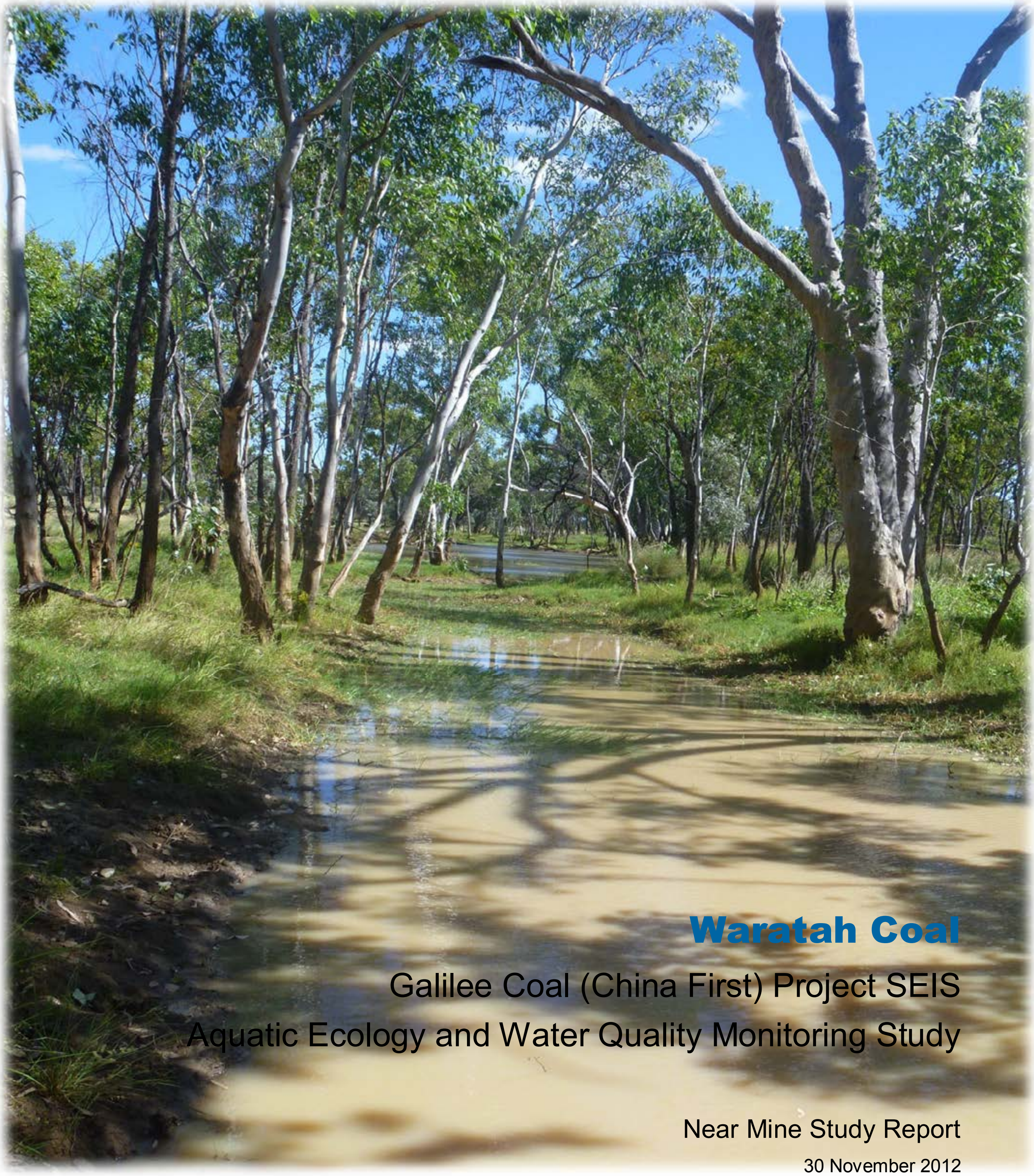

Waratah Coal

Galilee Coal (China First) Project SEIS
Aquatic Ecology and Water Quality Monitoring Study

Near Mine Study Report

30 November 2012

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Executive summary

Background and Scope

The Galilee Coal Project (GCP), also known as the China First Project, is a proposed new coal mine and rail link development, for which Waratah Coal is the proponent. The mine is located around 30km north of the township of Alpha in the Galilee Basin within EPC 1040 and EPC 1079. Waratah Coal proposes to mine 1.4 billion tonnes of coal from part of this area. An Environmental Impact Study (EIS) was developed by Waratah Coal and released in August 2011 for public comment. There were 1842 public submissions from in relation to the GCP EIS (15 from state agencies) indicating significant public interest in the GCP.

Subsequent to comments being received on the GCP EIS, Waratah Coal sought to carry out a supplementary EIS (SEIS) to address these comments. GHD were engaged by Waratah Coal in March 2012 to carry out additional aquatic ecology and water quality monitoring technical studies as part of the GCP SEIS. These studies focussed separately on the near-mine environment (referred to in this report as the near-mine GCP Project area) and the rail corridor. This report outlines the findings in relation to the former.

The purpose of this study was to fill data gaps and address key issues raised in relation to the GCP EIS as part of the public submissions process. To that end, this study addressed those issues by:

- Characterising all major waterways within and draining the GCP mine site;
- Sampling Lagoon Creek, the main immediate receiving waterway draining the GCP mine sitewith greater intensity in areas close to the GCP mine site;
- Characterising a range of waterbody types present within and immediately adjacent to the GCP mine site, including different types of stream habitat, farm dams, lagoons and wetland habitat;
- Sampling in areas covered by different mining activities associated with the GCP;
- Carrying out further water quality monitoring based on the full suite of parameters recommended by DEHP; and
- Comparing water quality results to various relevant guideline levels, chosen based on knowledge of the EVs for the Sandy Creek, the Burdekin Basin sub-catchment in which the GCP mine site occurs.

Beyond this, this study improved on the knowledge presented in the GCP EIS through:

- Characterising temporal variability based on repeat sampling at certain sites and comparisons between data collected in this study in April 2012 and that collected in the adjoining South Galilee Coal Project (SGCP) mine site in August 2011;
- Providing context to the results presented in this study through reference to a number of aquatic ecology and water quality monitoring studies carried out in the near-mine GCP Project area; and
- Providing more details on the sensitivities of taxa present in relation to degraded water quality and fish passage barriers.

A total of nine sites were sampled in April 2012 for both aquatic ecology values and water quality. Some of those sites and some additional prospective control sites were sampled opportunistically for water quality in September 2012 corresponding with stygofauna monitoring being carried out by GHD as part of the GCP SEIS. Aquatic ecology surveys focussed on fish, macroinvertebrate and macrophyte communities and aquatic habitat, including the riparian zone. Other aquatic vertebrates such as turtles, frogs, water rats, platypus and wader birds were not targeted specifically, but the intention was to record any site observations of these animals that may occur. Water quality monitoring included *in situ* testing using water quality meters and analytical laboratory testing of grab samples.

Results from this study were compared directly to results from similar monitoring carried out in relation to the adjoining mine site (South Galilee Coal Project –SGCP), which is currently also subject to an EIS approvals process. This was possible due to a data sharing arrangement between SGCP owners AMCI Capital and Bandanna Energy and Waratah Coal. Aside from this, where possible, data from this study were compared to those collected as part of the GCP EIS and those collected as part of the Alpha Coal Project EIS.

Main Findings

This study found that the waterways in the near-mine GCP Project area were subject to a range of modifications and pressures include the damming of creeks for stock irrigation, riparian vegetation clearing for agricultural purposes and the trampling of bed and banks through cattle access to creeks. Causeways were also present on a number of waterways, though in most cases, these represented a highly localised disturbance that only affected bed and bank stability and adjacent turbidity levels. Further, the main causeway on Lagoon Creek has actually created potential refugial habitat for aquatic flora and fauna in this system during dry spells. This is also true with respect to the dam habitat sampled and it should also be noted that dams in the study area appear to host the most diverse and unique macrophyte assemblages.

The fish fauna of the study area was of limited diversity and was composed exclusively of potadromous species. This was expected based on the inland location of the study area and the ephemeral nature of the waterways sampled. None of the species sampled were of conservation or fisheries significance and fishing activity is limited within the waterways sampled based on advice from local landholders and the fact that they are remote and are not publicly accessible. Further, few, if any, would be likely to be vulnerable to the effects of fish passage barriers. The fish species recorded in this study were similar to those recorded in other studies carried out in the vicinity of the GCP Mine Lease Application (MLA) area, with only one additional species recorded from this study (Fly-speckled Hardyhead). This species is known to occur in the Belyando River, however, so this find is not significant. The fish fauna in the near-mine GCP Project area are predominantly native species, but the noxious, exotic fish, Tilapia, appears to be expanding in terms of abundance and distribution within this area. This is only expected to continue over time and could possibly be exacerbated by the GCP if potential impacts to receiving waters are not managed properly. Apart from this, this study identified fish species that are vulnerable to reduced pH and elevated turbidity. This is of relevance given that activities associated with the GCP mine could potentially generate acid rock drainage (although this is comsidered unlikely) and elevated turbidity. However, the species in question are widely distributed such that even if they were impacted by the GCP they would still occur in unaffected waterways within the region.

The macro-crustacean community of the study area was also of limited diversity compared to the diversity known to occur in the Burdekin Catchment as a whole, but this was consistent with the findings of previous studies. Native crayfish, such as the Common Yabby and the Orange-fingered Yabby, were not commonly recorded, but the translocated native species, Red Claw Crayfish, was. There is some evidence to suggest that the latter is displacing these native crayfish species. Red Claw Crayfish are reportedly stocked in farm dams by some landowners for occasional consumption, though few were actually recorded from dams in this study. Other macro-crustaceans recorded from this study included Atyid Shrimp, Freshwater Prawns (*Macrobrachium* spp.) and the Freshwater Crab. Atyid Shrimp and Freshwater Prawns were largely restricted to dam and lagoon habitat, most likely because these habitats offered the water quality and substrates most suitable for the growth of their periphytic algal food source. As such, these macro-crustaceans would be vulnerable to the effects of increased turbidity in the dams and lagoons they inhabit through corresponding reductions in periphytic algal production.

The macroinvertebrate fauna from this study matched that recorded in most other studies carried out in the same vicinity in terms of diversity and, largely, in terms of the dominant taxa present. A higher diversity was recorded from the study carried out in the adjoining SGCP EIS study area by ALS (2011), but this was most likely due to the fact that that study was carried out following a period of extended surface flows in the area and the fact that that study also sampled habitat other than the edge habitat. Diversity was highest in Lagoon Creek and lowest in dam and lagoon habitat. Lagoon Creek sites had a diversity within the expected range for Central Queensland waterways and within the range expected based on Queensland Coastal AUSRIVAS autumn model reference conditions. Stream sites characterised by turbid water and/or subject to the effects of cattle access and riparian vegetation clearing had a lower than expected macroinvertebrate diversity, thus indicating potential reductions in macroinvertebrate diversity that could occur if issues such as erosion control, mine runoff and riparian vegetation clearing are not managed effectively as part of the GCP EM Plan. SIGNAL2 results indicated that most sites hosted mainly pollution-tolerant macroinvertebrate taxa. This was in line with results from other studies carried out in the same vicinity and is not surprising given that resident macroinvertebrate fauna are likely to be adapted to cope with the variety of water quality conditions that go with changes that occur naturally under the ephemeral waterway hydrological cycle. It should, be noted, however, that the most pollution-sensitive macroinvetebrate taxa recorded in this study, Leptophlebiidae, was only recorded from Lagoon Creek, the main immediate receiving water in relation to the GCP EPC. This macroinvertebrate family would therefore be most vulnerable to the potential impacts associated with the GCP mine construction and operation, though this taxon would still be expected to occur within unaffected waterways within the near-mine GCP area even if such impacts did occur.

Macrophyte diversity and cover was generally low in the waterways sampled apart from SPC-Dam on Spring Creek. Emergent forms, particularly those belonging to family Cyperaceae, dominated the taxa list. These findings are consistent with those of previous studies and conform to expectations with regards to the extreme hydrological variation within ephemeral streams generally not being conducive to the growth of submerged and floating macrophytes. No exotic or noxious macrophytes were recorded from this study, but previous studies have identified noxious weed species such as Para Grass and Noogoora Burr, as well other introduced macrophytes in waterways within the region.

Water quality testing carried out as part of this study revealed that total concentrations of some of the metals measured were above guideline levels, but of these, only aluminium exceeded guideline levels based on dissolved concentrations, suggesting that apart from aluminium, the bioavailability of metals is currently limited in the waterways sampled. It should be noted total and dissolved Aluminium concentrations were high at the majority of sites monitored. Also, most sites recorded low alkalinity levels indicative of soft to moderately hard water. This would reduce the capacity of local waterways to buffer the toxic effects of elevated Aluminium and other metal concentrations, so it will be important to minimise the release of metals through activities associated with the GCP.

Organic contaminants, including pesticides, were generally at concentrations less than the LOR. This is in line with results presented as part of the GCP EIS. Results from this study do, however, indicate nutrient enrichment of waterways in the near-mine GCP area. Further, EC, pHturbidity and dissolved oxygen were routinely outside of the recommended range, not just in this study, but also in the previous studies carried out in the general vicinity. Based on the fact that a number of parameters regularly recorded values outside their recommended guideline ranges, it is likely that more locally relevant water quality objectives will need to be developed for the near-mine GCP area in order for the potential impacts of the GCP on aquatic ecosystems to be assessed properly.

This study assessed water quality in relation to all relevant EVs for waterways of the near-mine GCP area that have associated trigger values in relevant guidelines. To that end, water quality data were compared against guidelines for stock drinking water as well as those for ecosystem protection. This study found that total an/or dissolved Aluminium concentrations occasionally exceeded stock watering guidelines, apart from that, the water quality of the waterways sampled generally complied with the requirements for stock watering.

One of the objectives associated with the second round of water quality monitoring in September was to sample prospective control monitoring sites to assess their potential suitability for inclusion as part of the GCP water quality monitoring program, which is currently being developed as part of the Environmental Management (EM) Plan. To that end, four such sites were sampled. Of these, data from sites located on Alpha Creek and Native Companion Creek show that these systems had quite different water quality to the waterways within and directly adjacent to the GCP mine site, so these systems do not appear to be suitable as reference systems in relation to waterways potentially impacted by the GCP. Jordan Creek and Tallarenha Creek appear to be more suitable systems for this purpose, notwithstanding that the latter may be subject to the impacts of the SGCP should that project go ahead, which would undermine that suitability. Jordan Creek may also be exposed to stormwater runoff from the GCP, but there are reaches of this system upstream of Jericho that will not be affected by this.

Study Limitations

While this study means that there are now sufficient aquatic ecosystem characterisation data for the near-mine GCP area to be able to properly assess potential impacts to aquatic ecosystems associated with the GCP mine going ahead, the findings presented in this study are still based on only one round of aquatic flora and fauna sampling for sites within and adjacent to the GCP mine site that were established as part of this study. Based on comparisons with data from other studies, additional sampling of these sites is unlikely to result in a host of new flora and fauna taxa being recorded. However, it is not possible to rule this out. This is particularly true with respect to aquatic macrophyte species, some of which are annuals whose occurrence in ephemeral streams is short-lived and, therefore, easily missed.

While this study provided a reasonable assessment of the aquatic biodiversity values present within the near-mine GCP area, the standard AUSRIVAS family level taxonomic resolution applied to macroinvertebratre community sampling data as part of this study is likely to have underestimated true diversity and, potentially, the conservation significance of macroinvertebrate species present within this area. The latter is highlighted by findings in relation to Tipulidae presented in this report. To be fair, however, the distribution and conservation status of macroinvertebrate species within Queensland is currently poorly understood, so a more in depth assessment of this is not possible at this stage.

For some of the waterways sampled as part of this study, low water levels meant that the natural creek line aquatic flora and fauna and habitat conditions could not be characterised and, instead, dam habitat on these streams had to be sampled. While this provided valuable information about the habitat status of those dams (which appear to be distinct aquatic ecosystems in their own right within the near-mine GCP area), the data collected may not be representative of the adjacent stream habitat.

The water quality sampling carried out as part of this study was never intended to represent strategic water quality monitoring as part of a formal GCP water quality monitoring program, but it is acknowledged that one is required as part of the EM Plan. The GCP water quality monitoring program is currently being developed as part of the GCP SEIS process and will be supplied to DEHP for assessment once the SEIS is delivered. Some of the sites monitored as part of this study could be included in the GCP water quality monitoring program study design, though some will no longer be available once the GCP mine is constructed.

Further to the above, this report is subject to, and must be read in conjunction with, the limitations set out in section 2 and the assumptions and qualifications contained throughout the Report.

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1. Introduction

1.1 Background to this study

The Galilee Coal Project (GCP), also known as the China First Project, is a proposed new coal mine and rail link development, for which Waratah Coal is the proponent. The mine Exploration Permit for Coal areas (EPC 1040 and part of EPC 1079) are located around 30km north of the township of Alpha.

Waratah Coal proposes to mine 1.4 billion tonnes of coal from EPC 1040 and part of EPC 1079. The mine would comprise four longwall underground mines, two open cut mines and two coal preparation facilities (CHPP). The proposed rail construction associated with the GCP is between the mine and future stockpiling and loading facilities within the Port of Abbot Point and the Abbot Point State Development Area. Due to uncertainty regarding the location of future stockpiling and loading facilities, the limit of assessment is the boundary of the Abbot Point State Development Area. As such, the length of the rail alignment is 453km. The rail facility would include state of the art, heavy duty standard gauge rail to support 25,000 tonne haul trains. The final rail easement would cover both rail and adjacent service road infrastructure.

An Environmental Impact Study (EIS) was developed and released by Waratah Coal in August 2011 for public comment (henceforth referred to as Waratah Coal, 2011). There were 1842 submissions were received (15 from government agencies) indicating significant public interest in the GCP.

Subsequent to those comments being received, Waratah Coal, sought to carry out a supplementary EIS (SEIS) to address these comments. To that end, GHD were engaged in March 2012 to carry out an additional aquatic ecology and water quality monitoring technical study as part of the GCP SEIS.

1.2 Purpose of this report

This report will be a technical report appended to the GCP SEIS. Information presented in this report will be used to address public and agency comments on the EIS with respect to issues relating to aquatic ecology and water quality issues associated with the rail corridor component of the GCP. The GCP has two core components: a mine site in the Galilee Basin and a rail corridor between the mine and the Abbot Point State Development Area. GHD carried out aquatic ecology and water quality sampling in relation to both of these components. Waratah Coal has asked GHD to prepare separate reports for each. This report outlines the results and findings in relation to the mine site (henceforth referred to as the ‘near mine’ study).

1.3 Scope

The broad objectives of the GCP SEIS technical studies carried out by GHD were to:

- Develop and implement a study design and sampling approach that would address relevant comments on the GCP EIS; and
- Provide a technical report that can be used to inform the development of the GCP SEIS.

Aquatic ecology monitoring conducted by GHD covered fish, aquatic macroinvertebrates and macro-crustacea, aquatic habitat (including qualitative assessment of the macrophyte and riparian vegetation components) and the recording of incidental sightings or capture of aquatic reptiles and mammals. Water quality monitoring involved *in situ* water testing and the collection of samples for analytical laboratory testing. The study area is a remote area and the waterways sampled are ephemeral systems for which the presence of surface water is often short-lived.

Thus, water sampling was done opportunistically in conjunction with the aquatic ecology survey in April 2012 and the second round of stygofauna sampling in September 2012 to maximise the data collected by the GHD field teams while on site and while surface water was present. A detailed water quality monitoring program for the GCP SEIS is still in development.

A technical report outlining the results of the above monitoring program (i.e. this report) was required by Waratah Coal. Other requirements for this report included:

- Identifying how specific GCP EIS comments have been addressed by the study;
- A comparison of our results with those of other relevant studies, in particular the GCP EIS, the AMCI South Galilee Coal Project EIS and the Hancock Coal Alpha Coal Project EIS;
- An assessment of temporal variability;
- Identify any corrections that need to be made with respect to data or statements put forward by E3 (2010a) and Waratah Coal (2011) as part of the GCP EIS reporting process; and
- Recommendations for further monitoring that could assist the development of the GCP SEIS impact assessment and the Environmental Management Plan (EM Plan).

No impact assessment or EM Plan details are provided in this technical report, nor does this report outline any legislative requirements or desktop assessment of significant aquatic flora, fauna or habitats, as this information is covered in the GCP EIS and has not been identified as requiring further update as part of the GCP SEIS.

1.4 Disclaimer

This report has been prepared by GHD for Waratah Coal and may only be used and relied on by Waratah Coal for the purpose agreed between GHD and the Waratah Coal as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Waratah Coal arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in sections 1.5 and 2 of this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Waratah Coal and that contained in other information sources (e.g. EIS reports for similar coal mine developments in the Galilee Basin). GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information

1.5 Assumptions

This study contains comparisons between results presented in this study and those from other related studies. It has been assumed by GHD that all data contained in those reports that have been referred to in this report are true, accurate and free from error.

Details provided in this report regarding the locations of various monitoring sites sampled as part of this study relative to GCP mine infrastructure are based on information given to GHD in the form of maps provided by Waratah Coal. GHD has assumed that those maps represent the most current mine plan.

Analytical water testing data presented in this report were provided by the ALS laboratory in Brisbane. While this laboratory is NATA–accredited for all analyses performed as part of this study, and QAQC tests performed in relation to the analyses done are provided in this report, GHD take on good faith that all analyses were carried out according to NATA-approved protocols.

2. Methods

As part of the GCP Supplementary EIS process, GHD was requested by Waratah Coal to carry out additional surface water aquatic ecology and water quality sampling. The approach adopted by GHD for this additional survey work was developed based on the following:

- The need to address specific public submissions made in relation to the original GCP EIS report;
- Discussions with Waratah Coal; and
- A review of the study sites and sampling methods used as part of the GCP EIS as reported in E3 (2010a).

The following sections detail the study design, sampling methods, the timing of sampling and the intended timing of reporting.

2.1 Public Submissions of Relevance

The following public submissions were used as a basis for informing GHD's scope of works for the surface water aquatic ecology component of the GCP supplementary EIS (see Table 2-1). GHD interpreted from these comments that there were spatial data gaps that needed to be filled and that this would require:

- Additional sampling in all major waterways intersecting the GCP MLA, as opposed to focussing only on Lagoon Creek;
- Additional sampling points in the reaches of Lagoon Creek immediately downstream of the GCP MLA in order to properly characterise the receiving environment; and
- Additional sampling at the location of the proposed dam site on Tallarenha Creek to assess its status as a significant wetland area and to characterise the aquatic flora and fauna of the wetland potentially at risk.

While many of the items in Table 2-1 relate to addressing perceived deficiencies in the GCP EIS with respect to water quality and water resources, GHD has interpreted that their underlying principles also extend to the surface water aquatic ecology component of the GCP EIS. Further, aquatic ecology sampling as part of the EIS was only undertaken in a single season. While there were no specific comments made in relation to this as part of the public submissions, DEHP generic EIS Terms of Reference generally require seasonality and / or temporal variability to be assessed. Accordingly, not only did GHD set out to monitor new sites in order to fill the abovementioned spatial data gaps, but GHD also sought to re-sample sites monitored as part of the original EIS in order to provide some indication of temporal variability within the aquatic ecosystems of the study area.

Table 2-1 GCP EIS public submission comments and recommendations outlining further data requirements in relation to the surface water aquatic ecology components of the GCP EIS.

Cross-Reference	Issues	Recommendations
Environmental Values (page 41-42 Executive Summary)	The environmental value assessment should include an assessment of all environmental values downstream of the proposed activity and that will be potentially affected. The assessment should not simply be an assessment of current environmental values on the proposed mine site itself.	The EIS should undertake an assessment of environmental values of waterways downstream of the proposed mine site. In addition to livestock drinking water, values such as crop irrigation, general farm use, potential recreational values (primary or secondary), human drinking water must be considered. This should include a map and subsequent inclusion of relevant water quality objectives (WQO) for those environmental values.
Surface Water Resources, Chapter 9, MINE EIS	Impacts on downstream ecosystems of the proposed on-creek dam on Tallarenha Creek (clean water supply) are insufficiently presented. The only mention found of this impact was found in Section 9.5.4 of Chapter 9 Surface Water Resources.	It is highly likely that damming Tallarenha Creek will impact on the downstream waterways and associated ecosystems or water users. For example, the proposal is likely to reduce the duration and intensity of downstream flows which support aquatic ecosystems in semi-permanent and permanent waterways (and ecosystems supported by the typical ephemeral flows, i.e. wetting/drying cycles). In addition, other environmental values (other than aquatic ecosystems) should be considered as potentially impacted by such a proposal; for example downstream livestock drinking water. It is clear from the photos of water quality monitoring sites downstream of the mine that many cattle footprints line the waterways, presumably where the animals congregate to drink. It is recommended that the percentage and duration of altered flows downstream of the proposed dam during construction, operation and during mine rehabilitation be estimated, characterised and presented in the EIS and the relevant EM plans. The planned mitigation measures should also be appropriately addressed.

Cross-Reference	Issues	Recommendations
Chapter 1 Project Description, Section 1.2.4.6 Proposed Tallarenha/Lagoon Creek Diversion (pages 57-58)	The proposed Tallarenha Creek diversion and storage seem to be located in the same area as a wetland of High Ecological Significance exists (Volume 2, Chapter 7, Figure 2 on page 219). Should a diversion and storage result in the removal or impact on this wetland, the EIS should address how the requirements of the 'Temporary State Planning Policy 1/a Protecting Wetlands of High Ecological Significance in Great Barrier Reef Catchments' would be met.	That the EIS should outline how the requirements for the 'Temporary State Planning Policy 1/11 Protecting Wetlands of High Ecological Significance in Great Barrier Reef Catchments' will be met in respect of the proposed diversion and storage on Tallarenha Creek.
Volume 2, Section 9.4.5 – Description of surface waters	A number of waterways (Beta Creek, Lagoon Creek, Malcolm Creek, Pebbly Creek, Saltbush Creek, and Spring Creek - refer Volume 2, section 9.4.5) intersect the mine site footprint and may be subject to mining and/or subsidence impacts. The current state of these creeks and potential impacts of mining and related activities have not been sufficiently described in the EIS, particularly with reference to seasonal variation in flow as per the Terms of Reference. Detailed information should be provided to allow DERM to adequately assess the potential impacts on these watercourses.	To adequately assess potential impacts on water quality, the EIS should describe the current state of Beta Creek, Lagoon Creek, Malcolm Creek, Pebbly Creek, Saltbush Creek, and Spring Creek.

2.2 Sampling Locations

A total of 9 sites were sampled as part of the GCP SEIS near mine surface water aquatic ecology sampling carried out by GHD (see Figure 2-1). These 9 sites were distributed across 6 catchments: Tallarenha Creek, Lagoon Creek (locally referred to as 'Monks' Creek where it intersects the Monklands property), Beta Creek, Malcolm Creek, Spring Creek and Pebbly Creek; all of which intersect the GCP MLA and/or represent potential receiving waters in relation to the GCP MLA. GHD were able to sample all the creek systems nominated by DEHP in their GCP EIS public submission as well as at the Wetland Management Area (WMA) trigger-listed, and Wetland Protected Area (WPA) trigger–listed wetland adjacent to Tallarenha Creek that, at the time of sampling, was identified as being potentially impacted by a proposed water supply dam (this dam has subsequently been removed from the project). While a moot point, Figure 2-1 shows that the proposed dam would not have coincided with this wetland, but still may have had indirect impacts through hydrological changes to the adjacent landscape.

GHD were able to sample Malcolm Creek as part of the GCP SEIS. Malcolm Creekwas listed by E3 (2010a) as as having being visited (site AQ-14 dry at the time of sampling), but for which the site location relative to Malcolm Creek is unresolved. While Figure 2-2 in E3 (2010a) shows the location of the AQ-14 as being in the vicinity of Malcolm Creek, the coordinates provided by E3 to GHD correspond to Saltbush Creek near GHD's Site04. No site coordinate details were provided in E3 (2010a) to confirm whether or not the site actually visited by E3 (2010a) was in fact on Malcolm Creek. Based on the fact that sampling points had been established in both Malcolm Creek and Saltbush Creek as part of this study, a new Lagoon Creek site was added to our sampling program (Alt AQ14). This, along with sampling further downstream at sites LC1 and LC3, increased our spatial coverage of lagoon Creek downstream of the GCP EPC, which will help address concerns raised as part of the public submissions process that the original spatial coverage by E3 (2010a) was insufficient to assess potential impacts of mine runoff on receiving waters. It should also be noted that apart from providing coverage of all creeks within and adjacent to the GCP EPC, the array of sampling sites for this study characterised areas potentially affected by all the main mine infrastructure elements (see Table 2-2, Figure 2-1).

There were no significant property access issues encountered as part of the near-mine survey, with the notable exception of access being denied to the property coinciding with the Bimblebox Nature Reserve. A key observation at the time of sampling was that habitat within the Bimblebox Nature Reserve was significantly different from the adjacent land where our sampling was carried out. There does not appear to be any major waterways intersecting the Bimblebox Nature Reserve based on maps provided by Waratah Coal (see Figure 2-1). However, there is a minor waterway present, which is likely to be characterised by higher instream and riparian vegetation habitat integrity than the sites sampled thus far by E3 and GHD. It is GHD's recommendation that this issue be looked into further and, if required, sampling be undertaken in streams intersecting the Bimblebox Nature Reserve. This issue is currently being discussed between GHD and Waratah Coal.

Another key observation from the near-mine survey was that many of the waterways intersecting the GCP MLA are highly ephemeral. Even after a reasonable wet season, many of the creeks had begun drying up by early April 2012. In some cases, the only sampling locations available were dammed sections of creek used for stock watering and irrigation purposes. Such sites are not necessarily representative of habitats and conditions in other reaches, but may represent the best locations in terms of being able to obtain a reasonable water quality data set as part of the objective of developing local water quality objectives for the GCP due to the greater persistence of surface water during a given year.

The locations of the sites sampled by GHD are given in Table 2-2. Sites with ‘Alt’ in the site code represent sites sampled by GHD that were nearby alternative sites to the corresponding E3 (2010a) sampling sites. The location of GHD sampling sites relative to E3 (2010a) monitoring sites within the near-mine area is shown in Figure 2-1.

2.3 Sampling Timing

Sampling for this study was carried out under late post-wet season conditions between 10/4/12 and 14/4/12. Sampling by E3 (2010a) for the GCP EIS baseline survey was also conducted during the late post-wet season (May, 2010). Sampling by AARC (2010) for the Alpha Coal Project EIS was also carried out in the post-wet season period (March 2009 and March 2010). Sampling by ALS (2011) for the SGCP EIS aquatic ecology baseline study was undertaken in early August 2011, but the 2010/11 wet season was large and flows still persisted at that time (Jamie Corfield, GHD, pers. obs.), essentially replicating what might be expected under post-wet season conditions. Based on the above, the available data for the aquatic ecosystems of the study area only covers the post-wet period. Having said that:

- The ephemeral nature of the waterways of the study area and the remoteness and bogginess of the terrain during the wet season means that opportunities to collect data at other times is limited;
- The available data spans between 2009 and 2012; and
- While sampling methods differed between various studies, the fact that all data were collected during the same season means that data comparisons can be made more readily.

It should be noted that a second round of water quality sampling was carried out in the study area opportunistically in conjunction with the second round of stygofauna sampling for the GCP SEIS carried out in September 2012. That water sampling was carried out to provide greater temporal characterisation of water quality in the study area. It involved repeated sampling at three of the sites sampled in April 2012 (Alt-AQ14, Site04 and PC-Dam). These sites were the only ones with surface water present in September besides SPC-Dam, which would have had water in it, but was not sampled as access to SPC-Dam was denied by Kiaora station landowners at that time. BC-5 had no water present, but an alternative Beta Creek site was located and sampled. That site (BC-Dam) is located downstream of BC5 and was constituted by a dam made of mounded earth. Water quality at this site may, therefore, not necessarily be representative of that in the stream section sampled previously. In addition to those sites, several other waterways neighbouring/upstream of the GCP EPC were sampled. These included Native Companion Creek and Alpha Creek (to the east), Tallarenha Creek at the highway crossing upstream of the GCP MLA (equivalent to TC-3 in ALS, 2011) and Jordan Creek at the highway crossing near Jericho. These sites were sampled because they were publicly accessible and contained substantial surface water at the time, but more importantly, because data collected from those sites were considered useful for determining the suitability of these sites as potential control sites as part of the GCP Water Quality Monitoring Program currently being developed as part of the EM Plan. The location details of the water quality monitoring sites sampled in September 2012 are given in Table 2-3.

Table 2-2 Location of near mine sites sampled by GHD as part of the GCP SEIS aquatic ecology and water quality survey. All GPS data are based on WGS84 datum.

Site Code	Sub-catchment	Latitude	Longitude	Description	Position Relative to GCP Infrastructure
LC-1	Lagoon Creek	23° 20.043' S	146° 29.120' E	Lagoon Creek 6km d/s of causeway	d/s of pit and overburden emplacement areas
LC-3	Lagoon Creek	23° 18.963' S	146° 30.128' E	Lagoon Creek 8.7km d/s of causeway	d/s of pit and overburden emplacement areas
MC-new	Malcolm Creek	23° 23.863' S	146° 25.758' E	Malcolm Creek at Kia Ora causeway	Within pit area
PC-Dam	Pebbly Creek	23° 26.333' S	146° 18.829' E	Pebbly Creek Dam	Within underground mining area
TC-Dam	Tallarenha Creek	23° 26.875	146° 26.336' E	Tallarenha Creek Wetland	Within / directly adjacent to overburden emplacement area
SPC-Dam	Spring Creek	23° 20.230' S	146° 21.892' E	Spring Creek Dam	Within underground mining area
Alt AQ14	Lagoon Creek	23° 23.086' S	146° 27.918' E	Lagoon ("Monks") Creek at causeway	Within overburden emplacement area
BC-5	Beta Creek	23°30.897' S	146°.20.3874' E	Beta Creek	Within underground mining area
Site04	Saltbush Creek	23° 20.395' S	146° 29.609' E	Saltbush Creek Lagoon	d/s of TSF/decant water facility & rail loop

Table 2-3 Location of water quality sites sampled by GHD in September 2012. All GPS data are based on WGS84 datum.

Site Code	Sub-catchment	Latitude	Longitude	Description	Position Relative to GCP Infrastructure
PC-Dam	Pebbly Creek	23° 26.333’ S	146° 18.829’ E	Pebbly Creek Dam	Within underground mining area
Alt AQ14	Lagoon Creek	23° 23.086’ S	146° 27.918’ E	Lagoon ("Monks") Creek at causeway	Within overburden emplacement area
MC-new	Malcolm Creek	23° 23.863’ S	146° 25.758’ E	Malcolm Creek at Kia Ora causeway	Within pit area
Site04	Saltbush Creek	23° 20.395’ S	146° 29.609’ E	Saltbush Creek Lagoon	d/s of TSF/decant water facility &rail loop
BC-Dam	Beta Creek	23° 30.410’ S	146° 21.321’ E	Beta Creek Dam	Within underground mining area
JC-1	Jordan Creek	23° 35.592’ S	146° 08.038’ E	Jordan Creek at highway crossing	Potential control site
NCC-1	Native Companion Creek	23° 38.563’ S	146° 42.250’ E	Native Companion Creek at highway crossing	Potential control site
AC-2*	Alpha Creek	23° 39.190’ S	146° 38.222’ E	Alpha Creek at highway crossing	Potential control site
TC-1+	Tallarenha Creek	23° 38.093' S	146° 28.449' E	Tallarenha Creek at highway crossing	Potential control site

* = Not equivalent to AC-2 listed in ALS (2011), + =equivalent to TC-3 in ALS (2011)

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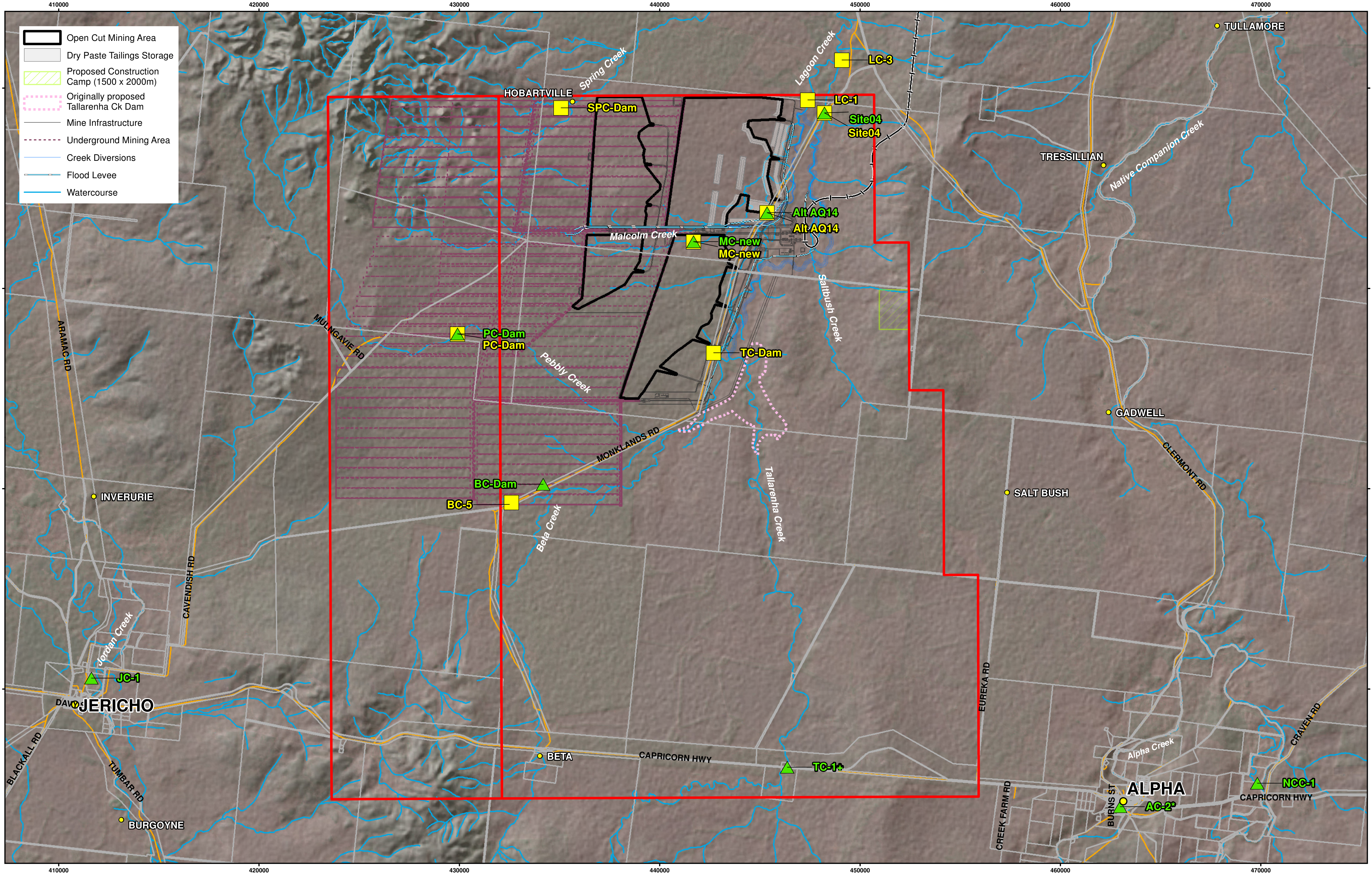

GALILEE COAL PROJECT (Northern Export Facility)

Waratah Coal
THE NEW ENERGY IN COAL

Mineralogy House, Level 7, 380 Queen Street, Brisbane Qld 4000, Australia

Source:	Cadastral Boundaries: DERM 2012 Roads: Geoscience Australia 2010 Waterways: Vegetation Management Act Queensland Regrowth Other Watercourses	Version 2.1 2011 Mine Detail: Waratah Coal Pty. Ltd. 2012 Sampling Sites: GHD - Environmental (Water Resources Group) 2012
Disclaimer:	This plan is based on or contains data provided by others. Waratah Coal Pty. Ltd. gives no warranty in relation to the data (including accuracy, reliability, completness, currency or suiability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to and use of the data. Data must not be used for direct marketing or be used in breach of privacy laws.	
File:	File: WAR20-26-SEIS0066a-FIG2-1-WATER-QUALITY-SAMPLING-121126	Date: 26/11/2012

N

0 2,000 4,000 6,000 8,000 10,000
Metres
A3 Scale 1:170,000

Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator

🟥 EPC1040 & Part of EPC1079
Road/Track

Sampling sites
🟨 Aquatic ecology and water quality monitoring
▲ Second round of water quality sampling

FIGURE 2-1:
LOCATION OF SITES SURVEYED IN APRIL AND SEPT. 2012 AS PART OF THE GCP SEIS AQUATIC ECOLOGY AND WATER QUALITY STUDY.

2.4 Macroinvertebrate Sampling Methods

Macroinvertebrates are aquatic animals lacking a backbone that are small, but visible to the naked eye. They consist of fully aquatic and semi-aquatic invertebrate fauna including a range of crustaceans, insect larvae and snails. For this study, macroinvertebrates are defined as those aquatic invertebrate fauna retained in a 250 µm mesh net, as used as part of standard AUSRIVAS sampling protocols in Queensland (DNRW, 2001; DERM, 2009b).

Based on our knowledge of the study area, true riffle habitat (flows over shallow cobble beds) is not common in inland ephemeral streams of the type found in the study area. However, flows over shallow sand beds are common, and represent a key aquatic habitat that should be sampled when characterising the aquatic environment of the study area. Such habitats are not among the key habitats targeted under the QLD AUSRIVAS sampling protocol, but can be incorporated as part of the composite habitat sampling approach used by DEHP (DERM, 2009b).

With the above in mind, GHD sought to carry out:

- AUSRIVAS-style sampling in edge habitat at each site;
- AUSRIVAS-style sampling in rifle bed at sites where that habitat occurred; and
- Composite habitat sampling in line with DEHP sampling protocols that took into account pool bed and sections of waterways where flows over shallow sand bars occurred.

However, given that edge habitat was the only sampleable habitat present at the near-mine GCP sites assessed, only edge habitat samples were collected as part of this study.

Three replicate edge habitat samples were collected at each site, but only one of these was processed on site using the AUSRIVAS live picking method. The remaining samples have been archived as whole (‘bulk) and could be processed at a later date if replicate sample data is required for statistical analysis. In addition to this, one riffle and / or composite habitat sample was taken at each site. This approach provided optimal characterisation of the macroinvertebrate community at each site and allowed the data collected to be compared against appropriate stream health benchmarks (e.g. AUSRIVAS QLD Coastal Autumn edge and riffle models and the expected ranges for taxa richness, Plecoptera, Ephemeroptera and Trichoptera (PET) richness and SIGNAL 2 for edge and composite habitat samples in Central Queensland given in the Queensland Water Quality Guidelines – DERM (2009a)). Those benchmarks were not referred to in the original GCP EIS report, but are referred to in this report.

Macroinvertebrate samples from the rail corridor and near-mine sampling were processed in GHD’s macroinvertebrate taxonomy laboratory. All specimens were counted and identified to taxonomic levels consistent with QLD AUSRIVAS (DNRW, 2001) requirements (generally family level, but order level for taxa such as Oligochaeta and Acarina and sub-family level for members of the chironomid midge family).

2.5 Macroinvertebrate Data Analysis

While the sampling carried out by GHD provided extra spatial coverage in terms of characterising the aquatic ecosystems within and adjacent to the GCP EPC , the new monitoring sites identified for this study were only sampled once. As a consequence, characterisation of the systems associated with those sites is confined to a single year and season. However, as a data sharing agreement is in place with AMCI Capital and Bandanna Energy who own the SGCP EPC to the immediate south of the GCP data collected in this study were able to be compared directly to data collected by the GHD Waer Sciences Group (who were ALS Water Science Group at the time) for the SGCP EIS baseline study conducted in August 2011. Direct data comparisons were possible as the same sampling methods and field teams were used for both studies. While different sites were sampled (apart from Site04, which was sampled as part of both), both studies sampled similar waterbody types (e.g. dams, lagoons, clear isolated pool streams and turbid narrow silt-clay bed streams). This provided some basis for assessing inter-annual variability within the study area. In addition, sites sampled as part of the SGCP EIS baseline study are all located upstream of the GCP EPC and represent potential upstream reference sites with respect to the GCP.

Data from the two studies were compared qualitatively based on graphed trends for the univariate biotic indices outlined above and on multivariate analysis data interpretation, principally non-metric multidimensional scaling ordination (NMDS), Analysis of Similarities (ANOSIM) and Similarity Percentages Analysis (SIMPER). All multivariate data analyses were performed in PRIMER version 6.1.6 (Clarke & Gorley, 2006). In addition to the above and where possible, data from these two studies were compared qualitatively with data collected by AARC as part of the Hancock Prospecting Alpha Coal Project EIS (AARC, 2010).

2.6 Fish Sampling Methods

Fish were sampled using techniques broadly similar to those used by E3 (2010a) for the original EIS. The following sampling methods were not adopted for safety reasons and the risk of fish and turtle mortality:

- Gill netting; and
- Spotlighting.

The following sampling techniques were adopted for this study and included:

- Backpack electrofishing;
- Bait Trapping;
- Fyke Netting; and
- Seine netting.

2.6.1 Backpack electrofishing

Backpack electrofishing (EF) was carried out at all sites using a Smith-Root Backpack unit LR24 model with the exception of site BC-5 where a NIWA EF500 electrofisher was used. However, only a limited number of moderately effective shots could be carried out atsite BC-5 due to faulty equipment. In all cases, electrofishing was conducted by an experienced operator according to Australian Code of Electrofishing Practice procedures while a second team member assisted in the collection of fish for identification and measurement. Sampling was carried out within a reach approximately 100m in length from downstream to upstream covering all major habitat types to ensure a representative range of fish species were collected. Up to 5 shots of 90 seconds duration were conducted at each site, dependant on habitat availability and operator safety, and the catch for each EF shot was recorded separately so that an estimate of catch per unit effort (CPUE) could be obtained.

2.6.2 Bait trapping

A maximum of ten commercial concertina 3mm mesh bait traps were deployed for a minimum of 4 hours, or overnight where sites were in close proximity. Traps were set along the river edge in slow flowing waters and were baited with dry pelletised cat food. Bait trapping was carried out wherever there was sufficient habitat and water depth, and currents were slow enough to prevent bait traps being swept off the substratum or washed downstream. Separate catch data were recorded for each trap deployed.

2.6.3 Fyke Netting

Fyke netting is a passive fish collection method used in shallow, slow flowing environments. At appropriate sites, a single-winged fyke net (1.2 m x 0.8 m opening, 6 mm mesh, 10 m wing) and a double-winged Fyke net (1.2 m x 0.8 m opening – 6 mm mesh, 10m wings) were set with the mouth of the net facing downstream and the cod ends tied above the water level to avoid mortality of air breathing biota such as turtles. Fyke nets were set in shallow water, preferably just above the entry hoop but no greater than 1 m deep. The nets were set for a minimum of 4 hrs. Separate catch data were recorded for each fyke net.

2.6.4 Seine Netting

A 25 m long seine net with a 2 m drop and 20 mm mesh was used where appropriate habitats were present. Seine netting involved one operator on the bank holding one end of the net, whilst the other end of the net was pulled out into the river and dragged back into the bank. The number of seine drags was dependent on available habitat and those sites where stream width, snags, deep pools or fast flowing water were present, seine netting was not conducted. Separate catch data were recorded for each seine drag.

2.6.5 Fish Catch Processing

For all gear types, all fish caught were identified and counted. Fish identifications of species were made using relevant keys (e.g. Allen *et. al.* 2003). A proportion of the fish catch (up to 20 individuals per species per site) were measured (total length to the nearest millimetre) and any wounds, lesions and deformities were recorded, if present. Native fish were released alive wherever possible. Introduced fish were euthanized and disposed of appropriately and humanely and in accordance with animal ethics and fisheries scientific collection permits.

2.7 Fish Community Data

Fish community data were assessed in a manner broadly similar to that described for macroinvertebrate community data in section 2.5. Key fish community data metrics assessed included total number of species and total abundance per site. However, these data were not collected in a standardised manner in terms of sampling methods used at each site, because the sampling methods were dependent on the prevailing habitat conditions, which differed between sites. Further, the data could not be converted to catch per unit effort (CPUE) for each site as a variety of gear types was deployed, each with a different means of calculating CPUE. Nonetheless, the total number of fish species collected per site provides an indication of abundance and diversity, so were used as a basis for assessment as part of this study and, where necessary, were accompanied by explanations as to how sampling effort/methods used might have contributed to the observed results.

Unlike the macroinvertebrate data analysis, there are no models currently developed for fish communities and as such a 'snap shot' health assessment cannot be made. Apart from assessing spatial and temporal trends in fish abundance and diversity, the focus of the data analysis in this report was on the migratory status, native versus exotic/introduced status, conservation status and fisheries-value status of the species recorded.

2.8 Other Aquatic Vertebrates

Targeted sampling for aquatic vertebrates other than fish (e.g. turtles, frogs, aquatic mammals, wader birds) was not undertaken as part of the aquatic survey carried out by GHD, though some turtle catch was expected as by-catch during fyke net sampling. At each site, GHD undertook to record any of these other aquatic vertebrates observed as by-catch or incidental sightings and, where possible, identify them using relevant keys (e.g. Cogger, 1992).

2.9 Aquatic Habitat Assessment Method

AUSRIVAS rapid assessment habitat description methods (DNRW, 2001) were used to characterise aquatic habitat. In addition to this, the growth form and species of any macrophytes present at a given site and their percent cover were recorded. No detailed riparian vegetation assessment was carried out as this was already undertaken as part of the GCP EIS. A broad-level description of the riparian vegetation was, however, undertaken at each site based on criteria listed in the QLD AUSRIVAS habitat assessment sheets. This information was considered sufficient in terms of being able to characterise the general condition of the riparian zone at each site prior to the GCP proceeding and to identify any current pressures on the riparian zone in the study area.

Copies of completed habitat assessment field sheets are presented in Appendix Appendix A.

2.10 Water Quality Assessment Method

In situ measurements of physico-chemical water quality parameters were collected at each site using a YSI 650 MDS multi-parameter water quality meter calibrated in accordance with the manufacturer's specifications. The YSI Water Quality meter was used to measure pH, EC (µS/cm), Water Temperature (ºC) and Dissolved Oxygen level (% saturation and mg/L). Turbidity (NTU) was measured using a Hach 2100P turbidity meter. Alkalinity, a key factor influencing the makeup of macroinvertebrate communities, was measured using a Chemetrics alkalinity field titration kit.

In addition to taking *in situ* water quality measurements, water samples were also collected at each site to test for a range of other parameters. Water samples were also collected as part of the GCP EIS process, but DEHP commented that they would like to see additional parameters added to the GCP water quality monitoring program for the SEIS. DEHP also provided guidance as to what additional WQ parameters should be measured. GHD included the DEHP recommendations in their sampling program and also added organic pesticides to the program in order to properly characterise the effects of adjacent agricultural landuse (an existing form of disturbance) on water quality. Table 2-4 provides a comparison between the range of parameters assessed as part of the GCP EIS and the range of parameters recommended by DEHP and monitored by GHD as part of the supplementary EIS. Note that, while not shown among the analytical testing parameters in Table 2-4, E3 (2010b) recorded *in situ* readings of EC, pH, Dissolved Oxygen and Turbidity.

Samples were collected and stored in accordance with methods outlined in DERM (2009b) and were sent to the ALS NATA-accredited laboratory in Brisbane for analysis. All samples collected in April and September 2012 were returned to the ALS laboratory in Brisbane intact and within required holding times. However, delays in processing the April 2012 samples by ALS meant that holding times for certain parameters were breached. Results for those parameters are presented in this report to allow some basis for between-site comparison, but they should be interpreted with caution with regards to comparisons with guideline trigger levels. The Limits of Reporting (LOR) applied by the Brisbane ALS Laboratory were, where possible, set below the trigger levels given in relevant water quality guidelines (see below).

It should be noted that the water sample collection and analysis undertaken by GHD was an opportunistic exercise coinciding with the supplementary EIS surface water aquatic ecology and the round 2 stygofauna survey. It was not part of any coordinated water quality sampling program set up by Waratah Coal and a program is currently still being developed as part of the EM Plan. It is, however, expected that certain sites sampled by GHD would likely be included in the GCP water quality monitoring program. Moreover, these data, along with data collected as part of the GCP EIS and the SGCP EIS, will help set the platform for eventually developing locally relevant water quality objectives in relation to the GCP that can be used as benchmarks for setting future license condition trigger levels.

Table 2-4 Comparison between the range of analytical testing parameters monitored as part of the GCP EIS and the range of analytical testing parameters recommended by DEHP and monitored by GHD as part of the GCP SEIS survey.

Parameters Tested for as part of the GCP EIS	Parameters Recommended by DEHP	Parameters Monitored by GHD
Physical		
		EC
		pH
		TSS
		TDS
Major Ions	Major Ions	Major Ions
Alkalinity as Ca C03	Alkalinity as Ca C03	Alkalinity as Ca C03
Sulphate	Sulphate	Sulphate
Chloride	Chloride	Chloride
Calcium	Calcium	Calcium
	Flouride	Flouride
Magnesium	Magnesium	Magnesium
Sodium	Sodium	Sodium
Potassium	Potassium	Potassium
Total Anions	Total Anions	Total Anions
Total Cations	Total Cations	Total Cations
Metals (Total concentration)		
	Aluminium	Aluminium
Arsenic	Arsenic	Arsenic
	Boron	Boron
Cadmium	Cadmium	Cadmium
Chromium	Chromium	Chromium
	Cobalt	Cobalt
Copper	Copper	Copper
Iron	Iron	Iron
Lead	Lead	Lead
	Manganese	Manganese
	Mercury	Mercury
	Molybdenum	Molybdenum
Nickel	Nickel	Nickel
	Selenium	Selenium
	Silver	Silver
	Uranium	Uranium
	Vanadium	Vanadium
Zinc	Zinc	Zinc
Metals (Dissolved)		
	Aluminium	Aluminium
	Arsenic	Arsenic
	Boron	Boron

Parameters Tested for as part of the GCP EIS	Parameters Recommended by DEHP	Parameters Monitored by GHD
	Cadmium	Cadmium
	Chromium	Chromium
	Cobalt	Cobalt
	Copper	Copper
	Iron	Iron
	Lead	Lead
	Manganese	Manganese
	Mercury	Mercury
	Molybdenum	Molybdenum
	Nickel	Nickel
	Selenium	Selenium
	Silver	Silver
	Uranium	Uranium
	Vanadium	Vanadium
	Zinc	Zinc
Nutrients		
Ammonia as N	Ammonia as N	Ammonia as N
Nitrate as N	Nitrate as N	Nitrate as N
Nitrite as N	Nitrite as N	Nitrite as N
TKN	TKN	TKN
TN	TN	TN
TP	TP	TP
		SRP
Primary Production		
Chlorophyll a	Chlorophyll a	Chlorophyll a
Organic Contaminants		
PCB	PCB	PCB
PAH	PAH	PAH
TPH (C10-36)	TPH (C10-36)	TPH (C10-36)
		BTEX
		O-C Pesticides
		O-P Pesticides

Water quality measurements and water quality samples were taken before any biological sampling was undertaken to ensure that the results were not compromised by disturbance of bottom sediments caused by sampling activity. In addition, care was taken not to disturb any of the biological habitats that were to be sampled when measuring water quality.

Flow conditions and water levels, along with water depth, were assessed on a qualitative basis at the time of sampling and information recorded to aid with the interpretation of the water quality data.

As a Qualty Assurance / Quality Control (QA/QC) measure, GHD arranged for trip blanks and rinsate water to be provided by ALS so that the field team could collect field blanks. Blanks were only collected with respect to organic contaminant components. Data for the trip and field blanks will be used to assess whether there was any evidence of contamination during sample collection, storage and transport.

For this report, water quality results were tabulated and assessed against relevant guideline ranges / trigger levels set out in the following:

- ANZECC and ARMCANZ (2000) Water Quality Guidelines (slightly to moderate disturbed freshwater ecosystems of Tropical Australia –i.e. 95% ecosystem level protection level);
- Qld Water Quality Guidelines 2009 (DERM, 2009a) (95% ecosystem level protection level for Central Qld freshwater ecosystems); and
- ANZECC and ARMCANZ (2000) Water Quality Guidelines (livestock drinking water).

One of the criticisms levelled at the GCP EIS report was that relevant environmental values (EVs) for waterways within and adjacent to the GCP EPC had not been identified and, as such, the water quality data were not interpreted with these in mind.

In 2009, the Burdekin Water Quality Improvement Plan (BWQIP) was developed by Dight (2009), which included the identification of draft waterway EVs for the 48 sub-catchments within the Burdekin River Basin. The draft EVs were identified through:

- Literature review and collation from other sources of information;
- Surveys and workshops involving community groups, traditional owners, scientists and resource managers; and
- Community engagement activities.

The GCP MLA is located within the Belyando River sub-catchment of the Burdekin River Basin. Draft waterway EVs were developed for 7 different sub-catchments within the Belyando River catchment:

- Upper Belyando River;
- Native Companion Creek;
- Sandy Creek;
- Mistake Creek;
- Fox Creek;
- Carmichael River; and
- Belyando Floodplain.

The sub-catchments relevant to the receiving waterways of the GCP near mine study are:

- Sandy Creek – includes mine site and immediate receiving waterways of Lagoon Creek and Sandy Creek, and
- Belyando Floodplain – includes lower reach of Belyando River downstream of Sandy Creek/Native Companion Creek.

It should be pointed out, however, that no near-mine water quality sites were sampled in the Belyando Floodplain sub-catchment by GHD. As such, the EVs for Sandy Creek were the only ones referred to when interpreting the water quality data for this report. The following draft EVs were identified for the Sandy Creek sub-catchment:

- Aquatic ecosystems (Slightly to Moderately Disturbed);
- Stock watering, and
- Cultural and spiritual values of the Bidjara traditional owners.

3. Results

3.1 Habitat Description

3.1.1 Beta Creek

Site BC-5, located on Beta Creek, was characterised by a narrow, shallow creek (maximum width 2.5 m, maximum depth 0.5 m), with shallow gradient banks largely covered with a terrestrial grass understory. Riparian canopy cover was patchy due to some clearing and consequently stream shading was minimal. There was no macrophyte cover and instream habitat such as leaf litter and large woody debris was limited. Bed and banks were dominated by silt-clay and there was evidence of bed and bank trampling by cattle at this site. These factors contributed to the highly turbid water at BC-5. Note also that poly pipe present at this site and advice from the Kia Ora landholder, Kelvin Sypher, suggested that this pool might be pumped dry at times by the landowner in order to encourage cattle to other drinking water sources/pastures. If this is the case, it would exacerbate the already short residence time of surface water in this reach, which would have flow on effects to the aquatic fauna living there. The sampled reach featured an isolated pool, intersected by an adjacent road. Water quality sampling in September 2012 revealed that the reach downstream of BC-5 was impounded by a farm dam and that there was no evidence of recent flows downstream of the dam. Hence, Beta Creek upstream of the dam may be isolated from the adjacent Tallarenha Creek at all times outside of floods, though this is not confirmed.

Figure 3-1: Site BC-5 looking upstream

3.1.2 Malcolm Creek

Site MC-new, located on Malcolm Creek, was very similar to BC-5 in that it was characterised by a narrow, shallow creek (maximum width 7 m, maximum depth 0.5 m), with shallow gradient banks largely covered with a terrestrial grass understory, but interspersed with small stands of emergent macrophytes. Riparian canopy cover was non-existent in the reach sampled due to extensive land clearing for cattle grazing (though patchy riparian vegetation occurred upstream - see Figure 3-2). Consequently, stream shading was also absent. There was little macrophyte cover extending into the water margin and leaf litter and large woody debris were limited. Bed and banks were dominated by silt-clay and there was evidence of bed and bank trampling by cattle at this site, though not to the same degree as was observed at BC-5. These factors contributed to the highly turbid water at this site. The sampled reach featured an isolated pool, intersected by an adjacent road. Downstream of the road crossing there was no ponded water although grasses and emergent macrophytes were abundant.

Figure 3-2: Site MC-New looking upstream

3.1.3 Spring Creek

Spring Creek was generally characterised by narrow, sand-bed channels with patchy riparian vegetation, but at the time of sampling, there was insufficient standing water in the Spring Creek main channel to sample. Sampling was instead carried out in Spring Creek Dam, which, while largely unrepresentative of natural conditions in the Spring Creek, was expected to act as refugial habitat for resident aquatic fauna during drier times. Further, it hosted extensive macrophyte diversity and cover (around 40%) and was seen being used by waterbirds so was considered an important habitat to assess as part of this study.

SPC-Dam featured a dam several hundred metres long with a maximum width of 100m. Average depth was around 1m, but in the upstream reaches, a channel had been dredged that was several metres deep. That dredging created undercut bank habitat in association with uncleared edge macrophyte habitat. While the bed was a mix of sand and silt-clay (predominantly the latter), the water was relatively clear at this site. Despite the abundant macrophyte growth present, there was limited detritus. Large woody debris was also limited. Both were due to a lack of riparian canopy cover around the dam margins. There was also a lack of dead trees as standing timber within the dam along the old creek line to contribute alternative structural habitat. The dam walls were earth mounds and these were colonised by terrestrial grasses, as visible in Figure 3-3.

Figure 3-3: SPC-Dam looking downstream

3.1.4 Pebbly Creek

Pebbly Creek, like Spring Creek, was generally characterised by narrow, sand/silt-clay bed channels with patchy riparian vegetation, but at the time of sampling, there was insufficient standing water in the Pebbly Creek main channel to sample. Sampling was instead carried out in Pebbly Creek Dam, which, while largely unrepresentative of natural conditions in Pebbly Creek, was expected to act as refugial habitat for resident aquatic fauna during drier times.

PC-Dam featured a dam several hundred metres long with a maximum width of 50m (mean wetted width though was around 30m). Maximum depth was around 1m, but the shallow gradient of the bank at this site meant much of the water present was less than 0.4m deep. The bed was entirely silt-clay and the site was regularly accessed by cattle while the field team were on site. As a result, the water in the dam was highly turbid. There was limited macrophyte growth apart from very isolated patches of Slender Knot Weed (*Persicaria decipiens*). However, there was standing timber present as structural habitat along the old creek line (see Figure 3-4). This and the relatively intact, though narrow band of Eucalypts around the dam also provided low to moderate amounts of large woody debris and leaf litter. The Eucalypts, however, were too high on the bank to offer any degree of stream shading.

Figure 3-4: PC –Dam looking upstream

3.1.5 Lagoon Creek

Three sites were sampled on Lagoon Creek as part of this study (see Figure 3-5 to Figure 3-7). The habitat descriptions given below cover sites in order from upstream to downstream. Lagoon Creek was characterised by a relatively wide stream channel (10-20m), lined with a narrow, continuous band of Eucalypts with a stream bed of sand/silt clay. Water was of moderate clarity, except in areas of sites LC-1 and LC-3 that were accessed by cattle. Macrophyte cover was limited, though terrestrial grasses extending beyond the water margin provided structural habitat for aquatic fauna, particularly at Alt-AQ14. Despite the relatively intact riparian canopy cover, large woody debris cover was fairly limited at all three sites surveyed, though all had abundant leaf litter cover.

At the time of sampling, Lagoon Creek was a series of isolated pools. Site Alt-AQ14 (Figure 3-5) was the largest of these pools, but this was due to the impoundment effects of the causeway, which resulted in water being backed up behind the causeway for some distance upstream (≥500m). It also meant that the water was deeper at this site compared to the other site, with a mean depth around 1.5m. Immediately downstream of the causeway, the geomorphology and water levels were much more consistent with sites monitored further downstream. The presence of the causeway and its impounding effect has created a section of Lagoon Creek less prone to the vagaries of ephemeral flows, thereby creating a refugial pool within this system, representing a valuable aquatic habitat within the study area. On the negative side, the causeway had a drop of around 1m at the time of sampling and would only be inundated to a level that would allow upstream fish passage during moderate to high flows. This could potentially influence the range of fish caught at this site, albeit such effects would be expected to be minimal based on a lack of migratory fish species in the near-mine GCP area. Further, this site had a relatively high diversity of fish species compared to other sites monitored as part of this study (see section 3.2).

Site LC-1 hosted the smallest pool (pool length <100m and mean wetted width 7m), with the stream channel expanding in the reach coinciding with LC-3. These pools were both shallow (average depth was 0.5m or less) and the dominant aquatic habitat was leaf litter and encroaching terrestrial grasses. Site LC-3 had bed and banks with a much higher proportion of slit-clay to other sites, such that while both LC-1 and LC-3 were accessed by cattle, turbid plumes were only observed at LC-3 (see Figure 3-7). Due to the reduced mean stream width at LC-1 and LC-3, stream shading at both sites was moderate (around 40%).

Figure 3-5: Lagoon Creek at Alt-AQ14

Figure 3-6: Lagoon Creek at LC-1

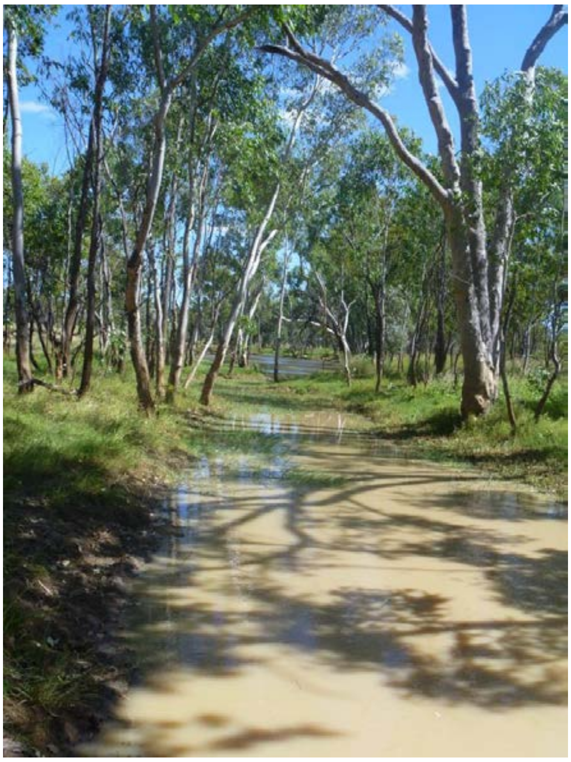

Figure 3-7: Lagoon Creek at LC-3

3.1.6 Tallarenha Creek Wetland

TC-Dam was characterised by a small, shallow wetland in a depression adjacent to a road culvert. The wetland had a maximum wetted width of around 10m and consisted of two sections: a larger downstream pool with only fringing emergent vegetation (see Figure 3-8) and a narrower section near the culvert that had abundant macrophyte cover dominated bythe floating macrophyte *Monochoria cyanea* (Lady Lilac or Native Water Hyacinth) (see Figure 3-21). The margins of this wetland were colonised by dense emergent macrophyte growth (mainly Bunchy Sedge -*Cyperus polystachyos*, but also some Dirty Dora - *Cyperus difformis*) and Spiny Mud Grass (*Pseudoraphis spinescens*). The water was shallow (mean <0.5m) and receding at the time of sampling. The bed and banks were predominantly silt-clay and, this combined with cattle access, meant that water at this site was turbid. Riparian canopy adjacent to the wetland pool was patchy and showed signs of past clearing. The riparian canopy was some distance from the edge of the pool, so offered limited shading. Downstream of the sampled wetland pool was a swamp area that was dry at the time of sampling, but in the wet season would be likely be inundated and connected with this pool.

Figure 3-8: Larger, downstream section of the wetland pool sampled at TC-Dam

3.1.7 Saltbush Creek Lagoon

Site04 on Saltbush Creek was characterised by a large (several hundred metres long and up to 20 m wide) lagoon pool that drains much narrower stream habitat upstream (Figure 3-9). According to Monklands landowner (Reid Bauman, *pers. comm.*), this lagoon was actually created through dredging and channel widening in the 1940's to provide a source of drinking water for cattle. However, it is understood that cattle rarely use it as a drinking water supply perhaps due to the tannin-stained water contained in it. Despite its origins, the appearance of the riparian and instream habitat at this site suggests that it has evolved into a natural ecosystem. The lagoon pool is bordered by a mature Eucalypt canopy zone that is relatively continuous, albeit narrow in width. This contributes to a healthy aquatic habitat at this site through stream shading, bank stabilisation and structural habitat (standing timber, tree roots, snags and leaf litter). The riparian understory consisted of a mix of Spiny Mud Grass and sedges (various *Cyperus* species) uniformly distributed forming a 2-5m band around the edges of the lagoon. Mean water depth was around 1m, though parts of the lagoon pool were just over 1.5 m. Bed and bank material was entirely silt-clay, but despite this, water clarity was good, albeit tannin-stained. Cattle were present in the vicinity of this lagoon, but there was very little evidence of either bank erosion or bed trampling.

Figure 3-9: Site04 looking upstream

3.2 Fish and Macrocrustacea

3.2.1 Fish Biogeography for the Burdekin Catchment

The Burdekin River's fish fauna is distinctive, containing elements from both northern and eastern Australia. The distribution of two biogeographically distinct fish fauna within the catchment is largely due to the presence of the Burdekin Falls at the lower quarter of the river's length providing an impassable barrier for many fish species (Pusey *et al.* 1998).

A total of 76 fish species occur in the Burdekin Basin (Alluvium, 2007). Of those, 58 are Australian species, including three potentially misidentified taxa and two species considered to have been introduced from other river basins (Yellowbelly -*Macquaria ambigua* and Eel-tailed Catfish, *Tandanus tandanus*). In addition there are 17 exotic species listed, most of which have been introduced into the Ross River. Among these, the highly invasive Tilapia (*Oreochromis mossambicus*) is now in the upper Burdekin River, including the Belyando catchment and continues to spread. Species that are now found outside their natural range include Sleepy Cod (*Oxyeleotris lineolatus*), Barramundi (*Lates calcarifer*) and Sooty Grunter (*Hephaestrus fuliginosus*) (Alluvium, 2007). Two species are endemic to the Burdekin River, the Small-headed Grunter (*Scortum parviceps*) and the Soft-spined Catfish (*Neosilurus mollepsiculum*) (GHD, 2010).

Historically, fish assemblages below the Burdekin Falls were characterised by piscivorous fish (i.e. those that feed on other fish), whereas such species were largely absent from upstream reaches. In recent decades, however, there have been numerous translocations of piscivorous fish species into the upper reaches of the Burdekin catchment, mainly to satisfy recreational fishing demands (Pusey *et al.* 2006).

3.2.2 Diversity

While a large number of species have been recorded throughout the Burdekin Catchment many species are not highly abundant within this system or have not been recorded for some time (Pusey *et al.* 2004). Table 3-1 shows the fish species that have been recorded in the Belyando River system. This list contains only 20 of the 76 species previously recorded in the Burdekin catchment. Considering the low stream order of sites sampled in the present study and the distance inland, it was considered unlikely that many of these species would be present in the current survey. For example, Snub-nosed Garfish (*Arrhamphus sclerolepis*) are a catadromous species (i.e. move downstream to spawn), so are generally found in areas with more direct connectivity to the lower catchment. Long-finned Eels (*Anguilla reinhardtii)* are another catadromous species which have been shown to be restricted from upper Burdekin reaches by the Burdekin Falls Dam and its presence in the Belyando catchment is based on historical records prior to barrier construction (Alluvium, 2007). Hence it would not be expected to occur commonly in the study area.

Monitoring as part of the SGCP EIS by ALS (2011) and Aquateco (2010) recorded 11 of the 20 species previously recorded from the Belyando catchment. This included two exotic pest fish species (Gambusia -*Gambusia holbrooki* and Tilapia –*Oreochromis mossambicus*) and one translocated species (Yellowbelly –*Macquaria ambigua*). AARC (2010) recorded seven fish species from 16 sites within the Belyando River catchment as part of the nearby Alpha Coal Project. Note that AARC (2010) stated that they caught "Carp Gudgeon –*Hypseleotris compressa*", which was probably Western Carp Gudgeon (*Hypseleotris klungzingeri*) or Midgely's Carp Gudgeon (*Hyseleotris* sp.1) given that *H. compressa* are actually Empire Gudgeons and these do not occur in the Belyando catchment. AARC (2010) did not find any of the translocated or exotic fish species listed in Table 3-1.

