CENWS-OD-TS-DMMO

MEMORANDUM FOR: RECORD September 12, 2006

SUBJECT: DETERMINATION ON THE SUITABILITY OF PROPOSED DREDGED MATERIAL FROM THE SOUTH DOCK MAINTENANCE AND DEEPENING DREDGING AND NORTH DOCK MAINTENANCE AND DEEPENING DREDGING (EXISTING BARGE CHANNEL 2), ANACORTES, WASHINGTON (FILE # NWS-2006-1481-NO) EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT FOR EITHER OPEN-WATER DISPOAL AT A DMMP DISPOSAL SITE, OR PLACEMENT AT A HABITAT (MITIGATION) SITE.

1. Introduction. The following summary 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 Environmental Protection Agency) on the suitability of approximately 18 thousand cubic yards (cy) of dredged material from the South Dock existing barge channel and 51 thousand cubic yards from the North Dock existing barge channel 2 Maintenance and Deepening Dredging projects, adjacent to Fidalgo Bay in Anacortes, Washington. Disposal of suitable material is planned for placement as construction material at the Fidalgo Bay MJB Habitat Site.

   The broad DMMP programmatic regulatory interpretative framework for dixoins disposal at dispersive sites and/or non-dispersive sites is not yet developed. It will be the focus of DMMP lead stakeholder workshops during 2006. Therefore, this framework is not available at the time of this suitability determination to evaluate suitability of material evaluated for dioxins from the North Dock for open-water disposal. When developed, a supplemental suitability determination may be forthcoming evaluating the suitability of the North Dock material for disposal at a dispersive or non-dispersive site.

   This project was ranked moderate for testing purposes, and the dredging is required to achieve a project depth of -14 ft MLLW with one foot of allowable overdepth (to –15 ft. MLLW) in the South Dock project area. At the North Dock project area, a depth of -12ft MLLW would be required along with one foot of allowable overdepth (to -13 ft. MLLW). These two "projects" are included in one Suitability Determination because USACE Regulatory Branch considers them as one project.

   This determination of suitability for open-water disposal is based on the acceptability of the sampling conducted by MJB contractors in April of 2006 (Table 1). All relevant test data from this sampling event is contained in two reports, one for South Dock and one for North Dock, submitted by Geomatrix dated May, 2006. These data were considered sufficient and acceptable for decision-making by the DMMP agencies using best-professional judgement.

Table 1. Regulatory Tracking Dates

SAP's received	December 14, 2005
SAP's approved	January 24, 2006
Sampling dates	April 7 and 11, 2006
Sampling Equipment	DMMU's: Impact Corer; Mitigation Site: Van Veen Grab
Data report submitted	June 3, 2006

Recency Determination: Moderate (5-7 years)	April 20011 – 2013
DAIS Tracking number	MJBNS-1-A-F-225

Table 2. Project Synopsis

Proposed disposal sites	Rosario Strait dispersive site, or permitted Fidalgo Bay MJB Habitat Site
Sediment ranking	moderate
Predicted dredge volume	69,000 cubic yards
Project last dredged	South Dock last dredged in 1975, North dock in 1976

2. Background. The North Dock Barge Channel 2 was originally dredged circa 1975 to an approximate bottom elevation of -5 to -6 feet MLLW. No known maintenance dredging has been conducted in the channel since the initial dredging. The current project includes maintenance dredging as well as deepening of this channel to -12 feet (MLLW) plus 1 foot of over-depth dredging. Because of the close proximity of this project to the old Scott paper Mill site, which is also an Ecology Agreed Order Site, it was determined that littoral drift could have contaminated this site with dioxin from the pulp mill. Therefore, Dioxin was added as a COC.

   The South Dock Barge Channel was originally dredged in 1976 to a bottom elevation of -12 feet MLLW. No known maintenance dredging has been conducted in the channel since initial dredging. The current project includes maintenance dredging as well as deepening of this channel to -14 feet MLLW plus 1 foot of over-depth dredging. The South Dock Barge Channel is located farther south from the old Scott Paper Mill Site than the North Dock and has a marina in between it and the mill site. Based on this information, it was determined during discussions with Ron Timm that it was unlikely the South Dock had been influenced by contaminants from the old Scott Paper Mill Site. Therefore, Dioxin analyses were not required for samples from the South Dock site.

3. Sampling. Sampling of the North Dock took place on April 7, 2006. Cliff Whitmus of Geomatrix called Sandy Lemlich to explain that they were experiencing refusal with their coring device and were not able to collect sediment from the entire dredging prism. He stated that the deepening (native) material was dry and consolidated and their coring device was not able to penetrate it. Even after moving the sampling locations the result was the same. Only 4-6 feet of material was sampled rather than the expected 7-9 feet. Cliff Whitmus saved several examples of the native material for EPA and USACE to inspect. Corps and EPA were out to observe the sampling of the South Dock on April 11, 2006. Jonathan Freedman of EPA and Sandy Lemlich of USACE observed several hours of sampling of the South Dock that proceeded without any problems except that one core was 0.2 feet short because native material was encountered. The native material observed from the North Dock cores appeared to be as Cliff Whitmus described and Corps/EPA agreed that this was the best that could be achieved without much more expensive sampling equipment. This was the same situation that occurred in the one short core from the South Dock.

