EAST FRONT STREET BLUFF RECLAMATION, STABILIZATION AND IMPROVEMENT PLAN

as part of the implementation of the
PENNSYLVANIA COASTAL ZONE
MANAGEMENT PROGRAM

Coastal Zone

Funded and Coordinated through
Dept. of Environmental Resources
Office of Resources Management
Coastal Zone Management Office

Submitted to:

Louis J. Tullio, Mayor
City of Erie, Pennsylvania

Submitted by:

KEYSTONE UNIVERSITY RESEARCH CORPORATION

434 West Eighth Street
Erie, Pennsylvania 16502

EAST FRONT STREET BLUFF RECLAMATION, STABILIZATION AND IMPROVEMENT PLAN

Prepared by:

Keystone University Research Corporation
434 West 8th Street
Erie, Pennsylvania 16502

Prepared for:

Louis J. Tullio, Mayor
City of Erie, Pennsylvania

December 1982

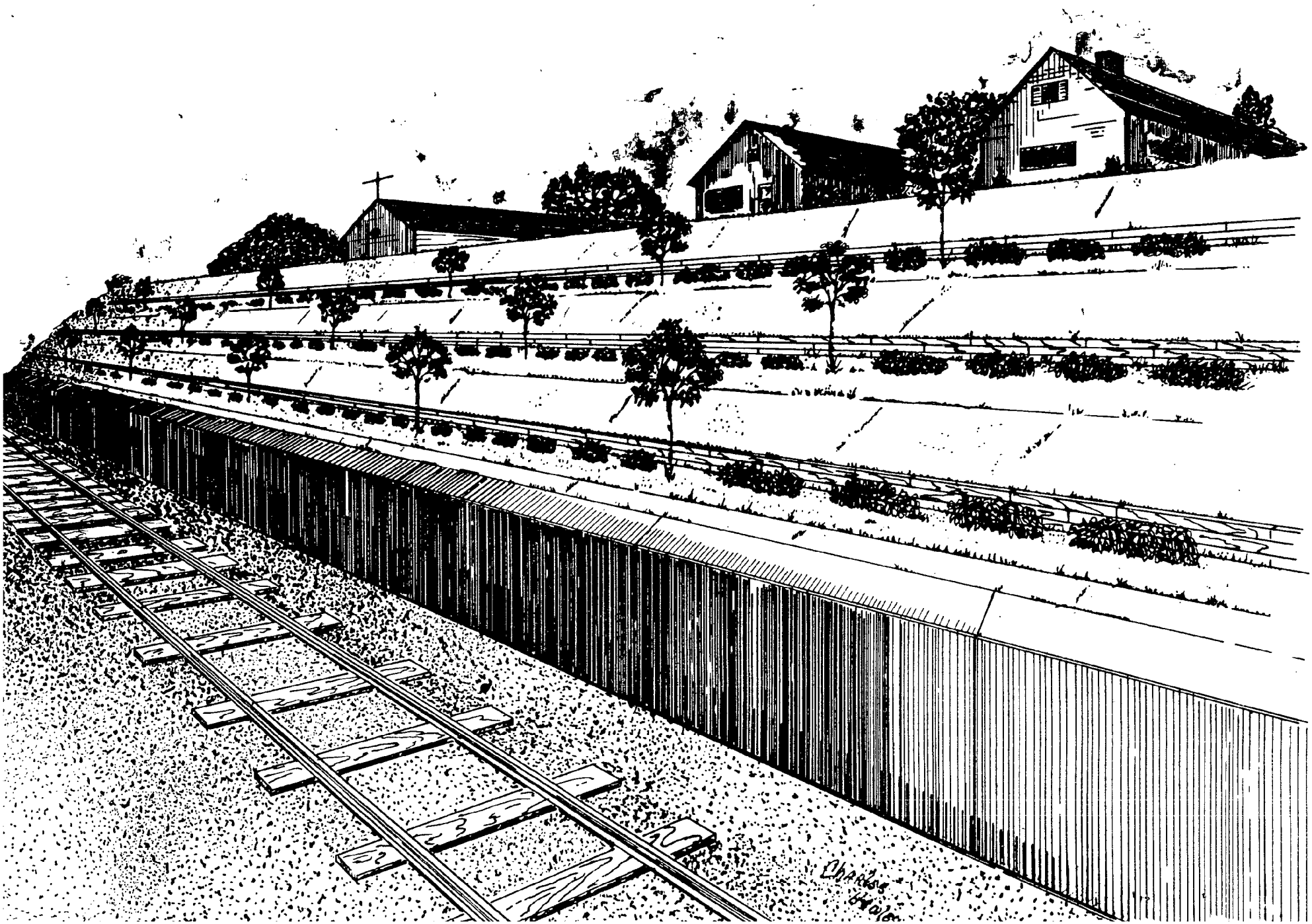


TABLE OF CONTENTS

1.0 INTRODUCTION AND EXECUTIVE SUMMARY

Keystone University Research Corporation under contract with the City of Erie, investigated the bluff which extends along East Front Street between Holland and Wallace Streets. The purpose of the study was to determine the best methods to be used for reclamation, stabilization and improvement of the bluff and its immediate surroundings.

The general findings and recommendations are as follows:

1. At present, the bluff area is blighted in appearance. There is little vegetative cover, and the face of the slope has been badly eroded due to surface water runoff. Recent street resurfacing has improved this situation somewhat. Water runoff should be less severe than it has been in the past.

2. Recommended steps for reclaiming and stabilizing the bluff include:

   (a) General cleanup and trash removal.
   (b) Construction of a two-foot high retaining wall at the toe of the slope.
   (c) General landscaping and earthwork on the bluff area.

3. Once the face of the bluff has been improved, rehabilitation of the park along the top of the bluff is recommended.

A specific discussion of each of these steps is presented in the following sections with accompanying illustrations and preliminary cost estimates. Total cost for improving and stabilizing the bluff would be approximately $145,000. Additional improvements at the top of the bluff are estimated to be approximately $60,000 for the park rehabilitation.

2.0 LOCATION OF THE STUDY AREA

The study area for this task is shown in Figure 1.* It includes the bluff and associated bluff face that runs along East Front Street between Holland and Wallace Streets. The area along the top of the

---

* All figures are contained in Appendix A.

face is largely single family residential in nature. At the bottom of the face, the area is primarily devoted to industrial usage. Figure 2 is an overhead view of the area showing significant geographic features including contour lines.

3.0 GEOLOGY OF THE STUDY AREA

The following discussion of the Erie County shoreline provides some general background information and is based on secondary source materials. A detailed geologic study of the area was beyond the scope of this study.

