162 MOSWANSICUT POND

MOSWANSICUT POND DAM, SCITUATE (162)

GZA reviewed available DEM files associated with Moswansicut Pond Dam (Figure 1), including records of a U.S. Army Corps (COE) Phase I Report dated October, 1980. The dam has historically been classified by DEM as having a **Low Hazard** potential.

1.00 SUMMARY OF SITE AND POTENTIAL DOWNSTREAM IMPACT AREA

In addition to compiling background information and GIS mapping data, GZA performed field reconnaissance of the dam and its associated downstream area (Figure 2). GZA representatives William L. Ladd, P.E., and David M. Leone, accompanied by DEM senior engineer Paul Guglielmino, P.E., visited the site and the downstream river valley on April 30, 2002. A field checklist from the reconnaissance is provided in **Attachment I** and selected photographs are provided in **Attachment II**.

1.10 Site Description

Moswansicut Pond Dam is located on Moswansicut Brook in the Town of Scituate, Kent County, Rhode Island (See Locus Map, Figure 1). The following identification numbers are associated with the dam:

- Army Corps of Engineers Number RI03002
- DEM ID Number 162

The dam has a total length of approximately 600 feet, and a maximum height of approximately 14 feet. The dam consists primarily of an earthen embankment with an 17-foot diameter morning glory (i.e., circular drop inlet) concrete spillway near the center line of the dam, set about 30 feet upstream of the dam. The spillway has provisions for stoplogs to control the reservoir water surface elevation. Access to the spillway is provided by a metal grate walkway. The spillway outlet conduit beneath the dam consists of an interior concrete box culvert and an exterior (older) stone masonry . Pertinent engineering data, as obtained from the DEM dam information database, is provided in **Table 1**.

Moswansicut Pond is utilized by the Providence Water Supply Board (PWSB) for water supply purposes. It is located less than 0.5 miles upstream of the headwaters of Scituate Reservoir in surrounding lands which are, in part, owned by the PWSB.

TABLE 1. Pertinent Engineering Data

Dam	
Type	Earth Embankment
Length	Approximately 600 feet
Height	14 feet
Drainage Area	4 sq.mi.
Elevation (feet above approximate MSL)	
Normal Pool (Spillway)	304.2
Top of Dam	309.3
Storage (Acre-feet)	
Normal Pool	5,466
Top of Dam	5,750
Main Spillway	
Type	Concrete "Morning Glory"
Diameter	17 feet

Note: Elevation data obtained from U.S. Army Corps Phase I Report

1.20 Downstream Description

Moswansicut Pond Dam is located on the Moswansicut Brook, which flows through the Town of Scituate. The immediate downstream area consists of wooded, uninhabited, property owned by the PWSB. Route 116 is located about 600 ft downstream

1.21 Downstream Dams

Horseshoe Dam (360) at Danielson Pike and Scituate Reservoir (Gainer Memorial) Dam (161) are not expected to be adversely affected by a dam failure at Moswansicut Pond, in GZA's opinion. See Section 2.30 for additional information

1.22 Downstream Bridges

There is a concrete arch culvert about 5 ft wide by 3 ft high beneath Route 116 (West Greenville Road), about 600 feet downstream of the dam. Route 6 (Hartford Pike) crosses the brook in a wetland area via an assumed submerged culvert, about 2,000 ft downstream of the dam.

1.23 Downstream Development

The land use of the floodplain of the Moswansicut Brook between Moswansicut Pond and the upstream extent of the Scituate Reservoir is primarily wooded. A majority of the land is owned and controlled by the PWSB for water quality control and conservation

purposes. Immediately downstream of Route 116, there are remnants of stone mill buildings and the brook is channelized by stone masonry training walls, about 8 to 10 feet in height. However, the floodplain is currently uninhabited and undeveloped.

2.00 DAM HAZARD POTENTIAL ASSESSMENT

To further evaluate the extent of flooding due to a potential dam failure, GZA performed a limited hydraulic investigation of the hypothetical dam break flood. The analysis was performed with the National Weather Service (NWS) Simplified Dam Break (SMPDBK) model, which estimates the peak dam break flood outflow, peak water surface elevations, and the timing of the flood wave as it travels downstream, given breach characteristics specific to the dam and the geometry of the downstream channel and overbank. SMPDBK output summaries are provided in **Attachment III**.