In this study, 2,156 fish belonging to 9 species were recorded from the 9 sites sampled. Details of the fish species caught in this study are provided in Table 3-2 and Figure 3-10. The species recorded include all the species captured as part of the AARC (2010) study and most of those captured as part of the two studies carried out as part of the SGCP EIS by ALS (2011). This study, however, recorded Fly-speckled Hardyhead (*Craterocephalus stercusmuscarum*), which was not recorded in any of the previous studies. This species was only recorded from Site04 and in low abundance. While both AARC (2010) and ALS (2011) recorded Bony Bream (*Nematalosa erebi*), this species was not recorded in this study. Further, while this study also recorded the exotic *O. mossambicus*, it did not record the other previously recorded exotic fish, *G. holbrooki*, or the translocated native fish, *M. ambigua* recorded as part of the ALS (2011) study *(*see Table 3-2*).*

Table 3-1: Potential fish assemblages within the upper reaches of the Burdekin River System based on DEEDI surveys and databases. * denotes exotic species, # denotes translocated species and + denotes species with migratory requirements.

Common Name	Scientific Name
Agassiz's Glassfish (aka Olive Perchlet)	*Ambassis agassizii*
Snub-nosed Garfish +	*Arrhamphus sclerolepis*
Fly-speckled Hardyhead	*Craterocephalus stercusmuscarum*
Gambusia (aka Mosquitofish) *	*Gambusia holbrooki*
Western Carp Gudgeon	*Hypseleotris klunzingeri*
Midgley's Carp Gudgeon	*Hypseleotris sp1*
Spangled Perch	*Leiopotherapon unicolor*
Golden Perch #	*Macquaria ambigua*
Eastern Rainbowfish	*Melanotaenia splendida*
Purple-spotted Gudgeon	*Mogurnda adspersa*
Bony Bream	*Nematalosa erebi*
Black Catfish	*Neosilurus ater*
Hyrtl's Tandan	*Neosilurus hyrtlii*
Soft-spined Catfish	*Neosilurus mollepsiculum*
Sleepy Cod	*Oxyeleotris lineolatus*
Flathead Gudgeon	*Philypnodon grandiceps*
Rendahl's Catfish	*Porochilus rendahli*
Small-headed Grunter	*Scortum parviceps*
Tilapia*	*Oreochromis mossambicus*
Long-finned Eel +	*Anguilla reinhardtii*

Fish diversity on a site by site basis ranged between 0 and 9, which is broadly consistent with the ranges recorded by AARC (2010) (0 to 6) and ALS (2011) (1 to 8). Based on results presented in Table 3-2, the sites with the highest diversity of fish species were sites Site04 in 2012 and AC-Dam, sampled by ALS (2011). Both are lagoon pools with intact riparian vegetation and abundant structural habitat in the form of large woody debris and tree roots, so these results might suggest that lagoons of this type are significant in a bioregional fish diversity context. What was surprising, however, was the marked increase in fish diversity at Site04 between August 2011 and April 2011 (2 species to nine species). This might be explained partly by the use of fyke netting in this study and not as part of the ALS (2011) study, but a more likely scenario is that recent hydrological connectivity with Lagoon Creek during the wet season may have resulted in more fish species colonising Saltbush Creek. This would certainly explain the presence of Tilapia at this site this year and not last year, given that apart from Site04, Tilapia was only recorded from Lagoon Creek sites in this study. Table 3-2 also shows that

Lagoon Creek sites Alt-AQ14 and LC3 also had relatively high fish diversity compared to other sites. This is of interest given that Lagoon Creek is the main receiving water in relation to the proposed GCP mine.

3.2.3 Abundance and Distribution

The fish species for which the highest number of individuals were captured in this study was Agassiz's Glassfish (*Ambassis agassizi*), with over 900 specimens collected across the 9 sites. Eastern Rainbowfish (*Melanotaenia splendida*) and Western Carp Gudgeon (*Hypseleotris klungzingeri*) were also recorded in relatively high numbers. Eastern Rainbowfish (*Melanotaenia splendida*) and Western Carp Gudgeon (*Hypseleotris klungzingeri*) were sub-dominant species within the fish catch associated with the Aquateco (2010) and ALS (2011) studies. For those studies, catches were dominated by Spangled Perch (*Leiopotherapon unicolor*) and Purple Spotted Gudgeon (*Mogurnda adspersa*), respectively. The contributions of Agassiz's Glassfish to catches associated with those studies was minimal, while the contributions of Spangled Perch and Purple Spotted Gudgeon to the catch in this study were low, so the results of this study are in contrast to those from the Aquateco (2010) and ALS (2011) surveys. It should be pointed out that almost half the total *A. agassizi* catch was recorded from one site (Site04), though sites LC-3 and Alt-AQ14 on Lagoon Creek also recorded high numbers of this species. No overall abundance data were provided for the fish species captured as part of the study by AARC (2010), but relative abundance figures for each site presented in that report show that Agassiz's Glassfish dominated the catch at their site AQ-23, which is also located on Lagoon Creek.

No site by site comparisons of fish abundance are made in this report as the fishing methods and sampling effort differed between sites, but it should be pointed out that vast numbers of fish were caught at Site04, while no fish at all were recorded from MC-New (Malcolm Creek) and TC-Dam. The absence of fish from MC-New might be explained by poor habitat conditions (i.e. high turbidity, lack of canopy cover and lack of structural habitat) and the highly ephemeral nature of this system. The absence of fish from TC-Dam may be because it to is an ephemeral system, but also because it is only likely to be connected to Tallarenha Creek during high flows, given that it is several hundred metres away from the main channel and the stream banks in that section are relatively high (several metres) and steep (Jamie Corfield, GHD, pers. obs.).

In terms of distribution, *A. agassizi*, *M. splendida*, *H. klungzingeri*, and *M. adspera* were recorded from all GCP SEIS study sites that contained fish. *L. unicolor* was present at the majority of GCP SEIS study sites (Table 3-2). These species were also among those that occurred most widely among the sites sampled by ALS (2011). In terms of the species with more limited distribution, Midgely's Carp Gudgeon (*Hypseleotris* sp1), was only recorded from two sites in this study and one in the study by ALS (2011). Two of the three sites it was recorded from were lagoons, suggesting that this species has a preference for such habitat. This is in line with information in the published literature, which indicates that, while it is found in a variety of waterbody types, it is often most common in lagoons and wetlands (Allen *et al.* 2003; Pusey *et al.* 2004). Two other species were only recorded from one site among the 20 sampled as part of this study and the ALS (2011) study combined. This included Fly-speckled Hardyhead (*C. stercusmuscarum*) and Bony Bream (*N. erebi).* Further, *N. erebi* was not among the more common or abundant fish species caught as part of the AARC (2010) study. These results indicate that their occurrence in the GCP Project area is likely to be limited. The same probably applies to the translocated native species, *M. ambigua*, for which only one specimen was recorded from across three studies carried out in the immediate vicinity of the GCP EPC and, to the exotic Gambusia (*G. holbrooki*), which was found at only one site in limited numbers as part of the SGCP EIS (ALS, 2011). The distribution of Tilapia (*O. mossambicus*) was restricted to three sites in this study and one of the sites sampled by ALS (2011). This species was not part of the catch recorded at Alt-AQ14, but many juveniles were observed in a small pool downstream of the causeway present at that site. In this study, its distribution was restricted to Lagoon Creek and Saltbush Creek. The high numbers of this exotic species recorded at Site04 in April 2012 was concerning given that no individuals of this species were recorded at that site in August 2011 by ALS (2011). This result probably represents a recent spread of Tilapia into Lagoon Creek and Saltbush Creek.

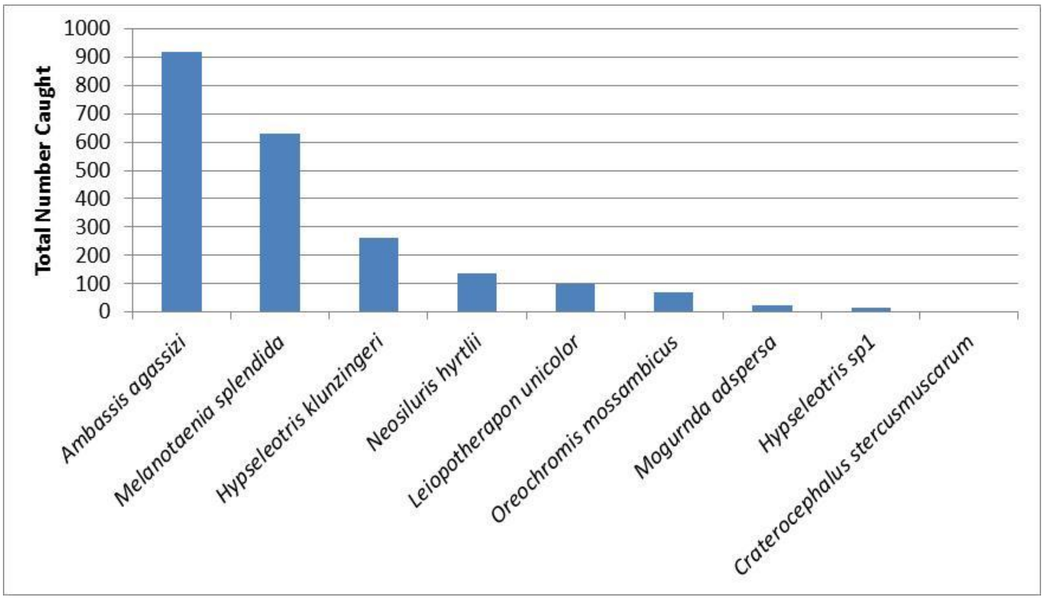

Figure 3-10: Numbers of individuals recorded as part of each fish species captured as part of this study.

Table 3-2: Distribution of fish species recorded from this study and the ALS (2011) study for the SGCP EIS. X = present.

	Study	GCP SEIS (2012)									SGCP EIS (2011)										
Status	Species	LC-3	MC-New	PC-Dam	SPC-Dam	BC-5	Alt- AQ14	Site 04	LC-1	TC-Dam	Site 04	TC-1	TC-3	SC-1	SC-2	SC-3	AC-1	AC-2	DC-2A	AC-Dam	UT-Dam
Native	*Ambassis agassizi*	X		X		X	X	X	X			X					X			X	X
	Craterocephalus stercusmuscarum							X													
	Hypseleotris klunzingeri	X		X		X	X	X			X	X	X			X	X		X	X	X
	Hypseleotris sp1						X	X												X	
	Leioptherapon unicolor	X		X	X	X		X					X	X	X	X	X	X		X	
	Melanotaenia splendida	X		X	X	X	X	X	X			X	X		X		X	X		X	
	Mogurada adspersa	X		X	X	X	X	X	X		X		X		X	X	X	X	X	X	X
	Nematalosa erebi												X								
	Neosiluris hyrtlii	X					X	X	X				X				X	X		X	
Exotic	*Oreochromis mossambicus*						X	X	X											X	
	Gambusia holbrooki																X				
Translocated	*Macquaria ambigua*												X								
	NUMBER OF SPECIES RECORDED	**6**	**0**	**5**	**3**	**5**	**7**	**9**	**5**	**0**	**2**	**3**	**7**	**1**	**3**	**3**	**7**	**4**	**2**	**8**	**3**

3.2.4 Composition

Conservation Significance Species

None of the endemic fish species recorded during this study or the previous studies carried out in the vicinity of the GCP near-mine study area, or historically known from the Belyando catchment, are listed as threatened species under either State or Commonwealth legislation. AARC (2010) for the Alpha Coal Project EIS list Murray Cod (*Maccullochella peelii peelii*) as a vulnerable species occurring in the Central Highlands region, but this species is not known historically from the Belyando River system. Volume 3, Chapter 7 of the GCP EIS (Waratah Coal, 2011) reports the occurrence of “Australian lung fish” at several rail corridor sites, though this species was not reported in the E3 (2010a) report and only occurs in the Brisbane, Burnett, Mary and Pine rivers located in South-East Queensland, so these records are considered erroneous.

Small-headed Grunter (*Scortum parviceps*) was once listed as ‘Rare’ under the EPBC Act, because it was thought to occur only in the upper arm of the Burdekin River. However, this was changed following advice to the Federal Government that this species is relatively common and is found elsewhere in the catchment including the Suttor-Belyando River complex. Regardless of this, it is endemic to the Burdekin Catchment, so has conservation significance. No *S. parviceps* were recorded in this study or any of the other studies carried out in the vicinity of the GCP EPC. The authors of this report have only observed Small-headed Grunter in clear, perennial flowing water in streams dominated by rocks and sand. These are features of the near-mine GCP study area, so *S. parviceps* could still potentially be present in areas affected by the GCP.

Note that the Biodiversity Assessment and Mapping Methodology (EPA, 2002) provides a list of bio-regionally significant species for the SGCP bioregions. Appendix 7 of this document lists ‘Priority Fauna Taxa Other Than EVR Taxa’ and among these, there are two species which occur in parts of the Brigalow Belt and Desert Upland regions covered by the Belyando catchment. These are Midgley’s Carp Gudgeon (*Hypseoltris* sp1) and Southern Purple-spotted Gudgeon (*Mogurnda adspersa*). It is unclear why Midgley’s Carp Gudgeon was listed as a non-EVR priority species and no information is provided in EPA (2002). No particular threats are currently listed for this species. The inclusion of the Southern Purple-spotted Gudgeon is due to the fact that the southern population is listed as threatened in NSW and threats to this population continue to this day, particularly in the Murray-Darling Basin. Given the location of the GCP, it is more likely that the Purple Spotted Gudgeon specimens captured were from the non-threatened northern population.

Migratory Species

The two fish species that occur in the Belyando River catchment that undertake movement for spawning, namely, the Long-finned Eel and Snub-nosed Garfish, are unlikely to occur in the GCP Project area. Therefore, the creation of barriers as part of the GCP will not affect those species. There is still a variety of potadromous (i.e. move wholly within freshwater reaches) species within the upper Burdekin Basin for which inter-basin movement is critical for their recruitment success and longer term species vigour and genetic viability (Alluvium, 2007). The small localised scale of barrier creation as part of the GCP will not affect inter-basin movement for these potadromous species, but it might have some effect on their local population status. For instance, various studies have suggested that adult Spangled Perch undertake spawning-related movement at the start of the wet season, though this is not confirmed, as movement is neither uniformly upstream nor downstream (Pusey *et al.* 2004). There is also some evidence that Eastern Rainbowfish undergo upstream migration in intermittent streams, although mass migration seems to be uncommon (Pusey *et al.* 2004). While there is little quantitative information concerning the movement of Agassiz's Glassfish, this species appears to undertake mass upstream dispersal often cued or facilitated by elevated discharges (Pusey *et al.* 2004). In addition, while originally thought to be a relatively sedentary species, recent studies have shown that large numbers of Carp Gudgeon (*H. klungzingeri*) attempt to move through fishways (Baumgartner 2003). Whether these movements reflect local dispersal or foraging movements is unknown.

Spangled Perch are one of the better species in terms of negotiating through fish passage barriers (DPI, 2009a), so it is potentially less vulnerable to fish barrier impacts than some of the other species present. Moreover, Spangled Perch are widely distributed, so any fish passage-related impacts associated with the GCP would not affect the long term viability of their population within the broader study region.

Introduced / Exotic Species

As discussed in section 3.2.3, Tilapia were recorded at a number of locations in the near-mine GCP study area, both in this study and that conducted by ALS (2011). Of concern is their spread into Saltbush Creek since the August 2011 survey by ALS, but this was inevitable given the rapid spread of Tilapia in the Burdekin Catchment since their introduction in 2005, and given the likely hydrological connectivity between Saltbush Creek and Lagoon Creek during the wet season. Like other exotic fish species, Tilapia are thought to be more tolerant of polluted conditions than native fish, so if the GCP was to increase pollution and habitat disturbance in Lagoon Creek, it could be to the advantage of this species and any resultant proliferation could compound the direct impacts of the GCP on the native fish community of the receiving waters. It should be pointed out, though, that apart from Tilapia, the presence of other exotic fish and translocated native fish in the near-mine GCP area appears to be limited.

Fisheries Significant Species

While the Burdekin Catchment features several fish species that are important recreational and commercial fishery species (e.g. Barramundi - *Lates calcarifer,* Sea Mullet - *Mugil cephalus* and Mangrove Jack - *Lutjanus argentimaculatus*), none of these species were recorded, or would be expected to occur in the near-mine GCP Project area. Yellowbelly (*M. ambigua*) have been stocked in the Burdekin Dam for the purposes of enhancing recreational fishing, but only a single specimen has been collected in the study area (ALS, 2011) and the local landowners contacted as part of this study were not aware of its presence in the local vicinity. Moreover, human consumption of aquatic fauna is not listed as an environmental value for the Sandy Creek sub-catchment, of which the waterways sampled in this study are a part. Hence, it is fair to say that there are no valued fisheries species present in the near-mine GCP Project area and that there is limited recreational fishing pressure on local fish communities in this area. As discussed in section 3.3, however, local landowners occasionally stock Red Claw Crayfish (*Cherax quadricarinatus*) in their farm dams for breeding and consumption purposes.

3.2.5 Condition / Appearance

In general, the fish collected during this study appeared to be in good condition. However, many of the Spangled Perch (*L. unicolor*) recorded from Spring Creek Dam (SPC-Dam) had external lesions (see examples in Figure 3-11). External lesions in fish are generally a sign of environmental stress, but given the broad physiological tolerance of L. *unicolor* (see section 3.2.6) and that the water quality at SPC-Dam was not markedly different from other sites and was generally in relatively good condition (see section 3.4), it is unclear what may have caused these lesions. It should also be pointed out that similar observations have been made in relation to this species at other locations in Queensland and these to have not borne any relationship with degraded water quality (Jamie Corfield, GHD, pers. obs.).

Figure 3-11: Spangled Perch from SPC-Dam with external lesions.

3.2.6 Tolerances and Sensitivities

Ephemeral streams are subject to wide physico-chemical fluctuations. This is reflected in the species composition of fish found in these types of waterways, and notably their tolerance to a wide range of physico-chemical qualities (McNeil, 2005). The species recorded in the study area can be described as habitat generalists that are distributed widely within the broader region and, in some cases, within Australia. For instance, Spangled Perch is the second-most widespread of Australia's freshwater fish species and is often very abundant when present (Pusey *et. al.,* 2004). Purple-spotted Gudgeon are a relatively common species of coastal drainages of Eastern Australia north of the Clarence River, NSW. It is found in a range of lentic and lotic habitats, most commonly in slow flowing and weedy areas of rivers, creeks and billabongs. However, it has also been recorded from shallows with moderately high flow velocities (Pusey *et. al.* 2004). Eastern Rainbowfish is a very widely distributed species along the east coast of Queensland and is usually abundant where it occurs (Pusey *et. al.,* 2004). The wide distribution and high abundance are largely due to the fact the Eastern Rainbowfish are not dependent on any particular substrate or habitat type, although they do show a preference for slower moving streams and those that are relatively free of aquatic vegetation (Pusey *et. al.,* 2004). Barred Grunter is also found across a range of habitats and adapts readily to a wide range of temperatures, conductivity and pH (Allen *et. al.,* 2003).

Physiological preference ranges with respect to water quality for species caught in the study area are shown in Table 3-3. This information is based on information from Pusey *et al.* (2004) and tolerance ranges might differ from the preference ranges shown. Many of the fish listed are tolerant of mildly acidic conditions, which might be of relevance if acid rock drainage issues occur in relation to the GCP. *A. agassizi, H. klungzingeri* and *Hyspseleotris* sp1. tolerate the lowest pHs of the fish listed in Table 3-3, so are unlikely to be directly susceptible to decreased pH should this occur. The same could not be said of *M. splendida*, which has a narrow pH tolerance range with a preference for neutral to slightly alkaline water. Several of the species listed in Table 3-3 can tolerate moderately low Dissolved Oxygen (DO) levels, at least for a short period. *M. adspersa* and *H. klungzingeri* were caught at DC-2A during the ALS (2011) study, where DO saturation was 1.07 mg/L (<10% saturation), which confirms physiological tolerance range data presented in Table 3-3.

Turbidity tolerance for Australian native fish is poorly known, but it is likely that they can withstand short periods of very high turbidity as occurs naturally with heavy rainfall events. They are, however, unlikely to tolerate elevated turbidity levels over extended periods. Suspended sediment can clog or damage gill membranes, causing poor health or even mortality in extreme cases. Sub-lethal effects include reduced predation success for visual predators, reduced breeding success in species that rely on visual cues for spawning (e.g. Eastern Rainbowfish), reduced predation rates for visual predators such Spangled Perch and reduced prey and shelter abundance through effects on plant growth, macroinvertebrates and their habitats. Many of the species listed in Table 3-3 tolerate moderately high turbidity levels. *M. adspersa* and *H. klungzingeri* were observed by ALS (2011) surviving in water of >1000 NTU at DC-2A, which greatly exceeds the tolerance range for these species given in Pusey *et al.* (2004). The fish species present in the near-mine GCP Project area most vulnerable to increased turbidity based on information presented in Table 3-3 are *M. splendida* and *N. erebi.* As such, managing and monitoring increases in turbidity associated with GCP construction and operation activities are paramount in order to protect the local populations of these species in the receiving environment.

Table 3-3: Physiological preference ranges of some native fish species recorded from the study area based on Pusey *et. al.* (2004)

Species	Water Temperature	Dissolved Oxygen	pH	Conductivity	Turbidity
	(ºC)	(mg/L)		(µS/cm)	(NTU)
Ambassis agassizi	11.0 - 33.6	0.30- 19.5	6.3 -9.9	19.5 - 15102	0.2 -144
Nematalosa erebi	15 – 31	4.0 – 12.0	6.7 – 8.5	50 – 780	0.3 – 20
Melanotaenia splendida	15.0 – 32.5	1.1 – 10.8	6.8 – 8.5	49 – 790	0.6 – 16
Leiopotherapon unicolor	5.0 – 40.0	≥ 0.4	4.0 – 8.6	0.2 – 35.5 ppt salinity	1.5 – 260
Mogurnda adspersa	11.9 - 31.7	0.6 – 12.8	5.6 – 8.8	72.0 – 2495	0.2 - 200
Hypseleotris klungzingeri	8.4 -31.7	0.6 – 12.8	4.8 – 9.1	19.5 – 5380	0.5 – 65.0
Hyseleotris sp1	8.4 – 31.2	0.3 – 19.5	4.4 – 8.9	51 - 4123	0.1 – 331.4
Neosiluris hyrtlii	12.8 – 32.2	5.2 – 11.4	6.76 – 8.46	56 - 790	0.25 - 120

3.3 Macro-crustaceans

3.3.1 Diversity

The Queensland Museum crustacean database identified a total of 41 crustacean species within the Burdekin Catchment. These taxa are dominated by marine and estuarine species with only five species of freshwater crustaceans recorded by AARC (2010) and seven species recorded by E3 (2010a). The study by ALS (2011) found only three species of macro-crustacea. In this study, five macro-crustacean taxa were observed (see Figure 3-12 and Table 3-4). The taxa recorded were similar to those collected in the previous studies listed above, with differences relating mainly to taxonomic resolution and nomenclature (see below).

This study recorded the Freshwater Crab (*Austrothelphusa transversa*). This species was recorded in both the AARC (2010) and the E3 (2010a) studies, though it was misidentified as *Holthuisana* spp by AARC (2010). This species was not recorded during the study by ALS(2011). Atyid shrimp were recorded by AARC (2010) as being *Parataya australiensis*, while Atyidae were assigned to *Caridina* sp. by E3 (2010a). It is expected that the two classifications relate to the same species as Atyidae are often difficult to identify in the field based on their small size. As a result, this study used the family level identification for these shrimp (Atyidae).

E3 (2010a) identified *Macrobrachium* to species level, whereas this was not done as part of the study by AARC (2010) or this study. Hence, this would have inflated the macro-crustacean diversity reported by E3 (2010a) compared to figures reported in this and the other aforementioned studies. The two *Macrobrachium* species reported by E3 (2010a) were the Australian River Prawn - *M. australiense* and the East Australian River Prawn – *M. tolmerum*. The latter was found at all E3 (2010a) rail corridor monitoring sites, while the latter was only found at a single site at the coastal end of the rail corridor, so based on this, it would not be expected to occur in the study area. Hence, the *Macrobrachium* species recorded in this study and those by AARC(2010) and ALS (2011)were probably *M. australiense*, though this cannot be positively confirmed.

AARC (2010) reported that the translocated Red-claw Crayfish (*Cherax quadricarinatus*) is displacing the Orange-fingered Yabby (*Cherax depressus*) in the Burdekin as the species seldom occur together and the latter tends to be restricted to areas with higher habitat values. However, AARC did not record any Orange-fingered Yabby in the study area (they only recorded the Common Yabby –*Cherax destructor* and Red Claw Crayfish –*Cherax quadricarinatus*). *C. depressus* was also not recorded in this study or the study by ALS (2011). The study by E3 (2010a) did recorded *C. depressus* at a single site along the rail corridor alignment, though that site was well removed from the GCP Project area. *C. quadricarinatus* did not co-occur at that site, lending support to the above statement made by AARC (2010) with regards to limited co-occurrence of these two species. The study by E3 (2010a) did not record *C. destructor*, but this species was recorded as part of the AARC (2010) and ALS (2011) surveys and as part of this study.

E3 (2010a) recorded an additional macro-crustacean species not recorded in any of the other studies (Riffle Shrimp – *Australotaya striolata*). As the name would suggest, this species is found in close association with riffle habitat and such habitat was not present in the near-mine GCP study area. Hence, its absence from the taxa collected as part of this study and those by AARC (2010) and ALS (2011) is not surprising. E3 (2010a) only recorded *A. striolata* from a single rail corridor monitoring site at the coastal end of the rail corridor, further underling confirming the low likelihood of this species occurring in the vicinity of the GCP EPC.

3.3.2 Abundance and Distribution

No catch data are presented in relation to macro-crustacean abundance in most of the previous studies outlined above, except for AARC (2010). In this study, *Macrobrachium* spp. was the most numerous in terms of total catch, with the next most numerous taxa being *C. quadricarinata* and Atyidae. The abundance of the other two macro-crustacean taxa was limited (Figure 3-12). In this study, *C. destructor* had both a limited distribution and occurred in limited abundance where it was found (Figure 3-12, Table 3-4). This contrasts with the findings of AARC (2010), where *C. destructor* occurred at virtually every site they sampled and was generally the dominant macro-crustacean taxa recorded at those sites. Further, in the study by AARC (2010), *Macrobrachium* spp. and *Parataya australiensis* (Atyidae) made up 8 and 12 individuals out of the 104 macro-crustaceans recorded in their study, while at the same time, 31 *A. transversa* were recorded. In essence, this means that results recorded in this study are more or less the reverse of what AARC (2010) recorded. This finding may relate to temporal or spatial variability, though it might also relate to differences in sampling methods between the two studies. AARC (2010) used only seining and bait trapping, with use of the former restricted at many sites due to snags and leaf litter, while this study used a combination of electrofishing, bait trapping, fyke netting and seining.

Despite being the most numerically abundant macro-crustacean recorded in this study, *Macrobrachium* spp. was recorded from only three out of nine sites. In the study by AARC (2010) it was also limited in distribution and was restricted to only four of the sixteen sites sampled. This species was present at 6 out of the 11 sites sampled by ALS (2011) as part of the SGCP EIS (Table 3-4).

Apart from being the second most numerous species recorded in this study, *C. quadricarinatus* was the most widely distributed macro-crustacean taxa recorded in this study. In contrast, it was not recorded as part of the SGCP EIS study (ALS, 2011) (Table 3-4). This may have been related to differences in the proximity of study sites to *C. quadricarinatus*-stocked dams, as a number of landholders reported stocking this species in local farm dams within and adjacent to the GCP EPC (see Figure 3-13). It is unclear, however, whether these landholders sourced individuals of this species from local creeks for stocking purposes or whether those individuals occurring in creeks are escapees from those dams. Under the low *C. quadricarinatus* abundances observed by AARC (2010) and ALS (2011), the locally native Common Crayfish (*C. destructor*) was more widely distributed and, in the case of the former, more abundant. It may be that *C. quadricarinatus* is also displacing this species in the GCP near-mine study area, though further surveys would be required to confirm this. It is also worth noting that, while no fish were recorded from TC-Dam, *C. quadricarinatus* was relatively abundant. This may be testament to their ability to move across land into pools well removed from main stream channel habitat, such as those present at TC-Dam.

Atyidae were restricted to three sites of those surveyed for this study. Two of these were located on Lagoon Creek, which was characterised by isolated pool habitat with clear water. The other was Site04 on Saltbush Creek, which is characterised by a lagoon with relatively clear water. As discussed in section 3.2.1, Atyidae are algivores, so their absence from some of the other sites may reflect a response to elevated turbidity at those sites and its effect on algal production.

While not recorded in the ALS (2011) study, *A. transversa* was recorded from the majority of sites in this study and in the study by AARC (2010). This species is common throughout the semi-desert central and northern parts of Australia extending south into the upper reaches of the Darling River System. It can burrow up to one metre deep into heavy, dense, clay soils in the banks of freshwater rivers and creeks, drainage channels, pools, swamps and farm dams (Queensland Museum website: http://www.qm.qld.gov.au/Find+out+about/Animals+of+Queensland/Crustaceans/Common+freshwater+and+terrestrial+crustaceans/Inland+Freshwater+Crab accessed 18/10/12).

The absence of this species from the survey by ALS (2011) as part of the SGCP EIS could potentially be explained by the fact that during the dry season, or in extended drought conditions of up to six years or more, they plug their burrows with earth and go into a dormant state, living off stores of fat in their tissues. Many of the sites sampled by ALS (2011) were isolated pools that were receding, though that sampling followed a heavy wet season, so perhaps this scenario is less likely compared to other factors.

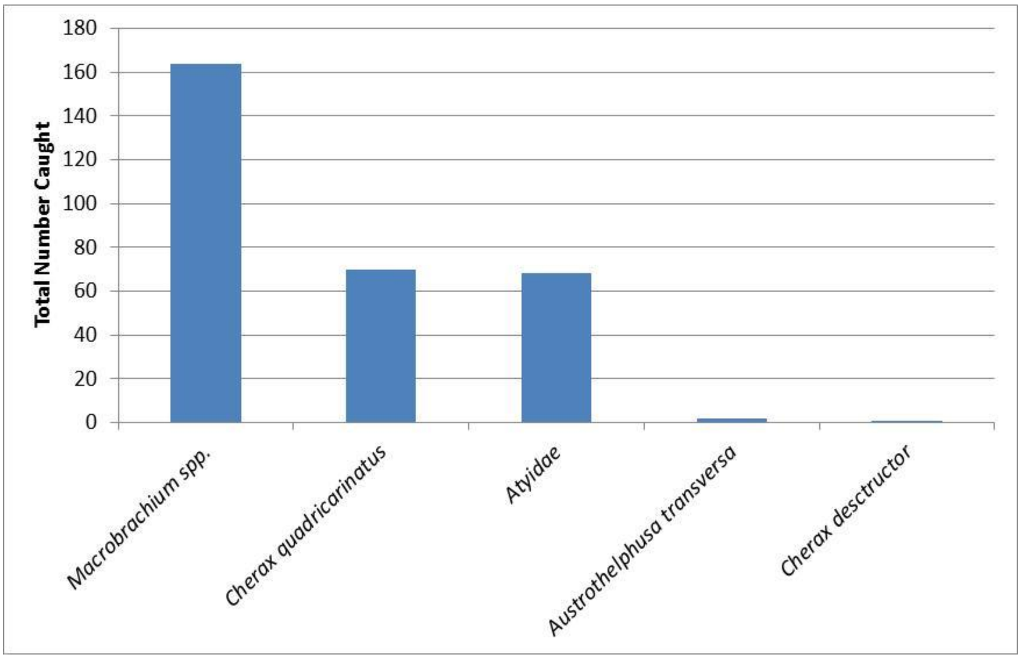

Figure 3-12: Number of individuals of each macro-crustacean taxa recorded in this study

Figure 3-13: Example of a stocked Red Claw Crayfish(*C. quadricarinatus*) caught in one of the sampled farm dams during the GCP SEIS survey

Table 3-4: Distribution of macro-crustacean taxa recorded from this study and that of the ALS (2011) study for the SGCP EIS. Note: Presence/absence data for the GCP SEIS is based on a combination of fish catch and macroinvertebrate sampling data. That for the SGCP EIS is based only on fish survey catch data. X = Present.

Study	**GCP SEIS (2012)**									**SGCP EIS (2011)**										
Species	LC-3	MC-New	PC-Dam	SPC-Dam	BC-5	Alt- AQ14	Site 04	LC-1	TC-Dam	Site 04	TC-1	TC-3	SC-1	SC-2	SC-3	AC-1	AC-2	DC-2A	AC-Dam	UT-Dam
Atyidae	X					X	X			X		X								
Cherax quadricarinatus	X	X	X	X		X	X	X	X											
Cherax destructor						X				X	X			X	X			X		
Austrothelphusa transversa	X	X			X	X		X												
Macrobrachium spp.				X		X	X			X		X		X		X	X		X	
NUMBER OF SPECIES RECORDED	**3**	**2**	**1**	**2**	**1**	**5**	**3**	**2**	**1**	**3**	**1**	**2**	**0**	**2**	**1**	**1**	**1**	**1**	**1**	**0**

3.1 Aquatic Vertebrates other than Fish

There are two crocodile species known to the Burdekin Catchment, the estuarine crocodile (*Crocodylus porosus*) and freshwater crocodile (*Crocodylus johnstoni*). The estuarine crocodile is listed as 'Marine' and 'Migratory' under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and 'Vulnerable' under Queensland's *Nature Conservation Act 1992* (NCA). Overall, numbers of both species of crocodile in the Burdekin Catchment are small and Estuarine Crocodiles (*Crocodylus porosus*) only extend as far up the catchment as the Burdekin River Dam wall, while Freshwater Crocodiles (*Crocodylus johnstoni*) were translocated to the Burdekin River Catchment as part of pet trading and a small breeding population exists in this catchment (DERM, 2010b *In* GHD, 2010). No crocodiles have been reported in the near-mine GCP Project area and none would be expected given its inland location and highly ephemeral waterways.

Freshwater turtle species known to be in the Burdekin Catchment include Cann's Long-Necked Turtle (*Chelodina canni*), Krefft's Turtle (*Emydura macquarii krefftii*), Irwin's Turtle (*Elseya irwini*), Saw-shelled Turtle (*Elseya latisternum*) and Snake-necked Turtle (*Chelodina longicollis*). The Northern Long-necked Turtle (*Chelodina rugosa*), has also been reported in the catchment (DERM WetlandInfo), however this record has not been verified (AARC, 2010; E3 2010a).

A single Snake –necked Turtle (*C. longicollis*) was observed in Lagoon Creek as part of the AARC (2010) study, but no turtles were recorded by other studies carried out in the near-mine GCP Project area, including this one. Anecdotal information from local landholders indicated that turtles were not seen commonly in this area. Similarly, no incidental sightings of Platypus were made during any of the surveys carried out and local landowners were not aware of their presence in the near-mine GCP area. A Water Rat (*Hydromys chrysogaster*) burrow was observed at Alt-AQ14 (Jamie Corfield, GHD, pers. obs). It should be noted that aquatic reptiles and mammals were not targeted specifically by sampling methods used for this study, or the previous studies. Hence, the findings presented in this report for these taxa should not be regarded as being definitive.

3.2 Macroinvertebrates

3.2.1 Past Macroinvertebrate Surveys

Many of the creeks and streams within the Burdekin catchment are ephemeral in nature, particularly those within the inland sub-catchments. As such, these waterways are characterised by wide fluctuations in water level and flow characteristics along with highly variable and unpredictable environmental conditions. This has a significant influence on the spatial and temporal variability in the diversity, composition and distribution of aquatic flora and fauna.

Macroinvetebrate surveys carried out in the Burdekin Basin reported in the published literature include those by Pearson (1991), Parsons Brinckerhoff (2009), AARC (2010), E3 (2010a) and ALS (2011). The results of the latter three studies are perhaps the most relevant to this study as they were carried out in the Galilee Basin within or adjacent to the GCP study area (rail corridor monitoring sites E3 AQ1 to E3 AQ-13 only), whereas the former two studies were carried out predominantly in the lower Burdekin Basin. However, both AARC (2010) and E3 (2010a) used non-standard methods of macroinvertebrate sampling (i.e. the QLD AUSRIVAS sampling protocols outlined in DNRW (2001) and DERM (2009b)), so results for those studies are not necessarily directly comparable to those collected as part of this study or those for the SGCP EIS conducted by ALS (2011). E3 (2010a) collected replicate macroinvertebrate samples from riffle, run and pool habitat and processed the samples by sieving them through sieves of various mesh sizes. AARC (2010) carried out kick net sampling in stream bed habitat, but gave no indication whether or not this was consistent with the QLD AUSRIVAS sampling protocols. AARC (2010) only live picked samples for 20 minutes, which is not in keeping with DNRW (2001) protocols. Sampling by both AARC and E3 did not cover edge habitat and, therefore, neglected one of the more commonly occurring aquatic habitats present in waterways within the study area. Edge habitat was the primary focus of this study and the ALS (2011) study as it was present at every site and would normally be expected to contain most of the same species present in pool bed habitat. Further, in the reaches sampled as part of this study and the ALS (2011) study, riffle habitat does not exist, whereas in reaches along the rail corridor sampled by E3 (2010a) closer to the coast, riffle habitat was present. Despite these differences, broad level comparisons in diversity and composition were made between the results obtained from this study and those of the other abovementioned studies (see below).

3.2.2 Diversity

Taxa Richness

Parsons Brinckerhoff (2009) reported that macroinvertebrate diversity in the Burdekin Basin is considered relatively low and that macroinvertebrate communities in this catchment are dominated by generalist species with few pollution sensitive taxa. However, several previous studies have recorded a relatively high diversity of macroinvertebrate taxa, with over 50 taxa (Pearson, 1991; AARC, 2010; E3 2010a). Note that sampling by AARC (2001) took place over two years and covered 19 sites, while sampling by E3 (2010a) covered 13 sites spread across a broad geographic area and multiple habitat types. A total of 845 individuals belonging to 51 taxa were collected from 9 sites as part of the single sampling round carried out as part of this study. While consistent with that recorded for most other studies, it is much less than the 78 taxa recorded from 12 sites during a one off sampling round in the neighbouring SGCP EIS study area by ALS (2011). It should be noted, however, that the enhanced diversity recorded as part of the ALS (2011) study was most likely the result of the extended flows in the study area following the big wet season in 2010/11 and the fact that a composite habitat sample from a shallow sand bar with water flowing over the top was taken as part of that study, which would have yielded additional taxa not commonly found in edge habitat. As such, the diversity results recorded in this study are probably more typical for the study area.

Figure 3-14 shows the taxa richness results for samples collected at each GCP SEIS study and SGCP EIS study sampling site and compares those results against the expected range for taxa richness from edge habitat in Central Queensland waterways based on data presented in DERM (2009a). Two sites on Lagoon Creek (LC-3 and Alt-AQ14) exceeded the expected range for taxa richness. While the SGCP EIS aquatic ecology survey carried out by ALS (2011) recorded a greater overall macroinvertebrate diversity, none of the edge habitat samples collected as part of that study exceeded the expected range for taxa richness. At the same time, four of the nine edge habitat samples collected in this study had lower than expected taxa richness. Three of these samples were from dams/wetlands, which commonly feature lower macroinvertebrate diversity than streams, while the other sample was from Malcolm Creek, a narrow, turbid, silt-clay dominated creek that lacked any riparian canopy cover and was surrounded by extensively cleared pastoral land.

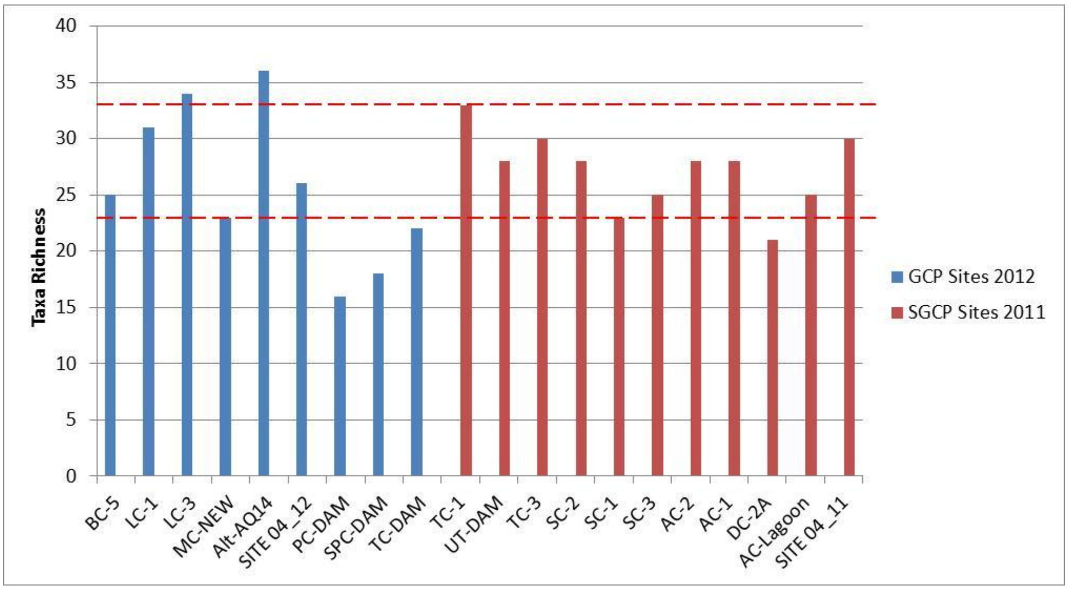

Figure 3-14: Variation in taxa richness according to site and study. Dashed lines represent 20% percentile and 80th percentile ranges for taxa richness in relation to Central Queensland edge habitat given in DERM (2009a)

3.2.3 Distribution

Occurrence

Dominant taxa recorded from the study by Parsons Brinckerhoff (2009) included mayfly nymphs (family Caenidae), midge larvae (subfamily Chironominae), diving beetles (family Dyticidae) and freshwater shrimps (family Atyidae). A number of these macroinvertebrate families were also found to be widespread and abundant throughout the Galilee Basin (AARC, 2010; E3, 2010a). For sites monitored as part of this study and the SGCP EIS by ALS (2011), the most widespread macroinvertebrate taxa were Chironominae, Dytiscidae and Leptoceridae, which occurred in edge habitat at all 20 of the sites sampled. Other commonly occurring taxa included mayflies belonging to family Baetidae. In that respect, the results of this study are in broad agreement with previous studies, albeit that freshwater shrimps (Atyidae) were only recorded from 6 out of the 20 sites where edge samples were collected, so were less well represented compared to samples collected as part of previous studies.

The taxa that were recorded from 2 or fewer sites including at least one of the sites sampled as part of this study are shown in Table 3-6. All sites besides PC-Dam and SPC-Dam hosted examples of such taxa. However, sites on Lagoon Creek (LC-1, LC-3 and Alt-AQ14) hosted the greatest range of such taxa, which is important in the context of Lagoon Creek being a potential receiving water for the GCP mine. Furthermore, based on SIGNAL sensitivity ratings for these taxa presented in Table 3-6, Lagoon Creek sites hosted the most pollution-sensitive of these less common taxa (e.g. Leptophlebiidae and Scirtidae) and these would be potentially more vulnerable to the effects of mine affected water runoff/release than other taxa. Many of the other less common taxa recorded during the near mine survey have lower SIGNAL sensitivity ratings indicating that they are more tolerant of pollution.

Other results of interest include the occurrence of Temnocephalidae exclusively within wetland habitat at TC-Dam (which might be a distinguishing feature of wetland habitat in the study area) and the occurrence of Tipulidae (crane fly larvae) exclusively at BC-5. *Ad hoc* collection of adult crane flies by Tipulidae taxonomist Zac Billingham (GHD) while taking part in the first round of stygofauna sampling for the GCP SEIS revealed the following Tipulidae species:

- *Molophilus (Molophilus) strix;*
- *Molophilus (Molophilus) maigamaigawa;*
- *Gonomyia (Leiponeura) cairnensis;*
- *Gonomyia (Leiponeura) brevivena;*
- *Gonomyia (Leiponeura) wunda;*
- *Symplecta (Trimicra) pilipes;*
- *Idiocera (Idiocera*) sp.;
- *Helius (Helius) communis;*
- *Dicranomyia (Dicranomyia) illingworthi; and*
- *Conosia irrorata*

From Zac's extensive data collection, this was the first time he had seen *D. illingworthi* and the first time he had collected any species from the genus *Idiocera*. Unfortunately the *Idiocera* was a female so he could not confirm the species, but the only known species in Australia (*I. collessi*) has published locations through Western Australia and coastal NT, so this find is either a new population of *I. collessi* or potentially a new species. That specimen, was however, collected from Emerald so may not necessarily be present within the GCP EPC and surrounds. According to Zac, the remaining Tipulidae species are relatively widespread in QLD and other states. Nonetheless, this information puts the find of Tipulidae being restricted to BC-5 in context, as the specimen collected could potentially be from either of the two rarer Tipulid taxa outlined above.

It should also be pointed out that, while not collected from edge habitat macroinvetebrate samples, a single specimen of a fairy shrimp (Anostraca) was collected from site MC-new as part of the electrofishing exercise at that site. It too was not found at any other site. Fairy shrimps occur in temporary freshwaters including, pools, ditches, rock holes, and ponds. They are planktonic filter feeders, using a groove between the bases of the thoracic legs to filter microscopic organisms from the water. Their eggs are resistant to desiccation and are activated by the presence of water (MDFRC website, accessed 5/10/2012). Given the above, it is not surprising that they occurred in Malcolm Creek as this was one of the more highly ephemeral sites sampled. While not uncommon, fairy shrimp have rarely been collected by GHD staff as part of our extensive macroinvertebrate survey work, so this represents somewhat of a novel find.

Table 3-5: Level of occurrence for various taxa among the samples collected as part of the GCP SEIS and SGCP EIS studies.

Family/Sub-family	Number Sites Recorded From	% Occurrence
Chironominae	20	100
Dytiscidae	20	100
Leptoceridae	20	100
Baetidae	19	95
Corixidae	19	95
Hydraenidae	19	95
Hydrophilidae	19	95
Notonectidae	19	95
Acarina sp.	18	90
Tanypodinae	18	90
Copepoda	17	85
Libellulidae	17	85
Pleidae	17	85
Caenidae	15	75
Nepidae	15	75
Ostracoda	15	75
Veliidae	15	75
Ceratopogonidae	14	70
Cladocera	14	70
Hydrochidae	14	70
Ancylidae	13	65
Coenagrionidae	13	65
Parastacidae	13	65
Culicidae	12	60
Ecnomidae	10	50
Gyrinidae	10	50
Gomphidae	9	45
Oligochaeta	9	45
Planorbidae	8	40
Orthocladiinae	7	35
Atyidae	6	30
Gerridae	6	30
Lymnaeidae	6	30
Aeshnidae	5	25
Elmidae	5	25
Sperchidae	5	25
Sundatelphusidae	5	25
Corduliidae	3	15
Hydrometridae	3	15
Mesoveliidae	3	15
Physidae	3	15
Tabanidae	3	15
Belostomatidae	2	10
Ephemeroptera sp.	2	10

Glossiphoniidae	2	10
Leptophlebiidae	2	10
Limnichidae	2	10
Lindeniidae	2	10
Noteridae	2	10
Ochteridae	2	10
Zygoptera sp.	2	10
Chaoboridae	1	5
Hyriidae	1	5
Lestidae	1	5
Palaemonidae	1	5
Philopotamidae	1	5
Protoneuridae	1	5
Scirtidae	1	5
Simuliidae	1	5
Sphaeriidae	1	5
Temnocephalidae	1	5
Tipulidae	1	5

Table 3-6: Distribution of least common taxa among GCP SEIS sampling sites

Family/Sub-family	SIGNAL Sensitivity rating	BC-5	LC-1	LC-3	MC-NEW	Alt- AQ14	SITE 04	PC-DAM	SPC-DAM	TC-DAM
Belostomatidae	1	0	0	0	0	0	4	0	0	0
Leptophlebiidae	8	0	2	1	0	0	0	0	0	0
Hyriidae	5	0	0	0	0	1	0	0	0	0
Lestidae	1	0	0	0	2	0	0	0	0	0
Palaemonidae	4	0	0	0	0	2	0	0	0	0
Protoneuridae	4	0	0	0	0	1Sit	0	0	0	0
Scirtidae	6	0	1	0	0	0	0	0	0	0
Temnocephalidae	5	0	0	0	0	0	0	0	0	3
Tipulidae	5	1	0	0	0	0	0	0	0	0

Figure 3-15: Fairy shrimp (Anostraca) captured at MC-New.

3.2.4 Community Condition

PET Richness and PET Taxa

PET richness refers to the proportional representation of key macroinvertebrate taxa belonging to the Plecoptera, Ephemeroptera and Trichopetera groups measured according to the number of PET taxa recorded in a given sample. At a broad level, these orders have been established to be among the more sensitive to water quality (although at the family level within these orders, sensitivity to water pollution varies considerably). Hence, PET richness represents a simple metric to assess the condition of macroinvertebrate communities in relation to water quality and habitat conditions.

Five PET taxa were recorded from sites sampled as part of the GCP near mine sampling program carried out in April 2012. These included three Ephemeroptera families (Baetidae, Caenidae and Leptophlebiidae) and two Trichoptera families (Ecnomidae and Leptoceridae). No Plecoptera families were recorded, but this was expected, because Plecoptera prefer cool, clear water mountain streams not of the sort present in the study area. All five PET taxa outlined above were also recorded as part of the SGCP EIS baseline survey (ALS, 2011). That study recorded an additional three PET taxa (Hydrobiosidae, Hydropsychidae and Philopotamidae), but these are all rheophilic taxa (preference for flowing streams) and were only recorded from Alpha Creek in an area where there was surface flow over shallow sand bars. No such habitat was present at the sites sampled as part of this study as waterbodies at each site were either isolated pools or dams. As such, these taxa, while they could possibly be present in the GCP area at times when surface flow is apparent, would not be expected from the samples collected as part of this study. The study by AARC (2010) recorded 6 PET taxa including all five recorded in this study and Hydropsychidae, which was recorded as part of the SGCP EIS baseline study (ALS, 2011).

The Queensland Water Quality Guidelines (DERM, 2009a) present data on the expected range for PET taxa from edge habitat in Central Queensland based on the 20th and 80th percentiles for

PET richness in relation to 21 reference sites sampled by DEHP. PET richness data are assessed in relation to this range in Figure 3-16 below.

In this study, PET richness values recorded fell within the expected range for all sites except SPC-Dam and PET richness for sites BC-5, Site04 and TC-Dam was at the lower end of the expected range. This accords with results from the SGCP EIS baseline study where, again, most sites recorded PET richness values within the expected range for edge habitat in Central Queensland (Figure 3-16). The only exception there was the higher than expected PET richness recorded at AC-2, but that result was influenced by the rheophilic PET taxa present in Alpha Creek which was flowing at the time. The study by AARC (2010) found that most sites recorded a PET richness of 1 and the maximum PET richness recorded for any of the sites they sampled was 3. It should be pointed out that that study only sampled pool bed habitat, so: a) results are not directly comparable with those from this study and that of ALS (2011) for which PET richness relates to edge habitat; and b) there are no guideline ranges for PET richness in relation to pool bed samples given in DERM (2009a). Further, pool bed habitat is well known to host fewer PET taxa and macroinvertebrate taxa in general compared to edge habitat, so the results presented in AARC (2010) are not surprising.

The sites with relatively low PET richness from both studies were wetlands (TC-Dam), lagoons (Site04 in 2012), dams (SPC-Dam), or isolated pool habitat in narrow streams (BC-5 and SC-1). PET richness in wetlands, dams and lagoons is expected to be lower than stream habitat due to lack of flushing and the often high levels of organic matter, which can subsequently lead to low dissolved oxygen levels. For sites TC-Dam and SPC-dam, diel (24h cycle) fluctuations in dissolved oxygen are likely to have been exacerbated by the dense growth of aquatic macrophytes as dissolved oxygen sags (reduced overnight minima) would be expected at night time when respiration rates exceed photosynthesis rates. Water quality conditions in isolated pools can also be diminished due to lack of flushing, particularly where pools are receding and evapo-concentration of nutrients, salts and metals is occurring. Further, site BC-5 featured turbid water and eroded banks due to cattle access. These factors would possibly explain the low PET richness recorded at sites BC-5 and SC-1. However, it should be noted that MC-New, PC-Dam, SC-2, SC-3 and DC-2a were also sites represented by isolated pool habitat with receding, turbid water and eroded banks and beds due to cattle access, yet these sites recorded relatively high PET richness values. Hence, PET richness in such habitat is not universally low, perhaps due to the relatively low sensitivity of the PET taxa present in the study area to degraded water quality and habitat conditions (discussed further in section 3.2.1).

Within the GCP Project area, sites on Lagoon Creek (LC-1, LC-3 and Alt-AQ14) recorded among the highest PET richness. This is important given that Lagoon Creek is the main potential receiving water for mine runoff/waste water releases.

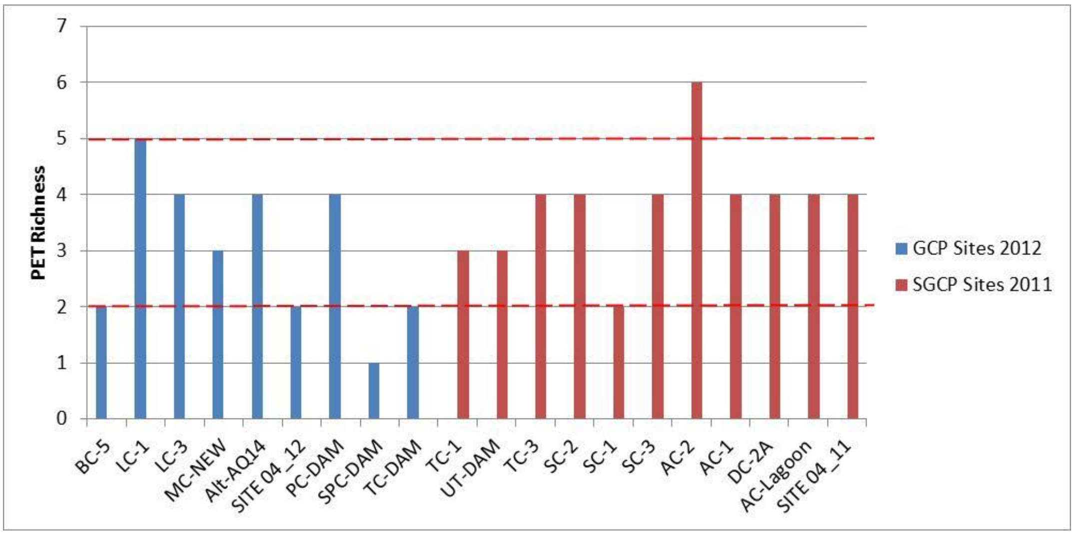

Figure 3-16: Variation in PET richness according to site and study. Dashed lines represent 20% percentile and 80th percentile ranges for PET richness in relation to Central Queensland edge habitat given in DERM (2009a)

SIGNAL 2 Scores and Sensitive Taxa

SIGNAL2 scores (Stream Invertebrate Grade Number Average Level - Version 2) (Chessman, 2003) represent a scoring system for macroinvertebrates derived from known responses of various macroinvertebrate families and orders to water pollution. This score represents the average of the range of SIGNAL sensitivity scores associated with various families and orders collected from a given sample. While there are no absolute critical thresholds for determining condition status based on this metric, scores of 4.5 or above are generally considered to represent good condition as they indicate that on average there are a relatively high proportion of taxa present within that sample that are pollution-sensitive. However, as with taxa richness and PET richness, guideline ranges for SIGNAL2 are given for edge habitat samples from Central Queensland waterways in DERM (2009a) and these were used as a gauge of the current condition for sites sampled as part of this study and that of ALS (2011) for the neighbouring SGCP. Note that the study by AARC (2010) also applied the SIGNAL2 scoring system, but they used the biplot system developed by Chessman (2003) to interpret these data. This approach was not used as part of this study because the guideline range given in DERM (2009a) supersedes any other evaluation system using SIGNAL2 scores and, because the values used to assign condition assessment quadrats in the biplot method can at times be fairly arbitrary.

Of the edge habitat sampled as part of this study and that by ALS (2011), samples from 50% of sites recorded SIGNAL2 scores within the expected range for Central Queensland. None of the SIGNAL2 scores recorded exceeded 3.75. This finding suggests that the edge habitat macroinvertebrate community of the study area is dominated by taxa with low to moderate sensitivity to degraded water quality and habitat conditions. This finding is not unexpected because the waterways sampled were ephemeral in nature and, as such, wider tolerance ranges are required to survive the highly variable conditions. Further, samples included those collected from dams, wetlands and lagoons, where lack of flushing and an often low dissolved oxygen regime do not favour macroinvertebrate taxa that are sensitive to degraded water quality. The study by AARC (2010) recorded SIGNAL2 scores between 3.75 and 4 at a number of sites. However, some of those scores corresponded to sites with low taxa richness and, as such, those sites were assigned to the most degraded category based on the Chessman (2003) biplot assessment system.

In this study, sites on Lagoon Creek (LC-1, LC-3 and Alt-AQ14) recorded among the highest SIGNAL2 scores. Interestingly enough, AARC (2010) found that Lagoon Creek macroinvertebrate samples had the combination of high taxa richness and SIGNAL2 scores and, as such, were rated as being in the best condition based on the biplot assessment system of Chessman (2003). Combined, these results suggest that the Lagoon Creek macroinvertebrate community would be comparatively more vulnerable to the impacts of water quality and habitat degradation associated with runoff/releases from the GCP. Once again, this is an important finding as Lagoon Creek is the main receiving water environment in relation to the GCP.

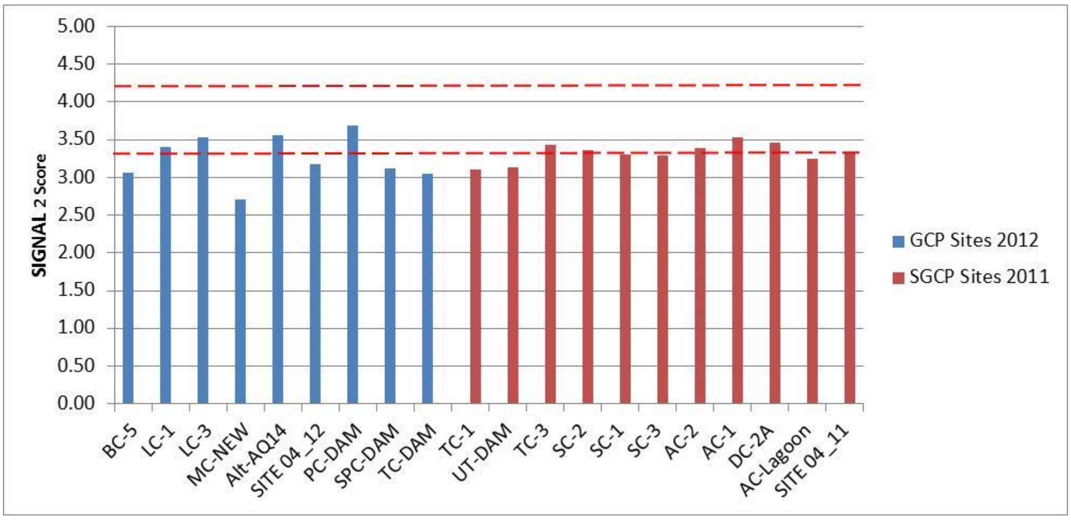

Figure 3-17: Variation in SIGNAL 2 Score according to site and study. Dashed lines represent 20% percentile and 80th percentile ranges for SIGNAL 2 Score in relation to Central Queensland edge habitat given in DERM (2009a)

There were only four taxa recorded in this study that had recorded SIGNAL sensitivity ratings > 5 (indicating above average pollution sensitivity). These were Acarina sp., Leptoceridae and Scirtidae, which have a SIGNAL sensitivity score of 6 and Leptophlebiidae, which has a SIGNAL sensitivity score of 8. As discussed above in relation to PET taxa, families including Hydrobiosidae, Hydropsychidae and Philopotamidae may also occur in the Project area at times when there is flowing water present. These taxa also have high SIGNAL sensitivity scores. As mentioned in section 3.2.3, Leptophlebiidae were only recorded from Lagoon Creek sites. Acarina and Leptoceridae, however, were found at every site. Nonetheless, this result further underlines the vulnerability of the Lagoon Creek macroinvertebrate community to change associated with runoff/releases from the GCP.

AUSRIVAS O/E50 and Bandings

Another means of assessing macroinvertebrate community health that was used as part of this study was the QLD AUSRIVAS model. This model uses site-specific predictions of the macroinvertebrate fauna expected to be present in the absence of environmental stress based on site location and a set of predictor variables (physical and chemical characteristics which cannot be influenced due to human activities, e.g. altitude). The QLD AUSRIVAS model was used to assess whether the assemblages sampled at each site were representative of what would be expected based on those location and habitat conditions. The QLD AUSRIVAS model produces two main outputs:

- The O/E50 score, which is a ratio of the observed (O) fauna to the expected (E) fauna and can range from zero, when none of the expected taxa are found at a site, to one, when all the expected taxa are found. Values can be greater than one if more families are found at the site than predicted by the model; and
- 'Health' rating bands based on the O/E50 scores derived from the model. These bandings provide evidence of whether or not the diversity and makeup of the macroinvertebrate assemblages has diminished, potentially due to anthropogenic influences.

The specific AUSRIVAS model used for this study was the Queensland Coastal Autumn edge habitat model. This was based on the location of the study being east of the Great Dividing Range, the samples having commonly been collected from riffle and edge habitat, and sampling rounds having been carried out under seasonal conditions approximating autumn. The outputs from this model are given below in Table 3-7. It is important to note, however, that the QLD AUSRIVAS model was not developed with ephemeral stream habitat in mind, so AUSRIVAS results presented in this study need to be interpreted with caution.

Ten of the 20 samples collected from this study and the SGCP EIS baseline study (ALS, 2011) study combined were rated as AUSRIVAS Band A (similar to reference system). In other words, the edge habitat samples from these sites contained the vast majority of taxa that were expected based on AUSRIVAS model reference site data and the site location and conditions. This implies that the edge habitat macroinvetebrate communities at those sites were healthy at the time of sampling. The remaining samples recorded an AUSRIVAS band B (significantly impaired) rating, which indicates that there were fewer taxa than expected in those samples, potentially due to anthropogenic disturbance. The study area is heavily utilised for agriculture and many of the sites sampled were dams or had been exposed to direct cattle access to the waterway and these factors would potentially explain the significantly impaired rating for some of these sites. However, many of the sites were also isolated pools, so the ephemeral nature of the systems sampled probably partly accounts for the significantly impaired rating recorded for those sites.

AUSRIVAS results confirmed that there were 15 taxa expected to be present in all edge habitat samples collected from the current study that were missing in at least one of those samples (see Table 3-8). These taxa mainly had low SIGNAL sensitivity ratings, so their absence is unlikely to be explained by water quality or habitat degradation. Among these 15 taxa, the ones missing from the majority of samples were shrimps and prawns (Atyidae and Palaeomonidae), water striders (Gerridae) and narrow-winged (or pond) damselfies (Coenagrionidae). The absence of shrimps and prawns may reflect a lack of algal production in the systems sampled as this accords with visual observations made while in the field (Jamie Corfield, GHD, pers. comm.). The absence of water striders from the sites sampled was also noted while in the field, but this taxon is also somewhat difficult to catch, so its absence from some sites may be partly a reflection of reduced catchability. The absence of Coenagrionidae may reflect a lack of submerged vegetation at many of the sites sampled as these damselflies are often found in association with such habitat (MDFRC website:

http://www.mdfrc.org.au/bugguide/display.asp?type=5&class=17&subclass=&Order=5&family=94&couplet=0, accessed 10/10/12). This would not explain their absence from SPC-Dam, however, as macrophyte cover was abundant and, while it was mainly emergent species that were present, those species would still provide structural habitat as attachment sites/shelter for Coenagrionidae.

Table 3-7: AUSRIVAS O/E50 Scores for Edge habitat samples collected as part of the GCP SEIS and the SGCP EIS studies. Results based on the Queensland Coastal Autumn Edge AUSRIVAS model.

Study	Site	OE50	Band
GCP SEIS	BC-5	0.69	B
GCP SEIS	LC-1	0.78	B
GCP SEIS	LC-3	1.06	A
GCP SEIS	MC-NEW	0.71	B
GCP SEIS	Alt AQ14	1.2	A
GCP SEIS	SITE 04	0.85	A
GCP SEIS	PC-DAM	0.78	B
GCP SEIS	SPC-DAM	0.64	B
GCP SEIS	TC-DAM	0.71	B
SGCP EIS	TC-1	0.99	A
SGCP EIS	UT-DAM	0.92	A
SGCP EIS	TC-3	0.99	A
SGCP EIS	SC-2	0.85	A
SGCP EIS	SC-1	0.69	B
SGCP EIS	SC-3	0.92	A
SGCP EIS	AC-2	0.77	B
SGCP EIS	AC-1	1.08	A
SGCP EIS	DC-2A	0.77	B
SGCP EIS	AC-Lagoon	0.78	B
SGCP EIS	SITE 04 (2011)	0.96	A

Table 3-8: List of taxa with a greater than 50% likelihood of being present that were missing from certain edge habitat samples collected as part of this study.

Taxa	SIGNAL 2 Sensitivity	Number of Sites Missing From
Oligochaeta	2	5
Acarina	6	1
Atyidae	3	6
Palaemonidae	4	8
Hydrophilidae	2	1
Ceratopogonidae	4	4
Tanypodinae	4	1
Baetidae	5	1
Caenidae	4	4
Veliidae	3	2
Gerridae	4	6
Corixidae	2	1
Pleidae	2	2
Ceonagrionidae	2	5
Libellulidae	4	1

3.2.1 Spatio-Temporal Variability

Variation between Studies

The NMDS plot in Figure 3-18 shows clear separation of samples in ordination space according to the study they relate to. However, similarity bandings based on cluster analysis shown in this plot indicate that samples from the two studies were all within the 60% similarity banding, indicating that 60% of the taxa collected were common to both studies. Despite this, results of a one-way ANOSIM showed that there was a significant difference in macroinvertebrate taxonomic composition between the two studies (Global R =0.304, p =0.01).

As different sites and catchments were sampled as part of the two studies, with little overlap (apart from Site04 and sampling in the Tallarenha Creek catchment), it is not possible to establish whether those differences relate to differences between the sites/catchments sampled or to temporal variation in taxonomic composition between August 2011 and April 2010. However, given that the two study areas are adjoining and that the two studies sampled a broadly similar array of waterbody types, it is more likely that these results mainly reflect the latter.

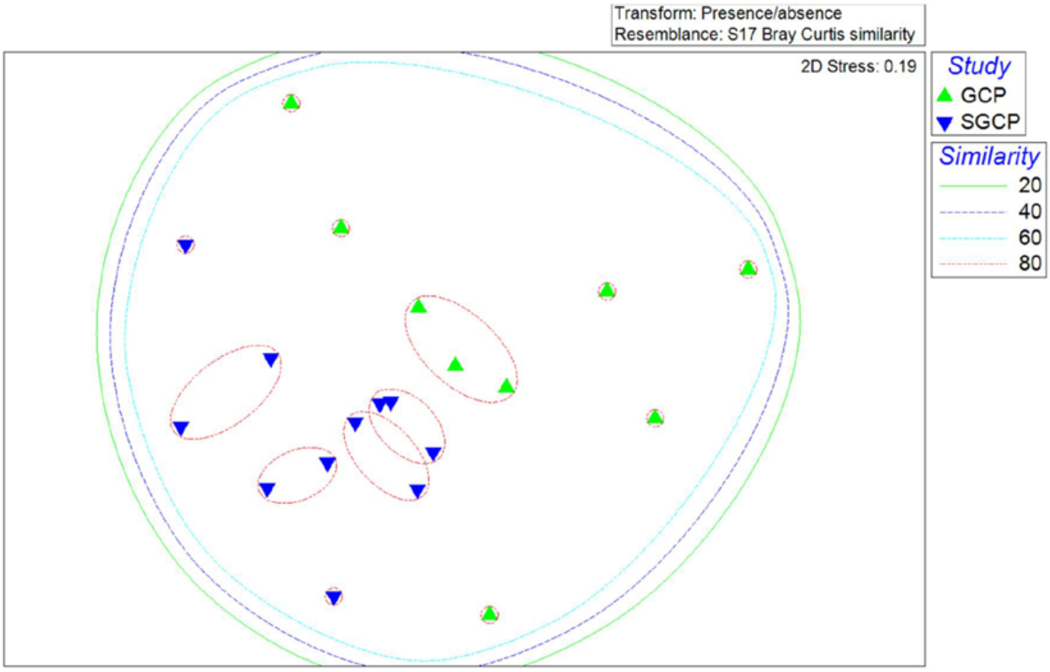

Figure 3-18: NMDS showing variation in macroinvertebrate taxonomic composition among samples collected as part of this study (GCP SEIS) and as part of the SGCP EIS study.

The results of SIMPER analysis presented in Table 3-9 show the species that contributed to dissimilarity between samples collected as part of this study and those collected as part of the ALS (2011) study. Eleven out of the forty taxa listed in this table were only recorded from one study. Taxa collected in this study, but not in the study by ALS (2011) included:

- Lymnaeidae (snail);
- Sperchidae (water beetle);
- Sundatelphusidae (freshwater crab); and
- Leptophlebiidae (mayfly).

Taxa collected only from the ALS (2011) study included:

- Elmidae (riffle beetle);
- Corduliidae (emerald dragonflies);
- Lindeniidae (tiger dragonflies);
- Limnichidae (minute marsh-loving beetles);
- Glossiphoniidae (leaches);
- Ochteridae (shore bugs);
- Noteridae (burrowing water beetles); and
- Unidentified Ephemeroptera (mayflies).

As above, it is unclear whether or not this pattern of presence/absence relates to differences in waterways sampled or to temporal variability in macroinvertebrate community composition within the study area. Certainly the presence/absence of insects such as dragonflies and mayflies that have aquatic larval stages and flying adults is determined partly on the timing of sampling relative to lifecycle, so differences in the timing of sampling between the two studies may explain the observed patterns for these taxa. With respect to Elmidae, only the ALS (2011) study involved sampling in streams with surface flow. Elmidae are rheophilic (flow-loving, as their common name would suggest), so would not be expected to be found in isolated pools, lagoons and dam habitats sampled as part of this study.

Table 3-9: Results of SIMPER analysis highlighting which taxa contributed most to dissimilarity between samples collected as part of his study (April 2012) abs as part of the SGCP EIS study (August 2011).

Taxa	GCP Average Abundance	SGCP Average Abundance	Average Dissimilarity	Dissimilarity / SD	Contrib. %	Cumulative %
Cladocera	0.33	1	1.3	1.36	3.8	3.8
Lymnaeidae	0.67	0	1.23	1.37	3.6	7.4
Coenagrionidae	0.44	0.82	1.09	1.06	3.18	10.58
Ecnomidae	0.33	0.64	1.06	1.07	3.1	13.68
Gyrinidae	0.67	0.36	1.05	1.07	3.06	16.74
Orthocladiinae	0.11	0.55	1.04	1.05	3.03	19.78
Sperchidae	0.56	0	1.01	1.09	2.94	22.72
Gomphidae	0.33	0.55	1	1	2.93	25.64
Sundatelphusidae	0.56	0	0.99	1.1	2.88	28.52
Culicidae	0.56	0.64	0.96	0.95	2.8	31.32
Oligochaeta	0.44	0.45	0.95	0.97	2.77	34.09
Ostracoda	0.56	0.91	0.95	0.9	2.76	36.84
Planorbidae	0.44	0.36	0.92	0.95	2.68	39.52
Parastacidae	0.78	0.55	0.91	0.93	2.66	42.19
Caenidae	0.56	0.91	0.91	0.9	2.66	44.84
Nepidae	1	0.55	0.9	0.89	2.63	47.48
Ceratopogonidae	0.56	0.82	0.9	0.91	2.63	50.1
Ancylidae	0.67	0.64	0.89	0.89	2.61	52.71
Hydrochidae	0.67	0.73	0.86	0.85	2.52	55.23
Elmidae	0	0.45	0.86	0.89	2.5	57.73
Gerridae	0.33	0.27	0.79	0.84	2.29	60.02
Atyidae	0.33	0.27	0.78	0.84	2.28	62.31
Veliidae	0.78	0.73	0.74	0.76	2.16	64.47
Aeshnidae	0.33	0.18	0.74	0.79	2.15	66.62
Copepoda	0.67	1	0.73	0.7	2.14	68.76
Pleidae	0.78	0.91	0.58	0.6	1.69	70.45
Physidae	0.22	0.09	0.52	0.6	1.53	71.98
Tabanidae	0.22	0.09	0.52	0.6	1.51	73.49
Corduliidae	0	0.27	0.51	0.6	1.49	74.98
Libellulidae	0.89	0.82	0.5	0.57	1.45	76.43

Mesoveliidae	0.11	0.18	0.49	0.57	1.43	77.86
Hydrometridae	0.11	0.18	0.47	0.57	1.37	79.23
Zygoptera sp.	0.11	0.09	0.38	0.46	1.1	80.33
Leptophlebiidae	0.22	0	0.37	0.53	1.09	81.42
Lindeniidae	0	0.18	0.36	0.46	1.06	82.48
Acarina sp.	0.89	0.91	0.36	0.47	1.06	83.54
Tanypodinae	0.89	0.91	0.36	0.47	1.05	84.59
Limnichidae	0	0.18	0.36	0.46	1.04	85.62
Glossiphoniidae	0	0.18	0.35	0.46	1.03	86.66
Belostomatidae	0.11	0.09	0.34	0.47	1.01	87.66
Ephemeroptera sp.	0	0.18	0.34	0.46	1	88.67
Ochteridae	0	0.18	0.34	0.46	1	89.67
Noteridae	0	0.18	0.32	0.47	0.94	90.61

Variation between Catchments

The NMDS plot in Figure 3-19 shows variation in macroinvertebrate taxonomic composition between catchments. As above, apart from Site04 on Saltbush Creek and sampling in the Tallarenha Creek catchment, the catchments sampled differed between this study and the SGCP EIS baseline study carried out by ALS (2011). As such, some of the patterns in this graph are likely to reflect differences according to sampling event than true differences between catchments. Nonetheless, Figure 3-19 shows that there was some grouping according to catchment sampled for catchments such as Lagoon Creek, Sapling Creek and Alpha Creek, and to a lesser degree, Tallarenha Creek. A one-way ANOSIM confirmed there were significant differences in macroinvertebrate taxonomic composition between catchments (Global R =0.515, p =0.01), but because many catchments only had one site sampled, further investigation as to which catchments were significantly dissimilar was not possible.

