

# Lakeshore Boulevard Relocation and Shoreline Restoration Project – Phase II

- Grant funded project - \$34,500 grant for a \$69,250 project
- Conduct public engagement and develop a preliminary design for restoring a 3,000 foot section of Lake Superior shoreline
- Provide two dune restoration demonstration areas
- Major delay – SHPO required an archaeological survey





# Cliffs-Dow Operational History

Cliffs-Dow Historical Aerial Photos circa 1950's

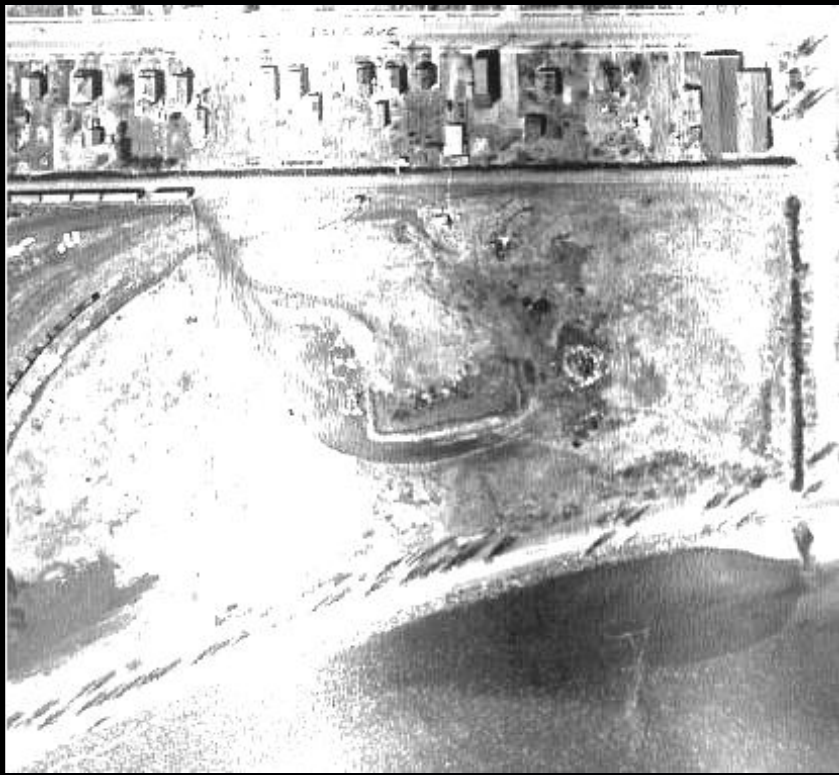


Photo of north 9-acre parcel with staining in Lake Superior

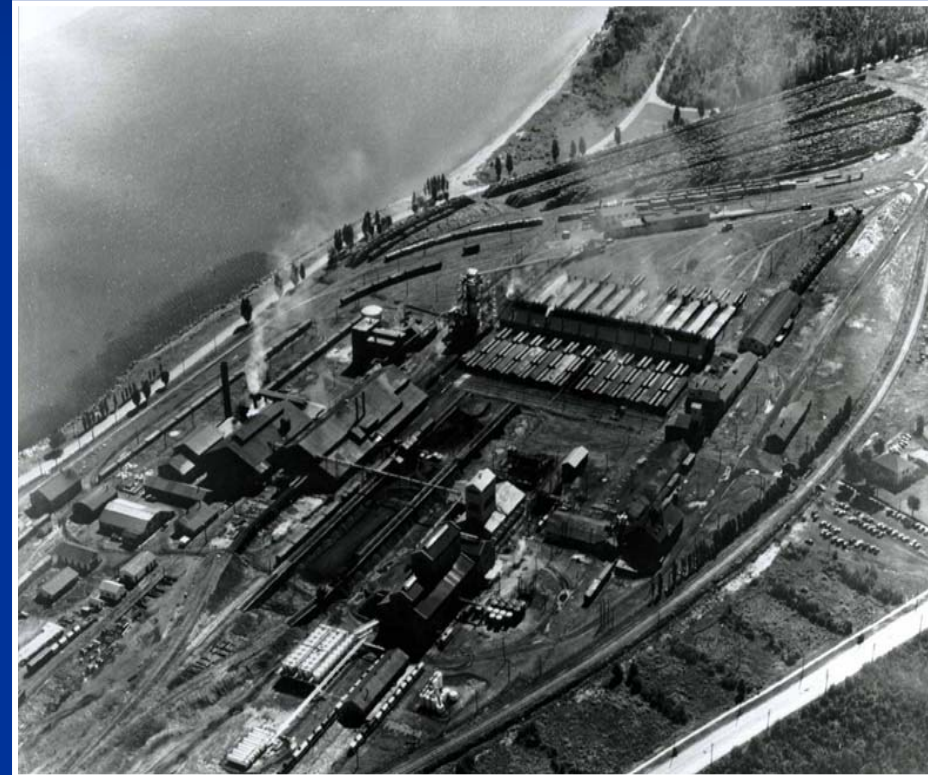
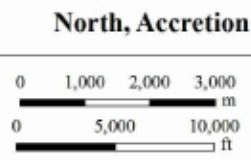
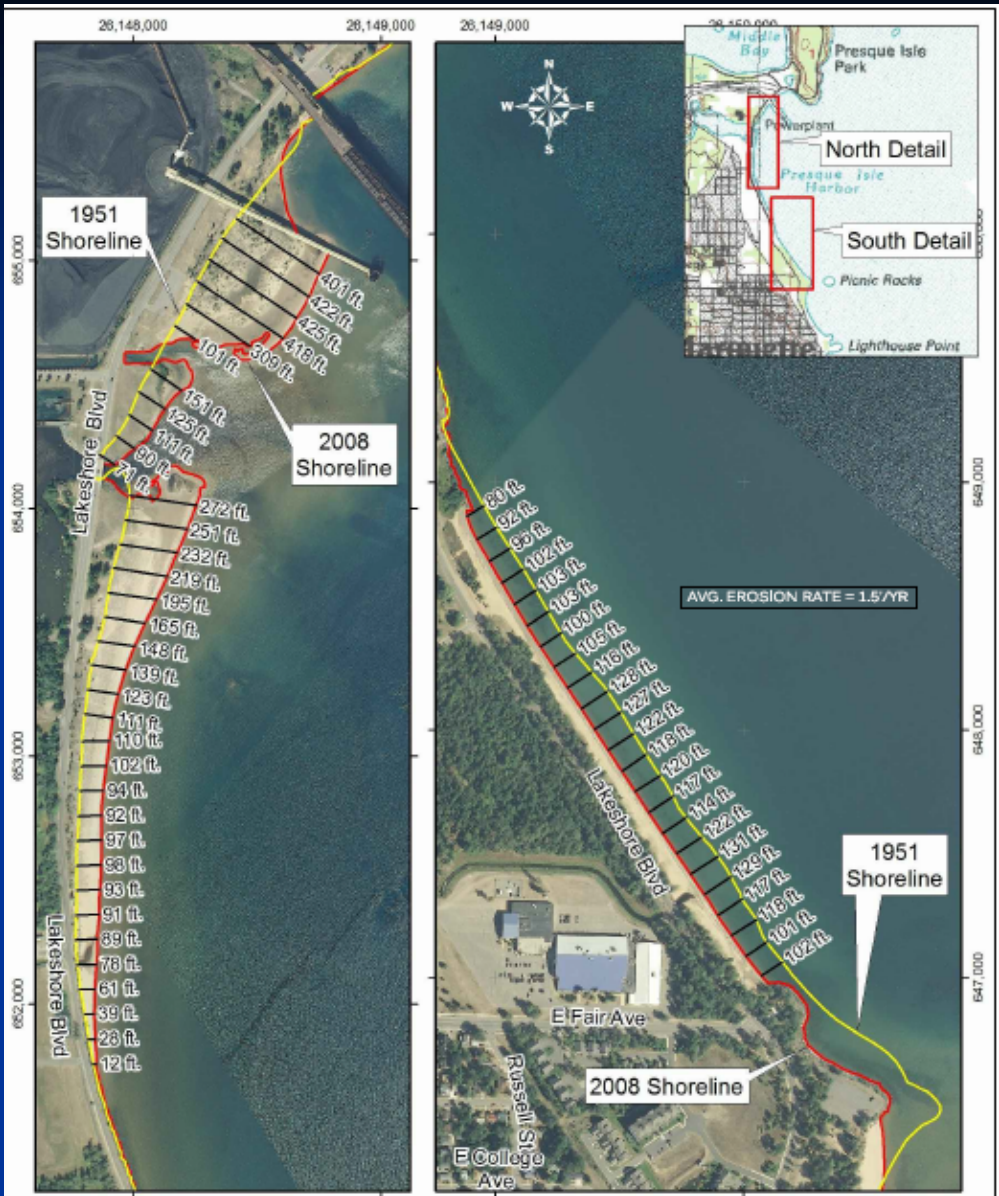