The soils in the area are generally the Rimer-Wauseon-Berrien variety, sandy or silty soils of the lake plain. They can vary in depth from 10 feet to 75 feet.

The bedrock in the area is generally of the Canadaway Formation and consists of flat lying sedimentary strata of shale and sandstone. The bedrock slopes gently to the south and southwest--rarely exceeding twenty feet per mile. It ranges from 6000 feet to 7500 feet thick.

The East Front Street bluff has been formed through years of erosive action of waves off Lake Erie. There is no sign of exposed bedrock in the area of study. Only the top layers of soil, which are evidently of considerable depth, have been affected.

4.0 EXISTING CONDITIONS OF THE STUDY AREA

The area is blighted in appearance due to the large quantities of trash that have been dumped over the edge in recent years. Some cleanup has already occurred. More is needed. The face has very little vegetative cover and is badly eroded due to surface water runoff. Groundwater seepage does not appear to be a significant problem, and there are no signs of slope failure or land slides.

The bluff at the top of the face is grassed with a few large established oak trees and several recently planted ones. There are

park benches at several locations along the bluff. East Front Street itself is an uncurbed, paved roadway which has recently been resurfaced. There is no sidewalk along the north side of the street, and the sidewalk along the south side is not continuous and is in rather poor condition. Parking areas are poorly defined, and vehicles have unlimited access to the bluff--a factor which most likely contributes to the trash problem on the side of the bluff. A side view indicating some of the existing conditions at the site is presented in Figure 3.

5.0 ALTERNATIVE SOLUTIONS TO PROVIDE BLUFF FACE PROTECTION

As discussed above, the slope associated with the bluff along East Front Street is blighted in appearance and is badly eroded. After a major cleanup operation, there are several means by which the face could be stabilized. These are discussed below along with the pros and cons for each alternative.

5.1 Construct a Major Retaining Wall

One obvious solution would be to construct a retaining wall along the entire bluff. This would, of course, require a rather high wall (up to 50 feet in height at some locations). Tremendous amounts of earthwork would also be required. This solution would prove to be extremely expensive.

5.2 Reduce Grade of Slope

Another obvious solution would be to cut the slope back to a less steep grade. A grade of 3:1 would be very acceptable. However, development along East Front Street and at the bottom of the slope presents restrictions that eliminate this possibility. It would be extremely expensive to acquire this developed property. The return on this investment would be a parcel of land ill-suited to most development due to its sloping nature.

5.3 Contour Wattling and Terracing

The most practical solutions involve only slight modification to the face that would stabilize the soil and control surface water

runoff. Soil stabilization can be achieved through the use of matting materials specifically developed to hold soil in place until a vegetative cover can be established. Paving bricks perforated with holes to allow grass to grow through have also been used successfully in soil stabilization projects.

Among the most popular methods of slowing runoff are slope terracing and contour wattling. These methods are illustrated in Figures 4 and 5. Both methods create obstructions which slow surface runoff and thereby reduce the possibility of erosion taking place. If the situation were to become more severe than it now is, terracing would be necessary. At present, however, it is believed to be unnecessary.

5.4 Proposed Solution

The proposed solution involves the establishment of a vegetative cover for the slope. This is not only aesthetically appealing, it serves a functional purpose as well. Planting a hardy ground cover and several evergreens will serve to slow runoff and act to catch sediment being carried by it. The root system will act as an anchor to stabilize the soil. Various grass and legume seed mixtures and certain shrubs and trees suitable for sloped terrain and requiring very little maintenance are discussed in Section 7. As indicated in that section, the recommended vegetative cover is Crown Vetch and the trees are Austrian Pine.

6.0 ALTERNATIVE SOLUTIONS TO IMPROVE THE AREA AT THE TOP OF THE BLUFF

The major decision to be made regarding the top of the bluff is how much work should be done. At one extreme is the "do nothing" alternative. The area is presently grassed, and there are trees in the area as described in Section 2. A few park benches have recently been placed in the area.

A very minimal improvement would include providing some picnic tables and a barrier (decorative guard rail constructed from treated

timbers, for example) to keep vehicles off the grass and away from the bluff face. Construction of a diversion berm along the top of the bluff, as shown in Figure 6, would intercept runoff before it ran down the face. This water would be collected and brought down the face in a controlled manner by means of storm sewers or a properly prepared ditch. The terracing method referred to earlier can also employ interceptor drains to catch storm water runoff and carry it to a suitable outlet point as shown in Figure 7.

A plan view of the complete rehabilitation as recommended is shown in Figure 8. Several trees have been added both for soil stability and for decorative purposes. If it is felt that trees would interfere with the view from the bluff, other ground cover could be substituted (see Table 1).

7.0 RECOMMENDED COURSE OF ACTION AND COST ESTIMATES

The ultimate goal for improvement of the study area is as follows:

(1) To completely reclaim the face of the bluff.

(2) To rehabilitate the park along the top of the bluff

A side view of the proposed improvements for the face of the bluff is shown in Figure 9. The most important factor contributing to a stable slope is stability at the toe of the slope. For this reason, a short retaining wall (approximately two feet in height) has been proposed to run along the bottom of the bluff for an approximate length of 2100 feet. This wall would be about one foot thick and probably be of reinforced concrete. Specific features would be dependent on design considerations at the time of construction. Above this is an area of semi-rigid soil support. This soil support could take the form of perforated paving blocks with grass growing through as mentioned earlier. Figure 10 shows the proposed retaining wall and associated structures. The slopes would initially be protected with matting as discussed in Section 5.3 and then planted

TABLE 1

SUITABLE VEGETATIVE COVERS

GRASS AND LEGUME SEED MIXTURES

Mixture No. 1

Species	Lbs/Acre
Perennial Rye Grass (Lolium perrene)	5
Redtop (Agrostis alba)	4
Smooth Bromegrass (Bromus inermis)	12
Orchard Grass (Dactylus glomerata)	8
Canada Bluegrass (Poa compressa)	8
Sweet Clover (Melilotus alba)	4
Red Clover (Trifolium pratense)	6
	47

Mixture No. 2

Species	Lbs/Acre
Creeping Red Fescue (Festuca rubra)	10
Kentucky Bluegrass (Poa Pratensis)	2
Redtop (Agrostis alba)	1
Tall Fescue (Festuca arundinacea)	20
Timothy (Phleum pratense)	2
Birdsfoot Trefoil (Lotus corniculatus)	10
	45

SHRUBS

Autumn olive (Elaeagnus umbellata)
Bearberry (Arctostaphylus uva-ursi)
Chokecherry (Prunus virginiana)
Gray Dogwood (Cornus racemosa)
Wild Grade (Vitus riparia)
Common Juniper (Juniperus communis)
Staghorn Sumac (Rhus typhina)
Sandbar Willow (Salix interior)
Heartleaved Willow (Salix Cordata)

TREES

Cottonwood (Populus deltoides)
Black Locuse (Robinia pseudo-acacia)
Silver Maple (Acer saccharinum)
Red Maple (Acer rubrum)
Box Elder (Acer negundo)
Austrian Pine

with grass and/or shrubs. A diversion berm should be constructed along the top edge of the bluff face. Due to the sandy nature of the soil, the need for interceptor drains along the top of the bluff and terraces is not anticipated. An artist's rendering of this improvement is shown on the frontispiece.

