MEMORANDUM

MOFFATT & NICHOL

600 University Street, Suite 610 Seattle, WA 98101
Phone: (206) 622-0222 Fax: (206) 622-4764

TO: Marilee Stander, EDAW

CC: 6629 File

FROM: Emy Carpenter, Moffatt & Nichol

DATE: July 14, 2008

SUBJECT: Technical Memorandum No. 3 – Shoreline Conditions

Meydenbauer Bay Park: Nearshore Conditions

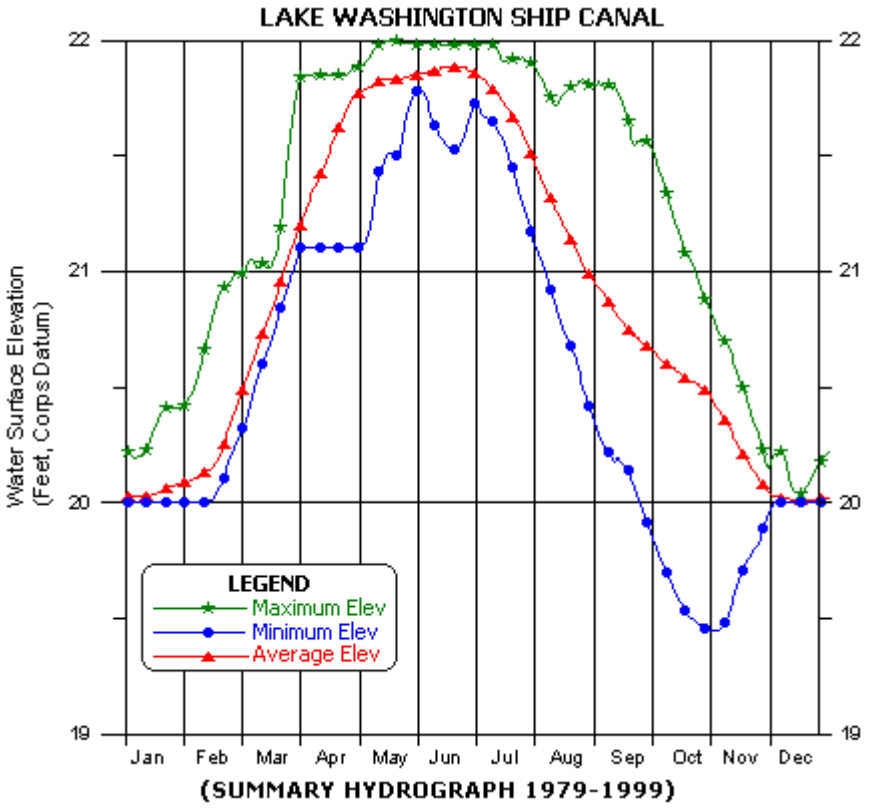
This memorandum is intended for use as a reference document in the development of a Master Plan for Meydenbauer Bay Park. It summarizes information relating to current nearshore conditions at the project site.

Water Levels

The legislation authorizing the Corps to maintain the Lake Washington Ship Canal specifies normal lower and upper operating levels of 20.0 and 22.0 feet relative to the Corps of Engineers vertical datum (USACE 2004). The Meydenbauer Bay Park and Land Use planning process uses the more recently defined vertical datum, the North American Vertical Datum of 1988 (or NAVD88), in its mapping and surveying. The zero point for the NAVD88 datum is shifted by about 3.2 feet relative to the zero point for the Corps datum: relative to NAVD88, the normal lower and upper operating levels for Lake Washington are 16.8 and 18.8 feet respectively. The water level measured by PGS, Inc. on June 12, 2008 was 18.7 feet, NAVD88.

Figure 1, taken from the Corps web site, shows how the water levels have historically varied with season.

Figure 1. Historical Water Levels in Lake Washington
(Corps Datum; equivalent range is 15.8 to 18.8 feet NAVD88)



Waves and Currents

Waves in Lake Washington are generated by local winds. Meydenbauer Bay Park project limits is relatively sheltered: the two points (Groat Point and Pickle Point) at the entrance to Meydenbauer Bay protect the project site from northerly and southerly winds, and the north end of Mercer Island provides further protection from southwesterly winds (Figure 2).

