NRC
NATURAL RESOURCES CONSULTANTS, INC.

1900 W. NICKERSON, STE. 207
SEATTLE, WASHINGTON 98119-1650, U.S.A.
TELEPHONE: (206) 285-3480
TELEFAX: (206) 283-8263
E-Mail : jjune@nrccorp.com (corporate)

FINAL REPORT

DERELICT FISHING GEAR REMOVAL PROJECT PORT GARDNER

PREPARED FOR:

NORTHWEST STRAITS FOUNDATION

PREPARED BY:

NATURAL RESOURCES CONSULTANTS, INC.

October 20, 2004

Introduction

Abandoned, lost and discarded fishing gear can present safety, liability, nuisance and environmental impact issues in marine waters. Identification, location and safe removal of derelict fishing gear can reduce these impacts. The Northwest Straits Commission (NWSC) recently teamed with the National Oceanic and Atmospheric Administration (NOAA) to address the issue of derelict fishing gear in north Puget Sound and the Strait of Juan de Fuca. The result of this project is a comprehensive program to safely remove derelict fishing gear from the marine environment in an environmentally acceptable manner. The Washington Department of Fish and Wildlife (WDFW) has recently published guidelines for derelict fishing gear removal in Washington marine waters based on the NOAA/NWSC project.

The Northwest Straits Foundation and the Snohomish County Marine Resources Committee (MRC) sought to locate and remove derelict fishing gear in Port Gardner off of Everett, Washington. The NWSF contracted with Natural Resources Consultants, Inc., (NRC) to manage the derelict fishing gear project. NRC subcontracted with the Innerspace Exploration Team for a sidescan sonar survey and with Doug Monk for diver gear recovery services. The derelict fishing gear survey and removal project followed the guidelines established by the WDFW and the NWSC and was conducted in collaboration with the WDFW, the Snohomish County MRC and the Tulalip Tribe.

Scope of Work

This project focused on the identification and removal of derelict crab pots in Port Gardner from Mission Beach east of Tulalip Bay in the north, south along the east shoreline of Gedney Island and the mud flats west of Jetty Island and along the southern shoreline of Port Gardner from the Port of Everett to the Washington State ferry terminal in Mukilteo (Figure 1).

A sidescan sonar survey of the commercial and recreational (sport) crab pot fishing grounds was conducted between 3 m (10 ft) and 36.5 m (120 ft) depth (the depth attainable by removal divers is limited to 100 ft) over five days in July and August 2004. Possible derelict fishing gear targets were identified and plotted on an electronic charting system.

A derelict fishing gear removal plan was prepared and submitted to the WDFW on September 2, 2004. WDFW approved the plan and extended the expiration date of a previously issued derelict gear removal approval letter for Port Gardner dated July 20, 2004.

Divers using surface supplied air conducted derelict gear removal operations for four days in September 2004. Gear retrieved during the course of this project was treated in line with the Washington State Abandoned Property

Rights Law and other salvage laws when applicable. The owners of the derelict fishing gear recovered, if identified, were contacted and provided an opportunity to recover their property. Derelict fishing gear that could not be identified to an owner was disposed of in the Port Angeles City landfill.

This report summarizes the results and conclusions from the derelict fishing gear survey and removal project in Port Gardner and provides recommendations for future actions.

Methodology

Sidescan Sonar Survey

The Innerspace Exploration Team performed the sidescan sonar survey in Port Gardner Bay. A Marine Sonic Sidescan Sonar System operating at 600 kHz and a differential global positioning system (DGPS) were used to locate possible derelict fishing gear targets on the seabed. The sonar system employed a heavy towfish towed off the bow of a 24-foot survey vessel. A hydraulic wench and cable controlled the depth of the towfish. The survey image was projected on a monitor onboard the vessel and recorded onto a computer hard drive for later processing.

Generally, the sidescan sonar survey was conducted at about 4.63 km/hr (2.5 knots) with a path width of 50 m (164 ft) on either side of the boat with a 10 m (33 ft) "blind spot" directly under the boat depending upon water depth, for an approximate area swept of 90 m (295 ft). The survey path width was occasionally decreased to 20 m (66 ft) on either side of the boat in shallow water (less than 5 m or 16 ft deep) or when a more detailed image of an object was desired. Survey depths generally ranged from about 3 m (10 ft) to 36.5 m (120 ft) in order to identify derelict fishing gear within the dive depth capabilities of the recovery team. The intent of the sidescan sonar survey was to cover as much of the fishing grounds as possible within the divers' depth range in Port Gardner in order to estimate the total amount of derelict fishing gear in the area and to provide locations of derelict fishing gear for recovery operations. The project budget did not allow for comprehensive survey coverage of the fishing grounds in water deeper than the operational depth range of the divers (greater than 36.5 m or 120 ft).

