

## INTEGRE – Pitcairn Pitcairn – Activity n°2 prevent soil erosion

**Author:** Michele Christian, [dmnature@pitcairn.gov.pn](mailto:dmnature@pitcairn.gov.pn)

**Description of Activity:**

**3 actions:**

- **2.1** : **Erosion control matting**
- **2.2** : **Ground cover plants**
- **2.3** : **Culverts**

*Note: considering the ongoing work on the alternate harbour, an additional work force is required for this activity. This will be sought for in French Polynesia.*

**2.1 & 2.3: Erosion control matting and ground covering plants:**

Erosion control matting: the foreseen brand is “Enkamat”: it is a flexible three-dimensional mat for permanent erosion protection on the most varied slope types. These mats offer immediate protection against erosion. The mat’s structure reduces the impact of wind and water on the surface, so it prevents soil runoff.

As a general rule, once laid on the slopes, mats are seeded and covered with humus or topsoil. Vegetation can then take root and develop easily because the mat’s artificial root structure protects the soil and germinating seeds.



*Photo: mats that have been laid on a slope to prevent soil erosion, finished result*

When properly installed, erosion control mats secure exposed and vulnerable soil and prevent rain and wind erosion. Surfaces covered with erosion control mats can later be planted with appropriate ground cover (*reservation lifted from 2014: however this can only take place once the goat population has been acceptably managed and contained*).

The action will be to install erosion control mats on all exposed surfaces showing signs of slippage or potential slippage: those key areas that require support in order to prevent soil erosion have been identified i.e. the Hill of Difficulty, below the Museum, the road that leads to Flatland.

### 2.3: Culverts

A culvert is a structure that allows water to flow under a road, trail or similar obstruction. Typically embedded into the ground, a culvert may be made from piping, reinforced concrete or other materials.

Culverts come in many shapes and sizes including round, elliptical, flat-bottomed, pear-shaped, and box-like structures. Culverts may be made of concrete, galvanized steel, aluminium or plastic, typically high density polyethylene.

The choice between concrete and polyethylene will compare the robustness of concrete to the durability, strength and easier maintenance of polyethylene, taking into account given Pitcairn's access to materials.



*Examples of culverts*

The culverts will be used to replace and/or reinforce existing bridges and to divert water runoff from the road by directing it underground, thereby preventing washouts, road damage and excess silt flowing into the harbour.

Pitcairn has a steep rugged terrain with a number of natural channels where rainwater concentrates and is funnelled downhill to the harbour. Wherever these natural flood zones intersect roads or other exposed areas, culverts will be used to divert flood waters in order to prevent damage and erosion.

#### **INTEGRE results which this activity supports:**

R10: The main threats have been identified and concrete actions are underway to address them in an integrated manner

*Labour force from FP:*

*R2: The OCTs are included in regional exchange and cooperation networks on sustainable development*

*R3: There have been exchanges with sister sites in the region*

#### **Pilot site issues this activity responds to:**

In February 2012 Pitcairn experienced exceptionally heavy rainfall of about 600 mm within a 24-hour period. This extreme weather caused several landslides around the island, particularly on the landing road.

After that, it was recommended that an engineer and a geotechnical engineer visit Pitcairn to assess the damage. This visit occurred in 2012, leading to some recommendations. (*Tonkin & Taylor Engineer & Environment Consultants NZ, 2012. Report is attached to the action plan*).

**Erosion control matting:**

The risk of ongoing land slippage above the Hill of Difficulty is quite high, as shown by both recent and historic landslides. The risk of land-slippage under the Hill of Difficulty road, which may undermine the road, is considered slight.

During the 2012 visit of Tonkin & Taylors' geotechnical engineer, the issue of soil erosion prevention methods was raised and erosion control matting was recommended.

**Culverts:**

Over the past four years Pitcairn has experienced an increase in rainfall and occasionally extreme weather conditions. Heavier rainfall is a contributing factor to soil erosion. Within the residential area we are experiencing heavy rainwater runoff which requires culverts and concrete drains to assist in diverting water flow away from dwellings. Polyethylene culverts are currently used on Pitcairn and are more environmentally-friendly as compared to the past practice of using 44-gallon petrol drums that eventually rusted and collapsed, however concrete culverts are the preferred option for some stakeholders.

