Harbor Commission

Regular Meeting Agenda

Tuesday, June 17, 2014, 5:30 p.m.
Council Chambers, South Haven City Hall

City of South Haven

Please note that the meeting will be held in South Haven City Hall, Council Chambers.

1. Call to Order

Roll Call: Chairman Jeff Arnold, Vice-Chairman Mary Stephens, Cathy Pyle, Tim Reineck, Alan Silverman, Daniel Strong, Greg Sullivan.

2. Approval of Agenda

3. Approval of Minutes: May 20, 2014 Regular Meeting

4. Interested Citizens in the Audience Will be Heard on Items Not on the Agenda

5. Marina Reports

6. 2015 Queen's Cup Agreement and Special Event Request

7. Fireboat Discussion

8. Surge Suppression

Member and Staff Comments

Adjourn

RESPECTFULLY SUBMITTED,
Paul VandenBosch
Secretary, Harbor Commission

Harbor Commission

Regular Meeting Minutes

Tuesday, May 20, 2014, 5:30 p.m.
Council Chambers, South Haven City Hall

City of South Haven

1. Call to Order

Present: Pyle, Reineck, Silverman, Stephens, Strong, Sullivan, Arnold
Absent: None

2. Approval of Agenda

Motion by Stephens, second by Strong to approve the agenda as presented.

All in favor. Motion carried.

3. Approval of Minutes: April 15, 2014 Regular Meeting
April 15, 2014 Workshop

Stephens remarked that she was unable to attend the last meeting but questioned the issue of Coast Guard certification and whether there are federal codes that the city must ensure that the owner comply with. Strong noted that the city attorney looked into that and came up with the conclusion that there is no such requirement. Discussion ensued regarding city liability if there were issues, with Sullivan pointing out that there are things the building code would not consider, such as buoyancy. It was noted that both the owner of the barge and the zoning administrator contacted the Coast Guard and were told they do not inspect and certify barges.

Motion by Strong, second by Sullivan to approve the April 15, 2014 regular meeting minutes and the April 15, 2014 workshop minutes as written.

All in favor. Motion carried.

4. Interested Citizens in the Audience Will be Heard on Items Not on the Agenda

None at this time.

5. Marina Reports

VandenBosch mentioned that approval of the budget amendment in a subsequent item is presumed and reviewed the reports as presented with the budget amendments.

VandenBosch noted that we are seeing some issues with the transient marina, partly due to the cold weather and partly due to the new vendor doing the state reservations. That system was down for about a week, making it impossible for boaters to go online and make reservations.

Sullivan inquired whether the DDA (Downtown Development Association) funding will be available again to which VandenBosch responded that he believes so.

VandenBosch noted that Lake Michigan levels today were about one (1) foot over the datum.

6. Fireboat Discussion

VandenBosch noted that he had invited Tony Marsala, the Fire Marshal, to be here to talk about this item and voiced disappointment that Marsala is not here. Silverman suggested skipping over this item in case Marsala is just late.

7. Weather Buoy Grant

VandenBosch noted that LimnoTech will be accepting the grant and mailing letters to the donors requesting payment. Referred to the “Annual Cost Commitments (Five Years)” table in the packet which shows which groups have already pledged toward the maintenance expenses. VandenBosch noted that the Steelheaders have pledged $5,000 for the temperature string and smaller donations have been promised from the Kiwanis and the Chamber of Commerce. VandenBosch noted, “If we get enough donors we may get (the buoy) in the water this year.”

Silverman expressed his thanks to the Steelheaders for getting the grant and to Tim Stegeman for all of his work.

8. Soundings

VandenBosch noted that we have a mound forming in the federal channel. Staff had Abonmarche look at the build-up; noted that the build-up started before the dredgers started as well as pointing out that major scouring is also happening. Trying to rule out things that might be causing this; have not yet ruled out water main or sewer main breaks. That is not the only potential source. The city has asked Abonmarche to put together a bid for soundings so we can see what is happening. That bid will be passed to Public Works as they need to know what is going on near the bridge, with the bridge repair project coming up

this fall. VandenBosch estimates that the mound is currently six (6) to seven (7) feet deep at present.

Discussion ensued regarding various methods that could be used to indicate whether there is a water main break or a sewer break.

VandenBosch explained the diagrams and soundings exhibits included in the packet.

Silverman asked if the mound forming has something to do with the river going from a narrower area to a wider one; VandenBosch said that is a condition that has existed for many years but needs to be looked into.

In response to a question from Silverman regarding whether there is a storm outlet somewhere near there, Strong said there is, and the closest owner to that outlet has had issues with sedimentation in his slip for the past couple of years. VandenBosch noted that Abonmarche did not feel there was enough storm water coming in to create that mound. Pyle pointed out that the city put substantial amounts of snow at the Black River Park launch as well as dredging spoils so the parameters have changed from previous years. VandenBosch noted some theories regarding the dredging. Silverman thinks underwater cameras could be used to do a time study on that drain to see how much debris is coming through and where it is going. VandenBosch said the foundation of the bridge is going to be the main concern for Public Works, and because of the scouring we would like to expand that and based on that, maybe learn a little more about why this is happening.

Silverman referred again to the blue/red chart, where the + (plus) means the dirt is deeper and the – (minus) means shallower and questioned whether it a one-year time span is indicated. VandenBosch responded that it shows the difference from 2013 to 2014.

9. Budget Amendment

VandenBosch noted that budget amendments are approved by City Council, and it is quite a substantial amount, so the action item listed here is a recommendation to City Council. VandenBosch noted the items, including maintenance and dredging, that were not budgeted for and noted that this was an error on the part of staff.

VandenBosch enumerated the various marina marketing endeavors being implemented noting that some of these marketing efforts were not in a budget so had to be added. Explained that staff thought that harbor dredging would be completed in the previous fiscal year, but not all of it was paid for, so it has to be added to the budget. VandenBosch noted that there is one page in the packet that is old information and corrected the figures to update the board.

VandenBosch said he mentioned several times that we were going to dredge Black River Park, but the contract for the dredger did not include Black River Park, so a contract

adjustment is going to be requested. The work was done under a fairly good bid price from the contractor. VandenBosch pointed out some of the key budget figures.

Motion by Silverman to recommend the budget amendment to City Council based on the information provided with the exception of page 33 of the agenda packet. Second by Strong.

All in favor. Motion carried.

Sullivan requested information on where the money is coming from. VandenBosch said the Black River Park amount is based on the volume removed from the Black River Park Marina, while the other funds were pulled from the only other two sources.

VandenBosch noted that the impact on the marina fund is very heavy and will affect maintenance on our marinas if we have some bad years. “I’m not sure we could do this again in five years and still maintain our marinas.”

Member and Staff Comments

Strong: Glad summer is here.

Silverman: Would like to see the issue of the surge in the South Marina back on the agenda. Wondered whether any tests were ever done. Since the construction of the South Marina twenty (20) years ago, there is a lot more information available in the way of attenuators. If we could reduce the surge in the South Marina it would be a real asset and remove the only detriment in the South Side Marina.

VandenBosch said we requested that Abonmarche provide suggestions and they suggested a rip-rap attenuation that would take away valuable park space on one side of the river and on the other side of the river there is not space to do that. VandenBosch said it is rather difficult to determine what works; staff has looked at it and it is an issue. There is also an issue on the far end of the North Marina making those slips difficult to rent.

Pyle noted that the water levels have been so low that the wave breakers on the piers themselves have not been able to do their job, but they have been working with the higher levels we have at present. It was noted that some were not aware that there were wave attenuators built into the piers.

Motion by Silverman, second by Stephens to table discussion on the fire boat since Marsala had not arrived.

All in favor. Motion carried.

Pyle: “When will the gate be manned at Black River Park?” VandenBosch updated the board. Pyle will try to speak with Norm.

Sullivan: Brought up sediment traps, given the constraints of the budget, and wondered if there is anything that can be done to prevent sediment from getting there, whether it is working with the county or soil conservation people.

Adjourn

Motion by Strong, second by Pyle to adjourn at 6:11 p.m.

All in favor. Motion carried.

RESPECTFULLY SUBMITTED,

Marsha Ransom
Recording Secretary

City of South Haven
Marina Fund - Fund 594
For the period ended May 31, 2014

Revenues:	*Month Actual*		*YTD Actual*	*2013-14 Adopted Budget*
State GrantS-Bldg & Dredging	$ -		$ -	$ -
Interest and Rents	2		107	5,000
Charges for Service	23,865		516,877	540,000
Other Revenue	190		3,120	8,740
Total Revenues	$ 24,057	#	$ 520,104	$ 553,740

Expenses:	*Month Actual*	*0*	*YTD Actual*	*2013-14 Adopted Budget*
Personnel Costs	$ 159		$ 56,121	$ 62,118
Supplies	2,696		6,624	7,000
Admin/Computing/Equipment Fees	3,203		35,907	38,435
Contractual Services	6,551		103,099	125,000
Other Services and Charges	8,219		103,793	113,931
Utilities	2,128		33,461	44,000
Repairs and Maintenance	-		9,838	31,000
Capital Outlay	-		7,976	-
Operating Transfers Out	1,757		19,323	21,080
Total Expenses	24,714	-	376,142	442,564
Depreciation	-		-	133,300
Total Expenses and Depreciation	$ 24,714		$ 376,142	$ 575,864

Net Fund Change	$ (656)	**$**	**143,962**	$ (22,124)

Retained Earnings	June 30	$	2,475,738
Less Net Capital Assets		$	(2,379,613)
Net Undesignated Reserves		**$**	**96,125**
Add Seasonal Rentals paid but not posted to income yet		**$**	**220,033**
Deduct Expenses paid in advance, not posted to expense yet			-1925
Deduct Receivables owed to Marina but not yet received		**$**	**(16,020)**
Deduct State amounts owed to Marina but not yet received		**$**	**(8,918)**
Add current expenses owed but not paid yet		**$**	**46,697**
Adjusted Undesignated Reserves		**$**	**479,954**
Cash & Investments Balance at month end		**$**	**479,954**

Marina Fund Revenue
As of May 31, 2014

Fiscal Year Ending in	Seasonal	Transient	Revenue Total	Operational Expense	Net Revenue
2002	234,236	161,984	396,220	369,081	27,139
2003	259,840	166,084	425,924	403,463	22,461
2004	280,151	167,907	448,058	429,353	18,705
2005	282,245	170,944	453,189	479,287	-26,098
2006	300,819	173,817	474,636	517,881	-43,245
2007	343,171	170,869	514,040	471,088	42,952
2008	368,408	168,362	536,770	493,906	42,864
2009	377,955	166,674	544,629	492,039	52,590
2010	350,635	161,584	512,219	485,399	26,820
2011	314,270	140,546	454,816	521,900	-67,084
2012	330,660	151,046	481,706	427,390	54,316
2013	377,199	89,267	466,466	599,418	-132,952
2014	393,929	122,948	516,877	368,688	148,189

NOTES ON OPERATIONAL EXPENSES:

Operational Expense does not include depreciation of approximately $133,000 per year.
Operational Expenses do not include large construction expenses.
Operational Expenses do not include the annual transfer to the River Maintenance Fund of approximately $21,080 annually.

Operating Expense excludes reimbursable dredging costs

Seasonal Marina Revenue

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Calendar Year Total
2007	58,007	147,702	34,975	42,960	23,115	-3,846	6,199	1,554	703	1,100	22,348	19,285	354,102
2008	60,795	185,520	32,325	36,210	19,130	16,761	820	50	0	6,550	26,799	900	385,860
2009	44,784	185,069	32,390	25,955	31,150	23,488	843	50	850	900	27,990	1,000	374,469
2010	13,035	218,460	41,530	20,235	5,050	20,692	0	434	350	200	29,812	1,000	350,798
2011	43,222	157,210	38,473	31,230	12,498	-158	800	1,950	400	1,100	17,625	8,865	313,215
2012	31,810	178,650	44,840	14,750	31,795	-1,925	0	200	1,050	3,940	11,420	850	317,380
2013	29,476	169,790	80,125	37,555	28,362	14,431	0	0	750	7,735	7,300	7,545	383,069
2014	328,765	5,389	22,415	950	13,080								370,599

Transient Marina Revenue

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Calendar Year Total
2007	0	0	0	8,528	11,494	39,340	56,647	48,986	10,983	1,553	-41	0	177,490
2008	0	0	0	11,657	8,957	29,620	53,315	53,501	11,385	630	0	0	169,065
2009	0	0	0	11,972	10,994	24,877	55,645	39,835	22,176	1,301	0	0	166,800
2010	0	0	0	8,445	9,029	25,154	52,730	40,107	8,654	1,299	0	0	145,418
2011	0	0	0	373	16,162	21,221	47,565	41,459	12,635	515	0	0	139,930
2012	0	0	0	4,684	12,448	31,740	40,344	21,935	4,392	0	-267	0	115,276
2013	0	706	3,502	2,466	3,689	12,501	33,066	40,527	17,724	843	359	542	115,924
2014	2,236	4,453	5,894	6,520	10,785								29,888

City of South Haven
Black River Park Fund - Fund 545
For the period ended May 31, 2014

Revenues:	*Month Actual*		*YTD Actual*	*2013-14 Adopted Budget*
State Grant	$ -	#	$ -	$ -
Charges for Service	22,393		136,689	148,500
Interest and Rents	1		148	3,000
Other Revenue	-		-	100
Total Revenues	$ 22,394	#	$ 136,837	$ 151,600

Expenses:	*Month Actual*	*YTD Actual*	*2013-14 Adopted Budget*
Personnel Costs	$ 7,659	$ 31,557	$ 44,096
Supplies	130	1,993	3,000
Admin/Computing/Equipment Fees	1,568	17,257	24,795
Contractual Services	132	61,825	133,828
Utilities	356	8,121	7,702
Other Services and Charges	801	12,627	10,050
Repairs and Maintenance	43	470	7,500
Capital Outlay	319	3,508	-
Operating Transfers Out to 296	483	5,317	5,800
Total Expenses	11,492	142,675	236,771
Depreciation	-	-	50,300
Total Expenses and Depreciation	$ 11,492	$ 142,675	$ 287,071

Net Fund Change	$ 10,902	**$ (5,838)**	$ (135,471)
Retained Earnings	June 30	$ 627,980	
Less Net Capital Assets		$ (466,574)	
Net Undesignated Reserves		**$ 161,407**	
Add Seasonal Rentals paid but not posted to income yet		**$ 41,673**	
Deduct Receivables owed to BRP but not yet received		**$ (315)**	
Deduct Expenses paid in advance, not posted to expense yet		**(2,695)**	
Add(Deduct) Amount due to/ from Beach, Rev earned but not in cash		**$ (5,411)**	
Add Accounts Payable owed but not paid yet		**$ -**	
Adjusted Undesignated Reserves		**$ 188,820**	
Cash & Investments Balance at month end		**$ 188,820**	

Black River Park Revenue
As of May 31, 2014

Fiscal Year Ending	Seasonal Dock	Transient Dock	Boat Launch & Parking fees	Seasonal Launch Permit	Revenue Total	Operational Expense	Net Revenue
2007	84,563	9,480	42,544	10,471	147,058	90,412	56,646
2008	96,484	11,143	37,896	10,053	155,576	97,145	58,431
2009	93,239	9,240	37,261	11,922	151,662	99,992	51,670
2010	84,432	9,249	38,478	10,183	142,342	90,883	51,459
2011	66,393	8,658	42,038	3,859	120,948	113,430	7,518
2012	73,619	10,711	55,134	10,097	149,561	129,949	19,613
2013	71,440	9,150	47,844	10,980	139,414	102,155	37,259
2014	76,755	10,043	41,387	8,125	136,310	142,675	-6,365

Note: Operational Expense does not include depreciation of approximately $50,000 per year.
Operational Expenses do not include large construction expenses.

Transfer to River Maintenance Fund of approximately $5,800 annually

Boat Launching & Parking Fees Revenue

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Calendar Year Total
2007	0	0	0	1,289	4,160	7,725	13,459	7,941	5,917	1,808	0	0	42,299
2008	0	0	0	831	2,768	5,172	11,030	10,046	4,709	2,170	0	0	36,726
2009	0	0	0	370	3,378	5,558	10,738	7,704	8,311	812	0	0	36,871
2010	0	0	0	527	6,102	4,284	13,972	11,844	2,799	2,186	0	0	41,714
2011	0	0	0	126	4,301	6,870	19,145	10,345	7,373	1,221	0	0	49,381
2012	0	0	0	0	7,000	10,050	19,667	9,346	4,702	2,376	1,031	112	54,285
2013	56	0	91	637	3,671	6,154	14,069	12,964	4,874	3,081	14	0	45,611
2014	0	0	0	866	5,519								6,385

Launching - Seasonal Permit Revenue

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Calendar Year Total
2007	0	0	0	2,261	4,157	2,749	1,453	0	0	0	0	0	10,620
2008	0	0	0	1,885	3,743	2,972	1,620	0	0	0	0	0	10,220
2009	0	0	0	2,770	4,924	2,608	640	0	0	0	0	0	10,942
2010	0	0	0	1,370	7,158	1,015	1,546	0	75	0	0	150	11,314
2011	0	0	0	610	75	1,403	1,222	0	0	75	0	0	3,385
2012	0	0	0	600	6,620	1,580	1,200	0	0	-270	0	0	9,730
2013	0	100	400	2,400	3,900	3,250	1,050	200	50	0	0	100	11,450
2014	100	75	175	1,875	4,500								6,725

Seasonal Dock Revenue

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Calendar Year Total
2007	9,140	27,530	6,155	11,695	12,270	5,762	0	0	250	400	5,200	4,787	83,189
2008	7,940	45,315	9,400	11,905	12,675	-1,388	0	0	200	2,000	5,009	1,655	94,711
2009	6,865	41,215	7,085	9,125	4,990	15,095	0	0	0	0	5,000	0	89,375
2010	3,740	30,265	19,680	11,325	15,585	-1,163	1,650	0	0	0	4,650	2,369	88,101
2011	6,550	22,995	3,740	7,215	8,505	8,720	727	3,707	0	1,680	2,175	4,670	70,684
2012	3,995	20,485	9,585	6,440	18,500	1,655	3,745	0	0	600	2,000	200	67,205
2013	3,070	24,760	11,180	6,850	17,300	1,735	55	985	0	800	4,700	2,650	74,085
2014	49,950	-430	-1,870	8,490	11,425								67,565

Transient Dock Revenue

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Calendar Year Total
2007	0	0	0	169	1,303	1,986	3,988	2,672	984	0	0	0	11,102
2008	0	0	0	329	1,562	1,609	2,571	2,904	1,204	303	0	0	10,481
2009	0	0	0	0	483	1,776	2,444	3,796	1,332	0	0	0	9,831
2010	0	0	0	0	748	930	2,657	2,479	746	0	0	0	7,560
2011	0	0	0	0	818	1,958	4,492	2,190	1,181	23	0	0	10,662
2012	0	0	0	0	604	2,221	3,567	2,325	1,125	98	0	0	9,939
2013	0	0	0	0	163	1,873	3,815	4,435	808	74	0	0	11,168
2014	0	0	0	0	911								911

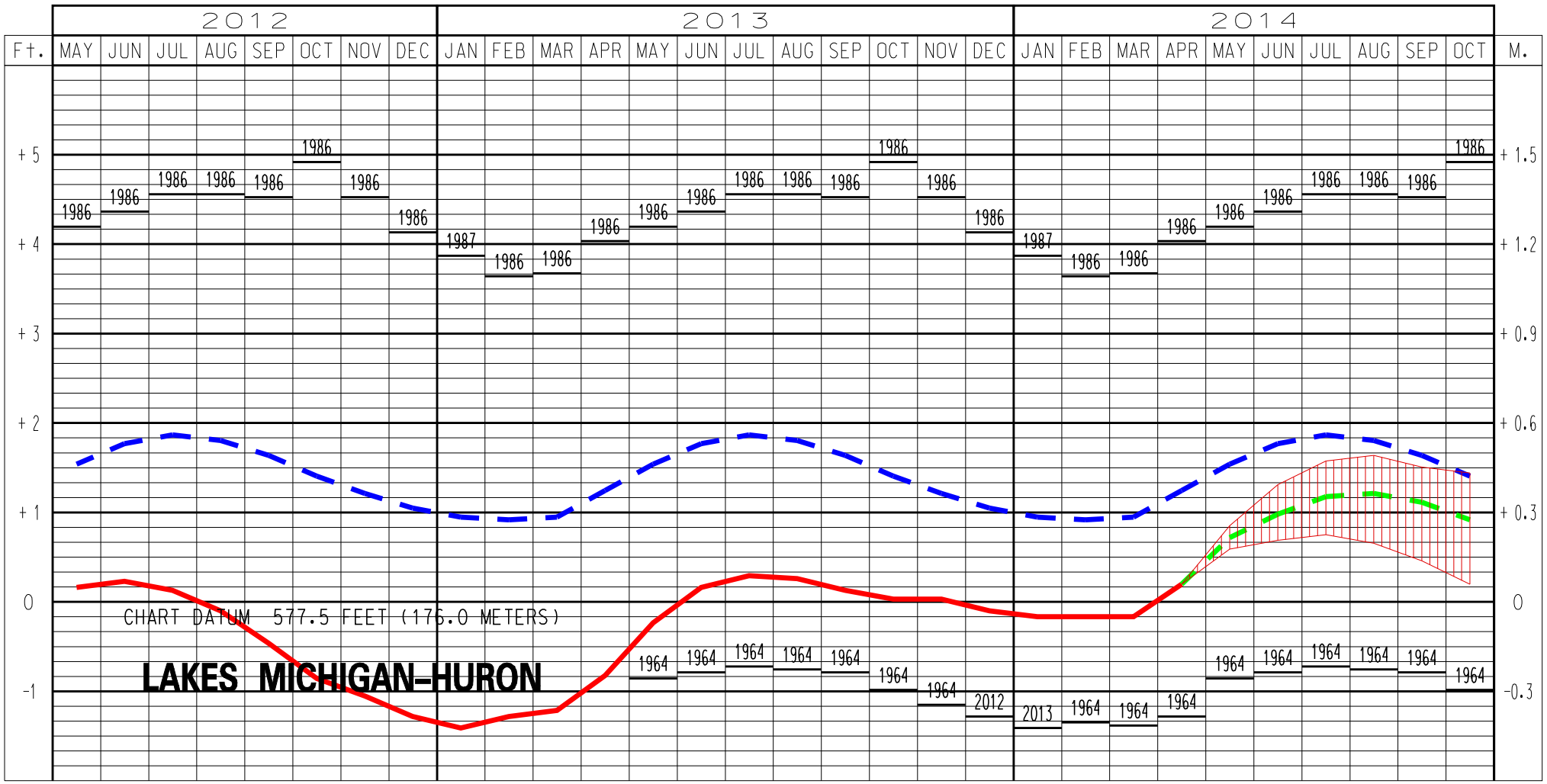
City of South Haven
River Maintenance Fund - Fund 296
For the period ended May 31, 2014

Revenues:	*Month Actual*	*YTD Actual*	*2013-14 Adopted Budget*
Assessments	$ -	$ -	$ -
Interest and Rents	863	1,725	-
Other Revenue	-	-	-
Operating Transfers In	3,073	33,807	36,880
Total Revenues	$ 3,936	$ 35,532	$ 36,880

Expenditures:	*Month Actual*	*YTD Actual*	*2013-14 Adopted Budget*
Operating Supplies	$ -	$ -	$ 500
Contractual Services	-	16	-
Repairs and Maintenance	-	-	-
Capital Outlay	-	6,990	55,000
Total Expenditures	$ -	$ 7,006	$ 55,500

Net Fund Change	$ 3,936	$ 28,526	$ (18,620)
Prior Year End Fund Balance	June 30	$ 25,506	
Estimated YTD Fund Balance		$ 54,032	
Cash & Investments Balance at month end		**$ 54,032**	
Projected Cash Balance at Fiscal Year End		**$ 6,886**	

LAKES MICHIGAN–HURON WATER LEVELS – MAY 2014



LEGEND

LAKE LEVELS

RECORDED

PROJECTED

AVERAGE **				
MAXIMUM **	1985	1985	1973	1973
MINIMUM **	1936	1934	1926	1934

** Average, Maximum and Minimum for period 1918-2013

PROCLAMATION

WHEREAS, Coast Guard Station #272, South Haven acquired land for a station in 1872, and built the Life Saving Station in 1887; and

WHEREAS, the station was moved to the south side of the harbor entrance in 1905; and

WHEREAS, the station was deactivated in June of 1973 and after extensive training, the U. S. Coast Guard Auxiliary Flotilla 18-01 was established in June of 1974; and

WHEREAS, in February 1989, disaster struck in the form of a fire which destroyed the 102 year old U. S. Coast Guard station, and

WHEREAS, the city, in exchange for the South Side Coast Guard property, provided dockage for Auxiliary vessels and constructed two buildings for the Auxiliary Detachment Station, currently located adjacent to the city's North Side Marina Building on Black River Street; and

WHEREAS, the all-volunteer U. S. Coast Guard Auxiliary Flotilla 33-01 in South Haven serves the community by providing boater safety education courses, free vessel safety examinations and patrols of the river harbor and Lake Michigan waters under the direction of the United States Coast Guard; and

WHEREAS, Auxiliary members are also trained to provide assistance to the Coast Guard for search and rescue operations, marine environment protection, and aids to navigation; and

WHEREAS, the United States Coast Guard Auxiliary's Flotilla 33-01, South Haven is celebrating forty years of service to the community, and

NOW, THEREFORE, BE IT RESOLVED, that the City Council of the City of South Haven does hereby recognize the South Haven Coast Guard Auxiliary Flotilla 33-01 for its forty years of dedicated service to both resident and visiting boaters.