Please note that the approximate extent of hypothetical dam break flooding generated with SMPDBK is not applicable for emergency planning nor other hydraulic design purposes. Detailed hydraulic modeling using state-of-the-practice unsteady flow models such as the NWS DAMBRK or FLDWAV computer programs, which is not in the scope of this study, should be performed when generating inundation maps for Emergency Action Plans or for use in spillway design / inflow design flood (IDF) studies.

2.10 Potential Dam Failure Mechanisms and Breach Description

As specified by the DEM, the simplified hypothetical dam failure analysis assumed starting pool elevations in the impoundment coincident with the top of dam elevation and average stream flow conditions prevailing (i.e., assumed about 1 to 2 cfs per square mile of drainage area). Dam breach parameters such as time of breach formation, breach shape, and the average width of the breach were selected according to these conditions and based upon the type of materials used in constructing the dam, in accordance with the recommended range of values published in the Federal Energy Regulatory Committee (FERC) guidelines and based on engineering judgment. For Moswansicut Pond Dam, primarily an earth embankment structure, a time to failure of 0.5 hrs and a trapezoidal breach shape (0.5 H : 1.0 V) was utilized. Such an earthen embankment dam is assumed to fail due to piping under fair weather circumstances. The average breach width was assumed to equal three times the height of the dam, or about 42 feet.

2.20 Estimated Peak Outflow from Dam Break

The peak outflow from the hypothetical dam break was estimated using the breach outflow approximation equation developed by the National Weather Service as part of their SMPDBK computer model (see Attachment III), using the breach parameters described above and top-of-dam pool reservoir characteristics. The estimated peak breach outflow is approximately 6,590 cfs. There are no published 100-year or 500-year flood flow estimates for the North Branch of the Pawtuxet River in the area of Moswansicut Pond. However, the estimated dam breach flow is about 150 percent larger than the 100-year flood estimate

of 4,340 cfs and 75 percent of the 500-year flood estimate of 8,800 cfs for the North Branch of the Pawtuxet River near its confluence with the Pawtuxet River (proper), about 15 miles downstream.

2.30 Estimated Approximate Flood Impact Area

Several riverine cross sections, developed by GZA from USGS 7.5 minute quadrangle maps, were input into the SMPDBK model to preliminarily estimate approximate peak water surface elevations. The results of the analysis are provided as the approximate inundation area depicted in **Figure 2**.

2.31 Downstream Extent of Flooding

The Moswansicut Brook downstream of Moswansicut Pond Dam is considerably sloped, reaching the headwaters of the Scituate Reservoir within about 0.5 miles. Typical Mannings "n" roughness coefficients used in the analysis generally ranged from 0.030 to 0.035 for the channel areas, and 0.050 to 0.085 for the overbank areas. These values are consistent with the range of values used in the FEMA Flood Insurance studies for the downstream communities.

The SMPDBK analysis was ended at Scituate Reservoir, approximately 0.75 miles downstream of Moswansicut Pond Dam. The flood wave emanating from the Moswansicut Pond Dam failure is expected to dissipate quickly, as a result of the availability of flood storage at the reservoir.

2.32 Potential Effects of Dam Break

Results of the analysis indicate a peak flood depth at the immediate toe of the dam of about 9 feet. As the flood wave progresses downstream, it is expected to attenuate. Thus, peak flood depths are predicted to decrease to about 3 feet near the upstream extent Scituate Reservoir. The extent of flooding due to the hypothetical dam break includes flooding of the unpopulated wooded area adjacent to the Moswansicut Brook, and potential shallow flooding at Routes 116 and 6.

2.40 Recommended Hazard Potential Classification

GZA recommends that Moswansicut Pond Dam be classified as ***Significant Hazard*** based on the aforementioned analyses, site / downstream valley reconnaissance, site-specific GIS mapping and other existing data, and professional judgment. While a potential dam failure of Moswansicut Pond Dam would likely result in no probable loss of human life, some disruption to Routes 116 and Route 6 may be expected as a result of potential shallow flooding of roadway crossings from the dam break. The Pond also serves as a water supply for the Providence area, and its loss may have effects on water supply availability.

