MICHIGAN
OCZM GRANT #04-8-M01-334
Subtask D — new (1979)

CITY OF MUSKEGON
LAKE MICHIGAN SHORELINE
MASTER LAND USE PLAN

CITY OF MUSKEGON
LAKE MICHIGAN SHORELINE
MASTER LAND USE PLAN
SEPTEMBER 1980

PLAN PREPARED WITH THE ASSISTANCE OF
THE MICHIGAN COASTAL MANAGEMENT PROGRAM
ADMINISTERED BY THE
MICHIGAN DEPARTMENT OF NATURAL RESOURCES
LAND RESOURCES PROGRAM DIVISION
IN COOPERATION WITH
THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

PLANNING COOPERATION PROVIDED BY
CITY OF MUSKEGON
DEPARTMENT OF RECREATION AND PARKS
AND DEPARTMENT OF PLANNING

PLAN PREPARED BY
M. C. SMITH & ASSOCIATES, INC.
LANDSCAPE ARCHITECTURE - LAND PLANNING
PARK & RECREATION PLANNING - URBAN DESIGN
529 GREENWOOD AVENUE S.E.
EAST GRAND RAPIDS, MICHIGAN 49506

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Introduction

Muskegon's Lake Michigan Shoreline is a magnificant stretch of coastline which runs for over 2 miles south from the Muskegon Channel. This acre area is of immense environmental and recreational value to the Citizens of Muskegon and the surrounding areas. Because of the very sensitive environmental nature of much of the area and need to plan and manage public land areas for their highest and best use; the City of Muskegon was awarded an eighty percent matching grant through the Michigan Coastal Zone Program for the preparation of Master Land Use Plans and Programs for this land area.

This report is the culmination of these planning efforts. The Master Plan, as with all master plans, is to be utilized as a guideline for the future utilization, development and management of the shoreline. The central goal of the planning has been to provide the Citizens of Muskegon with land use plans and programs which will allow a continued high level of recreational opportunities by improving upon and expanding existing recreational assets in concert with environmental conservation and preservation so that all future generations will have the continued benefit of this magnificent shoreline asset.

This plan may not totally evolve for many years, but if its intent and programs are continued to be followed the shoreline will evolve with a pattern of utilization which will preserve and enhance it's environmental character. The implementation of plan programs will only evolve if there is continued interest and support from citizens and community leaders. The private development portions of the plan will require public support, but if assisted these development portions will not only enhance the area but can provide significant revenues for development, management and continued maintenance of all the public recreation development.

The planning process was structured to provide significant opportunities for input by public officials and the general public. Open meetings were announced and held at the Muskegon City Hall in the commission chambers on the following occasions: Friday, July 18, 1980 at 2:00 p.m. for review

and input pertaining to the Environmental Inventory and Analysis; Thursday, July 31, 1980 at 3:30 p.m.

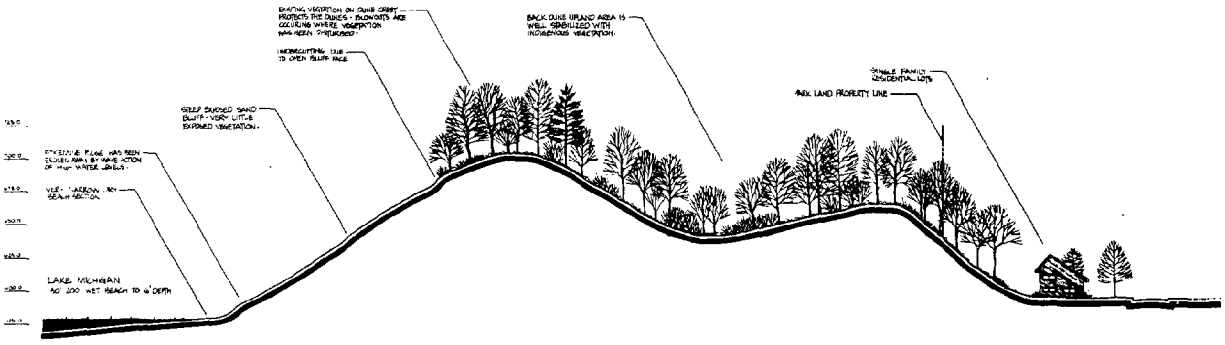
for review and input pertaining to the Preliminary Concept Plan; Thursday, August 21, 1980 at 7:30 p.m. for additional review and input pertaining to the Preliminary Concept Plan. A list of those attending and participating in the planning process at these meetings is at the end of this report.

Environmental Inventory & Analysis

To determine the existing environmental and cultural forces which influence both the utilization and ecosystems of the shoreline a comprehensive environmental inventory and analysis was conducted. The findings of this analysis became an integral element in preparation of the Master Land Use Plan and the Land Management Plan.

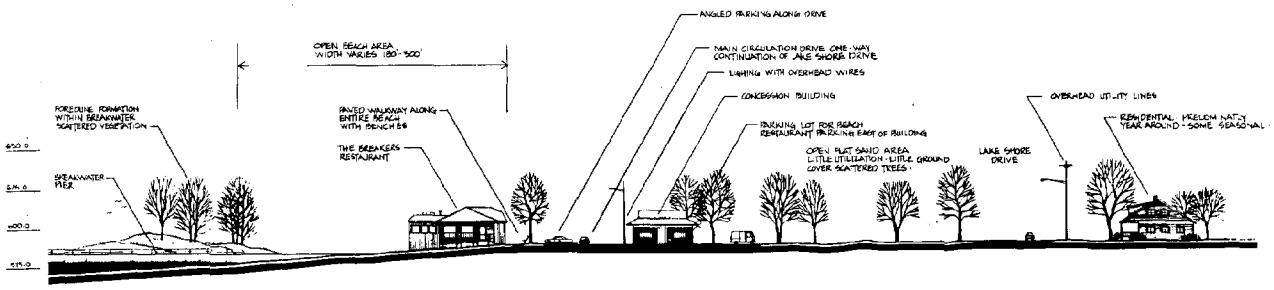
The natural systems of the shoreline are dynamic, intriguing and to be be respected. In nearly every situation where man has imposed upon these sensitive and dynamic systems the results have either been a continued battle to control the moving sand and gnawing waves or mans obliteration of the natural environment. By the careful assessment of the conditions and forces present today along the shoreline the Master Plan has been developed to observe and respect the existing and expected future environmental conditions of the shoreline. Where man's influence has had, and continues to have, great impacts on this environment the Master Plan and the Management Plan propose and provide the means for people to continue and increase shoreline utilization in a manner which will be compatible with the conservation of this resource.

The Environmental Inventory and Analysis includes documentation of the following: Landforms; Hydrology; Slopes; Soils; Ecological Associations; Vegetation; Microclimates; Wind Patterns; Erosion; Existing Features; Spaces; Views; Vehicular Circulation and Access; and Pedestrian Circulation and Access. The findings of the Inventory and

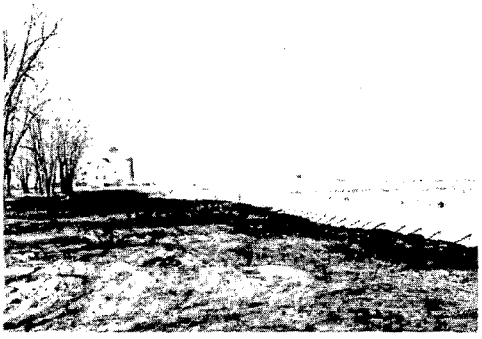
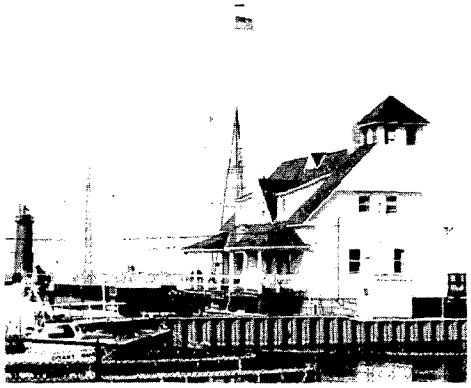


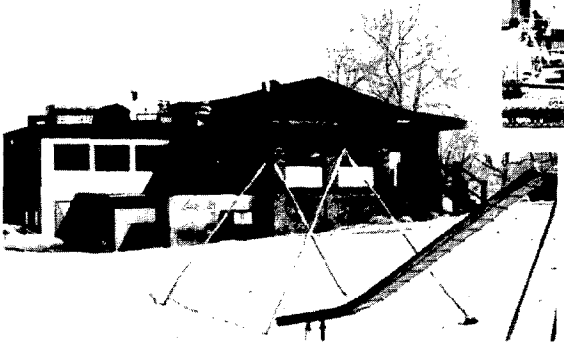
SITE SECTION NORTHERN BRONSON PARK AREA

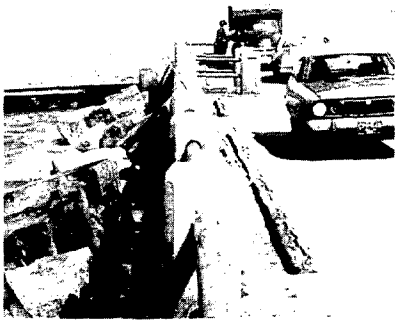
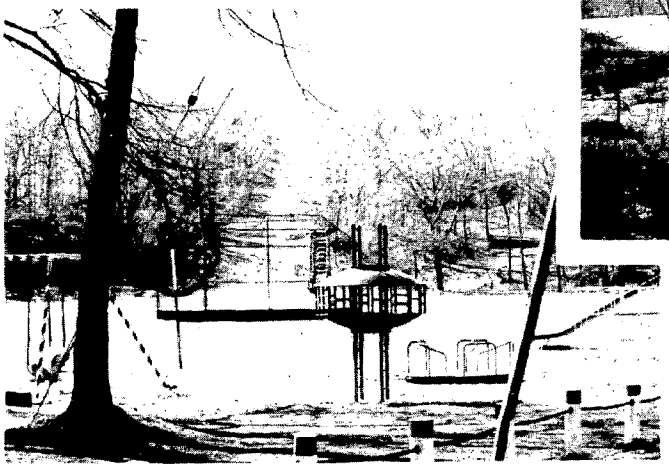
Analysis are presented both graphically and with explanatory notes by means of the plans which follow. Each plan folds out for the length of the entire shoreline. The approximate scale of these reduced plans is 1" equals 435'. Plans at a scale of 1" equals 200' are available for review. Preceding each plan are photographs of existing site conditions which are reflective of that Inventory and Analysis section.



