CENWS-OD-TS-DMMO **2 JULY 2008**

MEMORANDUM FOR RECORD

SUBJECT: DETERMINATION REGARDING THE SUITABILITY OF PROPOSED DREDGED MATERIAL FROM ZITTEL'S MARINA AT OLYMPIA WASHINGTON FOR UNCONFINED OPEN WATER DISPOSAL AT THE ANDERSON KETRON OPEN WATER DISPOSAL SITE

1. Introduction. This memorandum reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Washington Departments of Ecology and Natural Resources, and the U.S. Environmental Protection Agency) regarding the suitability of up to 32,000 cubic yards of dredged material from Zittel's Marina for disposal at the Anderson-Ketron open-water disposal sites.

2. Background. Zittel's Marina is located on the East Shore of Johnson's Point near Olympia Washington. Marinas are ranked moderate under DMMP guidelines. The marina is used by recreational boaters for moorage. The applicant is proposing to dredge and remove accumulated sediment to maintain -10 feet MLLW depth to accommodate marina boating activities.

3. Project Summary. Table 1 includes project summary and tracking information.

Table 1. Project Summary

Project ranking	Moderate
Proposed Dredging volume	32,000 cubic yards
Proposed Dredging depth	-10 feet MLLW
SAP Received	16 November 2007
SAP Approved	7 December 2007
Sampling Dates	17 and 18 January 2008
Data report received	12 May 2008
DAIS Tracking Number	ZITTE-1-B-F-252
USACE Permit Application Number	NWS-2008-
Recency Determination (Moderate = 5 to 7 Years)	17 January 2013 – 17 January 2015

4. Project Sampling. Core samples were taken from eight surface locations, and composited for two analyses. The MudMole^{tm} impact core sampler was used to collect the samples Z-samples were also collected from all core locations. The sampling and compositing scheme is outlined in Table 2. At three samples locations (A-1, A-4 and A-

5) compact sands and poorly graded gravel prevented the collection of Z-samples. Sample locations are illustrated in Figure 1.

5. Chemical Analysis. Sediments were evaluated for the standard list of DMMP chemicals of concern and for tributyltin (TBT). The approved sampling and analysis plan was followed and quality control guidelines specified by the PSEP and DMMP guidelines were met. The data were considered sufficient and acceptable for Regulatory decision-making.

Sediment conventional results are listed in Table 3. The material is predominantly silty sands, with some gravel and fine-grained sediment.

Chemical analysis results are listed in Table 4. DMMU 1 had several exceedances of DMMP screening levels: anthracene, fluoranthene, benzo(a)anthracene, and total DDT. DMMU 2 had no exceedances of DMMP screening levels. The sediment from DMMU 2 is suitable for open water disposal.

6. Biological Testing. DMMU 1 required biological testing in order to determine its suitability for open-water disposal. Bioassay results are listed in Table 5. Bioassays were conducted within the 56-day holding time.

Reference sediment was collected from Sequim Bay, and matched with the test sediment for grain-size and conventional parameters. The reference sediment contained 2.5% fines and 0.79% total organic carbon and the test sediment contained 5.3% fines and 1.42% total organic carbon.

Eohaustorius estuarius was used for the amphipod bioassay, and was collected from Yaquina Bay, Oregon. *Mytilus galloprovincialis* was selected for the sediment larval bioassay, and were supplied by M-REP of Carlsbad California, *Neanthes arenaceodentata* were used for the juvenile polychaete test and provided by Donald Reish of Long Beach California. Test methods followed the guidance provided by PSEP (1995), the DMMP Users Manual (2007) and DMMP program updates, and met all quality control guidelines.

The Neanthes and amphipod bioassays both passed DMMP guidelines. The sediment larval test failed the 2-hit guideline (test mortality 31% and statistically different than controls). Given the absence of any other confirmatory bioassay hits, the sediment from DMMU 1 meets the suitability guidelines for open-water disposal.

7. **Suitability Determination**. This memorandum documents the evaluation of the suitability of sediment proposed for dredging from Zittel's Marina for open-water disposal. The approved sampling and analysis plan was followed with the exceptions noted above. The data gathered were deemed sufficient and acceptable for regulatory decision-making under the DMMP program.

Based on the results of the previously described testing, the DMMP agencies conclude that **all 32,000 cubic yards are suitable** for open-water disposal at the Andserson-Ketron non-dispersive site. The applicant should make every effort to dredge and dispose of DMMU 1 prior to dredging and disposing DMMU 2.

