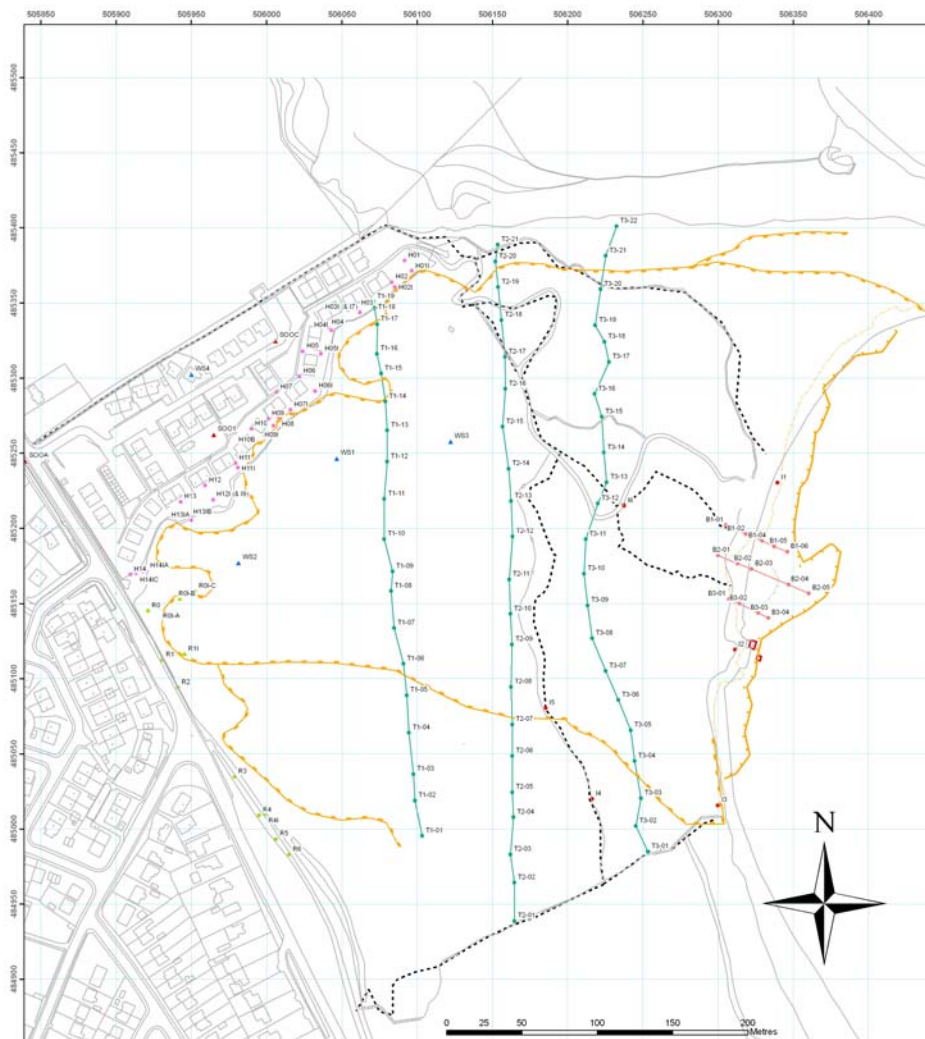


















Cayton Cliff, Cayton Bay, North Yorkshire Monitoring Report

Report No.: 005 Issue Date: 8.12.08

Monitoring data and analysis for the period:

July:	1.7.08- 29.7.08	} Report covers this period
August:	29.7.08- 26.8.08	
September:	26.8.08- 30.9.08	
October:	30.9.08- 28.10.08	
November:	28.10.08- 25.11.08	



Legend  Active Landslide (2 May) Survey Points (23-24 April)  Kinpe Point Headscarp Pin  A165 Headscarp Pin  Transect Pin (Landslide Body)  Transect Pin (Landslide Toe/ Beach)  Fixed Inspection Point  Water Sampling Point  Local Survey Control Network Point		Survey Lines (23-24 April)  Path  Pillbox  Transect (Landslide Toe/ Beach)  Transect (Landslide Body)  Remnant Boulder Arc  Cliff Toe  Landslide Toe Platform	
		Monitoring Layout Cayton Cliff, North Yorkshire (Version 6.5.08)	
		Halcrow Group Limited Lyndon House, 62 Hagley Road, Edgbaston, Birmingham, B16 8PE Tel: +44 (0)121 4562345 Fax +44(0)121 4561569 www.halcrow.com 	
		Client The National Trust	
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Knipe Point Headscarp Recession