   Sampling at the South Dock required three cores from DMMU-1 and two cores from DMMU-2. The cores from each of the DMMU's were composited to form a single sample from each of the two

DMMU's. At the North Dock site, two cores were collected from each of the four DMMU's and composited to form the four samples for analyses. Z-samples were also collected from each core and archived.

4. Chemical Analysis (except Dioxin). The Agencies' approved sampling and analysis plan was followed, and quality assurance/quality control guidelines specified by PSEP and the DMMP program was generally complied with. Chemical analyses were performed by Analytical Resources Incorporated (ARI) of Tukwila, Washington.

   Conventional results are presented in Table 3. Chemical analytical results (Table 4) demonstrated that most samples were predominately free of chemicals of concern, with very few detections of any COCs. None of the detection limits or detected values was above DMMP screening values. Based on these results, no further analyses were required.

5. Comparison to SMS Guidelines (except Dioxin). All results of the chemical analyses were compared to Washington State Sediment Management Standards, after carbon-normalizing the appropriate chemicals (Table 5). The analyses showed that levels of all detected and undetected contaminants were below the Sediment Quality Standards (SQS) set by Washington State.

6. Dioxin. Dioxin analyses were not required for samples from the South Dock site. Dioxin results and TEQ's for the 4 DMMU's from the North Dock Barge Channel 2 and the mitigation sites are presented in Figure 6. The dioxin TEQ results ranged from 0.9 – 3.1 pptr with a mean of 1.7 pptr for the four DMMU's.. All dioxin results, except from sample C-2, were lower than from the mitigation site (1.8 pptr). There is currently no established regulatory interpretation framework in place for evaluating dredged material for unconfined open-water disposal at a DMMP non-dispersive or dispersive site..

7. Suitability. This memo documents the suitability of proposed dredged sediments within the MJB Anacortes North Dock Barge Channel 2 and the South Dock Barge Channel project area for open water disposal. 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 concluded that the 18,000 cubic yards of material to be dredged from the South Dock Barge Channel project area is suitable for open water disposal Open water disposal may be at the Rosario Strait dispersive site, at Fidalgo Bay MJB Habitat/mitigation Site, or at a non-dispersive site.

   Based on the dioxin results, 51,000 cubic yards of sediment from the North Dock Barge Channel 2 can be disposed at the mitigation if it can be shown that this action will not result in an increase in the overall concentration of dioxin at the mitigation site. In order to achieve this result, a best-management-practice (BMP) must be followed, which would dredge/dispose the material from DMMU-2, with a TEQ of 3.1 pptr first, and followed by the next highest TEQ, and finally with the lowest TEQ material last. The material at the mitigation site has a TEQ of 1.8 pptr. Sediments from the remaining three DMMU's, with TEQ's ranging from 1.7 to a low of 0.9 pptr, will then be placed over those from DMMU-2. Thus the resulting surface will have a dioxin concentration at the mitigation site lower than the existing condition. However, due to difficulties in dredging DMMU-2 first because of its shallow depth and location against the shore, the applicant has requested that DMMU-2 be dredged second after DMMU-4. The sediment from the remaining two DMMU's would then be placed over those from DMMU-2 as described above. Since there would still be sufficient material to cover the sediment from DMMU-2, the end result would still be a surface with a dioxin concentration lower than or equal to the existing condition. If this procedure is

followed, sediments from the North Dock Barge Channel 2 can be disposed at the Fidalgo Bay MJB Habitat/mitigation site.

Since there is no process for disposal of sediments containing dioxin at dispersive open-water disposal sites, it is impossible to include disposal of sediments from the North Dock Barge Channel 2 at the Rosario Strait dispersive site. After the regulatory process is developed on a programmatic basis, the project can be re-evaluated at the applicants request. If it is found suitable for disposal at the Rosario Strait dispersive site, this Suitability Determination can be modified at that time.

A Dredging and Disposal plan for this project must be completed as part of the final project approval process. The Dredging and Disposal plan shall be provided to all DMMP agency representatives at least two weeks prior to the pre-dredge meeting. In addition, because this is a deepening project and there were two types of materials in each core, soft maintenance material and harder native material that is probably cleaner, each DMMU must be disposed as a whole unit at the same site and not divided by type of material since all material was tested together as one unit.

This suitability determination does not constitute final agency approval of the project. A final decision on project approval 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.

8. Reference.

Geomatrix 2006. Puget Sound Dredged Disposal Analysis Sediment Characterization, North Dock Maintenance Dredging (Existing Barge Channel 2), Anacortes Washington. Report to MJB Properties, Inc., Project No. 10131

Geomatrix 2006. Puget Sound Dredged Disposal Analysis Sediment Characterization, South Dock Maintenance Dredging, Anacortes Washington. Report to MJB Properties, Inc., Project No. 10131

Concur:

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Table 3. Sediment conventional results, MJB Anacortes North and South Dock.

