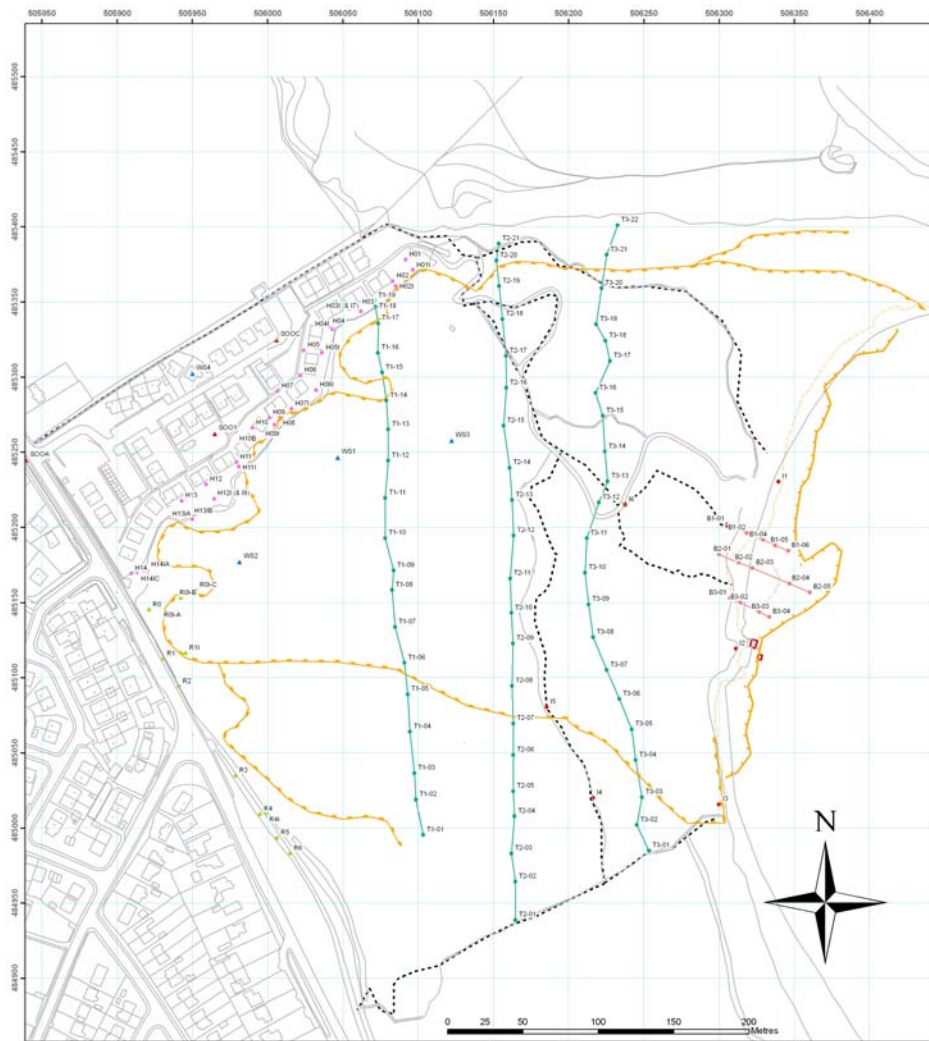


Cayton Cliff & Cornelian Bay, North Yorkshire Monitoring Report

Report No.: 006 Issue Date: 2.2.09

Monitoring data and analysis:

July 08:	1.7.08- 29.7.08	} Report covers this period
August 08:	29.7.08- 26.8.08	
September 08:	26.8.08- 30.9.08	
October 08:	30.9.08- 28.10.08	
November 08:	28.10.08- 25.11.08	
December 08:	25.11.08- 30.12.08	
January 09:	30.12.09- 30.1.09	



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)

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The National Trust

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Knipe Point Headscarp Recession