Some minor problems with the sidescan sonar imaging were occasionally experienced during the survey due to salinity distortions near sources of freshwater runoff and due to surface noise from wind waves and other vessel activity. The total area surveyed was reduced for poor image quality and the area surveyed presented in this report represents only good to excellent image quality coverage.

Derelict crab pots were readily identified on the sidescan sonar images during post-survey processing. Figure 2 shows a typical sidescan sonar

image of a derelict sport crab pot (square image in upper portion of the figure) and a derelict commercial crab pot with attached line (round image in lower portion of the figure). Counts and precise locations of derelict fishing gear were recorded during post-survey processing of the data that allowed greater time to examine the images.

Gear Recovery

Doug Monk diving conducted the diver recovery of the derelict crab pots encountered. Two divers equipped with surface supplied air and two-way communication systems operated off a 40-foot dive support and gear recovery vessel. An onboard scientist recorded gear and impact information. The list of the precise locations of derelict crab pots detected during the sonar survey was used by the scientist and dive team to locate the derelict pots using a Wide Area Augmented Geographic Positioning System (WASSGPS) and electronic chart software (Nobeltec®). Derelict gear target locations derived from the sidescan sonar survey were transferred into the Nobeltec charting software and plotted over a navigation chart of Port Gardner.

Highest priority was given to locations with multiple derelict gear targets to maximize the number of derelict gear units recovered during each dive operation. Using the WASSGPS system, the dive support vessel was directed to the exact location of the potential derelict gear target identified by the sidescan sonar survey. As the vessel arrived at the target location a clump weight with a line and float were deployed as near as possible to the derelict gear location. The dive support vessel was then anchored in the vicinity of the clump weight and a single diver deployed. The other diver stood by on deck as safety backup. A 30 m (100 ft) length of rope was passed through a loop on the rope near the clump weight and the other end was held by the diver. When poor water visibility conditions were encountered, the diver would drag the 30 m rope around the clump weight in a circle until it tangled with the derelict fishing gear and then the diver worked back along the rope to the gear.

Prior to recovery of the derelict fishing gear a variety of information about the derelict gear was reported to the scientist on board the support vessel by the diver. Information collected included whether the derelict gear was commercial or sport, whether it was fishing or disabled, whether it was equipped with rot cord (pots), whether the gear was actively fishing or not, the number of live and dead Dungeness crab, other crab and fish entrapped. Also reported was information about the overall condition of the gear and the depth and type of seabed where the gear was located. Gear to be recovered was freed by hand by the diver, a recovery line from the vessel was attached and it was hauled aboard the recovery vessel by the aid of a hydraulic winch. Pots buried more than 1/3 of their height in the seabed were disabled and left in place. The onboard scientist further inspected the gear at the surface and looked for owner identification information.

The derelict fishing gear was stored in the fish hold of the recovery vessel until offloaded at a secure location, returned or disposed of in a landfill.

Results

Sidescan Sonar Survey

The sidescan sonar survey was conducted over five days between July 19 and August 5, 2004. A total of 6.2 km^2 (1.8 nm^2) or 90% of the 6.9 km^2 (2.0 nm^2) area within the fishing grounds at depths of between 3 m (10 ft) and 36.5 m (120 ft) was surveyed. A total of 842 potential derelict gear targets were identified during the surveys (Figure 3). Based on the area surveyed and the number of derelict pots detected by sidescan sonar, the density of derelict crab pots observed was approximately 136 derelict gear targets per square kilometer of seabed. Since approximately 90% of the available fishing grounds within the depth range surveyed were covered by the survey, there may have been as many 935 derelict gear items on the fishing grounds.

A GPS malfunction eliminated the sidescan sonar data collected between the Washington State ferry terminal at Mukilteo and the dilapidated pier 1 km (0.5 nm) to the east. Potential derelict fishing gear targets were located in this area but were eliminated from the survey report and the area will require resurveying to establish the number and location of the potential derelict gear targets.

Derelict Gear Removal

A total of 158 (19%) of the 842 potential derelict gear targets produced by the sidescan sonar survey were investigated by divers during the removal operations. A total of 170 derelict gear items were encountered with 161 items removed and 9 items disabled and left in place. At 21 of the target locations multiple derelict gear items were discovered in addition to the primary gear target provided by the sidescan sonar survey. Additional derelict gear items encountered ranged from 1 to 4 gear items for a total of 38 additional derelict gear items either removed or disabled and left in place. A total of 26 targets investigated resulted in either the gear not being found (13 targets) or the target was not derelict fishing gear (13 targets) (log end pieces, a tackle box, coil of rope, etc.). A total of 684 or 81% of the surveyed targets remain to be investigated.