		North Dock				*South Dock*	
Rank		*M*	*M*	*M*	*M*	*M*	*M*
DMMU		C-1	C-2	C-3	C-4	C-1	C-2
Maximum Sampling depth (ft) [a, b]		4	4	6	5.7	7.5	5.3
Mean Sampling depth (ft) [a, b]		4	4	6	4.8	6.9	5.1
Volume (cubic yards)		13,591	14,091	9,841	11,202	8,791	8,309
Grain Size	% Gravel	5.6	33.7	7.4	28.9	2.3	1.0
	% Sand	32.3	38	40.4	25.0	15.5	12.2
	% Silt	34.7	21.1	35.8	31.5	57.0	54.6
	% Clay	27.3	7.3	16.4	14.6	25.1	32.2
	% Fines (clay+silt)	62	28.4	52.2	46.1	82.1	86.8
Total Solids (%)		78.1	76.9	74.5	73.7	54.5	62
Total Volatile Solids (%)		2.3	14.41	1.96	2.33	6.91	3.87
Total Organic Carbon, %		0.54	0.92	0.88	0.68	1.58	1.18
Total Ammonia, mg/kg		6.71	8.13	9.04	9.39	56.3	21.1
Total Sulfides, mg/kg		47	9	1.7U	19	970	160

[a] Includes z-sample which was not sampled

[b] Feet below mudline

Table 4. Results of chemical analysis compared to DMMP criteria.

Chemical	DMMP Criteria			North Dock				South Dock	
	SL	BT	ML	C-1	C-2	C-3	C-4	C-1	C-2
CONVENTIONALS									
Total Organic Carbon (%)	--	--	--	0.54	0.92	0.88	0.68	1.58	1.18
METALS (mg/kg)									
Antimony	150	150	200	6U	6U	6U	7U	9U	8U
Arsenic	57	507	700	9	7	8	9	13	9
Cadmium	5.1	11.3	14	0.2U	0.3	0.3U	0.3	0.7	0.4
Chromium	--	267	--	38.5	30.8	39.4	36.8	50.5	51.1
Copper	390	1027	1300	38.8	39.3	22.9	26.3	41.9	40.4
Lead	450	975	1200	7	7	5	5	17	8
Mercury	0.41	1.5	2.3	.05U	.05U	.06U	.06U	0.09	0.14
Nickel	140	370	370	34	25	30	28	41	39
Selenium	--	3	--	0.3U	0.2U	.3U	0.3U	0.3	0.3U
Silver	6.1	6.1	8.4	0.4U	0.4U	0.4U	0.4U	0.5U	0.5U
Zinc	410	2783	3,800	61.3	52.3	44.4	46.9	94	70
ORGANOMETALLIC COMPOUNDS (ug/l)									
Tributyltin (as TBT ion)	0.15	0.15	--	0.019U	0.019U	0.019U	0.019U	0.019U	0.019U
ORGANICS									
Total LPAH	5,200	--	29,000	20U	21	20U	20U	105	15J
Acenaphthylene	560	--	1,300	20U	20U	20U	20U	20U	20U
Acenaphthene	500	--	2,000	20U	20U	20U	20U	20U	20U
Anthracene	960	--	13,000	20U	20U	20U	20U	21	20U
Fluorene	540	--	3,600	20U	20U	20U	20U	20U	20U
Naphthalene	2,100	--	2,400	20U	20U	20U	20U	17J	20U
Phenanthrene	1,500	--	21,000	20U	21	20U	20U	67	15J
2-Methylnaphthalene	670	--	1,900	20U	20U	20U	20U	20U	20U
Total HPAH	12,000	--	69,000	97J	360J	48J	20U	863	218
Benzo(a)anthracene	1,300	--	5,100	11J	34	11J	20U	70	16J
Benzo(a)pyrene	1,600	--	3,600	20U	22	20U	20U	64	15J
Benzo (b) fluoranthene	--	--	--	14J	40	16J	20U	71	26
Benzo (k) fluoranthene	--	--	--	20U	18J	20U	20U	77	17J
Total Benzofluoranthenes	3,200	--	9,900	14J	58J	16J	20U	148	43J
Benzo(ghi)perylene	670	--	3,200	20U	12J	20U	20U	37	11J
Chrysene	1,400	--	21,000	20J	70	21	20U	120	35
Dibenzo(a,h)anthracene	230	--	1,900	20U	20U	20U	20U	20U	20U
Fluoranthene	1,700	4,600	30,000	25	78	20U	20U	220	46
Indeno(1,2,3-cd)pyrene	600	--	4,400	20U	11J	20U	20U	34	20U
Pyrene	2,600	11,980	16,000	27	75	20U	20U	170	52
MISCELLANEOUS EXTRACTABLES									
Dibenzofuran	540	--	1700	20U	20U	20U	20U	20U	20U
Hexachlorobutadiene	29	--	270	0.99U	0.98U	0.98U	0.99U	0.99U	1U
N-Nitrosodiphenylamine	28	--	130	20U	20U	20U	20U	20U	20U
Benzoic Acid	650	--	760	200U	200U	200U	200U	200U	200U
Benzyl Alcohol	57	--	870	20U	20U	20U	20U	20U	20U
Hexachloroethane	1,400	--	14,000	20U	20U	20U	20U	20U	20U