Photo of 46-acre parcel with staining in Lake Superior

# Phase I

- Coastal Engineering Firm (BAIRD)
  - Analyze erosion
  - Draft alternatives based on Community Master Plan and natural science
- Five alternatives presented to the community at a public meeting on March 27, 2013



**Shoreline Change,  
1951-2008**

Base Image: 2008 airphoto, courtesy USGS.  
Grid Spacing: 1,000 feet  
Spatial Reference: State Plane Michigan North.





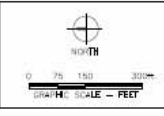
**Shoreline Change,  
1951-2008**

Shoreline positions are not corrected for water level.  
 Base Image: 2008 airphoto, courtesy USGS.  
 Grid Spacing: 1,000 feet  
 Spatial Reference: State Plane Michigan North.

DRAFT



General Notes:  
 1. ELEVATIONS ARE IN FEET AND REFERENCE TO 1840 BS.  
 2. CONTOUR INTERVAL FROM 5 FT. TO 1 FT. FROM 1840 AND UTM (2011).



## SHORELINE RESTORATION - ALTERNATIVE 1 REMOVE EXISTING REVETMENT

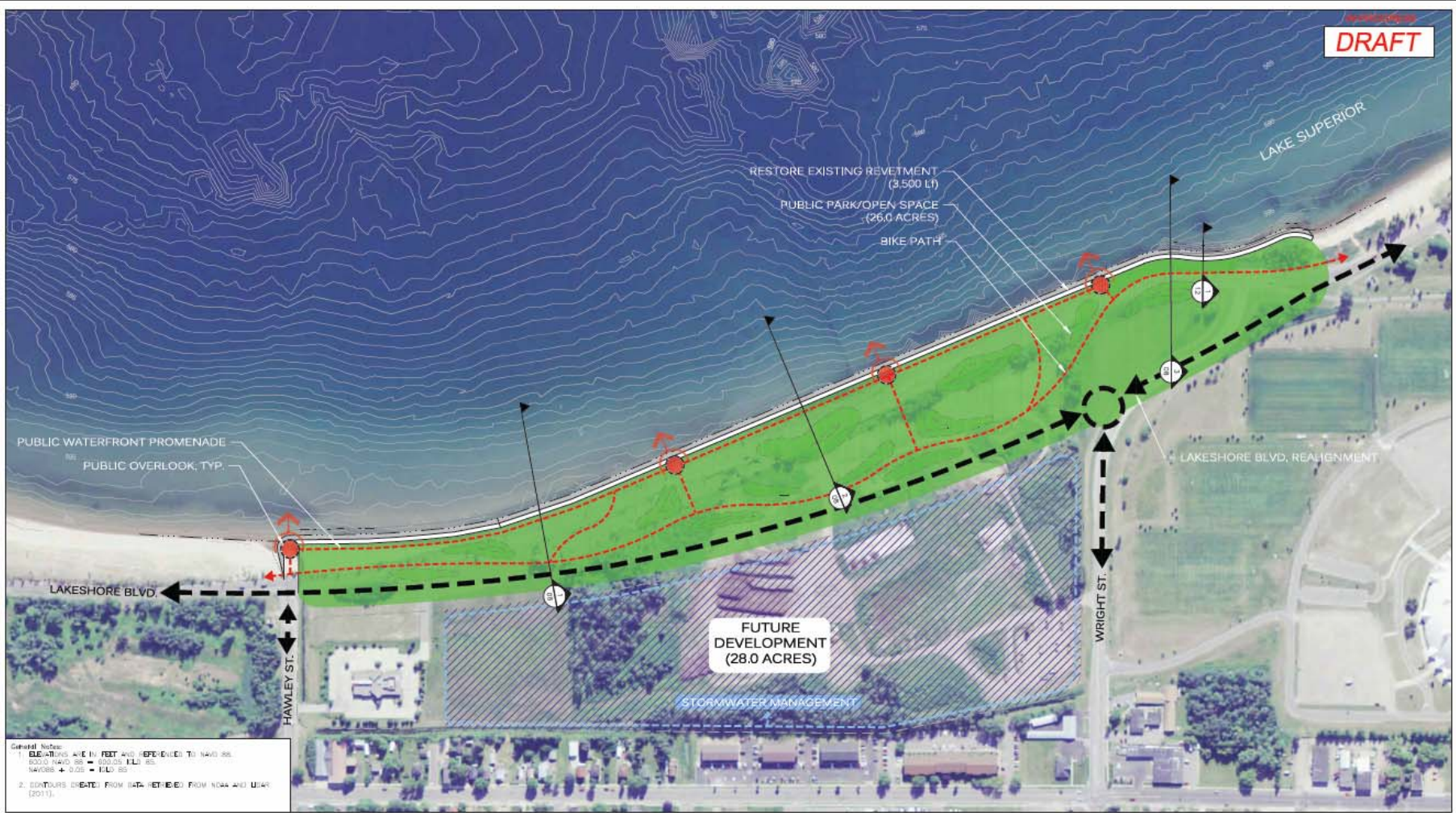
MARQUETTE SHORELINE RESTORATION	
Figure Number 12035-CD-03	Project Number 12035.100
Description ALTERNATIVE 1 - LAYOUT	Date 02/04/2013

Baird

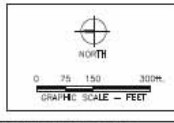
DATE PLOTTED: 02/04/2013 10:53:00 AM



DRAFT



General Notes:  
 1. ELEVATIONS ARE IN FEET AND REFERENCED TO NAVD 83.  
 200.0 NAVD 83 = 800.05 ILLI 85  
 NAVD83 + 0.05 = ILLI 85  
 2. CONTOURS (DATE) FROM DATA RETRIEVED FROM NOAA AND USGS (2011).



## SHORELINE RESTORATION - ALTERNATIVE 2 RESTORE EXISTING REVETMENT

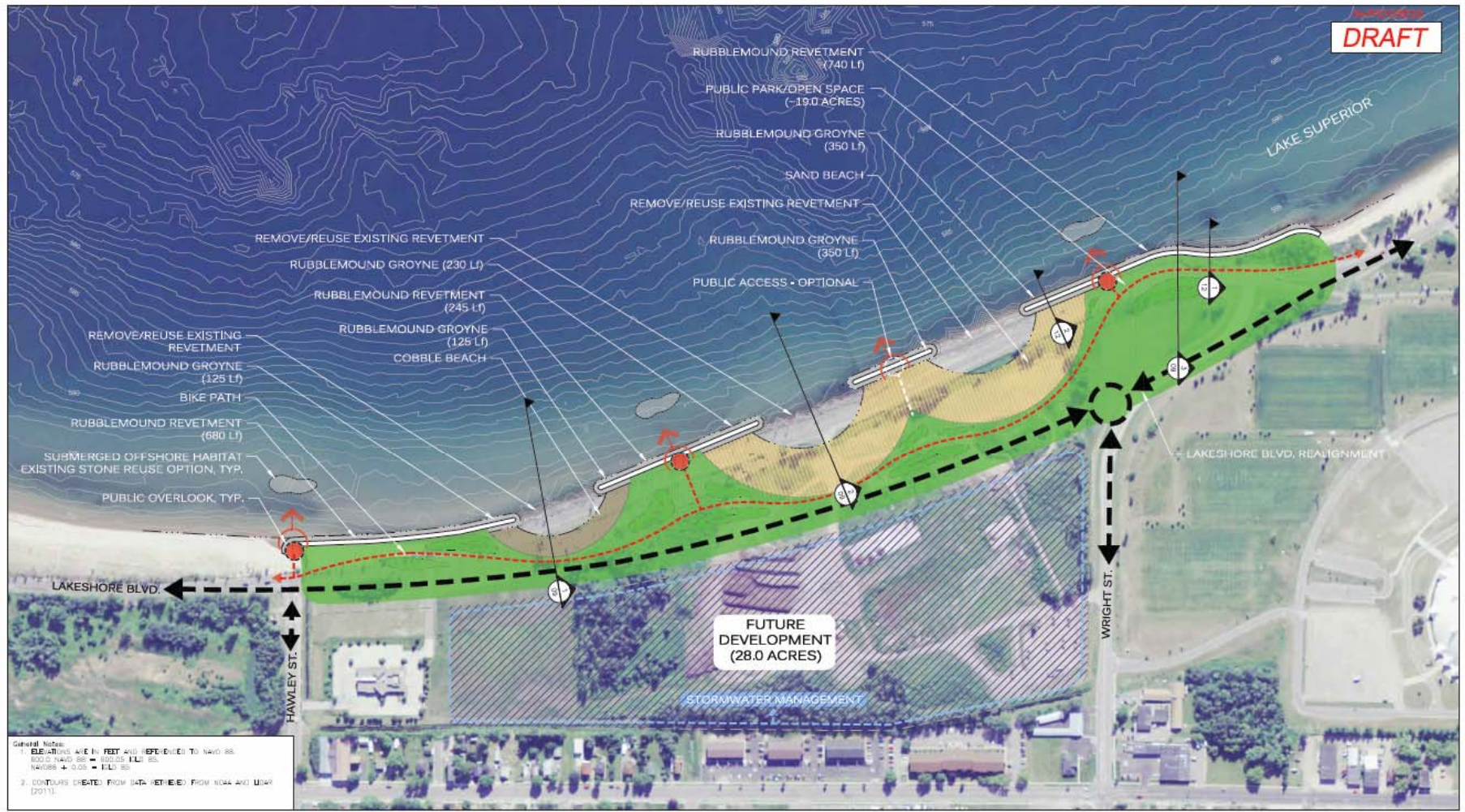
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Description: ALTERNATIVE 2 - LAYOUT	Date: 02/04/2013

