

Memo to

Brian Ross, Restoration Planning Office

RE: Review of RPI Shoreline Monitoring Program Proposal

From: Jim Clark, Bioremediation Monitoring Team

JRC 6/28/90

I have reviewed the proposal submitted by RPI for monitoring the Prince William Sound shoreline during the summer of 1990. The proposal is a comprehensive assessment of pertinent environmental and ecological factors potentially affected by the EXXON Valdez oil spill. The RPI staff are certainly experienced and qualified for this type of work and would offer a sensible degree of continuity. Their familiarity with ongoing activities would assure that information obtained through this effort would be integrated into essential ongoing clean-up activities.

The selection of ecological test parameters assumes impact and damages have already occurred. Those familiar with the damage assessment data should be consulted to answer such questions as "Is there sufficient evidence to believe that these monitoring efforts will be necessary, or is damage to the resource of interest merely speculation?". What evidence is there that grass beds or mussel populations have been exposed to oil to the extent that a large-scale monitoring program is necessary at such a large number of sites? The amount of biological evidence supporting this proposal is limited, thus the need for the ecological program remains unclear to me. Assessing oiling is much more straight forward and appears justified.

The sampling strategies for invertebrate communities probably will not provide quantitative estimates of the species distributions and abundances because of the low number of replicates proposed for each site. These communities are highly variable and patchy, requiring a large sample size to obtain quantitative environmental metrics. What evidence is there that the proposed sampling strategy will be effective?

The heterogenous nature of the sediment composition and oil distributions also would seem to require considerably greater numbers of replicate samples to quantify trends in oiling characteristics. RPI has been working with NOAA to quantify oil using only 5 samples per site as part of the winter sampling program. Have these data been analyzed to demonstrate that they are capable of detecting the trends such as those proposed in this study? The high degree of variability in animal tissues may negate the ability to detect trends as well.

The parameters selected for assessing physiological and developmental effects of oil exposure to shoreline invertebrates should be developed into a more detailed protocol to justify their use. What is the scientific basis for selecting these endpoints (pathology of gills, liver, kidney, etc)? Is this research or is there a strong proven link between environmental hydrocarbon exposures and the proposed monitoring endpoints. If laboratory data only are cited, I doubt if environmental exposures have been comparable to most laboratory exposure response studies, making the links for such intensive sampling and analyses programs tenuous.

The sampling program will generate some interesting data on oil in the shoreline environment and the presence or absence of some species or physiological conditions. However, this \$536,117 study for one year will most likely generate qualitative data with little predictive or statistical utility. To meet the objective of characterizing the recovery of intertidal areas impacted by the spill, the investigators could generate more quantitatively meaningful data if they focused their efforts on fewer sites where exposure and recovery can be studied in detail.

KDWA  
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US ENVIRONMENTAL PROTECTION AGENCY  
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**FACSIMILE REQUEST AND COVER SHEET**

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TO  
Brian Ross

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# Jean Snider Hazardous Materials Response Branch

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Date 6/25  
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Number of pages  
including this page 14

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Comments requested by: \_\_\_\_\_

## EXXON VALDEZ SHORELINE MONITORING PROGRAM Summer, 1990

### OBJECTIVES

The primary objective of this program is to evaluate the recovery of intertidal areas impacted by the Exxon Valdez spill. Analysis of data collected by NOAA and others will provide a basis for the Federal On-Scene Coordinator's decision on the need for additional shoreline treatment through comparisons among shorelines treated in 1989 and 1990, untreated oiled shorelines, and unoiled controls. Results will also support decisions on shoreline treatment in future spills. The program includes short-term monitoring of the effectiveness of selected treatment methods and long-term monitoring of the rates at which intertidal habitats recover from oil impacts.

The primary measures of recovery will be the quantity, composition and distribution of residual oil; the availability of oil to biological communities; and the effects of oil and shoreline treatment on biological recovery. The rates at which intertidal and selected subtidal habitats recover from oil impacts will be monitored. These data will enable comparison of oil fate and shoreline recovery, both physical and biological, on treated and untreated shorelines. The duration of monitoring will depend on the rates of recovery measured during the first season.

