4.1.1.4 KODAK DCS 420 (Near infrared).

This sensor was used at only one of the wetlands, namely Kromme River in the Eastern Cape. Appendix 6 contains an A3 size map of the KODAK DCS 420 (Near infrared) imagery covering the Kromme River wetland area. The image size is approximately 1.5 million pixels (1524 x 1012) with nominal pixel resolution of 0.6 m. The field of view is 914 m x 607 m when flown at 1000 m. Although the resolution of the sensor (1 m) is very good, the mosaic was not seamless, making data processing difficult and time consuming. Classifications and indices highlighted the mosaicing seams as differences in the spectral value of features, although it was the same feature on the ground. All 47 individual images were processed individually; edge matched and mosaiced after the classification. Seamless mosaics are considered to be important for wetland assessment.

All three bands were used and displayed as 1, 2, 3 (Red, Green, Blue). The primary reason for using red (R) and near-infrared (NIR) wavelengths is that they are useful for monitoring vegetation (Figure 108): Leaf chlorophyll absorbs energy in the visible-red to electromagnetic wavelengths (600-700 nm); crops with healthy leaves absorb higher levels of energy at these wavelengths. Healthy crops are also characterized by a good leaf-cell structure and leaf-water content. In the near-infrared wavelengths (800-900 nm) such characteristics cause a high reflectance response (Figure 108).

All three bands were used to optimize the spectral range in identifying the different wetland rehabilitation indicators (e.g. rehabilitation structure 5: Gabion weir at Hudsonvale, Figures 109 and 110). All the classes and structures were

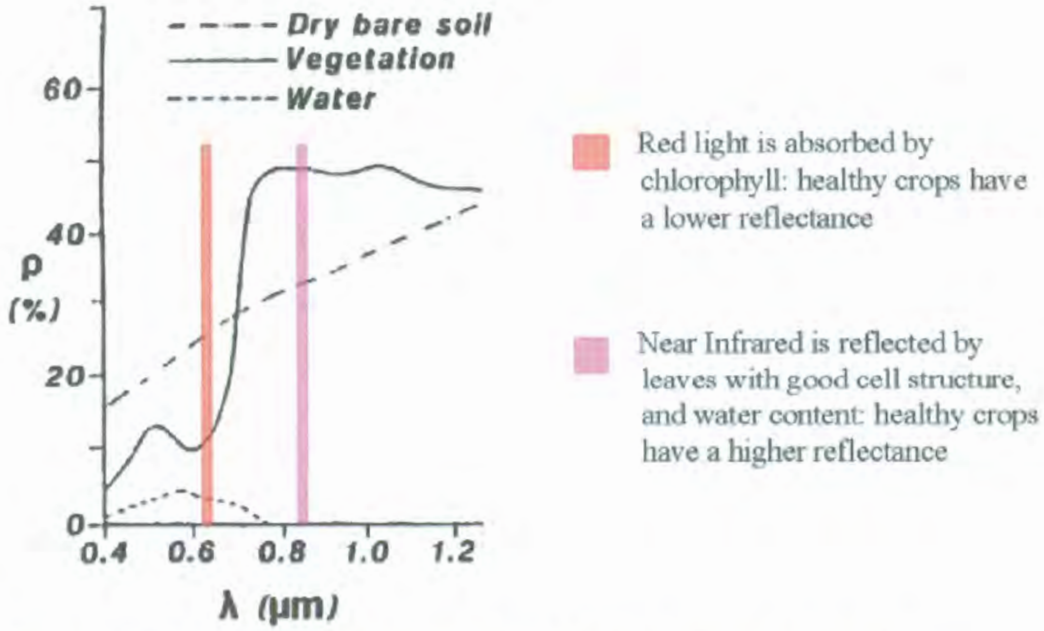

Figure 108: Reflectance values of KODAK240 (Near infrared).

mapped with ease (e.g. rehabilitation structure 5: Gabion weir at Hudsonvale, Figures 111 and 112). However, sediment deposits behind the rehabilitation structure 1 (a concrete weir, Figure 113) were highlighted successfully because they were not covered with shallow water (Figure 114). According to Campbell (2002), bare soil will display bright, vegetated land and water dark in the near infrared region, making it easy to determine the land-water body border. CIR film is suitable if the water is clear and not turbid. However, if the sediment deposits in this case were covered with water, the area would have displayed dark and if colonized with vegetation, it would display red. In the last two examples the sediment deposit would not be evident.

At Kompanjiesdrif (Figures 115 and 116, rehabilitation site 4: Gabion weir) measurement of the active headcut erosion could be determined successfully (Figure 117). It was also possible to map the wetland vegetation with this sensor. It is important to have adequate field points for the classification and verification of the data.

Kodak DCS 420 (Near infrared) example 1: Kromme River wend – site 5.

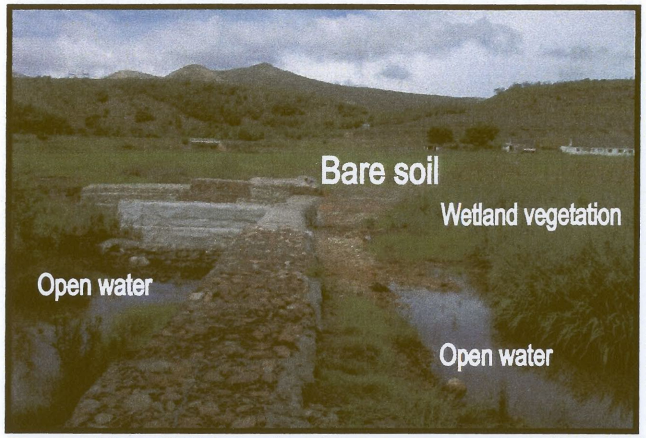

Figure 109: Gabion structure at site 5 (Hudsonvale) of the Kromme River Wetland.

