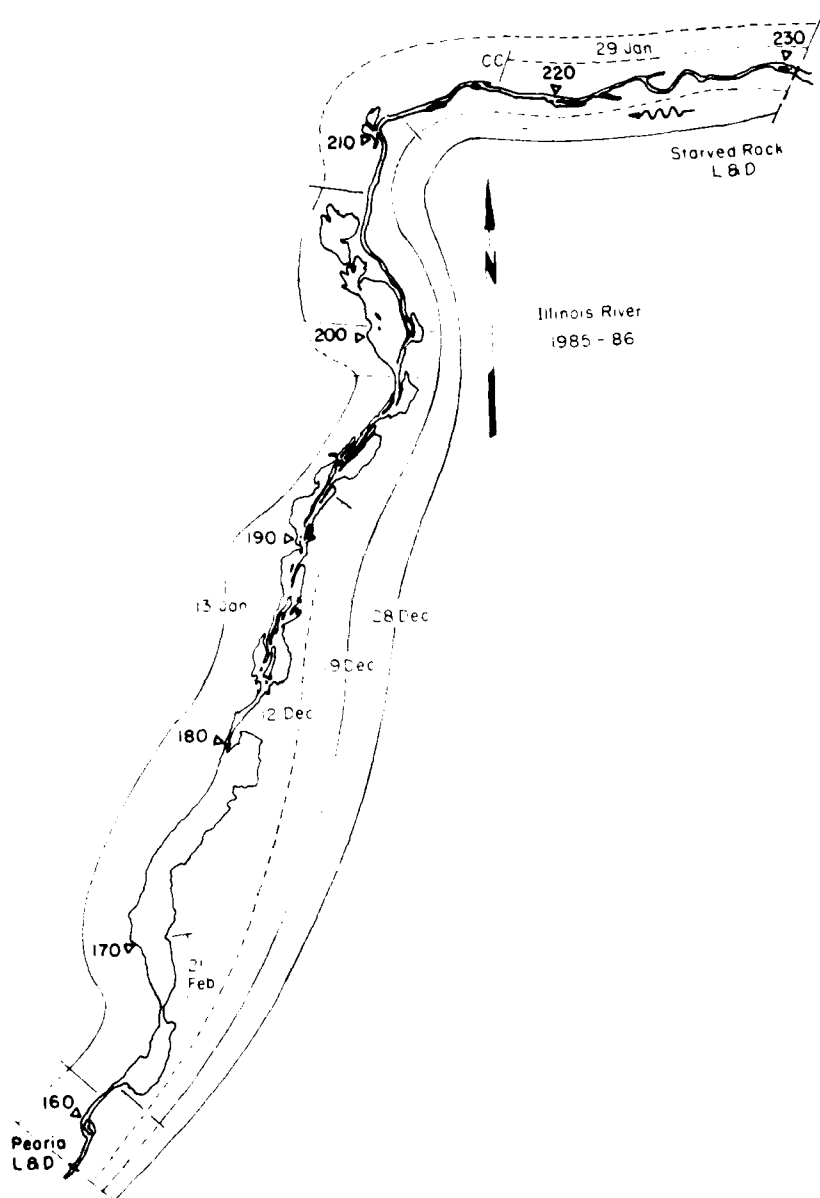
Ohio River with Landsat-5 imagery (dashed line indicates gray ice, solid line white ice).



TM band 3 image 50678-15445, 8 January 1986. Arrows show the gray ice (A) and Markland Dam (B) on the Ohio River.



