MINERAL RESOURCES TASMANIA

STORYS CREEK / ROSSARDEN

ACID DRAINAGE REMEDIATION STUDY

WATER QUALITY MONITORING REPORT

John Miedecke and Partners Pty Ltd • JUNE 2001

CONTENTS

1.0 INTRODUCTION

The Storys Creek/Rossarden remediation project is a cooperative project between Mineral Resources Tasmania (MRT), the Department of the Primary Industry Water and Environment (DPIWE) and the Commonwealth Department of the Environment. The aim is to design and implement a remediation strategy for the Storys Creek and Rossarden abandoned mine sites to reduce acid and heavy metal discharge into the South Esk River system. Mineral Resources Tasmania is supervising the acid drainage remediation works at the old abandoned mine workings at Storys Creek and Rossarden.

The remediation works are being funded by the State Government though the Rehabilitation of Mining Lands Trust. The Commonwealth through Riverworks Tasmania funded the investigations and trials.

Figure 1.1 shows the location of the study area and major catchments.

This report addresses the results of water quality monitoring. It covers the period since remediation work commenced in September 1998 until June 2001. Aquatic fauna monitoring, while recommended, has not been implemented and therefore any improvements in aquatic fauna which may have resulted cannot be established.

2.0 MONITORING PROGRAMME

2.1 Flow Gauging

The gauging station established by the HEC at Station 14, located just above Rossarden was used to correlate water quality and creek flows. The station rating curve is included in Appendix A. All water samples collected included observations at this Station.

2.2 Rainfall

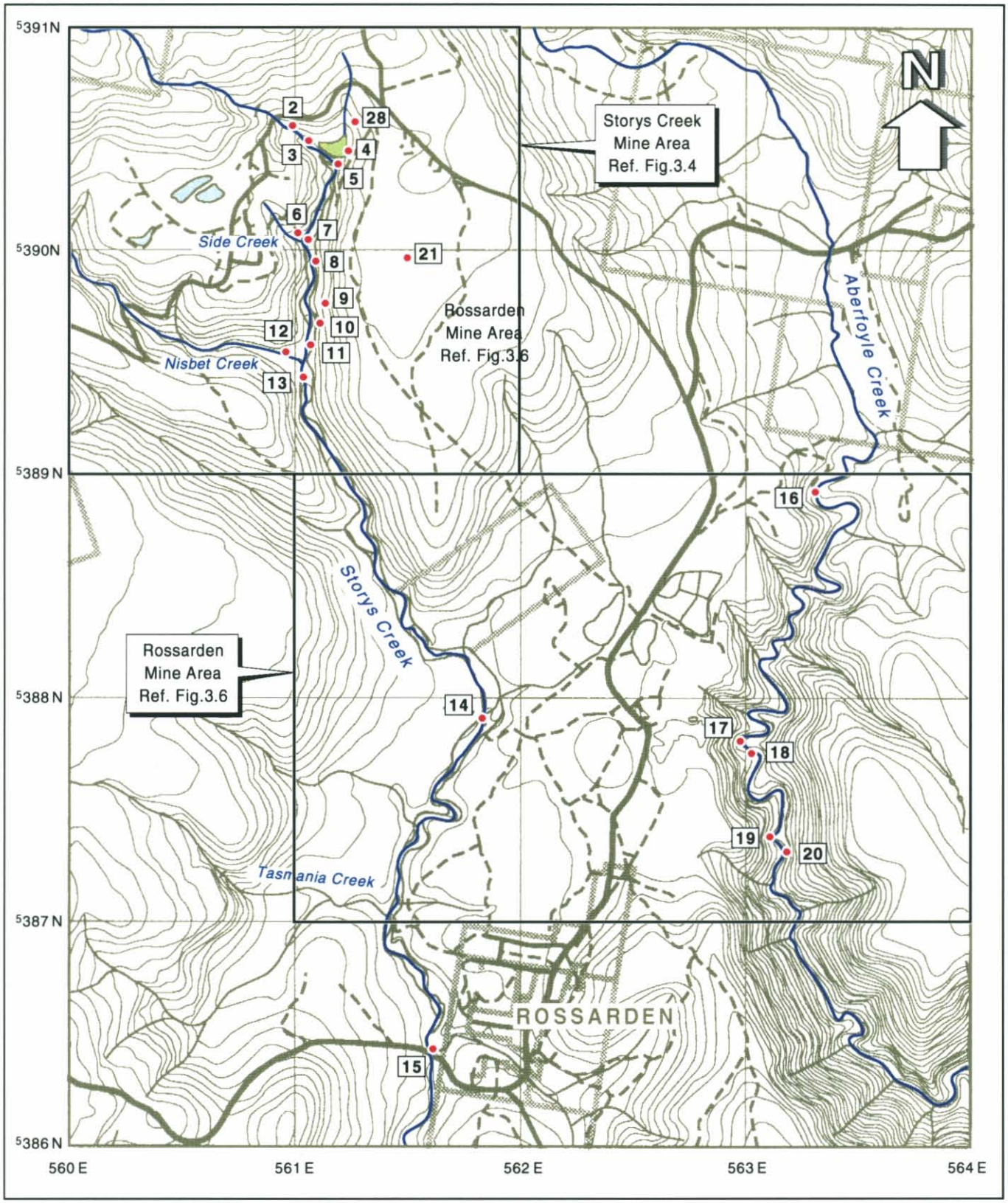
A rainfall gauging station was operated at Rossarden (Station 92100) by the Bureau of Meteorology. However, this Station was closed in January 1998 and the station could not be used with the flow gauging and water quality monitoring.

The nearest active gauging station was at Avoca. However, a comparison of the two revealed that historically the two stations did not have a good correlation as topography clearly had a marked effect on rainfall events.

Therefore, a qualitative estimate of rainfall was used for monitoring purposes.

2.3 Water Quality Monitoring

An opportunistic sampling program was carried out. This consisted of spot sampling at various locations at various dates. These samplings were correlated with the reading of the gauge heights at Station 14, notes on creek flows and appearance, and a subjective measure of rainfall in the



2. Storys above mine
3. Inflow to Storys near old workings
4. Tailings Dam outflow
5. Storys below Precipitate Dam
6. Side Creek - wetlands inflow
7. Side Creek - wetlands outflow
8. Storys below Side
9. Eastern Hill - wetlands inflow
10. Eastern Hill - wetlands outflow
11. Storys below Eastern Hill Adit
12. Nisbet Creek
13. Storys below Nisbet Creek
14. Storys below mine managers residence
15. Storys at Rossarden Bridge
16. Aberfoyle Creek above workings
17. No.2 Adit
18. Aberfoyle below No.2 Adit
19. No.4 Adit
20. Aberfoyle below No.4 Adit
21. Eastern Hill Tailings Dam - pond only
28. Diversion Channel above Tailings Dam

1 grid space to 1km

5 cm

(October 1999)

MINERAL RESOURCES TASMANIA

Storys Creek & Rossarden AD Remediation Projects
Water Sampling Locations Storys Creek Area

John Miedecke & Partners P/L

FIG 1

preceeding few days, from either evidence of rain, local contacts or rainfall records.

Water samples were collected in plastic bottles provide by the DPIWE University Laboratory, and stored in ice until delivered to the laboratory. A standard suite of parameters and metals (both filterable and non filterable) was measured. All data is contained in Appendix B. Samples from piezometers were collected from containers.

3.0 Monitoring Results and Discussion

The Final and Interim Report documents all the historical data and Appendix B contains all data collected during the study period.

Data has been presented in both concentrations and loads.

3.1 Contaminant Concentrations

Figures 2, 3 and 4 shows a summary of the results of the monitoring in concentrations in a graph format for all Stations below the Storys Creek Bridge to the gauging station at Site 14, just above Rossarden. Additional graphs and data are included in Appendix B for each of the stations. Both normal and logarithmic scale are shown for metals.

Figure 5 shows the results of all data for Station 14.

pH, Acidity and Sulphate

Figure 2a and 2b shows the results for pH, acidity and sulphate. Figure 2b shows a log scale.

There is a general trend of increasing pH over time with the effects most marked at the stations above Nisbett Creek. The results show an increase in pH to approximately 7 in the Precipitate Dam area and a general decrease downstream. A marked decrease in pH is noticeable all stations below the Precipitate Dam in the period November 2000 to April 2001. This coincided with the observed flow of Storys Creek mine water from Side Creek (this was evident from iron staining) to Storys Creek.

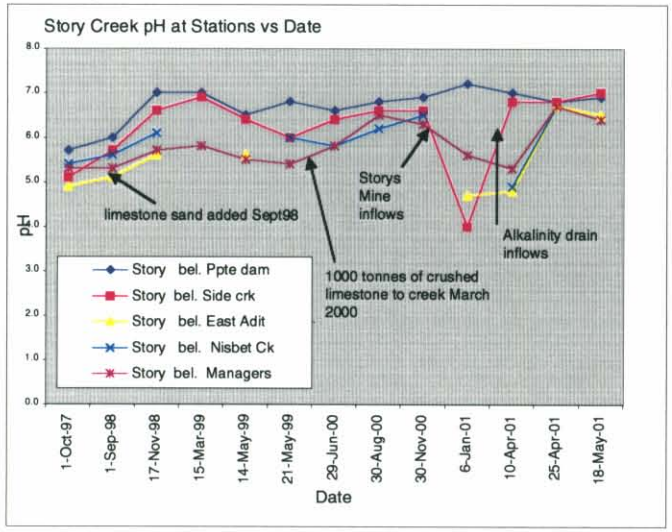
Acidity and sulphate concentrations show a trend of decreasing concentrations, with the effects of the mine inflows marked in the period November 2000 to January 2001. Acidity has decreased by a factor of ten for the stations close to the mine.

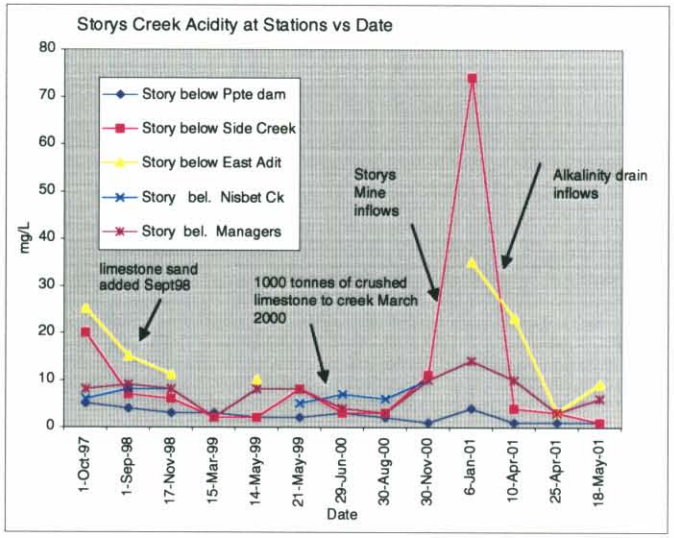
Metals

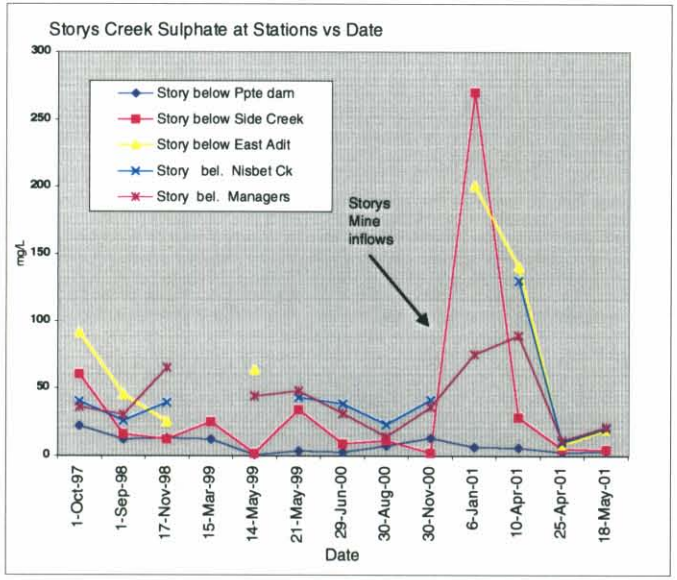
Figures 3a and 3b show the results for aluminium, cadmium copper and zinc, in Figure 3b with a logarithmic scale.

There is a general trend of decreasing concentrations over time. This is most evident at the Stations nearest the mine. Many have reduced by a factor of ten. The mine inflows have also markedly influenced the metals

Figure 2a Storys Creek Water Quality over Time
All stations. Non Metals

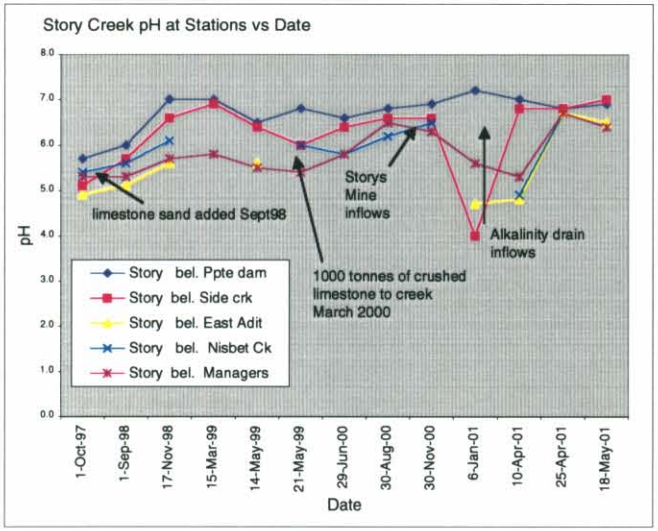


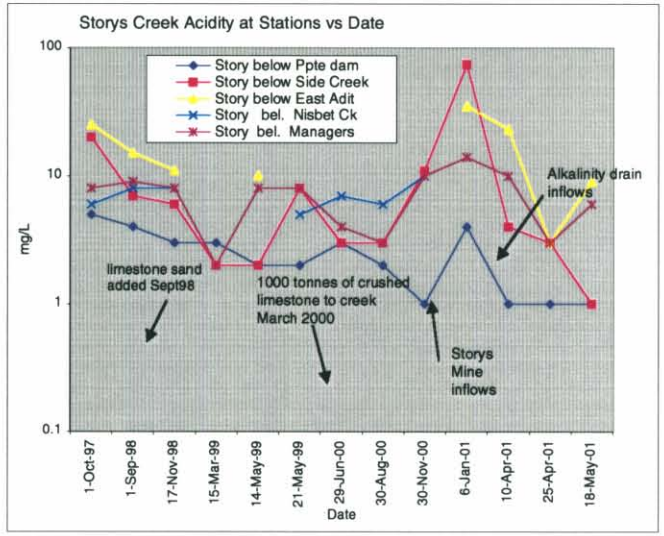


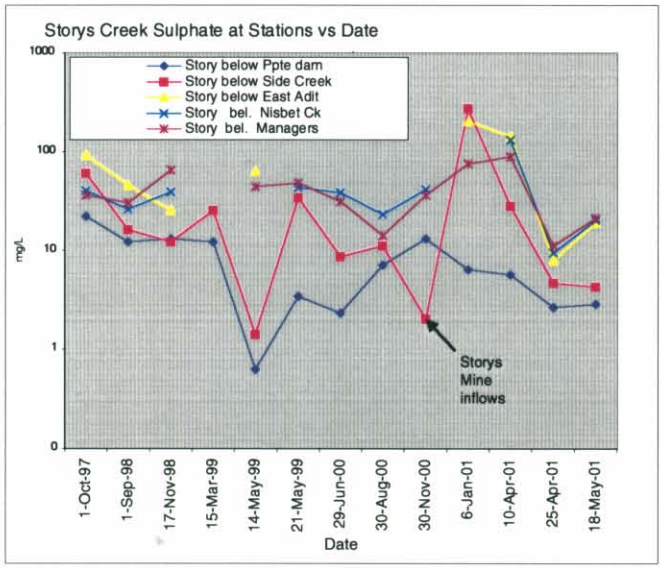


Shows trend of increasing pH over time. Limestone added in September 1998 had demonstrable effects.
pHs decline down the creek as influence of limestone declines
Addition of crushed limestone increased pH's
Storys Mine inflows affected water quality Nov - March
Anoxic alkalinity added to mine January 2001 - improvements.