Baird

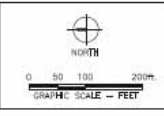
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 PROJECT: 12035-CD-04  
 SHEET: 12035-CD-04-01



DRAFT



General Notes:  
 1. ELEVATIONS ARE IN FEET AND REFERENCED TO NAVD 83.  
 800.0 NAVD 83 = 800.05 MLLW 83.  
 NAVD83 + 0.05 = TLL 83  
 2. CONTOURS DERIVED FROM DATUM-THEMATIC FROM NOAA AND USACE (2011).



## SHORELINE RESTORATION - ALTERNATIVE 3 LANDWARD BEACH DEVELOPMENT

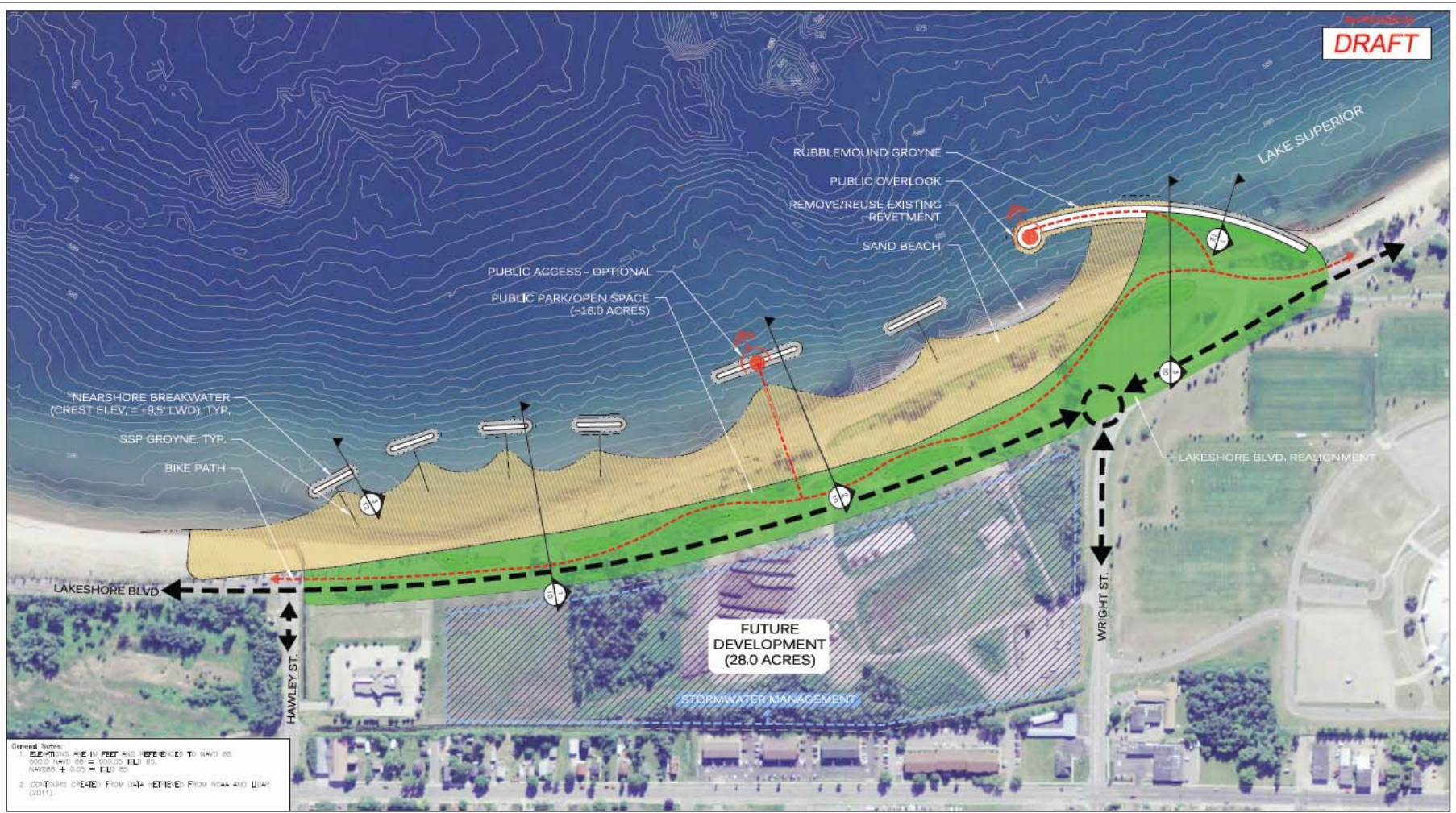
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Figure Number: 12035-CD-05	Project Number: 12035.100
Description: ALTERNATIVE 3 - LAYOUT	Date: 02/04/2013

**Baird**

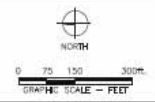
12035-000 MARQUETTE SHORELINE RESTORATION - ALTERNATIVE 3 - LAYOUT - 02/04/2013



DRAFT



General Notes:  
 1. ELEVATIONS ARE IN FEET AND REFERENCED TO NAVD 83.  
 500.0 HORIZ. DIST. = 80000.0 L.S. DIST.  
 HAWKES + 0.00 = ELEV. 80  
 2. CONTOURS CREATED FROM DATA RETRIEVED FROM NOAA AND USACE (2011).