Starved
Rock
L & D



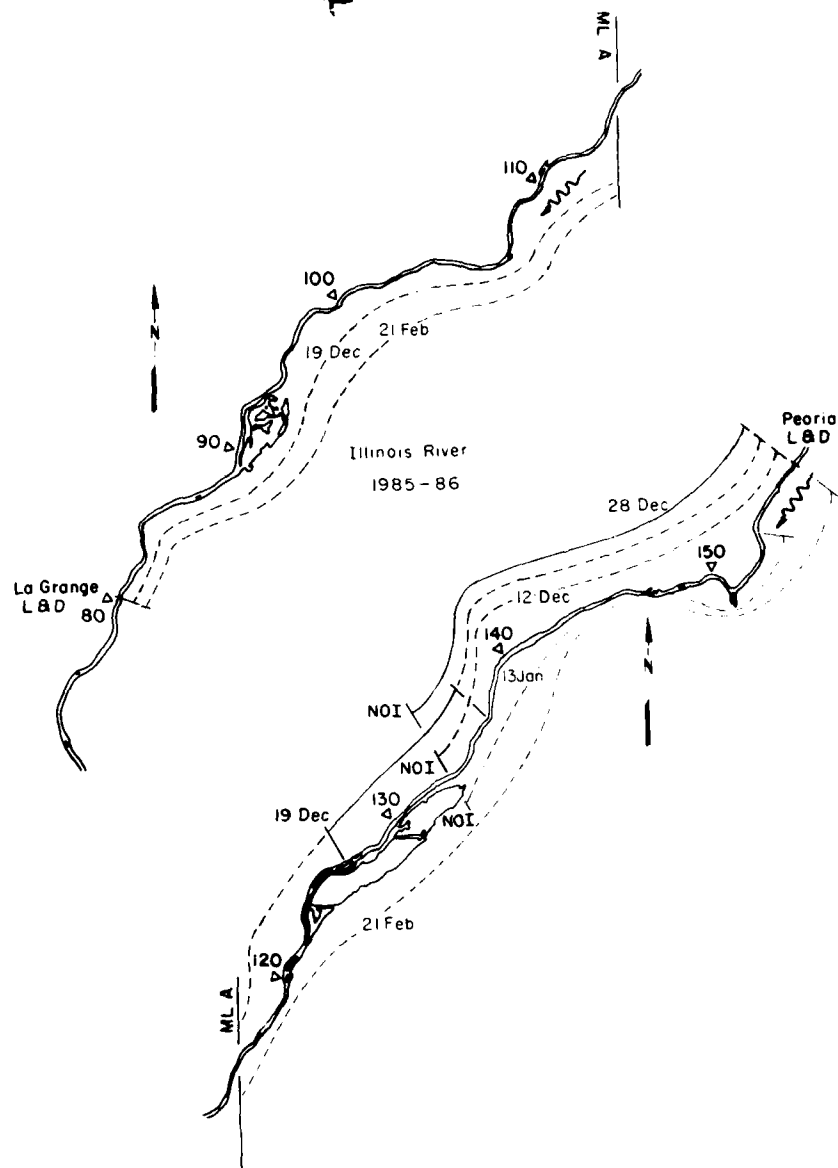
