



ISLAND CONSERVATION

Preventing Extinctions

## **DRAFT** Fall Field Trial Plan

**November 26-December 17, 2012**

**on the Farallon National Wildlife Refuge**



***Trial Plan for U.S. Fish and Wildlife Service  
Farallon National Wildlife Refuge  
San Francisco Bay Refuge Complex***

***Prepared by***

***Madeleine Pott and Dan Grout  
Island Conservation  
100 Shaffer Road, Santa Cruz, CA 95060***

***September 21, 2012***

## Farallon National Wildlife Refuge Field Trial: November-December 2012

### Objectives:

- Monitoring:
  - Establish roosting gull numbers on South Farallones prior to and after hazing efforts
  - Assess the relative success of various avian hazing techniques by comparing pre-trial gull densities to gull densities seen during and after hazing operations
  - Assess the efficacy of various hazing efforts in the presence of hand-broadcasted bait
  - Monitor and document the effects of avian hazing operations on marine mammals
- Hazing:
  - Haze a maximum number of gulls from Southeast Farallon, West End Island, and offshore islets using some or all of the following techniques:
    - Human movements
    - Effigies
    - Gas exploder or “Zon”
    - Biosonics (Bird Gard, Long Range Acoustic Device—LRAD)
    - Lasers
    - Spotlights
    - Pyrotechnics
    - Helicopter
    - Kites
    - Mylar
    - As staff and funds allow: trained dogs, from a boat, and either government and/or civilian-owned remote-controlled aircraft (UAVS)
  - Document where and to what extent successful clearing of loafing gulls can be achieved and which islands/locations serve as effective retreat zones for gulls; map these areas and monitor the number of gulls there.
  - Determine the effective ranges of techniques or a combination of techniques on gulls and at what distances they cause disturbances to marine mammals
  - Gauge how quickly gulls may habituate to the different hazing techniques
  - Track the personnel hours required to effectively haze gulls in order to inform an operational plan
  - Determine equipment, supply and staff time required to effectively haze gulls off the islands to inform an operational plan
- Bait trials:
  - Perform a bait availability study to determine the uptake rates and availability of Diphacinone bait on the Marine Terrace
  - Establish and monitor bait degradation cages for placebo pellets for registered Diphacinone and Brodifacoum bait.
  - Determine the feasibility of hazing gulls off areas where placebo bait pellets have broadcast into the terrestrial environment

## OVERVIEW

### TIMING

The trial is scheduled to run from November 26, 2012-December 17, 2012. Some gear and supplies may be sent out to the island prior to the trial in Late October –early November either via chartered vessel, USCG helicopter, or on a PRBO patrol boat. It is also possible that a small strike team will be sent out earlier than Nov. 26 to prepare for the arrival of the hazing team (either on a PRBO patrol boat or a chartered vessel).

### TRANSPORTATION

Most personnel and equipment will be transported to the island via a chartered vessel at the beginning of the trial. A personnel change-over will be supported by an additional boat charter or by utilizing scheduled tour-charter vessels.

### LOGISTICS

Some gear and supplies will be sent out prior to the trial on other boats (USFWS or PRBO patrol boats, chartered vessel) as possible. Personnel will meet in a pre-determined location on the mainland, either close to Sausalito or Emeryville on the afternoon/evening of Sunday November 25 and spend the night in hotels, with a departure from the dock at sunrise on Monday, Nov. 26, weather conditions permitting.

### STAFFING

Staffing for the hazing trial will be provided primarily by the core Farallon Restoration Project Partners (Island Conservation, USFWS, and PRBO). Supplemental expert staff will come from Oiled Wildlife Care Network and USDA-APHIS. Each of these entities will provide two personnel weeks (two personnel for one week each). A tentative personnel schedule can be found in Appendix 1. The Incident Command Structure to be used during the trial can be found in Appendix 2 of the plan. It is anticipated that personnel will be working 12-14 hour days, as needed, to completely haze gulls off the islands. Some pre-dawn and post-dusk hazing may be needed. It is likely that dawn and dusk will be the busiest times for hazing, with less intensive hazing being required at night and during mid-day.

A number of personnel whom we hope to engage for the trial have yet to be contacted, including potential dog handlers, personnel who work at local landfills, and David Riensche (East Bay Regional Park District). It is hoped that some these individuals can contribute some time to the hazing trial: either by reviewing the plan, participating in hazing activities, or loaning equipment/supplies.

To maximize the efficacy of the hazing, An Incident Command Structure (ICS) will be utilized during the duration of the trial (a Draft ICS chart will be attached to the Plan in a subsequent draft).

- A Hazing Coordinator whose sole role is to coordinate island-wide hazing activities and communicate with monitoring personnel to signal to hazers when disturbance to marine mammals is caused. The Hazing Coordinator will also coordinate with the PRBO staff lead that is not directly involved in the monitoring or hazing activities
- A minimum of four hazers who have no other responsibility but to police their sectors of the islands

- Minimum of two personnel capable of using pyrotechnic devices (ATF permitted) such as bird bombs, cracker shells, and CAPA launchers—one for each island. Ideally there should be four such personnel.
- Minimum of three monitoring personnel during daylight hours (one for West End, two for Southeast Farallon)—four would be ideal as they can match up to individuals hazers

According to the schedule, as many as eleven people would be brought onto the island for the express purposes of the hazing trial, and would be housed for the most part in the USFWS/USCG house, with one or two in the PRBO house, as space permits.

## BRIEFINGS AND TRAINING

During the boat transfer to the islands, briefings will be conducted for safety, biosecurity, natural resource protection, communication, and orientation to the Incident Command Structure. Immediately upon arrival at the island, a circumnavigation of the islands will be conducted to orientate the hazing crew to the islands' geography and place names. Upon transfer of crew and equipment to the island, a team meeting will be held and an on-island orientation will occur. Training sessions will commence on the afternoon of the first (Day I) and will likely continue onto the following day (Day II).

## PERMITS

An Incidental Harassment Permit (and Section 7 Consultation) for Level B harassment of marine mammals from NOAA is currently in process. The application was published in the Federal Register on August 27<sup>th</sup>. The last day for public comment is September 26<sup>th</sup>, 2012, and an IHA will be issued in October. The result of this application will dictate what degree of disturbance to marine mammals will be tolerated and thus, which hazing activities will be permitted and how frequently marine mammals may be incidentally harassed.

A Wilderness Determination will need to be obtained in order to use the Wilderness Area on West End Island. Use of these areas might include on-the-ground hazing as well as aerial harassment and monitoring.

All personnel intending to use any pyrotechnic device other than whistlers will need to be permitted by the Bureau of Alcohol, Tobacco, and Firearms. Island Conservation is currently applying for a user permit, hoping to receive the permit in time for the trial.

Finally, a Special Use Permit for all hazing activities will need to be issued by the USFWS manager of Farallon NWR, as well as an Overflight Permit from the GSNM Sanctuary.

Any monitoring conducted using an unmanned aerial vehicle (UAV) will need to obtain a Certificate of Authorization (COA) from the FAA. At present, permits are being sought to allow for the use of NASA Ames UAVs in December 2012, and/or UAVs from the USGS Rocky Mountain Science Center in March 2013 to determine the use of these vehicles in the monitoring of gulls and marine mammals. The USGS permitting process requires at least 135 business days (45 days for Spectrum Request approval from the Army, 90 days for COA approval).

## BACKGROUND INFORMATION

The vast majority of information available on gull hazing methods comes from those individuals and groups attempting to haze gulls from airfields, agriculture, aquaculture and landfill facilities, and chemical hazard sites. There are a wide range of techniques available, including lethal and nonlethal methods, those requiring substantial manpower and those requiring relatively little. For succinct descriptions of advantages and disadvantages of these techniques, see: Gorenzel & Salmon 2008 and Harris & Davis 1998.

There are many cases where the greatest efficacy in hazing gulls is achieved through integrating a number of methods into the hazing program. Harris and Davis (1998), in their report to the Canadian Government, list pyrotechnics, falconry, distress and alarm calls, and shooting (lethal removal) as key components of any effective hazing program, citing the use of effigies as a possible supplementary technique. The use of multiple audible and non/lethal techniques were more effective than multiple visual deterrents such as mylar & balloons (Cook et al. 2008). On-demand systems or those systems responsive to changes in animal behavior, as opposed to continuous or randomly activated systems, were also found to be most effective in dispersing problem birds (Ronconi and St. Clair 2006).