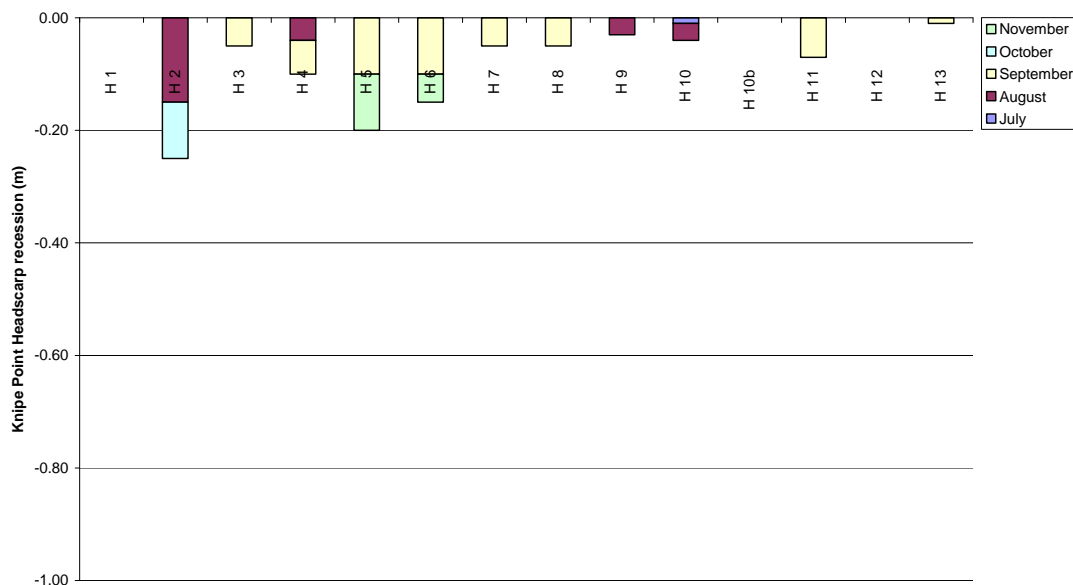
KEY RESULTS

- Recession measured at 8 pins during September (less than 0.1m monthly)
- Recession measured at 3 pins during October and November (less than 0.1m monthly). However significant change in-between pins (below)
- Previous tension cracking near H11, now a site of ongoing block displacement, resulting in local headscarp recession (Photo 1)
- Local headscarp recession between H8 and H9, following reported tension cracking on 19.11.08 (Photo 2)

RECOMMENDATIONS

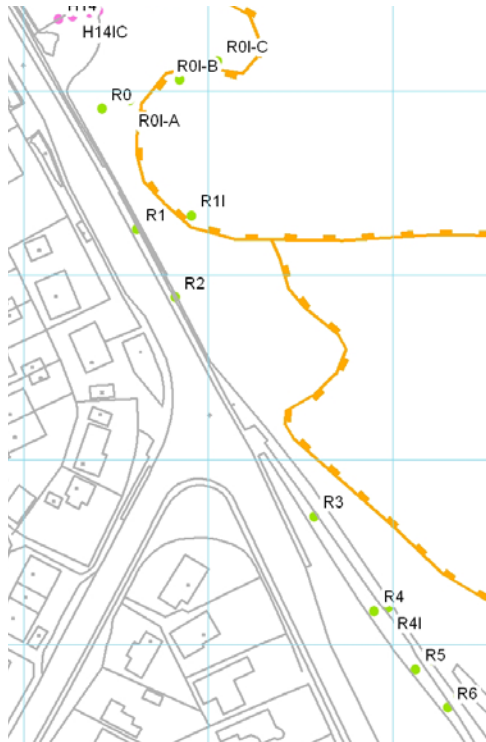
- Continue twice weekly (**Tue & Fri.**) observations and monitoring
- Carefully monitor the developing headscarp recession failures between H8 & H11
- **Be very vigilant as we enter winter. Owing to seasonal rainfall and rising groundwater, the risk of ground movement and cliff recession is much increased**

Peg measurement reference number



Note: coloured bars in the graph show total monthly recession measured since 1.7.08. Refer to user notes at the end of this report. Average monthly error of ± 0.04 m.