Removal effort was somewhat influenced by water visibility. Divers encountered poor water visibility on the mud flats off Jetty Island due to heavy sediment from the Snohomish River due to recent rain. Only a portion of one removal operation day was conducted in this area. Better visibility was encountered along the southern shoreline of Port Gardner from the Port of Everett to Mukilteo and virtually all of the derelict gear targets within the

operational depth range of the divers (to 100 ft) produced by the sidescan sonar survey in this area where investigated and either removed or disabled and left in place (Figure 3). Additional removal operations were conducted off the east shoreline of Gedney Island (also known as Hat Island). No removal operations were conducted on the potential derelict gear targets identified off Mission Beach. Removal operations were limited to a maximum depth of 32 m (105 ft). No potential gear targets beyond the maximum diver depth were investigated during the removal operations.

A total of 170 derelict gear items were removed or disabled and left in place during the removal operations including 158 derelict crab pots, 11 crab rings and 1 shrimp pot (Table 1). A total of 133 (78%) derelict gear items were removed from sand habitat, 33 (19%) from mud habitat and 4 (2%) from eelgrass habitat.

Of the 158 crab pots, 104 (66%) were sport pots and 54 (34%) were commercial pots. A total of 56 (35%) of the derelict crab pots were considered to be actively fishing and 102 pots were considered to be disabled and no longer actively fishing. One derelict shrimp pot was recovered that was still actively fishing without being equipped with rot cord and contained one dead Dungeness crab (Cancer magister). A dead kelp greenling (Hexagrammos decagrammus) was entangled in the webbing of one of the 11 crab rings recovered.

Of the 54 commercial crab pots recovered, 15 (28%) were still actively fishing and 39 (72%) were no longer fishing. Nine (17%) of the derelict commercial crab pots recovered were not equipped with rot cord, 29 (54%) commercial pots were equipped with rot cord and for 16 (30%) commercial pots it could not be determined if rot cord had been used or not. Of the 15 commercial crab pots still actively fishing, 9 (60%) did not have rot cord and 6 (40%) did have rot cord that had yet to disintegrate (Table 2).

Of the 104 sport crab pots recovered, 41 (40%) were still actively fishing and 63 (60%) were not actively fishing. Seventy-one (68%) were observed to have or have had rot cord, 17 (16%) did not have rot cord and for 16 (15%) pots it was impossible to determine if rot cord had or had not been used (Table 2). Of the 41 sport crab pots still actively fishing, 29 (70%) had rot cord that had not yet disintegrate and 12 (30%) had no rot cord.

A total of 244 live and dead crabs of all species were recovered from the 158 derelict crab pots recovered. A total of 231 Dungeness crab were recorded from 69 (44%) of the 158 sport and commercial crab pots recovered including 154 (67%) live and 77 (33%) dead Dungeness crab (Table 1). The overall catch rate of Dungeness crab was about 1.5 crab per pot recovered. The 54 commercial pots recovered contained 122 (53%) Dungeness crab for a catch rate of about 2.3 crab per pot. The 104 sport crab pots recovered contained 109 Dungeness crab for a catch rate of about 1.0 crab per pot. Actively

fishing sport and commercial pots contained 214 (93%) of the 231 Dungeness crab recovered and inactive pots contained 17 (7%) of the total Dungeness crab recovered including 14 dead Dungeness crab. The 15 actively fishing commercial pots recovered had the highest catch rate of Dungeness crab at 111 crab or 7.4 crab per pot (42 dead and 69 live Dungeness crab). The 41 actively fishing sport crab pots recovered contained 103 Dungeness crab or 2.5 crab per pot (21 dead and 82 live Dungeness crab).

Of the total of 231 Dungeness crab recovered, there was a total of 178 male (77%), 19 female (8%) and 33 (14%) dead crab for which the sex could not be determined. The ratio of male to female crab in the commercial pots recovered was about 12 to 1 compared with about 8 to 1 in sport pots.

A total of 13 red rock crab (Cancer productus) were found in the 158 derelict sport and commercial crab pots recovered including 2 dead and 11 live crab. Commercial pots contained 4 live and no dead red rock crab and the sport pots contained 7 live and 2 dead red rock crab. The overall catch rate for red rock crab was 0.08 crab per sport and commercial pot recovered, 0.09 crab per sport pot and 0.07 per commercial pot. Actively fishing sport and commercial pots contained 7 (54%) red rock crab and inactive pots contained 6 (46%) red rock crab.

Of the 170 derelict gear items found during the project, 9 were disabled and left in place on the seabed and 32 commercial crab pots were identified as Tulalip Tribal pots and released to Tulalip Tribal fisheries enforcement officers. The remaining 129 derelict gear items were disposed of in the Port Angeles landfill. The owners of one sport crab pot and one non-tribal commercial pot were identified, contacted and provided an opportunity to recover their gear but both declined the opportunity and released the gear to the custody of the project personnel for disposal.