### Lasers & lights

Lasers are concentrated light beams used in low lighting conditions to disperse or deter roosting & feeding birds. They remain one of the most effective tools for dispersing birds at night, when most other techniques are ineffective. Lasers emit either green or red light and are highly portable (Gorenzel and Salmon 2008). Lasers are not effective on all bird species, but there is considerable evidence that lasers can be used to effectively deter gulls (Blackwell et al. 2002, Baxter 2007). All-night control of gulls at a reservoir found that lasers could be used to disperse a population of 5,000 gulls, with no individuals remaining at daybreak. Researchers also observed an additive effect, whereby fewer and fewer gulls attempted to return to roost once hazing had begun. No habituation to the laser was seen for the duration of the 26-day trial and gull response to the laser was always immediate (Baxter 2007).

A study conducted on geese reduced use of the treated area by 34-93%, but prior use of the laser did not deter geese from using the treated area during the daytime. Researchers suggested that geese which were most responsive (populations which saw greatest reductions) were those exposed to little human disturbance and accustomed to very little ambient light during the night (Sherman and Barras 2004). There has been some use of moving spotlights or beacons to disperse or deter birds. In one instance, the intermittent use of a spotlight to deter waterfowl from contaminated bodies of water cut the number of birds using ponds by 90% and reduced bird mortality to less than one-third of that recorded the previous year. During the second year of operation, the beacon further reduced bird mortality to one-sixth of that seen during the first year (Read 1999). Gorenzel & Salmon (2008) also recommend the use of spotlights or strobes, though they suggest that efficacy is variable and other methods may need to be used to supplement spotlight use.

### Biosonics (Bird Gard & LRAD)

Biosonics, or bioacoustics, as a hazing method, involves using animal alarm or distress calls to alter the behavior or behavioral patterns of target species, typically causing them to vacate or avoid an area. The vocalizations used are usually those emitted by a predator of the target species or the alarm or distress call of the target species (or a closely related species). Vocalizations are typically broadcast from commercially available units or can be assembled from their component parts. (Gorenzel and Salmon 2008). Biosonics have often been used to haze a variety of seabirds at locations such as: landfills, in



association with airfields, at aquaculture facilities, and contaminated ponds (Gosler et al. 1995, Mott and Boyd 1995, Stevens et al. 2000, Cook et al. 2008).

The efficacy of biosonics has been found to be highly variable from one situation to the next. In studies specifically concerned with gulls, the numbers of gulls are typically reduced significantly within the first few weeks (Gosler et al. 1995, Baxter et al. 1999, Baxter 2000). Stout et al. (1975) found that distress calls were more effective at dispersing gulls than alarm, mew, trumpet, or choke type calls. In one study at a UK landfill where distress calls were the only method used, the numbers of gulls observed was reduced by 66-83% (Baxter 2000). Gosler (1995) observed that distress calls can be effective at dispersing and deterring gulls from returning, if there are alternate sites available to these individuals. Habituation to this method has been observed in a number of gull species and starts within one to four weeks of initiating hazing by this method (Baxter 2000, 2001, Soldatini et al. 2008).

When using distress calls, Gorenzel & Salmon (2008) recommend using distress calls from the target species, preferably from individuals inhabiting the same region as target individuals. Montoney & Boggs (1995) found that Laughing Gulls (*Leucophaeus atricilla*) are responsive to the distress calls of other species, although Baxter (1999) found conspecific bird calls to be significantly more effective than congeneric calls in dispersing birds. Interviews conducted by Harris & Davis (1998) indicated that distress calls enhanced by the use of pyrotechnics were more effective than calls alone. There has been only limited research into the effect of predator calls on target species. Harris & Davis (1998) reported that Gunn (1973) found gulls to be responsive to Peregrine Falcon calls.

### Effigies

Typically, human effigies or models (scarecrows) or predator models are recommended as a bird hazing technique (Curtis et al. 1996, Gorenzel and Salmon 2008). However, the use of dead bird effigies (gulls and vultures) has been shown to be effective in scaring birds (Stout et al. 1975, Seamans 2004). Stout et al. (1975) conducted a comprehensive study which found that effigies positioned on their sides (with wings folded) or effigies with wings outstretched elicited the greatest response from gulls. Taxidermy gulls were more effective at dispersing gulls than other imitation (fiberglass molded & partial taxidermy mounts) models, but these specimens often deteriorated in wet weather. They also showed that the greatest effect was seen in groups of gulls exposed to both effigies and distress calls, with no habituation in individuals. In the presence of food, however, gulls resisted dispersal. The combination of distress calls and effigies was the most effective method when food was available, yet still not successful in completely dispersing birds. Stout & Schwab (1979) found that by using very life-like models of Ring-billed Gulls (*Larus delawarensis*), Herring Gulls (*Larus argentatus*), and Laughing Gulls, that they were able to reduce the number of loafing gulls by 80% in a popular loafing area. In another study, effigies placed in loafing areas achieved similar results (gulls retreated to alternative sites), whereas effigies placed in areas of nesting or food sources had little effect (Seamans et al. 2007). Habituation to this technique was seen after as little as four weeks and as long as eight months after deploying effigies (Stout and Schwab 1979, Seamans et al. 2007).

### Mylar tape

Mylar flags or tape have frequently been prescribed as a stimulus used to deter birds from cropland or contaminated areas (Littauer 1990, Gorenzel and Salmon 2008). Mylar is a reflective plastic ribbon with one side colored either red or yellow. It is often tied to poles or suspended from overhanging lines, where its motion in the wind creates a humming or crackling sound and it reflects sunlight. It has been shown to be of variable efficacy in preventing passerines from feeding on food crops (Gilsdorf et al.

2002). Belant & Ickes (1997) conducted an experiment on Herring Gulls and showed that mylar was 50% effective in reducing the number of gulls using loafing areas, but was totally ineffective in deterring populations of nesting birds.

### Pyrotechnics

Pyrotechnics describe a wide variety of tools which can be used to non-lethally haze birds. Pyrotechnics are primarily an auditory stimulus, creating a loud bang or report, but many charges also produce bright flashes or spiraling light. Pyrotechnic charges are fired from a handheld pistol-style or shotgun-style launcher (Gorenzel and Salmon 2008). Pyrotechnics are used by a majority of airport control programs throughout North America (Harris and Davis 1998). When trialed individually against other techniques (taste deterrents sprayed on refuse) at a landfill, pyrotechnics were effective at reducing the number of foraging gulls from 2,000-2,500 gulls to between 40-50 gulls (Curtis et al. 1995). A study at another landfill in Denver, CO reflected similar findings of 90-95% reduction in gulls—sometimes 100% (Barnes et al. 1999). Habituation to this method can occur, if pyrotechnics are not used sparingly to disperse groups of gulls (Harris and Davis 1998). Some of the frequently cited advantages to this method are: relatively low cost, highly portable, and simple to execute (Curtis et al. 1995, Harris and Davis 1998, Gorenzel and Salmon 2008).

### Trained Dogs

Trained dogs—typically border collies—are commonly used to haze or “run off” problem birds (including gulls and geese) from urban areas such as golf courses, often achieving 100% hazing success in treated areas (Castelli and Sleggs 2000, Holevinski et al. 2007). Outside of the urban environment, border collies have been used to a limited degree at air force installations. At airfields (with mixed bird species, including some gulls), clearance rates ranged from 40% to 99.9% within a 2 kilometer radius (Carter 1999, Patterson 2000). In another instance, a 57% reduction in bird strikes was observed at an airfield (Froneman and van Rooyen 2003). It was noted, however, that as soon as dogs were removed from a treated area, birds returned, even over the course of just a weekend (Carter 1999). The success of border collie programs are largely dependent upon skilled handlers and properly trained dogs (Froneman and van Rooyen 2003). Carter (1999) suggests that a single dog and handler can maintain an area of 50 square kilometers (usually runways, and thus flat ground) free of unwanted animals. Collies are not bred or trained to harm wildlife and can be used to safely disperse birds or mammals.