## SHORELINE RESTORATION - ALTERNATIVE 4 OFFSHORE BREAKWATER BEACH DEVELOPMENT

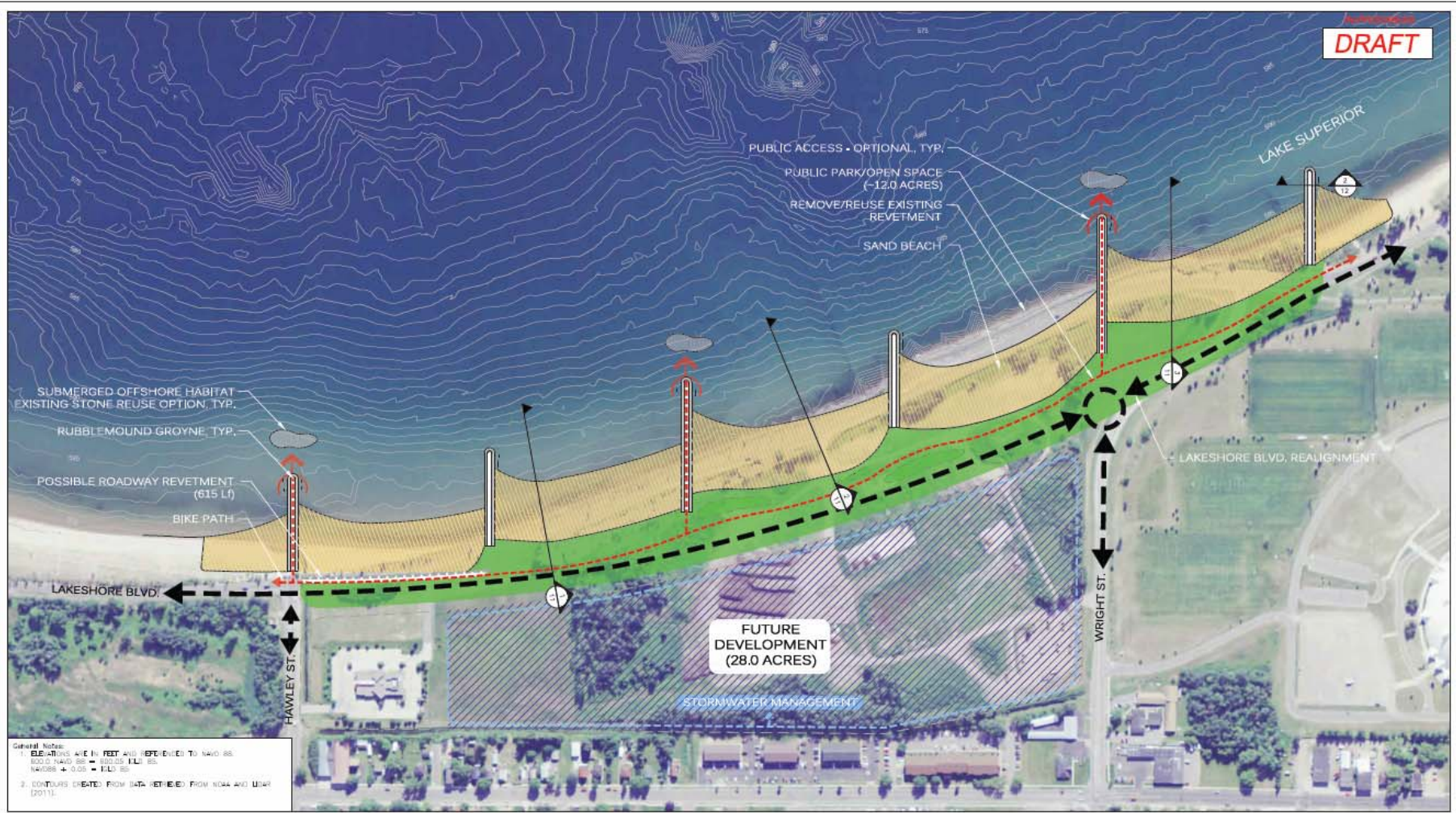
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Description: ALTERNATIVE 4 - LAYOUT	Date: 02/04/2013

**Baird**

DATE PLOTTED: 02/13/2013 10:41:02 AM



AutoCAD  
**DRAFT**



General Notes:  
1. ELEVATIONS ARE IN FEET AND REFERENCED TO NAVD 83.  
200.0 NAVD 83 = 802.05 ILLI 85.  
NAVD83 + 0.05 = ILLI 85.  
2. CONTOURS DEDUCTED FROM DATA RETRIEVED FROM NOAA AND USGS (2013).

# SHORELINE RESTORATION - ALTERNATIVE 5 RUBBLEMOUND GROYNES BEACH DEVELOPMENT

MARQUETTE SHORELINE RESTORATION	
Figure Number: 12035-CD-07	Project Number: 12036.100
Description: ALTERNATIVE 5 - LAYOUT	Date: 02/04/2013