Conclusions

The sidescan sonar survey effort covered nearly all (90%) of the sport and commercial crab fishing grounds between 3.0 m and 36.5 m (10 to 120 ft) depth range. Both the WDFW (Don Velasquez pers. comm.) and Tulalip Tribal fisheries (M. McHugh pers. comm.) reported that crab pot fishing and shrimp pot fishing occurs at depths deeper than the survey covered in Port Gardner. This deeper area was not surveyed since it is beyond the depth range of the recovery divers. Given that 842 derelict gear targets were surveyed over approximately 90% of the available crab pot fishing grounds, there could have been as many as 935 derelict crab pots on the fishing grounds within the depth range surveyed. Additional derelict pots may be located in deeper waters not surveyed. The 170 derelict gear items removed represented about 20% of the 842 derelict crab pots found during the project sidescan sonar survey. However, since 38 additional derelict gear items were found along with the single surveyed targets at 21 locations, there may be

actually more derelict fishing gear items than detected in the survey. There are 684 or about 80% of remaining derelict gear targets to be investigated. There could be over 700 derelict gear items remaining in Port Gardner within the depth range surveyed. Additional derelict gear items are likely to occur at depths deeper than the survey was conducted.

A critical factor affecting the impact of derelict crab pots on the crab resource is the length of time the derelict pots remain actively fishing. WDFW regulations require that crab and shrimp pots be constructed such that when equipped with 200 thread count (1/8 inch diameter) cotton rot cord, the pot will become disabled in a reasonable period of time after being lost. The results of this study indicate that adherence to this regulation is not universal. Additionally, the construction of some crab pots limit the effectiveness of the rot cord strategy for pot disablement.

A total of 56 (35%) of the 158 crab pots encountered during the removal operations were still actively fishing. A total of 21 (38%) of these actively fishing pots were not equipped with rot cord. Thirty-five (62%) pots were equipped with some type of rot cord but were still actively fishing. On eight of the 35 pots actively fishing with rot cord, the rot cord used was actually a synthetic cord material and not the cotton material required by regulation. Another seven of the 35 pots actively fishing had cotton rot cord but the diameter of the rot cord was much larger than the 1/8" diameter cord required by regulation, up to 3/8 inch diameter. Another seven of the 35 actively fishing pots had been equipped with rot cord but although the rot cord had disintegrated, the lids of the pots were wedged closed against the sides of the pots allowing the pots to remain actively fishing.

On five actively fishing commercial crab pots the rot cord had disintegrated but anemones, Metridium giganteum, had grown on the rims of the side frame and edge of the lids of the pots effectively holding the lids shut. One commercial pot had been turned upside down preventing the lid from opening after the rot cord had disintegrated but the pot was also equipped with plastic "finger" entry tunnels that allowed the pot to continue fishing even though inverted. If the pot had been equipped with the typical doors that remain closed only by gravity, the doors would have been open when the pot was turned upside down and the pot would have been disabled. Seven of the actively fishing pots had the proper size rot cord but it had yet to disintegrate.

Four dead Dungeness crab were found in 23 crab pots considered to be disabled and no longer fishing. It appears these crabs were unable to find the escape panel in the top of the sport crab pots (3 crab) or were unable to open the lid on the commercial crab pot (1 crab).

It is difficult to make projections about the total annual mortality resulting from either the recovered and/or projected remaining derelict fishing gear

encountered during the survey. Assumptions about entrapped animal survival time, pot deterioration, pot self-baiting rates and seasonal animal densities in the area would be necessary to estimate the total annual impact of the derelict fishing gear on the mortality of the species they entrap. Developing estimates for each of these assumptions is beyond the scope of this study but should be addressed in future research.

However, the results of the project indicate that some level of continuous mortality is occurring for Dungeness and other crab due to derelict crab pots in Port Gardner. An approximate estimate of annual mortality can be calculated if one assumes a fairly constant quantity of derelict fishing gear on the fishing grounds (newly lost gear replaces lost gear that becomes inactive), crab entrapment rates per actively fishing pot are similar to those observed in this study (live crab replace dead crab) and mortality of entrapped crab occurs within about 30 days of capture (based on personal communications with net pen owners holding live Dungeness crab for sale). Since nearly all of the Dungeness crab entrapped were large enough that their size prevented their escape through the escape rings on the pots, the estimates of annual mortality are based on the total number of dead and live crab observed in the actively fishing pots encountered during the project.

Using the above assumptions, the live and dead Dungeness crab observed in the actively fishing derelict crab pots recovered multiplied by 12 months provides an approximate annual mortality estimate of Dungeness crab per actively fishing derelict pot. The total number of actively fishing derelict pots in the area is estimated from the total number of derelict pots found during the survey multiplied times the percent of actively fishing pots found during the removal operations. Total annual mortality of crab within each area is then the estimate of mortality per actively fishing derelict pot multiplied times the projected number of actively derelict crab pots on the fishing grounds.