ATTACHMENT I

FIELD RECONNAISSANCE CHECKLIST

DAM HAZARD POTEN AL FIELD CHECKLIST

Name of Dam:	Moswansicut Pond Dam	RI DEM ID NO.	162
Location:	Scituate (Town / County)	Moswansicut Brook (River or Stream)	
	Scituate (Downstream Communities)	Scituate Reservoir (Major Confluence)	
Classification Data:	Small (Size)		1919 (Date Built)

PHYSICAL DATA:	Earth Embankment (Type of Dam)	14 ft (Height of Dam)	600 (Length of Dam)
	Morning Glory (Type of Spillway)	17 ft (Length of Spillway)	
	Water Supply (Purpose of Dam)	+/- 2" over crest (Pool at Inspection)	5,466 ac-ft (Normal Pool Storage Capacity)
	U/S: 3:1 D/S: 3:1 (Embankment Slopes (H:V))	Unknown - No bedrock outcrops (Foundation (if known, note rock/soil surroundings))	5,750 ac-ft (Maximum Pool Storage Capacity)

Name	Title/Position	Representing
William Ladd, P.E.	Sr. Project Mgr / Engineer	GZA GeoEnvironmental, Inc.
David M. Leone	Asst. Project Mgr / Hydrologist	GZA GeoEnvironmental, Inc.
Paul W. Guglielmino	DEM Dam Safety Senior Engineer	RIDEM Office of Compliance & Inspection

DATE OF INSPECTION: 4/30/2002

WEATHER: Mostly Cloudy TEMPERATURE: 45 deg. F

Name of Dam: Moswansicut Pond Dam I.D. No.: 162 Inspection Date: 30-Apr-02

STRUCTURAL CONDITION	1	Concrete Condition	Fair-some spalling at spillway discharge outlet
	2	Outlet Condition	Morning glory spillway to nat'l channel; concrete arch conduit to stone arch conduit beneath dam
	3	Unusual Movement	None observed
	4	Seepage / Wet Area	Toe drain present, but some wetness observed at downstream embankment
	5	Embankment Slides/Erosion	None observed
	6	Vegetation / Pest Control	Grassed crest; some tree growth near dam abutments
DAM & IMMEDIATE DOWNSTREAM AREA	7	Vicinity Description	Off of Route 116; dam is in a wooded, uninhabited area
	8	Dam Roads & Utilities	Gravel access road to left dam abutment
	9	Discharge Channel	Natural channel; wooded banks: steep at right, low area at left
	10	Structures (Gatehouses, etc.)	Metal walkway to spillway inlet for access to stoplogs
	11	Adjacent Land Use	Wooded / Low density residential
	12	Adjacent Population Density	Low to None; Route 116 not heavily developed and surrounding property owned by PWSB
	13	Downstream Constrictions	Route 116 bridge; concrete arch culvert about 5' wide x 3.5' high
	14	Downstream Access / Use	No access to downstream areas; PWSB property fenced off from Route 116
	15	Property / Infrastructure / Utility Description & Distance	Primarily PWSB owned property in immediate vicinity of dam
GENERAL DOWNSTREAM AREA	17	Land Use Classification	Wooded.
	18	Population Density	Low to None
	19	Property / Infrastructure	Primarily PWSB property downstream; two major roadway crossings prior to confluence with Scituate Reservoir headwaters.
	21	Downstream Dams	Scituate Reservoir; not affected by Moswansicut Pond dam breach, if it were to occur. Also Horseshoe Dam (360) about 3/4 mi. downstream.
	22	Downstream Bridges	Route 116 (see 13) and Route 6. Route 6 crosses channel via submerged culvert (not observed in the field).
	23	Upstream Dams	N/A
	24	Channel Description (depth, Manning's n, width, overbank)	Downstream of Route 116, remnants of stone masonry structure; River is channelized in about 8-ft high stone masonry training walls. Width is about 20'. Wooded, steep overbanks.

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE

ATTACHMENT II

FIELD PHOTOGRAPHS

Description: Photo 1. View of dam from near left abutment.