A165 Filey Road Headscarp Recession



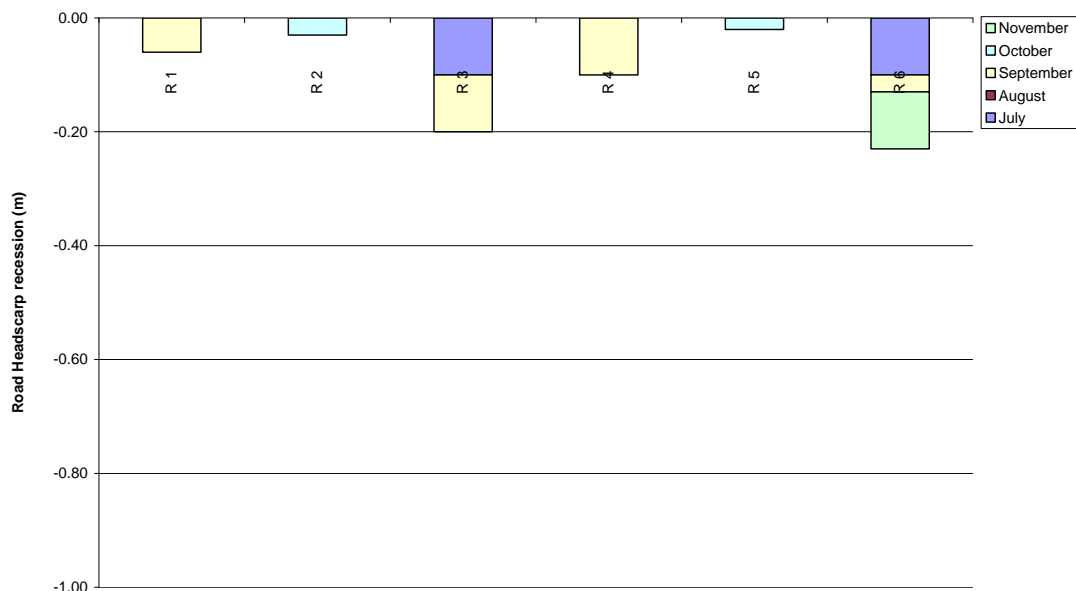
KEY RESULTS

- No significant recession of the headscarp, plotted values may be due to measurement error
- A surface crack and shallow depression along the road between R0 and R1 was reported on 1.8.08. A further inspection on 24.10.08 revealed no discernable change. The crack is being monitored by SBC

RECOMMENDATIONS

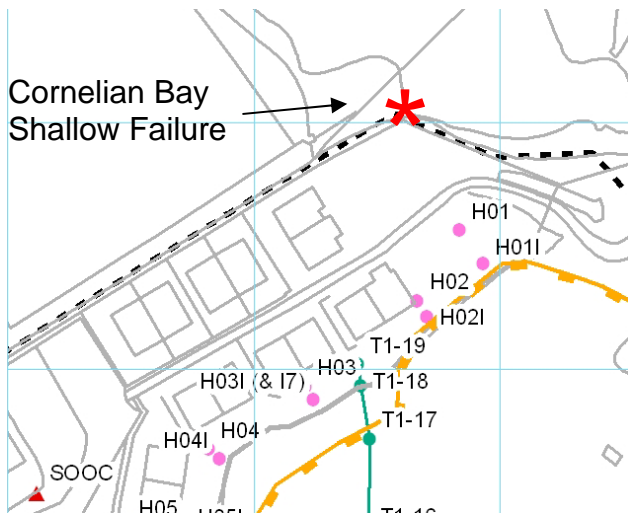
- Continue twice weekly (**Tue & Fri.**) observations and monitoring
- Pay close attention to the road surface between R0 to R2, and make a note of any observable change
- **Be very vigilant as we enter winter. Owing to seasonal rainfall and rising groundwater, the risk of ground movement and cliff recession is much increased**

Peg measurement reference number



Note: coloured bars in the graph show total monthly recession measured since 1.7.08. Refer to user notes at the end of this report. Average monthly error of ± 0.07 m.