This suitability determination does ***not*** constitute final agency approval of the expanded project. During the public comment period that follows a public notice, the resource agencies will provide input on the overall project. A final decision will be made after full consideration of agency input, and after an alternatives analysis is done under section 404(b)(1) of the Clean Water Act.

A pre-dredge meeting with DNR and the Corps of Engineers will be required. A dredging quality control plan must be developed and submitted to the Regulatory Branch of the Seattle District Corps of Engineers at least 7 days prior to the pre-dredge meeting. A DNR site use authorization must also be acquired.

8. Agency Signatures.

Concur:

7/10/08
Date

Stephanie Stirling, Seattle District Corps of Engineers

7/10/08
Date

Erika Hoffman, Environmental Protection Agency

07/10/2008
Date

Laura Inouye, Ph.D., Washington Department of Ecology

10-July-08
Date

Courtney Wasson, Washington Department of Natural Resources

Copies Furnished:

DMMP Agencies
Ravi Sanga, EPA
Jim Green, Seattle District Regulatory
Paul Meyer, Port of Seattle
Tad Deshler, Windward Environmental

Table 2. Sediment Compositing Scheme

DMMU Number	DMMO Sample Designation	Sample Core Sections	DMMU Volume	Composite ID
S-1	C-1	A-1A, A-2A A-3A, A4A	16,000	12708001001
S-2	C-2	A-5A,A-6A, A-7A, A-8A	16,000	12708001002

Table 3. Sediment Conventional Data.

		DMMU 1	DMMU 2
	DAIS ID:	C1	C2
GRAIN SIZE	% Gravel:	47.0	25.6
	% Sand:	27.1	41.7
	% Silt:	2.9	8.1
	% Clay:	2.4	2.8
	% Fines (clay+silt):	5.3	10.9
	Total Solids (%):	75.6	82.5
	Volatile Solids (%):	2.5	1.43
	Total Organic Carbon (%):	1.42	0.7
	Total Sulfides (mg/kg):	128	6.99
	Total Ammonia (mg N/kg):	2.41	3.57

Table 4. Chemical results compared to DMMP regulatory guidelines.

CHEMICAL	SL	BT	ML	DMMU 1		DMMU 2	
METALS (mg/kg dry)				conc	QL	conc	QL
Antimony	150	---	200	6	U	6	U
Arsenic	57	507	700	6		6	
Cadmium	5.1	11.3	14	0.2		0.2	U
Chromium	---	267	---	26.5		23	
Copper	390	1,027	1,300	13.5		10	
Lead	450	975	1,200	3		2	U
Mercury	0.41	1.5	2.3	0.06	U	0.05	U
Nickel	140	370	370	23	J	22	J
Selenium	---	3.0	---	0.2	U	0.2	U
Silver	6.1	6.1	8.4	0.4	U	0.4	U
Zinc	410	2,783	3,800	32		28	
ORGANOMETALLIC COMPOUNDS (ug/L interstitial water)							
Tributyltin (ion)	0.15	0.15	---	0.019	U	0.032	U
LPAH (ug/kg dry)							
2-Methylnaphthalene	670	---	1,900	41	J	19	U
Acenaphthene	500	---	2,000	19	U	19	U
Acenaphthylene	560	---	1,300	30	J	19	U
Anthracene	960	---	13,000	3,600	J	19	U
Fluorene	540	---	3,600	20	U	20	U
Naphthalene	2,100	---	2,400	190	J	19	U
Phenanthrene	1,500	---	21,000	**440**		19	U
Total LPAH	5,200	---	29,000	4,321	J	19	U
HPAH (ug/kg dry)							
Benzo(a)anthracene	1,300	---	5,100	**1,300**	J	19	U
Benzo(a)pyrene	1,600	---	3,600	760	J	19	U
Benzo(g,h,i)perylene	670	---	3,200	240	J	19	U
Benzofluoranthenes	3,200	---	9,900	1730	J	19	U
Chrysene	1,400	---	21,000	**2,100**	J	19	U
Dibenzo(a,h)anthracene	230	---	1,900	99	J	19	U
Fluoranthene	1,700	4,600	30,000	**1,900**	J	19	U
Indeno(1,2,3-c,d)pyrene	600	---	4,400	300	J	19	U
Pyrene	2,600	11,980	16,000	1800	J	19	U
Total HPAH	12,000	---	69,000	10,229	J	19	U
CHLORINATED HYDROCARBONS (ug/kg dry)							
1,2,4-Trichlorobenzene	31	---	64	0.9	U	1	U
1,2-Dichlorobenzene	35	---	110	0.9	U	1	U
1,3-Dichlorobenzene	170	---	---	0.9	U	1	U
1,4-Dichlorobenzene	110	---	120	4.7	U	5.2	U
Hexachlorobenzene	22	168	230	19	U	19	U
PHTHALATES (ug/kg dry)							
Bis(2-ethylhexyl)phthalate	1,300	---	8,300	19	U	19	U
Butyl benzyl phthalate	63	---	970	19	U	19	U
Di-n-butyl phthalate	1,400	---	5,100	19	U	19	U
Di-n-octyl phthalate	6,200	---	6,200	19	U	19	U
Diethyl phthalate	200	---	1,200	19	U	19	U
Dimethyl phthalate	71	---	1,400	19	U	19	U