The size of the waves generated in a particular storm is directly related to the fetch – the length of water over which the wind blows towards the site, and over which waves can grow. At the north end of the Park, there is a narrow fetch of up to four miles long in a westerly to southwesterly direction. The predominant winds in Lake Washington are from the north and south: however, high winds from the west and southwest can occur. For example, on December 15, 2006, a sustained wind from the southwest reached 40 knots (measured at Seatac International Airport). Consequently, occasional high waves can be expected at the north end of Meydenbauer Beach Park. Using the CEDAS-ACES program (Veritech Inc., 2008), the 50-year wave height at the park is estimated as follows:

- North end of the park: significant wave height 3.0 feet, wave period 3.4 seconds.
- North end of the marina: significant wave height 2.4 feet, wave period 3.0 seconds.

Currents in Meydenbauer Bay are expected to be small, given its isolated nature.

Figure 2. Fetch at the North End of Meydenbauer Bay Park Project Site (not to scale)

Water Depths

A hydrosurvey of the area was conducted in June 2008. Bottom contours indicate that the slopes flatten out in the vicinity of the marina. Although most of the marina is located in water depths 10 to 12 feet at low lake levels, slips within 30 to 50 feet of the shoreline are in water depths less than 7 feet. During low lake levels, water depths at Pier 3 are particularly shallow, ranging from 3 feet (near the shoreline) to about 7 feet at the outboard end. See Attachment A for hydrosurvey of the site.

Shoreline

Three main shoreline treatments are present at Meydenbauer Bay Park project limits.

At the north end of the park – at the swimming beach – the shoreline is characterized by an apparently artificial beach and concrete steps (Figure 3). The beach is largely composed of coarse sand: however, much of the substrate immediately offshore and at the dock is gravel-sized. The hydrographic survey prepared by PGS, Inc. (Attachment A) shows that the shoreline drops off rapidly – at a gradient as high as 1V:5H – immediately offshore of the marked swimming area.

Figure 3. Beach and Concrete Steps at the Swimming Beach (North End)

Immediately south of the swimming area, the shoreline changes to a low riprap slope, topped by grass and some riparian vegetation (see Figure 4). This general shoreline treatment

continues past the park, along the city-owned residential properties between the main park area and the marina.

Figure 4. Riprap Slope in the North Central Park Area

Finally, at the marina, the shoreline treatment is a combination of a timber bulkhead backed by paving. At Pier 3, a concrete bulkhead was constructed in the late 1960's (Figure 5).

The nearshore slope at the marina is much flatter than it is further north, and the water is generally shallower than it is offshore of the swimming beach. An accumulation of sediment can be expected at the southern, more sheltered end of Meydenbauer Bay because of the gradient in wave energy that reaches the shoreline.

Figure 5: Bulkhead at the Marina

Marina – Piers 1, 2 and 3

The three existing piers of the Bellevue Marina provide a total of 112 slips. There are two types of dock construction at the marina – fixed and floating. Fixed docks consist of piling that support the deck areas. Piers 1 and 3 are considered fixed docks, Pier 2 is a floating dock system. Covered moorage is provided on Piers 2 and 3; the roof structure on Pier 2 is supported by a pile system that extends into the subsurface soils, whereas the roof structure on Pier 3 is supported by posts that are located atop the pier deck. See Attachments B, C and D for layouts of the three piers.

Pier 1

Rebuilt in 1998, the pier consists of timber deck with timber and steel piling and is in overall good condition. The pier is the northernmost pier for the marina and also supports two buildings – a historic timber construction building, once used for whaling vessels and a 2-story timber building that houses two residential units. The upper unit is also used as the dockmaster's office.

Pier 2

Pier 2 was reconstructed in 1998; comprised of precast concrete floating docks with steel and timber piling. The pier and piling are in good condition. The steel piling provide support for the roof structure as well as anchor the floating dock system in-place. Treated timber mooring piling are located at midpoints between fingers to provide additional tie-off for boats.

Pier 3

Pier 3 was constructed in the late 1950's. The pier is timber construction. No drawings were available for Pier 3, however, field observations taken in June, 2008 indicate that most of the timber main walkway deck is in fair condition. Piling supporting the deck areas were located below the water surface therefore, the condition of the piling is unknown. The roof vertical supports are located atop the pier deck area.

