

CONTENTS	Page
DECLARATION	ii
ABSTRACT	iii
ACKNOWLEDGEMENTS	v
CONTENTS	vi
LIST OF FIGURES	viii
LIST OF TABLES	x
NOMENCLATURE	xi
 1 INTRODUCTION	 1
1.1 Introduction	1
1.2 Problem Identification	1
1.3 Aims & Objectives	2
1.4 Methodology	2
 2. AREA OF STUDY	 5
2.1 Overview of the Area of Study	5
2.2 Physical Characteristics	6
2.3 Land Use	8
2.4 System Overview	9
2.5 Process Flow	12
 3. WATER AND MINING	 16
3.1 Water in South Africa	16
3.2 Water in the S.A. Mining Industry	17
3.3 Gold Mining in South Africa	18
3.4 Mining & Sustainable Development	19
3.5 Legislation	20
 4. ACID MINE DRAINAGE (AMD)	 25
4.1 AMD Chemistry	25
4.2 Environmental Impacts of AMD	28
4.3 Tailings Dams as Potential Sources of AMD	29
 5 REMOTE SENSING	 33
5.1 Introduction	33
5.2 Aerial Photographs	33

5.3 Landsat Thematic Mapper	37
5.4 ASTER	55
5.5 Discussion	57
5.6 Conclusion	58
 6 SURFACE WATER ANALYSIS	 60
6.1 Introduction	60
6.2 Ionic Balance	61
6.3 Statistical Analysis	61
6.4 Chemical Analysis of Surface Water	63
6.5 Conclusion	75
 7 TAILINGS DAMS	 78
7.1 Introduction	78
7.2 Historical Background	79
7.3 Chemical Analysis of the Tailings	81
7.4 GIS Data Analysis	87
7.5 Conclusion	92
 8 GROUNDWATER ANALYSIS	 94
8.1 Introduction	94
8.2 Ion Balance	95
8.3 Statistical Analysis	96
8.4 Water Quality Analysis	100
8.5 GIS Analysis	107
8.6 Water Quality Modelling – Wateval	114
8.7 Water Quality Modelling – Stasoft	115
8.8 Conclusion	116
 9. CONCLUSIONS & RECCOMENDATIONS	 117
9.1 Conclusion	118
9.2 Recommendation/Further Investigation	120
 APPENDIX 1	 122
APPENDIX 1a	128
APPENDIX 2	130
APPENDIX 3	132
APPENDIX 4	136
 REFERENCES	 138