### Kites/balloons

Kites in the shape of predators or painted with predators have been used in the past to deter birds from feeding at aquaculture and agriculture facilities. These stimuli typically take the form of a traditional kite or consist of a kite held aloft by a Helium-filled balloon—a Helikite® (Harris and Davis 1998). The unpredictable movement of a kite in the wind serves to slow the habituation of gulls to this method, while not disturbing marine mammals. There has been limited research conducted to fully evaluate this technique, but one study indicated that the use of Helikites® had no effect on gulls persisting at a landfill site (Baxter 2001). A report to Transport Canada indicated that the usefulness of kites “is limited by habituation [and] are recommended only for situations where short-term and local control is sufficient” (Harris and Davis 1998).

### Radio-controlled Aircraft

Radio-controlled or ultralite aircraft—often painted with or in the form of a raptor—can also be used to haze birds (Harris and Davis 1998, Gorenzel and Salmon 2008). In one study conducted on geese, 25% of geese were dispersed on the first day, with each day seeing fewer and fewer animals. By the fifth day, 100% of geese had been dispersed. Geese remained absent for ten days, at which point goose

numbers returned to pretreatment levels (Fairaizl 1992). In studies involving gulls, Carter (2000) found radio-controlled aircraft to be “highly effective” against loafing gulls and “partially effective” at deterring gulls from feeding on earthworms on the runways of an airfield. In tests against soaring raptors, a balsa wood aircraft with a 6-foot wingspan, weighing 5 pounds, could travel at speeds of 75-100 miles per hour and target specific problem birds (Loud 2000). Littauer (1990) suggested that one operator and one plane could effectively cover 200 to 300 acres.

#### Gas exploder or “Zon”

Gas exploders, also called propane cannons or “Zon guns,” produce a loud, directional blast similar to that emitted by a cracker shell from a 12-gauge shotgun (D. Milsaps, pers. Comm.). They are easily and readily moved, can be automated and used with an on/off timer, firing either regularly or randomly. Some models can also be placed on a stand and programmed to rotate after each blast (Gorenzel and Salmon 2008). Unless zons are moved frequently and blasts randomly fired, gulls readily habituate to this method, often within a few days (Harris and Davis 1998). Hazing with zons has been found to have an effect, but a study by Washburn et al. (2006) indicated that zons did not significantly alter gull behavior at an airport, even when reinforced with lethal control methods.

## **METHODS**

### **SCOPE**

Hazing and monitoring personnel will need access to the greatest extent of the South Farallon islands, including West End Island. Personnel may require access to other such areas as: Fertilizer flat and Shell Beach. If IHA restrictions prevent gull hazing activities for 2 weeks in all areas, some specified areas with listed or sensitive marine mammals may be excluded from the full 2 weeks hazing operation. Saddle Rock and other small islets might be designated as roosting refugia if adaptive management requires it.

### **MONITORING**

Monitoring of gulls and marina mammals will take place by personnel on foot, from the air during daily crepuscular helicopter flights, and by using the Cal-Academy web-camera, if possible.

#### *Gulls*

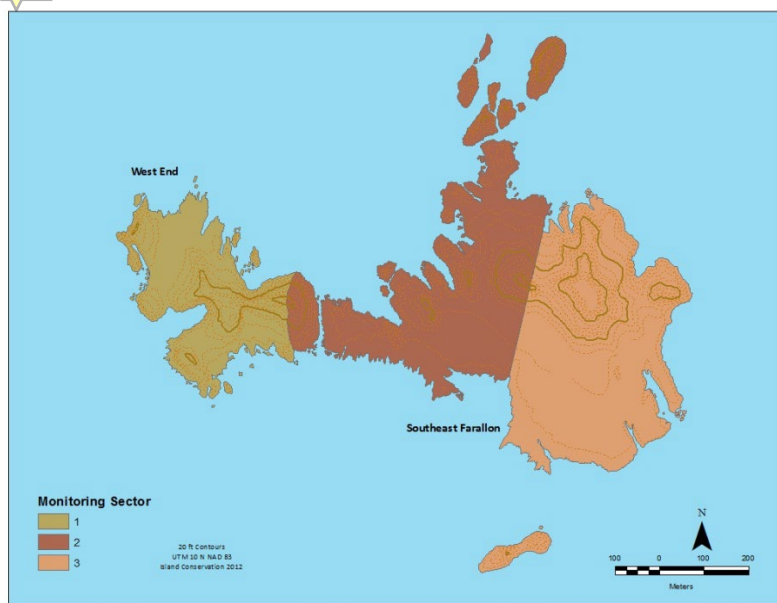
The entirety of the South Farallones will be monitored and mapped four times per day for gull presence and numbers. It is anticipated that these gull surveys will take place in the morning (0800), mid-morning (1000), in the afternoon (1400), and the evening (1600).

Monitoring the two islands will require at least three individuals: one person on WEI and two personnel at the Lighthouse (Figure 1).

- The person monitoring WEI will monitor Shell Beach, Pelican Bowl, Indian Head Beach, and Raven’s Cliff Beach
- The person responsible for monitoring Aulon & below Maintop will monitor the Weather Service peninsula/Jordan Channel, Aulon Peninsula, and Mirounga Beach, and Corm Blind Hill
- The person responsible for monitoring the southeastern portion of SEFI will monitor Garbage Gulch, Mussel Flat, Pigeon Point Cove, Blowhole Cove & Peninsula, below Shubrick Point, and Fertilizer Flat



**Figure 1.** Proposed monitoring sectors for gull and marine mammal activity on the Farallon NWR during the 2012 Fall Field



The division of labor amongst these monitors will likely vary based on gull movements and gull concentrations. The helicopter will be used to support the monitoring of gull roosts and congregation sites, specifically areas identified as “blind spots” which are not easily surveyed from southeast Farallon or West End (Figure 2). The helicopter will mainly be used to survey these blind spots in the morning and evenings, but should flights not be possible, ground teams will attempt to document gulls at these locations.

**Figure 2.** A map of areas subject to aerial monitoring by helicopter (in black), which have been identified as “blind spots” for surveying from Southeast Farallon.

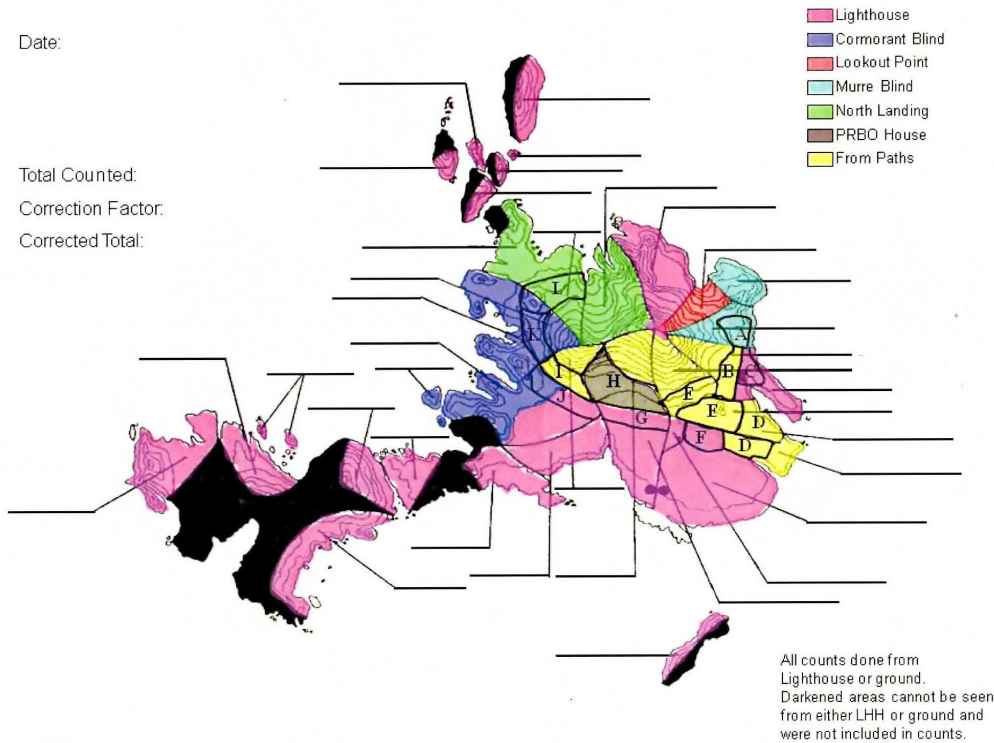
### Western Gull Census

Date:

Total Counted:

Correction Factor:

Corrected Total:



Protocols will be developed by PRBO to support proper documentation of gull numbers and retreat sites prior to and during hazing operations, as well as up to seven days after the cessation of hazing activities. These data will be collected by PRBO and USFWS staff who are well-versed in quantifying gulls.