In Port Gardner, a total of 214 dead and live Dungeness crab were observed in 56 actively fishing derelict crab pots (Table 1), or 3.8 crabs per pot. Multiplying the observed entrapment rate of 3.8 crabs per pot by 12 months provides an annual mortality estimate of 46 crab per actively fishing derelict pot. The sonar survey identified a total of 842 potential derelict crab pots on the fishing grounds between 3.0 m and 36.5 m (10 to 120 ft). Diver investigations of 158 of the 842 targets resulted in the discovery of 56 actively fishing crab pots indicating approximately 35% of the 842 potential derelict gear targets or about 300 targets may be actively fishing crab pots. Applying the estimate of annual mortality per actively fishing pot of 46 crab per pot to the estimate of 300 actively fishing derelict crab pots on the fishing grounds produces an overall rough annual mortality estimate of about 13,800 Dungeness crab in Port Gardner from derelict crab pots. The estimate may be low if additional derelict crab pots are actively fishing in water deeper than the 36.5 m (120 ft) limit of the survey conducted during the project.

It is clear that the impacts of derelict pots could be reduced by fishers complying with the regulations for the use of rot cord in all pots.

Recommendations

Based on the observations and the results of the Port Gardner derelict fishing gear project, the following are recommendations to further reduce the impact of derelict fishing gear on the marine environment.

- The derelict crab pots located during the project and remaining on the fishing grounds should be removed.

The concentration of derelict pots encountered and the number of crab and other organisms found in the gear is sufficiently high to warrant removal of the remaining derelict crab pots.

- Further sidescan sonar surveys should be conducted in areas not covered during the project.

Sidescan sonar effort was concentrated within areas and at depths that the salvage divers were capable of working. Additionally, there was insufficient time and budget for the project to survey deeper water areas where commercial crab and shrimp pot fishing occurs. It would be useful to survey these deeper areas and determine the density of derelict fishing gear. There may be other means available to recover deepwater derelict pots and traps such as by a remote operated vehicle. The area from the Washington State ferry terminal at Mukilteo 1 km east to the dilapidated pier should be re-surveyed for derelict gear.

- Fishing gear regulations should be enforced in commercial and recreational crab fisheries.

A total of 26 or 16% of the 158 derelict crab pots recovered were not equipped with rot cord. The use of rot cord is essential to minimize the impact of derelict crab and shrimp pots. Fifteen of the derelict pots recovered that were equipped with rot cord either had rot cord that was much larger than the 1/8" diameter cotton cord required by regulation or the rot cord material was actually synthetic. Six sport pots recovered were constructed of black plastic coated wire material with sides that snapped into wire tabs on the base and lid. These six pots had the proper sized escape rings but no accommodation for disabling the pots by the disintegration of rot cord. Other similar sports pots were recovered that had been modified by cutting the wire around one of the escape rings and tying the ring back in with rot cord. The manufactures and sellers of these pots may not be adequately informing purchasers of these type of pots of this required modification to comply with

regulations. The one derelict shrimp pot recovered was not equipped with rot cord and contained a Dungeness crab.

- Conduct a study to determine catch rates and survival time for entrapped crabs in derelict pots as well as time for rot cord disintegration and pot disabling.

There are a number of factors that determine the impact of derelict crab pots on crab populations. Very little research has been conducted to quantify these factors. A study should be conducted to provide information that can be used to estimate overall mortality from derelict crab pots.

Table 1. Number of derelict pots recovered, type of pot (commercial or sport), fishing status (actively fishing or not) and numbers of live and dead organisms observed during the Port Gardner Derelict Fishing Gear Project, 2004. Source: NRC.

	Commercial			Sport			Total		
Fishing/Not Fishing	Active	Inactive	Total	Active	Inactive	Total	Active	Inactive	Total
Number of Pots Recovered									
# Pots Recovered	15	39	54	41	63	104	56	102	158
% Pots Recovered	28%	72%	100%	39%	61%	100%	35%	65%	100%
Dungeness Crab									
# Dead Dungeness Crab	42	11	53	21	3	24	63	14	77
% Dead Dungeness Crab	79%	21%	100%	88%	13%	100%	82%	18%	100%
# Live Dungeness Crab	69	0	69	82	3	85	151	3	154
% Live Dungeness Crab	100%	0%	100%	96%	4%	100%	98%	2%	100%
Total Dungeness Crab	111	11	122	103	6	109	214	17	231
% Total Dungeness Crab	91%	9%	100%	94%	6%	100%	93%	7%	100%
Red Rock Crab									
# Dead Red Rock Crab	0	0	0	2	0	2	2	0	2
% Dead Red Rock Crab	0%	0%	0%	100%	0%	100%	100%	0%	100%
# Live Red Rock Crab	1	3	4	4	3	7	5	6	11
% Dead Red Rock Crab	25%	75%	100%	57%	43%	100%	45%	55%	100%
Total Red Rock Crab	1	3	4	6	3	9	7	6	13
% Total Red Rock Crab	25%	75%	100%	67%	33%	100%	54%	46%	100%
All Crab									
# Dead Crab	42	11	53	23	3	26	65	14	79
% Dead Crab	79%	21%	100%	88%	12%	100%	82%	18%	100%
# Live Crab	70	3	73	86	6	92	156	9	165
% Live Crab	96%	4%	100%	93%	7%	100%	95%	5%	100%
Total Crab	112	14	126	109	9	118	221	23	244
% Total Crab	89%	11%	100%	92%	8%	100%	91%	9%	100%

Table 2. Number of live and dead animals recovered from derelict crab pots by fishing activity and with and without rot cord during the Port Gardner Derelict Fishing Gear Project, 2004. Source: NRC.