Chemical	DMMP Criteria			North Dock				South Dock	
	SL	BT	ML	C-1	C-2	C-3	C-4	C-1	C-2
CHLORINATED HYDROCARBONS									
Hexachlorobenzene	22	168	230	0.99U	0.98U	0.98U	0.99U	0.99U	1U
1,2-Dichlorobenzene	35	--	110	1U	1U	0.9U	1.8U	1.1U	1.4U
1,3-Dichlorobenzene	170	--	--	1U	1U	0.9U	1.8U	1.1U	1.4U
1,4-Dichlorobenzene	110	--	120	1U	1U	0.9U	1.8U	1.1U	1.4U
1,2,4-Trichlorobenzene	31	--	64	5U	4.9U	4.4U	8.7U	5.6U	7.2U
PHTHALATES[5]									
Bis(2-ethylhexyl)phthalate	1,300	--	8,300	20U	16J	20U	20U	54	13J
Butyl benzyl phthalate	63	--	970	20U	20U	20U	20U	20U	20U
Diethyl phthalate	200	--	1,200	20U	20U	20U	20U	20U	20U
Dimethyl phthalate	71	--	1,400	20U	20U	20U	20U	12J	20U
Di-n-butyl phthalate	1,400	--	5,100	20U	20U	20U	20U	22U	20U
Di-n-octyl phthalate	6,200	--	6,200	20U	20U	20U	20U	20U	20U
PCBs									
Total PCBs	130	38	3,100	20U	20U	20U	20U	20U	20U
PESTICIDES									
Total DDT	6.9	50	69	2U	2U	2U	2U	2U	2U
Aldrin	10	--	--	0.99U	0.98U	0.98U	0.99U	0.99U	1U
Dieldrin	10	--	--	2U	2U	2U	2U	2U	2U
alpha-Chlordane	10	--	--	0.99U	0.98U	0.98U	0.99U	0.99U	1U
gamma-Chlordane	10	--	--	0.99U	0.98U	0.98U	0.99U	0.99U	1U
Heptachlor	10	--	--	0.99U	0.98U	0.98U	0.99U	0.99U	1U
gamma-BHC (Lindane)	10	--	--	0.99U	0.98U	0.98U	0.99U	0.99U	1U
VOLATILE ORGANICS									
Trichloroethene	160	--	1,600	1U	1U	0.9U	1.8U	1.1U	1.4U
Tetrachloroethene	57	--	210	1U	1U	0.9U	1.8U	1.1U	1.4U
Ethylbenzene	10	--	50	1U	1U	0.9U	1.8U	1.1U	1.4U
Xylenes	40	--	160	1U	1U	0.9U	1.8U	1.1U	1.4U
PHENOLS									
Pentachlorophenol	400	504	690	98U	98U	99U	98U	99U	99U
Phenol	420	--	1,200	20U	20U	20U	20U	27U	20U
2 Methylphenol	63	--	77	20U	20U	20U	20U	20U	20U
4 Methylphenol	670	--	3,600	20U	20U	20U	20U	11J	20U
2,4-Dimethylphenol	29	--	210	20U	20U	20U	20U	20U	20U

Notes:
Total LPAH = The sum of acenaphthylene, acenaphthene, anthracene, fluorene, naphthalene, and phenanthrene.
Total HPAH = The sum of benzo(a)anthracene, benzo(a)pyrene, total benzofluoanthenes, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3,-c,d)pyrene, and pyrene.
J = The result is an estimated concentration that is less than Method Reporting Limit but greater than or equal to the Method Detection Limit.
B = Analyte was found in the associated method blank at a level that is significant relative to the sample result.
Notes: Analytes with elevated non-detects are shaded and italicized

Table 5. Results of Chemical Analysis compared to SMS guidelines.