Suitable grass seed mixtures, shrubs and trees have been indicated in Table 1. The selection of type of vegetation to be planted depends on a number of factors. Most important among these is type of soil--whether it is droughty, well-drained, subject to alkalinity, acidity, toxicity or nutrient imbalance. Other factors include slope, availability of specific type of plant, desired visual impact and various functional considerations. A final important consideration is that the ground cover require little maintenance. All the varities mentioned here require relatively low maintanance and have been used on public properties for several years.

All species listed in Table 1 were chosen because of their suitability for well-drained soils such as those in the study area and would be acceptable for use in this area.

After reviewing the various possibilities, Crown Vetch was selected as the ground cover and Austrian Pine as the tree. Both are especially hardy and should be able to withstand both northern exposure and the extremes of water availability on the slope--ranging from too much at times to too little at other times. Both grow rapidly and grow well in sandy soil. Any other grass, shrubs and trees listed in Table 1 would also be suitable for the purposes of this project depending on the availability of good quality plants at the time of construction. All of these have been known to withstand severe exposure on seashore and lake shore frontage throughout the northeastern United States. They have often been used on steep slopes.

The plan view shown earlier in Figure 8 indicates trees planted approximately 80 feet apart with some shrubs or lower ground cover

planted in between. Crown Vetch is to be planted around trees as well as on sloped areas. This, it is felt, would create an aesthetically pleasing installation, but would not obstruct the view of Presque Isle Bay from the top of the bluff.

The estimated cost of this improvement follows. It must be emphasized that these are 1982 dollars and are very approximate in nature.

Retaining Wall	$115,000
Earthwork	15,000
Landscaping	15,000
Total --------	$145,000

Following stabilization of the bluff face, work could proceed on improvements to the area at the top of the bluff. As was described in Section 5, this work would consist of such things as providing picnic tables and construction of a guard rail along the north side of East Front Street.

The estimated cost for this phase of the improvement follows. Once again, it must be emphasized that these are 1982 dollars and are very approximate in nature.

Picnic Tables and Park Benches	$ 5,000
Landscaping	5,000
Guard Rails	50,000
Total ---------	$60,000

8.0 CONCLUDING REMARKS

The most important first steps toward the improvement of East Front Street are to clean up and then to stabilize the face of the bluff. Depending on the availability of funding, work could be done to create a "mini-park" along the top of the bluff.

There is an existing recreation area with baseball diamond, a wading pool and some playground equipment at the eastern edge of the study area. This park, located at the intersection of East Front Street and Wallace Street, would be developed jointly with

the area along East Front Street. This is a considerably larger parcel which would lend itself to a great many uses. It could be developed as a playground, a recreation area (with a swimming pool perhaps) or a picnic area (with trees and picnic facilities).

These proposals admittedly constitute very long range planning. Many may not even be possible in light of rapidly changing policies regarding funding of public works. However, it is the intention of this study to provide direction toward the solution of immediate problems in such a way that they also fit into a plan for ultimate improvement of the entire area.

The preparers of this report are aware of preliminary work being done on a Bayfront Port Access Road. Such a development would have a significant impact on the area being studied here. However, until more definite decisions have been made regarding the new roadway, exact impacts cannot be projected. Appropriate coordination between the two projects will be required should both be advanced to final design phases.

BIBLIOGRAPHY

Taylor, Albert D.: Plants for Landscape Planting, Cleveland, Ohio, 1916.

Tomikel, J.C. and Vincent C. Shepps: The Geomorphology and Geology of Erie County Pennsylvania. Harrisburg, Pennsylvania, 1967.

U.S. Army Corps of Engineers: Help Yourself - A discussion of erosion problems on the Great Lakes and alternative methods of shore protection, 1978.

U.S. Army Corps of Engineers: The Role of Vegetation in Shoreline Management - A guide for Great Lakes shoreline property owners, 1974.

U.S. Department of Agriculture, Soil Conservation Service: Soil Survey for Erie County Pennsylvania. Washington, D.C., 1960.

Woodruff, Inc.: Lakeshore Park Recreation Plan. Prepared for the Ashtabula County Ohio Board of Commissioners. Cleveland, Ohio, 1978.