Figure 110: Sedimentation downstream of the gabion structure at site 5.

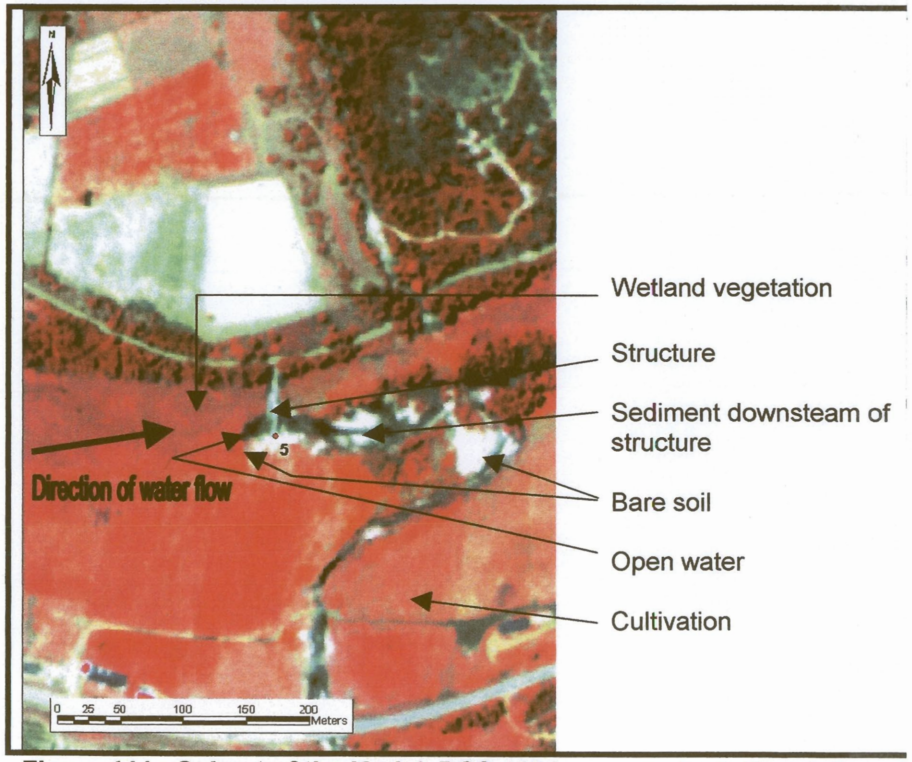

Figure 111: Subset of the Kodak DCS 420 image at site 5. Resolution: 1 Acquisition date: 22/01/2003.

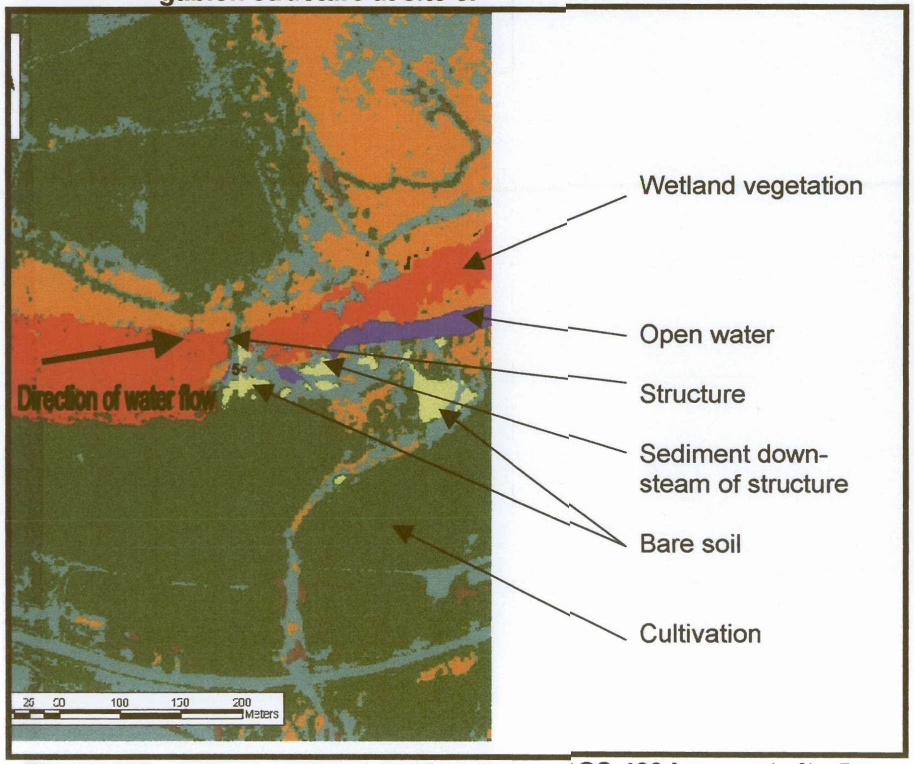

Figure 112: Subset of the classified Kodak DCS 420 image at site 5.

Kodak DCS 420 (Near infrared) example 2: Kromme River weır – sites 1 and 4.

