Agenda Item: CEP 6
Presented by: ASOC
Original: English
Submitted: 23/04/2013

Reuse of a site after remediation. A case study from Cape Evans, Ross Island

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Information Paper submitted by ASOC[1]

Abstract

The repair and remediation of environmental damage is a current topic at the CEP. Usually sites that have been subject to remediation are no longer used, or are reused by the same operator that conducted the remedial action and that can plan subsequent activities there. However, a different operator may reuse a remediated site without necessarily being aware of the site's history. The reuse of a remediated site may undo the effects of remediation. This Information Paper examines such an instance, using a case study from a small site at Cape Evans, Ross Island, and makes a number of suggestions relevant to assessing cumulative impacts, assessing the effectiveness of remediation, and managing remediated sites. In most instances, it would be better to concentrate new activities at sites that have already been impacted by earlier activities rather than locating them in near-pristine sites, but there may be scientific and practical value also in leaving some remediated sites undisturbed and subject to ongoing monitoring.

Overview

The repair and remediation of environmental damage is a topic of current discussion at the CEP. Usually sites are no longer used after remediation, or are reused by the same operator that conducted the remedial action and that can plan subsequent activities there. However, a new operator may reuse a site that has previously been subject to remediation without necessarily being aware of the site's history. This information paper examines such an instance, using a case study from Cape Evans, Ross Island. This is relevant to the assessment and monitoring of environmental impacts, including cumulative impacts, to assess the effectiveness of remedial action over time, and generally to the management of past activity sites.

Case study

World Park Base (WPB) was a small year-round facility established and run by the international environmental organisation Greenpeace International (GPI). WPB was located at Home Beach, Cape Evans, Ross Island, Antarctica (77°38′S, 166°24′E). Roura (2004) described the operation of WPB, its removal, and the results of a program for the monitoring and remediation of hydrocarbon contamination. This is summarised as one in several case studies in New Zealand (2013), which also describes other important issues concerning the remediation of contaminated sites.

WPB operated year-round from 1986-1987 until its complete removal in 1991–1992. Increased levels of hydrocarbons occurred in sediments nearby the base. The total volume of fuel spilt during Greenpeace operations was estimated at less than 200 litres, and is likely to have been well below this figure. Hydrocarbon contamination was highly localised and largely contained in the active layer. Low impact, low technology remedial action was applied at some sites and removed an estimate of about 75% of the fuel in the active layer, thus reducing the potential for secondary effects such as further dispersal of the fuel or exposure of wildlife to contaminated soil. Remediation also aimed to reduce the potential for further degradation that would have resulted, for instance, from leaving exposed the shallow excavations from where contaminated material had been extracted.

Dedicated monitoring took place until 1996. Subsequent opportunistic assessments by several visitors provided an overview of the site transformation over time. Opportunistic assessments were based on visual examinations and were necessarily impressionistic; however, they were made by people both knowledgeable

[1]Lead author: Dr. R. M. Roura.

about Cape Evans and aware of the history of occupation of that particular site. Overall, assessments of various kinds suggest the following changes since 1992[2]:

- A reduction in hydrocarbon contamination and an absence of obvious fuel spills, as it could be assessed visually or by smell;
- A progressive reduction in the quantity of materials resulting from previous occupation found at the site. These consisted of materials (including a fuel drum cap and some screws and nails) that had not been detected during the original clean up due to factors such as snow cover.
- A substantial reduction of the physical footprint of the base following the suspension of activities. Some observers noted that it was "virtually impossible" to identify the previous location of the base, even only a few years after its removal. Features caused by wind and freeze-thaw action, which had been previously largely obliterated by trampling, became apparent once again on the ground surface. Consequently, the site acquired an undisturbed appearance (Fig. 1), even though the geochemical footprint of past activities might still be detectable.
- The presence of nesting skuas at and around the site, which had been present before and during the operation of WPB.