Cornelian Bay Headscarp Recession



KEY RESULTS

- The Cornelian Bay landslide complex is independent from that occurring at Cayton Cliff. However, given the close proximity to both Cayton Cliff and the properties at Knipe Point, commentary on this site is provided
- From the start of October 2008 tension cracking (c. 12 m length), and a subsequent shallow failure along the Cornelian Bay Landslide headscarp (*) have occurred. This is manifest in the progressive downslope displacement of a failure block. Thereby truncating the Cleveland Way path access (Photo 3)

RECOMMENDATIONS

- Continue weekly observation of the Cornelian Bay headscarp failure, being vigilant for the development of new tension cracks to the rear of the existing failure
- Undertake consultation to seek permanent diversion of the Cleveland Way at this location

Photo 1: Ongoing failure and recession of the Knipe Point headscarp near H11 (A: 2.9.08; B: 28.11.08)

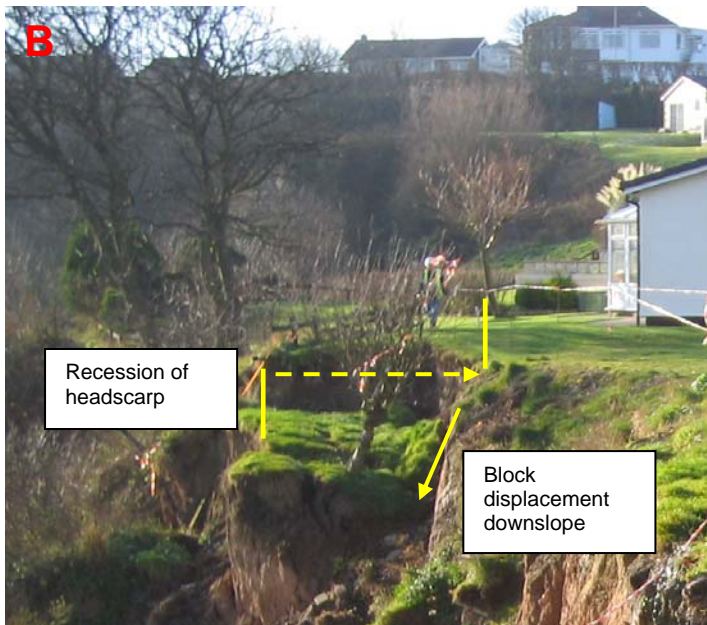
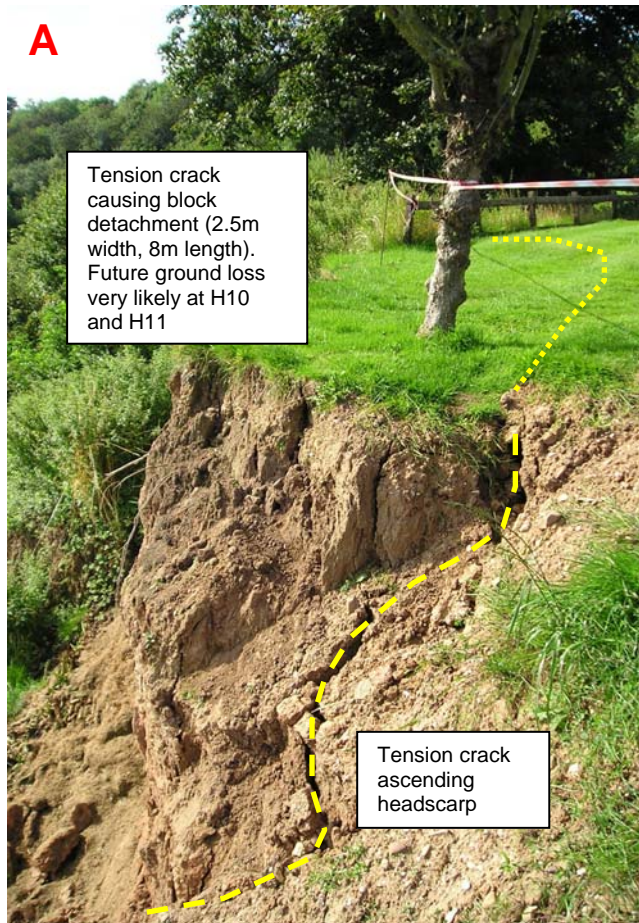


Photo 2: Recent failure and recession of the Knipe Point headscarp near H8 (28.11.08)

