

# REVIEW OF WATER QUALITY DATA IN HYDSYS DATABASE FOR THE DALY RIVER BASIN

Armando Padovan, Simon Townsend and Alex Vandenberg



Report No. 10/99D

October 1999

Resource Management Branch

Natural Resources Division

Department of Lands Planning and Environment

## Summary

The Natural Resources Division HYDSYS Water Quality database is a substantial resource, yet its potential contribution to surface water quality management, in particular the determination of seasonal and inter-annual water quality trends, has not been substantiated. This report evaluates the database, using the Daly River Basin as a case study, by assessing the number of sites sampled, the parameters tested and the number of results available. The most frequently sampled sites were for the Katherine River, close to Katherine township. The samples collected from these sites were tested for their properties that affect the supply of potable water to the township i.e. operational and public health considerations, rather than for ecological concerns. Overall, there is a paucity of water quality data of ecological significance (e.g. nutrients, suspended sediment, chlorophyll and optical parameters). The exception is conductivity, alkalinity and calcium concentrations for the Katherine River near Katherine, and some lower reaches of the Daly and Douglas Rivers; data from these sites could provide information on seasonal and inter-annual water quality trends.

## Main Findings

- The data in the HYDSYS water quality database for the Daly River Basin has been evaluated by assessing the number of sites sampled, the parameters tested and the number of results available. This was undertaken to provide an overview of the database, and to assess its usefulness in determining seasonal and inter-annual trends in water quality.
- The HYDSYS database mainly comprises results of samples analysed by the Water Resources Division (WRD, now called DFIP) Laboratory. The proportion of data collected by WRD not on HYDSYS is relatively small (estimated to be <5% for the Daly River Basin), consisting mainly of field data and analyses performed by other laboratories.
- Water quality data has been collected from a large number of sites (370), with most sites (72%) represented by less than 20 measurements. Only at sites where surface waters provide potable water, such as Donkey Camp Pool on the Katherine River, was a large (>500 analyses) data set available.
- The bulk of the analyses conducted in the Daly River Basin are associated with the C1 suite of analyses (see Table 5) which assesses the ionic composition of samples (conductivity, alkalinity, pH, cations, anions, silica). These analyses were conducted in response to human health and water supply operational concerns rather than ecological or environmental concerns. This data is important in identifying the hydro-geochemical source of surface waters and may be a valuable parameter, amongst others, for the assessment of environmental flow requirements. Data for these parameters is best suited to assess seasonal and inter-annual trends, notably for the Katherine River at Katherine township.
- Seventeen key water quality variables were identified (Table 1). Data on the nutrients nitrogen (4.8%), phosphorus (1.1%) and silica (0.7%), and suspended solids (0.004%) represents a small percentage of the total data set. The bulk of the nitrogen data (90%) is for nitrate, derived from C1 analyses. However, the detection levels used in this analysis were too high and this data is unusable for environmental assessment. Similarly, 63% of soluble phosphorus data is not useable.

- Measurements of certain key variables have been undertaken at different sites in the basin but have not been entered in HYDSYS. There are measurements of temperature, conductivity, pH, turbidity, and dissolved oxygen (all measured in the field) and TKN (total Kjeldhal nitrogen) that have been recorded but have yet to be entered into the database.
- The key variables chlorophyll a, colour, ammonia and light attenuation have not been measured by WRD in the Daly River Basin to date.

## 1. Introduction

The Commonwealth Government initiatives 'State of the Environment Reporting' and the 'National Land and Water Resources Audit' aim to assess national trends in the quality of surface waters based on long-term monitoring records. Such a task is particularly relevant to States/Territories where land and water resource developments have had significant impact on the aquatic environment. Water quality trends provide information about the changing state of the aquatic and terrestrial environment. However, to be used as an effective management tool anthropogenic contributions to trends need to be differentiated from the natural seasonal, inter-annual and longer-term influences.

Information about water quality trends are used in various ways. These include: 1) to indicate the impact catchment activities have on the aquatic environment; 2) as management objectives to assess the success of catchment programs to improve the aquatic environment; and 3) to assist in prioritizing resource allocation to maximise environmental, social and economic benefits.

In the Northern Territory where land and water resource development is still at a relatively early phase, long term data sets can provide information on the natural variability in water quality. Moreover, they can be used to provide a benchmark to assess the impact of future land and water resource developments on the ecological integrity of the aquatic environment and its beneficial uses.

Water quality data collection has been undertaken by Water Resources Division (now Natural Resources Division) for a range of projects. To date there has been no clear or objective overview of what information is in the Division's surface water quality database or on the usefulness of this information.

This report was prompted by a need to assess the potential contribution the Northern Territory could make to the above Commonwealth Government programs, and also to provide the first overview of Natural Resources Division's water quality database from a water quality management perspective

## **2. Objectives**

The two principal objectives of this report are to:

1. Provide an overview of surface water quality data available on HYDSYS (Natural Resources Division's electronic database).
2. Assess the adequacy of this data to assess seasonal and longer-term trends for water quality parameters of ecological significance. Table 1 lists these parameters, with an explanation for each parameter.

The Daly River Basin was selected as a case study because it is a priority basin for the Division's assessment and management activities. A second reason was the likelihood that it has the largest water quality data set of any NT basin. This is ascribed to its close proximity to Darwin, considerable size, the inclusion of several major rivers and the township of Katherine.

## **3. Catchment Description**

The Daly River Basin is located in the north-western region of the Northern Territory and covers an area of 52,940 square kilometres (Fig. 1). The major centre within the basin is the town of Katherine (approximate population 10,000). At present the major land use in the basin is cattle grazing. However, there are plans to develop large horticultural regions in the vicinity of Katherine and in the Douglas-Daly Region.

## **4. Method**

Water quality data in the HYDSYS WQ module for the Daly River Basin (site prefix G814-) covering the period from when samples were first measured (1957) until mid-December 1998 was examined. This includes 24 tidally affected sites located between the Daly River Crossing (near the Police Station) and the Daly River mouth from where a single C1 suite of analyses was measured at each site. Water quality data in HYDSYS Time Series was not extracted because it was not readily accessible as a single block of data and is not linked to HYDSYS WQ. The amount of data stored in HYDSYS Time Series is small relative to that stored in

## HYDSYS.

Results are presented as tables summarising the number of times a particular water quality parameter was measured at each site. Appendix A summarises all the sampling locations, the water quality variables that were measured and the number of times they were measured at each site over the entire period. Table A1 provides a description of the sampling site location, and Table A2 may be used to convert the ascribed HYDSYS variable number to a particular water quality measure.

Metals and bacteriological analyses make up, respectively, 4% and 2.5% of all measurements. Unless otherwise stated below, these measures were excluded from the summary tables. Biological and sediment data are also not included in this summary as this data is not available in HYDSYS.

## 5. Results

### *5.1 Number of water quality sampling sites*

Throughout the Daly River Basin 425 sites were sampled of which 370 were considered to be natural sites (Table A1). The unnatural sites are locations such as sewage ponds, drinking water and tanks. These have been included in Appendix A for completeness.

The waterways containing the most sites are the Katherine River (24% of sites), Daly River (23%), Flora River (9%) and Douglas River (6%) (Table 2). As a group, the rivers make up 72% of sites, the creeks 17%, springs 5%, billabongs 3% and lagoons 2%. Figure 1 shows the Daly River Basin and the major waterways in the basin.

### *5.2 Number of water quality measurements*

Data for 225 water quality variables (i.e.-different analyses) were recorded in the Daly River Basin. The total number of individual measurements made were 37,529 at all sites and 23,760

at only the natural sites. In general, few water quality measurements were made at most of the sites (Fig. 2). At 72% of the sites, less than 20 measurements were made. Between 20 and 100 measurements were made at 17% of the sites, 100-500 measurements were made at 8% of sites and more than 500 measurements were made at only 3% of the sites.

The natural sites where most measurements were made are shown in Table 3. The five sites containing the most data were in the Katherine River in the vicinity of Katherine, and at Seventeen Mile Creek (a tributary of the Katherine River). This is followed by the Daly River channel, where a total of 2,961 measurements are recorded from sites located along the length of the channel.

### *5.3 Key water quality parameters*

Of the 23,760 values recorded at natural sites in the Daly River Basin, 6,742 values (or 28%) were associated with key water quality variables shown in Table 1 (number of results available for each measure is summarised in Appendix B). The balance of the values were analyses for anions and cations (31%), suspended and dissolved solids, iron and silica as totals (19%), bicarbonate and hardness (17%) and bacteriological analyses (5%) (Table 4). The majority of these values are associated with C1 analyses where a standard suite of analyses (Table 5) are routinely performed.

An overview of the number of sites where each of the key water quality measures were made is shown in Table 6. Conductivity (field), turbidity (field), ammonia, chlorophyll *a*, light attenuation, colour and TKN data are not available in HYDSYS for the Daly River Basin, and pH (field), TSS, VSS and dissolved oxygen were measured at only one or two sites. The variables ammonia, chlorophyll *a*, colour and light attenuation have rarely been measured in the Daly River Basin. The most widely sampled variables were conductivity (lab), pH (lab), alkalinity and nitrate which were measured in more than 300 locations across the basin. The remaining variables (turbidity (lab), temperature and total and dissolved phosphorus) were measured at 22-33 sites.

Table 6 also shows the number of nutrient measurements recorded across the basin, and the



proportion of these values which were measured at levels of detection that were appropriate for environmental assessment (see table for what detection levels are required). All values for reactive silica and total phosphorus were higher than the limits of detection of the analyses, and this data is therefore useful. However, only a small proportion of data for nitrate (13%) and soluble phosphorus (27%) were measured at appropriate levels of detection to provide data that is useful for environmental assessment.