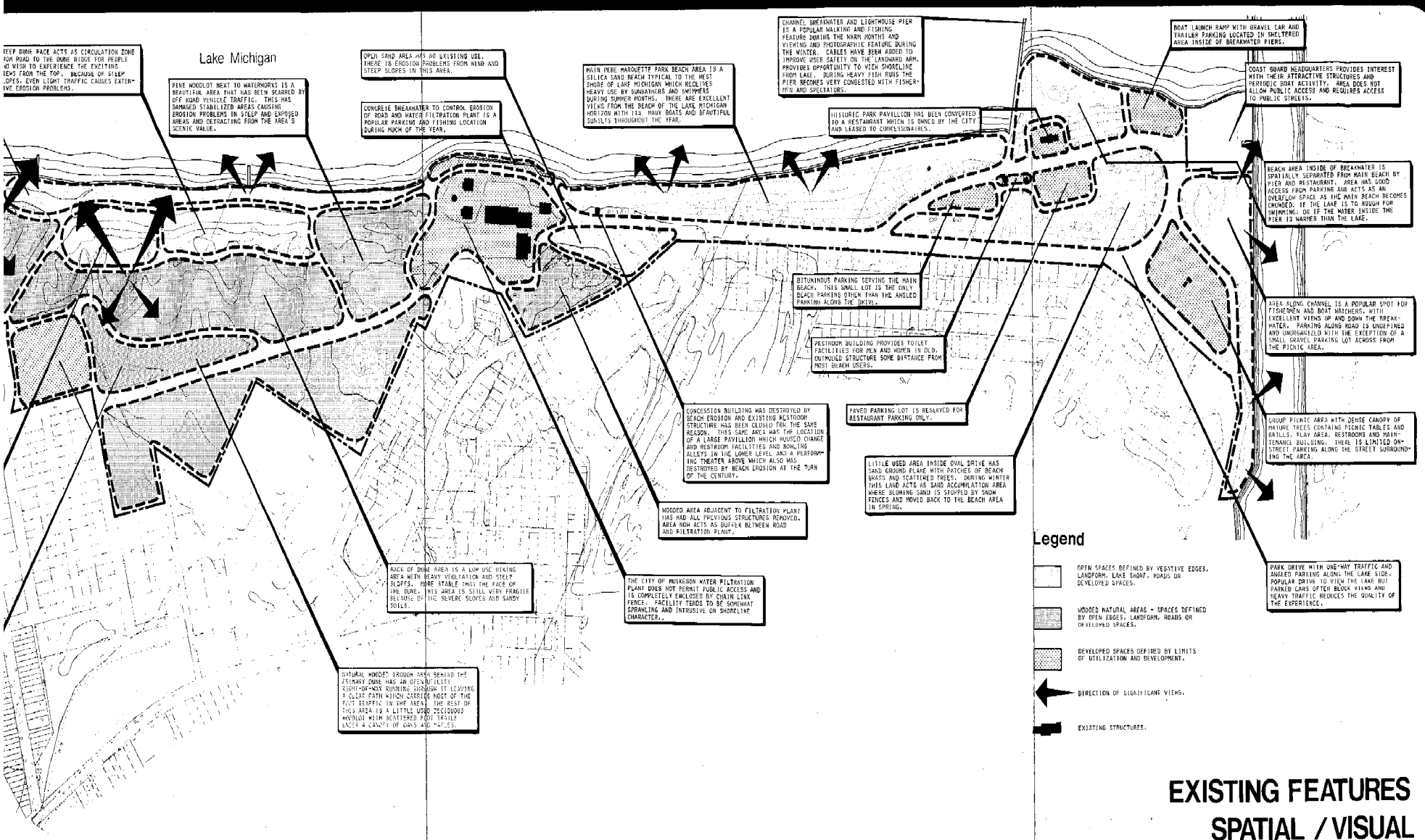
SITE SECTION PERE MARQUETTE PARK



Existing Features Spatial/Visual Inventory & Analysis



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EXISTING FEATURES SPATIAL / VISUAL INVENTORY AND ANALYSIS

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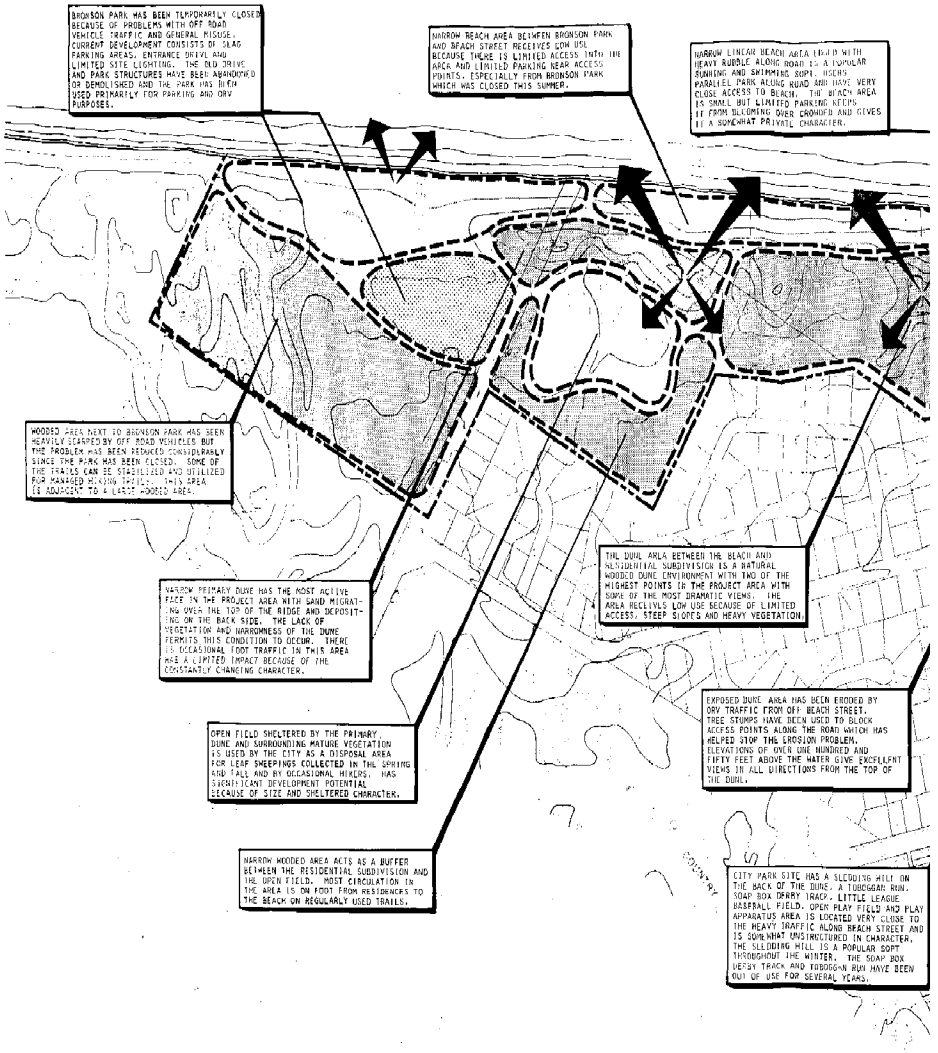
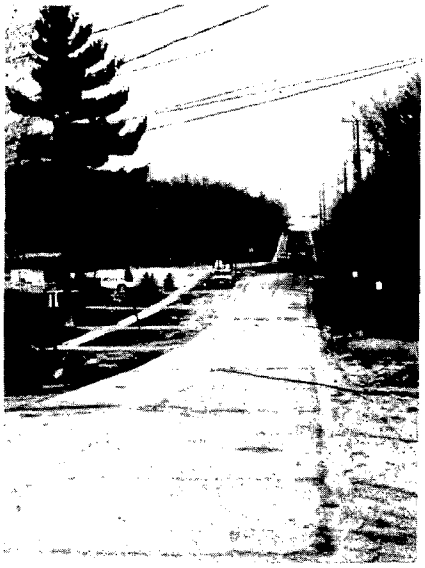
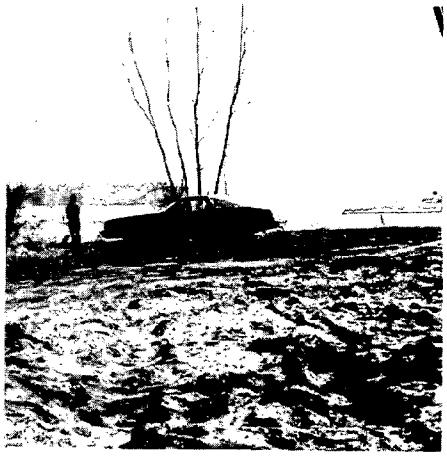
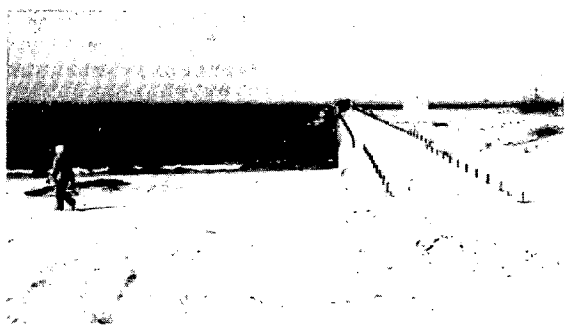


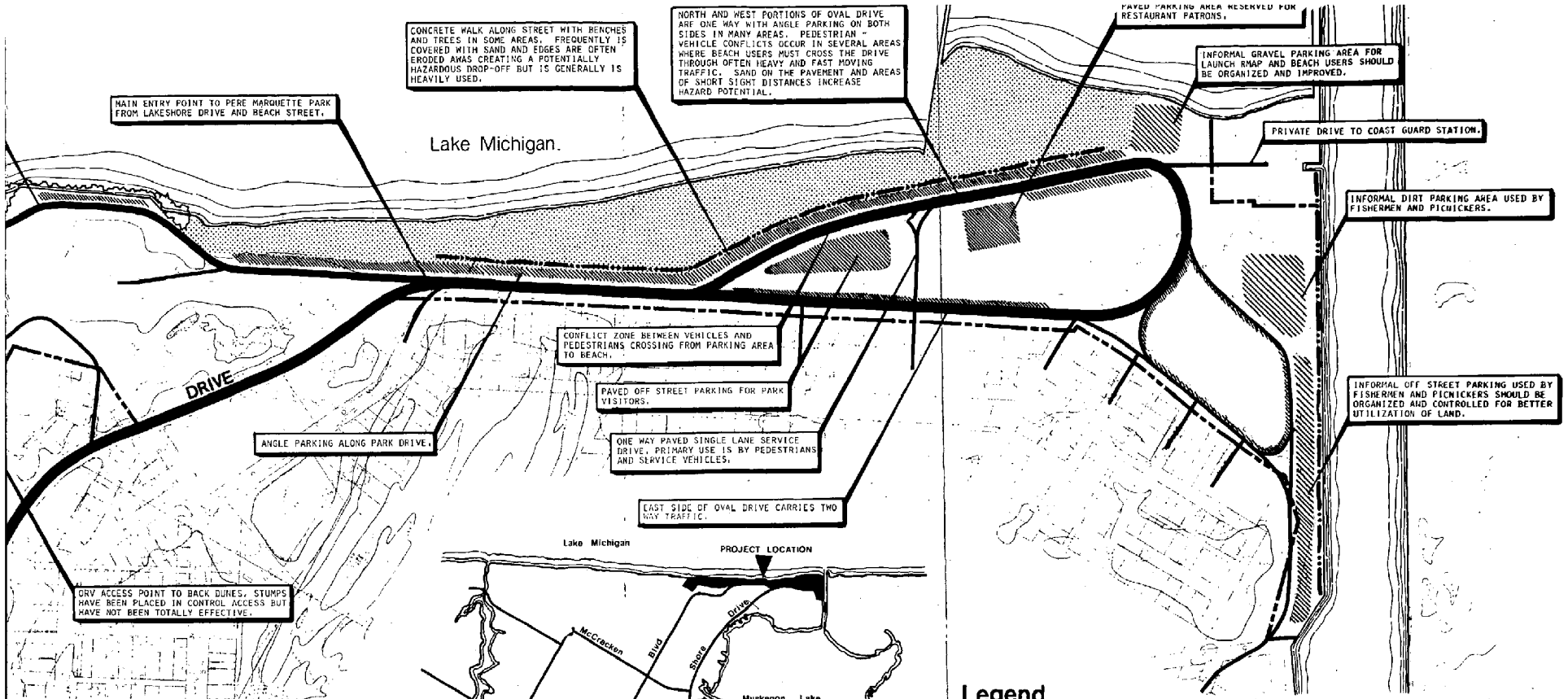
CITY OF MUSKEGON - LAKE







Vehicular / Pedestrian Circulation / Access Inventory & Analysis



Legend

- PRIMARY ACCESS AND CIRCULATION ROADS
- SECONDARY ACCESS AND CIRCULATION ROADS
- LOCAL ACCESS AND CIRCULATION ROADS
- LINEAR PEDESTRIAN CIRCULATION
- PARKING AREAS AND ZONES
- OPEN BEACH ACCESS TO LAKE MICHIGAN
- POINTS OF ORV INTRUSION

VEHICULAR - PEDESTRIAN CIRCULATION - ACCESS INVENTORY AND ANALYSIS

0 100 200 400

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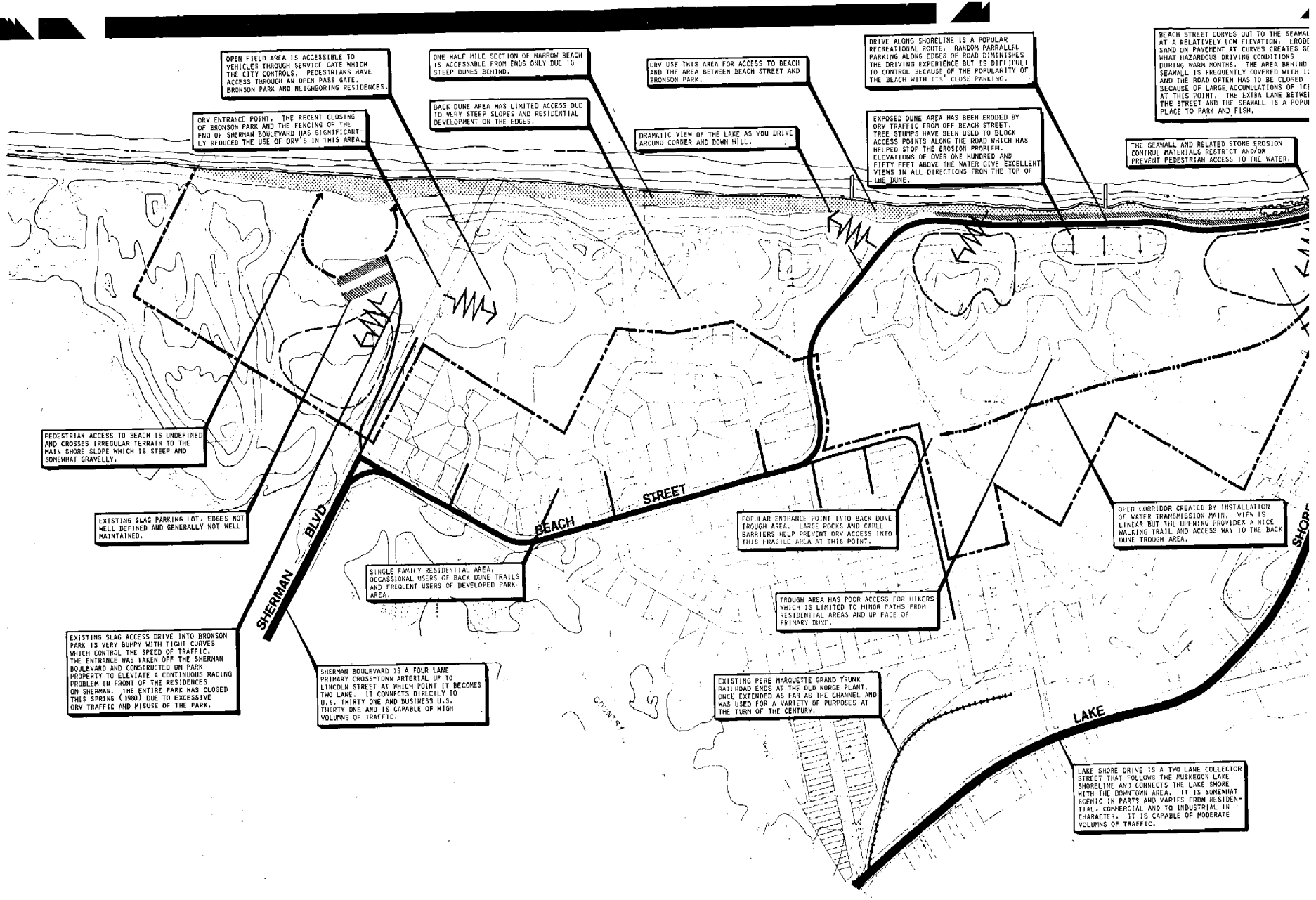
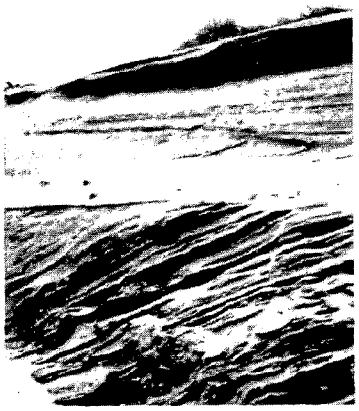
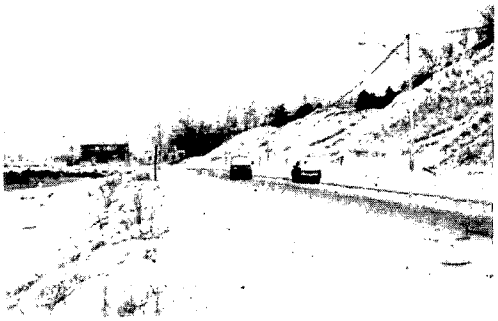
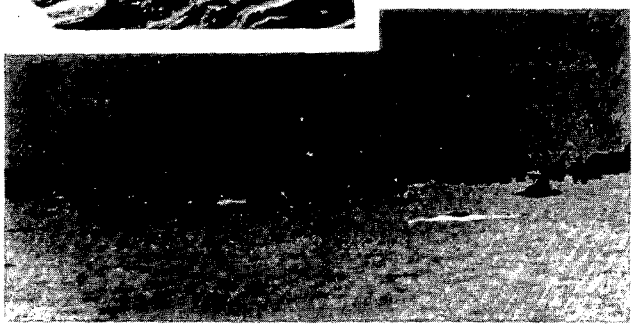
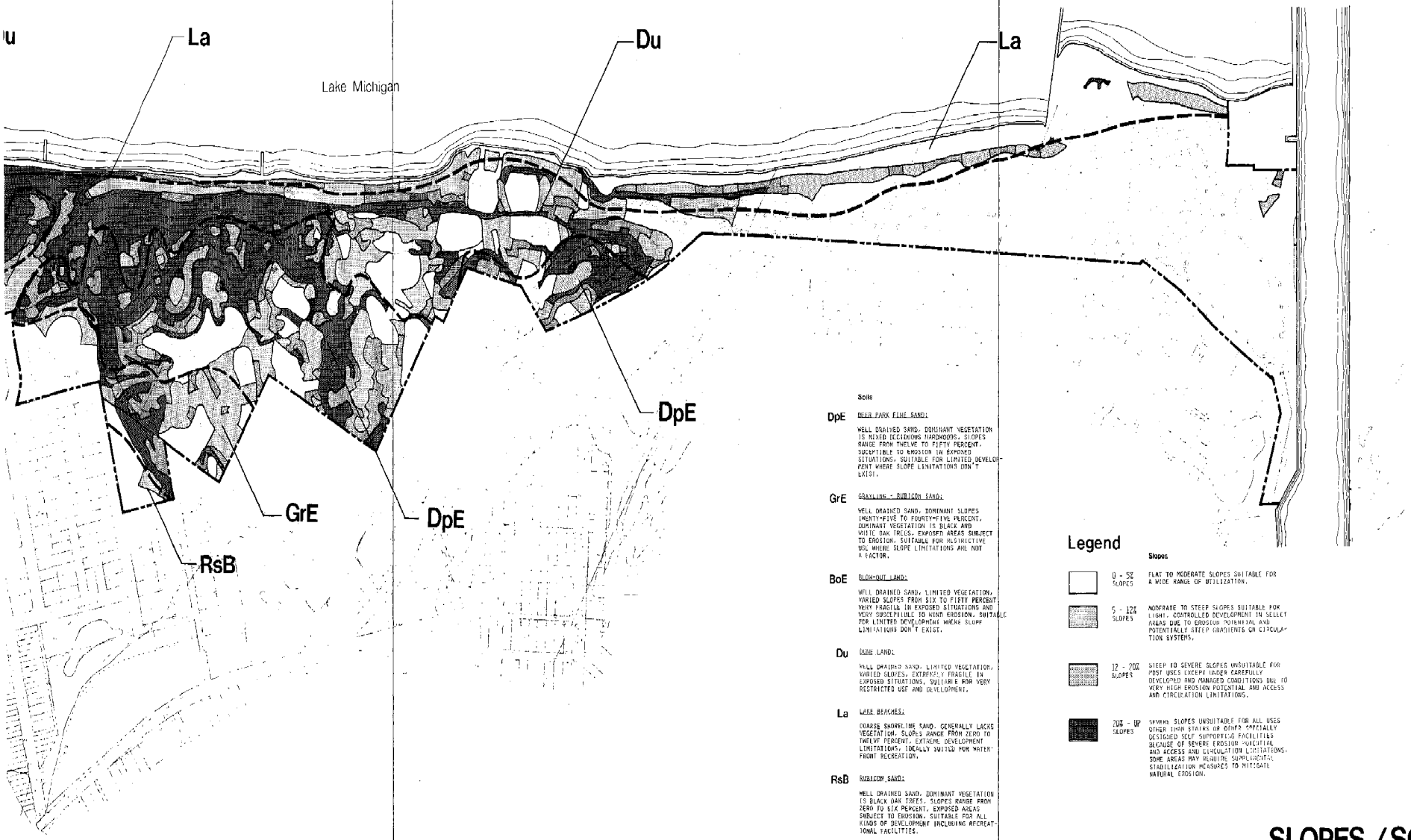