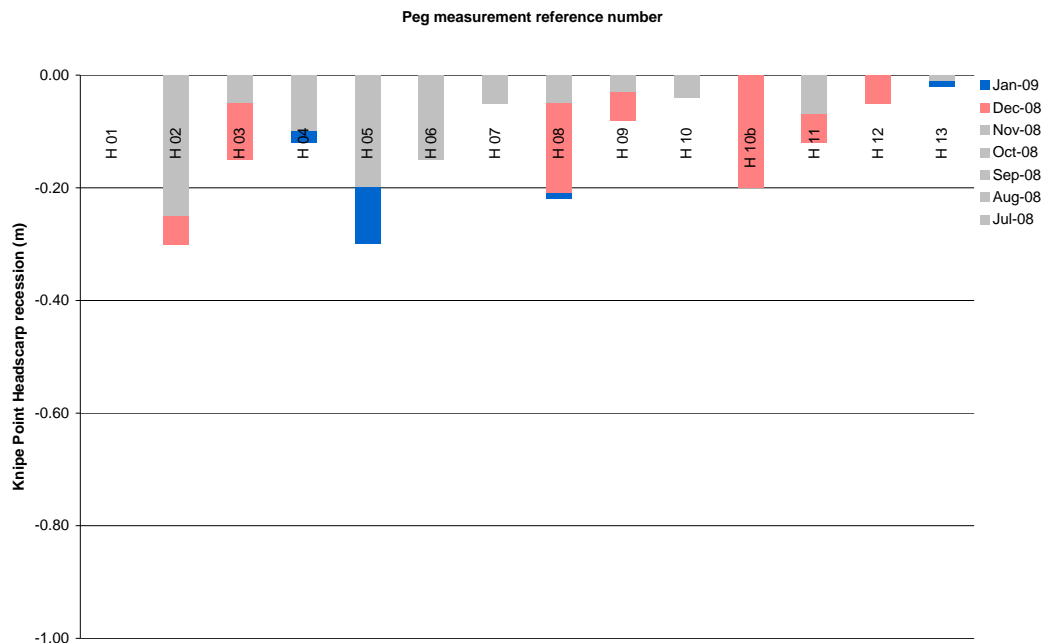


KEY RESULTS

- Recession measured at 7 pins during December (equal or less than 0.2 m monthly). Focus of activity between H 08 and H 11
- Recession measured at 4 pins during January (equal or less than 0.1m monthly)
- Ongoing block displacement near H 11, resulting in local headscarp recession (Photo 1)

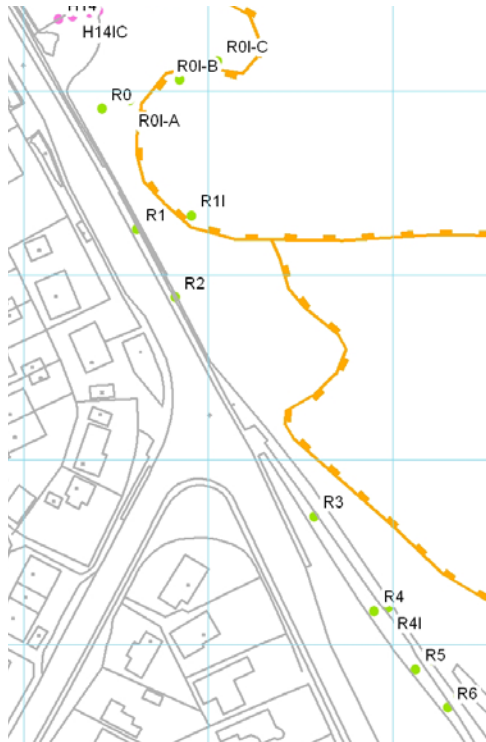
RECOMMENDATIONS

- Continue twice weekly (Tue. & Fri.) observations and monitoring
- Carefully monitor the developing headscarp recession failures between H 8 & H 11
- **Maintain vigilance through the winter. Owing to seasonal rainfall and rising groundwater, the risk of ground movement and cliff recession is much increased**



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 ± 0.05 m.