Overall, it is apparent that the remediation undertaken following the removal of WPB achieved its objectives of minimising pollution and the overall visual impact of the base, while limiting the impact of remediation itself. However:

> … if patterns and levels of human activity at the former Greenpeace site were to change in the future through an increase of helicopter or inflatable landings, or pedestrian traffic, they might result in changes to hydrocarbon concentrations and distribution patterns, as well as physical impacts on the terrain surface (Roura 2004: 65).

Later activities at the site included:

- Visits by scientists, tourists, conservators and other governmental and non-governmental people. For instance, between 1999 and 2004 an average of some 700 USAP staff, 400 tourists, and 200 Antarctica New Zealand staff visited Cape Evans on annual basis (NZ et al 2005: 24). Many visitors possibly restrict their visits to the historic *Terra Nova* hut and the area immediately around it, rather than venturing to the former WPB site some 200 m away.
- The establishment of a multi-seasonal camp in recent years. The camp has been established by the Antarctic Heritage Trust – NZ, which maintains the historic *Terra Nova* hut. The camp is in close proximity, and partly overlaps, the former WPB site (Figs. 1 and 2).

Trampling by visitors, the use of tracked vehicles, helicopter landings, the use of tents and huts, fuel storage and use, and other activities related to short-term visits or multi-season occupation contribute to the overall impact in the area and almost certainly undo some of the remedial actions undertaken in 1991-1992.

Broader implications

From the case study above it is possible to make a number of suggestions that are relevant to the monitoring, remediation and clean-up of other sites in Antarctica:

- The entire history of occupation of a site, including remediation and reuse, should be considered in future environmental monitoring of the site. This would provide useful information about cumulative impacts at the site.
- Remedial action at particular sites should be planned and executed with awareness that other activities may follow. This is particularly the case in areas subject to use by multiple governmental and non-governmental operators.
- More recent activities may undo, partly or fully, the effects of remedial action carried out at sites of earlier activities. This depends on the relative characteristics of the earlier and later activities, their relative environmental impacts, and the remedial actions undertaken.

[2] Observations by R.M. Roura and L. Carr (Greenpeace – 1992); D. Sheppard (NZAP – 1993); G. Harper (Greenpeace – 1993), R.M. Roura and A. Pickaver (Greenpeace – 1996); M. de Poorter (Antarctica NZ – 1998); A. Hemmings (Antarctica NZ – 2004), R.M. Roura (University of Canterbury - 2007) and R. Graham (MV *Tangaroa*, various years including early 2013).

- Remedial action may be more easily undone where relatively minor impacts were remediated using low impact, low technology approaches.
- In most instances, it is better to concentrate new activities at sites that have already been impacted by earlier activities rather than locating them in near-pristine sites. However, there may be value in leaving some remediated sites undisturbed and subject to ongoing monitoring. This includes the scientific value of investigating the evolution of impacted/remediated sites in particular environments, and the practical value of assessing the effectiveness of remediation approaches, and their potential application in other locations.

Closing remarks

As human activity and footprint in the Antarctic increases, and possibly also environmental clean ups and remediation, situations like the one described in this Information Paper are likely to become more common. Sites are used for some years, then subject to remediation, and subsequently reused. The status of a past activity site at any given time will result from a balance between changes caused by natural environmental processes, which will mask or obliterate the traces (or impacts) of earlier activities, including traces of remediation and clean up, and those caused by on-going activities, which will superimpose new traces over the earlier ones. In this regard, remediation is not a final state, nor necessarily marks the end of human presence at a particular site.

Awareness of these various processes should inform the assessment of environmental impacts (including indirect and cumulative impacts) at Antarctic sites, monitoring the environment and the effectiveness of remedial action, and planning new activities at past-activity sites.

References

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Roura, RM (2004): "Monitoring and remediation of hydrocarbon contamination at the former site of Greenpeace's World Park Base, Cape Evans, Ross Island, Antarctica." *Polar Record* 40 (212) 51-67.

Figure 1 - Home Beach, 27 December 2007. Arrow shows approximate location of WPB. Photo by R. Roura ©.

Figure 2 - Home Beach, 5 February 2013. Arrow shows approximate location of WPB. Photo by Chris Croxson ©.