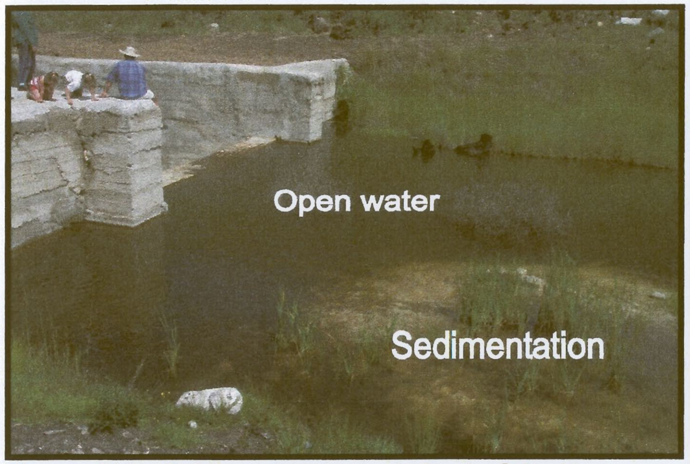

Figure 113: Gabion structure at site 1 of the Kromme River Wetland.

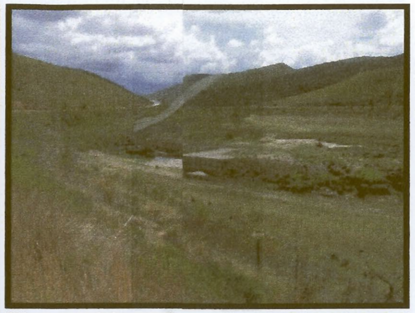

Figure 115: Gın structure at site 4 ınpanjiesdrif).

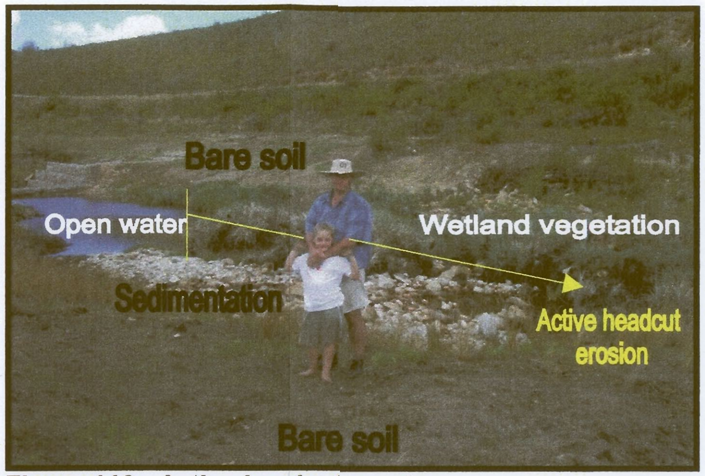

Figure 116: Active headcut erosion.

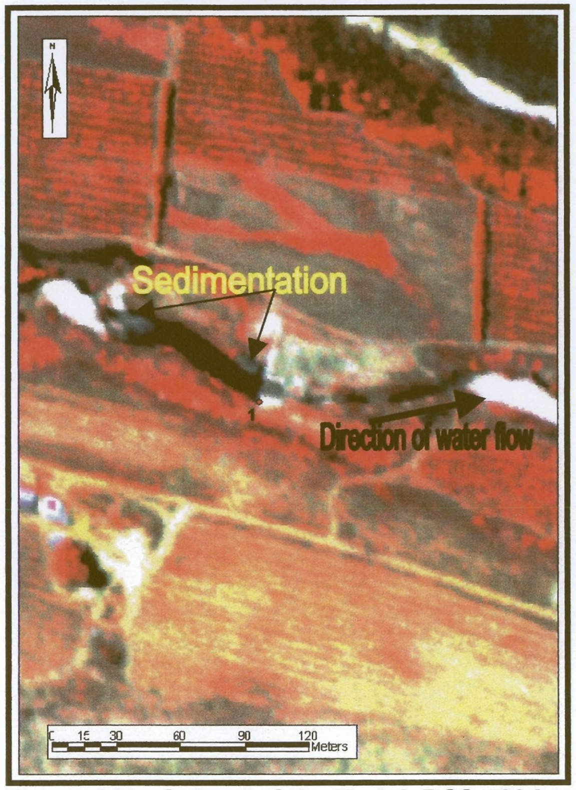

Figure 114: Subset of the Kodak DCS 420 image at site 1. Resolution: 1 m. Acquisition date: 22/01/2003