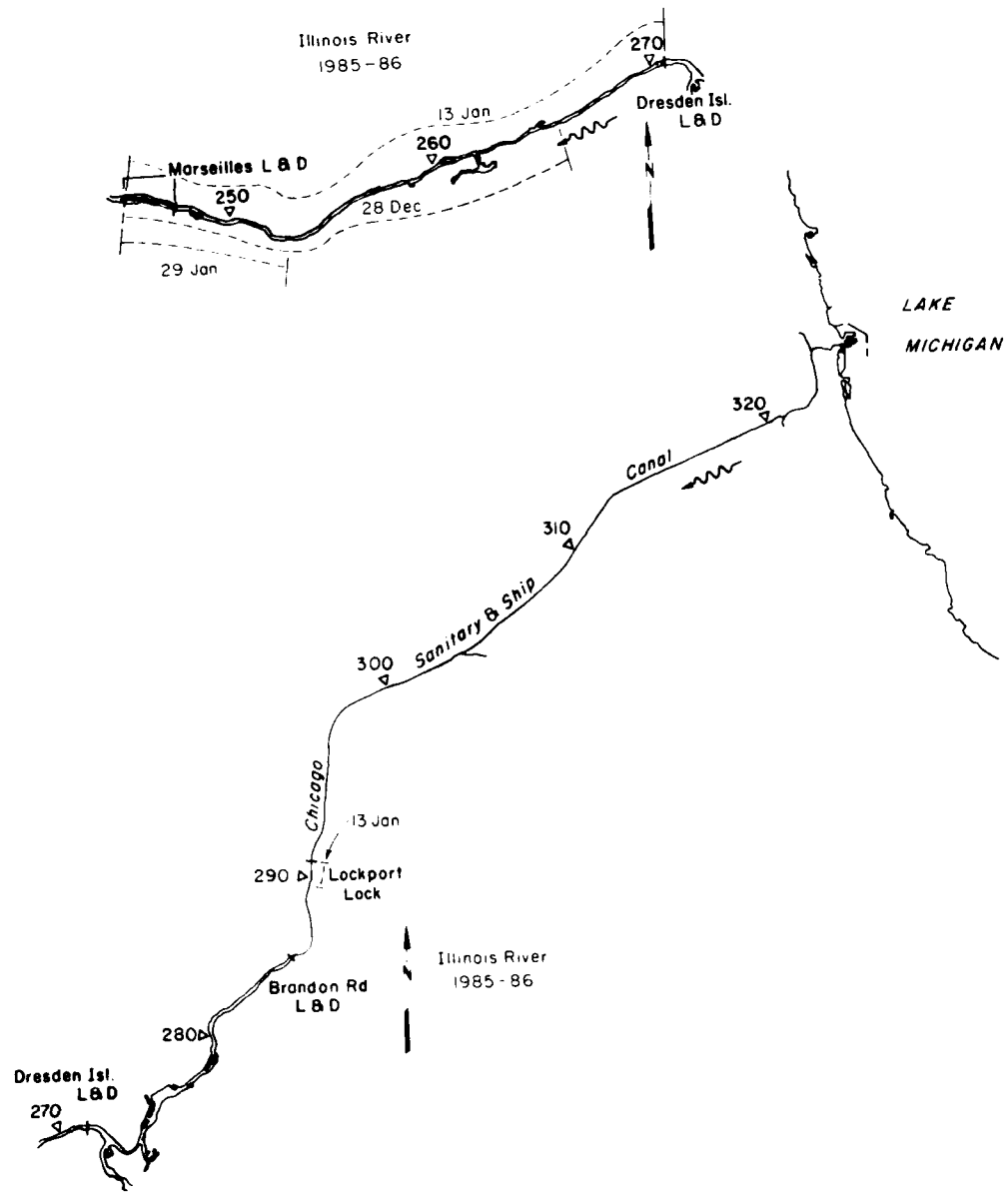
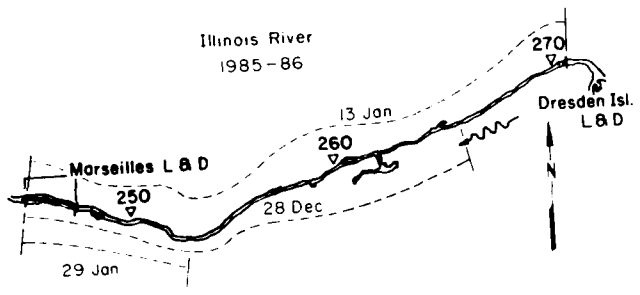