### STRATEGIES

#### Basic Study Components

The overall program is composed of three closely related projects. The first is a continuation of the NOAA winter monitoring program to determine long-term trends in oil distribution and composition. The second project will encompass monitoring of the effectiveness of shoreline treatment and short-term behavior of oil during and shortly after treatment during 1990. These observations will be very operational in nature, with the objective of documenting method-specific issues and geological processes which contribute to the overall effectiveness of the treatment method under various shoreline conditions. The third project will involve monitoring the rates of recovery of selected intertidal and subtidal ecosystems with respect to the physical framework of the site, degree of oiling, and broad class of treatment.

#### Study Site Selection

Three types of stations will be established under this overall program: 1) oiled and untreated (set-aside sites), 2) treated sites, and 3) unoiled controls. All of the NOAA winter monitoring stations are included in this program. Stations for

biological investigations have been selected to represent a combination of habitat types found in PWS.

Not yet selected are those sites to be monitored for short-term behavior and effectiveness of various treatment methods in 1990; these sites will be selected based on the proposed schedule for treatment. A number of types of treatment of oiled sites are being considered for the summer of 1990, including:

1. Break-up of asphalt pavements and leaving for natural dispersion.
2. Manual removal of asphalt pavements and mousse patties.
3. Spot washing of sites with significant amounts of surface oil.
4. Tilling of oiled sediments and leaving for natural dispersion.
5. Relocation of oiled storm berms to the intertidal zone.
6. Bioremediation (Inipol and Customblen), possibly in conjunction with methods 1, 3 and 4.
7. Excavation of oiled sediments, with washing or replacement with clean sediments.

The monitored sites will be selected to include a full range of treatment methods under various environmental settings.

Study sites outside PWS were included to consider impacted shorelines of widely varying potential hydrodynamic energy (PHE), both on regional and local scales. The potential energy of an area is generally the basic factor controlling the persistence of oil on an impacted site. The Kenai Peninsula/Barren Islands represent shoreline types with the highest degree of potential energy in the affected area. A wide range of potential energy exists within each region (e.g., outer exposed beaches versus a sheltered cove along the same stretch of shoreline); however, generally speaking, even a sheltered cove on the outer Kenai Peninsula area has much more wave action than one in PWS. Study sites have been selected to show a range of energy levels within two of the three major regions (the Kodiak region is not included).

Table 1 lists the sites presently selected for inclusion in the monitoring program.

#### **DATA COLLECTION PROGRAM : PHYSICAL PROCESSES**

At each study site, the physical setting will be mapped using the zonal method described below and monitored over time. The biological and chemical data will be tied to this physical framework. The surveys will be done: a) before 1990 treatment begins; b) as soon after treatment as possible; and c) at end of summer. Additional surveys in mid fall (Nov); and early spring (Mar/Apr) will be dependent results of the summer monitoring effort.

Basic data measurements will include:

1. A base map of the study site constructed by either: a) a series of beach profiles run perpendicular to the beach (the zonal method); or b) a detailed survey by transit with one or two key beach profiles being established.
2. Selected beach profiles will be measured on the schedule cited above to determine morphological changes at the site through time.
3. A sediment distribution map will be made by visual estimates of the relative distribution of sediment types and direct measurements of larger particles on a grid patterns covering the entire study area. Sediment size is a critical factor in oil penetration and reworking by waves. Where necessary, enough trenches will be dug to accurately map the distribution of buried oil.
4. A distribution map of oil types will be constructed and superimposed over the morphology and sediment maps.
5. Sediment samples will be collected for analysis of total petroleum hydrocarbons, with selected samples for detailed chemical characterization.
6. Detailed photographs will be used to record all of the physical attributes of the sites, including surficial and buried oil, sedimentation patterns, biological communities, and treatment methods used.
7. Videotaping of all sites will also be done.
8. Process measurements will be made at high tide in order to get a general idea of wave and tidal current patterns. Short-term changes in oil/sediment distributions and patterns in sheen production and transport will also be observed during various tidal stages and wave conditions. Because a seasonal record is needed for accurate assessment, the possibility of establishing wave gages at a few critical sites should be considered. Should that not be feasible, hindcasting of wave conditions for critical wind directions and speeds at the sites will be done. One or two representative sites for each major region will be selected for detailed monitoring of high-tide wave and current patterns. These studies should be conducted daily for 5-7 consecutive days (on spring tidal cycles).