**Baird**

12035-00 - LAKESHORE SHORE RESTORATION - ALTERNATIVE 5 - RUBBLEMOUND GROYNES BEACH DEVELOPMENT - LAYOUT - 47



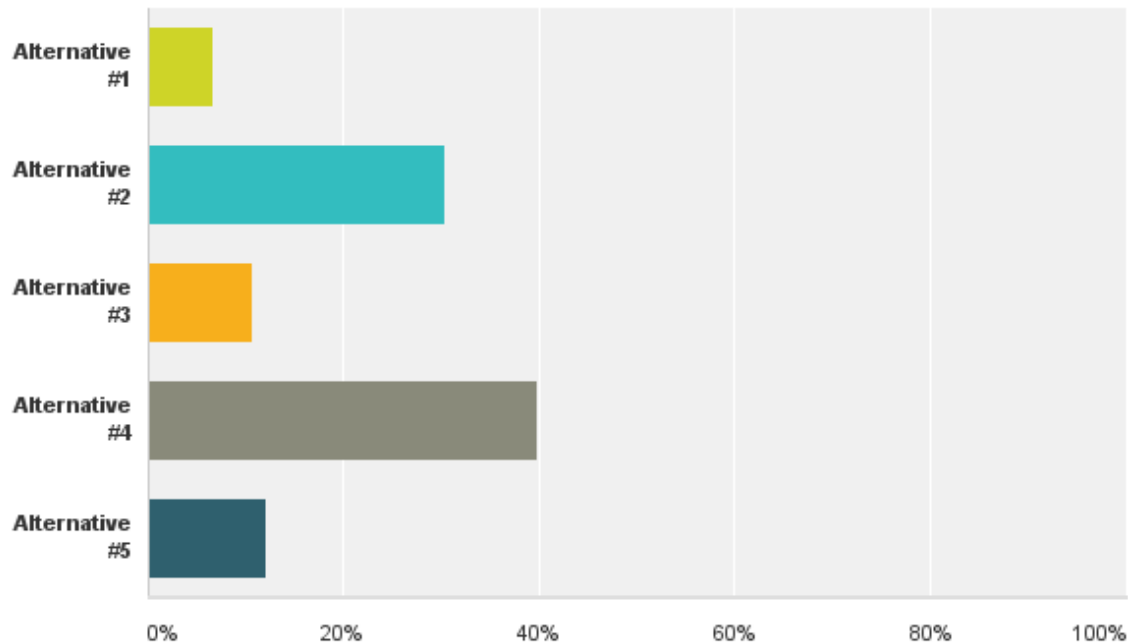
# Phase II

- Conduct public engagement
- Select or refine alternatives
- Develop dune restoration demonstration sites
- Draft preliminary design plans

# Community Survey - Select Your Favorite Alternative

Q1 Which of the alternatives do you prefer the most

Answered: 148 Skipped: 0

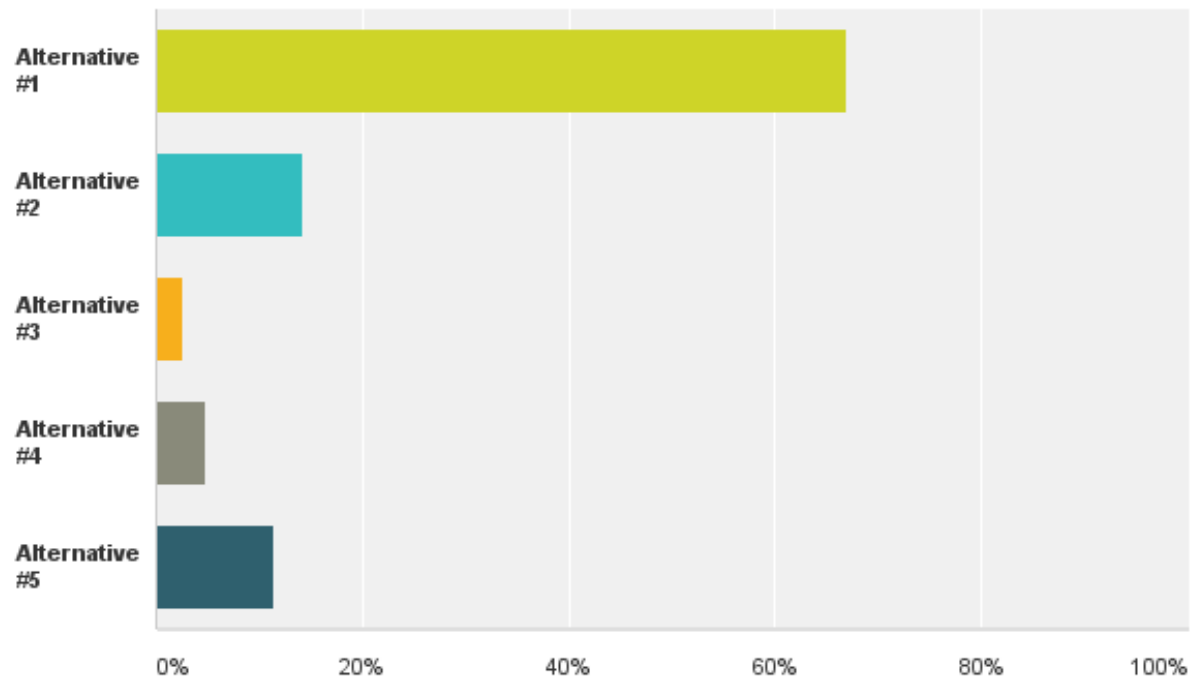




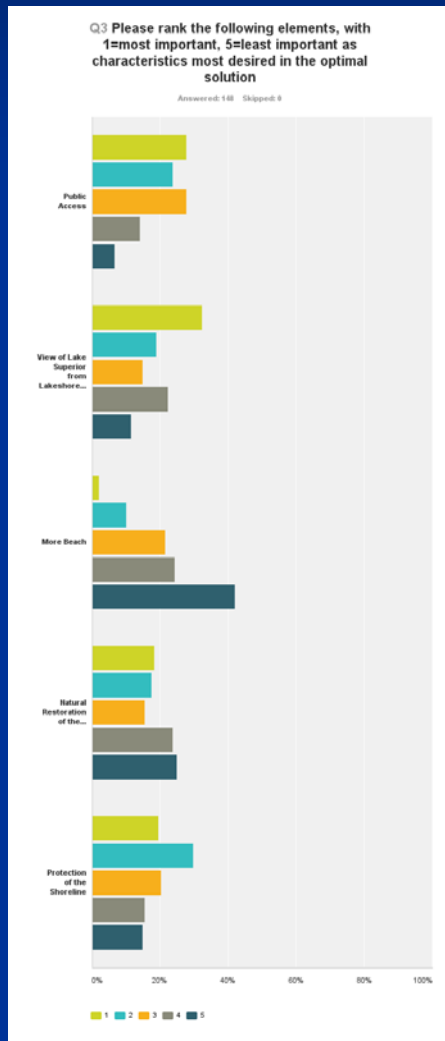
# Community Survey – Select Your Least Favorite Alternative