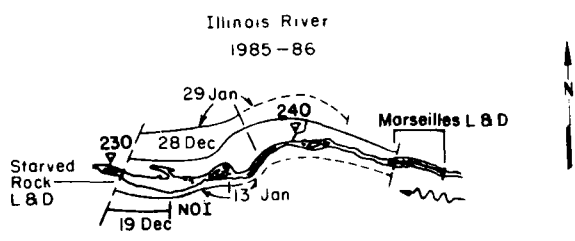
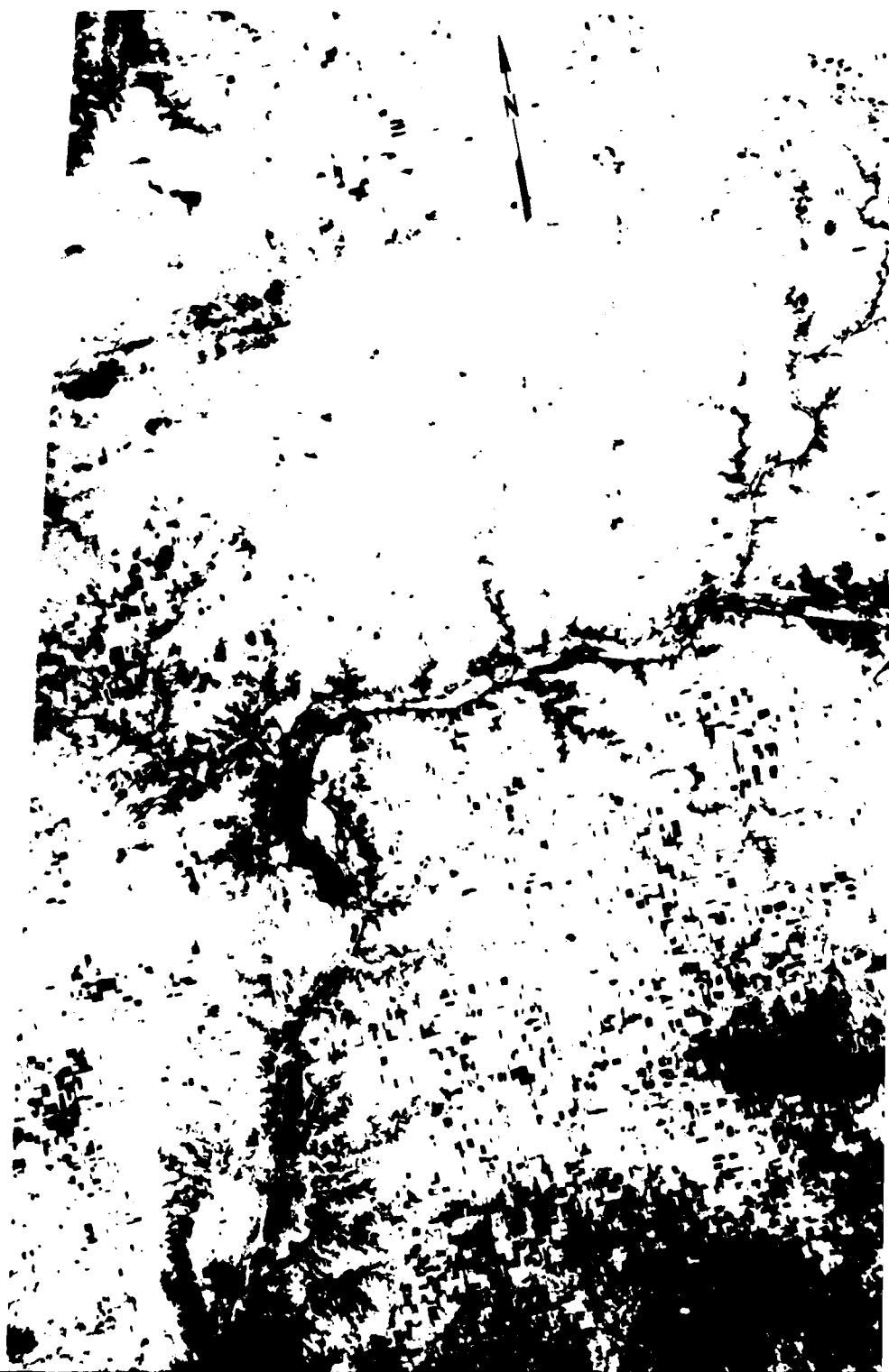