Chemical	SMS Criteria		North Dock				South Dock	
	SQS	CL	C-1	C-2	C-3	C-4	C-1	C-2
Conventionals								
Total Organic Carbon (%)	--	--	0.541	0.981	0.883	0.675	1.58	1.18
Metals (mg/kg dry wt)								
Arsenic	57	93	9	7	8	9	13	9
Cadmium	5.1	6.7	0.2U	0.3	0.3U	0.3	0.7	0.4
Chromium	260	270	38.5	30.8	39.4	36.8	50.5	51.1
Copper	390	390	36.8	39.3	22.9	26.3	41.9	40.4
Lead	450	530	7	7	5	5	17	8
Mercury	0.41	0.59	0.05U	0.05U	0.06U	0.06U	0.09	0.14
Silver	6.1	6.1	0.4U	0.4U	0.4U	0.4U	0.5U	0.5U
Zinc	410	960	61.3	52.3	44.4	46.9	94	70
Organics								
LPAH (mg/kg OC)								
Total LPAH	370	780	3.7U	2.3	2.3U	2.9U	6.6	1.2J
Acenaphthylene	66	66	3.7U	2.2U	2.3U	2.9U	1.2U	1.7U
Acenaphthene	16	57	3.7U	2.2U	2.3U	2.9U	1.2U	1.7U
Anthracene	220	1,200	3.7U	2.2U	2.3U	2.9U	1.3	1.7U
Fluorene	23	79	3.7U	2.2U	2.3U	2.9U	1.2U	1.7U
Naphthalene	99	170	3.7U	2.2U	2.3U	2.9U	1.1J	1.7U
Phenanthrene	100	480	3.7U	2.3	2.3U	2.9U	4.2	1.2
2-Methylnaphthalene	38	64	3.7U	2.2U	2.3U	2.9U	1.2U	1.7U
HPAH (mg/kg OC)								
Total HPAH	960	5,300	17.9J	39.2J	5.4J	2.9U	53.9	10.9
Benzo(a)anthracene	110	270	2.0J	3.7	1.2J	2.9U	4.4	1.3J
Benzo(a)pyrene	99	210	3.7U	2.4	2.3U	2.9U	4	1.2
Benzo (b+k) fluoranthene	230	450	2.6J	6.4J	1.8J	2.9U	9.2	3.6
Benzo(ghi)perylene	31	78	3.7U	1.3J	2.3U	2.9U	2.3	0.9J
Chrysene	110	460	3.7J	7.8	2.4J	2.9U	7.5	2.9
Dibenzo(a,h)anthracene	12	33	3.7U	2.2U	2.3U	2.9U	1.2U	1.7U
Fluoranthene	160	1,200	4.6	8.7	2.3U	2.9U	13.8	3.8
Indeno(1,2,3-cd)pyrene	34	88	3.7U	1.2J	2.3U	2.9U	2.1	1.7U
Pyrene	1,000	1,400	5	8.3	2.3U	2.9U	10.6	4.6
Miscellaneous Extractables								
Dibenzofuran (mg/kg OC)	15	58	3.7U	2.2U	2.3U	2.9U	1.2U	1.7U
Hexachlorobutadiene (mg/kg OC)	3.9	6.2	0.2U	0.1U	0.1U	0.1U	0.06U	0.08U
N-Nitrosodiphenylamine (mg/kg OC)	11	11	3.7U	2.2U	2.3U	2.9U	1.2U	1.7U
Benzoic Acid (mg/kg dry wt)	650	650	200U	200U	200U	200U	200U	200U
Benzyl Alcohol (mg/kg dry wt)	57	73	20U	20U	20U	20U	20U	20U
Chlorinated Hydrocarbons (mg/kg OC)								
Hexachlorobenzene	0.38	2.3	0.2U	0.1U	0.1U	0.1U	0.06U	0.08U
1,2-Dichlorobenzene	2.3	2.3	0.2U	0.1U	0.1U	0.3U	0.07U	0.1U
1,3-Dichlorobenzene	-	--	0.2U	0.1U	0.1U	0.3U	0.07U	0.1U
1,4-Dichlorobenzene	3.1	9	0.2U	0.1U	0.1U	0.3U	0.07U	0.1U
1,2,4-Trichlorobenzene	0.81	1.8	0.9U	0.5U	0.5U	1.3U	0.4U	0.6U

Chemical	SMS Criteria		North Dock				South Dock	
	SQS	CL	C-1	C-2	C-3	C-4	C-1	C-2
Phthalates (mg/kg OC)								
Bis(2-ethylhexyl)phthalate	47	78	3.7U	1.7J	2.3U	2.9U	3.4	1.1J
Butyl benzyl phthalate	4.9	64	3.7U	2.2U	2.3U	2.9U	1.2U	1.7U
Diethyl phthalate	61	110	3.7U	2.2U	2.3U	2.9U	0.8J	1.7U
Dimethyl phthalate	53	53	3.7U	2.2U	2.3U	2.9U	1.4U	1.7U
Di-n-butyl phthalate	220	1,700	3.7U	2.2U	2.3U	2.9U	1.2U	1.7U
Di-n-octyl phthalate	58	4,500	3.7U	2.2U	2.3U	2.9U	1.2U	1.7U
PCBs (mg/kg OC)								
Total PCBs	12	65	3.7U	2.2U	2.3U	2.9U	1.2U	1.7U
Phenols (mg/kg dry wt)								
Pentachlorophenol	360	690	98U	98U	99U	98U	99U	99U
Phenol	420	1,200	20U	20U	20U	20U	27U	20U
2 Methylphenol	63	63	20U	20U	20U	20U	20U	20U
4 Methylphenol	670	670	20U	20U	20U	20U	11J	20U
2,4-Dimethylphenol	29	29	20U	20U	20U	20U	20U	20U

