

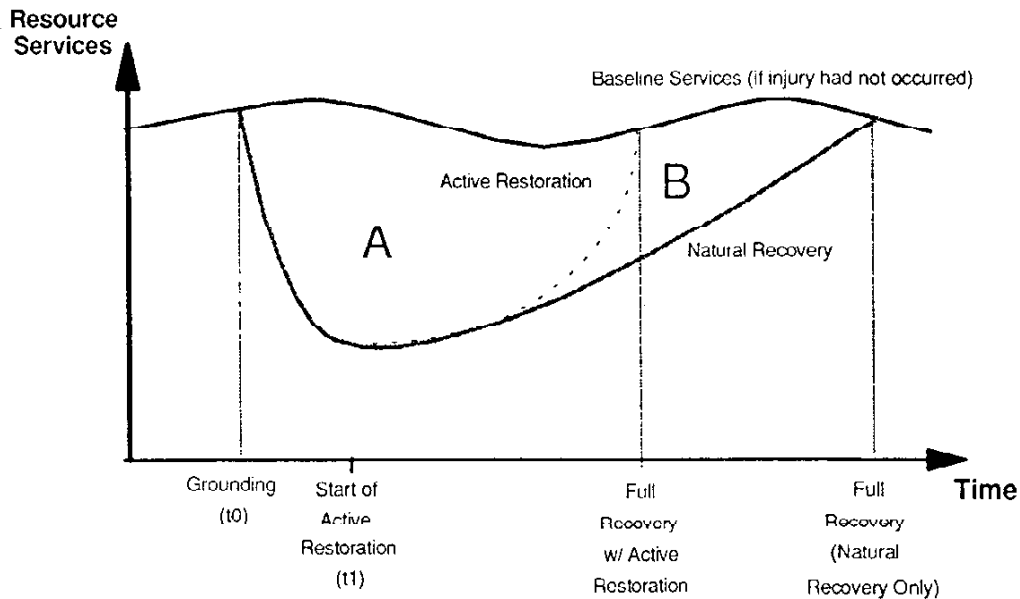
TECHNICAL APPENDIX

1. INTERIM LOST SERVICES

Figure 1 below graphically depicts the concept of interim lost services discussed in Section 3 of the assessment report, and the relationship between primary restoration activities and the level of interim lost services.

FIGURE 1

RELATIONSHIP BETWEEN RESTORATION AND INTERIM LOST SERVICES



Assume that a grounding occurs at time t_0 , injuring coral reef resources. Given this grounding, there are two general restoration alternatives available to address the on-site injuries: natural recovery and implementation of active restoration measures. First assume that the resource will recover naturally, and that the natural recovery path is defined by the solid curve in the diagram above. Under these assumptions, total lost resource services will be equal to area A plus area B, which represents the total baseline resource services that reef would have provided in the absence of the grounding minus the total resource services the reef actually provides given the occurrence of the grounding.

Now assume that active restoration activities, such as installation of reef modules and coral transplantation on the surface of these modules, are undertaken at time t_1 , and that

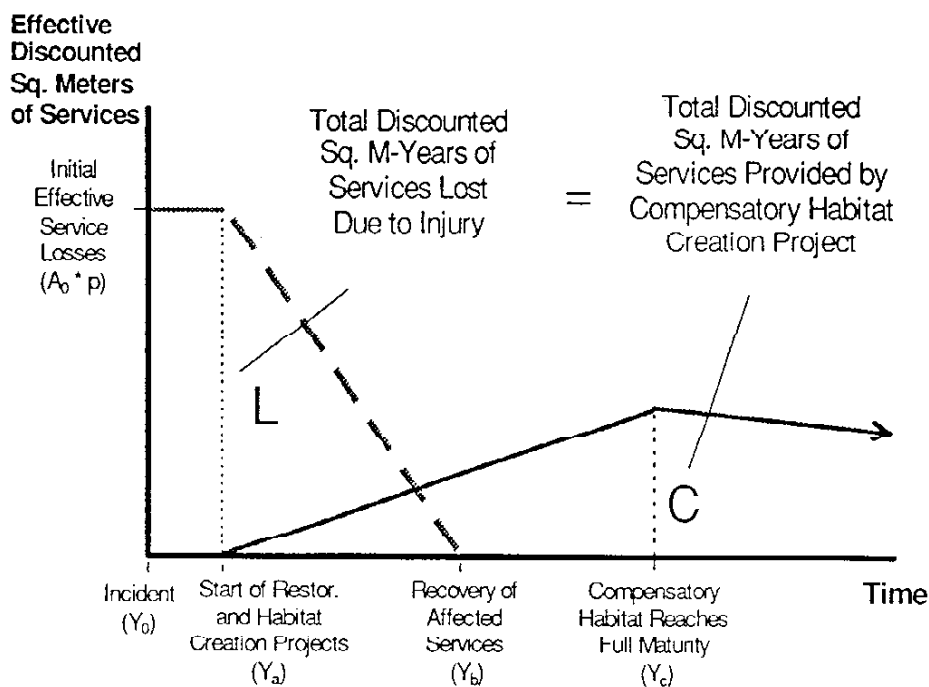
the recovery path following these activities is defined by the dotted curve in Figure 1 above. Under these alternative assumptions, the resource will return to baseline faster relative to the natural recovery scenario, and the level of interim lost services will be reduced by amount B to area A alone. To compensate for these interim lost services, additional habitat is created offsite that provides an equal level of services over its functional lifespan. HEA is used to calculate the extent of this compensatory habitat. The mechanics of this scaling procedure are discussed below.

2. USING HEA TO DETERMINE THE EXTENT OF THE COMPENSATORY HABITAT

Figure 2 below illustrates the process for determining the appropriate scale of the compensatory habitat creation project necessary to compensate for interim lost services.

FIGURE 2

GENERAL METHODOLOGY FOR CALCULATING EXTENT OF COMPENSATORY HABITAT



Throughout the analyses presented in the attached assessment report, the level of services provided by one square meter of reef habitat (pre-injury) during the course of a single year

is referred to as one "square meter-year" of reef services. Thus, the polygon bounded by the broken line (L), represents the total effective discounted square meter-years of services lost due to the grounding. The "effective" term refers to the fact that resource injuries have both an extent and severity component. Thus, if 100 square meters of a reef were injured by a vessel grounding, but the injury only resulted in a 50% reduction in services, then the effective square meter years of services lost in a give year would be 50 ($100 * .5$).¹⁹ Effective square-meter years of services lost in the initial period following the grounding are denoted in the figure above by A_0 (the initial extent of the injury) times p , the percent reduction in services in the initial period.

The square meter-years of services lost due to the grounding is constant from Y_0 until Y_a (but for the effect of discounting), because restoration is not assumed to occur until Y_a years after the grounding, and because the resource will not recover at all without active restoration efforts.

The area (C) defined by the solid line and the horizontal axis represents the total effective discounted square meter-years of services produced through the creation of the compensatory reef habitat in year Y_a .²⁰ In the years prior to Y_c , this compensatory habitat provides less than its maximum amount of effective square meter-years of services per year. This reduced productivity is due to the fact that $(Y_c - Y_a)$ years are required for the system to reach full maturity after restoration efforts are initiated, and thus provide a full flow of services. In the years following Y_c , the created system is assumed to provide its maximum effective square meter-years of services each year infinitely into the future.²¹ The curve denoting the services provided by the compensatory habitat creation project slopes downward in the years following Y_c due to the effects of discounting.

HEA is used to determine the appropriate scale of the compensatory habitat creation project(s), such that the total discounted square meter-years of services gained through

¹⁹ Because the injuries caused by the MISS BEHOLDEN resulted in a 100 percent loss in services in the initial period of the injury, effective square-meter years of services lost in the initial period will be equal to the extent of the injury (A_0).

²⁰ Note that in this analysis, the number of years following the grounding until on-site restoration activities are estimated to occur is equal to the number of years from the time of the grounding until off-site habitat creation is undertaken (both $Y_a - Y_0$ years). This is not a necessary assumption of the HEA, and the analysis presented in this report would remain unchanged from a theoretical standpoint if these periods were determined to differ.

²¹ We are able to incorporate infinite time horizons into the habitat equivalency analysis through the use of a discount rate. Discounting is a standard procedure within economics, which allows one to take into account society's willingness to trade off current services for services occurring in the future. Because the level of services required today to compensate for service losses further and further into the future is a decreasing function of time, it is possible to precisely evaluate the sum of this infinite series, and thus incorporate the concept of infinite time horizons into our analysis. The choice of an appropriate discount rate is discussed in Section 4.1.7.

the creation of the modular reef habitat is equal to the total discounted square meter-years of services lost due to the grounding (i.e. area C is equal to area L).

ATTACHMENT A
CALCULATION OF COMPENSATORY HABITAT
(SPUR TOPS)

Habitat Equivalency Analysis Input Parameters:	
Sq. Meters Injured by the Grounding:	
Spur Tops	249.50
Year of Initial Injury:	1993
Month of Initial Injury:	March
Current Year:	1995
Percent of Resource Services Lost in Initial Period Following Grounding:	100%
Recovery Function For Primary Restoration Area:	
Years following restoration in which no recovery occurs	0
Years of recovery following "no growth" period until successful recolonization	30
"Maturity" Function for Compensatory Habitat Project:	
Years following compensatory habitat creation in which no recovery occurs	0
Years of recovery following "no growth" period until successful recolonization	30
Relative Productivity of Created to Natural Habitat	100%
Time Horizon for Service Production of Created Habitat	Perpetuity
Time Elapsed Prior to Restoration of Injured Area (years from time of injury, due to settlement, planning, permitting, etc.)	4
Time Elapsed Prior to Habitat Creation (years from time of injury, due to settlement, planning, permitting, etc.)	4
Real Discount Rate	3.0%

ATTACHMENT A
CALCULATION OF COMPENSATORY HABITAT
(SPUR TOPS)

<i>Calculation of Total Square Meter-Years of Resource Services Lost:</i>					
Year	Percent of Resource Services Lost (Beginning of Period)	Percent of Resource Services Lost (End of Period)	Percent of Resource Services Lost (Average of Period)	Raw Square Meter-Years of Resource Services Lost	Discounted Square Meter-Years of Resource Services Lost
1993	100.0%	100.0%	100.0%	249.6	257.1
1994	100.0%	100.0%	100.0%	249.6	257.1
1995	100.0%	100.0%	100.0%	249.6	249.6
1996	100.0%	100.0%	100.0%	249.6	242.3
1997	100.0%	96.7%	98.3%	245.4	231.3
1998	96.7%	93.3%	95.0%	237.1	217.0
1999	93.3%	90.0%	91.7%	228.8	203.3
2000	90.0%	86.7%	88.3%	220.5	190.2
2001	86.7%	83.3%	85.0%	212.1	177.7
2002	83.3%	80.0%	81.7%	203.8	165.7
2003	80.0%	76.7%	78.3%	195.5	154.3
2004	76.7%	73.3%	75.0%	187.2	143.5
2005	73.3%	70.0%	71.7%	178.9	133.1
2006	70.0%	66.7%	68.3%	170.5	123.2
2007	66.7%	63.3%	65.0%	162.2	113.8
2008	63.3%	60.0%	61.7%	153.9	104.8
2009	60.0%	56.7%	58.3%	145.6	96.3
2010	56.7%	53.3%	55.0%	137.3	88.1
2011	53.3%	50.0%	51.7%	128.9	80.4
2012	50.0%	46.7%	48.3%	120.6	73.0
2013	46.7%	43.3%	45.0%	112.3	66.0
2014	43.3%	40.0%	41.7%	104.0	59.0
2015	40.0%	36.7%	38.3%	95.7	53.0
2016	36.7%	33.3%	35.0%	87.4	47.0
2017	33.3%	30.0%	31.7%	79.0	41.2
2018	30.0%	26.7%	28.3%	70.7	35.8
2019	26.7%	23.3%	25.0%	62.4	30.7
2020	23.3%	20.0%	21.7%	54.1	25.8
2021	20.0%	16.7%	18.3%	45.8	21.2
2022	16.7%	13.3%	15.0%	37.4	16.9
2023	13.3%	10.0%	11.7%	29.1	12.7
2024	10.0%	6.7%	8.3%	20.8	8.8
2025	6.7%	3.3%	5.0%	12.5	5.1
2026	3.3%	0.0%	1.7%	4.2	1.7
2027	0.0%	0.0%	0.0%	0.0	0.0
2028	0.0%	0.0%	0.0%	0.0	0.0
2029	0.0%	0.0%	0.0%	0.0	0.0
2030	0.0%	0.0%	0.0%	0.0	0.0
TOTAL DISCOUNTED SQ. M-YEARS OF SERVICES LOST:					3,726.8