The zonal approach will be used to monitor the following sites (tentative):

Prince William Sound	<u>PHE</u>
Pt. Helen	Medium
NE Latouche	Medium
Sleepy Bay	Medium
Bay of Isles (KN 136)	Low
Northwest Bay - West Arm	Low
Mussel Beach	Low
 Kenai Peninsula/Barren Islands	
Yalik Glacier Beach (YG-2)	Medium
Chugach Island (C-1)	Medium

Port Dick (PD-1)	Low
Morning Cove (PC-8)	Low
Gore Point	High
Barren Islands (US 1, 5, or 10)	High

### Monitoring During Treatment

A scientist from the team will be on scene at each selected study site during various phases of the treatment in order to:

1. Carefully document the treatment methods used.
2. Assess volume of oil and oiled sediments removed.
3. Observe sheening and other potential problems.
4. Specify which method was applied to the different segments of the site.

### DATA COLLECTION PROGRAM : BIOLOGICAL PROCESSES

The sampling effort will focus on three intertidal habitat types of particular importance in Prince William Sound: protected rock, protected sand/gravel/cobble (mixed soft), and exposed cobble. The protected sites are included because of their high biological productivity and because the low energy regime reduces the rate of natural weathering of oil. Exposed cobble beaches include some of the most heavily oiled beaches in the Sound and are areas where oil often penetrated particularly deeply into the open spaces between the coarse bed materials.

### Community Studies

#### Intertidal Epibenthos

A stratified-random sampling design will be used to assess important assemblage and population (individual taxa) parameters. Sampling will be structured to obtain statistically reliable estimates of density or cover of macrobiota inhabiting the surface (epibiota) and, where possible, the subsurface (infauna) within important life zones. Typically, three elevations will be sampled on rocky habitats and two elevations will be sampled on cobble and mixed soft habitats.

A variety of statistical analyses will be applied to quantitatively describe the data (number of species, number of individuals, species diversity, evenness) and to evaluate the significance of the findings. Parametric and non-parametric tests will be applied as applicable to evaluate the significance of differences observed between pre-and post-treatment conditions for each treatment type and habitat. For pre- to post-treatment comparisons and for testing for significant differences between oiled



and control sites, a 1- or 2-tailed, non-parametric t-test will be a primary tool. A Wilcoxin T test and/or multivariate approaches will be used for comparisons of assemblages between treatments, habitats, and over time. As time allows, cluster analysis and/or ordination procedures will be applied to the data sets to compare and contrast patterns in species composition and abundance and examine the spatial and temporal relationships among oiled, oiled and treated, and control sites.

### Rocky Habitats

To minimize variability inherent on natural beaches, sampling in rocky habitats will be stratified to focus on the upper and lower portions of the Fucus zone, as well as in the typically heavily oiled supralittoral zone (at the upper limit of attached macrobiota). Each elevation to be sampled will be permanently marked. At each elevation, ten 0.25-m<sup>2</sup> quadrats will be randomly located and permanently marked for non-destructive sampling.

Each quadrat will be photographed during each survey to document the change. Biological variables that will be measured or estimated include algal cover by taxon and abundance or cover of major epibenthic fauna (i.e., mussels, limpets, littorines, etc.). A subjective description of oiling in each quadrat will be recorded along with the percentage of the quadrat with oil cover.

<u>Oiled</u>	<u>Oiled &amp; Treated</u>	<u>Control</u>
Herring Bay	Northwest Bay Islet	Hogg Bay
Snug Harbor	North Elrington Is.	Eshamy Bay
Outside Bay	Not Selected	Crab Bay

### Mixed-Soft Substrates

Mixed-soft habitats will be sampled using different methods to address various components of the biota. Epibiota on surficial gravel and cobbles will be measured in a manner similar to that used in rocky habitats except that only the two lower elevations will be sampled. Ten randomly selected quadrats will be permanently marked at each elevation for sampling as described above. Fist-sized and smaller rocks will be lifted to record organisms living in the under-rock habitat.

<u>Oiled</u>	<u>Oiled &amp; Treated</u>	<u>Control</u>
Herring Bay	Northwest Bay West Arm	Sheep Bay
Snug Harbor	Shelter Bay	Crab Bay
Bay of Isles	Mussel Beach	Outside Bay

### Boulder/Cobble

Boulder/cobble substrates will be sampled using a combination of the techniques described above for rocky and mixed-soft habitats with infauna only sampled where substrate permits.