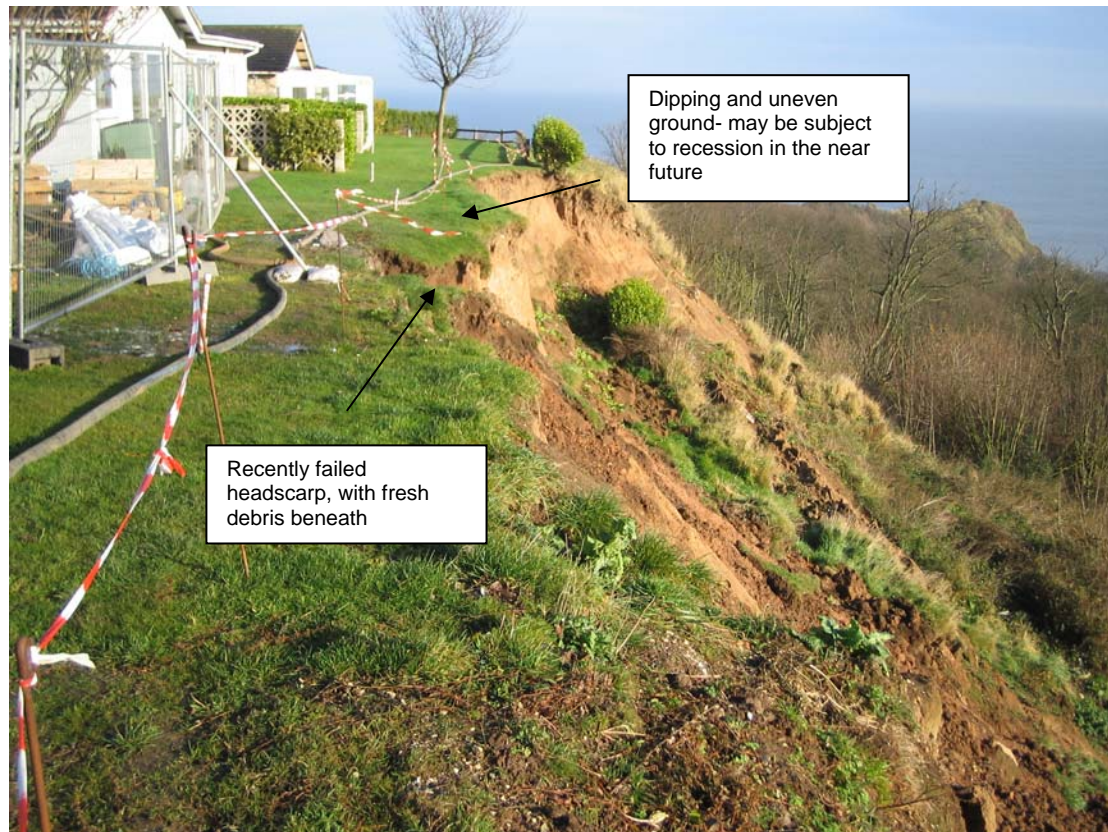


Photo3: Shallow slide development truncating the Cleveland Way
(Cornelian Bay Landslide basin- Immediately north of Knipe Point) (A: 3.10.08; B 22.10.08; C:28.11.08)



USER GUIDE

1. Background to the report:

A major reactivation of the Cayton Cliff landslide complex occurred on 1st April 2008. The landslide has led to recession of the headscarp and the loss of three bungalows at Knipe Point in April and May 2008. Further cliff top property, major services and the main coastal road (A165) are at risk from landslide activity and headscarp recession in the future.

An observation and slope monitoring strategy has been developed for the site. Regular survey of a fixed ground marker network permits an assessment as to whether the landslide is changing or not. These monitoring reports provide a technical summary of the observation and monitoring results to inform stakeholders of present and future forecast landslide activity and potential consequences at Cayton Cliff.

2. Monitoring methodology:

The observation and slope monitoring strategy comprises a ground marker network installed in specific landslide areas (See Table 1). Observations and taped measurements of the landslide are made from these markers. For example, at the headscarp, regular measurements are made from a fixed marker to features of interest (e.g. the edge of headscarp) (Figure 1). All measurements are recorded on a monitoring record sheet.

Tension cracks are also noted, as these extension fractures are commonly associated with landslide induced ground movement (Figure 2).