ATTACHMENT A
CALCULATION OF COMPENSATORY HABITAT
(SPUR TOPS)

Total Resource Services Provided by Compensatory Habitat Creation Project:

Year	Percent of Max. Service Flows Provided (Beginning of Period)	Percent of Max. Service Flows Provided (End of Period)	Percent of Max. Service Flows Provided (Average of Period)	Raw Sq. M-Years of Resource Services Provided by Compensatory Habitat Creation Project	Discounted Sq. M-Years of Resource Services Provided by Compensatory Habitat Creation Project
1993	0.0%	0.0%	0.0%	0.0	0.0
1994	0.0%	0.0%	0.0%	0.0	0.0
1995	0.0%	0.0%	0.0%	0.0	0.0
1996	0.0%	0.0%	0.0%	0.0	0.0
1997	0.0%	3.3%	1.7%	2.9	2.8
1998	3.3%	6.7%	5.0%	8.7	7.9
1999	6.7%	10.0%	8.3%	14.5	12.9
2000	10.0%	13.3%	11.7%	20.3	17.5
2001	13.3%	16.7%	15.0%	26.1	21.8
2002	16.7%	20.0%	18.3%	31.8	25.9
2003	20.0%	23.3%	21.7%	37.6	29.7
2004	23.3%	26.7%	25.0%	43.4	33.3
2005	26.7%	30.0%	28.3%	49.2	36.6
2006	30.0%	33.3%	31.7%	55.0	39.7
2007	33.3%	36.7%	35.0%	60.8	42.6
2008	36.7%	40.0%	38.3%	66.6	45.3
2009	40.0%	43.3%	41.7%	72.4	47.8
2010	43.3%	46.7%	45.0%	78.2	50.2
2011	46.7%	50.0%	48.3%	83.9	52.3
2012	50.0%	53.3%	51.7%	89.7	54.3
2013	53.3%	56.7%	55.0%	95.5	56.1
2014	56.7%	60.0%	58.3%	101.3	57.8
2015	60.0%	63.3%	61.7%	107.1	59.3
2016	63.3%	66.7%	65.0%	112.9	60.7
2017	66.7%	70.0%	68.3%	118.7	61.9
2018	70.0%	73.3%	71.7%	124.5	63.1
2019	73.3%	76.7%	75.0%	130.3	64.1
2020	76.7%	80.0%	78.3%	136.1	65.0
2021	80.0%	83.3%	81.7%	141.8	65.8
2022	83.3%	86.7%	85.0%	147.6	66.6
2023	86.7%	90.0%	88.3%	153.4	67.1
2024	90.0%	93.3%	91.7%	159.2	67.6
2025	93.3%	96.7%	95.0%	165.0	68.0
2026	96.7%	100.0%	98.3%	170.8	68.3
2027	100.0%	100.0%	100.0%	173.7	67.4
2028	100.0%	100.0%	100.0%	173.7	65.5
2029	100.0%	100.0%	100.0%	173.7	63.6
2030	100.0%	100.0%	100.0%	173.7	61.7
2031	100.0%	100.0%	100.0%	173.7	59.9
2032	100.0%	100.0%	100.0%	173.7	58.2
2033	100.0%	100.0%	100.0%	173.7	56.5
2034	100.0%	100.0%	100.0%	173.7	54.8
2035	100.0%	100.0%	100.0%	173.7	53.2
2036	100.0%	100.0%	100.0%	173.7	51.7
2037	100.0%	100.0%	100.0%	173.7	50.2
2038	100.0%	100.0%	100.0%	173.7	48.7
2039	100.0%	100.0%	100.0%	173.7	47.3
2040	100.0%	100.0%	100.0%	173.7	45.9
2041	100.0%	100.0%	100.0%	173.7	44.6
2042	100.0%	100.0%	100.0%	173.7	43.3
2043	100.0%	100.0%	100.0%	173.7	42.0
2044	100.0%	100.0%	100.0%	173.7	40.8
2045	100.0%	100.0%	100.0%	173.7	39.6
2046	100.0%	100.0%	100.0%	173.7	38.5

ATTACHMENT A
CALCULATION OF COMPENSATORY HABITAT
(SPUR TOPS)

2047	100.0%	100.0%	100.0%	173.7	37.3
2048	100.0%	100.0%	100.0%	173.7	36.3
2049	100.0%	100.0%	100.0%	173.7	35.2
2050	100.0%	100.0%	100.0%	173.7	34.2
2051	100.0%	100.0%	100.0%	173.7	33.2
2052	100.0%	100.0%	100.0%	173.7	32.2
2053	100.0%	100.0%	100.0%	173.7	31.3
2054	100.0%	100.0%	100.0%	173.7	30.4
2055	100.0%	100.0%	100.0%	173.7	29.5
2056	100.0%	100.0%	100.0%	173.7	28.6
2057	100.0%	100.0%	100.0%	173.7	27.8
2058	100.0%	100.0%	100.0%	173.7	27.0
2059	100.0%	100.0%	100.0%	173.7	26.2
2060	100.0%	100.0%	100.0%	173.7	25.4
2061	100.0%	100.0%	100.0%	173.7	24.7
2062	100.0%	100.0%	100.0%	173.7	24.0
2063	100.0%	100.0%	100.0%	173.7	23.3
2064	100.0%	100.0%	100.0%	173.7	22.6
2065	100.0%	100.0%	100.0%	173.7	21.9
2066	100.0%	100.0%	100.0%	173.7	21.3
2067	100.0%	100.0%	100.0%	173.7	20.7
2068	100.0%	100.0%	100.0%	173.7	20.1
2069	100.0%	100.0%	100.0%	173.7	19.5
2070	100.0%	100.0%	100.0%	173.7	18.9
2071	100.0%	100.0%	100.0%	173.7	18.4
2072	100.0%	100.0%	100.0%	173.7	17.8
2073	100.0%	100.0%	100.0%	173.7	17.3
2074	100.0%	100.0%	100.0%	173.7	16.8
2075	100.0%	100.0%	100.0%	173.7	16.3
2076	100.0%	100.0%	100.0%	173.7	15.8
2077	100.0%	100.0%	100.0%	173.7	15.4
2078	100.0%	100.0%	100.0%	173.7	14.9
2079	100.0%	100.0%	100.0%	173.7	14.5
2080	100.0%	100.0%	100.0%	173.7	14.1
2081	100.0%	100.0%	100.0%	173.7	13.7
2082	100.0%	100.0%	100.0%	173.7	13.3
2083	100.0%	100.0%	100.0%	173.7	12.9
2084	100.0%	100.0%	100.0%	173.7	12.5
2085	100.0%	100.0%	100.0%	173.7	12.1
2086	100.0%	100.0%	100.0%	173.7	11.8
2087	100.0%	100.0%	100.0%	173.7	11.4
2088	100.0%	100.0%	100.0%	173.7	11.1
2089	100.0%	100.0%	100.0%	173.7	10.8
2090	100.0%	100.0%	100.0%	173.7	10.5
2091	100.0%	100.0%	100.0%	173.7	10.2
2092	100.0%	100.0%	100.0%	173.7	9.9
2093	100.0%	100.0%	100.0%	173.7	9.6
2094	100.0%	100.0%	100.0%	173.7	9.3
2095	100.0%	100.0%	100.0%	173.7	9.0
2096	100.0%	100.0%	100.0%	173.7	8.8
2097	100.0%	100.0%	100.0%	173.7	8.5
2098	100.0%	100.0%	100.0%	173.7	8.3
2099	100.0%	100.0%	100.0%	173.7	8.0
2100	100.0%	100.0%	100.0%	173.7	7.8
2101	100.0%	100.0%	100.0%	173.7	7.6
2102	100.0%	100.0%	100.0%	173.7	7.3
2103	100.0%	100.0%	100.0%	173.7	7.1
2104	100.0%	100.0%	100.0%	173.7	6.9
2105	100.0%	100.0%	100.0%	173.7	6.7
2106	100.0%	100.0%	100.0%	173.7	6.5
2107	100.0%	100.0%	100.0%	173.7	6.3
2108	100.0%	100.0%	100.0%	173.7	6.2
2109	100.0%	100.0%	100.0%	173.7	6.0
2110	100.0%	100.0%	100.0%	173.7	5.8
2111	100.0%	100.0%	100.0%	173.7	5.6

ATTACHMENT A
CALCULATION OF COMPENSATORY HABITAT
(SPUR TOPS)