CITY OF MUSKEGON - LAKE MICHIGAN SHORELI



Slopes/Soils Inventory & Analysis



Soils

DpE BEER PARK FINE SAND:

WELL DRAINED SAND. DOMINANT VEGETATION IS MIXED DECIDUOUS HARDWOODS. SLOPES RANGE FROM TWELVE TO FIFTY PERCENT. SUSCEPTIBLE TO EROSION IN EXPOSED SITUATIONS. SUITABLE FOR LIMITED DEVELOPMENT WHERE SLOPE LIMITATIONS DON'T EXIST.

GrE GRAYLING - RUBICON SAND:

WELL DRAINED SAND. DOMINANT SLOPES TWENTY-FIVE TO FOURTY-FIVE PERCENT. DOMINANT VEGETATION IS BLACK AND WHITE OAK TREES. EXPOSED AREAS SUBJECT TO EROSION. SUITABLE FOR RECREATIVE USE WHERE SLOPE LIMITATIONS ARE NOT A FACTOR.

BoE BLOW-OUT LAND:

WELL DRAINED SAND. LIMITED VEGETATION. VARIED SLOPES FROM SIX TO FIFTY PERCENT. VERY FRAGILE IN EXPOSED SITUATIONS AND VERY SUSCEPTIBLE TO WIND EROSION. SUITABLE FOR LIMITED DEVELOPMENT WHERE SLOPE LIMITATIONS DON'T EXIST.

Du DUNE LAND:

WELL DRAINED SAND. LIMITED VEGETATION. VARIED SLOPES. EXTREMELY FRAGILE IN EXPOSED SITUATIONS. SUITABLE FOR VERY RESTRICTED USE AND DEVELOPMENT.

La LAKE BEACHES:

COARSE SHORELINE SAND. GENERALLY LACKS VEGETATION. SLOPES RANGE FROM ZERO TO TWELVE PERCENT. EXTREME DEVELOPMENT LIMITATIONS. IDEALLY SUITED FOR WATERFRONT RECREATION.

RsB RUBICON SAND:

WELL DRAINED SAND. DOMINANT VEGETATION IS BLACK OAK TREES. SLOPES RANGE FROM ZERO TO SIX PERCENT. EXPOSED AREAS SUBJECT TO EROSION. SUITABLE FOR ALL KINDS OF DEVELOPMENT INCLUDING RECREATIONAL FACILITIES.

LIMIT OF SOIL TYPE

Legend

Slopes

- 0 - 5% SLOPES — FLAT TO MODERATE SLOPES SUITABLE FOR A WIDE RANGE OF UTILIZATION.
- 5 - 12% SLOPES — MODERATE TO STEEP SLOPES SUITABLE FOR LIGHT, CONTROLLED DEVELOPMENT IN SELECT AREAS DUE TO EROSION POTENTIAL AND POTENTIALLY STEEP GRADIENTS ON CIRCULATION SYSTEMS.
- 12 - 20% SLOPES — STEEP TO SEVERE SLOPES UNSUITABLE FOR MOST USES EXCEPT UNDER CAREFULLY DEVELOPED AND MANAGED CONDITIONS DUE TO VERY HIGH EROSION POTENTIAL AND ACCESS AND CIRCULATION LIMITATIONS.
- 20% - UP SLOPES — SEVERE SLOPES UNSUITABLE FOR ALL USES OTHER THAN STAIRS OR OTHER SPECIALLY DESIGNED SELF SUPPORTING FACILITIES BECAUSE OF SEVERE EROSION POTENTIAL AND ACCESS AND CIRCULATION LIMITATIONS. SOME AREAS MAY REQUIRE SUPPLEMENTAL STABILIZATION MEASURES TO MITIGATE NATURAL EROSION.

SLOPES / SOILS INVENTORY AND ANALYSIS

0 100 200 400

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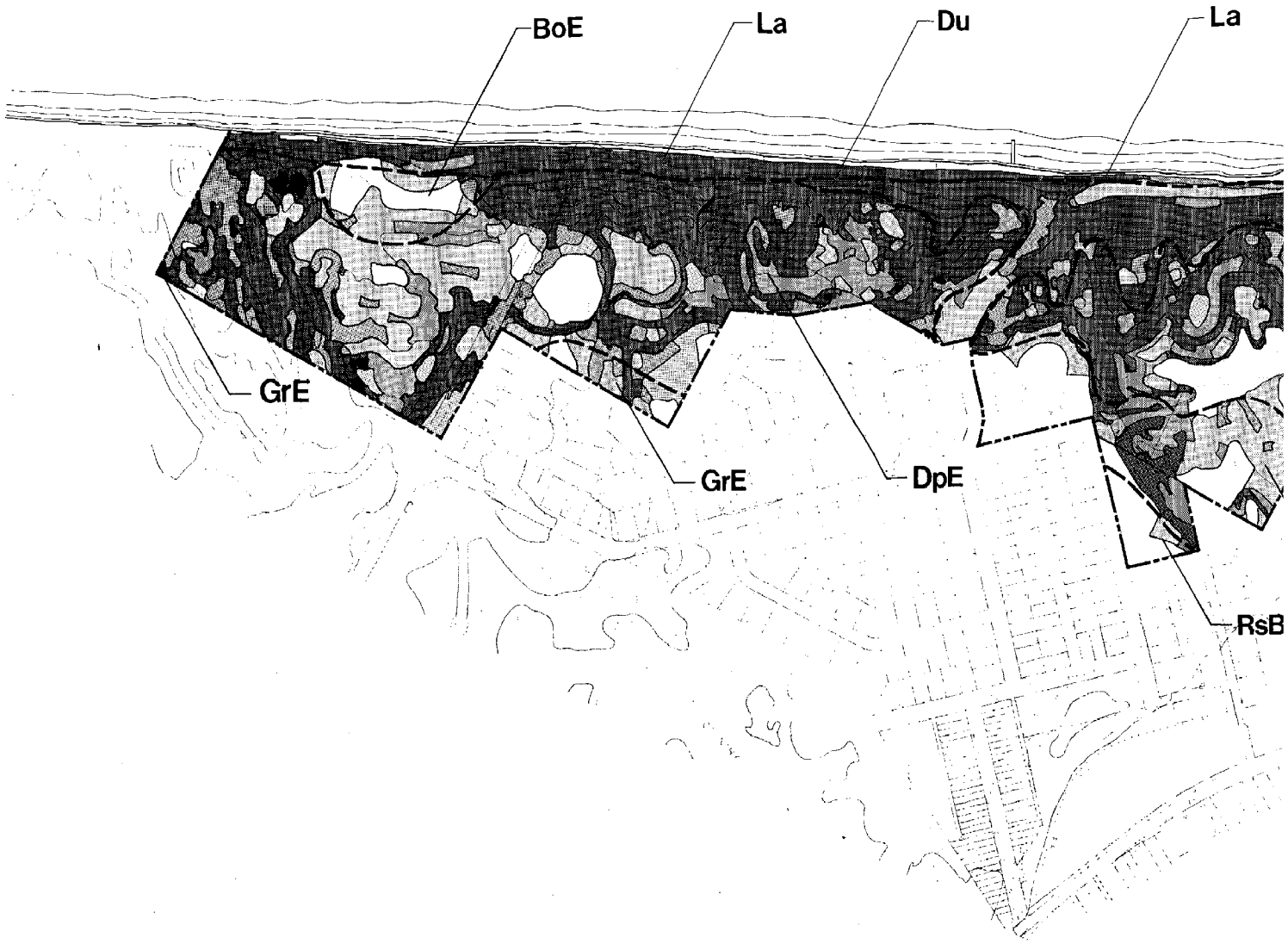

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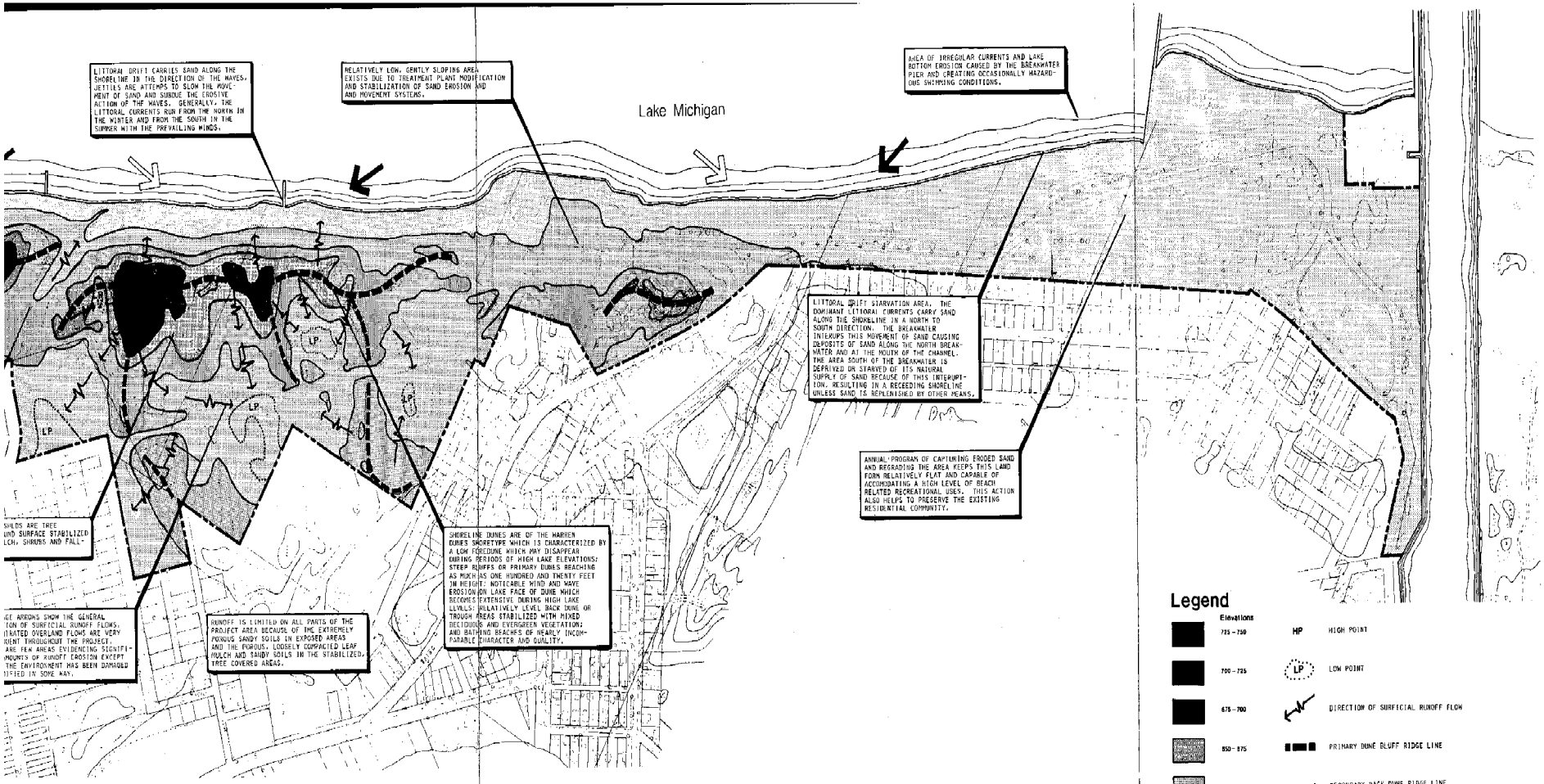
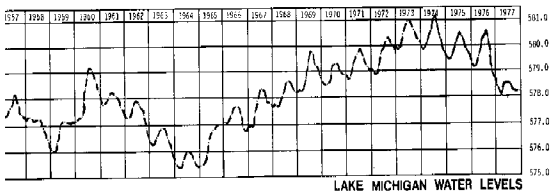
Landform/Hydrological Inventory & Analysis





LAKE MICHIGAN WATER LEVELS

Legend

Elevations

725 – 750	HP HIGH POINT
700 – 725	LP LOW POINT
675 – 700	DIRECTION OF SURFICIAL RUNOFF FLOW
650 – 675	PRIMARY DUNE BLUFF RIDGE LINE
625 – 650	SECONDARY BACK DUNE RIDGE LINE
600 – 625	DOMINANT LITTORAL DRIFT CURRENT
575 – 600	SECONDARY LITTORAL DRIFT CURRENT