### *Marine Mammals*

While hazing operations are taking place, PRBO staff will take the lead in documenting harassment or disturbance caused by hazing activities as required by the Section 7 IHA permit and granting agency requirements. PRBO and USFWS staff have prior experience in counting and documenting disturbances to the marine mammal populations and PRBO will develop the protocols and training necessary for other field staff to conduct the monitoring of their areas.

The three personnel (four, as staffing permits) responsible for monitoring gulls will also be responsible for documenting disturbance to marine mammals in the areas which they have been assigned. The helicopter may also be used to support the monitoring of marine mammals during over-flights of the island.

\*\* I foresee the following problem: if we are required to report decibel levels, we would need monitors down on the ground next to MM. But this also means that we won't be able to keep an eye on all the MM.... \*\*

## PRE-HAZING ACTIVITIES

For a general schedule of on-island activities, refer to Appendix 3.

### *Initial Monitoring*

On Day II, the entire island will be surveyed to map the presence and number of gulls and marine mammals, and any other sensitive resources present. Following these initial surveys, a hot debrief of the entire Trail Team will occur, and then the Incident Advisory Group (IAG) will meet to review and revise and add details to the hazing plan, monitoring plan and baiting plan. Hazing Team, Monitoring Team and Baiting Team assignments and individual daily work assignments will be made and tentative schedules for the week will be made at that time.

## HAZING

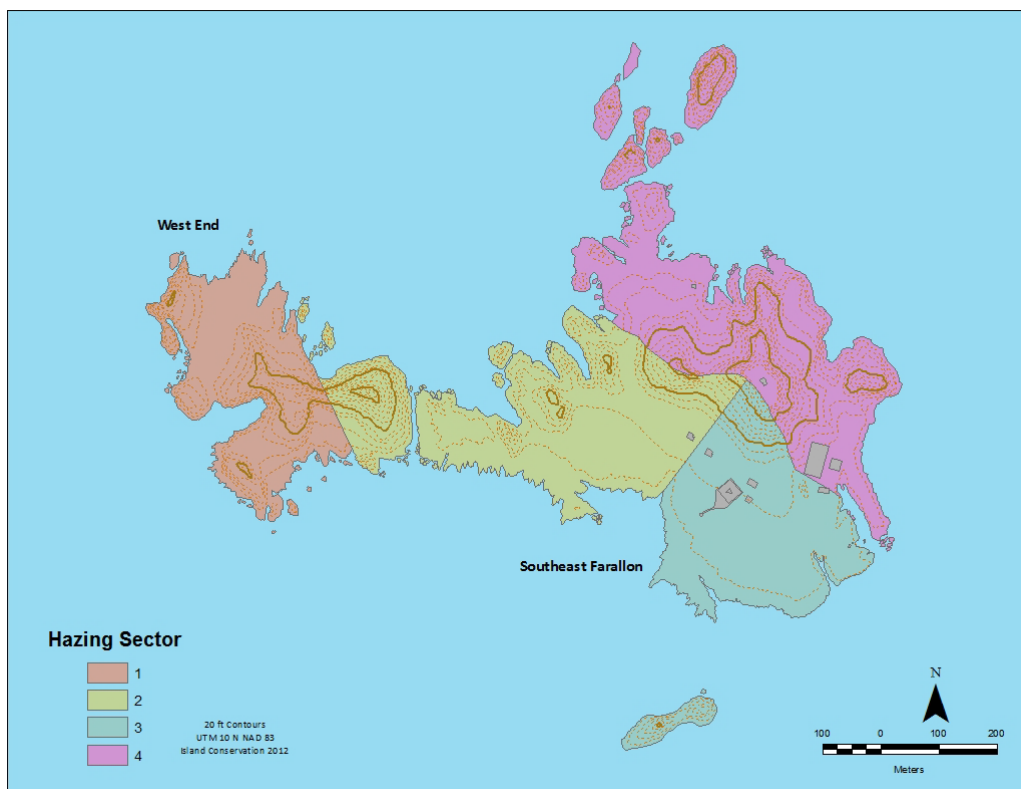
### *Sectioning*

Each of four Hazing Assistants will be stationed at and assigned one hazing sector as follows:

- Ground: West End Island—western portion
- Ground: Maintop, Weather Service Peninsula, Mirounga Beach (Aulon Peninsula)
- Ground: Mussel Flat and Helopad (Cistern, Catchment Pad, Blowhole Peninsula)
- Lighthouse: North Landing, Aulon Peninsula, Northern islets, Catchment Pad, Cistern, Blowhole Peninsula, Fertilizer Flat

See Figure 3 for a map of these sectors. Areas in parentheses indicate potential areas of overlap which might be better divided up between team members as the trial progresses and personnel learn where gulls retreat to and personnel try to manage the sector allotted to them.

**Figure 3.** A map of proposed hazing sectors on Farallon NWR.



Personnel responsible for sector hazing will ostensibly “police” their sector, working to keep a maximum of gulls off their sector for the duration of the operation. Hazers and the hazing coordinator will work in conjunction with monitors to ensure that a) they are not disturbing marine mammals, or, b) in the instance that marine mammals are disturbed, these harassment incidents are documented, and distances from the hazing activity are recorded. Monitors can help act as “eyes in the sky” for on-the-ground hazers. Hazers will also be responsible for tracking the amount of effort and the number of supplies used while carrying out hazing activities.

### *Sequencing*

The initial Hazing to occur will focus primarily on gently moving any marine mammals away from areas that might require significant gull hazing, so as to avoid any injuries to pinnipeds as result of the initial gull hazing measures, and to allow the team to place any automated equipment into areas where marine mammals may occur.

The sequence of techniques has been chosen with an eye to quickly clearing the majority of WEI and SEFI within the first few days using some of the more passive techniques and then moving on to more aggressive hazing tools once the team has pushed the gulls into peripheral areas or “pockets.”

Hazing will begin on Day III (see Tables 1 and 2 for Hazing Gantt chart for each of SEFI and WEI). At the beginning of the trial, dawn and dusk hazing (between the hours of 6.15 and 7.30) sessions will consist of the use of lasers and spotlights as well as human activity. As gulls habituate to these methods—or retreat to less accessible locations—the use of pyrotechnics will be introduced into the suite of hazing techniques. It is anticipated that the hazing team will have to resort to pyrotechnics at dawn and dusk

within five to six days of beginning the trial. Pyrotechnics will be used by each hazer within their assigned sector, no closer than **XXXX** meters from nearby marine mammals.

On Day III, after hazing gulls off the island during the dawn session using lasers and spotlights, a concerted effort will be made across both islands to encourage marine mammals to move away from loafing areas. Personnel will move slowly, low to the ground, attempting to herd marine mammals gently into the water. Once areas have been cleared of marine mammals, several passive hazing methods will be installed across the islands (See Figure 4). It is hoped that these tools will discourage marine mammals from returning to their loafing sites, thus minimizing the disturbance to the marine mammals. The islands will primarily have effigies, Zons, and kites installed in an effort to keep gulls off the island during the daytime. Within one to two days, habituation is anticipated, at which point a helicopter will be used to haze gulls during the early morning and late afternoon hours. A helicopter will be used for several days to haze gulls over SEFI. The next tool brought into play will be the Bird Gard, playing a selection of predator and Western Gull distress calls. As habituation to this and other methods occurs, the hazing team will resort to pyrotechnics to target problem gulls during the **daytime**.

With daytime hazing tools in place, daytime hazing activities will largely involve personnel walking around and inspecting loafing sites, checking on the condition of hazing tools (batteries still running, kites still intact, etc.), and moving/adjusting tools as needed. In the early stages of the trial, any large groups of gulls found loafing should be dispersed through human movement and voice. Later in the trial, hazers may resort to pyrotechnics (**depending** on the proximity of marine mammals).

**Dusk** hazing (between the hours of 16.30 and 17.45) will again consist of the use of lasers and spotlights in an effort to prevent gulls from accessing nighttime roost sites. Pyrotechnics will be introduced once lasers and spotlights prove ineffective in preventing gulls from coming in to roost at night.