APPENDIX A

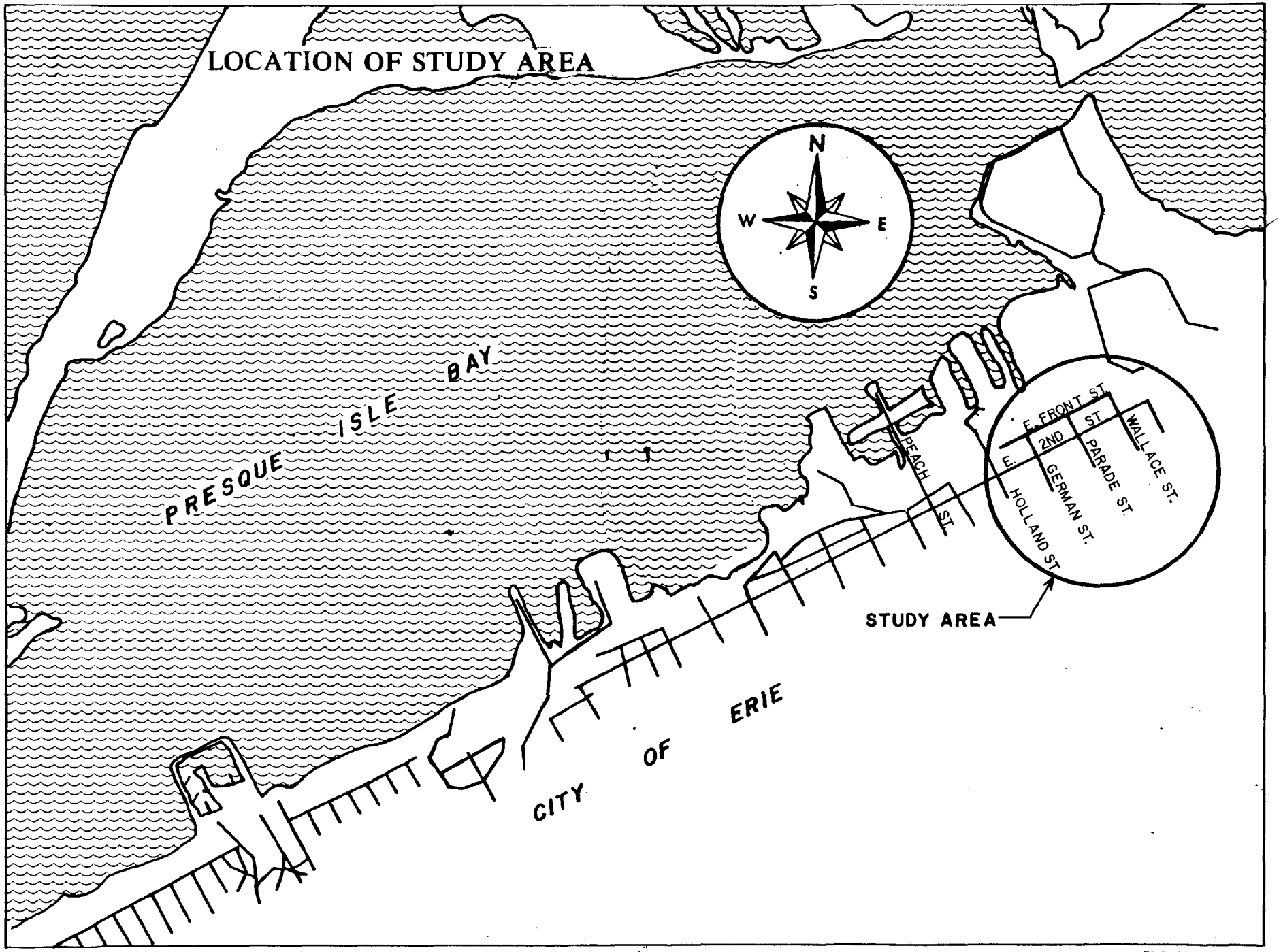

LOCATION OF STUDY AREA
N
W
E
S
PRESQUE ISLE BAY
CITY OF ERIE
PEACH ST.
E. FRONT ST.
2ND ST.
E.
HOLLAND ST.
GERMAN ST.
PARADE ST.
WALLACE ST.
STUDY AREA

FIGURE NO. 1

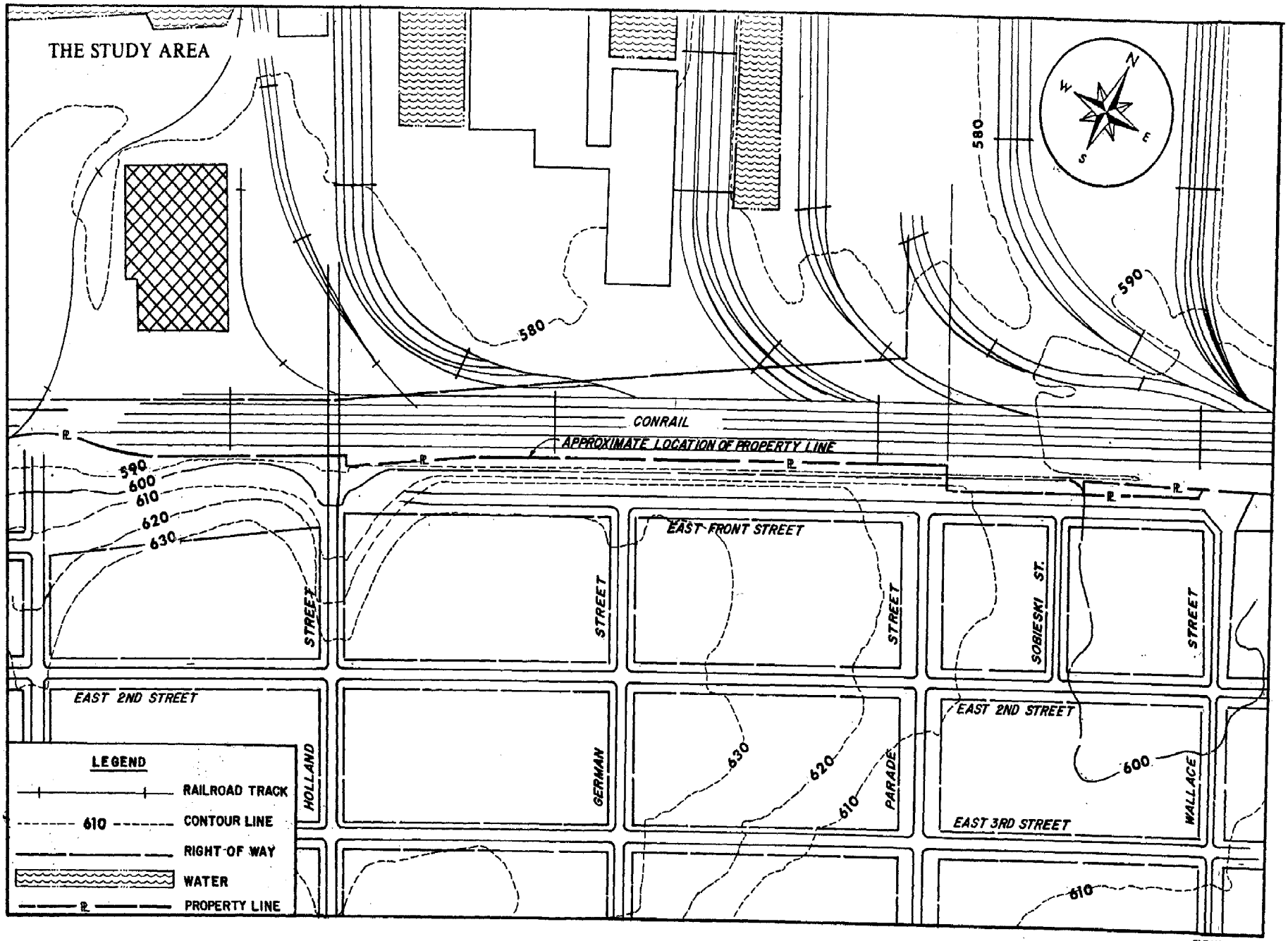

THE STUDY AREA
N
W
E
S
580
590
580
CONRAIL
APPROXIMATE LOCATION OF PROPERTY LINE
590
600
610
620
630
EAST FRONT STREET
STREET
STREET
STREET
SOBIESKI ST.
STREET
EAST 2ND STREET
EAST 2ND STREET
HOLLAND
GERMAN
PARADE
WALLACE
EAST 3RD STREET
630
620
610
600
610
LEGEND
RAILROAD TRACK
610 CONTOUR LINE
RIGHT-OF WAY
WATER
PROPERTY LINE