CHEMICAL	SL	BT	ML	DMMU 1		DMMU 2	
PHENOLS (ug/kg dry)							
2 Methylphenol	63	---	77	19	U	19	U
2,4-Dimethylphenol	29	---	210	19	U	19	U
4 Methylphenol	670	---	3,600	19	U	19	U
Pentachlorophenol	400	504	690	95	U	96	U
Phenol	420	---	1,200	19	U	19	U
MISCELLANEOUS EXTRACTABLES (ug/kg dry)							
Benzoic acid	650	---	760	190	U	190	U
Benzyl alcohol	57	---	870	19	U	19	U
Dibenzofuran	540	---	1,700	50	J	19	U
Hexachlorobutadiene	29	---	270	19	U	19	U
Hexachloroethane	1,400	---	14,000	19	U	19	U
N-Nitrosodiphenylamine	28	---	130	19	U	19	U
VOLATILE ORGANICS (ug/kg dry)							
Ethylbenzene	10	---	50	0.9	U	1	U
Tetrachloroethene	57	---	210	0.9	U	1	U
Total Xylene	40	---	160	0.9	U	1	U
Trichloroethene	160	---	1,600	0.9	U	1	U
PESTICIDES AND PCBs (ug/kg dry)							
Aldrin	10	---	---	0.97	U	0.98	U
Chlordane	10	37	---	0.97	U	0.98	U
Dieldrin	10	---	---	0.97	U	0.98	U
Heptachlor	10	---	---	0.97	U	0.98	U
Lindane	10	---	---	0.97	U	0.98	U
Total DDT	6.9	50	69	7	Y	2	U
Total PCBs	130	---	3,100	19	U	19	U
Total PCBs (mg/kg OC)	---	38	---				U