Hazers will also take part in nighttime patrols on southeast Farallon to ensure that gulls have not returned to roosts since nightfall. These patrols will take place between the hours of 20.00 and 22.00. Personnel would not need to patrol for the full two hours, but simply walk the perimeter of the island, ensuring that primary roost sites are clear of gulls, hazing individuals with lasers or spotlights as needed.

It is anticipated that as the trial progresses, large areas of SEFI and WEI will be cleared of gulls. The more difficult challenge will likely lie in targeting “hard to reach” places which gulls retreat to. These will probably be ledges and areas which remain unaffected by passive methods and which even pyrotechnics and lasers impact in only a limited fashion. These challenges will require that hazing personnel remain flexible and coordinate closely with other hazers so as to target these pockets of gulls.

A preliminary list of hazing equipment needed for the trial and approximate costs can be found in Appendix **5**.



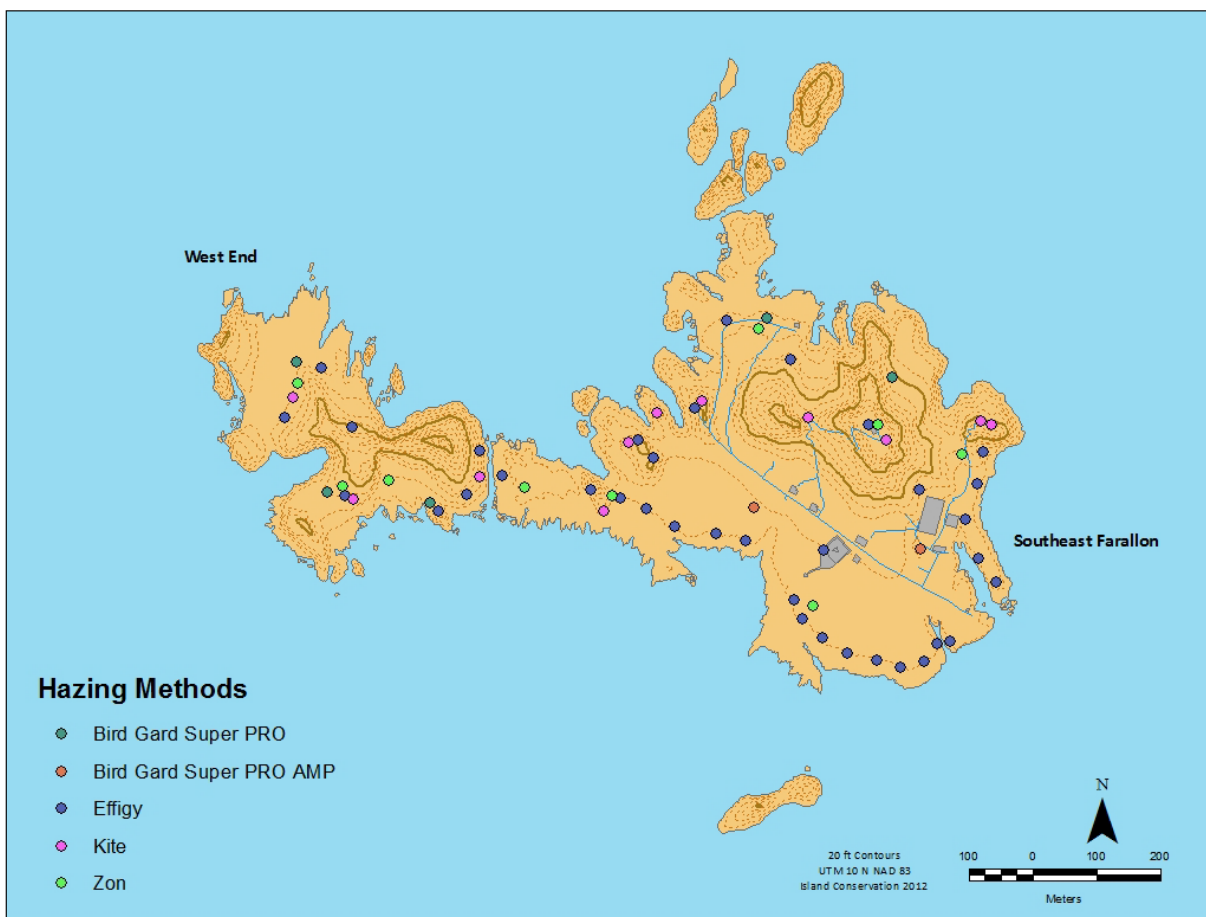
**Table 1.** Sequencing of hazing tools across Southeast Farallon.

Trial Day	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
Dawn 6h-8:30h	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans
	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers
	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights
							Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v
Daytime 10h-16h	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans
	Effigies	Effigies	Effigies	Effigies	Effigies	Effigies	Effigies	Effigies	Effigies	Effigies	Effigies	Effigies	Effigies	Effigies
	Zon	Zon	Zon	Zon	Zon	Zon	Bird Gards	Bird Gards	Bird Gards	Bird Gards	Bird Gards	Bird Gards	Bird Gards	Bird Gards
	Kites	Kites	Kites	Kites	Kites	Kites	Kites	Kites	Kites	Kites	Kites	Kites	Kites	Kites
					Bird Gards (Mylar)	Bird Gards (Mylar)	Zon (Mylar)	Zon (Mylar)	Zon (Mylar)	Zon (Mylar)	Zon (Mylar)	Zon (Mylar)	Zon (Mylar)	Zon (Mylar)
			Helicopter	Helicopter	Helicopter	Helicopter	Helicopter	Helicopter						
Dusk 16:30h-18h	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans
	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers
	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights
							Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v
Night 20h-22h	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans
	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers
	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights

Table 2. Sequencing of hazing tools across West End.

Trial Day	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
Dawn 6h-8:30h	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans
	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers
	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights
							Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v
Daytime 10h-16h	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans
	Effigies	Effigies	Effigies	Effigies	Effigies	Effigies	Effigies	Effigies	Effigies	Effigies	Effigies	Effigies	Effigies	Effigies
	Zon	Zon	Zon	Zon	Zon	Zon	Zon	Zon	Zon	Zon	Zon	Zon	Zon	Zon
					Bird Gards	Bird Gards	Bird Gards	Bird Gards	Bird Gards	Bird Gards	Bird Gards	Bird Gards	Bird Gards	Bird Gards
					Kites	Kites	Kites	Kites	Kites	Kites	Kites	Kites	Kites	Kites
					(Mylar)	(Mylar)	(Mylar)	(Mylar)	(Mylar)	(Mylar)	(Mylar)	(Mylar)	(Mylar)	(Mylar)
			Helicopter	Helicopter	Helicopter	Helicopter	Helicopter	Helicopter	Helicopter					
Dusk 16:30h-18h	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans	Humans
	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers	Lasers
	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights	Spotlights
							Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v	Pyros: a/v

**Figure 4.** A map of proposed deployment locations for several different hazing methods.



#### *Additional hazing methods*

**By boat** On those days where a vessel has been chartered to come out to the island, monitoring personnel and at least one hazer will be transported to the vessel for a trip around the island. The monitor will record any congregations of gulls which cannot be seen from the island as well as the effects of hazing from the boat. The hazer will use pyrotechnic devices to flush any gulls detected on these areas, especially offshore and northern islets, and the backside of the Great Arch.

**Trained Dogs** If possible, an experienced dog handler and trained dog will come out to the Farallones in an effort to test trained dogs as a dispersal method and learn about how this method might be useful in an eradication. Ideally, a trained dog would be used to haze the large gull roosts on SEFI (Mussel Flats, Mirounga Beach) early on in the trial. The dogs would be used to disperse groups of gulls congregating on the Marine Terrace, North Landing, and around the catchment pad and cistern. Dogs might become increasingly less useful as gulls retreat to only the most inaccessible locations. Should dogs be brought out the island, appropriate housing and containment will need to be provided for the dog.

If it is not possible to get a trained dog out to the island, there could be great value in an experienced handler travelling out to the island for a site visit. This site visit could either coincide with other hazing activities so that they can learn more about currently proposed methods, or at an earlier date (depending on available transport).

## BAIT TRIALS

Two placebo (non-toxic) versions of the two registered bait pellets will be tested during the trial:

- ~1.1g (3/8" diameter) Bell Laboratories, Inc. Conservation Dry Formulation pellet (25D)
- ~1 g Hacco, Inc. Ramik Green® pellet (D50)

Both products are designed to mimic exactly the toxic forms of these bait products. Both products will also be infused with the non-toxic biomarker 0.2% pyranine (also known as Solvent Green 7). The presence of this biomarker can be detected with an ultraviolet light.