**Partners:**

Natural Resources Division Manager, Michele Christian, will head the Project and liaise with the relevant Division Managers on island to ensure delivery of activities remains on schedule.

Culverts and mats: Government Department for Roads & Machinery will be involved as well as a small labour force made up of community members and external workforce as required.

Pitcairn Islands Financial Controller, Evan Dunn, will manage cashbooks and budget requirements. Pitcairn Islands Mayor Shawn Christian and Council.

**Cost of the activity and planned funding (NZD)**

Type of expenditure:	1: Enka mats	2: Ground covering plants	3: Concrete culverts	Total	FP workers travel & accommodation
Equipment	16 800	2 000	40 000	<b>58 800</b>	
Labour	54 000	12 000	30 000	<b>97 200</b>	
..					
<b>Total cost/budget:</b>	70 800	14 000	70 000	<b>156 000</b>	30 000
INTEGRE	70 800	14 000	70 000	<b>156 000</b>	21 000
Other sources					9 000

### Details on the labour costs calculation:

Note: Pitcairn has a standard pay rate of \$10.00 NZD per hour.

So, the labour costs have been calculated as follows:

- **Erosion control matting:** 90 days of work by 10 people, with 6h/day = **NZD 54 000**
- **Labour for the nursery:** 20 hours per month, over 2 months, by 2 people = **NZD 800**
- **Planting:** 2 weeks (6 days/week), 10 people, 8h/day + 2 extra days for cleaning = **NZD 11 200**
- **Concrete culverts:** team of 10, 2 months (25 days per month), 6h/day = **NZD 30 000**

This estimation of the number of working hours needed has been kept to evaluate the labour force cost. This has to be completed with the workers' travel and housing. Accommodation is offered by the Pitcairn Island Council (estimation of the co-financing: NZD 9 000). Travel is estimated at 3x(NZD 5 000 for the boat + NZD 900) and electricity for 6 months at NZD 600 ≈ 21 000 rom INTEGRE budget.

**Timetable: 2.5 years (from 2014 August to 2017 March):**

	2014	2015				2016				2017
Actions:	Q3	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
1	buy	install								
2		buy	nursery		plant		buy	nursery		plant
3	buy	install								

+ 6 months, following a delay in the buying/delivery of material (Claymore shipped with alternate harbour material in February 2015) + in the FP workers' recruitment

### Local acceptability and integration:

#### Erosion control matting:

The 2012 landslides brought soil erosion to the forefront along with the importance of prevention. Discussions took place on island with several key islanders and the visiting geotechnical engineer from Tonkin & Taylor Consultants to try to find solutions and plan future prevention.

Further research on mats was carried out by the Operations Division Manager and the Natural Resources Division Manager, leading to the choice of Enkamats.

#### Culverts:

The solution was chosen based on past and current on island experience in terms of weather conditions and product suitability to Pitcairn.

**Expected benefits for the community:**

***Erosion control matting:***

The Hill of Difficulty is the main road from the village to Bounty Bay Harbour (the Landing). The landing area houses three longboats and the islanders' canoes. At the moment, Bounty Bay is the only access in and out of the Island.



Photo 1. The Landing



Photo 2. Landslide and debris

***Culverts:***

The community benefits by having properly managed waterways that do not pose a threat to their homes or to safety on the roads.

**Sustainability (where applicable) :**

***Erosion control matting:***

Once plants and grass are established, only low plant maintenance is required. Two government departments will provide plant cultivation and plant maintenance.

***Culverts:***

The Roads and Machinery Department within the Operations Division is currently responsible for ongoing road maintenance including the existing culverts located around the island.

Installing further culverts and developing concrete roadside gutters will help manage water flow more effectively and make maintenance easier.

\*\*\*

**As a reminder, here are the criteria that will be used to evaluate this activity:**

1. Contributes to INTEGRE's objectives and expected outcomes;
2. Responds to the issues identified for that pilot site;
3. Strong local acceptance/integration into the cultural context
4. Benefits local communities
5. Sustainable in its use of the environment
6. Proven sustainability over time
7. Good cost-effectiveness ratio
8. Is cross-sectoral in nature – NB: Specific provision: private activities can only receive project support if they fill ALL the other conditions and such support cannot consist of a direct grant
9. Is reproducible, serves as a demonstration and/or is innovative
10. has joint funding (funding that is independent from INTEGRE is planned)