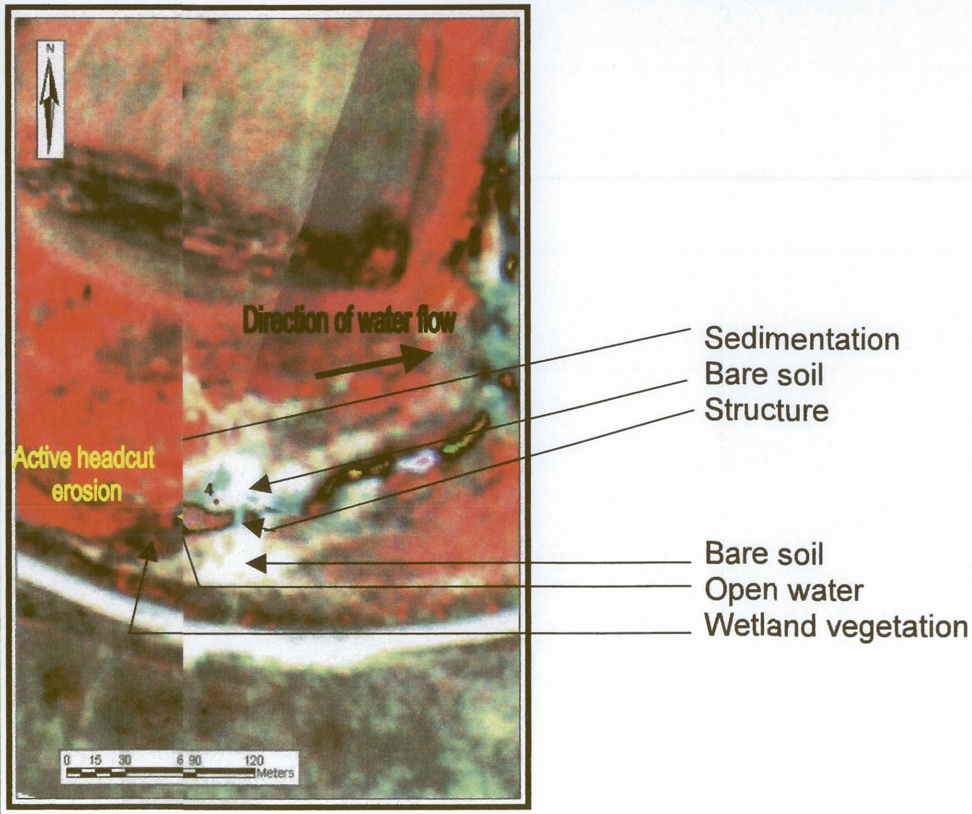

Figure 117: Set of the Kodak DCS 420 image at site 4. Rıution: 1 m. Acquisition date: 22/01/2003

4.1.1.5 DuncanTech CIR.

DuncanTech's CIR configuration produces images with green, red and near infrared bands. The imaging sensors are sensitive to wavelengths ranging from about 400 nm to 1100 nm, with peak sensitivity at approximately 500 nm. The spectral values for wetland vegetation (Profile 1), bare soil (Profile 2) and natural vegetation (profile 3) as reflected in Figure 118 from the DuncanTech CIR Camera image for Mbongolwane.

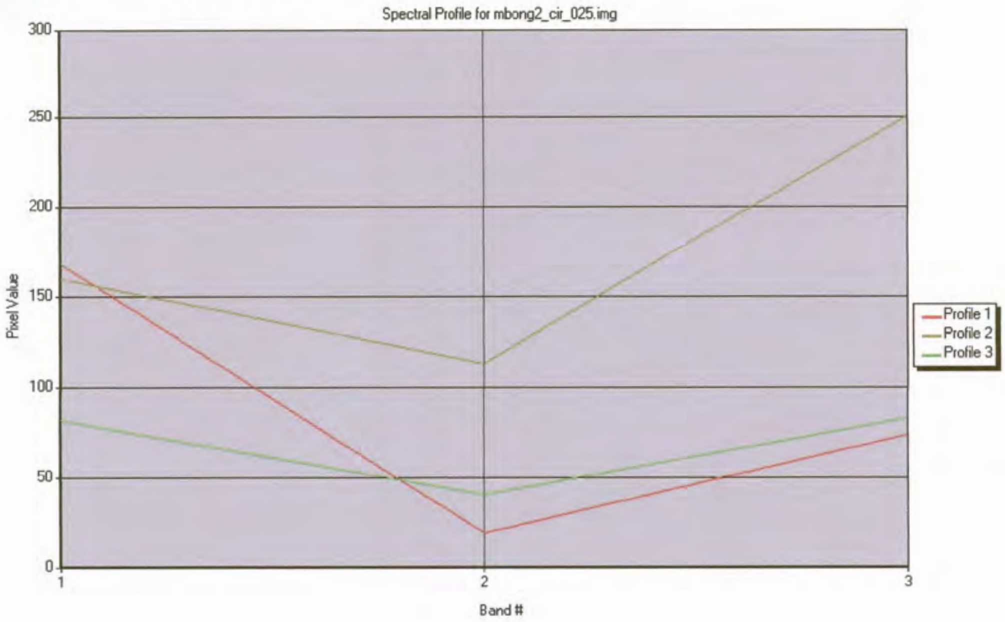

Figure 118: Spectral Profile for DuncanTech CIR.

Apart from the datasets being quite large and processing time being relatively long the data were very effective in mapping all the rehabilitated wetland indicators and structures. The following examples from Mbongolwane, Zoar and Rietvlei wetlands illustrate the effectiveness of this sensor.

Example 1: Mbongolwane wetland: Uvova.

Various wetland rehabilitation indicators and structures (Erosion - Figure 119; Concrete weir - Figure 120; Earthen embankment - Figure 121 and Sandbag groyne and sediment - Figure 122) are evident in Figures 123 and 124. They give a good indication of the level of detail this sensor is capable of. Figure 125 illustrates the level of detail including erosion, rehabilitation measures and sedimentation, using DuncanTech true colour imagery.

Example 2: Zoar wetland.

The main drain with clay plugs (Figure 126) and the road infrastructure (Figure 127) are evident in Figures 128 (DuncanTech CIR) and 129 (DuncanTech true colour). Dominant terrestrial vegetation replaced the aquatic plants in the wetland. Spectrally the wetland and grassland vegetation could not be adequately distinguished.

Example 3: Rietvlei wetland. The resolution for the DuncanTech CIR image of Rietvlei wetland was 0.5 m and not 0.25 m (as with Mbongolwane and Zoar). The Rietvlei wetland is situated near Irene and is therefore within the Johannesburg International Airport's Flight restriction area.