With regards to catchments sampled in both study periods, there were only two samples from Saltbush Creek (one per study), but the separation of these two samples in NMDS ordination space in Figure 3-19 provides an indication that macroinvertebrate taxonomic composition at this site underwent change between August 2011 and April 2012. Direct comparisons between results for Tallarenha Creek are not possible as the sites sampled in August 2011 as part of the SGCP EIS study were all stream habitat sites, whereas the one Tallarenha Creek site sampled in April 2012 (TC-Dam) was a wetland lagoon. For that reason, comparisons based on waterbody type provide more meaningful results than comparisons between catchments (see below).

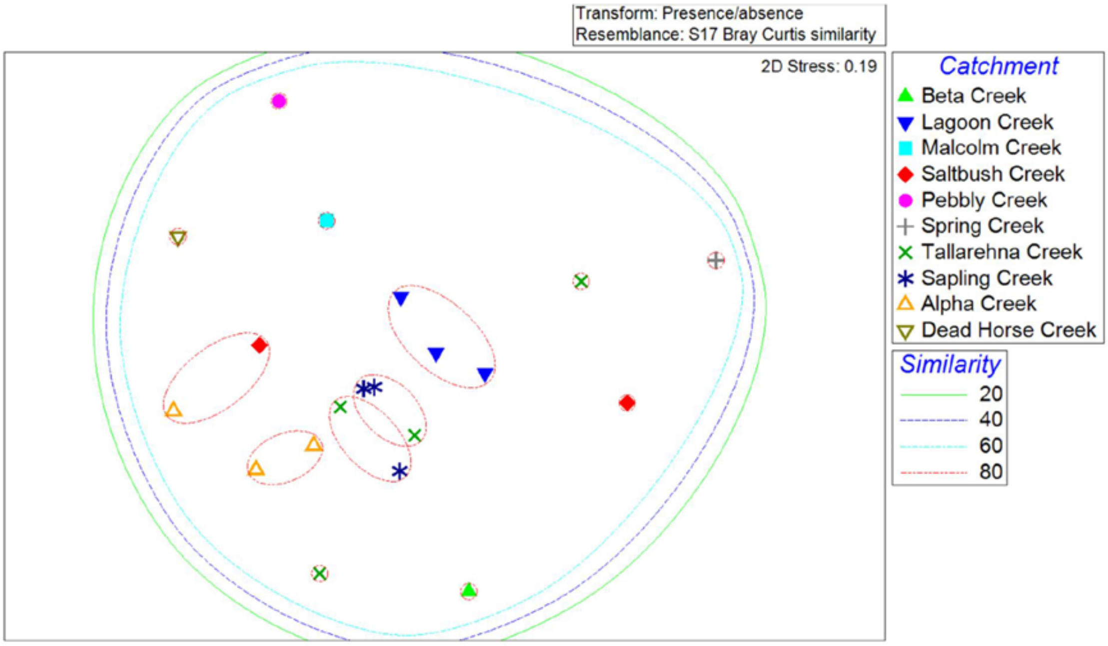

Figure 3-19: NMDS showing variation in macroinvertebrate taxonomic composition among samples collected from catchments sampled as part of this study (GCP SEIS) and as part of the SGCP EIS study.

Variation between Waterbody Types

The NMDS plot in Figure 3-20 shows variation in the macroinvertebrate taxonomic composition between the waterbody types sampled. For the purpose of this study, sites were assigned to one of the following waterbody type categories:

- Turbid, narrow, silt-clay dominated streams (e.g. Beta Creek, Malcolm Creek, Dead Horse Creek; Tallarenha Creek sites TC-1 and TC-3)
- Lagoon (Site04, TC-Dam, AC-Lagoon, TC-Dam);
- Dam (TC-2, PC-Dam, SPC-Dam);
- Clear water, isolated pool stream (all Lagoon Creek sites); and
- Clearing flowing stream (AC-1 and AC2).

While there are a limited number of samples per waterbody type and the patterns present in Figure 3-20 are partly a reflection of between study/sampling event variability, patterns in this NMDS plot suggest that there is some degree of habitat association according to waterbody type, particularly with respect to waterbody types other than dams and lagoons. Results of ANOSIM confirm this (Global R =0.349, p=0.01%). Pairwise ANOSIM tests showed that this was driven mainly by differences between macroinvertebrate taxa in samples from dams and lagoons with those from turbid, narrow, silt-clay dominated streams. As the latter were often characterised by isolated pool habitat, such differences are not necessarily attributable to hydrological conditions. It is possible that the greater array of structural habitat in the form of tree roots and macrophytes found in the dams and lagoons sampled contributed to this result. A more likely explanation is that these statistical differences are simply artefacts of the high degree of variability within the dam and lagoon sample groups (as evident from the dispersion of samples relating to these two waterbody types in Figure 3-20). However, see discussion below in relation to results in Table 3-11 and Table 3-12. The high degree of dispersion for dam samples in this NMDS plot perhaps indicates that the taxonomic composition of dams is not predictable and varies from dam to dam, though it must be pointed out that this statement is based on a small number of dam habitat samples (n=3).

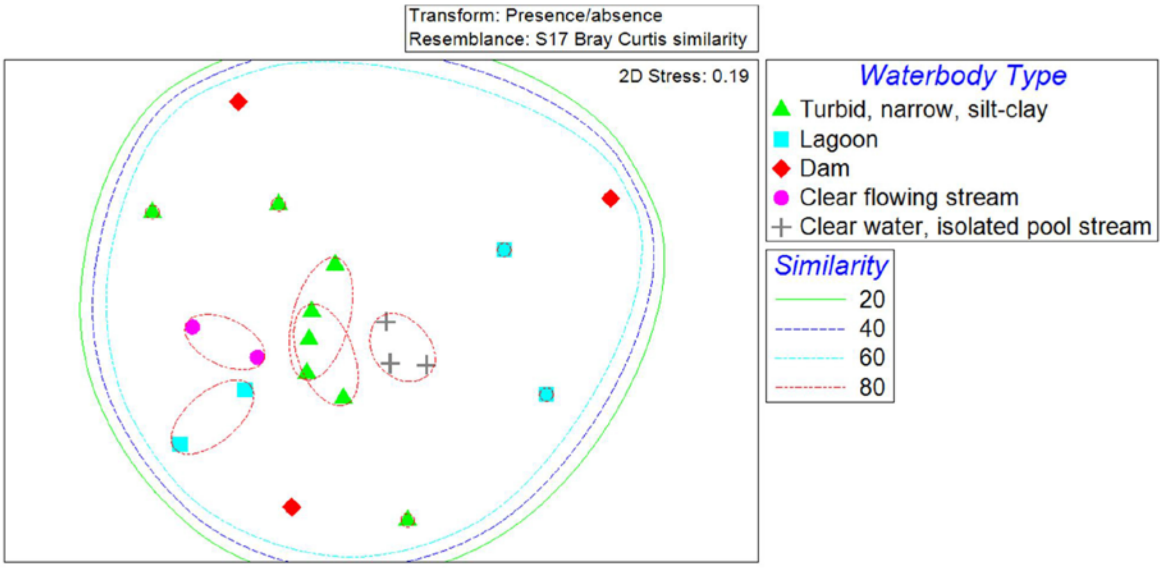

Figure 3-20: NMDS showing variation in macroinvertebrate taxonomic composition among samples collected from waterbody types sampled as part of this study (GCP SEIS) and as part of the SGCP EIS study.

Table 3-10: Results of pairwise ANOSIM tests comparing macroinvertebrate taxonomic composition between waterbody types sampled. Significant differences between waterbody types are shown as p values in red text.

Groups	R Statistic	P value	Possible Permutations	Actual Permutations	Number ≥ Observed
Turbid, narrow, silt-clay, Clear water, isolated pool stream	0.233	0.158	165	165	26
Turbid, narrow, silt-clay, Lagoon	0.421	0.016	495	495	8
Turbid, narrow, silt-clay, Dam	0.577	0.012	165	165	2
Turbid, narrow, silt-clay, Clear flowing stream	0.06	0.422	45	45	19
Clear water, isolated pool stream, Lagoon	0.093	0.343	35	35	12
Clear water, isolated pool stream, Dam	0	0.600	10	10	6
Clear water, isolated pool stream, Clear flowing stream	1	0.100	10	10	1
Lagoon, Dam	0.167	0.200	35	35	7
Lagoon, Clear flowing stream	0.25	0.133	15	15	2
Dam, Clear flowing stream	-0.125	0.700	10	10	7

While significant differences in macroinvertebrate taxonomic composition between narrow, turbid, silt-clay dominated stream habitat samples and those collected from lagoons and dams highlighted in Table 3-10 could well have been due partly to statistical artefact, the results of SIMPER analysis presented in Table 3-11 and Table 3-12 show that there were some taxa that contributed to dissimilarity which may have been present in one habitat and not the other due to ecological reasons. For instance, lagoons and dams featured Lymnaeid and Physid snails and Atyid shrimp, but these were not recorded from narrow, turbid, silt-clay dominated stream habitat sampled across the two studies. These taxa are algal grazers, so their absence from narrow, turbid, silt-clay dominated stream habitat is likely due to the reduced algal abundance in this habitat due to elevated turbidity. This finding is relevant to the GCP SEIS given that activities associated with the GCP could result in elevated turbidity in lagoon habitat downstream, which in turn, could lead to a decrease in the above algal grazer taxa.

Table 3-11: Results of SIMPER analysis showing which taxa contributed most to dissimilarity between samples collected from narrow, turbid, silt-lay dominated streams and those collected from lagoons.

Taxa	Narrow, turbid, silt-clay dom. streams	Lagoons	Average Dissimilarity	Dissimilarity / SD	Contrib. %	Cumulative %
Culicidae	0.88	0	1.68	2.53	4.94	4.94
Atyidae	0	0.75	1.42	1.68	4.19	9.12
Planorbidae	0.25	0.75	1.27	1.26	3.72	12.84
Cladocera	1	0.5	1.01	0.98	2.96	15.8
Lymnaeidae	0	0.5	1.01	0.98	2.96	18.76
Gyrinidae	0.5	1	1.01	0.98	2.96	21.71
Aeshnidae	0.13	0.5	1	0.98	2.94	24.66
Ostracoda	0.88	0.5	1	0.98	2.93	27.59
Caenidae	0.75	0.5	0.99	0.98	2.91	30.49
Ecnomidae	0.5	0.5	0.97	0.98	2.86	33.36
Gomphidae	0.5	0	0.96	0.97	2.83	36.18
Nepidae	0.75	0.5	0.96	0.97	2.82	39
Orthocladiinae	0.25	0.5	0.96	0.98	2.82	41.82
Veliidae	0.88	0.5	0.95	0.97	2.79	44.61
Gerridae	0.25	0.5	0.95	0.98	2.79	47.41
Oligochaeta	0.13	0.5	0.94	0.98	2.76	50.17
Coenagrionidae	0.63	0.75	0.88	0.87	2.58	52.75
Hydrochidae	0.63	1	0.78	0.76	2.3	55.05
Ancylidae	0.63	1	0.77	0.76	2.27	57.33
Ceratopogonidae	0.75	0.75	0.73	0.76	2.15	59.48
Parastacidae	0.75	0.75	0.73	0.76	2.13	61.61
Elmidae	0.38	0	0.7	0.76	2.04	63.65
Hydrometridae	0.38	0	0.69	0.76	2.04	65.69
Tanypodinae	0.88	0.75	0.63	0.66	1.86	67.55
Acarina sp.	0.88	0.75	0.62	0.66	1.82	69.37
Corduliidae	0.13	0.25	0.6	0.66	1.76	71.13
Lindeniidae	0.13	0.25	0.59	0.66	1.75	72.87
Noteridae	0.13	0.25	0.56	0.66	1.65	74.53
Pleidae	0.75	1	0.53	0.57	1.54	76.07
Tabanidae	0.25	0	0.53	0.57	1.54	77.62
Copepoda	1	0.75	0.52	0.57	1.54	79.16
Temnocephalidae	0	0.25	0.52	0.57	1.54	80.7
Libellulidae	0.75	1	0.5	0.57	1.48	82.18
Sundatelphusidae	0.25	0	0.5	0.57	1.48	83.66
Mesoveliidae	0.25	0	0.49	0.57	1.45	85.11
Glossiphoniidae	0	0.25	0.49	0.57	1.45	86.56
Hydraenidae	1	0.75	0.49	0.57	1.45	88.01
Belostomatidae	0	0.25	0.48	0.57	1.42	89.43
Corixidae	1	0.75	0.48	0.57	1.42	90.85

Table 3-12: Results of SIMPER analysis highlighting which taxa contributed most to dissimilarity between samples collected from narrow, turbid, silt-lay dominated streams and those collected from dams.

Taxa	Narrow, turbid, silt-clay dom. streams	Dams	Average Dissimilarity	Dissimilarity / SD	Contrib. %	Cumulative %
Cladocera	1	0.33	1.56	1.37	4.18	4.18
Copepoda	1	0.33	1.56	1.37	4.18	8.37
Culicidae	0.88	0.33	1.43	1.25	3.82	12.19
Ostracoda	0.88	0.33	1.43	1.25	3.82	16.01
Physidae	0	0.67	1.38	1.35	3.7	19.72
Oligochaeta	0.13	0.67	1.34	1.23	3.6	23.31
Hydrochidae	0.63	0	1.3	1.24	3.47	26.79
Parastacidae	0.75	0.33	1.24	1.14	3.32	30.11
Ceratopogonidae	0.75	0.33	1.24	1.13	3.31	33.42
Coenagrionidae	0.63	0.33	1.18	1.05	3.16	36.58
Ancylidae	0.63	0.33	1.16	1.04	3.1	39.68
Ecnomidae	0.5	0.33	1.09	0.96	2.92	42.6
Gomphidae	0.5	0	1.08	0.96	2.88	45.49
Gyrinidae	0.5	0	1.05	0.96	2.81	48.3
Pleidae	0.75	0.67	0.96	0.82	2.56	50.86
Caenidae	0.75	0.67	0.93	0.82	2.5	53.36
Veliidae	0.88	0.67	0.88	0.75	2.35	55.71
Nepidae	0.75	0.67	0.87	0.81	2.34	58.05
Orthocladiinae	0.25	0.33	0.86	0.81	2.3	60.35
Mesoveliidae	0.25	0.33	0.86	0.81	2.3	62.65
Zygoptera sp.	0.13	0.33	0.84	0.75	2.25	64.91
Planorbidae	0.25	0.33	0.82	0.83	2.21	67.11
Notonectidae	1	0.67	0.8	0.69	2.14	69.25
Elmidae	0.38	0	0.77	0.75	2.07	71.33
Hydrometridae	0.38	0	0.77	0.75	2.07	73.39
Baetidae	1	0.67	0.76	0.69	2.04	75.43
Lymnaeidae	0	0.33	0.76	0.69	2.04	77.48
Sperchidae	0	0.33	0.76	0.69	2.04	79.52
Aeshnidae	0.13	0.33	0.72	0.76	1.92	81.44
Corduliidae	0.13	0.33	0.72	0.76	1.92	83.37
Belostomatidae	0	0.33	0.62	0.69	1.66	85.03
Glossiphoniidae	0	0.33	0.62	0.69	1.66	86.69
Tabanidae	0.25	0	0.59	0.56	1.59	88.28
Libellulidae	0.75	1	0.57	0.56	1.52	89.8
Sundatelphusidae	0.25	0	0.57	0.56	1.52	91.31

3.3 Macrophytes

3.3.1 Diversity and Composition

A total of 55 aquatic-dependent flora species are known to the Burdekin Catchment (Inglis and Howell, 2009). Of these, 12 species live in the aquatic zone as opposed to the riparian zone. Limited data exist with regards to the macrophytes present within the study area. AARC (2011) did not record macrophytes as part of their study and only list desktop information for significant species known to the Burdekin Catchment. Sampling by E3 did not cover waterways within and adjacent to the GCP mine site adequately, but information on macrophyte prevalence and species composition for upper Belyando catchment sites was provided in the E3 (2010a) report. Sampling carried out as part of the SGCP EIS by Aquateco (2010) and ALS (2011) represents the only other data GHD is aware of.

Both E3 (2010a) and ALS (2011) found that the waterways of the study area lacked abundant macrophyte cover, with the exception of some of the dams surveyed. Emergent species were the dominant form represented. This is typical of what would be expected in an ephemeral stream habitat as emergent macrophytes are able to survive in the predominantly dry conditions and are less subject to severe fluctuations in water level in general. E3 (2010a) recorded Alteranthera sp. and Dirty Dora (*Cyperus difformis*) from upper-Belyando catchment sites.

In the adjoining SGCP Project area, Aquateco (2010) recorded six macrophytes from two sites, though that list included two native grass species (Brown Beetle Grass - *Diplachne fusca* and Umbrella Canegrass -*Leptochloa digitata*). Those species were present at many of the sites sampled by ALS (2011), but were not counted as macrophytes for that study based on the fact that that they occurred predominantly on the upper bank, well above the waterline. ALS (2011) recorded seven macrophyte species. These included two species of native, submerged macrophyte (Water Nymph -*Najas tenuifolia* and Red Water Milfoil - *Myriophyllum verrucosum)* at a single site (UT-Dam). They also include native emergent species such as Stream Club Rush (*Bolboschoenus fluviatilus*), Smart Weed (*Persicaria* sp.), Common Rush (*Juncus usitatus*) and Lomandra (*Lomandra* sp.).

In terms of exotic macrophyte species in the study area, Aquateco (2010) recorded two exotic macrophytes (Umbrella Sedge - *Cyperus eragrostis* and Jointed Rush- *Juncus articulatus*), while ALS (2011) recorded Paragrass (*Urochloa mutica*), a declared noxious ponded pasture weed, in the two dams they surveyed. E3 reported Noogoora Burr (*Xanthium pungens*) at one of the upper-Belyando catchment sites they surveyed.

This study recorded 12 species of macrophyte (including Spiny Mud Grass - *Pseudoraphis spinescens*) (see Table 3-13). The latter was included as it was found in mixed stands of macrophyte and grass directly adjacent to the water at certain sites. The 12 species recorded were all native species and were mainly emergent species. This is consistent with previous studies with respect to the dominance of emergent species (Aquateco, 2010; E3, 2010a; ALS, 2011). No submerged macrophytes were recorded in this study, highlighting the uniqueness of the find of submerged macrophytes in UT-Dam by ALS (2011). Members of the Cyperaceae family dominated the species list recorded as part of this study, with five species recorded. This includes *C. difformis,* which was the most widely distributed and was also recorded by E3 (2010a). Interestingly, there was very little overlap between the species recorded in this study and those recorded in the previous studies, which probably reflects the limited and patchy nature of macrophyte growth in the ephemeral streams of the study area.

TC-Dam and SPC-Dam featured the most diverse macrophyte community with four and six species recorded from these sites respectively. In contrast, only one species, Slender Knot Weed – *Persicaria decipiens*, was recorded from PC-Dam, the other dam sampled as part of this study. Nonetheless, apart from this result, data collected as part of this study and the ALS

(2011) study support the conclusion that dams host the greatest macrophyte diversity in the study area and, therefore, these waterbodies have some significance with regards to regional aquatic biodiversity.

Only three of the species recorded in this study were restricted to one site, these being *P. decipiens,* Smart Weed - *Persicaria attenuata* and Nadoo - *Marselia* sp. The latter was only recorded in small densities at Alt-AQ14 on Lagoon Creek, while the first two were restricted to dam sites. Lady Lilac (or Native Water Hyacinth) -*Monochoria cyanea (see* Figure 3-21*)* was restricted to the lagoon / wetland sites Site04 and TC-Dam. This species occurs on the edges of creeks or in damp mud beside bodies of water and is common in shallow depressions such as gilgais (Stephens and Dowling, 2002). As such, Site04 and TC-dam offered ideal growing conditions for this species. It is widespread throughout Queensland except for the far south-west of the state and, where it is present in ephemeral waterbodies, it grows as an annual species (Stephens and Dowling, 2002). This may explain why it was not recorded previously from Site04 during the ALS (2011) survey, which took place in August, and also why it may not have been recorded as part of the other previous studies listed above.

Figure 3-21: *Monochoria cyanea* growing at TC-Dam

Table 3-13: Macrophyte species recorded as part of this study (April, 2012). X = Present.

Form	Species Name	LC3	MC-NEW	PC-DAM	TC-DAM	SPC-DAM	BC-5	Alt- AQ14	Site 04	LC-1
Emergent	*Cyperus elongatus*	X						X		X
	Cyperus difformis	X	X		X	X			X	
	Cyperus digitatus							X		X
	Cyperus exaltatus		X						X	
	Cyperus polystachyos				X	X				
	Schoenoplectus validis		X			X				
	Persicaria decipiens			X						
	Persicaria attenuata					X				
	Eleocharis plana					X				
Emergent/Grass	*Pseudoraphis spinescens*				X	X			X	
Floating	*Monochoria cyanea*				X				X	
	Marselia sp.							X		

3.4 Water Quality

In situ Water Quality Testing

In situ water quality measurements taken in April and September were compared to trigger values given in the Queensland Water Quality Guidelines (DERM, 2009a) in relation to upland stream habitat in Central Queensland for slightly to moderately (SMD) disturbed aquatic ecosystems in Table 3-14.

Exceedances occurred in relation to all parameters for which a trigger level applies. Of these, there were only two occurrences of slightly elevated pH. The majority of pH, electrical conductivity (EC), dissolved oxygen saturation (DO%) and turbidity readings were outside the recommended range. These results are in keeping with the results of previous studies. AARC (2010) recorded elevated EC and turbidity levels at around half the sites they monitored, but pH was generally recorded within the guideline range. Similar results were observed during the study by ALS (2011), with similarly low DO% levels recorded at most sites. Results summarised from the study by E3 (2010b) in V2, Chapter 9 of the GCP EIS (Waratah Coal, 2011) show that median pH, EC, DO%, turbidity for sites sampled within the Belyando Catchment were all outside the recommended ranges for these parameters given in DERM (2009a). It should also be pointed out that ranges recorded for pH, EC, DO% and turbidity in this study were similar to those recorded in the abovementioned studies. Combined, these results suggest that the application of the DERM (2009a) guidelines in relation to upland stream habitat in Central Queensland for slightly to moderately (SMD) disturbed aquatic ecosystems is probably limited with regards to these parameters, and more locally relevant guidelines are required.

With regards to EC, comparisons between sampling events for sites sampled twice revealed substantial variation, with readings in April all below the trigger level, while those in September were all well above the trigger level. This also applied to sites sampled only in September. September coincided with the pre-wet season period and there had been little substantial rain in the study area prior to sampling. Hence, evapo-concentration of salts and/or a greater contribution of groundwater flows may explain the elevated EC levels in September. By contrast, the April sampling round coincided with the post-wet season, so the water quality in the study area would still have been influenced by the effects of recent rainfall.

With regards to DO%, most readings fell below the recommended range. While caution is required when interpreting instantaneous spot DO% readings such as these given that DO% is subject to diel (24h cycle) fluctuations and readings were taken at different times of the day, some DO% readings were particularly low, suggesting that they do actually reflect general ecological conditions at those sites. This scenario was particularly evident for Site04 and TC-Dam. The former is a tannin stained lagoon very rich in organic material (leaf litter), while TC-Dam was an isolated, shallow wetland pool with abundant macrophyte growth and rich organic bed material that had cattle access and faecal deposition. The decomposition of organic material consumes oxygen, while the substantial macrophyte growth can lead to oxygen depletion during the night while these plants are respiring. These factors, combined with the lack of flushing (which would explain the low DO% at the majority of sites monitored) were probably responsible for the very low DO% at Site04 and TC-Dam. Note that the recommended ranges for DO% given in DERM (2009a) apply to flowing streams only. Aside from Alpha Creek and Native Companion Creek (sites AC-2 and NCC-1, respectively), none of the other sites featured flowing water, so the fact that most DO% were below the minimum recommended range for Central Queensland uplamd streams given in DERM (2009a) is not of concern.

Findings in relation to turbidity presented in Table 3-14 corroborate visual habitat observations for sites monitored in April 2012 (see section 3.1) in that turbidity readings for PC-Dam, MC-New, TC-Dam and BC-5 were well in excess of the recommended range. Those for BC-5 were excessively high (>1000 NTU), but despite this, aquatic macroinvetebrates and fish were still recorded. A similar observation was made with respect to a site at Dead Horse Creek sampled by ALS (2011) as part of the SGCP EIS. All sites that were sampled twice had higher readings in September than April. This probably reflects the lower water levels and greater re-suspension of bed material in September.

Alkalinity readings recorded as part of this study ranged between those indicative of soft water (0-59 mg/L), moderate (60 -119 mg/L) to hard (120 -179 mg/L). Those with hard water related exclusively to Alpha Creek and Native Companion Creek sites sampled in September. These systems are well outside the influence of the GCP and were monitored as potential control sites. The value recorded for Alpha Creek (AC-2) is in keeping with that recorded for Alpha Creek sites by ALS (2011). The soft to moderately hard status of the water within waterways potentially affected by the GCP is notable as this means that they have less capacity to buffer the toxic effects of any metals released by activities associated with the GCP.

With regards to the suitability of the potential control sites monitored as part of this study, data presented in Table 3-14 show that data for those sites (TC-3, JC-1, AC-2, NCC-1) were broadly similar to those of sites within and adjacent to the GCP MLA that were monitored at that time, notwithstanding the fact that AC-2 and NCC-1 had higher alkalinity levels as discussed above and that all the potential control sites had higher EC levels (by an order of 50 to 300 µS/cm).

Table 3-14: Results of *in situ* water quality testing carried out by GHD in April and September 2012. Trigger level/ranges based on DERM (2009a) values for upland slightly to moderately disturbed upland stream habitat of Central Queensland. Recorded values outside the recommended DERM (2009a) range are highlighted in orange.

Site Code	**QWQG (DERM 2009a) Upland Streams of Central QLD**	**PC-DAM**		**Alt- AQ14**		**Site 04**		**TC-1**	**JC-1**	**BC-DAM**	**AC-2**	**NCC-1**	**LC-3**	**MC-NEW**	**TC-DAM**	**SPC-DAM**	**BC-5**	**LC-1**
Date (d/m)		13/4	26/9	12/4	26/9	13/4	26/9	26/9	25/9	25/9	25/9	25/9	12/4	12/4	13/4	13/4	11/4	12/4
Time(24h)		1605	1420	915	N/R	810	820	1025	1445	1325	1735	1825	1345	1630	1300	1700	1330	1050
Water Temperature (°C)		24.2	27.35	21.03	21.34	20.67	21.82	22.58	27.11	26.2	24.88	21.81	22.9	24.55	22.12	23.27	24.8	20.18
Conductivity (µS/cm)	168[1]	83	**868**	150	**834**	98	**888**	**954**	**1086**	**1002**	**1210**	**1104**	158	**238**	131	155	139	162
pH	6.5-7.5	**7.9**	**8.02**	**7.57**	**7.82**	7.43	7.79	7.78	7.61	7.37	**7.64**	7.45	**7.87**	**8.2**	6.92	**7.58**	7.47	7.4
DO (mg/L)		8.4	6.4	4.2	5.57	2.75	4.6	5.21	5.94	5.19	6.03	5.31	8.48	7.78	6	8.85	8.27	4.75
DO (% sat)	85-110	100.3	**81**	**47.2**	**63**	**30.7**	**52.6**	**60.3**	**75.1**	**64.3**	**73.1**	**60.7**	99	93.4	**6.94**	105	99.7	**53.4**
Turbidity (NTU)	25	**206**	**503**	21.8	**81.3**	10	**43.3**	**663**	**77.7**	**26.9**	18	8.23	**508**	**778**	**134**	**36**	**>1000**	17.5
Total Alkalinity (mg/L)	0-59 = Soft Water 60-119 = Moderate Water 120-179 = Hard Water 180-240 =Very Hard Water 400+ =Extremely Hard Water	30	49	70	40	50	100	70	53	40	160	145	70	100	80	<50	90	70

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[1] 75th percentile value given for the Bekyando-Suttor sub-catchment in DERM (2009a).

Analytical Testing

Results of analytical testing for samples collected as part of this study are given in the sections below. Note that data presented in this section only relate to parameters for which at least one measurement was above LOR. Raw water quality results containing all analytical water quality data are presented in Appendix Appendix B.

Ecosystem Protection

Results for metals are given in Table 3-15. These results show that for a number of metals, the total concentrations measured were above their nominated trigger value given in ANZECC and ARMCANZ (2000) guidelines for aquatic ecosystem protection. However, only two metals, Aluminium and Chromium, recorded dissolved (and therefore bioavailable) concentrations above these trigger levels. Dissolved Aluminium concentrations were well above the trigger level at all but two sites, both potential control sites for the GCP monitoring program (AC-2 and NCC-2). This may undermine their suitability for this purpose (at least with respect to Aluminium). Levels of dissolved Chromium were only exceeded at one site (PC-Dam) and these exceedances occurred on both occasions. However, it should be pointed out that the trigger level for Chromium used for this study is based on that given in ANZECC and ARMCANZ (2000) for Chromium VI and the form of Chromium present at this site is unknown, so the above finding is a conservative one. Waratah Coal (2011) stated that total Nickel, Lead and Zinc were occasionally above guideline levels while total Copper concentrations was consistently above guideline levels for the Belyando Catchment sites monitored by E3 (2010b). In this study, total Copper concentration was only above the ANZECC and ARMCANZ (2000) trigger level at one site, whereas it was much more common for total Nickel, Lead and Zinc to be above their respective ANZECC and ARMCANZ (2000) trigger levels (Table 3-15). No dissolved metals testing was carried out as part of the study by E3 (2010b) and no metals testing was carried out as part of the studies by AARC (201) or ALS (2011).

With regards to other analytes, no exceedances were recorded for any of the organic contaminant parameters (i.e. TPH, PAH, Organic C and Organic-P pesticides, BTEX, etc.). Only a few samples recorded levels of TPH compounds above LOR (Table 3-16, Appendix B). Those instances may relate to runoff from roads or oil leaks from agricultural machinery. The pattern observed in relation to TPH and PAH's in this study is in accordance with observations made by Waratah Coal (2011) who noted only a few instances where these compounds exceeded guideline levels in the Belyando Catchment (all in the wet season).

EC @ 25 ºC, as measured by ALS, exceeded DERM (2009a) guideline levels at prospective control sites monitored in September 2012, but was within these guidelines for the samples collected in April 2012 and at sites within and adjacent to the GCP mine site in September 2012 (Table 3-16). Note that these values differ markedly from EC values in Table 3-1. This was possibly due to the fact that the NATA method for estimating EC is based on a constant temperature of 25 ºC, whereas EC measured in the field is based on ambient temperature. However, it is also possible that the field EC measurements shown in Table 3-14 were erroneous despite the meter being calibrated before use.

Suspended solid concentrations were above the DERM (2009a) trigger level for the majority of samples collected as part of this study, but notably, were within those guidelines for samples collected from two prospective control sites in September (AC-2 and NCC-1) (Table 3-16). Once again, these results suggest that Alpha Creek and Native Companion Creek are not necessarily the best surrogates for sites potentially impacted by the GCP. Suspended solid results also corroborate results in relation to turbidity presented in Table 3-14, which showed that many sites recorded elevated turbidity levels. None of the other previous studies monitored suspended solid concentrations, but historical review data presented in Waratah Coal (2011) for a DERM monitoring site on Native Companion Creek showed a median of 110 mg/L for this parameter. The median suspended solid concentration for this study was only 18 mg/L, though that value is from a more limited number of samples compared to the DERM monitoring site on Native Companion Creek.

Results of this study indicate that the waterways sampled were nutrient enriched, given that most samples recorded levels of Ammonia, Total Nitrogen (TN) and Total Phosphorus (TP) above DERM (2009a) guideline levels (Table 3-16). This is not surprising given that the predominant adjacent landuse in the GCP Project area is agriculture and that many sites had cattle directly accessing the waterway and defecating into it. The only sites that recorded TP concentrations within the DERM (2009a) guideline level were AC-2 and NCC-1, yet further evidence that Alpha Creek and Native Companion Creek have a different water quality to the other systems monitored as part of this study. The studies by AARC (2010) and E3 (2010b) also found frequent exceedances with regards to TN and TP. E3 (2010b) reported that the majority of TN in their study was associated with Total Kjeldahl Nitrogen (organic nitrogen). This was also true in this study (Table 3-16). E3 (2010b) attributed this to the release of nitrogen though decomposition of leaf litter and other organic matter entering the waterways from the banks and adjoining floodplains during times of flooding. This may well also partly explain the high TN levels recorded in this and the other studies mentioned above.

Note that while there were no exceedances for Soluble Reactive Phosphorus recorded as part of this study, holding time breaches for this parameter occurred in relation to samples collected in April. Hence, those results need to be interpreted with caution. Nonetheless, the fact that results for these parameters were similar during the September sampling round provides more confidence in inferring that much of the phosphorus present in the waterways sampled was not in bioavailable form.

Chlorophyll-a results in (Table 3-16) show that concentrations exceeded DERM (2009a) guideline levels at a number of sites. These included two sites sampled in April (BC-5 and MC-New) and three sites sampled in September (JC1, PC-Dam and TC-1). With the exception of JC-1, these sites all had much higher nutrient concentrations than other sites, which probably explains their elevated Chlorophyll-a concentrations. Monitoring carried out by E3 (2010b) in the Belyando Catchment also found elevated Chlorophyll-a concentrations at several sites where elevated nutrient concentrations were present. Chlorophyll-a results for April 2012 need to be interpreted with caution as there were holding time breaches for this parameter for that sampling round. Further, the elevated Chlorophyll-a results for BC-5 and MC-New is surprising given the very high turbidity levels in Beta Creek and Malcolm Creek at that time. However, this was also the case for sites PC-Dam and TC-1 in September and Chlorophyll-a samples were all analysed within holding times during that sampling round, perhaps suggesting that the results for BC-5 and MC-New in April were not simply due to holding time breaches. Water samples were normally collected from shallow water margins as part of this study. It is possible that there was sufficient light penetration in these margins to allow for primary production even when turbidity levels were high.

Stock Watering

THe only metal for which concentrations were recorded above the Stock Watering guidelines given in ANZECC and ARMCANZ (2000) was Aluminium concentration. Total Aluminium concentrations were only above the ANZECC & ARMCANZ (2000) Stock Watering trigger levels at two sites (PC-Dam and TC-1) (Table 3-15), but dissolved Aluminium concentration were only above the trigger level at PC-Dam (albeit on both sampling occasions). PC-Dam is used for stock watering by the Cavendish property land holder. The same may be true of Tallarenha Creek near TC-1 as this site is adjacent to another cattle grazing property.

No other parameter measured exceeded the trigger levels given in ANZECC & ARMCANZ (2000) for Stock Watering (see Table 3-16).

Table 3-15: Comparison of analytical water quality testing results in relation to metals against trigger values relating to 95% ecosystem level protection for slightly to moderately disturbed waterways of tropical Australia and trigger values related to protecting stock watering environmental values, as given in ANZECC and ARMCANZ (2000), for samples collected in April and September 2012 for the GCP SEIS. Highlighted cells represent exceedance of corresponding guideline levels. All units are mg/L.

	ANZECC and ARMCANZ (2000) Aqutic Ecosystem Protection	ANZECC (2000) Stock watering	Site	AC-2	Alt-AQ14		BC-5	BC-DAM	JC-1	LC-1	LC-3	MC-NEW	NCC-1	PC-DAM		SITE-04		SPC-DAM	TC-1	TC-DAM
			Date	25/9	4/10	26/9	4/10	25/9	25/9	4/10	4/10	4/10	25/9	4/10	25/9	4/10	26/9	4/10	26/9	4/10
Analyte grouping/Analyte			**LOR**																	
Dissolved Metals																				
Aluminium	**0.055**	**5**	0.01	<0.01	**0.25**	**1.96**	**1.03**	**0.55**	**0.71**	**0.14**	**0.44**	**0.22**	<0.01	**5.76**	**5.23**	**0.2**	**3.02**	**0.07**	**0.2**	**1.09**
Arsenic	**0.013**	**5**	0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	0.001	0.001	0.002	0.001	<0.001	0.002	0.002	0.002	<0.001	0.001
Chromium	**0.001**	**1**	0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**0.004**	**0.003**	<0.001	0.002	<0.001	<0.001	<0.001
Copper	**0.014**	**0.4-5[2]**	0.001	<0.001	0.001	0.001	0.003	0.002	0.002	0.001	0.001	0.002	<0.001	0.003	0.004	<0.001	0.002	<0.001	0.002	0.002
Cobalt		**1**	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	**0.011**	**1**	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.004	0.004	<0.001	0.002	0.001	0.002	0.001
Lead	**0.0034**		0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	**0.008**	**20**	0.005	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Manganese	**1.9**		0.001	0.054	0.002	0.005	0.001	0.087	0.003	0.004	0.004	0.002	0.136	0.013	0.007	0.005	0.011	0.002	0.107	0.004
Boron	**0.37**	**5**	0.05	0.08	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Iron			0.05	<0.05	0.36	0.96	0.45	0.96	0.65	0.5	0.73	0.17	0.09	2.93	1.95	0.54	1.99	0.58	0.15	1
Total Metals																				
Aluminium	**0.055**	**5**	0.01	**0.11**	**0.38**	**3.91**	**2.19**	**0.73**	**2.42**	**0.18**	**0.71**	**3.56**	**0.26**	**5.51**	**21.3**	**0.19**	**2.36**	**0.08**	**18.2**	**1.6**

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[2] Depends on farmed stock species

	ANZECC and ARMCANZ (2000) Aqutic Ecosystem Protection	ANZECC (2000) Stock watering	Site	AC-2	Alt-AQ14		BC-5	BC-DAM	JC-1	LC-1	LC-3	MC-NEW	NCC-1	PC-DAM		SITE-04		SPC-DAM	TC-1	TC-DAM
			Date	25/9	4/10	26/9	4/10	25/9	25/9	4/10	4/10	4/10	25/9	4/10	25/9	4/10	26/9	4/10	26/9	4/10
Analyte grouping/Analyte			**LOR**																	
Arsenic	**0.013**	**5**	0.001	<0.001	0.001	0.002	0.002	<0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.004	0.002
Chromium	**0.001**	**1**	0.001	<0.001	<0.001	**0.004**	**0.002**	<0.001	**0.002**	<0.001	<0.001	**0.004**	<0.001	**0.002**	**0.024**	<0.001	**0.002**	<0.001	**0.021**	<0.001
Copper	**0.014**	**0.4-5**	0.001	<0.001	0.001	0.003	0.011	0.002	0.004	0.001	0.002	0.006	<0.001	0.004	**0.017**	<0.001	0.003	<0.001	0.014	0.002
Cobalt		**1**	0.001	<0.001	<0.001	0.002	0.01	0.002	0.001	0.001	<0.001	0.005	0.001	0.004	0.017	<0.001	0.002	<0.001	0.021	0.001
Nickel	**0.011**		0.001	0.001	0.002	0.003	0.004	0.002	0.003	0.002	0.002	0.004	0.001	0.004	**0.018**	<0.001	0.002	0.002	**0.016**	0.002
Lead	**0.0034**	**0.1**	0.001	<0.001	<0.001	0.001	**0.011**	<0.001	0.002	<0.001	<0.001	**0.008**	<0.001	**0.004**	0.021	<0.001	0.001	<0.001	**0.013**	0.003
Zinc	**0.008**	**20**	0.005	**0.011**	<0.005	0.006	**0.009**	<0.005	**0.01**	<0.005	<0.005	**0.01**	<0.005	0.006	**0.054**	<0.005	0.008	<0.005	**0.036**	<0.005
Manganese	**1.9**		0.001	0.239	0.114	0.104	0.403	0.229	0.102	0.23	0.104	0.342	0.403	0.129	0.298	0.085	0.095	0.295	1.52	0.198
Vanadium			0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.05	<0.01	<0.01	<0.01	0.05	<0.01
Boron	**0.37**	**5**	0.05	0.13	<0.05	0.07	<0.05	0.08	0.05	<0.05	<0.05	<0.05	0.09	<0.05	0.09	<0.05	0.06	<0.05	0.1	<0.05
Iron			0.05	0.94	1.28	4.59	5.63	2.12	4.12	1.23	1.89	5.79	1.2	4.71	24.4	1.04	3.86	1.38	24.9	2.68

Table 3-16: Comparison of analytical water quality testing results in relation to physico-chemical, nutrient and total petroleum hydrocarbon parameters against trigger values relating to 95% ecosystem level protection for slightly to moderately disturbed systems and trigger values related to protecting stock watering environmental values for samples collected in April and September 2012 for the GCP SEIS. Highlighted cells represent exceedance of corresponding guideline levels. All units are mg/L unless expressed otherwise.

	ANZECC (2000) Stock watering	QWQG (DERM 2009) Central QLD upland stream aquatic ecosystem protection	**Site**	**AC-2**	**Alt-AQ14**		**BC-5**	**BC-DAM**	**JC-1**	**LC-1**	**LC-3**	**MC-NEW**	**NCC-1**	**PC-DAM**		**SITE-04**		**SPC-DAM**	**TC-1**	**TC-DAM**
			Date	25/9	4/10	26/9	4/10	25/9	25/9	4/10	4/10	4/10	25/9	4/10	25/9	4/10	26/9	4/10	26/9	4/10
Analyte grouping/Analyte			**LOR**																	
Physico-Chemical																				
Electrical Conductivity @ 25°C		**168**	10	**465**	158	134	166	152	**169**	**172**	153	**244**	**389**	86	125	102	133	148	**221**	135
Total Dissolved Solids @180°C	**4000**			278	148	244	1380	147	195	164	169	625	302	329	1090	157	234	122	640	257
Suspended Solids (SS)		**10**	5	<5	10	**19**	**312**	**17**	**28**	**14**	**30**	**378**	6	**199**	**79**	10	**11**	**15**	**421**	**37**
Total Alkalinity as CaCO3				205	72	54	72	59	53	77	70	102	192	38	49	42	49	71	91	58
Major Ions																				
Sulfate as SO4 – Turbidimetric	**1000**		1	4	<1	<1	<1	14	1	<1	<1	<1	<1	<1	3	<1	<1	<1	<1	<1
Chloride			1	23	7	8	8	9	16	8	7	12	17	5	7	6	10	9	13	6
Fluoride (Total)	**2**		0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.3	0.1	<0.1
Calcium	**1000**		1	36	11	8	7	12	10	13	11	12	31	4	4	5	6	8	11	7
Magnesium			1	19	5	4	4	5	4	6	5	7	14	2	3	2	3	6	8	3
Sodium			1	29	7	9	12	5	14	8	8	17	36	4	9	8	14	8	20	8
Potassium			1	10	8	9	11	13	9	10	9	13	8	9	14	8	12	10	11	13
Total Anions			0.01	4.83	1.64	1.3	1.66	1.72	1.53	1.76	1.6	2.38	4.32	0.9	1.24	1.01	1.26	1.67	2.18	1.33
Total Cations			0.01	4.88	1.47	1.35	1.48	1.56	1.67	1.75	1.54	2.25	4.47	0.77	1.2	0.97	1.46	1.5	2.36	1.28

	ANZECC (2000) Stock watering	QWQG (DERM 2009) Central QLD upland stream aquatic ecosystem protection	**Site**	**AC-2**	**Alt-AQ14**		**BC-5**	**BC-DAM**	**JC-1**	**LC-1**	**LC-3**	**MC-NEW**	**NCC-1**	**PC-DAM**		**SITE-04**		**SPC-DAM**	**TC-1**	**TC-DAM**
			Date	25/9	4/10	26/9	4/10	25/9	25/9	4/10	4/10	4/10	25/9	4/10	25/9	4/10	26/9	4/10	26/9	4/10
Analyte grouping/Analyte			**LOR**																	
Nutrients																				
Ammonia as N		**0.02**	0.01	**0.05**	**0.03**	**0.03**	**1.2**	**0.15**	**0.03**	0.02	**0.05**	**0.14**	**0.14**	**0.17**	**0.16**	**0.03**	**0.05**	**0.07**	**0.04**	**0.07**
Nitrite as N	**30**		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate as N	**400**		0.01	0.04	0.01	0.03	0.02	0.02	0.03	0.01	0.02	0.04	0.01	0.03	0.17	0.01	0.03	0.02	0.02	0.02
Nitrite + Nitrate as N			0.01	0.04	0.01	0.03	0.02	0.02	0.03	0.01	0.02	0.04	0.01	0.03	0.22	0.01	0.03	0.02	0.02	0.02
Total Kjeldahl Nitrogen as N			0.1	0.3	0.6	0.9	5.3	1.3	0.9	0.9	0.8	3.1	2.5	1.7	2.7	1.2	1.8	1.1	3.4	1.5
Total Nitrogen as N		**0.25**	0.1	**0.3**	**0.6**	**0.9**	**5.3**	**1.3**	**0.9**	**0.9**	**0.8**	**3.1**	**2.5**	**1.7**	**2.9**	**1.2**	**1.8**	**1.1**	**3.4**	**1.5**
Total Phosphorus as P		**0.05**	0.01	0.04	0.03	**0.09**	**0.71**	**0.07**	**0.22**	**0.08**	**0.08**	**0.51**	0.05	**0.19**	**0.57**	**0.15**	**0.27**	**0.12**	**0.63**	**0.21**
Reactive Phosphorus as P			0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.02	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.05	0.06	<0.01	<0.01	<0.01
Total Petroleum Hydrocarbons																				
C15 - C28 Fraction			100	<100	<100	<100	<100	260	<100	<100	<100	<100	<100	180	300	<100	140	<100	120	230
C29 - C36 Fraction			50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	50	<50	<50	<50	<50	<50
C10 - C36 Fraction (sum)			50	<50	<50	<50	<50	260	<50	<50	<50	<50	<50	180	350	<50	140	<50	120	230
Primary Productivty																				
Chlorophyll a		**5**	1	<1	2	3	**8**	2	**6**	<1	2	**7**	<1	4	**12**	1	2	2	**42**	2

4. Discussion

4.1 How this Study has Addressed EIS Comments

This study addressed issues raised in relation to the GCP EIS through the public submissions process by:

- Characterising all major waterways within and draining the GCP MLA;
- Sampling Lagoon Creek, the main receiving waterway draining the GCP MLA with greater intensity in areas close to the GCP MLA;
- Characterising a range of waterbody types present within and immediately adjacent to the GCP mine site, including different types of stream habitat, farm dams, lagoons and wetland habitat;
- Sampling in areas covered by different mining activities associated with the GCP;
- Carrying out further water quality monitoring based on the full suite of parameters recommended by DEHP; and
- Comparing water quality results to various relevant guideline levels, chosen based on knowledge of the EVs for the Sandy Creek, the Burdekin Basin sub-catchment in which the GCP mine site occurs.

Beyond this, this study improved on the knowledge presented in the GCP EIS through:

- Characterising temporal variability based on repeat sampling at certain sites and comparisons between data collected in this study in April 2012 and that collected in the adjoining SGCP MLAin August 2012;
- Providing context to the results presented in this study through reference to a number of aquatic ecology and water quality monitoring studies carried out in the near-mine GCP Project area; and
- Providing more details on the sensitivities of taxa present in relation to degraded water quality and fish passage barriers.

4.2 Study Limitations

While the steps outlined above mean that there are now sufficient data to be able to properly assess potential impacts to aquatic ecosystems associated with the proposed GCP mine, the findings presented in this study are still based on only one round of aquatic flora and fauna sampling for sites within and adjacent to the GCP mine site that were established as part of this study. Based on comparisons with data from other studies, additional sampling of these sites is unlikely to result in a host of new flora and fauna taxa being recorded. However, it is not possible to rule this out. This is particularly true with respect to aquatic macrophyte species, some of which are annuals whose occurrence in ephemeral streams is short-lived.

While this study provided a reasonable assessment of the aquatic biodiversity values present within the near-mine GCP area, the standard AUSRIVAS family level taxonomic resolution applied to macroinvertebratre community sampling data as part of this study is likely to have underestimated true diversity and, potentially, the conservation significance of macroinvertebrate species present within this area. The latter is highlighted by findings in relation to Tipulidae presented in this report. To be fair, however, the distribution and conservation status of macroinvertebrate species within Queensland is currently poorly understood, so a more in depth assessment of this is not possible at this stage.

For some of the waterways sampled as part of this study, low water levels meant that the natural creek line aquatic flora and fauna and habitat conditions could not be characterised and, instead, dam habitat on these streams had to be sampled. While this provided valuable information about the habitat status of those dams (which appear to be distinct aquatic ecosystems in their own right within the near-mine GCP area), the data collected may not be representative of the adjacent stream habitat.

The water quality sampling carried out as part of this study was never intended to represent strategic water quality monitoring as part of a formal GCP water quality monitoring program, but it is acknowledged that one is required as part of the EM Plan. The GCP water quality monitoring program is currently being developed as part of the GCP SEIS process and will be supplied to DEHP for assessment. Some of the sites monitored as part of this study could be included in the GCP water quality monitoring program study design, though some will no longer be available once the GCP mine is constructed.

4.3 Conclusions

This study found that the waterways in the near-mine GCP area were subject to a range of modifications and pressures associated with the damming of creeks for stock irrigation, riparian vegetation clearing for agricultural purposes, and the trampling of bed and banks through cattle access to creeks. Causeways were also present on a number of waterways, though in most cases, these represented a highly localised disturbance that only affected bed and bank stability and adjacent turbidity levels. Further, the main causeway on Lagoon Creek has actually created potential refugial habitat for aquatic flora and fauna in this system during dry spells. This is also true with respect to the dam habitat sampled and it should also be noted that dams in the study appear to host the most diverse and unique macrophyte assemblages. These off-stream water storages, whilst shown to be very ecologically important from a local and regional perspective, are under private control and future management is uncertain. There is also the potential that some could be lost in association with the GCP mine development.

The fish fauna of the study area was of limited diversity and was composed exclusively of potadromous species. This was expected based on the inland location of the study area and the ephemeral nature of the waterways sampled. None of the species sampled were of conservation or fisheries significance and fishing activity is limited within the waterways sampled based on advice from local landholders and the fact that they are remote and are not publicly accessible. Further, few, if any, would be likely to be vulnerable to the effects of fish passage barriers. The fish species recorded in this study were similar to those recorded in other studies carried out in the vicinity of the GCP mine site, with only one additional species recorded from this study (Fly-speckled Hardyhead). This species is known to occur in the Belyando River, however, so this find is not significant. The fish fauna in the near-mine GCP area are predominantly native species, but the noxious, exotic fish, Tilapia, appears to be expanding in terms of abundance and distribution within this area. This is only expected to continue over time and could possibly be exacerbated by the GCP if potential impacts to receiving waters are not managed properly. Apart from this, this study identified fish species that are vulnerable to reduced pH and elevated turbidity. This is of relevance given that activities associated with the GCP mine could potentially generate acid rock drainage and elevated turbidity. However, the species in question are widely distributed such that even if they were impacted by the GCP they would still occur in unaffected waterways within the region.

The macro-crustacean community of the study area was also of limited diversity compared to the diversity known to the Burdekin Catchment as a whole, but this was consistent with the findings of previous studies. Native crayfish, such as the Common Yabby and the Orange-fingered Yabby, were not commonly recorded, but the translocated native species, Red Claw Crayfish, was. There is some evidence to suggest that the latter is displacing these native crayfish species. Red Claw Crayfish are reportedly stocked in farm dams by some landowners for occasional consumption, though few were actually recorded from dams in this study. Other macro-crustaceans recorded from this study included Atyid Shrimp, Freshwater Prawns (*Macrobrachium* spp.) and the Freshwater Crab. Atyid Shrimp and Freshwater Prawns were largely restricted to dam and lagoon habitat, most likely because these habitats offered the water quality and substrates most suitable for the growth of their periphytic algal food source. As such, these macro-crustaceans would be vulnerable to the effects of increased turbidity in the dams and lagoons they inhabit through corresponding reductions in periphytic algal production.

The macroinvertebrate fauna from this study matched that recorded in most other studies carried out in the same vicinity in terms of diversity and, largely, in terms of the dominant taxa present. A higher diversity was recorded from the study carried out in the adjoining SGCP mine site by ALS (2011), but this was most likely due to the fact that that study was carried out following a period of high rainfall and sustained surface flows in the area and the fact that that study also sampled habitat other than the edge habitat sampled as part of this study. Diversity was highest in Lagoon Creek and lowest in dam and lagoon habitat. Lagoon Creek sites had a diversity within the expected range for Central Queensland waterways and within the range expected based on Queensland Coastal AUSRIVAS autumn model reference conditions. Stream sites characterised by turbid water and/or subject to the effects of cattle access and riparian vegetation clearing had a lower than expected macroinvertebrate diversity, thus indicating potential reductions in macroinvertebrate diversity that could occur if issues such as erosion control, mine runoff and riparian vegetation clearing are not managed effectively as part of the GCP EM Plan. SIGNAL2 results indicated that most sites hosted mainly pollution-tolerant macroinvertebrate taxa. This was in line with results from other studies carried out in the same vicinity and is not surprising given that resident macroinvertebrate fauna are likely to be adapted to cope with the variety of water quality conditions that go with changes that occur naturally under the ephemeral waterway hydrological cycle. It should, be noted, however, that the most pollution-sensitive macroinvetebrate taxa recorded in this study, Leptophlebiidae, was only recorded from Lagoon Creek, the main receiving water in relation to the GCP mine site. This macroinvertebrate family would therefore be most vulnerable to the potential impacts associated with the GCP mine construction and operation, though this taxon would still be expected to occur within unaffected waterways within the near-mine GCP area even if such impacts did occur.

Macrophyte diversity and cover was generally low in the waterways sampled apart from SPC-Dam on Spring Creek. Emergent forms, particularly those belonging to family Cyperacea, dominated the taxa list. These findings are consistent with those of previous studies and conform to expectations with regards to the extreme hydrological variation within ephemeral streams generally not being conducive to the growth of submerged and floating macrophytes. No exotic or noxious macrophytes were recorded from this study, but previous studies have identified such species, including noxious weed species such as Para Grass and Noogoora Burr, as well other introduced macrophytes in waterways within the region.

Water quality testing carried out as part of this study revealed that total concentrations of some metals exceeded guideline levels, but of these, only Aluminium exceeded guideline levels based on both total and dissolved concentrations. This suggests that apart from Aluminium, the bioavailability of metals is currently limited in the waterways sampled. It should be noted, however, that total and dissolved Aluminium concentrations were high at the majority of sites monitored. Also, most sites recorded low alkalinity levels indicative of soft to moderately hard water. This would reduce the capacity of local waterways to buffer any toxic effects of elevated Aluminium and other metal concentrations, so it will be important to minimise the release of metals through activities associated with the GCP.

Organic contaminants, including pesticides, were generally at concentrations less than the LOR. This is in line with results presented as part of the GCP EIS. Results from this study do, however, indicate nutrient enrichment of waterways in the near-mine GCP area. Further, EC, pH, turbidity and dissolved oxygen were routinely outside the recommended range, not just in this study, but also in previous studies carried out in the general vicinity. Based on the fact that a number of parameters regularly recorded values outside their recommended guideline ranges, it is likely that more locally relevant water quality objectives will need to be developed for the near-mine GCP area in order for the potential impacts of the GCP on aquatic ecosystems to be assessed properly.

This study assessed water quality in relation to all relevant EVs for waterways of the near-mine GCP area that have associated trigger values in relevant guidelines. To that end, water quality data were compared against guidelines for stock drinking water as well as those for ecosystem protection. This study found that Total and/or dissolved Aluminium concentrations occasionally exceeded stock watering guidelines, but overall, the water quality of the waterways sampled generally complied with the requirements for stock watering.

One of the objectives associated with the second round of water quality monitoring in September was to sample prospective control monitoring sites to assess their potential suitability for inclusion as part of the GCP water quality monitoring program, which is currently being developed as part of the Environmental Management (EM) Plan. To that end, four such sites were sampled. Of these, data from sites located on Alpha Creek and Native Companion Creek show that these systems had quite different water quality to the waterways within and directly adjacent to the mine site, so these systems do not appear to be suitable as reference systems in relation to waterways potentially impacted by the GCP. Jordan Creek and Tallarenha Creek appear to be more suitable systems for this purpose, notwithstanding that the latter may be subject to the impacts of the SGCP should that project go ahead, which would undermine that suitability. Jordan Creek may also be exposed to stormwater runoff from the GCP, but there are reaches of this system upstream of Jericho that will not be affected by this.

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Appendices

Appendix A Completed Habitat Assessment Field Sheets

FIELD SHEET

PROJECT NAME: Galilee Coal Project **SITE CODE:** ALS ~~AQ4~~ new

SITE NAME: Lagoon (Monks) Creek at causeway

DATE: 12 / 4 / 12 **TIME (24hrs):** [0725] **PARTY:** JC + KP

LATITUDE: 23° 23'.086" **LONGITUDE:** 146° 27.918"

EASTING: 0445358 **NORTHING:** 7413781 **Mobile Coverage:** [✓ Y] / N

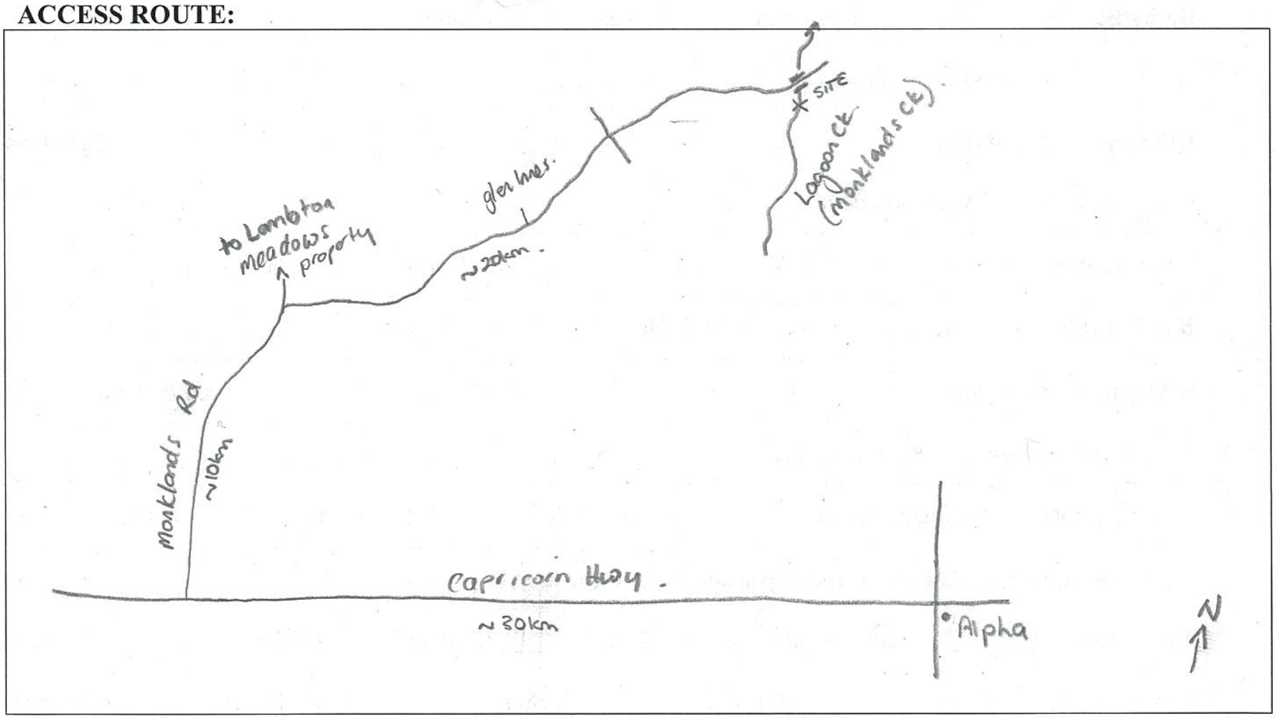
MAP NAME: — **MAP SCALE:** — **Sat. Phone Coverage:** [✓ Y] / N

DATUM (i.e. GDA94): WGS84 **PHOTO #'s:** 257 - 262 **Key required:** N

Water samples collected: Yes - on 10/4/12

ACCESS DETAILS: Accessed from the highway between Alpha + Jericho around 28km from Alpha. Follow Monklands Road past Glenn Inness property until you reach the causeway

ACCESS ROUTE:



LAND OWNER:

Name: Reid Bauman

ENTERED

Address:

Phone:

Permission Requirements: Yes - arrange through Kelvin Sypher @ waratah coal

Office Use:	Data Entered By:	TS	Date:	11/9/12

FIELD OBSERVATIONS AND WATER QUALITY SHEET

SITE CODE/NAME ALS AQ13 **DATE:** 12 / 4 / 12

WQ Parameter	Edge	Riffle	WQ Parameter	Edge	Riffle
Sample Depth (m)	0·4		DO (mg/L)	4·20	
Gauge Height (m)	N/A		DO (% sat)	47·20	
Water Temperature (°C)	21·03°		Turbidity (NTU)	21·8	
Conductivity (µS/cm)	150		Total Alkalinity (mg/L)	70	
pH	7·57		**Time Collected**	8·30	

Habitat's Present (circle if present) 1. Pool-K [✓ 2. Pool-S] 3. Run-K 4. Run-S 5.Riffle [✓ 6.LWD] 7. Macrophyte [✓ 8. Other] Trailing veg.

Stream Width Max 18 m Min 1·5 * on d/s side m Mode 14 m

Water Level [✓ 1. No Flow] 2.Dry/Isolated 3.<Watermark 4. Normal 5. >Watermark

Shading of River None Low [✓ Moderate] High

Type of River System [✓ Intermittent] Permanent Details...

Bank Erosion 1. None [✓ 2. Little] 3.Some 4. Moderate 5. Extensive

Dams/Barriers [✓ 1. Yes - Upstream] 2. Yes - Downstream 3. No 4. Don't Know

Dam/Barrier details... Farm dam on SGCP side of highway.......

Hydrological Variation 1. None [✓ 2. Little] 3.Some 4. Moderate 5. Extensive

Hydrological Variation details: Temporally variable, but only one hydraulic habitat

Point Source Pollution 1. Yes [✓ 2. No] 3. Don't Know Details..........................

Non Point Source Pollution [✓ 1. Yes] 2. No 3. Don't Know Details. Cattle access to creek, road runoff

Position in Catchment [✓ 1. Upland] 2. Midland 3. Lowland

Adjacent Landuse.... Cattle grazing...

Geomorphology 1. Steep Valley [✓ 2. Broad Valley] 3. Floodplain 4. Other..............

Riparian Zone (zone extends for 100m upstream and downstream from sampled area)

Trees<10m 5 % cover *Shrubs/Vines/Rushes* 0 % cover *Grasses/Ferns/Herbs* 98 % cover

Bare Ground	1. None	[✓ 2. Little]	3. Some	4. Moderate	5. Extensive
Grass	1. None	2. Little	3. Some	4. Moderate	[✓ 5. Extensive]
Shrubs	[✓ 1. None]	2. Little	3. Some	4. Moderate	5. Extensive
Trees<10m	1. None	[✓ 2. Little]	3. Some	4. Moderate	5. Extensive
Trees>10m	1. None	2. Little	3. Some	[✓ 4. Moderate]	5. Extensive

Comments: Mixed Eucalypt canopy dominated by ghost gum Mixed native grass sp.

MACROINVERTEBRATE FIELD SHEET 1

SITE CODE/NAME ALS AQ13 DATE: 12 / 4 / 12

HABITAT TYPE (E=Edge; R=Riffle; K=Rocky Bed; S=Sandy Bed; M=Macrophytes; N=Run; C=Composite)

KEY HABITAT FEATURES	Edge				
Vel count					
Vel depth					
Vel m/sec					
Vel (average) (m/sec)	0				
Mean Sample Depth (m)	0·4				
Mean Wetted Width (m)	15				
% Bedrock	0				
% Boulder (>soccer ball)	0				
% Cobble (tennis ball - soccer ball)	0				
% Pebble (marble - tennis ball)	0				
% Gravel (2 - 4mm)	10				
% Sand (0.005 - 2mm)	40				
% Silt/Clay (< 0.005 mm)	50				
% Detritus (leaves/twigs)	60				
% Sticks (<2cm)	10				
% Branches	10				
% Logs (>15cm)	10				
% Algae	10				
% Macrophytes	0				
% Overhanging habitat (e.g. vegetation, roots)	70	← trailing grasses			
% Blanketing silt (indicated by plume)	20				
% Shading	30				
Sampled By:	KP				
Picked By:	KP				

Comments:

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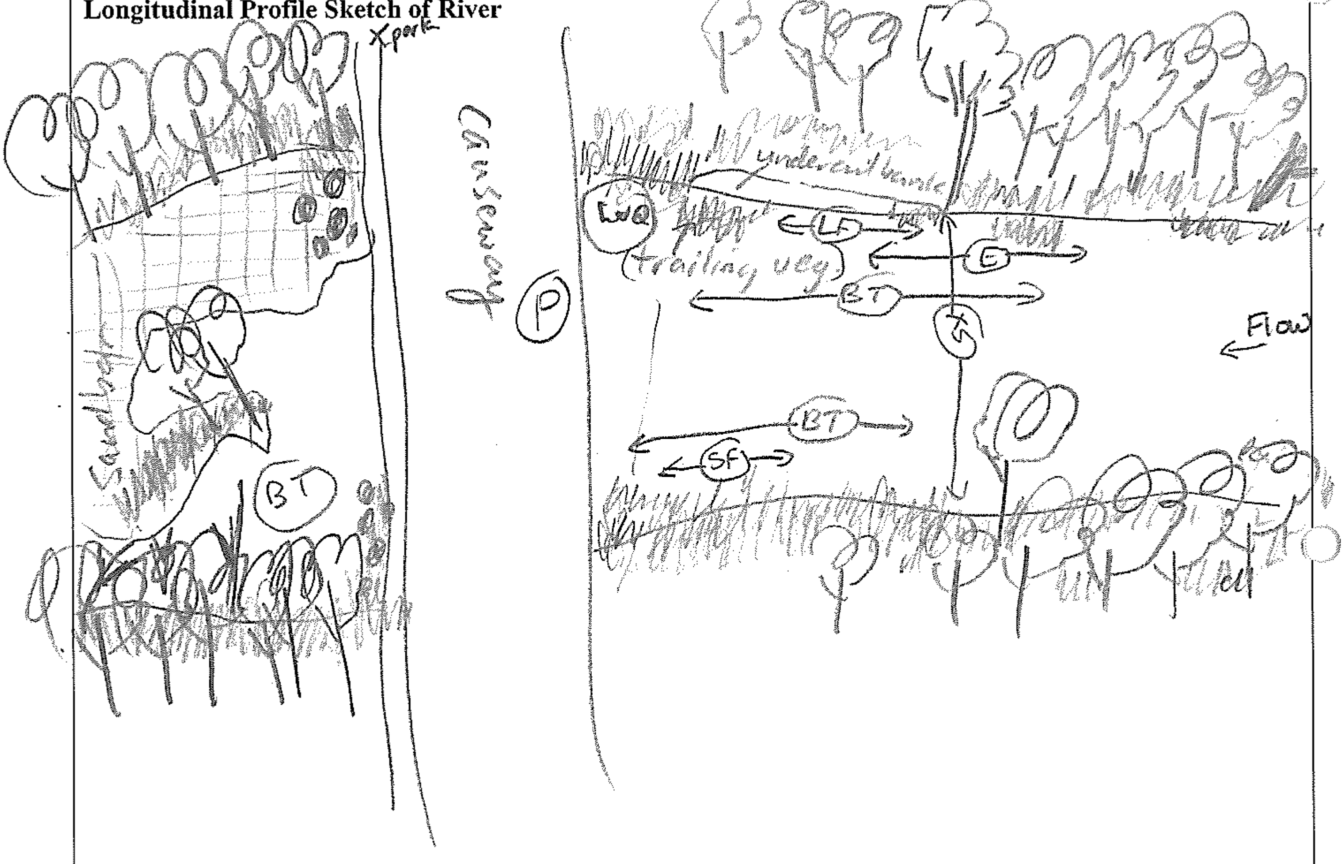
....

....

MACROINVERTEBRATE FIELD SHEET 2

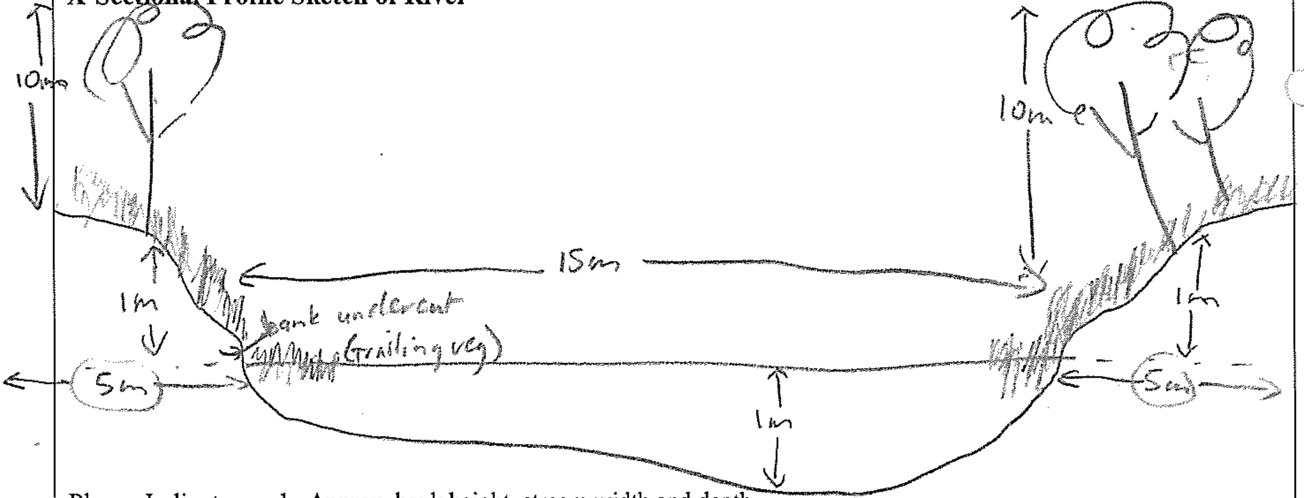
SITE CODE/NAME ALS AQ13 **DATE:** 12 / 4 / 12

Longitudinal Profile Sketch of River



Please Indicate:
1. Biological sampling sites for each habitat
2. location of where water quality parameters were taken
3. location of x-section
4. riparian zone width, type and height
5. location of where photos were taken

X-Sectional Profile Sketch of River



Please Indicate:
1. Approx. bank height, stream width and depth
2. Approx. riparian vegetation height

General Comments:

Upstream of causeway is long lagoon pool > 200m in length, fringed by mature eucalypts ≥ 10m & native grasses Isolated Cyperus sp. present + Native grasses enter pool as trailing veg. Bottom is sandy with fine silt overlay. Ponding caused by presence of causeway that acts as low flow barrier. D.S more representative of other parts of Lagoon creek. i.e. dry sandy creek bed with small isolated pools.