FIGURE NO. 2

EXISTING CONDITIONS

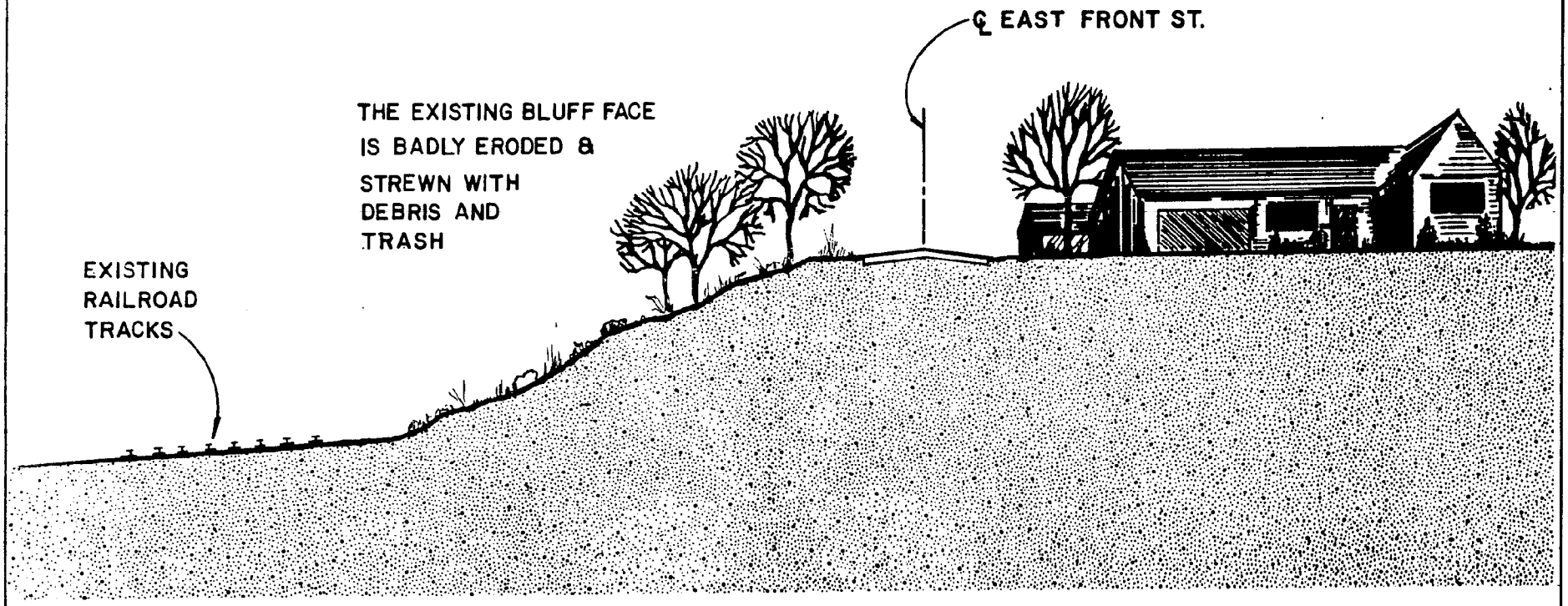


FIGURE NO. 3

SLOPE TERRACING