Site details at rehabilitation structure 4, 5.1 and 5.2 are shown in Figures 130 – 133. Figures 134 (DuncanTech CIR) and 135 (DuncanTech true colour) are subsets of the DuncanTech imagery and display the different wetland vegetation (tall and short emergent). It would be possible to map differences in vegetation types using the detailed field data collected by *Venter et al.* (2003) in the different wetland zones (permanent, seasonal and temporary). This could be processed together with an image acquired during the wet summer rainfall season and followed up with another image at the same time of the year but in a different year. This could be used for change detection and to monitor the status of the wetland. All the bands have been determined to be very useful in assessing vegetation characteristics.

DuncanTech example 1: Mbongolwane wetland – Uvova.

Figure 119: Erosion downstream at Uvova.

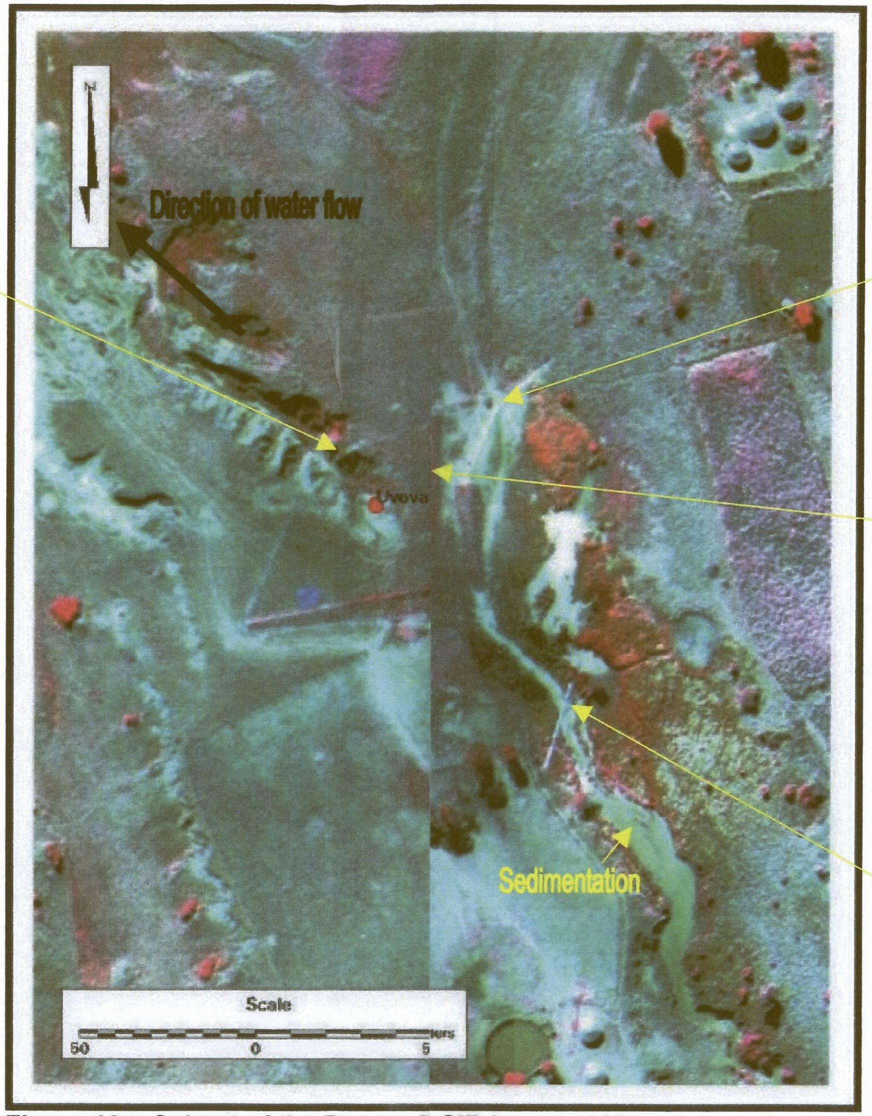

Figure 124: Subset of the DuncanT CIR image at Uvova. Resolution: 0.25 m. Acition date: 09/06/2003.

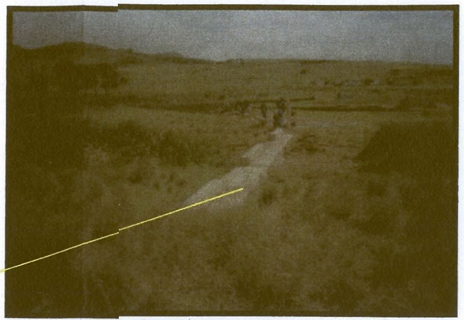

Figure 120: Concrete weir.

Figure 121: Earthen embankment.

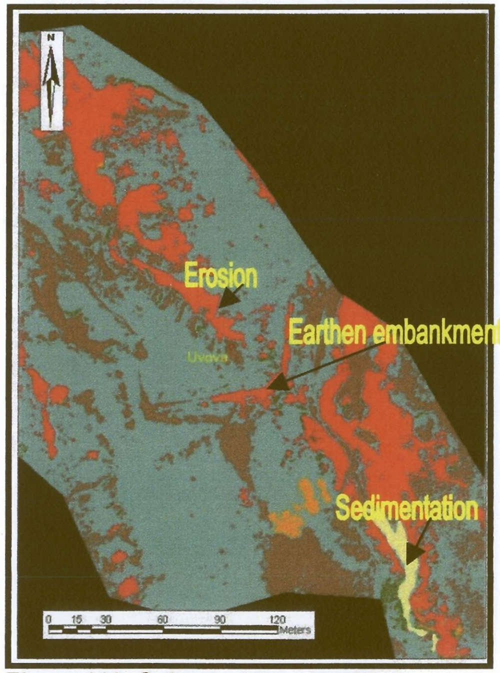

Figure 123: Subset of the classified DuncanTech CIR image at Uvova.

