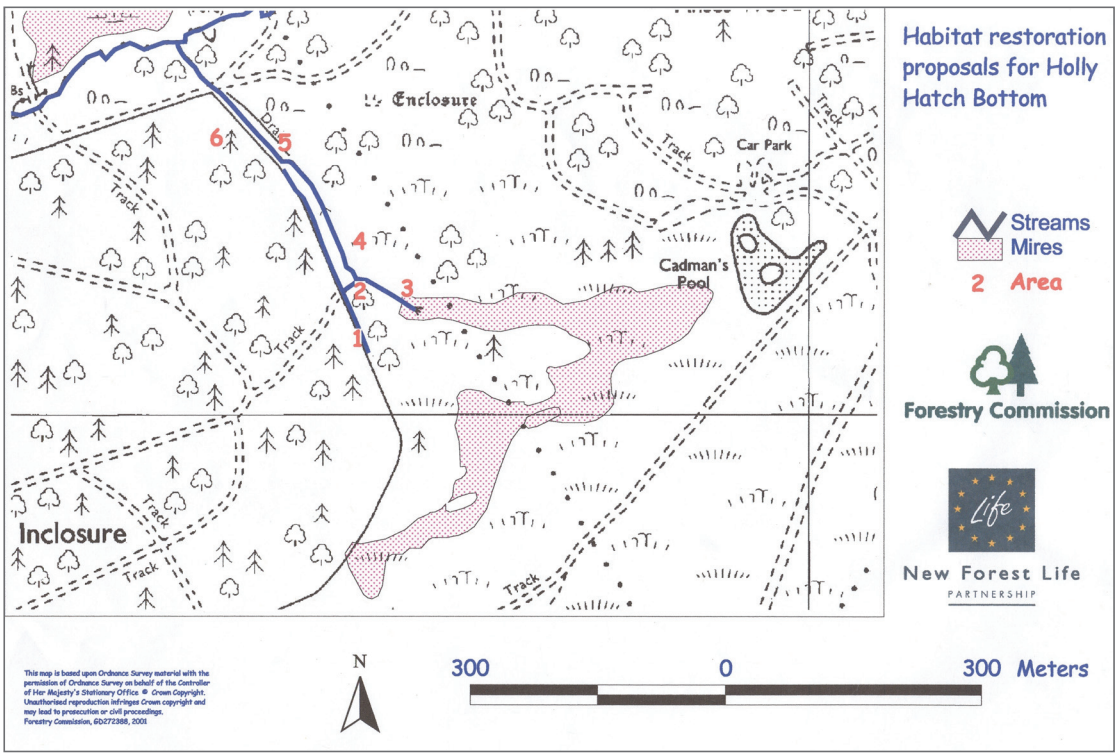
Area 4 – Main drainage channel from mire/soakway comprising a substantial incised gully 1.2-1.4m deep and wide, extending for 150m. The drain was infilled using heather bales and clay plugs to 0.3m below bank height. Excess material that had been previously washed out of the drain and deposited further downstream in Area 5 was recovered and used to top the heather bales, along with some imported material. Where banks needed to be regraded any excess material was also used to top dress the bales.

Area 5 – Overflow channel. This section of channel turns sharply west and rejoins the main Inclosure boundary drain. Works comprised Infill of channel to within 0.3m of bank height with infill tailing off downstream to join the Inclosure boundary drain using the same techiniques employed in Area 4.

Area 6 – At this point the flow rejoined the Inclosure boundary drain where it runs for approximately 110m before passing through and around a blocked culvert beneath a path and entering Dockens Water. The channel and culvert had become filled with washed out gravels and rejects from upstream some of which were spilling out onto adjacent habitats. Excess material was dug out and taken back upstream to top dress the heather bales and provide a bed substrate. In order to prevent the continued movement of bed material downstream several round wood dams were hammered into the bed of the drain. The culvert was removed



