Gossans West is a prospect in Central Queensland that has experienced intense hydrothermal alteration of volcanic, volcaniclastic and intrusive host rocks. Previous exploration has led to a number of contrasting interpretations including porphyry and epithermal, and part of the reason for the uncertainty of the Gossans West system is due to the overlap in the porphyry and epithermal classification. This study aims to characterise the geology, geochemistry and alteration of the hydrothermal system at Gossans West, and from this, infer the pressure, temperature and compositional conditions of formation and a genetic model for the system.

Three weeks of mapping and sampling were conducted at Gossans West to investigate the geology and alteration, and a number of maps ranging from outcrop to regional scale were produced. The alteration and primary features of the rocks were investigated using petrography. A PIMA alteration study by a consultant geologist helped define the mineralogy of pervasive clay alteration in brecciated bodies termed ‘alteration pipes’ and X-ray diffraction was used to verify the data and provide more detailed information on the alteration mineralogy. The soil geochemistry of the area was investigated using pre-existing lab-assay data, supplemented by X-ray fluorescence (XRF) results from this study, using a Niton instrument. Overlap in the samples analysed allowed the accuracy and precision of the XRF instrument to be determined. A statistical tool called a principal components analysis was implemented on the geochemical dataset to determine if there were any underlying elemental associations which could be linked to particular parts of a magmatic-hydrothermal system.

Results from this study show that Gossans West is hosted by a sequence of andesitic rocks, intersected by lenses of volcaniclastic breccia and conglomerate, and intruded by phreatomagmatic breccia, magmatic breccia, and porphyritic-phaneritic intrusions and dykes. It is likely to have formed in a volcano-sedimentary environment associated with a volcanic arc. It is dominantly affected by propylitic and advanced argillic alteration which consists of minerals such as alunite, dickite, quartz and kaolinite, many of are probably hypogene and supergene in origin. It is concluded that alteration most likely reflects temperature conditions where the current classification scheme separates porphyry from epithermal systems (200-300°C) and epithermal, low sulfidation banded quartz veins recognised in the field area mean it may therefore be an overprinted system. Significant concentrations of elements characteristically enriched in epithermal environments such as As and Se also occur at Gossans West. PCA results show a positive correlation of the epithermal-related elements at Gossans West, and the
possibility of the elements Mo and Pb (characteristic of lower epithermal/porphyry deposits) being related to a different system. This provided further evidence for a telescoped system. The study has also demonstrated the usefulness of the PIMA and Niton instruments, provided the results are verified by other techniques.