Former A165, Filey Road, Headscarp Recession

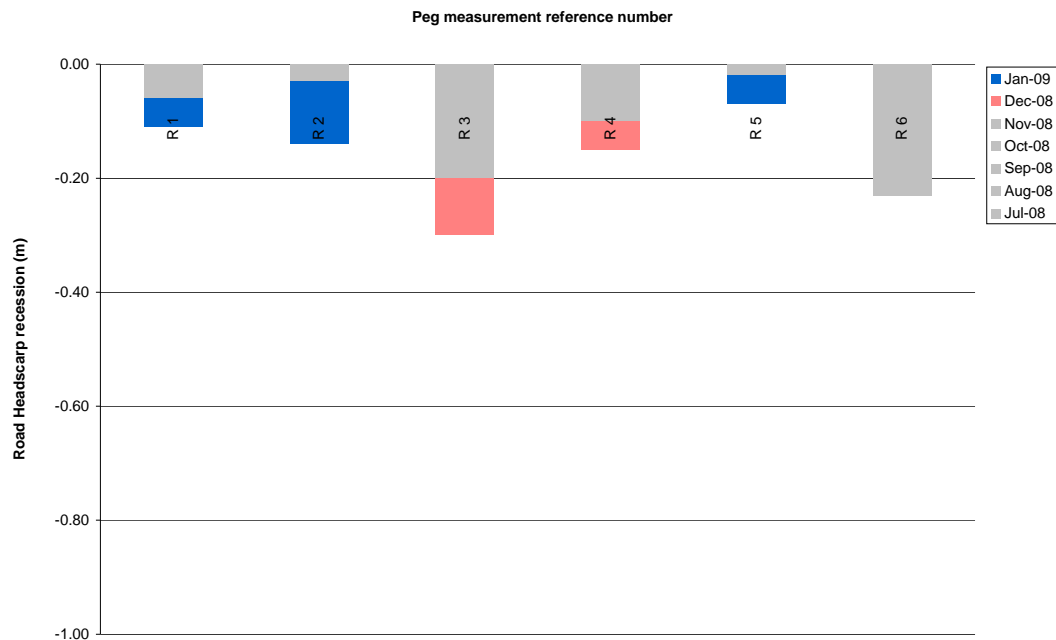


KEY RESULTS

- No significant recession of the headscarp observed
- A surface crack and shallow depression along the road between R0 and R1 was reported on 1.8.08. Further inspections during December and January revealed no discernable change. The crack is being monitored by SBC

RECOMMENDATIONS

- Continue twice weekly (Tue. & Fri.) observations and monitoring
- Record any change to the road surface and verge, between R0 to R2
- **Maintain vigilance through the winter. Owing to seasonal rainfall and rising groundwater, the risk of ground movement and cliff recession is much increased**

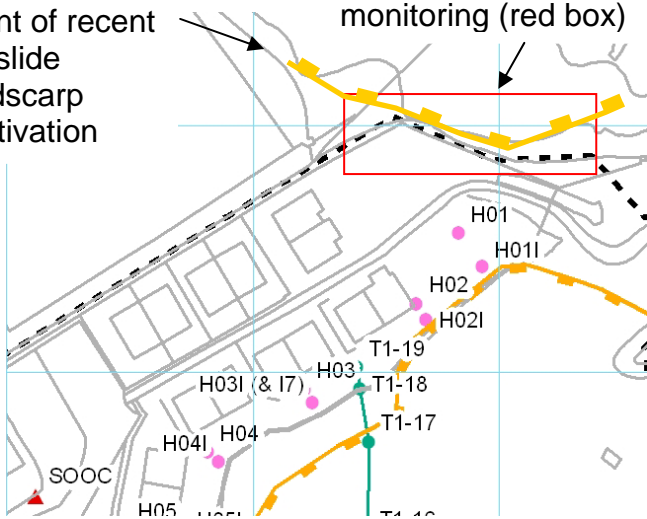


Note: coloured bars in the graph show total monthly recession measured since 1.7.08. Refer to user notes at the end of this report. Average monthly error of ± 0.06 m.