<u>Oiled</u>	<u>Oiled &amp; Treated</u>	<u>Control</u>
NE Latoche	Pt. Helen	Bass Harbor

**Infauna**

Excavations on Mixed-soft Substrates

At the lower of the two tidal elevations on mixed-soft substrates, up to four additional 0.25-m<sup>2</sup> quadrats will be sampled to a depth of approximately 20 cm (or until a biologically inert substrate is reached) hand-sorted to remove large infauna. Organisms of specific concern are butter and littleneck clams (Saxidomus giganteus and Protothaca staminea) and the burrowing spoonworm Echiurus.

Infaunal Core Samples

Smaller infauna in the lower intertidal zone will be sampled with five, 0.009-m<sup>2</sup> by 15-cm deep cores. These cores will be preserved in the field for later laboratory processing to remove and identify all organisms larger than 1.0 mm.

<u>Oiled</u>	<u>Oiled &amp; Treated</u>	<u>Control</u>
Snug Harbor	Northwest Bay West Arm	Outside Bay
Herring Bay	Shelter Bay	Sheep Bay
Chicken Island	N. Elrington Island	Crab Bay
Bay of Isles	Mussel Beach	
	W. Ingot Island	

Population Studies

Because the preponderance of oil that grounded in Prince William Sound initially came to rest in the mid to upper intertidal, it is important to examine population dynamics and reproductive success of a range of important intertidal organisms in order to determine if the hydrocarbons have interfered with the intertidal communities.

**Plants - Eelgrass**

Considering the amounts of hydrocarbons that may have been washed into the shallow subtidal zone by treatment, weathering, and storm activities, it is important to examine primary productivity and reproductive success of the macrophytes in that depth zone in order to determine if the hydrocarbons have interfered with either of those processes. This study is particularly significant because of the relative importance of macrophytes in carbon production in the embayments.

Each site will be sampled three times during the year. Seeds will be collected for germination studies in the laboratory.

The study will compare growth, productivity, physiological condition, and reproductive success of eelgrass (*Zostera marina*) populations in oiled and unoiled areas of Prince William Sound. Growth will be measured as changes in 1) average maximum plant length and 2) average plant biomass in specific beds. Productivity will be measured as changes in 1) bed biomass (average plant density X average plant biomass) and 2) chlorophyll concentrations in specific beds. Physiological condition will be measured by examination of 1) chlorophyll ratios and 2) starch content of rhizomes. Reproductive success will be evaluated through examination of patterns in 1) field seed germination (counting young-of-year plants), 2) flower, spadix, ovary, and seed production, and 3) laboratory seed germination. Physical and chemical variates measured will include water temperature, salinity, dissolved oxygen, water transparency, concentrations of orthophosphates and nitrates in water and sediment.

Data and samples for the eelgrass studies will be collected from 10 study sites at the following locations.

	<u>Oiled</u>	<u>Oiled &amp; Treated</u>	<u>Control</u>
<u>Intertidal</u>	Herring Bay	Northwest Bay Islet	Bass Harbor Eshamy Bay
<u>Shallow Subtidal</u>	Snug Harbor Bay of Isles	Shelter Bay	Crab Bay Bass Harbor Stockdale Harbor

**Invertebrates**

Clam Age and Growth

Clams will be sampled at sites listed below. Samples will be collected from excavations of randomly placed 0.25-m<sup>2</sup> quadrats from within areas of suitable mixed-soft substrate. The number and condition (alive, gaping, recently dead) of all bivalves collected will be recorded in the field and key species (*Protothaca staminea*) may be retained for later length and age analysis. These data will be used to compare and contrast relationships in recruitment, size structure, and growth rates among oiled, oiled and treated, and control sites. Each site will be sampled once during the summer season.

<u>Oiled</u>	<u>Oiled &amp; Treated</u>	<u>Control</u>
Snug Harbor	Northwest Bay West Arm	Outside Bay
Herring Bay	S. Disk Island	Sheep Bay
Chicken Island	Ingot Island	Crab Bay
	Bay of Isles	N. Elrington Island

Mussel Growth and Condition

Mussels are a dominant filter-feeder in the intertidal zone and were subjected to heavy contamination in many areas of the sound. A study of mussels is particularly significant because of the relative importance of mussels as a food resource for a broad range of vertebrate (e.g., otters, marine birds) and invertebrate predators (e.g., starfish, crabs, and drills) in the intertidal zone of Prince William Sound.