In witness Whereof, I have hereunto set my hand and caused the Seal of the City of South Haven to be affixed this 7th day of June, 2014.

_____

Robert G. Burr, Mayor
City of South Haven, Michigan

June 9, 2014

TO: Harbor Commission

FR: Paul VandenBosch

RE: Queen's Cup 2015

South Haven Yacht Club has requested the use of Municipal Marina facilities for the 2015 Queen's Cup, scheduled for June 26 and 27, 2015.

The entire South Side Marina will be reserved for use by event participants from 11:00 a.m. June 26 to 11:00 a.m. June 28, 2015. The fee for the use of South Side Marina for two nights is $3,000. The Yacht Club will determine which boats will be rafted and which will be placed in slips. It is expected that boats will be rafted on the headwall and within the marina basin.

Any available slips in the Maritime Marina will be offered to event participants and displaced Yacht Club members. Event participants will be allowed to raft in the Maritime Marina basin during the time period above. Boats using slips in the Maritime Marina will be charged a transient slip fee based on slip length. Boats which are rafted will not be charged a fee.

Any available slips in the North Side Marina will be offered to event participants and displaced Yacht Club members. No rafting will take place in the North Side Marina. Boats using slips will be charged a transient fee based on slip length.

Harbor Commission is requested to recommend to City Council regarding the festival event request and 2015 Queen's Cup Agreement.

QUEEN'S CUP EVENT AGREEMENT

This Queen's Cup Event Agreement (the "Agreement") is made as of _____, 2014, between the City of South Haven, a Michigan municipal corporation with a principal address of 539 Phoenix Street, South Haven, Michigan 49090 (the "City"), and the South Haven Yacht Club, a Michigan nonprofit corporation with a principal business address of 401 Williams Street, South Haven, Michigan 49090 (the "Yacht Club").

RECITALS

A. On June 26 and 27, 2015, the Yacht Club will serve as the finish host for the annual Queen's Cup Race, which is a sailing race from Milwaukee, Wisconsin, to alternating destinations in West Michigan (the "Race").

B. The Yacht Club has asked the City to allow Yacht Club members and Race participants to moor and raft boats at City marina facilities during the Race, and to provide sufficient staffing to assist with mooring and rafting.

C. The City Council, recognizing the numerous benefits that the Race will bring to the City and its residents, is amendable to accomodating the Yacht Club's request in accordance with the terms and conditions of this Agreement.

TERMS AND CONDITIONS

In exchange for the consideration in and referred to by this Agreement, the parties agree as follows:

1. Definitions. For purposes of this Agreement, the term "mooring" shall mean the act of holding a boat in place with ropes or cables attached to a dock immediately adjacent to the boat. The term "rafting" shall mean the act of holding a boat in place with at least one rope or cable attached to another boat.

2. Removal Obligation. The City shall cause all boats to be removed from the South Side Municipal Marina, as depicted in the attached **Exhibit A**, by 11:00 a.m. on June 26, 2015. The City shall not have any obligation to remove boats from other marina facilities.

3. Grant of License. The City grants the Yacht Club a temporary license to:

    a. Use all slips in the South Side Municipal Marina for the mooring and rafting of boats.

    b. Use available slips in the Maritime Marina, as depicted in the attached **Exhibit B**, for the mooring and rafting of boats.

    c. Use available slips in the North Side Municipal Marina, as depicted in the attached **Exhibit C**, for the mooring of boats only. No rafting of boats shall be permitted in the North Side Municipal Marina.

4. Term. The term of the license granted under this Agreement shall commence at 11:00 a.m. on June 26, 2015, and terminate at 11:00 a.m. on June 28, 2015.

5. Assignment of Slips. The Yacht Club shall be solely responsible for determining which boats shall be moored and rafted in which marina facility.

6. Fees.

   a. The Yacht Club shall pay the City a license fee of $3,000 for use of the slips in the South Side Marina.

   b. In addition, a fee in an amount equal to the transient slip fee, with rates as shown in the attached Exhibit D, shall be paid for each slip used in the Michigan Maritime Marina or North Side Municipal Marina as a result of the Race.

   c. The payment of fees by an individual boat owner shall not be construed as a contract between the City and such owner, as this Agreement is the sole contract relating to the use of the marina facilities during the Race.

7. Property Rights. This Agreement grants only a license to use and does not grant or convey to the Yacht Club any rights, title, or interest in the marina facilities. At the expiration of this Agreement the Yacht Club shall return the slips in the marina facilities to the condition they were in prior to the effective date of this Agreement.

8. Staffing. The City shall provide sufficient staffing at South Side Marina to assist Race participants and boat owners who normally moor boats in the Yacht Club facilities to tie down their boats in the marina facilities. "Sufficient staffing" shall not be construed to mean more than four City staff members between the hours of 12:00 a.m. to 12:00 p.m. on June 27, or to mean more than two City staff members at any other time during term of this Agreement. City staff shall follow their ordinary procedures and practices when providing assistance in tying down boats, and shall not have any obligation to take direction from Yacht Club personnel.

9. Loss Payment (Indemnification). The Yacht Club shall hold the City (defined for purposes of this paragraph to also include the City's officers and employees) harmless from, defend it against (with legal counsel reasonably acceptable to the City), and pay for any loss paid or owed by the City related in any way to the use of City facilities in connection with the Race, including losses caused by the rafting or mooring of boats in any marina facility by Yacht Club members or Race participants. "Loss" means a monetary amount paid or owed for any reason, including for example: judgments, settlements, fines, replacement costs, staff compensation, decreases in property value, and expenses incurred in defending a legal claim.

10. Insurance. Throughout the term of the License granted under this Agreement, the Yacht Club shall obtain and maintain commercial general liability insurance with limits of not less than $1,000,000.00 per occurrence and $2,000,000.00 in the aggregate. All policies shall name the City (including its officers and employees) as an additional insured and certificate holder. Copies of certificates of insurance showing the coverage to be in place, that the premiums are fully paid, and that coverage cannot be terminated or modified except after 30 days prior written notice to the City, shall be provided to the City. Upon request, the Yacht Club shall provide the City with copies of the policies of insurance and all endorsements.

11. Miscellaneous.

   (a) This is the entire agreement between the parties regarding its subject matter. This Agreement may not be modified or amended except in writing signed by the parties.

It shall not be affected by any course of dealing. The captions are for reference only and shall not affect its interpretation. The recitals are an integral part of the Agreement.

(b) The parties represent, warrant and agree that they have had the opportunity to receive independent legal advice from their attorneys with respect to the advisability of entering into this Agreement and are signing this Agreement after having been fully advised as to its effect. This Agreement shall be construed as if mutually drafted.

(c) To the extent permitted by law, the jurisdiction and venue for any action brought pursuant to, arising from, or to enforce any provision of this Agreement shall be solely in the state courts in Van Buren County, Michigan.

CITY OF SOUTH HAVEN

By: _____
Robert Burr, Mayor

By: _____
Amanda Morgan, Clerk

Date Signed: _____, 2014

SOUTH HAVEN YACHT CLUB

By: _____
Its: _____

Date Signed: _____, 2014

EXHIBIT A
SOUTH SIDE MUNICIPAL MARINA

Southside Marina

DOCK #	SIZE
1-6	HW
7-11	45'
12-13	40'
14-17	35'
18-29	30'
30-31	35'
32-35	40'
36-39	45'
40	50'

343' HEADWALL

NO BOAT

NO BOAT

Water St

Marina Locator Map

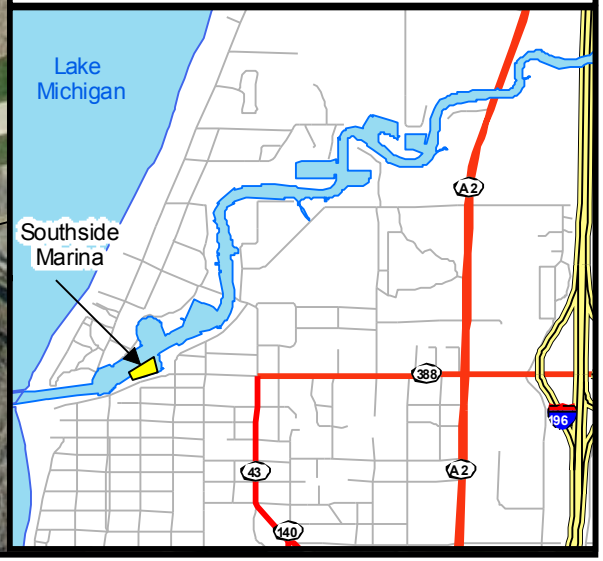
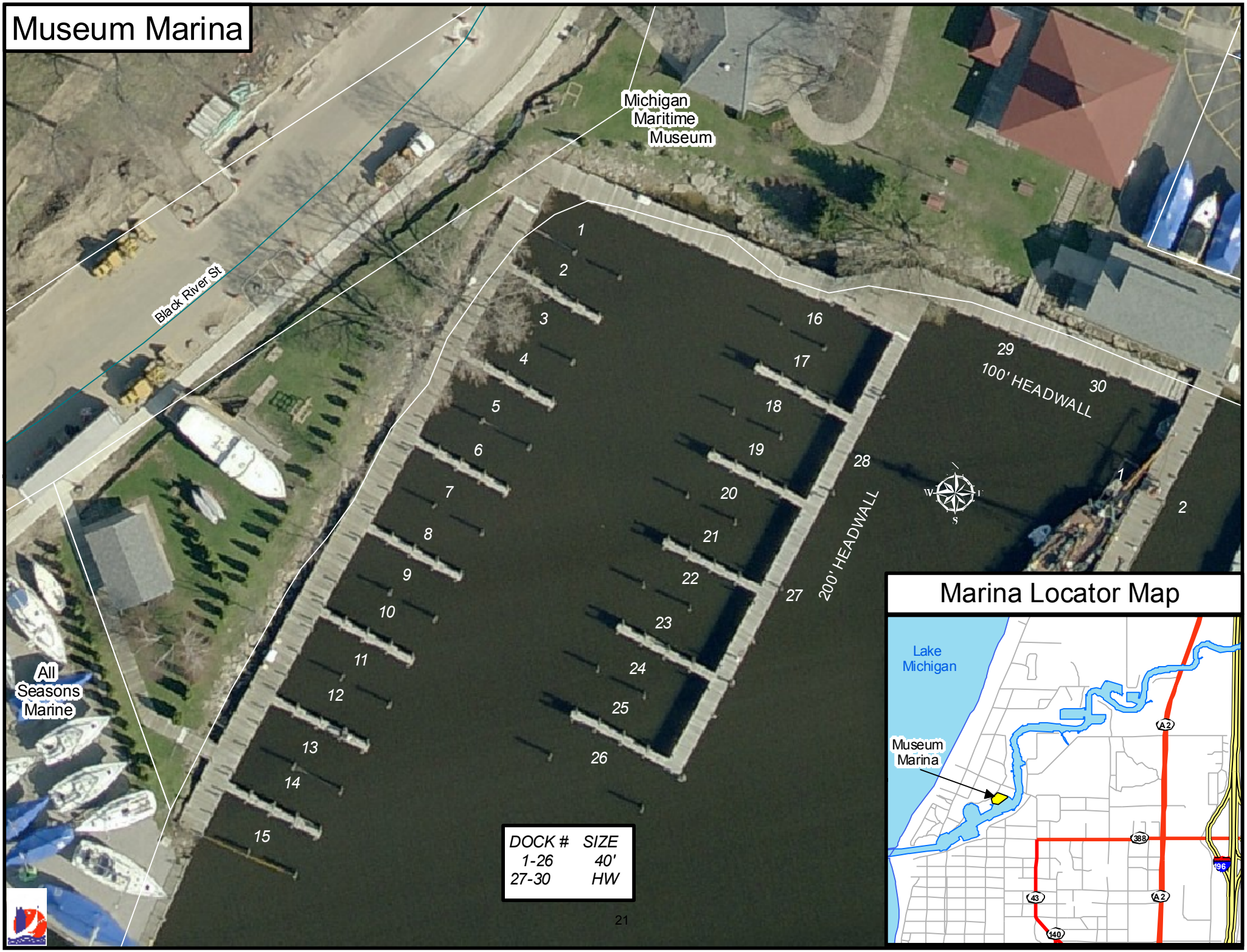


EXHIBIT B
MARITIME MARINA

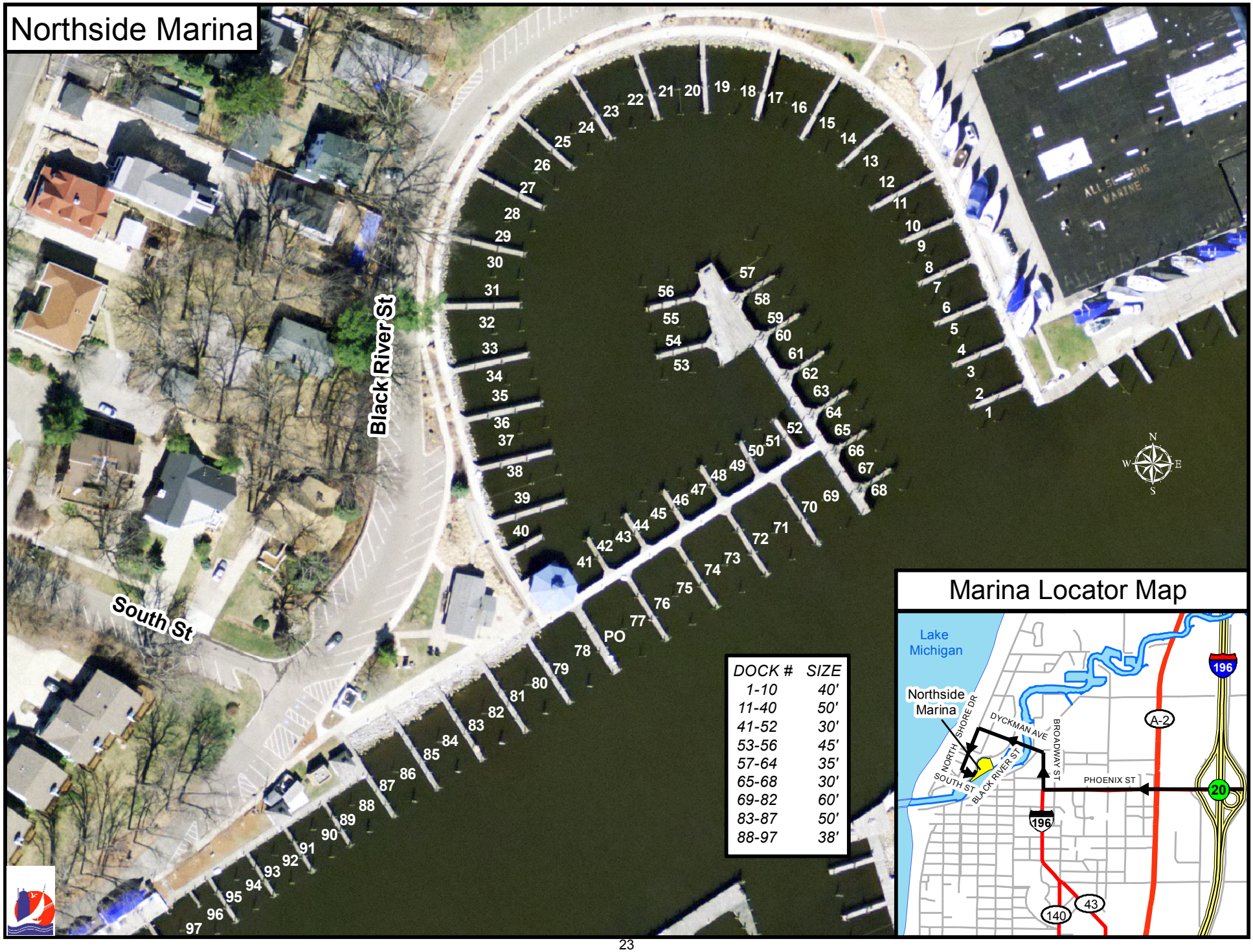
Museum Marina



Marina Locator Map

EXHIBIT C
NORTH SIDE MUNCIPAL MARINA

Northside Marina



DOCK #	SIZE
1-10	40'
11-40	50'
41-52	30'
53-56	45'
57-64	35'
65-68	30'
69-82	60'
83-87	50'
88-97	38'

Marina Locator Map

Exhibit D
Transient Slip Fee Schedule

2014 City of South Haven Rates
South Haven Municipal Marinas
Northside, Southside and Maritime Marina Slips

Slip Length or Headwall Boat Length (feet)	Daily Rate (US$)
25	32
26	34
27	35
28	36
29	37
30	39
31	41
32	42
33	43
34	45
35	46
36	50
37	51
38	52
39	58
40	59
41	61
42	62
43	64
44	65
45	67
46	68
47	70
48	71
49	73
50	74
51	75
52	77
53	78
54	80
55	81
56	83
57	84
58	86
59	87
60	89

61	90
62	92
63	93
64	95
65	96
66	98
67	99
68	101
69	102
70	104
71	105
72	107
73	108
74	110
75 ft or greater	$1.48 per foot

RECEIVED MAR 0 5 2014

FOR OFFICE USE ONLY
Special Event # _____
Date Received _____

CITY OF SOUTH HAVEN

Special Events & Festivals Application

The Special Events & Festivals Information Pamphlet must be read before filling out this application.

Complete and return this application to the Parks and Recreation Office at least 21 business days prior to the start of the event.

A new application must be submitted each year.

I have read the Special Events & Festivals Information Pamphlet and will fill out this application completely; agreeing to follow all policies and regulations set by the City of South Haven.

Initial _____ Date 2.26.14

CONTACT INFORMATION

Event Title: Queens Cup 2015

Sponsoring Organization: South Haven Yacht Club

Applicants Name: Todd Needham, Commodore

Telephone #: 616-291-5803 Phone # During Event: 269-637-2305

E-mail Address: southhavenyachtclub@gmail.com

Other contacts for/during event

Name: Roy Gooch Telephone: 269-217-1072

Name: Cheri Rehfeld Telephone: 269-214-1870

EVENT SPECIFIC INFORMATION

Event Location: 401 Williams St. South Haven, MI

Date(s) Requested: Fri June 26 2015 & Sat June 27, 2015 Alternative Date(s): _____

Start Time: 8:00Am 6/26/15 End Time: 2:00Am 6/27/15

Any event that exceeds 10:00 P.M. has to be approved by City Council

Number of people expected to attend: 1000+

EVENT DESCRIPTION

Please give a description of the event (Please attach a separate sheet with details if there is not enough space below).

As in 2012, SHYC will be the finish for the Queens Cup Race Expecting 175-225 Sailboats (weather permitting) Will Leave Milwaukee 6/26/15 Evening & arrive SH Sat 6/27 morning carrying 1000+ Sailors. South Haven Yacht Club will Be open to the public

MAPS/LOCATION – mark event items on map(s)

Check items below that apply to your event. **All items checked below must be indicated on the MAP(S).** Maps can be found on the city's website. Please note, **map(s) must be submitted with the Special Events & Festivals Application.**

☑ City property or city park use. **Show locations of fencing, barriers, or barricades. Include streets and/or sidewalks to be closed or barricaded on map(s).** To ensure requested items, such as cones or barricades, are reserved and available for the day of the event, please complete the **CONES AND BARRICADE REQUEST FORM** and submit it with the Special Events & Festival Application. Requested items are available Monday through Friday during office hours between 7:00am and 3:30pm; the office is closed during lunch from 12:00pm to 1:00pm. Should you require an alternate time a **$50 After Hour Charge** will be assessed. Please note, if the Cones and Barricade Request Form is not submitted, the City of South Haven can not guarantee the requested items will be available for the event, **first come - first served, limited quantity available.**

- ☐ Barricade Request: Mark locations on maps. Barricades that are damaged or not returned to the Public Works Department will be charged $25.00 per barricade.
- ☐ Cone Request: Mark locations on maps. Cones that are damaged or not returned to the Public Works Department will be charged $10.00 per cone.