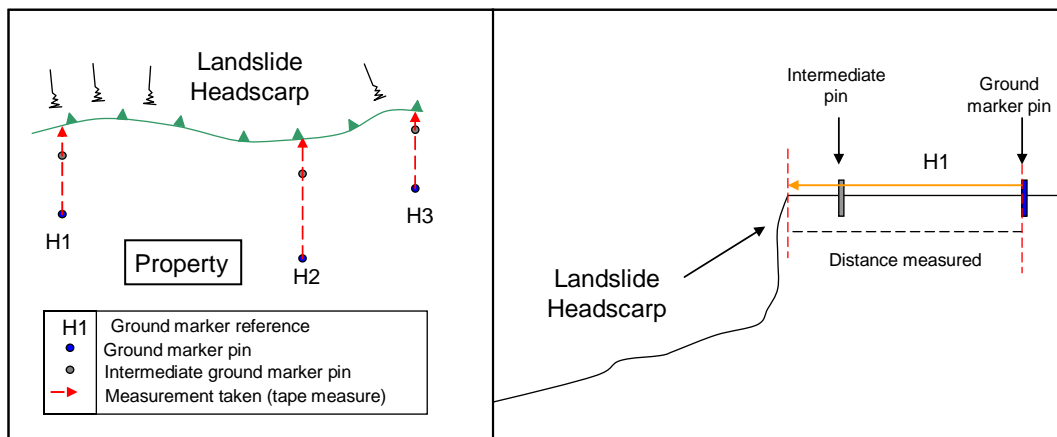


Figure 1. Schematic of ground marker measurement at the Headscarp

Landslide area	Monitoring components	No	Purpose
Knipe Point Headscarp	Measurement pins	15	Measure headscarp recession and evidence of tension cracks
	Field observation points	3	Visual observations of change
A165 Headscarp	Measurement pins	7	Measure headscarp recession and evidence of tension cracks

Table 1. Summary of the ground marker network

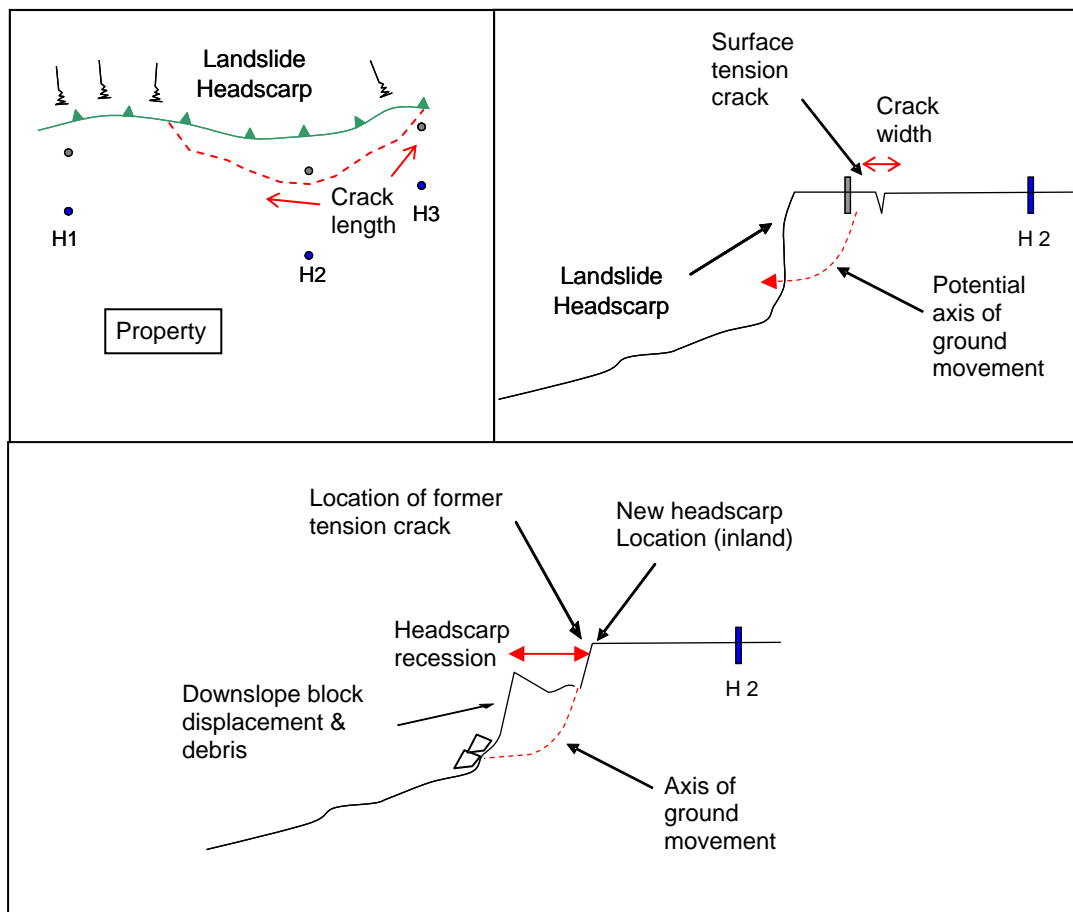


Figure 2. Schematic of tension cracking, and subsequent block displacement (ground movement) at the Headscarp, and their measurement axes