	Rot Cord			No Rot Cord			All Pots*		
Fishing/Not Fishing	Active	Inactive	Total	Active	Inactive	Total	Active	Inactive	Total
Commercial									
# Pots Recovered	6	23	29	9	0	9	15	39	54
# Dungeness Crab Dead	25	1	26	17	0	17	42	11	53
# Dungeness Crab Alive	13	0	13	56	0	56	69	0	69
# Red Rock Crab Dead	0	0	0	0	0	0	0	0	0
# Red Rock Crab Alive	0	0	0	1	0	1	1	3	4
# Total Crab Dead	25	1	26	17	0	17	42	11	53
# Total Crab Alive	13	0	13	57	0	57	70	3	73
Sport									
# Pots Recovered	29	42	71	12	5	17	41	63	104
# Dungeness Crab Dead	10	3	13	11	0	11	21	3	24
# Dungeness Crab Alive	53	1	54	29	2	31	82	3	85
# Red Rock Crab Dead	2	0	2	0	0	0	2	0	2
# Red Rock Crab Alive	4	3	7	0	0	0	4	3	7
# Total Crab Dead	12	3	15	11	0	11	23	3	26
# Total Crab Alive	57	4	61	29	2	31	86	6	92
All Pots									
# Pots Recovered	35	65	100	21	5	26	56	102	158
# Dungeness Crab Dead	35	4	39	28	0	28	63	14	77
# Dungeness Crab Alive	66	1	67	85	2	87	151	3	154
# Red Rock Crab Dead	2	0	2	0	0	0	2	0	2
# Red Rock Crab Alive	4	3	7	1	0	1	5	6	11
# Total Crab Dead	37	4	41	28	0	28	65	14	79
# Total Crab Alive	70	4	74	86	2	88	156	9	165
# Total Crab	107	8	115	114	2	116	221	23	244

* The status of rot cord on 16 commercial and 16 sport pots recovered could not be determined but are included in the total.