Cornelian Bay Headscarp Recession

Approximate
extent of recent
landslide
headscarp
reactivation

Zone of pin
monitoring (red box)



KEY RESULTS

- This landslide headscarp has continued to deteriorate. The fresh scarp is around 75-100 m in length, and 2 distinct failure blocks are now apparent and continue to be displaced downslope
- Collapse of the Cleveland Way Path has occurred above the headscarp (Photo 2), which is no longer passable
- A monitoring pin network was installed on 12.1.09

RECOMMENDATIONS

- Continue twice weekly (Tue. & Fri.) observations and monitoring
- Review footpath closure measures as access is becoming increasingly difficult and dangerous



Note: coloured bars in the graph show total monthly recession measured since 12.1.09. Refer to user notes at the end of this report. Average monthly error of ± 0.04 m.

Photo 1: Ongoing failure and recession of the Knipe Point headscarp near H11 (A: 28.11.08; B: 30.1.09)

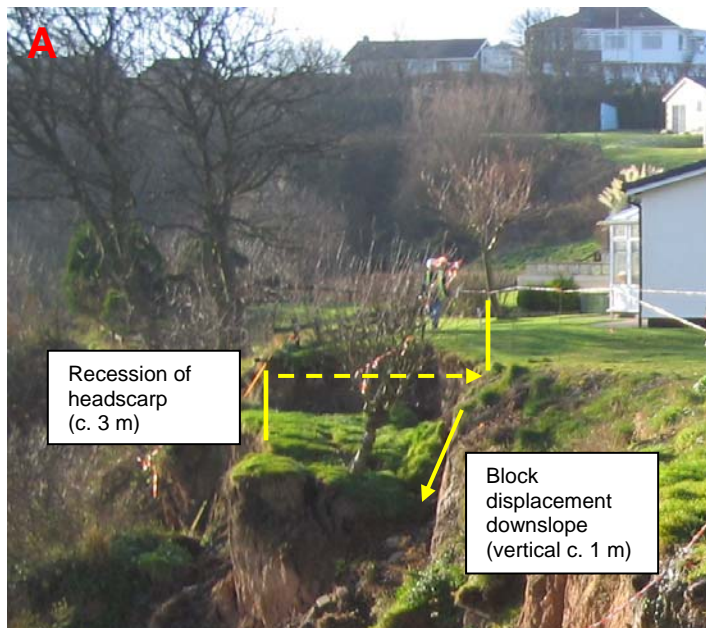


Photo 2: Shallow slide development truncating the Cleveland Way
(Cornelian Bay Landslide basin- Immediately north of Knipe Point) (A: 28.11.08; B: 20.1.09)



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. Recent (post October 2008) headscarp recession at Cornelian Bay is also ongoing adjacent to the Knipe Point residential area.

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 these landslides are 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 and part of the Cornelian Bay landslide.

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 landslides 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).