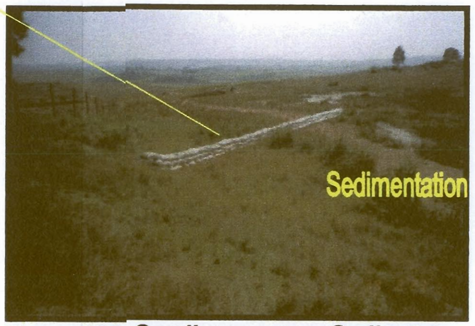

Figure 122: Sandbag groyne. Sediment Down - and upstream of the groyne.

DuncanTech example 1: Mbongolwane wetland – Uvova.

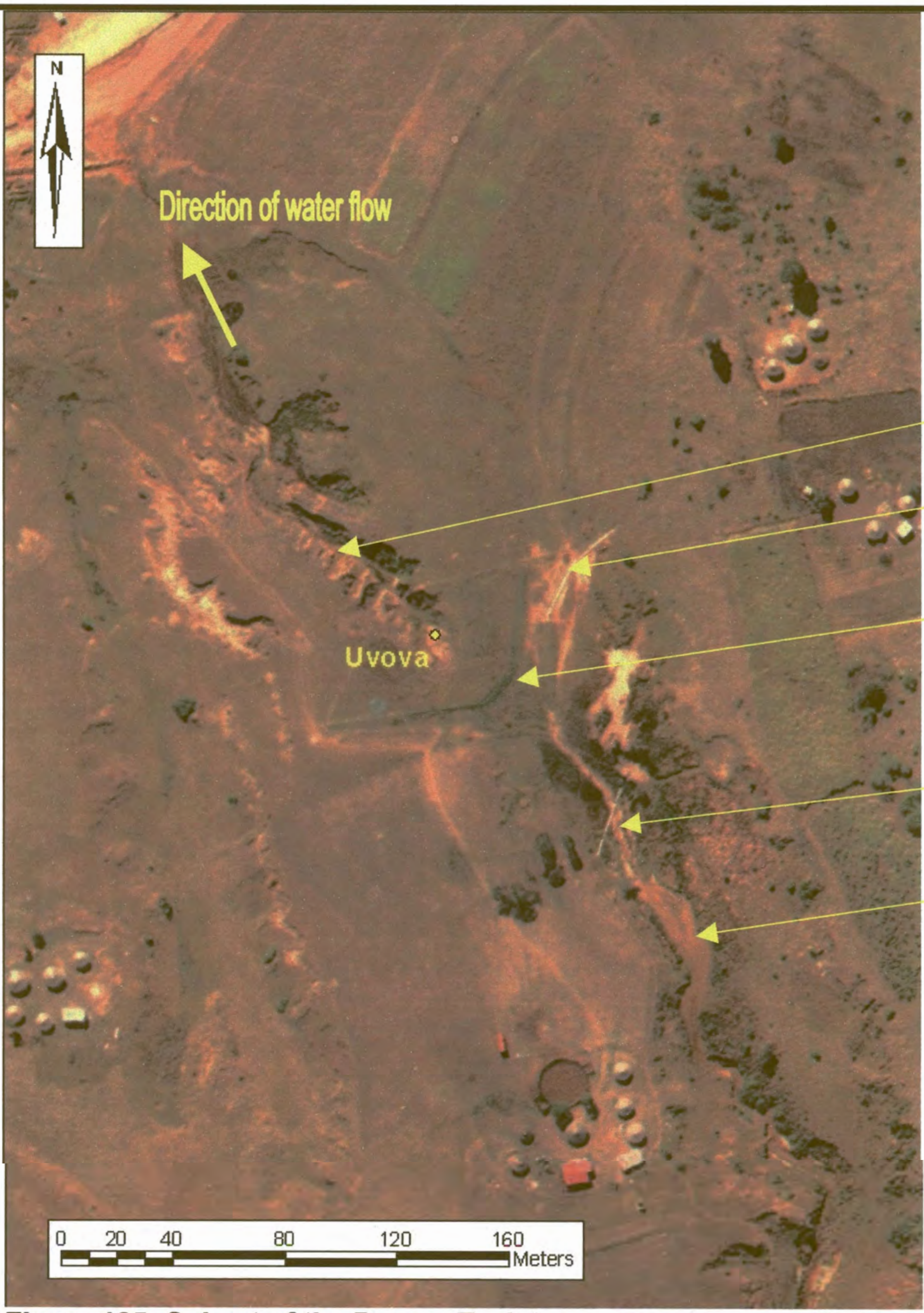

Figure 125: Subset of the DuncanTech true colour image at Uvova. Resolution: 0.25 m. Acquisition date: 09/06/2003.

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DuncanTech example 2: Zoar wetland.