Q2 Which alternative do you prefer the least

Answered: 148 Skipped: 0



# Community Survey – What are the Least/Most Important?



- Asked to rank from least important to most important
- Public access, view of the lake, and protection of shoreline were clear winners
- And the winner on the losing end is...more beach



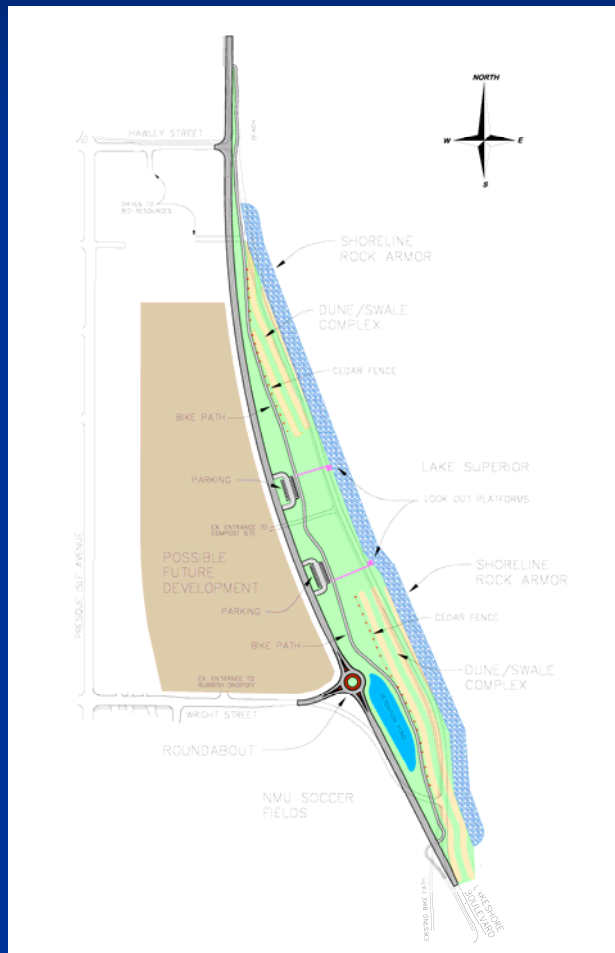
# Community Survey - Interpretation

- Statistical validity (8% EM and 77%CI)
- Minor separation between Alternative #2 and #4
- Alternative #4 creates more beach, yet more beach was the least desirable characteristic?
- Did provide for community engagement, used to inform Project Team

# Project Team Considerations

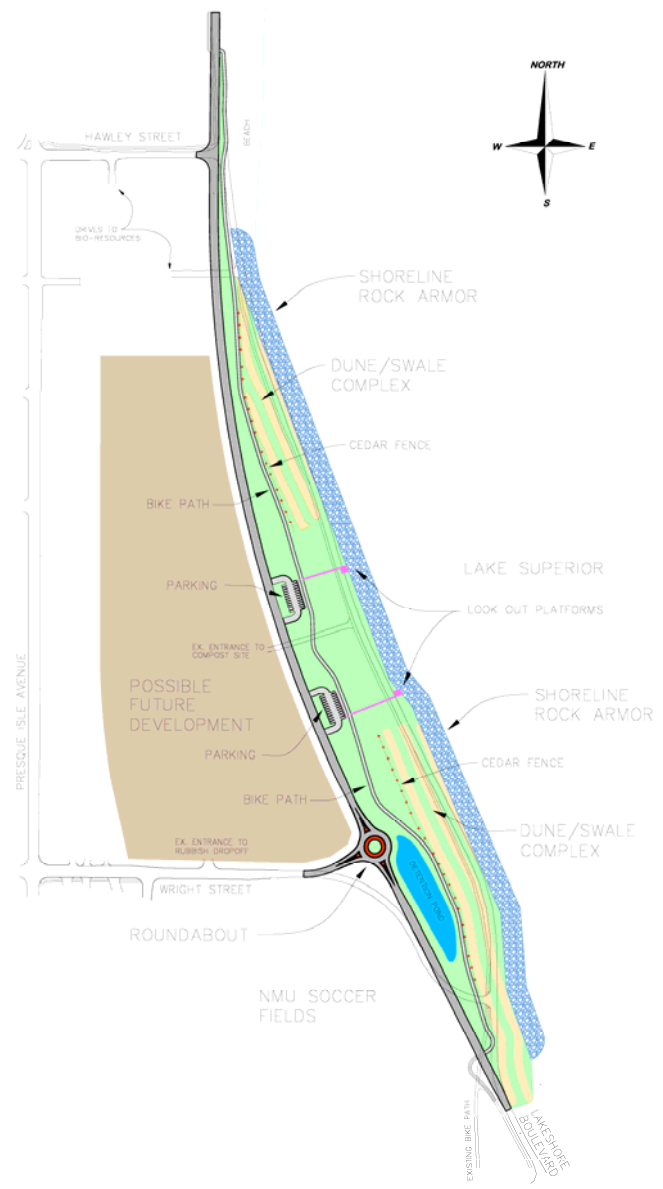
- Sensitivity of Site
  - Facility
- Natural Science and Public Safety
- Funding
- Grant Obligations
  - Natural restoration reconciled with man-made solutions
- Public Input