REFERENCE CONDITION SELECTION SHEET

SITE CODE: ALS AQ13 Date: 12/4/12 (If the impacts are unknown, seek further information before scoring; more than one person must complete this form)

Possible Impacts	5 (No Impact)	4 (Minor Impact)	3 (Moderate Impact)	2 (Major Impact)	1 (Extreme Impact)	Score	Previous Score
1. Agriculture and forestry*	No impact	[✓ Present but level of impact is barely discernible]	Evident, however, not severe and/or widespread	Obvious impact to stream, moderate and/or widespread	Severe and widespread, impact obvious	4	
2. Sand/gravel extraction*	[✓ No evidence or prior knowledge of extraction]	Small scale historical extraction	No current extraction; large historical extraction	Current small scale/localised extraction	Current and widespread extraction	5	
3. Upstream urban areas*	[✓ No impacts from urbanisation]	Possible impacts caused from urbanisation	Definite impacts caused from urbanisation	High impacts caused from urbanisation	Extreme impacts caused from urbanisation	5	
4. Point source pollution*	[✓ Nil point source pollution]	Low volumes of point source pollution discharged	Low to moderate volumes of point source pollution discharged	Moderate to high volumes of point source pollution discharged	High to extreme volumes of point source pollution discharged	5	
5. Dam/weir*	No artificial barriers in basin which will affect the site	[✓ Few small upstream barriers; not within impoundment]	Many small barriers; site not within impoundment	Multiple small barriers; Large barriers upstream; within small impoundment	Large barriers upstream; within large impoundment	4	
6. Flow regime alteration*	Seasonal flow regime natural	Seasonal flow regime not obviously altered	Flow regime altered	[✓ Flow regime obviously altered]	Flow regime highly modified	2	
7. Streamside veg. alteration@	Streamside vegetation unaltered	[✓ Vegetation slightly modified]	Obvious modification	Highly modified vegetation	Severe modification	4	
8. Riparian zone/ streambank erosion	No evidence of erosion beyond natural	[✓ Slightly more than natural levels of erosion]	Moderate levels of unnatural erosion	High levels of erosion	Extreme erosion	4	
9. Geomorphic change@	No evidence	Slight geomorphic change	[✓ Moderate change]	High changes	Extreme alteration	3	
10. Instream habitat alteration@	Instream habitats of natural appearance and diversity	Barely discernible impacts	[✓ Moderate modifications to instream habitats]	Highly modified modifications to instream habitats	Severe modification of instream habitats	3	
NOTE: When applicable, write down in the comments section the type and approx. distances from the impact If a score given differs from the previous score, state the reason why they are different in the comments section					Total	39	

COMMENTS

SC1: Cattle observed near creek & no fenceline, but no major trampling effects observed

SC2: –

SC3: –

SC4: –

SC5: Causeway acts as weir + low flow fishpassage barrier. Dam on Tallerebna C/k u/s (farm dam)

SC6: As above, ponded water u/s of causeway highly artificial/but created refugia (pool)) *

SC7: Some clearing associated with causeway construction

SC8: As above for SC7

SC9: As above for SC5 & SC6

SC10: As above for SC5 + SC6

FISH SAMPLING SHEETS

PROJECT NAME: Galilee Coal Project **SITE CODE:** ALS AQ13
SITE NAME: Lagoon (Monks) creek at causeway
DATE: 12/4/12 **TIME (24hrs):** [0800] **PARTY:** JC + KP

Site Summary

Species Name	Common Name	Count	Abundance Score
Ambassis agassizi	Agasizi's glass perchlet	20+ 224	5
Melanotaenia splendida	Eastern rainbowfish	20+ 125	5
Mogurnda adspersa	Purple spotted gudgeon	4	2
Neosilurus hyrtlii	Hyrtl's tandan	20+ 47	4
Atyidae	Shrimp	41	3
Macrobrachium sp.	Freshwater prawn	46.	3
Hypseleotris klunzingeri	Western Carp gudgeon	20+ 81	5
" spp	Midgely's Carp gudgeon	9	2
Cherax quadricarinatus	Red claw	16	3
Cherax destructor		1	1

* Reid Bowman (landholder) mentioned catching sleepy cod + tilapia hole
>100 juvenile tilapia observed in small pool d/s of causeway

Method Details

Electrofishing (EF)	
Operator:	
Assistant:	
Start Time:	
Finish Time:	
No. EF Seconds:	
EF Settings:	
Nets and Traps	
# Fyke Nets (FN):	overnight 1x large 1x small
# Seine Passes (SN):	
# Bait Traps (BT):	o/n 10

Fish abundance scale

Approx # Observed	Abundance Score
1	1
2-9	2
10-50	3
51-100	4
101-500	5
501-1000	6
1001-5000	7
>5000	8

Species: N hyrtlii				**Species:** A agasizi				**Species:** M. splendida			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1	Fyke (large)		92	1	Fyke (large)		33	1	Fyke (large)		48
2			76	2			29	2			47
3			74	3			27	3			49
4			81	4			45	4			38
5			87	5	count #		47	5			34
6	Count		89	6	𝍸𝍸𝍸	𝍸𝍸	29	6	Count		38
7			77	7	𝍸𝍸𝍸	𝍸𝍸	45	7	Fyke (sm)	25	38
8	Fyke (sm)	15	96	8	𝍸𝍸𝍸	𝍸𝍸	26	8			35
9	Bait 7	1	106	9	𝍸+50 +20	𝍸	27	9			35
10			86	10	𝍸𝍸 𝍸	=170	32	10			34
11			84	11			49	11			33
12			80	12	Fyke (sm)	13	22	12			24
13			89	13	Bait 3	5	25	13			33
14			75	14	Bait 4	6	27	14			40
15			72	15	Bait 5	11	27	15			36
16			85	16	Bait 7	2	42	16			33
17			82	17	Bait 8	10	44	17			40
18			90	18	Bait 9	2	48	18			21
19			90	19	Bait 10	5	26	19			36

count # 𝍸𝍸𝍸𝍸 𝍸𝍸 =31

count # 𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸 𝍸𝍸 +25 =100

Fish Sampling Field Sheet Cont.

20			85	20			41	20			29			
Species: H. klungzingeri				**Species:** H. sp1				**Species:** Mog Adspersa						
	Method	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**			
1	Fyke(Lg)		38	1	Fyke(lg)		35	1	Fyke (lg)		76.			
2			31	2			31	2			44			
3			31	3			33	3	Bait 6		84			
4			33	4			33	4			60			
5	Count #		33	5			32	5						
6	𝍸 𝍸 𝍸	+20	27	6	Bait 3		33	6						
7	𝍸 𝍸 𝍸	𝍸 𝍸	29	7	Bait 4		34	7						
8	||	=60	31	8	Bait 4		34	8						
9			35	9	Bait 7		34	9						
10	Fyke(Sm)	14	34	10				10						
11	Bait 2	3	30	11				11						
12	Bait 6	1	30	12				12						
13	Bait 8	2	30	13				13						
14	Bait 9	1	31	14				14						
15			28	15				15						
16			31	16				16						
17			31	17				17						
18			35	18				18						
19			30	19				19						
20			30	20				20						

Species: Red Claw				**Species:** Dyticidae				**Species:** Atyidae			
	Method	**LHS (J/I/A)**	count ~~**Length**~~		**Method**	**LHS (J/I/A)**	count ~~**Length**~~		**Method**	**LHS (J/I/A)**	count **Length**
1	Fyke(Lg)		7	1	Fyke(lg)		1	1	Bait 3		1
2	Bait 1		5	2	Bait 2		2	2	Fyke(lg)		35
3	Bait 5		3	3	Bait 5		1	3	Fyke(Sm)		5
4	Bait 8		1	4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

Fish Sampling Field Sheet Cont.

Species: Macrobrackium				Species: Freshwater crab.				Species: cherax destructor			
	Method	LHS (J/I/A)	count Length		Method	LHS (J/I/A)	count ~~Length~~		Method	LHS (J/I/A)	count ~~Length~~
1	Bait 3		2	1	Bait 8		2	1	Fyke(lg)		1
2	Bait 8		2	2				2			
3	Fyke(lg)		35	3				3			
4	Fyke(sm)		7	4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

Species:				Species:				Species:			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

MACROPHYTE FIELD SHEET

Ecowise Environmental

PROJECT NAME: Galilee Coal Project **SITE CODE:** ACS AQ13 **DATE:** 12/4/12 **PARTY:** JC+KP

SITE NAME: Lagoon (Monks) Creek at causeway **TIME (24hrs):** [0800]

Method: Belt transect (10m x 100m) ☒ Y or quadrat ☒ Y – pres/abs only. Too little cover present

Total Area of Coverage:
(can exceed 100%)

Total macrophyte coverage	<1%				
Submerged	0	Emergent	100	Floating	0
Rare	0	Noxious	0		

Species Observed:

Macrophyte Species	Common Name	% cover	Exotic / Native	Form (S/E/F)	Samples	Photos
Cyperus cf. elongatus		<1	N	E	–	–
Marsilia sp.	Nardoo	<1	N	E	–	–
Cyperus digitatus	Dirty Dora	<1	N	E	–	–

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FIELD SHEET

PROJECT NAME: GCP **SITE CODE:** TC-DAM

SITE NAME: Tallerenka Ck wetland next to road.

DATE: 13 / 4 / 12 **TIME (24hrs):** [12.30] **PARTY:** KP + JC

LATITUDE: 23° 26.875' **LONGITUDE:** 146° 26.336'

EASTING: 442690 **NORTHING:** 7406781 **Mobile Coverage:** [✓ Y] / N

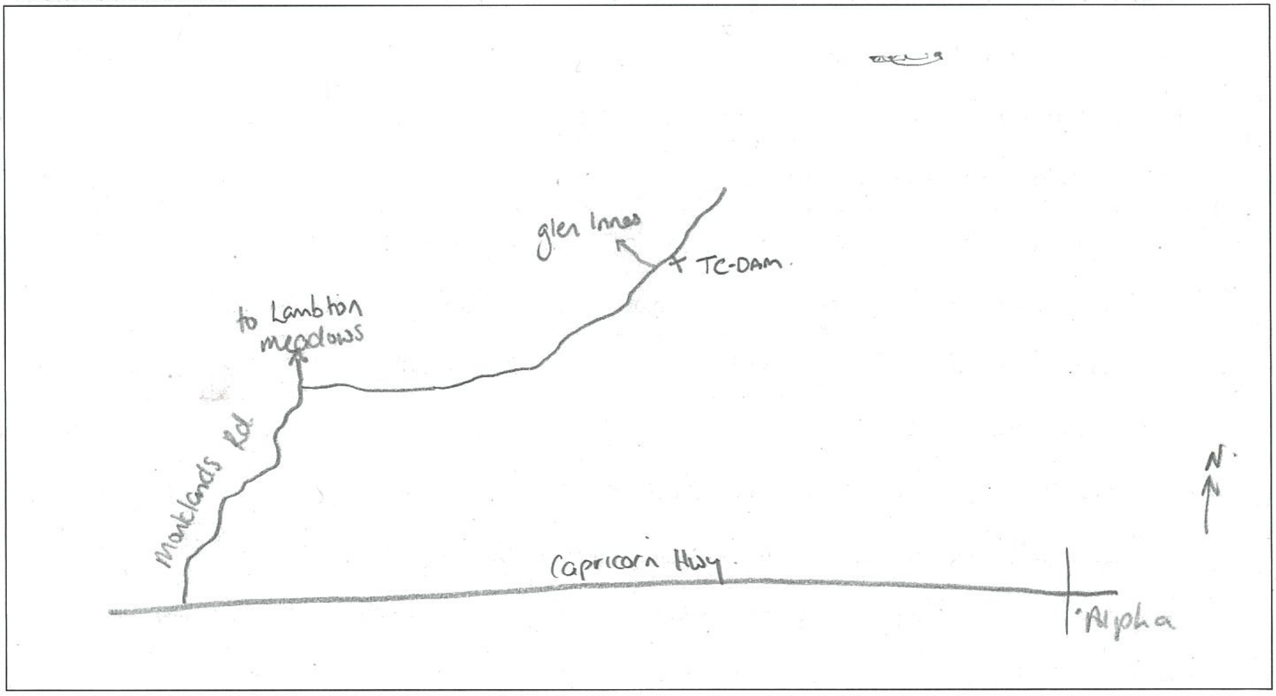
MAP NAME: – **MAP SCALE:** – **Sat. Phone Coverage:** [✓ Y] / N

DATUM (i.e. GDA94): WGS84 **PHOTO #'s:** 300 - 314 **Key required:** NO

Water samples collected: yes - 10/4/12.

ACCESS DETAILS: Travel west from alpha on capricorn Hwy ~28km to right turn into monklands Rd. Follow dirt for 12.7km to 'T' intersection, turn right. Continue along for ~20km to Glen Innes property turn off to left. Continue straight ~300m to wetland on right.

ACCESS ROUTE:



LAND OWNER:

Name: Reid Baumer - Monklands

ENTERED

Address:

Phone:

Permission Requirements: thru Kelvin Sypher (Kiora property owner). waratah coal rep.

Office Use:	Data Entered By:	TS	Date:	11/9/12

FIELD OBSERVATIONS AND WATER QUALITY SHEET

SITE CODE/NAME TC-Dam **DATE:** 13 / 4 / 12

WQ Parameter	**Edge**	**Riffle**	**WQ Parameter**	**Edge**	**Riffle**
Sample Depth (m)	0.3		DO (mg/L)	6.00	
Gauge Height (m)	–		DO (% sat)	69.4	
Water Temperature (°C)	22.12		Turbidity (NTU)	134	
Conductivity (µS/cm)	131		Total Alkalinity (mg/L)	80	
pH	6.92		**Time Collected**	1300	

Habitat's Present (circle if present) 1. Pool-K [✓ 2. Pool-S] 3. Run-K 4. Run-S 5.Riffle [✓ 6.LWD] [✓ 7. Macrophyte] [✓ 8. Other] Trailing veg.

Stream Width Max 10 m Min 1 m Mode 7 m

Water Level [✓ 1. No Flow] 2.Dry/Isolated [✓ 3.<Watermark] 4. Normal 5. >Watermark

Shading of River [✓ None] Low Moderate High

Type of River System [✓ Intermittent] Permanent Details: Gilgai

Bank Erosion 1. None [✓ 2. Little] 3.Some 4. Moderate 5. Extensive

Dams/Barriers 1. Yes - Upstream 2. Yes - Downstream [✓ 3. No] 4. Don't Know

Dam/Barrier details……

Hydrological Variation 1. None [✓ 2. Little] 3.Some 4. Moderate 5. Extensive

Hydrological Variation details: Temporally variable, but only 1 hydraulic habitat present

Point Source Pollution 1. Yes [✓ 2. No] 3. Don't Know Details……

Non Point Source Pollution [✓ 1. Yes] 2. No 3. Don't Know Details: Cattle access to creek, + road runoff

Position in Catchment [✓ 1. Upland] 2. Midland 3. Lowland

Adjacent Landuse Cattle Grazing

Geomorphology 1. Steep Valley [✓ 2. Broad Valley] 3. Floodplain 4. Other……

Riparian Zone (zone extends for 100m upstream and downstream from sampled area)

Trees<10m 2 % cover *Shrubs/Vines/Rushes* 2 % cover *Grasses/Ferns/Herbs* 80 % cover

Bare Ground 1. None 2. Little [✓ 3. Some] 4. Moderate 5. Extensive

Grass 1. None 2. Little 3. Some [✓ 4. Moderate] 5. Extensive

Shrubs 1. None [✓ 2. Little] 3. Some 4. Moderate 5. Extensive

Trees<10m 1. None [✓ 2. Little] 3. Some 4. Moderate 5. Extensive

Trees>10m 1. None 2. Little [✓ 3. Some] 4. Moderate 5. Extensive

Comments: Canopy of mixed Eucalypt, but patchy. Large bare area on one side due to cattle access + water level recession

MACROINVERTEBRATE FIELD SHEET 1

SITE CODE/NAME TC-Dam **DATE:** 13 / 4 / 12

HABITAT TYPE (E=Edge; R=Riffle; K=Rocky Bed; S=Sandy Bed; M=Macrophytes; N=Run; C=Composite)

KEY HABITAT FEATURES	Edge				
Vel count					
Vel depth					
Vel m/sec					
Vel (average) (m/sec)	0				
Mean Sample Depth (m)	0.15				
Mean Wetted Width (m)	5				
% Bedrock	0				
% Boulder (>soccer ball)	0				
% Cobble (tennis ball - soccer ball)	0				
% Pebble (marble - tennis ball)	0				
% Gravel (2 - 4mm)	0				
% Sand (0.005 - 2mm)	0				
% Silt/Clay (< 0.005 mm)	100				
% Detritus (leaves/twigs)	40				
% Sticks (<2cm)	5				
% Branches	0				
% Logs (>15cm)	15				
% Algae	5				
% Macrophytes	70				
% Overhanging habitat (e.g. vegetation, roots)	20				
% Blanketing silt (indicated by plume)	50				
% Shading	20				
Sampled By:	KP				
Picked By:	KP				

Comments:
....
....
....
....

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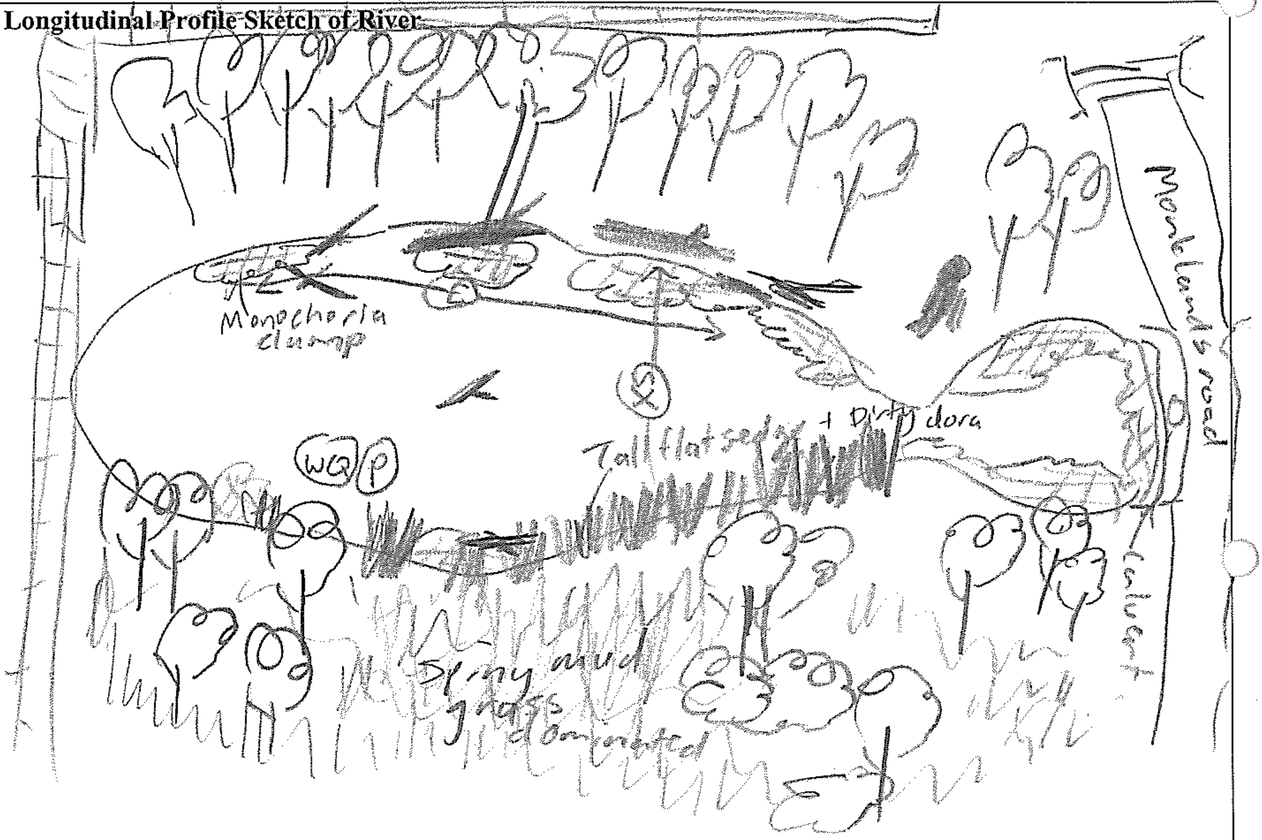
MACROINVERTEBRATE FIELD SHEET 2

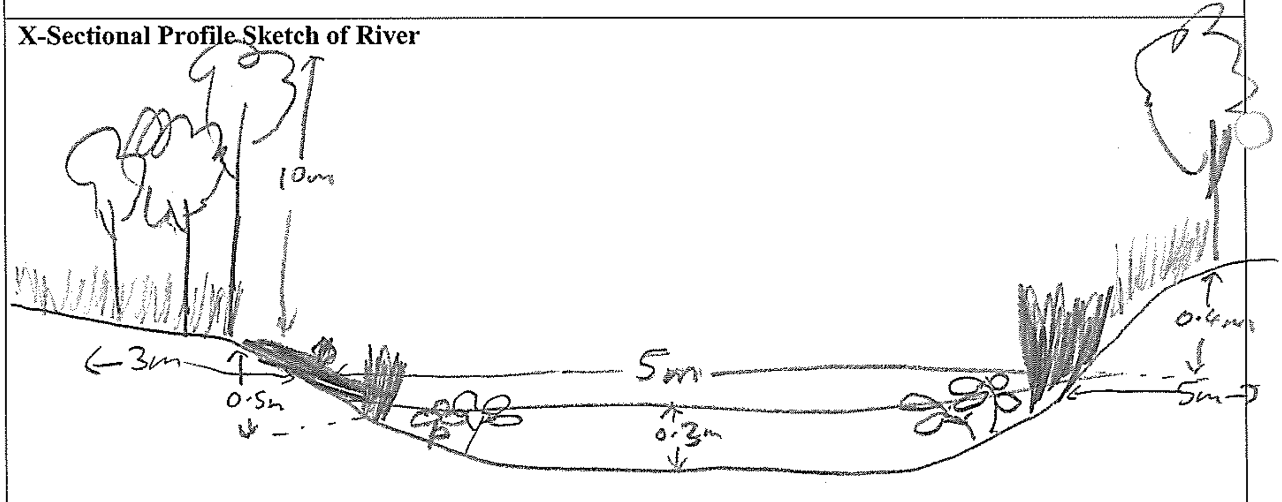
SITE CODE/NAME TC-Dam **DATE:** 13 / 4 / 12

Longitudinal Profile Sketch of River



Please Indicate:
1. Biological sampling sites for each habitat
2. location of where water quality parameters were taken
3. location of x-section
4. riparian zone width, type and height
5. location of where photos were taken

X-Sectional Profile Sketch of River



Please Indicate:
1. Approx. bank height, stream width and depth
2. Approx. riparian vegetation height

General Comments:

Gilgai lagoon pool with margins fringed by emergent macrophyte, + mixed eucalypt canopy (of patchy nature) Limited shading water v. turbid partly due to sand-clay bed + banks, plus minor erosion due to cattle access

REFERENCE CONDITION SELECTION SHEET

SITE CODE: TC-Dam Date: 13/4/12 (If the impacts are unknown, seek further information before scoring; more than one person must complete this form)

Possible Impacts	5 (No Impact)	4 (Minor Impact)	3 (Moderate Impact)	2 (Major Impact)	1 (Extreme Impact)	Score	Previous Score
1. Agriculture and forestry*	No impact	[✓ Present but level of impact is barely discernible]	Evident, however, not severe and/or widespread	Obvious impact to stream, moderate and/or widespread	Severe and widespread, impact obvious	4	
2. Sand/gravel extraction*	[✓ No evidence or prior knowledge of extraction]	Small scale historical extraction	No current extraction; large historical extraction	Current small scale/localised extraction	Current and widespread extraction	5	
3. Upstream urban areas*	[✓ No impacts from urbanisation]	Possible impacts caused from urbanisation	Definite impacts caused from urbanisation	High impacts caused from urbanisation	Extreme impacts caused from urbanisation	5	
4. Point source pollution*	[✓ Nil point source pollution]	Low volumes of point source pollution discharged	Low to moderate volumes of point source pollution discharged	Moderate to high volumes of point source pollution discharged	High to extreme volumes of point source pollution discharged	5	
5. Dam/weir*	[✓ No artificial barriers in basin which will affect the site]	Few small upstream barriers; not within impoundment	Many small barriers; site not within impoundment	Multiple small barriers; Large barriers upstream; within small impoundment	Large barriers upstream; within large impoundment	5	
6. Flow regime alteration*	[✓ Seasonal flow regime natural]	Seasonal flow regime not obviously altered	Flow regime altered	Flow regime obviously altered	Flow regime highly modified	5	
7. Streamside veg. alteration@	Streamside vegetation unaltered	[✓ Vegetation slightly modified]	Obvious modification	Highly modified vegetation	Severe modification	4	
8. Riparian zone/ streambank erosion	No evidence of erosion beyond natural	[✓ Slightly more than natural levels of erosion]	Moderate levels of unnatural erosion	High levels of erosion	Extreme erosion	4	
9. Geomorphic change@	No evidence	[✓ Slight geomorphic change]	Moderate change	High changes	Extreme alteration	4	
10. Instream habitat alteration@	Instream habitats of natural appearance and diversity	[✓ Barely discernible impacts]	Moderate modifications to instream habitats	Highly modified modifications to instream habitats	Severe modification of instream habitats	4	
NOTE: When applicable, write down in the comments section the type and approx. distances from the impact If a score given differs from the previous score, state the reason why they are different in the comments section					**Total**	45	

COMMENTS

SC1: Cattle access to creek
SC2:
SC3:
SC4:
SC5:
SC6:
SC7: Possibly some past clearing due to use as cattle drinking supply
SC8: Some evidence of bed & bank erosion due to cattle access but limited
SC9: Presence of culvert possibly provides for more persistent ponded water
SC10: As above for SC8

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FISH SAMPLING SHEETS

PROJECT NAME: ______________________ **SITE CODE:** ______________________
SITE NAME: ______________________
DATE: ___/___/___ **TIME (24hrs):** [ ] **PARTY:** ______________________

Site Summary

Species Name	Common Name	Count	Abundance Score

Method Details

Electrofishing (EF)	
Operator:	
Assistant:	
Start Time:	
Finish Time:	
No. EF Seconds:	
EF Settings:	
Nets and Traps	
# Fyke Nets (FN):	
# Seine Passes (SN):	
# Bait Traps (BT):	

Fish abundance scale

Approx # Observed	Abundance Score
1	1
2-9	2
10-50	3
51-100	4
101-500	5
501-1000	6
1001-5000	7
>5000	8

Species:				Species:				Species:			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			

Fish Sampling Field Sheet Cont.

20				20				20			
Species:				**Species:**				**Species:**			
	Method	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

Species:				**Species:**				**Species:**			
	Method	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

Fish Sampling Field Sheet Cont.

Species:				Species:				Species:			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

Species:				Species:				Species:			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
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17				17				17			
18				18				18			
19				19				19			
20				20				20			

MACROPHYTE FIELD SHEET

Ecowise Environmental

PROJECT NAME: Galilee Coal Project **SITE CODE:** TC-Dam **DATE:** 13/4/12 **PARTY:** JC + KP

SITE NAME: Tallarchna Ck wetland next to Monklands road (near Glenn Innes turnoff) **TIME (24hrs):** [1200]

Method: ~~Belt transect (10m x 100m) ☐ Y or quadrat ☐~~ Y pres/absence + visual estimate

Total Area of Coverage:
(can exceed 100%)

Total macrophyte coverage	45%				
Submerged	0	Emergent	100	Floating	0
Rare	0	Noxious	0		

Species Observed:

Macrophyte Species	Common Name	% cover	Exotic / Native	Form (S/E/F)	Samples	Photos
Monochoria cyanea	Monochoria	10 (15%)	N	E	–	313 + 314
Cyperus polystachyros	Bunchy Sedge	5 (9%)	N	E	–	308, 309 + 312
Cyperus difformis	Dirty Dora	5 (9%)	N	E	–	311
Pseudoraphis spinescens	Spiny mudgrass	25 (66%)	N	E	–	310
small herbaceous plant with	flowers at the stem  ←	present in area above water margin				315
grass small single spike	with small clumped leaves near	terminal point				316

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FIELD SHEET

PROJECT NAME: Galilee Coal Project **SITE CODE:** SPC-Dam

SITE NAME: Spring Creek Dam

DATE: 13/4/12 **TIME (24hrs):** [1700] **PARTY:** JC + KP

LATITUDE: 23° 20.230' **LONGITUDE:** 146° 21.892'

EASTING: 0435073 **NORTHING:** 7419011 **Mobile Coverage:** [✓ Y] / N

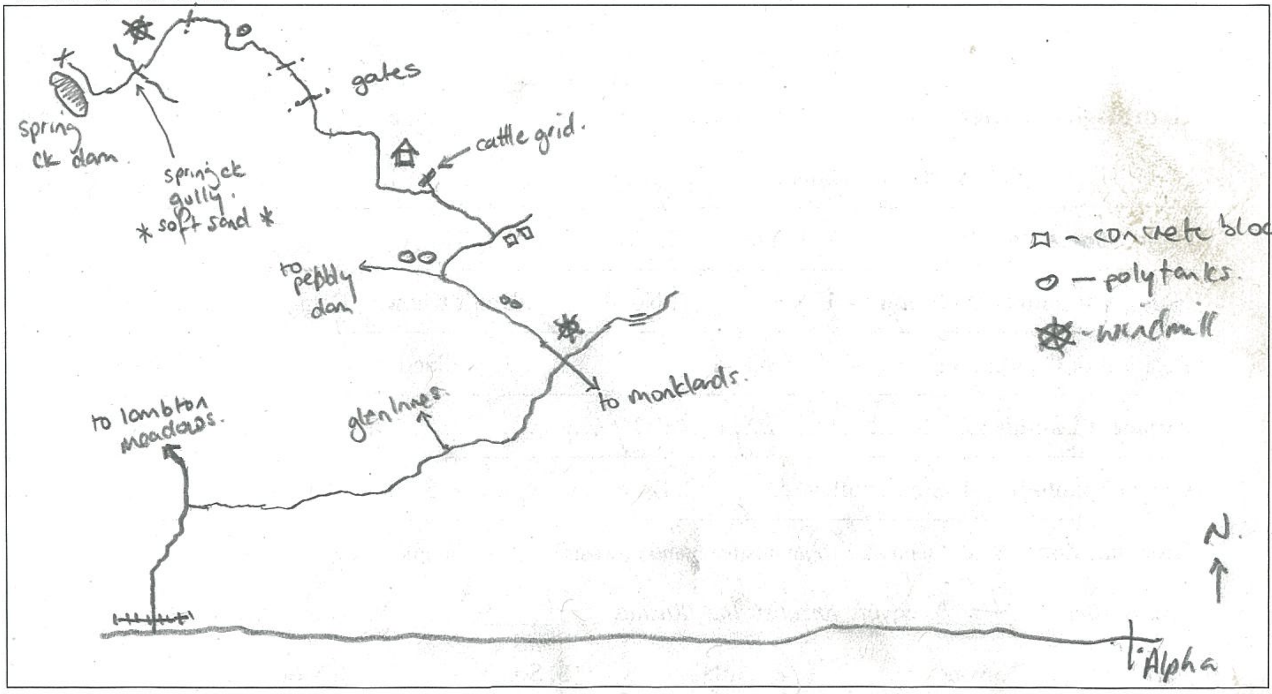
MAP NAME: — **MAP SCALE:** — **Sat. Phone Coverage:** [✓ Y] / N

DATUM (i.e. GDA94): WSG 84 **PHOTO #'s:** 322-334 **Key required:** N

Water samples collected: Yes - 10/4/12

ACCESS DETAILS: Travel west along Capricorn Hwy from Alpha ~28km to right turn into Monklands Rd. Continue along dirt road ~12.7km to 'T' intersection, take right turn and follow another ~20km to cross roads with Kiora + Monklands properties. Turn left into Kiora (windmill on side road). Travel along track to a right turn (poly tanks) then take next left (just before concrete blocks). Follow to just before house, veer left immediately before cattle grid. Follow around house and veer left then right to series of gates. Continue around to Spring Ck gully (dry soft sand) + on to dam.

ACCESS ROUTE:



LAND OWNER:

Name: Don + Kay Gordon

ENTERED

Address: Spring Creek

Phone: 07 4985 3514 / 0427853514 / 07 49851109

Permission Requirements: Yes - arrange via Kelvin Sypher (Waratah Coal)

Office Use:	Data Entered By:	TS	Date:	11/9/12

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FIELD OBSERVATIONS AND WATER QUALITY SHEET

SITE CODE/NAME SPC - Dam **DATE:** 13 / 4 / 12

WQ Parameter	**Edge**	**Riffle**	**WQ Parameter**	**Edge**	**Riffle**
Sample Depth (m)	0·4		DO (mg/L)	8·85	
Gauge Height (m)	—		DO (% sat)	105	
Water Temperature (°C)	23·27		Turbidity (NTU)	36	
Conductivity (μS/cm)	155		Total Alkalinity (mg/L)	<50	
pH	7·58		**Time Collected**	1700	

Habitat's Present (circle if present) 1. Pool-K [✓ 2. Pool-S] 3. Run-K 4. Run-S
5.Riffle [✓ 6.LWD] [✓ 7. Macrophyte] [✓ 8. Other] trailing veg

Stream Width Max 100 m Min 5 m Mode 60 m

Down— **Water Level** [✓ 1. No Flow] 2.Dry/Isolated 3.<Watermark [✓ 4. Normal] 5. >Watermark

Shading of River [✓ None] Low Moderate High

Type of River System [✓ Intermittent] Permanent Details Intermittently filled but more permanent than natural creekline

Bank Erosion 1. None [✓ 2. Little] 3.Some 4. Moderate 5. Extensive

Dams/Barriers 1. Yes - Upstream [✓ 2. Yes - Downstream] 3. No 4. Don't Know
Dam/Barrier details Site located on farm dam on Spring Creek

Hydrological Variation 1. None [✓ 2. Little] 3.Some 4. Moderate 5. Extensive
Hydrological Variation details: Intermittently filled but relatively permanent Only 1 hydraulic habitat (pool) represented

Point Source Pollution 1. Yes [✓ 2. No] 3. Don't Know Details……………………

Non Point Source Pollution [✓ 1. Yes] 2. No 3. Don't Know Details Cattle access to creek.

Position in Catchment [✓ 1. Upland] 2. Midland 3. Lowland

Adjacent Landuse Cattle grazing

Geomorphology 1. Steep Valley [✓ 2. Broad Valley] 3. Floodplain 4. Other……….

Riparian Zone (zone extends for 100m upstream and downstream from sampled area)

Trees<10m 2 % cover *Shrubs/Vines/Rushes* <1 % cover *Grasses/Ferns/Herbs* 90 % cover

Bare Ground	1. None	[✓ 2. Little]	3. Some	4. Moderate	5. Extensive
Grass	1. None	2. Little	3. Some	4. Moderate	[✓ 5. Extensive]
Shrubs	1. None	[✓ 2. Little]	3. Some	4. Moderate	5. Extensive
Trees<10m	1. None	[✓ 2. Little]	3. Some	4. Moderate	5. Extensive
Trees>10m	1. None	2. Little	[✓ 3. Some]	4. Moderate	5. Extensive

Comments: Back from dam banks, stands of Ghost gums (along creek line) but only isolated juvenile gums near water

MACROINVERTEBRATE FIELD SHEET 1

SITE CODE/NAME SPC-Dam **DATE:** 13 / 4 / 12

HABITAT TYPE (E=Edge; R=Riffle; K=Rocky Bed; S=Sandy Bed; M=Macrophytes; N=Run; C=Composite)

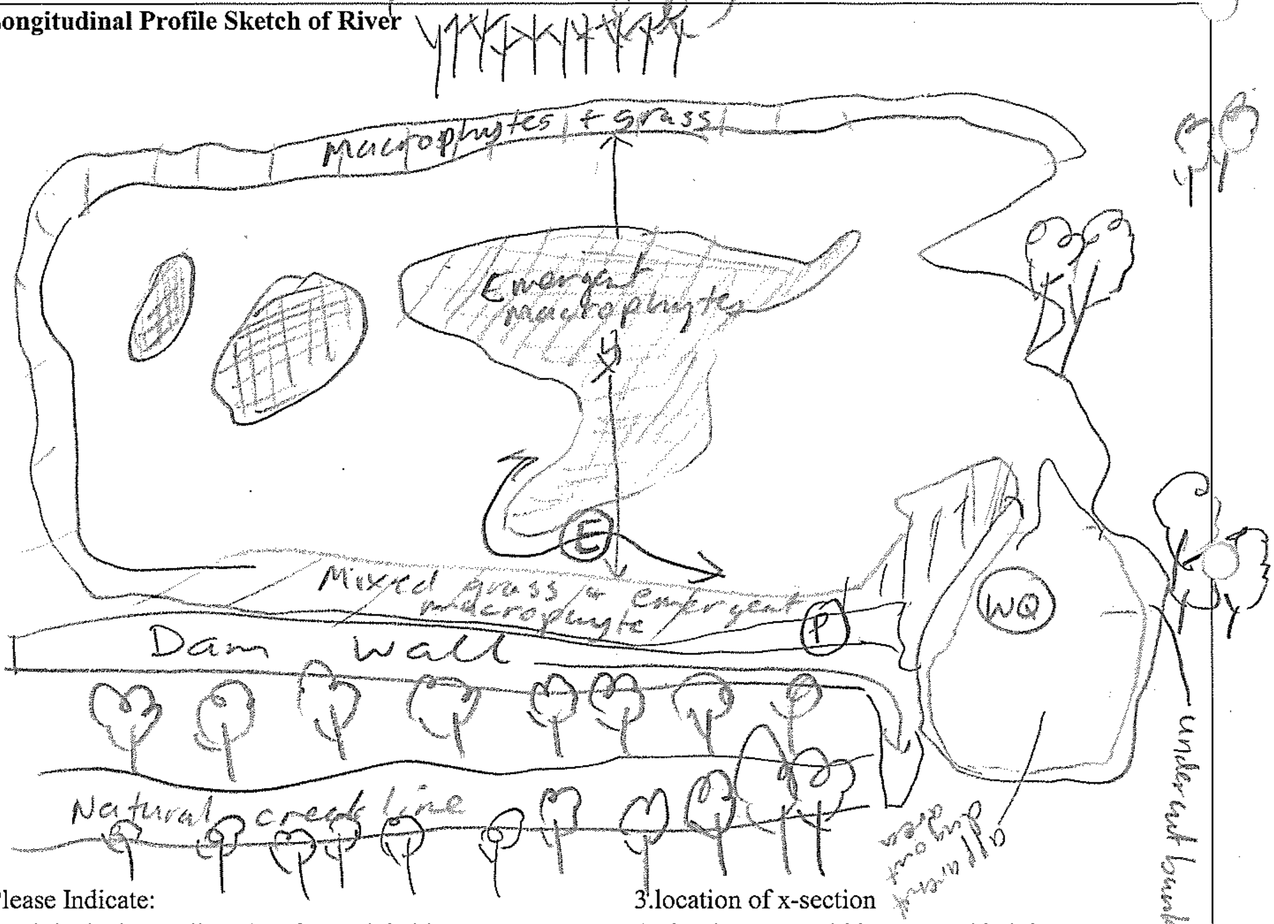
KEY HABITAT FEATURES	Edge				
Vel count					
Vel depth					
Vel m/sec					
Vel (average) (m/sec)	0				
Mean Sample Depth (m)	0.15				
Mean Wetted Width (m)	50				
% Bedrock	0				
% Boulder (>soccer ball)	0				
% Cobble (tennis ball - soccer ball)	0				
% Pebble (marble - tennis ball)	0				
% Gravel (2 - 4mm)	0				
% Sand (0.005 - 2mm)	30				
% Silt/Clay (< 0.005 mm)	70				
% Detritus (leaves/twigs)	10				
% Sticks (<2cm)	0				
% Branches	0				
% Logs (>15cm)	0				
% Algae	10				
% Macrophytes	40				
% Overhanging habitat (e.g. vegetation, roots)	5				
% Blanketing silt (indicated by plume)	50				
% Shading	10.				
Sampled By:	KP				
Picked By:	KP				

Comments: high cover of fine organic matter along edge

MACROINVERTEBRATE FIELD SHEET 2

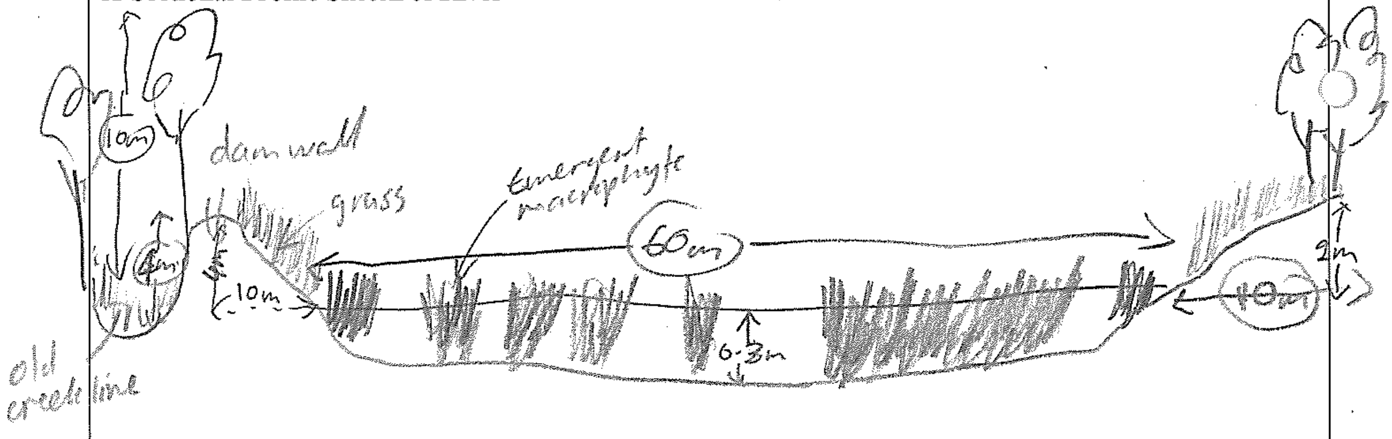
SITE CODE/NAME SPC-Dam **DATE:** 13 / 4 / 12

Longitudinal Profile Sketch of River



Please Indicate:
1. Biological sampling sites for each habitat
2. location of where water quality parameters were taken
3. location of x-section
4. riparian zone width, type and height
5. location of where photos were taken

X-Sectional Profile Sketch of River



Please Indicate:
1. Approx. bank height, stream width and depth
2. Approx. riparian vegetation height

General Comments:
Large wetland-like feature, well established mixed macrophyte stands fringed by native grasses. Largely shallow, but deep in parts possibly due to excavation. Lacking riparian canopy except well clear of banks

REFERENCE CONDITION SELECTION SHEET

SITE CODE: SPC-Dam Date: 13/4/12 (If the impacts are unknown, seek further information before scoring; more than one person must complete this form)

Possible Impacts	5 (No Impact)	4 (Minor Impact)	3 (Moderate Impact)	2 (Major Impact)	1 (Extreme Impact)	Score	Previous Score
1. Agriculture and forestry*	No impact	[✓ Present but level of impact is barely discernible]	Evident, however, not severe and/or widespread	Obvious impact to stream, moderate and/or widespread	Severe and widespread, impact obvious	4	
2. Sand/gravel extraction*	[✓ No evidence or prior knowledge of extraction]	Small scale historical extraction	No current extraction; large historical extraction	Current small scale/localised extraction	Current and widespread extraction	5	
3. Upstream urban areas*	[✓ No impacts from urbanisation]	Possible impacts caused from urbanisation	Definite impacts caused from urbanisation	High impacts caused from urbanisation	Extreme impacts caused from urbanisation	5	
4. Point source pollution*	[✓ Nil point source pollution]	Low volumes of point source pollution discharged	Low to moderate volumes of point source pollution discharged	Moderate to high volumes of point source pollution discharged	High to extreme volumes of point source pollution discharged	5	
5. Dam/weir*	No artificial barriers in basin which will affect the site	Few small upstream barriers; not within impoundment	Many small barriers; site not within impoundment	[✓ Multiple small barriers; Large barriers upstream; within small impoundment]	Large barriers upstream; within large impoundment	2	
6. Flow regime alteration*	Seasonal flow regime natural	Seasonal flow regime not obviously altered	Flow regime altered	Flow regime obviously altered	[✓ Flow regime highly modified]	1	
7. Streamside veg. alteration$^{@}$	Streamside vegetation unaltered	Vegetation slightly modified	[✓ Obvious modification]	Highly modified vegetation	Severe modification	3	
8. Riparian zone/ streambank erosion	No evidence of erosion beyond natural	[✓ Slightly more than natural levels of erosion]	Moderate levels of unnatural erosion	High levels of erosion	Extreme erosion	4	
9. Geomorphic change$^{@}$	No evidence	Slight geomorphic change	Moderate change	[✓ High changes]	Extreme alteration	2	
10. Instream habitat alteration$^{@}$	Instream habitats of natural appearance and diversity	Barely discernible impacts	Moderate modifications to instream habitats	[✓ Highly modified modifications to instream habitats]	Severe modification of instream habitats	2	
NOTE: When applicable, write down in the comments section the type and approx. distances from the impact If a score given differs from the previous score, state the reason why they are different in the comments section					**Total**	33	

COMMENTS

SC1: Cattle access to creek, Dam used for cattle drinking supply
SC2: —
SC3: —
SC4: —
SC5: Site within impounded section of creek
SC6: As per SC5
SC7: Loss of veg along original creekline Replaced by grasses + macrophytes
SC8: Only minor bank erosion due to cattle access
SC9: 〃 from flowing creek to lentic system
SC10: As per SC5 + SC9

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FISH SAMPLING SHEETS

PROJECT NAME: GCP **SITE CODE:** Spc-DAM

SITE NAME: Spring Ck dam

DATE: 14 / 3 / 12 **TIME (24hrs):** [8.00] **PARTY:** KP + JC.

Site Summary

Species Name	Common Name	Count	Abundance Score
Lei unicolour	Spangled Perch	131	5
macrobrachium	Freshwater prawn	87	4
mel. splend	Rainbow	10	2
Dyticidae		2	
mog adspersa	Purple spotted gudgeon	2	

Method Details

Electrofishing (EF)	
Operator:	KP
Assistant:	JC
Start Time:	–
Finish Time:	–
No. EF Seconds:	150 seconds / shot * 8 shots
EF Settings:	400V 50hz 12%.
Nets and Traps	
# Fyke Nets (FN):	2 O/N 1x lg 1x sml
# Seine Passes (SN):	–
# Bait Traps (BT):	10 O/N.

Fish abundance scale

Approx # Observed	Abundance Score
1	1
2-9	2
10-50	3
51-100	4
101-500	5
501-1000	6
1001-5000	7
>5000	8

* Lesion on 2 spangled perch (L) photo # 336.

Species: Lei uni				**Species:** macrobrachium				**Species:** Mel Spl.			
	Method	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	count ~~**Length**~~		**Method**	**LHS (J/I/A)**	**Length**
1	Bait 3		48	1	Bait 3		III = 3	1	Fyke (lg)		32
2			45	2	Fyke (lg)		~~IIII~~ ~~IIII~~ ~~IIII~~	2			24
3	Bait 7		40	3			~~IIII~~ ~~IIII~~ ~~IIII~~	3	Shot 6.		40
4	Fyke (sml)		47	4			~~IIII~~ ~~IIII~~ ~~IIII~~	4			70
5	Fyke (lg)		47	5			~~IIII~~ ~~IIII~~ ~~IIII~~	5	Shot 7		39
6			56	6			~~IIII~~ II	6			36
7			54 (L)	7			= 67	7			42
8			36 (L)	8	Shot 1		II	8	Shot 8		57
9			54	9	Shot 2		III	9			36
10			55	10	Shot 3		II	10			30.
11			44	11	Shot 4		IIII	11			
12			45	12	Shot 5		I	12			
13			56	13	Shot 6		II	13			
14			48	14	Shot 7		I	14			
15	Shot 1		49	15	Shot 8		~~IIII~~	15			
16	Shot 2		60 (L)	16				16			
17			45	17				17			
18			31	18				18			
19	Shot 3		50 (L)	19				19			

Fish Sampling Field Sheet Cont.

20			57	20				20			
Species: mog ads				**Species:** lei uni cont'd				**Species:** red claw			
	Method	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	count ~~**Length**~~		**Method**	**LHS (J/I/A)**	count ~~**Length**~~
1	Shot 2		41	1	Slot 3	(L)	IIII =4	1	Shot 5		1
2	Shot 3		38	2			I =1	2			
3				3	Slot 4		1	3			
4				4	Slot 5	(L)	1	4			
5				5	Slot 6		1	5			
6				6	Slot 7	(L)	1	6			
7				7			1	7			
8				8	Slot 8		1	8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

photo = 337-39

Species:				**Species:**				**Species:**			
	Method	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
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19				19				19			
20				20				20			

Fish Sampling Field Sheet Cont.

Species:				Species:				Species:			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
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19				19				19			
20				20				20			

Species:				Species:				Species:			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
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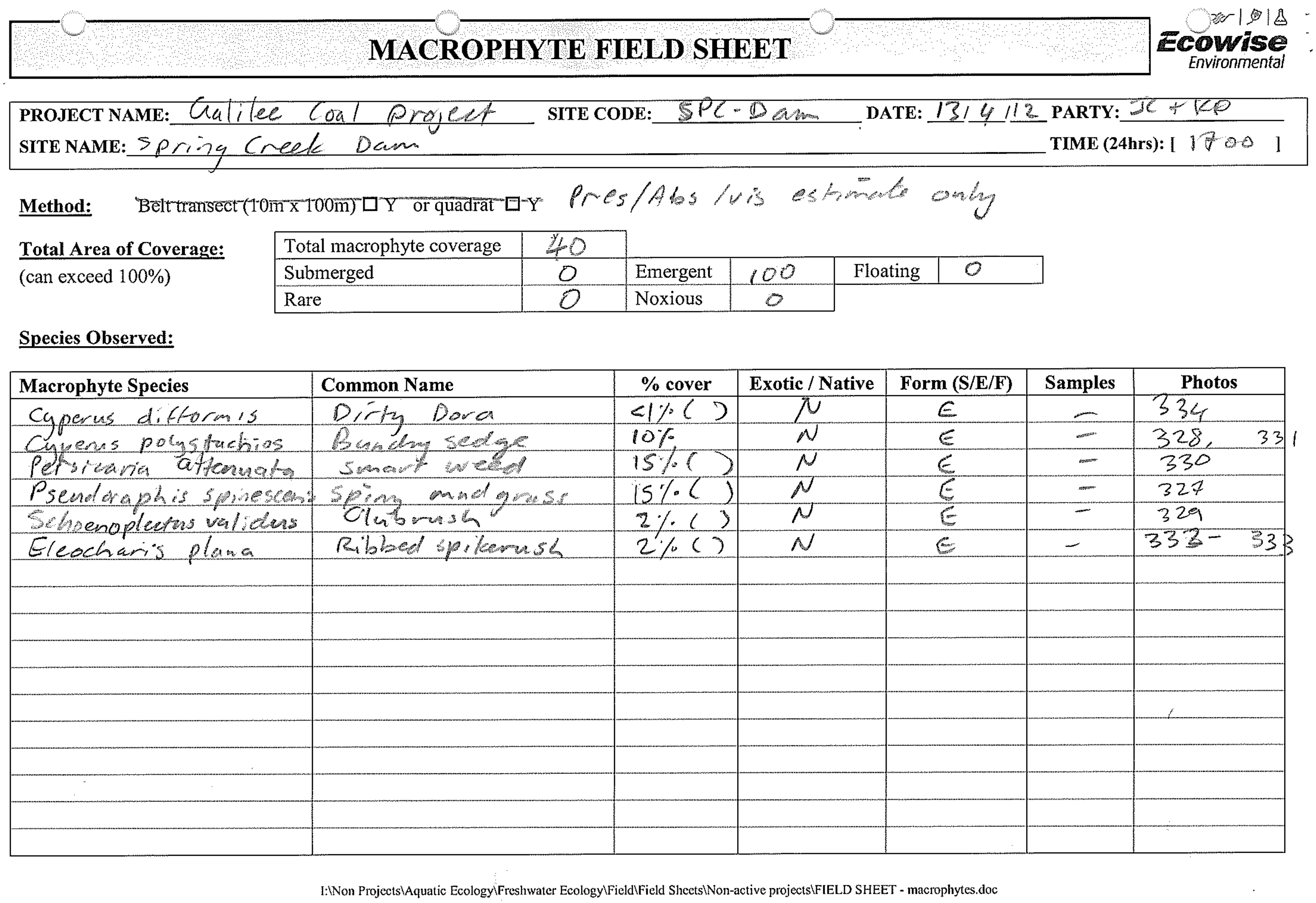
19				19				19			
20				20				20			



MACROPHYTE FIELD SHEET

Ecowise Environmental

PROJECT NAME: Galilee Coal Project SITE CODE: SPC-Dam DATE: 13/4/12 PARTY: JC + KP

SITE NAME: Spring Creek Dam TIME (24hrs): [1700]

Method: ~~Belt transect (10m x 100m) ☐ Y or quadrat ☐ Y~~ Pres/Abs /vis estimate only

Total Area of Coverage:
(can exceed 100%)

Total macrophyte coverage	40				
Submerged	0	Emergent	100	Floating	0
Rare	0	Noxious	0		

Species Observed:

Macrophyte Species	Common Name	% cover	Exotic / Native	Form (S/E/F)	Samples	Photos
Cyperus difformis	Dirty Dora	<1% ( )	N	E	–	334
Cyperus polystachios	Bunchy sedge	10%	N	E	–	328, 331
Persicaria attenuata	Smart weed	15% ( )	N	E	–	330
Pseudoraphis spinescens	Spiny mud grass	15% ( )	N	E	–	327
Schoenoplectus validus	Clubrush	2% ( )	N	E	–	329
Eleocharis plana	Ribbed spikerush	2% ( )	N	E	–	332- 333

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FIELD SHEET

PROJECT NAME: Galilee Coal Project **SITE CODE:** Site 04

SITE NAME: Saltbush Creek Lagoon

DATE: 13 / 4 / 12 **TIME (24hrs):** [0800] **PARTY:** JC + KP

LATITUDE: 23° 20.395' **LONGITUDE:** 146° 29.609'

EASTING: 0448273 **NORTHING:** 7418765 **Mobile Coverage:** [✓ Y] / N

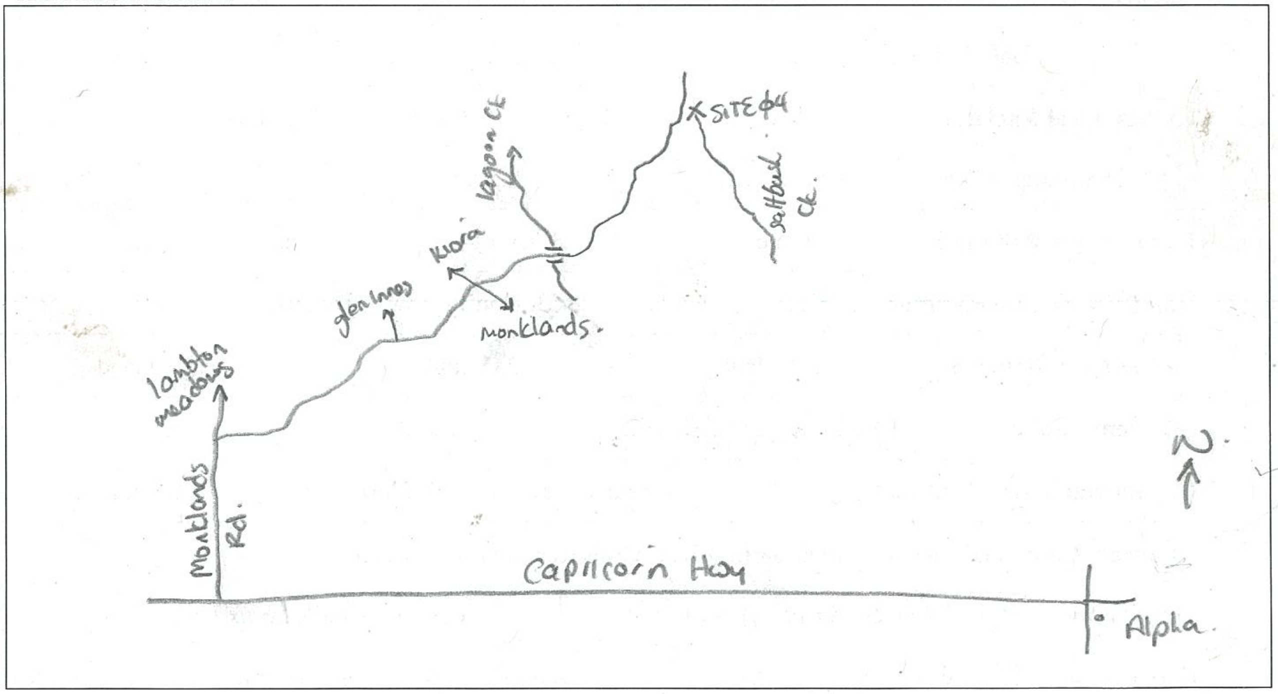
MAP NAME: – **MAP SCALE:** – **Sat. Phone Coverage:** [✓ Y] / N

DATUM (i.e. GDA94): WGS84 **PHOTO #'s:** 283 - 294 **Key required:** N

Water samples collected: Yes - 10/4/12

ACCESS DETAILS: Travel west along the capricorn hwy from Alpha ~30 km to right turn into monklands Rd. Follow 12.7 km to 'T' intersection, turn right. Continue for another 28.3 km to site 04 on right. Small overgrown track off on right.

ACCESS ROUTE:



LAND OWNER:

Name: Reid Bauman

ENTERED

Address: Monklands

Phone:

Permission Requirements: Yes - via kelvin Sypher (waratah Coal)

Office Use:	Data Entered By:	TS	Date:	11/9/12

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FIELD OBSERVATIONS AND WATER QUALITY SHEET

SITE CODE/NAME site 04 **DATE:** 13 / 4 / 12

WQ Parameter	Edge	Riffle	WQ Parameter	Edge	Riffle
Sample Depth (m)	0·3		DO (mg/L)	2·75	
Gauge Height (m)	–		DO (% sat)	30·7	
Water Temperature (°C)	20·67		Turbidity (NTU)	10	
Conductivity (µS/cm)	98		Total Alkalinity (mg/L)	50	
pH	7·43		**Time Collected**	0810	

Habitat's Present (circle if present) 1. Pool-K [✓ 2. Pool-S] 3. Run-K 4. Run-S 5.Riffle [✓ 6.LWD] 7. Macrophyte [✓ 8. Other] Tree roots / standing timber, leaf litter

Stream Width Max 20 m Min 2 m Mode 15 m

Water Level [✓ 1. No Flow] 2.Dry/Isolated 3.<Watermark 4. Normal 5. >Watermark

Slightly higher than July 2011, connected to u/s stream channel

Shading of River None Low [✓ Moderate] High

Type of River System [✓ Intermittent] Permanent Details……………………

Bank Erosion 1. None [✓ 2. Little] 3.Some 4. Moderate 5. Extensive

Dams/Barriers 1. Yes - Upstream 2. Yes - Downstream [✓ 3. No] 4. Don't Know

Dam/Barrier details……………………

Hydrological Variation 1. None 2. Little 3.Some 4. Moderate 5. Extensive

Hydrological Variation details: Temporally variable, but relatively permanent compared to adjacent narrow stream sections. Only 1 hydraulic habitat type

Point Source Pollution 1. Yes [✓ 2. No] 3. Don't Know Details……………………

Non Point Source Pollution [✓ 1. Yes] 2. No 3. Don't Know Details Cattle access to lagoon + road runoff

Landowner says cattle don't prefer to drink at this waterhole

Position in Catchment 1. Upland 2. Midland 3. Lowland

Adjacent Landuse Cattle grazing

Geomorphology 1. Steep Valley [✓ 2. Broad Valley] 3. Floodplain 4. Other……………

Riparian Zone (zone extends for 100m upstream and downstream from sampled area)

Trees<10m 5 % cover *Shrubs/Vines/Rushes* 1 % cover *Grasses/Ferns/Herbs* 98 % cover

Bare Ground	1. None	[✓ 2. Little]	3. Some	4. Moderate	5. Extensive
Grass	1. None	2. Little	3. Some	4. Moderate	[✓ 5. Extensive]
Shrubs	1. None	[✓ 2. Little]	3. Some	4. Moderate	5. Extensive
Trees<10m	1. None	[✓ 2. Little]	3. Some	4. Moderate	5. Extensive
Trees>10m	1. None	2. Little	3. Some	[✓ 4. Moderate]	5. Extensive

Comments: River fringed by mixed eucalypts, inc. mature ghost gum + grasses & sedges

MACROINVERTEBRATE FIELD SHEET 1

SITE CODE/NAME Site 04 **DATE:** 13 / 4 / 12

HABITAT TYPE (E=Edge; R=Riffle; K=Rocky Bed; S=Sandy Bed; M=Macrophytes; N=Run; C=Composite)

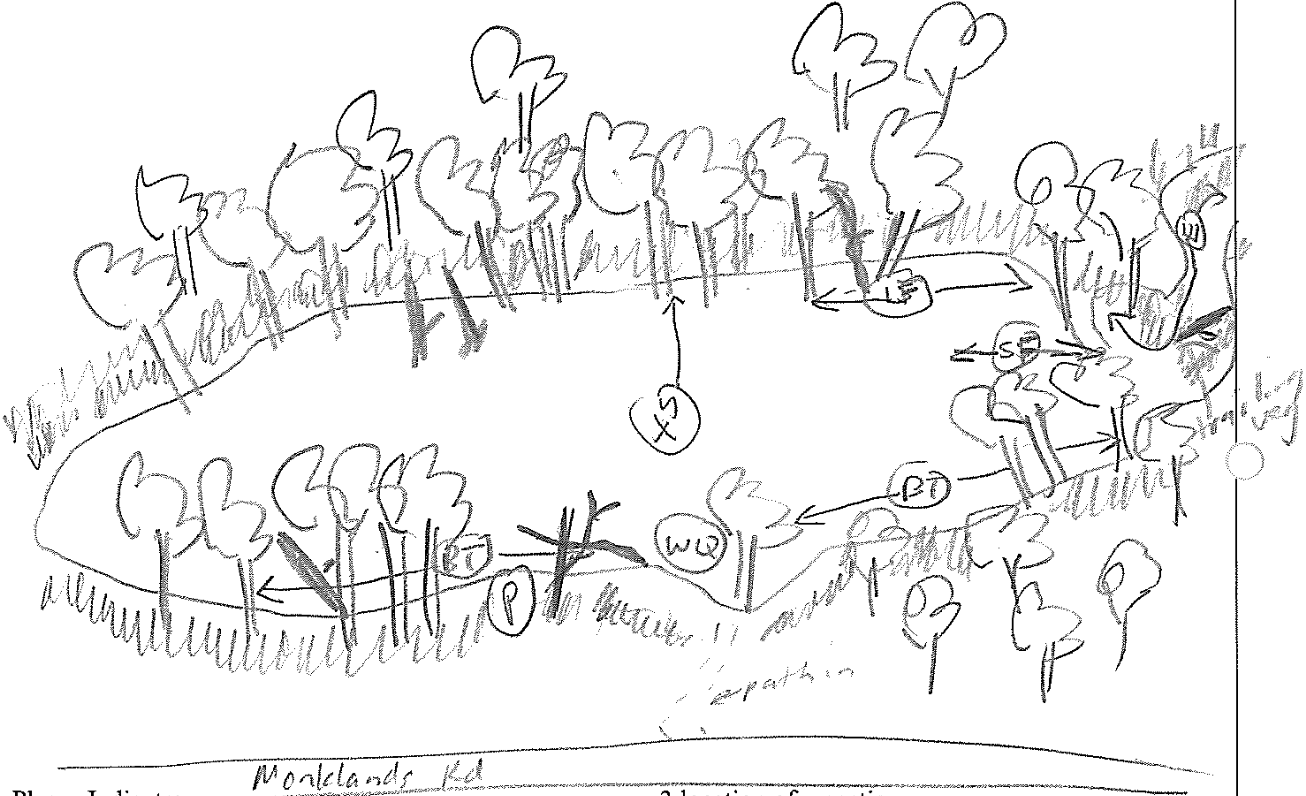
KEY HABITAT FEATURES	Edge				
Vel count					
Vel depth					
Vel m/sec					
Vel (average) (m/sec)	0				
Mean Sample Depth (m)	0.2				
Mean Wetted Width (m)	5				
% Bedrock	0				
% Boulder (>soccer ball)	0				
% Cobble (tennis ball - soccer ball)	0				
% Pebble (marble - tennis ball)	0				
% Gravel (2 - 4mm)	0				
% Sand (0.005 - 2mm)	0				
% Silt/Clay (< 0.005 mm)	100				
% Detritus (leaves/twigs)	80				
% Sticks (<2cm)	20				
% Branches	20				
% Logs (>15cm)	0				
% Algae	10				
% Macrophytes	10				
% Overhanging habitat (e.g. vegetation, roots)	70				
% Blanketing silt (indicated by plume)	30				
% Shading	50				
Sampled By:	KP				
Picked By:	KP				

Comments:

MACROINVERTEBRATE FIELD SHEET 2

SITE CODE/NAME site 04 **DATE:** 13 / 4 / 12

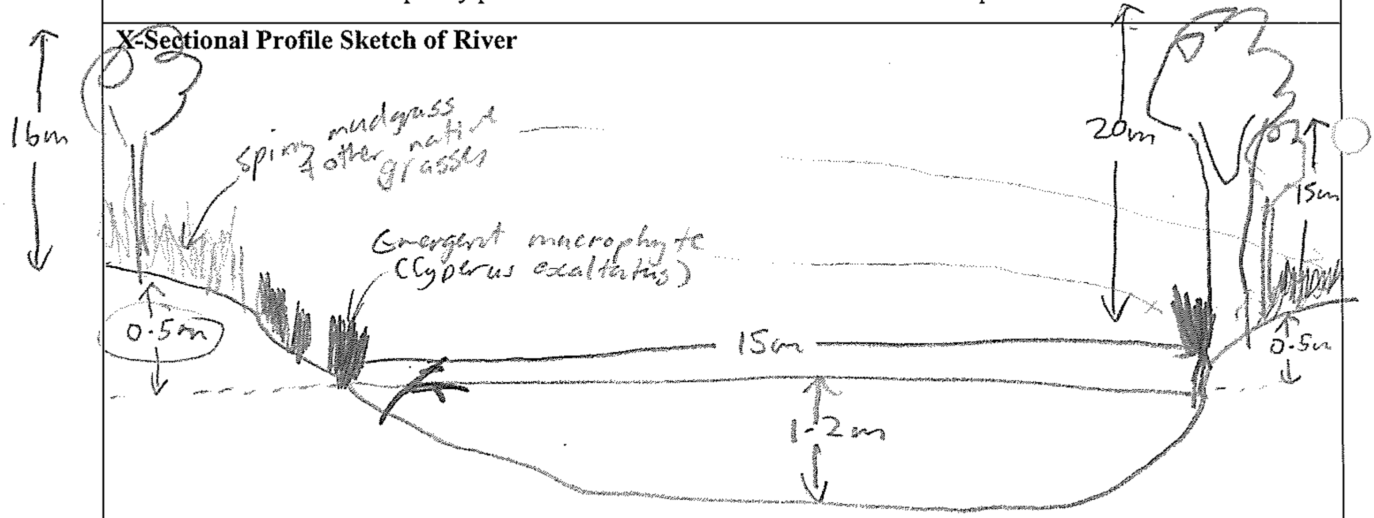
Longitudinal Profile Sketch of River



Please Indicate:

1. Biological sampling sites for each habitat
2. location of where water quality parameters were taken
3. location of x-section
4. riparian zone width, type and height
5. location of where photos were taken

X-Sectional Profile Sketch of River



Please Indicate:

1. Approx. bank height, stream width and depth
2. Approx. riparian vegetation height

General Comments:

Large open water lagoon pool connected to stream channel Mainly intact bed + banks & riparian vegetation. Clubrush make up a major understory component at the water margins + canopy dominated by ghost gum.

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REFERENCE CONDITION SELECTION SHEET

SITE CODE: Site 04 Date: 13/4/12 (If the impacts are unknown, seek further information before scoring; more than one person must complete this form)

Possible Impacts	5 (No Impact)	4 (Minor Impact)	3 (Moderate Impact)	2 (Major Impact)	1 (Extreme Impact)	Score	Previous Score
1. Agriculture and forestry*	No impact	[✓ Present but level of impact is barely discernible]	Evident, however, not severe and/or widespread	Obvious impact to stream, moderate and/or widespread	Severe and widespread, impact obvious	4	
2. Sand/gravel extraction*	[✓ No evidence or prior knowledge of extraction]	Small scale historical extraction	No current extraction; large historical extraction	Current small scale/localised extraction	Current and widespread extraction	5	
3. Upstream urban areas*	[✓ No impacts from urbanisation]	Possible impacts caused from urbanisation	Definite impacts caused from urbanisation	High impacts caused from urbanisation	Extreme impacts caused from urbanisation	5	
4. Point source pollution*	[✓ Nil point source pollution]	Low volumes of point source pollution discharged	Low to moderate volumes of point source pollution discharged	Moderate to high volumes of point source pollution discharged	High to extreme volumes of point source pollution discharged	5	
5. Dam/weir*	[✓ No artificial barriers in basin which will affect the site]	Few small upstream barriers; not within impoundment	Many small barriers; site not within impoundment	Multiple small barriers; Large barriers upstream; within small impoundment	Large barriers upstream; within large impoundment	5	
6. Flow regime alteration*	[✓ Seasonal flow regime natural]	Seasonal flow regime not obviously altered	Flow regime altered	Flow regime obviously altered	Flow regime highly modified	5	
7. Streamside veg. alteration@	[✓ Streamside vegetation unaltered]	Vegetation slightly modified	Obvious modification	Highly modified vegetation	Severe modification	5	
8. Riparian zone/ streambank erosion	[✓ No evidence of erosion beyond natural]	Slightly more than natural levels of erosion	Moderate levels of unnatural erosion	High levels of erosion	Extreme erosion	5	
9. Geomorphic change@	[✓ No evidence]	Slight geomorphic change	Moderate change	High changes	Extreme alteration	5	
10. Instream habitat alteration@	[✓ Instream habitats of natural appearance and diversity]	Barely discernible impacts	Moderate modifications to instream habitats	Highly modified modifications to instream habitats	Severe modification of instream habitats	5	
NOTE: When applicable, write down in the comments section the type and approx. distances from the impact If a score given differs from the previous score, state the reason why they are different in the comments section					**Total**	49	

COMMENTS

SC1: Cattle access site, but don't appear to use it much as a drinking water supply

SC2: —

SC3: —

SC4: —

SC5: —

SC6: —

SC7: —

SC8: —

SC9: — * but landowner says pool section is result of creek being dug out decades ago

SC10:

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FISH SAMPLING SHEETS

PROJECT NAME: Galilee coal Project **SITE CODE:** Site 04

SITE NAME: Saltbush Creek Lagoon

DATE: 13/4/12 **TIME (24hrs):** [0830] **PARTY:** JC + KP

Site Summary

Species Name	Common Name	Count	Abundance Score
Melanotaenia Splendida	Eastern Rainbowfish	399	5
Ambassis agassizi	Agassizi's glass perchlet	500	5
Mogurnda adspersa	Purple spotted gudgeon	8	2
Cherax quad	Red claw	14	3
Neosiluris hyrtlii	Hyrty's tandan	60	4
Atyidae	shrimp	27	3
Oreochromis mossambicus	Tilapia	68	4
Hypseleotris klungzingeri	Western Carp Gudgeon	23	3
Hypseleotris Species 1	midgeley Carp Gudgeon	7	2
Craterocephalus ste	Fly specked Hardyhead	1	1
Macrobrachium	Freshwater prawn	28	3
Leiopotheron unicolour	Spangled perch	5	2

Method Details

Electrofishing (EF)	
Operator:	
Assistant:	
Start Time:	
Finish Time:	
No. EF Seconds:	
EF Settings:	
Nets and Traps	
# Fyke Nets (FN):	2 o/n. 1x lg 1x sm
# Seine Passes (SN):	
# Bait Traps (BT):	10 o/n.

