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FINAL

UXO SITE ANALYSIS ROOSEVELT ROADS, PUERTO RICO PINEROS & CABEZA de PERRO ISLANDS

December 2004

For:
Commander,
NAVFAC Atlantic
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FINAL

UXO SITE ANALYSIS
FINAL REPORT
SIGNATURE SHEET

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1.0 SUMMARY

The Naval Explosive Ordnance Disposal Technology Division (NAVEODTECHDIV) conducted a UXO surface survey of the islands of Pineros and Cabeza de Perro from 25 October to 4 November 2004. Our main concentration was on the island of Pineros since historical documents listed this island as training for Special Forces and EOD. Pineros proved to have evidence of training activities being conducted on the island. Evidence included small arms remnants over about one third of the island; breeching activities conducted in and around the bunkers, booby traps, 40mm practice grenade clutter, and assorted expended demolition material. Out of all the items discovered on the island, only one item was found to be dud fired (percussion grenade).

Geophysical equipment was transported to the island for the first two days but was never used. The foliage was so thick and terrain so inhospitable that too much time would have been spent clearing an area to survey. It was decided that time would be better spent by covering a wider area with visual inspection. A limited offshore underwater survey was performed with mask and snorkel. No sign of any ordnance was observed.

A surface walk was conducted on Cabeza de Perro Island, which was inconclusive for UXO. Most of the island is tall grass, which obscures a visual and geophysical survey of the island without burn-off of the vegetation.

In our opinion the main concentration of UXO and UXO remnants will be found in the rectangular area of figure 8 (section 6.0 – Conclusions). To do a thorough survey of this island would require land-clearing techniques that may not be appropriate for the ecological well being of the islands.

2.0 INTRODUCTION

2.1 Background

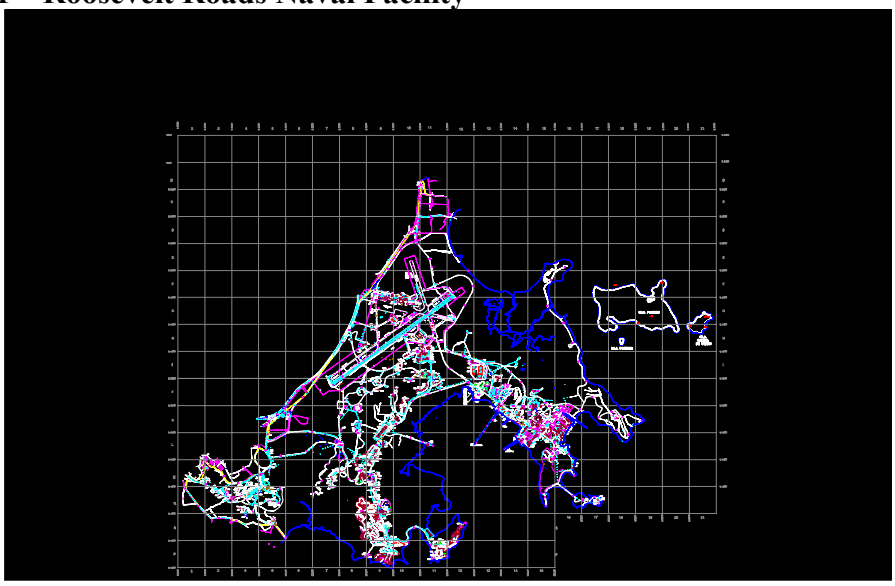
Record reviews and interviews indicate that Pineros and Cabeza de Perro islands, in Puerto Rico, have been used for military training and maneuver exercises since the late 1950's. Training exercises are reported to have included explosive ordnance disposal (EOD) operations with up to 5 pounds of plastic explosives, and maneuvering exercises have included the use of pyrotechnic devices (e.g., flares), training grenades, claymore mines, and various types of small arms munitions. NAVFAC needs unexploded ordnance (UXO) inspection of Pineros and Cabeza de Perro Islands to finalize their inspections of Naval Station Roosevelt Roads (NSRR).

EOD Mission:
"The mission of EOD organizations within the military may be stated broadly as being to effectively cope with incidents involving explosive ordnance items in support of both the military and civil populace, in order to minimize the hazard to life, property, and the progress of operations inherent in incidents involving unexploded ordnance, both U.S and foreign, in peace or in war"(The EOD Mission and Background, publication: 60A-1-1-1).

2.2 Purpose

The purpose of this task is for the Naval EOD Technology Division (NAVEODTECHDIV) to conduct a UXO Site Analysis survey with the aid of geophysical anomaly detectors on Pineros and Cabeza de Perro Islands for NAVFAC Atlantic Division. These islands belong to the former Naval Station Roosevelt Roads, Puerto Rico. All data should be recorded in logbooks with references to GPS position, digital photographs, and identification of suspected UXO (the two islands are in the center right side of the following map). The two islands are shown in figure 1 in the far right middle of the map.

Figure 1 – Roosevelt Roads Naval Facility



2.3 Planning/Use of Geophysical Equipment

After studying maps 3 through 6, the team decided to find benchmarks TV0715 and TV0716. These benchmarks would be logical destinations for the establishment of a Differential Global Positioning System (DGPS) Base station that would broadcast correction factors to a Real-Time Kinematics (RTK) Rover unit. The rover unit would be used to mark UXO and other items of interest to within 5 cm. of their absolute position on earth.

The shore area chosen to start the survey was the north side of the island (arrow in Map 5), following the west side of the lagoon. After passing the wetland area, the team would head southeast towards the top of the mountain.

The next area of concern was the suspected 40mm dud area shown on Map 5 on the northwestern side of the island. The team felt that the worst contaminated area would be at this location. Finally, from Map 4, the areas identified as "Demolition and Small Arms" was viewed as potential problem areas.

Geophysical equipment, used to detect near-surface anomalies, taken to Puerto Rico included: (1) an EM61 MkII, (2) a Minelabs Explorer, and (3) two Schonstedts.

Units (1) and (2) are active electromagnetic induction (EM or EMI) sensors which operate on the principle of a pulse current being applied to a transmitter coil generating eddy currents; eddy currents are circulating currents in a conducting surface induced by a close-proximity magnetic field. In this case the transmitter coil causes the magnetic field. This produces a corresponding magnetic field around the target that is sensed by a receiver coil on the EM device. The amplitude of the induced voltage on the receiver coil is measured a few milliseconds after the pulse is terminated. EM devices suffer an even worse signal response than magnetometers or gradiometers – $1/r^6$. However, they have advantages in noisy environments (those environments that have significant magnetic signals due to soil content or other

anomalies) and can detect all conducting metallic objects rather than just ferrous metallic objects.

The passive locator used (3) is a gradiometer. Magnetometers/gradiometers operate on the principle that ferrous metallic objects cause a local disturbance in the earth's magnetic field. This perturbation adds and subtracts to the Earth's magnetic field vector causing a change in the total field. Magnetometers are generally total field sensors that measure the actual or absolute total field at each point and must have wide dynamic ranges to effectively detect anomalous signals (magnetometers are routinely used to detect 1 gamma signals in ambient fields of between 20,000 and 80,000 gamma). Gradiometers operate by having two magnetic field sensors in close proximity to each other, which compensate for any gradient field differences (differences in the Earth's magnetic field due to location and positioning of the sensors themselves). When the earth's field is disturbed by a closely located secondary magnetic field, the two sensors go out of balance producing a signal. Anomalous magnetic fields dissipate quickly with distance for gradiometers at roughly the rate of $1/r^4$ (where r is the detector to target distance) and $1/r^3$ for magnetometers. Therefore, gradiometers are not as capable as magnetometers at detecting deeper targets.

2.4 <u>Historical Data.</u>

On Pineros Island, the Physical Site Inspection (PSI) observed numerous spent small arms munitions and flares, but no evidence of crew-served or heavy weapons usage. The PSI identified no evidence of military activity on Cabeza Island. There is no evidence either island was ever used as a range for crew-served weapons or as a firing point or impact area for indirect fire weapons (e.g., artillery, mortars). The shoreline of the western half of Pineros Island is heavily posted (of recent origin) with signs warning of the presence of UXO. The PSI included a significant portion of the island. No UXO was identified or found. Furthermore, the Environmental Condition of Property (ECP) investigation uncovered no evidence that either island was ever used as an impact area. Though a UXO inspection is not required to close out the ESQD arcs, a closeout inspection of these islands is preferred. We know that Special Operations folks did maneuvers and training exercises on Pineros Island and suspect Cabeza de Perro may have been used as well. Though the ECP indicated that there was no evidence that Cabeza de Perro was used. The ECP report had the following for these islands:
The ECP was conducted by environmental contractors and not EOD inspectors. An inspection is needed by qualified EOD inspectors, that would look for more than just debris or wrappers. Pineros Island is approx. 300 Acres (based on estimate) and Cabeza de Perro is less than 30 Acres.

2.5 Maps

The following map shows the islands of Pineros and Cabeza de Perro. These are blocked subsets of Figure 1 shown in section 2.2.

Figure 2 – Pineros and Cabeza de Perro Islands (NAVEODTECHDIV)

Figure 3 – Existing Improvements on Pineros and Cabeza de Perro Islands (Date?)