2112	100.0%	100.0%	100.0%	173.7	5.5
2113	100.0%	100.0%	100.0%	173.7	5.3
2114	100.0%	100.0%	100.0%	173.7	5.2
2115	100.0%	100.0%	100.0%	173.7	5.0
2116	100.0%	100.0%	100.0%	173.7	4.9
2117	100.0%	100.0%	100.0%	173.7	4.7
2118	100.0%	100.0%	100.0%	173.7	4.6
2119	100.0%	100.0%	100.0%	173.7	4.4
2120	100.0%	100.0%	100.0%	173.7	4.3
2121	100.0%	100.0%	100.0%	173.7	4.2
2122	100.0%	100.0%	100.0%	173.7	4.1
2123	100.0%	100.0%	100.0%	173.7	3.9
2124	100.0%	100.0%	100.0%	173.7	3.8
2125	100.0%	100.0%	100.0%	173.7	3.7
2126	100.0%	100.0%	100.0%	173.7	3.6
2127	100.0%	100.0%	100.0%	173.7	3.5
2128	100.0%	100.0%	100.0%	173.7	3.4
2129	100.0%	100.0%	100.0%	173.7	3.3
2130	100.0%	100.0%	100.0%	173.7	3.2
2131	100.0%	100.0%	100.0%	173.7	3.1
2132	100.0%	100.0%	100.0%	173.7	3.0
2133	100.0%	100.0%	100.0%	173.7	2.9
2134	100.0%	100.0%	100.0%	173.7	2.9
2135	100.0%	100.0%	100.0%	173.7	2.8
2136	100.0%	100.0%	100.0%	173.7	2.7
2137	100.0%	100.0%	100.0%	173.7	2.6
2138	100.0%	100.0%	100.0%	173.7	2.5
2139	100.0%	100.0%	100.0%	173.7	2.5
2140	100.0%	100.0%	100.0%	173.7	2.4
2141	100.0%	100.0%	100.0%	173.7	2.3
2142	100.0%	100.0%	100.0%	173.7	2.3
2143	100.0%	100.0%	100.0%	173.7	2.2
2144	100.0%	100.0%	100.0%	173.7	2.1
2145	100.0%	100.0%	100.0%	173.7	2.1
2146	100.0%	100.0%	100.0%	173.7	2.0
2147	100.0%	100.0%	100.0%	173.7	1.9
2148	100.0%	100.0%	100.0%	173.7	1.9
2149	100.0%	100.0%	100.0%	173.7	1.8
2150	100.0%	100.0%	100.0%	173.7	1.8
2151	100.0%	100.0%	100.0%	173.7	1.7
2152	100.0%	100.0%	100.0%	173.7	1.7
2153	100.0%	100.0%	100.0%	173.7	1.6
2154	100.0%	100.0%	100.0%	173.7	1.6
2155	100.0%	100.0%	100.0%	173.7	1.5
2156	100.0%	100.0%	100.0%	173.7	1.5
2157	100.0%	100.0%	100.0%	173.7	1.4
2158	100.0%	100.0%	100.0%	173.7	1.4
2159	100.0%	100.0%	100.0%	173.7	1.4
2160	100.0%	100.0%	100.0%	173.7	1.3
2161	100.0%	100.0%	100.0%	173.7	1.3
2162	100.0%	100.0%	100.0%	173.7	1.2
2163	100.0%	100.0%	100.0%	173.7	1.2
2164	100.0%	100.0%	100.0%	173.7	1.2
2165	100.0%	100.0%	100.0%	173.7	1.1
2166	100.0%	100.0%	100.0%	173.7	1.1
2167	100.0%	100.0%	100.0%	173.7	1.1
2168	100.0%	100.0%	100.0%	173.7	1.0
2169	100.0%	100.0%	100.0%	173.7	1.0
2170	100.0%	100.0%	100.0%	173.7	1.0
2171	100.0%	100.0%	100.0%	173.7	1.0
2172	100.0%	100.0%	100.0%	173.7	0.9
2173	100.0%	100.0%	100.0%	173.7	0.9
2174	100.0%	100.0%	100.0%	173.7	0.8
2175	100.0%	100.0%	100.0%	173.7	0.8
2176	100.0%	100.0%	100.0%	173.7	0.8

ATTACHMENT A
CALCULATION OF COMPENSATORY HABITAT
(SPUR TOPS)

2177	100.0%	100.0%	100.0%	173.7	0.8
2178	100.0%	100.0%	100.0%	173.7	0.8
2179	100.0%	100.0%	100.0%	173.7	0.8
2180	100.0%	100.0%	100.0%	173.7	0.7
2181	100.0%	100.0%	100.0%	173.7	0.7
2182	100.0%	100.0%	100.0%	173.7	0.7
2183	100.0%	100.0%	100.0%	173.7	0.7
2184	100.0%	100.0%	100.0%	173.7	0.7
2185	100.0%	100.0%	100.0%	173.7	0.6
2186	100.0%	100.0%	100.0%	173.7	0.6
2187	100.0%	100.0%	100.0%	173.7	0.6
2188	100.0%	100.0%	100.0%	173.7	0.6
2189	100.0%	100.0%	100.0%	173.7	0.6
2190	100.0%	100.0%	100.0%	173.7	0.5
2191	100.0%	100.0%	100.0%	173.7	0.5
2192	100.0%	100.0%	100.0%	173.7	0.5
2193	100.0%	100.0%	100.0%	173.7	0.5
2194	100.0%	100.0%	100.0%	173.7	0.5
2195	100.0%	100.0%	100.0%	173.7	0.5
2196	100.0%	100.0%	100.0%	173.7	0.5
2197	100.0%	100.0%	100.0%	173.7	0.4
2198	100.0%	100.0%	100.0%	173.7	0.4
2199	100.0%	100.0%	100.0%	173.7	0.4
2200	100.0%	100.0%	100.0%	173.7	0.4
2201	100.0%	100.0%	100.0%	173.7	0.4
2202	100.0%	100.0%	100.0%	173.7	0.4
2203	100.0%	100.0%	100.0%	173.7	0.4
2204	100.0%	100.0%	100.0%	173.7	0.4
2205	100.0%	100.0%	100.0%	173.7	0.3
2206	100.0%	100.0%	100.0%	173.7	0.3
2207	100.0%	100.0%	100.0%	173.7	0.3
2208	100.0%	100.0%	100.0%	173.7	0.3
2209	100.0%	100.0%	100.0%	173.7	0.3
2210	100.0%	100.0%	100.0%	173.7	0.3
2211	100.0%	100.0%	100.0%	173.7	0.3
2212	100.0%	100.0%	100.0%	173.7	0.3
2213	100.0%	100.0%	100.0%	173.7	0.3
2214	100.0%	100.0%	100.0%	173.7	0.3
2215	100.0%	100.0%	100.0%	173.7	0.3
2216	100.0%	100.0%	100.0%	173.7	0.3
2217	100.0%	100.0%	100.0%	173.7	0.2
2218	100.0%	100.0%	100.0%	173.7	0.2
2219	100.0%	100.0%	100.0%	173.7	0.2
2220	100.0%	100.0%	100.0%	173.7	0.2
2221	100.0%	100.0%	100.0%	173.7	0.2
2222	100.0%	100.0%	100.0%	173.7	0.2
2223	100.0%	100.0%	100.0%	173.7	0.2
2224	100.0%	100.0%	100.0%	173.7	0.2
2225	100.0%	100.0%	100.0%	173.7	0.2
2226	100.0%	100.0%	100.0%	173.7	0.2
2227	100.0%	100.0%	100.0%	173.7	0.2
2228	100.0%	100.0%	100.0%	173.7	0.2
2229	100.0%	100.0%	100.0%	173.7	0.2
2230	100.0%	100.0%	100.0%	173.7	0.2
2231	100.0%	100.0%	100.0%	173.7	0.2
2232	100.0%	100.0%	100.0%	173.7	0.2
2233	100.0%	100.0%	100.0%	173.7	0.2
2234	100.0%	100.0%	100.0%	173.7	0.1
2235	100.0%	100.0%	100.0%	173.7	0.1
2236	100.0%	100.0%	100.0%	173.7	0.1
2237	100.0%	100.0%	100.0%	173.7	0.1
2238	100.0%	100.0%	100.0%	173.7	0.1
2239	100.0%	100.0%	100.0%	173.7	0.1
2240	100.0%	100.0%	100.0%	173.7	0.1
2241	100.0%	100.0%	100.0%	173.7	0.1

ATTACHMENT A

**CALCULATION OF COMPENSATORY HABITAT
(SPUR TOPS)**

2242	100.0%	100.0%	100.0%	173.7	0.1
2243	100.0%	100.0%	100.0%	173.7	0.1
2244	100.0%	100.0%	100.0%	173.7	0.1
2245	100.0%	100.0%	100.0%	173.7	0.1
2246	100.0%	100.0%	100.0%	173.7	0.1
2247	100.0%	100.0%	100.0%	173.7	0.1
2248	100.0%	100.0%	100.0%	173.7	0.1
2249	100.0%	100.0%	100.0%	173.7	0.1
2250	100.0%	100.0%	100.0%	173.7	0.1
2251	100.0%	100.0%	100.0%	173.7	0.1
2252	100.0%	100.0%	100.0%	173.7	0.1
2253	100.0%	100.0%	100.0%	173.7	0.1
2254	100.0%	100.0%	100.0%	173.7	0.1
2255	100.0%	100.0%	100.0%	173.7	0.1
2256	100.0%	100.0%	100.0%	173.7	0.1
2257	100.0%	100.0%	100.0%	173.7	0.1
2258	100.0%	100.0%	100.0%	173.7	0.1
2259	100.0%	100.0%	100.0%	173.7	0.1
2260	100.0%	100.0%	100.0%	173.7	0.1
2261	100.0%	100.0%	100.0%	173.7	0.1
2262	100.0%	100.0%	100.0%	173.7	0.1
2263	100.0%	100.0%	100.0%	173.7	0.1
2264	100.0%	100.0%	100.0%	173.7	0.1
2265	100.0%	100.0%	100.0%	173.7	0.1
2266	100.0%	100.0%	100.0%	173.7	0.1
2267	100.0%	100.0%	100.0%	173.7	0.1
2268	100.0%	100.0%	100.0%	173.7	0.1
2269	100.0%	100.0%	100.0%	173.7	0.1
2270	100.0%	100.0%	100.0%	173.7	0.1
2271	100.0%	100.0%	100.0%	173.7	0.0
2272	100.0%	100.0%	100.0%	173.7	0.0
2273	100.0%	100.0%	100.0%	173.7	0.0
2274	100.0%	100.0%	100.0%	173.7	0.0
2275	100.0%	100.0%	100.0%	173.7	0.0
TOTAL DISCOUNTED SQ. M-YEARS OF SERVICES LOST DUE TO TIME					3,726.8
REQ. FOR CREATED HABITAT TO PROVIDE MAX. SERVICE FLOW					

ATTACHMENT A
CALCULATION OF COMPENSATORY HABITAT
(SPUR TOPS)

<i>Scale of Habitat Creation Effort (Compensation for Injury to Spur Tops):</i>	
Total Discounted Sq. M-Years of Resource Services Lost Due to Injury:	3,726.8
Total Discounted Sq. M-Years of Resource Services Provided by Created Habitat:	3,726.8
Total Sq. M of Habitat to be Created as Compensation for Injury:	173.7

ATTACHMENT B
CALCULATION OF COMPENSATORY HABITAT
(SPUR STRUCTURE/Framework)

Habitat Equivalency Analysis Input Parameters:	
Sq. Meters Injured by the Grounding:	
Spur Structure	133,500
Year of Initial Injury:	1993
Month of Initial Injury:	March
Current Year:	1995
Percent of Resource Services Lost in Initial Period Following Grounding:	100%
Recovery Function For Primary Restoration Area:	
Years following restoration in which no recovery occurs	0
Years of recovery following "no growth" period until successful recolonization	30
"Maturity" Function for Compensatory Habitat Project:	
Years following compensatory habitat creation in which no recovery occurs	0
Years of recovery following "no growth" period until successful recolonization	30
Relative Productivity of Created to Natural Habitat	100%
Time Horizon for Service Production of Created Habitat	Perpetuity
Time Elapsed Prior to Restoration of Injured Area (years from time of injury, due to settlement, planning, permitting, etc.)	4
Time Elapsed Prior to Habitat Creation (years from time of injury, due to settlement, planning, permitting, etc.)	4
Real Discount Rate	3.0%

ATTACHMENT B
CALCULATION OF COMPENSATORY HABITAT
(SPUR STRUCTURE/Framework)

Calculation of Total Square Meter-Years of Resource Services Lost:

Year	Percent of Resource Services Lost (Beginning of Period)	Percent of Resource Services Lost (End of Period)	Percent of Resource Services Lost (Average of Period)	Raw Square Meter-Years of Resource Services Lost	Discounted Square Meter-Years of Resource Services Lost
1993	100.0%	100.0%	100.0%	133.5	137.5
1994	100.0%	100.0%	100.0%	133.5	137.5
1995	100.0%	100.0%	100.0%	133.5	133.5
1996	100.0%	100.0%	100.0%	133.5	129.6
1997	100.0%	96.7%	98.3%	131.3	123.7
1998	96.7%	93.3%	95.0%	126.8	116.1
1999	93.3%	90.0%	91.7%	122.4	108.7
2000	90.0%	86.7%	88.3%	117.9	101.7
2001	86.7%	83.3%	85.0%	113.5	95.0
2002	83.3%	80.0%	81.7%	109.0	88.6
2003	80.0%	76.7%	78.3%	104.6	82.6
2004	76.7%	73.3%	75.0%	100.1	76.7
2005	73.3%	70.0%	71.7%	95.7	71.2
2006	70.0%	66.7%	68.3%	91.2	65.9
2007	66.7%	63.3%	65.0%	86.8	60.9
2008	63.3%	60.0%	61.7%	82.3	56.1
2009	60.0%	56.7%	58.3%	77.9	51.5
2010	56.7%	53.3%	55.0%	73.4	47.1
2011	53.3%	50.0%	51.7%	69.0	43.0
2012	50.0%	46.7%	48.3%	64.5	39.0
2013	46.7%	43.3%	45.0%	60.1	35.3
2014	43.3%	40.0%	41.7%	55.6	31.7
2015	40.0%	36.7%	38.3%	51.2	28.3
2016	36.7%	33.3%	35.0%	46.7	25.1
2017	33.3%	30.0%	31.7%	42.3	22.1
2018	30.0%	26.7%	28.3%	37.8	19.2
2019	26.7%	23.3%	25.0%	33.4	16.4
2020	23.3%	20.0%	21.7%	28.9	13.8
2021	20.0%	16.7%	18.3%	24.5	11.3
2022	16.7%	13.3%	15.0%	20.0	9.0
2023	13.3%	10.0%	11.7%	15.6	6.8
2024	10.0%	6.7%	8.3%	11.1	4.7
2025	6.7%	3.3%	5.0%	6.7	2.8
2026	3.3%	0.0%	1.7%	2.2	0.9
2027	0.0%	0.0%	0.0%	0.0	0.0
2028	0.0%	0.0%	0.0%	0.0	0.0
2029	0.0%	0.0%	0.0%	0.0	0.0
2030	0.0%	0.0%	0.0%	0.0	0.0
TOTAL DISCOUNTED SQ. M-YEARS OF SERVICES LOST:					1,993.5

ATTACHMENT B
CALCULATION OF COMPENSATORY HABITAT
(SPUR STRUCTURE/Framework)

Total Resource Services Provided by Compensatory Habitat Creation Project:

Year	Percent of Max. Service Flows Provided (Beginning of Period)	Percent of Max. Service Flows Provided (End of Period)	Percent of Max. Service Flows Provided (Average of Period)	Raw Sq. M-Years of Resource Services Provided by Compensatory Habitat Creation Project	Discounted Sq. M-Years of Resource Services Provided by Compensatory Habitat Creation Project
1993	0.0%	0.0%	0.0%	0.0	0.0
1994	0.0%	0.0%	0.0%	0.0	0.0
1995	0.0%	0.0%	0.0%	0.0	0.0
1996	0.0%	0.0%	0.0%	0.0	0.0
1997	0.0%	3.3%	1.7%	1.5	1.5
1998	3.3%	6.7%	5.0%	4.6	4.3
1999	6.7%	10.0%	8.3%	7.7	6.9
2000	10.0%	13.3%	11.7%	10.8	9.3
2001	13.3%	16.7%	15.0%	13.9	11.7
2002	16.7%	20.0%	18.3%	17.0	13.8
2003	20.0%	23.3%	21.7%	20.1	15.9
2004	23.3%	26.7%	25.0%	23.2	17.8
2005	26.7%	30.0%	28.3%	26.3	19.6
2006	30.0%	33.3%	31.7%	29.4	21.3
2007	33.3%	36.7%	35.0%	32.5	22.8
2008	36.7%	40.0%	38.3%	35.6	24.3
2009	40.0%	43.3%	41.7%	38.7	25.6
2010	43.3%	46.7%	45.0%	41.8	26.8
2011	46.7%	50.0%	48.3%	44.9	28.0
2012	50.0%	53.3%	51.7%	48.0	29.0
2013	53.3%	56.7%	55.0%	51.1	30.0
2014	56.7%	60.0%	58.3%	54.2	30.9
2015	60.0%	63.3%	61.7%	57.3	31.7
2016	63.3%	66.7%	65.0%	60.4	32.5
2017	66.7%	70.0%	68.3%	63.5	33.1
2018	70.0%	73.3%	71.7%	66.6	33.7
2019	73.3%	76.7%	75.0%	69.7	34.3
2020	76.7%	80.0%	78.3%	72.8	34.8
2021	80.0%	83.3%	81.7%	75.9	35.2
2022	83.3%	86.7%	85.0%	79.0	35.6
2023	86.7%	90.0%	88.3%	82.1	35.9
2024	90.0%	93.3%	91.7%	85.2	36.1
2025	93.3%	96.7%	95.0%	88.3	36.4
2026	96.7%	100.0%	98.3%	91.4	36.5
2027	100.0%	100.0%	100.0%	92.9	36.1
2028	100.0%	100.0%	100.0%	92.9	35.0
2029	100.0%	100.0%	100.0%	92.9	34.0
2030	100.0%	100.0%	100.0%	92.9	33.0
2031	100.0%	100.0%	100.0%	92.9	32.1
2032	100.0%	100.0%	100.0%	92.9	31.1
2033	100.0%	100.0%	100.0%	92.9	30.2
2034	100.0%	100.0%	100.0%	92.9	29.3
2035	100.0%	100.0%	100.0%	92.9	28.5
2036	100.0%	100.0%	100.0%	92.9	27.7
2037	100.0%	100.0%	100.0%	92.9	26.8
2038	100.0%	100.0%	100.0%	92.9	26.1
2039	100.0%	100.0%	100.0%	92.9	25.3
2040	100.0%	100.0%	100.0%	92.9	24.6
2041	100.0%	100.0%	100.0%	92.9	23.9
2042	100.0%	100.0%	100.0%	92.9	23.2
2043	100.0%	100.0%	100.0%	92.9	22.5
2044	100.0%	100.0%	100.0%	92.9	21.8
2045	100.0%	100.0%	100.0%	92.9	21.2
2046	100.0%	100.0%	100.0%	92.9	20.6

ATTACHMENT B
CALCULATION OF COMPENSATORY HABITAT
(SPUR STRUCTURE/FRAWORK)

2047	100.0%	100.0%	100.0%	92.9	20.0
2048	100.0%	100.0%	100.0%	92.9	19.4
2049	100.0%	100.0%	100.0%	92.9	18.8
2050	100.0%	100.0%	100.0%	92.9	18.3
2051	100.0%	100.0%	100.0%	92.9	17.7
2052	100.0%	100.0%	100.0%	92.9	17.2
2053	100.0%	100.0%	100.0%	92.9	16.7
2054	100.0%	100.0%	100.0%	92.9	16.2
2055	100.0%	100.0%	100.0%	92.9	15.8
2056	100.0%	100.0%	100.0%	92.9	15.3
2057	100.0%	100.0%	100.0%	92.9	14.9
2058	100.0%	100.0%	100.0%	92.9	14.4
2059	100.0%	100.0%	100.0%	92.9	14.0
2060	100.0%	100.0%	100.0%	92.9	13.6
2061	100.0%	100.0%	100.0%	92.9	13.2
2062	100.0%	100.0%	100.0%	92.9	12.8
2063	100.0%	100.0%	100.0%	92.9	12.4
2064	100.0%	100.0%	100.0%	92.9	12.1
2065	100.0%	100.0%	100.0%	92.9	11.7
2066	100.0%	100.0%	100.0%	92.9	11.4
2067	100.0%	100.0%	100.0%	92.9	11.1
2068	100.0%	100.0%	100.0%	92.9	10.7
2069	100.0%	100.0%	100.0%	92.9	10.4
2070	100.0%	100.0%	100.0%	92.9	10.1
2071	100.0%	100.0%	100.0%	92.9	9.8
2072	100.0%	100.0%	100.0%	92.9	9.5
2073	100.0%	100.0%	100.0%	92.9	9.3
2074	100.0%	100.0%	100.0%	92.9	9.0
2075	100.0%	100.0%	100.0%	92.9	8.7
2076	100.0%	100.0%	100.0%	92.9	8.5
2077	100.0%	100.0%	100.0%	92.9	8.2
2078	100.0%	100.0%	100.0%	92.9	8.0
2079	100.0%	100.0%	100.0%	92.9	7.8
2080	100.0%	100.0%	100.0%	92.9	7.5
2081	100.0%	100.0%	100.0%	92.9	7.3
2082	100.0%	100.0%	100.0%	92.9	7.1
2083	100.0%	100.0%	100.0%	92.9	6.9
2084	100.0%	100.0%	100.0%	92.9	6.7
2085	100.0%	100.0%	100.0%	92.9	6.5
2086	100.0%	100.0%	100.0%	92.9	6.3
2087	100.0%	100.0%	100.0%	92.9	6.1
2088	100.0%	100.0%	100.0%	92.9	5.9
2089	100.0%	100.0%	100.0%	92.9	5.8
2090	100.0%	100.0%	100.0%	92.9	5.6
2091	100.0%	100.0%	100.0%	92.9	5.4
2092	100.0%	100.0%	100.0%	92.9	5.3
2093	100.0%	100.0%	100.0%	92.9	5.1
2094	100.0%	100.0%	100.0%	92.9	5.0
2095	100.0%	100.0%	100.0%	92.9	4.8
2096	100.0%	100.0%	100.0%	92.9	4.7
2097	100.0%	100.0%	100.0%	92.9	4.6
2098	100.0%	100.0%	100.0%	92.9	4.4
2099	100.0%	100.0%	100.0%	92.9	4.3
2100	100.0%	100.0%	100.0%	92.9	4.2
2101	100.0%	100.0%	100.0%	92.9	4.0
2102	100.0%	100.0%	100.0%	92.9	3.9
2103	100.0%	100.0%	100.0%	92.9	3.8
2104	100.0%	100.0%	100.0%	92.9	3.7
2105	100.0%	100.0%	100.0%	92.9	3.6
2106	100.0%	100.0%	100.0%	92.9	3.5
2107	100.0%	100.0%	100.0%	92.9	3.4
2108	100.0%	100.0%	100.0%	92.9	3.3
2109	100.0%	100.0%	100.0%	92.9	3.2
2110	100.0%	100.0%	100.0%	92.9	3.1
2111	100.0%	100.0%	100.0%	92.9	3.0