Not all water quality data collected by WRD is stored in HYDSYS. For example, the field data (temperature, pH, dissolved oxygen, conductivity, turbidity) and TKN samples (approximately 250) collected by the Monitoring River Health program, and field data (approx. 100 measurements) for the 1997 Katherine River Donkey Camp fish kill have not been entered into the database. There may be other current or completed divisional projects which have a water quality component where the data has not been entered. Overall, though, the proportion of missing data is considered small, and estimated to be less than 5% for the Daly River Basin. However, this data is important as it was collected with the aim of undertaking environmental assessment where appropriate (i.e. lower) analytical detection levels were used. In other basins where more field data has been collected, for example Darwin River and Manton River Reservoirs in the Darwin Harbour catchment, the proportion and the overall amount of data not entered in HYDSYS is likely to be higher. This raises the important issue of the need for the Division to better manage the data that is collected (laboratory and field) to ensure all records are entered into the corporate database where they are readily accessible.

#### *5.4 The most intensively sampled sites*

Table 3 showed that most of the results in the database were measured in the Katherine River at sites in the vicinity of Katherine (approximately 40 river kilometres upstream and downstream). Table 7 summarises the number of results for the key water quality measures taken in the vicinity of Katherine, and shows the proportion of the total basin data these sites represent. Overall, approximately 40% of the key water quality variables were measured near Katherine. The majority of temperature data (87%) for the Daly River Basin was measured in the vicinity of Katherine, as was half the data for turbidity (lab), dissolved P, and reactive Si, and a third of the data available for conductivity (lab), pH (lab), alkalinity and nitrate. The sites

where most of the data was measured was either where river water was extracted for town water supply or at popular recreational areas. Sites other than those near Katherine where key variables were measured were various sites along the Daly River (conductivity (206 values), turbidity (185 values) and pH (162 values)) and Seventeen Mile Creek for dissolved phosphorus (37 values). The balance of the data not measured in the vicinity of Katherine was measured on only a few occasions at many sites throughout the basin.

The sites most intensively sampled for key water quality measures in the Daly River Basin were sites G8140001, G8140002, G8140012 and G8145222 (Table 7). These sites are very close to one another and are all in the vicinity of Katherine. In order to determine the seasonal distribution of sampling effort in this region, the number of analyses at these sites were combined, and the number of measurements taken each month counted (Table 8). Sampling effort for each of the key variables was evenly distributed throughout the months.

## **6. Discussion**

The most intensively sampled sites in the Daly River Basin are in the vicinity of Katherine. These sites account for 40% of the key water quality variables measured in the basin. This concentration of data in a small part of the catchment reflects the importance of this area for the provision of drinking water to the township. The remainder of the data is scattered across numerous sites around the rest of the basin.

The data stored in HYDSYS is most suitable for the assessment of seasonal and inter-annual trends in turbidity, conductivity and alkalinity in the Katherine River at Katherine township. At a national scale, long term trends in the conductivity of surface waters are sought as an indicator of salinity (caused by rising water tables). In the Daly River Basin, salinity resulting from agriculture is not considered to be a significant issue given the current low levels of activity. Turbidity is a useful measure for detecting increases in sediment load in the river resulting from increased erosion in the catchment or of the river banks.

More relevant, though, is the impact ground-water extraction for agriculture may have on the conductivity and alkalinity (specifically calcium concentrations) on dry season discharge.

Conductivity and alkalinity are likely to be water quality parameters sensitive to water allocations, and environmental flow requirements for the aquatic ecosystem. HYDSYS data for sites lower in the catchment, where agricultural development is planned, will be useful for assessing natural seasonal and inter-annual trends in the ionic composition of these waters.

There is insufficient data to assess seasonal and inter-annual trends in nutrients, suspended solids, chlorophyll *a* and light attenuation at all sites. An overview of wet season and dry season water quality data may be attained for some nutrient parameters, suspended solids and turbidity if some or all of the site data is combined to represent discrete river regions, for example river reaches or sub-catchments, rather than individual sites.

Several key water quality variables were absent from the HYDSYS database. In some cases particular variables (suspended solids, chlorophyll *a*, light attenuation, colour) have yet to be measured in the Daly River Basin. In other cases measurements have been made but the data has yet to be entered into the database (field measures for temperature, conductivity, pH, dissolved oxygen, TKN). This raises the important issue of the Division's need to better manage the data collected to ensure all records are entered into the corporate database where the information is readily available.

The absence of this data and the presence of a large amount of data not considered to be key water quality variables are a consequence of differing objectives for water testing in the past. Until recently, water quality testing has been undertaken mainly from a chemical (ionic composition) perspective to address drinking water quality standards and water treatment requirements, rather than an ecological or biological one. The C1 suite of analyses was developed to address health and engineering concerns in the provision of drinking water. Another consequence of this past perspective is that the analytical detection limits used were more suited to operational and health standards rather than to the concentrations appropriate to natural background levels. This is reflected in the large proportion of nitrate (a part of the C1 chemical suite) and soluble phosphorus results measured at detection levels that are too high to be useful in assessing environmental condition i.e. most of this data are recorded as being less than 1 mg/l which is orders of magnitude too high for ecological and biological work.

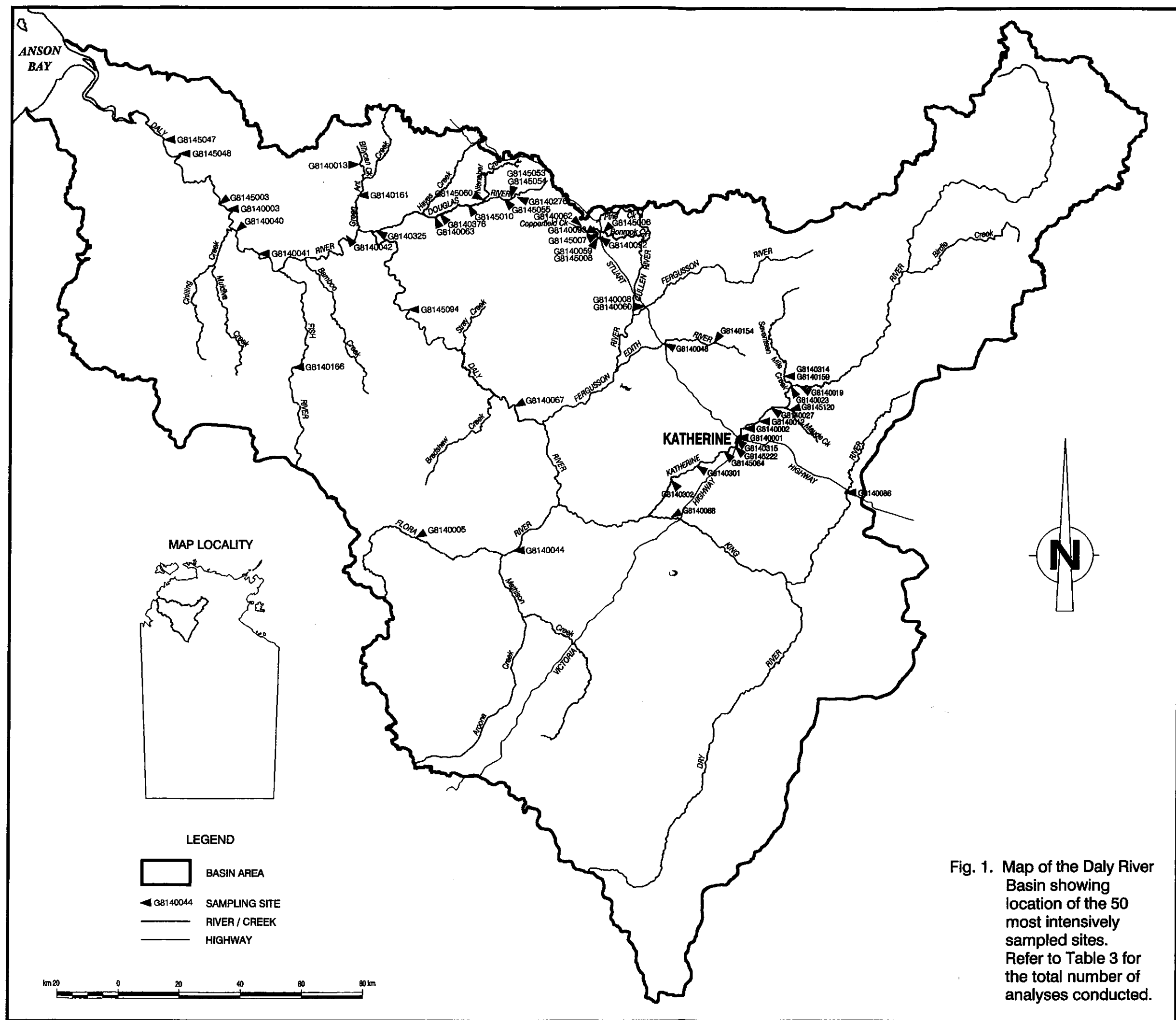
Water Quality Variable	Importance
Temperature	A fundamental measure of the physical environment which affects all biological activity. Is also needed to calculate the oxygen carrying capacity of water.
Conductivity	A measure of the amount of dissolved materials (mainly anions and cations). Is used to calculate salinity, and will show changes in salinity due to seasonal variability, land-use activities, interaction of surface and ground waters, and tidal influences.
Turbidity	A measure of the light scattering property of water as a result of material suspended in the water, and is correlated with suspended solids. It affects the amount of light available to plants for photosynthesis.
PH	The concentration of hydrogen ions. A fundamental measure which determines metal solubility, and hence metal toxicity, and affects an organisms ability to absorb minerals and nutrients. Is also an indirect measure of plant photosynthetic activity.
Alkalinity	Measure of the buffering capacity of water (how easily pH is changed when acid is added).
Dissolved Oxygen	Essential for all plant and animal processes. This is sensitive to eutrophication (increased plant/algal biomass due to nutrient enrichment), where large oscillations between super-saturated and total depletion (hypoxia) can occur. Prolonged hypoxia will lead to the death of fish and other animals. Is responsive to organic pollution.
Total Suspended Solids	A measure of the amount of all material carried in a river or stream. This measure will show whether erosion in the catchment is increasing or decreasing.
Volatile Suspended Solids	Is the component of material suspended in a river or stream which is organic in composition. When subtracted from TSS it gives the amount of material which is of inorganic origin.
Nitrate	An essential plant nutrient and a readily available source of inorganic nitrogen. Usually derived from anthropogenic or biological sources. Excessive levels in the water may lead to algal blooms and excessive growth of aquatic plants.
Ammonia	As for nitrate.
Total Kjeldhal Nitrogen	A combined measure of ammonia and organic nitrogen. When ammonia is subtracted from TKN the quantity of organic nitrogen is obtained, which is the amount of nitrogen potentially available to plants after it is decomposed by bacteria. When added to nitrate, it gives a measure of the total quantity of nitrogen in the water.
Dissolved Phosphorus	An essential plant nutrient which is readily available for uptake by aquatic plants and algae. Of geological origin but also applied in fertilizers. Is the most common nutrient limiting the amount of algae in a river, therefore, excessive levels in the water may lead to algal blooms.
Total Phosphorus	Is a measure of organic and inorganic phosphorus. When dissolved P is subtracted from TP, the organic component may be derived which is a measure of the amount of phosphorus potentially available to plants after it is decomposed by bacteria.
Reactive Silica	An essential nutrient for a group of phytoplankton called diatoms.
Chlorophyll a	The green component of plants used in photosynthesis. Is used as an index of the amount (biomass) of algae.
Colour	Is a measure of the dissolved organic material in water which gives it a brown, tea-like colour. Affects how much light passes through the water. Gives an indication of organic pollution.
Light Attenuation	A direct measure of light absorption (and hence availability) through the water. Light is essential for plant growth, and light intensity is affected by material suspended in the water and the colour of the water.