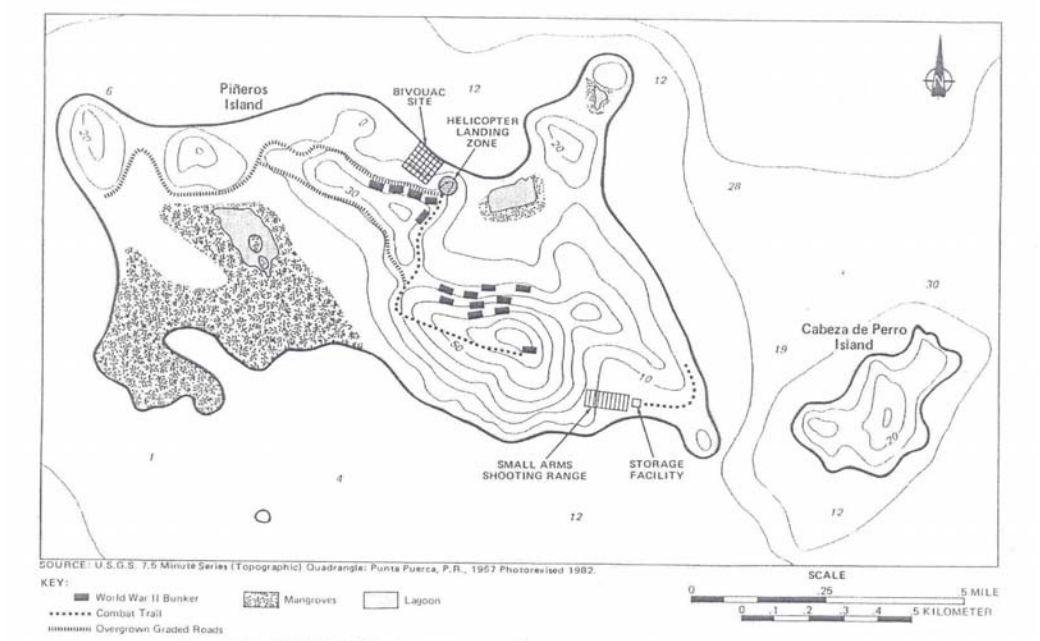


Figure 3–7 EXISTING IMPROVEMENTS ON PIÑEROS AND CABEZA DE PERRO ISLANDS

Figure 4 – Proposed Use Zones Under the Modification of Training Alternative

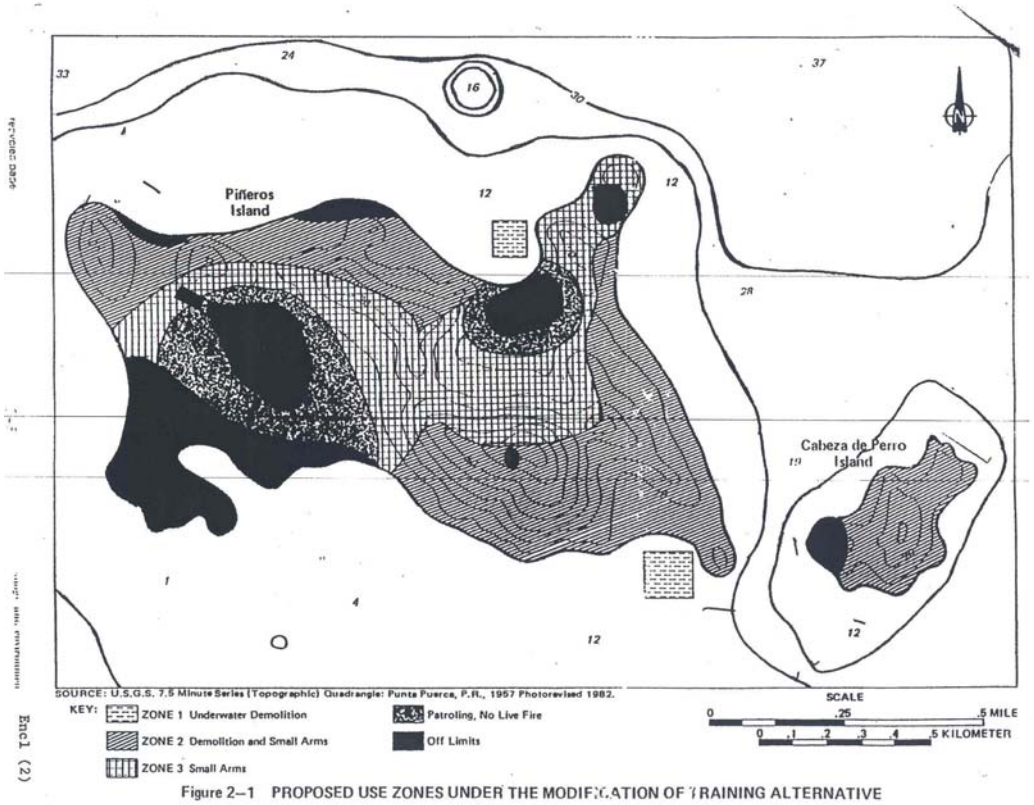


Figure 5 – Pineros Map (Unknown Origin)

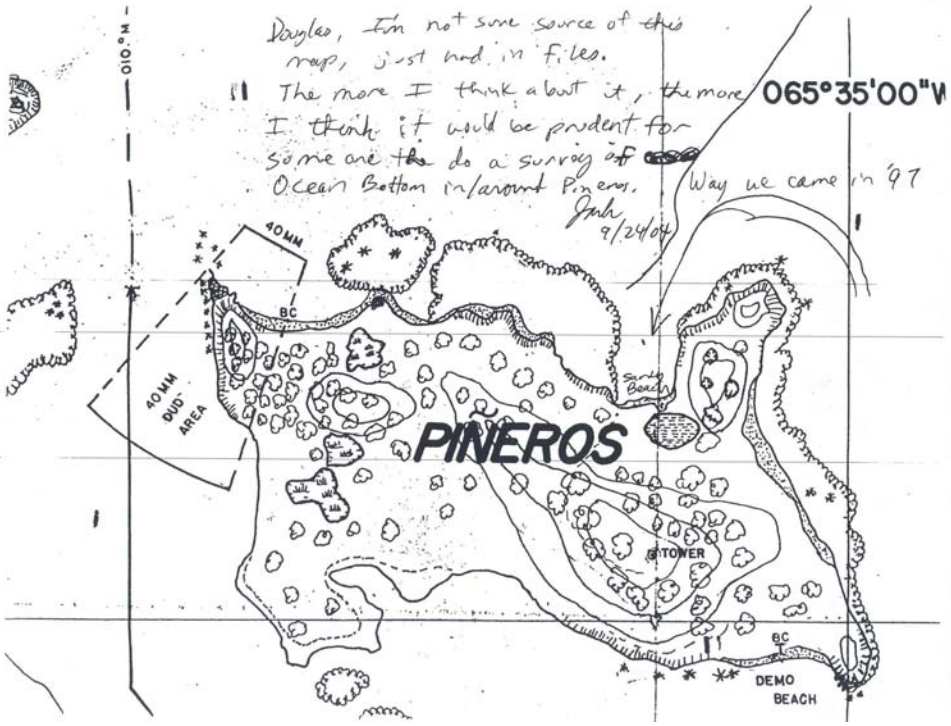


Figure 6 – Pineros Island with National Geodetic Survey Benchmarks (NAVEODTECHDIV)

2.6 Report Structure.

This site analysis report consists of the following five major sections:

- Summary
- Introduction: Background, purpose, planning, historical data, maps
- Pineros Island: Geography and pictures
- Cabeza de Perro Island: Geography and pictures
- Results: Descriptions and documentation of and what was found.
- Conclusions: EOD perspective of UXO contamination.

3.0 PINEROS ISLAND

3.1 Geography.

Pineros Island vegetation consists of 2/3 Coastal Scrub Forest and 1/3 mangroves. The area of the island, which was easiest to work in, was the northwestern side above the mangrove swamp (see Map 3). The following pictures show the diversity of vegetation.

4.0 CABEZA de PERRO ISLAND

4.1 Geography.

Cabeza de Perro Island, though less than 400 meters from Pineros Island, has different vegetation. Most of the island is tall grassland with the western portion containing some scrub forest. The shoreline is mostly rocky with cliffs interfering with inland access.

5.0 RESULTS

5.1 Pineros Island

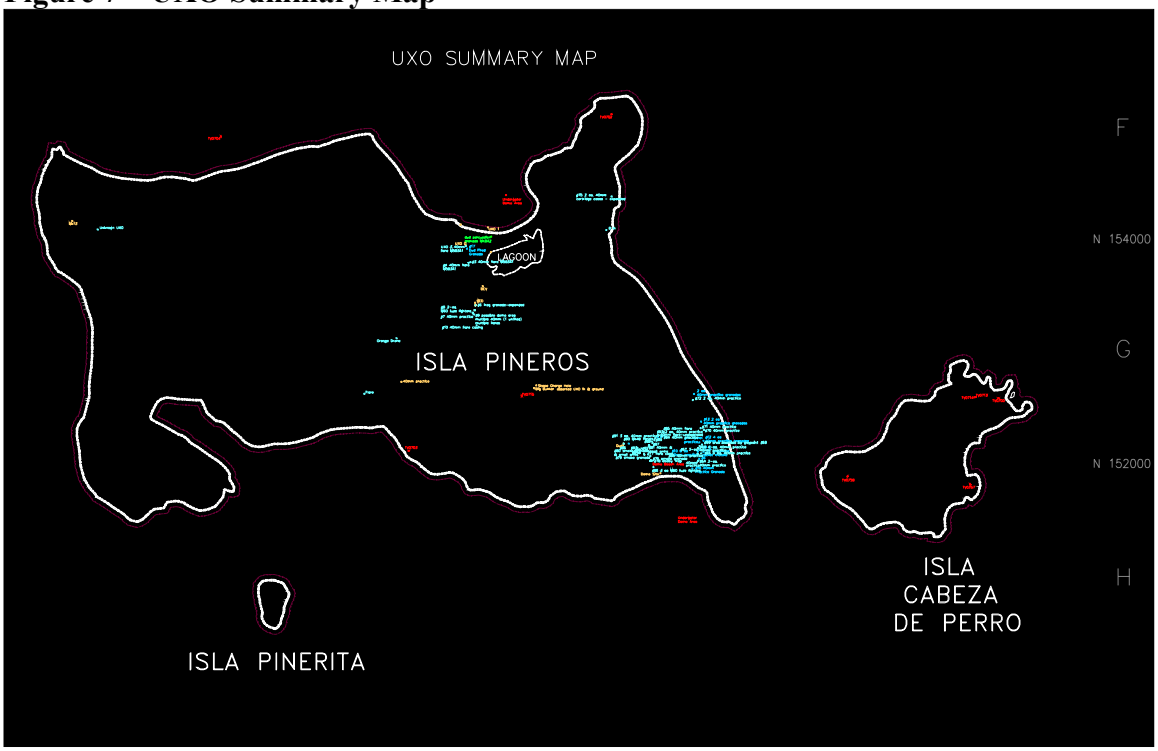
Conditions on Pineros Island were not conducive for an instrumented survey of near-surface conditions. With 10 working days planned it was decided that maximizing coverage of the island was more important than subsurface surveys. Use of EM equipment was further hampered by the necessity of clearing out large swaths of jungle close to the ground so that detectors could be used effectively. Centimeter accurate logging of UXO was also not an option since half the work force would have been utilized dragging heavy GPS equipment to the top of the mountain where stations TV0515 and TV0515 were located. Once on top of the mountain, the equipment would have been of little utility since there was no line of sight free from obstruction.
Pineros Island is cluttered with remnants of military maneuver, ambush, and breaching activities. No evidence of crew-served weapons (i.e. mortars, heavy machine guns, artillery) was found. Map 7 is a UXO summary map showing the locations of all items found.
It should be noted that 2 ½ days were spent around the northwestern side of the island where a 40mm dud area was shown. Only two items were found here, consisting of a Mk13 and an unknown item. The team believes that this area was incorrectly marked on the map and should be in the southeastern corner.