# Staff Recommended Design



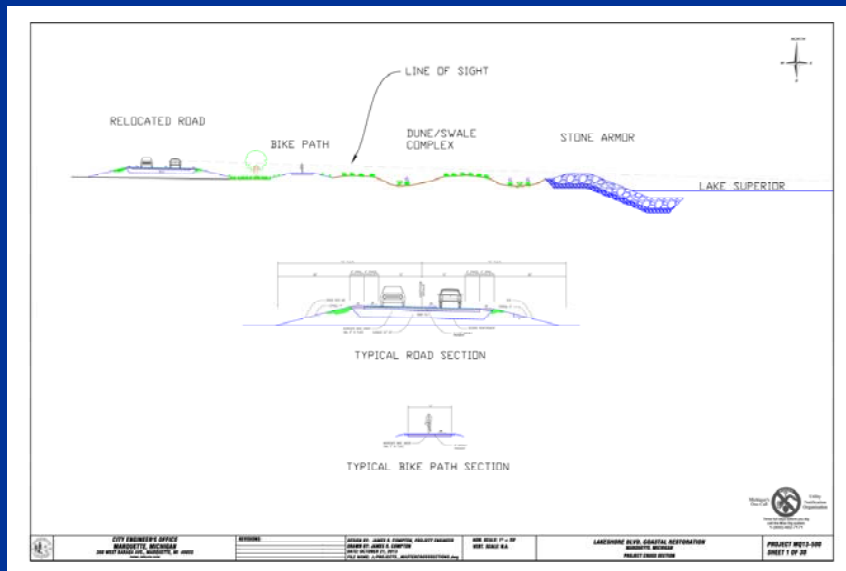
- Shoreward Erosion Control – Stone Armor
- Shoreline Restoration – Dune/Swale Complex
- Multi-use pathway
- Two designated parking areas
- Two viewing platforms
- Asphalt street structure
- Roundabout at terminating vista

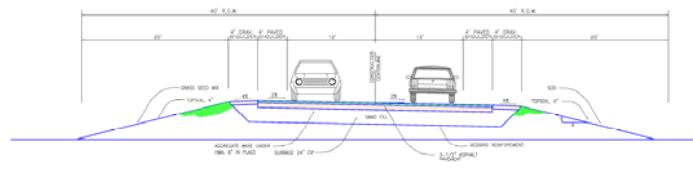
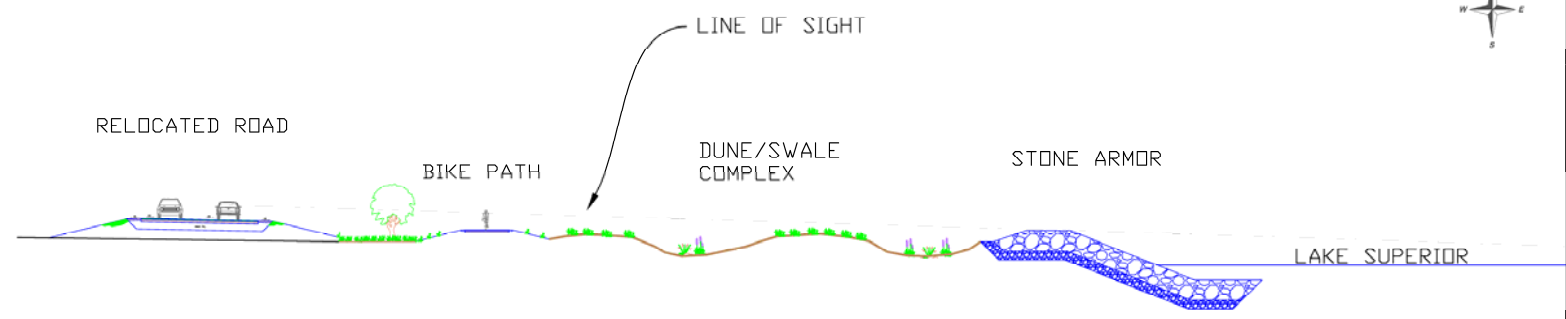
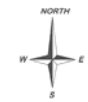




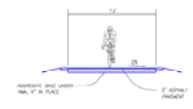
# Staff Recommended Design

- Stone Armor per U.S. Corps of Engineers design
- Street and multi-use pathway provide direct line of sight to lake
- Dune/Swale Complex – dune grass and native plants
- Street structure to incorporate geogrid reinforcement





TYPICAL ROAD SECTION



TYPICAL BIKE PATH SECTION



**CITY ENGINEER'S OFFICE**  
**MARQUETTE, MICHIGAN**  
 300 WEST BARADA AVE., MARQUETTE, MI 49855  
 PHONE: (605)204-8400

REVISIONS:

DESIGN BY: JAMES R. COMPTON, PROJECT ENGINEER  
 DRAWN BY: JAMES R. COMPTON  
 DATE: OCTOBER 21, 2013  
 FILE NAME: J-PROJECTS\_MASTERCROSSSECTIONS.dwg

HOR. SCALE: 1" = 30'  
 VERT. SCALE: N.A.

**LAKESHORE BLVD. COASTAL RESTORATION**  
 MARQUETTE, MICHIGAN  
 PROJECT CROSS SECTION

**PROJECT MQ13-500**  
**SHEET 1 OF 30**

# Dune Swale Example





# Staff Recommended Design - Preliminary Cost Estimate

Shoreline Rock Armor	\$4,500,000
Road Construction	\$854,000
Landscaping and Topsoil	\$654,000
Roundabout	\$500,000
Earthwork Moving	\$500,000
Bike Path	\$218,000
Water Main	\$196,000
Dune/Swale Complex	\$175,000
Bridge/culvert for Hawley St. Ditch	\$150,000
Sewer Main	\$118,000
Parking Lots	\$74,000
Fencing	<u>\$72,000</u>
	\$8,011,000
Contingency 10%	<u>\$801,100</u>
Total	\$8,812,100

# Next Steps

- With concurrence of the Commission, hold a public meeting to present staff recommended design
- Finalize preliminary design with oversight assistance from Coastal Engineering Firm
- Finalize grant
- Seek funding opportunities



Thank You

Questions?