Figure 2b Storys Creek Water Quality over Time
All stations. Non Metals Log Scale







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pHs decline down the creek as influence of limestone declines
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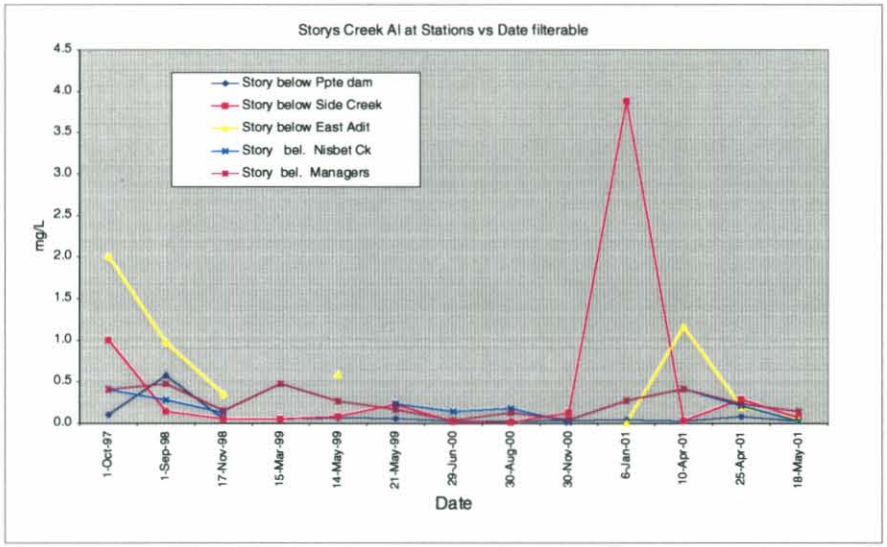
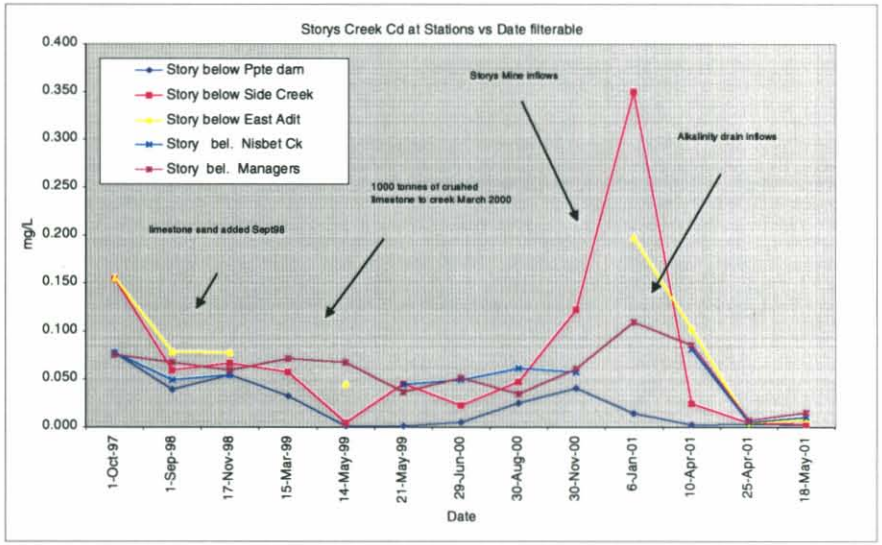
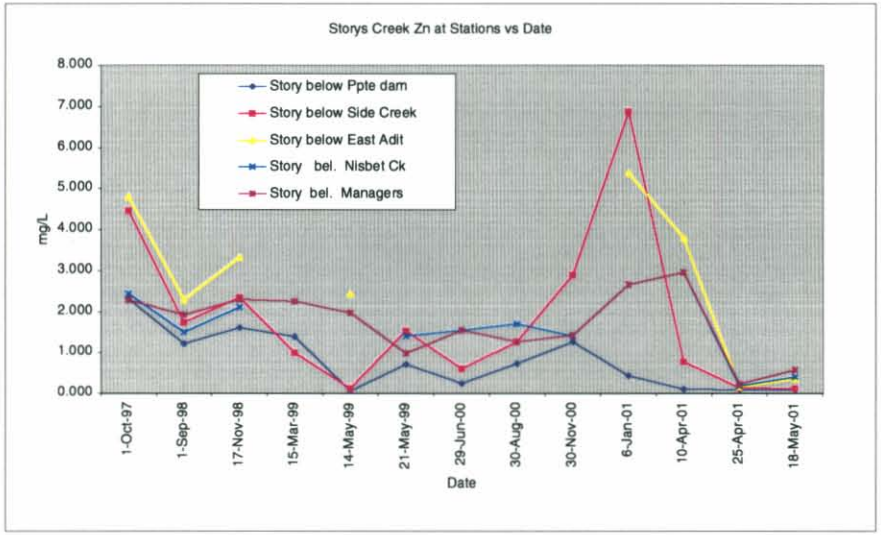
Anoxic alkalinity added to mine January 2001 - improvements.

Figure 3a Storys Creek Metal Concentrations
All stations







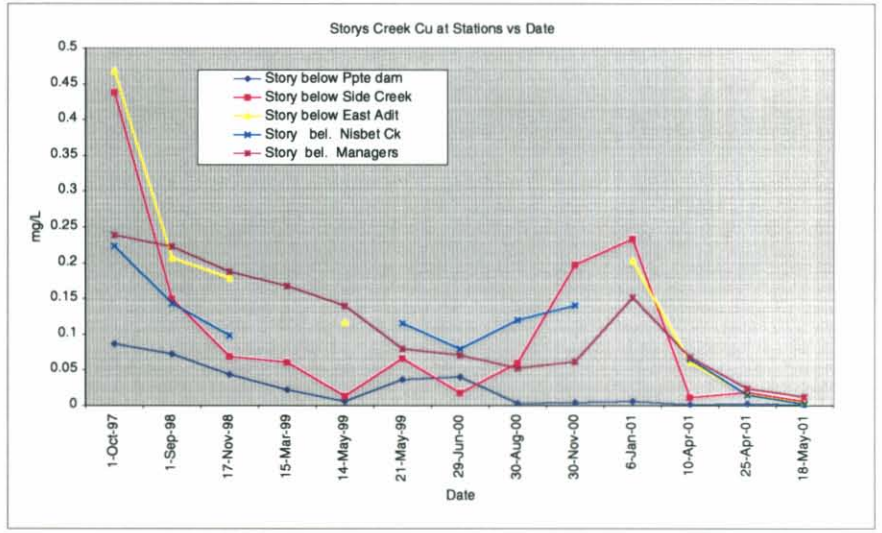
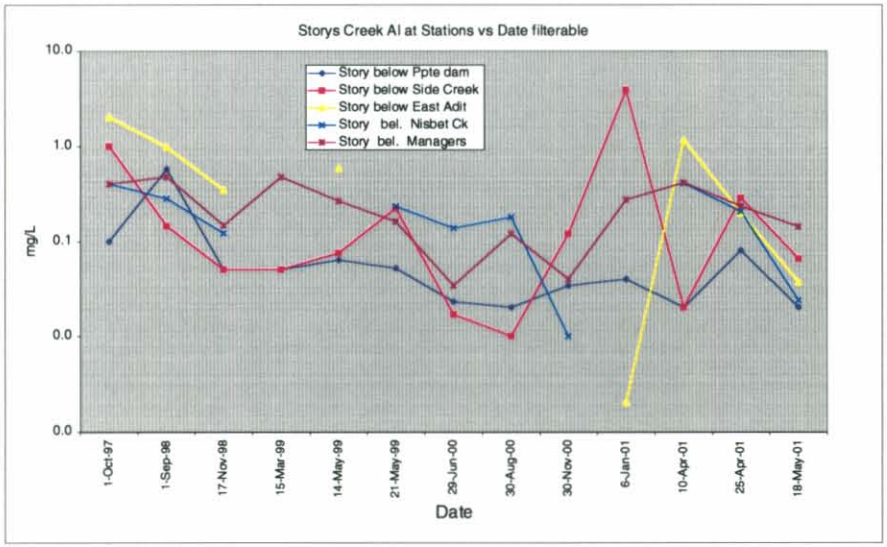
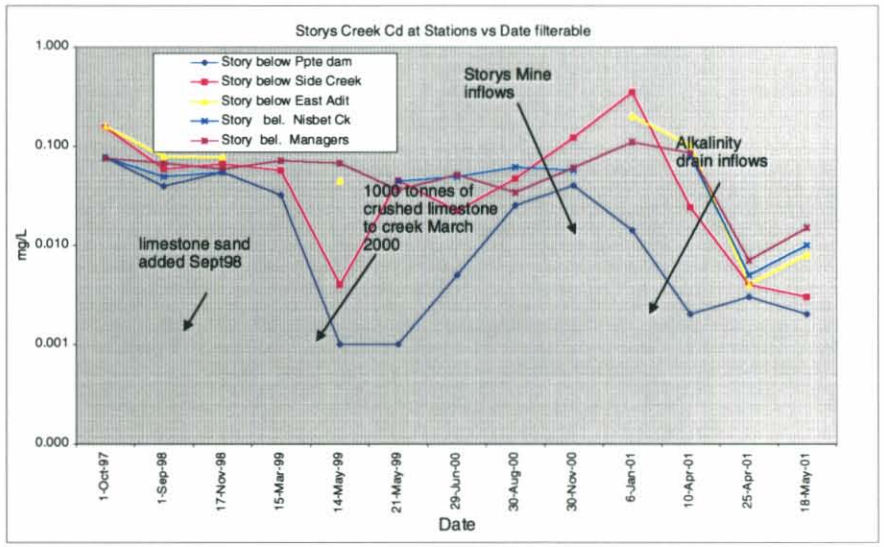
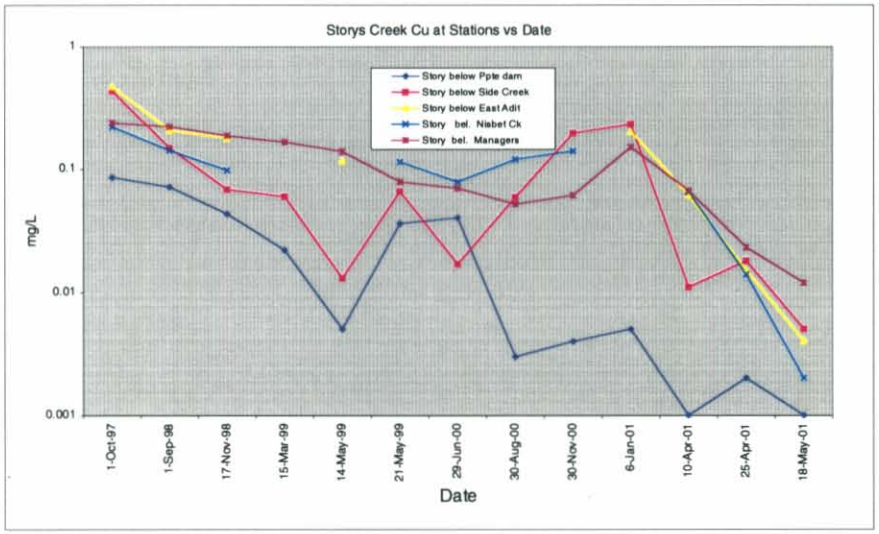
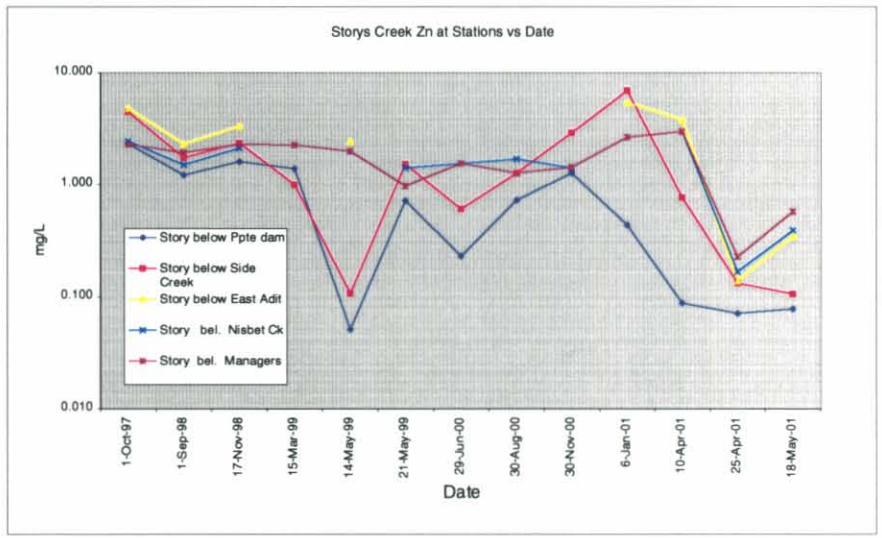


Figure 3b Storys Creek Metal Concentrations
All stations Log scale









concentrations in the period November 2000 to January 2001. Similar trends are evident for total metals (Figure 4).

3.2 Contaminant Loads

Figures 5a & 5b show the results of the monitoring in loads (kg/day) in a graph format for all Stations below the Storys Creek Bridge to the gauging station at Site 14, just above Rossarden. The loads have been calculated by multiplying the concentration by the flow estimates at each location, based on a proportion of the S14 measured flows.

They essentially support the data presented for the pollutant concentrations, with declining trends, but significantly distorted by mine inflows from Nov 2000 to April 2001.

The additional graphs and data are included in Appendix B for each of the stations. They shows that loads have significantly decreased for all contaminants for all the Stations except Station 14, where loads have decreased marginally.

Historically low loads for all contaminants was recorded in May 2001 after the distortions of the mine inflows.

Acidity and Sulphate

Figure 5a and 5b (log scale) show the results for acidity and sulphate. There is a general trend of decreasing acidity and sulphate loads over time with the effects most marked at the stations above Nisbett Creek. Based on this data acidity loads have reduced by a factor of five at these stations. The effects of the Mine inflows are very apparent. Below Nisbett Creek the declining loads are not as apparent.

Metals

Figures 5a and 5b also show the results for aluminium, cadmium copper and Zinc, in 5b with a logarithmic scale.

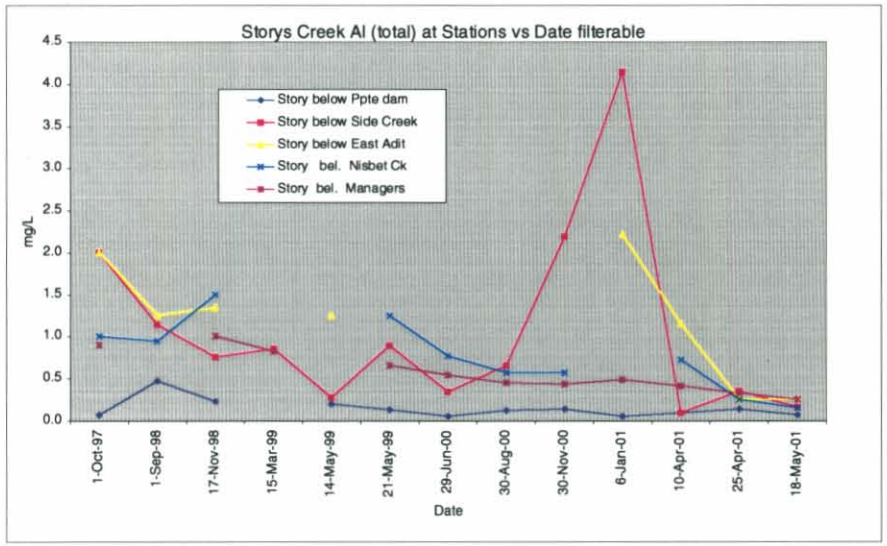
There is a general trend of decreasing loads over time. This is most evident at the Stations nearest the mine. The mine inflows have also markedly influenced the loads in the period November 2000 to January 2001.

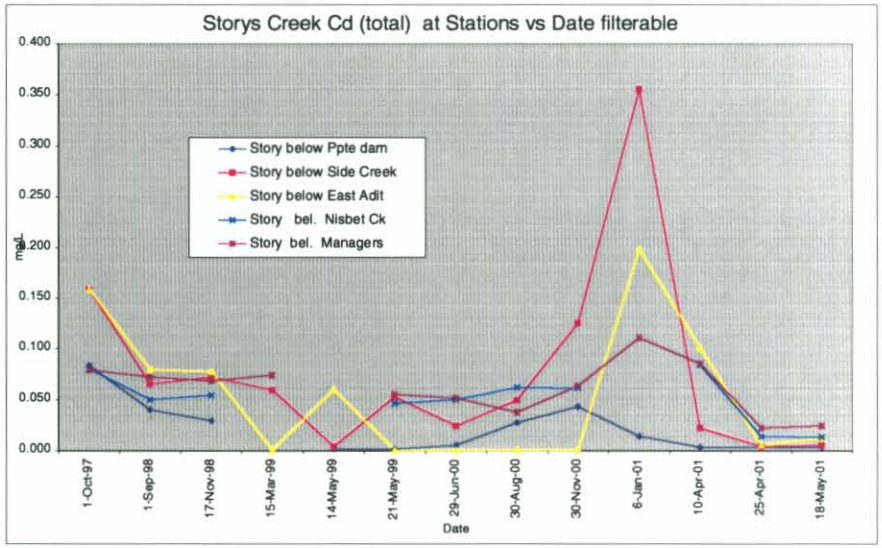
3.3 Station 14 (Managers Residence) Monitoring

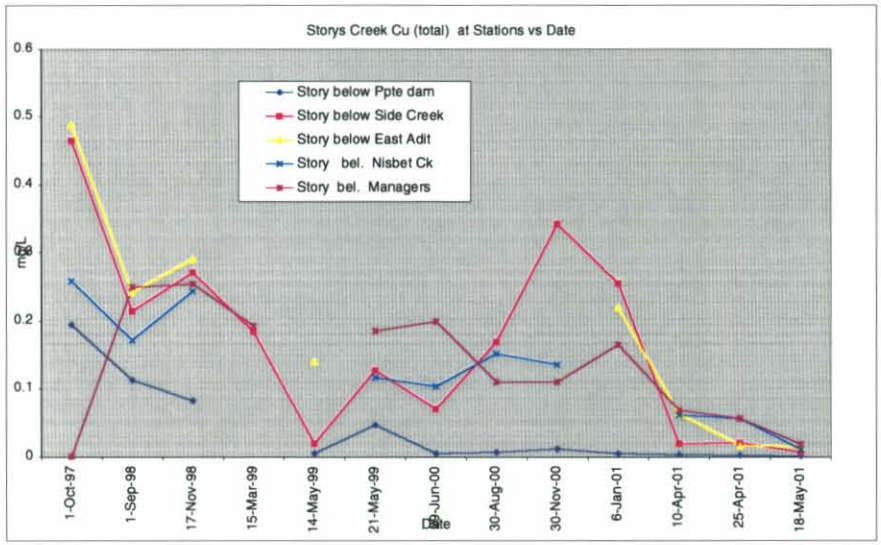
This Station is the one which has the most continuous records.