5.1.1 Expended Ordnance / UXO Observed (Pineros Island)

The following is a list of ordnance and UXO related debris from visual inspection of Pineros Island:

Dud and expended 40mm flares	Dud fired grenade
Hand grenades	Booby traps
40mm practice grenades	40mm cartridge cases
40mm smoke grenades	Mk84 timer
Missile cases	Detonation Cord
M60 fuze lighters	Explosive fasteners
Shape Charge remnants	
5.56 expended cartridge cases and other small arms	

Figure 7 – UXO Summary Map



5.2 Cabeza de Perro Island

A determination of UXO clutter on Cabeza de Perro Island cannot be made until the tall grass is either cut or burned. Visual inspection is nullified by the spongy, thick, vegetative ground cover that covers 2/3 of the eastern part of the island. Since historical records did not show activity on this island and the fact that most access to the island involves climbing a cliff, only a day was spent on this site.

5.3 Pictures

U.S. Signal, Distress Day & Night, Mk 13 Mod 0

U.S. Projectile, 40mm practice, M385

?

U.S. Projectile, 40mm practice, M385

U.S Rocket Motor, 2.75 in, expended

Firing Device, Mk48 Mod 0

Missile/Rocket Cases

Expended Small Arms Cartridges & Smoke Grenade

Grenade, offensive, Mk 3?

U.S. Grenade, Hand, Smoke, M18

Fuze Lighter, M60

Flare, 40mm, M583A1

U.S. Projectile, 40mm practice, M385

Small Arms Range

Shape Charge Hole in Large Bunker

Unknown IED inside bunker

Powder Actuated Projectile Unit Driver, Mk 22 Mod 0 Detonation Cord, Smoke Grenade

Pract. Grenade, Expended

Shape Charge Hole in Iron Plate

Large Bunker

Target Inside Bunker

6.0 CONCLUSIONS

It was the team's conclusion that over half the island is probably UXO and clutter free based upon visual inspection and historical data. However, to confirm this assumption would require land clearing and UXO surveying that would potentially be harmful to the environment.

Without an End Land Use Plan (ELUP) it will be difficult to determine future actions. If the land is going to be used as a wildlife refuge, then the current warning signs that are posted around the island would suffice for engineering controls. However, if the public is going to allowed access to the island then surface clearances will need to be accomplished and the land cleared in accordance with the CERCLA process. The rectangle, in red, in the following map (Figure 8) shows the area most likely to be contaminated with MEC, based on the team's survey. This area will certainly require attention in any follow-up work.

Figure 8 – Area of Concern

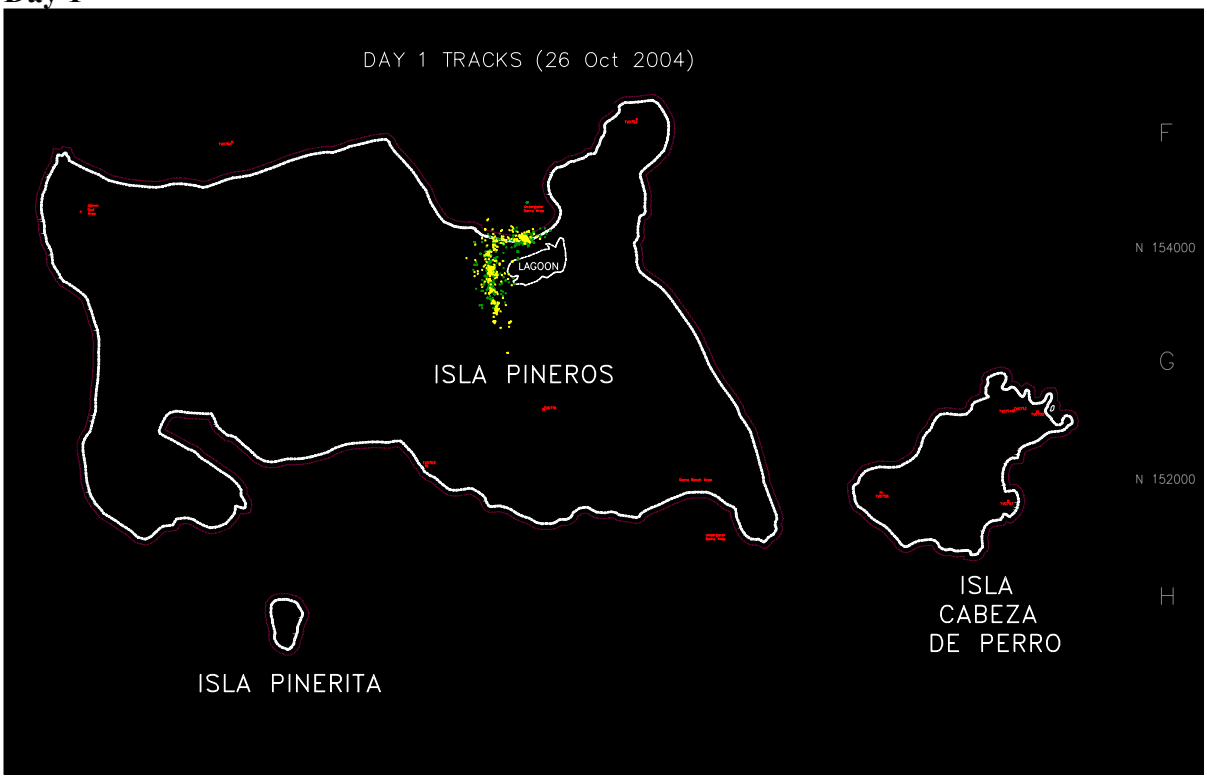
7.0 REFERENCES

ORDATA II (database of ordnance)
National Geodetic Survey (www.ngs.noaa.gov). Benchmark Identification
GPS Equipment Used – Garmin ETREX
Software Used:
- Blue Marble Geographic Calculator (coordinate transformations)
- AutoCad Map 2000 (data visualization)
- AutoLISP Scripts (data input to AutoCad)
- Waypoint+ V 1.8.03 (GPS data download freeware)

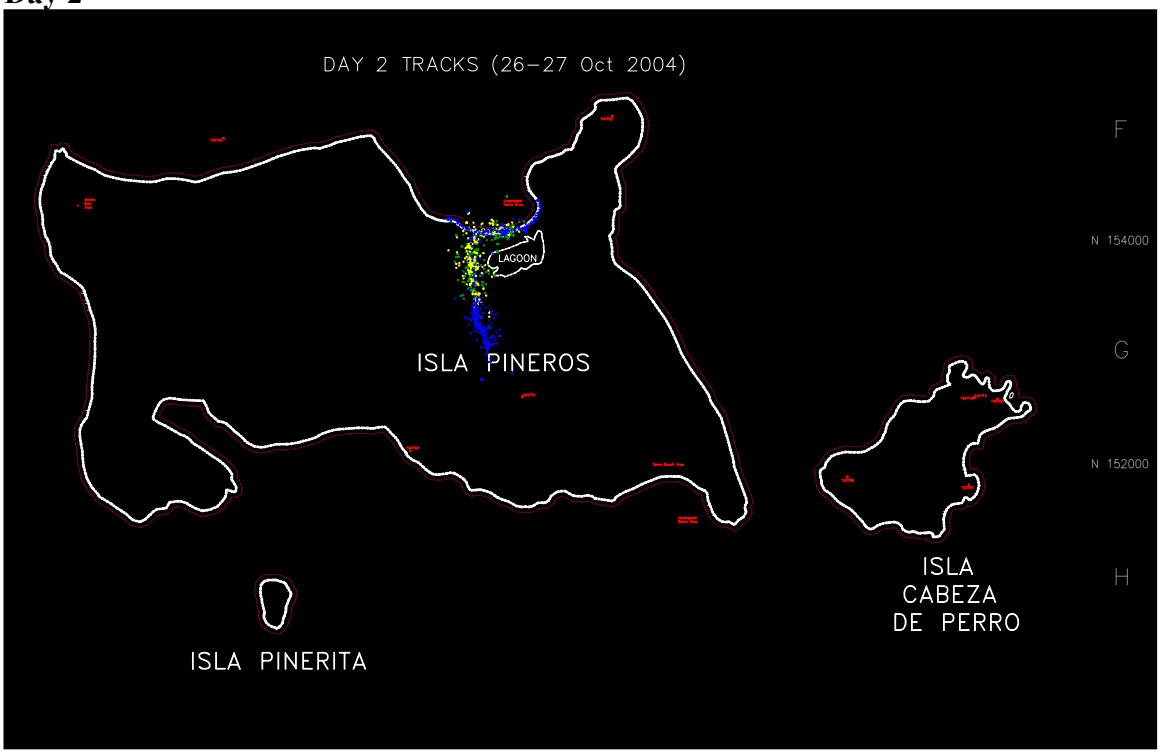
APPENDIX A

The following 10 maps show progress on each day and all previous days. Track-points were programmed to be taken every 30 seconds using Garmin Etrex Vista hand-held GPS's. Satellite reception, when available, showed 9 to 10 satellites and 5 meter resolution. If satellites could not be located, no data was logged. The circles on the maps represent navigation error of 5 meters and should not be used to determine search area coverage - the density of vegetation being so thick that visual coverage of many areas is limited.