LANDFORM / HYDROLOGICAL INVENTORY AND ANALYSIS

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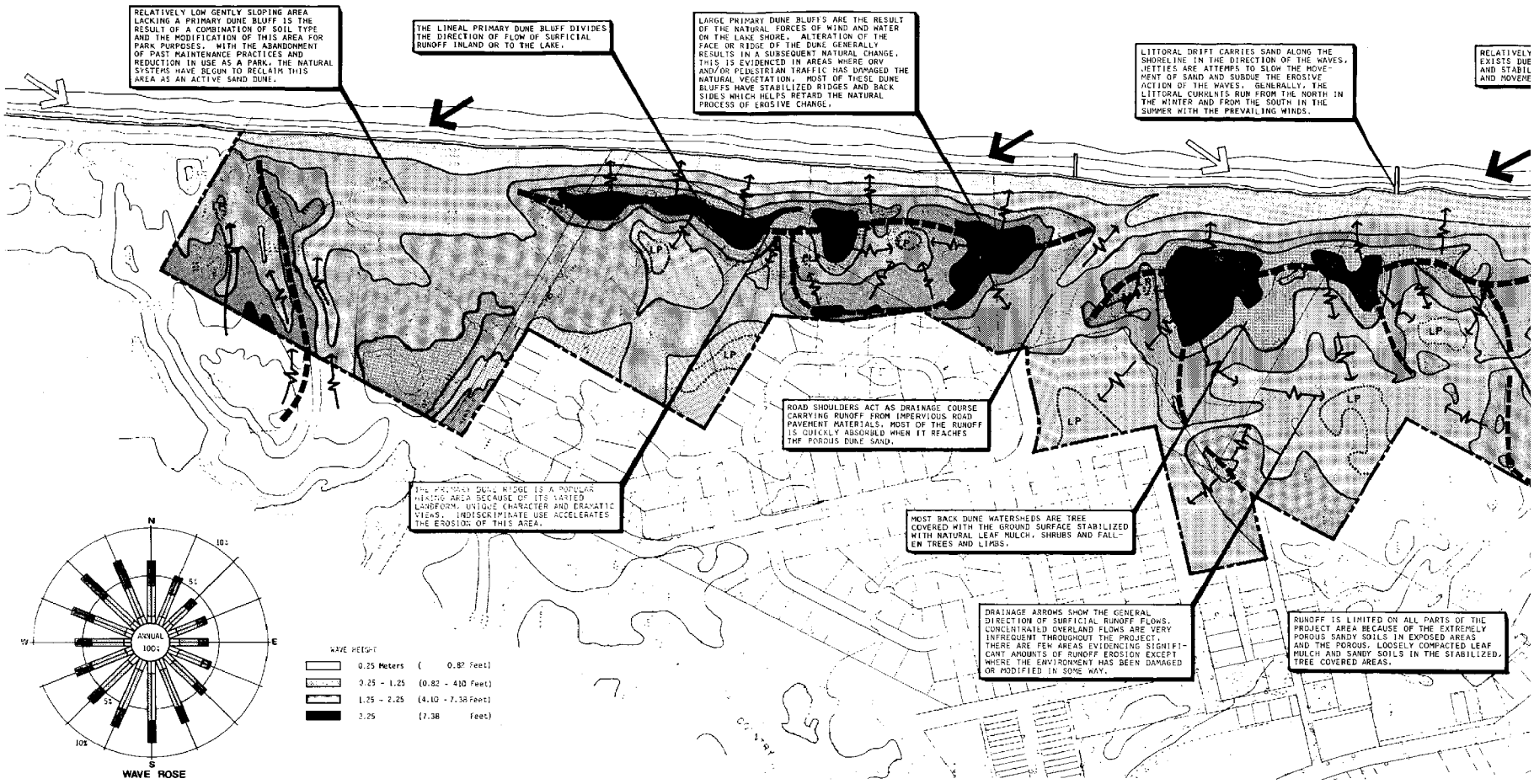
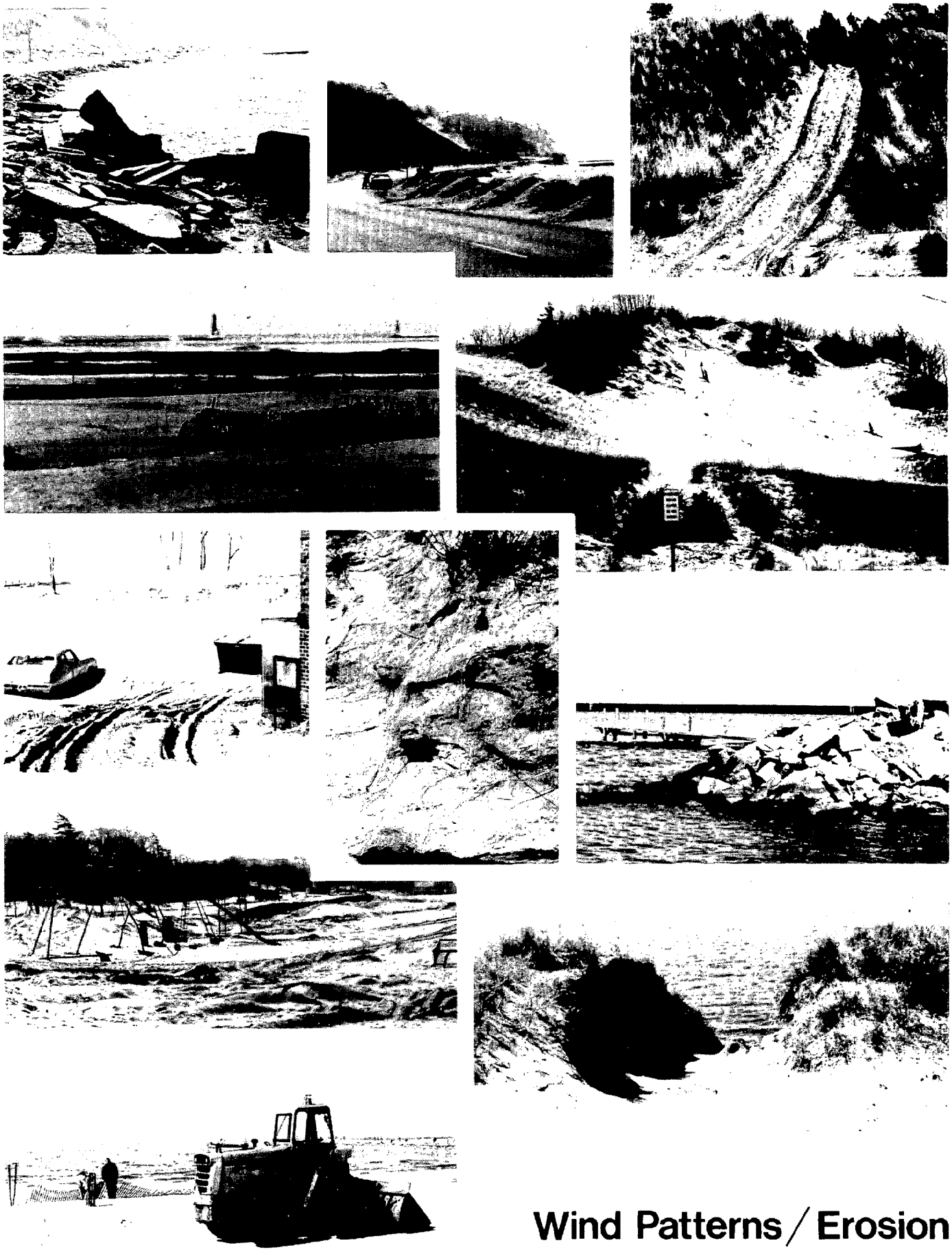
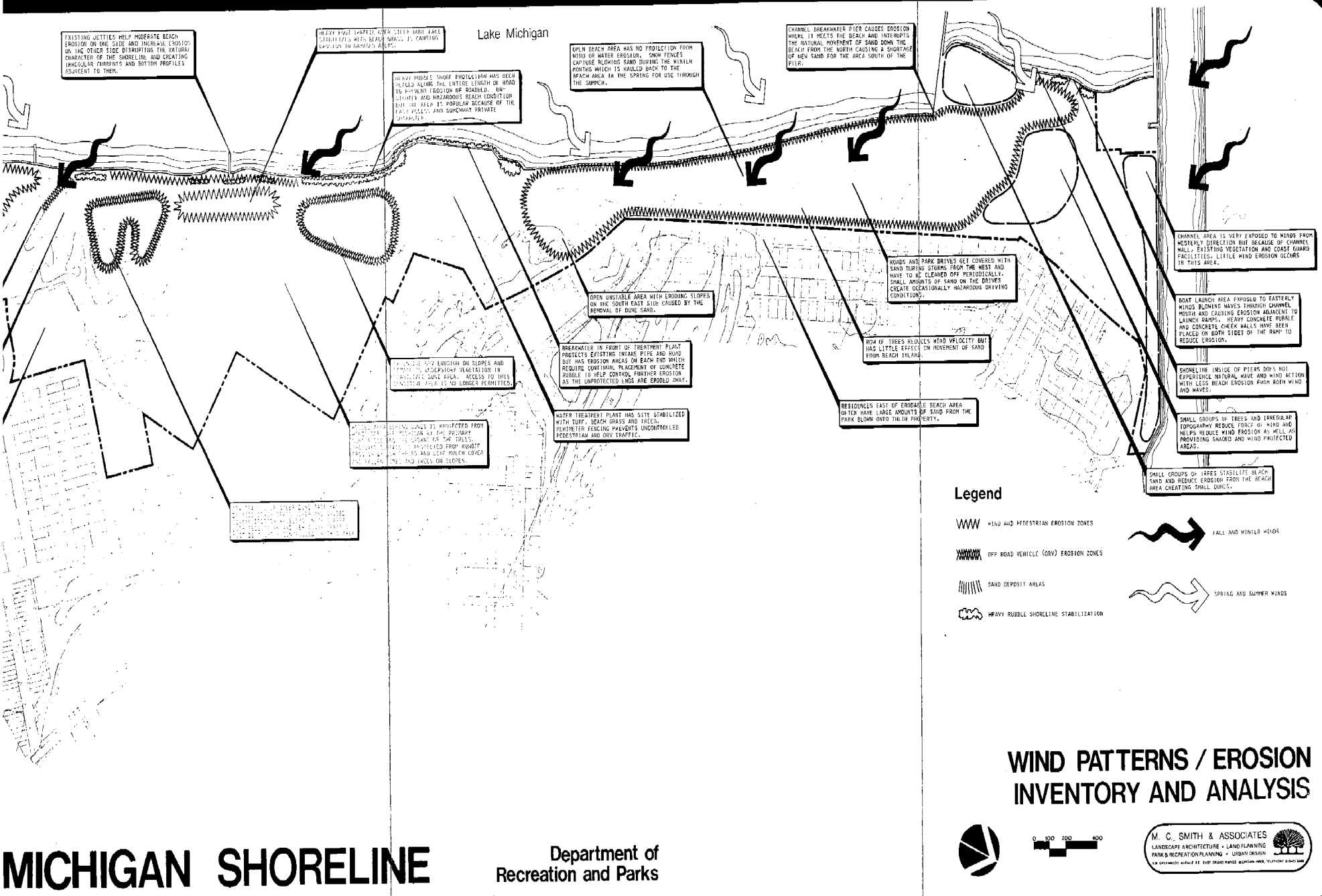


CITY OF MUSKEGON - LAKE MICHIGAN SHOR



Wind Patterns / Erosion
Inventory & Analysis



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WIND PATTERNS / EROSION INVENTORY AND ANALYSIS

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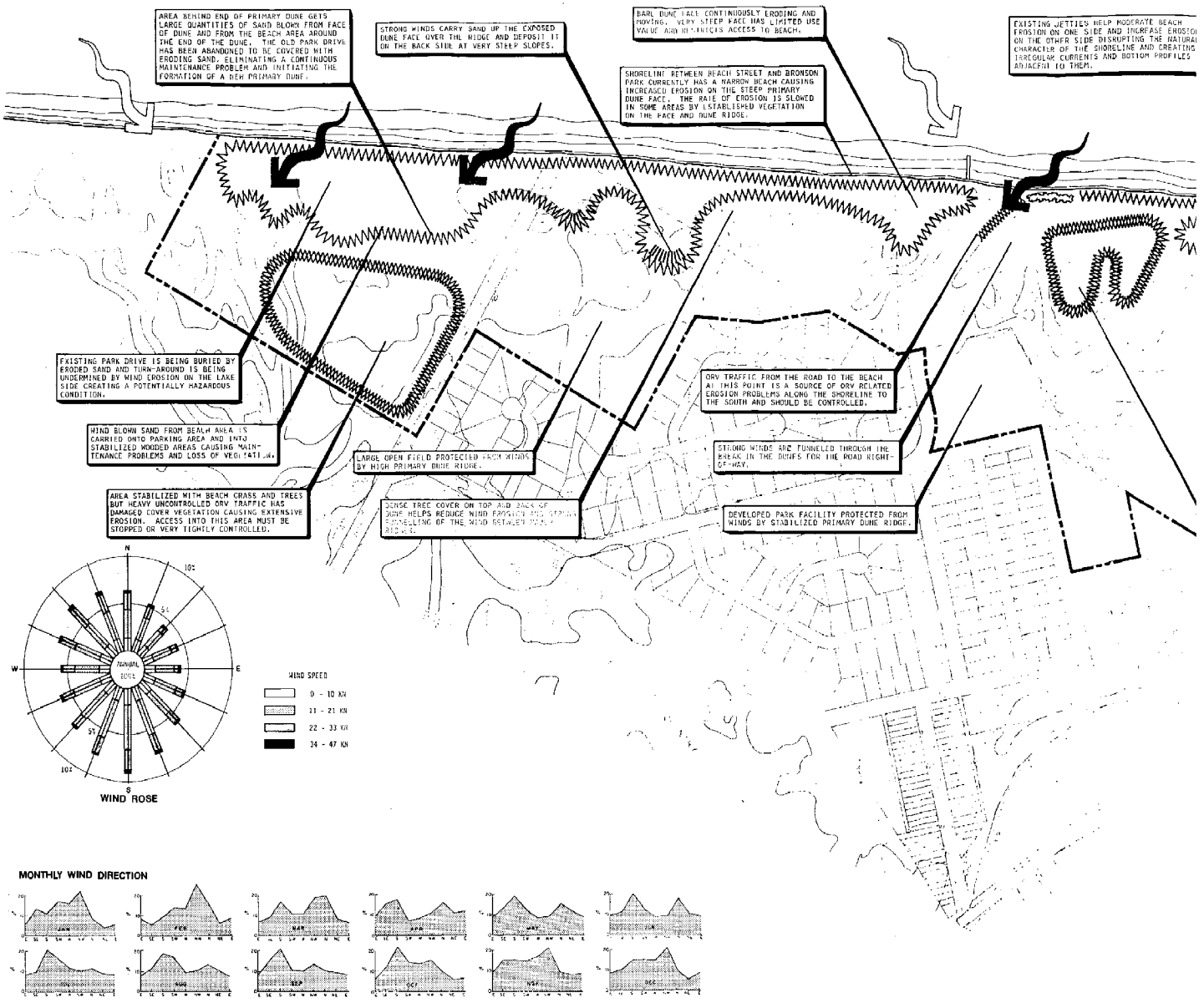