Table 1. Key water quality measures and there importance in assessing environmental impacts and changes.

Waterbody	Name	Sites
<b>RIVER</b>	Cullen River	1
	Daly River	86
	Douglas River	23
	Dry River	1
	Edith River	10
	Fergusson River	7
	Fish River	10
	Flora River	34
	Katherine River	89
	King River	4
	<b>Total</b>	<b>265</b>
<b>CREEK</b>	Anabanana Creek	1
	Billycan Creek	1
	Blackfellow Creek	1
	Bondi Creek	1
	Bonrook Creek	2
	Bradshaw Creek	5
	Collins Creek	1
	Copperfield Creek	8
	Dead Horse Creek	1
	Dorothy Creek	1
	Green Ant Creek	2
	Gun Creek	1
	Hayward Creek	3
	Jinduckin Creek	2
	Jool Chung Creek	1
	Kilfoyle Creek	1
	Leight Creek	1
	Limestone Creek	3
	Long John Creek	1
	Mathieson Creek	2
	Maude Creek	2
	Moon Boon Creek	1
	Muldiva Creek	1
	Mullens Creek	1
	Mut Pong Creek	1
	Native Cat Creek	1
	Pine Creek	1
	Sandy Creek	1
	Scott Creek	1
	Seventeen Mile Creek	1
	Small Creek	1
	Spring Creek	1
	Stray Creek	3
	Surrey Creek	1
	Survey Creek	3
	Waterbag Creek	2
	Yuwaiyunn Creek	3
	<b>Total</b>	<b>64</b>

Waterbody	Name	Sites
<b>B'BONG</b>	Belbowi Billabong	1
	Billabong at Florina Station	1
	Black Bullyard Billabong	1
	Daly River at Sawmill B'bong	1
	Hot Water Billabong at Rc4	1
	Mowatts Farm at Billabong	1
	Nulli Billabong	1
	Pelican Billabong	1
	Pluto Billabong	1
	Ruby Billabong	1
	Whitestone Billabong	1
	<b>Total</b>	<b>11</b>
<b>SPRING</b>	Beantree Springs	1
	C.S.I.R.O. Springs	1
	Davidson Spring	1
	Douglas Hot Springs	4
	Emu Springs	1
	Favell Spring	1
	Lilyvale Station at Spring	1
	Miriam Springs	1
	Paperbark Springs	1
	Paw Paw Springs	1
	Peggy Springs	1
	Spring at Door Creek	1
	Taylor's Spring	1
	Veda Spring	1
	<b>Total</b>	<b>17</b>
<b>LAGOON</b>	Anwoollolla Lagoon	1
	Ban Ban Lagoon	1
	Kowai Lagoon	1
	Leach Lagoon	1
	Naenayee Lagoon	1
	Red Lily Lagoon	1
	Wongalla Lagoon	1
	<b>Total</b>	<b>7</b>
<b>OTHER</b>	Collah W/hole : Fish R. Station	1
	Delamere Range - Q3 Site	1
	Dip at Umbrawarra Gorge	1
	Kilfoyle Waterhole	1
	Kybrook Spillway Chan.	1
	Manbulloo Stn at Pump Intake	1
	<b>Total</b>	<b>6</b>
<b>Total number of sites</b>		<b>370</b>

Table 2. Summary of the number of sampling sites associated with different waterbodies in the Daly River Basin.



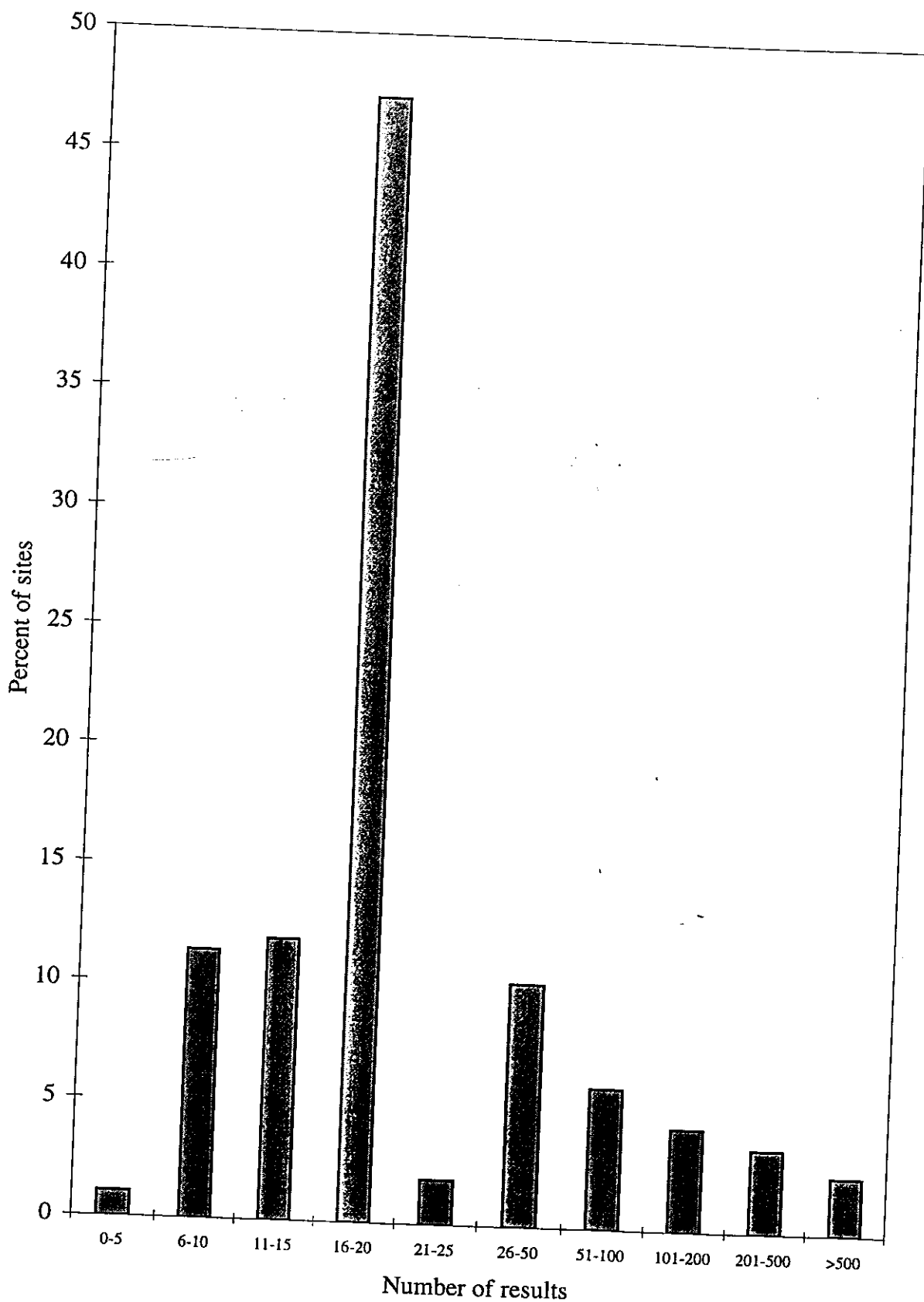


Fig. 2. Frequency distribution of the number of water quality values measured at all sites in the Daly River Basin.