City-Owned Residential Docks

The docks are timber construction, varying in length from 70 to 120 feet long, extending out into the Bay. The docks are in fair to poor condition; public access to the docks is currently not available.

A summary of the over-water areas for each pier is provided below:

Description	Area (SF)
Pier 1	12,050
Pier 2	23,200
Pier 3	12,200
Residential Docks	

Opportunities & Constraints

Review of the existing site conditions and existing shoreline structures suggests that there are opportunities to improve public access, increase vessel moorage or encourage/support other water-dependent uses such as sailing, rowing, kayaking.

The following is a list of suggestions that could be considered during the planning process:

Pier 1

- Extend marina using similar construction (fixed docks) either towards northwest or southwest directions to increase moorage.
- Connect pier to a boardwalk along the shoreline to the north and south to improve public access

Pier 2

- Relocate docks only, with reconfiguration possible. Improvements would require new mooring and guide piles for the floating docks. May be possible to salvage steel piling for cost savings.
- If the roof structure was relocated, would require new foundation/support piles.

Pier 3

- Remove docks and roof structure; provide smaller footprint marina, keeping berths to the outboard end for deeper water.
- Rebuild marina, dredging to provide deeper water depths for more slips.
- Remove docks and roof structure and construct public access pier with guest moorage.

City-Owned Residential Piers

- Rebuild for public access piers
- Integrate into a waterfront boardwalk

Waterborne Transportation

- Provide a facility that could support waterborne transportation.

Constraints

- Relocation of marina docks northerly would expose the marina to larger waves.
- Bond used for funding the construction of the three piers. Current revenue stream is from slip rentals; the bonds are currently scheduled to be paid off in 2018.

References

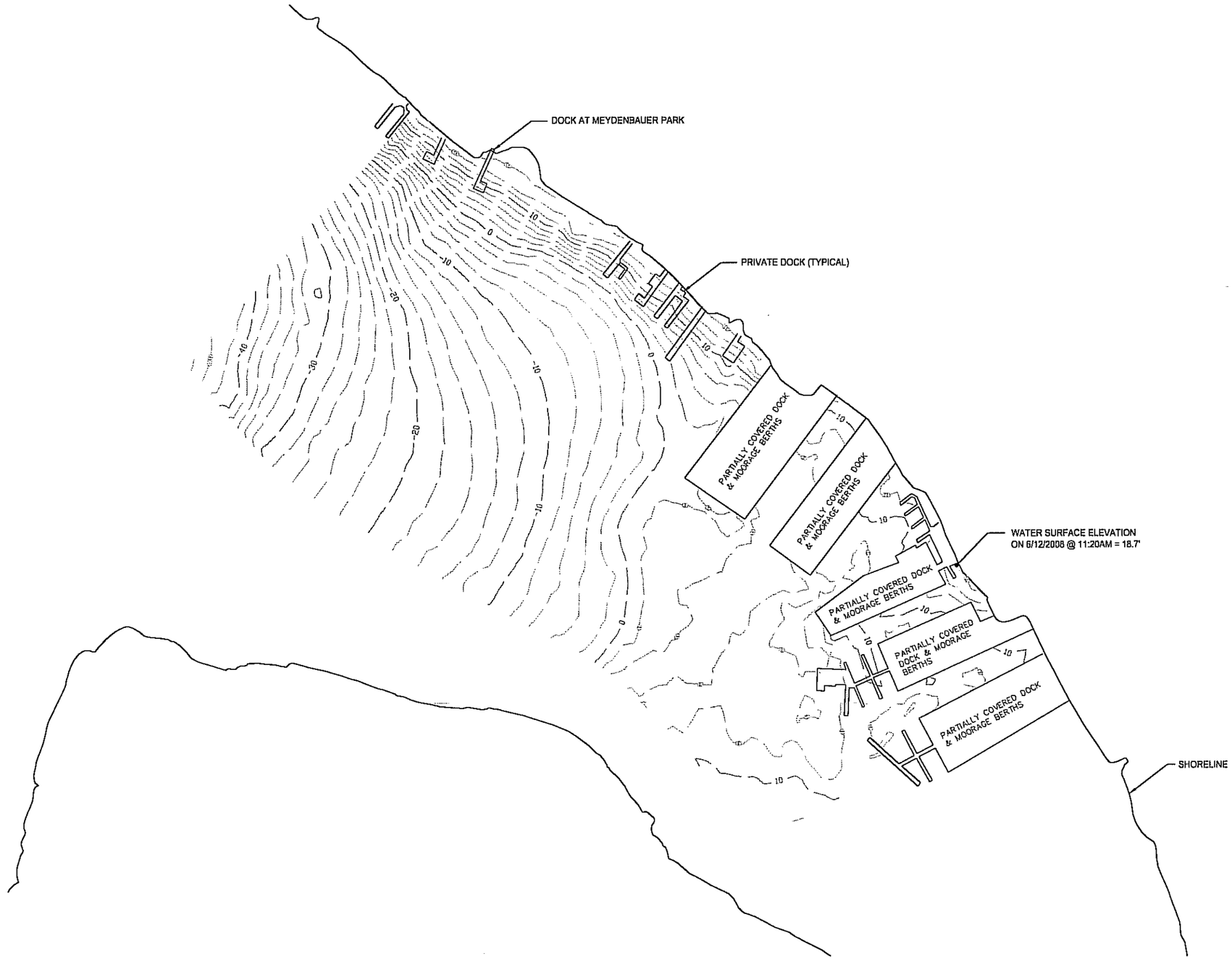
USACE. 2004. Lake Washington Basin: Lake Washington Summary Hydrograph. Viewed online at <http://www.nwd-wc.usace.army.mil/nws/hh/basins/lwscsh.html> on June 26, 2008