Explain closure The South Side Marina Will be occupied by sailboats as 2012. 6 Additional Slips needed 4-50'&2-40' to moor displaced SHYC members

☑ Entertainment, dance, tent or stage. Mark locations on maps. only on SHYC property

☒ Event Command Post. Mark location on maps. S. Side Marina Boaters lounge Beginning 10pm on 6/26/15 – Midnight 6/27/15

☐ Dumpsters and/or trash containers. The Mark location on maps.

☐ Portable toilet facilities. Mark locations on maps. How many? South Side Marina 6 showers 6 Bathrooms
The City requires the use of portable facilities for events expecting over 500 attendants.

☐ Parade. Mark beginning area, the route* (with arrows) and finish area on maps

*If Business Route I-196 needs to be closed for the Parade you will need to contact Department of Public Works at 269-637-0737 to obtain a MDOT permit for road closure.

☐ Participants. Mark parking areas, bus locations, and special passengers on maps.

☐ Relay event. Indicate "hand-off" points and areas of participant equipment impact.

☐ Aircraft landing / hot air balloons. Mark location on maps.

☐ Fireworks/pyrotechnics site. Mark location on maps.

☐ Vendors/General Merchandise concession areas. Mark areas on maps. Name of contact person for vendor(s)

Vendors and General Merchandise Concessions will not be allowed in the Central Business District (CBD). Please refer to the Special Events & Festivals Information Pamphlet for a detailed map of this area.

Name: _____ Telephone: _____

Note: Number will be given for all vendor inquiries. It is suggested that the Sponsoring Organization issue a paper permit to be displayed by vendor to let city and event staff now they are an approved vendor.

☒ First Aid facilities. Mark location on maps. List agency providing staff and equipment on SHYC property

Name: _____ Telephone: _____

☐ Live animal sites. Mark location on maps and describe: _____

_____

☐ Any other item(s) that should be included on maps. Explain: _____

_____

ADDITIONAL EVENT INFORMATION

☐ Liquor License
The sale and consumption of alcoholic beverages may occur on publicly-owned property located with the approved Downtown South Haven Special Event Area. Guidelines for such special event liquor licensing are available in the Special Event & Festivals Alcohol Policy. These policies require that an application be filed with the City of South Haven and the Michigan Liquor Control Commission.
City of South Haven Liquor License Application
Michigan Liquor Control Commission Website

Liquor license application must be submitted before the city will process this special event application.

☒ Noise: Please describe i.e. music, sound, amplification and any other noise that impacts surrounding area. Provide dates and times noise will occur. **All noise must stay with in the city's noise ordinance. Noise Ordinance Sec. 30-28. City Noise Ordinance will be enforced.** If you have any questions about the noise ordinance please contact the local police department 269-637-5151.

Live Music @ SHYC 6/27/15

Date: 6/27/15 Time: 11:00 Am - 11:00 pm

Date: _____ Time: _____

Date: _____ Time: _____

☒ Signage: Prior to the event a list of all signage (example: sandwich boards, banners, etc.) and placement of the signage needs to be turned in to the city's Parks and Recreation Supervisor. Upon submission the signage requests will be reviewed by the Parks and Recreation Supervisor; additional approval may be required.

☐ Street Marking: Painting and marking on roads and sidewalks should be held to a minimum, and paint specifically designed to wear away in a short period of time and approved by the city shall be used. Please contact the Parks and Recreation Supervisor for approved list.

CITY SERVICES

Are you requesting any utility services to be provided: ☐ Yes ☒ No
If yes, explain: _____

_____

If electric utilities requested, name of festival person or electrician who will be responsible:
Name: _____ Telephone: _____

Will vendors be using electric utilities: ☐ Yes ☒ No
If yes, the city's Electrical Inspector will be making inspections of all vendors using electric during events. A charge of $10.00 per vendor will be billed to the **Sponsoring Organization** (NOT the vendor) following the event.

Will you require additional police services: ☐ Yes ☒ No
If yes, explain: _____

_____

Will you require additional fire/ambulance services: ☐ Yes ☒ No
If yes, explain: _____

_____

Additional fire information: Mark all that apply

☐ Tents ☐ Concessions ☐ Exits ☐ Compressed Gases
☐ Extinguishers ☐ Electrical ☐ Exposed Flames
☐ Other:_____

If you checked any box in the "Additional fire information" section, you **MUST** obtain a **"FIRE & LIFE SAFETY (Form A3) REQUIREMENT FOR VENDORS, PARTICIPATING IN FESTIVALS, FAIRS AND ALL OTHER OUTSIDE EVENTS/ACTIVITIES"** information form from the Deputy Fire Chief. Please contact the South Haven Area Emergency Services at 269-637-5151 located at 90 Blue Star Hwy.

The primary concern during an event is Public Safety. In the event of inclement weather the City of South Haven has the right to cancel or postpone any special event; this includes the City Manager, Police Chief or his designee and Fire Chief or his designee.

INSURANCE

The city requires proof of insurance ($1,000,000) naming the City of South Haven as "additionally insured". The Proof of Insurance Certification needs to be turned in with the Special Event application.

Is the Proof of Insurance Certification Provided with Special Event Application? ☐ Yes ☐ No

REMINDERS

Please make sure the following items are turned in with the Special Events & Festivals Application

☐ Map(s)

☒ Proof of Insurance Certification To be provided in 2015

☐ Cones and Barricade Request Form (if applicable) N\A

☐ Submitted liquor license application (if applicable)

INDEMNIFICATION AGREEMENT

The undersigned agrees and promises, as a condition of approval of this Special Events & Festivals Application to defend, indemnify, and save harmless the City of South Haven, its agents, officials and employees from all suits, claims, damages, causes of action or demands of any kind and character arising out of resulting from or in connection with the use of said Public Property

Todd Dale

Applicants Signature

2·26·14

Date

COMMODORE, SOUTH HAVEN YACHT CLUB

Please return to:
Parks and Recreation Supervisor
Department of Public Works
City of South Haven
1199 8th Ave
South Haven, MI 49010
Phone: 269-637-0772 / Fax: 269-637-4778
Hours: Monday-Friday 7:00a.m. – 3:30p.m.

Please remember this application must be submitted to the Parks and Recreation Office at least 21 business days prior to the start of the event.

South Haven Pierhead to Dyckman Bridge South Haven, Michigan

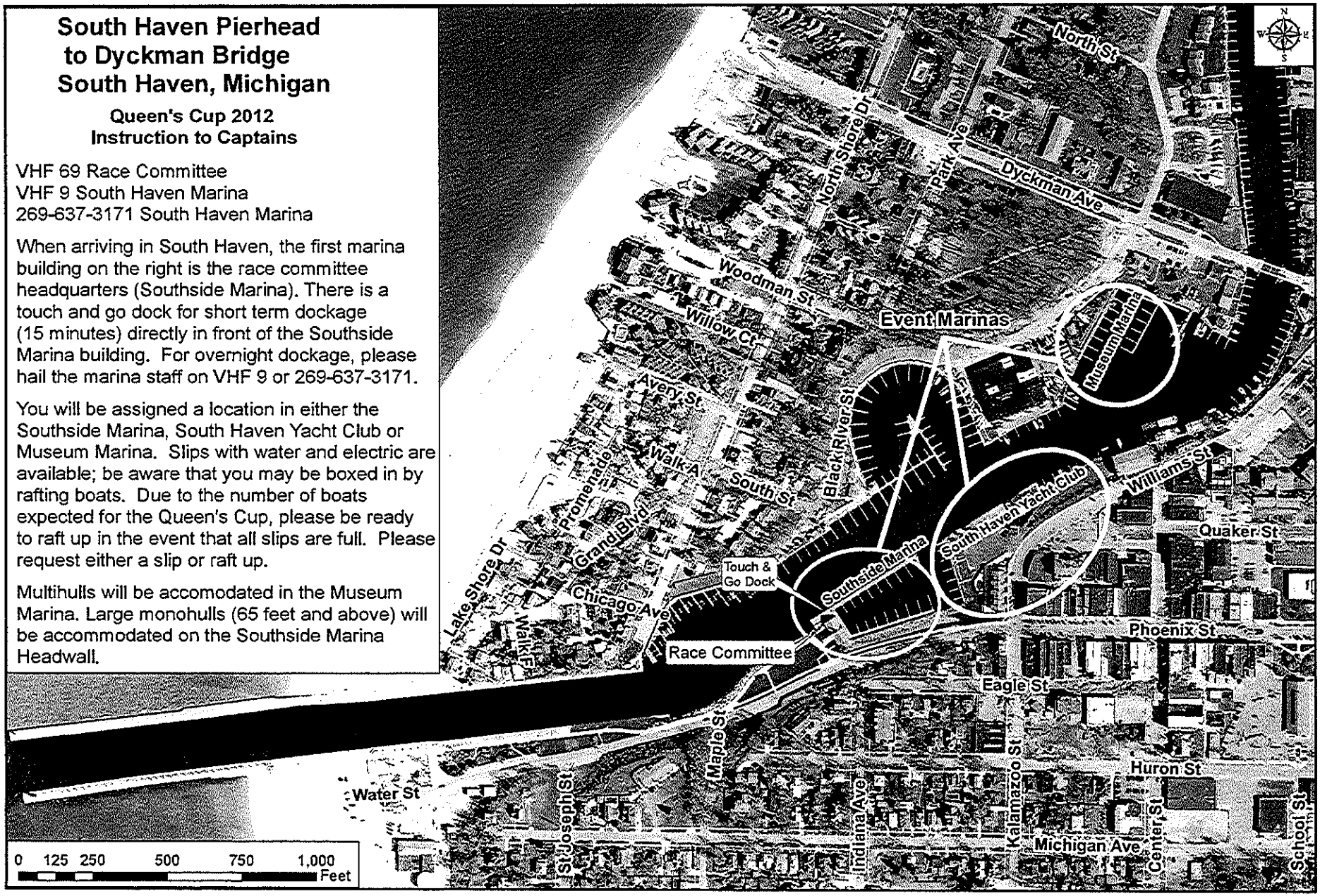
Queen's Cup 2012
Instruction to Captains

VHF 69 Race Committee
VHF 9 South Haven Marina
269-637-3171 South Haven Marina

When arriving in South Haven, the first marina building on the right is the race committee headquarters (Southside Marina). There is a touch and go dock for short term dockage (15 minutes) directly in front of the Southside Marina building. For overnight dockage, please hail the marina staff on VHF 9 or 269-637-3171.

You will be assigned a location in either the Southside Marina, South Haven Yacht Club or Museum Marina. Slips with water and electric are available; be aware that you may be boxed in by rafting boats. Due to the number of boats expected for the Queen's Cup, please be ready to raft up in the event that all slips are full. Please request either a slip or raft up.

Multihulls will be accomodated in the Museum Marina. Large monohulls (65 feet and above) will be accommodated on the Southside Marina Headwall.



SOUTH HAVEN
ASSESSMENT OF EXISTING AGITATION LEVELS AND PERFORMANCE OF PROPOSED MARINA BASIN

WFBA has completed an analysis of the wave agitation or 'surge" occurring in the Black River at South Haven. The results from model studies, previously completed by WFBA for harbors with similar harbor entrance configurations as South Haven, were analyzed and scaled to provide an estimation of agitation levels at South Haven. In addition, calculations of wave agitation using basic coastal engineering analyses were completed and the results compared to the model study results.

The intent of this study was to determine if a wave agitation problem will exist, either at the entrance to the proposed marina, or within the new marina. It was also necessary to determine the probable agitation levels in other parts of the Black River adjacent to the new marina site and to attempt to understand the problems which exist at present.

This report provides a brief summary of WFBA's understanding of the present situation based on: discussions with Mr. Marple[1]; a review of the various dimensions, materials and orientations of existing structures; analyses of agitation levels and sources;and preliminary designs for new revetments structures along the south shoreline.

The results provided in this report represent a preliminary assessment of the wave agitation problem. Structure cross sections presented in this report are based on preliminary engineering and soils information and will require additional work prior to final design.

SOURCES OF WAVE AGITATION/SURGE

Storm waves are generated by the action of wind on Lake Michigan. These waves can travel directly or indirectly through the entrance channel into the Black River at South Haven.

Outer Channel

1. Waves travel along the channel between the entrance jetties. This condition may occur with wind directions ranging from S to N when accounting for the refraction of offshore wave conditions. The most severe conditions will occur with waves originating from the SW to NW.

2. Waves overtopping either jetty. The original jetty structures were constructed to a maximum elevation of +6.5' LWD. Modifications have been made to the north jetty which have increased its elevation. The jetty structures will overtop frequently, especially during periods of high water and winter wave conditions. Overtopping is most likely to occur with wave action occurring from either the S to SW or N to NW.

1 During the investigation Mr. John Marple from the city of South Haven provided a substantial amount of assistance through telephone conversations and by providing harbor plans, air photos and structure cross sections. The assistance of Mr. Marple and his staff is greatly appreciated.

A plot of wind frequency by direction for Muskegon is attached to this report. It lists the number of hours by direction for a period of 10 years. This information shows that overtopping will be relatively frequent.

3. The wave conditions in the entrance will be relatively complex because of wave reflection from the vertical steel sheet pile walls. Waves may run along the jetty walls and produce a local increase in wave height adjacent to the wall. This condition is known as "mach stem" reflection because of the analogy to sound waves.

In general, some attenuation in wave height will occur due to the interaction of the waves with the vertical walls. However, the reduction in wave height is much less than would occur if the walls consisted of a revetment of armor stones.

Inner Channel - North Side

Wave agitation on the North side of the Black River inside of the jetties has several sources.

1. Diffracted from the entrance channel

   A diffraction analysis indicates that the wave height, solely due to diffraction, at Piers End Cove may be as high as 30% to 60% of the wave height at the inner end of the jetties. In addition, waves originating from the SW will travel along the face of the North jetty and be concentrated on the North side of the channel. These are often referred to as 'Mach stem' waves and will increase the agitation levels at Piers End Cove especially for SW wave conditions.

2. Reflected from a submerged wooden wall which exists along a large portion of the South shoreline.

   A reflection analysis indicates that waves originating in the entrance channel and reflected from the submerged wooden wall on the south side of the river are most likely to influence agitation levels at Mariners Dockage and at the most westerly Municipal marina slips rather than at Piers End Cove. Discussions with Mr. Marple and other residents of South Haven indicated that the agitation levels at Mariners Dockage and the most westerly Municipal marina slips are generally acceptable. These comments in combination with the results of the reflection analysis indicate that the submerged wall on the south side of the river does not have a significant adverse affect on the agitation levels at recent water levels. Due to the depth of the submerged wall (estimated to be -0.9' LWD), reflections are most likely to occur during periods of low water.

3. Reflected from the rubble shoreline on the South side.

   Wave agitation in the river due to reflections from the south shoreline will vary depending on the material along the existing shoreline and steepness of the banks. The existing shoreline consists of concrete rubble with slopes varying from 1:1 to 4:1 and crest elevations varying from +9' near the inner

end of the south jetty to +4' along the proposed marina site. The weights of individual pieces of the concrete rubble vary from a few pounds up to several tons. The smaller pieces have rounded corners due to movement during storms. It also appears that storm wave action approaches the top of the rubble slope along the length of the revetment.

An analysis of runup levels on rubble slopes indicates that the existing slope (smooth, relatively impermeable) will have higher runup and reflection coefficients than the proposed armored slopes (rough, permeable). Therefore, construction of the proposed shoreline revetments (slopes 2 horizontal :1 vertical) will likely reduce the agitation levels from those presently encountered. Additional analysis is required prior to final design.

4. Wave action created by boat wakes.

Mr. Marple indicated that boat wakes presently create some agitation problems at the Municipal marina. The contribution of boat wakes to the total agitation problem along the north shore is unknown.

Inner Channel - South Side

Wave agitation on the South side of the Black River inside of the jetties has one prominent source. The orientation of the Black River is such that the south side of the harbor is directly exposed to waves propagating through the entrance channel. Consequently wave conditions in the harbor are the most severe at this location. As mentioned previously, the majority of wave energy entering the harbor is presently absorbed by the broken concrete and rubble along the south side of the harbor directly in line with the entrance channel.

Any structure built in this section of the harbor should be designed to absorb wave energy and to minimize wave reflection. Wave overtopping is also a potential problem if public access is to be provided to this shoreline. If properly designed, the construction of new armour revetments will improve the total agitation levels in the Black River inside of the jetties.

ESTIMATION OF WAVE AGITATION LEVELS

It is not possible to determine exactly what the wave heights will be in the inner harbor without completing a three dimensional model study. However, an approximation is possible by extrapolating from previous model studies and experience.

In this study we have analyzed the wave climate at South Haven by first reviewing the results from three previous model studies completed by WFBA.

a) North Lake , Prince Edward Island.
b) Kenosha, Wisconsin
c) A theoretical study of wave attenuation along entrance channels

An approximation of expected wave conditions in the harbor are based on experience with similar projects. A more definitive estimate of wave conditions would require a suitably designed three-dimensional physical model study.

The following table summarizes the conclusions:

Location	Significant Wave Height Maximum Expected with 18' offshore Hs
Offshore	17.5'
West end of entrance	16'
East end of entrance	10'
Marina entrance	2'

The conclusions from the investigation are as follows:

- The maximum significant offshore wave height was estimated to be 17.5' with a peak period of 9s.
- The maximum significant wave height at the end of the jetties was estimated to be 16' with a peak period of 9s. (Depth limited breaking waves at harbor entrance during severe storms)
- Estimates of wave attenuation along the entrance channel were completed for both direct and oblique wave approaches to the entrance channel.
- Wave attenuation coefficients along the entrance channel ranged from 0.18 to to 0.49 depending on the method of calculation, wave period, and angle of approach to the entrance channel. These values mean that the wave height incident at the outer end of the jetties is reduced to between 18% and 49% of its original height by the time it reaches the inner end of the jetties.
- It was estimated that a 16' wave height at the end of the jetties will be reduced to approximately 10' by the time it reaches the inner end of the jetties. This would mean that the maximum offshore waves will exceed the top of the inner jetty wall (elev. +5.5' LWD) at recent water levels of approximately +1.5'LWD. These estimates are supported by observations by local residents during storms.
- Additional analyses were completed to determine the attenuation coefficients between the inner end of the jetties and the entrance to the new marina. These coefficients were estimated to be approximately 0.25 for waves with periods ranging from 7 to 9s and travelling along the center of the Black River. Therefore, the maximum expected wave height at the entrance to the marina will be in the order of 2'. In general, waves will be significantly less than this.

PRELIMINARY REVETMENT STRUCTURES

Preliminary revetment structures have been designed for the south shore inside of the South Haven entrance channel.

The revetment section extending from the inner end of the south jetty toward the proposed marina consists of 2 layers of 2 ton armour stones underlain by 2 layers of filter stone and the existing rubble or other granular material. A cross section view is shown in Section A of Figure 1. This section is directly exposed to waves from the entrance channel and is important in reducing agitation levels in general within the basin. The layers of armour and filter stone are important in reducing reflections from the revetment.

An analysis of runup levels on rough slopes indicates that the proposed design will provide better protection and lower runup and reflection coefficients than the existing

concrete rubble slope even though the new structure has a steeper slope. The first 250' of the revetment has a crest elevation of 589' USGS which then tapers over the next 100' down to 584' USGS. The remaining 290' of revetment takes advantage of the submerged pile wall, and oblique wave attack in the area, having a crest height of 584' USGS.

The toe detail for Section A includes a 3' excavation of existing materials and replacement with armour and filter stone. The toe detail requires additional work prior to final design including a more thorough review of the soils information and possible levels of toe scour.

The smaller revetment section (Section B) consists of 1 layer of 2 ton armour underlain by 2 layers of filter and existing rubble or other granular material. A cross section view is shown in Section B of Figure 1. Revetment section B is heavily dependent on the condition of the submerged piles which must be in excellent condition. Mr. Marple noted information he had received indicated that the piles were in excellent condition however, this should be verified prior to final design.

Revetment section B will also create an improvement over the existing situation in terms of reflections from the shoreline.

DESIGN OF MARINA WAVE WALL

A literature review of available information on the performance of slotted vertical wall structures for wave attenuation was completed. The information in the literature (Weckman 1983, Gardner 1986, Kakuno 1983, Allsop) covers a wide range of slotted structures and presents the results of model tests and theoretical analyses.

The most useful information relative to South Haven is provided in the paper by Gardner. Gardner describes the development of a slotted vertical wall for use as a breakwater for a marina in Plymouth. The structure was divided into double and single screen breakwaters depending on the exposure. The results for one section of the Plymouth breakwater can be extrapolated to provide a preliminary indication of what may occur at South Haven.

The most appropriate breakwater section for comparison to South Haven involved the use of a single screen breakwater with 8% porosity. In this instance the results indicate that for an incident wave height of 2' the reflected wave height will be in the order of 1.2' and the transmitted wave height will be approximately 6 inches.

Therefore, a single screen breakwater with 8% voids will provide sufficient protection to the marina and also reduce reflections within the Black River basin.

CONCLUSIONS & RECOMMENDATIONS

1) Wave agitation is presently most severe at Piers End Cove. Analysis of wave agitation levels indicate that wave heights can be as high as Hs=6' at Piers End Cove.

2) The majority of wave energy entering the harbor is absorbed by the concrete rubble along the south shoreline. The orientation of the Black River is such that

the south shoreline is directly exposed to waves propagating through the entrance channel.

3) The shoreline along the south side of the harbor immediately inside of the south jetty should be upgraded with a wave absorbing structure such as an armor stone revetment. If correctly designed this structure could improve the overall wave conditions in the harbor. The final design of a new revetment should consider overtopping conditions, stability of armor stones, and reflection characteristics.

Preliminary revetment designs for the south shoreline have been provided with this report. The cross sections are dependent on the stability of the existing soils and submerged piles. Therefore, cost estimates based on these preliminary designs may vary significantly depending on the existing conditions.

4) A vertical wall may be used along the north facing section of the proposed marina. The orientation of the proposed new marina wall it is not expected to increase overall agitation levels in the river with the exception of reflecting boat wakes which are presently at least partially absorbed by the shoreline. This structure should ,as a minimum, have gaps in the panels which will absorb between 10% and 30% of the wave energy (mainly from boat wakes).

5) Wave conditions at the marina entrance will be in the order of 2 feet during severe storms, the entrance detail and layout of berths should allow for these conditions.