Figure 6 shows the results of the water quality monitoring. The data has been distorted by the mine inflows in the period November 2000 to April 2001. However, there has been evident improvements in water quality of the waters draining the area. pH has increased from approximately 5 to over 6 and acidity, sulphates and metals have all decreased especially if the period of mine inflows is ignored. The period immediately after the limestone sand addition in September 1998 recorded the best water quality with pH nearly 7

Figure 4 Storys Creek Metal Concentrations
All stations (total metals)







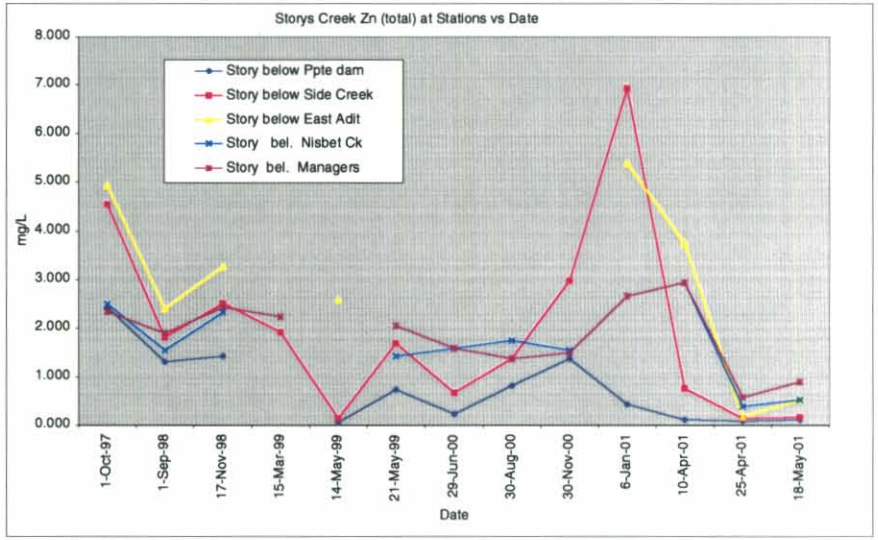
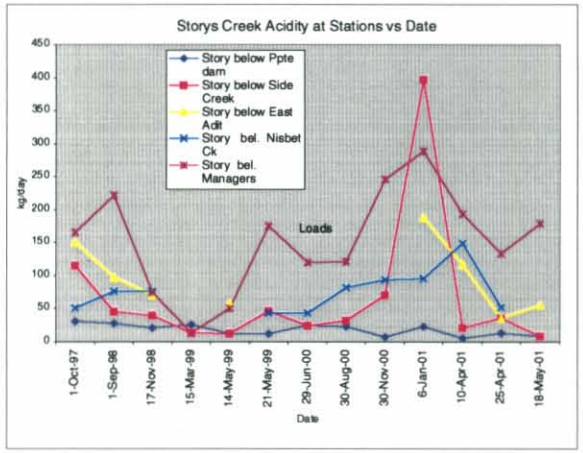
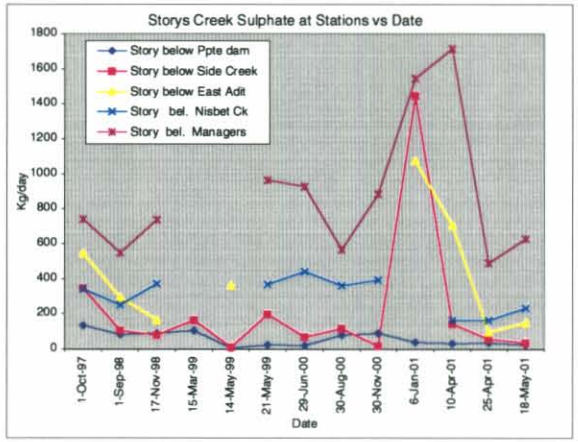
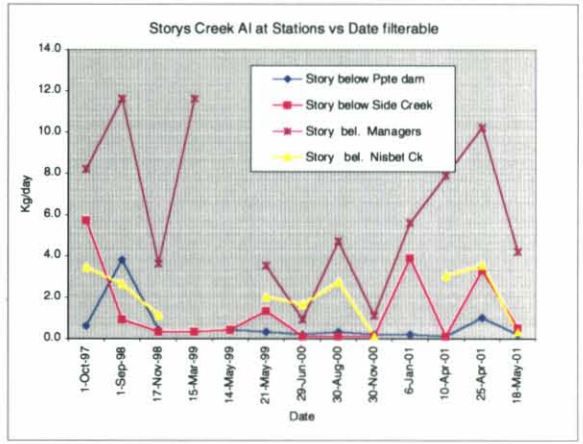
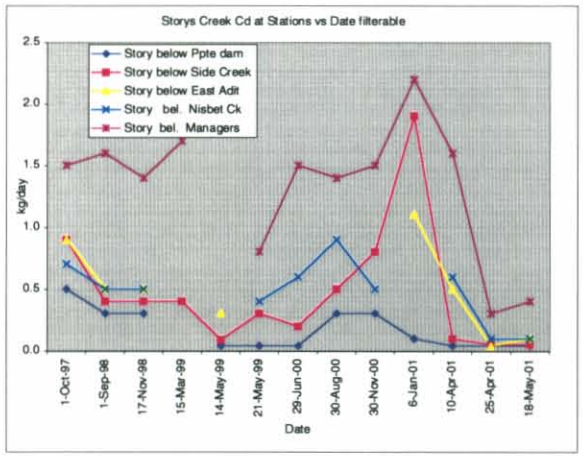


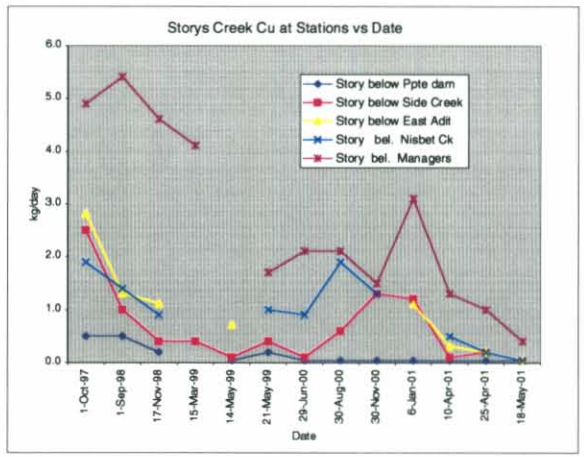
Figure 5a Storys Creek Contaminant Loads All Stations











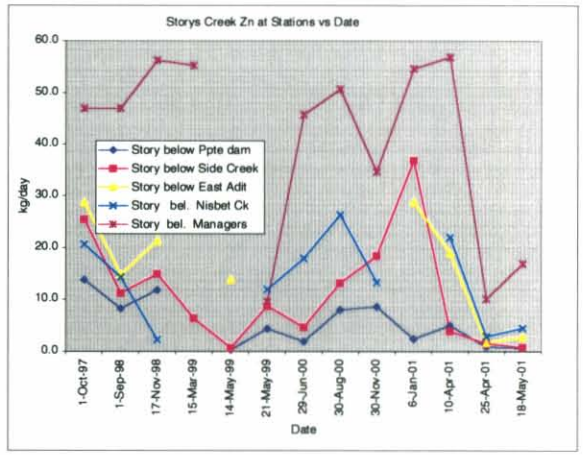
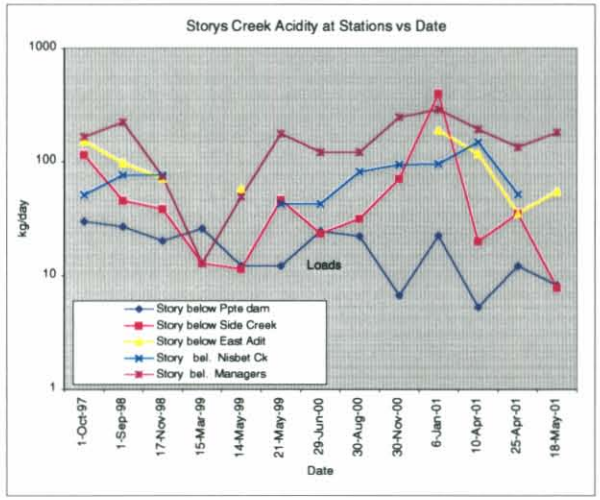
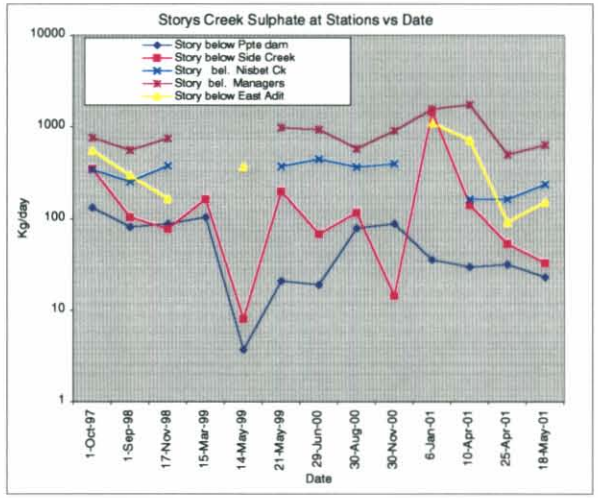
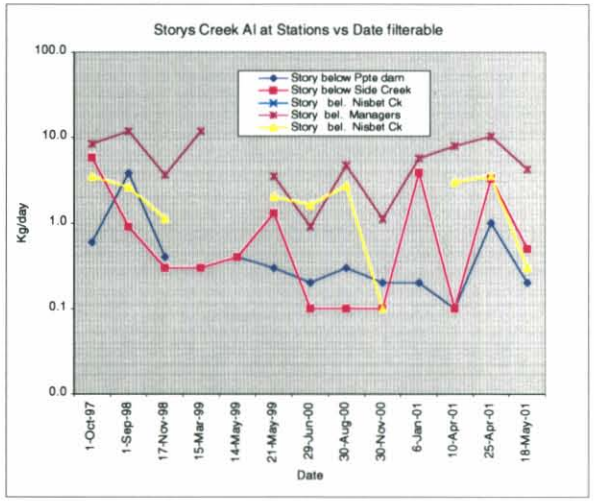
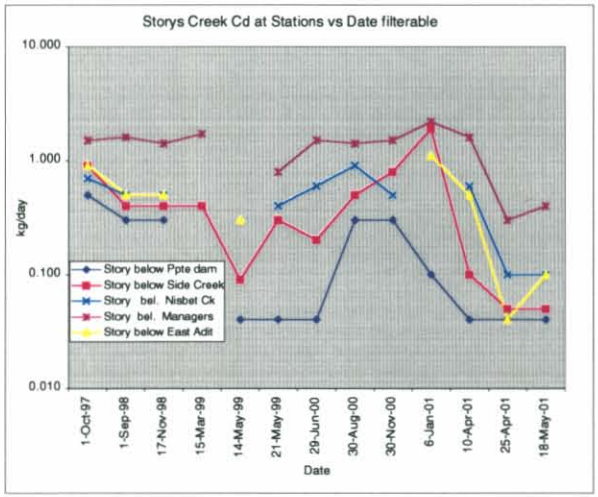


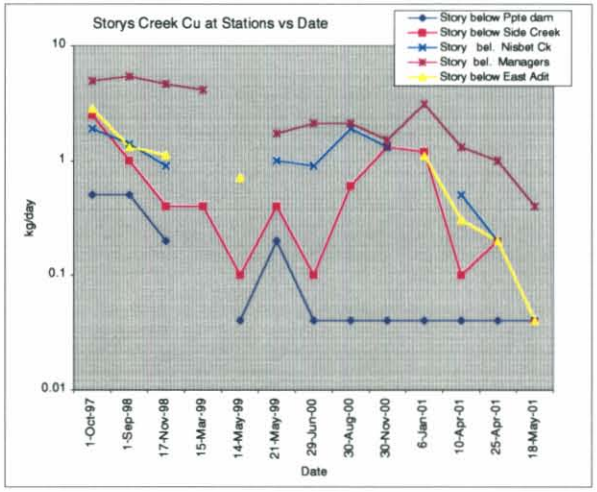
Figure 5b Storys Creek Contaminant Loads All Stations Log. Scale











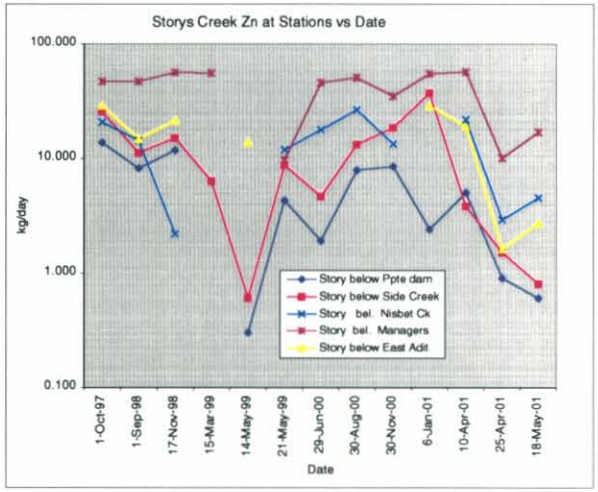
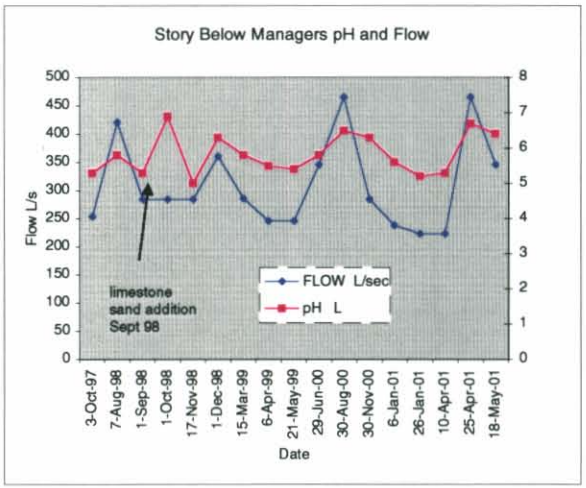
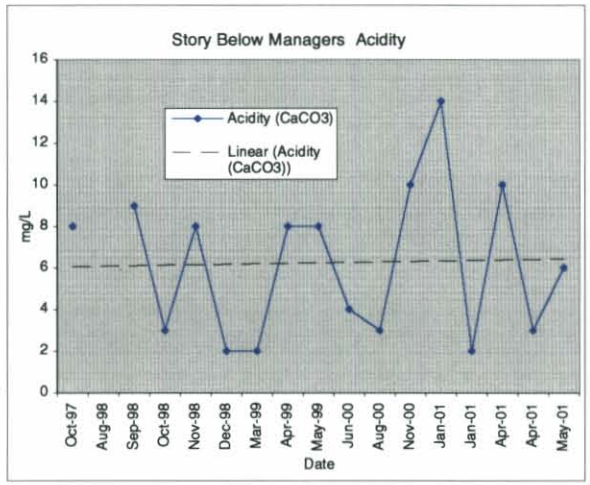
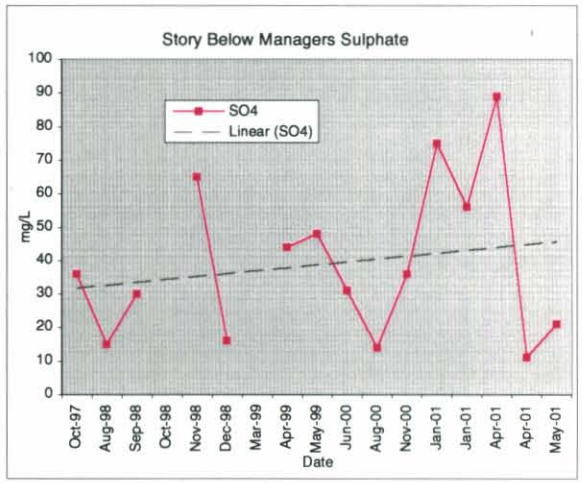
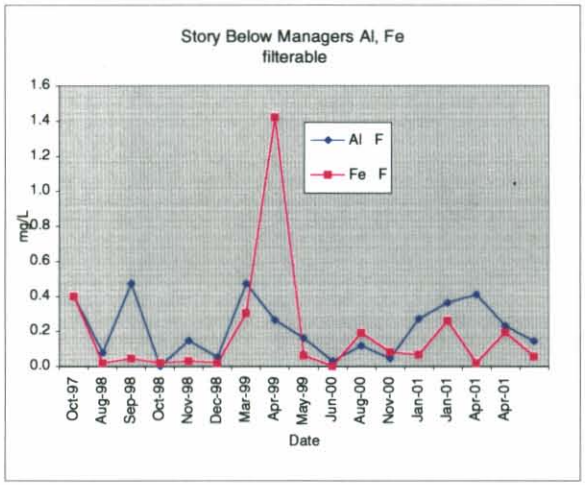


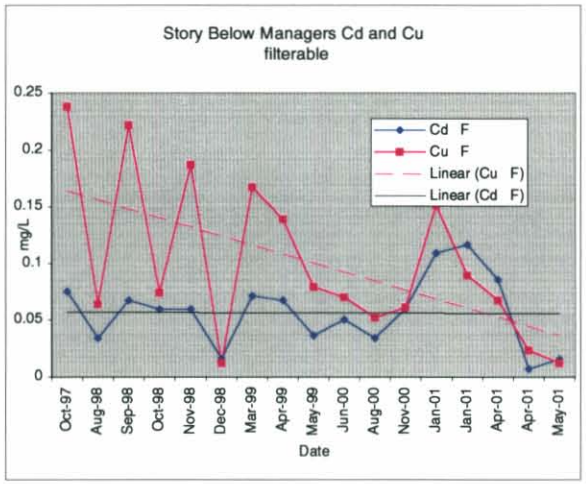
Figure 6 Station 14 Contaminant Concentration Trends

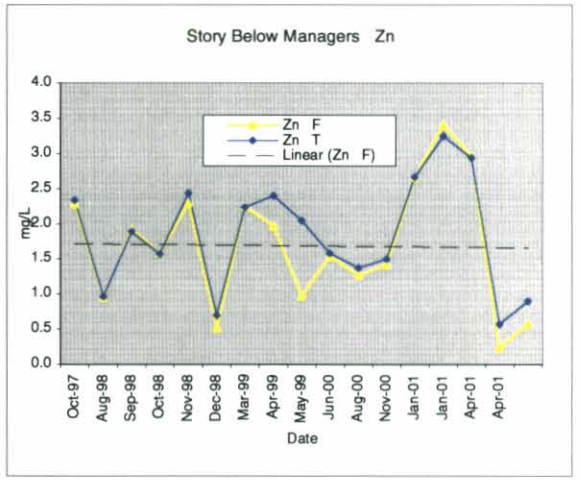












and low concentrations of other indicators. These are evident for both total and filterable metals, indicating that metals are being removed from solution.

Low flows tended to have the worst water quality, with the creek flow being made up of baseflow and leaching of stream deposits, with high flows of higher pH and lower metal concentrations as clean water higher up the catchment affect water quality. This indicates that limestone sand addition to the creek is required to raise pH.

3.4 Precipitate Dam Drainage

Figure 7 shows the results of the water quality monitoring. There have been marked improvements in water quality of the waters draining the area. pH has increased from approximately 3 to 6.5 and acidity, sulphates and metal concentrations have decreased by a factor of approximately five. This is also reflected in the Stations immediately downstream.

3.5 Anoxic Limestone Drain

The drain was constructed in January 2001. Table 1 shows the results of the monitoring. The drain is effective in raising alkalinity. High dissolved CO2 is being generated by the manure mixture.