Figure C7. Ice observed on the Illinois River with Landsat-5 imagery (dashed line indicates gray ice, solid line white ice).









a. Landsat-5 MSS band 2 images 50667-16024 and -16032, 2

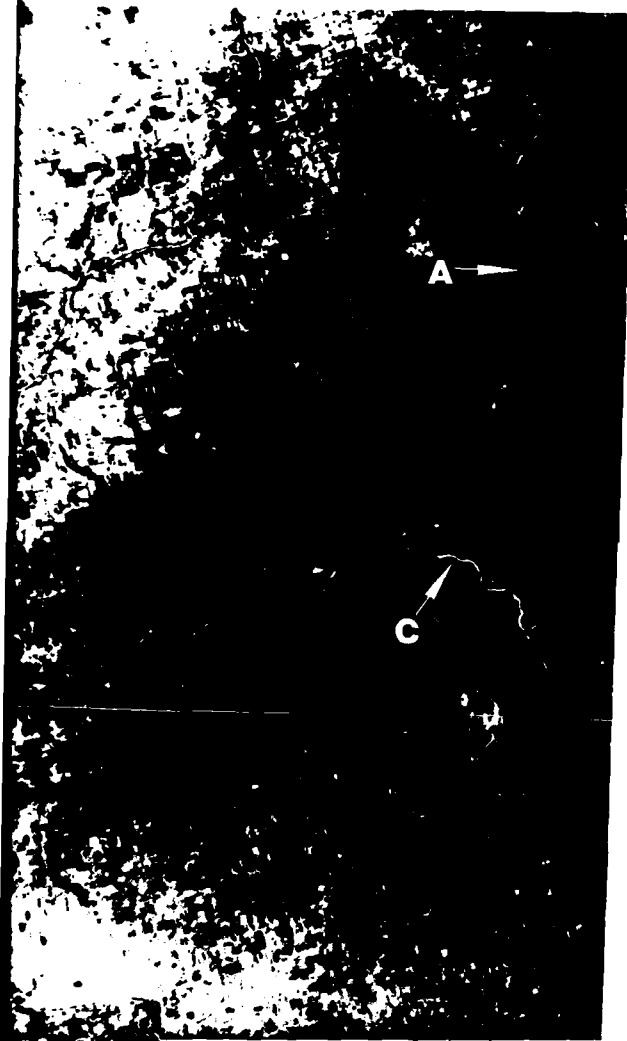
*Figure C8. Ice distribution from Lockport Lock (A) to river mile 133 (I
kee River (C).*



2 images 50667-16024 and -16032, 28 December 1985.

Rockport Lock (A) to river mile 133 (B), Illinois River and Kanka-








b. Landsat-5 TM band 3 images 50683-16023 and -16

Figure C8 (cont'd).



583-16023 and -16025, 13 January 1986.

'8 (cont'd).

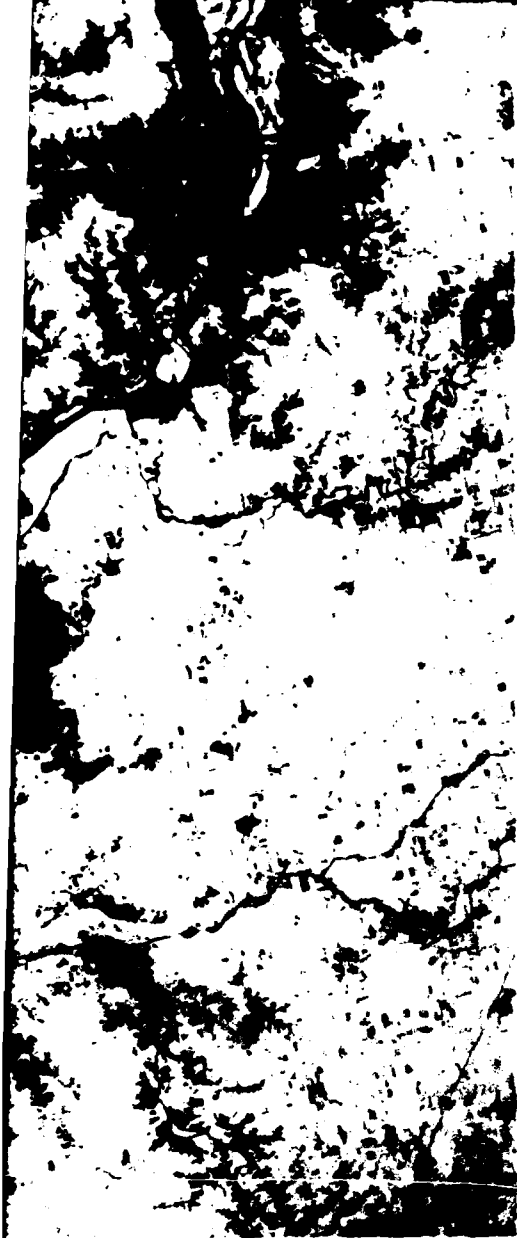






a. Landsat-5 MSS band 2 images 50658-16090 and -16093, 19

Figure C9. Ice distribution from Starved Rock Dam (A) to river mile



0658-16090 and -16093, 19 December 1985.

Rock Dam (A) to river mile 84 (B), Illinois River.







b. Landsat-5 TM band 3 images 50722-16074 and -16081, 21 F

Figure C9 (cont'd).



722-16074 and -16081, 21 February 1986.

9 (cont'd).

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