6) If it is desired to improve the overall wave conditions in the harbor and/or to expand the usable area of the harbor, this could be achieved by placing armor stones along sections of the sides of the main entrance channel. The armor stone revetment absorbs the wave energy and has been proven to significantly attenuate waves at other similar locations in the Great Lakes. If a reduction in the overall wave conditions in the harbor is desired a three-dimensional physical model study should be undertaken to support the design process.

REFERENCES

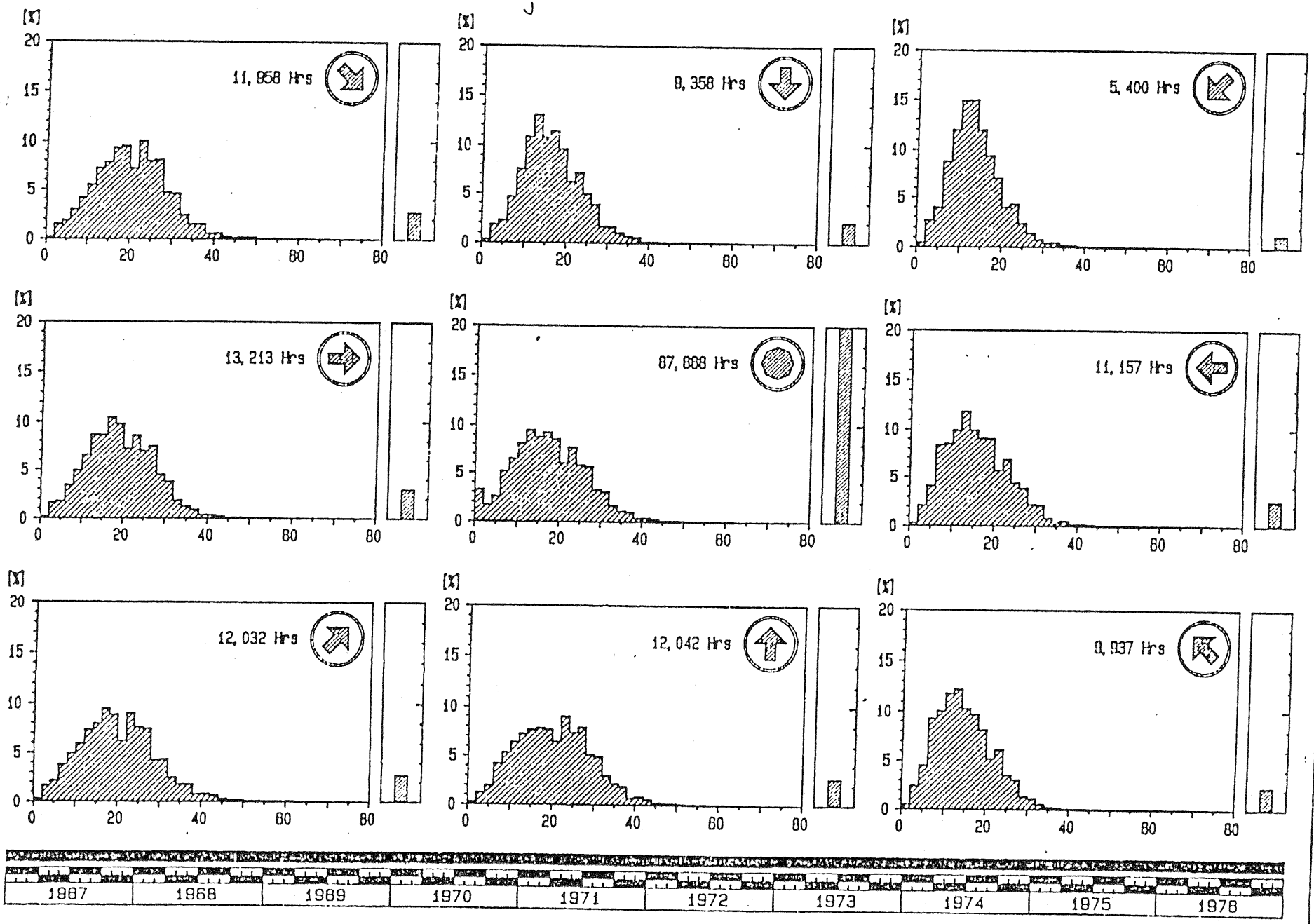
Allsop, N.W., Hettiarachchi, S.S., Reflections from Coastal Structures, Paper No. 261,

Kakuno, S., Reflection and transmission of Waves Through Vertical Slit Type Structures, Proceedings of Coastal Structures ASCE, Arlington, March 1983, pp 939-952.

Gardner, J.D., Townsend, T.H., Fleming, C.A., The Design of a Slotted Vertical Screen Breakwater, Proceedings of Coastal Engineering 1986, pp1881-1893.

Weckman, J., Bigham, N., Dixon, R.O., Reflection Characteristics of a Wave Absorbing Pier, Proceedings of Coastal Structures ASCE, Arlington, March 1983, pp 953-960.

MUSKEGON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1976

Johnson, Johnson & Roy/Inc.
Planning/Landscape Architecture/
Urban Design

303 N. Main Street
Ann Arbor, Michigan 48104
313 662-4457

JJR

Report

- [x] Conference
- [ ] Field Inspection
- [ ] Telephone Conversation

project: South Haven Marina Park
JJR No. 15225.10

location: NRC "Wave Tank" Facility, Ottawa, Canada

date: 16 and 17 August 1989

participants: John Marple - City of South Haven
Kevin MacIntosh, William Baird - Baird and Associates
Bob Doyle - Johnson Johnson & Roy/inc

items discussed:

The purpose of the meeting at NRC was to review the testing being completed on the model of existing conditions and to set a direction for the testing of the proposed conditions model. The meeting occurred over a two day period. The first day's efforts focused on evaluating the accuracy of the model of existing conditions and the second day focused on giving Baird & Associates direction towards testing the model of the proposed conditions. A summary of the issues discussed follows:

16 AUGUST 1989

1. The model of the existing conditions was complete and thoroughly detailed. The model included the underwater wall on the north side of the proposed marina site and the sand lens which occurs on the north side of the channel. The model was tested with an 8 foot offshore wave (4 second interval) and a 16 foot offshore wave (9 second interval). From these first series of tests a few preliminary conclusions could be made, including:

a. The test results seem to be confirmed by the conclusions made in Baird & Associates' earlier report and the on-site observations made by Mr. Marple.

b. The existing concrete rubble at the project site is absorbing wave energy. The proposed armour stone revetment will hopefully absorb even greater levels of wave energy.

c. The waves measured near the proposed location of the marina building site and marina entrance did not appear threatening to the proposed activities. It is hoped that further analysis will indicate that the floating breakwater and/or the marina wall along the docks are not required to protect the proposed marina.

d. The wave action at the end of the north jetty wall and in the area of the private docks is quite severe, but is nearly dissipated by the time it arrives at the existing municipal basin.

. The wave action to the north side of the river seems to be the result of wave diffraction as well as reflection from the south shore (i.e., proposed marina site).

2. JJR requested that Baird & Associates relate the waves tested to some level of probability of frequency (e.g. a 10 year storm). Mr. Marple indicated that the series of tests with the 8 foot offshore wave probably represented a "typical" severe summer storm.

3. The arrangement of the wave generator produced waves directly perpendicular to the jetty walls. While this situation rarely occurs in the natural setting, Baird & Associates feel that this arrangement produces a situation in which the effects of "northwester" and "southwester" storms can be evaluated in one set of tests.

4. William Baird suggested that measures could be taken along the south and/or north jetty with armour stone that would reduce the wave energy that effects the north side of the river basin. Mr. Marple responded that the City would not be in favor of constricting the channel with armour stone. Stone could be placed at the end of the north jetty which might help protect the docks at Pier's End Cove without constricting the channel.

5. Mr. MacIntosh proposed that the remaining series of tests of the existing conditions be performed during his absence due to vacation. Following his return, Mr. MacIntosh will review the test results and either order additional series of tests or proceed

directly into testing the proposed marina configuration. JJR and/or the City will return to observe the testing of the proposed configuration.

6. Mr. Marple would like JJR to look into the possibility of getting the sanitary sewer designed and relocated this fall.

17 AUGUST 1989

1. Mr. MacIntosh confirmed that the schedule proposed on 16 August was acceptable with Mr. Baird and that they would assume responsibility for any costs incurred for holding the NRC tank during Kevin's absence.

2. JJR and the City directed Baird & Associates to construct the proposed model assuming the removal and/or burial of the existing underwater wall. Based on the current estimated location of the COE dredge line, the toe of the stone revetment will occur within the limits of the dredge line.

3. JJR reviewed their current thoughts on wrapping the stone revetment underneath the Marina Building. Baird may have to modify their model slightly to make this work.

4. The proposed model should show the proposed docks, especially those at the South Haven Yacht Club.

5. The current informal criteria for acceptable wave height is 2 foot at the marina entrance and 1 foot inside the basin.

6. To evaluate the proposed marina configuration JJR and the City requested the following series of wave conditions be tested:

   a. A full series (i.e., four different wave conditions) with the stone revetment in place but without the floating breakwater and marina wall;

   b. A full series with the stone revetment and floating breakwater only;

   c. An 8 foot wave condition with the stone revetment and marina wall only;

   d. An 8 foot wave condition with the stone revetment, floating breakwater and marina wall.

e. An 8 foot wave condition with the wave measurement devices shifted to the west.

f. An 8 foot wave condition with a stone revetment in place at the end of the north jetty (i.e. Pier's End Cove).

7. JJR requested that Mr. Marple direct George Mitchell Surveys to locate the COE dredge line on a survey base.

Submitted by Robert R. Doyle/JJR.

RRD:mm

cc Participants
Fred Klancnik, Pat Doher, Kate Sullivan/JJR

City of South Haven
City Hall • 539 Phoenix Street • South Haven, Michigan 49090-1499
Telephone (616) 637-5211

August 1, 1989

To: Kevin MacIntosh
Baird and Associates
Suite 150
38 Antates Drive
Ottawa, Ontario, Canada K2E 7V2

FAX 613-225-5957

Re: Harbor Wall Condition

Dear Kevin;

Following is the condition of the Harbor Wall as surveyed by Robert Nichols on Monday, July 31, 1989. I hope that you will be able to read the following. Should there be any questions, please feel free to call.

AREA A
The whole area is engulfed with large concrete rip-rap that is spilling extensively out into the river. Wall is visible at times but buried in rip-rap fairly evenly on both sides of the wall. Heavy surge action appearant. Rip-rap has worked out into the river. Dotted line shows approximate location of wall.

AREA B
One hundred feet in length. Substantial wall along this section with heavy rip-rap on inside and outside of wall. Top of wall goes from two feet underneath water level to five feet below water level going east.

AREA C - SIXTY FEET IN LENGTH
Wall buried underneath the rip-rap, deterioration to four to six feet below surface. Wall way underneath water at this point which shows why there is erosion in the area.

AREA D - ONE HUNDRED THIRTY FEET IN LENGTH
Wall in very good condition. Fifteen feet of depth at base of wall on river side. Pilings every five to six feet. At eastern end of section D, wall breaks south to form old slip area. Length of wall running south is thirty feet. Thirty-five feet from slip on eastern end, there is a twenty foot break in wall.

AREA E - FIFTY-FIVE TO SIXTY FEET IN LENGTH
No wall in area, old slip was constructed there. Concrete covers bottom with ten feet of depth at wall line.

AREA F - ONE HUNDRED FIFTEEN FEET IN LENGTH
Wall in very good condition. Nearly vertical. Heavy whalers with pilings every four feet or so, sometimes doubled.

AREA G - SEVENTY-FIVE TO EIGHTY FEET IN LENGTH
Wall pushed down flat by broken concrete which spills out into the river. The wall disappears downstream side of this section.

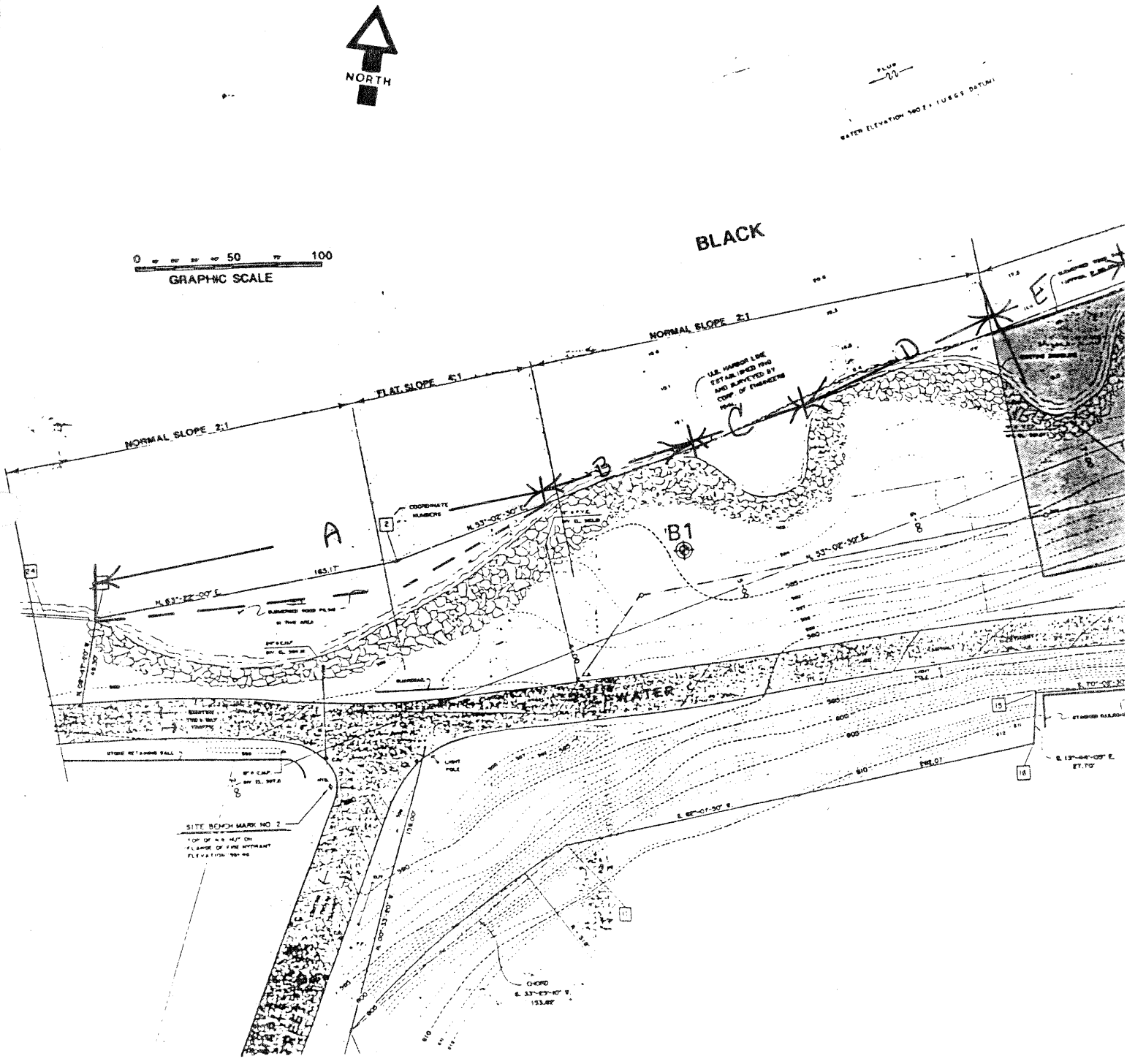
AREA H - SIXTY FEET IN LENGTH
Wall has begun to collapse with a forty-five degree angle. Concrete rip-rap on both sides of wall with a twelve foot depth at base of wall.

AREA I - SIXTY-FIVE TO SEVENTY FEET
Wall at twenty-five degree angle with eight feet of depth with rip-rap on both sides of wall. Quite a bit of rip-rap on outside of wall.

AREA J - FORTY-FIVE TO FIFTY FEET
Wall again at twenty-five degree angle with twelve feet of depth on outside of wall. Less rip-rap than in Area I.

AREA K - SIXTY FEET
Twelve foot depth at wall. Wall has collapsed out into river at approximately forty-five degree angle. Rip-rap covers wall with very little into river outside of wall. Wall is eight feet off bottom of river at the top edge.

This covers the project area. Bob Nichols' phone number is 616-637-7026 should you have any questions. If you need anything, please let me know.


NORTH
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NORMAL SLOPE 2:1
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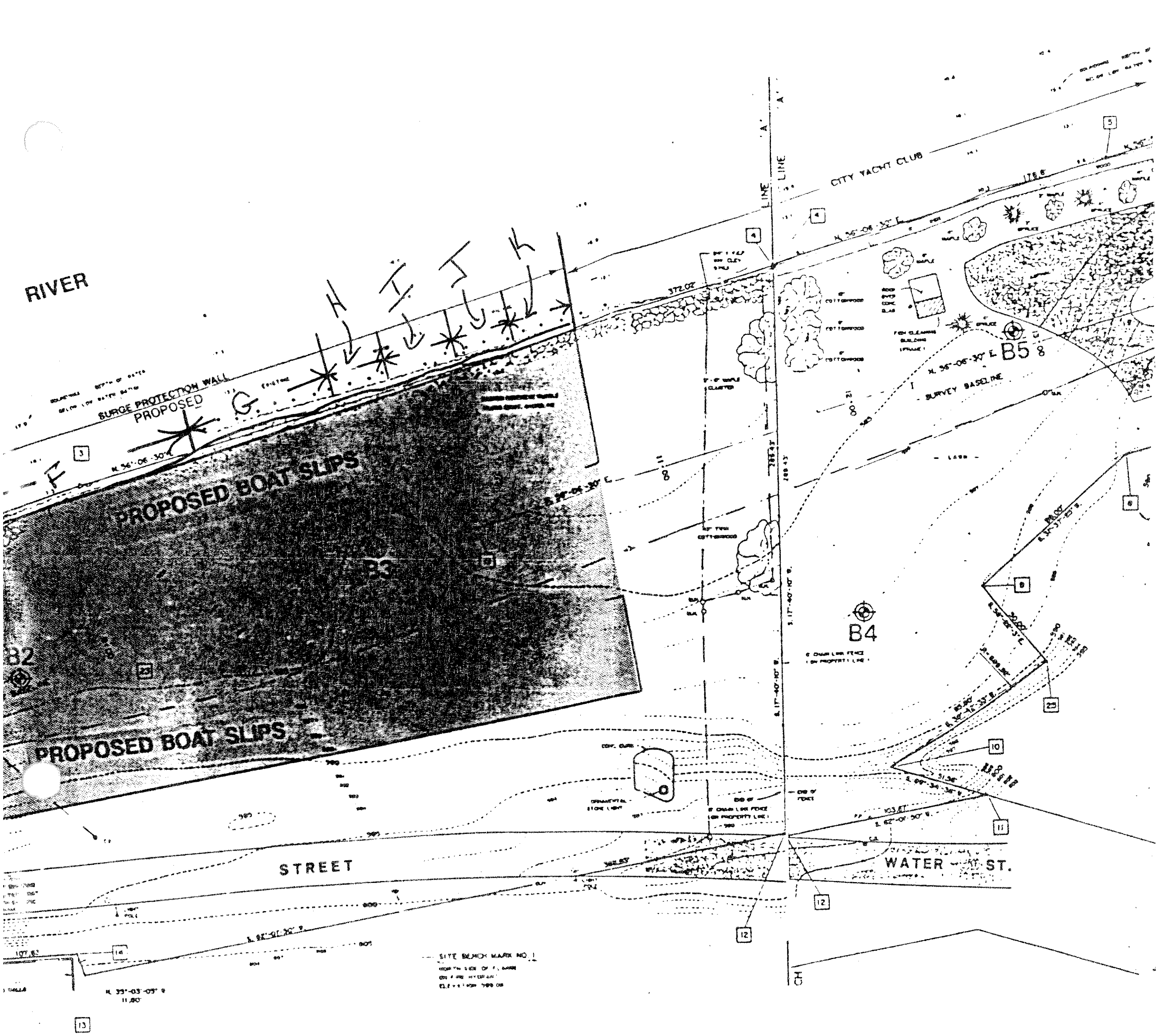
NORMAL SLOPE 2:1
A
B
B1
C
D
E
SITE BENCH MARK NO. 2
B1
INDICATES TEST



SOIL BORING LOCATION DIAGRAM
SOUTH HAVEN MARINA DEVELOPMENT

soil and materials engineers, inc

ANN ARBOR
BATTLE CREEK
BAY CITY
LANSING
LIVONIA

Date	5-8-89
Drawn By	CB
Scale	NTS
Job	

IN LOCATIONS

John Marple

Johnson, Johnson & Roy/Inc.
Planning/Landscape Architecture/
Urban Design

303 N. Main Street
Ann Arbor, Michigan 48104
313 662-4457

JJR

Report

☒ Conference
☐ Field Inspection
☐ Telephone Conversation

project:	South Haven Marina Park JJR No. 15225.10
location:	NRC "Wave Tank" Facility, Ottawa, Canada
date:	13 September 1989
participants:	Kevin MacIntosh - W. F. Baird & Associates Bob Doyle - Johnson, Johnson & Roy

The purpose of the meeting at NRC was to observe the testing being completed on the model of the proposed Marina Park. The visit occurred mid-way through the testing procedure so that a direction for completing the work could be set and any modifications to the model could be made.

Observations from the Initial Tests

1. Wrapping the stone around the end of the south jetty seems to work well.

2. Armor stone larger than 2 ton may be required in the first section of the revetment (+/- 200' from the end of the south jetty). Also, it may be advantageous to go with three layers of stone in this area. A 3 foot horizontal to 1 foot vertical slope may be the flattest slope achievable in this area.

3. Transitions in slope steepness could be difficult to achieve smoothly and will need to be studied further during final engineering.

4. The transition in revetment height as shown on the latest plan works very well as it parallels the transition of wave height.

5. The eastern 275 feet of revetment may be reduced in width to help cut costs; i.e., increase the elevation of the revetment toe.

6. There is a long period wave swell occurring at the South Haven Yacht Club proposed slips.

7. It appears that the floating breakwater may not be necessary to attenuate wave energy. Also, the length of the wave wall built into the docks may be shortened from the original plan of running the wall along the entire length of the north head dock. JJR and W. F. Baird discussed optional locations of the wave wall with and without the floating breakwater. In either case, if the wall is used it will be located on the inside edge of the north dock.