Rank	Station	Site Description	Number of Analyses
1	G8140002	Katherine River.Hospital (Notts) Xing	2545
2	G8140012	Katherine River at Donkey Camp-Outflow	1838
3	G8140001	Katherine River - Railway Bridge	1626
4	G8140159	Seventeen Mile Creek at Waterfall View	1269
5	G8145222	Katherine River at Low-Level Bridge	1135
6	G8140040	Daly River at Mount Nancar	765
7	G8140062	Copperfield Creek at Chinamans Camp	540
8	G8145047	Daly River at Point B1	530
9	G8140041	Daly River at Gourley	519
10	G8140067	Daly River at Upstream Dorisvale Crossing	409
11	G8140008	Fergusson River at Old Railway Bridge	405
12	G8140166	Fish River at Gorge	372
13	G8140027	Katherine River at Inflow to Donkey Camp	304
14	G8140003	Daly River at Police Station	301
15	G8140063	Douglas River at Downstream Old Douglas H/S	266
16	G8140161	Green Ant Creek at Tipperary	266
17	G8145010	Douglas Station at Douglas Hot Springs	240
18	G8140044	Flora River & Upstream Kathleen Falls	235
19	G8145008	Copperfield Creek at Spillway Confluence	235
20	G8140048	Edith River at Stuart Highway	227
21	G8140068	King River at Downstream Victoria Highway	224
22	G8140060	Cullen River at Railway Bridge	207
23	G8140023	Katherine River at Gorge Caravan Park	185
24	G8140086	King River at Downstream Stuart Highway	177
25	G8145007	Kybrook Spillway Channel at Kybrook Farm Road	161
26	G8140013	Billycan Creek at Pig Hole	152
27	G8145053	Douglas River at Pt.C (Butterfly Gorge)	151
28	G8145006	Bonrook Creek on Old Stuart Highway	144
29	G8145003	Daly River at Daly R. Mission Pump Intake	135
30	G8145064	Lilyvale Station at Spring	129
31	G8140019	Katherine River - Gorge	127
32	G8140154	Edith River at Edith Falls	123
33	G8140042	Daly River at Beeboom Crossing 2Km D/S	122
34	G8140376	Douglas River at Road Crossing	118
35	G8145054	Douglas River at Pt D (Crystal Falls)	112
36	G8145094	Daly River at Pt. 26 Douglas/Daly	112
37	G8140302	Katherine River at Ballongilly	104
38	G8140315	Favell Spring at Katherine	102
39	G8140059	Copperfield Creek Site 2	100
40	G8140092	Copperfield Creek at 100m D/S Confluence Spillway	99
41	G8140301	Katherine River at Galloping Jacks	92
42	G8140314	Anabanana Creek at 200m U/S GS8140159	87
43	G8145060	Douglas River at Point K	81
44	G8145055	Douglas River at Point E	80
45	G8140005	Flora River (Upper) & Picker Pocket	79
46	G8140276	Douglas River at Butterfly Gorge	76
47	G8140325	Douglas River at Lower Crossing (PtAh)	76
48	G8140093	Pine Creek at Spillway Channel Jindare Road Crossing	74
49	G8145120	Maude Creek at Pump Intake	74
50	G8145048	Daly River at Point C	68

Table 3. Summary of the 50 most intensively sampled natural sites in the Daly R. Basin (NB: number of analyses does not include trace metals).



<b>Variables</b>	<b>Proportion of Results</b>
Potassium, Sodium, Calcium, Sulphate, Magnesium, Fluoride Chloride and Chloride as NaCl	31%
Total Si, Total Fe, Suspended Solids, and Total Dissolved Solids	19%
Bicarbonate Hardness	17%
Total Coliforms Faecal Coliforms Faecal Strep. Total Plate counts	5%
<b>Total</b>	<b>72 %</b>

Table 4. Breakdown of composition of non-key water quality variables measured at natural sites (total number of values 17,050). Note that 'chloride as NaCl' is a calculated variable derived from the concentration of chloride. Although calculated, it is included in this table as this variable contributes to the total number of results in the database.

PH
Electrical conductivity (25 °C)
Total Dissolved Solids (dried at 180 °C)
Sodium
Potassium
Calcium
Magnesium
Total Hardness
Total Alkalinity (as CaCO <sub>3</sub> , including OH, CO <sub>3</sub> and HCO <sub>3</sub> )
Total Iron
SiO <sub>2</sub>
Chloride
Sulphate
Nitrate
Fluoride
NaCl (calculated)

Table 5. Standard suite of tests performed in the C1 analysis conducted by DPIF Laboratory (formerly Water Resources Division Laboratory).

Variable	No. of Sites	No. of Values
Conductivity (lab)	366	
Conductivity (field)	0	
Turbidity (lab)	33	
Turbidity (field)	0	
Temperature	26	
pH (lab)	366	
pH (field)	2	
Alkalinity	370	
Total Suspend Solids	1	
Volatile Suspend Solids	1	
Nitrate	316	974 (13%)
Nitrate/Nitrite	21	
Ammonia	0	
TKN	0	
Dissolved Oxygen	1	
Total Phosphorus	22	52 (100%)
Dissolved Phosphorus	33	193 (27%)
Reactive Silica	67	147 (100%)
Chlorophyll a	0	
Light Attenuation	0	

Table 6. Summary of the number of natural sites in the Daly River Basin where key water quality variables were measured. The third column shows the number of values measured for various nutrients where data is available, and the percent of those values measured at levels of detection suitable for environmental assessment. (suitable levels of detection are: nitrate 1 ug/L-N; total and dissolved phosphorus 1 ug/L-P; silica 0.1 mg/L-Si)

	Cond. (lab)	Turb. (lab)	Temperature	pH (lab)	TSS	Alkalinity	Nitrate	D.O.	Total P	Dissolved P	Reactive Si
G8140001	102	139	8	102	0	87	42	0	0	30	9
G8140002	132	101	2	132	0	131	119	0	0	52	50
G8140012	86	102	61	86	0	85	62	0	1	4	7
G8140019	10	3	0	10	0	10	3	0	0	3	0
G8140023	13	4	0	13	0	13	11	0	2	2	0
G8140027	1	0	58	1	0	1	1	0	0	0	1
G8140301	5	0	0	5	0	5	5	0	0	0	4
G8140302	7	0	0	7	0	7	5	0	0	0	4
G8140315	5	3	6	5	0	5	4	0	0	0	0
G8140335	4	2	0	4	0	4	3	0	0	0	0
G8145222	65	65	10	65	0	57	43	0	0	0	7
<b>Total No. values</b>	430	419	145	430	0	405	298	0	3	91	82
<b>% suitable values</b>	100	100	100	100	100	100	1.3	100	100	10	100
<b>All Sites Total</b>	1531	710	167	1489	1	1409	974	1	52	193	147
<b>% of all sites</b>	28.1	59.0	86.8	28.9	0	28.7	30.6	0	5.8	47.2	55.8

Table 7. Summary of the number of values for each key water quality variable measured in the vicinity of Katherine for which data was available (See Table A1 for site description details). % of suitable values refers to the proportion of data measured at detection levels suitable for environmental assessments.

	Cond. (lab)	Turb. (lab)	Temp.	pH (lab)	Alkalinity	Reactive Si
January	29	53	6	40	29	9
February	59	104	10	34	56	5
March	31	59	5	21	25	5
April	40	16	4	59	38	6
May	23	13	6	29	25	5
June	26	18	17	24	25	5
July	24	9	6	27	19	7
August	38	28	4	30	28	7
September	16	15	6	24	19	6
October	39	25	4	39	38	8
November	39	27	6	39	37	7
December	21	40	7	19	21	3

Table 8. Summary of the monthly distribution of sampling effort for key water quality variables for four closely located sites near Katherine (sites G8140001, G8140002, G8140012 and G8145222). Note that nitrate and dissolved phosphorus are not included as a large proportion of this data is not suitable for environmental assessment.

## **Appendix A**

Summary of the number of values of all water quality variables measured at all sites in the Daly River Basin. See Table A1 for description of sites and Table A2 for description of variable numbers.

Natural Sites	
Station	Description
G8140001	Katherine River - Railway Bridge
G8140002	Katherine River Hospital (Nottis) Xing
G8140003	Daily River at Police Station
G8140005	Flora River (Upper) & Picker Pocket
G8140006	Fish River at Coolah Waterhole
G8140007	Kilfoyle Creek at Bugle Waterhole
G8140008	Fergusson River at Old Railway Bridge
G8140009	Daily River at Woolianna
G8140011	Dry River at Manbulloo Boundary
G8140012	Katherine River at Donkey Camp - Outflow
G8140013	Billycan Creek at Pig Hole
G8140019	Katherine River - Gorge
G8140023	Katherine River at Gorge Caravan Park
G8140027	Katherine River at Inflow to Donkey Camp
G8140029	Katherine River at Blue Metal Crossing
G8140040	Daily River at Mount Nancar
G8140041	Daily River at Gourley
G8140042	Daily River at Beeboom Crossing 2Km D/S
G8140044	Flora River and Upstream Kathleen Falls
G8140045	June Spring (Flora River) at Upstream Kathleen Falls
G8140048	Edith River at Stuart Highway
G8140058	Copperfield Creek Site 1 at U/S Umbrawurra Gorge Road
G8140059	Copperfield Creek Site 2
G8140060	Cullen River at Railway Bridge
G8140061	Copperfield Creek at Blue Hole
G8140062	Copperfield Creek at Chinamans Camp
G8140063	Douglas River at Downstream Old Douglas H/S
G8140067	Daily River at Upstream Dorisvale Crossing
G8140068	King River at Downstream Victoria Highway
G8140086	King River at Downstream Stuart Highway
G8140089	King River at Old Telegraph Site Site No.1
G8140092	Copperfield Creek at 100m D/S Confluence Spillway
G8140093	Pine Creek at Spillway Channel Jindare Road Crossing
G8140151	Mathieson Creek at Victoria Highway
G8140154	Edith River at Edith Falls
G8140159	Seventeen Mile Creek at Waterfall View
G8140161	Green Ant Creek at Tipperary
G8140166	Fish River at Gorge