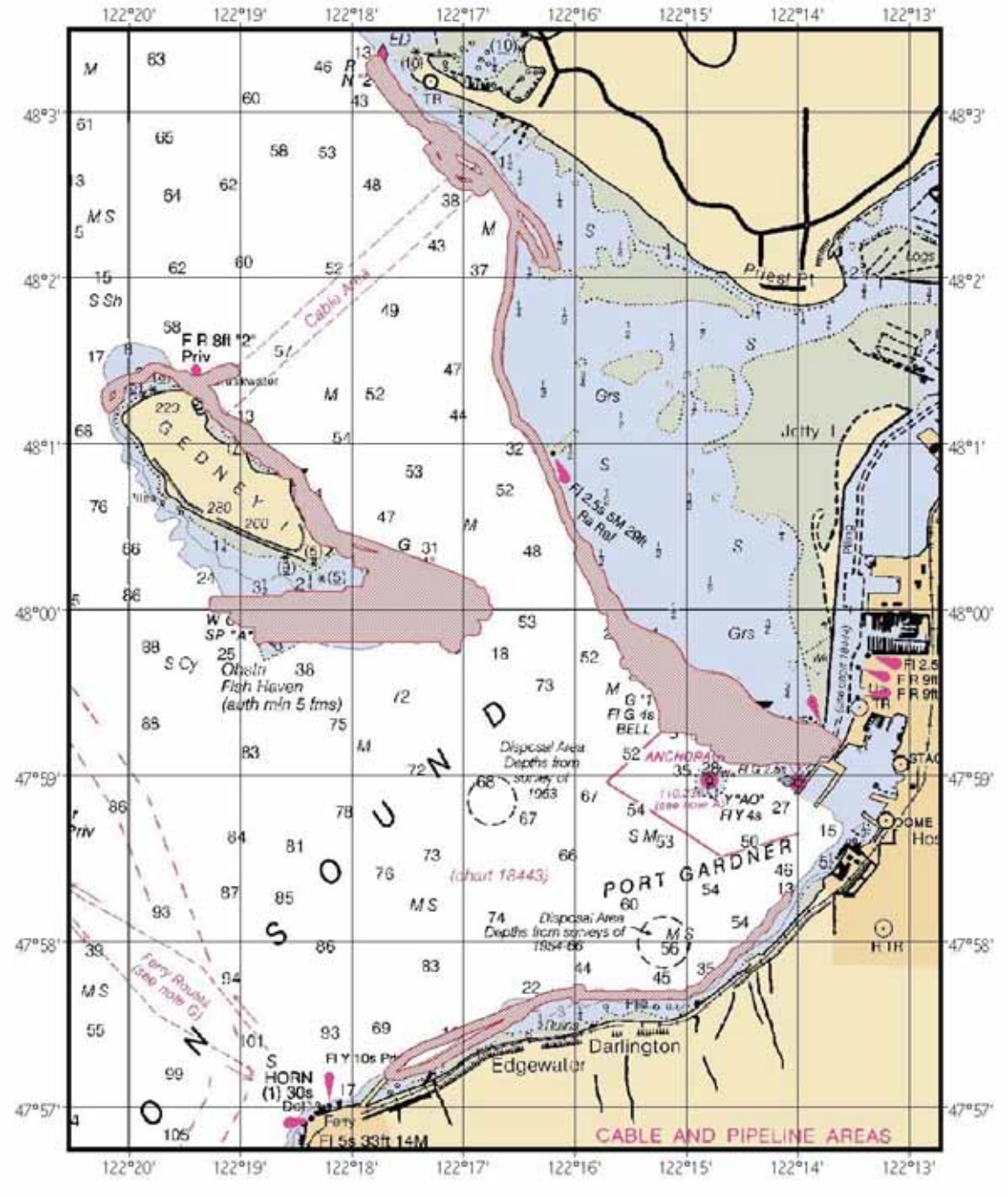

Figure 1. Location of the study area and sidescan sonar survey transects conducted during the Port Gardner derelict gear removal project. Source: NRC.