8. Tests were run with a wall in place to protect Pier's End Cove. Data was not yet available for evaluation of impacts.

9. The general layout and location of the revetment appear to work well as shown on current plans.

Project Direction

1. W. F. Baird will make the following modifications to the model prior to running the remaining tests:

   a. Increase height of revetment to proposed elevations

   b. Remove partical board "wall" at top of revetment

   c. Increase elevation of revetment toe at eastern section of revetment

   d. Lower elevation of water to current water level

   e. Relocate test stand to evaluate waves at South Haven Yacht Club

2. W. F. Baird will test the following conditions:

   a. With 60' length of wave wall

   b. With full length of wave wall

c. With a horse hair blanket that will simulate three layers of stone at the west section of the revetment

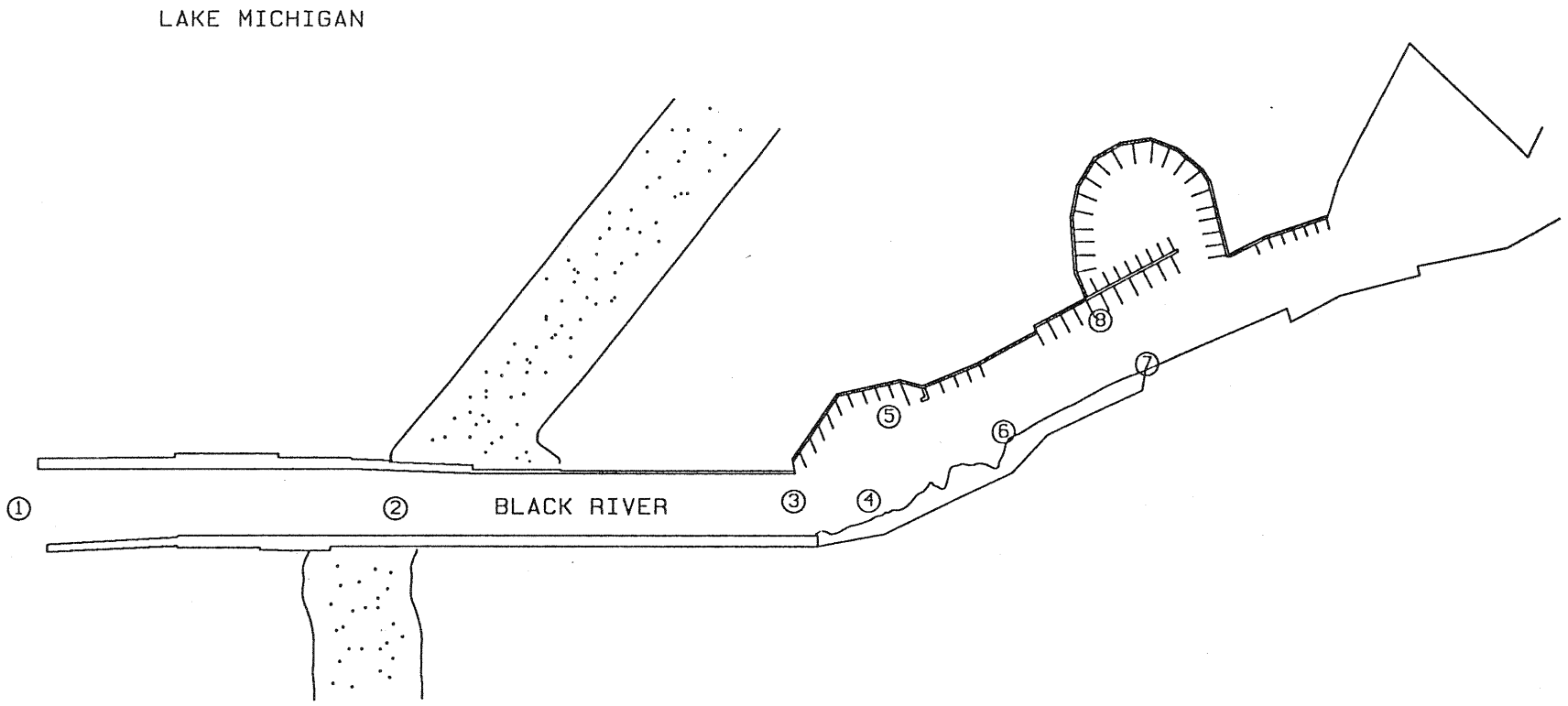
3. W. F. Baird will investigate the nature of the surge observed at the Yacht Club slips to determine if surge is a modelling phenomenon or an actual condition.

4. JJR will investigate the relative permeability of the material to be located beneath the sidewalk along the top of the revetment and report back to W. F. Baird.

Submitted by Robert Doyle/JJR RD

RRD:mm

cc John Marple - City of South Haven
Fred Klancnik, Pat Doher - JJR
Kevin MacIntosh - W. F. Baird & Associates



SOUTH HAVEN MARINA STUDY

Baird & Associates

EXISTING CONDITIONS

SCALE 1 : 5000 | FIGURE 1

SOUTH HAVEN WAVE AGITATION MODEL STUDY

Existing Condition Tests

Hs (ft)

LOCATION	GAUGE #	EX503	EX504	EX505	EX701	EX702	EX801	EX802	EX903	EX904
		closed				open				
Outer End of Jetty	1	7.9	7.9	7.6	12.3	12.2	14.3	14.4	15.7	15.8
Middle Of Channel	2	5.9	6.0	6.3	8.9	9.0	10.1	10.1	9.1	9.1
Inner End of Jetty	3	6.0	5.6	5.7	7.2	7.3	7.7	7.7	7.7	7.5
Adj to S Revetment	4	1.7	1.7	2.8	2.7	2.6	3.4	3.3	3.5	3.5
Piers End	5	0.9	1.0	1.4	2.1	2.1	2.6	2.6	2.3	2.3
W end of Marina	6	0.8	0.8	1.2	1.2	1.2	1.3	1.3	1.6	1.6
E end of Marina	7	0.4	0.4	0.3	0.6	0.6	0.8	0.8	1.2	1.2
Municipal Marina	8	0.7	0.7	0.9	1.0	1.0	1.0	1.0	1.1	1.1

Additional Tests

Hs (ft)

LOCATION	GAUGE #	EX501	EX502	EX901	EX902	EX000	EX001
Outer End of Jetty	1	7.9	7.9	16.3	16.5	0.3	0.4
Middle Of Channel	2	6.4	6.3	9.7	9.8	0.2	0.2
Inner End of Jetty	3	6.2	6.1	7.7	7.7	0.1	0.1
Adj to S Revetment	4	2.3	2.3	3.4	3.5	0.1	0.1
Piers End	5	1.1	1.1	2.3	2.4	0.1	0.1
W end of Marina	6	1.1	1.1	1.4	1.4	0.0	0.0
E end of Marina	7	0.4	0.4	1.1	1.1	0.0	0.0
Municipal Marina	8	0.8	0.8	1.1	1.1	0.0	0.0

* EX series involved determining the effects of wind on the model

Comparison of Existing Conditions and Revetment Tests

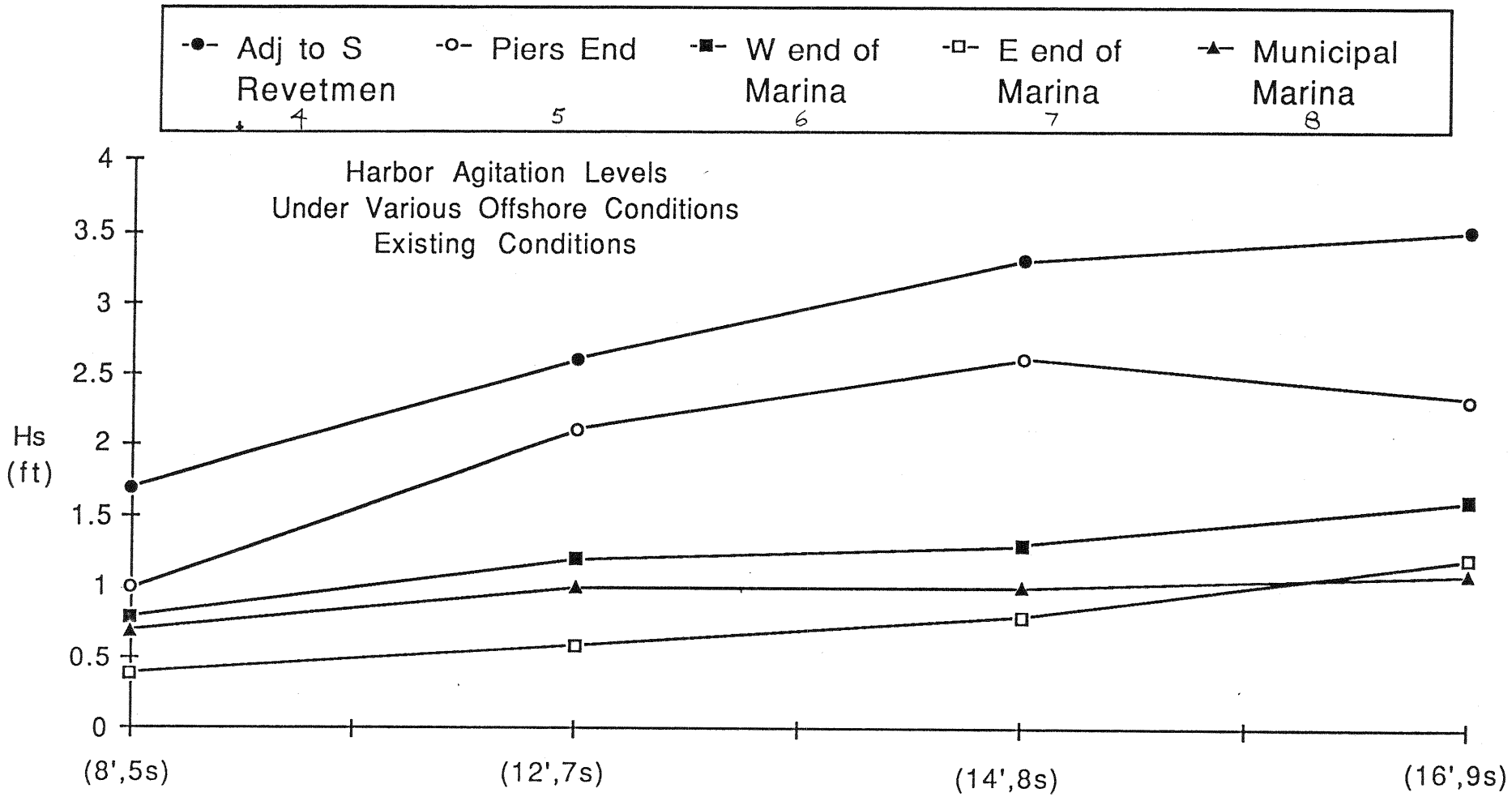
LOCATION	GAUGE #	EX503	R2502	EX701	R2702	EX801	R2801	EX903	R2901
Outer End of Jetty	1	7.9	7.6	12.3	12.1	14.3	14.3	15.7	15.9
Middle Of Channel	2	5.9	6.4	8.9	9.0	10.1	10.0	9.1	10.2
Inner End of Jetty	3	6.0	6.1	7.2	7.3	7.7	7.6	7.7	7.5
Adj to S Revetment	4	1.7	2.5	2.7	2.6	3.4	2.6	3.5	2.8
Piers End	5	0.9	0.9	2.1	1.4	2.6	1.8	2.3	2.1
W end of Marina	6	0.8	1.2	1.2	1.4	1.3	1.5	1.6	1.5
E end of Marina	7	0.4	0.6	0.6	0.7	0.8	0.6	1.2	0.7
Municipal Marina	8	0.7	0.4	1.0	0.7	1.0	0.9	1.1	0.9

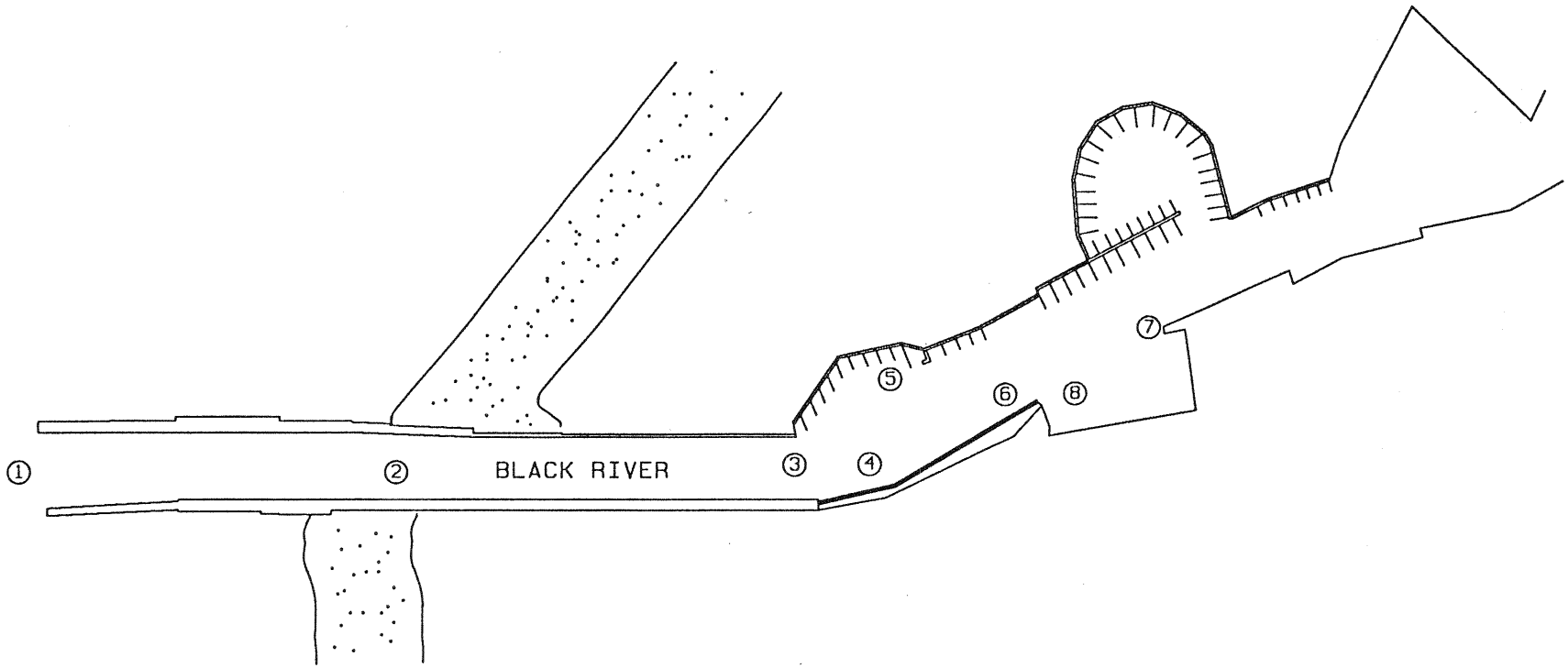
Note: Gauge 8 was moved prior to the R2 tests. Therefore a direct comparison is not possible.

LOCATION	(8ft, 5s)	(12.3ft, 7s)	(14.4ft, 8s)	(15.8ft, 9s)
Offshore of Jet	7.9	12.2	14.4	15.8
Middle Of Chan	6	9	10.1	9.1
Inner End of Je	5.6	7.3	7.7	7.5
Adj to S Revetn	1.7	2.6	3.3	3.5
Piers End	1	2.1	2.6	2.3
W end of Marin	0.8	1.2	1.3	1.6
E end of Marina	0.4	0.6	0.8	1.2
Municipal Mar	0.7	1	1	1.1

Water Level	2	1	-0.5
GAUGE #	EX505	EX501	EX503
1	7.6	7.9	7.9
2	6.3	6.4	5.9
3	5.7	6.2	5.96
4	2.8	2.3	1.7
5	1.4	1.1	0.9
6	1.2	1.1	0.8
7	0.3	0.4	0.4
8	0.9	0.8	0.7

Note:
Following graph indicates that the wave heights in the inner basin do not change significantly once the offshore wave heights exceed (H_s 12', $T_p = T_s$)


Adj to S Revetmen
Piers End
W end of Marina
E end of Marina
Municipal Marina
4
5
6
7
8
Harbor Agitation Levels
Under Various Offshore Conditions
Existing Conditions
Hs
(ft)
4
3.5
3
2.5
2
1.5
1
0.5
0
(8',5s)
(12',7s)
(14',8s)
(16',9s)



SOUTH HAVEN MARINA STUDY

Baird & Associates	
REVETMENT TEST	
SCALE 1 : 5000	FIGURE 2

SOUTH HAVEN WAVE AGITATION MODEL STUDY

EVETMENT TESTS

LOCATION	GAUGE #	Hs (ft) R1501	R1701	R2502	R2702	R2703	R2801	R2802	R2901
Outer End of Jetty	1	7.6	12.1	7.6	12.1	12.1	14.3	14.4	15.9
Middle Of Channel	2	6.3	8.8	6.4	9.0	8.9	10.0	10.0	10.2
Inner End of Jetty	3	6.1	7.3	6.1	7.3	7.4	7.6	7.7	7.5
Adj to S Revetme	4	2.5	2.5	2.5	2.6	2.6	2.6	2.6	2.8
Piers End	5	1.0	1.4	0.9	1.4	1.5	1.8	1.9	2.1
W end of Marina	6	1.2	1.4	1.2	1.4	1.5	1.5	1.5	1.5
E end of Marina	7	0.6	0.7	0.6	0.7	0.7	0.6	0.7	0.7
NEW Marina W enc	8	0.6	0.8	0.4	0.7	0.7	0.9	0.9	0.9

* Gauge 8 was moved from the Municipal marina following Series R1 to within the new marina basin

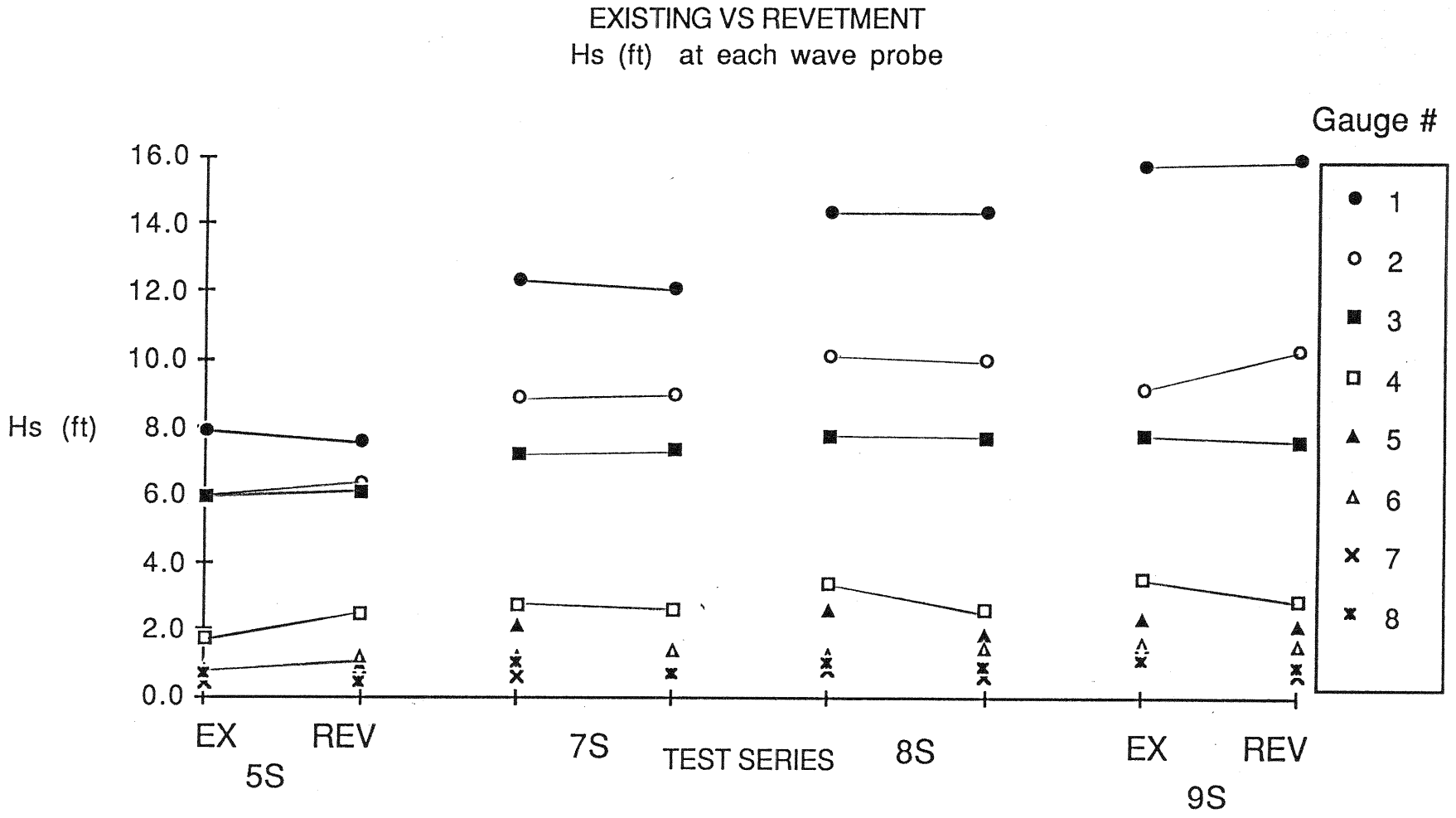
PIERS END TESTS

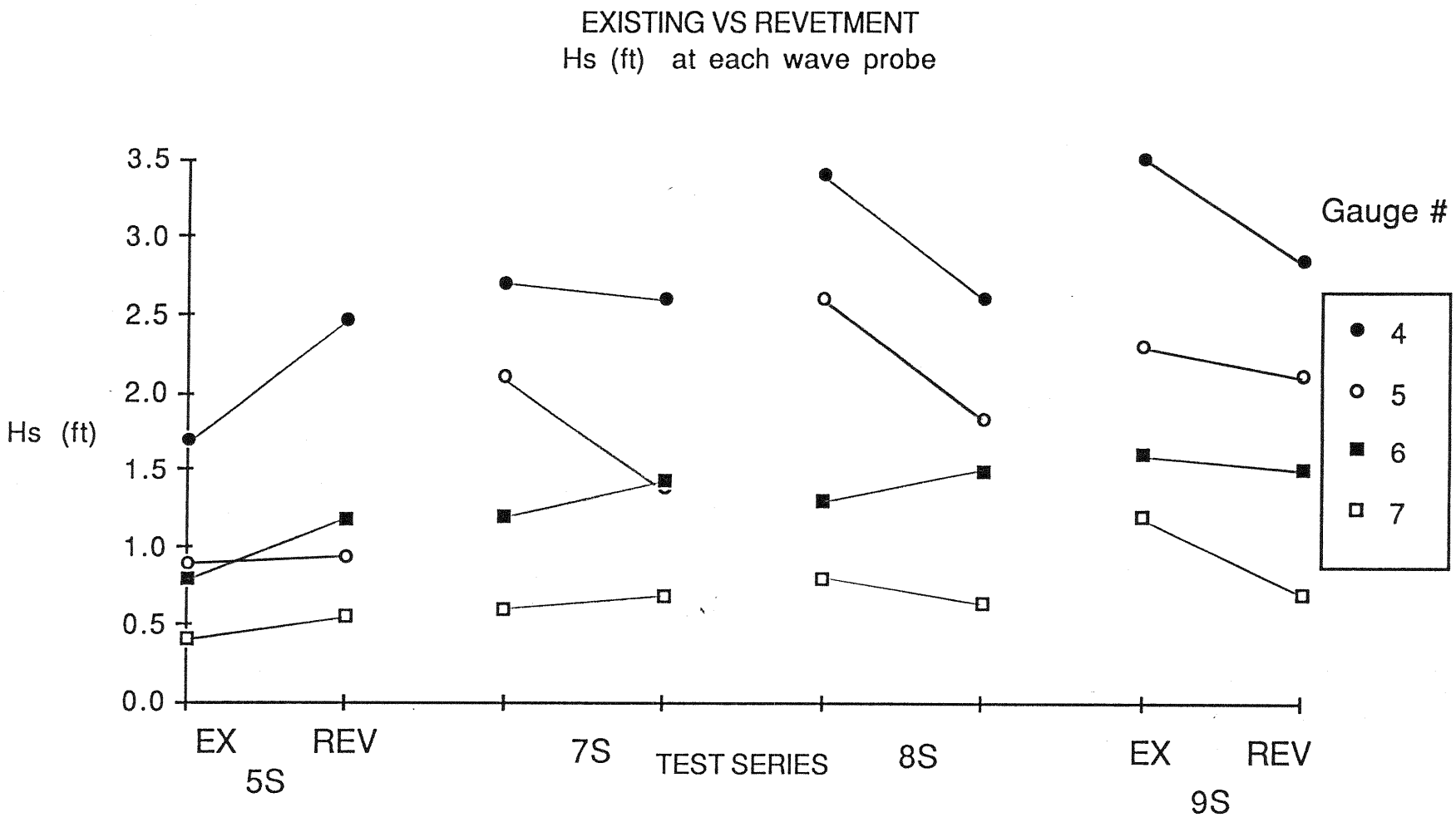
LOCATION	GAUGE #	Hs (ft) PE901	PE902	R3901	R2901	% Of Offshore Hs PE901	R2901
Outer End of Jetty	1	16.3	15.9	15.9	15.9	100	100
Middle Of Channel	2	10.3	10.2	10.1	10.2	64	64
Inner End of Jetty	3	6.8	6.9	7.2	7.5	42	47
Adj to S Revetme	4	2.6	2.5	2.7	2.8	16	18
Piers End	5	1.4	1.5	1.6	2.1	8	13
W end of Marina	6	1.2	1.1	1.4	1.5	7	9
E end of Marina	7	0.5	0.5	0.6	0.7	3	4
NEW Marina W enc	8	0.8	0.8	0.8	0.9	5	5

* PE refers to Piers End Caisson in place

- The addition of a 65' extension to the north jetty did not significantly improve the situation at Pier's end.
- The extension may have also had some impact on increasing the wave height within the inner harbor.