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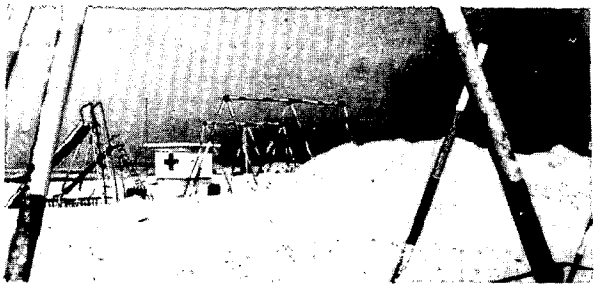
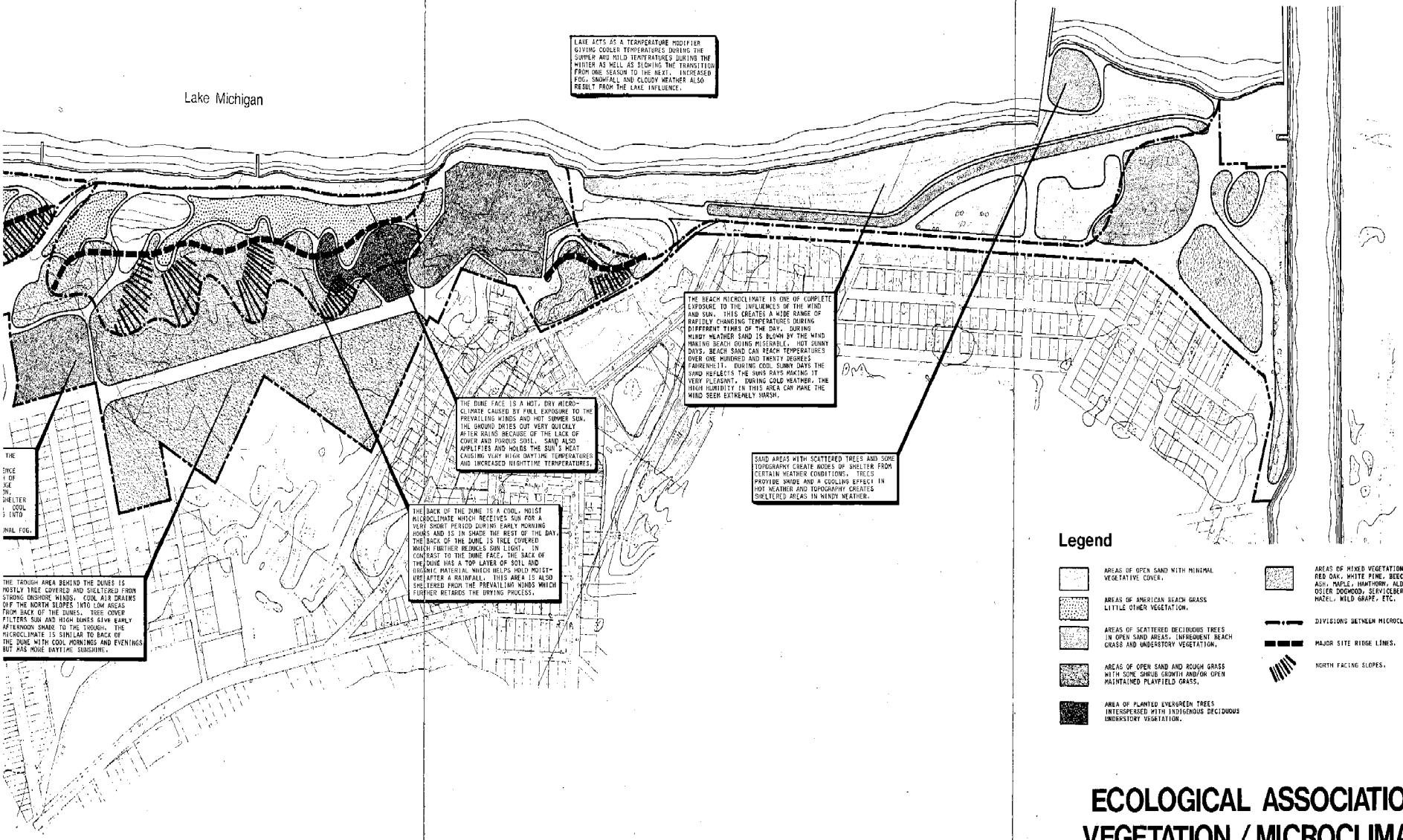


Ecological Association Vegetation/Microclimates Inventory & Analysis



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ECOLOGICAL ASSOCIATIONS / VEGETATION / MICROCLIMATES INVENTORY AND ANALYSIS

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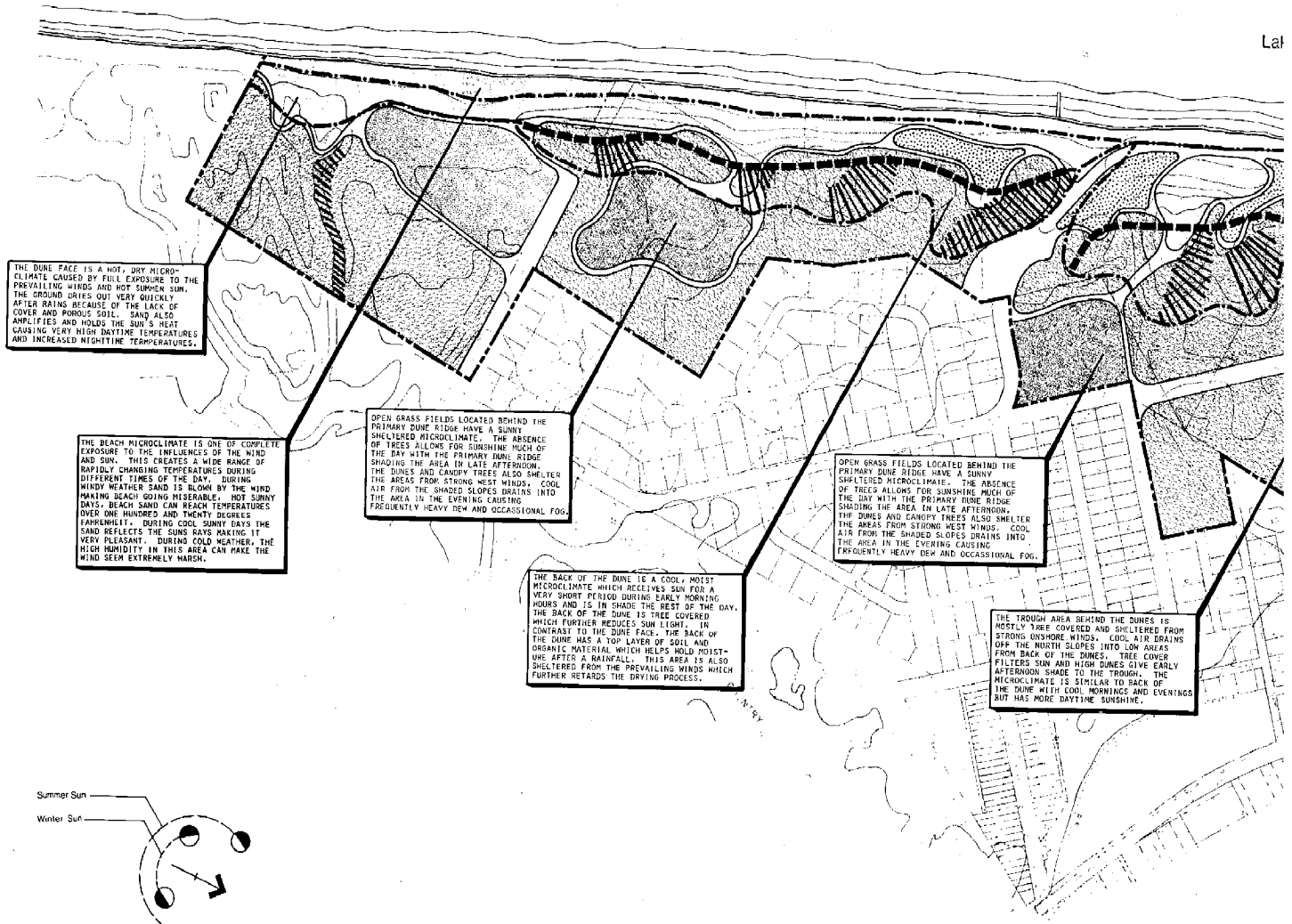


Sun Diagram

CITY OF MUSKEGON - LAKE MICHIGAN

Master Land Use Plan

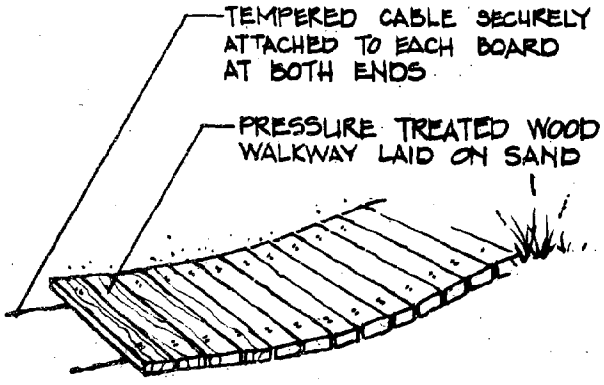
Based upon the Environmental Inventory and Analysis and input by public officials and interested citizens a Preliminary Concept Plan was developed for the shoreline. Based upon public and official reviews of this plan the Master Land Use Plan was developed.

As previously stated this Plan is intended to be utilized as a guideline for all future public and private improvements, development and management within the City's shoreline area. This plan provides for the structured utilization of this resource in a manner that will benefit the broadest range of interest while still conserving, protecting, and respecting the natural features of the area.

The Master Land Use Plan folds out following this section. The approximate scale of this reduced plan is 1" equals 435'. A plan at the scale of 1" equals 200' is available for review. For the purpose of plan discussion the plan has been divided into the following sections: Bronson Park Area; Beach Street Shoreline Access; Beachwood Neighborhood Park; Beach Street Shoreline and Back Dune Area; Water Filtration Plant Development Area; Pere Marquette Park Area; Channel Frontage Area.

BRONSON PARK AREA

Bronson Park is proposed to be devoted to the utilization, enjoyment and experience of the natural shoreline and dune areas. Access will be improved with a traffic circle at the intersection of Beach Street and Sherman Boulevard. The access drive will be off from this circle with Sherman's residential access off from the park drive. A control gate will be placed past the residential access point. Parking will be divided into two main sections with a total of 200 spaces. The north parking will serve the beach and a series of trails through the back dune area. Nature information and shelters are proposed in the North Bronson back dune area. Picnic facilities with



REMOVABLE BOARDWALK

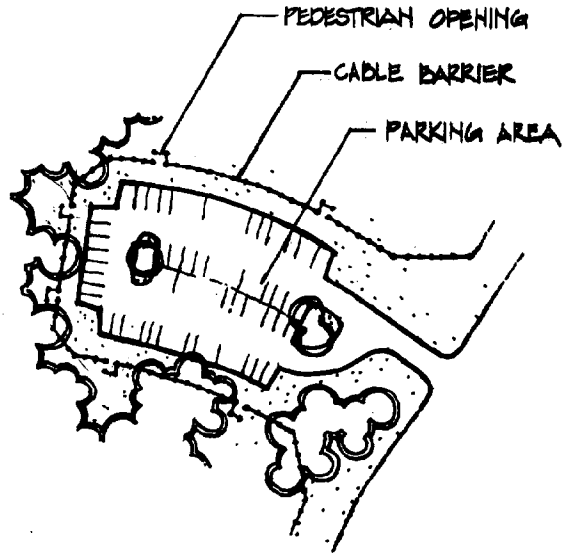
associated shelters, restrooms and play areas are proposed adjacent to the parking area. A Maintenance Center is proposed in this area which will serve the entire southern shoreline area. Beach access will be provided by wood dune cross-over steps. Where the trails pass through sensitive areas they will be of either on grade or elevated boardwalk construction.

In the stable back dune southern area of Bronson Park, a complex of 100 rustic rental cottages is proposed. These rental units could be privately developed and managed. Construction will be rustic with units clustered in fours on elevated platforms with boardwalks connecting each cluster to protect the naturally stabilized soil. Three restroom/bathhouses will serve the complex. A central concession and dining facility will act as the administrative center. It is intended that this complex provide a wide range of individuals and groups with the experience of staying on the shoreline in a very natural setting with very little disturbance to the environment. The lease of the land for

RUSTIC COTTAGE CLUSTER

this complex could provide revenues for improvements and maintenance of the other areas of Bronson Park.

All parking and access drives in the park will be surrounded with low level bollard and cable fences to prevent ORV access. Revegetation and stabilization programs will continue.



CABLE BARRIER AROUND PARKING

BEACH STREET SHORELINE ACCESS

The Master Plan proposes that utimately Beach Street along the shore be restricted to pedestrian and emergency vehicles only. Beach Street is proposed to terminate with a turn-around and drop-off above the shore. An observation platform and steps will be provided to the beach. A paved walkway will connect to a parking area off Beach Street with 40 spaces.

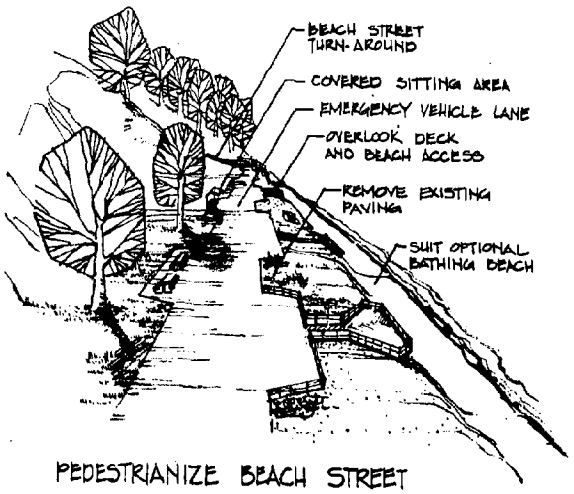
PLAY AREA

BEACHWOOD NEIGHBORHOOD PARK

Beachwood Neighborhood Park will be improved to better serve the adjacent neighborhood. The play area will be relocated away from the corner and provided with new equipment and suitable surfacing. The softball field will be relocated with new backstop, fencing and scorers/restroom building. A small parking area will be provided. The park will have new landscaping, lighting and signage.