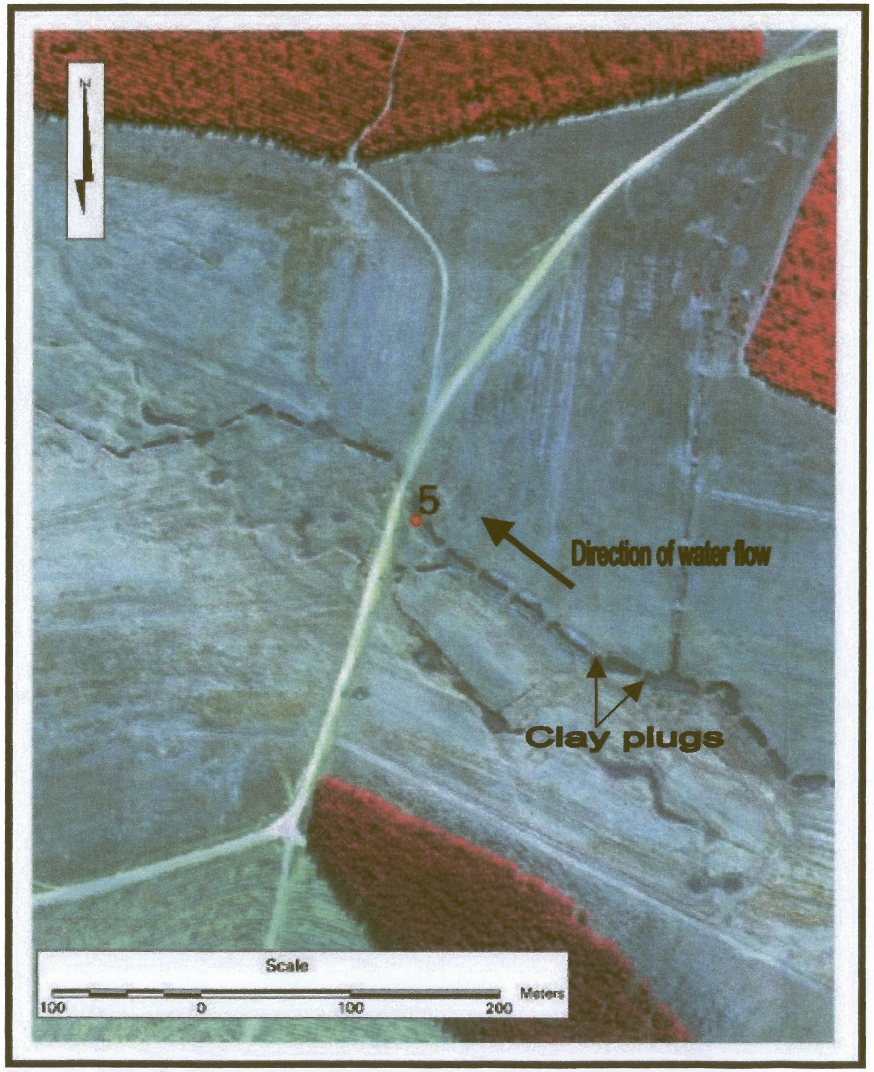


Figure 128: Subset of the DuncanTech CIR image at Uvova. Resolution: 0.25 m. Acquisition date: 09/06/2003.

Figu 26: Drains with clay plugs and evidence of wetness. Photo taken 26/05/2003.

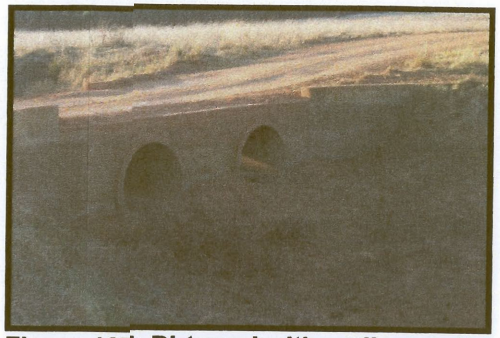
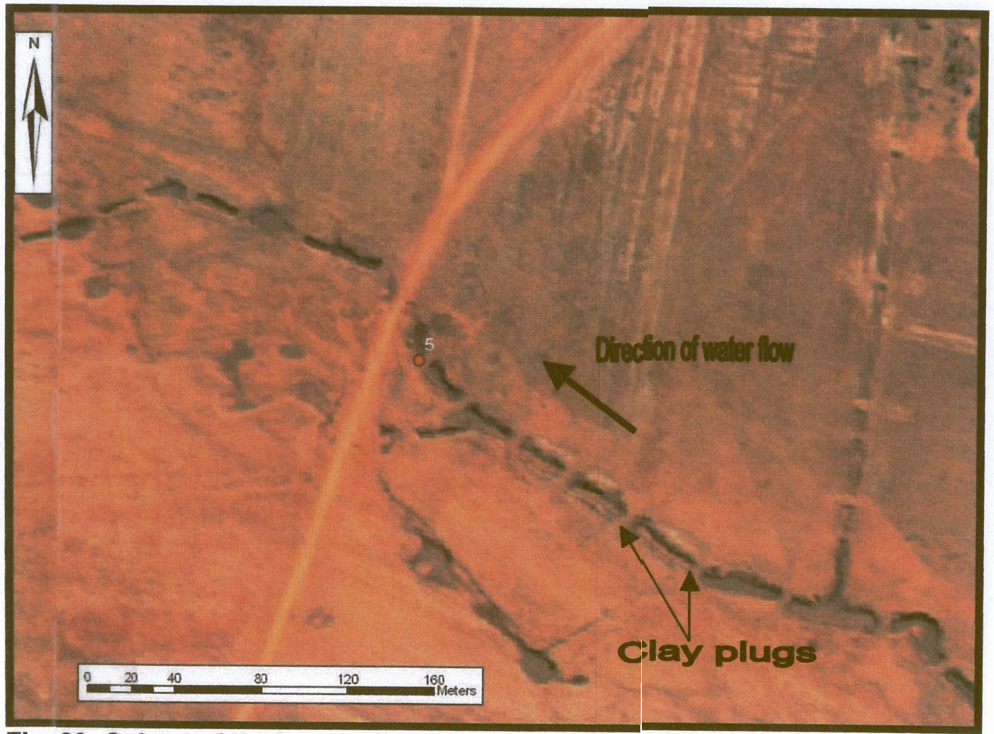


Figure 127: Dirt road with sedimentation deposited upstream of the culvert.