Fish abundance scale

Approx # Observed	Abundance Score
1	1
2-9	2
10-50	3
51-100	4
101-500	5
501-1000	6
1001-5000	7
>5000	8

Species: Mel spl

	Method	LHS (J/I/A)	Length
1	Large fyke		37
2			40
3			50
4	Count		28
5	100+100	+100+20	40
6	+10+6+5	+5+3	40
7	+5+2+1	=357	33
8			42
9	Fyke (sm)	𝍸	57
10	Bait 2	|	30
11	Bait 3	||||	35
12	Bait 4	𝍸	40
13	Bait 5	𝍸|	45
14	Bait 9	|	37
15			35
16			39
17			40
18			27
19			28

Species: Amb aga

	Method	LHS (J/I/A)	Length
1	Fyke (lg)		47
2			44
3			21
4	Count		21
5	15+15+15	+10+20	23
6	+15+20+	20+20	45
7	+20+20+	10+15	25
8	+20+10	+30=275	23
9	Fyke (sml)	15+22	24
10	+7+10	=54	22
11	Bait 1	1	26
12	Bait 3	1	24
13	Bait 4	10+10+8	27
14	Bait 5	10+10	24
15	Bait 6	20	47
16	Bait 7	15	25
17	Bait 8	1	24
18	Bait 9	35	24
19	Bait 10	50	23

Species: O. mos

	Method	LHS (J/I/A)	Length
1	Fyke (lg)		45
2			54
3			55
4	Count		48
5	𝍸 𝍸 𝍸	𝍸 𝍸	58
6	𝍸 𝍸 𝍸	𝍸 |	62
7		= 46	55
8	Fyke (sm)	|| = 2	59
9			56
10			67
11			47
12			38
13			53
14			60
15			56
16			44
17			58
18			60
19			60

Fish Sampling Field Sheet Cont.

20			24

Species: Neo hyr

	Method	LHS (J/I/A)	Length
1	Fyke (lg)		85
2			130
3	Count		105
4	卌 卌 卌	卌 卌	120
5	||| = 28		88
6			110
7	Fyke (sm)	155mm	69
8	$ = 12	卌 卌		80
9			135
10			88
11			85
12			112
13			65
14			74
15			80
16			52
17			70
18			70
19			76
20			113

20			18

Species: Mog ads

	Method	LHS (J/I/A)	Length
1	Fyke (lg)		84
2			48
3			74
4			41
5	Fyke (sm)		93
6			39
7	Bait 5.		79
8	Bait 10		80
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

20			54

Species: H. klunzingeri

	Method	LHS (J/I/A)	Length
1	Fyke (lg)		35
2			30
3			30
4			29
5			28
6			34
7			26
8			30
9			33
10	Fyke (sm)		35
11			35
12	Bait 4		30
13			35
14			30
15			30
16			28
17	Bait 5		31
18			27
19			29
20			31

Bait 9 |||

Species: cra ske.

	Method	LHS (J/I/A)	Length
1	Fyke (lg)		34
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Species: H. sp1

	Method	LHS (J/I/A)	Length
1	Fyke (lg)		34
2			40
3			35
4	Fyke (sm)		34
5	Bait 1		32
6	Bait 3		35
7	Bait 7		35
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Species: Red claw

	Method	LHS (J/I/A)	Count ~~Length~~
1	Fyke (lg)		8
2	Fyke (sm)		1
3	Bait 3		1
4	Bait 4		1
5	Bait 5		|||
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Fish Sampling Field Sheet Cont.

Species: macrobrachium				**Species:** atyidae.				**Species:** lei uni			
	Method	**LHS (J/I/A)**	count ~~**Length**~~		**Method**	**LHS (J/I/A)**	count **Length**		**Method**	**LHS (J/I/A)**	**Length**
1	Fyke (lg)		𝍸 𝍸 𝍸	1	Fyke (lg)		𝍸 𝍸 𝍸	1	Fyke (sm)		155
2			IIII =19	2			𝍸 𝍸 =25	2			155
3	Fyke (sm)		𝍸 =5	3	Fyke (sml)		II =2	3			125
4	Bait 5		III =3	4				4			96
5	Bait 10		I	5				5			43
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

Species:				**Species:**				**Species:**			
	Method	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

MACROPHYTE FIELD SHEET

Ecowise Environmental

PROJECT NAME: GCP. **SITE CODE:** SITE 04 **DATE:** 13 / 4 /12 **PARTY:** KP + JC

SITE NAME: site 04 - Saltbush Ck **TIME (24hrs):** [9.30]

Method: Belt transect (10m x 100m) ☐ ~~Y~~ or quadrat ☐ ~~Y~~ N/A

Total Area of Coverage:
(can exceed 100%)

Total macrophyte coverage	25				
Submerged	0	Emergent	100	Floating	0
Rare	0	Noxious	0		

Species Observed:

Macrophyte Species	Common Name	% cover	Exotic / Native	Form (S/E/F)	Samples	Photos
monochoria cyanea	monochoria	1 plant	N	E	No.	#294, 295
Cyperus exaltatus	Tall flatsedge	23% (95%)	N	E	NO	287
Pseudoraphis spinescens	Spiny mudgrass	1% 65%)	N	E	No	298
unknown submerged species						296 297
with thin alternate leaves	E.f. & Crassula helmsii (swamp stonecrop)	1 plant	N	E		
growing to 10cm						
Cyperus difformis	Dirty Dora	1% (25)				298

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FIELD SHEET

PROJECT NAME: GCP **SITE CODE:** PC-DAM

SITE NAME: Pebbly Ck dam

DATE: 13 / 4 / 12 **TIME (24hrs):** [14 10] **PARTY:** KP + JC

LATITUDE: 23° 26·333' **LONGITUDE:** 146° 18·829'

EASTING: 429908 **NORTHING:** 7407728 **Mobile Coverage:** [✓ Y] / N

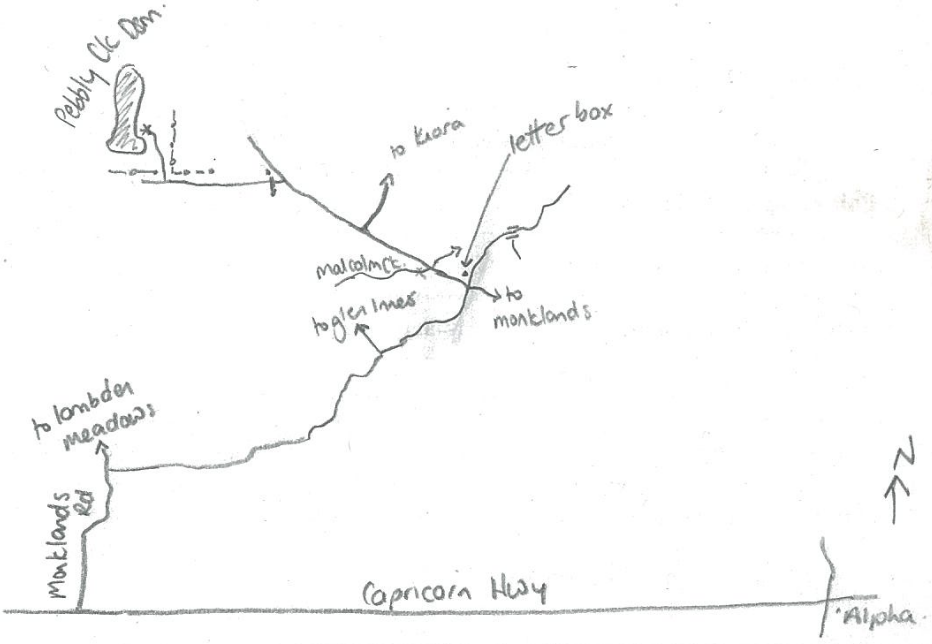
MAP NAME: — **MAP SCALE:** — **Sat. Phone Coverage:** [✓ Y] / N

DATUM (i.e. GDA94): WGS84 **PHOTO #'s:** 317-321 **Key required:** NO.

Water samples collected: Yes 10.4.12, collected TPH today

ACCESS DETAILS: Travel west on Capricorn Hwy ~28km from Alpha to right turn into Monklands Rd. Follow dirt road for 12·7km to 'T' intersection. Turn right and continue ~20km to cross roads with 2 properties. Turn left into Kiora property (not signed). Travel ~18km to double gates + track on left * ensure gate is locked exactly the same way as found * Follow track to opening in fence + dam.

ACCESS ROUTE:



LAND OWNER:

Name:

Address:

Phone:

Permission Requirements:
Ensure gates are locked as per way left.

ENTERED

Office Use:	Data Entered By:	TS	Date:	10/9/12

FIELD OBSERVATIONS AND WATER QUALITY SHEET

SITE CODE/NAME PC-Dam **DATE:** 13 / 4 / 12

WQ Parameter	**Edge**	**Riffle**	**WQ Parameter**	**Edge**	**Riffle**
Sample Depth (m)	0.1		DO (mg/L)	8.40	
Gauge Height (m)	–		DO (% sat)	100.3	
Water Temperature (°C)	24.20		Turbidity (NTU)	206	
Conductivity (µS/cm)	83		Total Alkalinity (mg/L)	30	
pH	7.90		**Time Collected**	1420	

Habitat's Present (circle if present) 1. Pool-K [✓ 2. Pool-S] 3. Run-K 4. Run-S 5.Riffle [✓ 6.LWD] [✓ 7. Macrophyte] 8. Other

Stream Width Max 50 m Min 5 m Mode 20 m

Water Level [✓ 1. No Flow] 2.Dry/Isolated 3.<Watermark 4. Normal 5. >Watermark

Shading of River None [✓ Low] Moderate High

Type of River System [✓ Intermittent] Permanent Details. Dammed intermittent stream section

Bank Erosion 1. None 2. Little [✓ 3.Some] 4. Moderate 5. Extensive

Dams/Barriers 1. Yes - Upstream [✓ 2. Yes - Downstream] 3. No 4. Don't Know

Dam/Barrier details. Site located on dammed section of stream

Hydrological Variation 1. None [✓ 2. Little] 3.Some 4. Moderate 5. Extensive

Hydrological Variation details: Treeline suggests water level varies by around 4m from dry to filled. Only pool habitat present

Point Source Pollution 1. Yes [✓ 2. No] 3. Don't Know Details.......................

Non Point Source Pollution [✓ 1. Yes] 2. No 3. Don't Know Details. Cattle access to creek

Position in Catchment [✓ 1. Upland] 2. Midland 3. Lowland

Adjacent Landuse. Cattle grazing

Geomorphology 1. Steep Valley [✓ 2. Broad Valley] 3. Floodplain 4. Other..............

Riparian Zone (zone extends for 100m upstream and downstream from sampled area)

Trees<10m 5 % cover *Shrubs/Vines/Rushes* 5 % cover *Grasses/Ferns/Herbs* 35 % cover

Bare Ground	1. None	2. Little	3. Some	[✓ 4. Moderate]	5. Extensive
Grass	1. None	2. Little	[✓ 3. Some]	4. Moderate	5. Extensive
Shrubs	1. None	[✓ 2. Little]	3. Some	4. Moderate	5. Extensive
Trees<10m	1. None	[✓ 2. Little]	3. Some	4. Moderate	5. Extensive
Trees>10m	1. None	2. Little	3. Some	[✓ 4. Moderate]	5. Extensive

Comments: Fringed by ghost gums in section > 100m u/s of dam

MACROINVERTEBRATE FIELD SHEET 1

SITE CODE/NAME PC-Dam **DATE:** 13 / 4 / 12

HABITAT TYPE (E=Edge; R=Riffle; K=Rocky Bed; S=Sandy Bed; M=Macrophytes; N=Run; C=Composite)

KEY HABITAT FEATURES	Edge				
Vel count					
Vel depth					
Vel m/sec					
Vel (average) (m/sec)	0				
Mean Sample Depth (m)	0·10				
Mean Wetted Width (m)	30				
% Bedrock	0				
% Boulder (>soccer ball)	0				
% Cobble (tennis ball - soccer ball)	0				
% Pebble (marble - tennis ball)	0				
% Gravel (2 - 4mm)	0				
% Sand (0.005 - 2mm)	0				
% Silt/Clay (< 0.005 mm)	100				
% Detritus (leaves/twigs)	20				
% Sticks (<2cm)	10				
% Branches	30				
% Logs (>15cm)	0				
% Algae	10				
% Macrophytes	15				
% Overhanging habitat (e.g. vegetation, roots)	0				
% Blanketing silt (indicated by plume)	30				
% Shading	5				
Sampled By:	KP				
Picked By:	KP				

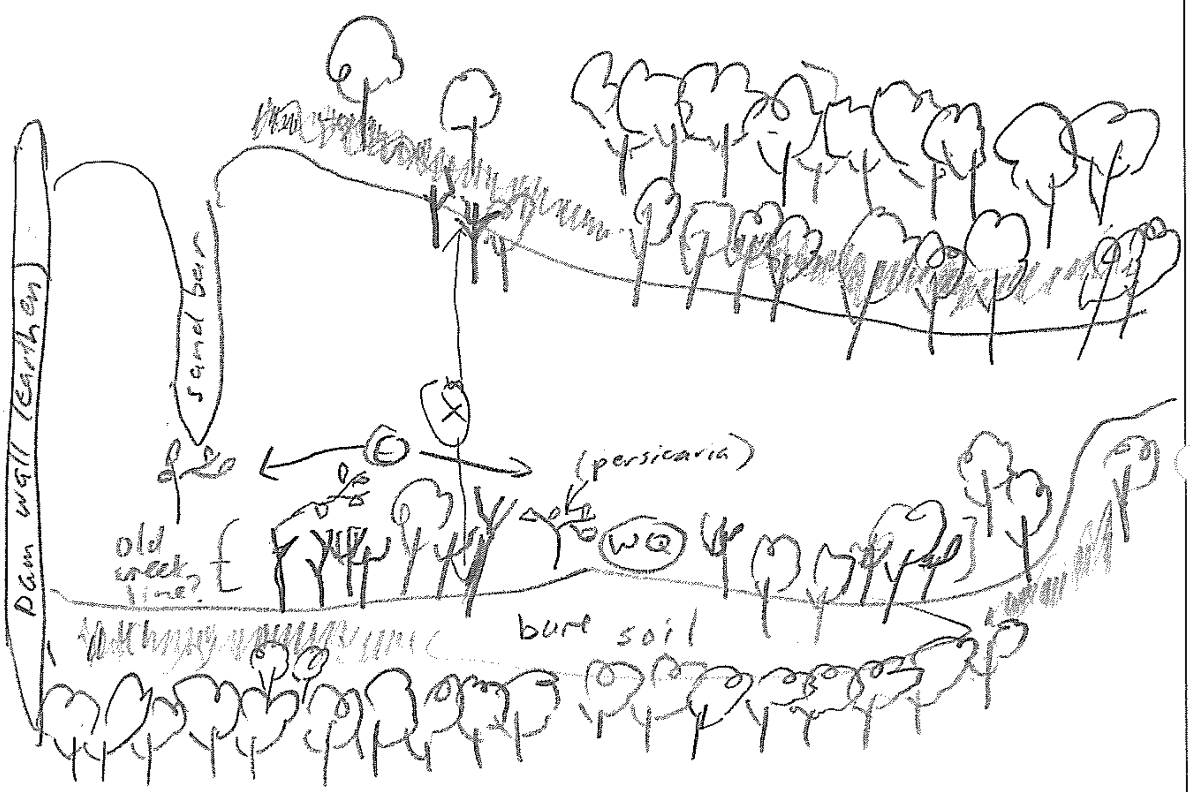
Comments: Water very shallow + turbid. Banks gentle sloping + limited habitat structure present, so 'edge' habitat quality marginal

observed Nepidae + Gerridae

MACROINVERTEBRATE FIELD SHEET 2

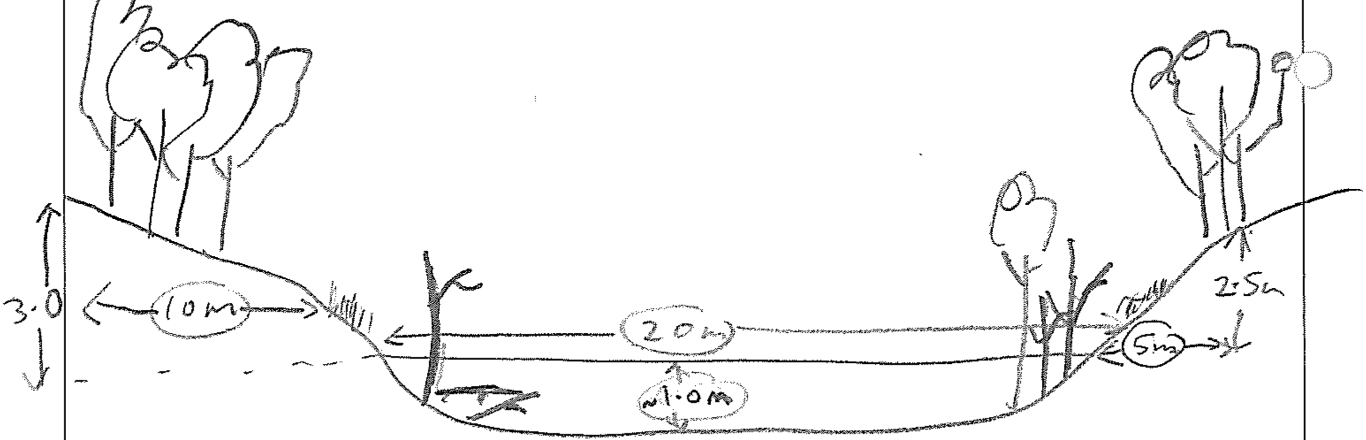
SITE CODE/NAME PC-Dam **DATE:** 13 / 4 / 12

Longitudinal Profile Sketch of River



Please Indicate:
1. Biological sampling sites for each habitat
2. location of where water quality parameters were taken
3. location of x-section
4. riparian zone width, type and height
5. location of where photos were taken

X-Sectional Profile Sketch of River



Please Indicate:
1. Approx. bank height, stream width and depth
2. Approx. riparian vegetation height

General Comments:

Open pool, shallow, with gentle sloping banks, which are largely bare soil in places with small patches of native grass. Bed & bank consist of sand-clay and show signs of wear due to cattle access. Dead trees near lower margin possibly indicative of original creek line.

REFERENCE CONDITION SELECTION SHEET

SITE CODE: PC-Dam Date: 13/4/12 (If the impacts are unknown, seek further information before scoring; more than one person must complete this form)

Possible Impacts	5 (No Impact)	4 (Minor Impact)	3 (Moderate Impact)	2 (Major Impact)	1 (Extreme Impact)	Score	Previous Score
1. Agriculture and forestry*	No impact	Present but level of impact is barely discernible	[✓ Evident, however, not severe and/or widespread]	Obvious impact to stream, moderate and/or widespread	Severe and widespread, impact obvious	3	
2. Sand/gravel extraction*	[✓ No evidence or prior knowledge of extraction]	Small scale historical extraction	No current extraction; large historical extraction	Current small scale/localised extraction	Current and widespread extraction	5	
3. Upstream urban areas*	[✓ No impacts from urbanisation]	Possible impacts caused from urbanisation	Definite impacts caused from urbanisation	High impacts caused from urbanisation	Extreme impacts caused from urbanisation	5	
4. Point source pollution*	[✓ Nil point source pollution]	Low volumes of point source pollution discharged	Low to moderate volumes of point source pollution discharged	Moderate to high volumes of point source pollution discharged	High to extreme volumes of point source pollution discharged	5	
5. Dam/weir*	No artificial barriers in basin which will affect the site	Few small upstream barriers; not within impoundment	Many small barriers; site not within impoundment	[✓ Multiple small barriers; Large barriers upstream; within small impoundment]	Large barriers upstream; within large impoundment	2	
6. Flow regime alteration*	Seasonal flow regime natural	Seasonal flow regime not obviously altered	Flow regime altered	[✓ Flow regime obviously altered]	Flow regime highly modified	2	
7. Streamside veg. alteration@	Streamside vegetation unaltered	Vegetation slightly modified	[✓ Obvious modification]	Highly modified vegetation	Severe modification	3	
8. Riparian zone/ streambank erosion	No evidence of erosion beyond natural	[✓ Slightly more than natural levels of erosion]	Moderate levels of unnatural erosion	High levels of erosion	Extreme erosion	4	
9. Geomorphic change@	No evidence	Slight geomorphic change	Moderate change	[✓ High changes]	Extreme alteration	2	
10. Instream habitat alteration@	Instream habitats of natural appearance and diversity	Barely discernible impacts	Moderate modifications to instream habitats	[✓ Highly modified modifications to instream habitats]	Severe modification of instream habitats	2	
NOTE: When applicable, write down in the comments section the type and approx. distances from the impact If a score given differs from the previous score, state the reason why they are different in the comments section					**Total**		

COMMENTS

SC1: Clearing of adjacent land + cattle access to creek
SC2: –
SC3: –
SC4: –
SC5: Site within impounded area of farm dam
SC6: * Farm dam preventing downstream flow in this arm of pebbly creek except during big wet
SC7: Dead trees indicate effects of damming of original creek line veg zone + loss of veg through cattle access
SC8: Erosion of bed + banks due to cattle access, only limited due to shallow slope of bank
SC9: Damming of creek has led to more permanent ponding than natural
SC10: Original ephemeral creek bed submerged. Bed trampled by cattle & reduced LWD due to lack of trees next to original creek line

For downstream in 2008 + 2010, but only filled 2011

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FISH SAMPLING SHEETS

PROJECT NAME: GCP **SITE CODE:** PC-DAM
SITE NAME: Pebbly Ck dam
DATE: 14 / 4 / 12 **TIME (24hrs):** [16·30] **PARTY:** KP + JC.

Site Summary

Species Name	Common Name	Count	Abundance Score
Lei unicolour	Spangled Perch	48	3
Mog. adspersa	Purple spotted gudgeon	3	2
macrobrachium	Freshwater Prawn	3	2
Cherax qua·	Red claw	1	1
Mel splenda	Rainbow	11	3
Hyp. klu	Western Carp gudgeon.	135	5
amb. agazzizi	Glass perchlet	14	3

Method Details

Electrofishing (EF)	
Operator:	KP
Assistant:	JC
Start Time:	150 seconds / shot
Finish Time:	5 shots.
No. EF Seconds:	LR-24
EF Settings:	400V 50hz 12%
Nets and Traps	
# Fyke Nets (FN):	2 1x lg 1x sml o/n set
# Seine Passes (SN):	–
# Bait Traps (BT):	0 –

Fish abundance scale

Approx # Observed	Abundance Score
1	1
2-9	2
10-50	3
51-100	4
101-500	5
501-1000	6
1001-5000	7
>5000	8

Species: Lei uni

	Method	LHS (J/I/A)	Length
1	Shot 1		40
2			41
3			36
4			37
5			37
6			37
7			23
8			45
9			30
10	Shot 2		37
11			30
12	Count		45
13	Shot 3.	𝍸 𝍸 |	61
14	Shot 4	𝍸	35
15	Fyke (sm)	||||	37
16	Fyke (lg)	𝍸	36
17			34
18			33
19			40

Species: macrobrachium

	Method	LHS (J/I/A)	count ~~Length~~
1	Shot 1		1
2	Fyke (sm)		1
3	Fyke (lg)		1
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			

Species: Mog ads

	Method	LHS (J/I/A)	Length
1	Shot 1		40
2	Shot 3		34
3	Fyke (sm)		48
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			

Fish Sampling Field Sheet Cont.

20			30	20				20			
Species: Che qua (redclaw)				**Species:** amb aga				**Species:** mel spl.			
	Method	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**
1	Shot 3	—	1	1	Shot 5		37	1	Shot 5		45
2				2	Fyke (sm)		44	2			42
3				3			40	3			36
4				4	Fyke (lg)		38	4			45
5				5			41	5	Fyke (lg)		57
6				6			46	6			46
7				7			40	7			29
8				8			36	8			56
9				9			46	9			42
10				10			37	10			40
11				11			38	11			52
12				12			46	12			
13				13			44	13			
14				14			38	14			
15				15			40	15			
16				16			41	16			
17				17			68	17			
18				18				18			
19				19				19			
20				20				20			

Species: Hyp klu				**Species:** Lei uni cont'd.				**Species:**			
	Method	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**
1	Shot 4		22	1	Fyke (lg)		145	1			
2			20	2	few large were		155	2			
3	Fyke (lg)		22	3	measured.		225	3			
4			18	4				4			
5			20	5				5			
6	count Fyke (lg).		18	6				6			
7	𝍸𝍸𝍸		16	7				7			
8	𝍸𝍸𝍸		17	8				8			
9	𝍸𝍸𝍸		20	9				9			
10	𝍸𝍸𝍸		21	10				10			
11	𝍸𝍸𝍸		28	11				11			
12	𝍸𝍸𝍸		20	12				12			
13	𝍸𝍸𝍸		24	13				13			
14	𝍸𝍸		19	14				14			
15			19	15				15			
16			22	16				16			
17			23	17				17			
18			22	18				18			
19			24	19				19			
20			25	20				20			

Fish Sampling Field Sheet Cont.

Species:				Species:				Species:			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

Species:				Species:				Species:			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
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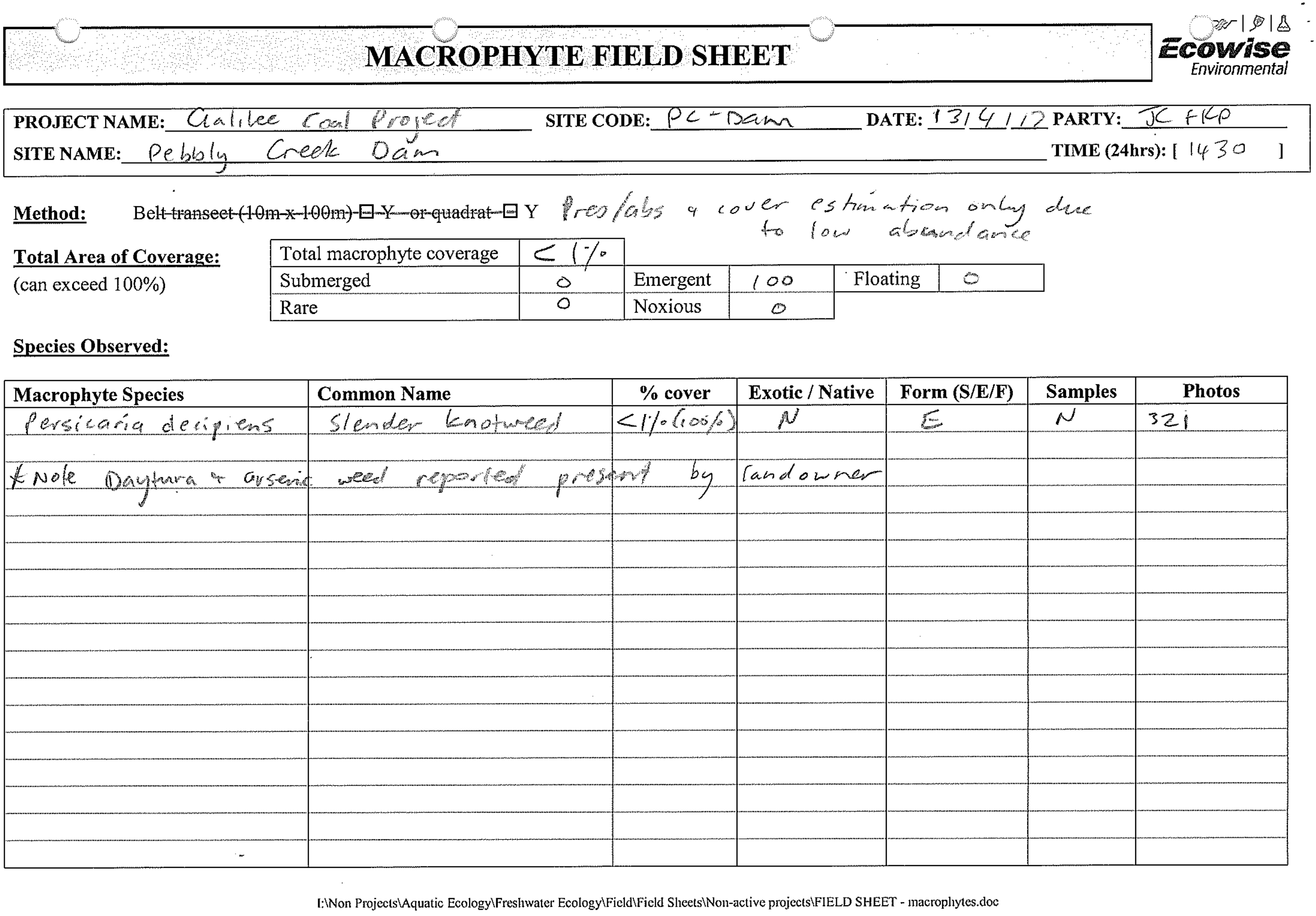
18				18				18			
19				19				19			
20				20				20			



MACROPHYTE FIELD SHEET

Ecowise Environmental

PROJECT NAME: Galilee Coal Project SITE CODE: PC - Dam DATE: 13/4/12 PARTY: JC FKP

SITE NAME: Pebbly Creek Dam TIME (24hrs): [1430]

Method: Belt ~~transect (10m x 100m) ☐ Y or quadrat ☐~~ Y Pres/abs & cover estimation only due to low abundance

Total Area of Coverage:
(can exceed 100%)

Total macrophyte coverage	< 1%				
Submerged	0	Emergent	100	Floating	0
Rare	0	Noxious	0		

Species Observed:

Macrophyte Species	Common Name	% cover	Exotic / Native	Form (S/E/F)	Samples	Photos
Persicaria decipiens	Slender knotweed	<1% (100%)	N	E	N	321
*Note Dayhura + arsenic	weed reported present	by	landowner			

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FIELD SHEET

PROJECT NAME: GCP **SITE CODE:** MC-NEW

SITE NAME: Malcolm Ck. @ Kiora causeway.

DATE: 12 / 4 / 12 **TIME (24hrs):** [16.00] **PARTY:** KP + JC

LATITUDE: 23° 23.863' **LONGITUDE:** 146° 25.758'

EASTING: 441686 **NORTHING:** 7412336 **Mobile Coverage:** [✓ Y] / N weak

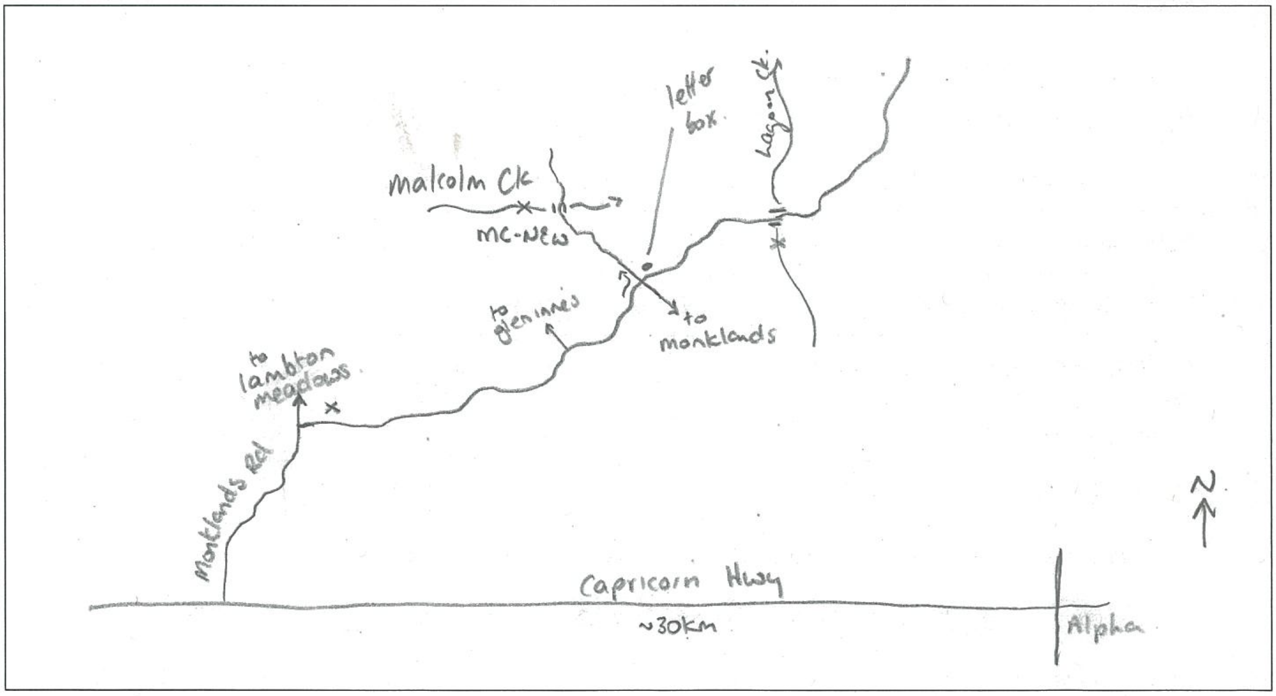
MAP NAME: – **MAP SCALE:** – **Sat. Phone Coverage:** [✓ Y] / N

DATUM (i.e. GDA94): WGS84 **PHOTO #'s:** 277-280 **Key required:** NO

Water samples collected: Yes - 10.4.12.

ACCESS DETAILS: Follow capricorn Hwy west from Alpha ~30km to right turn into Monklands Rd. Continue ~10km to right turn towards Monklands property. Follow along road passed glen innes property turn off (on left) to cross roads. Take left turn into Kiora property (no sign), rusty barrel letterbox out front. Continue along road until cross Malcolm Ck. Sample u/s causeway (left).

ACCESS ROUTE:



LAND OWNER:

Name: Kelvin Sypher. – Kiora property.

ENTERED

Address:

Phone:

Permission Requirements: Yes, Kelvin is contact for property & at Waratah Coal

Office Use:	Data Entered By:	T.S.	Date:	10/9/12

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FIELD OBSERVATIONS AND WATER QUALITY SHEET

SITE CODE/NAME MC-new **DATE:** 12/4/12

WQ Parameter	Edge	Riffle	WQ Parameter	Edge	Riffle
Sample Depth (m)	0.3		DO (mg/L)	7.78	
Gauge Height (m)	–		DO (% sat)	93.4	
Water Temperature (°C)	24.55		Turbidity (NTU)	778	
Conductivity (µS/cm)	238		Total Alkalinity (mg/L)	100	
pH	8.20		**Time Collected**	1630	

Habitat's Present (circle if present) 1. Pool-K [✓ 2. Pool-S] 3. Run-K 4. Run-S 5.Riffle [✓ 6.LWD] 7. Macrophyte [✓ 8. Other] – Trailing veg.

Stream Width Max 7 m Min 3 m Mode 5 m

Water Level [✓ 1. No Flow] 2.Dry/Isolated 3.<Watermark 4. Normal 5. >Watermark

Shading of River [✓ None] Low Moderate High

Type of River System [✓ Intermittent] Permanent Details……

Bank Erosion 1. None [✓ 2. Little] 3.Some 4. Moderate 5. Extensive

Dams/Barriers 1. Yes - Upstream 2. Yes - Downstream 3. No [✓ 4. Don't Know]

Dam/Barrier details……

Hydrological Variation 1. None [✓ 2. Little] 3.Some 4. Moderate 5. Extensive

Hydrological Variation details: Temporally variable, but only 1 hydraulic habitat present

Point Source Pollution 1. Yes [✓ 2. No] 3. Don't Know Details……

Non Point Source Pollution [✓ 1. Yes] 2. No 3. Don't Know Details Cattle access to creek + road runoff

Position in Catchment [✓ 1. Upland] 2. Midland 3. Lowland

Adjacent Landuse Cattle grazing

Geomorphology 1. Steep Valley [✓ 2. Broad Valley] 3. Floodplain 4. Other……

Riparian Zone (zone extends for 100m upstream and downstream from sampled area)

Trees<10m 1 % cover *Shrubs/Vines/Rushes* 0 % cover *Grasses/Ferns/Herbs* 99 % cover

Bare Ground [✓ 1. None] 2. Little 3. Some 4. Moderate 5. Extensive

Grass 1. None 2. Little 3. Some 4. Moderate [✓ 5. Extensive]

Shrubs [✓ 1. None] 2. Little 3. Some 4. Moderate 5. Extensive

Trees<10m 1. None [✓ 2. Little] 3. Some 4. Moderate 5. Extensive

Trees>10m 1. None [✓ 2. Little] 3. Some 4. Moderate 5. Extensive

Comments: Almost completely devegetated in terms of riparian canopy Consistent with adjacent large-scale land clearing

MACROINVERTEBRATE FIELD SHEET 1

SITE CODE/NAME MC-new **DATE:** 12/4/12

HABITAT TYPE (E=Edge; R=Riffle; K=Rocky Bed; S=Sandy Bed; M=Macrophytes; N=Run; C=Composite)

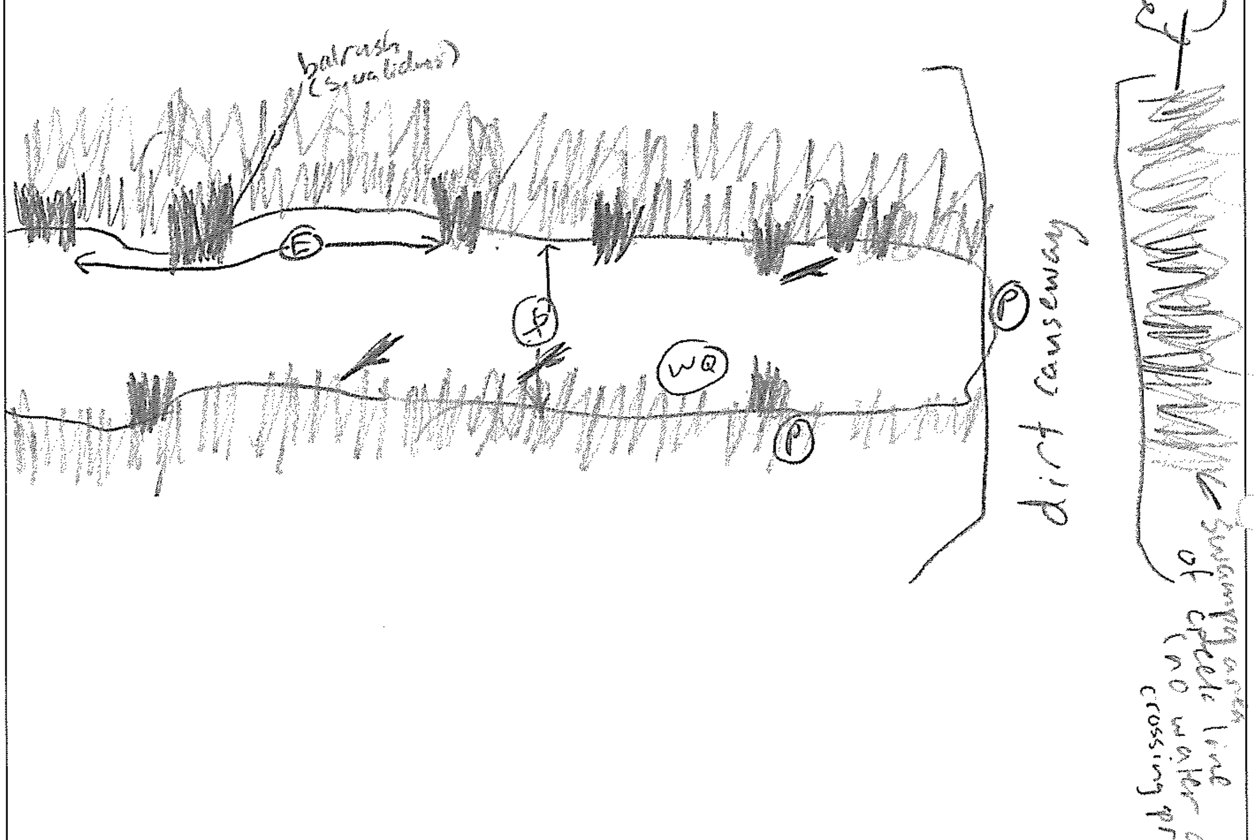
KEY HABITAT FEATURES	Edge				
Vel count					
Vel depth					
Vel m/sec					
Vel (average) (m/sec)	0				
Mean Sample Depth (m)	0.2				
Mean Wetted Width (m)	6				
% Bedrock	0				
% Boulder (>soccer ball)	0				
% Cobble (tennis ball - soccer ball)	0				
% Pebble (marble - tennis ball)	0				
% Gravel (2 - 4mm)	20				
% Sand (0.005 - 2mm)	30				
% Silt/Clay (< 0.005 mm)	50				
% Detritus (leaves/twigs)	5				
% Sticks (<2cm)	0				
% Branches	0				
% Logs (>15cm)	20				
% Algae	5				
% Macrophytes	2				
% Overhanging habitat (e.g. vegetation, roots)	5				
% Blanketing silt (indicated by plume)	10				
% Shading	0				
Sampled By:	KP				
Picked By:	KP				

Comments: Very turbid. Adjacent causeway. Lacking structural edge habitat. Banks low + gentle sloping + limited trailing veg. or macrophytes. Cattle pugging of clay banks also present

MACROINVERTEBRATE FIELD SHEET 2

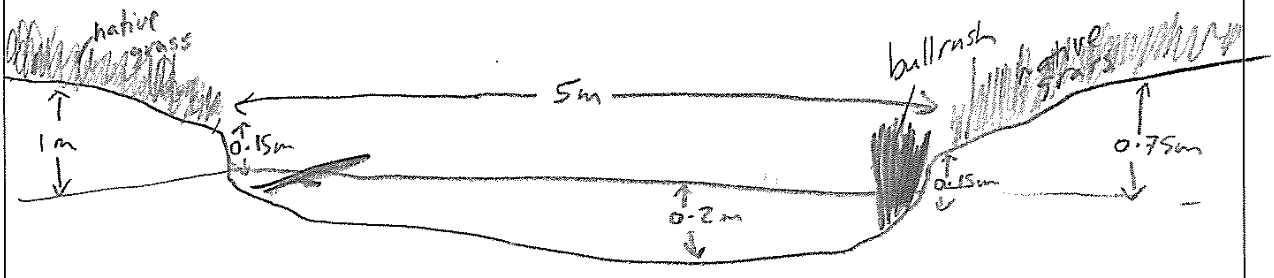
SITE CODE/NAME MC-new **DATE:** 12 / 4 / 12

Longitudinal Profile Sketch of River



Please Indicate:
1. Biological sampling sites for each habitat
2.location of where water quality parameters were taken
3.location of x-section
4. riparian zone width, type and height
5.location of where photos were taken

X-Sectional Profile Sketch of River



Please Indicate:
1. Approx. bank height, stream width and depth
2. Approx. riparian vegetation height

General Comments:

Shallow, narrow channel of fairly uniform habitat, lacking complex structural habitat or overhead canopy. Banks low & of gentle slope consisting of sand clay. Bed of similar material. Fringed by native grass + bullrush (S.validus)

REFERENCE CONDITION SELECTION SHEET

SITE CODE: MC -new **Date:** 12/4/12 **(If the impacts are unknown, seek further information before scoring; more than one person must complete this form)**

Possible Impacts	5 (No Impact)	4 (Minor Impact)	3 (Moderate Impact)	2 (Major Impact)	1 (Extreme Impact)	Score	Previous Score
1. Agriculture and forestry*	No impact	Present but level of impact is barely discernible	Evident, however, not severe and/or widespread	[✓ Obvious impact to stream, moderate and/or widespread]	Severe and widespread, impact obvious	2	
2. Sand/gravel extraction*	[✓ No evidence or prior knowledge of extraction]	Small scale historical extraction	No current extraction; large historical extraction	Current small scale/localised extraction	Current and widespread extraction	5	
3. Upstream urban areas*	[✓ No impacts from urbanisation]	Possible impacts caused from urbanisation	Definite impacts caused from urbanisation	High impacts caused from urbanisation	Extreme impacts caused from urbanisation	5	
4. Point source pollution*	[✓ Nil point source pollution]	Low volumes of point source pollution discharged	Low to moderate volumes of point source pollution discharged	Moderate to high volumes of point source pollution discharged	High to extreme volumes of point source pollution discharged	5	
5. Dam/weir*	[✓ No artificial barriers in basin which will affect the site]	Few small upstream barriers; not within impoundment	Many small barriers; site not within impoundment	Multiple small barriers; Large barriers upstream; within small impoundment	Large barriers upstream; within large impoundment	5	
6. Flow regime alteration*	Seasonal flow regime natural	[✓ Seasonal flow regime not obviously altered]	Flow regime altered	Flow regime obviously altered	Flow regime highly modified	4	
7. Streamside veg. alteration@	Streamside vegetation unaltered	Vegetation slightly modified	Obvious modification	[✓ Highly modified vegetation]	Severe modification	2	
8. Riparian zone/ streambank erosion	No evidence of erosion beyond natural	[✓ Slightly more than natural levels of erosion]	Moderate levels of unnatural erosion	High levels of erosion	Extreme erosion	4	
9. Geomorphic change@	No evidence	[✓ Slight geomorphic change]	Moderate change	High changes	Extreme alteration	4	
10. Instream habitat alteration@	Instream habitats of natural appearance and diversity	Barely discernible impacts	[✓ Moderate modifications to instream habitats]	Highly modified modifications to instream habitats	Severe modification of instream habitats	3	
NOTE: When applicable, write down in the comments section the type and approx. distances from the impact If a score given differs from the previous score, state the reason why they are different in the comments section					**Total**	39	

COMMENTS

SC1: Riparian canopy completely cleared, Cattle access to creek
SC2: –
SC3: –
SC4: –
SC5: –
SC6: Causeway probably results in artificial ponding u/s + lack of water d/s
SC7: As per SC-1
SC8: @ Causeway + some on lower bank where cattle access, but minor
SC9: Due to presence of causeway & altered hydrology.
SC10: Lack of leaf litter + LWD due to riparian veg. clearing

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FISH SAMPLING SHEETS

PROJECT NAME: Galilee Coal Project **SITE CODE:** MC-new

SITE NAME: Malcom Creek @ Kiora Causeway

DATE: 15/4/12 **TIME (24hrs):** [11·00] **PARTY:** KP + JC

Site Summary

Species Name	Common Name	Count	Abundance Score
cherax quad	Red claw	17	3

NO FISH

* collected fairy shrimp during EF. photo 340-341 kept in macro sample.

Method Details

Electrofishing (EF)	
Operator:	KP
Assistant:	JC
Start Time:	–
Finish Time:	–
No. EF Seconds:	150 seconds/shot * 5 shots
EF Settings:	400V 50hz 12%
Nets and Traps	
# Fyke Nets (FN):	0
# Seine Passes (SN):	0
# Bait Traps (BT):	0

Fish abundance scale

Approx # Observed	Abundance Score
1	1
2-9	2
10-50	3
51-100	4
101-500	5
501-1000	6
1001-5000	7
>5000	8

Species: cha qua red claw				Species:				Species:			
	Method	LHS (J/I/A)	count ~~Length~~		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1	Shot 1		3	1				1			
2	Shot 2		4	2				2			
3	Shot 3		1	3				3			
4	Shot 4		7	4				4			
5	Shot 5		2	5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			

Fish Sampling Field Sheet Cont.

20				20				20			
Species:				**Species:**				**Species:**			
	Method	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

Species:				**Species:**				**Species:**			
	Method	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
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16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

Fish Sampling Field Sheet Cont.

Species:				Species:				Species:			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
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16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

Species:				Species:				Species:			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
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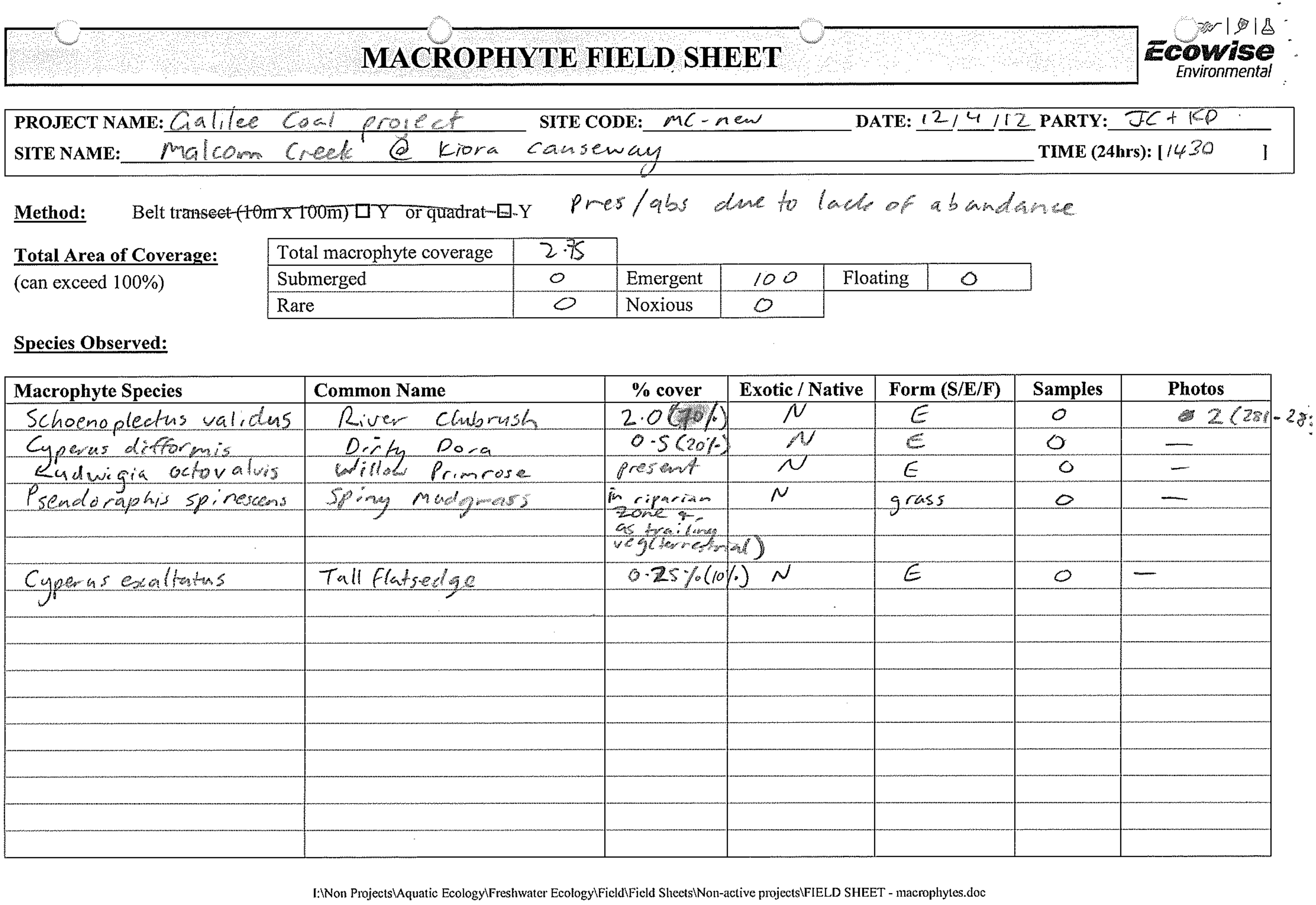

MACROPHYTE FIELD SHEET

Ecowise Environmental

PROJECT NAME: Galilee Coal project **SITE CODE:** MC-new **DATE:** 12/4/12 **PARTY:** JC + KP
SITE NAME: Malcom Creek @ Kiora causeway **TIME (24hrs):** [1430]

Method: Belt ~~transect (10m x 100m)~~ ☐ Y or ~~quadrat~~ ☐ Y pres/abs due to lack of abandance

Total Area of Coverage:
(can exceed 100%)

Total macrophyte coverage	2.75				
Submerged	0	Emergent	100	Floating	0
Rare	0	Noxious	0		

Species Observed:

Macrophyte Species	Common Name	% cover	Exotic / Native	Form (S/E/F)	Samples	Photos
Schoenoplectus validus	River Clubrush	2.0 ([illegible]%)	N	E	0	2 (281-28
Cyperus difformis	Dirty Dora	0.5 (20%)	N	E	0	—
Ludwigia octovalvis	Willow Primrose	present	N	E	0	—
Pseudoraphis spinescens	Spiny mudgrass	in riparian zone &	N	grass	0	—
		as trailing				
		veg(terrestrial))				
Cyperus exaltatus	Tall Flatsedge	0.25%(10%)	N	E	0	—

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FIELD SHEET

PROJECT NAME: Galilee Coal Project **SITE CODE:** LC3

SITE NAME: Lagoon Creek 8.7km d/s of Causeway (ALS AQ13)

DATE: 12 / 4 / 12 **TIME (24hrs):** [1345] **PARTY:** JC + KP

LATITUDE: 23°18.963" **LONGITUDE:** 146° 30.128'

EASTING: 0449097 **NORTHING:** 7421406 **Mobile Coverage:** [✓ Y] / N

MAP NAME: – **MAP SCALE:** – **Sat. Phone Coverage:** [✓ Y] / N

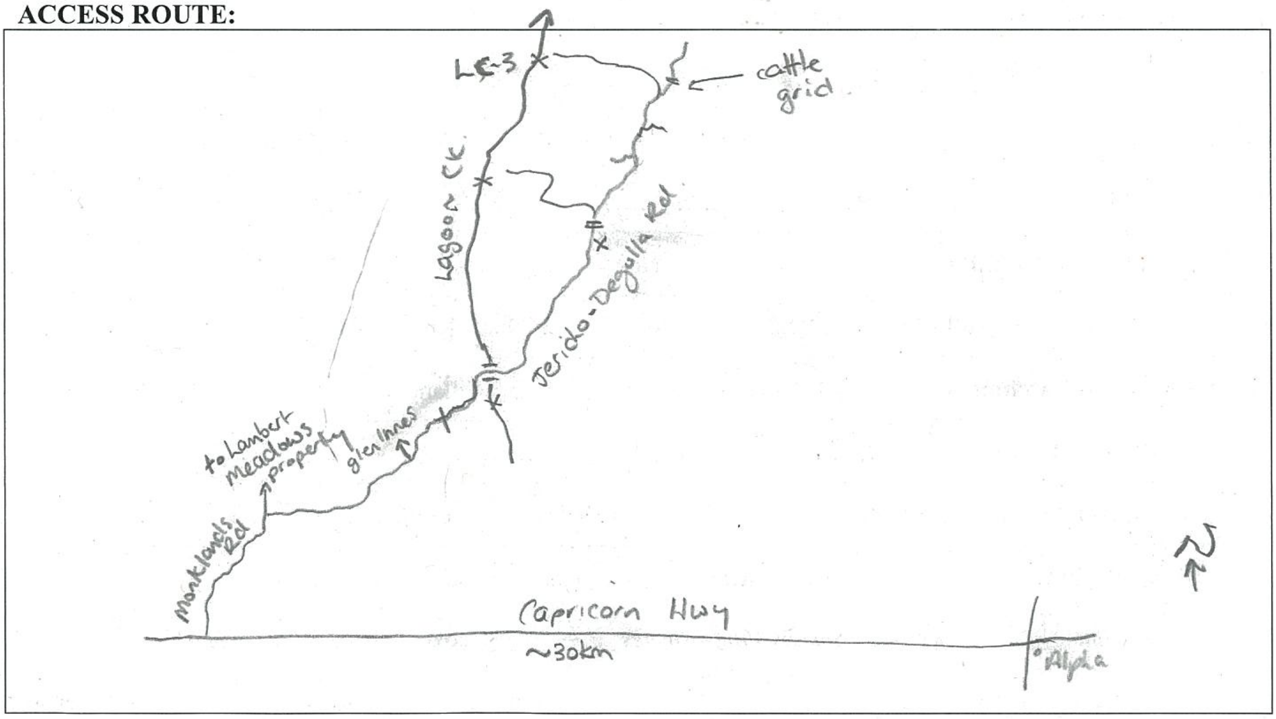
DATUM (i.e. GDA94): WGS84 **PHOTO #'s:** 272-276 **Key required:** N

Water samples collected: Yes - 10/4/12

tracks on GPS #2

ACCESS DETAILS: Head west on Capricorn Hwy from Alpha. ~30km to right turn into Monklands Rd. Follow ~10km to right turn towards Monklands property. Continue along road passed glen innes turn off, over causeway (AQ-13), passed site 04. Veer left just before cattle grid

ACCESS ROUTE:



LAND OWNER:

Name: N/A

Address:

Phone:

Permission Requirements:

ENTERED

Office Use:	Data Entered By:	TS	Date:	10/9/12

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FIELD OBSERVATIONS AND WATER QUALITY SHEET

SITE CODE/NAME LC3 **DATE:** 12 / 4 / 12

WQ Parameter	**Edge**	**Riffle**	**WQ Parameter**	**Edge**	**Riffle**
Sample Depth (m)	0.2		DO (mg/L)	8.48	
Gauge Height (m)			DO (% sat)	99.0	
Water Temperature (°C)	22.9		Turbidity (NTU)	508	
Conductivity (µS/cm)	158		Total Alkalinity (mg/L)	70	
pH	7.87		**Time Collected**	1345	

Habitat's Present (circle if present) 1. Pool-K [✓ 2. Pool-S] 3. Run-K 4. Run-S 5.Riffle [✓ 6.LWD] 7. Macrophyte 8. Other Trailing veg.

Stream Width Max 20 m Min 2 m Mode 10 m

Water Level [✓ 1. No Flow] 2.Dry/Isolated 3.<Watermark 4. Normal 5. >Watermark

Shading of River None Low [✓ Moderate] High

Type of River System [✓ Intermittent] Permanent Details……………………………………

Bank Erosion 1. None 2. Little [✓ 3.Some] 4. Moderate 5. Extensive

Dams/Barriers [✓ 1. Yes - Upstream] 2. Yes - Downstream 3. No 4. Don't Know

Dam/Barrier details: Causeway on Monklands Rd + farm dam on Tallgrenhacle on SGCP side

Hydrological Variation 1. None [✓ 2. Little] 3.Some 4. Moderate 5. Extensive

Hydrological Variation details: Temporally variable, but only 1 hydraulic habitat present

Point Source Pollution 1. Yes [✓ 2. No] 3. Don't Know Details……………………

Non Point Source Pollution [✓ 1. Yes] 2. No 3. Don't Know Details: Cattle grazing / road runoff

Position in Catchment [✓ 1. Upland] 2. Midland 3. Lowland

Adjacent Landuse: Cattle grazing

Geomorphology 1. Steep Valley [✓ 2. Broad Valley] 3. Floodplain 4. Other…………..

Riparian Zone (zone extends for 100m upstream and downstream from sampled area)

Trees<10m 10 % cover *Shrubs/Vines/Rushes* 2 % cover *Grasses/Ferns/Herbs* 90 % cover

Bare Ground	1. None	[✓ 2. Little]	3. Some	4. Moderate	5. Extensive
Grass	1. None	2. Little	3. Some	4. Moderate	[✓ 5. Extensive]
Shrubs	1. None	[✓ 2. Little]	3. Some	4. Moderate	5. Extensive
Trees<10m	1. None	2. Little	[✓ 3. Some]	4. Moderate	5. Extensive
Trees>10m	1. None	2. Little	3. Some	[✓ 4. Moderate]	5. Extensive

Comments: Mixed Eucalypt canopy, grass/herb understorey. Castor oil plants common

MACROINVERTEBRATE FIELD SHEET 1

SITE CODE/NAME LC 3 DATE: 12 / 4 / 12

HABITAT TYPE (E=Edge; R=Riffle; K=Rocky Bed; S=Sandy Bed; M=Macrophytes; N=Run; C=Composite)

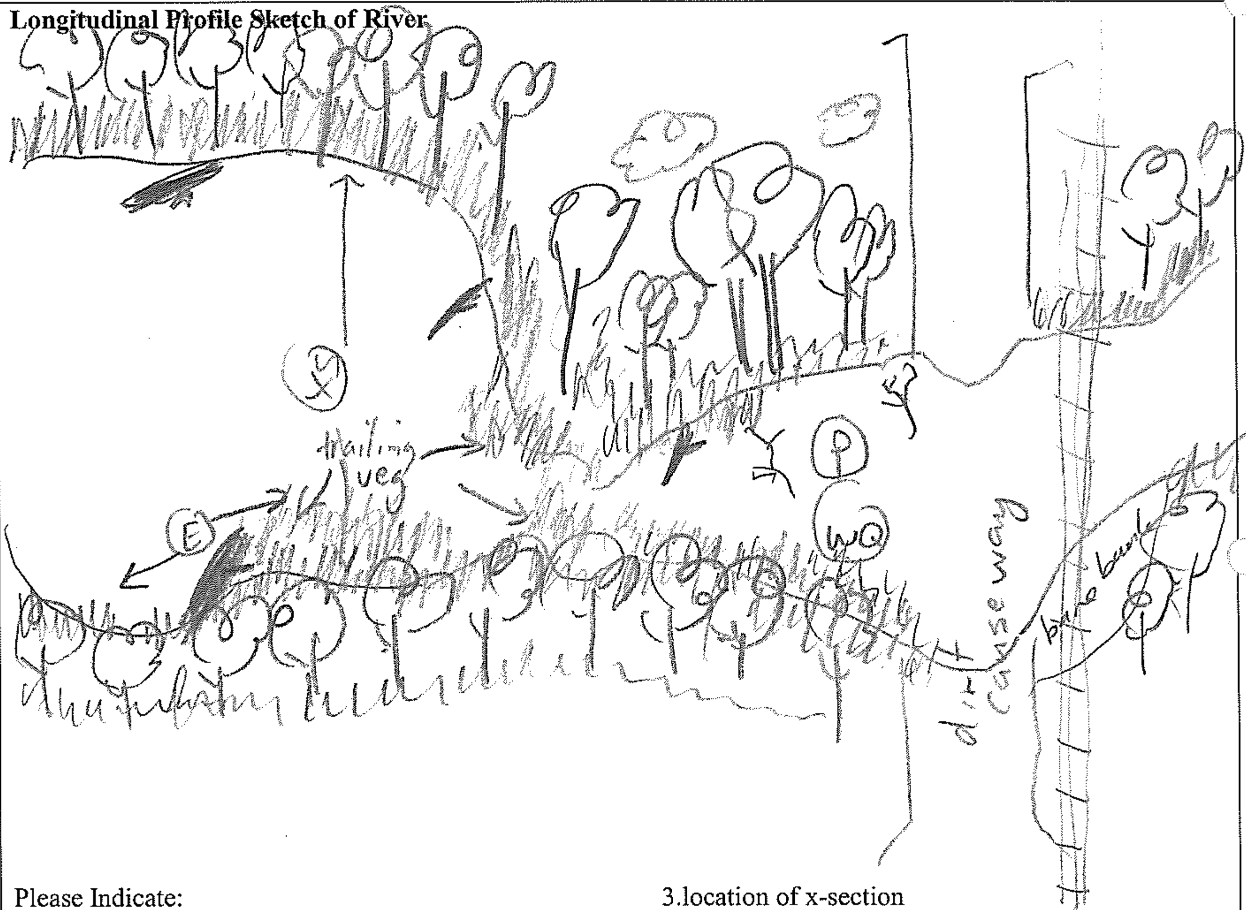
KEY HABITAT FEATURES	Edge				
Vel count					
Vel depth					
Vel m/sec					
Vel (average) (m/sec)	0				
Mean Sample Depth (m)	0.1				
Mean Wetted Width (m)	12				
% Bedrock	0				
% Boulder (>soccer ball)	0				
% Cobble (tennis ball - soccer ball)	0				
% Pebble (marble - tennis ball)	0				
% Gravel (2 - 4mm)	0				
% Sand (0.005 - 2mm)	10				
% Silt/Clay (< 0.005 mm)	90				
% Detritus (leaves/twigs)	70				
% Sticks (<2cm)	20				
% Branches	10				
% Logs (>15cm)	0				
% Algae	10				
% Macrophytes	0				
% Overhanging habitat (e.g. vegetation, roots)	25				
% Blanketing silt (indicated by plume)	10				
% Shading	40				
Sampled By:	KP				
Picked By:	KP				

Comments: Turbid water + multiple cattle access points. Bed compacted by pugging

MACROINVERTEBRATE FIELD SHEET 2

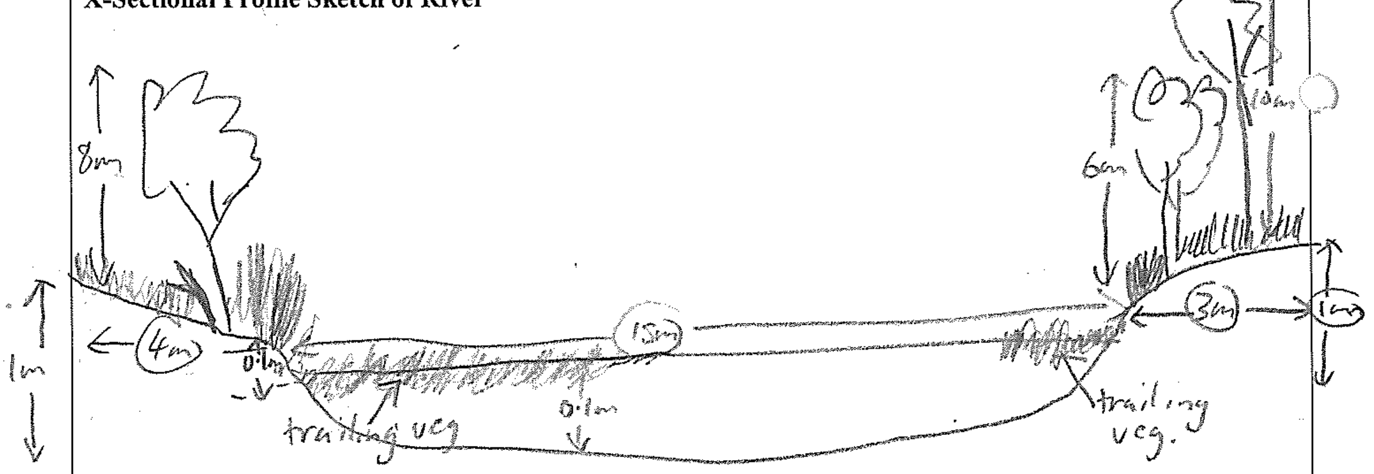
SITE CODE/NAME LC3 **DATE:** 12 / 4 / 12

Longitudinal Profile Sketch of River



Please Indicate:
1. Biological sampling sites for each habitat
2. location of where water quality parameters were taken
3. location of x-section
4. riparian zone width, type and height
5. location of where photos were taken

X-Sectional Profile Sketch of River



Please Indicate:
1. Approx. bank height, stream width and depth
2. Approx. riparian vegetation height

General Comments:
Large open shallow pool flowing into narrow channel stream. Water very shallow as are bank gradients. Bed & bank are muddy sand. Canopy a mix of eucalypts, understorey dominated by grasses, some of which serve as trailing veg. Some shading, but water very turbid. Limited LWD

REFERENCE CONDITION SELECTION SHEET

SITE CODE: LC3 Date: 12/4/12 (If the impacts are unknown, seek further information before scoring; more than one person must complete this form)

Possible Impacts	5 (No Impact)	4 (Minor Impact)	3 (Moderate Impact)	2 (Major Impact)	1 (Extreme Impact)	Score	Previous Score
1. Agriculture and forestry*	No impact	[✓ Present but level of impact is barely discernible]	Evident, however, not severe and/or widespread	Obvious impact to stream, moderate and/or widespread	Severe and widespread, impact obvious	4	
2. Sand/gravel extraction*	[✓ No evidence or prior knowledge of extraction]	Small scale historical extraction	No current extraction; large historical extraction	Current small scale/localised extraction	Current and widespread extraction	5	
3. Upstream urban areas*	[✓ No impacts from urbanisation]	Possible impacts caused from urbanisation	Definite impacts caused from urbanisation	High impacts caused from urbanisation	Extreme impacts caused from urbanisation	5	
4. Point source pollution*	[✓ Nil point source pollution]	Low volumes of point source pollution discharged	Low to moderate volumes of point source pollution discharged	Moderate to high volumes of point source pollution discharged	High to extreme volumes of point source pollution discharged	5	
5. Dam/weir*	No artificial barriers in basin which will affect the site	[✓ Few small upstream barriers; not within impoundment]	Many small barriers; site not within impoundment	Multiple small barriers; Large barriers upstream; within small impoundment	Large barriers upstream; within large impoundment	4	
6. Flow regime alteration*	[✓ Seasonal flow regime natural]	Seasonal flow regime not obviously altered	Flow regime altered	Flow regime obviously altered	Flow regime highly modified	5	
7. Streamside veg. alteration@	Streamside vegetation unaltered	[✓ Vegetation slightly modified]	Obvious modification	Highly modified vegetation	Severe modification	4	
8. Riparian zone/ streambank erosion	No evidence of erosion beyond natural	[✓ Slightly more than natural levels of erosion]	Moderate levels of unnatural erosion	High levels of erosion	Extreme erosion	4	
9. Geomorphic change@	No evidence	[✓ Slight geomorphic change]	Moderate change	High changes	Extreme alteration	4	
10. Instream habitat alteration@	Instream habitats of natural appearance and diversity	[✓ Barely discernible impacts]	Moderate modifications to instream habitats	Highly modified modifications to instream habitats	Severe modification of instream habitats	4	
NOTE: When applicable, write down in the comments section the type and approx. distances from the impact If a score given differs from the previous score, state the reason why they are different in the comments section					Total		

COMMENTS

SC1: Cattle access to creeks evident
SC2: —
SC3: —
SC4: —
SC5: Causeway + farm dam u/s, but not affecting hydrology/geomorphology
SC6: —
SC7: Clearing for causeway Some weed spp. present (Castor oil plant)
SC8: Erosion associated with causeway xing, + cattle + feral pig access to creek
SC9: As above for SC8
SC10: As above for SC8

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FISH SAMPLING SHEETS

PROJECT NAME: Galilee Coal Project **SITE CODE:** LC3

SITE NAME: Lagoon Creek

DATE: 12 / 4 / 12 **TIME (24hrs):** [1350] **PARTY:** KP + JC

Site Summary

roughly 2 (per shot) 卌

卌 |

shot 7 ↗ 1

Species Name	Common Name	Count	Abundance Score
Ambassis agassizi	Agassizi's glass perchlet		
Hypseleotris klunzingeri	Western Carp gudgeon		
Melanotaenia splendida	Eastern Rainbow fish		
Neosiluris hyrtlii	Hyrtl's tandan		
Macrobrachium sp.	Freshwater prawn		
Cherax quadricarinatus	Red claw crayfish		
Atyidae	Shrimp |||		
Mogurnda adspersa	Purple spotted gudgeon		

Method Details

Electrofishing (EF)	
Operator:	KP
Assistant:	JC
7 shots Start Time:	—
Finish Time:	—
No. EF Seconds:	x 150
EF Settings:	400V, 50MHZ, 12% duty cycle
Nets and Traps	
# Fyke Nets (FN):	—
# Seine Passes (SN):	—
# Bait Traps (BT):	—

↙ ran out of battery on ~~7th~~ x 150secs on time

Fish abundance scale

Approx # Observed	Abundance Score
1	1
2-9	2
10-50	3
51-100	4
101-500	5
501-1000	6
1001-5000	7
>5000	8

Species: A. aga				Species: H klu				Species: Mel spl.			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1	sweepnet		x 3	1	Sweepnet	x 1		1	Shot 1		23
2	shot 1		21	2	Shot 4	[illegible]	32	2	[illegible]		26
3	卌 卌		29	3				3	shot 2		25
4	卌 卌		30	4				4	卌 |||		23
5	shot 2		29	5				5	shot 3	|||	18
6	卌 卌		26	6				6	Shot 4	||||	20
7	||||		30	7				7	shot 5	卌||||	30
8	shot 3	卌 卌	25	8				8	shot 6	|||	26
9	卌 卌			27	9				9			17
10	Shot 4		20	10				10			23
11	卌 卌 ||		26	11				11			31
12	Shot 5	卌 卌	24	12				12			25
13	Shot 6	卌		32	13				13			26
14	Shot 7	卌 ||||	31	14				14			22
15			26	15				15			32
16			25	16				16			30
17			25	17				17			21
18			24	18				18			25
19			22	19				19			27

Fish Sampling Field Sheet Cont.

20	Shot 1		21	20				20	Shot 1		21
Species: Mog. ads				**Species:** Lei uni				**Species:** Neo hyr			
	Method	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**
1	Shot 2		32	1	Shot 2		44	1	Shot 3		50
2			42	2	Shot 3		60	2			60
3			40	3	Shot 4		62	3			48
4			35	4				4			51
5	Shot 3		46	5				5			63
6				6				6			57
7				7				7			53
8				8				8	Shot 4		59
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

Species:				**Species:**				**Species:**			
	Method	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

Fish Sampling Field Sheet Cont.