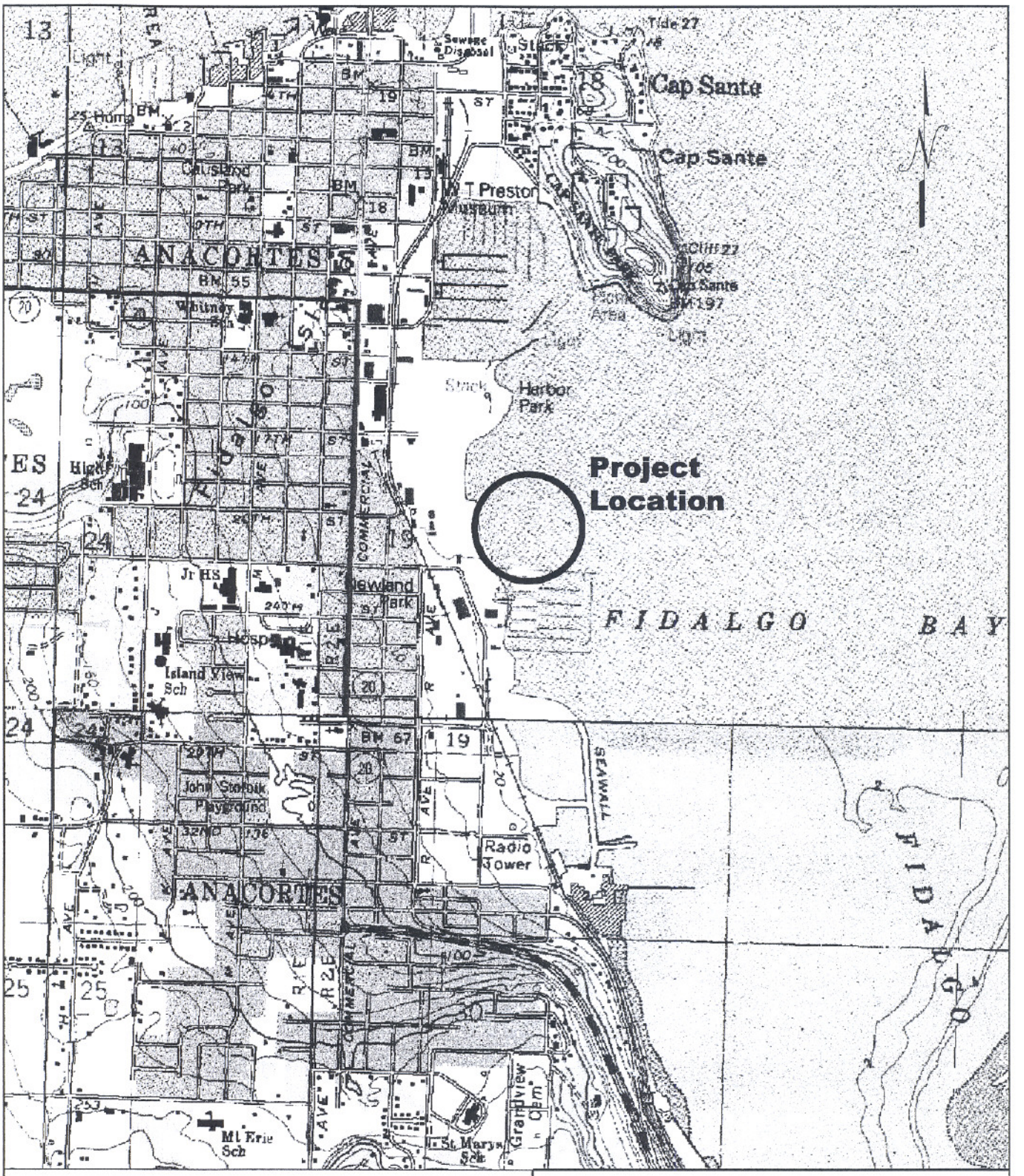
Notes:
Total LPAH = The sum of acenaphthylene, acenaphthene, anthracene, fluorene, naphthalene, and phenanthrene.
Total HPAH = The sum of benzo(a)anthracene, benzo(a)pyrene, total benzofluoanthenes, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3,-c,d)pyrene, and pyrene.
U = Compound was analyzed for, but was not detected at or above the indicated detection limit.
J = The result is an estimated concentration that is less than Method Reporting Limit but greater than or equal to the Method Detection Limit.

Table 6. Results of Dioxin/Furan Analysis.

Analyte	TEF	C-1			C-2			C-3			C-4			Mitigation Site		
		ng/kg-dw	LQ	TEQ[1]	ng/kg-dw	LQ	TEQ[1]	ng/kg-dw	LQ	TEQ[1]	ng/kg-dw	LQ	TEQ[1]	ng/kg-dw	LQ	TEQ[1]
2,3,7,8-TCDD	1	0.1	K	0.1	0.169		0.169	0.086	K	0.086	0.1	K	0.1	0.159	K	0.159
1,2,3,7,8-PeCDD	1	0.4		0.4	0.666	K	0.666	0.231		0.231	0.2		0.2	0.46		0.46
1,2,3,4,7,8-HxCDD	0.1	0.4		0.04	0.773		0.0773	0.3		0.03	0.235		0.0235	0.438		0.0438
1,2,3,6,7,8-HxCDD	0.1	2.4		0.24	4.76		0.476	1.37		0.137	1.13		0.113	2.31		0.231
1,2,3,7,8,9-HxCDD	0.1	1.3		0.13	2.2		0.22	0.777		0.0777	0.675		0.0675	1.62		0.162
1,2,3,4,6,7,8-HpCDD	0.01	39.3		0.393	78.1		0.781	23.6		0.236	19.8		0.198	21.6		0.216
OCDD	0.0003	253		0.0759	469		0.1407	152		0.0456	125		0.0375	125		0.0375
2,3,7,8-TCDF	0.1	0.7		0.07	1.04		0.104	0.5		0.05	0.429		0.0429	1.57		0.157
1,2,3,7,8-PeCDF	0.03	0.224		0.00672	0.315		0.00945	0.149	K	0.00447	0.108		0.00324	0.253	K	0.00759
2,3,4,7,8-PeCDF	0.3	0.305	K	0.0915	0.45		0.135	0.193		0.0579	0.179		0.0537	0.386	K	0.1158
1,2,3,4,7,8-HxCDF	0.1	0.433		0.0433	0.74		0.074	0.217		0.0217	0.205		0.0205	0.554		0.0554
1,2,3,6,7,8-HxCDF	0.1	0.294	K	0.0294	0.546		0.0546	0.165		0.0165	0.172		0.0172	0.41		0.041
2,3,4,6,7,8-HxCDF	0.1	0.321		0.0321	0.553		0.0553	0.175		0.0175	0.154		0.0154	0.322		0.0322
1,2,3,7,8,9-HxCDF	0.1	0.087	U	0.00435	0.073	K	0.0073	0.0461	U	0.002305	0.0461	U	0.002305	0.049	U	0.00245
1,2,3,4,6,7,8-HpCDF	0.01	6.61		0.0661	12.3		0.123	4.53		0.0453	3.62		0.0362	5.26		0.0526
1,2,3,4,7,8,9-HpCDF	0.01	0.409		0.00409	0.648		0.00648	0.269		0.00269	0.193		0.00193	0.538		0.00538
OCDF	0.0003	15.1		0.00453	29.5		0.00885	11.8		0.00354	8.89		0.002667	10.9		0.00327
Total TEQ:				1.7			3.1			1.1			0.9			1.8