Station	Description
G8140214	Scott Creek at Victoria Highway
G8140215	Limestone Creek at Victoria Highway
G8140218	Katherine River at Mt Epsworth
G8140261	Daily River Plains near Mt Litchfield
G8140266	Daily River at Upstream Moon Billabong
G8140276	Douglas River at Butterfly Gorge
G8140278	Douglas River at Hot Springs
G8140301	Katherine River at Galloping Jacks
G8140302	Katherine River at Bailongilly
G8140306	Paw Paw Springs at Rc 1
G8140307	Paper Bark Springs at Rc 2
G8140309	Hot Water Billabong at Rc 4
G8140312	C.S.I.R.O. Springs at Katherine
G8140314	Anabanana Creek at 200m U/S GS8140159
G8140315	Favell Spring at Katherine
G8140325	Douglas River at Lower Crossing (PtAh)
G8140326	Douglas River Downstream Hot Springs
G8140327	Green Ant Creek at Site No.1 300'D/S Fence Line
G8140335	Katherine River at Springflow at Springvale
G8140339	Copperfield Creek at U/S GS 81462
G8140350	Fish River at Site No.1
G8140351	Fish River at Site No. 2 1Km D/S Buldivack.
G8140362	Small Creek at Enroute 17 Mile Creek
G8140376	Douglas River at Road Crossing
G8140387	Edith River @ Inflow Morrison's Waterhole
G8140388	Edith River @ Outflow Morrison's Waterhole
G8140389	Fergusson River @ 20m D/S Confluence Edith River
G8140396	Edith River @ Outflow Etty Waterhole
G8140414	Dorothy Creek Site 2 at 5Km Upstream Confluence
G8145000	Taylor's Spring at 10.3 Km S.W. of Carbeen Park
G8145001	Fish River Station at Jarong Springs
G8145002	Tipperary Station at Emu Springs
G8145003	Daily River at Daly R. Mission Pump Intake
G8145004	Douglas Station at Douglas Spring
G8145005	Muldiva Creek at Billabong
G8145006	Bonbrook Creek on Old Stuart Highway
G8145007	Kybrook Spillway Channel at Kybrook Farm Road
G8145008	Copperfield Creek at Spillway Confluence
G8145009	Red Lily Lagoon

Station	Description
G8145010	Douglas Station at Douglas Hot Springs
G8145012	Bonbrook Station at Creek
G8145013	Collah W/Hole : Fish R. Stn.
G8145015	Fish River Station at Jarong Spring Yard
G8145016	Fish River Station at Spring
G8145017	Fish River Station at Homestead Spring
G8145018	Black Bullyard Billabong
G8145019	Daily River at Sawmill Billabong
G8145020	Whitestone Billabong
G8145021	Flora River at Kathleen Falls
G8145022	Flora River at South Branch Spring
G8145023	Flora River at North Branch Spring
G8145024	Flora River at Spring
G8145025	Flora River at Spring
G8145026	Flora River at U/S Daly + Katherine Confluence
G8145027	Kowai Lagoon
G8145028	Manbullo Station at Pump Intake
G8145029	Mathieson Creek at Spring
G8145030	Native Cat Creek at Spring
G8145031	Waterbag Creek at Noon Springs
G8145032	Waterbag Creek at Spring
G8145033	Daily River at Spring
G8145034	Pelican Billabong
G8145035	Ooloo Station at Ban Ban Lagoon
G8145036	Ruby Billabong
G8145037	Nulli Billabong
G8145038	Pluto Billabong
G8145039	Belbowi Billabong
G8145040	Anwoollolla Lagoon
G8145041	Mowatts Farm at Billabong
G8145042	Copperfield Creek at Spring
G8145043	Bradshaw Creek at Spring
G8145044	Dorisvale Station at Bradshaw Creek
G8145045	Wongalla Lagoon
G8145046	Daily River at Point A
G8145047	Daily River at Point B1
G8145048	Daily River at Point C
G8145049	Daily River at Dip (Near Mt. Briggs)
G8145050	Daily River at Green Ant Creek Junction

Table A1. Description of site labels used in Hydsys database. Note that sites are separated into natural and unnatural sites.

Station	Description
G8145051	Douglas River at Point A
G8145052	Douglas River at Point B
G8145053	Douglas River at Point C (Butterfly Gorge)
G8145054	Douglas River at Point D. (Crystal Falls)
G8145055	Douglas River at Point E
G8145056	Douglas River at Point F
G8145057	Douglas River at Point G
G8145058	Douglas River at Point H
G8145059	Douglas River at Point I (Mango Farm)
G8145060	Douglas River at Point K
G8145061	Douglas River at Point L
G8145062	Douglas River at Point M
G8145063	Douglas River at Point O
G8145064	Lilyvale Station at Spring
G8145065	Naenayee Lagoon
G8145066	Miriam Springs
G8145067	Veda Spring
G8145068	Leight Creek at Road Crossing
G8145069	Daly River at Pt. 1 Douglas/Daly
G8145070	Daly River at Pt. 2 Douglas/Daly
G8145071	Daly River at Pt. 3 Douglas/Daly
G8145072	Daly River at Pt. 4 Douglas/Daly
G8145073	Daly River at Pt. 5 Douglas/Daly
G8145074	Daly River at Pt. 6 Douglas/Daly
G8145075	Daly River at Pt. 7 Douglas/Daly
G8145076	Daly River at Pt. 8 Douglas/Daly
G8145077	Daly River at Pt. 9 Douglas/Daly
G8145078	Daly River at Pt. 10 Douglas/Daly
G8145079	Daly River at Pt. 11 Douglas/Daly
G8145080	Daly River at Pt. 12 Douglas/Daly
G8145081	Daly River at Pt. 13 Douglas/Daly
G8145082	Daly River at Pt. 14 Douglas/Daly
G8145083	Daly River at Pt. 15 Douglas/Daly
G8145084	Daly River at Pt. 16 Douglas/Daly
G8145085	Survey Creek at Pt. 17 Douglas/Daly
G8145086	Survey Creek at Pt. 18 Douglas/Daly
G8145087	Survey Creek at Pt. 19 Douglas/Daly
G8145088	Fish River at Pt. 20 Douglas/Daly
G8145089	Daly River at Pt. 21 Douglas/Daly

Station	Description
G8145090	Moon Boon Creek at Pt. 22 Douglas/Daly
G8145091	Daly River at Pt. 23 Douglas/Daly
G8145092	Daly River at Pt. 24 Douglas/Daly
G8145093	Daly River at Pt. 25 Douglas/Daly
G8145094	Daly River at Pt. 26 Douglas/Daly
G8145095	Daly River at Pt. 27
G8145096	Daly River at Pt.28 Douglas/Daly
G8145097	Daly River at Pt. 29 Douglas/Daly
G8145098	Daly River at Pt. 30 Douglas/Daly
G8145099	Daly River at Pt. 31 Douglas/Daly
G8145100	Daly River at Pt. 32 Douglas/Daly
G8145101	Daly River at Pt. 33 Douglas/Daly
G8145102	Daly River at Pt. 34 Douglas/Daly
G8145103	Daly River at Pt. 35 Douglas/Daly
G8145104	Douglas River at Pt. 36 Douglas/Daly
G8145105	Sandy Creek at Pt. 37 Douglas/Daly
G8145106	Douglas River at Pt. 38 Douglas/Daly
G8145107	Douglas River at Pt. 39 (3Km D/S Hayes Creek)
G8145108	Daly River at Pt. 40 Douglas/Daly
G8145109	Flora River at Pt. 41 Douglas/Daly
G8145110	Flora River at Pt. 42 Douglas/Daly
G8145111	Daly River at Pt. 43 Douglas/Daly
G8145112	Daly River at Pt. 44 Douglas/Daly
G8145113	Daly River at Pt. 45 Douglas/Daly
G8145114	Fergusson River at Pt. 46 Douglas/Daly
G8145115	Fergusson River at Pt. 47 Douglas/Daly
G8145116	Daly River at Pt. 48 Douglas/Daly
G8145117	Daly River at Pt. 49 Douglas/Daly
G8145118	Daly River at Pt. 50 Douglas/Daly
G8145119	Maude Creek at Minewater Supply
G8145120	Maude Creek at Pump Intake
G8145121	Daly River at Point "A" Douglas/Daly
G8145122	Daly River at Point "B" Douglas/Daly
G8145123	Douglas/Daly at Point "C" Douglas/Daly
G8145124	Katherine River at Point "D"
G8145125	Limestone Creek at Point "E"
G8145126	Limestone Creek at Point "F"
G8145127	Katherine River at Point "G"
G8145128	King River at Point "H"

Station	Description
G8145129	Flora River at Point "I"
G8145130	Flora River at Point "J"
G8145131	Katherine River at Point "K"
G8145132	Flora River at Pt. "L" Douglas/Daly
G8145133	Collins Creek at Point "M" Douglas/Daly
G8145134	Katherine River at Point "N"
G8145135	Douglas/Daly at Point "O" Douglas/Daly
G8145136	Douglas/Daly at Point "P"
G8145137	Daly River at Point "Q" Douglas/Daly
G8145138	Surrey Creek at Point "R"
G8145139	Hot Springs at Point "S"
G8145140	Daly River at Point "T" Douglas/Daly
G8145141	Daly River at Point "U" Douglas/Daly
G8145142	Daly River at Point "V" Douglas/Daly
G8145143	Daly River at Point "W"
G8145144	Daly River at Point "X"
G8145145	Daly River at Point "Y"
G8145146	Daly River at Point "Z"
G8145147	Daly River at Point "Aa"
G8145148	Daly River at Point "Ab"
G8145149	Daly River at Point "Ac"
G8145150	Daly River at Point "Ad"
G8145151	Daly River at Point "Ae"
G8145152	Daly River at Point "Af"
G8145153	Douglas River at Point "Ag"
G8145155	Daly River at Point "Aj"
G8145156	Douglas River at Point "Ak"
G8145157	Jinduckin Creek at Point "Al"
G8145158	Katherine River at Point "Am"
G8145159	Katherine River at Point "An"
G8145160	Katherine River at Point "Ao"
G8145161	Daly River at Point "Ap"
G8145162	Stray Creek at Point "Aq"
G8145163	Bradshaw Creek at Point "Ar"
G8145164	Jinduckin Creek at Point "As"
G8145165	Jool Chung Creek at Point "At"
G8145166	Daly River at Point "Au"
G8145167	Fergusson River at Point "Av"
G8145168	Edith River at Point "Aw"