Species:				Species:				Species:			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

Species:				Species:				Species:			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

MACROPHYTE FIELD SHEET

Ecowise Environmental

PROJECT NAME: Galilee Coal Project **SITE CODE:** LC 3 **DATE:** 12/4/12 **PARTY:** JC + KP

SITE NAME: Lagoon Creek 8.7 km d/s causeway (ALS AQ13) **TIME (24hrs):** [1350]

Method: Belt ~~transect (10m x 100m) ☐ Y or quadrat ☐ Y~~ pres/abs only. Insufficient abundance

Total Area of Coverage:
(can exceed 100%)

Total macrophyte coverage	2%				
Submerged	0	Emergent	100	Floating	0
Rare	0	Noxious	0		

Species Observed:

Macrophyte Species	Common Name	% cover	Exotic / Native	Form (S/E/F)	Samples	Photos
Cyperus elongatus		1.5 (75%)				
Cyperus difformis	Dirty Dora	0.5 (25%)				

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FIELD SHEET

PROJECT NAME: GCP (China First) **SITE CODE:** LC-1

SITE NAME: Lagoon Ck ~6km d/s causeway

DATE: 12 / 4 / 12 **TIME (24hrs):** [11:15] **PARTY:** KP + JC.

LATITUDE: 23° 20.043' **LONGITUDE:** 146° 29.120'

EASTING: 447386 **NORTHING:** 7419405 **Mobile Coverage:** [✓ Y] / N

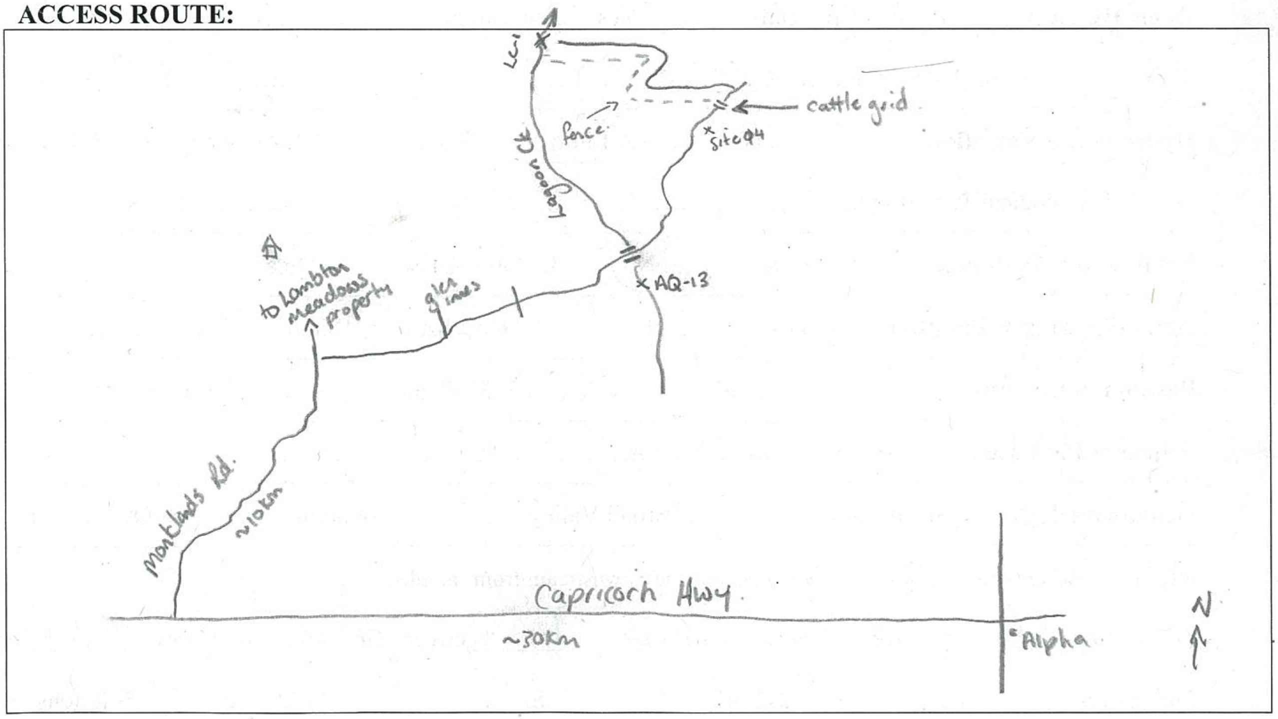
MAP NAME: – **MAP SCALE:** – **Sat. Phone Coverage:** [✓ Y] / N

DATUM (i.e. GDA94): WGS84 **PHOTO #'s:** 267-271 **Key required:** NO.

Water samples collected: Yes.

ACCESS DETAILS: From Alpha travel west along Capricorn Hwy ~28km to Right turn into Monklands Rd (dirt Rd). Continue along ~10km to 'T' intersection, turn right onto Jericho-Degulla Rd towards Monklands property. Follow along track, over causeway (AQ-13) to 'site04'. Just passed site04, over cattle grid is left turn. follow along fenceline to site

ACCESS ROUTE:



ENTERED

LAND OWNER:

Name:

Address:

Phone:

Permission Requirements:

Office Use:	Data Entered By:	TS	Date:	11/9/12

FIELD OBSERVATIONS AND WATER QUALITY SHEET

SITE CODE/NAME LC 1 **DATE:** 12/4/12

WQ Parameter	**Edge**	**Riffle**	**WQ Parameter**	**Edge**	**Riffle**
Sample Depth (m)	0·3		DO (mg/L)	4·75	
Gauge Height (m)	–		DO (% sat)	53·4	
Water Temperature (°C)	20·18		Turbidity (NTU)	17·5	~~17·5~~
Conductivity (µS/cm)	162		Total Alkalinity (mg/L)	70	~~70~~
pH	7·40		**Time Collected**	1050	

Habitat's Present (circle if present) 1. Pool-K [✓ 2. Pool-S] 3. Run-K 4. Run-S

5.Riffle [✓ 6.LWD] 7. Macrophyte [✓ 8. Other] trailing veg. + leaf litter

Stream Width Max 10 m Min 7 1 at w/s pool ends m Mode 7 m

Water Level [✓ 1. No Flow] 2.Dry/Isolated 3.<Watermark 4. Normal 5. >Watermark

Shading of River None Low [✓ Moderate] High

Type of River System [✓ Intermittent] Permanent Details……………………………

Bank Erosion 1. None [✓ 2. Little] 3.Some 4. Moderate 5. Extensive

Dams/Barriers [✓ 1. Yes - Upstream] 2. Yes - Downstream 3. No 4. Don't Know

Dam/Barrier details Causeway + farm dam on other side of highway on Tallarenha Ck

Hydrological Variation 1. None [✓ 2. Little] 3.Some 4. Moderate 5. Extensive

Hydrological Variation details: Temporally variable but only one hydraulic habitat present

Point Source Pollution 1. Yes [✓ 2. No] 3. Don't Know Details………………………

Non Point Source Pollution [✓ 1. Yes] 2. No 3. Don't Know Details Cattle grazing, road runoff

Position in Catchment [✓ 1. Upland] 2. Midland 3. Lowland

Adjacent Landuse Cattle grazing

Geomorphology 1. Steep Valley [✓ 2. Broad Valley] 3. Floodplain 4. Other…………..

Riparian Zone (zone extends for 100m upstream and downstream from sampled area)

Trees<10m 5 % cover *Shrubs/Vines/Rushes* 1 % cover *Grasses/Ferns/Herbs* 90 % cover

Bare Ground	1. None	[✓ 2. Little]	3. Some	4. Moderate	5. Extensive
Grass	1. None	2. Little	3. Some	4. Moderate	[✓ 5. Extensive]
Shrubs	1. None	[✓ 2. Little]	3. Some	4. Moderate	5. Extensive
Trees<10m	1. None	[✓ 2. Little]	3. Some	4. Moderate	5. Extensive
Trees>10m	1. None	2. Little	[✓ 3. Some]	4. Moderate	5. Extensive

Comments: Mixed eucalypt canopy + mix of native grass + Cyperus understorey

MACROINVERTEBRATE FIELD SHEET 1

SITE CODE/NAME LC1 **DATE:** 12/4/12

HABITAT TYPE (E=Edge; R=Riffle; K=Rocky Bed; S=Sandy Bed; M=Macrophytes; N=Run; C=Composite)

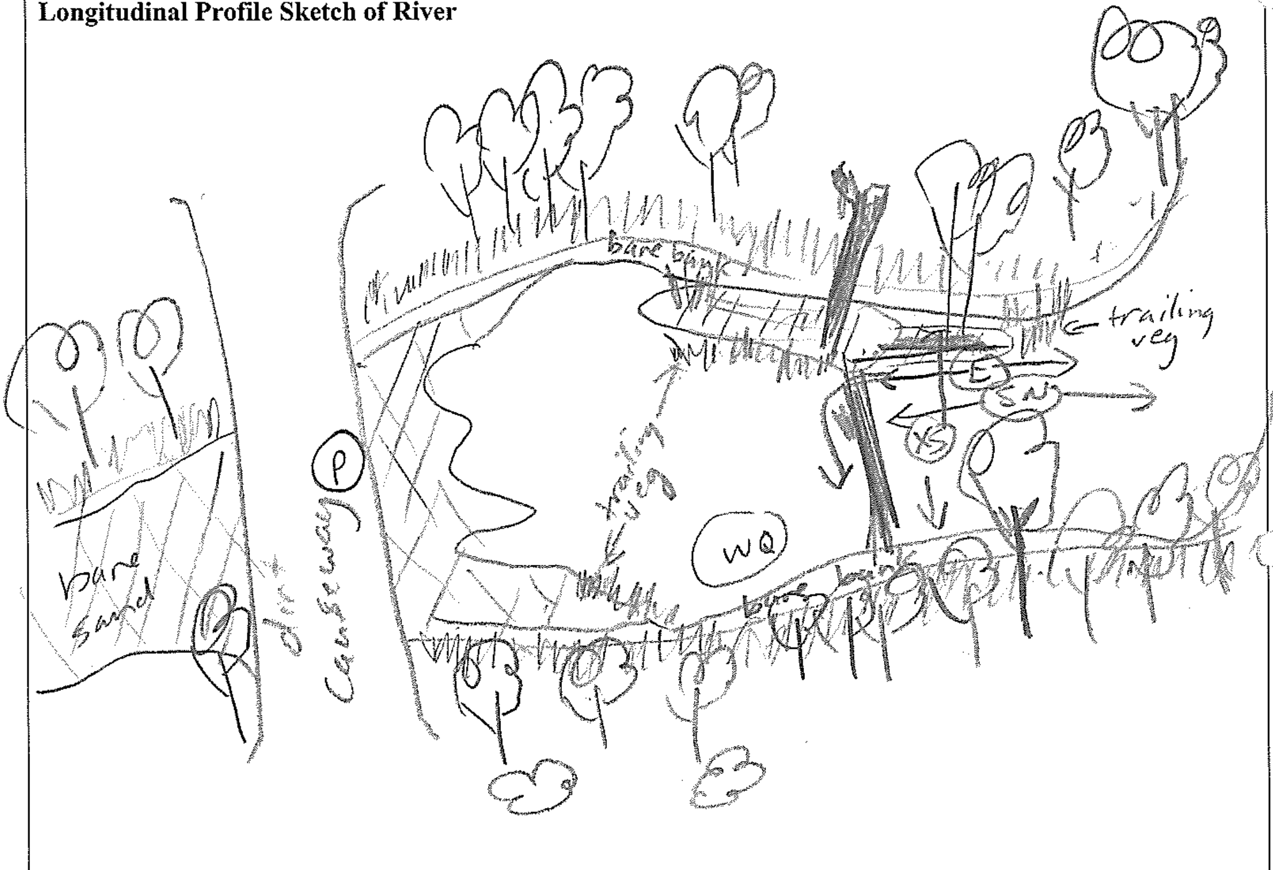
KEY HABITAT FEATURES	Edge				
Vel count					
Vel depth					
Vel m/sec					
Vel (average) (m/sec)	0				
Mean Sample Depth (m)	0.2				
Mean Wetted Width (m)	7				
% Bedrock	0				
% Boulder (>soccer ball)	0				
% Cobble (tennis ball - soccer ball)	0				
% Pebble (marble - tennis ball)	0				
% Gravel (2 - 4mm)	0				
% Sand (0.005 - 2mm)	60				
% Silt/Clay (< 0.005 mm)	40				
% Detritus (leaves/twigs)	90				
% Sticks (<2cm)	20				
% Branches	20				
% Logs (>15cm)	10				
% Algae	10				
% Macrophytes	0				
% Overhanging habitat (e.g. vegetation, roots)	20				
% Blanketing silt (indicated by plume)	10				
% Shading	40				
Sampled By:	KP				
Picked By:	KP				

Comments: Trailing veg mainly native grasses. V. abundant leaf litter. No bank undercuts + minimal woody debris. Water level has receded 15cm in recent times + pool was isolated + not flowing + quite shallow. Little habitat heterogeneity

MACROINVERTEBRATE FIELD SHEET 2

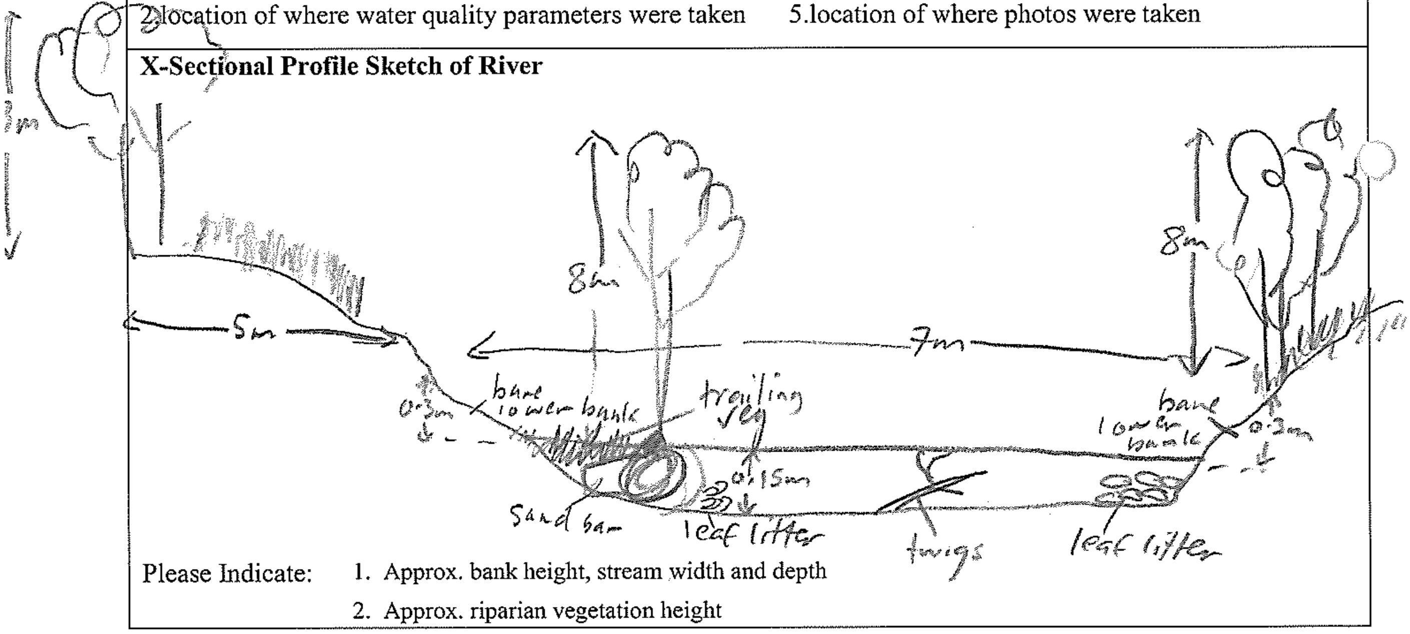
SITE CODE/NAME LC1 **DATE:** 12 / 4 / 12

Longitudinal Profile Sketch of River



Please Indicate:
1. Biological sampling sites for each habitat
2. location of where water quality parameters were taken
3. location of x-section
4. riparian zone width, type and height
5. location of where photos were taken

X-Sectional Profile Sketch of River



Please Indicate:
1. Approx. bank height, stream width and depth
2. Approx. riparian vegetation height

General Comments:
Shallow sandy stream with gradual sloping small banks lined with mixed eucalypt canopy + native grass/cyperus understorey. Leaf litter in stream abundant. Pool >100m long & average depth is ≥20cm. Lower bank is bare sand/clay

REFERENCE CONDITION SELECTION SHEET

SITE CODE: LC 1 Date: 12/4/12 (If the impacts are unknown, seek further information before scoring; more than one person must complete this form)

Possible Impacts	5 (No Impact)	4 (Minor Impact)	3 (Moderate Impact)	2 (Major Impact)	1 (Extreme Impact)	Score	Previous Score
1. Agriculture and forestry*	No impact	[✓ Present but level of impact is barely discernible]	Evident, however, not severe and/or widespread	Obvious impact to stream, moderate and/or widespread	Severe and widespread, impact obvious	4	
2. Sand/gravel extraction*	[✓ No evidence or prior knowledge of extraction]	Small scale historical extraction	No current extraction; large historical extraction	Current small scale/localised extraction	Current and widespread extraction	5	
3. Upstream urban areas*	[✓ No impacts from urbanisation]	Possible impacts caused from urbanisation	Definite impacts caused from urbanisation	High impacts caused from urbanisation	Extreme impacts caused from urbanisation	5	
4. Point source pollution*	[✓ Nil point source pollution]	Low volumes of point source pollution discharged	Low to moderate volumes of point source pollution discharged	Moderate to high volumes of point source pollution discharged	High to extreme volumes of point source pollution discharged	5	
5. Dam/weir*	No artificial barriers in basin which will affect the site	[✓ Few small upstream barriers; not within impoundment]	Many small barriers; site not within impoundment	Multiple small barriers; Large barriers upstream; within small impoundment	Large barriers upstream; within large impoundment	4	
6. Flow regime alteration*	[✓ Seasonal flow regime natural]	Seasonal flow regime not obviously altered	Flow regime altered	Flow regime obviously altered	Flow regime highly modified	5	
7. Streamside veg. alteration@	Streamside vegetation unaltered	[✓ Vegetation slightly modified]	Obvious modification	Highly modified vegetation	Severe modification	4	
8. Riparian zone/ streambank erosion	No evidence of erosion beyond natural	[✓ Slightly more than natural levels of erosion]	Moderate levels of unnatural erosion	High levels of erosion	Extreme erosion	4	
9. Geomorphic change@	No evidence	[✓ Slight geomorphic change]	Moderate change	High changes	Extreme alteration	4	
10. Instream habitat alteration@	Instream habitats of natural appearance and diversity	[✓ Barely discernible impacts]	Moderate modifications to instream habitats	Highly modified modifications to instream habitats	Severe modification of instream habitats	4	
NOTE: When applicable, write down in the comments section the type and approx. distances from the impact If a score given differs from the previous score, state the reason why they are different in the comments section					**Total**	44	

COMMENTS

SC1: Minimal cattle access impacts, but within cattle grazing area + creekline not fenced
SC2: –
SC3: –
SC4: –
SC5: causeway on Monklands Rd + farm dam on Tallarenha Ck on SGCP side of highway
SC6: –
SC7: – some cattle grazing effects on understorey near creek in isolated spots
SC8: Isolated only and due to shallow gradient sand banks, no real impacts. @ causeway some erosion
SC9: Erosion @ causeway only
SC10: as above for SC7 - SC9

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FISH SAMPLING SHEETS

PROJECT NAME: Galilee Coal Project **SITE CODE:** LC 1

SITE NAME: Lagoon Creek 6km d/s causeway (ALS AQ13)

DATE: 12/4/12 **TIME (24hrs):** [1050] **PARTY:** KP+JC

Site Summary

Species Name	Common Name	Count	Abundance Score
Melanotaenia splendida	rainbow	8	
Ambassis agassizi	glass fish	14	
Cherax quad	Red claw	11	
O. Mos	Tilapia	2	
Mog. adspersa	Purple spotted gudgeon	1	
Neosilurus Hyrtlii	Hyrtyls tandan	1	

Method Details

Electrofishing (EF)	
Operator:	KP
Assistant:	JC
Start Time:	–
Finish Time:	–
No. EF Seconds:	150 seconds/shot * 4 shots
EF Settings:	400V 50hz 12%
Nets and Traps	
# Fyke Nets (FN):	–
# Seine Passes (SN):	3
# Bait Traps (BT):	–

Fish abundance scale

Approx # Observed	Abundance Score
1	1
2-9	2
10-50	3
51-100	4
101-500	5
501-1000	6
1001-5000	7
>5000	8

Species: Mel. spl

	Method	LHS (J/I/A)	Length
1	Seine 1		31
2			28
3			33
4	Seine 2	–	–
5	Seine 3		35
6			24
7	Shot 2		28
8	Shot 3		30
9			32
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			

Species: Amb. aga

	Method	LHS (J/I/A)	Length
1	Seine 1		30
2			32
3			25
4			26
5			26
6			30
7			28
8			30
9	Seine 2	–	–
10	Shot 1		28
11			33
12			30
13			30
14	Shot 3		33
15	Shot 4		34
16			
17			
18			
19			

Species: Cherax quad

	Method	LHS (J/I/A)	Count ~~Length~~
1	Seine 1		2
2	Seine 2	–	–
3	Seine 3		2
4	Shot 2		2
5	Shot 3		lll =3
6	Shot 4		ll =2
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			

Fish Sampling Field Sheet Cont.

20				20				20			
Species: Hyr Tan				**Species:** mog ads				**Species:**			
	Method	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**
1	Shot 3		71	1	Shot 3		51	1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

Species: O. MOS				**Species:**				**Species:**			
	Method	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**
1	Shot 4		70	1				1			
2			56.	2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

Fish Sampling Field Sheet Cont.

Species:				**Species:**				**Species:**			
	Method	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

Species:				**Species:**				**Species:**			
	Method	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**		**Method**	**LHS (J/I/A)**	**Length**
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
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14				14				14			
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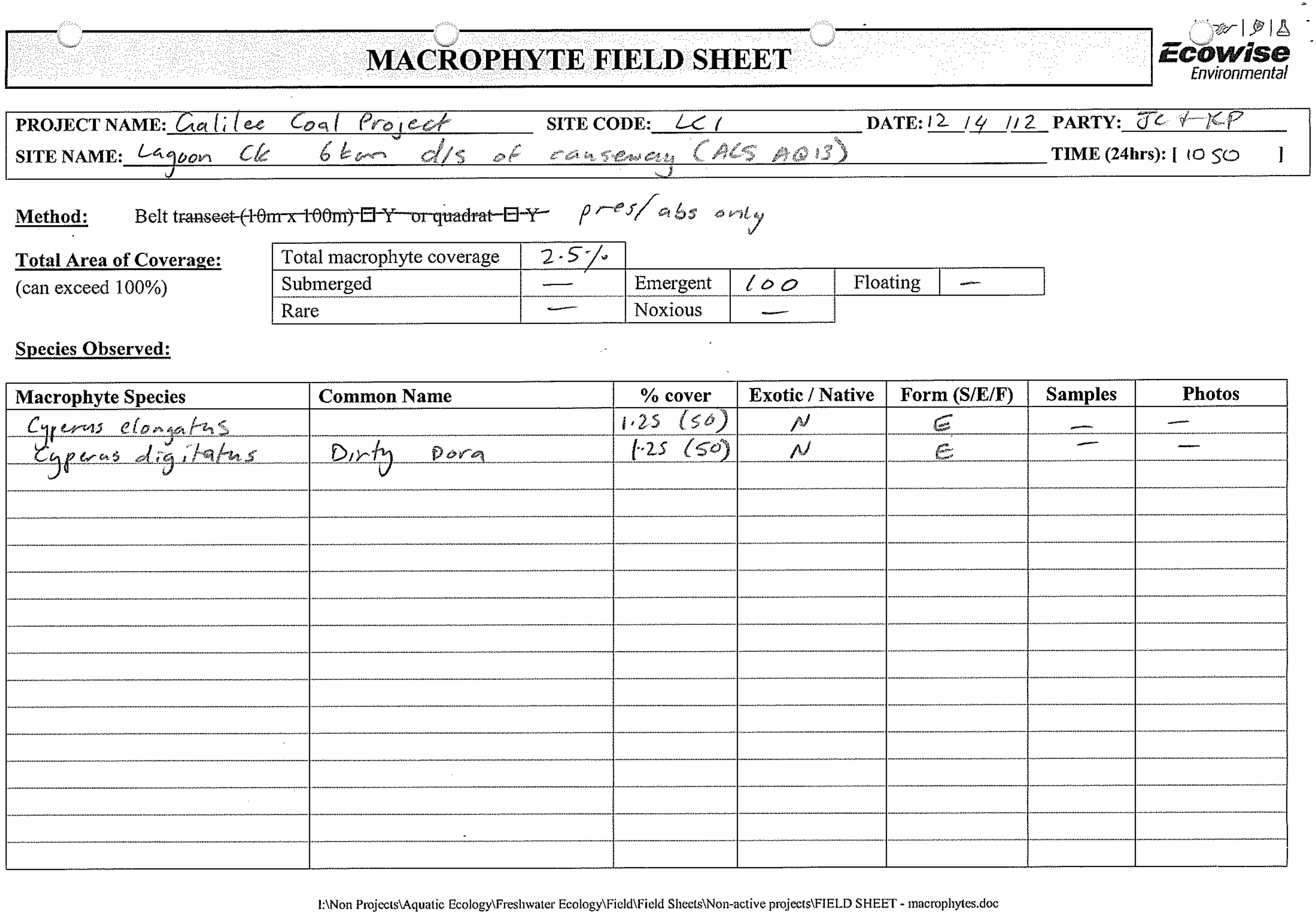
19				19				19			
20				20				20			



MACROPHYTE FIELD SHEET

Ecowise Environmental

PROJECT NAME: Galilee Coal Project **SITE CODE:** LC1 **DATE:** 12/4/12 **PARTY:** JC + KP

SITE NAME: Lagoon Ck 6km d/s of causeway (ALS AQ13) **TIME (24hrs):** [1050]

Method: Belt ~~transect (10m x 100m) ☐ Y or quadrat ☐ Y~~ pres/abs only

Total Area of Coverage:
(can exceed 100%)

Total macrophyte coverage	2.5%				
Submerged	—	Emergent	100	Floating	—
Rare	—	Noxious	—		

Species Observed:

Macrophyte Species	Common Name	% cover	Exotic / Native	Form (S/E/F)	Samples	Photos
Cyperus elongatus		1.25 (50)	N	E	—	—
Cyperus digitatus	Dirty Dora	1.25 (50)	N	E	—	—

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FIELD SHEET

PROJECT NAME: GCP (China First) **SITE CODE:** BC-5

SITE NAME: Beta Ck

DATE: 11 / 4 / 12 **TIME (24hrs):** [13·30] **PARTY:** KP + JC

LATITUDE: 23·51495 **LONGITUDE:** 146·33979

EASTING: 432599 **NORTHING:** 7399319 **Mobile Coverage:** [✓ Y] / N

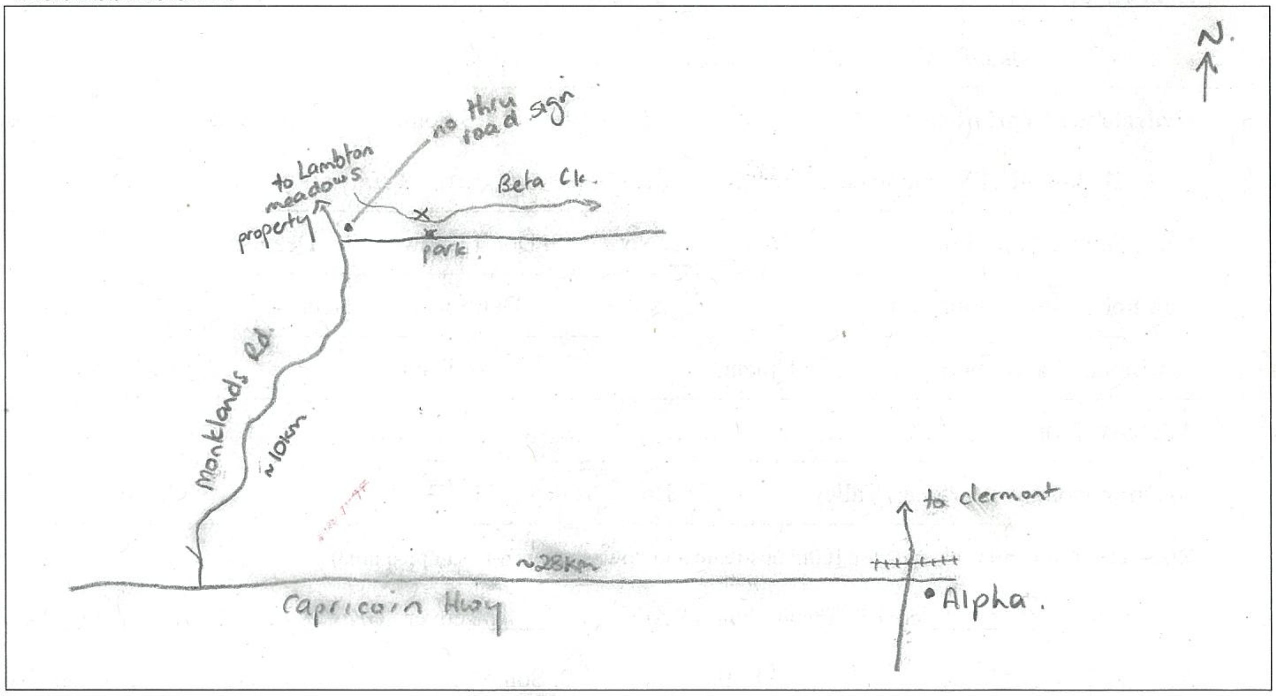
MAP NAME: — **MAP SCALE:** — **Sat. Phone Coverage:** [✓ Y] / N

DATUM (i.e. GDA94): WGS 84 **PHOTO #'s:** 254 – 6 **Key required:** No

Water samples collected: Yes 10.4.12

ACCESS DETAILS: From Alpha, travel west along Capricorn Hwy for ~28km turn right into Monklands Rd. Follow main road to intersection, turn right and travel ~1km to site on left.

ACCESS ROUTE:



LAND OWNER:

Name: N/A.

Address:

Phone:

Permission Requirements:

ENTERED

Office Use:	Data Entered By:	TS	Date:	11/9/12

FIELD OBSERVATIONS AND WATER QUALITY SHEET

SITE CODE/NAME BC-5 **DATE:** 11 / 4 / 12

WQ Parameter	**Edge**	**Riffle**	**WQ Parameter**	**Edge**	**Riffle**
Sample Depth (m)	0.10		DO (mg/L)	8.27	
Gauge Height (m)	—		DO (% sat)	99.7	
Water Temperature (°C)	24 80		Turbidity (NTU)	+1000 NTU.	
Conductivity (µS/cm)	169		Total Alkalinity (mg/L)	90	
pH	7.47		**Time Collected**	1.30 pm	

Habitat's Present (circle if present) 1. Pool-K [✓ 2. Pool-S] 3. Run-K 4. Run-S 5.Riffle [✓ 6.LWD] 7. Macrophyte 8. Other

Stream Width Max 2.5 m Min 0.3 m Mode 2 m

Water Level [✓ 1. No Flow] 2.Dry/Isolated 3.<Watermark 4. Normal 5. >Watermark

Shading of River None [✓ Low] Moderate High

Type of River System [✓ Intermittent] Permanent Details…………………………………………

Bank Erosion 1. None 2. Little [✓ 3.Some] 4. Moderate 5. Extensive due to cattle access

Dams/Barriers 1. Yes - Upstream 2. Yes - Downstream [✓ 3. No] 4. Don't Know

Dam/Barrier details……………………………………………………………………………

Hydrological Variation 1. None [✓ 2. Little] 3.Some 4. Moderate 5. Extensive

Hydrological Variation details: Temporally variable, but only pool habitat present

Point Source Pollution 1. Yes [✓ 2. No] 3. Don't Know Details………………………

Non Point Source Pollution [✓ 1. Yes] 2. No 3. Don't Know Details. Cattle access to creeks, road runoff

Position in Catchment [✓ 1. Upland] 2. Midland 3. Lowland

Adjacent Landuse Cattle grazing

Geomorphology 1. Steep Valley [✓ 2. Broad Valley] 3. Floodplain 4. Other…………..

Riparian Zone (zone extends for 100m upstream and downstream from sampled area)

Trees<10m 30 % cover *Shrubs/Vines/Rushes* 3 % cover *Grasses/Ferns/Herbs* 75 % cover

Bare Ground	1. None	[✓ 2. Little]	3. Some	4. Moderate	5. Extensive
Grass	1. None	2. Little	3. Some	4. Moderate	[✓ 5. Extensive]
Shrubs	1. None	[✓ 2. Little]	3. Some	4. Moderate	5. Extensive
Trees<10m	1. None	2. Little	[✓ 3. Some]	4. Moderate	5. Extensive
Trees>10m	[✓ 1. None]	2. Little	3. Some	4. Moderate	5. Extensive

Comments: Trees constituted by rough dark barked Eucalypts with round leaves, Dominated by native grasses

MACROINVERTEBRATE FIELD SHEET 1

SITE CODE/NAME BC-5 **DATE:** 11 / 4 / 12

HABITAT TYPE (E=Edge; R=Riffle; K=Rocky Bed; S=Sandy Bed; M=Macrophytes; N=Run; C=Composite)

KEY HABITAT FEATURES	E				
Vel count					
Vel depth					
Vel m/sec					
Vel (average) (m/sec)	0				
Mean Sample Depth (m)	0·30				
Mean Wetted Width (m)	2·5				
% Bedrock	0				
% Boulder (>soccer ball)	0				
% Cobble (tennis ball - soccer ball)	0				
% Pebble (marble - tennis ball)	0				
% Gravel (2 - 4mm)	0				
% Sand (0.005 - 2mm)	20				
% Silt/Clay (< 0.005 mm)	80				
% Detritus (leaves/twigs)	30				
% Sticks (<2cm)	20				
% Branches	10				
% Logs (>15cm)	0				
% Algae	0				
% Macrophytes	0				
% Overhanging habitat (e.g. vegetation, roots)	10				
% Blanketing silt (indicated by plume)	100 — very turbid...				
% Shading	25				
Sampled By:	KP				
Picked By:	KP				

Comments:

………

………

………

………

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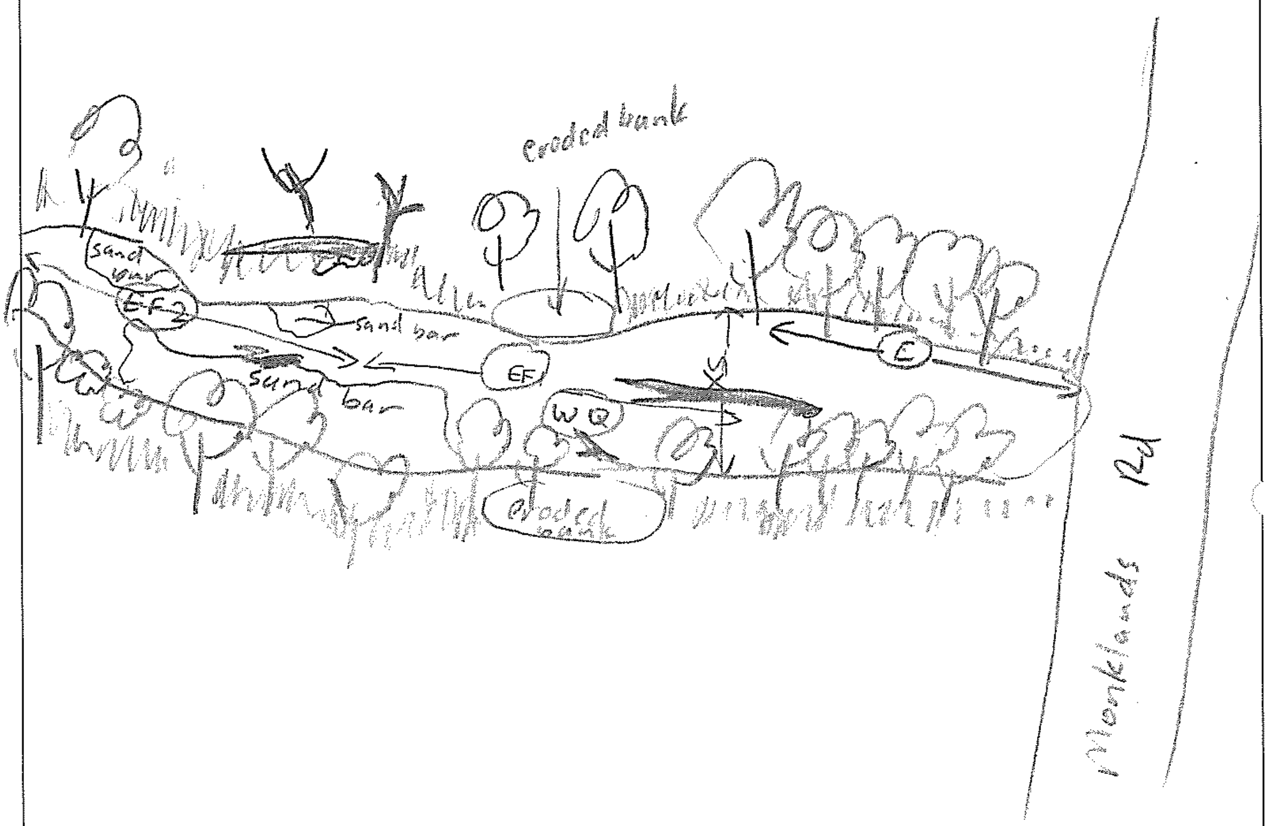
MACROINVERTEBRATE FIELD SHEET 2

SITE CODE/NAME BC-5 **DATE:** 11 / 4 / 12

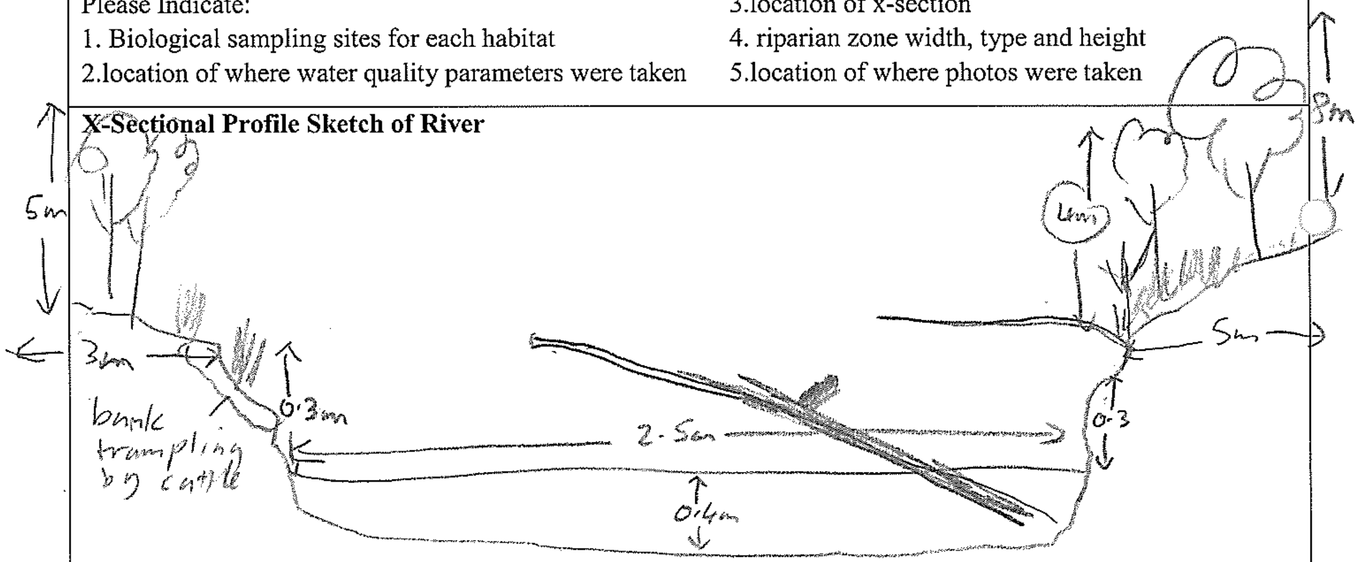
Longitudinal Profile Sketch of River



Please Indicate:

1. Biological sampling sites for each habitat
2. location of where water quality parameters were taken
3. location of x-section
4. riparian zone width, type and height
5. location of where photos were taken

X-Sectional Profile Sketch of River



Please Indicate:

1. Approx. bank height, stream width and depth
2. Approx. riparian vegetation height

General Comments:

Narrow, confined channel dominated by steep mud banks of less than 1m height, muddy substrate with some sand bed aggradations, turbid water and a riparian zone dominated by native grasses and with a single eucalypt species of patchy distribution.

REFERENCE CONDITION SELECTION SHEET

SITE CODE: BC5 Date: 11/4/12 **(If the impacts are unknown, seek further information before scoring; more than one person must complete this form)**

Possible Impacts	5 (No Impact)	4 (Minor Impact)	3 (Moderate Impact)	2 (Major Impact)	1 (Extreme Impact)	Score	Previous Score
1. Agriculture and forestry*	No impact	Present but level of impact is barely discernible	Evident, however, not severe and/or widespread	Obvious impact to stream, moderate and/or widespread	Severe and widespread, impact obvious	4	
2. Sand/gravel extraction*	No evidence or prior knowledge of extraction	Small scale historical extraction	No current extraction; large historical extraction	Current small scale/localised extraction	Current and widespread extraction	5	
3. Upstream urban areas*	No impacts from urbanisation	Possible impacts caused from urbanisation	Definite impacts caused from urbanisation	High impacts caused from urbanisation	Extreme impacts caused from urbanisation	5	
4. Point source pollution*	Nil point source pollution	Low volumes of point source pollution discharged	Low to moderate volumes of point source pollution discharged	Moderate to high volumes of point source pollution discharged	High to extreme volumes of point source pollution discharged	5	
5. Dam/weir*	No artificial barriers in basin which will affect the site	Few small upstream barriers; not within impoundment	Many small barriers; site not within impoundment	Multiple small barriers; Large barriers upstream; within small impoundment	Large barriers upstream; within large impoundment	5	
6. Flow regime alteration*	Seasonal flow regime natural	Seasonal flow regime not obviously altered	Flow regime altered	Flow regime obviously altered	Flow regime highly modified	5	
7. Streamside veg. alteration@	Streamside vegetation unaltered	Vegetation slightly modified	Obvious modification	Highly modified vegetation	Severe modification	4	
8. Riparian zone/ streambank erosion	No evidence of erosion beyond natural	Slightly more than natural levels of erosion	Moderate levels of unnatural erosion	High levels of erosion	Extreme erosion	4	
9. Geomorphic change@	No evidence	Slight geomorphic change	Moderate change	High changes	Extreme alteration	5	
10. Instream habitat alteration@	Instream habitats of natural appearance and diversity	Barely discernible impacts	Moderate modifications to instream habitats	Highly modified modifications to instream habitats	Severe modification of instream habitats	4	
NOTE: When applicable, write down in the comments section the type and approx. distances from the impact If a score given differs from the previous score, state the reason why they are different in the comments section					**Total**	46	

COMMENTS

SC1: Cattle observed previous day accessing creek, some trampling of bed + bank observed
SC2: —
SC3: —
SC4: —
SC5: —
SC6: * Note that polypipe present waterhole possibly pumped dry by grazier to get cattle to alternate drinking source
SC7: Possibly limited clearing of trees. Evidence of grazing by cattle
SC8: Erosion at limited points where cattle access stream
SC9:
SC10: As above, slight bed + bank trampling + bank erosion due to cattle access

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FISH SAMPLING SHEETS

PROJECT NAME: Galilee Coal Project **SITE CODE:** BC5

SITE NAME: Beta Creek 'site 5'

DATE: 11/4/12 **TIME (24hrs):** [1400] **PARTY:** JC + KP

Site Summary

Species Name	Common Name	Count	Abundance Score
Melanotaenia splendida	Eastern Rainbowfish	15	3
Ambassis agassizi	Agassizi's Glass Perchlet	5	2
Leiopotherapon unicolor	Spangled Perch	4	2
Hypseleotris klungzingeri	Western Carp Gudgeon	1	1
Mogurnda adspersa	Purple spotted gudeon	1	1

Method Details

Electrofishing (EF)	
Operator:	KP
Assistant:	JC
Start Time:	–
Finish Time:	–
(for site) No. EF Seconds:	260
EF Settings:	Mainly 3 on NIWA EF300
Nets and Traps	
# Fyke Nets (FN):	–
# Seine Passes (SN):	–
# Bait Traps (BT):	–

Fish abundance scale

Approx # Observed	Abundance Score
1	1
2-9	2
10-50	3
51-100	4
101-500	5
501-1000	6
1001-5000	7
>5000	8

* Electrofisher used without anode ring – suspected overheat on Shot 2

Species: Shot 1				Species: Shot 2 - 110secs				Species: dipnet			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1 (150 secs)	SRA-shot1	Mel spl	23	1	Shot 2 SRA	Lei uni	22	1	dipnet	Edge	
2			32	2				2		Lei uni	52
3			42	3				3			35
4			37	4				4		Mel spl	50
5			41	5		Mel spl	35	5			
6			40	6			30	6		A aga	35
7			42	7			40	7			30
8			46	8				8			
9			36	9				9		Mog.ads	35
10			43	10				10			
11	SRAshot1	A.aga	32	11				11			
12			42	12				12			
13			46	13				13			
14	SRA shot	Mel spl	39	14				14			
15				15				15			
16		Lei uni	24	16				16			
17				17				17			
18				18	H. klu	[illegible]	16	18			
19				19				19			

Fish Sampling Field Sheet Cont.

20				20				20			
Species:				Species:				Species:			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
19				19				19			
20				20				20			

Species:				Species:				Species:			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
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19				19				19			
20				20				20			

Fish Sampling Field Sheet Cont.

Species:				Species:				Species:			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
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18				18				18			
19				19				19			
20				20				20			

Species:				Species:				Species:			
	Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length		Method	LHS (J/I/A)	Length
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
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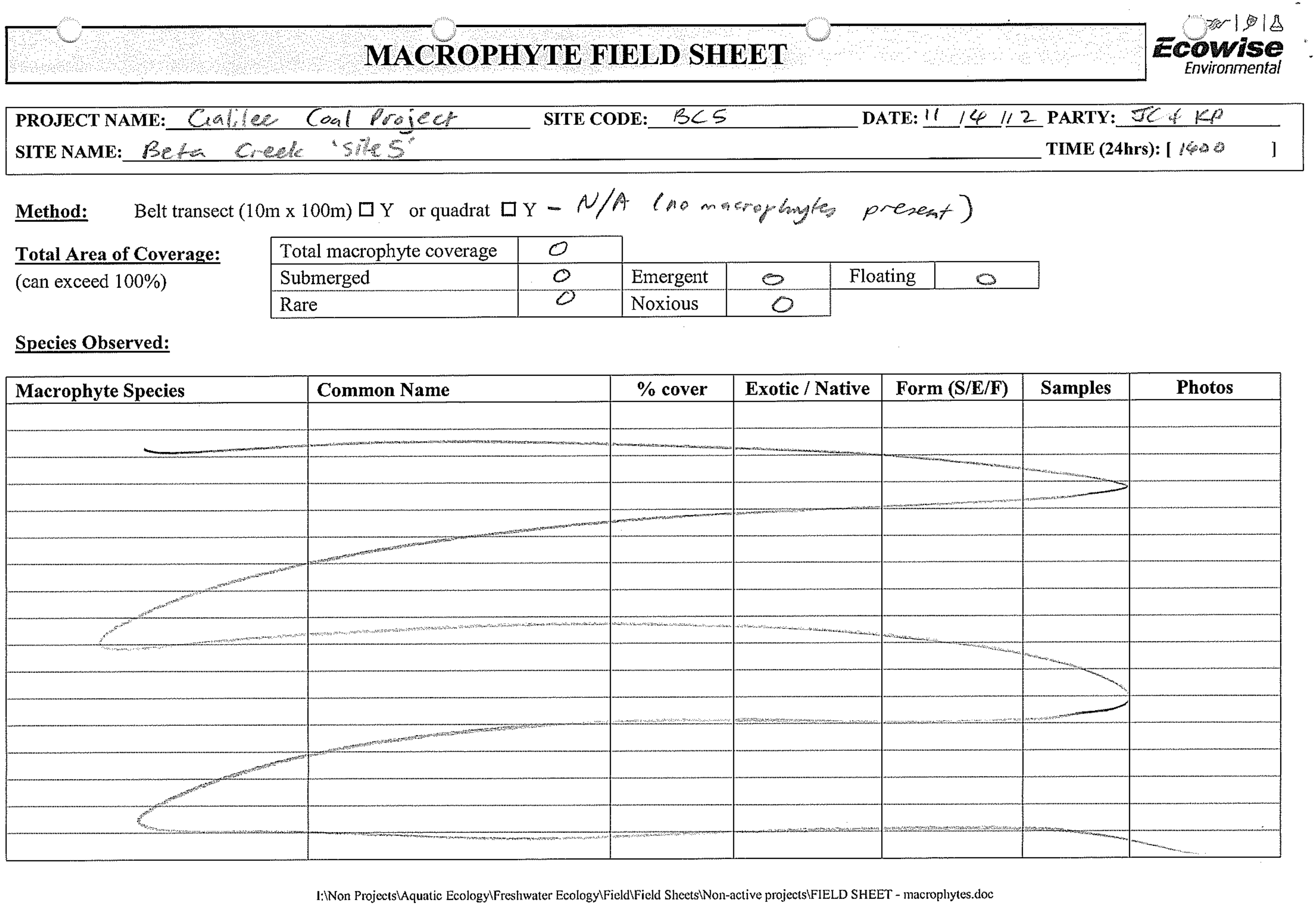


MACROPHYTE FIELD SHEET

Ecowise Environmental

PROJECT NAME: Galilee Coal Project SITE CODE: BCS DATE: 11 /4 /12 PARTY: JC & KP
SITE NAME: Beta Creek 'site 5' TIME (24hrs): [1400]

Method: Belt transect (10m x 100m) ☐ Y or quadrat ☐ Y – N/A (no macrophytes present)

Total Area of Coverage:
(can exceed 100%)

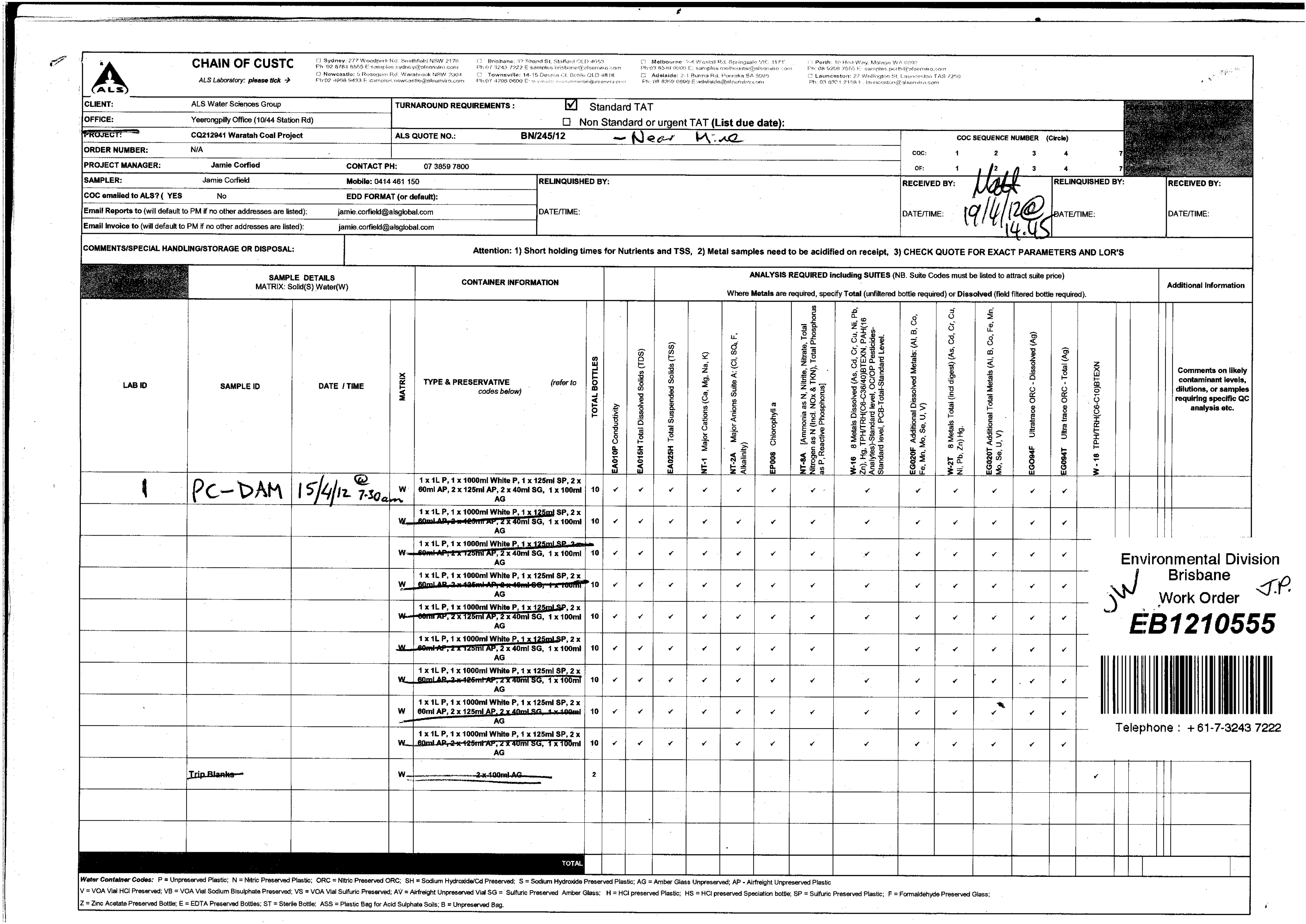
Total macrophyte coverage	0				
Submerged	0	Emergent	0	Floating	0
Rare	0	Noxious	0		

Species Observed:

Macrophyte Species	Common Name	% cover	Exotic / Native	Form (S/E/F)	Samples	Photos

I:\Non Projects\Aquatic Ecology\Freshwater Ecology\Field\Field Sheets\Non-active projects\FIELD SHEET - macrophytes.doc

Appendix B Raw Water Quality Data



CHAIN OF CUSTC

ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2176 Ph: 02 8784 8555 E:samples.sydney@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ Brisbane: 32 Shand St, Stafford QLD 4053 Ph:07 3243 7222 E:samples.brisbane@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E:townsville.environmental@alsenviro.com
☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 9600 E: samples.melbourne@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ Perth: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT: ALS Water Sciences Group
OFFICE: Yeerongpilly Office (10/44 Station Rd)
~~PROJECT:~~ CQ212941 Waratah Coal Project
ORDER NUMBER: N/A
PROJECT MANAGER: Jamie Corfied
CONTACT PH: 07 3859 7800
SAMPLER: Jamie Corfield
Mobile: 0414 461 150
COC emailed to ALS? (YES No
EDD FORMAT (or default):
Email Reports to (will default to PM if no other addresses are listed): jamie.corfield@alsglobal.com
Email Invoice to (will default to PM if no other addresses are listed): jamie.corfield@alsglobal.com

TURNAROUND REQUIREMENTS : ☑ Standard TAT
☐ Non Standard or urgent TAT **(List due date):**
ALS QUOTE NO.: BN/245/12 – Near Mine

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 7
OF: 1 2 3 4 7

RELINQUISHED BY:
DATE/TIME:
RECEIVED BY: Matt
DATE/TIME: 19/4/12@ 14.45
RELINQUISHED BY:
DATE/TIME:
RECEIVED BY:
DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Attention: 1) Short holding times for Nutrients and TSS, 2) Metal samples need to be acidified on receipt, 3) CHECK QUOTE FOR EXACT PARAMETERS AND LOR'S

SAMPLE DETAILS MATRIX: Solid(S) Water(W) | CONTAINER INFORMATION | **ANALYSIS REQUIRED including SUITES** (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required). | Additional Information

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	**EA010P** Conductivity	**EA015H** Total Dissolved Solids (TDS)	**EA025H** Total Suspended Solids (TSS)	**NT-1** Major Cations (Ca, Mg, Na, K)	**NT-2A** Major Anions Suite A: (Cl, SO4, F, Alkalinity)	**EP008** Chlorophyll a	**NT-8A** [Ammonia as N, Nitrite, Nitrate, Total Nitrogen as N (Incl. NOx & TKN), Total Phosphorus as P, Reactive Phosphorus]	**W-16** 8 Metals Dissolved (As, Cd, Cr, Cu, Ni, Pb, Zn), Hg, TPH/TRH(C6-C36/40)BTEXN, PAH(16 Analytes)-Standard level, OC/OP Pesticides-Standard level, PCB-Total-Standard Level.	**EG020F** Additional Dissolved Metals: (Al, B, Co, Fe, Mn, Mo, Se, U, V)	**W-2T** 8 Metals Total (incl digest) (As, Cd, Cr, Cu, Ni, Pb, Zn) Hg.	**EG020T** Additional Total Metals (Al, B, Co, Fe, Mn, Mo, Se, U, V)	**EG094F** Ultratrace ORC - Dissolved (Ag)	**EG094T** Ultra trace ORC - Total (Ag)	**W - 18** TPH/TRH(C6-C10)BTEXN	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	PC-DAM	15/4/12 @ 7·30am	W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, 1 x 100ml AG	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
			W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, 1 x 100ml AG	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
			W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, 1 x 100ml AG	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
			W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, 1 x 100ml AG	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
			W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, 1 x 100ml AG	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
			W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, 1 x 100ml AG	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
			W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, 1 x 100ml AG	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
			W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, 1 x 100ml AG	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
			W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, 1 x 100ml AG	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	~~Trip Blanks~~		W	~~2 x 100ml AG~~	2														✓	
				TOTAL																

Environmental Division
Brisbane
Work Order
EB1210555
Telephone : +61-7-3243 7222
JW J.P.

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Group
Environmental Division

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **EB1210555**

Client : **ALS WATER RESOURCES GROUP**
Contact : MR JAMIE CORFIELD
Address : PO BOX 3216
YERONGA 4104

E-mail : jamie.corfield@alsglobal.com
Telephone : +61 07 3859 7800
Facsimile : +61 07 3859 7820

Project : CQ212941 Waratah Coal Project
Order number : ----
C-O-C number : ----
Site : ----
Sampler : Jamie Corfield

Laboratory : Environmental Division Brisbane
Contact : Customer Services
Address : 32 Shand Street Stafford QLD Australia 4053

E-mail : Brisbane.Enviro.Services@alsglobal.com
Telephone : +61 7 3243 7222
Facsimile : +61 7 3243 7218

Page : 1 of 2

Quote number : EB2012ECOENV0381 (BN/245/12)

QC Level : NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received : 19-APR-2012
Client Requested Due Date : 30-APR-2012

Issue Date : 23-APR-2012 13:30
Scheduled Reporting Date : **02-MAY-2012**

Delivery Details

Mode of Delivery : Carrier
No. of coolers/boxes : 1 SMALL
Security Seal : Intact.

Temperature : 23.0°C
No. of samples received : 1
No. of samples analysed : 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- Samples received in appropriately pretreated and preserved containers.
- Turnaround times have been extended due to laboratory capacity. If you would like a preliminary report prior to this date please contact Client Services
- **Samples received in appropriately pretreated and preserved containers.**
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**
- **Please be advised that the sample was only logged for TPH(C10-C36)/PCB/OC/OP/PAH as only a 100ml amber glass bottle received. The rest of the analytes requires non preserved bottle, sulphuric acid preserved, Nitric Acid preserved and VOC vials.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Matt Goodwin.
- Analytical work for this work order will be conducted at ALS Brisbane.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Issue Date : 23-APR-2012 13:30
Page : 2 of 2
Work Order : EB1210555
Client : ALS WATER RESOURCES GROUP

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default to 15:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory for processing purposes and will be shown bracketed without a time component.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EP066-PCB-WA Polychlorinated Biphenyls (PCB)	WATER - EP071(SV-TPH-WD) Total Petroleum Hydrocarbons (TPH)	WATER - EP075 SIM PAH only SIM - PAH only	WATER - W-12 OC/OP Pesticides
EB1210555-001	15-APR-2012 07:30	PC-DAM	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

MR JAMIE CORFIELD

- *AU Certificate of Analysis - NATA (COA)	Email	jamie.corfield@alsglobal.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jamie.corfield@alsglobal.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jamie.corfield@alsglobal.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jamie.corfield@alsglobal.com
- A4 - AU Tax Invoice (INV)	Email	jamie.corfield@alsglobal.com
- Chain of Custody (CoC) (COC)	Email	jamie.corfield@alsglobal.com
- EDI Format - ENMRG (ENMRG)	Email	jamie.corfield@alsglobal.com
- EDI Format - ESDAT (ESDAT)	Email	jamie.corfield@alsglobal.com
- EDI Format - XTab (XTAB)	Email	jamie.corfield@alsglobal.com

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB1210555**	Page	: 1 of 6
Client	: ALS WATER RESOURCES GROUP	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMIE CORFIELD	Contact	: Customer Services
Address	: PO BOX 3216 YERONGA 4104	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: jamie.corfield@alsglobal.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3859 7800	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3859 7820	Facsimile	: +61 7 3243 7218
Project	: CQ212941 Waratah Coal Project	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 19-APR-2012
Sampler	: Jamie Corfield	Issue Date	: 03-MAY-2012
Order number	: ----		
		No. of samples received	: 1
Quote number	: BN/245/12	No. of samples analysed	: 1

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Page : 2 of 6
Work Order : EB1210555
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EP066: Polychlorinated Biphenyls (PCB)							
Amber Glass Bottle - Unpreserved (EP066) PC-DAM	**15-APR-2012**	**26-APR-2012**	22-APR-2012	✗	**01-MAY-2012**	05-JUN-2012	✓
EP068A: Organochlorine Pesticides (OC)							
Amber Glass Bottle - Unpreserved (EP068) PC-DAM	**15-APR-2012**	**26-APR-2012**	22-APR-2012	✗	**01-MAY-2012**	05-JUN-2012	✓
EP068B: Organophosphorus Pesticides (OP)							
Amber Glass Bottle - Unpreserved (EP068) PC-DAM	**15-APR-2012**	**26-APR-2012**	22-APR-2012	✗	**01-MAY-2012**	05-JUN-2012	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) PC-DAM	**15-APR-2012**	**26-APR-2012**	22-APR-2012	✗	**01-MAY-2012**	05-JUN-2012	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM)) PC-DAM	**15-APR-2012**	**26-APR-2012**	22-APR-2012	✗	**01-MAY-2012**	05-JUN-2012	✓

Page	: 3 of 6
Work Order	: EB1210555
Client	: ALS WATER RESOURCES GROUP
Project	: CQ212941 Waratah Coal Project

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		*Count*		*Rate (%)*			*Quality Control Specification*
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Control Samples (LCS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	1	**100.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	1	**100.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	1	**100.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	1	**100.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	1	**100.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	1	**100.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	1	**100.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	1	**100.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Polychlorinated Biphenyls (PCB)	EP066	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Pesticides by GCMS	EP068	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH - Semivolatile Fraction	EP071	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 500 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2). ALS default excludes sediment which may be resident in the container.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Laboratory Control Spike (LCS) Recoveries							
EP068B: Organophosphorus Pesticides (OP)	2688987-002	----	**Monocrotophos**	6923-22-4	11.8 %	16.4-100%	**Recovery less than lower control limit**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	2688987-012	----	**Fluorene**	86-73-7	53.4 %	55-121%	**Recovery less than lower control limit**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	**Days overdue**	*Date analysed*	*Due for analysis*	**Days overdue**
EP066: Polychlorinated Biphenyls (PCB)						
Amber Glass Bottle - Unpreserved PC-DAM	26-APR-2012	22-APR-2012	**4**	----	----	----
EP068A: Organochlorine Pesticides (OC)						
Amber Glass Bottle - Unpreserved PC-DAM	26-APR-2012	22-APR-2012	**4**	----	----	----
EP068B: Organophosphorus Pesticides (OP)						
Amber Glass Bottle - Unpreserved PC-DAM	26-APR-2012	22-APR-2012	**4**	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons						
Amber Glass Bottle - Unpreserved PC-DAM	26-APR-2012	22-APR-2012	**4**	----	----	----
EP080/071: Total Petroleum Hydrocarbons						
Amber Glass Bottle - Unpreserved PC-DAM	26-APR-2012	22-APR-2012	**4**	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft						

Matrix: **WATER**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft - Analysis Holding Time Compliance						
Amber Glass Bottle - Unpreserved						
PC-DAM	26-APR-2012	22-APR-2012	**4**	----	----	----

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB1210555**	Page	: 1 of 6
Client	: **ALS WATER RESOURCES GROUP**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMIE CORFIELD	Contact	: Customer Services
Address	: PO BOX 3216 YERONGA 4104	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: jamie.corfield@alsglobal.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3859 7800	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3859 7820	Facsimile	: +61 7 3243 7218
Project	: CQ212941 Waratah Coal Project	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 19-APR-2012
Sampler	: Jamie Corfield	Issue Date	: 03-MAY-2012
Order number	: ----		
		No. of samples received	: 1
Quote number	: BN/245/12	No. of samples analysed	: 1

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Matt Frost	Senior Organic Chemist	Brisbane Organics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

- **No Laboratory Duplicate (DUP) Results are required to be reported.**

Page : 4 of 6
Work Order : EB1210555
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 2270610)								
EP066: Total Polychlorinated biphenyls	----	1	µg/L	<1	10 µg/L	76.6	57	125
EP068A: Organochlorine Pesticides (OC) (QCLot: 2270609)								
EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	5 µg/L	71.5	55	127
EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	5 µg/L	66.5	51	126
EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	5 µg/L	73.9	49	126
EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	5 µg/L	71.3	53	131
EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	5 µg/L	71.3	49	131
EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	5 µg/L	73.9	43	128
EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	5 µg/L	73.0	57	131
EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	5 µg/L	72.7	57	124
EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	5 µg/L	71.5	53.4	120
EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	5 µg/L	75.6	53	133
EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	5 µg/L	72.2	52.4	120
EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	5 µg/L	76.9	51	128
EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	5 µg/L	75.5	54.8	125
EP068: Endrin	72-20-8	0.5	µg/L	<0.5	5 µg/L	77.3	49.1	135
EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	5 µg/L	79.2	54	123
EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	5 µg/L	77.6	54.3	129
EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	5 µg/L	79.8	54.3	127
EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	5 µg/L	78.4	47	136
EP068: 4.4`-DDT	50-29-3	2.0	µg/L	<2	5 µg/L	79.7	40	130
EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	5 µg/L	79.3	43	138
EP068: Methoxychlor	72-43-5	2.0	µg/L	<2	5 µg/L	73.4	16.1	130
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2270609)								
EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	5 µg/L	73.1	53.6	128
EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	5 µg/L	72.1	49.2	135
EP068: Monocrotophos	6923-22-4	2.0	µg/L	<2	5 µg/L	# 11.8	16.4	100
EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	5 µg/L	62.1	51.3	129
EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	5 µg/L	71.0	49	133
EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	5 µg/L	70.7	54.6	123
EP068: Parathion-methyl	298-00-0	2.0	µg/L	<2	5 µg/L	72.4	47	130
EP068: Malathion	121-75-5	0.5	µg/L	<0.5	5 µg/L	69.5	51	129
EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	5 µg/L	71.2	51	120
EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	5 µg/L	73.4	57.6	126

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Work Order : EB1210555
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2270609) - continued								
EP068: Parathion	56-38-2	2.0	µg/L	<2	5 µg/L	70.8	48	126
EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	5 µg/L	71.6	54.7	122
EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	5 µg/L	74.4	54.7	130
EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	5 µg/L	75.2	54.8	120
EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	5 µg/L	70.3	48.3	126
EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	5 µg/L	76.8	53.7	121
EP068: Ethion	563-12-2	0.5	µg/L	<0.5	5 µg/L	76.5	54.6	130
EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	5 µg/L	77.3	53.4	128
EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	5 µg/L	64.5	34	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2270612)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	10 µg/L	49.5	46	115
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	10 µg/L	75.8	51	122
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	10 µg/L	81.9	50	118
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	10 µg/L	# 53.4	55	121
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	10 µg/L	81.1	54	110
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	10 µg/L	80.7	49	118
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	10 µg/L	85.5	51	117
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	10 µg/L	85.0	51	117
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	10 µg/L	88.4	53	120
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	10 µg/L	65.0	48	114
EP075(SIM): Benzo(b)fluoranthene	205-99-2	1	µg/L	<1.0	10 µg/L	79.4	48	133
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	10 µg/L	84.3	43	127
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	10 µg/L	78.5	44	120
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	10 µg/L	65.5	45	132
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	10 µg/L	95.8	47	135
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	10 µg/L	83.0	42	131
EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	1	µg/L	<1.0	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2270611)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	1275 µg/L	102	49	125.5
EP071: C15 - C28 Fraction	----	100	µg/L	<100	1850 µg/L	117	58	131
EP071: C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2270611)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	1670 µg/L	108	49	125.5
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	1285 µg/L	116	58	131
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) Results are required to be reported.**

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

ALS Group

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order : **EB1210555**
Client : **ALS WATER RESOURCES GROUP**
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YERONGA 4104
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Facsimile : +61 07 3859 7820
Project : CQ212941 Waratah Coal Project
Order number : ----
C-O-C number : ----
Sampler : Jamie Corfield
Site : ----

Quote number : BN/245/12

Page : 1 of 6
Laboratory : Environmental Division Brisbane
Contact : Customer Services
Address : 32 Shand Street Stafford QLD Australia 4053
E-mail : Brisbane.Enviro.Services@alsglobal.com
Telephone : +61 7 3243 7222
Facsimile : +61 7 3243 7218
QC Level : NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Date Samples Received : 19-APR-2012
Issue Date : 03-MAY-2012

No. of samples received : 1
No. of samples analysed : 1

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

WORLD RECOGNISED ACCREDITATION

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Matt Frost	Senior Organic Chemist	Brisbane Organics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

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Work Order : EB1210555
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analytical Results

Sub-Matrix: **WATER**			Client sample ID	**PC-DAM**	----	----	----	----
			Client sampling date / time	15-APR-2012 07:30	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB1210555-001**	**----**	**----**	**----**	**----**
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	1	µg/L	<1	----	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	----	----	----	----
beta-BHC	319-85-7	0.5	µg/L	<0.5	----	----	----	----
gamma-BHC	58-89-9	0.5	µg/L	<0.5	----	----	----	----
delta-BHC	319-86-8	0.5	µg/L	<0.5	----	----	----	----
Heptachlor	76-44-8	0.5	µg/L	<0.5	----	----	----	----
Aldrin	309-00-2	0.5	µg/L	<0.5	----	----	----	----
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	----	----	----	----
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	----	----	----	----
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	----	----	----	----
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	----	----	----	----
Dieldrin	60-57-1	0.5	µg/L	<0.5	----	----	----	----
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	----	----	----	----
Endrin	72-20-8	0.5	µg/L	<0.5	----	----	----	----
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	----	----	----	----
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	----	----	----	----
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	----	----	----	----
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	----	----	----	----
4.4`-DDT	50-29-3	2	µg/L	<2	----	----	----	----
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	----	----	----	----
Methoxychlor	72-43-5	2	µg/L	<2	----	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	----	----	----	----
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	----	----	----	----
Monocrotophos	6923-22-4	2	µg/L	<2	----	----	----	----
Dimethoate	60-51-5	0.5	µg/L	<0.5	----	----	----	----
Diazinon	333-41-5	0.5	µg/L	<0.5	----	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	----	----	----	----
Parathion-methyl	298-00-0	2	µg/L	<2	----	----	----	----
Malathion	121-75-5	0.5	µg/L	<0.5	----	----	----	----
Fenthion	55-38-9	0.5	µg/L	<0.5	----	----	----	----
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	----	----	----	----
Parathion	56-38-2	2	µg/L	<2	----	----	----	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	----	----	----	----

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Work Order : EB1210555
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**PC-DAM**	----	----	----	----
			Client sampling date / time	15-APR-2012 07:30	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB1210555-001**	**----**	**----**	**----**	**----**
EP068B: Organophosphorus Pesticides (OP) - Continued								
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	----	----	----	----
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	----	----	----	----
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	----	----	----	----
Prothiofos	34643-46-4	0.5	µg/L	<0.5	----	----	----	----
Ethion	563-12-2	0.5	µg/L	<0.5	----	----	----	----
Carbophenothion	786-19-6	0.5	µg/L	<0.5	----	----	----	----
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	----	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	----	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	----	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	----	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	----	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	----	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	----	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	----	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	----	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	----	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	----	----	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L	<0.5	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	**100**	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	**50**	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	**150**	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft								
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	**130**	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	**130**	----	----	----	----
EP066S: PCB Surrogate								

Analytical Results

Sub-Matrix: **WATER**

			Client sample ID	**PC-DAM**	----	----	----	----
			Client sampling date / time	15-APR-2012 07:30	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB1210555-001**	**----**	**----**	**----**	**----**
EP066S: PCB Surrogate - Continued								
Decachlorobiphenyl	2051-24-3	0.1	%	**124**	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**84.4**	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	**64.7**	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**21.8**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	**59.4**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	**59.5**	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**69.2**	----	----	----	----
Anthracene-d10	1719-06-8	0.1	%	**76.7**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	**53.8**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%)	
		Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	37	138.2
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	40.4	134.4
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	41.8	143.3
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10.0	71.9
2-Chlorophenol-D4	93951-73-6	26.8	130.2
2.4.6-Tribromophenol	118-79-6	19.3	180.8
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	13.9	146.1
Anthracene-d10	1719-06-8	34.6	137.4
4-Terphenyl-d14	1718-51-0	36.2	154.2

CHAIN OF CUSTC

ALS Laboratory: *please tick* →

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☐ **Brisbane**: 32 Shand St, Stafford QLD 4053 Ph:07 3243 7222 E:samples.brisbane@alsenviro.com
☐ **Townsville**: 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E:townsville.environmental@alsenviro.com
☐ **Melbourne**: 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 9600 E: samples.melbourne@alsenviro.com
☐ **Adelaide**: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ **Perth**: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ **Launceston**: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

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OFFICE: Yeerongpilly Office (10/44 Station Rd)
PROJECT: CQ212941 Waratah Coal Project
ORDER NUMBER: N/A
PROJECT MANAGER: Jamie Corfied
CONTACT PH: 07 3859 7800
SAMPLER: Jamie Corfield
Mobile: 0414 461 150
COC emailed to ALS? ~~YES~~ No
EDD FORMAT (or default):
Email Reports to (will default to PM if no other addresses are listed): jamie.corfield@alsglobal.com
Email Invoice to (will default to PM if no other addresses are listed): jamie.corfield@alsglobal.com

TURNAROUND REQUIREMENTS : ☑ Standard TAT ☐ Non Standard or urgent TAT **(List due date):**
ALS QUOTE NO.: BN/245/12

COC SEQUENCE NUMBER (Circle)
COC: [✓ 1] 2 3 4 6 7
OF: [✓ 1] 2 3 4 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Int Yes No
Free ice / frozen ice bricks Yes No
Random Sample C
Other comment:

RELINQUISHED BY: Kim PIERCY
DATE/TIME: 11.4.12 10.00
RECEIVED BY: Alice Chipperfield
DATE/TIME: 11.4.12 9:30
RELINQUISHED BY:
DATE/TIME:
RECEIVED BY: OHO
DATE/TIME: 12/04/12 08:20

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:
Attention!: 1) Short holding times for Nutrients and TSS, 2) Metal samples need to be acidified on receipt, 3) CHECK QUOTE FOR EXACT PARAMETERS AND LOR'S

Environmental Division
Brisbane
Work Order DB
EB1209803
Telephone : + 61-7-3243 7222

HI

SAMPLE DETAILS MATRIX: Solid(S) Water(W) | **CONTAINER INFORMATION** | **ANALYSIS REQUIRED including SUITES** (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required). | **Additional Information**

		DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA010P Conductivity	EA015H Total Dissolved Solids (TDS)	EA025H Total Suspended Solids (TSS)	NT-1 Major Cations (Ca, Mg, Na, K)	NT-2A Major Anions Suite A: (Cl, SO4, F, Alkalinity)	EP008 Chlorophyll a	NT-8A [Ammonia as N, Nitrite, Nitrate, Total Nitrogen as N (incl. NOx & TKN), Total Phosphorus as P, Reactive Phosphorus]	W-16 8 Metals Dissolved (As, Cd, Cr, Cu, Ni, Pb, Zn), Hg, TPH/TRH(C6-C36/40)BTEXN, PAH(16 Analytes)-Standard level, OC/OP Pesticides-Standard level, PCB-Total-Standard Level.	EG020F Additional Dissolved Metals: (Al, B, Co, Fe, Mn, Mo, Se, U, V)	W-2T 8 Metals Total (incl digest) (As, Cd, Cr, Cu, Ni, Pb, Zn) Hg.	EG020T Additional Total Metals (Al, B, Co, Fe, Mn, Mo, Se, U, V)	EG094F Ultratrace ORC - Dissolved (Ag)	EG094T Ultra trace ORC - Total (Ag)	W - 18 TPH/TRH(C6-C10)BTEXN	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	LC-3	16.35 10.4.12	W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, 1 x 100ml AG	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
2	SPC-DAM	17.55 10.4.12	W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, 1 x 100ml AG	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
3	TC-DAM	15.15 10.4.12	W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, 1 x 100ml AG	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
4	BC-5	14.25 10.4.12	W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, 1 x 100ml AG	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
5	PC-DAM	18.55 10.4.12	W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, ~~1 x 100ml AG~~	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
6	SITE 04	16.00 10.4.12	W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, 1 x 100ml AG	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
7	LC-1	16.15 10.4.12	W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, 1 x 100ml AG	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
8	AQ-13	17.00 10.4.12	W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, 1 x 100ml AG	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
9	MC-NEW	17.15 10.4.12	W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, 1 x 100ml AG	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
10	Trip Blanks	8.00 11.4.12	W	2 x 100ml AG	2								KP						✓	
11	FB-1	8.00 11.4.12	W	2x 60ml AP, 2x 125ml AP, 2x40ml SG, 1 x 100ml AG	7								✓	✓	✓	✓	✓	✓		
				TOTAL																

NOTE: DISSOLVED METALS HAVE NOT BEEN FIELD FILTERED.