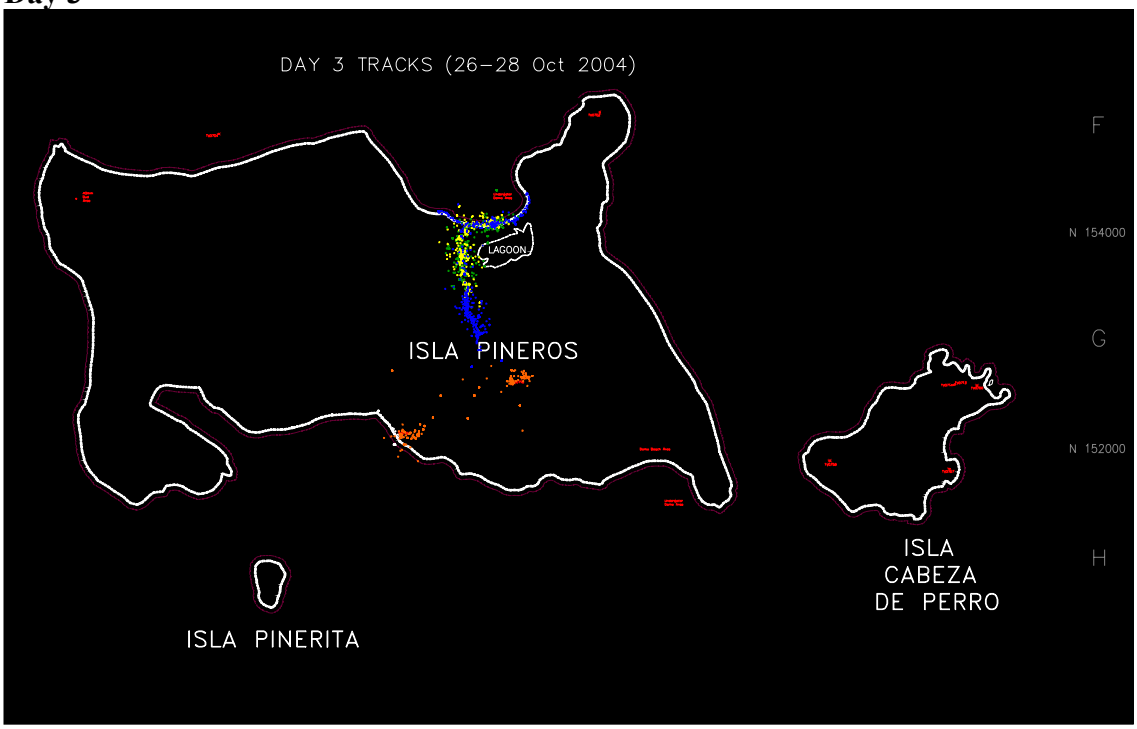
Day 1



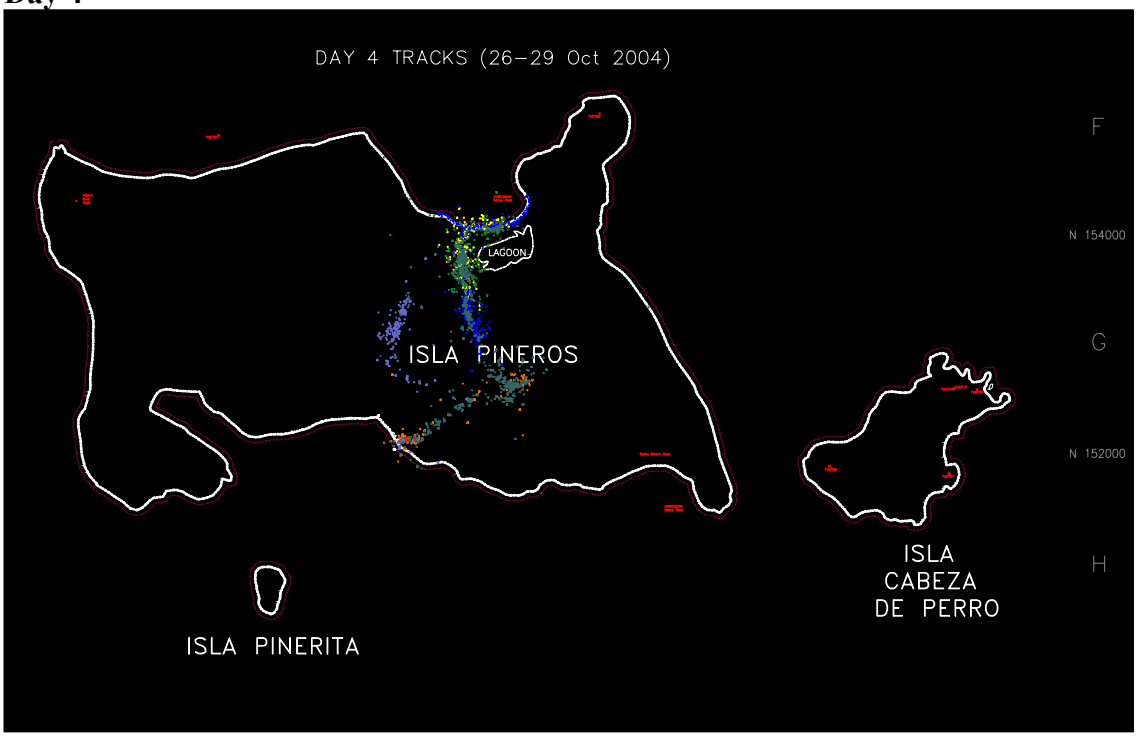
Day 2


DAY 2 TRACKS (26–27 Oct 2004)
F
N 154000
G
N 152000
H
LAGOON
ISLA PINEROS
ISLA PINERITA
ISLA
CABEZA
DE PERRO

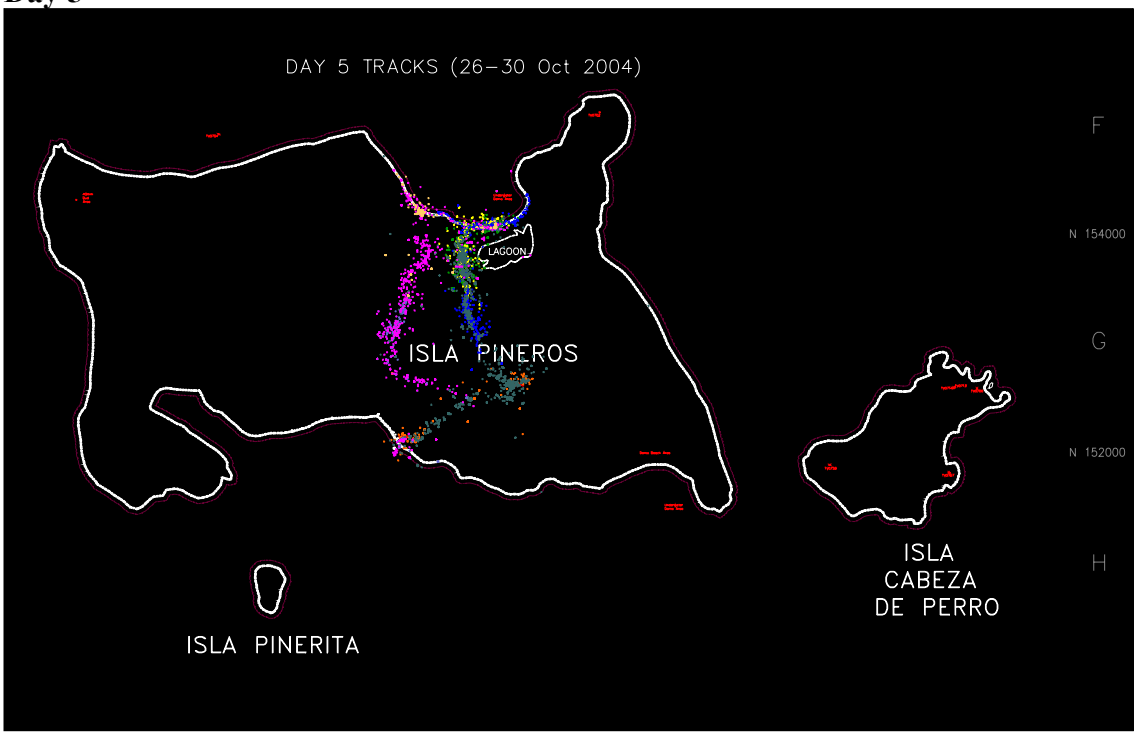
Day 3


DAY 3 TRACKS (26–28 Oct 2004)
F
N 154000
G
N 152000
H
LAGOON
ISLA PINEROS
ISLA PINERITA
ISLA
CABEZA
DE PERRO

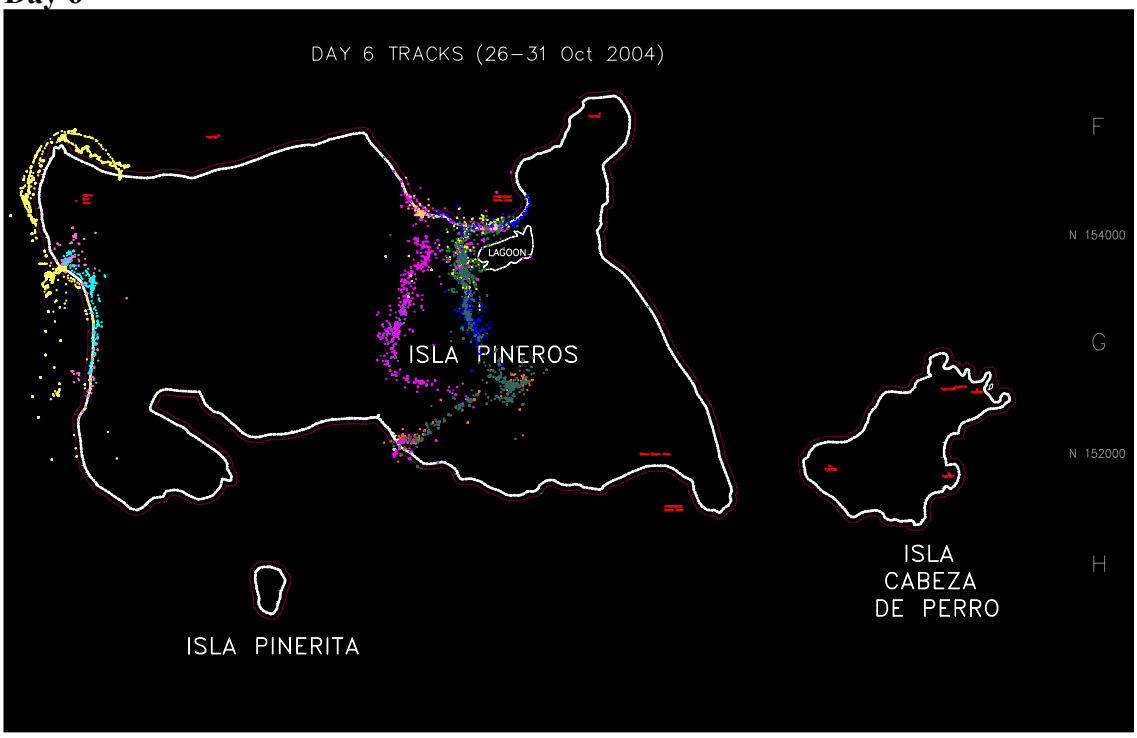
Day 4


DAY 4 TRACKS (26–29 Oct 2004)
F
N 154000
G
N 152000
H
LAGOON
ISLA PINEROS
ISLA CABEZA DE PERRO
ISLA PINERITA

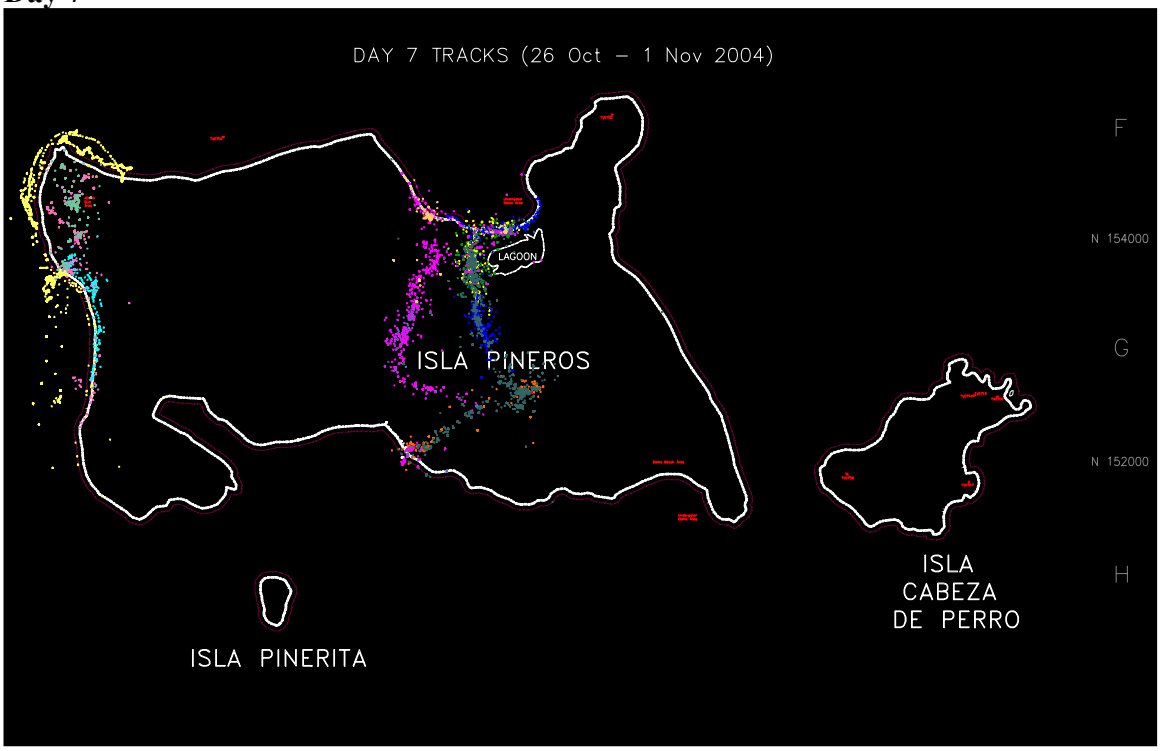
Day 5


DAY 5 TRACKS (26–30 Oct 2004)
F
N 154000
G
N 152000
H
LAGOON
ISLA PINEROS
ISLA CABEZA DE PERRO
ISLA PINERITA

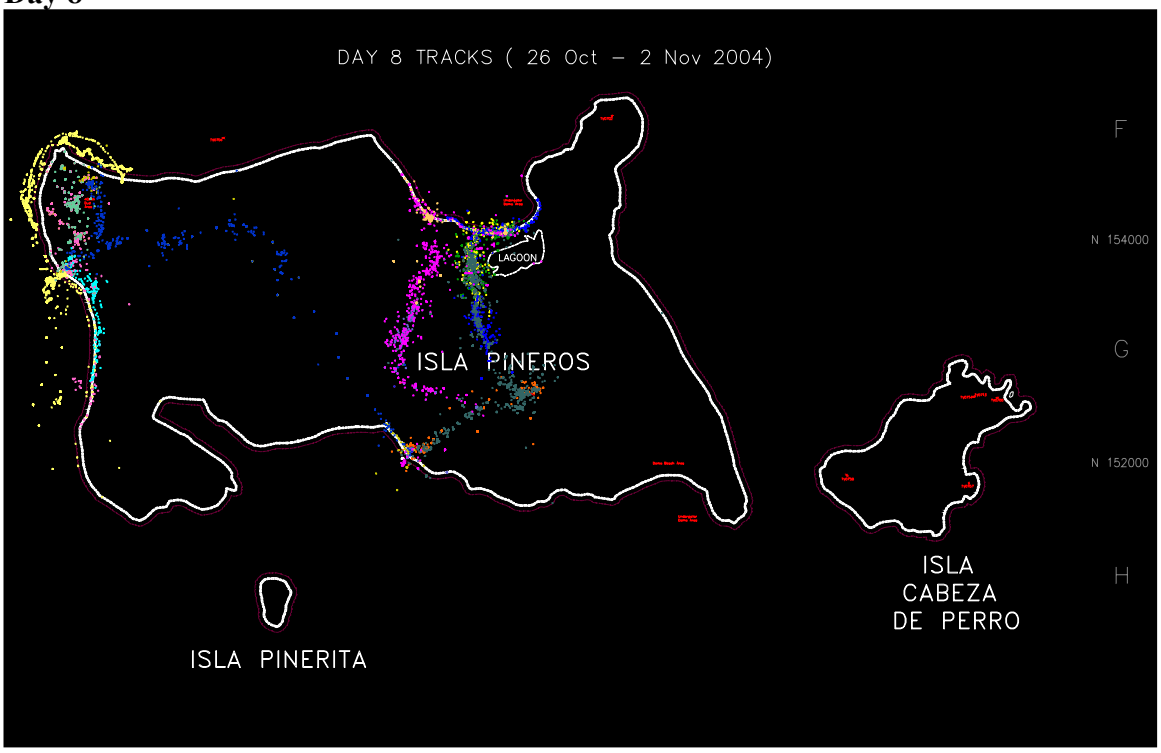
Day 6


DAY 6 TRACKS (26–31 Oct 2004)
F
N 154000
G
N 152000
H
LAGOON
ISLA PINEROS
ISLA CABEZA DE PERRO
ISLA PINERITA

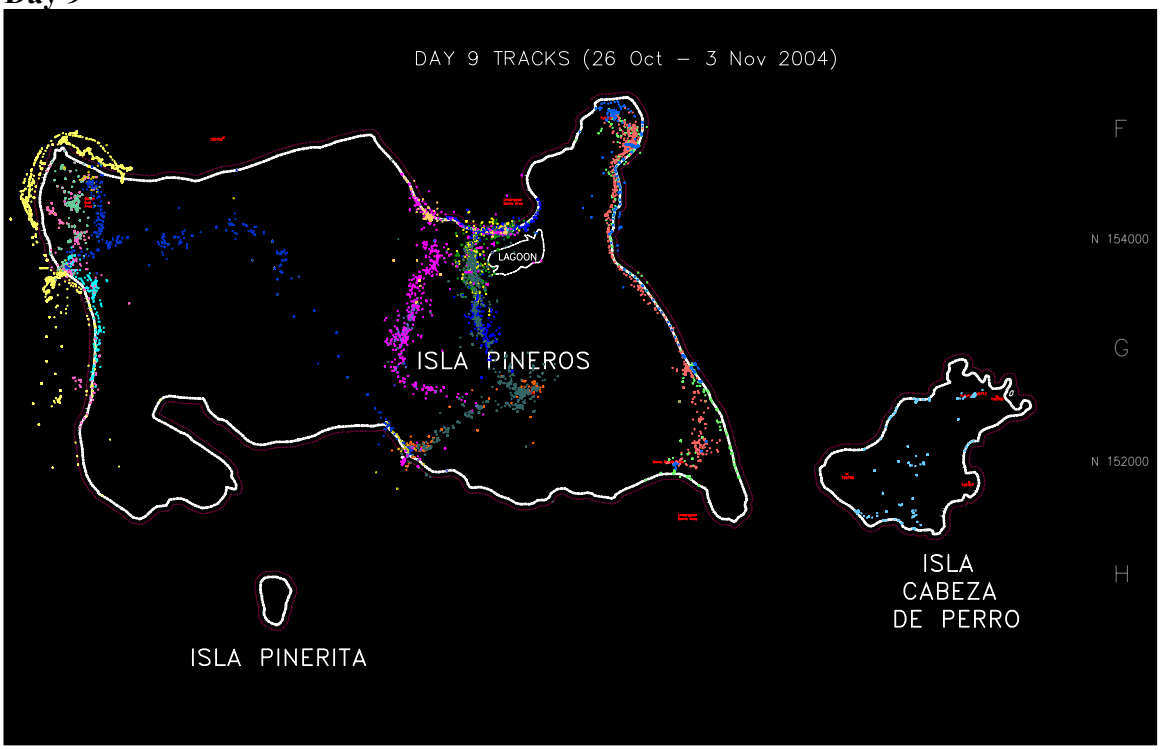
Day 7


DAY 7 TRACKS (26 Oct – 1 Nov 2004)
F
N 154000
G
N 152000
H
LAGOON
ISLA PINEROS
ISLA CABEZA DE PERRO
ISLA PINERITA

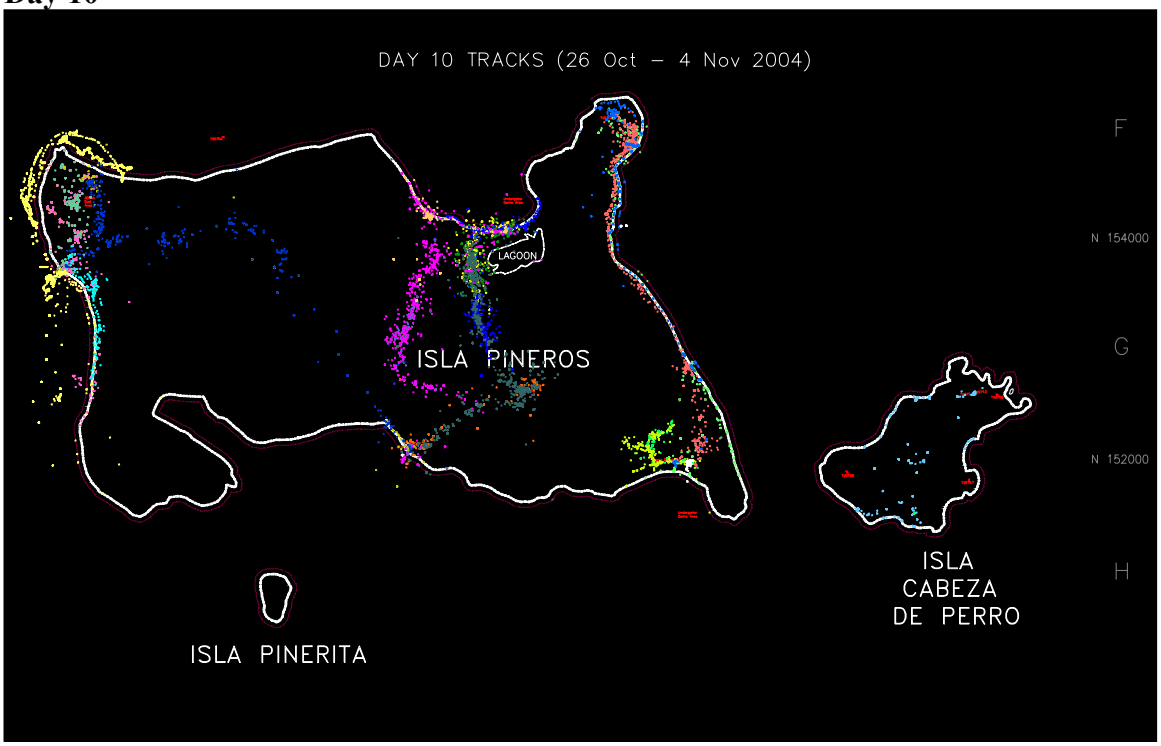
Day 8


DAY 8 TRACKS (26 Oct – 2 Nov 2004)
F
N 154000
G
N 152000
H
LAGOON
ISLA PINEROS
ISLA PINERITA
ISLA
CABEZA
DE PERRO

Day 9


DAY 9 TRACKS (26 Oct – 3 Nov 2004)
F
N 154000
G
N 152000
H
LAGOON
ISLA PINEROS
ISLA PINERITA
ISLA
CABEZA
DE PERRO

Day 10


DAY 10 TRACKS (26 Oct – 4 Nov 2004)
F
N 154000
G
N 152000
H
LAGOON
ISLA PINEROS
ISLA PINERITA
ISLA
CABEZA
DE PERRO

APPENDIX B

Transportation of Equipment from Boat to Shore

Underwater Visual Survey

Northwest Shore Line (Pineros Island)

Flare Parachute in Tree

Unregistered Monument (NW Pineros Island)

GPS Monument 8" below ground

Ruins of Helical Antenna

South Shore (Cabeza de Perro)

Southern Shore Cliffs (Cabeza de Perro)

Southeast Shoreline (Cabeza de Perro)

Top of Cabeza de Perro Island (looking at Pineros Island)

APPENDIX C

WAYPOINTS (TOM DOUGLAS)

	Geodetic WGS84				NAD 83, Zone 5201, State Plane, feet	
	Longitude	Latitude		Descriptions	Easting	Northing
1	-65.58918	18.2536	1	see Pope Burr #1	949050.3	809453.17
2	-65.58911	18.25296	2	see Pope Burr #2	949075.65	809220.88
3	-65.58924	18.25304	3	40mm flare M583A1	949030.42	809249.72
4	-65.58929	18.25302	4	40mm flare M583A1	949013.1	809242.38
5	-65.58929	18.25307	5	unknown	949013.02	809260.54
6	-65.58912	18.25198	6	frag grenade, expended (training)	949073.82	808865
7	-65.58918	18.25178	7	40mm grenade, practice	949053.34	808792.28
8	-65.58919	18.2518	8	2 ea, M60 fuze lighters	949049.84	808799.53
9	-65.58915	18.25175	9	possible demo area, multiple 40mm practice (1 unfired), multiple flare cases	949063.8	808781.43