Table A1. Continued



Station	Description
G8145169	Fergusson River at Point "Ax"
G8145170	Douglas/Daly at Point "Ay"
G8145171	Gum Creek at Point "A1"
G8145172	Daly River at Point "A2" Billabong
G8145173	Beantree Springs at Point "A3"
G8145174	Bradshaw Creek at Point "A4"
G8145175	Edith River at Point "A5" "Spring"
G8145176	Yuwaiyunn Creek at Point "A6"
G8145177	Yuwaiyunn Creek at Point "A7"
G8145178	Yuwaiyunn Creek at Point "A8"
G8145179	Daly River at Point "A9"
G8145180	Edith River at Point "A10"
G8145181	Daly River at Point "A11"
G8145182	Daly River at Point "A12"
G8145183	Mullens Creek at Point "A13"
G8145184	Spring Creek at Point "A14"
G8145185	Daly River at Point "A15"
G8145186	Daly River at Point "A16"
G8145187	Bradshaw Creek at Point "A17"
G8145188	Daly River at Point "A18"
G8145189	Daly River at Point "A19"
G8145190	Daly River at Point "A20"
G8145191	Daly River at Point "A21"
G8145192	Stray Creek at Point "A22"
G8145193	Hayward Creek at Point "A23"
G8145194	Bondi Creek at Point "A24"
G8145195	Edith River at Point "A25"
G8145196	Fergusson River at Point "A26" Billabong
G8145197	Hayward Creek at Point "A27"
G8145198	Flora River at Point "A28"
G8145199	Flora River at Point "A29"
G8145200	Flora River at Point "A30"
G8145201	Flora River at Point "A31"
G8145202	Dead Horse Creek at Point "A32"
G8145203	Flora River at Point "A33"
G8145204	Daly River at Point "A34"
G8145205	Flora River at Point "A35"
G8145206	Edith River at Point "A36"
G8145207	Flora River at Point "A37"

Station	Description
G8145208	Katherine River at Point "Aa"
G8145209	Katherine River at Point "Ab"
G8145210	Katherine River at Point "Ac"
G8145211	Katherine River at Point "Ad"
G8145212	Katherine River at Point "Ae"
G8145213	Katherine River at Point "Af"
G8145214	Katherine River at Point "Ag"
G8145215	Katherine River at Point "Ah"
G8145216	Katherine River at Point "Ai"
G8145217	Katherine River at Point "Aj"
G8145218	Katherine River at Point "Ak"
G8145220	Katherine River at Point "Am"
G8145221	Katherine River at Point "An"
G8145222	Katherine River at Low-Level Bridge
G8145223	Katherine River at Point "Ap"
G8145224	Katherine River at Point "Aq"
G8145225	Katherine River at Point "Ar"
G8145226	Katherine River at Point "As"
G8145227	Katherine River at Point "At"
G8145228	Katherine River at Point "Au"
G8145229	Katherine River at Point "Av"
G8145230	Katherine River at Point "Aw"
G8145231	Katherine River at Point "Ax"
G8145232	Katherine River at Point "Ay"
G8145233	Katherine River at Point "Az"
G8145234	Katherine River at Point "Ba"
G8145235	Katherine River at Point "Bb"
G8145237	Long John Creek at Port 2900 Katherine
G8145238	Spring at Door Creek
G8145239	Spring MLN380 at Davidson Spring
G8145240	Billabong at Florina Station
G8145242	Katherine River Pump Site @ Carbeen Park
G8145243	Banana Farm Pump Site at S. Campbell's (Kath R.)
G8145245	H/S Spring No. 2 at Fish River
G8145246	Falls at Trib Hayward Creek
G8145247	Dip at Umbrawarra Gorge
G8145248	Rockhole at Mut Pong Creek
G8145249	Dip at Blackfellow Creek
G8145250	Dip at Peggy Springs

Station	Description
G8145255	Katherine River at Slesbeck
G8145256	Leach Lagoon
G8145257	Kilfoyle Waterhole
G8145258	Katherine River Site 1 (Capacity Assessment)
G8145259	Katherine River Site 2 (Capacity Assessment)
G8145260	Katherine River Site 3 (Capacity Assessment)
G8145261	Katherine River Site 4 (Capacity Assessment)
G8145262	Katherine River Site 5 (Capacity Assessment)
G8145264	Katherine River Site 6 (Capacity Assessment)
G8145265	Katherine River Site 7 (Capacity Assessment)
G8145266	Katherine River Site 8 (Capacity Assessment)
G8145267	Katherine River Site 9 (Capacity Assessment)
G8145268	Katherine River Site 10 (Capacity Assessment)
G8145269	Katherine River Site 11 (Capacity Assessment)
G8145270	Katherine River Site 12 (Capacity Assessment)
G8145271	Katherine River Site 13 (Capacity Assessment)
G8145272	Katherine River Site 14 (Capacity Assessment)
G8145273	Katherine River Site 15 (Capacity Assessment)
G8145274	Katherine River Site 16 (Capacity Assessment)
G8145275	Kath R. Catchment Assessment
G8145276	Katherine River Site 18 (Capacity Assessment)
G8145277	Katherine River Site 19 (Capacity Assessment)
G8145278	Katherine River Site 20 (Capacity Assessment)
G8145279	Katherine River Site 21 (Capacity Assessment)
G8145280	Katherine River Site 22 (Capacity Assessment)
G8145281	Katherine River Site 23 (Capacity Assessment)
G8145282	Katherine River Site 24 (Capacity Assessment)
G8145283	Katherine River Site 25 (Capacity Assessment)
G8145284	Katherine River Site 26 (Capacity Assessment)
G8145285	Katherine River Site 27 (Capacity Assessment)
G8145286	Katherine River Site 28 (Capacity Assessment)
G8145288	Katherine River Site 30 (Capacity Assessment)
G8145289	Katherine River Site 31 (Capacity Assessment)
G8145290	Katherine River Site 32 (Capacity Assessment)
G8145291	Katherine River Site 33 (Capacity Assessment)
G8145294	Katherine River Site 36 (Capacity Assessment)
G8145295	Katherine River Site 37 (Capacity Assessment)
G8145296	Katherine River Site 38 (Capacity Assessment)
G8145298	Katherine River Site 40 (Capacity Assessment)

Table A1. Continued

Station	Description
G8145300	Katherine River Site 42 (Capacity Assessment)
G8145301	Katherine River Site 43 (Capacity Assessment)
G8145302	Katherine River Site 44 (Capacity Assessment)
G8145304	Katherine River Site 46 (Capacity Assessment)
G8145315	Umbrawarra Gorge = Stray Ck.
G8145316	Katherine R. Eva Valley Road
G8145318	Delamere Range - Q3 Site
G8145319	Flora River at SP5
G8145320	Flora River at SP8
G8145321	Flora River at SP13
G8145322	Flora River at SP10
G8145323	Flora River at SP22
G8145324	Flora River at SP36
G8145326	Flora River at SP30
G8145327	Flora River at SP25
G8145328	Flora River at SP28
G8145329	Flora River at SP19
G8145330	Flora River at SP20
G8145331	Flora River at SP18
G8145332	Flora River at SP26

Unnatural Sites	
Station	Description
G8140030	Katherine River. d/s Sewerage Ponds Outflow
G8140152	Edith River at Dam Site
G8140158	McAdden Creek at Dam Site
G8140317	Springvale Tourist Camp at Katherine
G8140395	
G8140500	Katherine Sew. East Outlet
G8140501	Katherine Sewerage Ponds Outflow
G8140502	No. 1 Primary Pond Katherine Sewage
G8140503	Before Filter at Katherine Sewage
G8140504	No. 2 Primary Pond Kath. Sewage
G8140505	Secondary Pond Katherine Sewage
G8140506	Outlet Final at Katherine Sewage
G8140507	No. 6 at Katherine Sewage
G8140508	No. 5 Outlet at Katherine Sewage
G8140509	No. 4 Pond at Katherine Sewage
G8140510	No. 3 Pond at Katherine Sewage
G8140511	No. 2 Pond Outlet at Katherine Sewage
G8140512	No. 1 Pond Inlet at Katherine Sewage
G8140513	Raw at Katherine Sewage
G8140514	Pump Station at Tindal RAAF Sewage
G8140515	Hosecock Lagoon No. 2 at Tindal RAAF Sewage
G8140516	Outlet No. 2 at Tindal RAAF Sewage
G8140517	Centre Lagoon No. 1 at Tindal RAAF Sewage
G8140518	Inlet Lagoon No. 1 at Tindal RAAF Sewage
G8140519	Raw at Tindal RAAF Sewage
G8140520	No. 8 Pond at Katherine Sewage
G8140521	No. 7 Pond at Katherine Sewage
G8140522	Final Outlet Sewage at Pine Creek
G8140523	Primary Pond at Daly River Mission Sewage
G8140524	S.P. Outlet at Daly River Mission Sewage
G8140525	S.P. Bypass at Daly River Mission Sewage
G8140526	Primary Pond Outlet at Daly River Mission Sewage
G8140527	Raw at Daly River Mission Sewage
G8140528	Raw at Pine Creek Sewage
G8140529	Inlet No. 1 at Pine Creek Sewage
G8140530	No. 2 Pond at Pine Creek Sewage
G8140531	No. 3 Pond at Pine Creek Sewage
G8140532	No. 4 Pond at Pine Creek Sewage