"Meydenbauer Bay Marina, Pier 2 Covered Moorage," Construction plans prepared by Spearman Engineering for Mr. William Lagan, 1997.

"Meydenbauer Bay Marina, Pier 1," Construction plans prepared by Spearman Engineering for Mr. William Lagan, 1997.

Veri-Tech, Inc. (2005). Coastal Engineering Design and Analysis System (CEDAS)-ACES version 4.0.2.

PLOTTED: Jul 14, 2008 - 8:05am BY: erogers



SOURCE:

HYDROGAPHIC SURVEY BY PGS, INC., DATED 6/16/2008.
SHORLINE BY SASAKI, INC.

VERTICAL DATUM:

THE VERTICAL DATUM FOR THIS SURVEY IS NAVD 88, BASED ON A PUBLISHED ELEVATION FOR CITY OF BELLEVUE BENCHMARK 262.

ELEVATION: 94.35 FEET

HORIZONTAL DATUM:

THE HORIZONTAL DATUM FOR THIS SURVEY IS NAD 83/91 (SPC WASHINGTON NORTH ZONE), BASED ON GPS OBSERVATIONS AND CITY OF BELLEVUE HORIZONTAL STATION 0092.

SURVEYORS NOTE:

THE DOCK LINES SHOWN HEREON WERE DERIVED FROM AERIAL PHOTOGRAPHY. THEY ARE SHOWN FOR GRAPHICAL REFERENCE ONLY AND SHOULD BE CONSIDERED APPROXIMATE.

100 0 100 200
Scale: 1"=200'

FILE: P:\6629 Meydenbauer Bay Park Master Plan\CADD\SheetFiles\Composite Site Plan