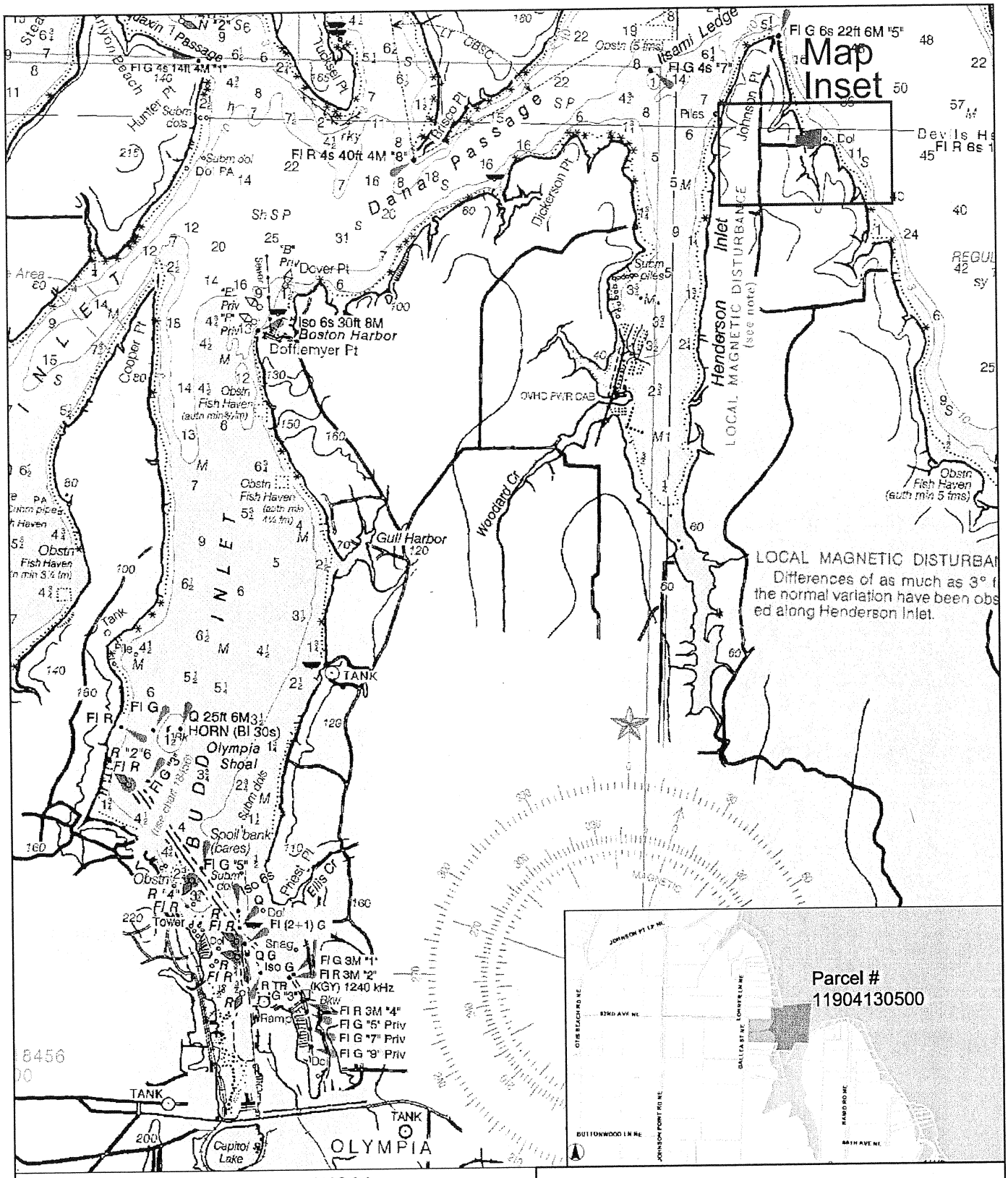
Y = elevated reporting limit
J = estimated concentration
U = undetected
QL = laboratory qualifier
OC = organic carbon
SL = screening level
BT = bioaccumulation trigger
ML = maximum level