Figu 29: Subset of the DuncanTech true colour image Resolution: 0.25 m. Acquisition Date: 09/06/2003.

DuncanTech CIR example 3: Rietvlei wetland.

Figure 1: Gabion structure at site 5.2. Nothe difference in the water table upeam and downstream of the strure.

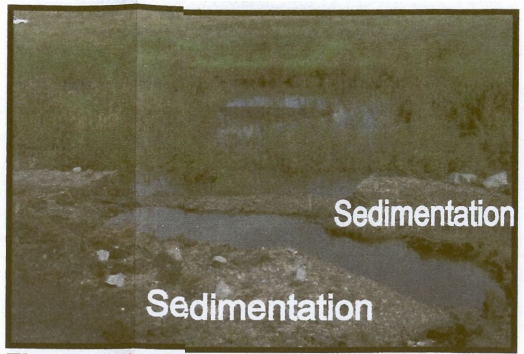


Figure 131: Site no 5.1.. Sedimentation taking place behind the structure.

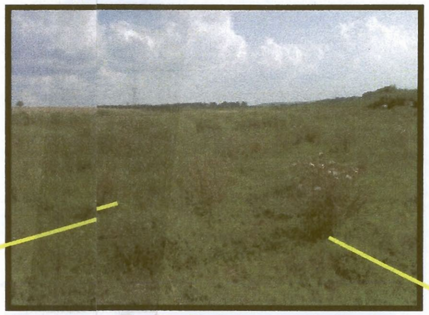


Figure : Terrestrial vegetation between structure 4 and 5.1 and 5.2.

Figure : Concrete weir at site 4. Note thetland vegetation (tall engent, ***Phragmites australis)*** bad the structure.

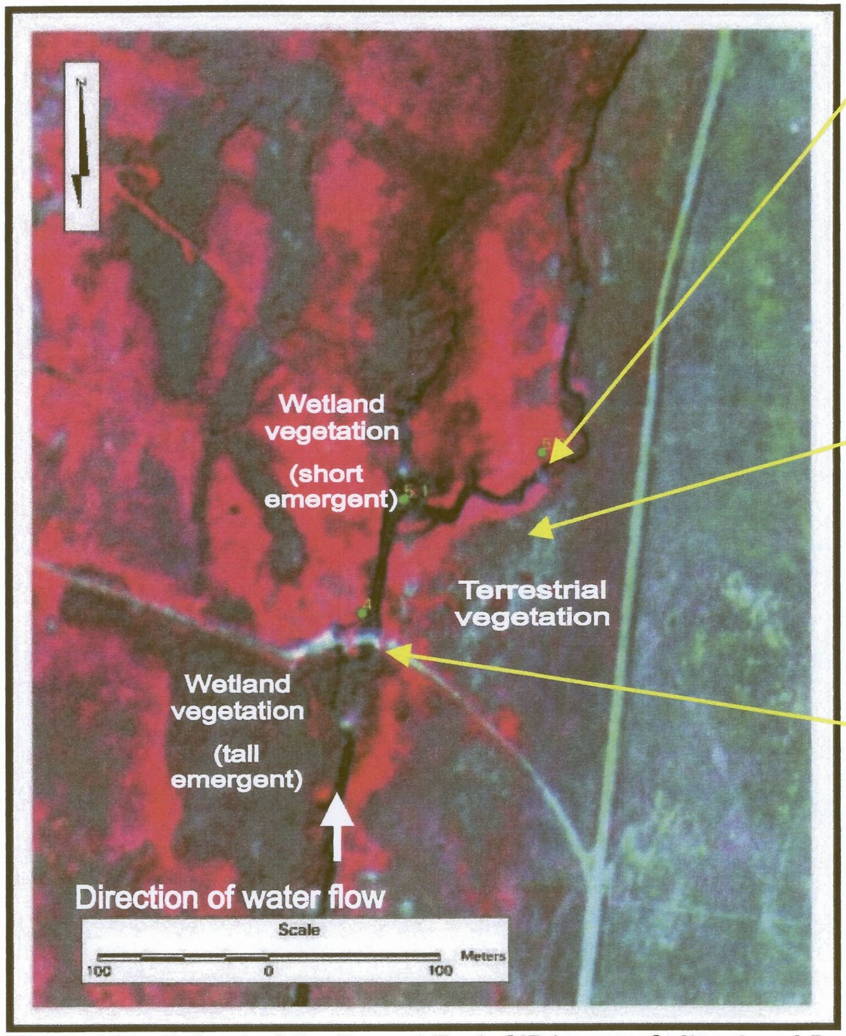


Figure 134: Subset of the DuncanTech CIR image of sites 4 and 5. Resolution: 0.5 m. Acquisition date: 09/06/2003.

Figure 135: Subset of the DuncanTech true colour image. Resolution: 0.5 m. Acquisition date: 09/06/2003.