MOFFATT & NICHOL
600 UNIVERSITY STREET, SUITE 610
SEATTLE, WA 98101
206-622-0222

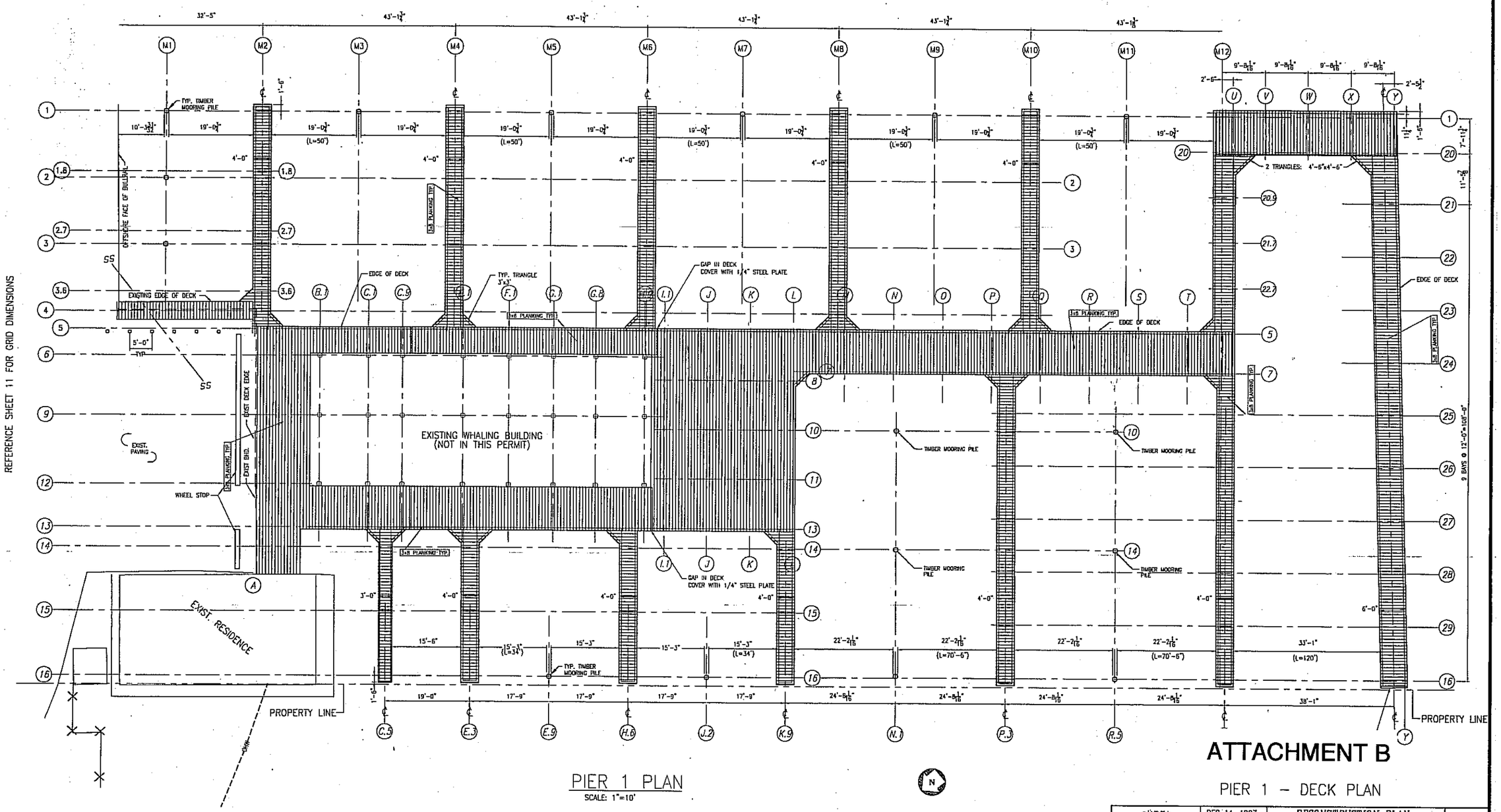
Job No.: 6629
Prepared by: Moffatt & Nichol
Date: 07 JUL 2008

MEYDENBAUER PARK HYDROGRAPHIC SURVEY

SHORELINE CONDITIONS

Attachment
A

REFERENCE SHEET 11 FOR GRID DIMENSIONS



PIER 1 PLAN

SCALE: 1"=10'