Over deepened and eroded drainage channels
prior to restoration

Infilling with material

After restoration

Prepared watercourse for bed-level raising

Installing clay plugs

Chestnut post dams to prevent movement of material

Ditch post restoration

Costs

Machine/ Equipment	Hire	
ATV	15 days	£750
360 Excavator	15 days	£960
5 tonne digger	10 days	£750
6 tonne dumper	10 days	£350
Dumper transport	Drop/Collect	£80
Materials		
Clay	197.42t	£1,480
Gravel/Hoggin	207.96t	£1,581
Oak Boards	204 @ 3x3"	£1326
Oak Boards	136 @8x1"	£1768
Heather Bales (cut, baled & hauled by local contractor)	836 bales	£2090
Fuel	103 litres	£77
Labour		
Contract (9 hr day)	54 days	£6,480
TOTAL		**£17,692**

CASE STUDY 2: STONY MOORS MIRE RESTORATION

Background

Stony Moors is located to the west of Holmsley Inclosure and to the north of Holmsley campsite (part of the former Holmsley Aerodrome). The area comprises three main tributaries that converge just upstream of the footbridge near the pumping station before flowing east downstream along the valley and into Holmsley Inclosure. The fen and mire habitats present at Stony Moors are well-known for their botanical diversity, largely attributable to the alkali influence of the underlying clay layer.

There is evidence of past drainage activities (likely to be 1930's in origin, and further works associated with the construction of Holmsley Aerodrome in 1941-42), with incised channels, headward erosion and localised spoil heaps. As a result of this past drainage, scrub woodland has been able to colonise parts of the mire and fen system and associated stream corridor. Over the past 100+ years Scots pine has colonised the Open Forest from the adjacent Inclosure and this species has a significant presence in the pasture woodland as well as in the open fen & mire, heath and grassland habitats.

The restoration proposals aimed to:

- Remove colonising tree species from the surface of the fen & mire habitats.
- Halt further erosion of the stream channels into mire habitats.
- Raise the bed levels of the stream.

The Works

The works focused on seven drainage channels and ten areas of scrub clearance as shown in Figures A & B.

Channel A was incised to 1.5m deep x 1-1.25m wide with an eroding nick point. Restoration work was carried out on a 40m length by infilling to 0.3m below bank height using staked heather bales, occasional clay plugs and live willow stakes. The stakes were produced by coppicing willow in situ.

Channel B was also eroding headward into the mire habitat and past efforts using stone-filled gabion baskets had failed resulting in a plunge pool 1.75m deep. Works involved removing the failed gabions and infilling the channel for 15m to bank height at the head of the channel to 0.3m below bank height at the confluence with channel A.

Channel C - The character/morphology of Channel C (up to 1.3m deep and 2-2.5m wide) was a direct result of the past drainage activities downstream. Two soakway flows also entered the channel from the north, one falling into the channel with resultant erosion features. The other soakway had successfully been supported by a stone-filled gabion, though part of the gabion was now exposed. Downstream of the gabion was a 10m drain that flowed out into Channel C. Restoration of the channel from the confluence of Channels A & B down to within 10m of the confluence with Channel D involved infilling. The upstream end was infilled to within 0.3m of bank height tailing-off downstream to within 0.15m of existing stream bed level. The height of the infill varied locally to allow the outflow from the two soakways to enter the channel. The side drain downstream of the gabion was infilled to

bank height at the gabion, with the infill tailing-off to 0.3m where it joined Channel C. The part-exposed gabion was covered with a shallow layer of spoil from elsewhere on site. In all cases, the channel infill utilised the same materials and techniques as Channels A & B.

Channel D flows south to north from the campsite area down through woodland to the confluence with Channel C, just upstream of the pumping station and footbridge. Past drainage activities in this channel were evident and the channel was slowly restoring itself. However there were still significant erosion features due to the steep gradient and the nature of the flow. Nick points and plunge-pools were infilled with staked heather bales wherever required for the first 120 metres upstream of the confluence with Channel C. Live willow stakes were produced on site and driven in to the channel bed to stabilise the substrate. The establishment of the willow in the channel required the thinning of the willow/pine/birch canopy. Scots pine was also felled wherever possible.