Station	Description
G8145014	Delamere Station at Dam
G8145241	Recreation Dam at Copperfield Creek - Pine Creek
G8145251	Small Dam at Frances Creek Mine
G8145252	Large Dam at Frances Creek Mine
G8145253	Open Cut (Lake) at Frances Creek Mine
G8145254	Town Tank at Katherine Water Supply
G8145305	H/L Tank Nauiyu Nambiy
G8145306	Tanks Tindal RAAF
G8145307	Tank Rowlands Dairy
G8145308	Top Tank Gorge Caravan Park
G8145309	H/L Tank Edith Falls
G8145310	Tindal Water Meter
G8145311	Tindal Water Supply Outlet
G8145312	Green Ant Ck. W/W Licence 327=Weir
G8145313	Nauiyu Nambiy = L/L Tank
G8145314	Mt. Todd Mine = Watertank
G8145317	Kybrook Farm Dam

Table A1. Continued

Variable	Description
2010.51	Conductivity lab (uS/cm)
2011.51	Conductivity field
2030.51	Turbidity lab (NTU)
2032.57	Turbidity field (NTU)
2049.51	Colour, Gilvin Absrb
2051.40	Colour - Hazen, True
2080.51	Temperature (Deg C)
2100.48	pH lab measure (pH units)
2100.51	pH lab measure (pH units)
2101.51	pH field measure (pH)
2113.34	Alkalinity Phenpth (mg/L)
2113.49	Alkalinity total (mg/L)
2123.49	Hydroxide alkalinity
2123.81	Hydroxide alkalinity
2124.49	Carbonate alkalinity
2124.95	Hardness carbonate (mg/L)
2125.49	Bicarbonate (mg/L)
2131.34	Hardness total (mg/L)
2172.51	Total Suspend Solids
2172.54	Residue N-flt (mg/L)
2172.57	Suspended solids (mg/L)
2173.52	TDS 180C (mg/L)
2173.55	TDS filterable (mg/L)
2173.58	TDS (mg/L)
2173.80	TDS (mg/L)
2177.51	Settleable matter (mg/L)
2193.51	Volatile Susp Solids
2193.53	Volatile residue (mg/L)
2193.54	Volatile Susp Solids
2301.90	Calcium - total +/-20%
2302.14	Calcium - soluble (mg/L)
2311.35	Chloride (mg/L)
2316.80	Chloride as NaCl (mg/L)
2322.12	Magnesium - soluble
2322.14	Magnesium - soluble
2322.90	Magnesium - soluble
2330.30	Nitrate NO3 (mg/L)
2331.30	Nitrate NO3 (mg/L)
2331.52	Nitrate NO3 (mg/L)
2332.55	Nitrite NO2 (mg/L)
2333.52	Nitrate+Nitrite (mg/L)
2334.51	Ammonia free (N,mg/L)

Variable	Description
2335.51	Ammonia (N,mg/L)
2335.53	Ammonia (N,mg/L)
2337.51	Nitrogen total (mg/L)
2338.51	Aluminoid-N (mg/L)
2339.52	Nitrogen Org. (mg/L)
2339.58	Nitrogen Org. (mg/L)
2351.34	Dissolved oxygen (mg/L)
2351.41	Dissolved oxygen (mg/L)
2352.51	Dissolved oxygen (%)
2361.44	Phosphorous reactive (P)
2363.44	Phosphorous total (P)
2363.52	Phosphorous ortho (P)
2371.52	Filterable Phosphorous
2373.51	Potassium (mg/L)
2381.12	Sodium (mg/L)
2391.12	Sulphate (mg/L)
2401.37	Sulphate (mg/L)
2401.44	Sulphate (mg/L)
2401.52	Sulphate (mg/L)
2501.17	Aluminium - total (ug/L)
2501.90	Aluminium total +/-20%
2501.95	Aluminium - total (ug/L)
2502.17	Aluminium - soluble
2503.17	Aluminium - residual
2511.94	Antimony total x/2 (ug/l)
2521.19	Arsenic - total (ug/L)
2521.90	Arsenic total +/-20%
2521.97	Arsenic - total (ug/L)
2522.95	Arsenic - soluble (ug/L)
2523.95	Arsenic - nonfilt (ug/L)
2531.90	Barium total +/-20%
2541.90	Bismuth total +/-20%
2551.51	Boron (ug/L)
2551.90	Boron total +/-20% (ug/l)
2561.94	Bromide total x/2 (ug/l)
2571.17	Cadmium - total (ug/L)
2571.90	Cadmium total +/-20%
2571.95	Cadmium - total (ug/L)
2571.96	Cadmium - total (ug/L)
2572.95	Cadmium - soluble (ug/L)
2573.95	Cadmium - nonfilt (ug/L)
2581.94	Caesium total x/2 (ug/l)

Variable	Description
2591.35	Chlorine total (titr)
2596.45	Chlorine free (res)
2601.17	Chromium - total (ug/L)
2601.90	Chromium total +/-20%
2611.17	Cobalt - total (ug/L)
2611.90	Cobalt total +/-20%
2611.98	Cobalt - total (ug/L)
2621.17	Copper - total (ug/L)
2621.71	Copper - total (ug/L)
2621.90	Copper total +/-20%
2621.95	Copper - total (ug/L)
2622.17	Copper - soluble (ug/l)
2622.95	Copper - soluble (ug/L)
2622.96	Copper - soluble (ug/L)
2623.17	Copper - residual (ug/l)
2623.95	Copper - nonfilt (ug/L)
2623.96	Copper - nonfilt (ug/L)
2631.46	Cyanide (ug/l)
2641.51	Fluoride (mg/L)
2651.94	Gold total x/2 (ug/l)
2661.94	Iodine total x/2 (ug/l)
2681.12	Iron - total (mg/L)
2681.17	Iron - total (mg/L)
2681.94	Iron total x/2 (mg/L)
2681.95	Iron - total (mg/L)
2681.97	Iron - total (mg/L)
2682.12	Iron - soluble (mg/L)
2682.17	Iron - soluble (mg/L)
2682.95	Iron - soluble (mg/L)
2682.96	Iron - soluble (mg/L)
2682.98	Iron - soluble (mg/L)
2683.12	Iron - residual (mg/L)
2683.17	Iron - residual (mg/L)
2683.97	Iron - nonfilt (mg/L)
2691.17	Lead - total (ug/L)
2691.90	Lead total +/-20% (ug/l)
2691.95	Lead - total (ug/L)
2692.17	Lead - soluble (ug/l)
2692.95	Lead - soluble (ug/L)
2693.17	Lead - residual (ug/L)
2693.95	Lead - nonfilt (ug/L)

Table A2. Description of variable numbers used in Hydsys water quality database.

Variable	Description
2701.90	Lithium total +/-20%
2711.17	Manganese - total (ug/L)
2711.71	Manganese - total (ug/L)
2711.95	Manganese - total (ug/L)
2712.17	Manganese - soluble
2712.90	Manganese soluble +/-20%
2712.95	Manganese - soluble
2712.96	Manganese - soluble
2713.17	Manganese - residual
2713.95	Manganese - nonfilt
2713.96	Manganese - nonfilt
2731.90	Molybdenum total +/-20%
2741.17	Nickel - total (ug/L)
2741.71	Nickel - total (ug/L)
2741.98	Nickel - total (ug/L)
2742.17	Nickel - soluble (ug/l)
2742.90	Nickel soluble +/-20%
2743.17	Nickel - residual (ug/l)
2743.95	Nickel - nonfilt (ug/L)
2751.19	Selenium - total (ug/L)
2751.94	Selenium total x/2 (ug/l)
2751.97	Selenium - total (ug/L)
2761.52	Silica - total (mg/L)
2766.51	Silica - reactive (mg/L)
2766.53	Silica - molbdate
2771.90	Silver total +/-20%
2781.90	Strontium total +/-20%
2791.94	Tin, total x/2 (ug/L)
2801.94	Titanium total x/2 (ug/l)
2811.90	Vanadium - total +/-20%
2821.17	Zinc - total (ug/L)
2821.71	Zinc - total (ug/L)
2821.90	Zinc total +/-20% (ug/l)
2821.97	Zinc - total (ug/L)
2822.17	Zinc - soluble (ug/l)
2822.95	Zinc - soluble (ug/L)
2823.17	Zinc - residual (ug/l)
2823.95	Zinc - nonfilt (ug/L)
2831.94	Zirconium total x/2
2891.94	Uranium - total x/2
3001.50	BOD-5 total ()
3002.50	BOD-5 filtered ()

Variable	Description
3011.51	COD total ()
3041.50	Oils + grease (mg/L)
6101.53	Plate Count (37c)
6111.51	Total coliform (count/100
6112.51	Faecal coliform
6114.51	E coliform (count/100 mL)
6121.51	Faecal Streptococci
6122.51	Enterococci count
6132.51	Pseudomo. Aeruginosa
7004.51	Chlorophyll a ()
7005.51	Phaeophytin ()
7206.50	Botryococcus total
7206.51	Botryococcus coloured
7206.52	Botryococcus white
7503.80	Augelena (%)
8012.95	Radium 226 - soluble
8012.96	Radium 226 - soluble
8013.95	Radium 226 - residual
8013.96	Radium 226 - residual
8501.90	Beryllium total +/-20%
8511.94	Scandium total x/2 (ug/l)
8521.94	Gallium total x/2 (ug/l)
8531.94	Germanium total x/2
8541.90	Rubidium total +/-20%
8551.94	Ruthenium total x/20
8561.94	Rhodium total x/2 (ug/l)
8571.94	Palladium total x/2
8581.90	Tellurium total +/-20%
8591.94	Praseodymium total x/2
8601.94	Neodymium total x/2
8611.94	Samarium total x/2 (ug/l)
8621.94	Europium total x/2 (ug/l)
8631.94	Terbium total x/2 (ug/l)
8641.94	Dysprosium total x/2
8651.94	Holmium total x/2 (ug/l)
8661.94	Erbium total x/2 (ug/l)
8671.94	Thulium total x/2 (ug/l)
8681.94	Ytterbium total x/2
8691.94	Lutetium total x/2 (ug/l)
8701.94	Hafnium total x/2 (ug/l)
8711.94	Tantalum total x/2 (ug/l)
8721.94	Tungsten total x/2 (ug/l)

Table A2. Continued

## **Appendix B**

Summary of the number of values of key water quality variables measured at each natural site in the Daly River Basin. See Table A1 for description of site labels. Note that the key water quality variables TKN, chlorophyll a, colour and light attenuation are not included as these have not been measured in the basin or have not been entered into the database.