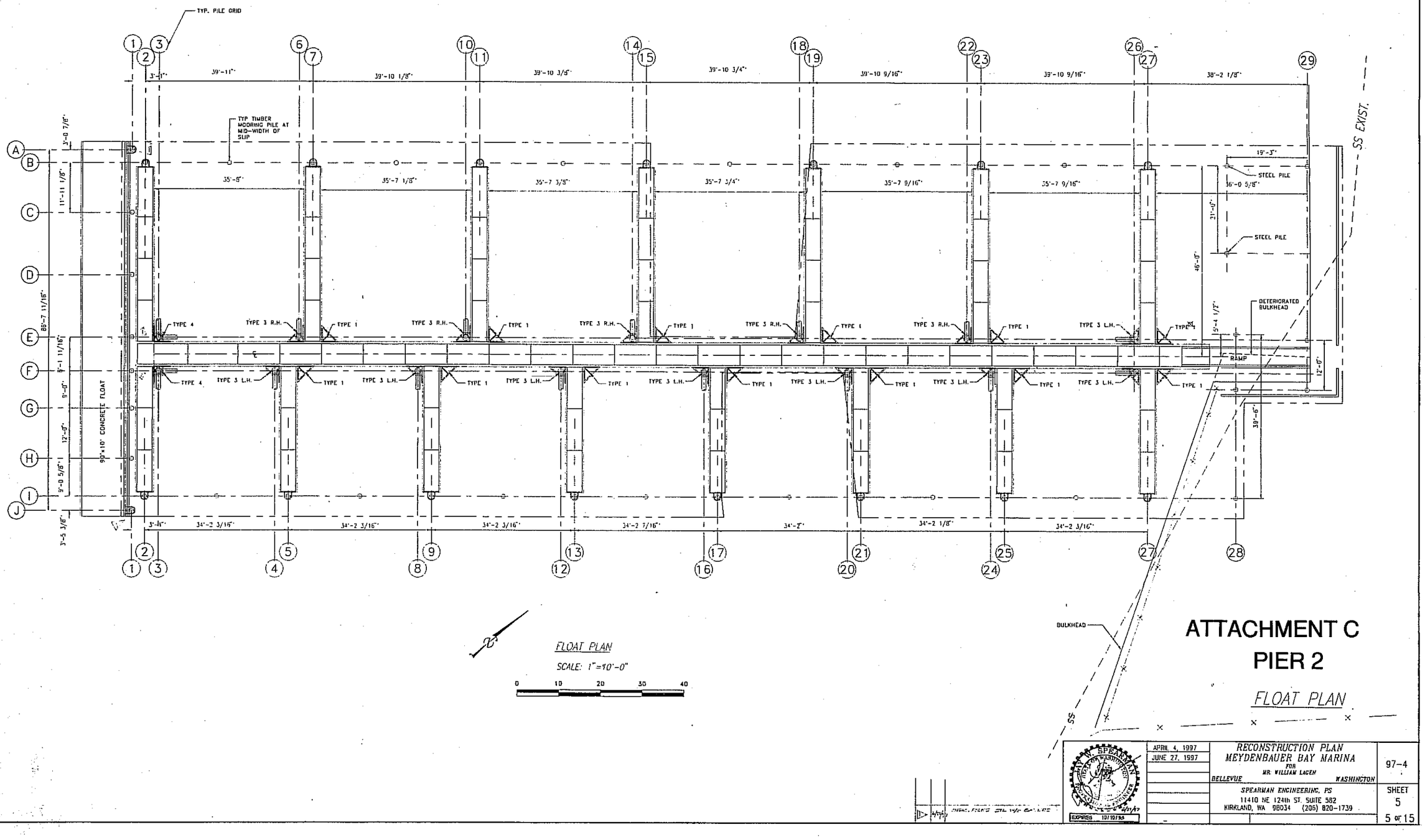
GRAPHIC SCALE

ATTACHMENT B

PIER 1 – DECK PLAN

DEC 14, 1997 DEC 22, 1997 JAN 7, 1998 JAN 14, 1998 JAN 16, 1998	*RECONSTRUCTION PLAN* *MEYDENBAUER BAY MARINA* *FOR* *MR. WILLIAM LACEN* *BELLEVUE* *WASHINGTON*	97-4
	SPEARMAN ENGINEERING, PS 11410 NE 124th ST. SUITE 582 KIRKLAND, WA 98034 (425) 820-1739	SHEET 4 OF 14

JAMES R. SPEARMAN — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 10/15/98



FLOAT PLAN

SCALE: 1"=10'-0"