ATTACHMENT B

**CALCULATION OF COMPENSATORY HABITAT
(SPUR STRUCTURE/FRAEMWORK)**

2112	100.0%	100.0%	100.0%	92.9	2.9
2113	100.0%	100.0%	100.0%	92.9	2.8
2114	100.0%	100.0%	100.0%	92.9	2.8
2115	100.0%	100.0%	100.0%	92.9	2.7
2116	100.0%	100.0%	100.0%	92.9	2.6
2117	100.0%	100.0%	100.0%	92.9	2.5
2118	100.0%	100.0%	100.0%	92.9	2.4
2119	100.0%	100.0%	100.0%	92.9	2.4
2120	100.0%	100.0%	100.0%	92.9	2.3
2121	100.0%	100.0%	100.0%	92.9	2.2
2122	100.0%	100.0%	100.0%	92.9	2.2
2123	100.0%	100.0%	100.0%	92.9	2.1
2124	100.0%	100.0%	100.0%	92.9	2.1
2125	100.0%	100.0%	100.0%	92.9	2.0
2126	100.0%	100.0%	100.0%	92.9	1.9
2127	100.0%	100.0%	100.0%	92.9	1.9
2128	100.0%	100.0%	100.0%	92.9	1.8
2129	100.0%	100.0%	100.0%	92.9	1.8
2130	100.0%	100.0%	100.0%	92.9	1.7
2131	100.0%	100.0%	100.0%	92.9	1.7
2132	100.0%	100.0%	100.0%	92.9	1.6
2133	100.0%	100.0%	100.0%	92.9	1.6
2134	100.0%	100.0%	100.0%	92.9	1.5
2135	100.0%	100.0%	100.0%	92.9	1.5
2136	100.0%	100.0%	100.0%	92.9	1.4
2137	100.0%	100.0%	100.0%	92.9	1.4
2138	100.0%	100.0%	100.0%	92.9	1.4
2139	100.0%	100.0%	100.0%	92.9	1.3
2140	100.0%	100.0%	100.0%	92.9	1.3
2141	100.0%	100.0%	100.0%	92.9	1.2
2142	100.0%	100.0%	100.0%	92.9	1.2
2143	100.0%	100.0%	100.0%	92.9	1.2
2144	100.0%	100.0%	100.0%	92.9	1.1
2145	100.0%	100.0%	100.0%	92.9	1.1
2146	100.0%	100.0%	100.0%	92.9	1.1
2147	100.0%	100.0%	100.0%	92.9	1.0
2148	100.0%	100.0%	100.0%	92.9	1.0
2149	100.0%	100.0%	100.0%	92.9	1.0
2150	100.0%	100.0%	100.0%	92.9	1.0
2151	100.0%	100.0%	100.0%	92.9	0.9
2152	100.0%	100.0%	100.0%	92.9	0.9
2153	100.0%	100.0%	100.0%	92.9	0.9
2154	100.0%	100.0%	100.0%	92.9	0.8
2155	100.0%	100.0%	100.0%	92.9	0.8
2156	100.0%	100.0%	100.0%	92.9	0.8
2157	100.0%	100.0%	100.0%	92.9	0.8
2158	100.0%	100.0%	100.0%	92.9	0.8
2159	100.0%	100.0%	100.0%	92.9	0.7
2160	100.0%	100.0%	100.0%	92.9	0.7
2161	100.0%	100.0%	100.0%	92.9	0.7
2162	100.0%	100.0%	100.0%	92.9	0.7
2163	100.0%	100.0%	100.0%	92.9	0.6
2164	100.0%	100.0%	100.0%	92.9	0.6
2165	100.0%	100.0%	100.0%	92.9	0.6
2166	100.0%	100.0%	100.0%	92.9	0.6
2167	100.0%	100.0%	100.0%	92.9	0.6
2168	100.0%	100.0%	100.0%	92.9	0.6
2169	100.0%	100.0%	100.0%	92.9	0.5
2170	100.0%	100.0%	100.0%	92.9	0.5
2171	100.0%	100.0%	100.0%	92.9	0.5
2172	100.0%	100.0%	100.0%	92.9	0.5
2173	100.0%	100.0%	100.0%	92.9	0.5
2174	100.0%	100.0%	100.0%	92.9	0.5
2175	100.0%	100.0%	100.0%	92.9	0.5
2176	100.0%	100.0%	100.0%	92.9	0.4

ATTACHMENT B
CALCULATION OF COMPENSATORY HABITAT
(SPUR STRUCTURE/FRAWORK)

2177	100.0%	100.0%	100.0%	92.9	0.4
2178	100.0%	100.0%	100.0%	92.9	0.4
2179	100.0%	100.0%	100.0%	92.9	0.4
2180	100.0%	100.0%	100.0%	92.9	0.4
2181	100.0%	100.0%	100.0%	92.9	0.4
2182	100.0%	100.0%	100.0%	92.9	0.4
2183	100.0%	100.0%	100.0%	92.9	0.4
2184	100.0%	100.0%	100.0%	92.9	0.3
2185	100.0%	100.0%	100.0%	92.9	0.3
2186	100.0%	100.0%	100.0%	92.9	0.3
2187	100.0%	100.0%	100.0%	92.9	0.3
2188	100.0%	100.0%	100.0%	92.9	0.3
2189	100.0%	100.0%	100.0%	92.9	0.3
2190	100.0%	100.0%	100.0%	92.9	0.3
2191	100.0%	100.0%	100.0%	92.9	0.3
2192	100.0%	100.0%	100.0%	92.9	0.3
2193	100.0%	100.0%	100.0%	92.9	0.3
2194	100.0%	100.0%	100.0%	92.9	0.3
2195	100.0%	100.0%	100.0%	92.9	0.3
2196	100.0%	100.0%	100.0%	92.9	0.2
2197	100.0%	100.0%	100.0%	92.9	0.2
2198	100.0%	100.0%	100.0%	92.9	0.2
2199	100.0%	100.0%	100.0%	92.9	0.2
2200	100.0%	100.0%	100.0%	92.9	0.2
2201	100.0%	100.0%	100.0%	92.9	0.2
2202	100.0%	100.0%	100.0%	92.9	0.2
2203	100.0%	100.0%	100.0%	92.9	0.2
2204	100.0%	100.0%	100.0%	92.9	0.2
2205	100.0%	100.0%	100.0%	92.9	0.2
2206	100.0%	100.0%	100.0%	92.9	0.2
2207	100.0%	100.0%	100.0%	92.9	0.2
2208	100.0%	100.0%	100.0%	92.9	0.2
2209	100.0%	100.0%	100.0%	92.9	0.2
2210	100.0%	100.0%	100.0%	92.9	0.2
2211	100.0%	100.0%	100.0%	92.9	0.2
2212	100.0%	100.0%	100.0%	92.9	0.2
2213	100.0%	100.0%	100.0%	92.9	0.1
2214	100.0%	100.0%	100.0%	92.9	0.1
2215	100.0%	100.0%	100.0%	92.9	0.1
2216	100.0%	100.0%	100.0%	92.9	0.1
2217	100.0%	100.0%	100.0%	92.9	0.1
2218	100.0%	100.0%	100.0%	92.9	0.1
2219	100.0%	100.0%	100.0%	92.9	0.1
2220	100.0%	100.0%	100.0%	92.9	0.1
2221	100.0%	100.0%	100.0%	92.9	0.1
2222	100.0%	100.0%	100.0%	92.9	0.1
2223	100.0%	100.0%	100.0%	92.9	0.1
2224	100.0%	100.0%	100.0%	92.9	0.1
2225	100.0%	100.0%	100.0%	92.9	0.1
2226	100.0%	100.0%	100.0%	92.9	0.1
2227	100.0%	100.0%	100.0%	92.9	0.1
2228	100.0%	100.0%	100.0%	92.9	0.1
2229	100.0%	100.0%	100.0%	92.9	0.1
2230	100.0%	100.0%	100.0%	92.9	0.1
2231	100.0%	100.0%	100.0%	92.9	0.1
2232	100.0%	100.0%	100.0%	92.9	0.1
2233	100.0%	100.0%	100.0%	92.9	0.1
2234	100.0%	100.0%	100.0%	92.9	0.1
2235	100.0%	100.0%	100.0%	92.9	0.1
2236	100.0%	100.0%	100.0%	92.9	0.1
2237	100.0%	100.0%	100.0%	92.9	0.1
2238	100.0%	100.0%	100.0%	92.9	0.1
2239	100.0%	100.0%	100.0%	92.9	0.1
2240	100.0%	100.0%	100.0%	92.9	0.1
2241	100.0%	100.0%	100.0%	92.9	0.1

ATTACHMENT B

**CALCULATION OF COMPENSATORY HABITAT
(SPUR STRUCTURE/Framework)**

2242	100.0%	100.0%	100.0%	92.9	0.1
2243	100.0%	100.0%	100.0%	92.9	0.1
2244	100.0%	100.0%	100.0%	92.9	0.1
2245	100.0%	100.0%	100.0%	92.9	0.1
2246	100.0%	100.0%	100.0%	92.9	0.1
2247	100.0%	100.0%	100.0%	92.9	0.1
2248	100.0%	100.0%	100.0%	92.9	0.1
2249	100.0%	100.0%	100.0%	92.9	0.1
2250	100.0%	100.0%	100.0%	92.9	0.0
2251	100.0%	100.0%	100.0%	92.9	0.0
2252	100.0%	100.0%	100.0%	92.9	0.0
2253	100.0%	100.0%	100.0%	92.9	0.0
2254	100.0%	100.0%	100.0%	92.9	0.0
2255	100.0%	100.0%	100.0%	92.9	0.0
2256	100.0%	100.0%	100.0%	92.9	0.0
2257	100.0%	100.0%	100.0%	92.9	0.0
2258	100.0%	100.0%	100.0%	92.9	0.0
2259	100.0%	100.0%	100.0%	92.9	0.0
2260	100.0%	100.0%	100.0%	92.9	0.0
2261	100.0%	100.0%	100.0%	92.9	0.0
2262	100.0%	100.0%	100.0%	92.9	0.0
2263	100.0%	100.0%	100.0%	92.9	0.0
2264	100.0%	100.0%	100.0%	92.9	0.0
2265	100.0%	100.0%	100.0%	92.9	0.0
2266	100.0%	100.0%	100.0%	92.9	0.0
2267	100.0%	100.0%	100.0%	92.9	0.0
2268	100.0%	100.0%	100.0%	92.9	0.0
2269	100.0%	100.0%	100.0%	92.9	0.0
2270	100.0%	100.0%	100.0%	92.9	0.0
2271	100.0%	100.0%	100.0%	92.9	0.0
2272	100.0%	100.0%	100.0%	92.9	0.0
2273	100.0%	100.0%	100.0%	92.9	0.0
2274	100.0%	100.0%	100.0%	92.9	0.0
2275	100.0%	100.0%	100.0%	92.9	0.0
TOTAL DISCOUNTED SQ. M-YEARS OF SERVICES LOST DUE TO TIME					1,993.5
REQ. FOR CREATED HABITAT TO PROVIDE MAX. SERVICE FLOW					

ATTACHMENT B
CALCULATION OF COMPENSATORY HABITAT
(SPUR STRUCTURE/Framework)

<i>Scale of Habitat Creation Effort (Compensation for Injury to Spur Tops):</i>	
Total Discounted Sq. M-Years of Resource Services Lost Due to Injury:	1,993.5
Total Discounted Sq. M-Years of Resource Services Provided by Created Habitat:	1,993.5
Total Sq. M of Habitat to be Created as Compensation for Injury:	92.9

ATTACHMENT C
CALCULATION OF COMPENSATORY HABITAT
(GROOVE AREA)