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

TWAB940818

ALS Group
Environmental Division

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order	: **EB1209803**		
Client	: **ALS WATER RESOURCES GROUP**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMIE CORFIELD	Contact	: Customer Services
Address	: PO BOX 3216 YERONGA 4104	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: jamie.corfield@alsglobal.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3859 7800	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3859 7820	Facsimile	: +61 7 3243 7218
Project	: CQ212941 Waratah Coal Project	Page	: 1 of 4
Order number	: ----		
C-O-C number	: ----	Quote number	: EB2012ECOENV0381 (BN/245/12)
Site	: ----		
Sampler	: Jamie Corfield	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 12-APR-2012	Issue Date	: 13-APR-2012 00:48
Client Requested Due Date	: 23-APR-2012	Scheduled Reporting Date	: **23-APR-2012**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 5.6°C<->9.1°C
No. of coolers/boxes	: 5 MEDIUM	No. of samples received	: 11
Security Seal	: Intact.	No. of samples analysed	: 11

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Sample containers do not comply to pretreatment / preservation standards (AS, APHA, USEPA). Please refer to the Sample Container(s)/Preservation Non-Compliance Log at the end of this report for details.**
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**
- **Please be advised that we are unable to analyse for dissolved metals on sample "FB-1" as we did not receive a filtered metals bottle or an unpreserved plastic container (Green label). Unfiltered lab-acidified metals containers are not suitable for lab filtering as the samples are acidified on receipt by the laboratory.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Samples submitted for dissolved metals analysis should be acidified with nitric acid, following field filtration. Additional charges of up to $5.00 will apply to each sample requiring filtration and preservation upon receipt by the laboratory.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Matt Goodwin.
- Analytical work for this work order will be conducted at ALS Brisbane.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Issue Date : 13-APR-2012 00:48
Page : 2 of 4
Work Order : EB1209803
Client : ALS WATER RESOURCES GROUP

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method *Client sample ID*	**Sample Container Received**	**Preferred Sample Container for Analysis**
EG020A-F : Dissolved Metals by ICP-MS - Suite A		
LC-3	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
SPC-DAM	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
TC-DAM	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
BC-5	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
PC-DAM	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
SITE 04	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
LC-1	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
AQ-13	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
MC-NEW	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
EG020B-F : Dissolved Metals by ICP-MS - Suite B		
LC-3	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
SPC-DAM	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
TC-DAM	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
BC-5	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
PC-DAM	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
SITE 04	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
LC-1	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
AQ-13	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
MC-NEW	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
EG035F : Dissolved Mercury by FIMS		
LC-3	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
SPC-DAM	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
TC-DAM	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
BC-5	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
PC-DAM	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
SITE 04	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
LC-1	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
AQ-13	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
MC-NEW	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
EG094A-F : Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS		
LC-3	- Clear Plastic Bottle - Natural	- Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered
SPC-DAM	- Clear Plastic Bottle - Natural	- Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered
TC-DAM	- Clear Plastic Bottle - Natural	- Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered
BC-5	- Clear Plastic Bottle - Natural	- Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered
PC-DAM	- Clear Plastic Bottle - Natural	- Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered
SITE 04	- Clear Plastic Bottle - Natural	- Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered
LC-1	- Clear Plastic Bottle - Natural	- Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered
AQ-13	- Clear Plastic Bottle - Natural	- Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered
MC-NEW	- Clear Plastic Bottle - Natural	- Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered
EP066 : Polychlorinated Biphenyls (PCB)		
PC-DAM	- Clear Plastic Bottle - Natural	- Amber Glass Bottle - Unpreserved
EP068 : Pesticides by GCMS		
PC-DAM	- Clear Plastic Bottle - Natural	- Amber Glass Bottle - Unpreserved
EP071 : TPH - Semivolatile Fraction		
PC-DAM	- Clear Plastic Bottle - Natural	- Amber Glass Bottle - Unpreserved
EP075(SIM) : PAH/Phenols (GC/MS - SIM)		
PC-DAM	- Clear Plastic Bottle - Natural	- Amber Glass Bottle - Unpreserved
EP080 : TPH Volatiles/BTEX		
Trip Blanks	- Amber Glass Bottle - Unpreserved	- Amber VOC Vial - HCl

Summary of Sample(s) and Requested Analysis

Issue Date : 13-APR-2012 00:48
Page : 3 of 4
Work Order : EB1209803
Client : ALS WATER RESOURCES GROUP

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default to 15:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory for processing purposes and will be shown bracketed without a time component.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EA010P Conductivity (PC)	WATER - EA015H Total Dissolved Solids - High Level	WATER - EA025H Suspended Solids (High Level)	WATER - EG020F Dissolved Metals by ICPMS	WATER - EG020T Total Recoverable Metals by ICPMS	WATER - EG094A-F Dissolved Metals in Fresh Water Suite A by ORC-ICPMS	WATER - EG094A-T Total Metals in Fresh water Suite A by ORC-ICPMS	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F)
EB1209803-001	10-APR-2012 16:35	LC-3	✓	✓	✓	✓	✓	✓	✓	✓
EB1209803-002	10-APR-2012 17:55	SPC-DAM	✓	✓	✓	✓	✓	✓	✓	✓
EB1209803-003	10-APR-2012 15:15	TC-DAM	✓	✓	✓	✓	✓	✓	✓	✓
EB1209803-004	10-APR-2012 14:25	BC-5	✓	✓	✓	✓	✓	✓	✓	✓
EB1209803-005	10-APR-2012 18:55	PC-DAM	✓	✓	✓	✓	✓	✓	✓	✓
EB1209803-006	10-APR-2012 16:00	SITE 04	✓	✓	✓	✓	✓	✓	✓	✓
EB1209803-007	10-APR-2012 16:15	LC-1	✓	✓	✓	✓	✓	✓	✓	✓
EB1209803-008	10-APR-2012 17:00	AQ-13	✓	✓	✓	✓	✓	✓	✓	✓
EB1209803-009	10-APR-2012 17:15	MC-NEW	✓	✓	✓	✓	✓	✓	✓	✓
EB1209803-011	11-APR-2012 08:00	FB-1					✓		✓	

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EP008 Chlorophyll a	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02A Major Anions (Chloride, Sulphate, Fluoride, Alkalinity)	WATER - NT-08A Total Nitrogen + NO2 + NO3 + NH3 + Total P + Reactive P	WATER - W-02T 8 metals (Total)	WATER - W-16 TPH/BTEX/PAH/OC/OP/PCB/8 Metals	WATER - W-16T TPH/BTEX/PAH/OC/OP/PCB/8 Total metals	WATER - W-18 TPH(C6 - C9)/BTEX
EB1209803-001	10-APR-2012 16:35	LC-3	✓	✓	✓	✓	✓	✓		
EB1209803-002	10-APR-2012 17:55	SPC-DAM	✓	✓	✓	✓	✓	✓		
EB1209803-003	10-APR-2012 15:15	TC-DAM	✓	✓	✓	✓	✓	✓		
EB1209803-004	10-APR-2012 14:25	BC-5	✓	✓	✓	✓	✓	✓		
EB1209803-005	10-APR-2012 18:55	PC-DAM	✓	✓	✓	✓	✓	✓		
EB1209803-006	10-APR-2012 16:00	SITE 04	✓	✓	✓	✓	✓	✓		
EB1209803-007	10-APR-2012 16:15	LC-1	✓	✓	✓	✓	✓	✓		
EB1209803-008	10-APR-2012 17:00	AQ-13	✓	✓	✓	✓	✓	✓		
EB1209803-009	10-APR-2012 17:15	MC-NEW	✓	✓	✓	✓	✓	✓		
EB1209803-010	11-APR-2012 08:00	Trip Blanks								✓
EB1209803-011	11-APR-2012 08:00	FB-1							✓	

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

MR JAMIE CORFIELD

- *AU Certificate of Analysis - NATA (COA)	Email	jamie.corfield@alsglobal.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jamie.corfield@alsglobal.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jamie.corfield@alsglobal.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jamie.corfield@alsglobal.com
- A4 - AU Tax Invoice (INV)	Email	jamie.corfield@alsglobal.com
- Chain of Custody (CoC) (COC)	Email	jamie.corfield@alsglobal.com
- EDI Format - ENMRG (ENMRG)	Email	jamie.corfield@alsglobal.com
- EDI Format - ESDAT (ESDAT)	Email	jamie.corfield@alsglobal.com
- EDI Format - XTab (XTAB)	Email	jamie.corfield@alsglobal.com

ALS Group
Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order : **EB1209803**

Client : ALS WATER RESOURCES GROUP
Contact : MR JAMIE CORFIELD
Address : PO BOX 3216
YERONGA 4104

E-mail : jamie.corfield@alsglobal.com
Telephone : +61 07 3859 7800
Facsimile : +61 07 3859 7820

Project : CQ212941 Waratah Coal Project
Site : ----
C-O-C number : ----
Sampler : Jamie Corfield
Order number : ----

Quote number : BN/245/12

Page : 1 of 15

Laboratory : Environmental Division Brisbane
Contact : Customer Services
Address : 32 Shand Street Stafford QLD Australia 4053

E-mail : Brisbane.Enviro.Services@alsglobal.com
Telephone : +61 7 3243 7222
Facsimile : +61 7 3243 7218

QC Level : NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Date Samples Received : 12-APR-2012
Issue Date : 24-APR-2012

No. of samples received : 11
No. of samples analysed : 11

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)			*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA010P: Conductivity by PC Titrator								
Clear Plastic Bottle - Natural (EA010-P)								
LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW	SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	**---**	08-MAY-2012	----	**18-APR-2012**	08-MAY-2012	✓
EA015: Total Dissolved Solids								
Clear Plastic Bottle - Natural (EA015H)								
LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW	SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	**----**	----	----	**16-APR-2012**	17-APR-2012	✓
EA025: Suspended Solids								
Clear Plastic Bottle - Natural (EA025H)								
LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW	SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	**----**	----	----	**16-APR-2012**	17-APR-2012	✓
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW	SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	**---**	24-APR-2012	----	**18-APR-2012**	24-APR-2012	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW	SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	**---**	08-MAY-2012	----	**13-APR-2012**	08-MAY-2012	✓

Page : 3 of 15
Work Order : EB1209803
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
ED045G: Chloride Discrete analyser							
Clear Plastic Bottle - Natural (ED045G) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	---	08-MAY-2012	----	**13-APR-2012**	08-MAY-2012	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	---	17-APR-2012	----	**13-APR-2012**	17-APR-2012	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Natural (EG020A-F) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	---	07-OCT-2012	----	**19-APR-2012**	07-OCT-2012	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	**19-APR-2012**	07-OCT-2012	✓	**19-APR-2012**	07-OCT-2012	✓
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T) FB-1	**11-APR-2012**	**19-APR-2012**	08-OCT-2012	✓	**19-APR-2012**	08-OCT-2012	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Natural (EG020B-F) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	---	07-OCT-2012	----	**19-APR-2012**	07-OCT-2012	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020B-T) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	**19-APR-2012**	07-OCT-2012	✓	**19-APR-2012**	07-OCT-2012	✓
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020B-T) FB-1	**11-APR-2012**	**19-APR-2012**	08-OCT-2012	✓	**19-APR-2012**	08-OCT-2012	✓

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Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Natural (EG035F) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	**---**	08-MAY-2012	----	**19-APR-2012**	08-MAY-2012	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035T) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	**----**	----	----	**19-APR-2012**	08-MAY-2012	✓
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035T) FB-1	**11-APR-2012**	**----**	----	----	**19-APR-2012**	09-MAY-2012	✓
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS							
Clear Plastic Bottle - Natural (EG094A-F) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	**17-APR-2012**	07-OCT-2012	✓	**17-APR-2012**	07-OCT-2012	✓
EG094T: Total metals in Fresh water by ORC-ICPMS							
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG094A-T) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	**17-APR-2012**	07-OCT-2012	✓	**17-APR-2012**	07-OCT-2012	✓
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG094A-T) FB-1	**11-APR-2012**	**17-APR-2012**	08-OCT-2012	✓	**17-APR-2012**	08-OCT-2012	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	**---**	08-MAY-2012	----	**18-APR-2012**	08-MAY-2012	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	**---**	08-MAY-2012	----	**19-APR-2012**	08-MAY-2012	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	---	12-APR-2012	----	**13-APR-2012**	12-APR-2012	×
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	---	08-MAY-2012	----	**19-APR-2012**	08-MAY-2012	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	**17-APR-2012**	08-MAY-2012	✓	**18-APR-2012**	08-MAY-2012	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	**17-APR-2012**	08-MAY-2012	✓	**18-APR-2012**	08-MAY-2012	✓
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	---	12-APR-2012	----	**13-APR-2012**	12-APR-2012	×
EP008: Chlorophyll a & Pheophytin a							
White Plastic Bottle - Unpreserved (EP008) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	----	----	----	**13-APR-2012**	12-APR-2012	×

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Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EP066: Polychlorinated Biphenyls (PCB)							
Amber Glass Bottle - Unpreserved (EP066) LC-3, TC-DAM, SITE 04, AQ-13, SPC-DAM, BC-5, LC-1, MC-NEW	**10-APR-2012**	**16-APR-2012**	17-APR-2012	✓	**21-APR-2012**	26-MAY-2012	✓
Amber Glass Bottle - Unpreserved (EP066) FB-1	**11-APR-2012**	**16-APR-2012**	18-APR-2012	✓	**21-APR-2012**	26-MAY-2012	✓
Clear Plastic Bottle - Natural (EP066) PC-DAM	**10-APR-2012**	**16-APR-2012**	17-APR-2012	✓	**21-APR-2012**	26-MAY-2012	✓
EP068A: Organochlorine Pesticides (OC)							
Amber Glass Bottle - Unpreserved (EP068) LC-3, TC-DAM, SITE 04, AQ-13, SPC-DAM, BC-5, LC-1, MC-NEW	**10-APR-2012**	**16-APR-2012**	17-APR-2012	✓	**21-APR-2012**	26-MAY-2012	✓
Amber Glass Bottle - Unpreserved (EP068) FB-1	**11-APR-2012**	**16-APR-2012**	18-APR-2012	✓	**21-APR-2012**	26-MAY-2012	✓
Clear Plastic Bottle - Natural (EP068) PC-DAM	**10-APR-2012**	**16-APR-2012**	17-APR-2012	✓	**21-APR-2012**	26-MAY-2012	✓
EP068B: Organophosphorus Pesticides (OP)							
Amber Glass Bottle - Unpreserved (EP068) LC-3, TC-DAM, SITE 04, AQ-13, SPC-DAM, BC-5, LC-1, MC-NEW	**10-APR-2012**	**16-APR-2012**	17-APR-2012	✓	**21-APR-2012**	26-MAY-2012	✓
Amber Glass Bottle - Unpreserved (EP068) FB-1	**11-APR-2012**	**16-APR-2012**	18-APR-2012	✓	**21-APR-2012**	26-MAY-2012	✓
Clear Plastic Bottle - Natural (EP068) PC-DAM	**10-APR-2012**	**16-APR-2012**	17-APR-2012	✓	**21-APR-2012**	26-MAY-2012	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft							
Amber Glass Bottle - Unpreserved (EP071) LC-3, TC-DAM, SITE 04, AQ-13, SPC-DAM, BC-5, LC-1, MC-NEW	**10-APR-2012**	**16-APR-2012**	17-APR-2012	✓	**20-APR-2012**	26-MAY-2012	✓
Amber Glass Bottle - Unpreserved (EP071) FB-1	**11-APR-2012**	**16-APR-2012**	18-APR-2012	✓	**20-APR-2012**	26-MAY-2012	✓
Clear Plastic Bottle - Natural (EP071) PC-DAM	**10-APR-2012**	**16-APR-2012**	17-APR-2012	✓	**20-APR-2012**	26-MAY-2012	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM)) LC-3, TC-DAM, SITE 04, AQ-13, SPC-DAM, BC-5, LC-1, MC-NEW	**10-APR-2012**	**16-APR-2012**	17-APR-2012	✓	**20-APR-2012**	26-MAY-2012	✓
Amber Glass Bottle - Unpreserved (EP075(SIM)) FB-1	**11-APR-2012**	**16-APR-2012**	18-APR-2012	✓	**20-APR-2012**	26-MAY-2012	✓
Clear Plastic Bottle - Natural (EP075(SIM)) PC-DAM	**10-APR-2012**	**16-APR-2012**	17-APR-2012	✓	**20-APR-2012**	26-MAY-2012	✓
EP080: BTEXN							
Amber Glass Bottle - Unpreserved (EP080) Trip Blanks	**11-APR-2012**	**19-APR-2012**	25-APR-2012	✓	**19-APR-2012**	25-APR-2012	✓
Amber VOC Vial - Sulfuric Acid (EP080) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	**19-APR-2012**	24-APR-2012	✓	**19-APR-2012**	24-APR-2012	✓
Amber VOC Vial - Sulfuric Acid (EP080) FB-1	**11-APR-2012**	**19-APR-2012**	25-APR-2012	✓	**19-APR-2012**	25-APR-2012	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP080) Trip Blanks	**11-APR-2012**	**19-APR-2012**	25-APR-2012	✓	**19-APR-2012**	25-APR-2012	✓
Amber VOC Vial - Sulfuric Acid (EP080) LC-3, TC-DAM, PC-DAM, LC-1, MC-NEW SPC-DAM, BC-5, SITE 04, AQ-13,	**10-APR-2012**	**19-APR-2012**	24-APR-2012	✓	**19-APR-2012**	24-APR-2012	✓
Amber VOC Vial - Sulfuric Acid (EP080) FB-1	**11-APR-2012**	**19-APR-2012**	25-APR-2012	✓	**19-APR-2012**	25-APR-2012	✓

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Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		*Count*		*Rate (%)*			*Quality Control Specification*
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	4	36	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a and Pheophytin a	EP008	2	12	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite B	EG020B-F	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	2	12	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Dissolved	ED093F	4	38	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	40	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids (High Level)	EA015H	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-T	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	4	36	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a and Pheophytin a	EP008	1	12	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite B	EG020B-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	12	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

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Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	40	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids (High Level)	EA015H	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	36	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a and Pheophytin a	EP008	1	12	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite B	EG020B-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	12	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Dissolved	ED093F	2	38	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	40	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids (High Level)	EA015H	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	36	**5.6**	**5.0**	✓	ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		*Count*		*Rate (%)*			*Quality Control Specification*
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Dissolved Mercury by FIMS	EG035F	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	12	**8.3**	**5.0**	✓	ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	18	**5.6**	**5.0**	✓	ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-T	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids (High Level)	EA015H	WATER	In-House, APHA 21st ed., 2540C A gravimetric procedure that determines the amount of \`filterable\` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Suspended Solids (High Level)	EA025H	WATER	In-House, APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of \`non-filterable\` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Alkalinity by PC Titrator	ED037-P	WATER	APHA 21st ed., 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	APHA 21st ed., 4500-SO4 Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chloride by Discrete Analyser	ED045G	WATER	APHA 21st ed., 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	Major Cations is determined based on APHA 21st ed., 3120; USEPA SW 846 - 6010 The ICPAES technique ionises the 0.45um filtered sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2) Sodium Absorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2) Total Hardness is calculated based on APHA 21st ed., 2340 B. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): Samples are 0.45 um filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite B	EG020B-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): Samples are 0.45 um filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite B	EG020B-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45 um filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Mercury by FIMS	EG035T	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-T	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Fluoride by PC Titrator	EK040P	WATER	APHA 21st ed., 4500 F--C CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N by Discrete analyser	EK055G	WATER	APHA 21st ed., 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N by Discrete Analyser	EK057G	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrate as N by Discrete Analyser	EK058G	WATER	APHA 21st ed., 4500-NO3- F. Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	APHA 21st ed., 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	APHA 21st ed., 4500-Norg D. 25mL water samples are digested using a traditional Kjeldahl digestion followed by determination by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	APHA 21st ed., 4500-Norg / 4500-NO3-. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Analytical Methods	Method	Matrix	Method Descriptions
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	APHA 21st ed., 4500-P B&F This procedure involves sulphuric acid digestion of a 100mL sample to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	APHA 21st ed., 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ionic Balance by PCT DA and Turbi SO4 DA	EN055 - PG	WATER	APHA 21st Ed. 1030F. The Ionic Balance is calculated based on the major Anions and Cations. The major anions include Alkalinity, Chloride and Sulfate which determined by PCT and DA. The Cations are determined by Turbi SO4 by DA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chlorophyll a and Pheophytin a	EP008	WATER	In-house (APHA 21st ed., 10200 H mod.) The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically.
Polychlorinated Biphenyls (PCB)	EP066	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Pesticides by GCMS	EP068	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH - Semivolatile Fraction	EP071	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	APHA 21st ed., 4500 Norg - D; APHA 21st ed., 4500 P - H. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Digestion for Total Recoverable Metals	EN25	WATER	USEPA SW846-3005 Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Digestion for Total Recoverable Metals - ORC	EN25-ORC	WATER	Modified USEPA SW846-3005. This is an Ultrapure Nitric acid digestion procedure used to prepare surface and ground water samples for analysis by ORC- ICPMS. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 500 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2). ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Laboratory Control Spike (LCS) Recoveries							
EP068A: Organochlorine Pesticides (OC)	2671588-002	----	**Endrin aldehyde**	7421-93-4	133 %	54.3-127%	**Recovery greater than upper control limit**
EP068A: Organochlorine Pesticides (OC)	2671588-002	----	**4.4`-DDT**	50-29-3	131 %	40-130%	**Recovery greater than upper control limit**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

Sub-Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Samples Submitted							
EP068S: Organochlorine Pesticide Surrogate	EB1209803-001	LC-3	**Dibromo-DDE**	21655-73-2	135 %	40.4-134.4 %	**Recovery greater than upper data quality objective**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EK057G: Nitrite as N by Discrete Analyser						
Clear Plastic Bottle - Natural LC-3, SPC-DAM, TC-DAM, BC-5, PC-DAM, SITE 04, LC-1, AQ-13, MC-NEW	----	----	----	13-APR-2012	12-APR-2012	**1**
EK071G: Reactive Phosphorus as P by discrete analyser						
Clear Plastic Bottle - Natural LC-3, SPC-DAM, TC-DAM, BC-5, PC-DAM, SITE 04, LC-1, AQ-13, MC-NEW	----	----	----	13-APR-2012	12-APR-2012	**1**
EP008: Chlorophyll a & Pheophytin a						

Matrix: **WATER**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EP008: Chlorophyll a & Pheophytin a - Analysis Holding Time Compliance						
White Plastic Bottle - Unpreserved LC-3, SPC-DAM, TC-DAM, BC-5, PC-DAM, SITE 04, LC-1, AQ-13, MC-NEW	----	----	----	13-APR-2012	12-APR-2012	**1**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

ALS Group
Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB1209803**	Page	: 1 of 16
Client	: **ALS WATER RESOURCES GROUP**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMIE CORFIELD	Contact	: Customer Services
Address	: PO BOX 3216 YERONGA 4104	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: jamie.corfield@alsglobal.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3859 7800	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3859 7820	Facsimile	: +61 7 3243 7218
Project	: CQ212941 Waratah Coal Project	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 12-APR-2012
Sampler	: Jamie Corfield	Issue Date	: 24-APR-2012
Order number	: ----		
		No. of samples received	: 11
Quote number	: BN/245/12	No. of samples analysed	: 11

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Jonathon Angell	Inorganic Coordinator	Brisbane Inorganics
Matt Frost	Senior Organic Chemist	Brisbane Organics
Stephen Hislop	Senior Inorganic Chemist	Brisbane Inorganics
Stephen Hislop	Senior Inorganic Chemist	WB Water Lab Brisbane

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA010P: Conductivity by PC Titrator (QC Lot: 2260693)									
EB1209803-001	LC-3	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	153	153	0.0	0% - 20%
EB1209890-001	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	438	440	0.4	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 2259627)									
EB1209654-001	Anonymous	EA015H: Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	375	372	0.8	0% - 20%
EB1209803-002	SPC-DAM	EA015H: Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	122	128	4.8	0% - 50%
EA025: Suspended Solids (QC Lot: 2258421)									
EB1209796-005	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EB1209803-006	SITE 04	EA025H: Suspended Solids (SS)	----	5	mg/L	10	11	9.5	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 2260692)									
EB1209803-001	LC-3	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	70	67	4.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	70	67	4.0	0% - 20%
EB1209890-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.0	No Limit
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2255844)									
EB1209242-060	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	30	30	0.0	0% - 20%
EB1209796-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	483	501	3.6	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2255849)									
EB1209796-003	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1	1	0.0	No Limit
EB1209812-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.0	No Limit
ED045G: Chloride Discrete analyser (QC Lot: 2255845)									
EB1209796-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	3960	3970	0.2	0% - 20%
EB1209796-003	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	7	7	0.0	No Limit
ED045G: Chloride Discrete analyser (QC Lot: 2255850)									
EB1209812-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	31	31	0.0	0% - 20%
EB1209819-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	84	84	0.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 2255842)									
EB1209242-060	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	135	136	0.8	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	11	11	0.0	0% - 50%
		ED093F: Sodium	7440-23-5	1	mg/L	1010	1010	0.6	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	10	10	0.0	0% - 50%

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Work Order : EB1209803
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED093F: Dissolved Major Cations (QC Lot: 2255842) - continued									
EB1209796-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	86	86	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	273	273	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	2200	2190	0.7	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	102	102	0.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 2255848)									
EB1209796-003	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	<1	<1	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	<1	<1	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	5	6	0.0	No Limit
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.0	No Limit
EB1209812-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	17	18	0.0	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	10	10	0.0	0% - 50%
		ED093F: Sodium	7440-23-5	1	mg/L	28	30	4.6	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	3	4	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2256955)									
EB1209803-002	SPC-DAM	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.07	0.08	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.58	0.59	0.0	0% - 50%
EB1209865-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.646	0.626	3.1	0% - 20%
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	0.002	0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.006	26.7	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2256955) - continued									
EB1209865-001	Anonymous	EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.09	0.08	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2256956)									
EB1209803-002	SPC-DAM	EG020B-F: Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
EB1209865-001	Anonymous	EG020B-F: Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 2257717)									
EB1209590-002	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.012	0.013	8.3	0% - 50%
		EG020A-T: Cobalt	7440-48-4	0.001	mg/L	0.062	0.064	3.3	0% - 20%
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	8.16	8.37	2.5	0% - 20%
		EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.626	0.644	2.9	0% - 20%
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.023	0.024	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.01	0.01	0.0	No Limit
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.01	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EB1209803-007	LC-1	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Cobalt	7440-48-4	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.230	0.262	13.0	0% - 20%
		EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.18	0.21	12.9	0% - 20%
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	1.23	1.36	10.0	0% - 20%
EG020T: Total Metals by ICP-MS (QC Lot: 2257718)									
EB1209590-002	Anonymous	EG020B-T: Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit

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Work Order : EB1209803
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG020T: Total Metals by ICP-MS (QC Lot: 2257718) - continued									
EB1209803-007	LC-1	EG020B-T: Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 2256954)									
EB1209803-001	LC-3	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EB1209865-002	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2264772)									
EB1208795-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EB1209803-011	FB-1	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 2258125)									
EB1209794-002	Anonymous	EG094A-F: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EB1209803-009	MC-NEW	EG094A-F: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EG094T: Total metals in Fresh water by ORC-ICPMS (QC Lot: 2258128)									
EB1209604-001	Anonymous	EG094A-T: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EB1209794-002	Anonymous	EG094A-T: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 2260694)									
EB1209803-001	LC-3	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.1	<0.1	0.0	No Limit
EB1209890-001	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.3	0.3	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 2262984)									
EB1209800-005	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.11	0.10	10.3	0% - 50%
EB1209801-019	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.03	0.05	43.4	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 2255843)									
EB1209242-060	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EB1209796-001	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 2262983)									
EB1209800-005	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.45	0.49	8.3	0% - 20%
EB1209801-019	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.03	0.03	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 2259824)									
EB1208910-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.5	0.4	0.0	No Limit
EB1209803-002	SPC-DAM	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.1	1.0	9.3	0% - 50%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 2259825)									
EB1208910-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.05	0.04	33.0	No Limit
EB1209832-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	51.2	50.0	2.5	0% - 20%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 2255847)									
EB1209796-001	Anonymous	EK071G: Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EB1209796-003	Anonymous	EK071G: Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP008: Chlorophyll a & Pheophytin a (QC Lot: 2256252)									
EB1209795-001	Anonymous	EP008: Chlorophyll a	----	1	mg/m3	16	16	0.0	0% - 50%
EB1209803-009	MC-NEW	EP008: Chlorophyll a	----	1	mg/m3	7	7	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2260339)									

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Work Order : EB1209803
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2260339) - continued									
EB1209803-001	LC-3	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EB1209803-011	FB-1	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QC Lot: 2260339)									
EB1209803-001	LC-3	EP080: C6 - C10 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
		EP080: C6 - C10 Fraction minus BTEX (F1)	----	20	µg/L	<20	<20	0.0	No Limit
EB1209803-011	FB-1	EP080: C6 - C10 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
		EP080: C6 - C10 Fraction minus BTEX (F1)	----	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 2260339)									
EB1209803-001	LC-3	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Sum of BTEX	----	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Total Xylenes	1330-20-7	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EB1209803-011	FB-1	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Sum of BTEX	----	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Total Xylenes	1330-20-7	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EA010P: Conductivity by PC Titrator (QCLot: 2260693)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	4000 µS/cm	101	93	107
EA015: Total Dissolved Solids (QCLot: 2259627)								
EA015H: Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	<10	2000 mg/L	84.0	80	120
EA025: Suspended Solids (QCLot: 2258421)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	101	82	120
ED037P: Alkalinity by PC Titrator (QCLot: 2260692)								
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	----	200 mg/L	98.9	88	112
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2255844)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	105	70	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2255849)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	107	70	130
ED045G: Chloride Discrete analyser (QCLot: 2255845)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	1000 mg/L	98.3	70	128
ED045G: Chloride Discrete analyser (QCLot: 2255850)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	1000 mg/L	99.9	70	128
ED093F: Dissolved Major Cations (QCLot: 2255842)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	----	----	----	----
ED093F: Magnesium	7439-95-4	1	mg/L	<1	----	----	----	----
ED093F: Sodium	7440-23-5	1	mg/L	<1	----	----	----	----
ED093F: Potassium	7440-09-7	1	mg/L	<1	----	----	----	----
ED093F: Dissolved Major Cations (QCLot: 2255848)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	----	----	----	----
ED093F: Magnesium	7439-95-4	1	mg/L	<1	----	----	----	----
ED093F: Sodium	7440-23-5	1	mg/L	<1	----	----	----	----
ED093F: Potassium	7440-09-7	1	mg/L	<1	----	----	----	----
EG020F: Dissolved Metals by ICP-MS (QCLot: 2256955)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.500 mg/L	91.5	83	125
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	97.1	86	124
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.100 mg/L	95.5	89	117
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	104	89	127
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.100 mg/L	97.2	88	116
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.200 mg/L	101	86	115
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.100 mg/L	101	91	111

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EG020F: Dissolved Metals by ICP-MS (QCLot: 2256955) - continued								
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.100 mg/L	98.5	85	118
EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.100 mg/L	100	91	113
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	100	88	115
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.100 mg/L	99.1	86	122
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.100 mg/L	88.8	81	113
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.200 mg/L	100	86	120
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.50 mg/L	107	70	129
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.50 mg/L	104	84	124
EG020F: Dissolved Metals by ICP-MS (QCLot: 2256956)								
EG020B-F: Uranium	7440-61-1	0.001	mg/L	<0.001	----	----	----	----
EG020T: Total Metals by ICP-MS (QCLot: 2257717)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.500 mg/L	95.2	70	120
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	93.7	78	120
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.100 mg/L	93.9	84	114
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	102	86	121
EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.100 mg/L	101	86	120
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.200 mg/L	98.3	70	119
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.100 mg/L	92.9	70	117
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.100 mg/L	115	87	123
EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.100 mg/L	94.4	70	114
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	98.8	86	119
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.100 mg/L	93.7	70	112
EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.100 mg/L	86.8	76	120
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.200 mg/L	93.5	81	123
EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	0.500 mg/L	102	76	129
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.500 mg/L	115	70	130
EG020T: Total Metals by ICP-MS (QCLot: 2257718)								
EG020B-T: Uranium	7440-61-1	0.001	mg/L	<0.001	----	----	----	----
EG035F: Dissolved Mercury by FIMS (QCLot: 2256954)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	97.6	84	116
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2264772)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.0100 mg/L	105	80	116
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2258125)								
EG094A-F: Silver	7440-22-4	0.1	µg/L	<0.1	10 µg/L	106	80	120
EG094T: Total metals in Fresh water by ORC-ICPMS (QCLot: 2258128)								
EG094A-T: Silver	7440-22-4	0.1	µg/L	<0.1	10 µg/L	107	80	120
EK040P: Fluoride by PC Titrator (QCLot: 2260694)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	10 mg/L	97.7	85	115

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2262984)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	83.0	70	120
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2255843)								
EK057G: Nitrite as N	----	0.01	mg/L	<0.01	0.5 mg/L	102	78	128
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2262983)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	77.8	70	124
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2259824)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10.0 mg/L	75.7	70	115
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2259825)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.2 mg/L	101	76	117
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 2255847)								
EK071G: Reactive Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	108	81	121
EP008: Chlorophyll a & Pheophytin a (QCLot: 2256252)								
EP008: Chlorophyll a	----	5	mg/m3	<5	2000 mg/m3	86.9	70.7	118
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 2255376)								
EP066: Total Polychlorinated biphenyls	----	1	µg/L	<1	10 µg/L	99.3	57	125
EP068A: Organochlorine Pesticides (OC) (QCLot: 2255375)								
EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	5 µg/L	85.9	55	127
EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	5 µg/L	69.8	51	126
EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	5 µg/L	88.6	53	131
EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	5 µg/L	85.3	49	131
EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	5 µg/L	95.2	43	128
EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	5 µg/L	88.5	57	131
EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	5 µg/L	98.8	57	124
EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	5 µg/L	100	53.4	120
EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	5 µg/L	91.4	53	133
EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	5 µg/L	101	52.4	120
EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	5 µg/L	92.8	51	128
EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	5 µg/L	90.7	54.8	125
EP068: Endrin	72-20-8	0.5	µg/L	<0.5	5 µg/L	117	49.1	135
EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	5 µg/L	91.6	54	123
EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	5 µg/L	83.5	54.3	129
EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	5 µg/L	# 133	54.3	127
EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	5 µg/L	98.1	47	136
EP068: 4.4`-DDT	50-29-3	2.0	µg/L	<2	5 µg/L	# 131	40	130
EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	5 µg/L	96.9	43	138
EP068: Methoxychlor	72-43-5	2.0	µg/L	<2	5 µg/L	121	16.1	130
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2255375)								

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2255375) - continued								
EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	5 µg/L	97.4	53.6	128
EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	5 µg/L	88.7	49.2	135
EP068: Monocrotophos	6923-22-4	2.0	µg/L	<2	5 µg/L	17.1	16.4	100
EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	5 µg/L	82.0	51.3	129
EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	5 µg/L	91.0	49	133
EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	5 µg/L	94.1	54.6	123
EP068: Parathion-methyl	298-00-0	2.0	µg/L	<2	5 µg/L	100	47	130
EP068: Malathion	121-75-5	0.5	µg/L	<0.5	5 µg/L	96.8	51	129
EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	5 µg/L	97.9	51	120
EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	5 µg/L	91.4	57.6	126
EP068: Parathion	56-38-2	2.0	µg/L	<2	5 µg/L	109	48	126
EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	5 µg/L	99.4	54.7	122
EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	5 µg/L	98.7	54.8	120
EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	5 µg/L	95.0	48.3	126
EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	5 µg/L	99.2	53.7	121
EP068: Ethion	563-12-2	0.5	µg/L	<0.5	5 µg/L	102	54.6	130
EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	5 µg/L	110	53.4	128
EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	5 µg/L	52.9	34	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2255378)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	10 µg/L	71.4	46	115
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	10 µg/L	73.5	51	122
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	10 µg/L	74.5	50	118
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	10 µg/L	72.0	55	121
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	10 µg/L	73.1	54	110
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	10 µg/L	76.4	49	118
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	10 µg/L	76.4	51	117
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	10 µg/L	77.8	51	117
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	10 µg/L	80.0	53	120
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	10 µg/L	82.5	48	114
EP075(SIM): Benzo(b)fluoranthene	205-99-2	1	µg/L	<1.0	10 µg/L	82.8	48	133
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	10 µg/L	87.5	43	127
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	10 µg/L	84.3	44	120
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	10 µg/L	83.6	45	132
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	10 µg/L	85.5	47	135
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	10 µg/L	82.2	42	131
EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	1	µg/L	<1.0	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2255377)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	1275 µg/L	83.2	49	125.5
EP071: C15 - C28 Fraction	----	100	µg/L	<100	1850 µg/L	97.1	58	131

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2255377) - continued								
EP071: C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2260339)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	160 µg/L	104	69	135
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2255377)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	1670 µg/L	89.0	49	125.5
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	1285 µg/L	92.2	58	131
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2260339)								
EP080: C6 - C10 Fraction	----	20	µg/L	<20	185 µg/L	103	64	136
EP080: C6 - C10 Fraction minus BTEX (F1)	----	20	µg/L	<20	----	----	----	----
EP080: BTEXN (QCLot: 2260339)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	100	76	124
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	103	71	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	103	73	125
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	20 µg/L	105	70.4	129
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	104	72	124
EP080: Total Xylenes	1330-20-7	2	µg/L	<2	----	----	----	----
EP080: Sum of BTEX	----	1	µg/L	<1	----	----	----	----
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	110	77	119

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
ED045G: Chloride Discrete analyser (QCLot: 2255845)							
EB1209796-002	Anonymous	ED045G: Chloride	16887-00-6	400 mg/L	73.8	70	130
ED045G: Chloride Discrete analyser (QCLot: 2255850)							
EB1209803-005	PC-DAM	ED045G: Chloride	16887-00-6	400 mg/L	83.5	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 2256955)							
EB1209803-004	BC-5	EG020A-F: Aluminium	7429-90-5	0.500 mg/L	129	70	130
		EG020A-F: Arsenic	7440-38-2	0.100 mg/L	95.6	70	130
		EG020A-F: Cadmium	7440-43-9	0.100 mg/L	111	70	130
		EG020A-F: Chromium	7440-47-3	0.100 mg/L	114	70	130
		EG020A-F: Cobalt	7440-48-4	0.100 mg/L	109	70	130
		EG020A-F: Copper	7440-50-8	0.200 mg/L	114	70	130
		EG020A-F: Lead	7439-92-1	0.100 mg/L	87.5	70	130
		EG020A-F: Manganese	7439-96-5	0.100 mg/L	110	70	130
		EG020A-F: Molybdenum	7439-98-7	0.100 mg/L	76.0	70	130
		EG020A-F: Nickel	7440-02-0	0.100 mg/L	113	70	130
		EG020A-F: Selenium	7782-49-2	0.100 mg/L	91.8	70	130
		EG020A-F: Vanadium	7440-62-2	0.100 mg/L	113	70	130
		EG020A-F: Zinc	7440-66-6	0.200 mg/L	96.3	70	130
		EG020A-F: Boron	7440-42-8	0.500 mg/L	107	70	130
EG020T: Total Metals by ICP-MS (QCLot: 2257717)							
EB1209770-001	Anonymous	EG020A-T: Arsenic	7440-38-2	1.000 mg/L	104	70	130
		EG020A-T: Cadmium	7440-43-9	0.500 mg/L	98.5	70	130
		EG020A-T: Chromium	7440-47-3	1.000 mg/L	94.8	70	130
		EG020A-T: Cobalt	7440-48-4	1.000 mg/L	103	70	130
		EG020A-T: Copper	7440-50-8	1.000 mg/L	98.3	70	130
		EG020A-T: Lead	7439-92-1	1.000 mg/L	93.2	70	130
		EG020A-T: Manganese	7439-96-5	1.000 mg/L	103	70	130
		EG020A-T: Nickel	7440-02-0	1.000 mg/L	101	70	130
		EG020A-T: Vanadium	7440-62-2	1.000 mg/L	94.8	70	130
		EG020A-T: Zinc	7440-66-6	1.000 mg/L	100	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 2256954)							
EB1209803-003	TC-DAM	EG035F: Mercury	7439-97-6	0.010 mg/L	91.1	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2264772)							
EB1209803-001	LC-3	EG035T: Mercury	7439-97-6	0.010 mg/L	78.2	70	130
EK040P: Fluoride by PC Titrator (QCLot: 2260694)							

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Work Order : EB1209803
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EK040P: Fluoride by PC Titrator (QCLot: 2260694) - continued							
EB1209803-001	LC-3	EK040P: Fluoride	16984-48-8	6.1 mg/L	97.4	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2262984)							
EB1209800-006	Anonymous	EK055G: Ammonia as N	7664-41-7	0.4 mg/L	92.7	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2255843)							
EB1209796-002	Anonymous	EK057G: Nitrite as N	----	0.4 mg/L	99.0	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2262983)							
EB1209800-006	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.2 mg/L	122	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2259824)							
EB1209803-001	LC-3	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	91.0	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2259825)							
EB1209803-001	LC-3	EK067G: Total Phosphorus as P	----	1.0 mg/L	103	70	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 2255847)							
EB1209796-002	Anonymous	EK071G: Reactive Phosphorus as P	----	0.4 mg/L	126	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2260339)							
EB1209803-002	SPC-DAM	EP080: C6 - C9 Fraction	----	40 µg/L	108	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2260339)							
EB1209803-002	SPC-DAM	EP080: C6 - C10 Fraction	----	40 µg/L	114	70	130
EP080: BTEXN (QCLot: 2260339)							
EB1209803-002	SPC-DAM	EP080: Benzene	71-43-2	10 µg/L	106	70	130
		EP080: Toluene	108-88-3	10 µg/L	112	70	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*MSD*	*Low*	*High*	*Value*	*Control Limit*
ED045G: Chloride Discrete analyser (QCLot: 2255845)										
EB1209796-002	Anonymous	ED045G: Chloride	16887-00-6	400 mg/L	73.8	----	70	130	----	----
ED045G: Chloride Discrete analyser (QCLot: 2255850)										
EB1209803-005	PC-DAM	ED045G: Chloride	16887-00-6	400 mg/L	83.5	----	70	130	----	----
EG020F: Dissolved Metals by ICP-MS (QCLot: 2256955)										
EB1209803-004	BC-5	EG020A-F: Aluminium	7429-90-5	0.500 mg/L	129	----	70	130	----	----
		EG020A-F: Arsenic	7440-38-2	0.100 mg/L	95.6	----	70	130	----	----
		EG020A-F: Cadmium	7440-43-9	0.100 mg/L	111	----	70	130	----	----

Sub-Matrix: **WATER**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*MSD*	*Low*	*High*	*Value*	*Control Limit*
EG020F: Dissolved Metals by ICP-MS (QCLot: 2256955) - continued										
EB1209803-004	BC-5	EG020A-F: Chromium	7440-47-3	0.100 mg/L	114	----	70	130	----	----
		EG020A-F: Cobalt	7440-48-4	0.100 mg/L	109	----	70	130	----	----
		EG020A-F: Copper	7440-50-8	0.200 mg/L	114	----	70	130	----	----
		EG020A-F: Lead	7439-92-1	0.100 mg/L	87.5	----	70	130	----	----
		EG020A-F: Manganese	7439-96-5	0.100 mg/L	110	----	70	130	----	----
		EG020A-F: Molybdenum	7439-98-7	0.100 mg/L	76.0	----	70	130	----	----
		EG020A-F: Nickel	7440-02-0	0.100 mg/L	113	----	70	130	----	----
		EG020A-F: Selenium	7782-49-2	0.100 mg/L	91.8	----	70	130	----	----
		EG020A-F: Vanadium	7440-62-2	0.100 mg/L	113	----	70	130	----	----
		EG020A-F: Zinc	7440-66-6	0.200 mg/L	96.3	----	70	130	----	----
		EG020A-F: Boron	7440-42-8	0.500 mg/L	107	----	70	130	----	----
EG020T: Total Metals by ICP-MS (QCLot: 2257717)										
EB1209770-001	Anonymous	EG020A-T: Arsenic	7440-38-2	1.000 mg/L	104	----	70	130	----	----
		EG020A-T: Cadmium	7440-43-9	0.500 mg/L	98.5	----	70	130	----	----
		EG020A-T: Chromium	7440-47-3	1.000 mg/L	94.8	----	70	130	----	----
		EG020A-T: Cobalt	7440-48-4	1.000 mg/L	103	----	70	130	----	----
		EG020A-T: Copper	7440-50-8	1.000 mg/L	98.3	----	70	130	----	----
		EG020A-T: Lead	7439-92-1	1.000 mg/L	93.2	----	70	130	----	----
		EG020A-T: Manganese	7439-96-5	1.000 mg/L	103	----	70	130	----	----
		EG020A-T: Nickel	7440-02-0	1.000 mg/L	101	----	70	130	----	----
		EG020A-T: Vanadium	7440-62-2	1.000 mg/L	94.8	----	70	130	----	----
		EG020A-T: Zinc	7440-66-6	1.000 mg/L	100	----	70	130	----	----
EG035F: Dissolved Mercury by FIMS (QCLot: 2256954)										
EB1209803-003	TC-DAM	EG035F: Mercury	7439-97-6	0.010 mg/L	91.1	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2264772)										
EB1209803-001	LC-3	EG035T: Mercury	7439-97-6	0.010 mg/L	78.2	----	70	130	----	----
EK040P: Fluoride by PC Titrator (QCLot: 2260694)										
EB1209803-001	LC-3	EK040P: Fluoride	16984-48-8	6.1 mg/L	97.4	----	70	130	----	----
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2262984)										
EB1209800-006	Anonymous	EK055G: Ammonia as N	7664-41-7	0.4 mg/L	92.7	----	70	130	----	----
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2255843)										
EB1209796-002	Anonymous	EK057G: Nitrite as N	----	0.4 mg/L	99.0	----	70	130	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2262983)										
EB1209800-006	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.2 mg/L	122	----	70	130	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2259824)										
EB1209803-001	LC-3	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	91.0	----	70	130	----	----
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2259825)										

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Work Order : EB1209803
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Sub-Matrix: **WATER**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*MSD*	*Low*	*High*	*Value*	*Control Limit*
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2259825) - continued										
EB1209803-001	LC-3	EK067G: Total Phosphorus as P	----	1.0 mg/L	103	----	70	130	----	----
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 2255847)										
EB1209796-002	Anonymous	EK071G: Reactive Phosphorus as P	----	0.4 mg/L	126	----	70	130	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2260339)										
EB1209803-002	SPC-DAM	EP080: C6 - C9 Fraction	----	40 µg/L	108	----	70	130	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2260339)										
EB1209803-002	SPC-DAM	EP080: C6 - C10 Fraction	----	40 µg/L	114	----	70	130	----	----
EP080: BTEXN (QCLot: 2260339)										
EB1209803-002	SPC-DAM	EP080: Benzene	71-43-2	10 µg/L	106	----	70	130	----	----
		EP080: Toluene	108-88-3	10 µg/L	112	----	70	130	----	----

ALS Group
Environmental Division

CERTIFICATE OF ANALYSIS

Work Order : **EB1209803**
Client : **ALS WATER RESOURCES GROUP**
Contact : MR JAMIE CORFIELD
Address : PO BOX 3216
YERONGA 4104
E-mail : jamie.corfield@alsglobal.com
Telephone : +61 07 3859 7800
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Project : CQ212941 Waratah Coal Project
Order number : ----
C-O-C number : ----
Sampler : Jamie Corfield
Site : ----

Quote number : BN/245/12

Page : 1 of 19
Laboratory : Environmental Division Brisbane
Contact : Customer Services
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QC Level : NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Date Samples Received : 12-APR-2012
Issue Date : 24-APR-2012

No. of samples received : 11
No. of samples analysed : 11

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Jonathon Angell	Inorganic Coordinator	Brisbane Inorganics
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Work Order	: EB1209803
Client	: ALS WATER RESOURCES GROUP
Project	: CQ212941 Waratah Coal Project

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **No acidified filtered (ORC bottle) samples were supplied for EG094A-F therefore natural unacidified sample was filtered and then acidified overnight.**
- **TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.**
- **The LOR for sample Trip Blanks has been raised due to high levels of DCM present.**

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Work Order : EB1209803
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analytical Results

Sub-Matrix: **WATER**

			Client sample ID	LC-3	SPC-DAM	TC-DAM	BC-5	PC-DAM
			Client sampling date / time	10-APR-2012 16:35	10-APR-2012 17:55	10-APR-2012 15:15	10-APR-2012 14:25	10-APR-2012 18:55
Compound	CAS Number	LOR	Unit	EB1209803-001	EB1209803-002	EB1209803-003	EB1209803-004	EB1209803-005
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	153	148	135	166	86
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	169	122	257	1380	329
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	30	15	37	312	199
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	70	71	58	72	38
Total Alkalinity as CaCO3	----	1	mg/L	70	71	58	72	38
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	<1	<1	<1
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	7	9	6	8	5
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	11	8	7	7	4
Magnesium	7439-95-4	1	mg/L	5	6	3	4	2
Sodium	7440-23-5	1	mg/L	8	8	8	12	4
Potassium	7440-09-7	1	mg/L	9	10	13	11	9
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.44	0.07	1.09	1.03	5.76
Arsenic	7440-38-2	0.001	mg/L	0.001	0.002	0.001	<0.001	0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.004
Copper	7440-50-8	0.001	mg/L	0.001	<0.001	0.002	0.003	0.003
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.001
Nickel	7440-02-0	0.001	mg/L	0.002	0.001	0.001	0.002	0.004
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.002
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Manganese	7439-96-5	0.001	mg/L	0.004	0.002	0.004	0.001	0.013
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	0.06	<0.05
Iron	7439-89-6	0.05	mg/L	0.73	0.58	1.00	0.45	2.93

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Work Order : EB1209803
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**LC-3**	**SPC-DAM**	**TC-DAM**	**BC-5**	**PC-DAM**
			Client sampling date / time	10-APR-2012 16:35	10-APR-2012 17:55	10-APR-2012 15:15	10-APR-2012 14:25	10-APR-2012 18:55
Compound	*CAS Number*	*LOR*	*Unit*	**EB1209803-001**	**EB1209803-002**	**EB1209803-003**	**EB1209803-004**	**EB1209803-005**
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.71**	**0.08**	**1.60**	**2.19**	**5.51**
Arsenic	7440-38-2	0.001	mg/L	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	**0.002**	**0.002**
Copper	7440-50-8	0.001	mg/L	**0.002**	<0.001	**0.002**	**0.011**	**0.004**
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	**0.001**	**0.010**	**0.004**
Nickel	7440-02-0	0.001	mg/L	**0.002**	**0.002**	**0.002**	**0.004**	**0.004**
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	**0.003**	**0.011**	**0.004**
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	**0.009**	**0.006**
Manganese	7439-96-5	0.001	mg/L	**0.104**	**0.295**	**0.198**	**0.403**	**0.129**
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	**0.02**	<0.01
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Iron	7439-89-6	0.05	mg/L	**1.89**	**1.38**	**2.68**	**5.63**	**4.71**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
EG094T: Total metals in Fresh water by ORC-ICPMS								
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.1**	**0.3**	<0.1	<0.1	<0.1
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.05**	**0.07**	**0.07**	**1.20**	**0.17**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.02**	**0.02**	**0.02**	**0.02**	**0.03**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.02**	**0.02**	**0.02**	**0.02**	**0.03**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								

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Work Order : EB1209803
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analytical Results

Sub-Matrix: WATER			Client sample ID	LC-3	SPC-DAM	TC-DAM	BC-5	PC-DAM
			Client sampling date / time	10-APR-2012 16:35	10-APR-2012 17:55	10-APR-2012 15:15	10-APR-2012 14:25	10-APR-2012 18:55
Compound	*CAS Number*	*LOR*	*Unit*	**EB1209803-001**	**EB1209803-002**	**EB1209803-003**	**EB1209803-004**	**EB1209803-005**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser - Continued								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.8**	**1.1**	**1.5**	**5.3**	**1.7**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**0.8**	**1.1**	**1.5**	**5.3**	**1.7**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.08**	**0.12**	**0.21**	**0.71**	**0.19**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**1.60**	**1.67**	**1.33**	**1.66**	**0.90**
Total Cations	----	0.01	meq/L	**1.54**	**1.50**	**1.28**	**1.48**	**0.77**
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m³	**2**	**2**	**2**	**8**	**4**
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	1	µg/L	<1	<1	<1	<1	<1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDT	50-29-3	2	µg/L	<2	<2	<2	<2	<2
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Methoxychlor	72-43-5	2	µg/L	<2	<2	<2	<2	<2
EP068B: Organophosphorus Pesticides (OP)								

Analytical Results

Sub-Matrix: **WATER**

			Client sample ID	**LC-3**	**SPC-DAM**	**TC-DAM**	**BC-5**	**PC-DAM**
			Client sampling date / time	10-APR-2012 16:35	10-APR-2012 17:55	10-APR-2012 15:15	10-APR-2012 14:25	10-APR-2012 18:55
Compound	CAS Number	LOR	Unit	**EB1209803-001**	**EB1209803-002**	**EB1209803-003**	**EB1209803-004**	**EB1209803-005**
EP068B: Organophosphorus Pesticides (OP) - Continued								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Monocrotophos	6923-22-4	2	µg/L	<2	<2	<2	<2	<2
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	298-00-0	2	µg/L	<2	<2	<2	<2	<2
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	56-38-2	2	µg/L	<2	<2	<2	<2	<2
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5

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Work Order : EB1209803
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analytical Results

Sub-Matrix: WATER			Client sample ID	LC-3	SPC-DAM	TC-DAM	BC-5	PC-DAM
			Client sampling date / time	10-APR-2012 16:35	10-APR-2012 17:55	10-APR-2012 15:15	10-APR-2012 14:25	10-APR-2012 18:55
Compound	*CAS Number*	*LOR*	*Unit*	**EB1209803-001**	**EB1209803-002**	**EB1209803-003**	**EB1209803-004**	**EB1209803-005**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	**230**	<100	**180**
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	**230**	<50	**180**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft								
C6 - C10 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	----	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	**100**	**240**	<100	**200**
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	**100**	**240**	<100	**200**
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L	<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**133**	**119**	**119**	**108**	**122**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**135**	**129**	**115**	**112**	**127**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	**129**	**116**	**107**	**104**	**110**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**22.8**	**25.1**	**30.0**	**29.9**	**36.6**
2-Chlorophenol-D4	93951-73-6	0.1	%	**56.5**	**70.8**	**73.0**	**72.5**	**86.4**
2.4.6-Tribromophenol	118-79-6	0.1	%	**48.1**	**91.6**	**92.4**	**85.8**	**88.6**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**65.2**	**89.2**	**80.4**	**80.7**	**85.9**
Anthracene-d10	1719-06-8	0.1	%	**69.5**	**100**	**96.4**	**87.6**	**93.4**
4-Terphenyl-d14	1718-51-0	0.1	%	**76.6**	**101**	**94.0**	**89.1**	**95.4**
EP080S: TPH(V)/BTEX Surrogates								

Analytical Results

Sub-Matrix: **WATER**

			Client sample ID	**LC-3**	**SPC-DAM**	**TC-DAM**	**BC-5**	**PC-DAM**
			Client sampling date / time	10-APR-2012 16:35	10-APR-2012 17:55	10-APR-2012 15:15	10-APR-2012 14:25	10-APR-2012 18:55
Compound	*CAS Number*	*LOR*	*Unit*	**EB1209803-001**	**EB1209803-002**	**EB1209803-003**	**EB1209803-004**	**EB1209803-005**
EP080S: TPH(V)/BTEX Surrogates - Continued								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**96.3**	**93.1**	**103**	**101**	**111**
Toluene-D8	2037-26-5	0.1	%	**91.8**	**92.2**	**105**	**99.4**	**111**
4-Bromofluorobenzene	460-00-4	0.1	%	**94.8**	**88.1**	**99.7**	**96.2**	**106**

Analytical Results

Sub-Matrix: **WATER**

			Client sample ID	**SITE 04**	**LC-1**	**AQ-13**	**MC-NEW**	**Trip Blanks**
			Client sampling date / time	10-APR-2012 16:00	10-APR-2012 16:15	10-APR-2012 17:00	10-APR-2012 17:15	11-APR-2012 08:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1209803-006**	**EB1209803-007**	**EB1209803-008**	**EB1209803-009**	**EB1209803-010**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**102**	**172**	**158**	**244**	----
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	**157**	**164**	**148**	**625**	----
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	**10**	**14**	**10**	**378**	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**42**	**77**	**72**	**102**	----
Total Alkalinity as CaCO3	----	1	mg/L	**42**	**77**	**72**	**102**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	<1	<1	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	**6**	**8**	**7**	**12**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**5**	**13**	**11**	**12**	----
Magnesium	7439-95-4	1	mg/L	**2**	**6**	**5**	**7**	----
Sodium	7440-23-5	1	mg/L	**8**	**8**	**7**	**17**	----
Potassium	7440-09-7	1	mg/L	**8**	**10**	**8**	**13**	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.20**	**0.14**	**0.25**	**0.22**	----
Arsenic	7440-38-2	0.001	mg/L	**0.002**	**0.001**	<0.001	**0.001**	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	<0.001	**0.001**	**0.001**	**0.002**	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.002**	**0.001**	**0.001**	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Manganese	7439-96-5	0.001	mg/L	**0.005**	**0.004**	**0.002**	**0.002**	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	----
Iron	7439-89-6	0.05	mg/L	**0.54**	**0.50**	**0.36**	**0.17**	----

Analytical Results

Sub-Matrix: **WATER**

			Client sample ID	**SITE 04**	**LC-1**	**AQ-13**	**MC-NEW**	**Trip Blanks**
			Client sampling date / time	10-APR-2012 16:00	10-APR-2012 16:15	10-APR-2012 17:00	10-APR-2012 17:15	11-APR-2012 08:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1209803-006**	**EB1209803-007**	**EB1209803-008**	**EB1209803-009**	**EB1209803-010**
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.19**	**0.18**	**0.38**	**3.56**	----
Arsenic	7440-38-2	0.001	mg/L	**0.002**	**0.002**	**0.001**	**0.002**	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	**0.004**	----
Copper	7440-50-8	0.001	mg/L	<0.001	**0.001**	**0.001**	**0.006**	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	**0.001**	<0.001	**0.005**	----
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.002**	**0.002**	**0.004**	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	**0.008**	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	**0.010**	----
Manganese	7439-96-5	0.001	mg/L	**0.085**	**0.230**	**0.114**	**0.342**	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	**0.02**	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	----
Iron	7439-89-6	0.05	mg/L	**1.04**	**1.23**	**1.28**	**5.79**	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	----
EG094T: Total metals in Fresh water by ORC-ICPMS								
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	<0.1	**0.1**	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.03**	**0.02**	**0.03**	**0.14**	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.01**	**0.01**	**0.01**	**0.04**	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.01**	**0.01**	**0.01**	**0.04**	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								

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Work Order : EB1209803
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analytical Results

Sub-Matrix: **WATER**			Client sample ID	SITE 04	LC-1	AQ-13	MC-NEW	Trip Blanks
			Client sampling date / time	10-APR-2012 16:00	10-APR-2012 16:15	10-APR-2012 17:00	10-APR-2012 17:15	11-APR-2012 08:00
Compound	*CAS Number*	*LOR*	*Unit*	EB1209803-006	EB1209803-007	EB1209803-008	EB1209803-009	EB1209803-010
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser - Continued								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**1.2**	**0.9**	**0.6**	**3.1**	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**1.2**	**0.9**	**0.6**	**3.1**	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.15**	**0.08**	**0.03**	**0.51**	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	----	0.01	mg/L	**0.05**	<0.01	<0.01	<0.01	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**1.01**	**1.76**	**1.64**	**2.38**	----
Total Cations	----	0.01	meq/L	**0.97**	**1.75**	**1.47**	**2.25**	----
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m³	**1**	<1	**2**	**7**	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	1	µg/L	<1	<1	<1	<1	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
4.4`-DDT	50-29-3	2	µg/L	<2	<2	<2	<2	----
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Methoxychlor	72-43-5	2	µg/L	<2	<2	<2	<2	----
EP068B: Organophosphorus Pesticides (OP)								

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Work Order : EB1209803
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analytical Results

Sub-Matrix: **WATER**

			Client sample ID	SITE 04	LC-1	AQ-13	MC-NEW	Trip Blanks
			Client sampling date / time	10-APR-2012 16:00	10-APR-2012 16:15	10-APR-2012 17:00	10-APR-2012 17:15	11-APR-2012 08:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1209803-006**	**EB1209803-007**	**EB1209803-008**	**EB1209803-009**	**EB1209803-010**
EP068B: Organophosphorus Pesticides (OP) - Continued								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Monocrotophos	6923-22-4	2	µg/L	<2	<2	<2	<2	----
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Parathion-methyl	298-00-0	2	µg/L	<2	<2	<2	<2	----
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Parathion	56-38-2	2	µg/L	<2	<2	<2	<2	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----

Analytical Results

Sub-Matrix: **WATER**

			Client sample ID	**SITE 04**	**LC-1**	**AQ-13**	**MC-NEW**	**Trip Blanks**
			Client sampling date / time	10-APR-2012 16:00	10-APR-2012 16:15	10-APR-2012 17:00	10-APR-2012 17:15	11-APR-2012 08:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1209803-006**	**EB1209803-007**	**EB1209803-008**	**EB1209803-009**	**EB1209803-010**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<90
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft								
C6 - C10 Fraction	----	20	µg/L	<20	<20	<20	<20	<40
^ **C6 - C10 Fraction minus BTEX (F1)**	----	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	<100	<100	<100	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L	<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**127**	**121**	**125**	**102**	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**134**	**123**	**117**	**98.4**	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	**115**	**109**	**109**	**94.3**	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**27.1**	**28.3**	**31.6**	**27.3**	----
2-Chlorophenol-D4	93951-73-6	0.1	%	**68.1**	**71.1**	**76.1**	**67.3**	----
2.4.6-Tribromophenol	118-79-6	0.1	%	**90.4**	**95.2**	**94.7**	**77.5**	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**83.6**	**87.3**	**85.0**	**71.4**	----
Anthracene-d10	1719-06-8	0.1	%	**93.8**	**99.1**	**98.5**	**82.3**	----
4-Terphenyl-d14	1718-51-0	0.1	%	**94.0**	**98.7**	**99.3**	**86.8**	----
EP080S: TPH(V)/BTEX Surrogates								

Analytical Results

Sub-Matrix: **WATER**

			Client sample ID	**SITE 04**	**LC-1**	**AQ-13**	**MC-NEW**	**Trip Blanks**
			Client sampling date / time	10-APR-2012 16:00	10-APR-2012 16:15	10-APR-2012 17:00	10-APR-2012 17:15	11-APR-2012 08:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1209803-006**	**EB1209803-007**	**EB1209803-008**	**EB1209803-009**	**EB1209803-010**
EP080S: TPH(V)/BTEX Surrogates - Continued								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**102**	**101**	**94.1**	**111**	**78.3**
Toluene-D8	2037-26-5	0.1	%	**105**	**101**	**99.9**	**103**	**92.7**
4-Bromofluorobenzene	460-00-4	0.1	%	**97.5**	**97.1**	**94.5**	**101**	**101**

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**FB-1**	----	----	----	----
			Client sampling date / time	11-APR-2012 08:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB1209803-011**	**----**	**----**	**----**	**----**
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Uranium	7440-61-1	0.001	mg/L	<0.001	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EG094T: Total metals in Fresh water by ORC-ICPMS								
Silver	7440-22-4	0.1	µg/L	<0.1	----	----	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	1	µg/L	<1	----	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	----	----	----	----
gamma-BHC	58-89-9	0.5	µg/L	<0.5	----	----	----	----
delta-BHC	319-86-8	0.5	µg/L	<0.5	----	----	----	----
Heptachlor	76-44-8	0.5	µg/L	<0.5	----	----	----	----
Aldrin	309-00-2	0.5	µg/L	<0.5	----	----	----	----
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	----	----	----	----
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	----	----	----	----
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	----	----	----	----
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	----	----	----	----
Dieldrin	60-57-1	0.5	µg/L	<0.5	----	----	----	----
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	----	----	----	----
Endrin	72-20-8	0.5	µg/L	<0.5	----	----	----	----

Analytical Results

Sub-Matrix: **WATER**			Client sample ID	**FB-1**	----	----	----	----
			Client sampling date / time	11-APR-2012 08:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB1209803-011**	**----**	**----**	**----**	**----**
EP068A: Organochlorine Pesticides (OC) - Continued								
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	----	----	----	----
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	----	----	----	----
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	----	----	----	----
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	----	----	----	----
4.4`-DDT	50-29-3	2	µg/L	<2	----	----	----	----
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	----	----	----	----
Methoxychlor	72-43-5	2	µg/L	<2	----	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	----	----	----	----
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	----	----	----	----
Monocrotophos	6923-22-4	2	µg/L	<2	----	----	----	----
Dimethoate	60-51-5	0.5	µg/L	<0.5	----	----	----	----
Diazinon	333-41-5	0.5	µg/L	<0.5	----	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	----	----	----	----
Parathion-methyl	298-00-0	2	µg/L	<2	----	----	----	----
Malathion	121-75-5	0.5	µg/L	<0.5	----	----	----	----
Fenthion	55-38-9	0.5	µg/L	<0.5	----	----	----	----
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	----	----	----	----
Parathion	56-38-2	2	µg/L	<2	----	----	----	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	----	----	----	----
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	----	----	----	----
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	----	----	----	----
Prothiofos	34643-46-4	0.5	µg/L	<0.5	----	----	----	----
Ethion	563-12-2	0.5	µg/L	<0.5	----	----	----	----
Carbophenothion	786-19-6	0.5	µg/L	<0.5	----	----	----	----
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	----	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	----	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	----	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	----	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	----	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	----	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	----	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	----	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	----	----	----	----

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Work Order : EB1209803
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**FB-1**	----	----	----	----
			Client sampling date / time	11-APR-2012 08:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB1209803-011**	**----**	**----**	**----**	**----**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Chrysene	218-01-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	----	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	----	----	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L	<0.5	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft								
C6 - C10 Fraction	----	20	µg/L	<20	----	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	----	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ **Total Xylenes**	1330-20-7	2	µg/L	<2	----	----	----	----
^ **Sum of BTEX**	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**116**	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**115**	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	**108**	----	----	----	----

Page : 18 of 19
Work Order : EB1209803
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**FB-1**	----	----	----	----
			Client sampling date / time	11-APR-2012 08:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB1209803-011**	**----**	**----**	**----**	**----**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**31.3**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	**74.6**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	**94.4**	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**82.0**	----	----	----	----
Anthracene-d10	1719-06-8	0.1	%	**98.7**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	**96.8**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**104**	----	----	----	----
Toluene-D8	2037-26-5	0.1	%	**105**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	**99.7**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	37	138.2
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	40.4	134.4
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	41.8	143.3
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10.0	71.9
2-Chlorophenol-D4	93951-73-6	26.8	130.2
2.4.6-Tribromophenol	118-79-6	19.3	180.8
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	13.9	146.1
Anthracene-d10	1719-06-8	34.6	137.4
4-Terphenyl-d14	1718-51-0	36.2	154.2
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66.1	137.9
Toluene-D8	2037-26-5	79.2	119.6
4-Bromofluorobenzene	460-00-4	74.2	118.0

CHAIN OF CUSTC

ALS Laboratory: *please tick* →

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☐ **Launceston**: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	ALS Water Sciences Group
OFFICE:	Yeerongpilly Office (10/44 Station Rd)
PROJECT:	CQ212941 Waratah Coal Project
ORDER NUMBER:	N/A
PROJECT MANAGER:	Jamie Corfied
CONTACT PH:	07 3859 7800
SAMPLER:	Tara Steele
Mobile:	0423246913
COC emailed to ALS? (YES	No
EDD FORMAT (or default):	
Email Reports to (will default to PM if no other addresses are listed):	jamie.corfield@alsglobal.com
Email Invoice to (will default to PM if no other addresses are listed):	jamie.corfield@alsglobal.com

TURNAROUND REQUIREMENTS :
☑ Standard TAT
☐ Non Standard or urgent TAT **(List due date):**

ALS QUOTE NO.: BN/245/12

COC SEQUENCE NUMBER (Circle)
COC: [✓ 1] 2 3 4 7
OF: [✓ 1] 2 3 4 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Int. Yes No
Free ice / frozen ice bricks Yes No
Random Sample
Other comment

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
TARA STEELE	AChippesfield		Jodie
DATE/TIME: 26/9/12 13:15	DATE/TIME: 26/9/12 1320	DATE/TIME:	DATE/TIME: 27/9/12 08:40

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Attention: 1) Short holding times for Nutrients and TSS, 2) Metal samples need to be acidified on receipt, 3) CHECK QUOTE FOR EXACT PARAMETERS AND LOR'S

Environmental Division
Brisbane
Work Order JR
EB1225477

Telephone : + 61-7-3243 7222

	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).														Additional Information
	ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA010P Conductivity	EA015H Total Dissolved Solids (TDS)	EA025H Total Suspended Solids (TSS)	NT-1 Major Cations (Ca, Mg, Na, K)	NT-2A Major Anions Suite A: (Cl, SO4, F, Alkalinity)	EP008 Chlorophyll a	NT-8A [Ammonia as N, Nitrite, Nitrate, Total Nitrogen as N (incl. NOx & TKN), Total Phosphorus as P, Reactive Phosphorus]	W-16 8 Metals Dissolved (As, Cd, Cr, Cu, Ni, Pb, Zn), Hg, TPH/TRH(C6-C36/40)BTEXN, PAH(16 Analytes)-Standard level, OC/OP Pesticides-Standard level, PCB-Total-Standard Level.	EG020F Additional Dissolved Metals: (Al, B, Co, Fe, Mn, Mo, Se, U, V)	W-2T 8 Metals Total (incl digest) (As, Cd, Cr, Cu, Ni, Pb, Zn) Hg.	EG020T Additional Total Metals (Al, B, Co, Fe, Mn, Mo, Se, U, V)	EG094F Ultratrace ORC - Dissolved (Ag)	EG094T Ultra trace ORC - Total (Ag)	W - 18 TPH/TRH(C6-C10)BTEXN	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	NCC-1	25/9/12 18:20	W	1 x 1L P, 1 x 1000ml White P, 1 x 125ml SP, 2 x 60ml AP, 2 x 125ml AP, 2 x 40ml SG, 1 x 100ml AG	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
2	AC-2	25/9/12 17:40	W	" "	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
3	BC-DAM	25/9/12 13:20	W	" "	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
4	JC-1	25/9/12 14:45	W	" "	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
5	PC-DAM	25/9/12 16:05	W	" "	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
6	SITE04	26/9/12 08:20	W	" "	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
7	AQ14	26/9/12 9:10	W	" "	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
8	TC-1	26/9/12 10:20	W	" "	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
9	S4FB	26/9/12 08:20	W	1×1LP, 1×125ml SP, 2×60ml AP 2×125ml AP 2×40ml SG 1×100ml AG	10	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		
10	Trip Blanks	17/9/12	W	2 x 100ml AG	2														✓	
				TOTAL																

HT

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Environmental Division

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order	: **EB1225477**		
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: JAMIE CORFIELD	Contact	: Customer Services
Address	: PO BOX 3216 YERONGA BRISBANE 4104	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: Jamie.Corfield@ghd.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: 07 3859 7800	Telephone	: +61 7 3243 7222
Facsimile	: 07 3859 7820	Facsimile	: +61 7 3243 7218
Project	: CQ212941 Waratah Coal Project	Page	: 1 of 4
Order number	: ----		
C-O-C number	: ----	Quote number	: ES2012GHDSER0597 (EN/005/12)
Site	: ----		
Sampler	: Tara Steele	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 27-SEP-2012	Issue Date	: 27-SEP-2012 16:27
Client Requested Due Date	: 05-OCT-2012	Scheduled Reporting Date	: **05-OCT-2012**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 11.2, 8.9, 7.9°C - Ice present
No. of coolers/boxes	: 3 MEDIUM	No. of samples received	: 10
Security Seal	: Intact.	No. of samples analysed	: 10

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- Sample containers do not comply to pretreatment / preservation standards (AS, APHA, USEPA). Please refer to the Sample Container(s)/Preservation Non-Compliance Log at the end of this report for details.
- Samples submitted for dissolved metals analysis should be acidified with nitric acid, following field filtration. Additional charges of up to $5.00 will apply to each sample requiring filtration and preservation upon receipt by the laboratory.
- **Sample containers do not comply to pretreatment / preservation standards (AS, APHA, USEPA). Please refer to the Sample Container(s)/Preservation Non-Compliance Log at the end of this report for details.**
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- **Please be advised that 2 x100mL orange amber unpreserved bottles were received labelled as "S4FB" (ALS #9). However both were different in colour. An orange bottle was not received for sample "SITE04" (ALS #6), but one of the bottles from #9 matched that sample. Therefore it was assigned to that sample instead. If this is incorrect, please contact client services ASAP.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Matt Goodwin.
- Analytical work for this work order will be conducted at ALS Brisbane.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of work order.