Samples of the blue mussel (*Mytilus edulis*) will be collected at sites listed below. Samples will be collected from randomly placed 0.0625-m<sup>2</sup> quadrats from within major concentrations of mussels. In the laboratory, the number and condition (alive, gaping, recently dead) will be recorded and shell length and whole wet weight will be measured. These data will be used to compare and contrast relationships in recruitment, size structure, and growth rates among oiled, oiled and treated, and control sites.

An additional objective is to examine subsamples of mussels from each site histologically to determine condition of gills, liver, kidney, digestive gland, and reproductive organs, as well as reproductive condition (maturity) and incidence of carcinomas or papillomas. Samples will be retained and these analyses will be deferred until the next contracting year.

Each site will be sampled twice during year with greatest possible separation.

<u>Oiled</u>	<u>Oiled &amp; Treated</u>	<u>Control</u>
NE Latouche	Mussel Beach	Bass Harbor
Snug Harbor	Northwest Bay Islet	Crab Bay
Herring Bay	Shelter Bay	Eshamy Bay
Chicken Island	North Elrington Island	Outside Bay
		Hogg Bay
		Sheep Bay

Littorina sitkana Growth and Condition

Littorines are a dominant grazer in the intertidal zone, were subjected to heavy contamination in many areas of the sound, and were observed grazing on oil films. Because of their ubiquity and their intimate, long-term contact with oil (contact with the foot while moving on oiled rocks, gills with water-soluble fractions or suspended particles, and alimentary canal due to direct grazing on oiled surfaces), littorines provide one of the better opportunities to evaluate the effects of oil on intertidal organisms.

Samples of the periwinkle *Littorina sitkana* will be collected at sites listed below. Samples will be collected from randomly placed 0.0625-m<sup>2</sup> quadrats from within major concentrations of periwinkles. In the laboratory, the number in each sample will be recorded and shell length and whole wet weight of each individual will be measured. These data will be used to compare and contrast relationships in

recruitment, size structure, and growth rates among oiled, oiled and treated, and control sites.

An additional objective is to examine subsamples of the snails from each site histologically to determine condition of gills, liver, kidney, digestive gland, and reproductive organs, as well as reproductive condition (maturity) and incidence of carcinomas or papillomas. Samples will be retained and these analyses will be deferred until the next contracting year.

Each site will be sampled twice during year.

<u>Oiled</u>	<u>Oiled &amp; Treated</u>	<u>Control</u>
Herring Bay	NW Bay Islet	Bass Harbor
Snug Harbor	S. Disk Island	Eshamy Bay
Chicken Island?	Shelter Bay	Crab Bay
	Outside Bay	

Growth, Condition, and Reproduction of *Nucella* species

Drills are a dominant predator in the intertidal zone, feeding primarily on barnacles and mussels. They were subjected to heavy contamination in many areas of the sound and prey mainly on organisms that were heavily oiled. Because their principal prey species were oiled and they have been exposed to intimate, long-term contact with oil (contact with the foot while moving on oiled rocks and gills with water-soluble fractions or suspended particles), drills provide an excellent opportunity to evaluate the effects of oil on intertidal organisms and examine bioaccumulation of hydrocarbons in the food web.

Samples of the drills *Nucella lamellosa* and *Nucella lima* will be collected at sites listed below. Samples will be collected randomly placed 0.25-m<sup>2</sup> quadrats from within major concentrations of drills. In the laboratory, the number per sample will be recorded and shell length and whole wet weight of each individual will be measured. These data will be used to compare and contrast relationships in recruitment, size structure, and growth rates among oiled, oiled and treated, and control sites.

An additional objective is to examine subsamples of the snails from each site histologically to determine condition of gills, liver, kidney, digestive gland, and reproductive organs, as well as reproductive condition (maturity) and incidence of carcinomas or papillomas. Samples will be retained and these analyses will be deferred until the next contracting year.

Each site will be sampled twice during year.

<u>Oiled</u>	<u>Oiled &amp; Treated</u>	<u>Control</u>
Herring Bay	Northwest Bay West Arm	Bass Harbor
Snug Harbor	S. Disk Island	Eshamy Bay
Chicker Island?	Shelter Bay	Crab Bay
	Outside Bay	Northwest Bay Islet

## HYDROCARBON SAMPLING

Samples will be collected at each site to determine levels of hydrocarbon contamination in sediments and tissues. Samples will be labeled appropriately, recorded on chain-of-custody forms and field logs, placed in ice chests, and shipped to the specified analytical chemistry laboratory through appropriate channels.