Notes: • The revetment reduces the wave agitation levels within the harbor for the longer period waves. (gauges 4,5,6,7)


EXISTING VS REVETMENT
Hs (ft) at each wave probe
Gauge #
1
2
3
4
5
6
7
8
Hs (ft)
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
EX
REV
5S
7S
TEST SERIES
8S
EX
REV
9S


EXISTING VS REVETMENT
Hs (ft) at each wave probe
Hs (ft)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
EX
REV
5S
7S
TEST SERIES
8S
EX
REV
9S
Gauge #
4
5
6
7

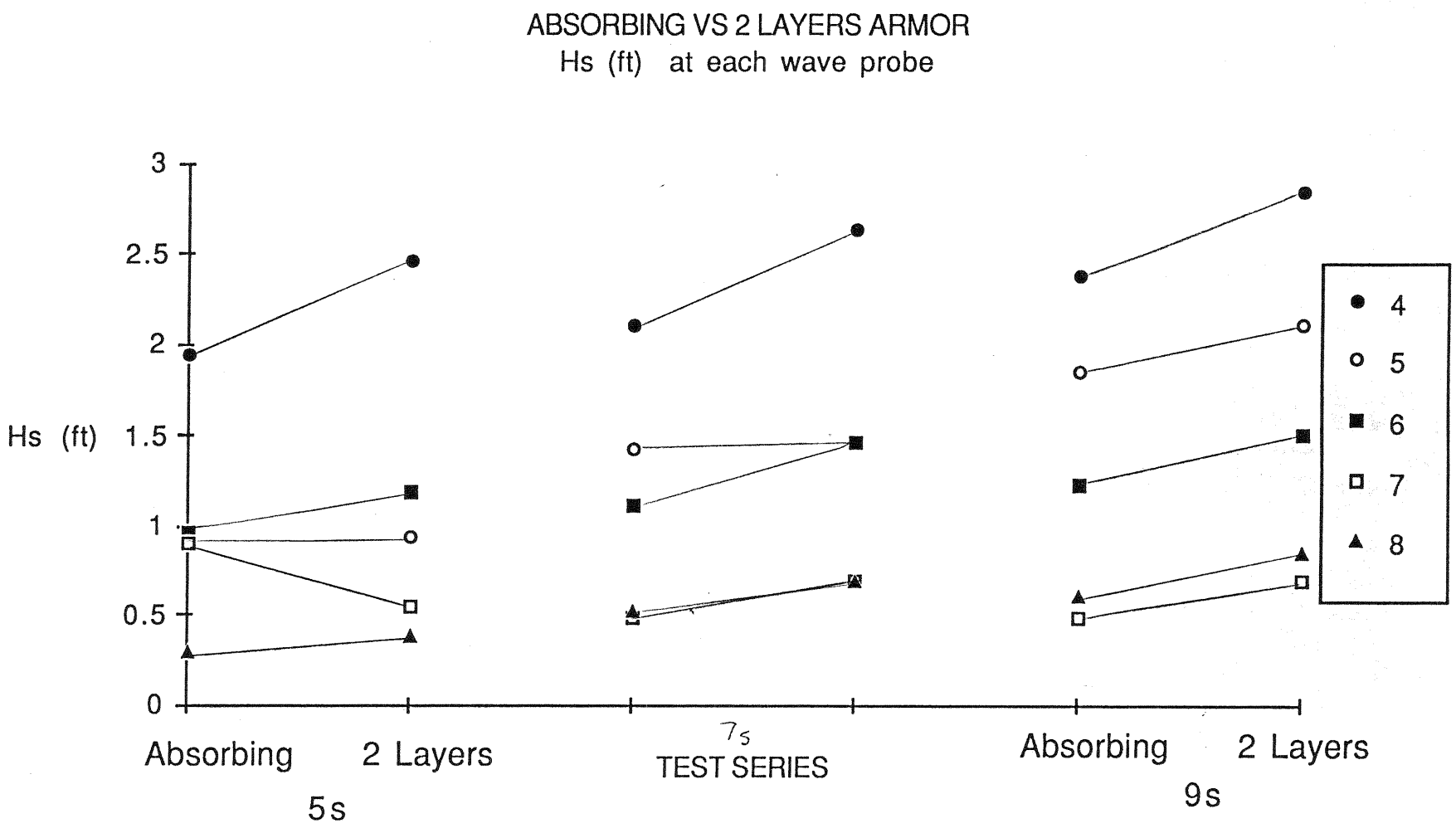
Absorbing Revetment vs 2 layers of Armour

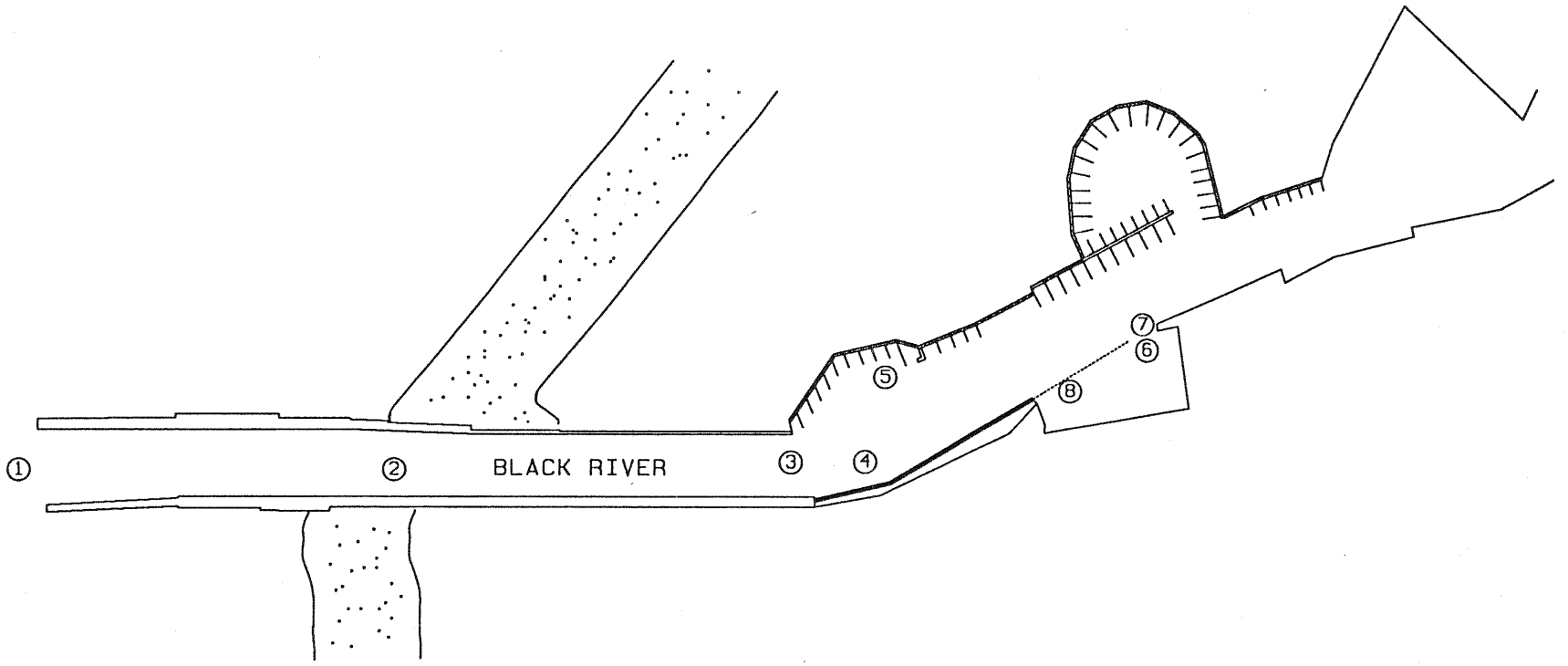
LOCATION	GAUGE #	HH501	R2502	HH701	R2703	HH901	R2901
Outer End of Jetty	1	7.6	7.6	12.14	12.1	15.9	15.9
Middle Of Channel	2	6.3	6.4	8.95	8.9	10.25	10.2
Inner End of Jetty	3	5.7	6.1	6.88	7.4	7.04	7.5
Adj to S Revetme	4	1.9	2.5	2.1	2.6	2.38	2.8
Piers End	5	0.9	0.9	1.42	1.5	1.84	2.1
W end of Marina	6	1.0	1.2	1.12	1.5	1.22	1.5
E end of Marina	7	0.9	0.6	0.48	0.7	0.48	0.7
NEW Marina W enc	8	0.3	0.4	0.52	0.7	0.61	0.9

*HH signifies Horse Hair Tests
** R2 signifies 2 Layers of Armor on Revetment

1) POROUS REVETMENT reduces agitation levels at gauges 4, 6, 7, 8 by approximately 20 to 30%.

2) POROUS REVETMENT creates no significant improvement at gauge 5, Piers End.


ABSORBING VS 2 LAYERS ARMOR
Hs (ft) at each wave probe
Hs (ft)
3
2.5
2
1.5
1
0.5
0
4
5
6
7
8
Absorbing
2 Layers
7s
TEST SERIES
Absorbing
2 Layers
5s
9s



SOUTH HAVEN MARINA STUDY

Baird & Associates	
WAVE WALL TEST	
SCALE 1 : 5000	FIGURE 4

60' Wave Wall in Place

LOCATION	GAUGE #	Hs (ft) R4902	R4801	R4802	R4701	R4702	R4501	R4502
Outer End of Jetty	1	16.0	14.5	14.5	12.3	12.2	7.5	7.6
Middle Of Channel	2	10.3	10.1	10.1	8.8	9.1	6.3	6.4
Inner End of Jetty	3	7.2	7.3	7.3	7.0	7.1	5.5	5.8
Adj to S Revetment	4	2.7	2.5	2.5	2.5	2.5	2.1	2.2
Piers End	5	1.7	1.6	1.6	1.3	1.4	0.8	0.9
NEW Marina E end	6	1.3	1.3	1.3	1.3	1.3	0.9	1.0
E end of Marina	7	0.6	0.5	0.5	0.5	0.5	0.3	0.4
NEW Marina W end	8	0.7	0.7	0.7	0.6	0.6	0.3	0.3

Comparison of 60' Wave Wall and Full Wall

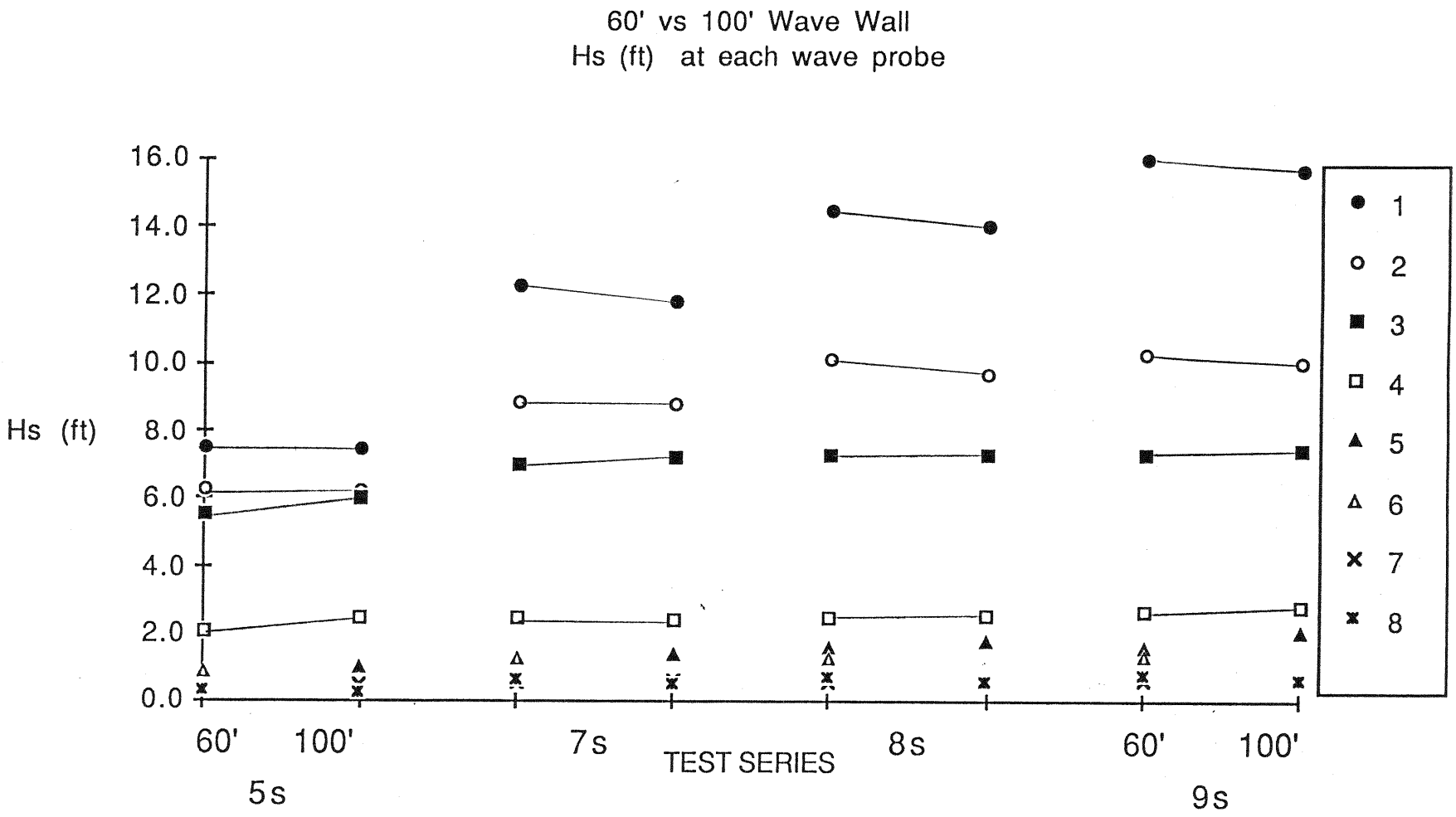
LOCATION	GAUGE #	R4501	WF501	R4701	WF701	R4801	WF801	R4901	WF901
Outer End of Jetty	1	7.5	7.4	12.3	11.8	14.5	14.0	15.9	15.6
Middle Of Channel	2	6.3	6.2	8.8	8.8	10.1	9.6	10.2	10.0
Inner End of Jetty	3	5.5	6.0	7.0	7.2	7.3	7.3	7.3	7.4
Adj to S Revetment	4	2.1	2.4	2.5	2.4	2.5	2.5	2.6	2.8
Piers End	5	0.8	1.0	1.3	1.4	1.6	1.8	1.6	2.1
* *	6	0.9	0.6	1.3	0.6	1.3	0.6	1.4	0.6
E end of Marina	7	0.3	0.5	0.5	0.6	0.5	0.6	0.6	0.7
NEW Marina W end	8	0.3	0.2	0.6	0.5	0.7	0.6	0.7	0.6

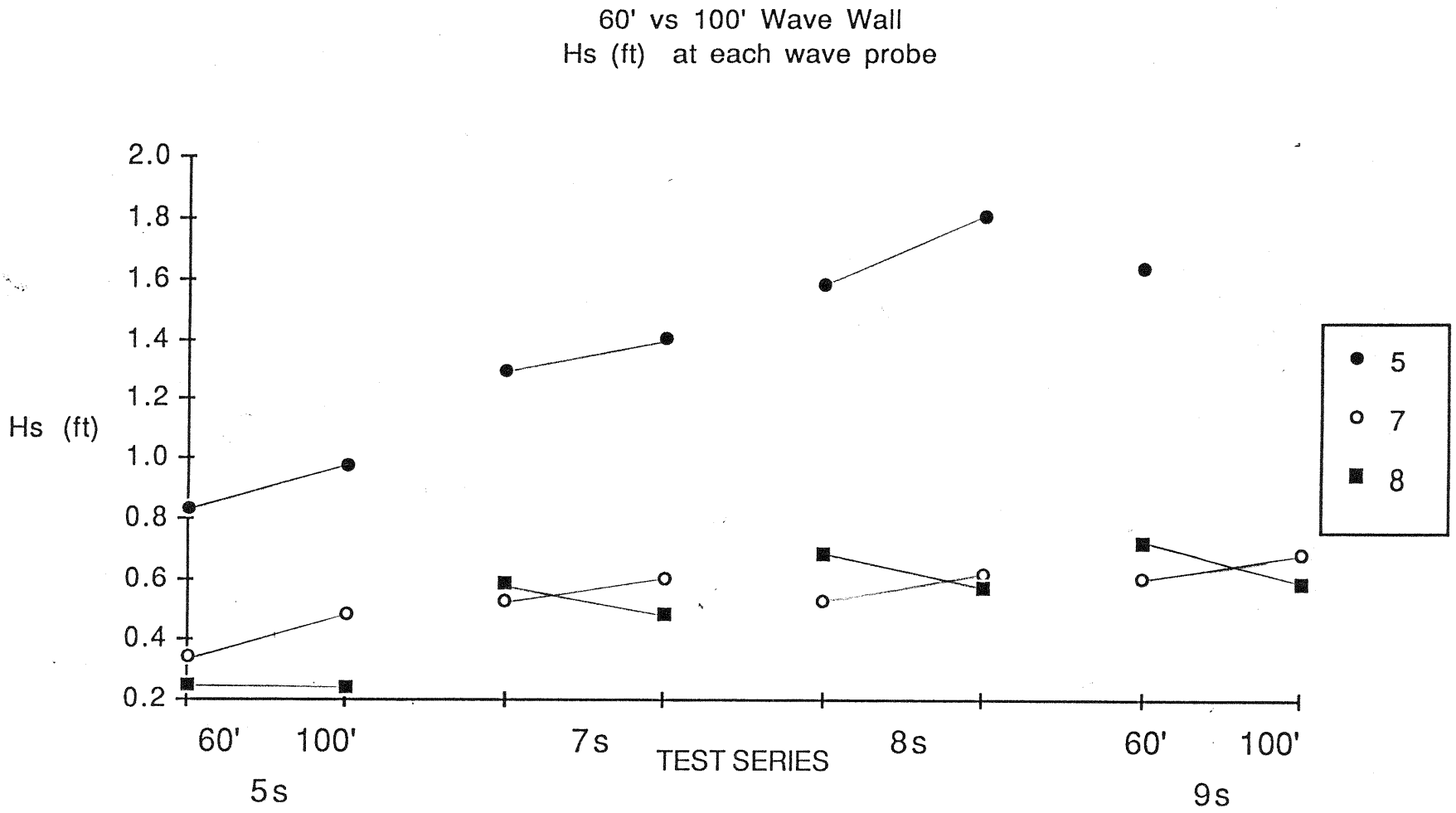
**** Gauge 6 in harbor for R series and in new marina for WF series**

Note:

1) There is an increase in Hs at gauge 7 (New Marina Entrance) with a full wave wall vs 60' wave wall.