BEACH STREET SHORELINE & BACK DUNE AREA

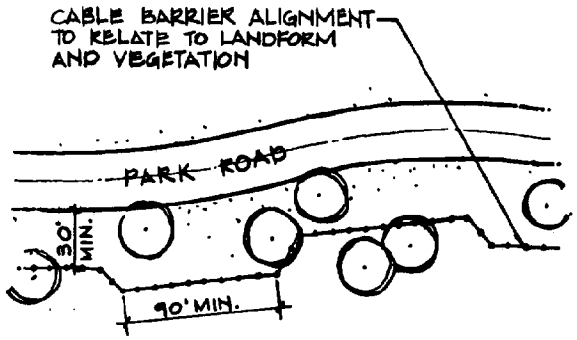
The Master Plan proposes to restrict the traffic along the shoreline on Beach Street to only pedestrians, bicycles and emergency vehicles. This will allow for a much higher level of beach utilization and eliminate the continuous battle to prevent water levels and wave action from destroying the road which was essentially constructed on the foredune ridge.



PEDESTRIANIZE BEACH STREET

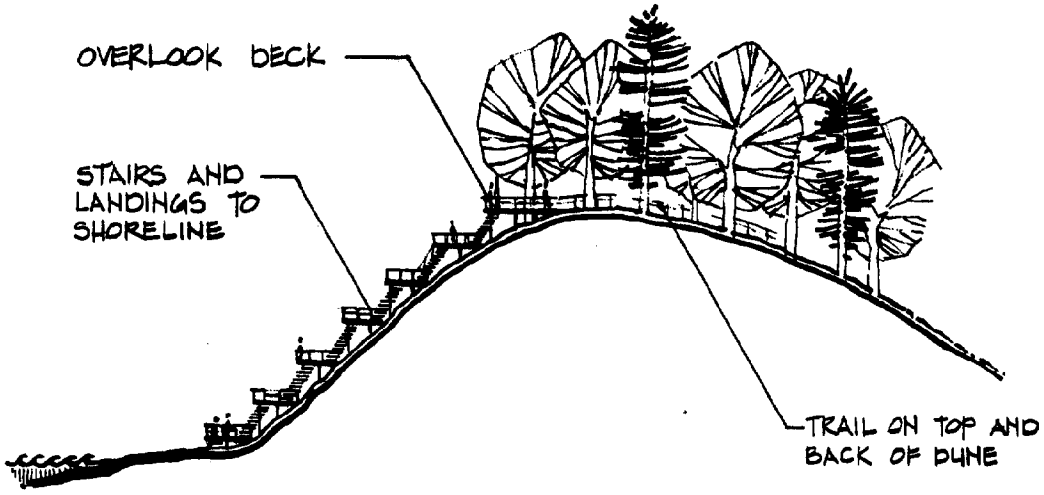
A new connecting drive will be provided in the area where the water line from the filtration plant cuts through the woods. This drive will curve past the back of the filtration plant and connect to Lake Shore Drive.

Three parking areas off from the drive will provide 190 parking spaces for beach use via pathways and wood step dune cross-over structures for beach access. The drive and all parking areas will have low level bollard and cable fencing to prevent ORV intrusions into the back dune area. Picnic areas will be provided within the back dune area with associated facilities.

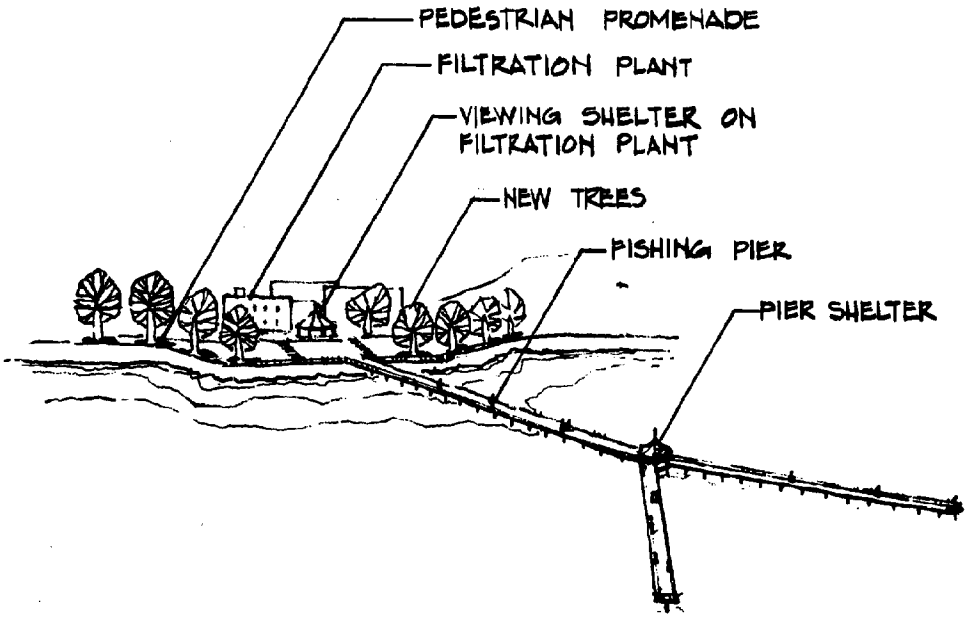


ROADSIDE CABLE BARRIER

The back dune trail system will provide an opportunity to observe this most attractive portion of the shoreline. At slopes and sensitive areas the trails will utilize steps and either elevated or on grade boardwalk sections. Overlook decks will provide magnificant views of the lake from the higher dune areas. Revegetation and stabilization programs will continue in this area.



DUNE CROSSOVER SECTION



FISHING PIER AT FILTRATION PLANT

WATER FILTRATION PLANT DEVELOPMENT AREA

The Water Filtration Plant has a significant environmental and visual impact on the shoreline. The Master Land Use Plan proposes an intense level of private development with associated public facilities within this area. In the area north of the filtration plant the Master Plan proposes a high rise structure which would be developed with a multi-level parking structure. The top of which would be developed as a roof garden with a pool, tennis courts, and landscaping. At the roof garden level the high rise would have retail and office space; the upper floors would be developed as residential condominium units. This structure would be approximately 15 stories high and have approximately 300 units, with magnificant Lake Michigan views.

The parking structure would provide public parking for the adjacent beach areas and for the public area developed in front of the filtration plant. With the elimination of Beach Street in front of the filtration plant this area will be developed as a pedestrian viewing terrace with a fishing pier projecting out into the lake.

Across Lake Shore Drive from the high rise the Master Plan Proposed a hotel which will be connected to the parking structure via a pedestrian bridge. Drop-off and services access will be provided to the hotel via Woodward Street. This street will also provide a controled emergency access route.

This complex will provide another dynamic component to the utilization of the shoreline. A long term lease of the land for this complex could provide the City with funds for a majority of the Master Plans proposed public improvements and developments as well as funds for continued management and maintenance of the shoreline.

PERE MARQUETTE PARK AREA

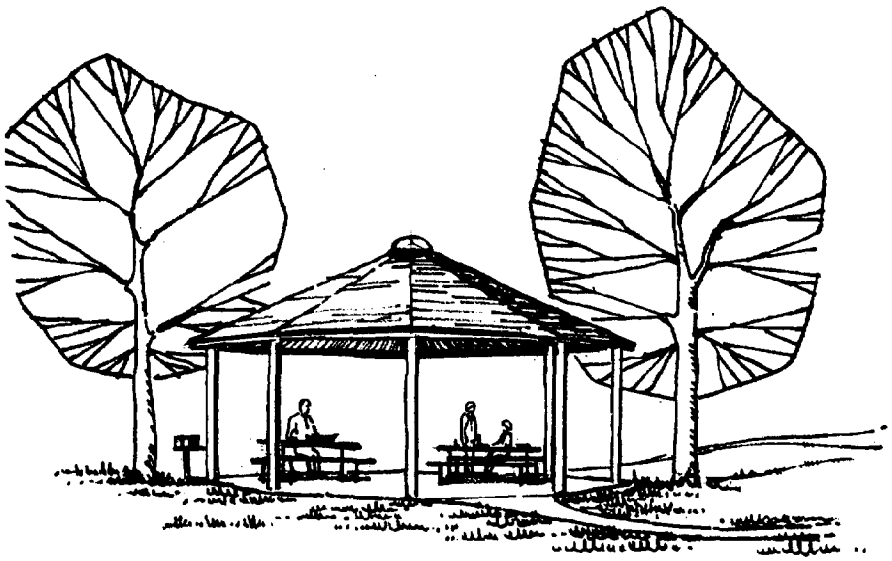
The recreational activities at Pere Marquette Park will continue as today but with significant improvements. A primary improvement will be in the vehicular circulation and parking system.

To slow and control traffic, traffic circles will be constructed at the point where Lake Shore Drive comes down to the beach and at Ohio Street. Both of these points will help control traffic speed and the circle at Ohio Street will provide a major access point into the Peninsula Park, should this area ever develop.

Parking for Pere Marquette Park and its activities will be provided in three major parking areas with a total of 360 spaces. Three access points will control all traffic and the parking areas to be open. A drive to an improved launch ramp and a frontage drive will provide internal vehicular circulation between the parking areas.

The existing restaurant will remain and be encouraged to develop a series of outdoor dining decks on the rise west of the building; which will be provided access via boardwalks.

A new bathhouse will be constructed for beach users. At the south end of the parking areas provision will be made for concession vehicle hook-ups. A shade structure with observation decks and dining tables and a restroom building will be provided here. A landscaped promenade walkway with benches will run along the entire beach to the condonimium complex connecting all activities.

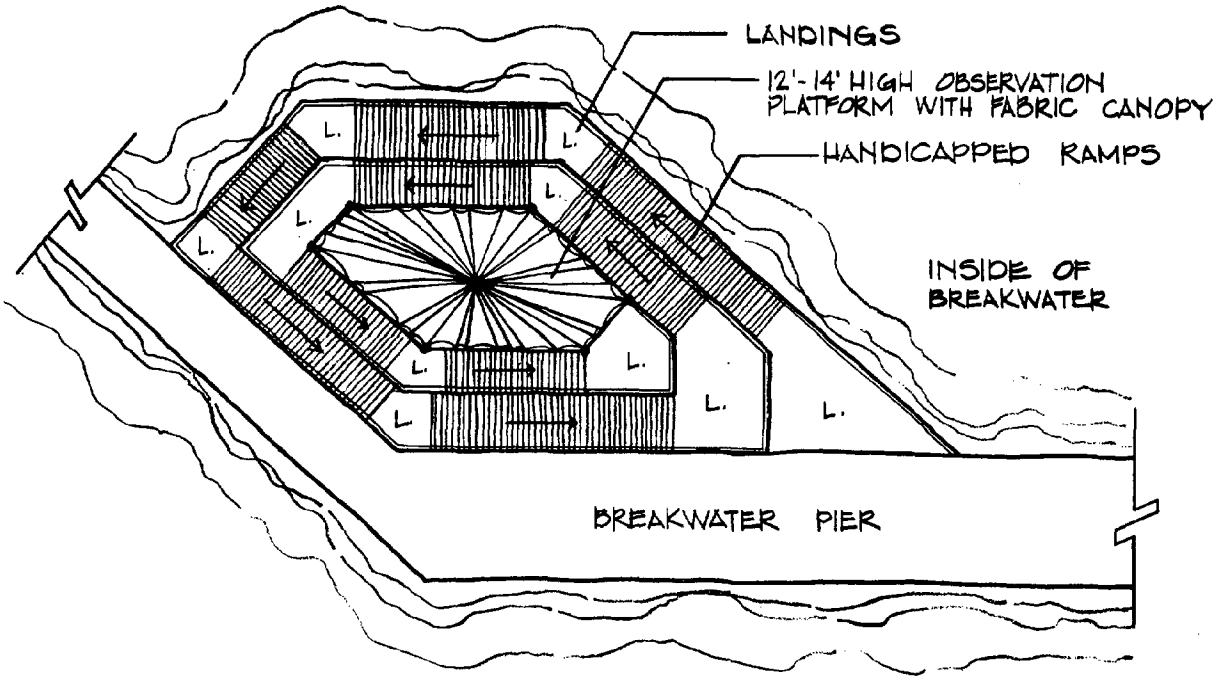


PICNIC SHELTER

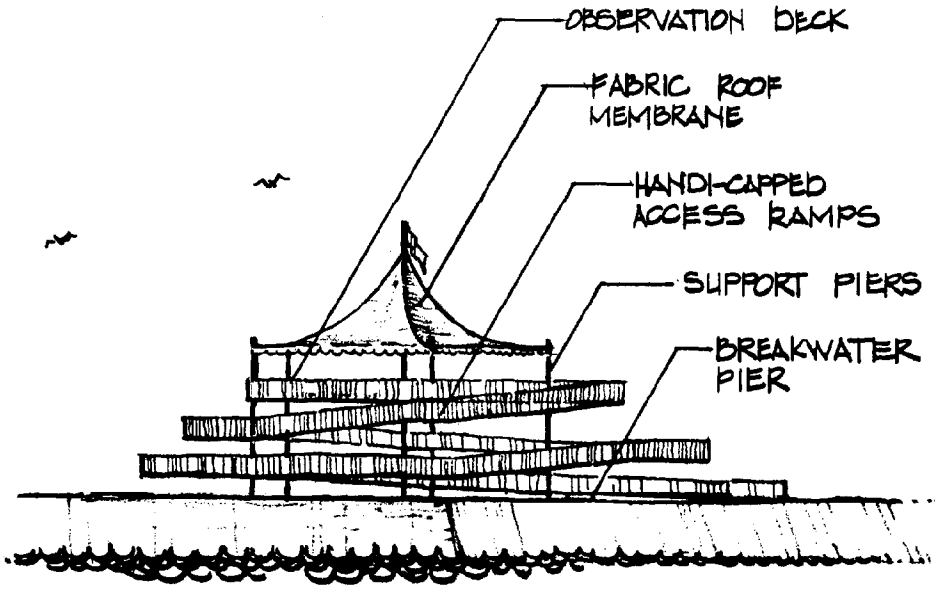
A conference/reception building is proposed in the park. This land area would be leased for private development. The developers would be required to construct one of the major parking areas, provide picnic shelters, childrens play area, and a beach restroom building for the opportunity to develop this business. This developement would provide revenues which could be used for park development and maintenance as well as expanding the activities and utilization of a currently non utilized portion of Pere Marquette Park.

Additional proposed private development which could produce revenues for Pere Marquette Park improvements include provision in the Master Plan for a building housing a variety of seasonal shops, artist studios, and speciality shops. This mini-mall would front on an Entertainment Area which, in season, would have special playground facilities, rides and amusements.