Habitat Equivalency Analysis Input Parameters:	
Sq. Meters Injured by the Grounding:	
Groove	642.46
Year of Initial Injury:	1993
Month of Initial Injury:	March
Current Year:	1995
Percent of Resource Services Lost in Initial Period Following Grounding:	100%
Recovery Function For Primary Restoration Area:	
Years following restoration in which no recovery occurs	0
Years of recovery following "no growth" period until successful recolonization	15
"Maturity" Function for Compensatory Habitat Project:	
Years following compensatory habitat creation in which no recovery occurs	0
Years of recovery following "no growth" period until successful recolonization	15
Relative Productivity of Created to Natural Habitat	100%
Time Horizon for Service Production of Created Habitat	Perpetuity
Time Elapsed Prior to Restoration of Injured Area (years from time of injury, due to settlement, planning, permitting, etc.)	4
Time Elapsed Prior to Habitat Creation (years from time of injury, due to settlement, planning, permitting, etc.)	4
Real Discount Rate	3.0%

ATTACHMENT C
CALCULATION OF COMPENSATORY HABITAT
(GROOVE AREA)

Calculation of Total Square Meter-Years of Resource Services Lost:

Year	Percent of Resource Services Lost (Beginning of Period)	Percent of Resource Services Lost (End of Period)	Percent of Resource Services Lost (Average of Period)	Raw Square Meter-Years of Resource Services Lost	Discounted Square Meter-Years of Resource Services Lost
1993	100.0%	100.0%	100.0%	642.5	661.9
1994	100.0%	100.0%	100.0%	642.5	661.8
1995	100.0%	100.0%	100.0%	642.5	642.5
1996	100.0%	100.0%	100.0%	642.5	623.8
1997	100.0%	93.3%	96.7%	621.1	585.4
1998	93.3%	86.7%	90.0%	578.2	529.2
1999	86.7%	80.0%	83.3%	535.4	475.7
2000	80.0%	73.3%	76.7%	492.6	424.9
2001	73.3%	66.7%	70.0%	449.7	376.6
2002	66.7%	60.0%	63.3%	406.9	330.9
2003	60.0%	53.3%	56.7%	364.1	287.4
2004	53.3%	46.7%	50.0%	321.2	246.2
2005	46.7%	40.0%	43.3%	278.4	207.2
2006	40.0%	33.3%	36.7%	235.6	170.2
2007	33.3%	26.7%	30.0%	192.7	135.2
2008	26.7%	20.0%	23.3%	149.9	102.1
2009	20.0%	13.3%	16.7%	107.1	70.8
2010	13.3%	6.7%	10.0%	64.2	41.2
2011	6.7%	0.0%	3.3%	21.4	13.3
2012	0.0%	0.0%	0.0%	0.0	0.0
2013	0.0%	0.0%	0.0%	0.0	0.0
2014	0.0%	0.0%	0.0%	0.0	0.0
2015	0.0%	0.0%	0.0%	0.0	0.0
2016	0.0%	0.0%	0.0%	0.0	0.0
2017	0.0%	0.0%	0.0%	0.0	0.0
2018	0.0%	0.0%	0.0%	0.0	0.0
2019	0.0%	0.0%	0.0%	0.0	0.0
2020	0.0%	0.0%	0.0%	0.0	0.0
2021	0.0%	0.0%	0.0%	0.0	0.0
2022	0.0%	0.0%	0.0%	0.0	0.0
2023	0.0%	0.0%	0.0%	0.0	0.0
2024	0.0%	0.0%	0.0%	0.0	0.0
2025	0.0%	0.0%	0.0%	0.0	0.0
2026	0.0%	0.0%	0.0%	0.0	0.0
2027	0.0%	0.0%	0.0%	0.0	0.0
2028	0.0%	0.0%	0.0%	0.0	0.0
2029	0.0%	0.0%	0.0%	0.0	0.0
2030	0.0%	0.0%	0.0%	0.0	0.0
TOTAL DISCOUNTED SQ. M-YEARS OF SERVICES LOST:					6,586.2

ATTACHMENT C
CALCULATION OF COMPENSATORY HABITAT
(GROOVE AREA)

Total Resource Services Provided by Compensatory Habitat Creation Project.

Year	Percent of Max. Service Flows Provided (Beginning of Period)	Percent of Max. Service Flows Provided (End of Period)	Percent of Max. Service Flows Provided (Average of Period)	Raw Sq. M-Years of Resource Services Provided by Compensatory Habitat Creation Project	Discounted Sq. M-Years of Resource Services Provided by Compensatory Habitat Creation Project
1993	0.0%	0.0%	0.0%	0.0	0.0
1994	0.0%	0.0%	0.0%	0.0	0.0
1995	0.0%	0.0%	0.0%	0.0	0.0
1996	0.0%	0.0%	0.0%	0.0	0.0
1997	0.0%	6.7%	3.3%	8.4	8.2
1998	6.7%	13.3%	10.0%	25.2	23.1
1999	13.3%	20.0%	16.7%	42.0	37.3
2000	20.0%	26.7%	23.3%	58.8	50.7
2001	26.7%	33.3%	30.0%	75.6	63.3
2002	33.3%	40.0%	36.7%	92.4	75.1
2003	40.0%	46.7%	43.3%	109.2	86.2
2004	46.7%	53.3%	50.0%	126.0	99.0
2005	53.3%	60.0%	56.7%	142.8	106.2
2006	60.0%	66.7%	63.3%	159.6	115.3
2007	66.7%	73.3%	70.0%	176.4	123.7
2008	73.3%	80.0%	76.7%	193.2	131.5
2009	80.0%	86.7%	83.3%	210.0	138.8
2010	86.7%	93.3%	90.0%	226.8	145.6
2011	93.3%	100.0%	96.7%	243.6	151.8
2012	100.0%	100.0%	100.0%	252.0	152.4
2013	100.0%	100.0%	100.0%	252.0	148.0
2014	100.0%	100.0%	100.0%	252.0	143.7
2015	100.0%	100.0%	100.0%	252.0	139.5
2016	100.0%	100.0%	100.0%	252.0	135.4
2017	100.0%	100.0%	100.0%	252.0	131.5
2018	100.0%	100.0%	100.0%	252.0	127.7
2019	100.0%	100.0%	100.0%	252.0	123.9
2020	100.0%	100.0%	100.0%	252.0	120.3
2021	100.0%	100.0%	100.0%	252.0	116.8
2022	100.0%	100.0%	100.0%	252.0	113.4
2023	100.0%	100.0%	100.0%	252.0	110.1
2024	100.0%	100.0%	100.0%	252.0	106.9
2025	100.0%	100.0%	100.0%	252.0	103.8
2026	100.0%	100.0%	100.0%	252.0	100.8
2027	100.0%	100.0%	100.0%	252.0	97.8
2028	100.0%	100.0%	100.0%	252.0	95.0
2029	100.0%	100.0%	100.0%	252.0	92.2
2030	100.0%	100.0%	100.0%	252.0	89.5
2031	100.0%	100.0%	100.0%	252.0	86.9
2032	100.0%	100.0%	100.0%	252.0	84.4
2033	100.0%	100.0%	100.0%	252.0	81.9
2034	100.0%	100.0%	100.0%	252.0	79.6
2035	100.0%	100.0%	100.0%	252.0	77.2
2036	100.0%	100.0%	100.0%	252.0	75.0
2037	100.0%	100.0%	100.0%	252.0	72.8
2038	100.0%	100.0%	100.0%	252.0	70.7
2039	100.0%	100.0%	100.0%	252.0	68.6
2040	100.0%	100.0%	100.0%	252.0	66.6
2041	100.0%	100.0%	100.0%	252.0	64.7
2042	100.0%	100.0%	100.0%	252.0	62.8
2043	100.0%	100.0%	100.0%	252.0	61.0
2044	100.0%	100.0%	100.0%	252.0	59.2
2045	100.0%	100.0%	100.0%	252.0	57.5
2046	100.0%	100.0%	100.0%	252.0	55.8

ATTACHMENT C
CALCULATION OF COMPENSATORY HABITAT
(GROOVE AREA)

2047	100.0%	100.0%	100.0%	252.0	54.2
2048	100.0%	100.0%	100.0%	252.0	52.6
2049	100.0%	100.0%	100.0%	252.0	51.1
2050	100.0%	100.0%	100.0%	252.0	49.6
2051	100.0%	100.0%	100.0%	252.0	48.1
2052	100.0%	100.0%	100.0%	252.0	46.7
2053	100.0%	100.0%	100.0%	252.0	45.4
2054	100.0%	100.0%	100.0%	252.0	44.0
2055	100.0%	100.0%	100.0%	252.0	42.8
2056	100.0%	100.0%	100.0%	252.0	41.5
2057	100.0%	100.0%	100.0%	252.0	40.3
2058	100.0%	100.0%	100.0%	252.0	39.1
2059	100.0%	100.0%	100.0%	252.0	38.0
2060	100.0%	100.0%	100.0%	252.0	36.9
2061	100.0%	100.0%	100.0%	252.0	35.8
2062	100.0%	100.0%	100.0%	252.0	34.8
2063	100.0%	100.0%	100.0%	252.0	33.8
2064	100.0%	100.0%	100.0%	252.0	32.8
2065	100.0%	100.0%	100.0%	252.0	31.8
2066	100.0%	100.0%	100.0%	252.0	30.9
2067	100.0%	100.0%	100.0%	252.0	30.0
2068	100.0%	100.0%	100.0%	252.0	29.1
2069	100.0%	100.0%	100.0%	252.0	28.3
2070	100.0%	100.0%	100.0%	252.0	27.5
2071	100.0%	100.0%	100.0%	252.0	26.7
2072	100.0%	100.0%	100.0%	252.0	25.9
2073	100.0%	100.0%	100.0%	252.0	25.1
2074	100.0%	100.0%	100.0%	252.0	24.4
2075	100.0%	100.0%	100.0%	252.0	23.7
2076	100.0%	100.0%	100.0%	252.0	23.0
2077	100.0%	100.0%	100.0%	252.0	22.3
2078	100.0%	100.0%	100.0%	252.0	21.7
2079	100.0%	100.0%	100.0%	252.0	21.0
2080	100.0%	100.0%	100.0%	252.0	20.4
2081	100.0%	100.0%	100.0%	252.0	19.8
2082	100.0%	100.0%	100.0%	252.0	19.3
2083	100.0%	100.0%	100.0%	252.0	18.7
2084	100.0%	100.0%	100.0%	252.0	18.1
2085	100.0%	100.0%	100.0%	252.0	17.6
2086	100.0%	100.0%	100.0%	252.0	17.1
2087	100.0%	100.0%	100.0%	252.0	16.6
2088	100.0%	100.0%	100.0%	252.0	16.1
2089	100.0%	100.0%	100.0%	252.0	15.7
2090	100.0%	100.0%	100.0%	252.0	15.2
2091	100.0%	100.0%	100.0%	252.0	14.8
2092	100.0%	100.0%	100.0%	252.0	14.3
2093	100.0%	100.0%	100.0%	252.0	13.9
2094	100.0%	100.0%	100.0%	252.0	13.5
2095	100.0%	100.0%	100.0%	252.0	13.1
2096	100.0%	100.0%	100.0%	252.0	12.7
2097	100.0%	100.0%	100.0%	252.0	12.4
2098	100.0%	100.0%	100.0%	252.0	12.0
2099	100.0%	100.0%	100.0%	252.0	11.6
2100	100.0%	100.0%	100.0%	252.0	11.3
2101	100.0%	100.0%	100.0%	252.0	11.0
2102	100.0%	100.0%	100.0%	252.0	10.7
2103	100.0%	100.0%	100.0%	252.0	10.3
2104	100.0%	100.0%	100.0%	252.0	10.0
2105	100.0%	100.0%	100.0%	252.0	9.8
2106	100.0%	100.0%	100.0%	252.0	9.5
2107	100.0%	100.0%	100.0%	252.0	9.2
2108	100.0%	100.0%	100.0%	252.0	8.9
2109	100.0%	100.0%	100.0%	252.0	8.7
2110	100.0%	100.0%	100.0%	252.0	8.4
2111	100.0%	100.0%	100.0%	252.0	8.2