Description: Photo 2. View of morning glory spillway inlet.

Description: Photo 3. View of receiving stream just downstream of dam.

Description: Photo 4. Rt 116 Bridge / culvert crossing, 600' downstream of dam.

Description: Photo 5. View of Moswansicut Brook downstream of Rt 116.

Description: Photo 6. View of Rt 6, looking downstream, at assumed location of culvert.

Description: Photo 7. Wetland area upstream of Rt 6 at Moswansicut Brook.

ATTACHMENT III

SMPDBK OUTPUT SUMMARY

SIMPLIFIED DAMBREAK MODEL (SMPDBK) VERSION: 9/91
BY D.L. FREAD, J.M. LEWIS, & J.N. WETMOR[illegible] PHONE: (301) 427-7640
NWS HYDROLOGIC RESEARCH LAB W/OH3, 1325 [illegible]-WEST HIGHWAY,
SILVER SPRING, MD 20910

***** DISTANCE TO PRIMARY POINT OF INTEREST MOVED TO THE CROSS SECTION
***** CLOSEST TO THIS LOCATION (MI .75)

DATA FOR THIS DAM IS AS FOLLOWS:

TYPE OF DAM (IDAM)	EARTH	
DAM BREACH ELEVATION (HDE)	308.00	FT
FINAL BREACH ELEVATION (BME)	294.00	FT
SURFACE AREA OF RESERVOIR (SA)	282.00	ACRES
FINAL BREACH WIDTH (BW)	42.00	FT
TIME OF DAM FAILURE (TFM)	30.00	MINUTES
NON-BREACH FLOW (QO)	6.00	CFS
DISTANCE TO PRIMARY PT OF INTEREST (DISTTN)	.75	MILES
DEAD STORAGE EQUIV. MANN. N (CMS)	.50	

CROSS SECTION NO. 1
FLOOD DEPTH (FLD) .00 FT

ELEV.(FT) (HS)	294.0	296.0	300.0	308.0
TWIDTHS(FT) (BS)	42.0	42.0	250.0	400.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.035	.035	.085	.085

CROSS SECTION NO. 2
REACH LENGTH (D) .10 MI
FLOOD DEPTH (FLD) .00 FT

ELEV.(FT) (HS)	293.9	296.0	300.0	308.0
TWIDTHS(FT) (BS)	.0	42.0	250.0	400.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.035	.035	.085	.085

CROSS SECTION NO. 3
REACH LENGTH (D) .28 MI
FLOOD DEPTH (FLD) .00 FT

.(FT) (HS)	289.0	291.0	300.0	310.0
THS(FT) (BS)	.0	10.0	550.0	900.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.035	.035	.085	.085

CROSS SECTION NO. 4
REACH LENGTH (D) .75 MI
FLOOD DEPTH (FLD) .00 FT

ELEV.(FT) (HS)	288.0	290.0	300.0	310.0
TWIDTHS(FT) (BS)	1200.0	1300.0	1900.0	2500.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.035	.085	.085	.085

AN ASTERISK (*) BESIDE A PARAMETER IMPLIES THAT A DEFAULT VALUE WAS COMPUTED

NAME OF DAM: MOSWANSICUT DAM NAME OF RIVER: MOSWANSICUT BROOK

RVR MILE FROM DAM	MAX FLOW (CFS)	MAX ELEV (FT-MSL)	MAX DEPTH (FT)	TIME(HR) MAX DEPTH	TIME(HR) FLOOD	TIME(HR) DEFLOOD	FLOOD DEPTH(FT)
.00	6588.	303.18	9.18	.50	.00	.00	.00
.10	5031.	302.41	8.51	.56	.00	.00	.00
.28	4887.	297.33	8.33	.60	.00	.00	.00
.75	4838.	290.72	2.72	.87	.00	.00	.00

ANALYSIS IS COMPLETE

FIGURES

SOURCE:

RIGIS

MAP DATE 1975

FIGURE 1. LOCUS MAP
MOSWANSICUT POND DAM
SCITUATE, RI

SCALE

500 0 500 1000 Feet

RHODE ISLAND DEM
OFFICE OF COMPLIANCE & INSPECTION

GZA

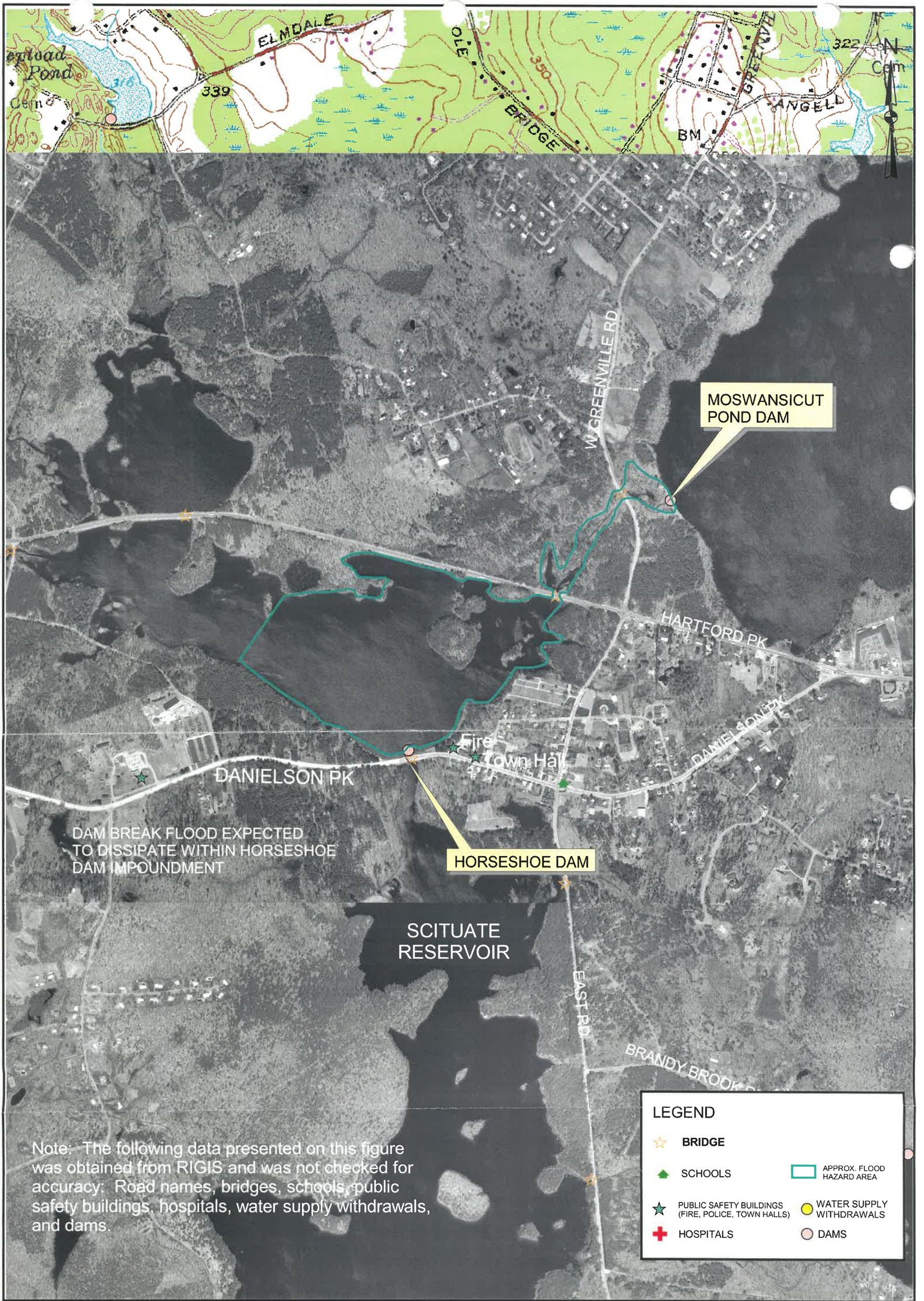

FIGURE 2

GZA NO. 17085

DAM HAZARD POTENTIAL CLASSIFICATION MAP

MOSWANSICUT POND DAM SCITUATE, RHODE ISLAND

SOURCE RIGIS

DATE OF MAP: APRIL 1997

SCALE

500 0 500 1000 Feet

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