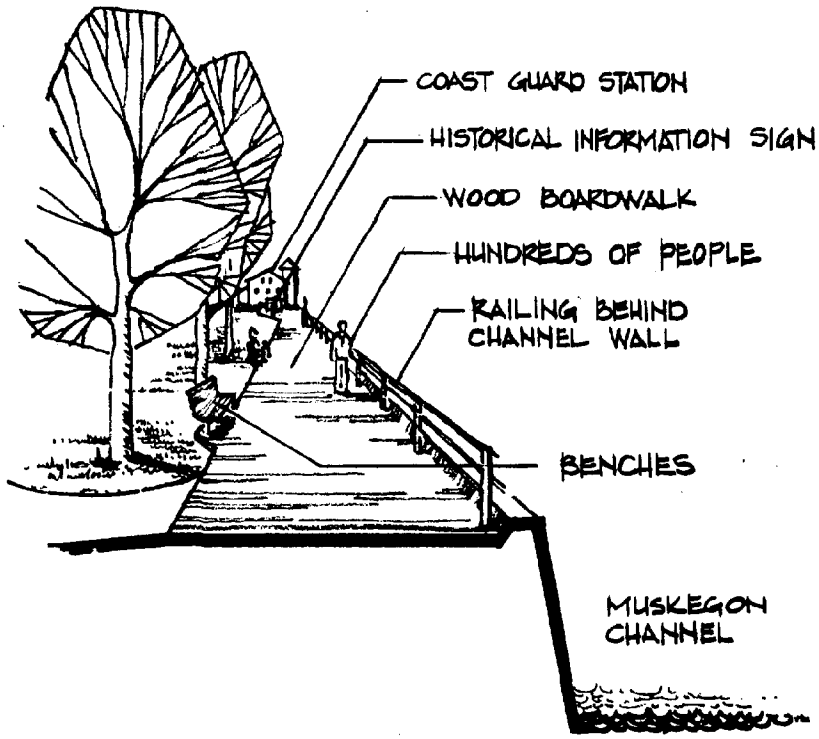
Other park improvements include the construction of ramps and a paved walkway which will provide beach access and a water contact zone for the handicapped. At the writing of this report this element is under construction with financial assistance from the Michigan Coastal Zone Program.



On the existing breakwater pier the Master Plan proposes an elevated observation platform which also would be totally accessible to the handicapped.



BREAKWATER PIER OBSERVATION STRUCTURE

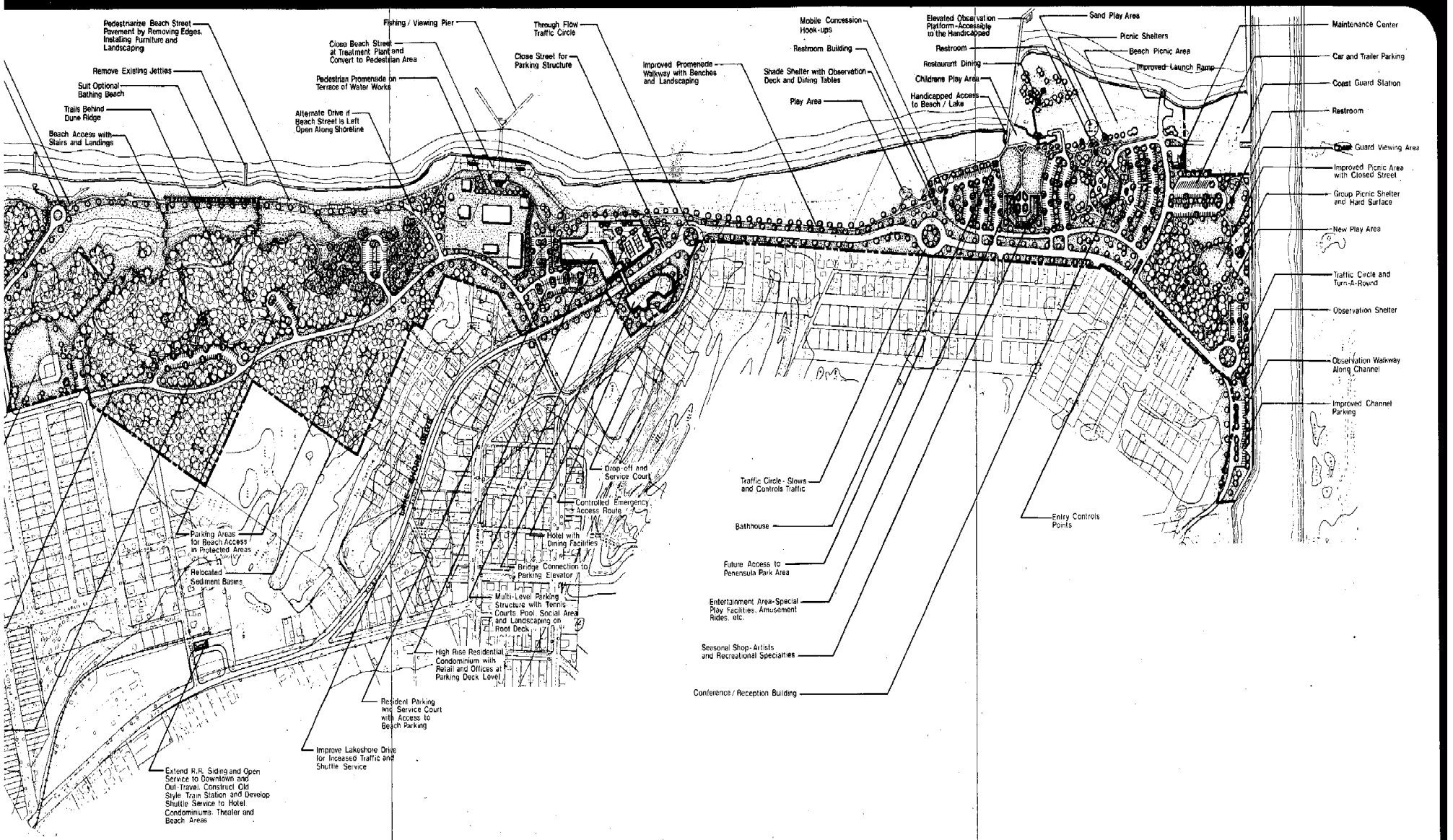


CHANNEL PROMENADE

CHANNEL FRONTAGE AREA

The primary goal of the Master Plan for this area is the expansion of the picnic area to the channel and provisions for easy access to the channel for viewing and fishing. The existing circulation dirve north and west of the current picnic area will be removed to allow for the expansion of the picnic area to the channel. A group picnic shelter in a paved area will be provided at the channel. An ovservation walkway with benches, railings, lighting and landscaping will be constructed along the channel wall. An observation shelter will be located at the east end of the walkway. A Coast Guard viewing area with intrepretive signage will be provided at the west end of the walkway. 155 parking spaces are provided in 3 parking areas to serve picnickers, viewers, and fishermen. A new restroom building will be provided along with improving the existing building. A new childrens play area will be provided and the entire area will be landscaped. A Maintenance Center will be developed adjacent to the Coast Guard property which will serve the entire Pere Marquette Park and Channel Frontage Areas.

The Master Land Use Plan folds out following this section which illustrates and details the plan elements and concepts discussed in this text.



MASTER LAND USE PLAN

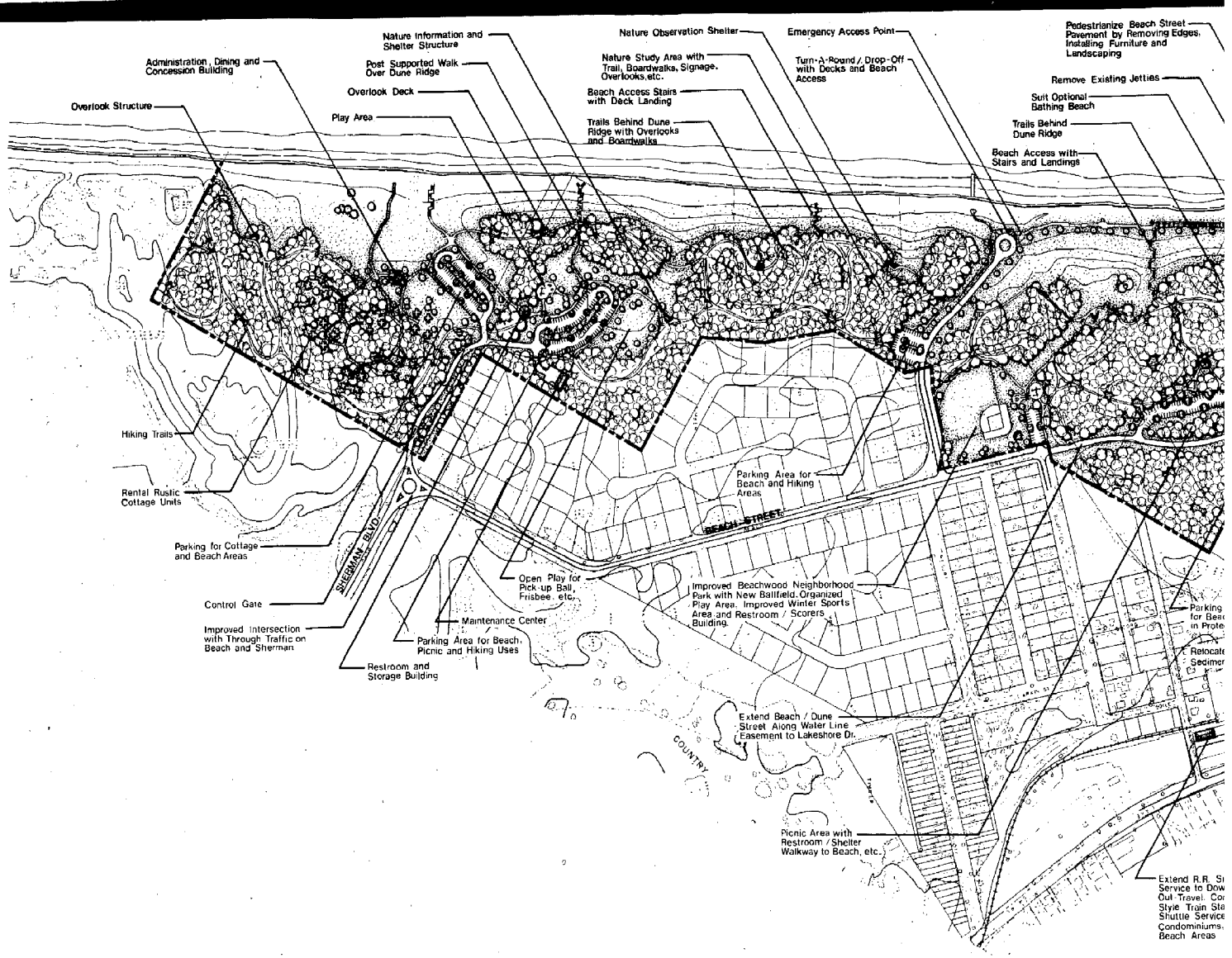
MICHIGAN SHORELINE

Department of Recreation and Parks

0 100 200 400

SCALE 1" = 200'

M. C. SMITH & ASSOCIATES
LANDSCAPE ARCHITECTURE • LAND PLANNING
PARK & RECREATION PLANNING • URBAN DESIGN

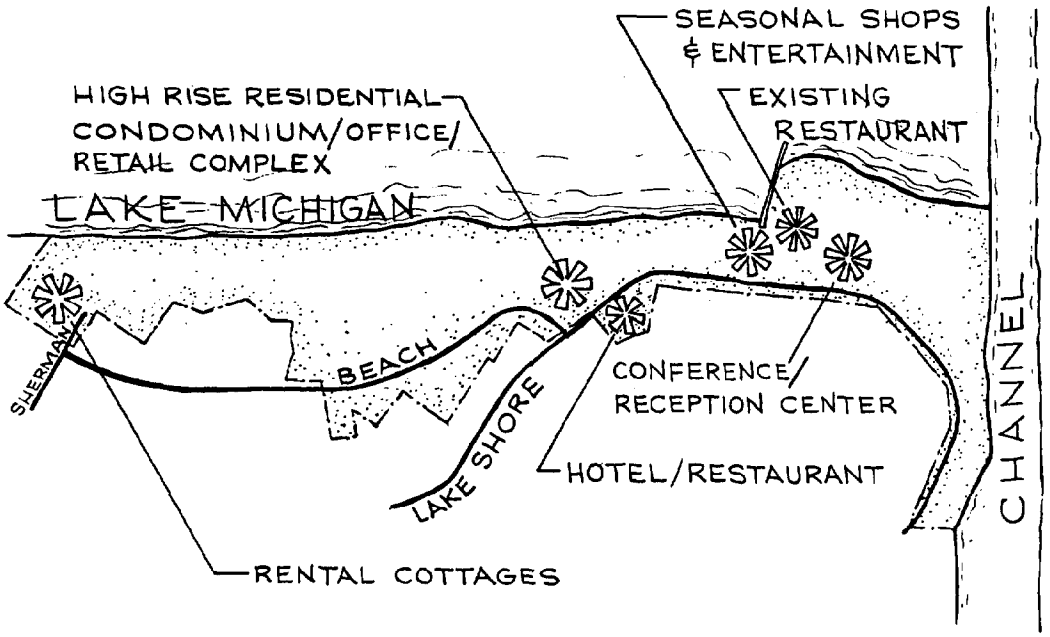


CITY OF MUSKEGON - LAKE MICHIGAN

Development Process

The implementation of the Master Land Use Plan will require many years and the continued support of community leaders and public officials. Although the planning process and plans have been reviewed and given technical approval the plan must still receive formal approvals of the Recreation and Parks Board, the Planning Commission and the City Commission. Upon these formal approvals the plan will be established as the guide for all future development, utilization and management of the Cities Shoreline. But the most important ingredient in the implementation process is the financing of the various improvements and the continued maintenance and management of the improvements and the natural systems of the shoreline.

As previously indicated the Master Land Use Plan proposes several appropriate locations for the opportunity of private development. Although this private development could provide significant revenues for public improvements, a certain amount of public improvements and maintenance will have to come from public sources. The financing for these public improvements may utilize funds from the following sources: Michigan Coastal Management Funds for low cost construction projects;



PRIVATE DEVELOPMENT OPPORTUNITIES

Herigage Conservation and Recreation Services Land and Water Conservation Funds; Community Development Block Grants; The Urban Park and Recreation Recovery Program(?); Private Foundations; and Community Business and Industry Sources.

Most of these sources require matching funds of one degree or another and the City will have to employ creative financial structuring to meet these matches; such as the dune grass donation from the Soil Conservation District in the current Coastal Zone Management Program low cost project.

The opportunity for revenues from private development land leases or other arrangements holds the potential of making the entire Master Plan a reality.

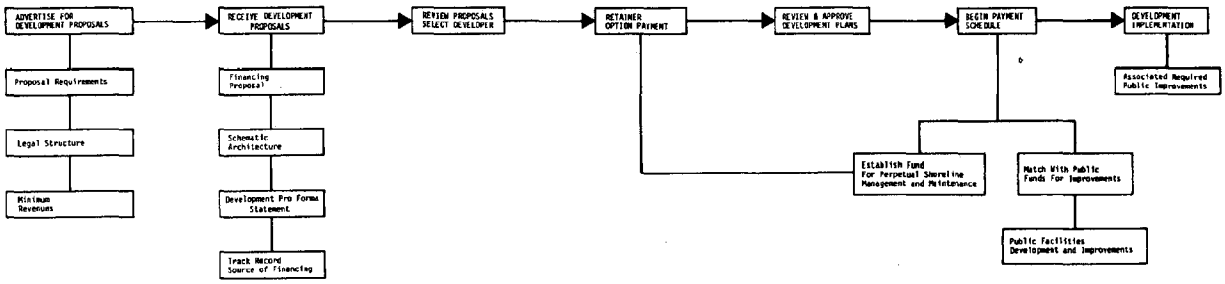
Private development should be required to provide public improvements along with their development (see chart). The proposed private development, as planned, will add to the public utilization of the shoreline and enhance the area to a significant degree.