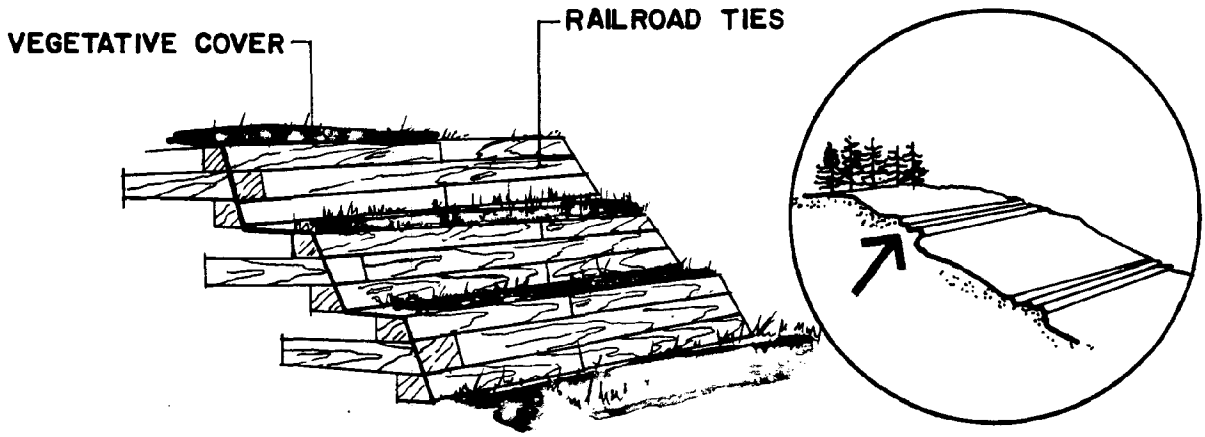


FIGURE NO. 4

CONTOUR WATTLING

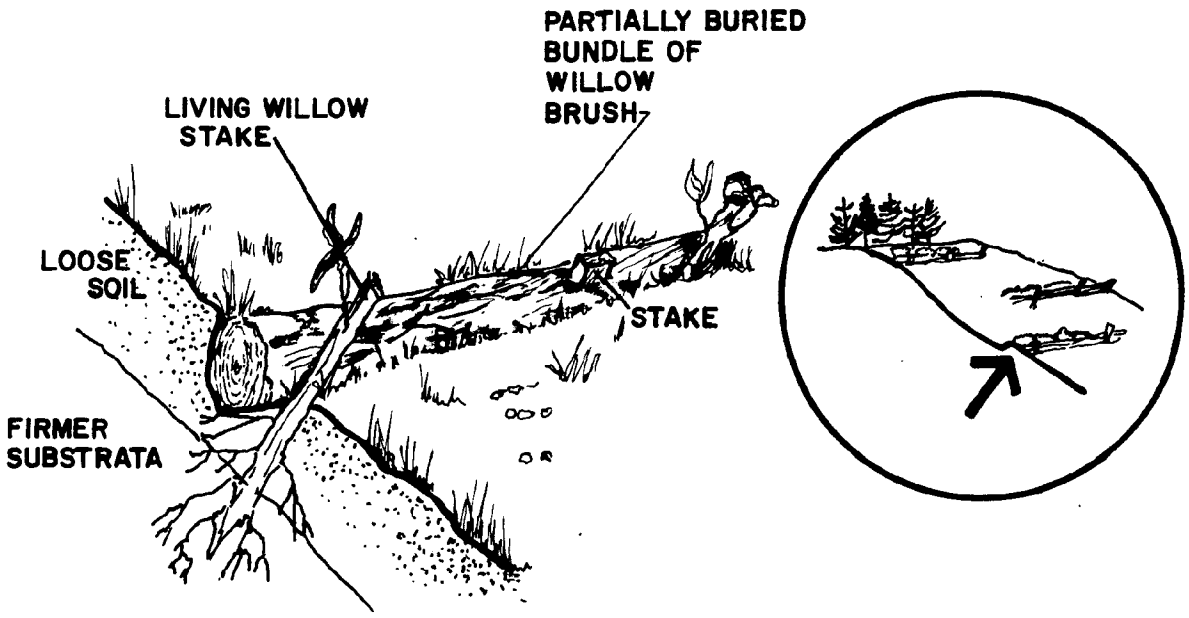


FIGURE NO. 5