10	-65.58909	18.25149	10	40mm flare casing	949085.05	808687.12
11	-65.58881	18.25114	11	see Pope Burr #11	949182.79	808560.47
12	-65.58829	18.25001	12	see Pope Burr #12	949365.1	808150.97
13	-65.59083	18.24842	13	see Pope Burr #13	948486.48	807569.53
14	-65.59063	18.24848	14	see Pope Burr #14	948555.77	807591.64
15	-65.58973	18.24909	15	see Pope Burr #15	948867.02	807814.58
16	-65.58945	18.24932	16	see Pope Burr #16	948963.78	807898.55
17	-65.58944	18.24929	17	see Pope Burr #17	948967.3	807887.67
18	-65.58914	18.24947	18	see Pope Burr #18	949071.09	807953.52
19	-65.58911	18.24948	19	see Pope Burr #19	949081.48	807957.2
20	-65.58869	18.24952	20	see Pope Burr #20	949227.14	807972.39
21	-65.58864	18.24959	21	see Pope Burr #21	949244.37	807997.89
22	-65.58832	18.24952	22	see Pope Burr #22	949355.51	807972.99
23	-65.58797	18.2498	23	hole in canopy?	949476.48	808075.22

24	-65.58955	18.24965	24	see Pope Burr #24	948928.53	808018.22
25	-65.59019	18.24983	25	see Pope Burr #25	948706.18	808082.56
26	-65.59025	18.24989	26	see Pope Burr #26	948685.26	808104.26
27	-65.59035	18.24992	27	see Pope Burr #27	948650.51	808114.99
28	-65.5904	18.24997	28	see Pope Burr #28	948633.08	808133.07
29	-65.59069	18.24997	29	see Pope Burr #29	948532.46	808132.6
30	-65.591	18.25007	30	see Pope Burr #30	948424.74	808168.42
31	-65.59124	18.25037	31	see Pope Burr #31	948340.97	808276.98
32	-65.59111	18.25074	32	see Pope Burr #32	948385.46	808411.54
33	-65.59097	18.25104	33	see Pope Burr #33	948433.53	808520.7
34	-65.59115	18.25118	34	orange drone	948370.84	808571.25
35	-65.59102	18.25125	35	see Pope Burr #35	948415.83	808596.88
36	-65.59094	18.25137	36	see Pope Burr #36	948443.39	808640.58
37	-65.59086	18.25167	37	see Pope Burr #37	948470.64	808749.65
38	-65.59072	18.25245	38	see Pope Burr #38	948517.91	809033.11
39	-65.59062	18.25189	39	see Pope Burr #39	948553.54	808829.92
40	-65.59076	18.25196	40	see Pope Burr #40	948504.85	808855.12
41	-65.5908	18.25226	41	see Pope Burr #41	948490.47	808963.99
42	-65.59073	18.25248	42	see Pope Burr #42	948514.39	809043.99
43	-65.59023	18.25287	43	see Pope Burr #43	948687.22	809186.41
44	-65.59041	18.2534	44	see Pope Burr #44	948623.88	809378.58
45	-65.59042	18.2535	45	see Pope Burr #45	948620.24	809414.88
46	-65.58889	18.25342	46	see Pope Burr #46	949151.21	809388.27
47	-65.58316	18.25274	47	hole in canopy?	951140.39	809150.54
48	-65.59902	18.25227	48	see Pope Burr #48	945638.49	808954.56
49	-65.59961	18.25319	49	see Pope Burr #49	945432.27	809287.71
50	-65.5991	18.25503	50	Trail Mark TM	945606.17	809956.67