ATTACHMENT C
CALCULATION OF COMPENSATORY HABITAT
(GROOVE AREA)

2112	100.0%	100.0%	100.0%	252.0	7.9
2113	100.0%	100.0%	100.0%	252.0	7.7
2114	100.0%	100.0%	100.0%	252.0	7.5
2115	100.0%	100.0%	100.0%	252.0	7.3
2116	100.0%	100.0%	100.0%	252.0	7.0
2117	100.0%	100.0%	100.0%	252.0	6.8
2118	100.0%	100.0%	100.0%	252.0	6.6
2119	100.0%	100.0%	100.0%	252.0	6.4
2120	100.0%	100.0%	100.0%	252.0	6.3
2121	100.0%	100.0%	100.0%	252.0	6.1
2122	100.0%	100.0%	100.0%	252.0	5.9
2123	100.0%	100.0%	100.0%	252.0	5.7
2124	100.0%	100.0%	100.0%	252.0	5.6
2125	100.0%	100.0%	100.0%	252.0	5.4
2126	100.0%	100.0%	100.0%	252.0	5.2
2127	100.0%	100.0%	100.0%	252.0	5.1
2128	100.0%	100.0%	100.0%	252.0	4.9
2129	100.0%	100.0%	100.0%	252.0	4.8
2130	100.0%	100.0%	100.0%	252.0	4.7
2131	100.0%	100.0%	100.0%	252.0	4.5
2132	100.0%	100.0%	100.0%	252.0	4.4
2133	100.0%	100.0%	100.0%	252.0	4.3
2134	100.0%	100.0%	100.0%	252.0	4.1
2135	100.0%	100.0%	100.0%	252.0	4.0
2136	100.0%	100.0%	100.0%	252.0	3.9
2137	100.0%	100.0%	100.0%	252.0	3.8
2138	100.0%	100.0%	100.0%	252.0	3.7
2139	100.0%	100.0%	100.0%	252.0	3.6
2140	100.0%	100.0%	100.0%	252.0	3.5
2141	100.0%	100.0%	100.0%	252.0	3.4
2142	100.0%	100.0%	100.0%	252.0	3.3
2143	100.0%	100.0%	100.0%	252.0	3.2
2144	100.0%	100.0%	100.0%	252.0	3.1
2145	100.0%	100.0%	100.0%	252.0	3.0
2146	100.0%	100.0%	100.0%	252.0	2.9
2147	100.0%	100.0%	100.0%	252.0	2.8
2148	100.0%	100.0%	100.0%	252.0	2.7
2149	100.0%	100.0%	100.0%	252.0	2.7
2150	100.0%	100.0%	100.0%	252.0	2.6
2151	100.0%	100.0%	100.0%	252.0	2.5
2152	100.0%	100.0%	100.0%	252.0	2.4
2153	100.0%	100.0%	100.0%	252.0	2.4
2154	100.0%	100.0%	100.0%	252.0	2.3
2155	100.0%	100.0%	100.0%	252.0	2.2
2156	100.0%	100.0%	100.0%	252.0	2.2
2157	100.0%	100.0%	100.0%	252.0	2.1
2158	100.0%	100.0%	100.0%	252.0	2.0
2159	100.0%	100.0%	100.0%	252.0	2.0
2160	100.0%	100.0%	100.0%	252.0	1.9
2161	100.0%	100.0%	100.0%	252.0	1.9
2162	100.0%	100.0%	100.0%	252.0	1.8
2163	100.0%	100.0%	100.0%	252.0	1.8
2164	100.0%	100.0%	100.0%	252.0	1.7
2165	100.0%	100.0%	100.0%	252.0	1.7
2166	100.0%	100.0%	100.0%	252.0	1.6
2167	100.0%	100.0%	100.0%	252.0	1.6
2168	100.0%	100.0%	100.0%	252.0	1.5
2169	100.0%	100.0%	100.0%	252.0	1.5
2170	100.0%	100.0%	100.0%	252.0	1.4
2171	100.0%	100.0%	100.0%	252.0	1.4
2172	100.0%	100.0%	100.0%	252.0	1.3
2173	100.0%	100.0%	100.0%	252.0	1.3
2174	100.0%	100.0%	100.0%	252.0	1.3
2175	100.0%	100.0%	100.0%	252.0	1.2
2176	100.0%	100.0%	100.0%	252.0	1.2

ATTACHMENT C
CALCULATION OF COMPENSATORY HABITAT
(GROOVE AREA)

2177	100.0%	100.0%	100.0%	252.0	1.2
2178	100.0%	100.0%	100.0%	252.0	1.1
2179	100.0%	100.0%	100.0%	252.0	1.1
2180	100.0%	100.0%	100.0%	252.0	1.1
2181	100.0%	100.0%	100.0%	252.0	1.0
2182	100.0%	100.0%	100.0%	252.0	1.0
2183	100.0%	100.0%	100.0%	252.0	1.0
2184	100.0%	100.0%	100.0%	252.0	0.9
2185	100.0%	100.0%	100.0%	252.0	0.9
2186	100.0%	100.0%	100.0%	252.0	0.9
2187	100.0%	100.0%	100.0%	252.0	0.9
2188	100.0%	100.0%	100.0%	252.0	0.8
2189	100.0%	100.0%	100.0%	252.0	0.8
2190	100.0%	100.0%	100.0%	252.0	0.8
2191	100.0%	100.0%	100.0%	252.0	0.8
2192	100.0%	100.0%	100.0%	252.0	0.7
2193	100.0%	100.0%	100.0%	252.0	0.7
2194	100.0%	100.0%	100.0%	252.0	0.7
2195	100.0%	100.0%	100.0%	252.0	0.7
2196	100.0%	100.0%	100.0%	252.0	0.7
2197	100.0%	100.0%	100.0%	252.0	0.6
2198	100.0%	100.0%	100.0%	252.0	0.6
2199	100.0%	100.0%	100.0%	252.0	0.6
2200	100.0%	100.0%	100.0%	252.0	0.6
2201	100.0%	100.0%	100.0%	252.0	0.6
2202	100.0%	100.0%	100.0%	252.0	0.6
2203	100.0%	100.0%	100.0%	252.0	0.5
2204	100.0%	100.0%	100.0%	252.0	0.5
2205	100.0%	100.0%	100.0%	252.0	0.5
2206	100.0%	100.0%	100.0%	252.0	0.5
2207	100.0%	100.0%	100.0%	252.0	0.5
2208	100.0%	100.0%	100.0%	252.0	0.5
2209	100.0%	100.0%	100.0%	252.0	0.5
2210	100.0%	100.0%	100.0%	252.0	0.4
2211	100.0%	100.0%	100.0%	252.0	0.4
2212	100.0%	100.0%	100.0%	252.0	0.4
2213	100.0%	100.0%	100.0%	252.0	0.4
2214	100.0%	100.0%	100.0%	252.0	0.4
2215	100.0%	100.0%	100.0%	252.0	0.4
2216	100.0%	100.0%	100.0%	252.0	0.4
2217	100.0%	100.0%	100.0%	252.0	0.4
2218	100.0%	100.0%	100.0%	252.0	0.3
2219	100.0%	100.0%	100.0%	252.0	0.3
2220	100.0%	100.0%	100.0%	252.0	0.3
2221	100.0%	100.0%	100.0%	252.0	0.3
2222	100.0%	100.0%	100.0%	252.0	0.3
2223	100.0%	100.0%	100.0%	252.0	0.3
2224	100.0%	100.0%	100.0%	252.0	0.3
2225	100.0%	100.0%	100.0%	252.0	0.3
2226	100.0%	100.0%	100.0%	252.0	0.3
2227	100.0%	100.0%	100.0%	252.0	0.3
2228	100.0%	100.0%	100.0%	252.0	0.3
2229	100.0%	100.0%	100.0%	252.0	0.2
2230	100.0%	100.0%	100.0%	252.0	0.2
2231	100.0%	100.0%	100.0%	252.0	0.2
2232	100.0%	100.0%	100.0%	252.0	0.2
2233	100.0%	100.0%	100.0%	252.0	0.2
2234	100.0%	100.0%	100.0%	252.0	0.2
2235	100.0%	100.0%	100.0%	252.0	0.2
2236	100.0%	100.0%	100.0%	252.0	0.2
2237	100.0%	100.0%	100.0%	252.0	0.2
2238	100.0%	100.0%	100.0%	252.0	0.2
2239	100.0%	100.0%	100.0%	252.0	0.2
2240	100.0%	100.0%	100.0%	252.0	0.2
2241	100.0%	100.0%	100.0%	252.0	0.2

ATTACHMENT C
CALCULATION OF COMPENSATORY HABITAT
(GROOVE AREA)

2242	100.0%	100.0%	100.0%	252.0	0.2
2243	100.0%	100.0%	100.0%	252.0	0.2
2244	100.0%	100.0%	100.0%	252.0	0.2
2245	100.0%	100.0%	100.0%	252.0	0.2
2246	100.0%	100.0%	100.0%	252.0	0.2
2247	100.0%	100.0%	100.0%	252.0	0.1
2248	100.0%	100.0%	100.0%	252.0	0.1
2249	100.0%	100.0%	100.0%	252.0	0.1
2250	100.0%	100.0%	100.0%	252.0	0.1
2251	100.0%	100.0%	100.0%	252.0	0.1
2252	100.0%	100.0%	100.0%	252.0	0.1
2253	100.0%	100.0%	100.0%	252.0	0.1
2254	100.0%	100.0%	100.0%	252.0	0.1
2255	100.0%	100.0%	100.0%	252.0	0.1
2256	100.0%	100.0%	100.0%	252.0	0.1
2257	100.0%	100.0%	100.0%	252.0	0.1
2258	100.0%	100.0%	100.0%	252.0	0.1
2259	100.0%	100.0%	100.0%	252.0	0.1
2260	100.0%	100.0%	100.0%	252.0	0.1
2261	100.0%	100.0%	100.0%	252.0	0.1
2262	100.0%	100.0%	100.0%	252.0	0.1
2263	100.0%	100.0%	100.0%	252.0	0.1
2264	100.0%	100.0%	100.0%	252.0	0.1
2265	100.0%	100.0%	100.0%	252.0	0.1
2266	100.0%	100.0%	100.0%	252.0	0.1
2267	100.0%	100.0%	100.0%	252.0	0.1
2268	100.0%	100.0%	100.0%	252.0	0.1
2269	100.0%	100.0%	100.0%	252.0	0.1
2270	100.0%	100.0%	100.0%	252.0	0.1
2271	100.0%	100.0%	100.0%	252.0	0.1
2272	100.0%	100.0%	100.0%	252.0	0.1
2273	100.0%	100.0%	100.0%	252.0	0.1
2274	100.0%	100.0%	100.0%	252.0	0.1
2275	100.0%	100.0%	100.0%	252.0	0.1
2276	100.0%	100.0%	100.0%	252.0	0.1
2277	100.0%	100.0%	100.0%	252.0	0.1
2278	100.0%	100.0%	100.0%	252.0	0.1
2279	100.0%	100.0%	100.0%	252.0	0.1
2280	100.0%	100.0%	100.0%	252.0	0.1
2281	100.0%	100.0%	100.0%	252.0	0.1
2282	100.0%	100.0%	100.0%	252.0	0.1
2283	100.0%	100.0%	100.0%	252.0	0.1
2284	100.0%	100.0%	100.0%	252.0	0.0
2285	100.0%	100.0%	100.0%	252.0	0.0
2286	100.0%	100.0%	100.0%	252.0	0.0
2287	100.0%	100.0%	100.0%	252.0	0.0
2288	100.0%	100.0%	100.0%	252.0	0.0
2289	100.0%	100.0%	100.0%	252.0	0.0
2290	100.0%	100.0%	100.0%	252.0	0.0
TOTAL DISCOUNTED SQ. M-YEARS OF SERVICES LOST DUE TO TIME					6,586.2
REQ. FOR CREATED HABITAT TO PROVIDE MAX. SERVICE FLOW					