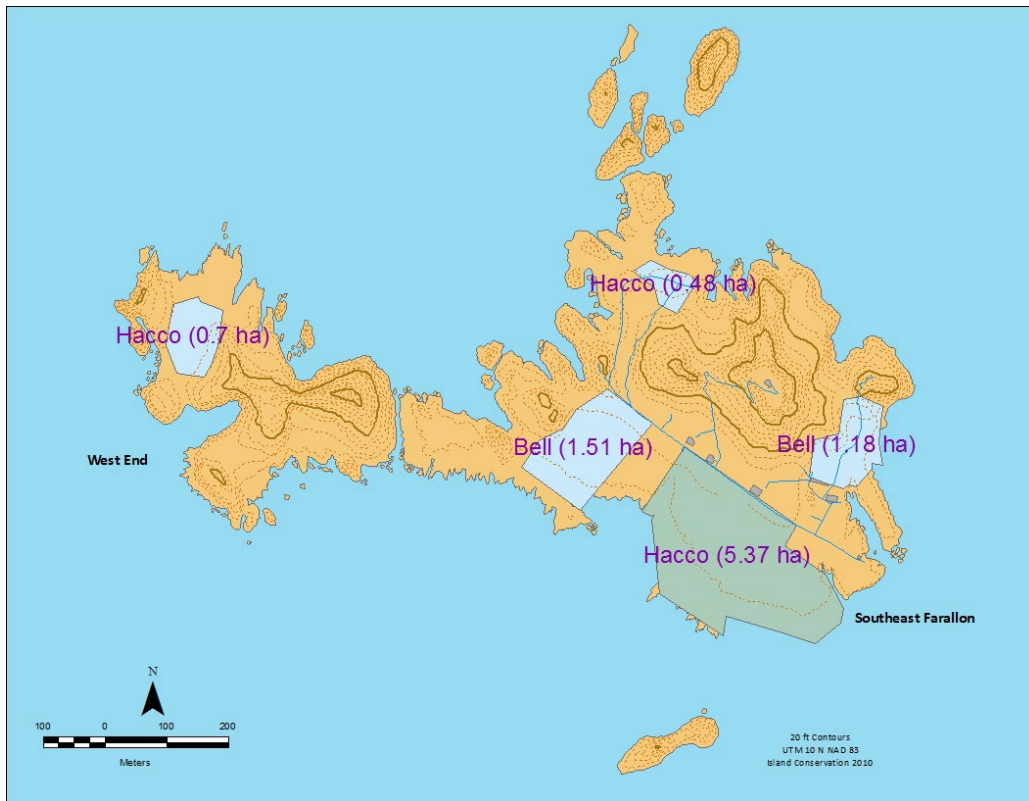
### *Targeted Bait Test*

In an effort to determine if gulls can be successfully hazed off a plot of land which has had a placebo bait broadcast at an established and uniform density, four areas across West End and Southeast Farallon have been chosen for close monitoring for the consumption of bait pellets by gulls. These small plots ( $\leq 1.5$  ha) have been chosen for the ease of hand broadcasting bait pellets and monitoring subsequent gull behavior at these sites.

Prior to hazing activities—on Day II or III—four plots (see Figure 5) will be demarcated using pin flags. Once hazing has begun—on Day V or VI of the trial—these four plots will be hand-broadcast with one of the two bait types. The bait product manufactured by Bell Laboratories, Inc. will be broadcast at a density of 18 kg/ha, as per the USDA label limit. The bait product manufactured by Hacco, Inc. will be broadcast at a density of 50 kg/ha.

The boundaries of these areas will be clearly marked with pin flags so that observers can monitor the area from a distance. The monitoring team will track gull activity within these plots during regularly-scheduled island-wide counts.

**Figure 5.** A map of areas to be baited by hand-broadcast. Areas in blue represent plots which will be subject to the targeted bait tests, while the area in green will be used for the bait availability study. The types of bait (referred to by name of manufacturer) and the areas of these plots are indicated.



### *Bait Degradation*

A bait degradation (weathering) trial will be conducted using placebo versions of the two types of legally available bait pellets. Bait cages of wire hardware cloth will be used to prevent the pellets from being consumed or disturbed by mice or birds. Each cage, which has 16 compartments, will have eight pellets of each formulation placed in each cage. One to two cages will be placed in each of three locations: the Water tank at the saddle on the lighthouse trail, the cisterns on the Marine Terrace, and North Landing (See Figure 6.) Cages will be tested on bare soil, rock and vegetated substrate.

The establishment of bait degradation cages will likely occur early in November during a 2-3 day strike team visit to the island to transfer supplies to the island.

Cages will be sampled 7, 14, and 21 days after deployment by PRBO staff. Each pellet in each cage will be inspected for signs of degradation and classified according to a modified Craddock Scale (Appendix 5). Cages will be monitored weekly by PRBO until April 1?

### *Bait Availability*

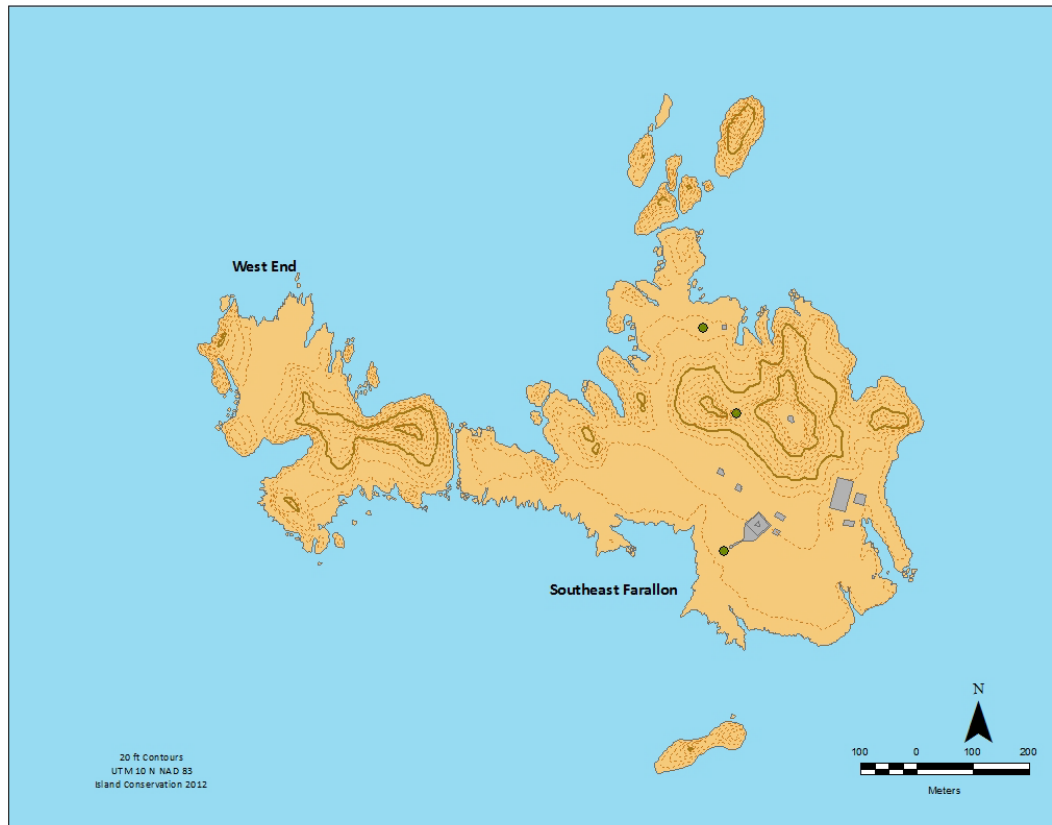
In November 2010, a bait availability study was conducted using the Bell Laboratories, Inc. pellet. A similar trial will be conducted during this trial, using the 1 g Hacco, Inc. Ramik Green pellet.

Subsequent to the island-wide gull and marine mammal census slated for Days II/III, X bait availability plots (measuring 1m x 25m) will be established on the Marine Terrace. On day V/VI, once hazing activities have been initiated, a ~5-hectare portion of the Marine Terrace (see Figure 5) will be hand-



broadcast with the Hacco, Inc. bait at a density of 50 kg/ha. Immediately following the bait broadcast, these plots will be calibrated to contain a representative number of pellets for a bait application of 50 kg/ha. The availability of pellets within these plots will be monitored every day for a total of seven days.