51	-65.59837	18.25364	51	Trail Mark TM	945861.74	809453.08
52	-65.59652	18.25362	52	Trail Mark TM	946503.64	809448.75
53	-65.59556	18.2539	53	Trail Mark TM	946836.25	809551.94
54	-65.59487	18.25379	54	Trail Mark TM	947075.83	809513.1
55	-65.59453	18.25349	55	Trail Mark TM	947194.29	809404.7

56	-65.59415	18.2533	56	Trail Mark TM	947326.45	809336.31
57	-65.59415	18.25304	57	Trail Mark TM	947326.88	809241.89
58	-65.5942	18.25284	58	Trail Mark TM	947309.86	809169.19
59	-65.59417	18.25284	59	Trail Mark TM	947320.27	809169.24
60	-65.59315	18.25134	60	Trail Mark TM	947676.66	808626.17
61	-65.59288	18.25094	61	Trail Mark TM	947771.01	808481.35
62	-65.59228	18.2501	62	Trail Mark TM	947980.58	808177.27
63	-65.59137	18.249	63	Trail Mark TM	948298.15	807779.28
64	-65.58342	18.24814	64	2-ea 40mm practice	951057.94	807479.74
65	-65.58343	18.24831	65	40mm practice	951054.18	807541.45
66	-65.58334	18.24832	66	6 -ea in area, 40mm practice	951085.39	807545.23
67	-65.58342	18.24845	67	3-ea 40mm practice	951057.42	807592.31
68	-65.58338	18.2485	68	4-ea 40mm practice	951071.21	807610.53
69	-65.58332	18.24854	69	area bounded by waypoint #68	951091.96	807625.15
70	-65.58327	18.2489	70	40mm practice	951108.7	807755.96
71	-65.58335	18.24894	71	40mm practice	951080.88	807770.35
72	-65.58355	18.24963	72	2-ea 40mm practice	951010.32	808020.59
73	-65.58366	18.25037	73	where trail meets beach on east side of Pineros 3 Nov 04	950970.91	808289.13
74	-65.58515	18.25637	74	top of cliff on southeast side of Pineros 3 Nov 04	950443.85	810465.5
75	-65.58561	18.25463	75	2-ea 40mm cartridge cases, expended	950287.18	809832.92
76	-65.58464	18.24815	76	smoke grenade, expended 4 Nov 04	950634.63	807481.41
77	-65.58465	18.24826	77	flare case expended 4 Nov 04	950630.97	807521.33
78	-65.58459	18.24815	78	booby trap on wooden raised platform	950651.98	807481.49
79	-65.5848	18.24829	79	smoke grenade, expended 4 Nov 04	950578.88	807531.99
80	-65.58493	18.24834	80	smoke grenade and small arms, expended 4 Nov 04	950533.69	807549.93
81	-65.58481	18.24832	81	small arms and 40mm cartridge case expended	950575.36	807542.86
82	-65.58487	18.24845	82	small arms and 40mm cartridge case & smoke grenade expended	950554.32	807589.97
83	-65.58498	18.24846	83	2-ea smoke grenade expended	950516.14	807593.43
84	-65.58499	18.24836	84	missile cases	950512.84	807557.1
85	-65.58504	18.24839	85	smoke grenade expended	950495.44	807567.91
86	-65.58533	18.24847	86	40mm flare dud fired - unexpended	950394.69	807596.5
87	-65.58459	18.24858	87	2-ea 40mm practice	950651.25	807637.63