Issue Date : 27-SEP-2012 16:27
Page : 2 of 4
Work Order : EB1225477
Client : GHD PTY LTD

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method *Client sample ID*	Sample Container Received	Preferred Sample Container for Analysis
EG020A-F : Dissolved Metals by ICP-MS - Suite A		
NCC-1	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
AC-2	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
BC-DAM	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
JC-1	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
PC-DAM	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
SITE 04	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
AQ14	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
TC-1	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
S4FB	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
EG020B-F : Dissolved Metals by ICP-MS - Suite B		
NCC-1	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
AC-2	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
BC-DAM	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
JC-1	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
PC-DAM	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
SITE 04	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
AQ14	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
TC-1	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
S4FB	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
EG035F : Dissolved Mercury by FIMS		
NCC-1	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
AC-2	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
BC-DAM	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
JC-1	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
PC-DAM	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
SITE 04	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
AQ14	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
TC-1	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
S4FB	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
EG094A-F : Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS		
NCC-1	- Clear Plastic Bottle - Natural	- Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered
AC-2	- Clear Plastic Bottle - Natural	- Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered
BC-DAM	- Clear Plastic Bottle - Natural	- Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered
JC-1	- Clear Plastic Bottle - Natural	- Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered
PC-DAM	- Clear Plastic Bottle - Natural	- Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered
SITE 04	- Clear Plastic Bottle - Natural	- Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered
AQ14	- Clear Plastic Bottle - Natural	- Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered
TC-1	- Clear Plastic Bottle - Natural	- Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered
S4FB	- Clear Plastic Bottle - Natural	- Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default to 15:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory for processing purposes and will be shown bracketed without a time component.

Issue Date : 27-SEP-2012 16:27
Page : 3 of 4
Work Order : EB1225477
Client : GHD PTY LTD

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EA010P Conductivity (PC)	WATER - EA015H Total Dissolved Solids - High Level	WATER - EA025H Suspended Solids (High Level)	WATER - EG020F Dissolved Metals by ICPMS	WATER - EG020T Total Recoverable Metals by ICPMS	WATER - EG094A-F Dissolved Metals in Fresh Water Suite A by ORC-ICPMS	WATER - EG094A-T Total Metals in Fresh water Suite A by ORC-ICPMS	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F)
EB1225477-001	25-SEP-2012 18:20	NCC-1	✓	✓	✓	✓	✓	✓	✓	✓
EB1225477-002	25-SEP-2012 17:40	AC-2	✓	✓	✓	✓	✓	✓	✓	✓
EB1225477-003	25-SEP-2012 13:20	BC-DAM	✓	✓	✓	✓	✓	✓	✓	✓
EB1225477-004	25-SEP-2012 14:45	JC-1	✓	✓	✓	✓	✓	✓	✓	✓
EB1225477-005	25-SEP-2012 16:05	PC-DAM	✓	✓	✓	✓	✓	✓	✓	✓
EB1225477-006	26-SEP-2012 08:20	SITE 04	✓	✓	✓	✓	✓	✓	✓	✓
EB1225477-007	26-SEP-2012 09:10	AQ14	✓	✓	✓	✓	✓	✓	✓	✓
EB1225477-008	26-SEP-2012 10:20	TC-1	✓	✓	✓	✓	✓	✓	✓	✓
EB1225477-009	26-SEP-2012 08:20	S4FB	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EP008 Chlorophyll a	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02A Major Anions (Chloride, Sulphate, Fluoride, Alkalinity)	WATER - NT-08A Total Nitrogen + NO2 + NO3 + NH3 + Total P + Reactive P	WATER - W-02T 8 metals (Total)	WATER - W-16 TPH/BTEX/PAH/OC/OP/PCB/8 Metals	WATER - W-18 TPH(C6 - C9)/BTEX
EB1225477-001	25-SEP-2012 18:20	NCC-1	✓	✓	✓	✓	✓	✓	
EB1225477-002	25-SEP-2012 17:40	AC-2	✓	✓	✓	✓	✓	✓	
EB1225477-003	25-SEP-2012 13:20	BC-DAM	✓	✓	✓	✓	✓	✓	
EB1225477-004	25-SEP-2012 14:45	JC-1	✓	✓	✓	✓	✓	✓	
EB1225477-005	25-SEP-2012 16:05	PC-DAM	✓	✓	✓	✓	✓	✓	
EB1225477-006	26-SEP-2012 08:20	SITE 04	✓	✓	✓	✓	✓	✓	
EB1225477-007	26-SEP-2012 09:10	AQ14	✓	✓	✓	✓	✓	✓	
EB1225477-008	26-SEP-2012 10:20	TC-1	✓	✓	✓	✓	✓	✓	
EB1225477-009	26-SEP-2012 08:20	S4FB		✓	✓	✓	✓	✓	
EB1225477-010	17-SEP-2012 15:00	Trip Blanks							✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Issue Date : 27-SEP-2012 16:27
Page : 4 of 4
Work Order : EB1225477
Client : GHD PTY LTD

Requested Deliverables

JAMIE CORFIELD

- *AU Certificate of Analysis - NATA (COA)	Email	Jamie.Corfield@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	Jamie.Corfield@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	Jamie.Corfield@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	Jamie.Corfield@ghd.com
- A4 - AU Tax Invoice (INV)	Email	Jamie.Corfield@ghd.com
- Chain of Custody (CoC) (COC)	Email	Jamie.Corfield@ghd.com
- EDI Format - ENMRG (ENMRG)	Email	Jamie.Corfield@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	Jamie.Corfield@ghd.com
- EDI Format - XTab (XTAB)	Email	Jamie.Corfield@ghd.com

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB1225477**	Page	: 1 of 15
Client	: ALS WATER RESOURCES GROUP	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMIE CORFIELD	Contact	: Customer Services
Address	: PO BOX 3216 YERONGA 4104	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: jamie.corfield@alsglobal.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3859 7800	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3859 7820	Facsimile	: +61 7 3243 7218
Project	: CQ212941 Waratah Coal Project	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 27-SEP-2012
Sampler	: Tara Steele	Issue Date	: 05-OCT-2012
Order number	: ----		
		No. of samples received	: 10
Quote number	: BN/245/12	No. of samples analysed	: 10

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)			*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA010P: Conductivity by PC Titrator								
Clear Plastic Bottle - Natural (EA010-P) NCC-1, BC-DAM, PC-DAM	AC-2, JC-1,	**25-SEP-2012**	---	23-OCT-2012	----	**28-SEP-2012**	23-OCT-2012	✓
Clear Plastic Bottle - Natural (EA010-P) SITE 04, TC-1,	AQ14, S4FB	**26-SEP-2012**	---	24-OCT-2012	----	**28-SEP-2012**	24-OCT-2012	✓
EA015: Total Dissolved Solids								
Clear Plastic Bottle - Natural (EA015H) NCC-1, BC-DAM, PC-DAM	AC-2, JC-1,	**25-SEP-2012**	---	02-OCT-2012	----	**28-SEP-2012**	02-OCT-2012	✓
Clear Plastic Bottle - Natural (EA015H) SITE 04, TC-1,	AQ14, S4FB	**26-SEP-2012**	---	03-OCT-2012	----	**28-SEP-2012**	03-OCT-2012	✓
EA025: Suspended Solids								
Clear Plastic Bottle - Natural (EA025H) NCC-1, BC-DAM, PC-DAM	AC-2, JC-1,	**25-SEP-2012**	---	02-OCT-2012	----	**28-SEP-2012**	02-OCT-2012	✓
Clear Plastic Bottle - Natural (EA025H) SITE 04, TC-1,	AQ14, S4FB	**26-SEP-2012**	---	03-OCT-2012	----	**28-SEP-2012**	03-OCT-2012	✓
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P) NCC-1, BC-DAM, PC-DAM	AC-2, JC-1,	**25-SEP-2012**	---	09-OCT-2012	----	**28-SEP-2012**	09-OCT-2012	✓
Clear Plastic Bottle - Natural (ED037-P) SITE 04, TC-1,	AQ14, S4FB	**26-SEP-2012**	---	10-OCT-2012	----	**28-SEP-2012**	10-OCT-2012	✓

Page : 3 of 15
Work Order : EB1225477
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) NCC-1, BC-DAM, PC-DAM AC-2, JC-1,	**25-SEP-2012**	---	23-OCT-2012	----	**27-SEP-2012**	23-OCT-2012	✓
Clear Plastic Bottle - Natural (ED041G) SITE 04, TC-1, AQ14, S4FB	**26-SEP-2012**	---	24-OCT-2012	----	**27-SEP-2012**	24-OCT-2012	✓
ED045G: Chloride Discrete analyser							
Clear Plastic Bottle - Natural (ED045G) NCC-1, BC-DAM, PC-DAM AC-2, JC-1,	**25-SEP-2012**	---	23-OCT-2012	----	**27-SEP-2012**	23-OCT-2012	✓
Clear Plastic Bottle - Natural (ED045G) SITE 04, TC-1, AQ14, S4FB	**26-SEP-2012**	---	24-OCT-2012	----	**27-SEP-2012**	24-OCT-2012	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F) NCC-1, BC-DAM, PC-DAM AC-2, JC-1,	**25-SEP-2012**	---	02-OCT-2012	----	**27-SEP-2012**	02-OCT-2012	✓
Clear Plastic Bottle - Natural (ED093F) SITE 04, TC-1, AQ14, S4FB	**26-SEP-2012**	---	03-OCT-2012	----	**27-SEP-2012**	03-OCT-2012	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Natural (EG020A-F) NCC-1, BC-DAM, PC-DAM AC-2, JC-1,	**25-SEP-2012**	---	24-MAR-2013	----	**03-OCT-2012**	24-MAR-2013	✓
Clear Plastic Bottle - Natural (EG020A-F) SITE 04, TC-1, AQ14, S4FB	**26-SEP-2012**	---	25-MAR-2013	----	**03-OCT-2012**	25-MAR-2013	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T) NCC-1, BC-DAM, PC-DAM AC-2, JC-1,	**25-SEP-2012**	**02-OCT-2012**	24-MAR-2013	✓	**02-OCT-2012**	24-MAR-2013	✓
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T) SITE 04, TC-1, AQ14, S4FB	**26-SEP-2012**	**02-OCT-2012**	25-MAR-2013	✓	**02-OCT-2012**	25-MAR-2013	✓

Work Order : EB1225477
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Natural (EG020B-F) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	---	24-MAR-2013	----	**03-OCT-2012**	24-MAR-2013	✓
Clear Plastic Bottle - Natural (EG020B-F) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	---	25-MAR-2013	----	**03-OCT-2012**	25-MAR-2013	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020B-T) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	**02-OCT-2012**	24-MAR-2013	✓	**02-OCT-2012**	24-MAR-2013	✓
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020B-T) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	**02-OCT-2012**	25-MAR-2013	✓	**02-OCT-2012**	25-MAR-2013	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Natural (EG035F) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	---	23-OCT-2012	----	**04-OCT-2012**	23-OCT-2012	✓
Clear Plastic Bottle - Natural (EG035F) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	---	24-OCT-2012	----	**04-OCT-2012**	24-OCT-2012	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035T) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	----	----	----	**04-OCT-2012**	23-OCT-2012	✓
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035T) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	----	----	----	**04-OCT-2012**	24-OCT-2012	✓
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS							
Clear Plastic Bottle - Natural (EG094A-F) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	**03-OCT-2012**	24-MAR-2013	✓	**03-OCT-2012**	24-MAR-2013	✓
Clear Plastic Bottle - Natural (EG094A-F) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	**03-OCT-2012**	25-MAR-2013	✓	**03-OCT-2012**	25-MAR-2013	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EG094T: Total metals in Fresh water by ORC-ICPMS							
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG094A-T) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	**03-OCT-2012**	24-MAR-2013	✓	**03-OCT-2012**	24-MAR-2013	✓
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG094A-T) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	**03-OCT-2012**	25-MAR-2013	✓	**03-OCT-2012**	25-MAR-2013	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	**---**	23-OCT-2012	----	**28-SEP-2012**	23-OCT-2012	✓
Clear Plastic Bottle - Natural (EK040P) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	**---**	24-OCT-2012	----	**28-SEP-2012**	24-OCT-2012	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	**---**	23-OCT-2012	----	**02-OCT-2012**	23-OCT-2012	✓
Clear Plastic Bottle - Sulfuric Acid (EK055G) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	**---**	24-OCT-2012	----	**02-OCT-2012**	24-OCT-2012	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	**---**	27-SEP-2012	----	**27-SEP-2012**	27-SEP-2012	✓
Clear Plastic Bottle - Natural (EK057G) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	**---**	28-SEP-2012	----	**27-SEP-2012**	28-SEP-2012	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	**---**	23-OCT-2012	----	**02-OCT-2012**	23-OCT-2012	✓
Clear Plastic Bottle - Sulfuric Acid (EK059G) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	**---**	24-OCT-2012	----	**02-OCT-2012**	24-OCT-2012	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	**28-SEP-2012**	23-OCT-2012	✓	**28-SEP-2012**	23-OCT-2012	✓
Clear Plastic Bottle - Sulfuric Acid (EK061G) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	**28-SEP-2012**	24-OCT-2012	✓	**28-SEP-2012**	24-OCT-2012	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	**28-SEP-2012**	23-OCT-2012	✓	**28-SEP-2012**	23-OCT-2012	✓
Clear Plastic Bottle - Sulfuric Acid (EK067G) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	**28-SEP-2012**	24-OCT-2012	✓	**28-SEP-2012**	24-OCT-2012	✓
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	**---**	27-SEP-2012	----	**27-SEP-2012**	27-SEP-2012	✓
Clear Plastic Bottle - Natural (EK071G) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	**---**	28-SEP-2012	----	**27-SEP-2012**	28-SEP-2012	✓
EP008: Chlorophyll a & Pheophytin a							
White Plastic Bottle - Unpreserved (EP008) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	**----**	----	----	**27-SEP-2012**	27-SEP-2012	✓
White Plastic Bottle - Unpreserved (EP008) SITE 04, AQ14, TC-1	**26-SEP-2012**	**----**	----	----	**27-SEP-2012**	28-SEP-2012	✓
EP066: Polychlorinated Biphenyls (PCB)							
Amber Glass Bottle - Unpreserved (EP066) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	**28-SEP-2012**	02-OCT-2012	✓	**28-SEP-2012**	07-NOV-2012	✓
Amber Glass Bottle - Unpreserved (EP066) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	**28-SEP-2012**	03-OCT-2012	✓	**28-SEP-2012**	07-NOV-2012	✓

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Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP068A: Organochlorine Pesticides (OC)							
Amber Glass Bottle - Unpreserved (EP068) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	**28-SEP-2012**	02-OCT-2012	✓	**28-SEP-2012**	07-NOV-2012	✓
Amber Glass Bottle - Unpreserved (EP068) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	**28-SEP-2012**	03-OCT-2012	✓	**28-SEP-2012**	07-NOV-2012	✓
EP068B: Organophosphorus Pesticides (OP)							
Amber Glass Bottle - Unpreserved (EP068) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	**28-SEP-2012**	02-OCT-2012	✓	**28-SEP-2012**	07-NOV-2012	✓
Amber Glass Bottle - Unpreserved (EP068) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	**28-SEP-2012**	03-OCT-2012	✓	**28-SEP-2012**	07-NOV-2012	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft							
Amber Glass Bottle - Unpreserved (EP071) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	**28-SEP-2012**	02-OCT-2012	✓	**28-SEP-2012**	07-NOV-2012	✓
Amber Glass Bottle - Unpreserved (EP071) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	**28-SEP-2012**	03-OCT-2012	✓	**28-SEP-2012**	07-NOV-2012	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM)) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	**28-SEP-2012**	02-OCT-2012	✓	**28-SEP-2012**	07-NOV-2012	✓
Amber Glass Bottle - Unpreserved (EP075(SIM)) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	**28-SEP-2012**	03-OCT-2012	✓	**28-SEP-2012**	07-NOV-2012	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) Trip Blanks	**17-SEP-2012**	**28-SEP-2012**	01-OCT-2012	✓	**28-SEP-2012**	01-OCT-2012	✓
Amber VOC Vial - Sulfuric Acid (EP080) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	**28-SEP-2012**	09-OCT-2012	✓	**28-SEP-2012**	09-OCT-2012	✓
Amber VOC Vial - Sulfuric Acid (EP080) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	**28-SEP-2012**	10-OCT-2012	✓	**28-SEP-2012**	10-OCT-2012	✓

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Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP080/071: Total Petroleum Hydrocarbons							
Amber VOC Vial - Sulfuric Acid (EP080) Trip Blanks	**17-SEP-2012**	**28-SEP-2012**	01-OCT-2012	✓	**28-SEP-2012**	01-OCT-2012	✓
Amber VOC Vial - Sulfuric Acid (EP080) NCC-1, AC-2, BC-DAM, JC-1, PC-DAM	**25-SEP-2012**	**28-SEP-2012**	09-OCT-2012	✓	**28-SEP-2012**	09-OCT-2012	✓
Amber VOC Vial - Sulfuric Acid (EP080) SITE 04, AQ14, TC-1, S4FB	**26-SEP-2012**	**28-SEP-2012**	10-OCT-2012	✓	**28-SEP-2012**	10-OCT-2012	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		*Count*		*Rate (%)*			*Quality Control Specification*
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	3	27	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a and Pheophytin a	EP008	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite B	EG020B-F	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	2	11	**18.2**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Dissolved	ED093F	2	9	**22.2**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	2	15	**13.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	15	**6.7**	**10.0**	✗	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	10	**20.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids (High Level)	EA015H	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	4	40	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-T	2	11	**18.2**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	4	32	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	27	**7.4**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	9	**22.2**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a and Pheophytin a	EP008	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite B	EG020B-F	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

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Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Polychlorinated Biphenyls (PCB)	EP066	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids (High Level)	EA015H	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	40	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-T	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	32	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a and Pheophytin a	EP008	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite B	EG020B-F	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Dissolved	ED093F	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids (High Level)	EA015H	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	40	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-T	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	32	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	14	**7.1**	**5.0**	✓	ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		*Count*		*Rate (%)*			*Quality Control Specification*
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Chloride by Discrete Analyser	ED045G	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	11	**9.1**	**5.0**	✓	ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	19	**5.3**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	15	**6.7**	**5.0**	✓	ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	40	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-T	1	11	**9.1**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	32	**6.3**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids (High Level)	EA015H	WATER	In-House, APHA 21st ed., 2540C A gravimetric procedure that determines the amount of \`filterable\` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Suspended Solids (High Level)	EA025H	WATER	In-House, APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of \`non-filterable\` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Alkalinity by PC Titrator	ED037-P	WATER	APHA 21st ed., 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	APHA 21st ed., 4500-SO4 Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chloride by Discrete Analyser	ED045G	WATER	APHA 21st ed., 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	Major Cations is determined based on APHA 21st ed., 3120; USEPA SW 846 - 6010 The ICPAES technique ionises the 0.45um filtered sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2) Sodium Absorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2) Hardness parameters are calculated based on APHA 21st ed., 2340 B. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): Samples are 0.45 um filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.

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Work Order : EB1225477
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite B	EG020B-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): Samples are 0.45 um filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite B	EG020B-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45 um filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Mercury by FIMS	EG035T	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-T	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Fluoride by PC Titrator	EK040P	WATER	APHA 21st ed., 4500 F--C CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N by Discrete analyser	EK055G	WATER	APHA 21st ed., 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N by Discrete Analyser	EK057G	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrate as N by Discrete Analyser	EK058G	WATER	APHA 21st ed., 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	APHA 21st ed., 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	APHA 21st ed., 4500-Norg D. 25mL water samples are digested using a traditional Kjeldahl digestion followed by determination by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	APHA 21st ed., 4500-Norg / 4500-NO3-. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	APHA 21st ed., 4500-P B&F This procedure involves sulphuric acid digestion of a 100mL sample to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	APHA 21st ed., 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ionic Balance by PCT DA and Turbi SO4 DA	EN055 - PG	WATER	APHA 21st Ed. 1030F. The Ionic Balance is calculated based on the major Anions and Cations. The major anions include Alkalinity, Chloride and Sulfate which determined by PCT and DA. The Cations are determined by Turbi SO4 by DA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chlorophyll a and Pheophytin a	EP008	WATER	In-house (APHA 21st ed., 10200 H mod.) The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically.
Polychlorinated Biphenyls (PCB)	EP066	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Pesticides by GCMS	EP068	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH - Semivolatile Fraction	EP071	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Digestion for Total Recoverable Metals	EN25	WATER	USEPA SW846-3005 Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Digestion for Total Recoverable Metals - ORC	EN25-ORC	WATER	Modified USEPA SW846-3005. This is an Ultrapure Nitric acid digestion procedure used to prepare surface and ground water samples for analysis by ORC- ICPMS. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 500 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2). ALS default excludes sediment which may be resident in the container.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Laboratory Control Spike (LCS) Recoveries							
EP068B: Organophosphorus Pesticides (OP)	2988367-011	----	**Monocrotophos**	6923-22-4	20.5 %	21.2-49%	**Recovery less than lower control limit**
EP068B: Organophosphorus Pesticides (OP)	2988367-011	----	**Azinphos Methyl**	86-50-0	37.8 %	49-135%	**Recovery less than lower control limit**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

- **No Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

Matrix: **WATER**

Quality Control Sample Type Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	1	15	6.7	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

QUALITY CONTROL REPORT

Work Order	: **EB1225477**	Page	: 1 of 17
Client	: **ALS WATER RESOURCES GROUP**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMIE CORFIELD	Contact	: Customer Services
Address	: PO BOX 3216 YERONGA 4104	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: jamie.corfield@alsglobal.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3859 7800	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3859 7820	Facsimile	: +61 7 3243 7218
Project	: CQ212941 Waratah Coal Project	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 27-SEP-2012
Sampler	: Tara Steele	Issue Date	: 05-OCT-2012
Order number	: ----		
		No. of samples received	: 10
Quote number	: BN/245/12	No. of samples analysed	: 10

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Greg Vogel	Laboratory Manager	Brisbane Inorganics
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Matt Frost	Senior Organic Chemist	Brisbane Organics
Stephen Hislop	Senior Inorganic Chemist	Brisbane Inorganics
Stephen Hislop	Senior Inorganic Chemist	WB Water Lab Brisbane

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

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Work Order : EB1225477
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA010P: Conductivity by PC Titrator (QC Lot: 2520876)									
EB1225477-003	BC-DAM	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	152	151	0.0	0% - 20%
EB1225477-006	SITE 04	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	133	134	0.0	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 2522134)									
EB1225413-001	Anonymous	EA015H: Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	577	577	0.0	0% - 20%
EB1225477-001	NCC-1	EA015H: Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	302	301	0.3	0% - 20%
EA025: Suspended Solids (QC Lot: 2522135)									
EB1225413-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	16	18	11.8	No Limit
EB1225477-001	NCC-1	EA025H: Suspended Solids (SS)	----	5	mg/L	6	5	18.2	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 2520879)									
EB1225422-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	486	499	2.6	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	486	499	2.6	0% - 20%
EB1225477-003	BC-DAM	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	59	59	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	59	59	0.0	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 2520880)									
EB1225477-006	SITE 04	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	49	48	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	49	48	0.0	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2520942)									
EB1225477-001	NCC-1	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.0	No Limit
EB1225477-009	S4FB	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.0	No Limit
ED045G: Chloride Discrete analyser (QC Lot: 2520941)									
EB1225477-001	NCC-1	ED045G: Chloride	16887-00-6	1	mg/L	17	17	0.0	0% - 50%
ED093F: Dissolved Major Cations (QC Lot: 2520938)									
EB1225477-001	NCC-1	ED093F: Calcium	7440-70-2	1	mg/L	31	31	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	14	14	0.0	0% - 50%
		ED093F: Sodium	7440-23-5	1	mg/L	36	36	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	8	8	0.0	No Limit
EB1225477-009	S4FB	ED093F: Calcium	7440-70-2	1	mg/L	<1	<1	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	<1	<1	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	<1	<1	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED093F: Dissolved Major Cations (QC Lot: 2520938) - continued									
EB1225477-009	S4FB	ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2523262)									
EB1225477-001	NCC-1	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.136	0.138	1.4	0% - 20%
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.06	0.07	18.6	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.09	0.10	11.8	No Limit
EB1225477-009	S4FB	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2523264)									
EB1225477-001	NCC-1	EG020B-F: Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
EB1225477-009	S4FB	EG020B-F: Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 2523275)									
EB1225477-001	NCC-1	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.002	0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Cobalt	7440-48-4	0.001	mg/L	0.001	0.001	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG020T: Total Metals by ICP-MS (QC Lot: 2523275) - continued									
EB1225477-001	NCC-1	EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.403	0.402	0.3	0% - 20%
		EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.26	0.23	14.4	0% - 20%
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Boron	7440-42-8	0.05	mg/L	0.09	0.09	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	1.20	1.16	4.2	0% - 20%
EB1225556-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.011	0.011	0.0	0% - 50%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.032	0.031	5.1	0% - 20%
		EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.002	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.018	0.012	40.9	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	1.03	0.92	12.0	0% - 20%
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	1.18	1.08	9.1	0% - 20%
EG020T: Total Metals by ICP-MS (QC Lot: 2523276)									
EB1225477-001	NCC-1	EG020B-T: Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
EB1225556-001	Anonymous	EG020B-T: Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 2523261)									
EB1225477-001	NCC-1	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EB1225480-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2529991)									
EB1225354-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	0.0038	0.0043	12.6	0% - 20%
EB1225477-008	TC-1	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 2522997)									
EB1225477-001	NCC-1	EG094A-F: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EB1225505-003	Anonymous	EG094A-F: Silver	7440-22-4	0.1	µg/L	<1.0	<1.0	0.0	No Limit
EG094T: Total metals in Fresh water by ORC-ICPMS (QC Lot: 2522995)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG094T: Total metals in Fresh water by ORC-ICPMS (QC Lot: 2522995) - continued									
EB1225477-001	NCC-1	EG094A-T: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EB1225505-003	Anonymous	EG094A-T: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 2520877)									
EB1225422-001	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.2	0.2	0.0	No Limit
EB1225477-003	BC-DAM	EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 2524924)									
EB1225411-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.02	0.0	No Limit
EB1225477-001	NCC-1	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.14	0.14	0.0	0% - 50%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 2520939)									
EB1225477-001	NCC-1	EK057G: Nitrite as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EB1225477-009	S4FB	EK057G: Nitrite as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 2524923)									
EB1225411-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.02	0.02	0.0	No Limit
EB1225477-001	NCC-1	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.01	0.01	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 2522100)									
EB1225417-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.2	1.2	0.0	0% - 50%
EB1225450-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.0	1.0	0.0	0% - 50%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 2522102)									
EB1225477-004	JC-1	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.9	0.9	0.0	No Limit
EB1225486-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.6	0.6	0.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 2522101)									
EB1225417-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.83	0.79	4.7	0% - 20%
EB1225477-004	JC-1	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.22	0.20	11.3	0% - 20%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 2520940)									
EB1225477-001	NCC-1	EK071G: Reactive Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.0	No Limit
EP008: Chlorophyll a & Pheophytin a (QC Lot: 2521189)									
EB1225477-001	NCC-1	EP008: Chlorophyll a	----	1	mg/m3	<1	<1	0.0	No Limit
EB1225518-002	Anonymous	EP008: Chlorophyll a	----	1	mg/m3	<1	<1	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2520976)									
EB1225510-001	Anonymous	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<101	<100	1.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (WHO)	----	0.5	µg/L	<101	<100	1.0	No Limit
		EP075(SIM): Naphthalene	91-20-3	1.0	µg/L	162	140	14.3	0% - 20%
		EP075(SIM): Acenaphthylene	208-96-8	1.0	µg/L	<101	<100	1.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	1.0	µg/L	<101	<100	1.0	No Limit
		EP075(SIM): Fluorene	86-73-7	1.0	µg/L	<101	<100	1.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	1.0	µg/L	<101	<100	1.0	No Limit
		EP075(SIM): Anthracene	120-12-7	1.0	µg/L	<101	<100	1.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	1.0	µg/L	<101	<100	1.0	No Limit

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Work Order : EB1225477
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2520976) - continued									
EB1225510-001	Anonymous	EP075(SIM): Pyrene	129-00-0	1.0	µg/L	<101	<100	1.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	1.0	µg/L	<101	<100	1.0	No Limit
		EP075(SIM): Chrysene	218-01-9	1.0	µg/L	<101	<100	1.0	No Limit
		EP075(SIM): Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<101	<100	1.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<101	<100	1.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<101	<100	1.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<101	<100	1.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<101	<100	1.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2521763)									
EB1225255-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP1208005-006	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2521770)									
EB1225352-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EB1225477-002	AC-2	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QC Lot: 2521763)									
EB1225255-001	Anonymous	EP080: C6 - C10 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP1208005-006	Anonymous	EP080: C6 - C10 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QC Lot: 2521770)									
EB1225352-001	Anonymous	EP080: C6 - C10 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EB1225477-002	AC-2	EP080: C6 - C10 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 2521763)									
EB1225255-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP1208005-006	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP080: BTEXN (QC Lot: 2521770)									
EB1225352-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	6	6	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	8	8	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEXN (QC Lot: 2521770) - continued									
EB1225352-001	Anonymous	EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EB1225477-002	AC-2	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

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Work Order : EB1225477
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EA010P: Conductivity by PC Titrator (QCLot: 2520876)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	4000 µS/cm	97.0	93	107
EA015: Total Dissolved Solids (QCLot: 2522134)								
EA015H: Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	<10	2000 mg/L	109	80	120
EA025: Suspended Solids (QCLot: 2522135)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	107	82	120
ED037P: Alkalinity by PC Titrator (QCLot: 2520879)								
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	----	200 mg/L	98.5	88	112
ED037P: Alkalinity by PC Titrator (QCLot: 2520880)								
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	----	200 mg/L	97.6	88	112
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2520942)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	97.2	70	130
ED045G: Chloride Discrete analyser (QCLot: 2520941)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	1000 mg/L	91.5	75	117
ED093F: Dissolved Major Cations (QCLot: 2520938)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	----	----	----	----
ED093F: Magnesium	7439-95-4	1	mg/L	<1	----	----	----	----
ED093F: Sodium	7440-23-5	1	mg/L	<1	----	----	----	----
ED093F: Potassium	7440-09-7	1	mg/L	<1	----	----	----	----
EG020F: Dissolved Metals by ICP-MS (QCLot: 2523262)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.500 mg/L	104	78	124
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	98.7	78	122
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.100 mg/L	96.3	79	121
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	105	81	122
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.100 mg/L	99.5	80	123
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.200 mg/L	98.7	78	122
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.100 mg/L	100	80	125
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.100 mg/L	102	80	118
EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.100 mg/L	102	77	120
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	98.3	75	120
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.100 mg/L	98.9	77	119
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.100 mg/L	96.7	81	115
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.200 mg/L	100	79	119
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.50 mg/L	96.8	80	126

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EG020F: Dissolved Metals by ICP-MS (QCLot: 2523262) - continued								
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.50 mg/L	101	79	122
EG020F: Dissolved Metals by ICP-MS (QCLot: 2523264)								
EG020B-F: Uranium	7440-61-1	0.001	mg/L	<0.001	----	----	----	----
EG020T: Total Metals by ICP-MS (QCLot: 2523275)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.500 mg/L	102	80	120
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	89.0	77	119
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.100 mg/L	99.0	84	116
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	107	88	120
EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.100 mg/L	106	87	120
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.200 mg/L	98.8	85	119
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.100 mg/L	103	89	117
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.100 mg/L	105	88	123
EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.100 mg/L	101	89	119
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	102	88	118
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.100 mg/L	104	72	119
EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.100 mg/L	93.3	79	120
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.200 mg/L	93.2	78	123
EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	0.500 mg/L	102	79	129
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.500 mg/L	108	78	129
EG020T: Total Metals by ICP-MS (QCLot: 2523276)								
EG020B-T: Uranium	7440-61-1	0.001	mg/L	<0.001	----	----	----	----
EG035F: Dissolved Mercury by FIMS (QCLot: 2523261)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	84.6	84	116
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2529991)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.0100 mg/L	105	80	116
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2522997)								
EG094A-F: Silver	7440-22-4	0.1	µg/L	<0.1	10 µg/L	99.7	80	120
EG094T: Total metals in Fresh water by ORC-ICPMS (QCLot: 2522995)								
EG094A-T: Silver	7440-22-4	0.1	µg/L	<0.1	10 µg/L	103	80	120
EK040P: Fluoride by PC Titrator (QCLot: 2520877)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	10 mg/L	101	85	115
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2524924)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	101	70	120
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2520939)								
EK057G: Nitrite as N	----	0.01	mg/L	<0.01	0.5 mg/L	95.0	83	119
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2524923)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	96.2	70	124

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Work Order : EB1225477
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2522100)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10.0 mg/L	76.9	70	115
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2522102)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10.0 mg/L	82.0	70	115
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2522101)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.2 mg/L	91.7	77	117
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 2520940)								
EK071G: Reactive Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	105	88	121
EP008: Chlorophyll a & Pheophytin a (QCLot: 2521189)								
EP008: Chlorophyll a	----	5	mg/m3	<5	2000 mg/m3	84.4	70.7	118
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 2520974)								
EP066: Total Polychlorinated biphenyls	----	1	µg/L	<1	10 µg/L	106	52	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 2520972)								
EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	5 µg/L	101	50	128
EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	5 µg/L	94.8	46	116
EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	5 µg/L	90.4	44	129
EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	5 µg/L	80.8	48	129
EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	5 µg/L	93.6	44	115
EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	5 µg/L	113	38	118
EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	5 µg/L	111	52	123
EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	5 µg/L	108	52	124
EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	5 µg/L	115	48	125
EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	5 µg/L	112	48	134
EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	5 µg/L	118	47	125
EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	5 µg/L	108	46	127
EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	5 µg/L	104	50	123
EP068: Endrin	72-20-8	0.5	µg/L	<0.5	5 µg/L	110	44	129
EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	5 µg/L	105	49	126
EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	5 µg/L	103	49	124
EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	5 µg/L	100	49	132
EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	5 µg/L	104	42	124
EP068: 4.4`-DDT	50-29-3	2.0	µg/L	<2	5 µg/L	92.2	35	135
EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	5 µg/L	91.2	38	129
EP068: Methoxychlor	72-43-5	2.0	µg/L	<2	5 µg/L	82.6	15	139
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2520972)								
EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	5 µg/L	90.8	49	115
EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	5 µg/L	77.4	44	118
EP068: Monocrotophos	6923-22-4	2.0	µg/L	<2	5 µg/L	# 20.5	21.2	49
EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	5 µg/L	61.6	46	111

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2520972) - continued								
EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	5 µg/L	114	44	129
EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	5 µg/L	98.5	50	118
EP068: Parathion-methyl	298-00-0	2.0	µg/L	<2	5 µg/L	83.7	42	122
EP068: Malathion	121-75-5	0.5	µg/L	<0.5	5 µg/L	101	46	122
EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	5 µg/L	83.2	48	121
EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	5 µg/L	96.3	53	119
EP068: Parathion	56-38-2	2.0	µg/L	<2	5 µg/L	97.9	43	127
EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	5 µg/L	121	50	127
EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	5 µg/L	108	50	127
EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	5 µg/L	114	50	124
EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	5 µg/L	92.2	43	121
EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	5 µg/L	118	49	126
EP068: Ethion	563-12-2	0.5	µg/L	<0.5	5 µg/L	100	50	127
EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	5 µg/L	99.7	48	128
EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	5 µg/L	# 37.8	49	135
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2520976)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	10 µg/L	104	47	109
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	10 µg/L	108	46	118
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	10 µg/L	102	50	109
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	10 µg/L	112	50	114
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	10 µg/L	113	49	115
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	10 µg/L	108	44	120
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	10 µg/L	115	46	122
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	10 µg/L	113	46	122
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	10 µg/L	112	48	125
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	10 µg/L	116	43	119
EP075(SIM): Benzo(b)fluoranthene	205-99-2	1	µg/L	<1.0	10 µg/L	104	43	138
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	10 µg/L	129	40	132
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	10 µg/L	116	40	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	10 µg/L	123	40	137
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	10 µg/L	124	42	140
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	10 µg/L	122	37	136
EP075(SIM): Benzo(a)pyrene TEQ (WHO)	----	0.5	µg/L	<0.5	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2520970)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	1275 µg/L	81.1	42	116
EP071: C15 - C28 Fraction	----	100	µg/L	<100	1850 µg/L	96.4	53	135
EP071: C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2521763)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	160 µg/L	101	71	129

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Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2521770)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	160 µg/L	95.0	71	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2520970)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	1670 µg/L	87.5	47	125
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	1285 µg/L	92.7	47	133
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2521763)								
EP080: C6 - C10 Fraction	----	20	µg/L	<20	185 µg/L	102	70	130
EP080: C6 - C10 Fraction minus BTEX (F1)	----	20	µg/L	<20	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2521770)								
EP080: C6 - C10 Fraction	----	20	µg/L	<20	185 µg/L	94.6	70	130
EP080: C6 - C10 Fraction minus BTEX (F1)	----	20	µg/L	<20	----	----	----	----
EP080: BTEXN (QCLot: 2521763)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	98.9	76	124
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	102	75	125
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	104	75	124
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	20 µg/L	99.9	76	126
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	105	76	124
EP080: Total Xylenes	1330-20-7	2	µg/L	<2	----	----	----	----
EP080: Sum of BTEX	----	1	µg/L	<1	----	----	----	----
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	104	74	124
EP080: BTEXN (QCLot: 2521770)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	91.6	76	124
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	96.5	75	125
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	95.2	75	124
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	20 µg/L	97.6	76	126
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	98.0	76	124
EP080: Total Xylenes	1330-20-7	2	µg/L	<2	----	----	----	----
EP080: Sum of BTEX	----	1	µg/L	<1	----	----	----	----
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	96.3	74	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Matrix Spike (MS) Report		
Spike	*Spike Recovery (%)*	*Recovery Limits (%)*

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Work Order : EB1225477
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
ED045G: Chloride Discrete analyser (QCLot: 2520941)							
EB1225477-002	AC-2	ED045G: Chloride	16887-00-6	400 mg/L	99.1	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 2523262)							
EB1225477-003	BC-DAM	EG020A-F: Aluminium	7429-90-5	0.500 mg/L	72.0	70	130
		EG020A-F: Arsenic	7440-38-2	0.100 mg/L	96.4	70	130
		EG020A-F: Cadmium	7440-43-9	0.100 mg/L	98.2	70	130
		EG020A-F: Chromium	7440-47-3	0.100 mg/L	96.0	70	130
		EG020A-F: Cobalt	7440-48-4	0.100 mg/L	100	70	130
		EG020A-F: Copper	7440-50-8	0.200 mg/L	93.1	70	130
		EG020A-F: Lead	7439-92-1	0.100 mg/L	91.9	70	130
		EG020A-F: Manganese	7439-96-5	0.100 mg/L	97.8	70	130
		EG020A-F: Molybdenum	7439-98-7	0.100 mg/L	77.3	70	130
		EG020A-F: Nickel	7440-02-0	0.100 mg/L	98.2	70	130
		EG020A-F: Selenium	7782-49-2	0.100 mg/L	95.7	70	130
		EG020A-F: Vanadium	7440-62-2	0.100 mg/L	102	70	130
		EG020A-F: Zinc	7440-66-6	0.200 mg/L	103	70	130
		EG020A-F: Boron	7440-42-8	0.500 mg/L	105	70	130
EG020T: Total Metals by ICP-MS (QCLot: 2523275)							
EB1225477-002	AC-2	EG020A-T: Arsenic	7440-38-2	0.1 mg/L	90.9	70	130
		EG020A-T: Cadmium	7440-43-9	0.1 mg/L	99.1	70	130
		EG020A-T: Chromium	7440-47-3	0.1 mg/L	99.8	70	130
		EG020A-T: Cobalt	7440-48-4	0.1 mg/L	102	70	130
		EG020A-T: Copper	7440-50-8	0.2 mg/L	97.6	70	130
		EG020A-T: Lead	7439-92-1	0.1 mg/L	94.4	70	130
		EG020A-T: Manganese	7439-96-5	0.1 mg/L	96.3	70	130
		EG020A-T: Nickel	7440-02-0	0.1 mg/L	95.7	70	130
		EG020A-T: Vanadium	7440-62-2	0.1 mg/L	103	70	130
		EG020A-T: Zinc	7440-66-6	0.2 mg/L	97.8	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 2523261)							
EB1225477-002	AC-2	EG035F: Mercury	7439-97-6	0.010 mg/L	76.1	70	130
EK040P: Fluoride by PC Titrator (QCLot: 2520877)							
EB1225306-001	Anonymous	EK040P: Fluoride	16984-48-8	6.1 mg/L	102	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2524924)							
EB1225411-002	Anonymous	EK055G: Ammonia as N	7664-41-7	0.4 mg/L	106	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2520939)							
EB1225477-002	AC-2	EK057G: Nitrite as N	----	0.4 mg/L	94.5	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2524923)							
EB1225411-002	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.4 mg/L	96.6	70	130

Page : 15 of 17
Work Order : EB1225477
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2522100)							
EB1225449-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	103	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2522102)							
EB1225477-005	PC-DAM	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	89.8	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2522101)							
EB1225449-001	Anonymous	EK067G: Total Phosphorus as P	----	1.0 mg/L	118	70	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 2520940)							
EB1225477-002	AC-2	EK071G: Reactive Phosphorus as P	----	0.4 mg/L	96.2	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2521763)							
EB1225526-008	Anonymous	EP080: C6 - C9 Fraction	----	40 µg/L	102	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2521770)							
EB1225362-001	Anonymous	EP080: C6 - C9 Fraction	----	40 µg/L	85.7	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2521763)							
EB1225526-008	Anonymous	EP080: C6 - C10 Fraction	----	40 µg/L	92.8	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2521770)							
EB1225362-001	Anonymous	EP080: C6 - C10 Fraction	----	40 µg/L	82.5	70	130
EP080: BTEXN (QCLot: 2521763)							
EB1225526-008	Anonymous	EP080: Benzene	71-43-2	10 µg/L	99.3	70	130
		EP080: Toluene	108-88-3	10 µg/L	98.4	70	130
EP080: BTEXN (QCLot: 2521770)							
EB1225362-001	Anonymous	EP080: Benzene	71-43-2	10 µg/L	105	70	130
		EP080: Toluene	108-88-3	10 µg/L	108	70	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EK040P: Fluoride by PC Titrator (QCLot: 2520877)										
EB1225306-001	Anonymous	EK040P: Fluoride	16984-48-8	6.1 mg/L	102	----	70	130	----	----
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2520939)										
EB1225477-002	AC-2	EK057G: Nitrite as N	----	0.4 mg/L	94.5	----	70	130	----	----
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 2520940)										
EB1225477-002	AC-2	EK071G: Reactive Phosphorus as P	----	0.4 mg/L	96.2	----	70	130	----	----

Sub-Matrix: **WATER**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report					
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*MSD*	*Low*	*High*	*Value*	*Control Limit*
ED045G: Chloride Discrete analyser (QCLot: 2520941)										
EB1225477-002	AC-2	ED045G: Chloride	16887-00-6	400 mg/L	99.1	----	70	130	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2521763)										
EB1225526-008	Anonymous	EP080: C6 - C9 Fraction	----	40 µg/L	102	----	70	130	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2521763)										
EB1225526-008	Anonymous	EP080: C6 - C10 Fraction	----	40 µg/L	92.8	----	70	130	----	----
EP080: BTEXN (QCLot: 2521763)										
EB1225526-008	Anonymous	EP080: Benzene	71-43-2	10 µg/L	99.3	----	70	130	----	----
		EP080: Toluene	108-88-3	10 µg/L	98.4	----	70	130	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2521770)										
EB1225362-001	Anonymous	EP080: C6 - C9 Fraction	----	40 µg/L	85.7	----	70	130	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2521770)										
EB1225362-001	Anonymous	EP080: C6 - C10 Fraction	----	40 µg/L	82.5	----	70	130	----	----
EP080: BTEXN (QCLot: 2521770)										
EB1225362-001	Anonymous	EP080: Benzene	71-43-2	10 µg/L	105	----	70	130	----	----
		EP080: Toluene	108-88-3	10 µg/L	108	----	70	130	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2522100)										
EB1225449-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	103	----	70	130	----	----
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2522101)										
EB1225449-001	Anonymous	EK067G: Total Phosphorus as P	----	1.0 mg/L	118	----	70	130	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2522102)										
EB1225477-005	PC-DAM	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	89.8	----	70	130	----	----
EG035F: Dissolved Mercury by FIMS (QCLot: 2523261)										
EB1225477-002	AC-2	EG035F: Mercury	7439-97-6	0.010 mg/L	76.1	----	70	130	----	----
EG020F: Dissolved Metals by ICP-MS (QCLot: 2523262)										
EB1225477-003	BC-DAM	EG020A-F: Aluminium	7429-90-5	0.500 mg/L	72.0	----	70	130	----	----
		EG020A-F: Arsenic	7440-38-2	0.100 mg/L	96.4	----	70	130	----	----
		EG020A-F: Cadmium	7440-43-9	0.100 mg/L	98.2	----	70	130	----	----
		EG020A-F: Chromium	7440-47-3	0.100 mg/L	96.0	----	70	130	----	----
		EG020A-F: Cobalt	7440-48-4	0.100 mg/L	100	----	70	130	----	----
		EG020A-F: Copper	7440-50-8	0.200 mg/L	93.1	----	70	130	----	----
		EG020A-F: Lead	7439-92-1	0.100 mg/L	91.9	----	70	130	----	----
		EG020A-F: Manganese	7439-96-5	0.100 mg/L	97.8	----	70	130	----	----
		EG020A-F: Molybdenum	7439-98-7	0.100 mg/L	77.3	----	70	130	----	----
		EG020A-F: Nickel	7440-02-0	0.100 mg/L	98.2	----	70	130	----	----
		EG020A-F: Selenium	7782-49-2	0.100 mg/L	95.7	----	70	130	----	----
		EG020A-F: Vanadium	7440-62-2	0.100 mg/L	102	----	70	130	----	----
		EG020A-F: Zinc	7440-66-6	0.200 mg/L	103	----	70	130	----	----

Sub-Matrix: **WATER**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*MSD*	*Low*	*High*	*Value*	*Control Limit*
EG020F: Dissolved Metals by ICP-MS (QCLot: 2523262) - continued										
EB1225477-003	BC-DAM	EG020A-F: Boron	7440-42-8	0.500 mg/L	105	----	70	130	----	----
EG020T: Total Metals by ICP-MS (QCLot: 2523275)										
EB1225477-002	AC-2	EG020A-T: Arsenic	7440-38-2	0.1 mg/L	90.9	----	70	130	----	----
		EG020A-T: Cadmium	7440-43-9	0.1 mg/L	99.1	----	70	130	----	----
		EG020A-T: Chromium	7440-47-3	0.1 mg/L	99.8	----	70	130	----	----
		EG020A-T: Cobalt	7440-48-4	0.1 mg/L	102	----	70	130	----	----
		EG020A-T: Copper	7440-50-8	0.2 mg/L	97.6	----	70	130	----	----
		EG020A-T: Lead	7439-92-1	0.1 mg/L	94.4	----	70	130	----	----
		EG020A-T: Manganese	7439-96-5	0.1 mg/L	96.3	----	70	130	----	----
		EG020A-T: Nickel	7440-02-0	0.1 mg/L	95.7	----	70	130	----	----
		EG020A-T: Vanadium	7440-62-2	0.1 mg/L	103	----	70	130	----	----
		EG020A-T: Zinc	7440-66-6	0.2 mg/L	97.8	----	70	130	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2524923)										
EB1225411-002	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.4 mg/L	96.6	----	70	130	----	----
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2524924)										
EB1225411-002	Anonymous	EK055G: Ammonia as N	7664-41-7	0.4 mg/L	106	----	70	130	----	----

ALS Group

Environmental Division

ALS Life Sciences

Foods Environmental Pharmaceutical

CERTIFICATE OF ANALYSIS

Work Order : **EB1225477**
Client : **ALS WATER RESOURCES GROUP**
Contact : MR JAMIE CORFIELD
Address : PO BOX 3216
YERONGA 4104
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Telephone : +61 07 3859 7800
Facsimile : +61 07 3859 7820
Project : CQ212941 Waratah Coal Project
Order number : ----
C-O-C number : ----
Sampler : Tara Steele
Site : ----

Quote number : BN/245/12

Page : 1 of 15
Laboratory : Environmental Division Brisbane
Contact : Customer Services
Address : 32 Shand Street Stafford QLD Australia 4053
E-mail : Brisbane.Enviro.Services@alsglobal.com
Telephone : +61 7 3243 7222
Facsimile : +61 7 3243 7218
QC Level : NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Date Samples Received : 27-SEP-2012
Issue Date : 05-OCT-2012

No. of samples received : 10
No. of samples analysed : 10

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA

WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Greg Vogel	Laboratory Manager	Brisbane Inorganics
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Matt Frost	Senior Organic Chemist	Brisbane Organics
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Environmental

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General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **Ionic balances are within acceptable limits as detailed in the 21st Ed. APHA "Standard Methods for the Examination of Water and Wastewater".**
- **ORC - EG094 - T (Total Metals) LOR's for samples PC-DAM (EB1225477005), and TC-1 (EB1225477008) have been raised due to matrix interferance.**
- **TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.**

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Work Order : EB1225477
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

			Client sample ID	**NCC-1**	**AC-2**	**BC-DAM**	**JC-1**	**PC-DAM**
			Client sampling date / time	25-SEP-2012 18:20	25-SEP-2012 17:40	25-SEP-2012 13:20	25-SEP-2012 14:45	25-SEP-2012 16:05
Compound	*CAS Number*	*LOR*	*Unit*	**EB1225477-001**	**EB1225477-002**	**EB1225477-003**	**EB1225477-004**	**EB1225477-005**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**389**	**465**	**152**	**169**	**125**
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	**302**	**278**	**147**	**195**	**1090**
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	**6**	<5	**17**	**28**	**79**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**192**	**205**	**59**	**53**	**49**
Total Alkalinity as CaCO3	----	1	mg/L	**192**	**205**	**59**	**53**	**49**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	**4**	**14**	**1**	**3**
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	**17**	**23**	**9**	**16**	**7**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**31**	**36**	**12**	**10**	**4**
Magnesium	7439-95-4	1	mg/L	**14**	**19**	**5**	**4**	**3**
Sodium	7440-23-5	1	mg/L	**36**	**29**	**5**	**14**	**9**
Potassium	7440-09-7	1	mg/L	**8**	**10**	**13**	**9**	**14**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	**0.55**	**0.71**	**5.23**
Arsenic	7440-38-2	0.001	mg/L	**0.002**	<0.001	**0.001**	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.003**
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	**0.002**	**0.002**	**0.004**
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.001**
Nickel	7440-02-0	0.001	mg/L	**0.001**	**0.001**	**0.002**	**0.002**	**0.004**
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.001**
Zinc	7440-66-6	0.005	mg/L	<0.005	**0.007**	<0.005	<0.005	<0.005
Manganese	7439-96-5	0.001	mg/L	**0.136**	**0.054**	**0.087**	**0.003**	**0.007**
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

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Work Order : EB1225477
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

			Client sample ID	**NCC-1**	**AC-2**	**BC-DAM**	**JC-1**	**PC-DAM**
			Client sampling date / time	25-SEP-2012 18:20	25-SEP-2012 17:40	25-SEP-2012 13:20	25-SEP-2012 14:45	25-SEP-2012 16:05
Compound	*CAS Number*	*LOR*	*Unit*	**EB1225477-001**	**EB1225477-002**	**EB1225477-003**	**EB1225477-004**	**EB1225477-005**
EG020F: Dissolved Metals by ICP-MS - Continued								
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	7440-42-8	0.05	mg/L	**0.06**	**0.08**	<0.05	<0.05	<0.05
Iron	7439-89-6	0.05	mg/L	**0.09**	<0.05	**0.96**	**0.65**	**1.95**
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.26**	**0.11**	**0.73**	**2.42**	**21.3**
Arsenic	7440-38-2	0.001	mg/L	**0.002**	<0.001	<0.001	**0.002**	**0.002**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	**0.002**	**0.024**
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	**0.002**	**0.004**	**0.017**
Cobalt	7440-48-4	0.001	mg/L	**0.001**	<0.001	**0.002**	**0.001**	**0.017**
Nickel	7440-02-0	0.001	mg/L	**0.001**	**0.001**	**0.002**	**0.003**	**0.018**
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	**0.002**	**0.021**
Zinc	7440-66-6	0.005	mg/L	<0.005	**0.011**	<0.005	**0.010**	**0.054**
Manganese	7439-96-5	0.001	mg/L	**0.403**	**0.239**	**0.229**	**0.102**	**0.298**
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.002**
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	**0.05**
Boron	7440-42-8	0.05	mg/L	**0.09**	**0.13**	**0.08**	**0.05**	**0.09**
Iron	7439-89-6	0.05	mg/L	**1.20**	**0.94**	**2.12**	**4.12**	**24.4**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
EG094T: Total metals in Fresh water by ORC-ICPMS								
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<2.1
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.2**	**0.2**	<0.1	<0.1	<0.1
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.14**	**0.05**	**0.15**	**0.03**	**0.16**
EK057G: Nitrite as N by Discrete Analyser								

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**NCC-1**	**AC-2**	**BC-DAM**	**JC-1**	**PC-DAM**
			Client sampling date / time	25-SEP-2012 18:20	25-SEP-2012 17:40	25-SEP-2012 13:20	25-SEP-2012 14:45	25-SEP-2012 16:05
Compound	*CAS Number*	*LOR*	*Unit*	**EB1225477-001**	**EB1225477-002**	**EB1225477-003**	**EB1225477-004**	**EB1225477-005**
EK057G: Nitrite as N by Discrete Analyser - Continued								
Nitrite as N	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	**0.05**
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.01**	**0.04**	**0.02**	**0.03**	**0.17**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.01**	**0.04**	**0.02**	**0.03**	**0.22**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**2.5**	**0.3**	**1.3**	**0.9**	**2.7**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**2.5**	**0.3**	**1.3**	**0.9**	**2.9**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.05**	**0.04**	**0.07**	**0.22**	**0.57**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	----	0.01	mg/L	**0.02**	<0.01	**0.01**	**0.02**	<0.01
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**4.32**	**4.83**	**1.72**	**1.53**	**1.24**
Total Cations	----	0.01	meq/L	**4.47**	**4.88**	**1.56**	**1.67**	**1.20**
Ionic Balance	----	0.01	%	**1.74**	**0.50**	----	----	----
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m³	<1	<1	**2**	**6**	**12**
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	1	µg/L	<1	<1	<1	<1	<1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5

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Work Order : EB1225477
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**NCC-1**	**AC-2**	**BC-DAM**	**JC-1**	**PC-DAM**
			Client sampling date / time	25-SEP-2012 18:20	25-SEP-2012 17:40	25-SEP-2012 13:20	25-SEP-2012 14:45	25-SEP-2012 16:05
Compound	*CAS Number*	*LOR*	*Unit*	**EB1225477-001**	**EB1225477-002**	**EB1225477-003**	**EB1225477-004**	**EB1225477-005**
EP068A: Organochlorine Pesticides (OC) - Continued								
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDT	50-29-3	2	µg/L	<2	<2	<2	<2	<2
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Methoxychlor	72-43-5	2	µg/L	<2	<2	<2	<2	<2
^ **Total Chlordane (sum)**	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of DDD + DDE + DDT**	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Monocrotophos	6923-22-4	2	µg/L	<2	<2	<2	<2	<2
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	298-00-0	2	µg/L	<2	<2	<2	<2	<2
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	56-38-2	2	µg/L	<2	<2	<2	<2	<2
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

			Client sample ID	**NCC-1**	**AC-2**	**BC-DAM**	**JC-1**	**PC-DAM**
			Client sampling date / time	25-SEP-2012 18:20	25-SEP-2012 17:40	25-SEP-2012 13:20	25-SEP-2012 14:45	25-SEP-2012 16:05
Compound	*CAS Number*	*LOR*	*Unit*	**EB1225477-001**	**EB1225477-002**	**EB1225477-003**	**EB1225477-004**	**EB1225477-005**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (WHO)**	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	**260**	<100	**300**
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	**50**
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	**260**	<50	**350**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft								
C6 - C10 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	----	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	**280**	<100	**340**
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	<100	**280**	<100	**340**
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1

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Work Order : EB1225477
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	NCC-1	AC-2	BC-DAM	JC-1	PC-DAM
			Client sampling date / time	25-SEP-2012 18:20	25-SEP-2012 17:40	25-SEP-2012 13:20	25-SEP-2012 14:45	25-SEP-2012 16:05
Compound	CAS Number	LOR	Unit	EB1225477-001	EB1225477-002	EB1225477-003	EB1225477-004	EB1225477-005
EP080: BTEXN - Continued								
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L	<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**80.8**	**103**	**79.5**	**102**	**89.3**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**92.3**	**108**	**96.8**	**114**	**92.5**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	**106**	**131**	**104**	**128**	**108**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**34.2**	**42.7**	**36.0**	**40.8**	**39.1**
2-Chlorophenol-D4	93951-73-6	0.1	%	**75.7**	**100**	**81.6**	**96.7**	**89.2**
2.4.6-Tribromophenol	118-79-6	0.1	%	**92.3**	**123**	**100**	**126**	**110**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**90.5**	**122**	**86.5**	**116**	**96.6**
Anthracene-d10	1719-06-8	0.1	%	**94.1**	**122**	**96.7**	**123**	**109**
4-Terphenyl-d14	1718-51-0	0.1	%	**102**	**134**	**99.0**	**125**	**110**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**106**	**103**	**99.1**	**111**	**102**
Toluene-D8	2037-26-5	0.1	%	**98.7**	**97.8**	**90.8**	**94.7**	**96.7**
4-Bromofluorobenzene	460-00-4	0.1	%	**97.1**	**93.9**	**87.7**	**95.2**	**95.2**

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Work Order : EB1225477
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**SITE 04**	**AQ14**	**TC-1**	**S4FB**	**Trip Blanks**
			Client sampling date / time	26-SEP-2012 08:20	26-SEP-2012 09:10	26-SEP-2012 10:20	26-SEP-2012 08:20	17-SEP-2012 15:00
Compound	CAS Number	LOR	Unit	**EB1225477-006**	**EB1225477-007**	**EB1225477-008**	**EB1225477-009**	**EB1225477-010**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**133**	**134**	**221**	<1	----
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	GIS-210-010	10	mg/L	**234**	**244**	**640**	<10	----
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	**11**	**19**	**421**	<5	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**49**	**54**	**91**	<1	----
Total Alkalinity as CaCO3	----	1	mg/L	**49**	**54**	**91**	<1	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	<1	<1	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	**10**	**8**	**13**	<1	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**6**	**8**	**11**	<1	----
Magnesium	7439-95-4	1	mg/L	**3**	**4**	**8**	<1	----
Sodium	7440-23-5	1	mg/L	**14**	**9**	**20**	<1	----
Potassium	7440-09-7	1	mg/L	**12**	**9**	**11**	<1	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**3.02**	**1.96**	**0.20**	<0.01	----
Arsenic	7440-38-2	0.001	mg/L	**0.002**	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	**0.002**	**0.001**	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	**0.002**	**0.001**	**0.002**	<0.001	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	**0.002**	**0.002**	**0.002**	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Manganese	7439-96-5	0.001	mg/L	**0.011**	**0.005**	**0.107**	<0.001	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----

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Work Order : EB1225477
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**SITE 04**	**AQ14**	**TC-1**	**S4FB**	**Trip Blanks**
			Client sampling date / time	26-SEP-2012 08:20	26-SEP-2012 09:10	26-SEP-2012 10:20	26-SEP-2012 08:20	17-SEP-2012 15:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1225477-006**	**EB1225477-007**	**EB1225477-008**	**EB1225477-009**	**EB1225477-010**
EG020F: Dissolved Metals by ICP-MS - Continued								
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	----
Iron	7439-89-6	0.05	mg/L	**1.99**	**0.96**	**0.15**	<0.05	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**2.36**	**3.91**	**18.2**	<0.01	----
Arsenic	7440-38-2	0.001	mg/L	**0.002**	**0.002**	**0.004**	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	**0.002**	**0.004**	**0.021**	<0.001	----
Copper	7440-50-8	0.001	mg/L	**0.003**	**0.003**	**0.014**	<0.001	----
Cobalt	7440-48-4	0.001	mg/L	**0.002**	**0.002**	**0.021**	<0.001	----
Nickel	7440-02-0	0.001	mg/L	**0.002**	**0.003**	**0.016**	<0.001	----
Lead	7439-92-1	0.001	mg/L	**0.001**	**0.001**	**0.013**	<0.001	----
Zinc	7440-66-6	0.005	mg/L	**0.008**	**0.006**	**0.036**	**0.008**	----
Manganese	7439-96-5	0.001	mg/L	**0.095**	**0.104**	**1.52**	<0.001	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	**0.05**	<0.01	----
Boron	7440-42-8	0.05	mg/L	**0.06**	**0.07**	**0.10**	<0.05	----
Iron	7439-89-6	0.05	mg/L	**3.86**	**4.59**	**24.9**	<0.05	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	----
EG094T: Total metals in Fresh water by ORC-ICPMS								
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<2.1	<0.1	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	**0.1**	<0.1	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.05**	**0.03**	**0.04**	**0.03**	----
EK057G: Nitrite as N by Discrete Analyser								

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**SITE 04**	**AQ14**	**TC-1**	**S4FB**	**Trip Blanks**
			Client sampling date / time	26-SEP-2012 08:20	26-SEP-2012 09:10	26-SEP-2012 10:20	26-SEP-2012 08:20	17-SEP-2012 15:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1225477-006**	**EB1225477-007**	**EB1225477-008**	**EB1225477-009**	**EB1225477-010**
EK057G: Nitrite as N by Discrete Analyser - Continued								
Nitrite as N	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.03**	**0.03**	**0.02**	**0.04**	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.03**	**0.03**	**0.02**	**0.04**	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**1.8**	**0.9**	**3.4**	**0.1**	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**1.8**	**0.9**	**3.4**	**0.1**	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.27**	**0.09**	**0.63**	**0.01**	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	----	0.01	mg/L	**0.06**	<0.01	<0.01	<0.01	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**1.26**	**1.30**	**2.18**	<0.01	----
Total Cations	----	0.01	meq/L	**1.46**	**1.35**	**2.36**	<0.01	----
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m³	**2**	**3**	**42**	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	1	µg/L	<1	<1	<1	<1	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----

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Work Order : EB1225477
Client : ALS WATER RESOURCES GROUP
Project : CQ212941 Waratah Coal Project

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			*Client sample ID*	SITE 04	AQ14	TC-1	S4FB	Trip Blanks
			Client sampling date / time	26-SEP-2012 08:20	26-SEP-2012 09:10	26-SEP-2012 10:20	26-SEP-2012 08:20	17-SEP-2012 15:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1225477-006**	**EB1225477-007**	**EB1225477-008**	**EB1225477-009**	**EB1225477-010**
EP068A: Organochlorine Pesticides (OC) - Continued								
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
4.4`-DDT	50-29-3	2	µg/L	<2	<2	<2	<2	----
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Methoxychlor	72-43-5	2	µg/L	<2	<2	<2	<2	----
^ **Total Chlordane (sum)**	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
^ **Sum of DDD + DDE + DDT**	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Monocrotophos	6923-22-4	2	µg/L	<2	<2	<2	<2	----
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Parathion-methyl	298-00-0	2	µg/L	<2	<2	<2	<2	----
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Parathion	56-38-2	2	µg/L	<2	<2	<2	<2	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								

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Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**SITE 04**	**AQ14**	**TC-1**	**S4FB**	**Trip Blanks**
			Client sampling date / time	26-SEP-2012 08:20	26-SEP-2012 09:10	26-SEP-2012 10:20	26-SEP-2012 08:20	17-SEP-2012 15:00
Compound	CAS Number	LOR	Unit	**EB1225477-006**	**EB1225477-007**	**EB1225477-008**	**EB1225477-009**	**EB1225477-010**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
^ **Benzo(a)pyrene TEQ (WHO)**	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	µg/L	**140**	<100	**120**	<100	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	**140**	<50	**120**	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft								
C6 - C10 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	----	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	----
>C16 - C34 Fraction	----	100	µg/L	**160**	<100	**130**	<100	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	**160**	<100	**130**	<100	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1

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Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

			Client sample ID	SITE 04	AQ14	TC-1	S4FB	Trip Blanks
			Client sampling date / time	26-SEP-2012 08:20	26-SEP-2012 09:10	26-SEP-2012 10:20	26-SEP-2012 08:20	17-SEP-2012 15:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1225477-006**	**EB1225477-007**	**EB1225477-008**	**EB1225477-009**	**EB1225477-010**
EP080: BTEXN - Continued								
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L	<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**83.1**	**81.0**	**80.4**	**68.2**	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**104**	**102**	**105**	**79.7**	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	**113**	**114**	**108**	**94.4**	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**37.4**	**35.7**	**30.5**	**31.1**	----
2-Chlorophenol-D4	93951-73-6	0.1	%	**86.2**	**85.4**	**79.5**	**69.4**	----
2.4.6-Tribromophenol	118-79-6	0.1	%	**109**	**108**	**103**	**84.6**	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**93.4**	**95.0**	**85.7**	**82.4**	----
Anthracene-d10	1719-06-8	0.1	%	**104**	**104**	**96.0**	**86.9**	----
4-Terphenyl-d14	1718-51-0	0.1	%	**104**	**106**	**99.0**	**91.1**	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**98.7**	**117**	**102**	**108**	**104**
Toluene-D8	2037-26-5	0.1	%	**89.5**	**107**	**97.5**	**101**	**100**
4-Bromofluorobenzene	460-00-4	0.1	%	**86.4**	**107**	**92.5**	**99.4**	**106**

Surrogate Control Limits

Sub-Matrix: **WATER**

		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	37	138.2
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	40.4	134.4
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	41.8	143.3
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10.0	71.9
2-Chlorophenol-D4	93951-73-6	26.8	130.2
2.4.6-Tribromophenol	118-79-6	19.3	180.8
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	13.9	146.1
Anthracene-d10	1719-06-8	34.6	137.4
4-Terphenyl-d14	1718-51-0	36.2	154.2
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66.1	137.9
Toluene-D8	2037-26-5	79.2	119.6
4-Bromofluorobenzene	460-00-4	74.2	118.0

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		Name	Signature	Name	Signature	Date
1	Jamie Corfield	Garry Bennison		Garry Bennison		24/10/2012
2	Jamie Corfield	Garry Bennison		Garry Bennison		28/11/2012

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