**Figure 6.** Location of Bait Degradation Cages (green dots)



## Literature Cited

- Barnes, N., R. Christie, and S. Kruse. 1999. Private Industry Initiative at Bird Control: A Success Story. Bird Strike Committee USA/Canada, First Joint Annual Meeting, Vancouver, BC.
- Baxter, A. 2000. Use of Distress Calls to Deter Birds from Landfill Sites near Airports. *in* International Bird Strike Committee. IBSC25/WP-AV9.
- Baxter, A. 2001. Bird control on landfill sites--Is there still a hazard to your aircraft? Pages 48-55 Bird Strike Committee USA/Canada Proceedings, Third Joint Annual Meeting, Calgary, AB.
- Baxter, A. 2007. Laser dispersal of gulls from reservoirs near airports. Bird Strike Committee USA/Canada Proceedings, 9th Annual Meeting, Kingston, ON.
- Baxter, A., J. Bell, J. Allan, and J. Fairclough. 1999. The Interspecificity of Distress Calls. Bird Strike Committee USA/Canada, First Joint Annual Meeting, Vancouver, BC.
- Belant, J. and S. Ickes. 1997. Mylar Flags as Gull Deterrents. Pages 73-80 *in* C. Lee and S. Hygnstrom, editors. Great Plains Wildlife Damage Control Workshop Proceedings.
- Blackwell, B., G. Bernhardt, and R. Dolbeer. 2002. Lasers as Nonlethal Avian Repellents. *The Journal of Wildlife Management* **66**:250-258.
- Carter, N. 1999. The Use of Border Collies in Avian and Wildlife Control Programs. Pages 265-282 *in* Proceedings of the International Seminar on Flight Safety and Birds in the Middle East. International Center for the Study of Bird Migration.
- Carter, N. 2000. Analysis of the Use of Radio-Controlled Models in Bird Dispersal. Bird Strike Committee USA/Canada, 2nd Annual Meeting, Minneapolis, MN.
- Castelli, P. and S. Sleggs. 2000. Efficacy of border collies to control nuisance Canada Geese. *Wildlife Society Bulletin* **28**:385-392.
- Cook, A., S. Rushton, J. Allan, and A. Baxter. 2008. An Evaluation of Techniques to Control Problem Bird Species on Landfill Sites. *Environmental Management* **41**:834-843.
- Curtis, K., W. Pitt, and M. Conover. 1996. Overview of Techniques for Reducing Bird Predation at Aquaculture Facilities. Jack H. Berryman Institute, Department of Fisheries and Wildlife.
- Curtis, P., C. Smith, and W. Evans. 1995. Techniques for reducing bird use at Nanticoke Landfill, near E.A. Link Airport, Broome County, New York. Pages 67-78 *in* Eastern Wildlife Damage Control Conferences, Asheville, NC.
- Fairaizl, S. 1992. An Integrated Approach to the Management of Urban Canada Goose Depredations. Pages 105-109 15th Vertebrate Conference Proceedings.
- Froneman, A. and M. van Rooyen. 2003. The Successful Implementation of a Border Collie Bird Scaring Program at Durban International Airport, South Africa. International Bird Strike Committee, Warsaw, Poland.
- Gilsdorf, J., S. Hygnstrom, and K. VerCauteren. 2002. Use of frightening devices in wildlife damage management. *Integrated Pest Management Reviews* **7**:29-45.
- Gorenzel, W. and T. Salmon. 2008. Bird Hazing Manual Techniques and Strategies for Dispersing Birds from Spill Sites. University of California, Davis, CA.
- Gosler, A., R. Kenward, and N. Horton. 1995. The effect of gull deterrence on roost occupancy, daily gull movements and wintering wildfowl. *Bird study* **42**:144-157.
- Harris, R. and R. Davis. 1998. Evaluation of the Efficacy of Products and Techniques for Airport Bird Control. Aerodrome Safety Branch, Transport Canada.
- Holevinski, R., P. Curtis, and R. Malecki. 2007. Hazing of Canada geese is unlikely to reduce nuisance populations in urban and suburban communities. *Human-Wildlife Conflicts* **1**:257-264.
- Littauer, G. 1990. Avian Predators: Frightening Techniques for Reducing Bird Damage at Aquaculture Facilities. Southern Regional Aquaculture Center, Cooperative State Extension Service, Mississippi State, Mississippi.
- Loud, M. 2000. Dispersal of Soaring Raptors Using Radio-Controlled Aircraft. *in* Bird Strike Committee USA/Canada, 2nd Annual Meeting, Minneapolis, MN.

- Montoney, A. and H. Boggs. 1995. Effects of a Bird Hazard Reduction Force on Reducing Bird/Aircraft Strike Hazards at the Atlantic City International Airport, NJ Pages 59-66 *in* Eastern Wildlife Damage Control Conferences, Asheville, NC.
- Mott, D. and F. Boyd. 1995. A review of techniques for preventing cormorant depredations at aquaculture facilities in the Southeastern United States. *Colonial Waterbirds* **18**:176-180.
- Patterson, B. 2000. Wildlife Control at Vancouver International Airport: Introducing Border Collies. *in* International Bird Strike Committee. IBSC25/WP-A6, Amsterdam.
- Read, J. 1999. A strategy for minimizing waterfowl deaths on toxic waterbodies. *Journal of Applied Ecology* **36**:345-350.
- Ronconi, R. and C. St. Clair. 2006. Efficacy of a radar-activated on-demand system for deterring waterfowl from oil sands tailing ponds. *Journal of Applied Ecology* **43**:111-119.
- Seamans, T. 2004. Response of Roosting Turkey Vultures to Vulture Effigy. *Ohio Journal of Science* **5**:136-138.
- Seamans, T., C. Hlcks, and K. Preusser. 2007. Dead bird effigies: A nightmare for gulls? Bird Strike Committee USA/Canada Proceedings, 9th Annual Meeting, Kingston, ON.
- Sherman, D. and A. Barras. 2004. Efficacy of a Laser Device for Hazing Canada Geese from Urban Areas of Northeast Ohio. *Ohio Journal of Science* **3**:38-42.
- Soldatini, C., Y. Albores-Barajas, P. Torricelli, and D. Mainardi. 2008. Testing the efficacy of deterring systems in two gull species. *Applied Animal Behaviour* **110**:330-340.
- Stevens, G., J. Rogue, R. Weber, and L. Clark. 2000. Evaluation of a radar-activated, demand-performance bird hazing system. *International Biodeterioration & Biodegradation* **45**:129-137.
- Stout, J., W. Gillett, J. Hayward, and C. Amlaner. 1975. Dispersal of Seagulls in an Aerodrome Environment. Air Force Weapons Laboratory.
- Stout, J. and E. Schwab. 1979. Behavioral control of seagulls at Langley Air Force Base. Bird Control Seminars Proceedings.
- Washburn, B., R. Chipman, and L. Francoeur. 2006. Evaluation of Bird Responses to Propane Exploders in an Airport Environment. *in* 22nd Vertebrate Pest Conference.

## APPENDIX 1: STAFFING

This Gantt chart indicates which staff will be on-island for the hazing trial between November 26 and December 17, 2012. The days outlined in heavy black represent the extent of the 14-day hazing period. Transportation is not yet confirmed and subject to change.