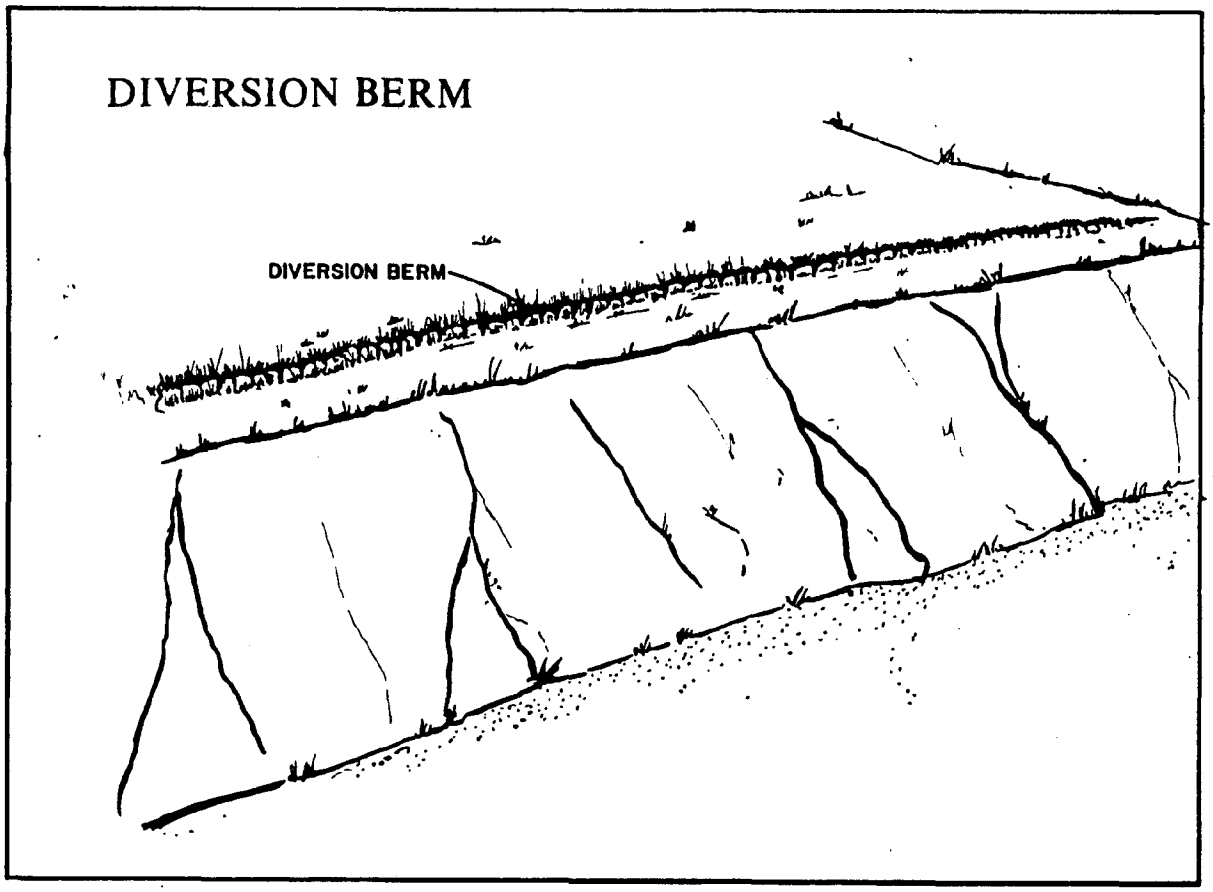
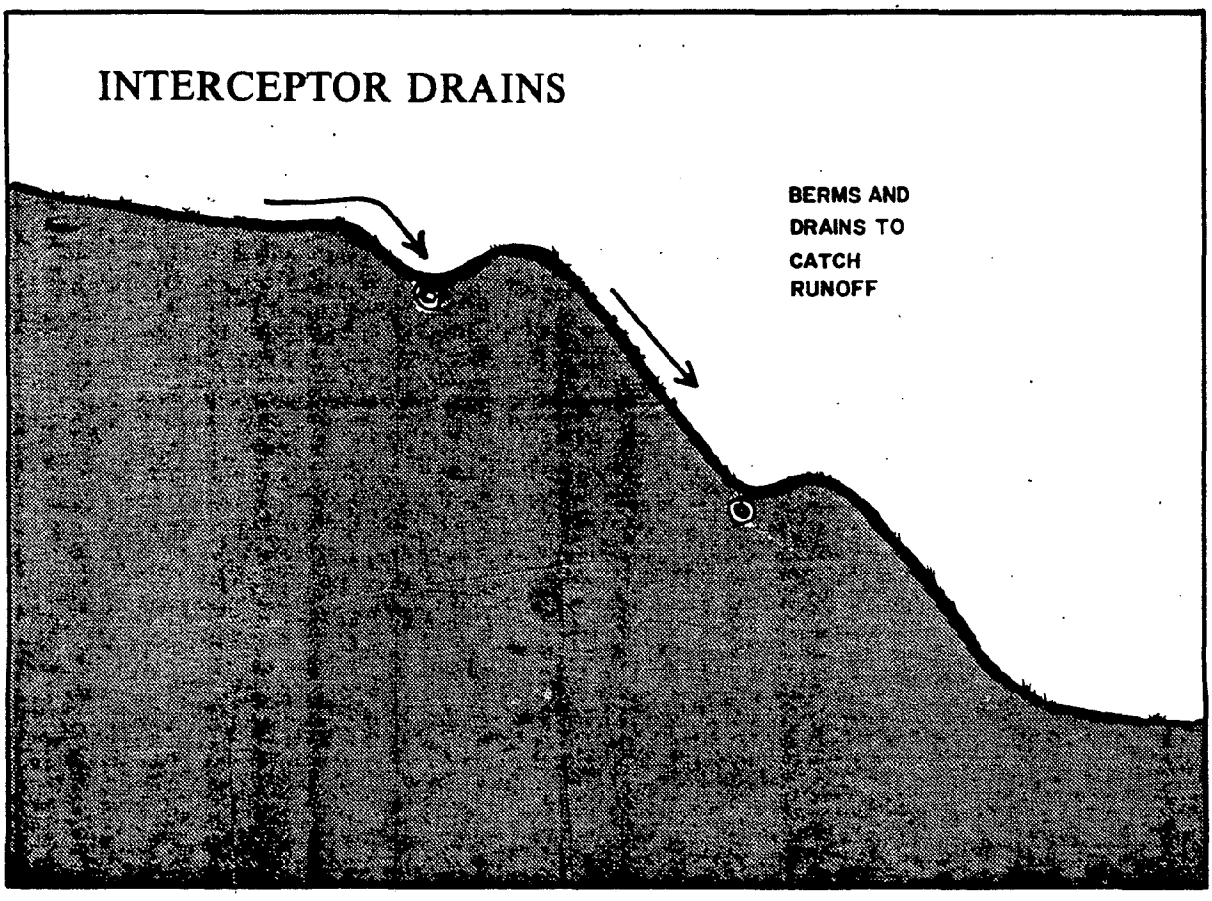
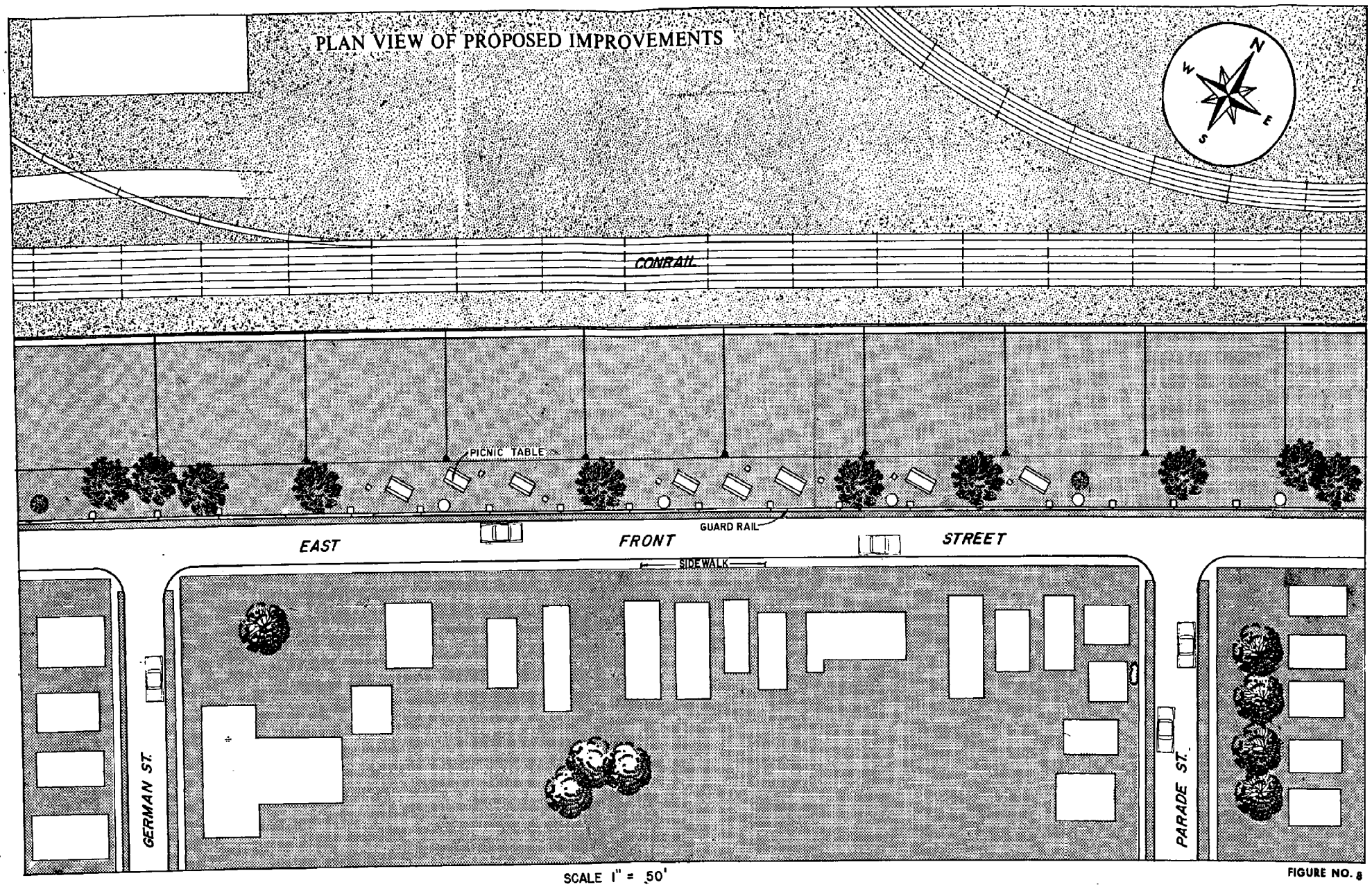