Laboratory Qualifier:
K: peak detected but did not meet quantification criteria; result reported represents the estimated maximum possible concentration. Results flagged with a K were considered valid results when calculating the TEQ since nothing in the validation report indicated otherwise.

[1] Used 1/2 DL to calculate the TEQ


Cap Sante
Cap Sante
Preston Museum
ANACORTES
Harbor Park
Project Location
FIDALGO BAY
Newland Park
Hospital
Island View Sch
John Stebik Playground
Radio Tower
ANACORTES
SEAWALL
Mt Erie Sch
St Mary's Sch
Grandview Cem
COMMERCIAL
R2E
Sewage Disposal
Tide 27
Caulsland Park
Whitney Sch
High Sch
Jr HS
Park Area
Cliff 27
Cap Sante
BM 197
Stack
Light
25 Hump
BM 55
BM 67
BM 22
BM 18
BM 19
BM 13
BM 20
BM 24
BM 25
BM 30
BM 32
BM 36
BM 40
BM 50
BM 60
BM 100
BM 200
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BM 280
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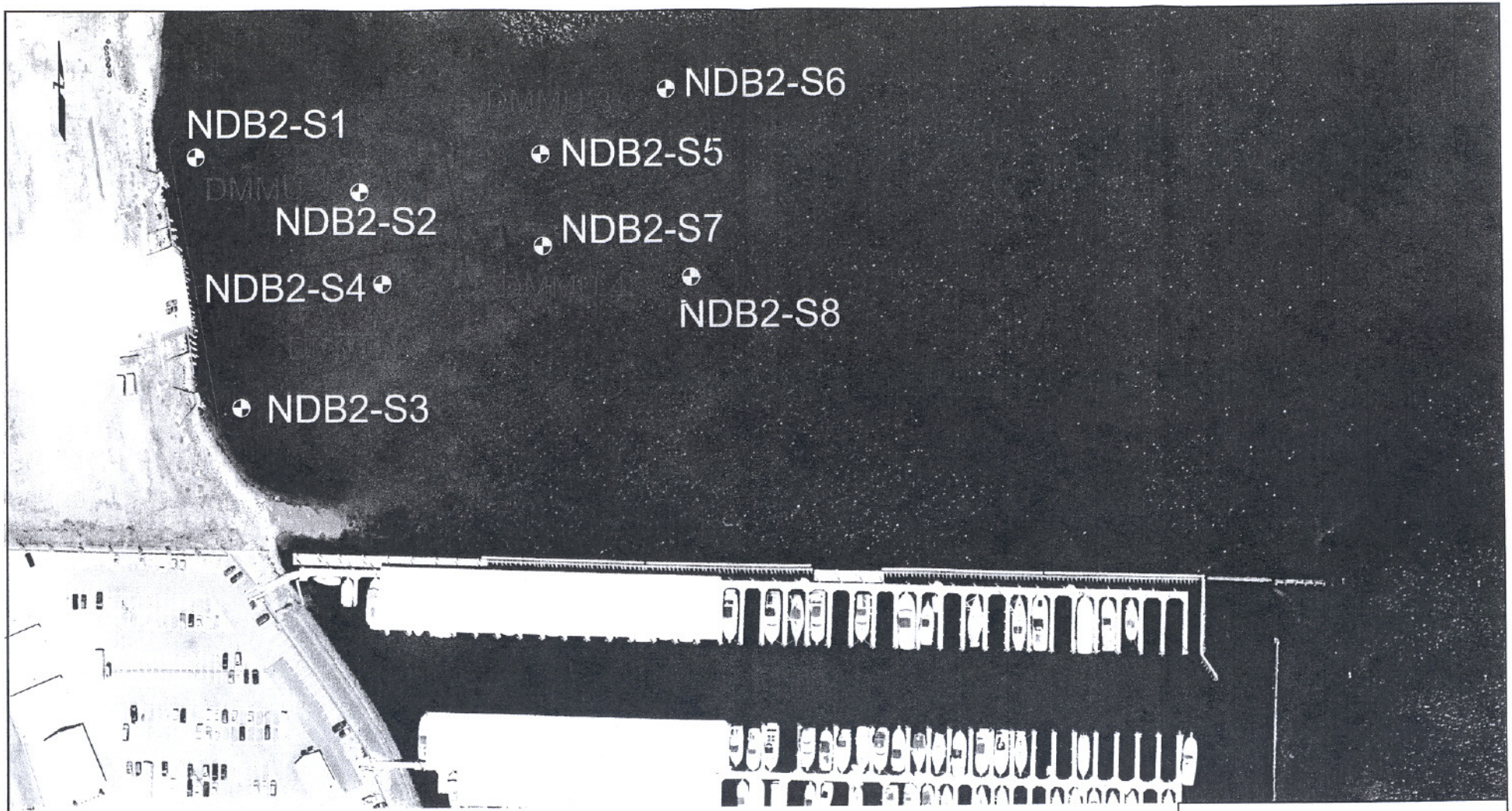