88	-65.58461	18.24862		88		40mm practice & 40mm flare	950644.25	807652.12
89	-65.58454	18.24865		89		2-ea 40mm practice	950668.48	807663.13
90	-65.58459	18.24868		90		unknown timer	950651.08	807673.94
91	-65.58452	18.2487		91		3-ea 40mm practice - highly corroded	950675.34	807681.32
92	-65.58444	18.24877		92		same as #86	950702.98	807706.87
93	-65.58445	18.24878		93		2-ea 40mm practice	950699.49	807710.48
94	-65.58435	18.24874		94		40mm practice	950734.25	807696.12
95	-65.5843	18.24885		95		40mm flare case expended	950751.42	807736.14
96	-65.58457	18.24799		96		3-ea M60 fuze lighters	950659.18	807423.42
97	-65.58345	18.2481		40	MM	40mm practice	951047.6	807465.16
98	-65.5994	18.25455	40MM			Suspected 40mm Training Area	945502.88	809781.9
99	-65.59103	18.25011	40MM		C	see Pope Burr, waypoint # 55	948414.26	808182.9
100	-65.58575	18.25381		8	IN	P	950239.99	809534.93
101	-65.65639	18.21751	AFWTF				925787.27	796244.66
102	-65.5883	18.25392	BASE		1		949355.08	809570.78
103	-65.57924	18.24888	BASE		2		952506.99	807755.2
104	-65.58845	18.25382	BEACH			see Pope Burr, waypoint # 56	949303.2	809534.23
105	-65.59035	18.25421	BEACH			see Pope Burr, waypoint # 57	948643.34	809672.81
106	-65.59904	18.25021	BEACH			see Pope Burr, waypoint # 58	945634.96	808206.49
107	-65.59056	18.25435	BENCH			see Pope Burr, waypoint # 59	948570.25	809723.31
108	-65.58893	18.25245	BEV		bivouac	Bivouac Area, see Pope Burr waypoint # 60	949138.96	809035.97
109	-65.58762	18.24994	BIG		bunker	Big Bunker, see Pope Burr waypoint # 61	949597.68	808126.62
110	-65.67526	18.2102	BUNDY			Camp Bundy, Roosevelt Roads	919249.92	793562.76
111	-65.58874	18.25103	BUNKER			see Pope Burr, waypoint # 62	949207.26	808520.64
112	-65.59891	18.25411	BUNKER			Bunker	945673.61	809622.89
113	-65.58941	18.25277	CLEAR			see Pope Burr, waypoint # 63	948971.89	809151.41
114	-65.58949	18.25396	CLIFF			see Pope Burr, waypoint # 64	948942.14	809583.4
115	-65.58245	18.24764	CLIFF			Cliff 1	951395.34	807299.74
116	-65.58542	18.25512	CLIFF			Cliff 2	950352.28	810011.15
117	-65.58494	18.25634	CLIFF			Cliff 3	950516.76	810454.94
118	-65.59968	18.25532	CLIFF			see Pope Burr, waypoint # 65	945404.46	810061.06
119	-65.58439	18.24784	DEMO			see Pope Burr, waypoint # 84	950721.89	807369.24

120	-65.61811	18.22885	DOCK			Boat Dock	939053	800420.28
121	-65.59055	18.25341	END	RO		see Pope Burr, waypoint # 66	948575.29	809381.99
122	-65.63583	18.33489	FAJARD			Fajardo Hotel	932736.44	838899.48
123	-65.59198	18.24982	FLARE			flare	948085.14	808076.08
124	-94.79902	38.85555	GARMIN			Garmin Waypoint	-7963745.21	9141498.69
125	-65.5911	18.25088	GRENAD			Garmin Waypoint	948388.69	808462.4
126	-1.4639	50.98288	GRMEUR			Garmin Waypoint	18328601.09	16640160.92
127	-111.94611	33.33019	GRMPHX			Garmin Waypoint	-13608425.08	8136469.13
128	121.64027	25.06178	GRMTWN			Garmin Waypoint	52905757.68	32756709.52
129	-65.58909	18.25337	LAGOON			see Pope Burr, waypoint # 67	949081.91	809369.8
130	-65.58541	18.25597	LAGOON			Lagoon	950354.32	810319.83
131	-65.59428	18.25266	MANGRO			Mangrove Boundary	947282.41	809103.7
132	-65.65719	18.33917	MARKET			Super Market	925322.4	840421.86
133	-65.59946	18.25409	MK		13	see Pope Burr, waypoint # 68	945482.82	809614.76
134	-65.59938	18.25372	MON			see Pope Burr, waypoint # 69	945511.19	809480.53
135	-65.58914	18.25186	OPEN	A		Open Area	949067.09	808821.39
136	-65.59263	18.25058	OTARGE			old target	947858.35	808351.02
137	-65.59434	18.22918	PERCA			Closest Point to Pineros from Roosevelt Roads	947300.65	800577.37
138	-65.61239	18.22827	PW			Public Works at Roosevelt Roads	941038.79	800218.53
139	-66.01033	18.43647	R	CAR		Budget Rental Car at Airport	802777.64	875354.17
140	-65.58757	18.25001	SHAPE			see Pope Burr, waypoint # 71	949614.91	808152.12
141	-65.47413	18.74144	SIGHT			**invalid waypoint**	988039.03	986804.55
142	-65.58782	18.2538	SWAMP			see Pope Burr, waypoint # 72	949521.81	809527.97
143	-65.58927	18.25285	TRAIL			see Pope Burr, waypoint # 73	949020.33	809180.68
144	-65.59881	18.25139	TRAPS			see Pope Burr, waypoint # 74	945712.81	808635.34
145	-65.57569	18.24964	TV0700			Benchmark	953737.4	808036.93
146	-65.58561	18.25664	TV0702			Benchmark	950283.8	810562.8
147	-65.59086	18.24842	TV0703			Benchmark	948476.07	807569.48
148	-65.59564	18.25614	TV0704			Benchmark	946804.77	810365.22
149	-65.57628	18.24967	TV0713			Benchmark	953532.65	808046.87
150	-65.57631	18.24967	TV0714			Benchmark	953522.24	808046.82
151	-65.58794	18.24975	TV0715			Benchmark	949486.97	808057.11

152	-65.58794	18.24975	TV0716			Benchmark	949486.97	808057.11
153	-65.63106	18.25464	TV0725			Benchmark	934518.31	809765.5
154	-65.57644	18.24753	TV0757			Benchmark	953480.77	807269.52
155	-65.57958	18.24775	TV0758			Benchmark	952390.93	807344.32
156	-65.63511	18.248	TV0807			Benchmark	933123.67	807348.19
157	-65.59085	18.24845	TVO070			Benchmark	948479.49	807580.39
158	-65.58793	18.2498	TVO071			Benchmark	949490.36	808075.29
159	-65.59881	18.25388	UNK	UX		unknown	945708.69	809539.53
160	-66.00442	18.43636	USAIR			US Air Terminal at Airport	804826.09	875318.99
161	-65.58832	18.25472	UWN			Underwater Demo Site off Pineros (south shore)	949346.8	809861.25
162	-65.58366	18.24696	UWS			Underwater Demo Site off Pineros (north shore)	950976.66	807050.86
163	-65.58936	18.25345	UXO		0	unknown UXO	948988.1	809398.41
164	-65.58879	18.25389	UXO		1	unknown UXO (see Pope Burr)	949185.12	809559.1
165	-65.58936	18.25343	UXO		3	40mm flare M583A1	948988.13	809391.15
166	-65.59105	18.25014	WASH	O		washout area	948407.28	808193.76
167	-65.58913	18.25204	WED			?, see Pope Burr, waypoint # 79	949070.25	808886.77
168	-65.59101	18.25108	Y	TRAI		Yfork in Trail, see Pope Burr, waypoint # 80	948419.58	808535.17

WAYPOINTS (POPE BURR)

	Geodetic WGS84				NAD 83, Zone 5201, State Plane, feet	
	Longitude	**Latitude**		**Descriptions**	**Easting**	**Northing**
1	-65.59914	18.25055	1	Dave Kroc's TM	945599.7	808329.79
2	-65.59932	18.25381	2	Dave Kroc's TM	945531.86	809513.31
3	-65.59934	18.25379	3	Dave Kroc's TM	945524.95	809506.01
4	-65.59919	18.25506	4	Dave Kroc's TM	945574.9	809967.42
5	-65.59974	18.25542	5	Dave Kroc's TM	945383.48	810097.28
6	-65.58918	18.2536	1	Trail Mark TM	949050.3	809453.17
7	-65.58911	18.25296	2	Trail Mark TM	949075.65	809220.88
8	-65.58924	18.25304	3	Trail Mark TM	949030.42	809249.72
9	-65.58929	18.25302	4	Trail Mark TM	949013.1	809242.38
10	-65.58929	18.25307	5	Trail Mark TM	949013.02	809260.54
11	-65.58912	18.25198	6	Trail Mark TM	949073.82	808865
12	-65.58918	18.25178	7	Trail Mark TM	949053.34	808792.28
13	-65.58919	18.2518	8	Trail Mark TM	949049.84	808799.53
14	-65.58915	18.25175	9	Trail Mark TM	949063.8	808781.43
15	-65.58909	18.25149	10	Trail Mark TM	949085.05	808687.12
16	-65.58881	18.25114	11	Trail Mark TM	949182.79	808560.47
17	-65.58829	18.25001	12	Trail Mark TM	949365.1	808150.97
18	-65.59083	18.24842	13	Benchmark	948486.48	807569.53
19	-65.59063	18.24848	14	Trail Mark TM	948555.77	807591.64
20	-65.58973	18.24909	15	Trail Mark TM	948867.02	807814.58
21	-65.58945	18.24932	16	Trail Mark TM	948963.78	807898.55
22	-65.58944	18.24929	17	Trail Mark TM	948967.3	807887.67
23	-65.58914	18.24947	18	Trail Mark TM	949071.09	807953.52
24	-65.58911	18.24948	19	Trail Mark TM	949081.48	807957.2
25	-65.58869	18.24952	20	Trail Mark TM	949227.14	807972.39
26	-65.58864	18.24959	21	Trail Mark TM	949244.37	807997.89
27	-65.58832	18.24952	22	Trail Mark TM	949355.51	807972.99