TABLE 1 Anoxic Limestone Alkalinity Drain Monitoring Results

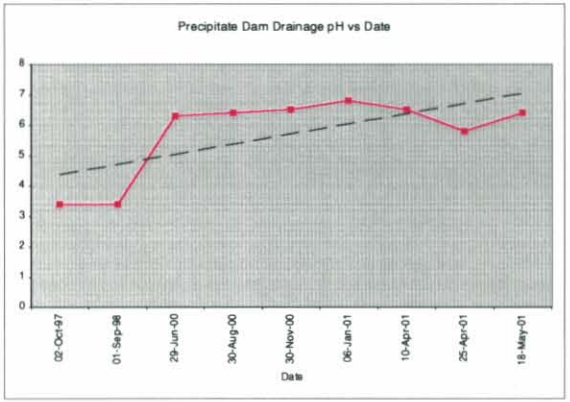
PARAMETER (mg/l)				
SAMPLE DATE	26-Jan-01	10-Apr-01	25-Apr-01	18-May-01
FLOW L/sec	low /mod	high	High surface waters	Low 3L/min
pH L	7.8	7.1	7.4	7.2
Cond mS/cm L	786	198	207	402
TDS	431	137	145	200
NFR (suspended solids)		14	24	45
Alkalinity (CaCO3)	191	65	69	130
CO2 free mg/L CO2		122	281	247
CO2 total mg/L CO2		179	341	361
SO4		2.9	4.7	1.6
Ca T		16.3	20.1	41.3
Mg T		3.66	4.06	8.18
Na T		8.25	8.55	18.5

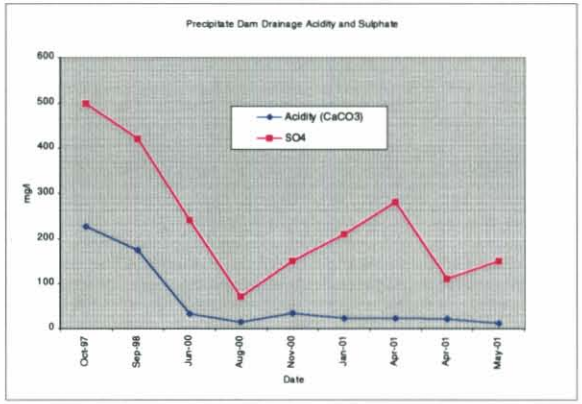
3.6 Tailings Deposit Lysimeters

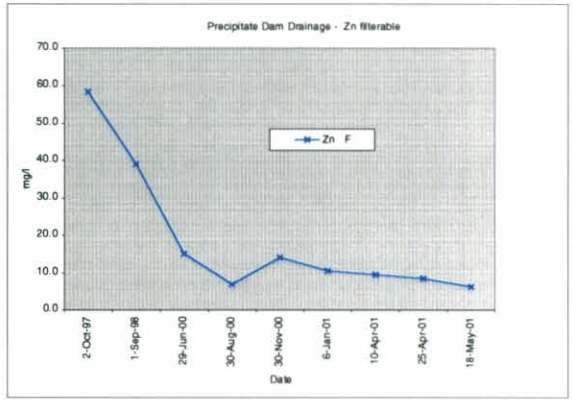
Two lysimeters were installed in the tailings deposit as described in the construction report.

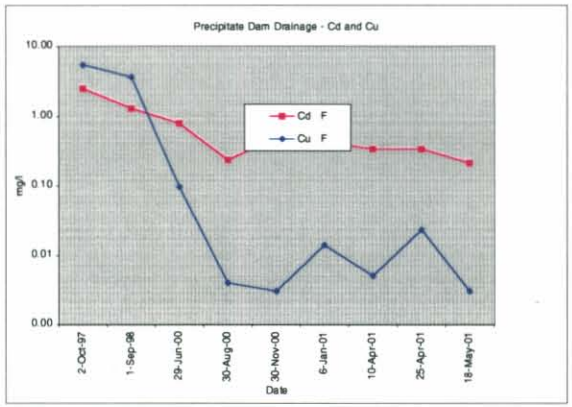
The lysimeters drain via poly pipes to containers located in the base of an gum tree. The lysimeter containers had been removed on several occasions and had to be replaced. Water samples were collected on one occasion, in

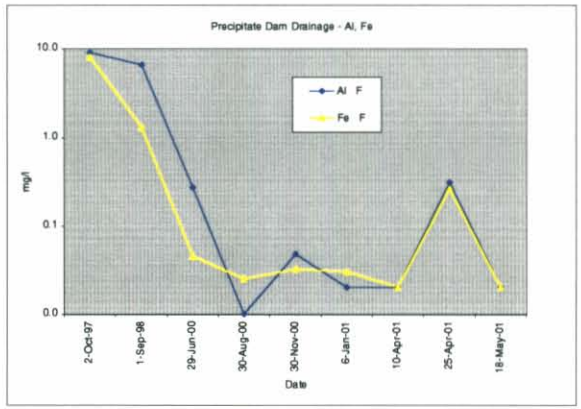
Figure 7 Precipitate Dam Drainage Water Quality Trends











August 2000. Only 4L had drained to the lysimeters on that occasion. The results are shown in Appendix B and show that the water quality while acid was of good quality.

In June 2001 approximately 10L was evident in the lower lysimeter (this lysimeter was installed underneath the area where jig tails were laid). This equates to infiltration of 3.5mm of rainfall in the period April - June 2001.

Ongoing monitoring and recording of inflows will allow the calculation of the effectiveness of the cover.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

The findings and conclusions contained in the Final Report are confirmed by the latest data.

The results correlate well with the remediation works.

It was noted that the addition of alkalinity to Storys Creek itself by the additional of limestone sand, resulted in the creation of an obvious white precipitate in the creek bed during dry periods. This is believed to be an aluminium hydroxide floc. This precipitate was removed in high flow periods, presumably being carried further downstream and ultimately to the South River system.

Subjectively the appearance of Storys Creek has improved markedly following limestone addition, with little of the previous iron staining and discolouration.

Opportunistic water quality sampling may miss isolated events which may have influenced water quality (such as an intense storm after an extended dry period - such as the Jig Tailings leaching). However, there have been demonstrable improvements in water quality immediately in the vicinity of the mine and where remediation works were concentrated.

There was a marked reduction in metals in solution and significantly reduced acidity and sulphate loads. There is a progressive reduction in effect down to the Nisbett Creek Junction. This correlates well with the observation of sand distribution. There are marginal but apparent improvements in water quality at Station 14. Results have been influenced by the outflow of poor quality acid drainage from the Storys Creek mine workings observed in late 2000 to early 2001

There is an excellent correlation of metal concentrations with sulphates, which indicates the metal source is from acid seepages.

Monitoring also shows there is an increase in metal concentrations following rainfall events. However, the best water quality coincides with high flows, due to the contribution of clean water further up the catchment, which is steep and flows vary rapidly following rainfall events.

The increase in metal contribution following these events is attributed to seepage from contamination sources such as jig tailings and creek bank materials.

The removal of the Precipitate Dam tailings has markedly reduced this source of contamination.

There were obvious improvements in water quality resulting from the addition of the limestone sands and these beneficial effects may have now declined.

The addition of crushed limestone to the creek banks also appears to have raised pH, decreased acidity and metal concentrations, but did not influence low flow conditions (as was anticipated).

The construction of the anoxic alkaline drain coincided with a period immediately following the observations of mine outflows from the area near Side Creek (and probably other locations). This dramatically effected water quality and there was a marked improvement after the ALD was constructed. Contaminant loads were the lowest on record in the last samples.

4.2 Recommendations

The addition of limestone sands at the four access locations prepared in 2000 is recommended. This should consist of approximately 100 tonnes at each location.

Water quality monitoring should be continued on an opportunistic basis, concentrating at Station 14 and ideally include the stations located at Nisbett Creek, Side Creek and below the Precipitate Dam.

REFERENCES

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JMP 2001. Storys Creek/Rossarden Acid Drainage Remediation Study –Final Report John Miedecke and Partners, October 1999.

APPENDICES

APPENDIX A STATION 14 Rating

APPENDIX B WATER QUALITY DATA

APPENDIX A STATION 14 Rating

John Miedecke and Partners

Storys Creek Flow Rating

Rating Table 100.00 River Level (Metres) to 140.00 Stream Flow (Cumecs)
Steps:
1) Rating(1379.1 STORYS CREEK (MINE WATER): 140.00 Stream Flow (Cumecs): R1: Grp 0)

Level (m)	+0.000	+0.001	+0.002	+0.003	+0.004	+0.005	+0.006	+0.007	+0.008	+0.009
0.10	0.000	0.001	0.002	0.004	0.005	0.006	0.008	0.009	0.010	0.011
0.11	0.013	0.014	0.015	0.016	0.018	0.019	0.020	0.022	0.023	0.024
0.12	0.025	0.027	0.028	0.029	0.031	0.032	0.033	0.034	0.036	0.037
0.13	0.038	0.040	0.041	0.042	0.044	0.045	0.046	0.048	0.049	0.050
0.14	0.052	0.053	0.054	0.056	0.057	0.058	0.060	0.061	0.062	0.064
0.15	0.065	0.066	0.068	0.069	0.071	0.072	0.073	0.075	0.076	0.077
0.16	0.079	0.080	0.082	0.083	0.084	0.086	0.087	0.088	0.090	0.091
0.17	0.093	0.094	0.095	0.097	0.098	0.100	0.101	0.102	0.104	0.105
0.18	0.107	0.108	0.109	0.111	0.112	0.114	0.115	0.116	0.118	0.119
0.19	0.121	0.122	0.124	0.125	0.126	0.128	0.129	0.131	0.132	0.134
0.20	0.135	0.137	0.138	0.139	0.141	0.142	0.144	0.145	0.147	0.148
0.21	0.150	0.151	0.152	0.154	0.155	0.157	0.158	0.160	0.161	0.163
0.22	0.164	0.166	0.167	0.168	0.170	0.171	0.173	0.174	0.176	0.177
0.23	0.179	0.180	0.182	0.183	0.185	0.186	0.188	0.189	0.191	0.192
0.24	0.194	0.195	0.197	0.198	0.199	0.201	0.202	0.204	0.205	0.207
0.25	0.208	0.210	0.211	0.213	0.214	0.216	0.217	0.219	0.220	0.222
0.26	0.223	0.225	0.226	0.228	0.229	0.231	0.232	0.234	0.235	0.237
0.27	0.238	0.240	0.241	0.243	0.244	0.246	0.247	0.249	0.250	0.252
0.28	0.253	0.255	0.257	0.258	0.260	0.261	0.263	0.264	0.266	0.267
0.29	0.269	0.270	0.272	0.273	0.275	0.276	0.278	0.279	0.281	0.282
0.30	0.284	0.285	0.287	0.288	0.290	0.291	0.293	0.294	0.296	0.297
0.31	0.299	0.301	0.302	0.304	0.305	0.307	0.308	0.310	0.311	0.313
0.32	0.314	0.316	0.317	0.319	0.320	0.322	0.323	0.325	0.326	0.328
0.33	0.329	0.331	0.332	0.334	0.335	0.337	0.339	0.340	0.342	0.343
0.34	0.345	0.346	0.348	0.349	0.351	0.352	0.354	0.355	0.357	0.358
0.35	0.360	0.361	0.363	0.364	0.366	0.367	0.369	0.370	0.372	0.373
0.36	0.375	0.376	0.378	0.379	0.381	0.383	0.384	0.386	0.387	0.389
0.37	0.390	0.392	0.393	0.395	0.396	0.398	0.399	0.401	0.402	0.404
0.38	0.405	0.407	0.408	0.410	0.411	0.413	0.414	0.416	0.417	0.419
0.39	0.420	0.422	0.423	0.425	0.426	0.428	0.429	0.431	0.432	0.434
0.40	0.435	0.436	0.438	0.439	0.441	0.442	0.444	0.445	0.447	0.449
0.41	0.450	0.452	0.453	0.455	0.456	0.458	0.459	0.461	0.462	0.464
0.42	0.465	0.467	0.468	0.470	0.472	0.473	0.475	0.476	0.478	0.479
0.43	0.481	0.483	0.484	0.486	0.487	0.489	0.490	0.492	0.494	0.495
0.44	0.497	0.498	0.500	0.502	0.503	0.505	0.507	0.508	0.510	0.511
0.45	0.513	0.515	0.516	0.518	0.520	0.521	0.523	0.525	0.526	0.528
0.46	0.530	0.531	0.533	0.535	0.536	0.538	0.540	0.541	0.543	0.545
0.47	0.546	0.548	0.550	0.551	0.553	0.555	0.557	0.558	0.560	0.562
0.48	0.564	0.565	0.567	0.569	0.570	0.572	0.574	0.576	0.577	0.579
0.49	0.581	0.583	0.584	0.586	0.588	0.590	0.591	0.593	0.595	0.597
0.50	0.599	0.600	0.602	0.604	0.606	0.608	0.609	0.611	0.613	0.615
0.51	0.617	0.618	0.620	0.622	0.624	0.626	0.628	0.629	0.631	0.633
0.52	0.635	0.637	0.639	0.640	0.642	0.644	0.646	0.648	0.650	0.652
0.53	0.654	0.655	0.657	0.659	0.661	0.663	0.665	0.667	0.669	0.671
0.54	0.672	0.674	0.676	0.678	0.680	0.682	0.684	0.686	0.688	0.690
0.55	0.692	0.694	0.695	0.697	0.699	0.701	0.703	0.705	0.707	0.709
0.56	0.711	0.713	0.715	0.717	0.719	0.721	0.723	0.725	0.727	0.729
0.57	0.731	0.733	0.735	0.737	0.739	0.741	0.743	0.745	0.747	0.749
0.58	0.751	0.753	0.755	0.757	0.759	0.761	0.763	0.765	0.767	0.769
0.59	0.771	0.773	0.776	0.778	0.780	0.782	0.784	0.786	0.788	0.790
0.60	0.792	0.794	0.796	0.798	0.800	0.803	0.805	0.807	0.809	0.811
0.61	0.813	0.815	0.817	0.819	0.822	0.824	0.826	0.828	0.830	0.832
0.62	0.834	0.836	0.839	0.841	0.843	0.845	0.847	0.849	0.852	0.854
0.63	0.856	0.858	0.860	0.862	0.865	0.867	0.869	0.871	0.873	0.876
0.64	0.878	0.880	0.882	0.884	0.887	0.889	0.891	0.893	0.896	0.898
0.65	0.900	0.902	0.905	0.907	0.909	0.912	0.914	0.916	0.919	0.921
0.66	0.924	0.926	0.929	0.932	0.934	0.937	0.940	0.942	0.945	0.948
0.67	0.951	0.954	0.957	0.959	0.962	0.965	0.968	0.971	0.974	0.978
0.68	0.981	0.984	0.987	0.990	0.993	0.997	1.000	1.003	1.007	1.010
0.69	1.013	1.017	1.020	1 024	1.027	1.031	1.034	1.038	1.042	1.045
0.70	1.049	1.053	1.056	1.060	1.064	1.068	1.072	1.075	1.079	1.083
0.71	1.087	1.091	1.095	1.099	1.103	1.107	1.111	1.116	1.120	1.124
0.72	1.128	1.132	1.137	1.141	1.145	1.149	1.154	1.158	1.163	1.167
0.73	1.171	1.176	1.180	1.185	1.190	1.194	1.199	1.203	1.208	1.213
0.74	1.217	1.222	1.227	1.232	1.236	1.241	1.246	1.251	1.256	1.261
0.75	1.266	1.271	1.275	1.280	1.286	1.291	1.296	1.301	1.306	1.311
0.76	1.316	1.321	1.326	1.332	1.337	1.342	1.347	1.353	1.358	1.363
0.77	1.369	1.374	1.380	1.385	1.391	1.396	1.401	1.407	1.413	1.418
0.78	1.424	1.429	1.435	1.441	1.446	1.452	1.458	1.463	1.469	1.475
0.79	1.481	1.486	1.492	1.498	1.504	1.510	1.516	1.522	1.528	1.533
0.80	1.539	1.545	1.551	1.557	1.564	1.570	1.576	1.582	1.588	1.594
0.81	1.600	1.606	1.613	1.619	1.625	1.631	1.638	1.644	1.650	1.656
0.82	1.663	1.669	1.675	1.682	1.688	1.695	1.701	1.708	1.714	1.720
0.83	1.727	1.733	1.740	1.747	1.753	1.760	1.766	1.773	1.780	1.786
0.84	1.793	1.799	1.806	1.813	1.820	1.826	1.833	1.840	1.847	1.853
0.85	1.860	1.867	1.874	1.881	1.888	1.894	1.901	1.908	1.915	1.922
0.86	1.929	1.936	1.943	1.950	1.957	1.964	1.971	1.978	1.985	1.992
0.87	1.999	2.006	2.014	2.021	2.028	2.035	2.042	2.049	2.056	2.064
0.88	2.071	2.078	2.085	2.093	2.100	2.107	2.114	2.122	2.129	2.136
0.89	2.144	2.151	2.158	2.166	2.173	2.180	2.188	2.195	2.203	2.210
0.90	2.218	2.225	2.232	2.240	2.247	2.255	2.262	2.270	2.277	2.285
0.91	2.292	2.300	2.308	2.315	2.323	2.330	2.338	2.345	2.353	2.361
0.92	2.368	2.376	2.384	2.391	2.399	2.407	2.414	2.422	2.430	2.437
0.93	2.445	2.453	2.461	2.468	2.476	2.484	2.492	2.499	2.507	2.515
0.94	2.523	2.530	2.538	2.546	2.554	2.562	2.570	2.577	2.585	2.593
0.95	2.601	2.609	2.617	2.625	2.632	2.640	2.648	2.656	2.664	2.672
0.96	2.680	2.688	2.696	2.704	2.712	2.719	2.727	2.735	2.743	2.751
0.97	2.759	2.767	2.775	2.783	2.791	2.799	2.807	2.815	2.823	2.831
0.98	2.839	2.847	2.855	2.863	2.871	2.879	2.887	2.895	2.903	2.911

APPENDIX B WATER QUALITY DATA

Appendix B: Storys and Aberfoyle Creek Water Quality Monitoring All Data (mg/L)