2) There is a decrease in Hs at gauge 8. (Western end of new marina)


60' vs 100' Wave Wall
Hs (ft) at each wave probe
Hs (ft)
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
60'
100'
5s
7s
8s
60'
100'
9s
TEST SERIES
1
2
3
4
5
6
7
8


60' vs 100' Wave Wall
Hs (ft) at each wave probe
Hs (ft)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
5
7
8
60'
100'
5s
7s
8s
60'
100'
9s
TEST SERIES

SOUTH HAVEN WAVE AGITATION MODEL STUDY

Porous Wave Wall / Full Length in Place

Hs (ft)

LOCATION	GAUGE #	WF501	WF502	WF701	WF702	WF801	WF802	WF901	WF902
Outer End of Jetty	1	7.4	7.5	11.8	11.8	14.0	14.0	15.6	15.7
Middle Of Channel	2	6.2	6.4	8.8	8.7	9.6	9.8	10.0	9.9
Inner End of Jetty	3	6.0	6.1	7.2	7.3	7.3	7.4	7.4	7.4
Adj to S Revetment	4	2.4	2.4	2.4	2.4	2.5	2.6	2.8	2.8
Piers End	5	1.0	1.0	1.4	1.4	1.8	1.8	2.1	2.1
NEW Marina E end	6	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.6
E end of Marina	7	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7
NEW Marina W end	8	0.2	0.2	0.5	0.5	0.6	0.6	0.6	0.6

* The wave wall had 8% porosity during the WF series and no proosity during the WB series

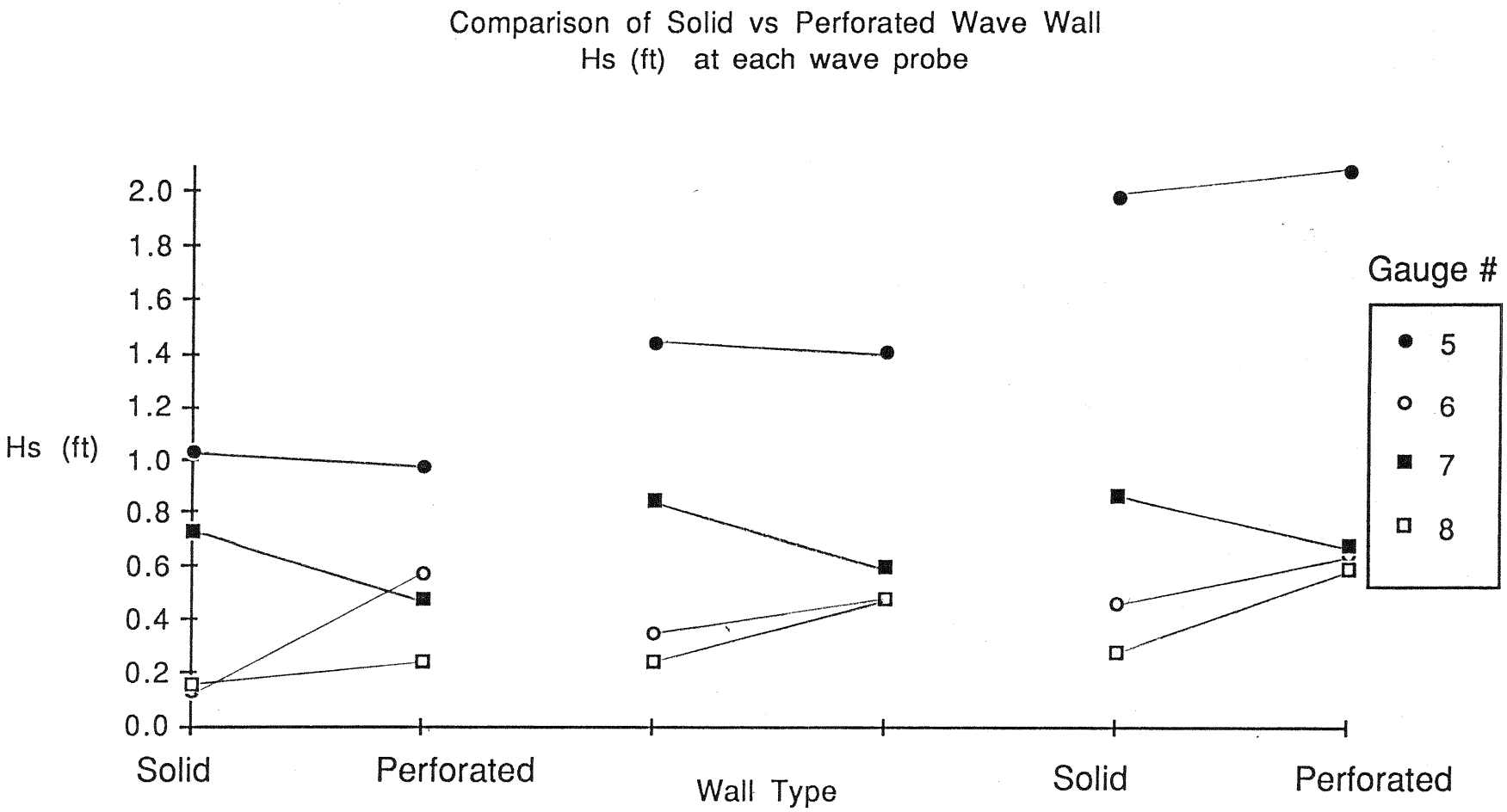
Comparison of Wave Wall with and without porosity

Hs (ft)

LOCATION	GAUGE #	WB501	WF501	WB701	WF701	WB901	WF901
Outer End of Jetty	1	7.6	7.4	12.0	11.8	15.6	15.6
Middle Of Channel	2	6.4	6.2	8.8	8.8	9.7	10.0
Inner End of Jetty	3	6.0	6.0	7.3	7.2	7.4	7.4
Adj to S Revetment	4	2.3	2.4	2.4	2.4	2.8	2.8
Piers End	5	1.0	1.0	1.4	1.4	2.0	2.1
NEW Marina E end	6	0.1	0.6	0.4	0.6	0.5	0.6
E end of Marina	7	0.7	0.5	0.8	0.6	0.9	0.7
NEW Marina W end	8	0.2	0.2	0.2	0.5	0.3	0.6

- No change at Gauge 5 (Piers End)

Notes:
- Gauge 6 reveals that the porous wall is more effective with larger wave periods
- Gauge 7 increases due to the decrease in absorption by the wave wall
- Gauge 8 shows a large decrease in wave height due to the lack of transmission of wave energy through the porous wall


Comparison of Solid vs Perforated Wave Wall
Hs (ft) at each wave probe
Hs (ft)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Gauge #
5
6
7
8
Solid
Perforated
Wall Type
Solid
Perforated

Revetment Test / Wave Wall Removed

LOCATION	GAUGE #	WR501	WR502	WR701	WR702	WR801	WR802	WR901
Outer End of Jetty	1	7.4	7.4	11.7	11.7	13.8	14.0	15.6
Middle Of Channel	2	6.1	6.2	8.7	8.6	9.5	9.6	9.7
Inner End of Jetty	3	5.8	5.9	7.2	7.1	7.3	7.3	7.4
Adj to S Revetment	4	2.1	2.2	2.4	2.4	2.5	2.5	2.7
Piers End	5	0.8	0.9	1.3	1.4	1.8	1.8	2.0
NEW Marina E end	6	0.6	0.6	0.7	0.7	0.7	0.7	0.7
E end of Marina	7	0.5	0.5	0.7	0.7	0.7	0.7	0.8
NEW Marina W end	8	0.3	0.3	0.6	0.6	0.8	0.8	0.8

* Wave wall removed prior to series WR

Low Water (-1.4' IGLD) Tests

LOCATION	GAUGE #	LW501	LW502	LW701	LW702	LW801	LW802	LW901	LW902
Outer End of Jetty	1	7.3	7.2	11.4	11.5	13.5	13.6	15.1	15.0
Middle Of Channel	2	6.1	6.2	8.6	8.6	8.9	8.9	8.9	9.0
Inner End of Jetty	3	5.6	5.5	7.1	7.1	7.0	7.2	7.3	7.2
Adj to S Revetment	4	2.0	2.3	2.4	2.4	2.6	2.6	2.8	2.9
Piers End	5	0.9	0.8	1.5	1.5	1.8	1.8	2.0	2.2
NEW Marina E end	6	0.6	0.6	0.7	0.7	0.8	0.8	0.7	0.8
E end of Marina	7	0.4	0.6	0.6	0.6	0.7	0.7	0.7	0.7
NEW Marina W end	8	0.3	0.3	0.6	0.6	0.7	0.7	0.7	0.7

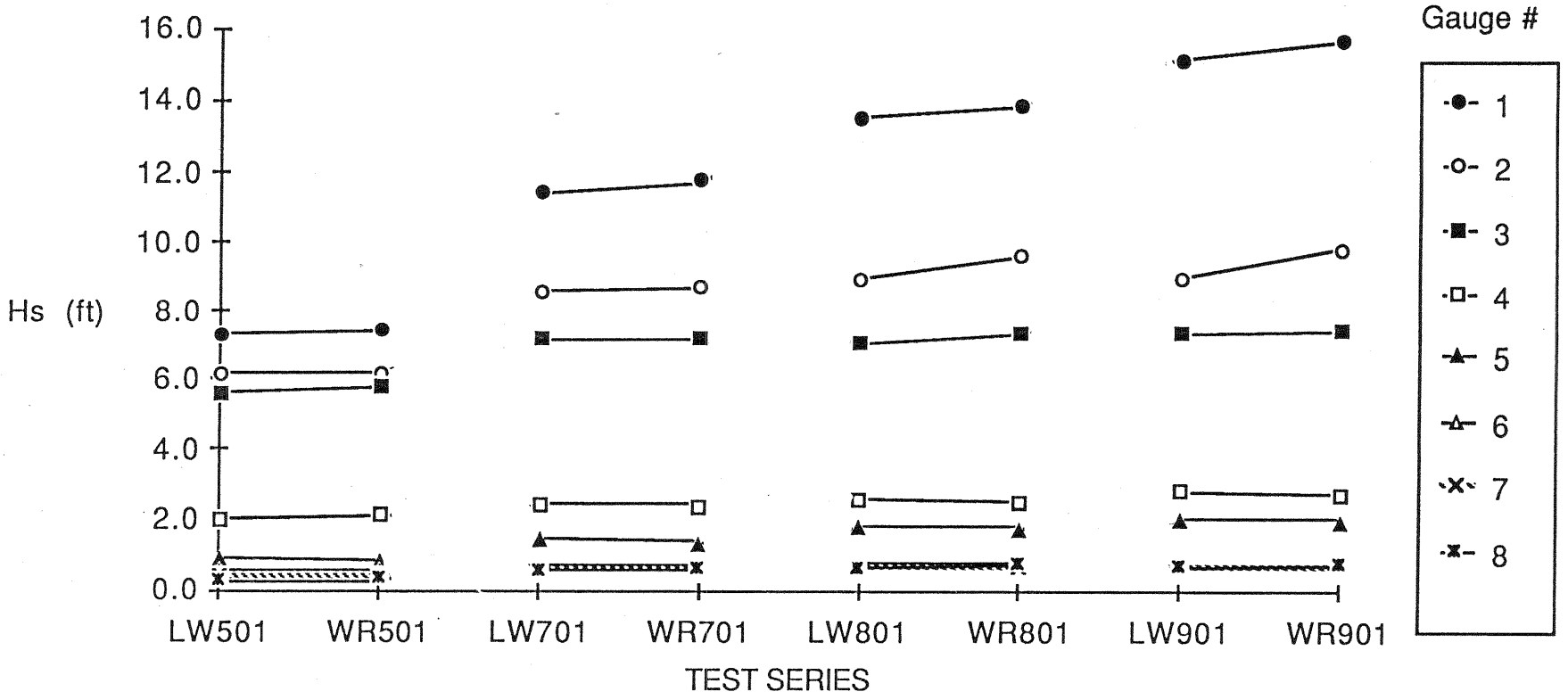
* LW indicates low water tests (water level -1.4' IGLD)

Comparison of Low Water (-1.4') vs 1989 Water Level (+2) LWD

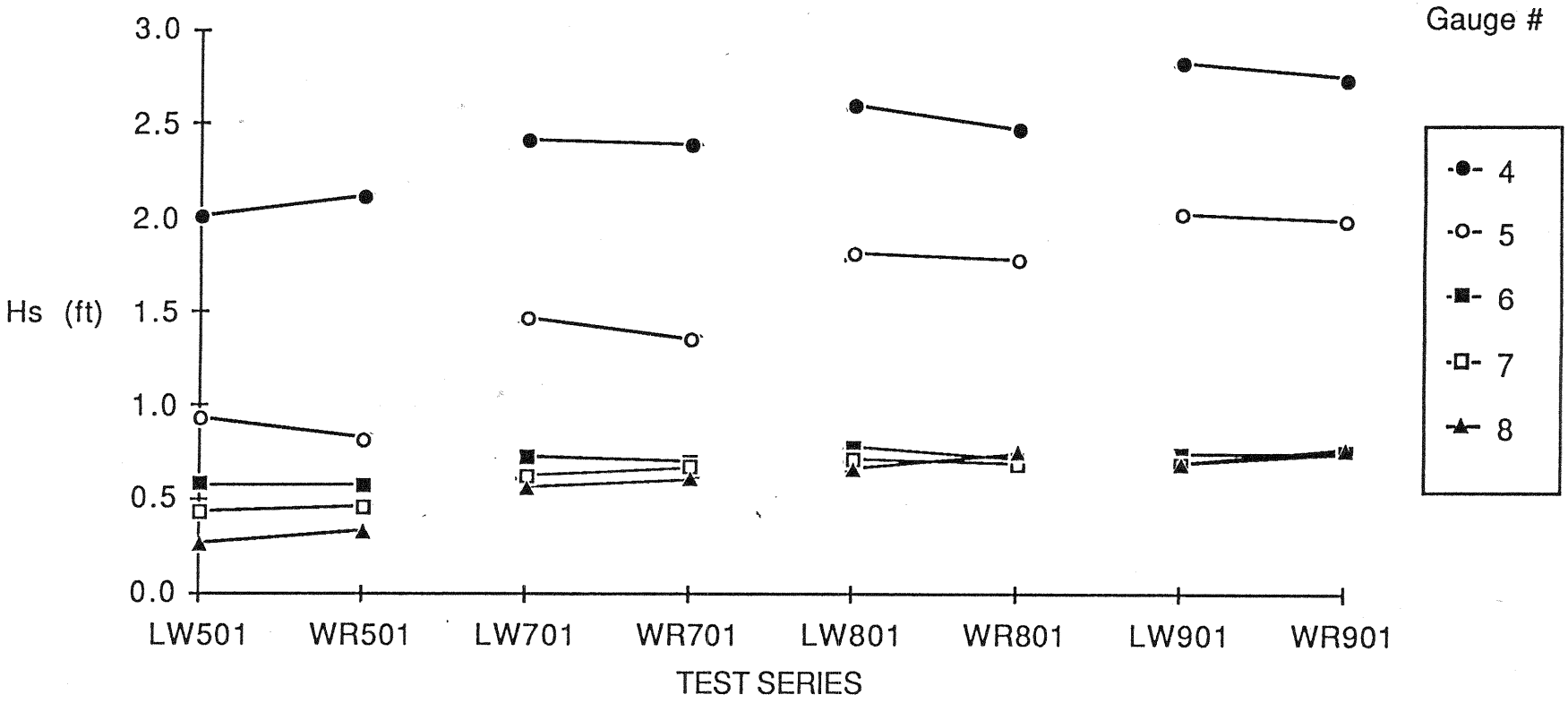
LOCATION	GAUGE #	LW501	WR501	LW701	WR701	LW801	WR801	LW901	WR901
Outer End of Jetty	1	7.3	7.4	11.4	11.7	13.5	13.8	15.1	15.6
Middle Of Channel	2	6.1	6.1	8.6	8.7	8.9	9.5	8.9	9.7
Inner End of Jetty	3	5.6	5.8	7.1	7.2	7.0	7.3	7.3	7.4
Adj to S Revetment	4	2.0	2.1	2.4	2.4	2.6	2.5	2.8	2.7
Piers End	5	0.9	0.8	1.5	1.3	1.8	1.8	2.0	2.0
NEW Marina E end	6	0.6	0.6	0.7	0.7	0.8	0.7	0.7	0.7
E end of Marina	7	0.4	0.5	0.6	0.7	0.7	0.7	0.7	0.8
NEW Marina W end	8	0.3	0.3	0.6	0.6	0.7	0.8	0.7	0.8

Notes: - At the higher wave periods (8,9s) the wave heights in the channel are larger with a higher water level however, by the time the inner edge of the jetties are reached the wave heights are equivalent regardless of water level.

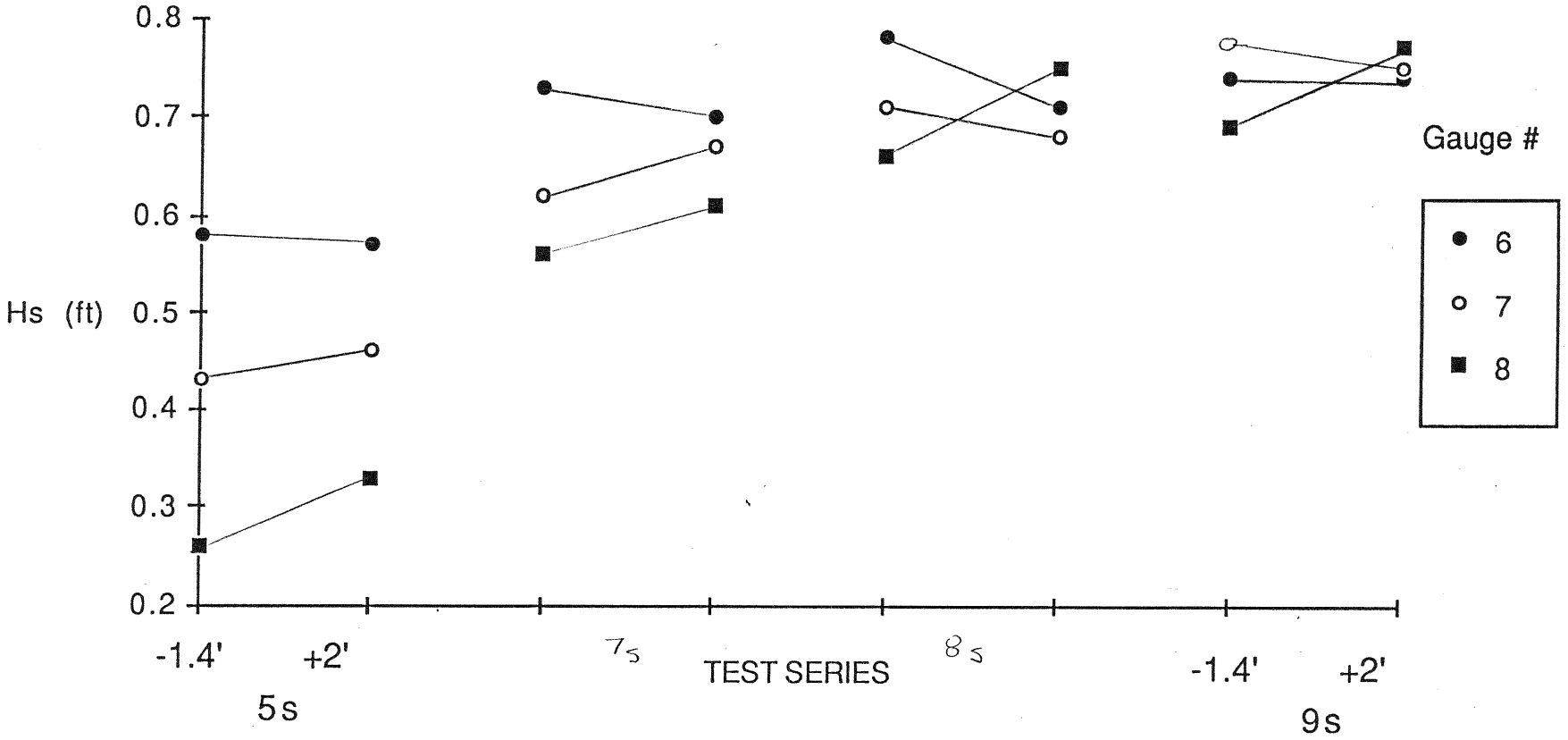
Effect of Water Level
Hs (ft) at each wave probe