ATTACHMENT C
CALCULATION OF COMPENSATORY HABITAT
(GROOVE AREA)

<i>Scale of Habitat Creation Effort (Compensation for Injury to Spur Tops):</i>	
Total Discounted Sq. M Years of Resource Services Lost Due to Injury:	6,586.2
Total Discounted Sq. M-Years of Resource Services Provided by Created Habitat:	6,586.2
Total Sq. M of Habitat to be Created as Compensation for Injury:	252.0

ATTACHMENT D

**COSTS ASSOCIATED WITH RESTORATION AND
COMPENSATORY HABITAT CREATION**

<i>Reef Module Costs Associated with Restoration Project:</i>	
Module Dimensions (meters):	
Length	2.44
Width	1.22
Height	1.22
Reef Modules Required for Primary Framework Restoration	45.0
Cost Per Reef Module (includes all development, fabrication and deployment costs)	\$7,000
Percent of Compensatory Habitat Area Elevated (Modules)	25%
Reef Modules Needed for Creation of Compensatory Habitat	44.0
Cost of Reef Modules for Primary Framework Restoration	\$315,000
Cost of Reef Modules for Compensatory Habitat Creation	\$308,000
Total Cost of Reef Modules for Entire Project	\$623,000

<i>Diver Cost Assumptions:</i>	
No. of People/Team:	3 (2 divers, 1 materials handler/support)
Number of Teams:	3
Diver Type:	Scuba
Cost Per Diver per Hour	\$38.79
Diver Labor Cost/hr.:	\$349.13 (total for all teams)
Dive Hours Per Day:	8
Dive Days Per Week:	6

<i>Extent of Primary Injury (sq. m):</i>	
Spur Tops	249.58
Spur Framework/Structural	133.50
Groove Area	642.48
TOTAL	1,025.56

<i>Total Habitat Required to Compensate for Interim Lost Services (sq. m):</i>	
Spur Tops	173.68
Spur Framework/Structural	92.90
Groove Area	251.96
TOTAL	518.55

ATTACHMENT D

**COSTS ASSOCIATED WITH RESTORATION AND
COMPENSATORY HABITAT CREATION**

<i>Transplanting Assumptions:</i>	
Transplant Density (transplants per sq. meter):	
<i>P. astreoides</i>	4.48
<i>M. complanata</i>	2.68
Hours required per transplant per team (incl. collection time)	1.50

<i>Total Transplants Required for Primary Restoration and Compensatory Habitat:</i>	
Area	Number of Tranplants Required
Transplants on Spur Tops	
<i>P. astreoides</i>	1,117
<i>M. complanata</i>	669
Transplants on Spur Structure	
<i>P. astreoides</i>	597
<i>M. complanata</i>	358
Transplants in Groove Area	
<i>P. astreoides</i>	0
<i>M. complanata</i>	0
<i>Soft Coral Species</i>	0
Transplants on Compensatory Modular Habitat	
<i>P. astreoides</i>	580
<i>M. complanata</i>	348
Total Transplants Required (All Areas)	3,670

<i>Durations Associated with Restoration/Transplanting:</i>	
Transplants Completed per Hour (total for all teams)	2.00
Total Hours Required to Complete Transplanting Effort	1,835
Total Days Required to Complete Transplanting Effort	229
Total Weeks Required to Complete Transplanting Effort	38

<i>Dive Labor Costs Associated with Transplanting Efforts:</i>	
Dive Labor Cost per Hour (all teams)	\$349.13
Hours Required for Transplanting (all areas)	1,835
Total Dive Labor Costs	\$640,582

ATTACHMENT D

**COSTS ASSOCIATED WITH RESTORATION AND
COMPENSATORY HABITAT CREATION**

<i>Cement Costs Associated with Transplanting Efforts:</i>	
Cost Per Bag:	
Type II Portland Cement	\$7.50
Molding Plaster	\$15.00
Bags Needed Per Transplant:	
Type II Portland Cement	0.25
Molding Plaster	0.05
Costs Per Transplant:	
Type II Portland Cement	\$1.88
Molding Plaster	\$0.75
Cement Costs Per Transplant	<u>\$2.63</u>
Total Cement Costs (All Areas)	\$9,833

<i>Boat/Crew Costs Associated with Restoration/Transplanting Efforts:</i>	
Cost Per Day of Offshore Diving Platform Vessel (includes costs for captain, fuel, and 3 meals per day for divers and crew)	\$800
Cost Per Day of Supply Vessel (25 ft. outboard)	\$116
Cost Per Day of Mate to Crew Offshore Platform and Operate Supply Vessel	\$100
Daily Fuel Costs for Supply Vessel	<u>\$21</u>
Total Daily Boat-Related Costs	\$1,037
Total Boat Related Costs for Entire Project	\$237,773

ATTACHMENT D

**COSTS ASSOCIATED WITH RESTORATION AND
COMPENSATORY HABITAT CREATION**

<i>Rubble Removal Costs Associated With Restoration Effort:</i>	
Area of Rubble Removal Site (sq. m)	441.5
No. of Divers Removing Rubble	9
Dive Hours Per Day:	8.0
Diver Hours Required to Clear 1 Sq. m	3.0
Total Diver Hours Req. to Remove Rubble	1,324.5
Total Days Required to Remove Rubble	18.4
Metal Baskets Required Per Dive Team	1.0
Cost Per Metal Basket	\$500
Lift Bags Required Per Basket	4.0
Cost Per Lift Bag	\$50
Labor Costs Per Diver Per Hour	€38.70
Scow Tug and Barge Costs Per Day	\$2,111
Crane Costs Per Day	\$317
Offshore Dive Platform Costs per Day	\$800
Total Dive Labor Costs for Rubble Removal	\$51,380
Total Vessel/Crane Costs for Rubble Remov.	\$59,370
Total Basket/Lift Bag Costs for Rubble Rem.	\$2,100
Total Rubble Removal Costs	\$112,849

<i>Summary of Total Restoration Costs:</i>	
Rubble Removal Costs	\$112,849
Reef Module Costs	\$623,000
Dive Labor Costs	\$640,582
Boat-Related Costs	\$237,773
Underwater Cement Costs	\$9,633
TOTAL RESTORATION COSTS	\$1,623,837

ATTACHMENT E

MONITORING COSTS FOR RESTORATION AND HABITAT CREATION PROJECTS

<i>Initial Assumptions:</i>	
Raw Hourly Rate for Principal Investigator	\$29,119
Raw Hourly Rate for Assistant Biologist	\$13,773
Number of Days Per Field Trip	4.0
Hours Per Field and Analysis Day	8.0
Percentage of Data Analysis Days Allocated to Principal Investigator	33.3%
Percentage of Data Analysis Days Allocated to Assistant Biologist	66.7%
Projected Annual Inflation Rate	3.2%

<i>NOAA Overhead Rates for Sanctuaries Personnel:</i>	
Leave Surcharge	20.5%
Benefits	20.0%
NOAA Space Charge	8.5%
NOAA Support	33.3%

ATTACHMENT E

MONITORING COSTS FOR RESTORATION AND HABITAT CREATION PROJECTS

<i>Loaded Hourly Rates for Monitoring Personnel (1995):</i>	
Loaded Hourly Rate for Principal Investigator	\$56.91
Loaded Hourly Rate for Assistant Biologist	\$26.77

Monitoring Costs Associated with Miss Beholden Restoration and Compensatory Habitat Creation Projects:

Monitoring Year	Number of Field Trips Per Year		Total Field Days Per Person Per Year		Total Data Analysis Days Per Year		Raw Labor Costs for Principal Investigator		Raw Labor Costs for Principal Biologist		Total Raw Labor Costs	Total Labor Costs Adj. for Inflation
	Per Year	Per Year	Per Person	Per Year	Per Year	Per Year	Investigator	Biologist	Principal	Biologist		
1	4	16	16	40	40	\$13,355	\$9,137	\$22,492	\$23,941			
2	3	12	12	15	15	\$7,740	\$4,711	\$12,451	\$13,673			
3	3	12	12	15	15	\$7,740	\$4,711	\$12,451	\$14,107			
4	3	12	12	15	15	\$7,740	\$4,711	\$12,451	\$14,554			
5	3	12	12	15	15	\$7,740	\$4,711	\$12,451	\$15,015			
6	2	8	8	5	5	\$4,401	\$2,427	\$6,828	\$8,495			
7	2	8	8	5	5	\$4,401	\$2,427	\$6,828	\$8,765			
8	2	8	8	5	5	\$4,401	\$2,427	\$6,828	\$9,043			
9	2	8	8	5	5	\$4,401	\$2,427	\$6,828	\$9,329			
10	2	8	8	5	5	\$4,401	\$2,427	\$6,828	\$9,625			
Total Discounted Monitoring Costs											\$126,547	

ATTACHMENT F

FEDERAL ASSESSMENT AND RESPONSE COSTS (FISCAL YEARS 93-95)

	Labor Costs	Travel Costs	Other Costs	Total Costs
<u>FY 93</u>				
Damage Assessment Center	\$5,078	\$0	\$25	\$5,103
Office of General Counsel	\$5,094	\$0	\$25	\$5,120
Office of Ocean and Coastal Resource Mgmt.	\$23,420	\$140	\$100	\$23,660
Total	\$33,592	\$140	\$150	\$33,883
<u>FY 94</u>				
Damage Assessment Center	\$12,771	\$1,034	\$100	\$13,905
Office of General Counsel	\$1,325	\$435	\$18	\$1,777
Office of Ocean and Coastal Resource Mgmt.	\$5,008	\$601	\$4,545	\$10,155
Total	\$19,104	\$2,070	\$4,663	\$25,837
<u>FY 95 (through 6/24/95)</u>				
Damage Assessment Center	\$5,490	\$0	\$38	\$5,527
Office of General Counsel	\$1,369	\$521	\$13	\$1,902
Office of Ocean and Coastal Resource Mgmt.	\$64	\$0	\$0	\$64
Total	\$6,922	\$521	\$50	\$7,493
GRAND TOTALS	\$59,618	\$2,731	\$4,864	\$67,213

ATTACHMENT G

INTEREST ON FEDERAL ASSESSMENT AND RESPONSE COSTS

Interest Rate on Past Assessment Costs:	4.1%
(Historical nominal interest rate on 2 year U.S. Treasury Bills - 1993)	

Fiscal Year	Total Federal Costs	Interest on Costs Incurred
93	\$33,882.81	\$2,835.35
94	\$25,836.71	\$1,059.31
95	\$7,493.20	\$0.00
Total	\$67,212.72	\$3,894.65