LOCATION	ANZECC Drinking		Aqu Life	ANZECC Livestock	Irrigation	2 Storys above mine				3 inflow	4 PPT Dam outflow	PPT Dam outflow	PPT Dam outflow	PPT Dam outflow	4 PPT Dam outflow	4 PPT Dam outflow	PPT Dam outflow	PPT Dam outflow	PPT Dam outflow	PPte dam Pit near Fe pptates	Story Pit in river tails	Story Pit in river tails?.	Adit Y above Eastern	Disposal area lysimeters	
PARAMETER (mg/l)	Toxicant	Non Toxic.	EQOs			975998		2a	2a	975999	976000		after works	after works								on w bank			
SAMPLE DATE						2-Oct-97	1-Sep-98	1-Oct-98	14-May-99	3-Oct-97	2-Oct-97	1-Sep-98	29-Jun-00	10778 30-Aug-00	30-Nov-00	6-Jan-01	10-Apr-01	25-Apr-01	18-May-01	1-Sep-98	17-Nov-98	1-Sep-98	17-Nov-98	10776 30-Aug-00 LL	10777 30-Aug-00 LU
FLOW L/sec Observations See Station 14 comments and flows						41				0.2	1			approx 4L/s	1-2L/s	no flow no flow?	no flow no flow	3L/s strong flow	10L/s strong flow						
pH L		6.5-8.5			4.5-9.0	5.8	6.3	7.1	6.4	6.1	3.4	3.4	6.3	6.4	6.5	6.8	6.5	5.8	6.4	6.1	3.3	4.3	6.7	4.7	4.7
pH F						7.6				7.2	3.6														
Cond mS/cm L					0-500	23	20	55	20	42	908	881	550	200	355	505	551	252	400	606	640	330	108	61	68
Cond F						24				42	826														
TDS		1000		3000	0-800 ok	26	18	51	26	44	692	606		122	267	361	429	126	295	479	431	258	67	54	46
NFR (suspended solids)						<1	<1	553	8	<1	59	45		13	2	2	3	23	14	337	3	68	5	16	5
Alkalinity (CaCO3)						11	5	14	1	20	<1	<1		8	6	1	1	9	12	49	1	1	1	1	
Acidity (CaCO3)						2	1	1	2	<1	227	174	32	14	34	22	22	21	30	158	112	68	9	12	
SO4		400		1000		0.5	0.3	0.3	0.3	1	498	420	240	71	150	210	280	110	150	240	68	160	3	1	1
DOC mg/L						1.4				1.0	1.8														
Hardness (CaCO3)		500				7				14	197														
Cl						1.6				2.3	17.0			4.2										12.0	14.0
F				2	1	<0.02	<0.02			0.02	12.00	9.40								6.00		4.50			
K T						0.1	0.0			0.2	0.9	0.9								1.6		0.7			
Ca T				1000		2.0	1.6			3.0	44.0		48.4	15.5	30.1	65.0	65.8	23.8	40.4	69.5		26.2		1.4	1.6
Mg T				600		0.7	0.7			2.0	21.0	25.1	19.4	7.6	13.5	20.9	20.4	9.4	14.5	23.9		9.6		1.2	1.4
Na T		300				2.0	1.1			2.0	4.0	3.7		3.9	4.2	6.9	5.6	3.6	4.1	2.7		2.7		5.1	6.0
Metals																									
Al F			**0.1**			<0.1	<0.050	<0.050	0.068	0.100	9.000	6.550	0.272	0.010	0.048	0.020	0.020	0.312	0.020	0.811	4.690	5.600	0.597	0.022	0.020
Al T		0.2		5	5	0.1	0.054	0.055	0.187	0.100	10.000	6.810	1.030	0.471	0.856	0.020	0.031	1.790	0.598	2.700	4.690	7.300	0.678	0.031	0.039
Cd F			**0.0002**			<0.001	<0.001	<0.001		0.010	2.450	1.280	0.790	0.235	0.496	0.421	0.334	0.333	0.210	2.520	0.297	0.292	0.011	0.001	0.001
Cd T	0.005			0.01	0.01	<0.001	<0.001	<0.001		0.001	2.550	1.390	0.792	0.245	0.502	0.412	0.331	0.370	0.439	2.600	0.274	0.307	0.012	0.001	0.001
Cu F			**0.005**			0.001	0.016	0.009		0.002	5.420	3.640	0.096	0.004	0.003	0.014	0.005	0.0	0.0	0.089	0.290	1.010	0.036	0.001	0.012
Cu T		1		0.5	0.2	<0.001	0.009	0.005		0.003	5.620	3.830	0.142	0.011	0.010	0.018	0.008	0.1	0.0	0.426	0.290	1.090	0.042	0.002	0.016
Fe F			**1**			<0.1	<0.1	<0.02	0.034	<0.1	8.0	1.3	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.02	2.35	20.00	0.02	0.04	0.03
Fe T		0.3			1	<0.1	<0.1	0.028	0.159	<0.1	30.0	26.7	0.7	0.2	0.9	0.1	0.1	1.1	0.4	7.7	4.0	1.4	0.2	0.05	0.05
Mn F						<0.1	<0.1	<0.005	0.006	<0.1	6.0	4.9	4.7	1.6	4.0	3.6	3.5	1.380	1.200	5.9	2.5	2.0	0.5	0.13	0.14
Mn T		0.2			2	<0.1	<0.1	<0.005	0.011	<0.1	6.0	5.4	4.7	1.7	4.0	3.5	3.6	1.4	2.79	6.3	2.5	2.1	0.5	0.14	0.15
Zn F			**0.05**			0.004	0.003	<0.001	0.014	0.051	58.400	39.000	15.100	6.780	14.000	10.400	9.350	8.43	6.16	67.10	10.90	8.38	0.51	0.02	0.03
Zn T		5		20	2	<0.001	0.007	0.005	0.012	0.052	61.800	39.200	15.300	7.17	14.3	10.4	9.45	9.1	15.9	75.600	10.800	8.39	0.52	0.02	0.03

EQOs in BOLD

Appendix B: Storys and Aberfoyle Creek Water Quality Monitoring All Data (mg/L)

LOCATION	5 Storys below PPT Dam							5						6 Side Creek	
PARAMETER (mg/l)	976001							10779	139653					976002	
SAMPLE DATE	1-Oct-97	1-Sep-98	1-Oct-98	17-Nov-98	14-May-99	21-May-99	29-Jun-00	30-Aug-00	30-Nov-00	6-Jan-01	10-Apr-01	25-Apr-01	16-May-01	2-Oct-97	30-Nov-00
FLOW L/sec	42	see Station 14												0.3	
Observations See Station 14 comments and flows															
pH L	5.7	6.0	7.0	7.0	6.5	6.8	6.6	6.8	6.9	7.2	7.0	6.8	6.9	3.7	3.1
pH F	6.2													3.7	
Cond mS/cm L	64	45	68	69	20	43	41	46	74	68	50	35	34	254	855
Cond F	67													291	
TDS	54	38	44	58	19	35		17	44	48	45	1	37	149	452
NFR (suspended solids)	11	4	721	6	8	6		9	5	1	1	1	2	<1	10
Alkalinity (CaCO3)	4	3	12	13	1	5		5	13	1	13	7	6	<1	1
Acidity (CaCO3)	5	4	3	3	2	2	3	2	1	4	1	1	1	35	145
SO4	22	12	13	12	0	3	2	7	13.0	6.3	5.6	2.6	2.8	94	350
DOC mg/L	0.5													2.2	
Hardness (CaCO3)	17													53	
Cl	1.8							2.6						3.4	
F	0.56	0.47												5.30	
K T	0.2	0.1												0.9	
Ca T	4.0						2.9	3.3	6.6	8.4	2.9	1.38	2.14	12.0	43.2
Mg T	2.0	1.4					0.8	1.3	2.1	1.92	1.07	0.65	0.79	6.0	20.4
Na T	2.0	1.3						1.7	2.2	2.4	1.8	1.65	1.36	3.0	4.1
Metals															
Al F	0.10	0.57	<0.050	<0.050	0.06	0.05	0.02	0.02	0.03	0.04	0.02	0.08	0.02	3.00	9.10
Al T	0.70	0.47	0.76	0.23	0.20	0.13	0.05	0.12	0.14	0.05	0.09	0.14	0.07	3.00	9.07
Cd F	0.077	0.039	0.054	0.032	0.001	<0.001	0.005	0.025	0.040	0.014	0.002	0.003	0.002	0.139	0.319
Cd T	0.083	0.040	0.055	0.029	0.001	<0.001	0.005	0.027	0.043	0.014	0.003	0.003	0.003	0.143	0.320
Cu F	0.086	0.072	0.043	0.022	0.005	0.036	0.004	0.003	0.004	0.005	0.001	0.002	0.001	0.169	0.604
Cu T	0.194	0.113	0.167	0.092	0.005	0.046	0.005	0.007	0.011	0.005	0.003	0.002	0.001	0.174	0.604
Fe F	<0.1	<0.2	0.1	0.0	0.5	0.04	0.04	0.03	0.02	0.02	0.03	0.1	0.0	0.1	5.8
Fe T	3.0	0.3	0.7	0.5	0.2	0.25	0.07	0.10	0.15	0.06	0.09	0.1	0.0	0.2	26.3
Mn F	0.2	0.1	0.2	0.1	0.01	0.19	0.04	0.17	0.31	0.08	0.03	0.0	0.0	0.9	5.6
Mn T	0.2	0.1	0.2	0.1	0.0	0.2	0.0	0.2	0.3	0.1	0.0	0.0	0.0	0.9	5.6
Zn F	2.300	1.210	1.600	1.380	0.051	0.708	0.228	0.718	1.260	0.431	0.087	0.071	0.077	4.070	10.600
Zn T	2.430	1.300	1.600	1.420	0.058	0.725	0.223	0.803	1.360	0.428	0.106	0.076	0.105	4.140	10.500

Appendix B: Storys and Aberfoyle Creek Water Quality Monitoring All Data (mg/L)

LOCATION	B Storys below Side	B		B				B						
PARAMETER (mg/l)	976003							10780						
SAMPLE DATE	1-Oct-97	1-Sep-98	17-Nov-98	15-Mar-99	14-May-99	14-May-99	29-Jun-00	30-Aug-00	30-Nov-00	6-Jan-01	10-Apr-01	25-Apr-01	18-May-01	
FLOW L/sec Observations See Station 14 comments and flows	40								flows from Side Ck evident poor quality - pptates	poor quality - pptates	low flows clear	recent high flows - clear water		
pH L	5.1	5.7	6.6	6.9	6.4	6.0	6.4	6.6	6.6	4.0	6.8	6.8	7.0	
pH F	5.3													
Cond mS/cm L	141	57	95	96	23	111	52	55	135.0	532.0	95.0	33.0	35.0	
Cond F	145													
TDS	99	41	55		22	103		25	93	410	71	33	30	
NFR (suspended solids)	5	8	3		9	9		7	6	14	4	1	1	
Alkalinity (CaCO3)	1	1	7		2	3		2	8	1	9	6	6	
Acidity (CaCO3)	20	7	6	2	2	8	3	3	11	74	4	3	1	
SO4	60	16	12	25	1	34	9	11	2	270	28	5	4	
DOC mg/L	0.8													
Hardness (CaCO3)	37													
Cl	1.8							2.5	3.0					
F	1.40	0.58												
K T	0.3	0.2												
Ca T	9.0	4.4					4.9	4.5	13.0	60.5	8.5	1.9	2.8	
Mg T	3.0	1.5					1.0	1.4		18.3	2.1	0.8	0.8	
Na T	2.0	1.4						1.9		4.7	2.0	1.6	1.4	
Metals														
Al F	1.00	0.14	0.05	0.05	0.08	0.22	0.02	0.01	0.12	3.88	0.02	0.28	0.07	
Al T	2.00	1.14	0.75	0.85	0.27	0.89	0.34	0.65	2.19	4.14	0.09	0.35	0.16	
Cd F	0.154	0.059	0.066	0.057	0.004	0.045	0.022	0.047	0.122	0.350	0.024	0.004	0.003	
Cd T	0.158	0.065	0.072	0.059	0.004	0.052	0.024	0.049	0.125	0.355	0.022	0.004	0.005	
Cu F	0.438	0.149	0.068	0.06	0.013	0.066	0.017	0.059	0.197	0.233	0.011	0.018	0.005	
Cu T	0.464	0.214	0.271	0.184	0.019	0.127	0.070	0.169	0.342	0.255	0.019	0.02	0.007	
Fe F	2.0	<0.02	0.0	<0.02	0.0	0.063	0.020	0.02	0.02	7.17	0.02	0.05	0.02	
Fe T	3.0	0.3	0.7	0.4	0.2	3.290	0.160	0.13	0.86	20.00	0.04	0.07	0.05	
Mn F	0.6	0.1	0.2	0.2	0.0	0.411	0.079	0.14	0.42	2.99	0.14	0.03	0.01	
Mn T	0.6	0.2	0.2	0.2	0.0	0.422	0.082	0.1	0.4	3.0	0.1	0.0	0.0	
Zn F	4.460	1.730	2.330	0.988	0.107	1.520	0.597	1.260	2.880	6.870	0.761	0.132	0.105	
Zn T	4.540	1.810	2.510	1.910	0.127	1.680	0.666	1.370	2.970	6.920	0.750	0.136	0.154	

note exit from Prec Dam ??

Appendix B: Storys and Aberfoyle Creek Water Quality Monitoring All Data (mg/L)

LOCATION refer Hydro report	11 Storys below Eastern Hill								12 Nisbet Creek	
PARAMETER (mg/l)	976006								976007	
SAMPLE DATE Gauge Ht	1-Oct-97	1-Sep-98	17-Nov-98	14-May-99	6-Jan-01	10-Apr-01	25-Apr-01	18-May-01	1-Oct-97	1-Sep-98
FLOW L/sec Observations See Station 14 comments and flows					poor quality - pptates	poor quality - pptates	recent high flows clear water		37	
pH L	4.9	5.1	5.6	5.6	4.7	4.8	6.7	6.5	5.7	6.5
pH F	4.9								6.6	
Cond mS/cm L	197	121	174	163	396	269	71	66	35	35
Cond F	201								39	
TDS	155	73	123	135	306	219	38	49	24	19
NFR (suspended solids)	5	5	15	11	18	12	1	7	<1	1
Alkalinity (CaCO3)	<1	<1	<1	1	1	1	5	3	13	9
Acidity (CaCO3)	25	15	11	10	35	23	3	7	<1	3
SO4	91	45	25	63	200	140	8	19	2	2
DOC mg/L	0.4								0.8	
Hardness (CaCO3)	56								11	
Cl	2.0								2.0	
F	1.40	1.10							0.02	0.03
K T	0.3	0.2							0.1	0.1
Ca T	14.0	8.6			48.8	25.5	2.8	5.1	2.0	2.7
Mg T	5.0	3.3			14.4	8.4	1.1	1.7	1.0	1.3
Na T	3.0	1.5			4.3	2.8	1.8	1.4	2.0	1.5
Metals										
Al F	2.00	0.97	0.34	0.58	1.89	1.15	0.20	0.04	0.10	0.06
Al T	2.00	1.26	1.34	1.25	2.21	1.15	0.25	0.25	0.10	0.10
Cd F	0.155	0.078	0.077	0.044	0.197	0.102	0.004	0.008	<0.001	0.002
Cd T	0.158	0.079	0.077	0.059	0.197	0.100	0.005	0.013	<0.001	0.002
Cu F	0.468	0.206	0.178	0.116	0.202	0.061	0.015	0.004	0.001	0.003
Cu T	0.487	0.242	0.29	0.139	0.219	0.063	0.016	0.014	0.001	0.07
Fe F	3.0	<0.02	0.1	0.4	3.3	1.6	0.3	0.0	<0.1	<0.02
Fe T	4.0	2.4	4.9	5.1	12.7	2.7	0.4	0.6	<0.1	0.2
Mn F	1.0	0.6	0.6	1.0	2.4	1.6	0.1	0.1	<0.1	<0.005
Mn T	1.0	0.6	0.7	1.0	2.4	1.6	0.1	0.2	<0.1	<0.005
Zn F	4.790	2.280	3.310	2.410	5.360	3.780	0.136	0.345	0.020	0.061
Zn T	4.920	2.390	3.250	2.580	5.370	3.730	0.154	0.514	0.015	0.070

Appendix B: Storys and Aberfoyle Creek Water Quality Monitoring All Data (mg/L)

LOCATION refer Hydro report	13 Storys below Nisbet					13				
PARAMETER (mg/l)	976008					10781				
SAMPLE DATE Gauge Ht	1-Oct-97	1-Sep-98	17-Nov-98	21-May-99	29-Jun-00	30-Aug-00	30-Nov-00	10-Apr-01	25-Apr-01	18-May-01
FLOW L/sec Observations See Station 14 comments and flows	98						cloudy - pptates	pptates		
pH L	5.4	5.6	6.1	6.0	5.8	6.2	6.5	4.9	6.7	6.4
pH F	5.9									
Cond mS/cm L	109	84	135	125	117	82	132	241	52	71
Cond F	115									
TDS	85	67	98	328		39	90	202	41	54
NFR (suspended solids)	7	5	18	15		14	5	1	1	8
Alkalinity (CaCO3)	2	1	2	2		1	6	1	6	3
Acidity (CaCO3)	6	8	8	5	7	6	10	20	3	1
SO4	40	26	39	43	38	23	41	130	9	20
DOC mg/L	0.4									
Hardness (CaCO3)	32									
Cl	2.0					2.8				
F	0.77	0.56								
K T	0.2	0.3								
Ca T	8.0	6.5			11.1	3.3	12.2	21.5	4.5	5.9
Mg T	3.0	2.6			3.3	1.3	3.7	6.4	1.4	1.9
Na T	2.0	1.6				1.7	2.5	2.8	2.1	1.5
Metals										
Al F	0.40	0.28	0.12	0.23	0.14	0.18	0.01	0.41	0.21	0.02
Al T	1.00	0.94	1.50	1.25	0.77	0.57	0.97	0.72	0.25	0.15
Cd F	0.077	0.049	0.054	0.044	0.049	0.061	0.057	0.081	0.005	0.01
Cd T	0.080	0.050	0.054	0.046	0.050	0.062	0.061	0.840	0.014	0.013
Cu F	0.223	0.143	0.098	0.115	0.079	0.12	0.14	0.065	0.014	0.002
Cu T	0.259	0.172	0.244	0.117	0.103	0.152	0.136	0.062	0.058	0.1
Fe F	0.3	<0.02	0.0	0.2	0.0	0.02	0.02	0.0	0.2	0.0
Fe T	1.0	1.1	3.0	1.6	1.2	0.21	2.73	0.0	0.3	0.3
Mn F	0.5	0.3	0.5	0.4	0.4	0.32	0.45	0.4	0.1	0.1
Mn T	0.6	0.7	0.2	0.5	0.4	0.3	0.5	0.4	0.1	0.2
Zn F	2.434	1.490	2.100	1.400	1.540	1.690	1.400	2.950	0.166	0.388
Zn T	2.500	1.540	2.320	1.420	1.580	1.740	1.540	2.930	0.380	0.516

Appendix B: Storys and Aberfoyle Creek Water Quality Monitoring All Data (mg/L)