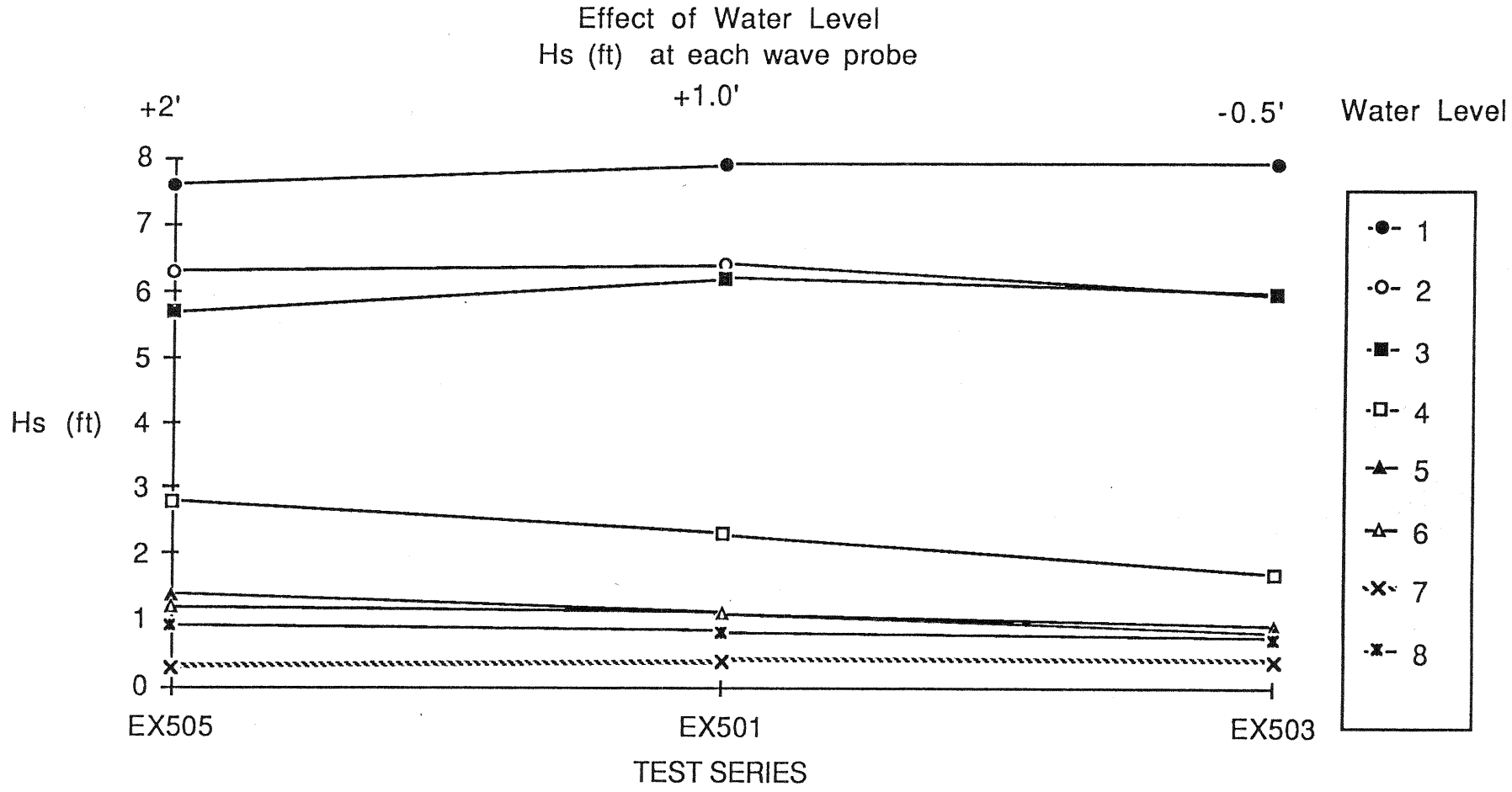


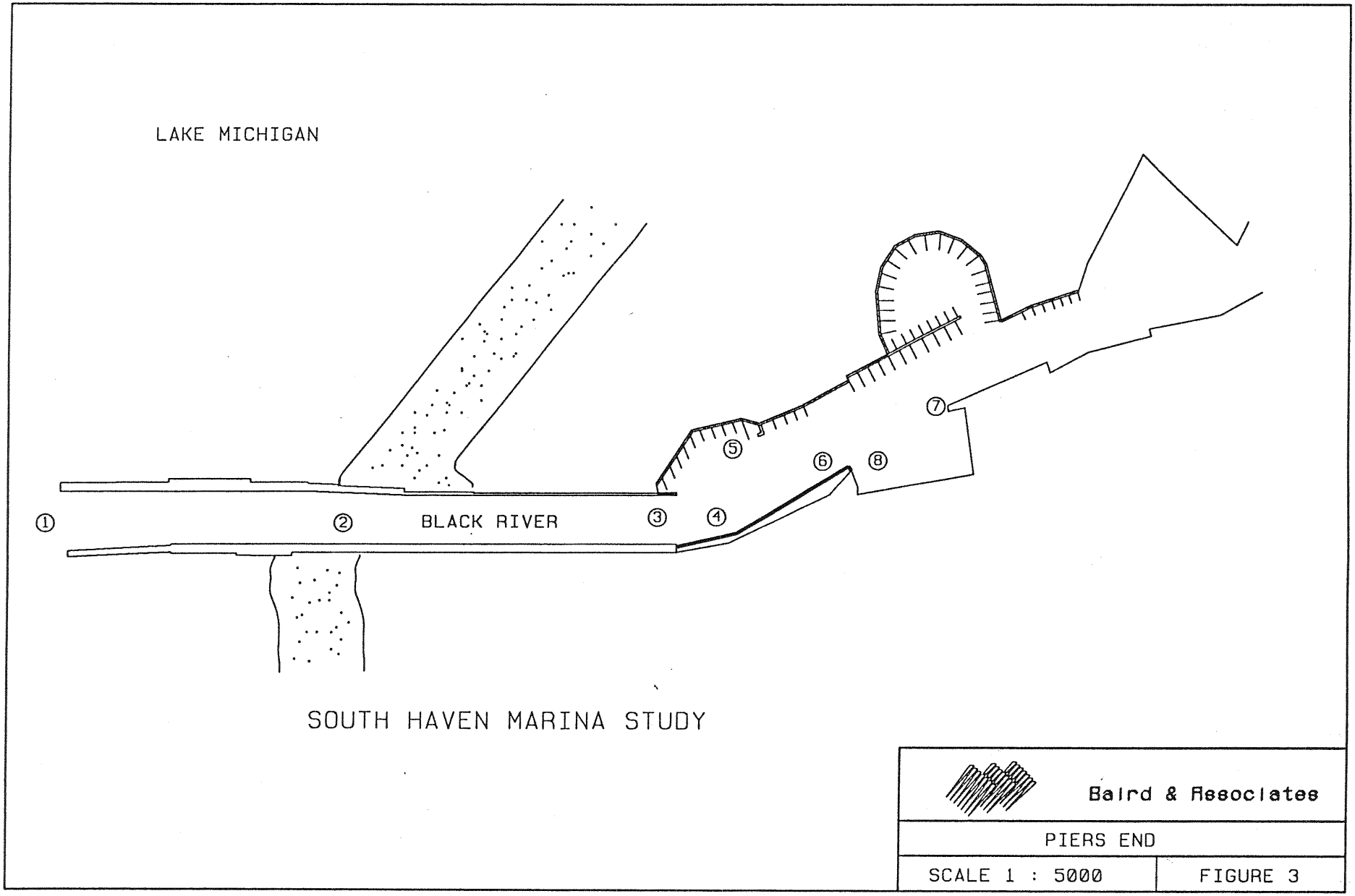
Effect of Water Level
Hs (ft) at each wave probe



Effect of Water Level
Hs (ft) at each wave probe

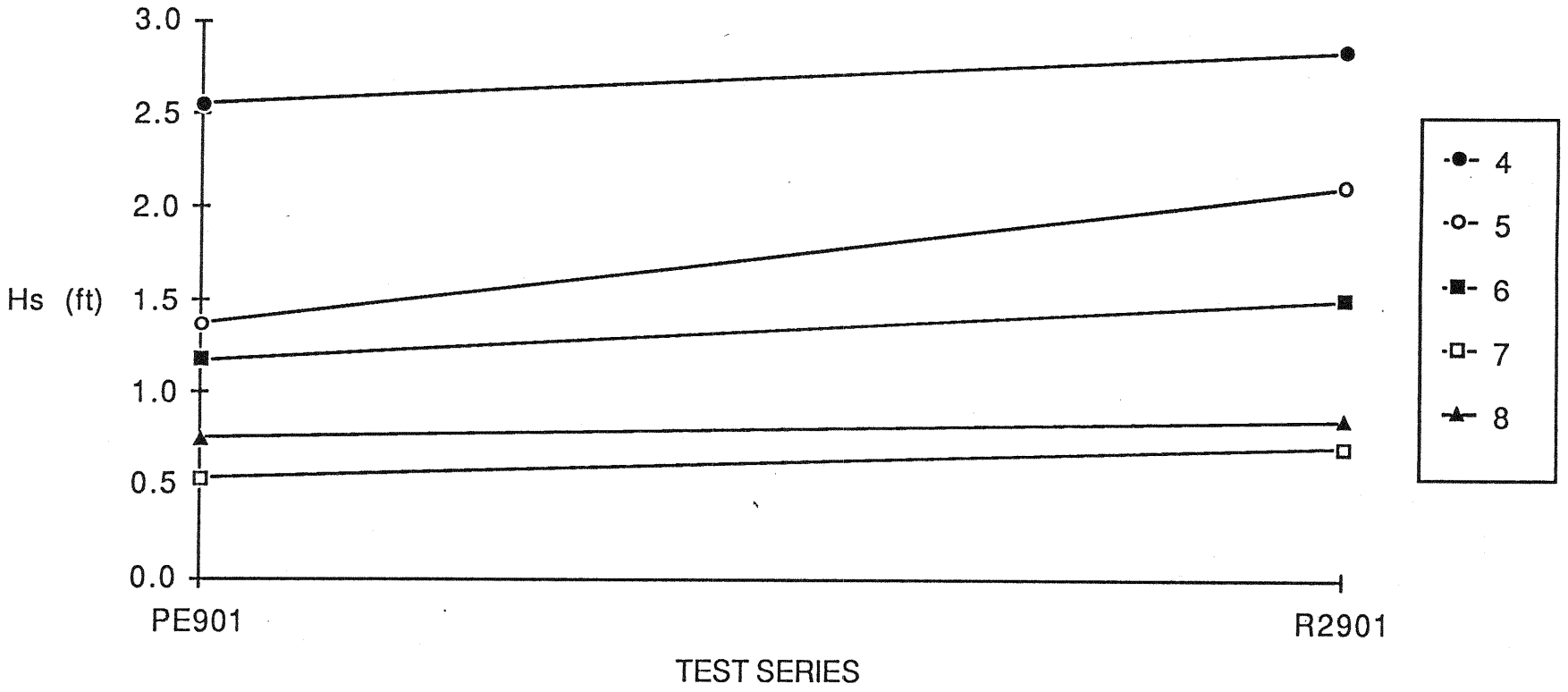



Effect of Water Level
Hs (ft) at each wave probe
+2'
+1.0'
-0.5'
Water Level
Hs (ft)
8
7
6
5
4
3
2
1
0
1
2
3
4
5
6
7
8
EX505
EX501
EX503
TEST SERIES


LAKE MICHIGAN
BLACK RIVER
①
②
③
④
⑤
⑥
⑦
⑧
SOUTH HAVEN MARINA STUDY
Baird & Associates
PIERS END
SCALE 1 : 5000
FIGURE 3

EFFECT OF CRIB AT PIERS END

Hs (ft) at each wave probe



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Wave Attenuator

The stackable floats are 3' x 4' x 20". The upper float is foam filled for flotation of the structure. The stackable empty float is bolted to the bottom of the float and is filled with water. If needed, a second water filled float can be added. This system adds only the weight of the shell to the dock. The encased water acts as the attenuator against waves. It is an inexpensive and effective way to deter waves. The picture shown below shows a wave attenuator dock on Lake Erie. Notice the large swells on the right of the dock, compared to the left.

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Wave Attenuator Foam Filled

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Wave Attenuator Empty

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Quantity: 1

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    - Deck Plates
    - Hoops
  - Bar Hoop no Roller
  - Bar Hoop with Roller
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    - 4" Extension
    - No Extension
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    - Light
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  - Square Internal
    - Non-Removeable
    - Removeable
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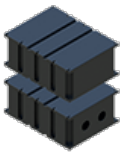

The Permafloat floating wave attenuator system provides an affordable way of dissipating wave action around most mooring areas. This two-part system is comprised of a durable double-flanged top float filled with polystyrene and a hollow bottom shell that fills with water, acting as ballast and helping to attenuate the waves that strike it. A wood or metal framework can be attached to the top float to connect rows of wave attenuators end-to-end. Because of the flexibility of the Permafloat floating wave attenuator system, some marinas incorporate wave attenuators into their floating dock systems specifically for wave attenuation, while others also take advantage of the added stability that the lower ballast shell offers to their floating docks.

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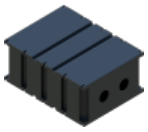
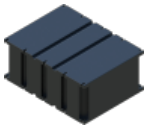
	**Double-Flanged Wave Attenuator Hollow Bottom Shell** • Model: DF-C-WA-36048-20-DFM • Width: 36" • Length: 48" • Height: 20" • For use with Double-Flanged Wave Attenuator Top Float (DF-C-WA-364820-DFF)	**$162.96** **In Stock** Shipping Details Add: 0
	**Double-Flanged Wave Attenuator Top Float (Filled with EPS)** • Model: DF-C-WA-36048-20-DFF • Width: 36" • Length: 48" • Height: 20" • Buoyancy: 1100 lbs • For use with Double-Flanged Wave Attenuator Hollow Bottom Shell (DF-C-WA-364820-DFM)	**$248.06** **In Stock** Shipping Details Add: 0
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1 WaveEater is an innovative, convenient, floating breakwater system designed for various waterfront applications that is both easy to install and environmentally safe. Click to learn more about the history behind our **wave attenuation devices.**

Our breakwater devices are constructed of linear low density molded polyethylene with a high density polyethylene tubular core. The interior is hollow which is filled with water at installation until the units are two-thirds submerged. The exterior has a series of baffles that agitate back and forth as the waves strike the system.

Our Floating Breakwater System

2 WaveEater's innovative design allows for a number of different configurations based on the amount of wave dissipation (the removal of wave height and energy) required, as it passes through the attenuator.

See WaveEater in action.

When engineering a wave attenuation system we take into account the wave length, (distance crest to crest), wave height, water depth and fetch distance. Based on those aquatic specifications, we can design a **breakwater system** encompassing your specific needs.

WaveEater Protection

3 Our product provides a means of protection that is both economical and functional. Installations in the US and various other countries have been designed for protecting marinas, boat launch facilities, utility spillways, shore erosion prevention and even floating breakwater for even fish farms. Explore our many **wave attenuation case studies**

Since WaveEater is comprised of plastic and filled with water it's "footprint" on the environment is minimal, thereby allowing for an expedited processing when design and installation permits are required.

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WaveEater creates floating breakwater systems which handle marina wave attenuation and also combat erosion

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Providing industry-leading floating breakwater and wave attenuation devices since 1992
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The ELFWA™ has been designed to extract the energy from incoming waves through the design of our patented WhisprWave® modules and proprietary flexible backbone allowing the system to work effectively and withstand substantial environmental forces.

The ELFWA™ is an extremely effective and durable system designed for the mitigation of wave energy where permanent type breakwaters are not acceptable.

WhisprWave® wave attenuators can be moved from location to location. They allow the flow of water through the attenuator after the energy has been removed which prevents stagnation of the water behind.

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Watch Video

Wavebrake dissipates water wave energy.

Wavebrake is the ultimate solution in wave attenuation, wave dispersion and shoreline control. Various crude offshore systems utilizing tires or other modular designs have been introduced for purposes of erosion control and wave energy extraction. The Wavebreak wave attenuator module is a one of a kind floating breakwater having multiple recesses that channel flowing water.

When a plurality of these wave attenuator modules is constructed into a wave attenuation system, the water will be channeled into a series of constrictions and voids that will dissipate the water wave energy by hydraulic resistance and friction. This is critical to the effectiveness and efficiency of the system. The need for these buoyant modules is to break the laminar flow of water into a state of turbulence. The turbulence increases the disorganization and chaos of the incoming water, greatly increasing the distance that individual cells of water travel. As the water cells travel farther through the system, the overall resistance flowing through the system is greatly increased.

The Wavebrake System Has Many Applications

- **Wave & Wake Barriers**
  - Protection for Docks, Lifts and Boarding
  - Eliminate Chop from Heavy Boat Traffic
  - Use the Boat No Matter the Weather
  - Use the Dock for Mooring without Damage
- **Residential Harbors**
  - Create Quite Water in Wave Conditions
  - Promotes Safe Boating in All Conditions
- **Erosion Control**
  - Perpendicular Structures; jetty, groin, or pier
  - Parallel Structure; offshore breakwaters
- **Beach Stabilization**
  - Create offshore shoals to slow wave energy
  - Slow sand migration and build beach mass
- **Marina Breakwaters**
  - Eliminate wake & chop from the mooring area
  - Eliminate repair costs from storm driven waves
- **Marine Habitat**
  - Creates a fish hotel for the area
  - May impact speed of weed growth
  - Does not impede littoral drift
  - Negative environmental impact
- **Wetlands**

- Protect plantings in restored shore areas
- Protect exposed areas from storms
- Protect marshes without fill

Wavebrake is fully customized to YOUR specifications... No matter how big or small the disturbance is, or how deep the water runs, you can count on the Wavebrake to perform exactly as you intend!

View from the Shore

150' Wavebrake System off Pier

The Wavebrake System's physical attributes

- **Flexibility**
  - Standard blue for visibility, black submerged
  - Special designed connectors for cube to cube connection
  - Cubes weigh 15#'s each at 3/16" thickness
  - Rope is braid polyester (30,000# tensile strength)
  - Cubes are connected through interlocking flanges
- **Modularity**
  - Diamond is the strongest configuration
  - Staggered Alignment is optimum attenuation
  - Other configurations are possible (slope, curtain, blanket, staggered)
- **Site Knowledge Required**
  - Water Depths
  - Wind direction and velocities
  - Wave height and load history required
  - Bottom type determines anchoring selection
- **Assembly**
  - Build from the bottom up as you go with connector
  - Thread rope through flanges holes for anchor
- **Anchoring**
  - Depends on bottom and load requirements
  - Types; concrete block, chase, manta, piles
  - Number of tethers determined from wind loads
  - 3 to 6 tethers per 25' section
  - Tether is 4' grommet loop to anchor line
- **Configuration**
  - Modified diamond: 2x3x2 or 3x4x3x2
  - Staggered: 2x4x2 or 3x6x3
  - Wave travel length: 10' to 15'
  - Depth is 40" to 80"
  - Height above the water is 4" (reef), 2' to 4' to 6'
  - Possible to go as deep, wide or high as necessary for the application

Standard 2x3x2 Configuration End View

Standard 2x3x2 Configuration Front View

Large 3x4x3x2 Configuration End View

Launch from Boat Trailer

Tied to Dock

The Wavebrake System's cost elements

- Permits
- Cubes & Rope & Connectors
- Assembly of System
- Anchoring at the Site
- Installation at the site
- Maintenance (Very Low)

Summary

- Inland conditions are 2’ to 6’ waves with a 4-6 second or less interval
- Designed to take wave energy off the shore line
- Residential erosion control
- Residential Safe Harbor
- Safe boating in rough conditions
- Marina Wind & Wave Barrier

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Products

- Floating Docks
- Floating Fishing Piers
- Gangways & Ramps
- Floating Wave Attenuators
- Custom Floating Structures

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Floating Wave Attenuators

One of the most critical factors of marina planning and design is determining the project location's exposure to wind and waves. Riprap, sheet pile, or other fixed break walls most commonly offer protection from this "exposure," however when site conditions (such as water depth) disallow such a structure, floating wave attenuators offer an attractive alternative by creating a sheltered basin for floating docks and vessels moored within.

Appearance

Although typically characterized by a higher freeboard, FDS wave attenuators bear an "above water" resemblance to our floating docks. As a result, these products share a number customizable options such as decking, fenders, and bumper as identified on our Floating Docks product page. However, given that their primary purpose is to absorb and dissipate forces from driving waves, they are a fundamentally different structure.


Wave Attenuators Appear Similar to Floating Docks

Structure

The "industry standard" ideology of a wave attenuator typically combines extreme structure weight with a very aggressive anchorage system. Our unique design differs from this format in that internal chambers actually use water itself as the breaking mechanism. That being said, our version of this product is certainly not to be considered "light-duty," as indicated by the monolithic attenuator section (which is one of many that will be linked together) loaded onto a semi-tractor trailer.


Single Attenuator Section Loaded on a Trailer

Application

The proper application for a floating wave attenuator is virtually always dictated by project-specific parameters. Depending on such "parameters," wave attenuators may be used as standalone units or integrated as a part of the entire floating dock system. In a "standalone" format, sections may be joined together (thus creating a continuous break wall structure), or used independently in staggered rows. When connected directly to a dock, the wave attenuator often creates additional dockage space by enclosing a slip or providing broadside mooring areas.

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Wavebraakker™

Reduce the Force of Waterborne Waves
by as much as 75% or more.

Floating Breakwater Products

A floating breakwater system for waterfront & marina protection.

The "WaveBraakker™" is a scientifically designed system to not only serve as a wave barrier but also to reduce the wave forces and mitigate the traditional "Bounce Back" effects experienced with rigid barrier concepts.

 The system is assembled from specially shaped modules. They are positioned in a configuration with alternate positions vacant and forming voids or cavities.

These cavities generate turbulence in the flowing waters and in turn reduce the wave force and magnitude by the resulting resonator or self-canceling effect. Depending on the size of the waves, the cross sectional area of the system might be increased or decreased.

The modules are rotary molded of LLDPE (Linear Low Density Polyethylene). We have selected green to signify that green solution to wave reduction.

This material is extremely tough in cold or heat and is not brittle. The finished wall thickness is a minimum of ¼ Inch and produces a rugged long life product (estimated at 20- 25 years). The material in the modules is environmentally friendly and is not known to release chemicals harmful to the environment or marine life.

The modules have three (3) "ears" on each end.  Long life synthetic fiber ropes are strung through holes in the ears to allow stringing together sections of the full assembly. This multi-string approach is much like stringing beads for a necklace. Buyers selecting the intrusion barrier have the option of selecting wire rope. All modules have stainless steel sleeves in the holes to minimize wear to the module.

Other variations of the "Base Line" design can be configured to suit the particular environmental requirements of the site. One (1) example might be closely passing deep draft vessels such as catamarans or ocean going ships. In these instances, the system may need to be deeper to control the subsurface wave action.

View of Wavebraakker™

View of floating barrier

View of artificial reef.
Floating breakwater systems typically float with the upper portion above the calm water surface and the lower portion submerged below the surface.

The visible above water surface position contains the visible waves. The below water portion free floods and controls the subsurface waves. LLDPE has a specific gravity slightly less that fresh water and will always float at or near the water surface and not sink to the bottom.
WaveBraakker™ sections can be outfitted with Warning Signs or Lights to suit local regulatory requirements.

The system floats partially submerged near the water surface to control the primary wave action. It does not extend to the lake bottom or sea floor or interfere with normal marine life in the lower portion of the water column.

The floating system is held in position with mooring lines and anchors to resist the oncoming wave forces. A lesser number of mooring lines and anchors are positioned on the leeward side of the system to maintain relative position during slack weather conditions or reduced water levels.

For normal tidal or seasonal water level variations, a simple catenary mooring system with locally made concrete clump weight anchors is adequate. For greater water level variations, it may be advisable to add mid length weights to the mooring lines to reduce the slack and maintain tighter control of the position.

Applications with considerable water level variations will require more complex moorings. The more common system uses manual or electric driven winches with wire ropes and periodic, possibly daily adjustment to compensate for water level variations. In recent years, a self regulating system has been introduced to the marine market. This system is typically site specific engineered by the supplier and uses something that in principle resembles Bungee Cords. Within their water level variation capabilities, the mooring lines stretch or contract to maintain the position of the floating object (breakwater system, floating dock, anchored vessel, etc.). There are at least two (2) known suppliers of this type mooring system.

The WaveBraakker™ system is most commonly recommended for floating breakwater or wave barrier applications. Less sophisticated variations of the system may also be used for floating security barriers or for lines of demarcation around swimming areas, etc.

Another mooring system uses pilings positioned at selected intervals. The floating sections are attached to “Slip Rings” which slide up and down on the pilings with changes of water level.

For a “Cost Free” – “No Obligation” evaluation of your particular location, please contact us at sales@wavebraakker.com.

Other Articles of Interest:

- Floating Breakwater System
- Marina Facility Breakwaters
- Rigid Bulkheads
- Rubber Tire Breakwaters
- Personal Harbors

- **Reflected Wave Hazards**
- **Shadowing Effect of Breakwaters**
- **Floating intrusion Barriers**
- **Barrier Islands**
- **Artificial Reefs**
- **Positioning Entry to Harbors/Marinas**

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