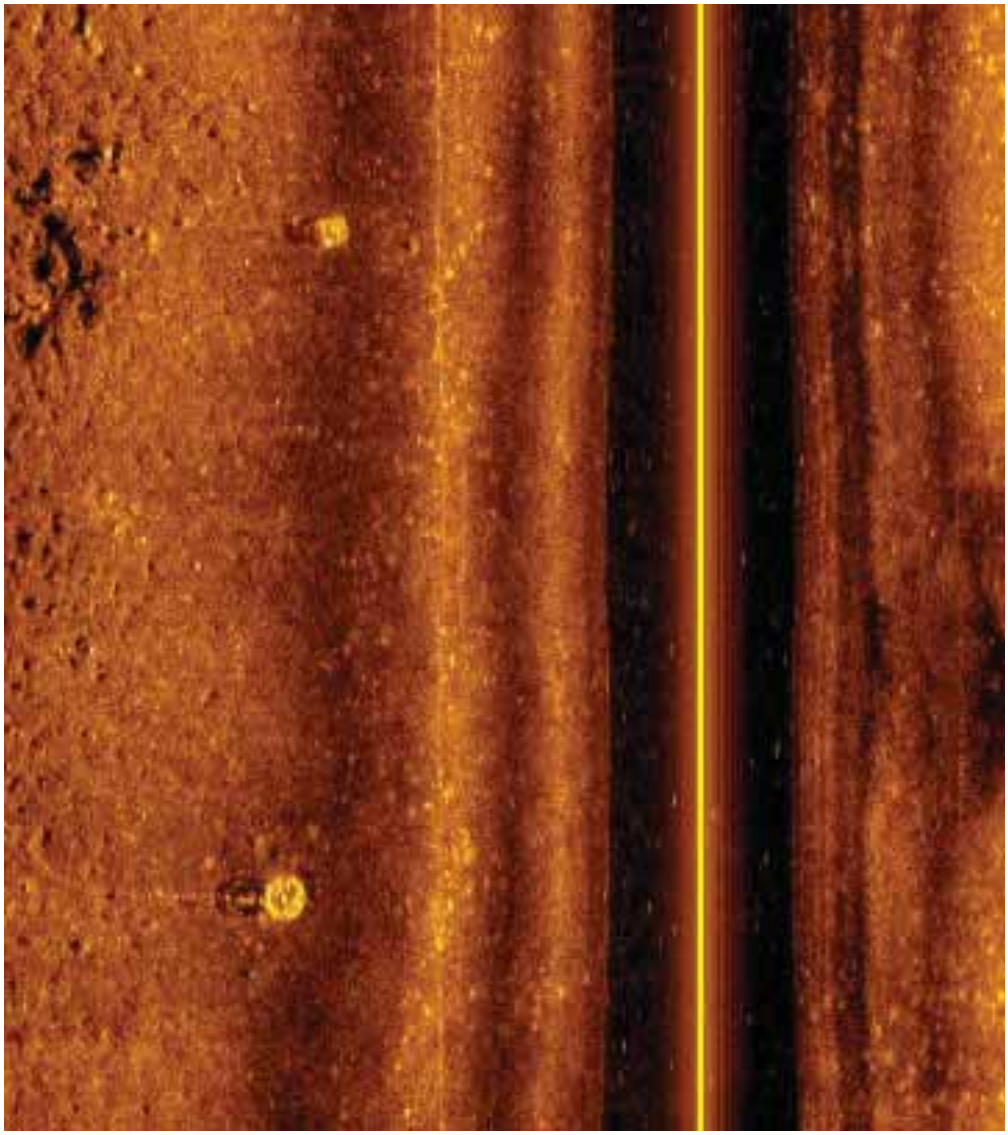

Figure 2. An example of a sidescan sonar image of derelict crab pots. (Square sport pot in upper image and round commercial pot with line in lower image). Source: Innerspace Exploration Team.

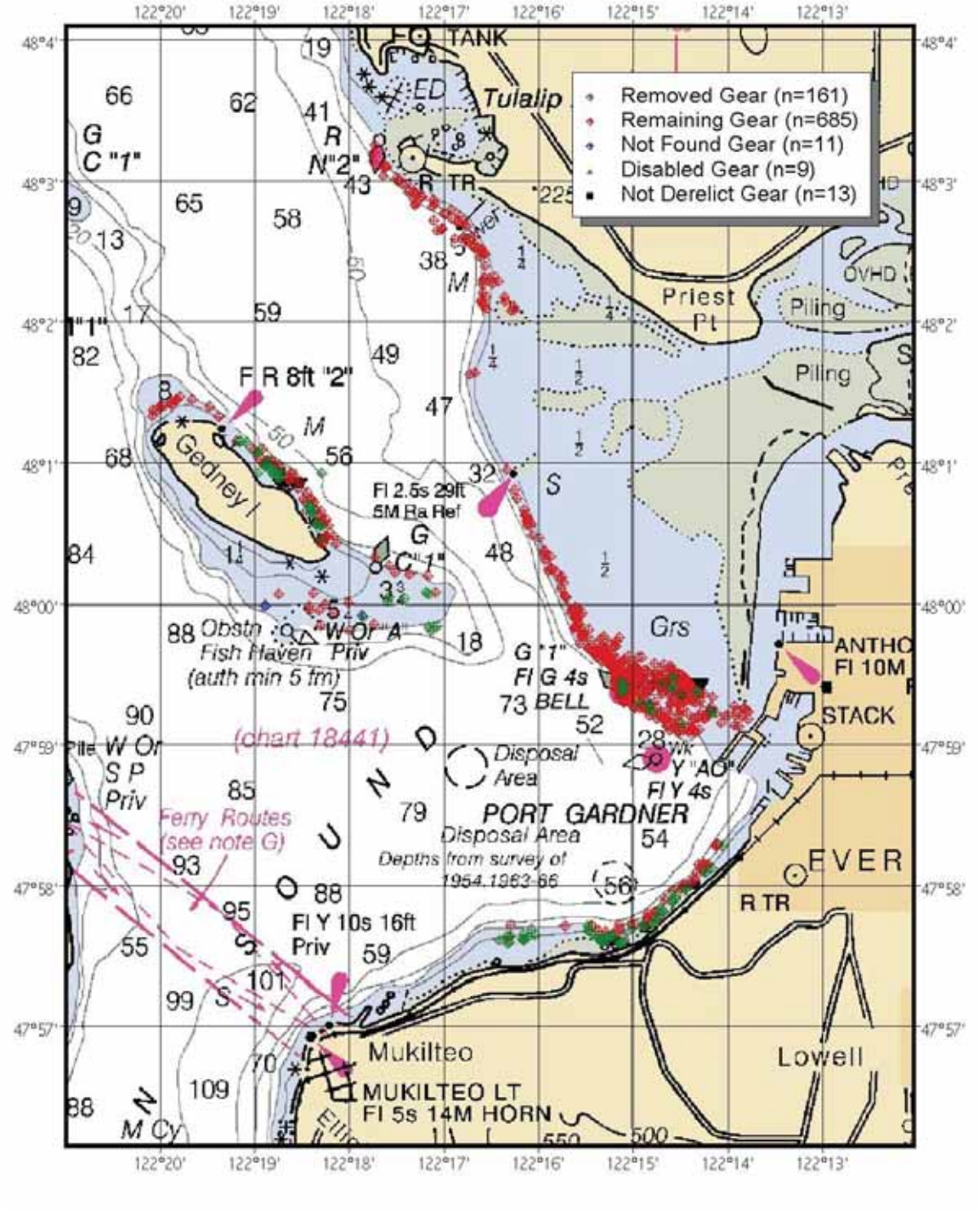

Figure 3. The location of removed or disabled in place and remaining potential derelict gear targets in Port Gardner. Source: NRC and the Innerspace Exportation Team.