LOCATION	14																	
refer Hydro report	Storys below pumphouse (managers)																	
PARAMETER (mg/l)	976009			After Lstone							10782							
SAMPLE DATE	3-Oct-97	7-Aug-98	1-Sep-98	1-Oct-98	17-Nov-98	1-Dec-98	15-Mar-99	6-Apr-99	21-May-99	29-Jun-00	30-Aug-00	23-Sep-00	30-Nov-00	6-Jan-01	26-Jan-01	10-Apr-01	25-Apr-01	18-May-01
Gauge Ht		0.39	0.3	0.3	0.3	0.35	0.3	0.28	0.28	0.34	0.42		0.3	0.27	0.26	0.26	0.45	0.34
FLOW L/sec	153	420	284	284	284	360	285	107	107	345		NR						
Observations See Station 14 comments and flows		clear falling after rain	clear no rain	clear low rain	low,clear, some rain prev wend	low,clear, some rain prev 2 days	low clear no rain obvious ppt.	low clear little rain obvious ppt.	clear after rain prev few days	clear mod flow falling	clear strong rain in last few days		pptates	pptates	clear low flow	clear low flow	recnt high flow clear	recnt high flow clear
pH L	5.3	5.8	5.3	6.9	5.7	6.3	5.8	5.5	5.4	5.8	6.5	6.6	6.3	5.6	5.2	5.3	6.7	6.4
pH F	5.8																	
Cond mS/cm L	98	59	92		128	68	143	146	127	102	63	82	119	191	123	179	54	71
Cond F	100																	
TDS	63		65		84			90	257		13	78	88	147	86	139	44	54
NFR (suspended solids)	6	5	5		7			5	8		6	1	3	1	6	2	2	3
Alkalinity (CaCO3)	1		1	3	1			1	1		2	4	3	1	1	1	5	3
Acidity (CaCO3)	8		9	3	8	2	2	8	8	4	3	1	10	14	2	10	3	6
SO4	36	15	30		65	16		44	48	31	14	20	36	75	56	89	11	21
DOC mg/L	1.2																	
Hardness (CaCO3)	27																	
Cl	2.3							1.9			3.0							
F	0.56		0.53															
K T	0.3		0.2															
Ca T	6.0		6.5							8.6	4.7	6.2	10.5	21.7	21.3	15.6	4.5	5.9
Mg T	3.0		2.7							2.6	1.7	2.1	3.2	6.1	6.2	4.8	1.5	1.9
Na T	3.0		1.6								2.2	2.4	3.3	3.9	3.4	2.8	2.0	1.7
Metals																		
Al F	0.40	0.08	0.47	<0.05	0.15	0.05	0.47	0.26	0.16	0.03	0.12	0.01	0.04	0.27	0.36	0.41	0.23	0.14
Al T	0.90	0.38	1.00	1.38	0.81	0.05	0.82	0.94	0.65	0.54	0.45	1.10	0.43	0.49	0.54	0.41	0.33	0.25
Cd F	0.075	0.034	0.067	0.059	0.059	0.016	0.071	0.067	0.036	0.05	0.034	0.047	0.060	0.109	0.116	0.085	0.007	0.015
Cd T	0.079	0.034	0.072	0.062	0.068	0.02	0.074	0.080	0.055	0.051	0.037	0.049	0.063	0.110	0.128	0.085	0.022	0.024
Cu F	0.238	0.064	0.222	0.074	0.187	0.012	0.187	0.139	0.079	0.07	0.052	0.043	0.061	0.151	0.089	0.067	0.023	0.12
Cu T	0.262	0.093	0.249	0.288	0.254	0.017	0.192	0.193	0.185	0.119	0.11	0.197	0.111	0.165	0.194	0.068	0.056	0.18
Fe F	0.4	0.02	0.0	0.0	0.029	0.02	0.3	1.4	0.1	0.0	0.19	0.02	0.08	0.07	0.26	0.02	0.2	0.1
Fe T	0.8	0.33	0.8	1.4	1.75	0.075	1.2	0.5	0.9	1.1	0.38	1.48	0.75	0.70	0.74	0.02	0.3	0.2
Mn F	0.4	0.15	0.3		0.338	0.136	0.5	0.5	0.4	0.3	0.16	0.24	0.26	0.29	0.41	0.44	0.4	0.1
Mn T	0.4	0.16	0.4		0.384	0.152	0.5	0.5	0.4	0.3	0.2	0.2	0.3	0.3	0.4	0.4	0.1	0.2
Zn F	2.280	0.934	1.910	1.580	2.29	0.501	2.240	1.960	0.966	1.530	1.260	1.220	1.410	2.650	3.400	2.950	0.225	0.568
Zn T	2.330	0.959	1.890	1.570	2.43	0.697	2.230	2.400	2.040	1.580	1.370	1.330	1.490	2.660	3.240	2.930	0.568	0.869

Appendix B: Storys and Aberfoyle Creek Water Quality Monitoring All Data (mg/L)

LOCATION	15 Storys at Rossarden Bridge					15 after Istne							14	22 Aberfoyle above Storys			
PARAMETER (mg/l)	dpiwe	dpiwe	dpiwe	dpiwe	median	976010 dpiwe		dpiwe	15	15 dpiwe		15	15	10783	976017	22	22
SAMPLE DATE	15-Nov-96	23-Dec-96	3-Feb-97	19-Aug-97		1-Oct-97	30-Apr-98	21-Aug-98	1-Sep-98	6-Apr-99	7-Jul-99	16-Sep-99	29-Jun-00	30-Aug-00	3-Oct-97	1-Sep-98	17-Nov-98
Gauge Ht																	
FLOW L/sec						216									174		
Observations See Station 14 comments and flows																	
pH L						5.7			5.2	5.3			5.7	6.5	6.7	7.0	7.7
pH F						5.9									7.0		
Cond mS/cm L						82			92	136			104	63	193	178	218
Cond F						84									197		
TDS						61			64	93				13	126	118	121
NFR (suspended solids)						3			5	5				6	<1	1	6
Alkalinity (CaCO3)						1			<1	1				2	43	28	4
Acidity (CaCO3)						5			9	8			6	3	<1	2	2
SO4						26			28	41			33	14	48	40	37
DOC mg/L						2.4									2.0		
Hardness (CaCO3)						13									79		
Cl						3.0				2.1				3.0	3.8		
F						0.40			0.51						0.78	0.81	
K T						0.4			0.6			0.3			0.7	0.6	
Ca T						5.0			6.5			5.9	8.9	4.0	17.0	17.4	
Mg T						2.0			2.7			1.9	2.6	1.5	9.0	9.1	
Na T						3.0			2.8			2.8		3.4	4.0	3.3	
Metals																	
Al F						0.3			0.5	0.4			0.2	0.12	0.1	0.1	0.1
Al T						0.6	1.4	0.6	0.9	0.4	1.1		0.4	0.45	0.2	0.2	0.1
Cd F						0.060			0.069	0.091			0.058	0.034	0.012	0.011	0.006
Cd T	0.043	0.090	0.140	0.032	0.07	0.060	0.118	0.067	0.068	0.087	0.024		0.060	0.037	0.014	0.015	0.008
Cu F						0.172			0.242	0.205			0.1	0.052	0.013	0.014	0.012
Cu T	0.138	0.23	0.37	0.101	0.18	0.193	0.396	0.215	0.248	0.208	0.134		0.119	0.11	0.028	0.057	0.028
Fe F						0.2			0.2	0.3			0.0	0.19	<0.1	0.0	0.0
Fe T	0.7	1.5	1.1	0.5	0.93	0.4	1.2	0.6	0.8	0.3	0.9		0.9	0.38	0.5	0.8	0.6
Mn F						0.3			0.3	0.4			0.3	0.16	0.4	0.3	0.3
Mn T	0.3	0.5	0.7	0.1	0.39	0.3	0.6	0.3	0.3	0.6	0.1		0.3	0.2	0.4	0.4	0.3
Zn F						1.770			1.910	2.550		1.190	1.720	1.260	0.457	0.485	0.276
Zn T	1.400	2.800	4.300	0.998	2.10	1.810	3.940	1.710	1.890	3.110	0.740	1.220	1.780	1.370	0.549	0.646	0.412
													note exit from Prec Dam ??				
															5.9		
															0.3		
															1.9		
															2.8		

Appendix B: Storys and Aberfoyle Creek Water Quality Monitoring All Data (mg/L)

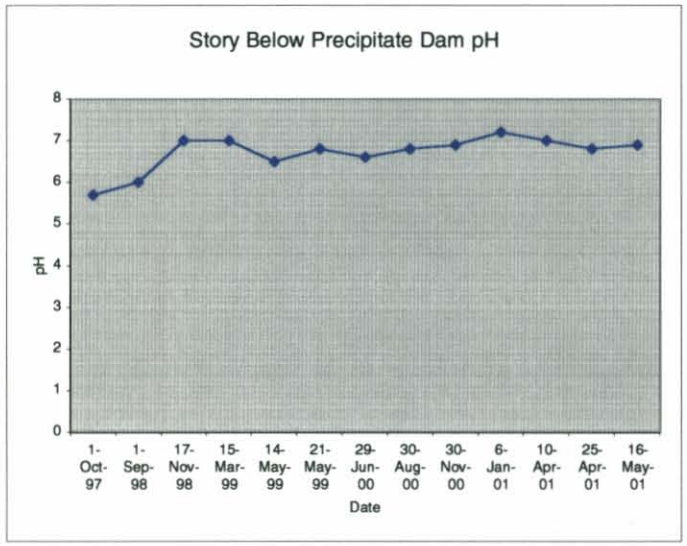
LOCATION	21 Storys above Aberfoyle				23 Storys below Aberfoyle										27 Storys above South Esk	24 South Esk above Storys	24	24
PARAMETER (mg/l)	976018	21		21	dpiwe	dpiwe	dpiwe	dpiwe	975997	dpiwe	dpiwe	23	23	dpiwe	976022	976019		
SAMPLE DATE	3-Oct-97	1-Sep-98	1-Oct-98	17-Nov-98	15-Nov-96	23-Dec-96	3-Feb-97	19-Aug-97	3-Oct-97	30-Apr-98	21-Aug-98	1-Sep-98	17-Nov-98	7-Jul-99	3-Oct-97	3-Oct-97	1-Sep-98	17-Nov-98
Gauge Ht																		
FLOW L/sec	220								394						470	10230		
Observations See Station 14 comments and flows																		
pH L	5.6	5.4	7.3	5.8					6.0			6.8	7.5		6.4	6.5	6.6	6.9
pH F	6.0								6.9						6.9	7.2		
Cond mS/cm L	71	83	70	110					107			147	183		119	74	67	109
Cond F	72								109						122	76		
TDS	47	71	56	83					80			109	115		87	48	58	58
NFR (suspended solids)	<1	2	1	5					<1			2	7		<1	2	6	22
Alkalinity (CaCO3)	1	1	2	1					13			18	3		16	17	10	2
Acidity (CaCO3)	6	7	2	6					<1			3	2		<1	<1	3	5
SO4	19	24	17	48					27			35	50		30	2	2	45
DOC mg/L	2.0								2.3						1.7	2.4		
Hardness (CaCO3)	17								35						42	17		
Cl	3.7								3.7						3.7	11.0		
F	0.29	0.44							0.47			0.88			0.48	<0.02	0.02	
K T	0.5	0.3							0.6			0.5			0.6	0.6	0.5	
Ca T	4.0	5.6							8.0			13.5			9.0	3.0	3.0	
Mg T	2.0	2.3							4.0			6.9			5.0	2.0	2.2	
Na T	4.0	2.4							4.0			2.9			4.0	7.0	5.7	
Metals																		
Al F	0.2	0.3	0.1	0.1					0.1			0.075	0.1		0.1	0.2	0.099	0.1
Al T	0.4	0.7	0.4	0.2					0.4	0.6	0.3	0.332	0.1	0.3	0.3	0.3	0.211	0.2
Cd F	0.046	0.058	0.043	0.064					0.034			0.027	0.03		0.030	<0.001	<0.001	0.001
Cd T	0.048	0.065	0.046	0.063	0.041	0.050	0.060	0.022	0.038	0.081	0.041	0.034	0.034	0.035	0.033	<0.001	<0.001	0.001
Cu F	0.080	0.187	0.048	0.135					0.044			0.032	0.030		0.029	0.002	0.010	0.006
Cu T	0.097	0.215	0.073	0.157	0.072	0.09	0.17	0.059	0.067	0.219	0.106	0.126	0.065	0.072	0.058	0.001	0.007	0.009
Fe F	<0.1	0.1	0.0	0.0					<0.1			0.261	0.0		<0.1	0.1	0.075	0.1
Fe T	0.1	0.3	0.3	0.1	0.5	0.3	0.1	0.4	0.3	0.3	0.4	0.654	0.4	0.4	0.3	0.3	0.203	0.5
Mn F	0.2	0.2	0.2	0.2					0.3			0.004	0.3		0.2	<0.1	0.005	0.0
Mn T	0.2	0.2	0.2	0.2	0.4	0.3	0.4	0.1	0.3	0.4	0.3	0.26	0.3	0.2	0.2	<0.1	0.028	0.1
Zn F	1.380	1.740	1.100	2.270					1.030			0.893	0.854		0.896	0.007	0.027	0.005
Zn T	1.420	1.760	1.100	2.170	1.200	1.480	2.200	0.737	1.120	2.690	1.110	0.990	1.010	1.040	0.991	0.003	0.004	0.004

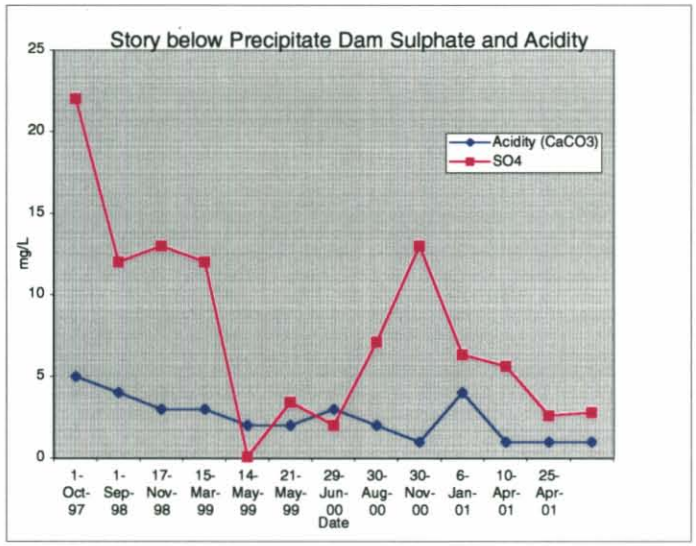
Appendix B: Storys and Aberfoyle Creek Water Quality Monitoring All Data (mg/L)

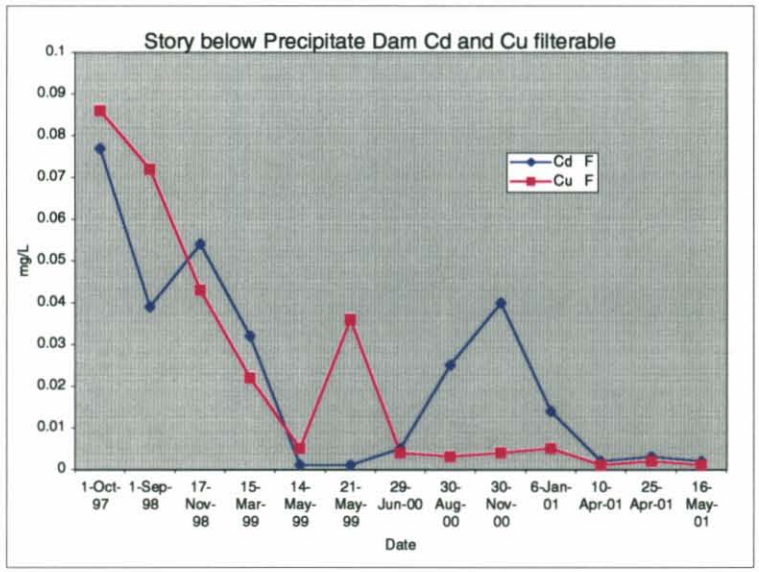
LOCATION	25 South Esk below Storys			South Esk At Avoca							26 South Esk at Lewellyn	28 Channel above PPT Dam
PARAMETER (mg/l)	976020			dpiwe	dpiwe	dpiwe	dpiwe	dpiwe	dpiwe	dpiwe	976021	976023
SAMPLE DATE	3-Oct-97		17-Nov-98	15-Nov-96	23-Dec-96	3-Feb-97	19-Aug-97	30-Apr-98	21-Aug-98	7-Jul-99	3-Oct-97	2-Oct-97
Gauge Ht												
FLOW L/sec	10701										12540	0.12
Observations See Station 14 comments and flows												
pH L	6.4	6.7	4.6								6.4	4.8
pH F	7.2										7.3	5.0
Cond mS/cm L	76	71	109								81	285
Cond F	78										83	290
TDS	56	65	71								59	246
NFR (suspended solids)	2		11								1	11
Alkalinity (CaCO3)	17	10	21								18	<1
Acidity (CaCO3)	<1	4	4								<1	35
SO4	3	2	2								3	132
DOC mg/L	2.3										2.6	1.4
Hardness (CaCO3)	18										20	85
Cl	10.0										11.0	3.5
F	0.03	0.04									0.03	0.59
K T	0.6	0.5									0.6	0.8
Ca T	3.0	3.0									4.0	17.0
Mg T	2.0	2.2									3.0	10.0
Na T	7.0	5.3									8.0	3.0
Metals												
Al F	0.2	0.1	0.1								0.2	2.0
Al T	0.3	0.2	0.2					0.1	0.1	0.1	0.4	3.0
Cd F	0.001	0.002	0.001								0.001	0.328
Cd T	0.001	0.002	0.001	0.003	0.005	0.005	0.001	0.005	0.002	0.001	0.001	0.339
Cu F	0.004	0.01	0.008								0.004	0.014
Cu T	0.004	0.019	0.008	0.009	0.005	0.005	0.005	0.014	0.018	0.003	0.005	0.014
Fe F	0.1	0.1	0.1								0.1	<0.1
Fe T	0.3	0.2	0.3	0.3	0.3	0.9	0.5	0.2	0.2	0.2	0.3	<0.1
Mn F	<0.1	0.0	0.0								<0.1	3.0
Mn T	<0.1	0.0	0.0	0.3	0.0	0.1	0.3	0.0	0.0	0.0	<0.1	3.0
Zn F	0.034	0.046	0.027								0.035	17.700
Zn T	0.040	0.050	0.020	0.096	0.070	0.060	0.049	0.169	0.052	0.049	0.032	17.000