Photo Courtesy of City of Anacortes

APPROXIMATE SCALE IN FEET

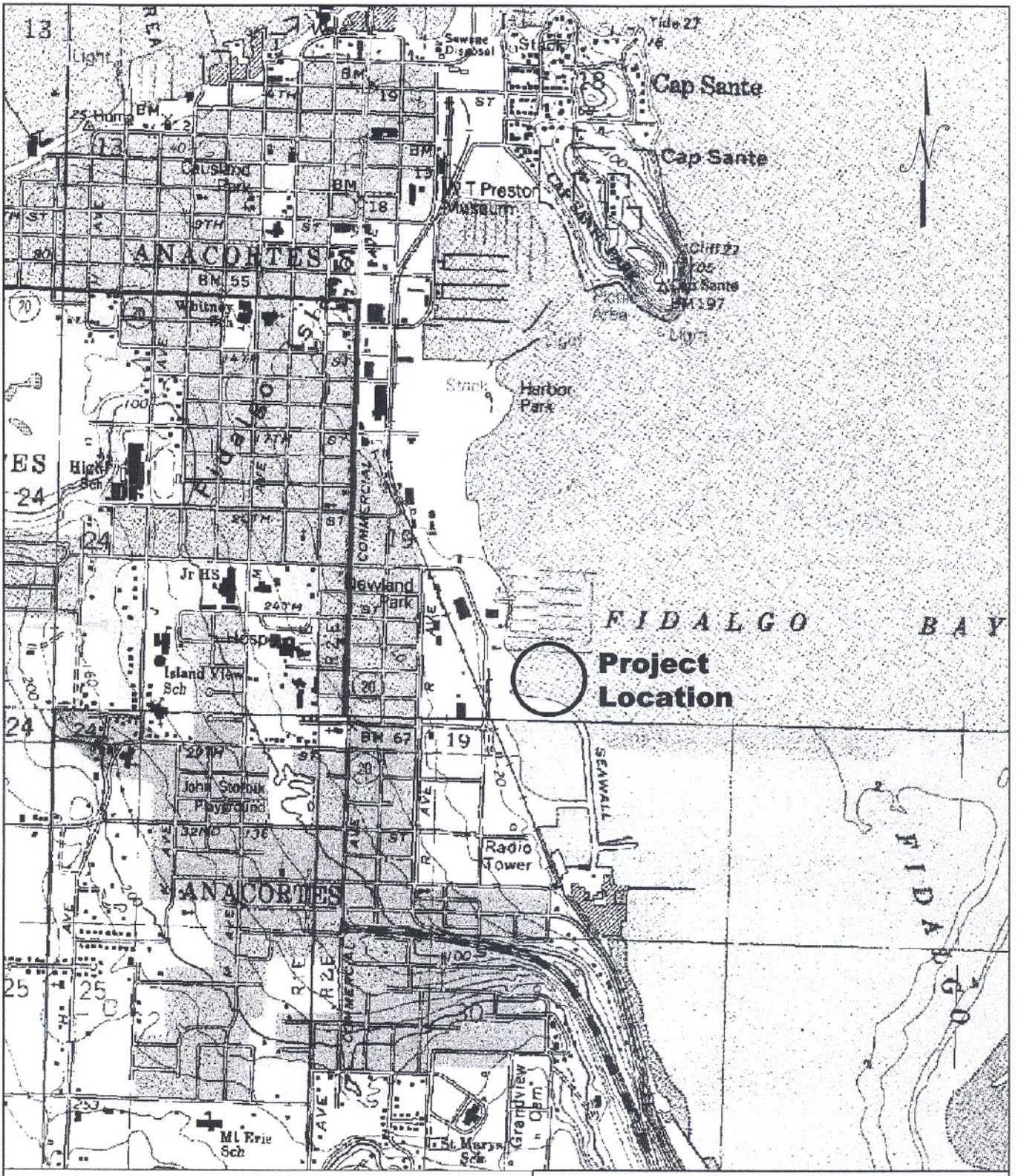
0 50 100 200

ACTUAL CORE SAMPLING LOCATIONS

North Dock Maintenance Dredging
(Existing Barge Channel 2)
Anacortes, WA

By: GSM	Date: 4-26-06	Project No. 010131.000
Geomatrix		Figure 2

L_5 Aerial Photo.dwg



Map Courtesy of USGS

APPROXIMATE SCALE IN FEET

0 750 1500 3000

PROJECT VICINITY

South Dock Maintenance Dredging
Anacortes, Washington

By: GSM	Date: 5-26-06	Project No. 010131-000
Geomatrix		Figure 1

Project Vicinity.dwg

Photo Courtesy of City of Anacortes

APPROXIMATE SCALE IN FEET

0 50 100 200

ACTUAL CORE SAMPLING LOCATIONS

South Dock Maintenance Dredging
Anacortes, WA

By: GSM	Date: 4-26-06	Project No. 010131.000
Geomatrix		Figure 2

L_S Aerial Photo.dwg