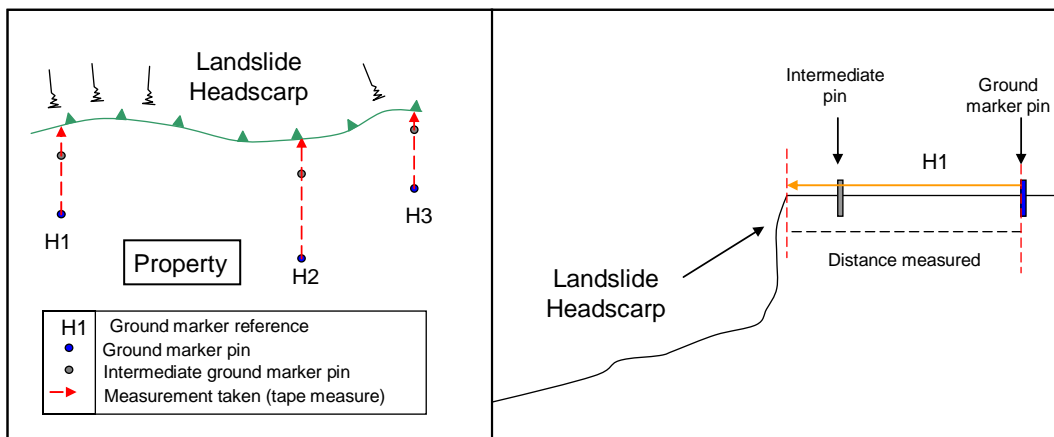


Figure 1. Schematic of ground marker measurement at the Headscarp

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
Cornelian Bay (Jan. 2009)	Measurement pins	8	Measure headscarp recession and evidence of tension cracks

Table 1. Summary of the ground marker network

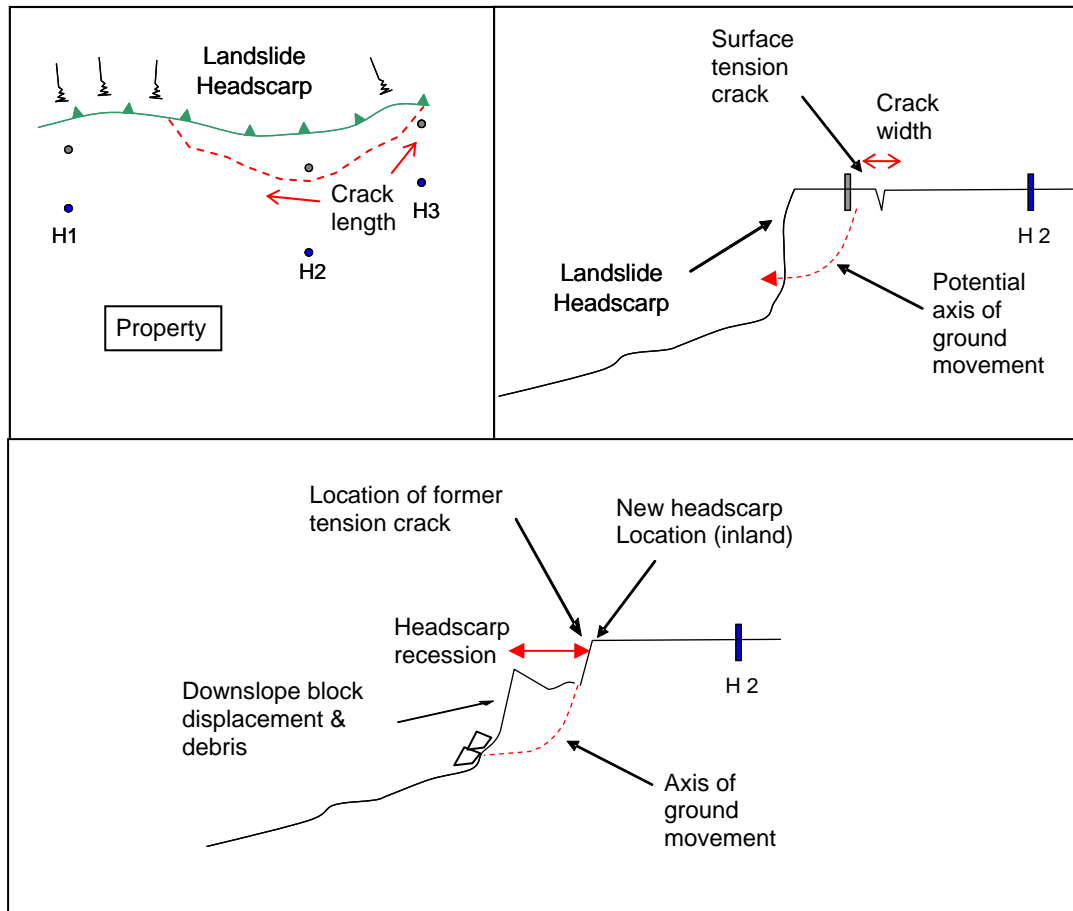


Figure 2. Schematic of tension cracking, and subsequent block displacement (ground movement) at the Headscarp, and their measurement axes

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.