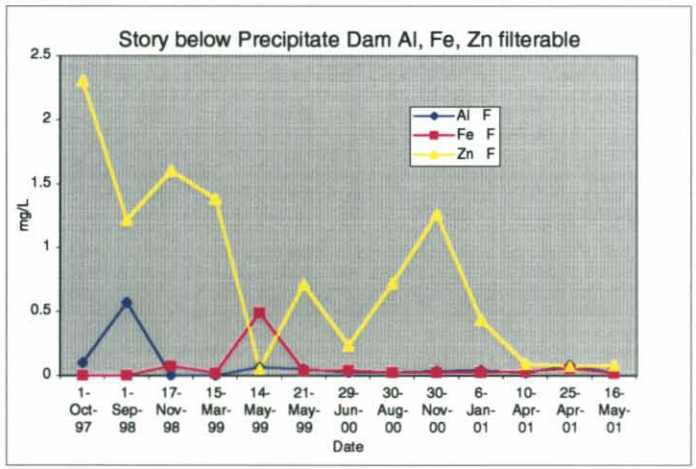
nothing exceeds EQO
CD limits too high

Storys Creek below Precipitate Dam Water Quality Data

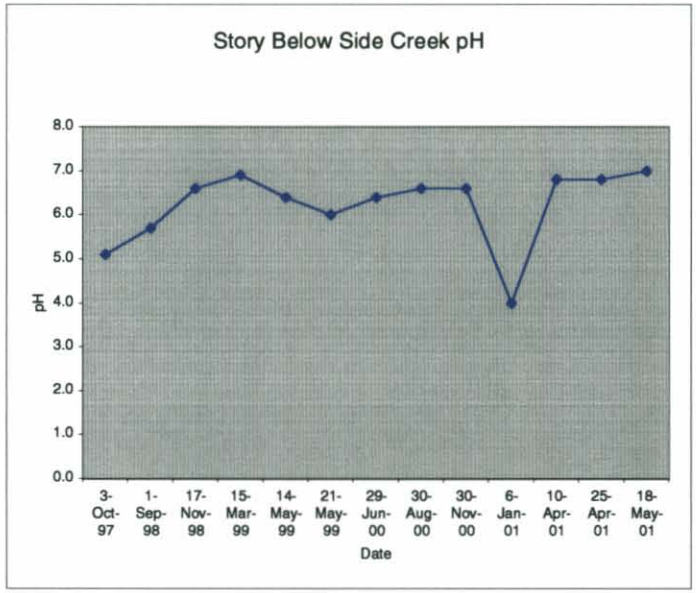


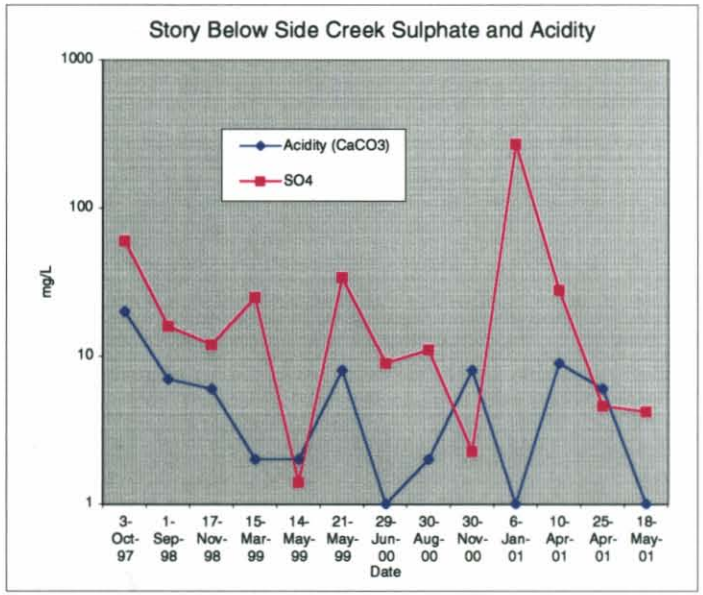


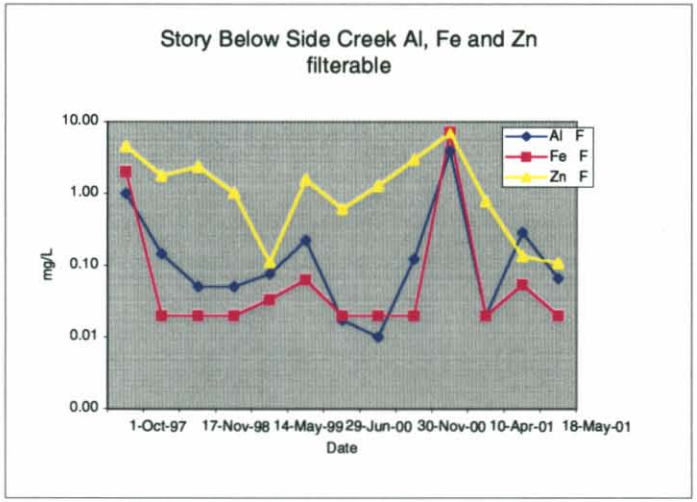


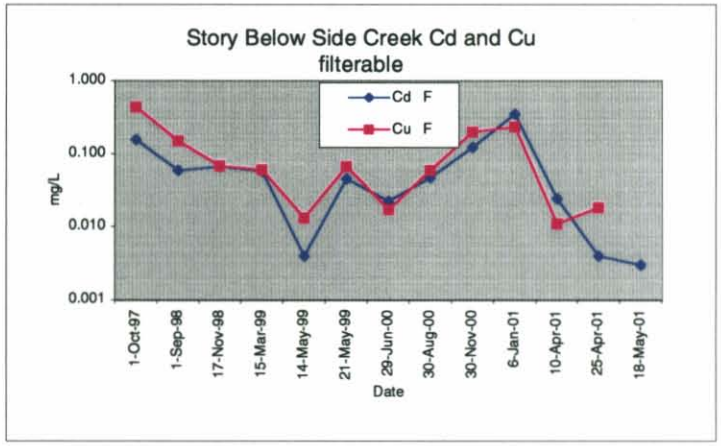


Storys Creek below Side Creek Water Quality Data

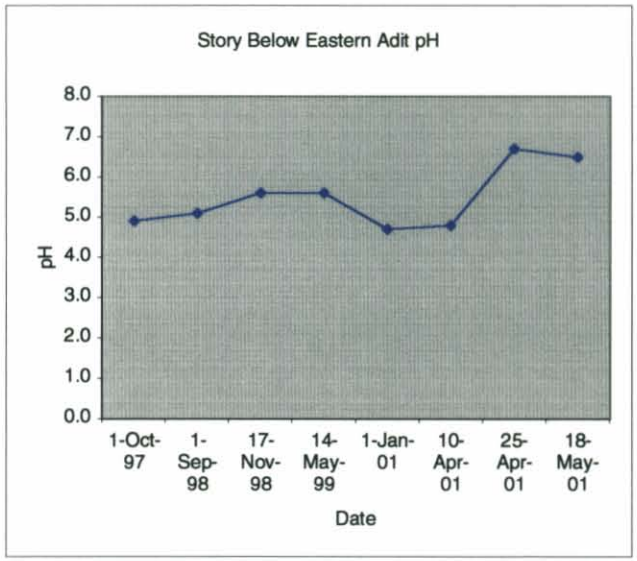


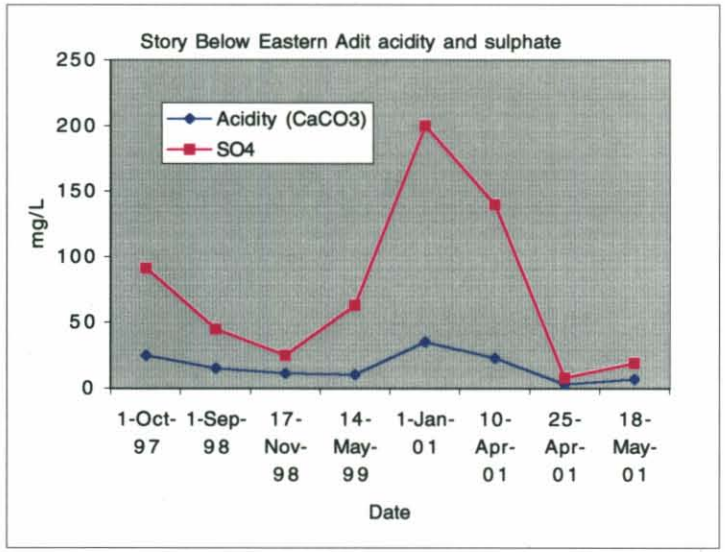


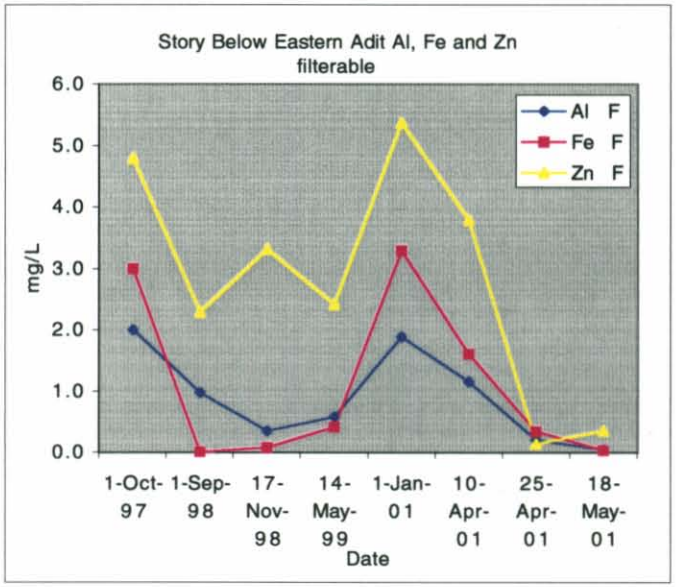


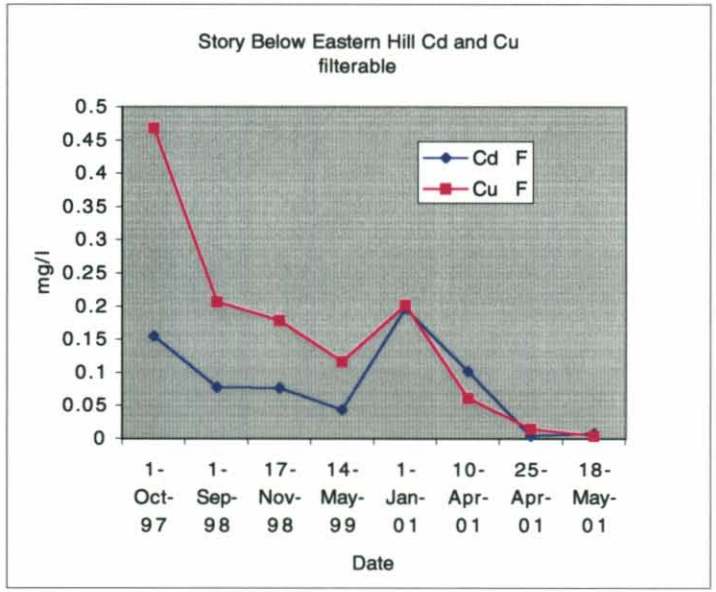


Storys Creek below Eastern Adit Water Quality Data

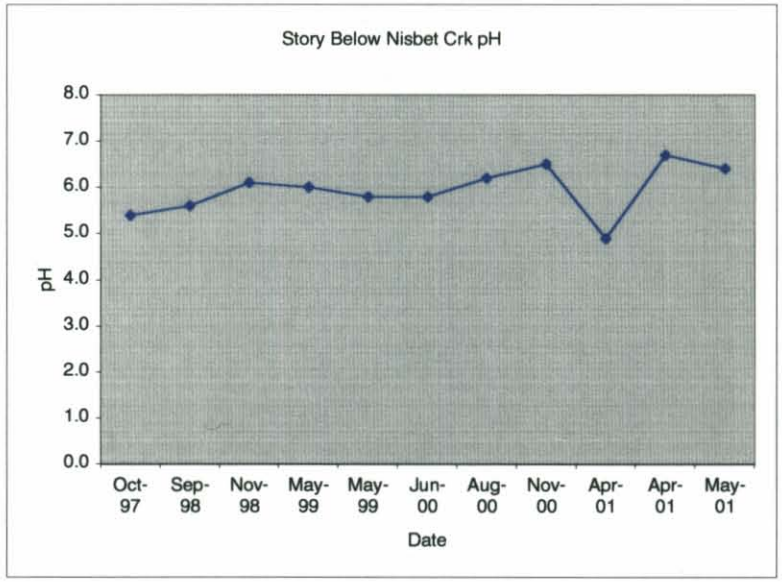


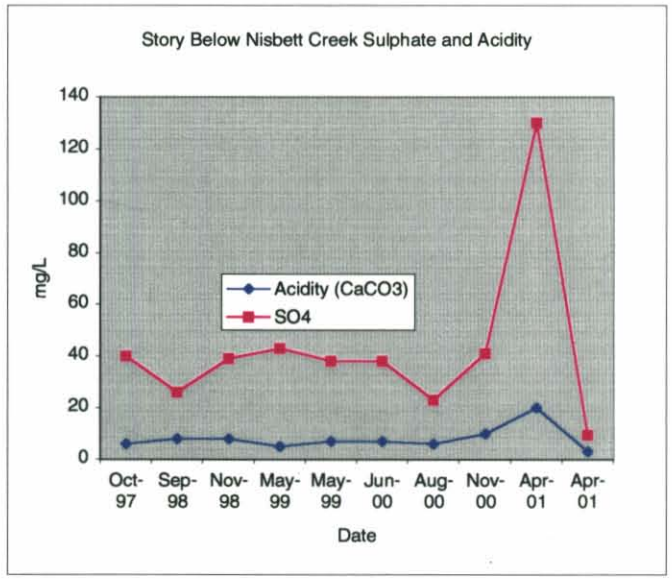


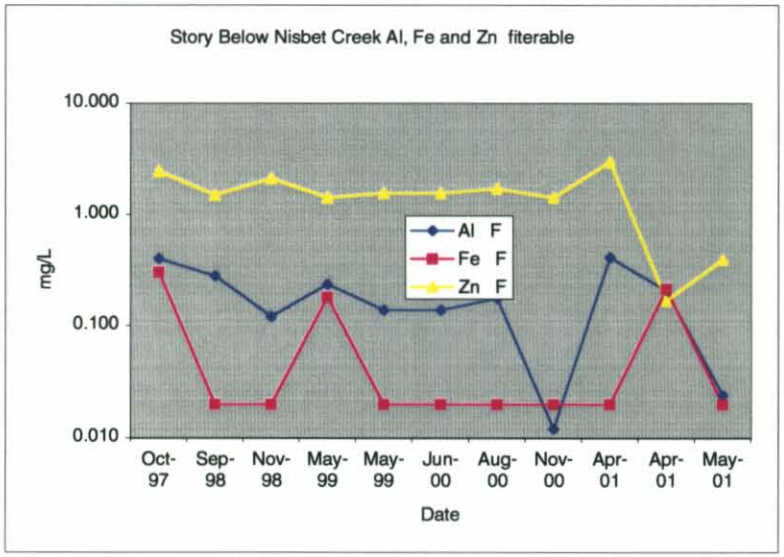


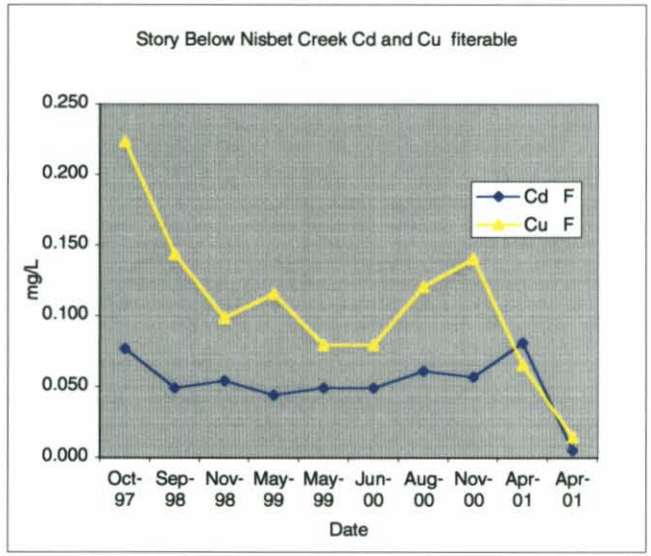


Storys Creek below Nisbett Creek Water Quality Data



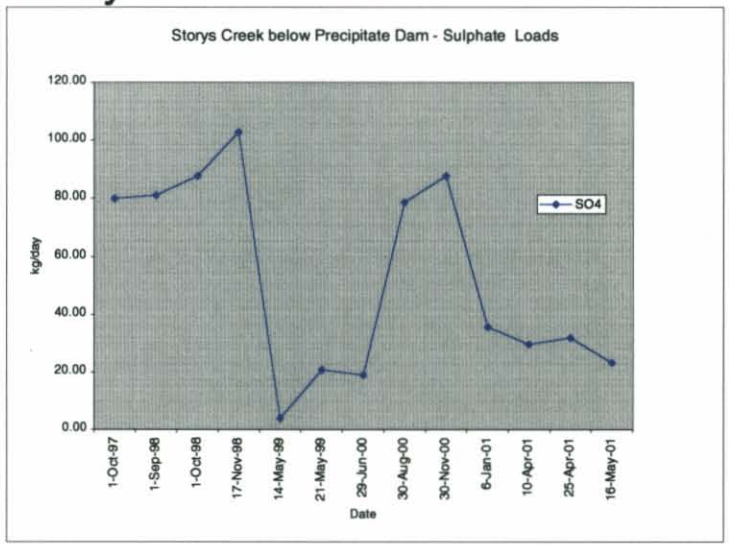


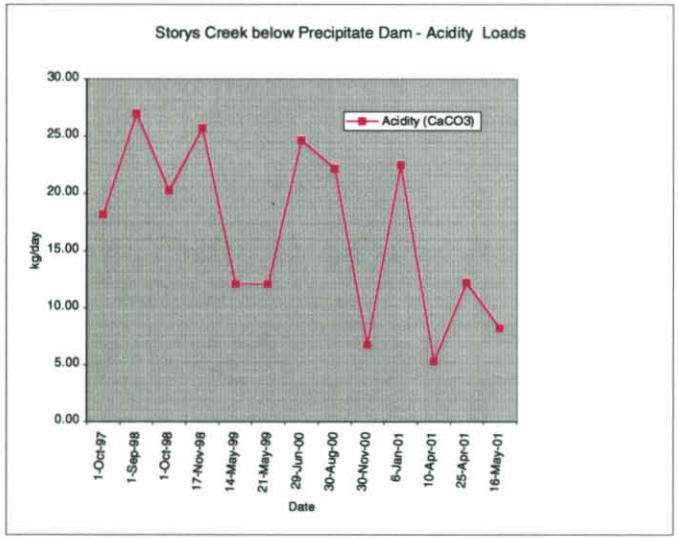


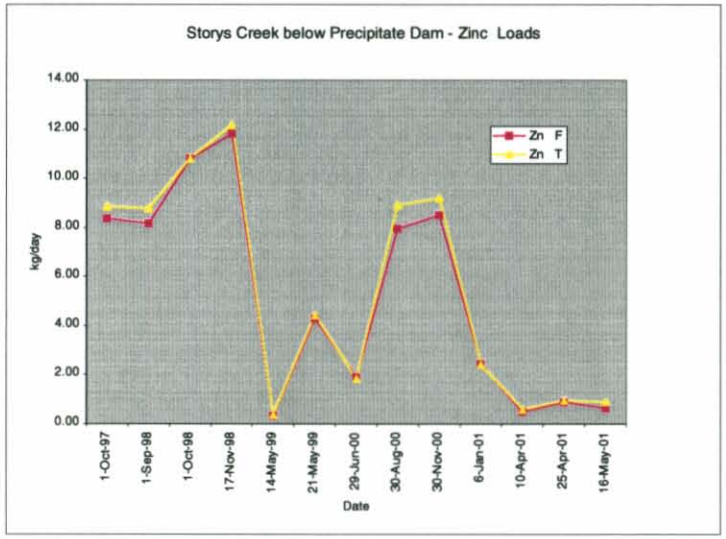


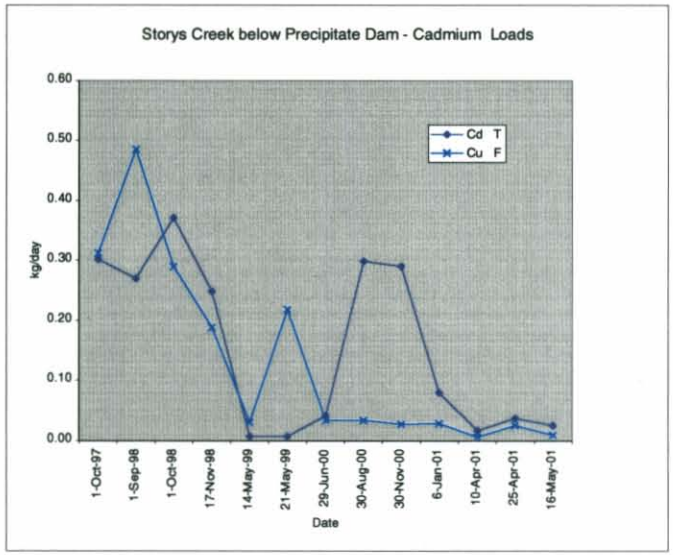
Storys Creek Below Precipitate Dam Loads