Upon formal adoption of the Master Land Use Plan the City should take official action to promote and advertise for proposals for the specific

PRIVATE DEVELOPMENT OPPORTUNITIES	ASSOCIATED REQUIRED PUBLIC IMPROVEMENTS
A. Rental Cottage Units in Bronson Park	Improved Access Drive Public Parking Area Beach Access Steps and Walkways
B. High Rise Residential Condominium/ Office/Retail Complex	Parking Structure Viewing Terrace in Front of Filtration Plant Fishing/Viewing Pier Adjacent Street Improvements
C. Conference/Reception Building in Pere Marquette Park	New Access Drive to Launch Ramp Public Parking Area Picnic Shelters and Restroom Building Childrens Play Area
D. Seasonal Shops/Entertainment Center	Public Parking Area Paved Walkways Park Landscaping

development segments. A specific process for reviewing development proposals should be established as indicated in the following diagram.

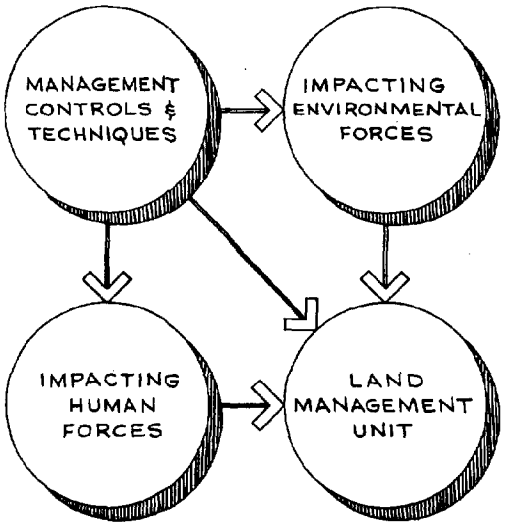
If matching funds can be acquired the City should apply for Land and Water Conservation Funds and Coastal Zone Low Cost Construction Funds for public improvements. Two areas of highest priority would be: improvements and reopening of Bronson Park; and improvements and development of the Channel Frontage Area. The last section of this report provides order-of-magnitude cost projections for the proposed public improvements.



PRIVATE DEVELOPMENT PROCESS DIAGRAM

Land Management Programs

Both environmental and human forces have a significant impact on the natural systems of the City's Shoreline. By utilizing a series of control and stabilization techniques the forces which act upon this valuable resource can be mitigated.



LAND MANAGEMENT RELATIONSHIPS

If measures are taken to control the human impacts and assist in the control of the environmental forces; then the shoreline can be utilized to a high level with little environmental degradation.

The central goal of this management program is protect the shoreline environment so that users can continue to utilize and enjoy the varying natural situations without impacting on these natural systems by their presence.

Land Management Programs must be implemented in concert with the implementation of Master Plan elements. Currently one of the most significant impacts on the fragile dune ecosystem has been the intrusion by ORV's and even human foot traffic in many locations. The Cities recent programs of stricter ordinances, barricading ORV access points and the closing of Bronson Park have resulted in noticable regeneration of the environment in many locations.

The current implementation of a Coastal Management Program supported dune grass planting program will result in the stabilization of significant areas which are currently open to wind blown erosion. Revegetation programs should continue in all areas that do not have vegetative cover and that can be effectively planted. Whenever areas become open to the elements they should be

replanted immediately to prevent additional erosion. The following list of plant materials are suggested as well as American Beach Grass (Ammophila breviligulata) which is one of the most effective froms of stabilizing open sand areas.

SHRUBS:

Autumn Olive
Elaeagnus umbellata

Bearberry
Arctostaphylus uva-ursi

Chokecherry
Prunus virginiana

Gray Dogwood
Cornus racemosa

Red-Osier Dogwood
Cornus stolonifera

Wild Grape
Vitis riparia

Common Juniper
Juniperus communis

Staghorn Sumac
Rhus typhina

Sandbar Willow
Salix interior

Heartleaved Willow
Salix cordata

TREES:

Cottonwood
Populus deltoides

Black Locust
Robinia pseudo-acacia

Silver Maple
Acer saccharinum

Willow
Salix spp.

Red Maple
Acer rubrum

Box Elder
Acer negundo

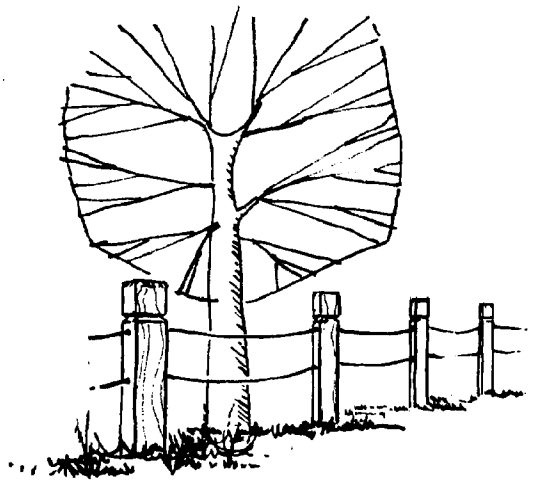
USE CONTROL SIGN

With future utilization of the shoreline, management measures must be taken to control and halt all ORV intrusion. All parking areas and roads which are adjacent to or run through the shoreline areas should have bollard post and cable barriers along the entire lengths to prevent ORV access. A warning signage program should be implemented to make the restrictions on ORV's clear to all users.

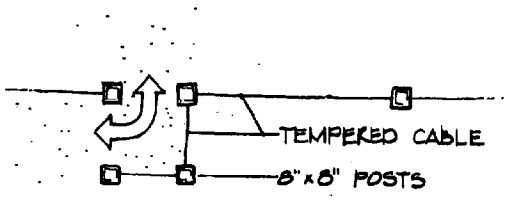
Access points should be provided in the bollard and cable barriers for pedestrians.

Pedestrian trail systems should be provided for access to all areas. Whenever trails pass over the dunes or through steep areas boardwalks and steps should be utilized. Boardwalks may be on grade or elevated in areas of very sensitive ecosystems.

Specific attention should be given to the management of the Soils/Slopes and Vegetation Land Management Units. As well as these natural units the developed public improvements must be maintained and managed to protect these public investments. The following tables indicate some of the management and control techniques to be applied to these management units.



POST AND CABLE BARRIER



O.R.V. BARRIER WITH PEDESTRIAN OPENING

MANAGEMENT UNIT: SOILS/SLOPES

IMPACTING ENVIRONMENTAL FORCES:	MANAGEMENT CONTROLS AND TECHNIQUES
Wind Blown Erosion	Surface Stabilization Plantings Wind Screen Plantings Sand Fencing to Break Wind Patterns Seasonal Regrading of High Use Areas
Water Related Erosion - Land	Surface Plantings to Retard Water Movement
Water Related Erosion - Shore	No Development in Hazard Areas Revetments and Bulkhead Only in Critical Areas
IMPACTING HUMAN FORCES:	
ORV and Motorcycle Damage Resulting in Wind and Water Erosion	Barriers and Fences Stringent Ordinances Warning Signs - Policing
Foot Traffic Resulting in Wind and Water Erosion	Provide Trails, Boardwalks and Steps for Dunes Cross-overs and Steep Areas

MANAGEMENT UNIT: VEGETATION

IMPACTING ENVIRONMENTAL FORCES:	MANAGEMENT CONTROLS AND TECHNIQUES
Migrating Dunes/Blow Outs Covering Existing Vegetation	Replant Face of Blows to Prevent Additional Movement
Natural Death and Wind Destruction	Replant All Blow Overs to Prevent Erosion - Utilize Indiginous Material When Possible
Undercutting of Vegetation Along Dune Crest at Bluffs	Plant Face of Bluff and Below Undercutting
IMPACTING HUMAN FORCES:	
ORV and Motorcycle Destruction	Provide Barrier and Fences Replant Destruction
Foot Traffic Damage	Provide Trails, Boardwalks and Steps for Dune Cross-overs and Steep Areas. Replant Damaged Areas.

MANAGEMENT UNIT: DEVELOPED PUBLIC IMPROVEMENTS

IMPACTING ENVIRONMENTAL FORCES:	MANAGEMENT CONTROLS AND TECHNIQUES
General Weathering: Wind, Sun, Rain and Seasonal Changes	Utilize Natural Materials Avoid Paint- Stain to Protect Surfaces Exposed to the Elements Continuous Preventive Maintenance
IMPACTING HUMAN FORCES:	
Wear Vandalism	Correct All Wear and Vandalism Problems Immediately Provide Continuous Maintenance Provide Security

In respect to the management of the impact that high water and wave action have on the shoreline it is suggested that stabilization measures only be utilized in areas of very high use or value, such as in front of the Water Filtration Plant. In general unless shore stabilization techniques are very extensive their value is only localized with negetative impacts to support the improved areas.

The extensive seasonal management of the Pere Marquette Beach should continue in its present manner for this seasonal expenditure provides a great deal of recreation at a very low user cost. In the future, when any master plan improvements are proposed the cost of maintenance and managment should be evaluated and budgeted as part of the development program.

Cost Projections

Based upon the Master Land Use Plan the following are order-of-magnitude cost projections for the public improvements. The private development portions and the required associated public improvements are not included. These cost areas are divided into the same sections as was the Master Plan. Professional site engineering and architectural fees have not been included in the cost projections.

BRONSON PARK AREA:

Clean-Up Site and Site Preparation	$8,500.00
Bituminous Drive and Parking Area	$26,680.00
2 Overlook Structures	$14,000.00
Trails	$22,890.00
Open Play for Pick-Up Ball, etc.	$2,250.00
Play Area	$14,500.00
Nature Information and Shelter Structure	$15,600.00
2 Beach Access Stairs W/Deck Landings	$11,500.00
Post Supported Walk Over Dune Ridge	$2,560.00
Revegetation, Landscaping and Seeding	$15,000.00
Lighting	$18,000.00
Signage	$2,000.00
Restroom/Bathhouse	$25,000.00
Bollard Post and Cable Fencing	$27,900.00
Maintenance Center	$30,000.00
Subtotal	$236,380.00
10% Contingency	$23,638.00
Area Total	$260,018.00

BEACH STREET SHORELINE ACCESS:

Bituminous and Turn-Around	$4,000.00
Parking Lot	$12,458.00
Trails	$2,625.00
Nature Study Shelter	$2,000.00
Signage	$700.00
Lighting	$2,500.00
Clean-Up and Site Preparation	$2,250.00
Boardwalk Including Steps	$14,080.00
Decking (By Turn-Around)	$5,500.00
Revegetation, Landscaping and Seeding	$3,500.00
Concrete Walkway	$2,600.00
Bollard Post and Cable Fencing	$16,275.00
Subtotal	$69,275.00
10% Contingency	$6,955.00
Area Total	$76,493.00

BEACH STREET SHORELINE AND BACK DUNE AREA:

Bituminous Concrete Road	$65,340.00
Bituminous Concrete Parking Area	$69,385.00
Beach Access W/Stairs and Landing	$21,200.00
Boardwalk Inconjunction With Trails	$9,400.00
3 Picnic Areas	$7,500.00
Lighting - Parking Areas	$18,000.00
Pedestrian Beach Street Walk	
Install Benches	$6,600.00
Install Waste Receptacles	$1,250.00
Landscaping Along Walk	$5,000.00
Pavement Work and Lighting	$28,000.00
Shelter Building	$20,000.00
Chips and Fines - Trails	$15,500.00
Site Preparation	$13,000.00

Signage		$2,500.00
Revegetation, Landscaping and Seeding		$18,500.00
Bollard Post and Cable Fencing		$46,000.00
	Subtotal	$347,175.00
	10% Contingency	$34,720.00
	Area Total	$381,895.00

BEACHWOOD NEIGHBORHOOD PARK:

New Ballfield		$30,000.00
Play Area Including Edging, Woodchips		$12,500.00
Restroom/Scorers Building		$18,500.00
Parking Lot		$10,148.00
Chips and Fines - Trail		$2,050.00
Lighting - Security		$3,500.00
Signage		$750.00
Landscaping and Seeding		$8,500.00
Clean-Up and Site Preparation		$3,000.00
	Subtotal	$88,948.00
	10% Contingency	$8,895.00
	Area Total	$97,843.00

PERE MARQUETTE PARK AREA:

Clean-Up and Site Preparation	$18,000.00
Removal of Existing Bituminous Concrete Roads	$27,500.00
Sand Play Area	$12,500.00
Improved Launch Ramp	$3,250.00
Shade Shelter W/Observation Deck	$27,500.00
Restroom/Bathhouse Building	$52,000.00
2 Picnic Shelters	$24,000.00

Improved Promenade Surface	$28,000.00
Benches	$7,000.00
Waste Receptacles	$1,250.00
Trees	$3,000.00
Shrubs	$750.00
Pedestrian Lights	$10,000.00
Mobile Concession Hook-ups - 3	$7,500.00
Bituminous Concrete Road	$74,250.00
Bituninous Concrete Parking Lots - Total	$149,573.00
Beach Picnic Area by Picnic Shelters	$2,000.00
Landscaping of 3 Parking Lots	$12,000.00
Revetatation, Landscaping and Seeding	$5,000.00
Signage	$2,500.00
Lighting	$25,000.00
Pedestrian Walks	$8,900.00
Entry Control Stations - 3	$6,000.00
Subtotal	$372,857.00
10% Contingency	$37,285.00
Area Total	$410,142.00

CHANNEL FRONTAGE AREAS:

Clean-Up and Site Preparation	$4,500.00
Remove Existing Bituminous Concrete Roads	$12,100.00
Improved Picnic Area	$3,500.00
New Play Area	$10,000.00
Observation Shelter Building	$17,500.00
Observation Walkway Along Channel	
Surfacing	$128,250.00
Lighting	$16,000.00
Benches	$7,000.00
Waste Receptacles	$875.00

Railing	$31,680.00
Landscaping	$12,750.00
Group Picnic Shelter	$15,000.00
Bituminous Concrete Drives and Parking	$69,135.00
Concrete Paths	$5,490.00
Revegetation, Landscaping and Seeding	$12,500.00
Area Lighting	$11,250.00
Signage	$1,850.00
Restroom Building	$18,000.00
Subtotal	$377,380.00
10% Contingency	$37,738.00
Area Total	$415,118.00

The following individuals participated in one or all of the public review sessions for the planning of the City of Muskegon's Lake Michigan Shoreline:

Marvin Gudelsky
Marguerite Holcomb
Richard Freye
Robert Lighton
Rick Chapla
Ray W. Seppamaki
William K. Gleason
Suzan Moun
Don Johnson
Jack Lipman
Jerry Billingsley
Robert H. Kuhn
Ric Scott
Donald Smith
Robert Van Lente
Marsha Van Lente
Hilmer Anderson
Mary Anderson
Larry DeVoogd
Pat DeVoogd
Greg Ruiter
Carol Ruiter
Bill Uecker
Harold J. Workman
Ruth Workman
Jerry Hage
Everett Harsted
E. Jordan

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