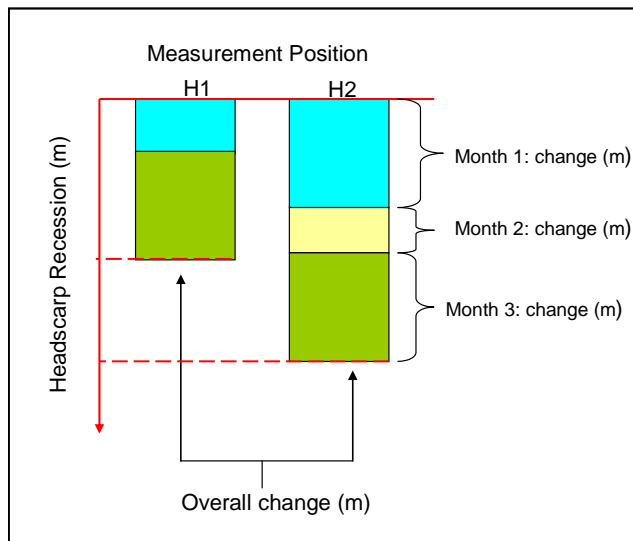


Figure 3. Explanation of cumulative change

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.

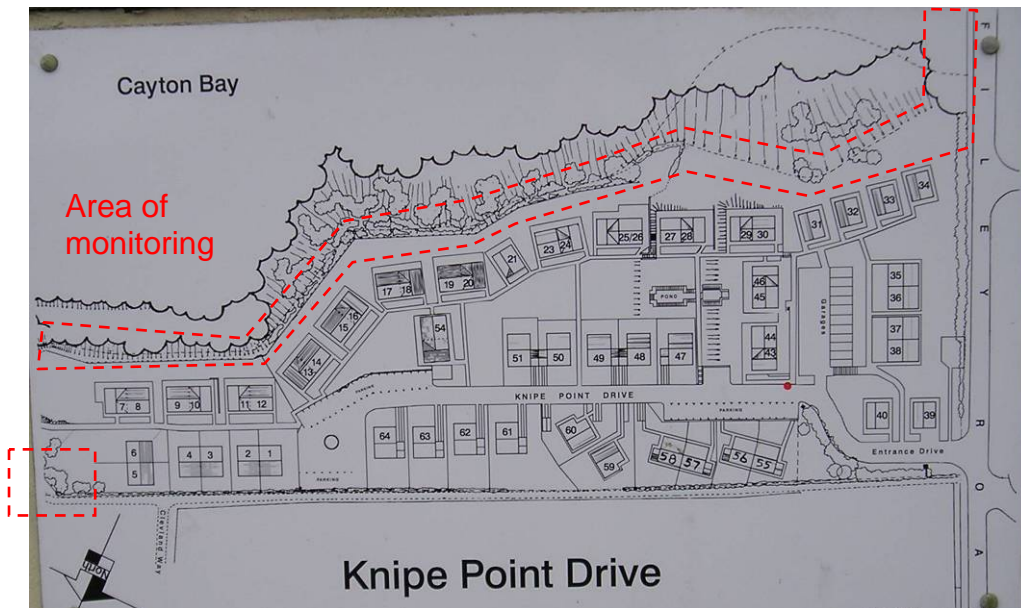


Figure 4. Map of the Knipe Point Development