Storys below PPT Dam

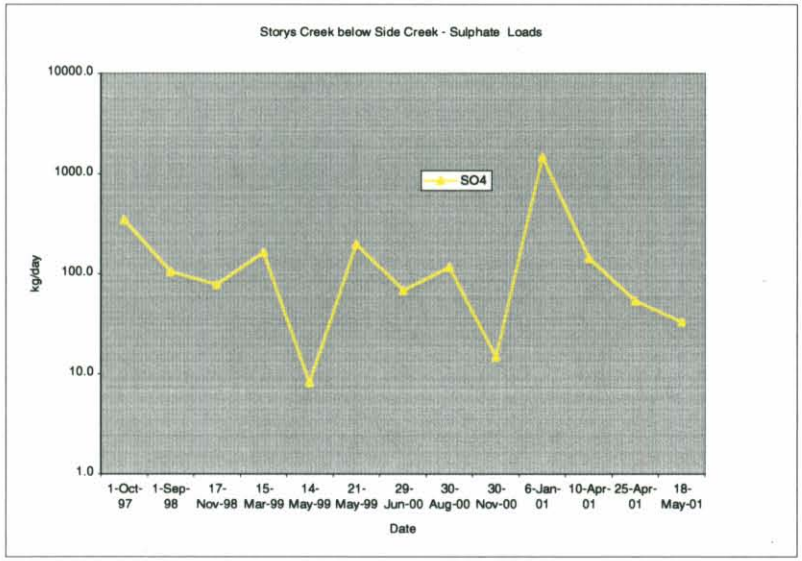


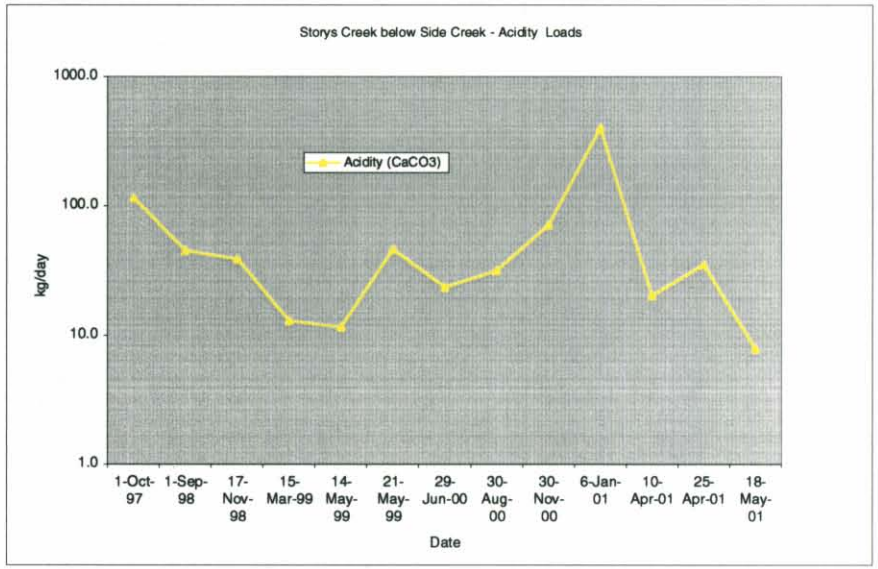


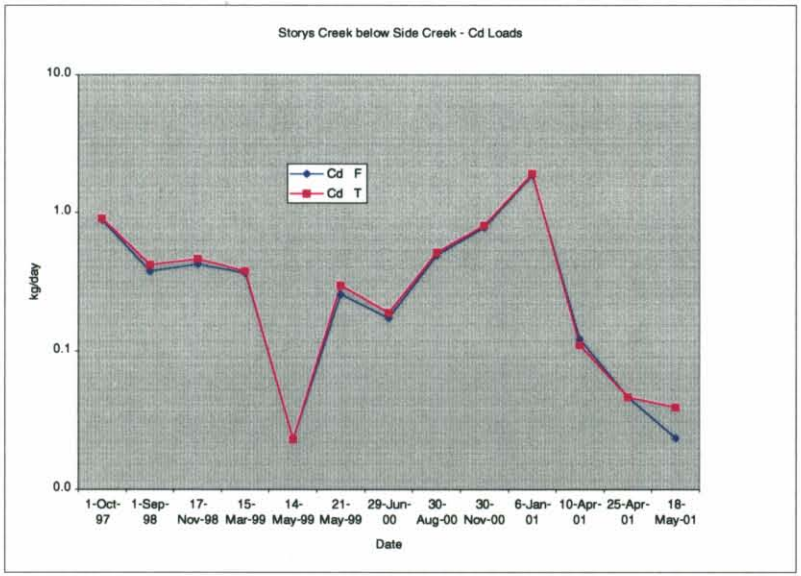


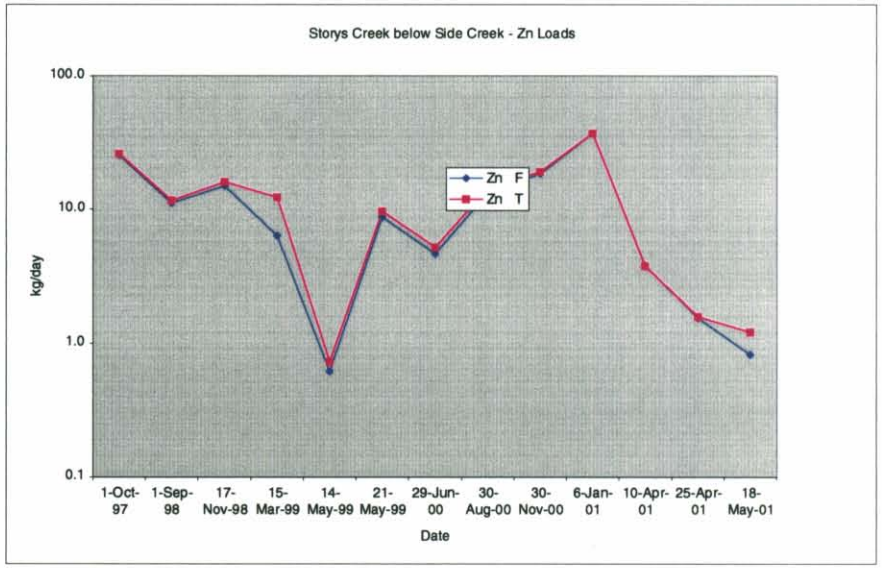


Storys Creek Below Side Creek Loads

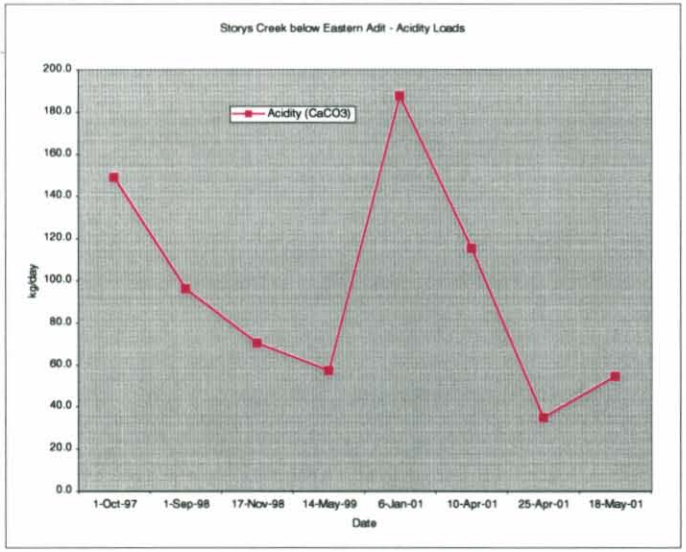


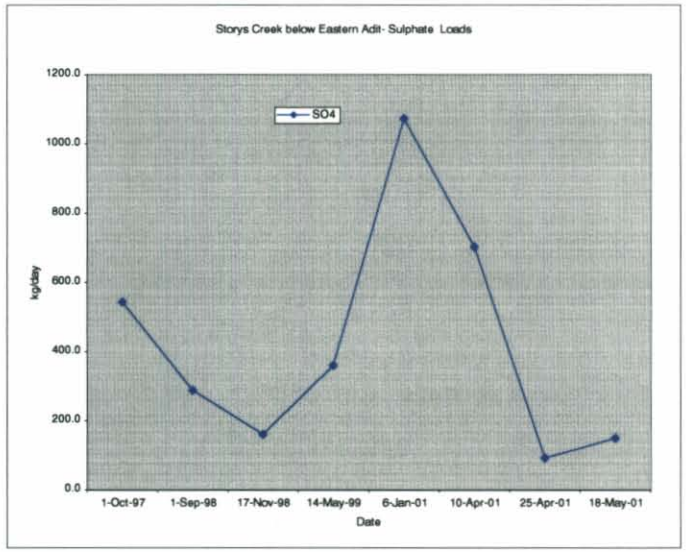


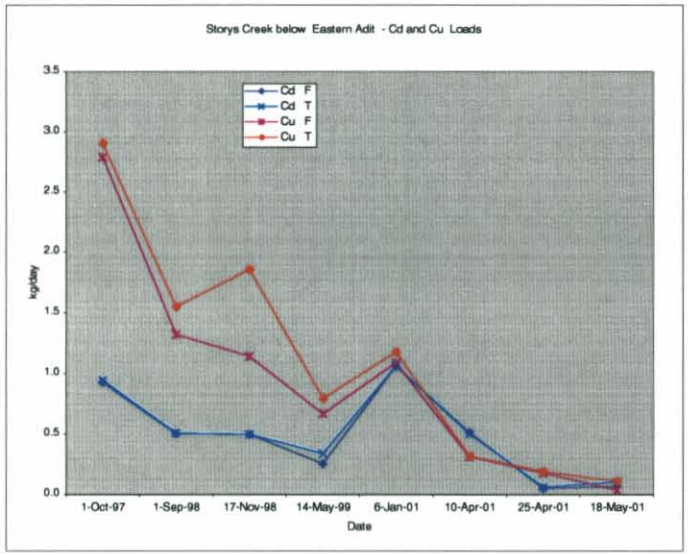


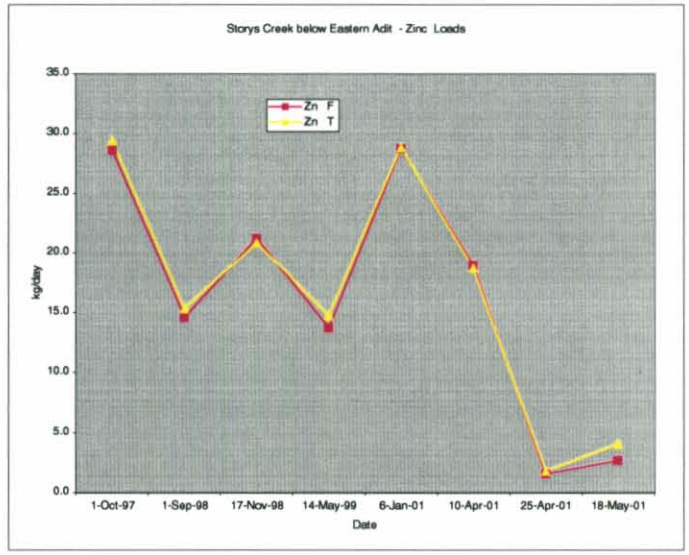


Storys Creek below Eastern Adit - Loads



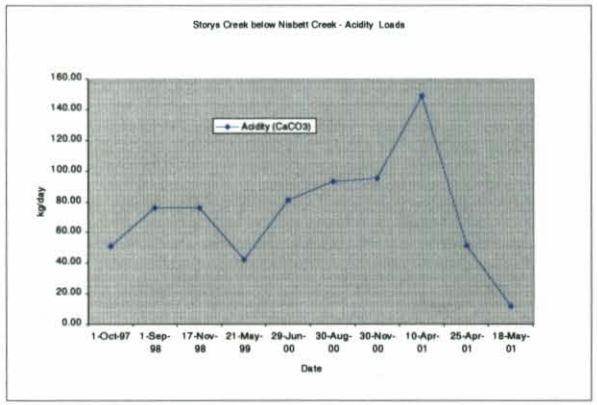


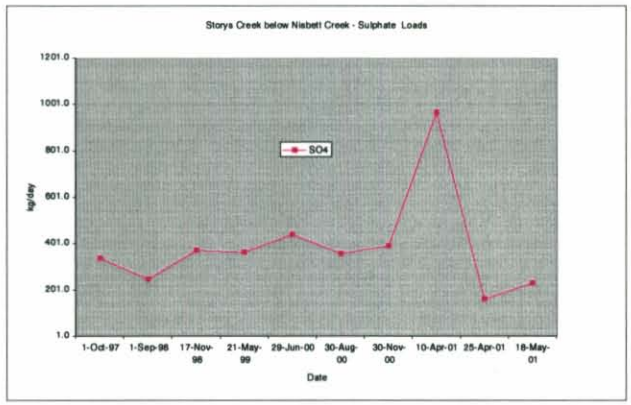


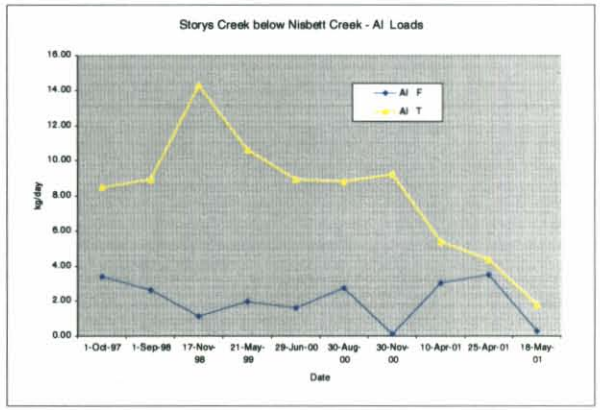


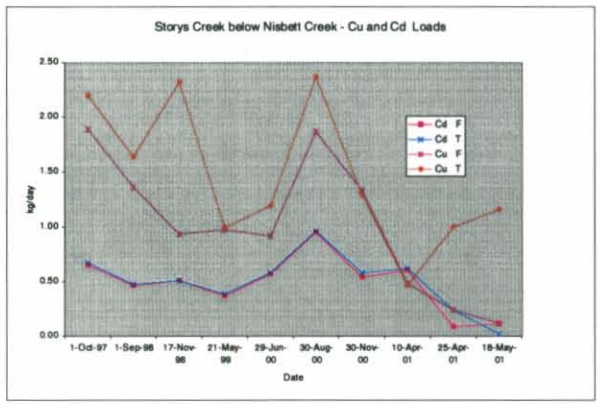
Storys Below Nisbett Creek Contaminant Load Trends

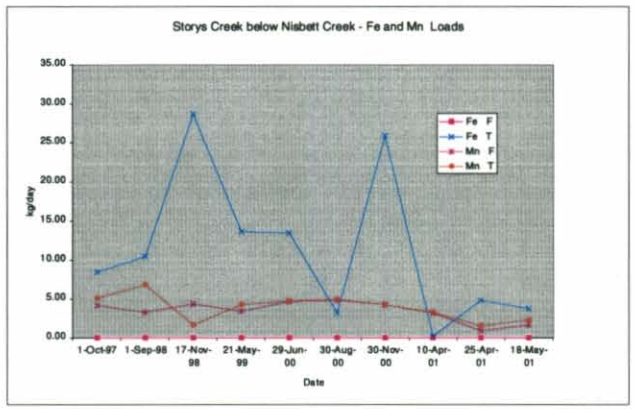
Storys below Nisbet

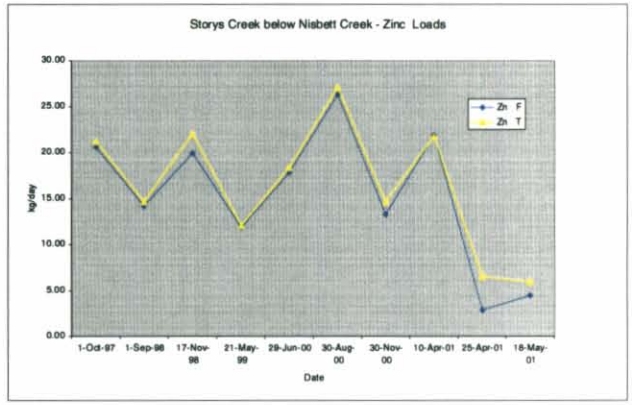












Storys at Station 14 Contaminant Load Trends