0 10 20 30 40

ATTACHMENT C
PIER 2

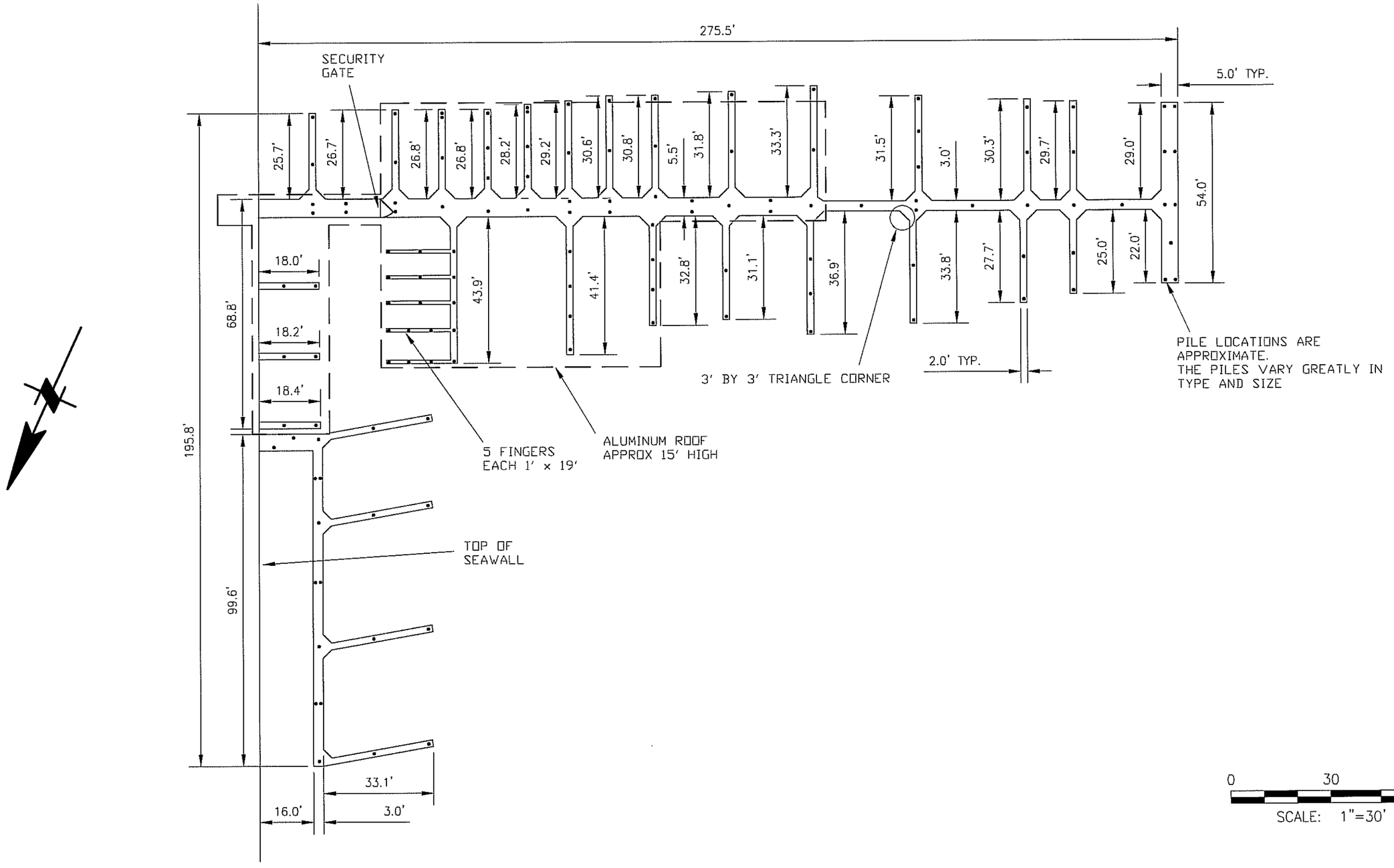
FLOAT PLAN

APRIL 4, 1997	RECONSTRUCTION PLAN
JUNE 27, 1997	MEYDENBAUER BAY MARINA
	FOR MR. WILLIAM LAGEN
	BELLEVUE WASHINGTON
	SPEARMAN ENGINEERING, PS
	11410 NE 124th ST. SUITE 582
	KIRKLAND, WA 98034 (206) 820-1739

97-4

SHEET 5

5 OF 15



MOFFATT & NICHOL 600 UNIVERSITY STREET, SUITE 610 SEATTLE, WA 98101 206-622-0222	Prepared by: Moffatt & Nichol Date: 07 JUL 2008	MEYDENBAUER PARK PIER 3	PIER 3	Attachment D