3. Analysis of monitoring results (Headscarp):

Field measurements are entered into a master database, and measurement errors are calculated (average standard deviation). The data are plotted on a graph to show the amount of recession recorded by month, since 1st July 2008 (Figure 3). The graphs reveal that headscarp recession is sporadic over time with some locations and time points recording no recession (i.e. no change is shown on the graph). Other locations show a variable amount of recession from one time to another confirming the unpredictable nature of headscarp recession due to variable weather and ground conditions.

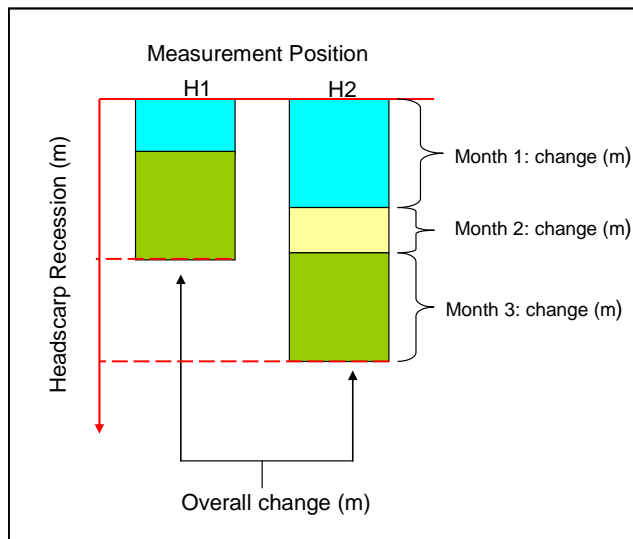


Figure 3. Explanation of cumulative change

4. Where is your property at Knipe Point?

Figure 4 provides a plan of the properties at Knipe Point. This will help locate a property relative to the preceding maps of the observation and slope monitoring network.

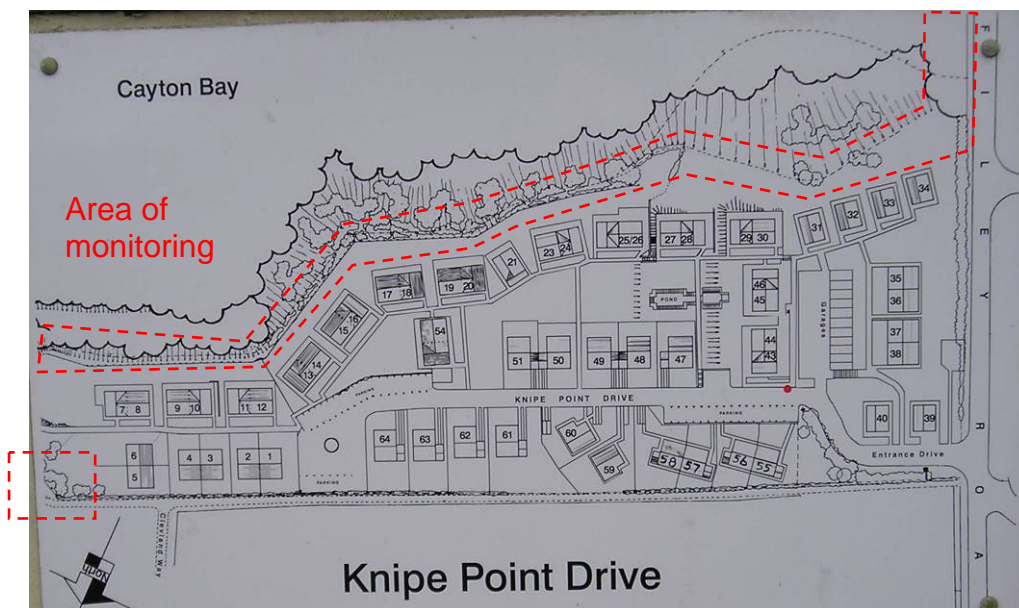


Figure 4. Map of the Knipe Point Development