DIVERSION BERM
DIVERSION BERM

FIGURE NO. 6


INTERCEPTOR DRAINS
BERMS AND
DRAINS TO
CATCH
RUNOFF



SCALE 1" = 50'

FIGURE NO. 8

SIDE VIEW OF PROPOSED IMPROVEMENTS

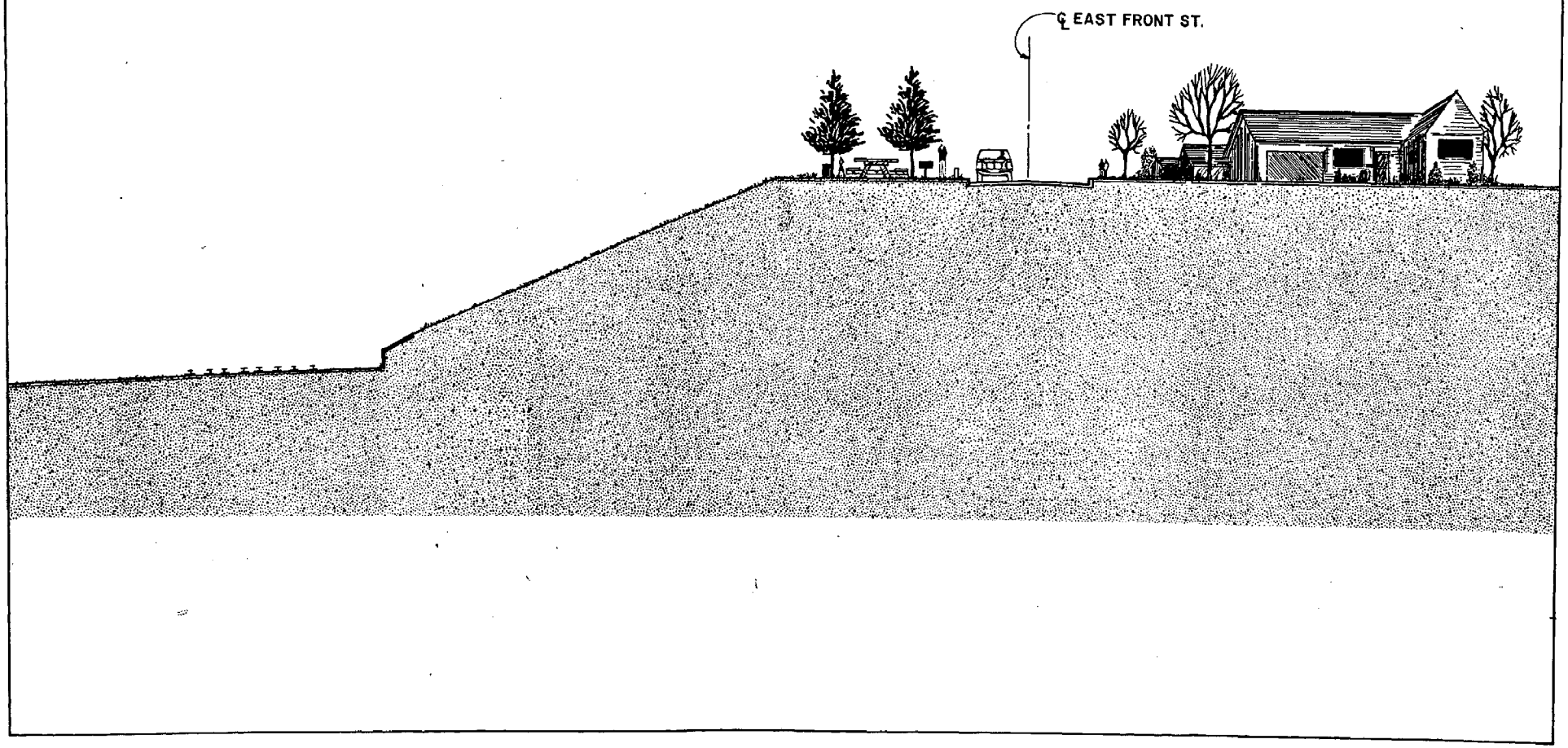


FIGURE NO. 9

PROPOSED RETAINING WALL INSTALLATION

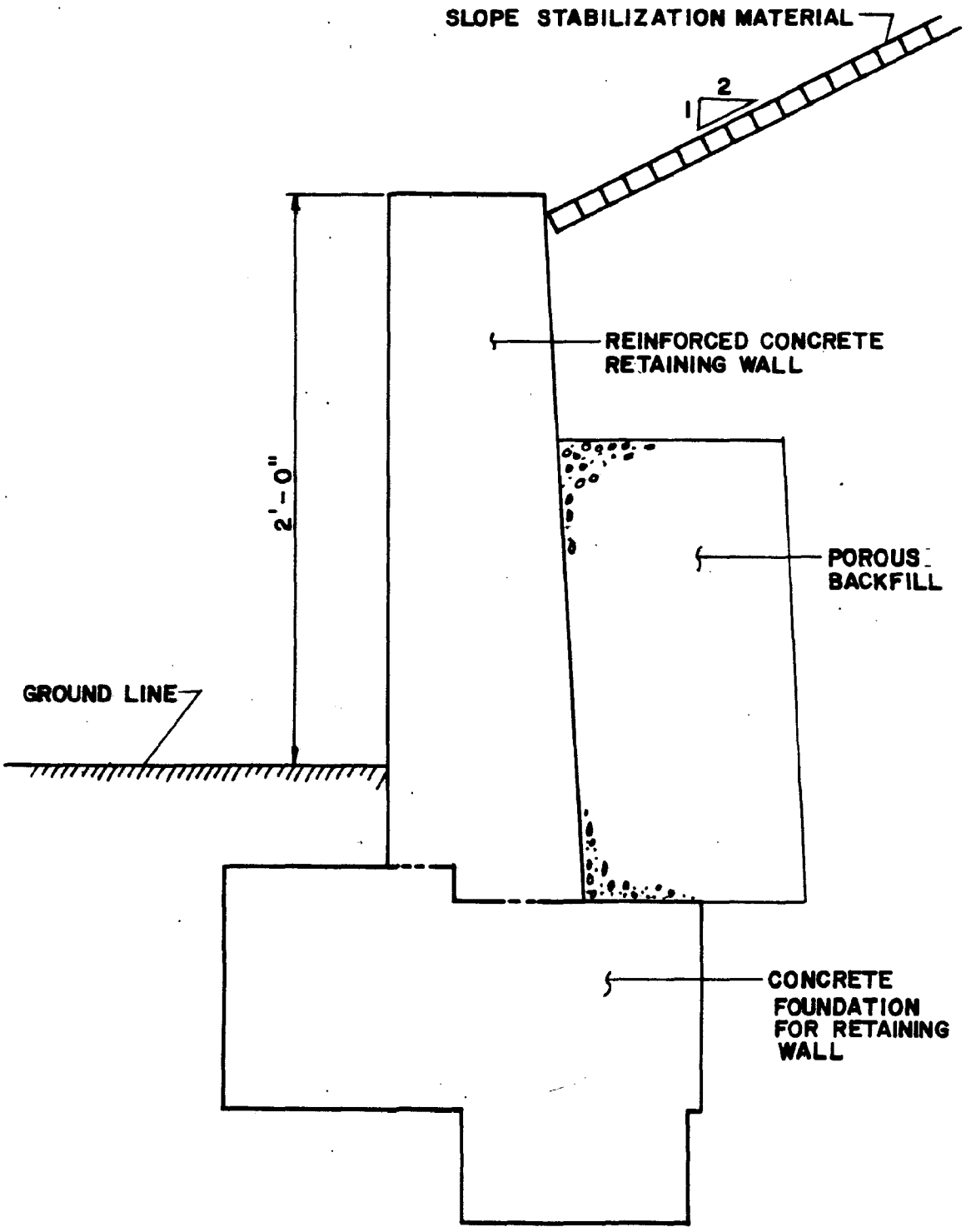


FIGURE NO. 10