Channel E was very similar in character to Channel D. The channel did show some signs of natural recovery but much of the channel was still eroding through underlying gravels and clay. Nick points and plunge-pools were infilled with staked heather bales wherever required for the first 150 metres upstream of the confluence with Channel F. Live willow stakes were produced on site and driven in to the channel bed to stabilise the substrate. The establishment of the willow in the channel required thinning of the willow/birch canopy.

Channel F extended from just upstream of the footbridge down to the boundary between the Open Forest and Holmsley Inclosure. The channel displayed evidence of past drainage works, with spoil heaps extending along much of the north side of the stream. The spoil often supported the leading edge of the mire and fen habitat to the north, and so the material could not be used in the restoration. The channel was largely incised, but was locally more 'natural' due to the presence of debris dams that have supported gravels and slowed the process of erosion. Therefore, additional debris dams were installed (approximately every 20 metres) along the length of the stream channel. Where willow was available on the bank of the stream, these were adapted into debris dams. Once the dams were in place, hoggin was imported and distributed in the channel to restore bed levels. Locally, streamside trees (birch and willow) were felled to allow light into the channel.

Over the remaining ten areas highlighted on Figure B, 8.8 hectares of vegetation clearance and scrub management was carried out to restore areas of mire that had been colonised by pine and willow. Selective oak and birch were also removed. Thinning was also carried out to increase the light levels to ground flora.

Staked heather bales were used to repair erosion at crossing points and a watering hole.

Figure A

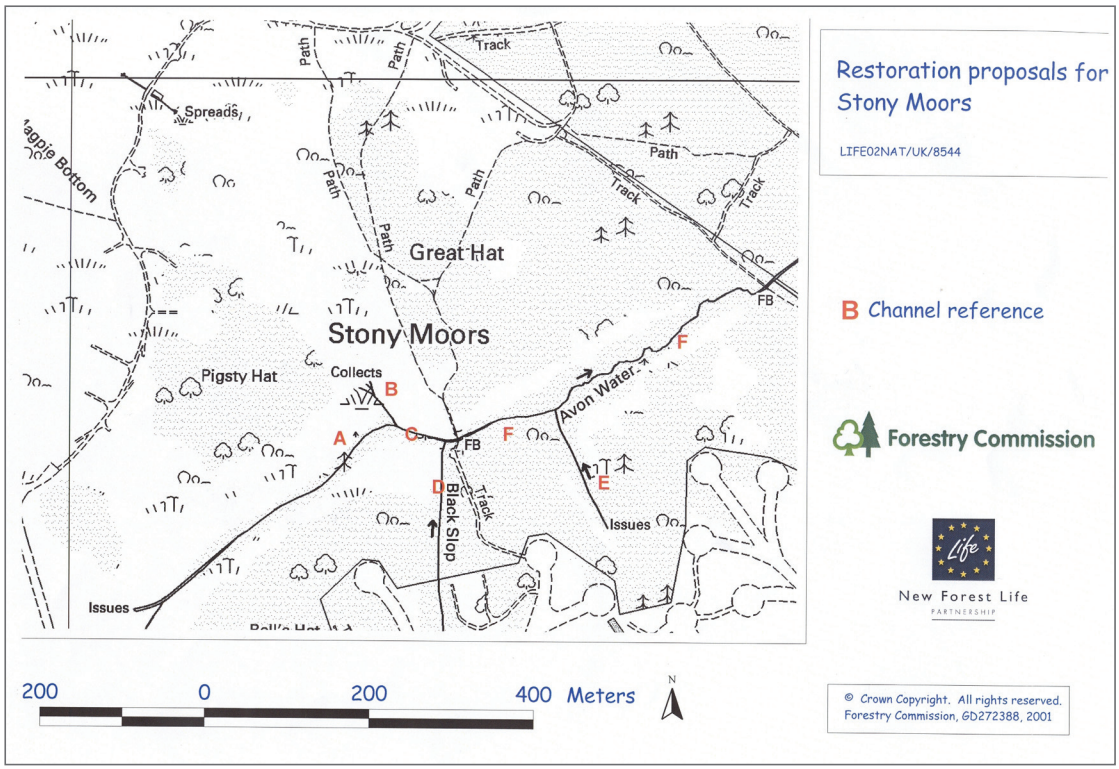


Figure B