28	-65.58797	18.2498		23	Trail Mark TM	949476.48	808075.22
29	-65.58955	18.24965		24	Trail Mark TM	948928.53	808018.22
30	-65.59019	18.24983		25	Trail Mark TM	948706.18	808082.56
31	-65.59025	18.24989		26	Trail Mark TM	948685.26	808104.26
32	-65.59035	18.24992		27	Trail Mark TM	948650.51	808114.99
33	-65.5904	18.24997		28	Trail Mark TM	948633.08	808133.07
34	-65.59069	18.24997		29	Trail Mark TM	948532.46	808132.6
35	-65.591	18.25007		30	Trail Mark TM	948424.74	808168.42
36	-65.59124	18.25037		31	Trail Mark TM	948340.97	808276.98
37	-65.59111	18.25074		32	Trail Mark TM	948385.46	808411.54
38	-65.59097	18.25104		33	Trail Mark TM	948433.53	808520.7
39	-65.59115	18.25118		34	Trail Mark TM	948370.84	808571.25
40	-65.59102	18.25125		35	Orange Drone	948415.83	808596.88
41	-65.59094	18.25137		36	Trail Mark TM	948443.39	808640.58
42	-65.59086	18.25167		37	Trail Mark TM	948470.64	808749.65
43	-65.59072	18.25245		38	Trail Mark TM	948517.91	809033.11
44	-65.59062	18.25189		39	Trail Mark TM	948553.54	808829.92
45	-65.59076	18.25196		40	Trail Mark TM	948504.85	808855.12
46	-65.5908	18.25226		41	Trail Mark TM	948490.47	808963.99
47	-65.59073	18.25248		42	Trail Mark TM	948514.39	809043.99
48	-65.59023	18.25287		43	Trail Mark TM	948687.22	809186.41
49	-65.59041	18.2534		44	Trail Mark TM	948623.88	809378.58
50	-65.59042	18.2535		45	Trail Mark TM	948620.24	809414.88
51	-65.58889	18.25342		46	Trail Mark TM	949151.21	809388.27
52	-65.58316	18.25274		47	**invalid waypoint**	951140.39	809150.54
53	-65.59902	18.25227		48	Trail Mark TM	945638.49	808954.56
54	-65.59961	18.25319		49	Trail Mark TM	945432.27	809287.71
55	-65.59103	18.25011	40MM	C	40mm practice	948414.26	808182.9
56	-65.58845	18.25382	BEACH		Beach 1	949303.2	809534.23
57	-65.59035	18.25421	BEACH		Beach 2	948643.34	809672.81
58	-65.59904	18.25021	BEACH		Beach 3	945634.96	808206.49
59	-65.59056	18.25435	BENCH		Benchmark	948570.25	809723.31

60	-65.58893	18.25245	BEV			Bivouac Area	949138.96	809035.97
61	-65.58762	18.24994	BIG	BU		Big Bunker	949597.68	808126.62
62	-65.58874	18.25103	BUNKER			Bunker	949207.26	808520.64
63	-65.58941	18.25277	CLEAR			Clearing	948971.89	809151.41
64	-65.58949	18.25396	CLIFF			Cliff Edge	948942.14	809583.4
65	-65.59968	18.25532	CLIFF			Cliff Edge	945404.46	810061.06
66	-65.59055	18.25341	END	RO		End Of Road	948575.29	809381.99
67	-65.58909	18.25337	LAGOON			Lagoon	949081.91	809369.8
68	-65.59946	18.25409	MK		13	Mk13	945482.82	809614.76
69	-65.59938	18.25372	MON			?	945511.19	809480.53
70	-65.58914	18.25186	OPEN	A		Open Area	949067.09	808821.39
71	-65.58757	18.25001	SHAPE			Shape Charge Hole	949614.91	808152.12
72	-65.58782	18.2538	SWAMP			Swamp	949521.81	809527.97
73	-65.58927	18.25285	TRAIL			Trail	949020.33	809180.68
74	-65.59881	18.25139	TRAPS			Crab Traps	945712.81	808635.34
75	-65.58936	18.25345	UXO		0	Unknown UXO 0	948988.1	809398.41
76	-65.58879	18.25389	UXO		1	Unknown UXO 1	949185.12	809559.1
77	-65.58936	18.25343	UXO		3	40mm flare M583A1	948988.13	809391.15
78	-65.59105	18.25014	WASH	O		Wash Out	948407.28	808193.76
79	-65.58913	18.25204	WED			?	949070.25	808886.77
80	-65.59101	18.25108	Y	TRAI		Fork in Trail	948419.58	808535.17
81	-65.57909	18.24878		4		**invalid waypoint**	952559.2	807719.13
82	-65.57913	18.24882		5		**invalid waypoint**	952545.25	807733.59
83	-65.59937	18.25376		9		Trail Mark TM	945514.59	809495.07
84	-65.58439	18.24784	DEMO			Demo Site	950721.89	807369.24
85	-65.5994	18.25455	40MM			40mm practice	945502.88	809781.9
86	-65.58468	18.24852	40MM1			40mm practice	950620.13	807615.7
87	-65.58522	18.24857	ANTENN			Large Antenna	950432.68	807632.99
88	-65.57884	18.2476	CBS		1	Concrete Foundation	952647.94	807291.04
89	-65.57766	18.24804	CBS	TO		Concrete Foundation	953056.61	807452.73
90	-65.57916	18.24671	DOG	BE		Dog's Head Beach	952538.42	806967.34
91	-65.57623	18.24971	DOG	TO		Beacon Tower	953549.93	808061.48

92	-65.58533	18.24857	DUD1	Dud 1	950394.52	807632.81
93	-65.58409	18.24902	END	Last day End Point	950823.99	807798.21

WAYPOINTS (DAVE KROC)

	Geodetic WGS84					NAD 83, Zone 5201, State Plane, feet	
	Longitude	**Latitude**		**Descriptions**	**Picture**	**Easting**	**Northing**
1	-65.59914	18.25055	1	trail mark?		945599.7	808329.8
2	-65.59932	18.25381	2	trail mark?		945531.9	809513.3
3	-65.59934	18.25379	3	trail mark?		945525	809506
4	-65.59919	18.25506	4	trail mark?		945574.9	809967.4
5	-65.59974	18.25542	5	trail mark?		945383.5	810097.3
6	-65.58339	18.24819	6	trail mark?		951068.3	807497.9
7	-65.58343	18.24836	7	40mm practice **(same as #10)**		951054.1	807559.6
8	-65.58343	18.24836	8	40mm practice **(same as #10)**		951054.1	807559.6
9	-65.58338	18.24841	9	2-ea 2.75 inch expended rocket motors		951071.4	807577.9
10	-65.58335	18.24849	10	6-ea 40mm practice		951081.6	807606.9
11	-65.58339	18.24859	11	40mm practice		951067.6	807643.2
12	-65.58328	18.24863	12	4-ea 40mm practice		951105.7	807657.9
13	-65.58334	18.2491	13	2-ea 40mm practice		951084.1	807828.5
14	-65.58352	18.24978	14	2-ea 40mm practice		951020.5	808075.1
15	-65.58556	18.25666	15	TV0702		950301.1	810570.2
16	-65.58357	18.24795	16	40mm practice		951006.2	807410.5
17	-65.58933	18.25337	17	new location of dud fired grenade, up 1st days trail on right behind tree in milk carton		948998.6	809369.4
18	-65.5852	18.24857	18	antenna	PB040013	950439.6	807633
19	-65.58446	18.24872	19	trail mark?		950696.1	807688.7

WAYPOINTS (ZACK HOZACK)

	Geodetic WGS84				NAD 83, Zone 5201, State Plane, feet	
	Longitude	**Latitude**		**Descriptions**	**Easting**	**Northing**
1	-65.58796	18.24977	4	TV0715	949480	808064.34
2	-65.58927	18.24932	5	same as #6	949026.2	807898.84
3	-65.58928	18.24931	6	trail mark?	949022.8	807895.19
4	-65.58958	18.24966	7	trail mark?	948918.1	808021.81
5	-65.59036	18.24989	8	trail mark?	948647.1	808104.08
6	-65.59122	18.25097	9	same as #10	948346.9	808494.89
7	-65.59122	18.25096	10	trail mark?	948346.9	808491.25
8	-65.59107	18.25091	11	trail mark?	948399.1	808473.34
9	-65.59126	18.25122	12	orange drone	948332.6	808585.6
10	-65.5904	18.25145	13	orange drone (same as 12)	948630.6	808670.5
11	-65.59102	18.25113	14	trail mark?	948416	808553.31
12	-65.59071	18.25195	15	trail mark?	948522.2	808851.57
13	-65.58949	18.25263	16	trail mark?	948944.4	809100.44
14	-65.5906	18.25258	17	trail mark?	948559.3	809080.51
15	-65.59062	18.25256	18	trail mark?	948552.4	809073.22
16	-65.59021	18.25285	19	bunker 2	948694.2	809179.18
17	-65.5904	18.25409	21	trail mark?	948626.2	809629.15
18	-65.58871	18.25366	22	dud percussion grenade MK8A2	949213.3	809475.71
19	-65.56618	18.19791	23	40mm practice **(invalid point)**	957125.9	789267.92
20	-65.56618	18.19791	24	**(invalid point)**	957125.9	789267.92
21	-65.57951	18.26559	25	40mm practice **(invalid point)**	952385	813822.64
22	-65.53081	18.2526	26	2-ea 40mm practice **(invalid point)**	969303.6	809186.63
23	-65.57507	18.26435	27	2-ea 40mm practice **(invalid point)**	953927.5	813379.56
24	-65.58557	18.25667	28	benchmark TV0702	950297.6	810573.76