## INTERTIDAL SEDIMENTS

Intertidal sediments will be collected at each site at which mixed-soft sediments are sampled and as possible at each rocky site. At sites sampled commonly by the geological and biological program, the geological team will collect the sediments. At sites examined only for biological characteristics, sediments will be collected in accordance with the sampling strategy and techniques used by the geological team.

## SUBTIDAL SEDIMENTS

Subtidal sediments will be collected at each site at which mixed-soft sediments are sampled and as possible at each rocky site. At sites sampled commonly by the geological and biological program, the geological team will collect the sediments. At sites examined only for biological characteristics, sediments will be collected in accordance with the sampling strategy and techniques used by the geological team.

## INTERTIDAL TISSUE SAMPLES

Tissue samples will be collected at each site utilizing appropriate representative species. Target species for collections include the invertebrates species listed above (the bivalves *Mytilus edulis* and *Protothaca staminea*; the snails *Littorina sitkana*, *Nucella lamellosa* and *Nelima*), and the starfish *Pycnopodia helianthoides*.

## PROPOSED SCHEDULE OF EVENTS

1. Initial site surveys, before shoreline treatment; initial biological surveys (June).
2. On-site evaluation of shoreline treatment methods (all summer).
3. Resurvey site when shoreline treatment is complete in order to:
  - a) remap site
  - b) photo-document conditions at the site

- c) collect oil samples for chemical analysis
- d) describe oil distribution patterns
- 4. Process measurements at high tide at selected sites (all summer).
- 5. Middle biological surveys for infauna, clam, eelgrass, nucella, and sediment sampling (July/August).
- 6. Resurvey all sites at end of summer (Sept)
- 7. Report on summer treatment effectiveness due October 1990.
- 8. Final biological survey results due December 1990.

**BUDGET****RPI**

Salary and Overhead	Days	
Jacqueline Michel	64	\$ 37,142
Miles Hayes	62	41,517
Field Technician	90	27,321
Assistant	30	7,941
<b>Total RPI Salary</b>		<b>113,921</b>

**Other Direct Costs**

Per Diem (246 days @ \$56/day)	13,776
Airfare (20 RT @ \$1200/ea)	24,000
Field gear	6,000
Report Preparation	12,750
<b>Total Direct Costs</b>	<b>56,526</b>

**Subcontracts****ERCE**

Task	Labor	Direct	Total
Mob/Demob	3,601	2,658	6,260
Travel	3,789	9,007	12,796
Intertidal - Field	42,125	5,692	47,817
Infauna - Lab	0	0	0
Mollusc - Lab	16,704	876	17,580
Eelgrass - Field	0	563	563
Eelgrass - Lab	27,088	1,526	28,614
Clam Studies	0	0	0
Data Analysis	16,262	7,881	24,143
Report Preparation	11,415	5,848	17,263
Project Management	4,777	250	5,027
<b>ERCE Totals</b>	<b>125,760</b>	<b>34,302</b>	<b>160,062</b>



**PENTEC**

Task	Labor	Direct	Total
Mob/Demob	2,619	3,409	6,028
Travel	4,091	10,008	14,099
Intertidal - Field	42,031	16,138	58,169
Infauna - Lab	879	34,840	35,719
Mollusc - Lab	0	0	0
Eelgrass - Field	0	0	0
Eelgrass - Lab	0	0	0
Clam Studies	4,616	1,501	6,117
Data Analysis	17,994	876	18,870
Report Preparation	12,323	2,971	15,294
Project Management	4,131	625	4,757
<b>PENTEC Totals</b>	<b>88,685</b>	<b>70,367</b>	<b>159,052</b>
<b>TOTAL COSTS</b>			<b>489,561</b>
<b>FEE (10% exclusive of airfare, car)</b>			<b><u>46,556</u></b>
<b>GRAND TOTAL</b>			<b>536,117</b>
<b>Less available funding in RPI contract (Task 2.1)</b>			<b><u>-131,015</u></b>
<b>ADDITIONAL FUNDS REQUIRED</b>			<b>405,102</b>