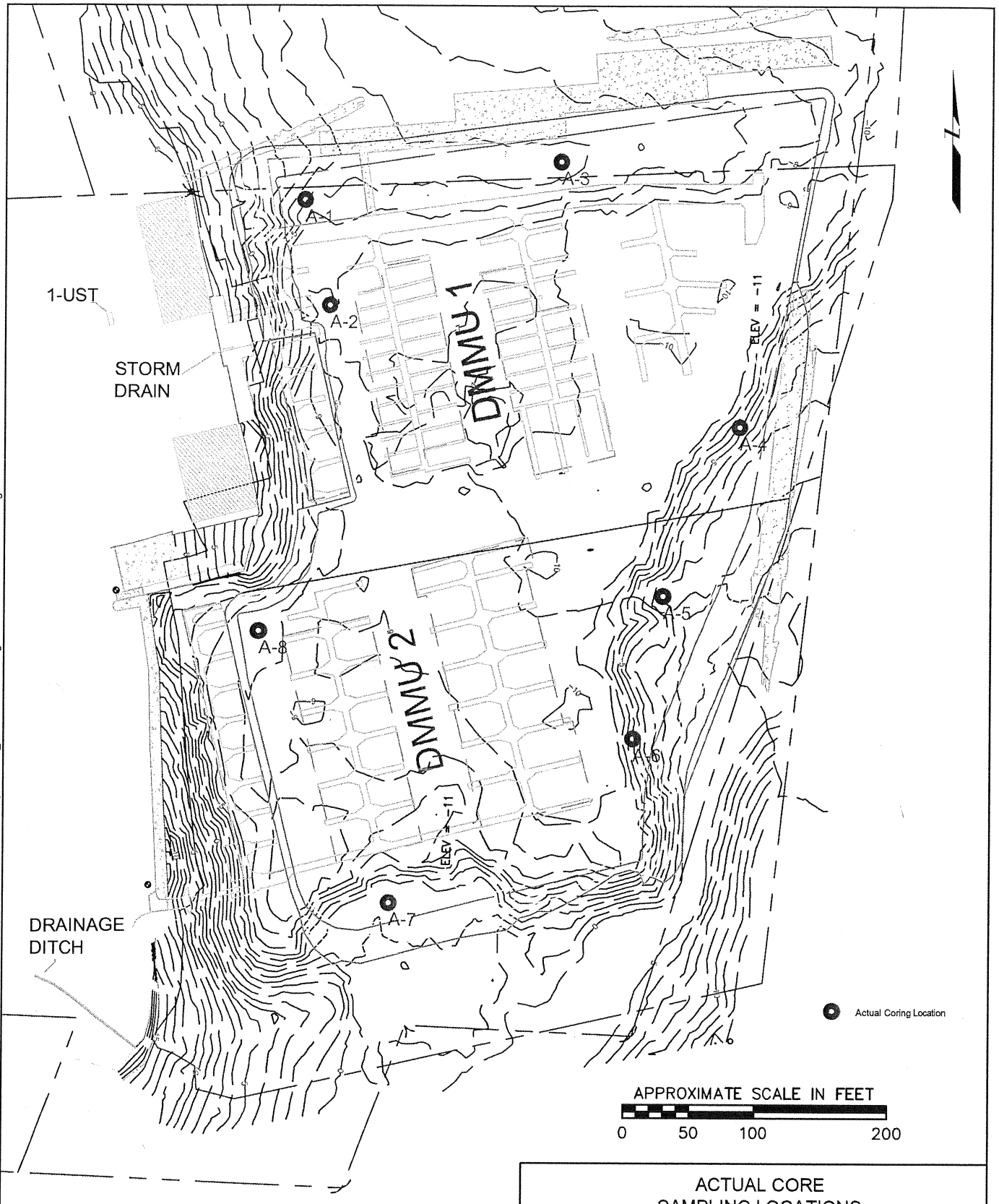
TABLE 5

BIOASSAY RESULTS
Zittel's Marina Dredging Project
Olympia, Washington

Test (test species)	Negative Control Performance Standard	Negative Control Results	Reference Sediment Performance Standards	Reference Sediment Results	DMMP Interpretive Guidelines		Bioassay Results	Determination
Amphipod (*Eohaustorius estuarius*)	$M_C \leq 10$ %	2% M	$M_R - M_C \leq 20$ %	1% M	2-hit guideline	$M_T - M_C > 20$ % and M_T vs M_R SD ($p = 0.05$)	4% M	Pass
					1-hit guideline	$M_T - M_R > 30$ %	3% M	Pass
Juvenile Polychaete (*Nephtys*)	$M_C \leq 10$% and MIGc ≥ 0.38 mg/ind/d (dry)	4% M and 0.557 mg/ind/day	$M_R \leq 20$% and $MIG_R \div MIG_C \geq 0.80$	12% M and 90% MIG	2-hit guideline	$MIG_T/MIG_C < 0.80$ and $MIG_T/MIG_R < 0.70$ MIG_T vs MIG_R SD ($p = 0.05$)	94% MIG and 104% MIG	Pass
					1-hit guideline	$MIG_T/MIG_R < 0.50$	104% MIG	Pass
Sediment Larval (*Mytilus galloprovincialis*)	$N_C \div I \geq 0.70$	87.3% N	$N_R \div N_C \geq 0.65$	95% N	2-hit guideline	$N_T \div N_C < 0.80$ and N_T/N_C vs N_R/N_C SD ($p = 0.10$)	69% N SD	Fail
					1-hit guideline	$N_R/N_C \div N_T/N_C > 0.30$	26% N	Pass

M = mortality, N = normal larvae, I = Initial Count, MIG = mean individual growth rate, SD = statistically different, R = reference, C = control, T = test


Map Inset
Parcel #
11904130500
Chart Courtesy of NOAA
VICINITY MAP
Zittel's Marina
Olympia, WA
APPROXIMATE SCALE IN FEET
0 3000 6000 12000
By: GSM
Date: 1-22-08
Project No. 12708.001
Geomatrix
Figure 1
Vicinity Map 2.dwg



REVISED DREDGE VOLUME ESTIMATE
BASED ON NEW DREDGE OUTLINE PER CLIENT

3H:1V SIDE SLOPES

DREDGE TO −10: 20,132 CY CUT
DREDGE TO −11: 27,020 CY CUT

ACTUAL CORE
SAMPLING LOCATIONS

Zittel's Marina
Olympia, WA

By: GSM	Date: 3-25-08	Project No. 12708.001
Geomatrix		Figure 2

Plot Date: 03/25/08 - 4:21pm, Plotted by: gmaxwell
Drawing Path: Z:\Zittels Marina\12708-001 Zittels Marina Permitting\17000 CAD\October 2007 Revision\, Drawing Name: e_Zittel's Marina Dredge Outline 10-11-07 Civil 3D.dwg