Transport	B + H		B														PRBO						B		B					
Trial Day	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	XXII								
Date	26-Nov	27-Nov	28-Nov	29-Nov	30-Nov	1-Dec	2-Dec	3-Dec	4-Dec	5-Dec	6-Dec	7-Dec	8-Dec	9-Dec	10-Dec	11-Dec	12-Dec	13-Dec	14-Dec	15-Dec	16-Dec	17-Dec								
People present on Island																														
Dan Grout (IC)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x								
Madeleine Pott (IC)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x								
Tommy Hall (IC)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x								
Jonathan Shore (USFWS)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	(x)	(x)	(x)	(x)	(x)	(x)	(x)								
Gerry McChesney (USFWS)	x	x	x	x	x	x	x	x																						
Russ Bradley (PRBO)	x	x	x	x	x	x	x	x																						
Pete Warzybok (PRBO)								x	x	x	x	x	x	x	x	x														
PRBO Volunteer 1 (Liz Ames)								x	x	x	x	x	x	x	x	x	x	x	x	x	x	x								
Winston Vickers (OWCN/OSPR)	x	x	x	x	x	x	x	x																						
Paul Gorenzel (OWCN/OSPR)								x	x	x	x	x	x	x	x	x														
Valerie (USDA-APHIS)	x	x	x	x	x	x	x	x																						
Derek Milsaps (USDA-APHIS)								x	x	x	x	x	x	x	x	x														
Helicopter pilot (TBD)	x*	x*	x*	x*	x*	x*	x*	x*	x*	x*																				
UAV pilot 1 (NASA)																														
UAV pilot 2 (NASA)																														
Additional hazer (EBRPD)																														
Additional hazer (Landfill)																														
Dog handler (TBD)																														
Total personnel:	9	9	9	9	9	9	9	9	9	9	8	8	8	8	8	5	5	5	5	5	5	5								
	Red type font indicates personnel who are currently ATF permitted.																													
	Bracketed individuals represent those whose presence has not yet been secured.																													
	A * indicates that the duration of their stay is not certain and is funding dependent.																													

## **Incident Command Structure (ICS) – To be inserted**



### APPENDIX 3: GENERAL SCHEDULE

Transport	B + H		B														PRBO		B		B					
Trial Day	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	XXII				
Date	26-Nov	27-Nov	28-Nov	29-Nov	30-Nov	1-Dec	2-Dec	3-Dec	4-Dec	5-Dec	6-Dec	7-Dec	8-Dec	9-Dec	10-Dec	11-Dec	12-Dec	13-Dec	14-Dec	15-Dec	16-Dec	17-Dec				
Activity																										
Training/orientation	x	x																								
Island-wide gull & marine mammal survey		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				
Mark baiting zones		(x)	x																							
Hazing			x	x	x	x	x	x	x	x	x	x	x	x	x	x										
Marine Mammal dissuasion			x																							
Hand-broadcast bait					x	(x)																				
Calibrate availability plots					x	(x)																				
Monitor bait availability					x	x	x	x	x	x	x	(x)														
Personnel arrival/change-over/departure	x																x								x	
Activities in brackets indicate that the timing of the activity will be time dependent and may be pushed to the following day.																										

## APPENDIX 4: PRELIMINARY HAZING EQUIPMENT NEEDS

Lists of equipment to be loaned to the trial should be finalized by October 5, 2012.

Orders for outstanding equipment to be purchased will be placed before October 20, 2012.

Quantity	Equipment detail	Cost per	Total Cost	Loan OWCN	Loan USDA	Loan Other	Purchase #	Lease #	Supplier					
	5 Bird Gard Super PRO						5		<a href="http://birdgard.com/product/Bird-Gard-Super-Pro">http://birdgard.com/product/Bird-Gard-Super-Pro</a>					
	2 Bird Gard Super PRO AMP						2		<a href="http://birdgard.com/product/Bird-Gard-Super-Pro-Amp">http://birdgard.com/product/Bird-Gard-Super-Pro-Amp</a>					
	7 Chips						7		<a href="http://birdgard.com/products/8">http://birdgard.com/products/8</a>					
	5 Marine batteries	200	1000						<a href="http://www.amazon.com">www.amazon.com</a>					
	7 Zon gun	275			7				LOAN					
	7 Propane for Zon Gun	35	245						<a href="http://www.walmart.com/ip/Backyard-Grill-Refillable-Propan">http://www.walmart.com/ip/Backyard-Grill-Refillable-Propan</a>					
	3 Zon multi-shot controller/timer	200	600						<a href="http://margosupplies.com/public/american1/scare/zon_mark">http://margosupplies.com/public/american1/scare/zon_mark</a>					
10 to 12	Kites	\$10-100							<a href="http://www.suttonag.com/VisualBirdControl.html">http://www.suttonag.com/VisualBirdControl.html</a> ; <a href="http://www">http://www</a>					
	35 Effigies	0	0						SEFI population					
	6 Small laser pointers (red/green)	40	240						<a href="http://www.amazon.com">www.amazon.com</a>					
1 to 2	Avian Dissuader-red	1,395			1				<a href="http://www.birdbusters.com/scare_bird_control.html">http://www.birdbusters.com/scare_bird_control.html</a>					
1 to 2	Avian Dissuader-green	1,995			1	1			<a href="http://www.reedjoseph.com/lasers.htm">http://www.reedjoseph.com/lasers.htm</a>					
	4 Spotlights (1 M candle)	60	240						<a href="http://www.amazon.com">www.amazon.com</a>					
	2000 Pyrotechnics: caps	\$8/100	160						<a href="http://www.suttonag.com/BirdControlPyrotechnics.html">http://www.suttonag.com/BirdControlPyrotechnics.html</a>					
	400 Pyrotechnics: whistlers	\$45/100	180						<a href="http://margosupplies.com/public/american1/scare/pyro_laun">http://margosupplies.com/public/american1/scare/pyro_laun</a>					
	200 Pyrotechnics: screamers	\$21/50	84						<a href="http://margosupplies.com/public/american1/scare/pyro_laun">http://margosupplies.com/public/american1/scare/pyro_laun</a>					
	200 Pyrotechnics: flaming whistlers	\$21/50	84						<a href="http://margosupplies.com/public/american1/scare/pyro_laun">http://margosupplies.com/public/american1/scare/pyro_laun</a>					
	200 Pyrotechnics: bangers	\$48/100	96						<a href="http://www.suttonag.com/BirdControlPyrotechnics.html">http://www.suttonag.com/BirdControlPyrotechnics.html</a>					
	4 Pyrotechnics: single shot launch	33							<a href="http://www.suttonag.com/BirdControlPyrotechnics.html">http://www.suttonag.com/BirdControlPyrotechnics.html</a>					
	4 Pyrotechnics: double barrel lau	42							<a href="http://www.suttonag.com/BirdControlPyrotechnics.html">http://www.suttonag.com/BirdControlPyrotechnics.html</a>					
2 to 4	Pyrotechnics: CAPA launcher	200							<a href="http://www.reedjoseph.com/pyrotechnics.htm">http://www.reedjoseph.com/pyrotechnics.htm</a>					
	50 Pyrotechnics: CAPA cartridge	\$450/25	900						<a href="http://www.reedjoseph.com/pyrotechnics.htm">http://www.reedjoseph.com/pyrotechnics.htm</a>					
1 to 2	12-gauge shotgun					1								
	75 Pyrotechnics: cracker shell	\$120/100	120						<a href="http://www.suttonag.com/BirdControlPyrotechnics.html">http://www.suttonag.com/BirdControlPyrotechnics.html</a>					

## APPENDIX 5: CRADDOCK (2004)

	Pellet matrix	Change in shape	Presence of mold	Loss of volume
<b>Condition 1</b> <i>Fresh pellets</i>	Identical to fresh bait	Identical to fresh bait	None	None
<b>Condition 2</b> <i>Soft pellets</i>	<50% pellet matrix is or has been soft/moist	Distinct cylinder still; smooth sides may have been lost	<50% bait pellets mold	Little or no volume lost
<b>Condition 3</b> <i>Mush pellets</i>	>50% bait matrix is or has been soft/moist	<50% pellet has lost distinct cylinder shape	>50% bait pellets have mold	Bait has lost some volume (<50%)
<b>Condition 4</b> <i>Pile of mush</i>	100% of bait matrix is or has been soft	Pellets lost distinct cylinder shape & resembles a pile of mush with some grain particles in matrix showing distinct separation from main pile	>50% bait pellets have mold	Bait has lost some volume (<50%)
<b>Condition 5</b> <i>Disintegrating Pile of mush</i>	100% of bait matrix is or has been soft	Pellet has completely lost distinct cylindrical shape and resembles a pile of mush with >50% of the grain particles in the bait matrix showing distinct separation from each other and the main pile	>50% bait pellets have mold	Bait has lost a significant amount of volume (>50%)
<b>Condition 6</b> <i>Bait gone</i>	Bait is gone or is recognizable as only a few separated particles of grain or powder.	Bait is gone or is recognizable as only a few separated particles of grain or powder.	Bait is gone or is recognizable as only a few separated particles of grain or powder.	Bait is gone or is recognizable as only a few separated particles of grain or powder.