	Conductivity (lab)	Conductivity (field)	Turbidity (lab)	Turbidity (field)	Temperature	pH (lab)	pH (field)	Total Suspend Solids	Volatile Suspend Solids	Nitrate	Nitrate/Nitrite	Nitrite	Ammonia	Alkalinity	Dissolved Oxygen	Total Phosphorus	Dissolved Phosphorus	Reactive Silica
G8140001	102	0	139	0	8	102	0	0	0	42	0	0	0	87	0	0	30	9
G8140002	132	0	101	0	2	132	0	0	0	119	0	0	0	131	0	0	52	50
G8140003	21	0	4	0	0	21	0	0	0	15	1	0	0	20	0	1	1	0
G8140005	6	0	1	0	0	6	0	0	0	3	0	0	0	6	0	0	0	0
G8140006	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0
G8140007	2	0	2	0	0	3	0	0	0	0	0	0	0	3	0	0	0	0
G8140008	35	0	2	0	0	36	0	1	0	15	3	0	0	24	0	3	4	0
G8140009	1	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0
G8140011	1	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0
G8140012	86	0	102	0	61	86	0	0	0	62	0	0	0	85	0	0	0	0
G8140013	9	0	0	0	0	9	0	0	0	8	0	0	0	9	0	0	0	0
G8140019	10	0	3	0	0	10	0	0	0	3	0	0	0	10	0	0	0	0
G8140023	13	0	4	0	0	13	0	0	0	11	2	0	0	13	0	2	2	0
G8140027	1	0	0	0	58	1	0	0	0	1	0	0	0	1	0	0	0	1
G8140029	3	0	0	0	0	3	0	0	0	2	0	0	0	3	0	0	0	0
G8140040	51	0	90	0	0	51	0	0	0	12	3	0	0	49	0	3	0	0
G8140041	25	0	78	0	0	25	0	0	0	9	0	0	0	24	0	1	5	0
G8140042	9	0	0	0	0	9	0	0	0	7	3	0	0	9	0	0	0	0
G8140044	17	0	1	0	0	17	0	0	0	12	3	0	0	16	0	0	0	0
G8140045	2	0	0	0	0	2	0	0	0	2	0	0	0	2	0	0	0	0
G8140048	19	0	5	0	0	20	0	0	0	8	0	0	0	10	0	1	0	0
G8140058	2	0	0	0	0	2	0	0	0	2	0	0	0	2	0	0	0	0
G8140059	3	0	0	0	0	3	0	0	0	3	0	0	0	3	0	0	0	0
G8140060	20	0	1	0	0	20	0	0	0	8	0	0	0	9	0	1	0	0
G8140061	4	0	3	0	0	4	0	0	0	0	0	0	0	4	0	0	0	0
G8140062	33	0	15	0	1	33	0	0	0	0	0	0	0	33	0	2	0	0
G8140063	22	0	3	0	0	22	0	0	0	25	2	0	0	18	0	0	0	0
G8140067	27	0	17	0	0	27	0	0	0	10	3	0	0	24	0	3	6	0
G8140068	20	0	9	0	0	20	0	0	0	14	0	0	0	20	0	0	0	0
G8140086	12	0	14	0	0	12	0	0	0	6	0	0	0	12	0	0	0	0
G8140089	1	0	0	0	0	1	0	0	0	2	0	0	0	1	0	0	0	0
G8140092	4	0	0	0	0	4	0	0	0	1	0	0	0	4	0	0	0	0
G8140093	3	0	0	0	0	3	0	0	0	4	0	0	0	3	0	0	0	0
G8140151	1	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0
G8140154	8	0	0	0	0	8	0	0	0	8	3	0	0	8	0	3	3	0
G8140159	71	0	19	0	1	70	0	0	0	57	3	0	0	70	0	37	2	0
G8140161	16	0	2	0	0	18	0	0	0	9	2	0	0	14	0	3	0	0
G8140166	27	0	11	0	0	27	0	0	0	14	2	0	0	27	0	2	0	0
G8140214	3	0	3	0	0	3	0	0	0	0	0	0	0	3	0	2	0	0
G8140215	4	0	3	0	0	4	0	0	0	1	0	0	0	4	0	0	0	0
G8140218	7	0	3	0	0	7	0	0	0	1	0	0	0	6	0	0	0	0
G8140261	1	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0

	Conductivity (lab)	Conductivity (field)	Turbidity (lab)	Turbidity (field)	Temperature	pH (lab)	pH (field)	Total Suspend Solids	Volatile Suspend Solids	Nitrate	Nitrate/ Nitrite	Ammonia	Alkalinity	Dissolved Oxygen	Total Phosphorus	Dissolved Phosphorus	Reactive Silica
G8140266	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140276	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140278	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140301	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140302	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140306	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140307	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140309	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140312	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140314	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140315	5	0	3	0	6	0	0	0	0	0	0	0	0	0	0	0	0
G8140325	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140326	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140327	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140335	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140339	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140350	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140351	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140362	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140376	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140387	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140388	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140389	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140396	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8140414	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8145000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8145001	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8145002	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8145003	5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
G8145004	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8145005	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8145006	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8145007	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8145008	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8145009	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G8145010	21	0	0	0	2	21	0	0	0	14	4	0	20	0	4	0	0
G8145012	2	0	0	0	0	2	0	0	0	2	0	0	2	0	0	0	0
G8145013	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145015	2	0	0	0	0	2	0	0	0	2	0	0	2	0	0	0	0
G8145016	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145017	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145018	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0

	Conductivity (lab)	Conductivity (field)	Turbidity (lab)	Turbidity (field)	Temperature	pH (lab)	pH (field)	Total Suspend Solids	Volatile Suspend Solids	Nitrate	Nitrate/Nitrite	Ammonia	Alkalinity	Dissolved Oxygen	Total Phosphorus	Dissolved Phosphorus	Reactive Silica
G8145019	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145020	2		0	0	0	2	0	0	0	1	0	0	2	0	0	0	0
G8145021	4		0	0	0	4	0	0	0	2	0	0	4	0	0	0	0
G8145022	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145023	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145024	2		0	0	0	2	0	0	0	2	0	0	2	0	0	0	0
G8145025	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145026	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145027	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145028	2		0	0	0	1	0	0	0	1	0	0	2	0	0	0	0
G8145029	2		0	0	0	2	0	0	0	2	0	0	2	0	0	0	0
G8145030	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145031	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145032	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145033	4		0	0	0	4	0	0	0	1	0	0	4	0	0	0	0
G8145034	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145035	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145036	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145037	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145038	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145039	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145040	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145041	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145042	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145043	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145044	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145045	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145046	2		1	0	0	2	0	0	0	8	0	0	1	0	0	0	0
G8145047	103		0	0	0	59	0	0	0	0	0	0	58	0	0	0	0
G8145048	11		0	0	0	10	0	0	0	0	0	0	9	0	0	0	0
G8145049	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145050	4		0	0	0	4	0	0	0	1	0	0	4	0	0	0	0
G8145051	4		0	0	0	4	0	0	0	4	0	0	4	0	0	0	0
G8145052	4		0	0	0	4	0	0	0	6	0	0	4	0	0	0	0
G8145053	14		1	0	0	13	0	0	0	7	0	0	12	0	2	2	0
G8145054	7		0	0	0	7	0	0	0	5	0	0	7	0	0	0	0
G8145055	5		0	0	0	5	0	0	0	2	0	0	5	0	0	0	0
G8145056	2		0	0	0	2	0	0	0	3	0	0	2	0	0	0	0
G8145057	4		0	0	0	4	0	0	0	4	0	0	4	0	0	0	0
G8145058	4		0	0	0	4	0	0	0	2	0	0	4	0	0	0	0
G8145059	2		0	0	0	2	0	0	0	5	0	0	2	0	0	0	0
G8145060	5		0	0	0	5	0	0	0	0	0	0	5	0	0	0	0



	Conductivity (lab)	Conductivity (field)	Turbidity (lab)	Turbidity (field)	Temperature	pH (lab)	pH (field)	Total Suspend Solids	Volatile Suspend Solids	Nitrate	Nitrate/ Nitrite	Ammonia	Alkalinity	Dissolved Oxygen	Total Phosphorus	Dissolved Phosphorus	Reactive Silica
G8145061	4	0	0	0	0	4	0	0	0	4	0	0	4	0	0	0	0
G8145062	3	0	0	0	0	3	0	0	0	3	0	0	3	0	0	0	0
G8145063	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145064	7	0	0	0	1	7	0	0	0	7	0	0	7	0	0	0	0
G8145065	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145066	2	0	0	0	0	2	0	0	0	2	0	0	2	0	0	0	0
G8145067	2	0	0	0	0	2	0	0	0	2	0	0	2	0	0	0	0
G8145068	3	0	2	0	0	3	0	0	0	3	0	0	3	0	0	0	0
G8145069	2	0	0	0	0	2	0	0	0	2	0	0	2	0	0	0	0
G8145070	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145071	2	0	0	0	0	2	0	0	0	2	0	0	2	0	0	0	0
G8145072	2	0	0	0	0	2	0	0	0	2	0	0	2	0	0	0	0
G8145073	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145074	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145075	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145076	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145077	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145078	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145079	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145080	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145081	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145082	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145083	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145084	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145085	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145086	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145087	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145088	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145089	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145090	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145091	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145092	2	0	0	0	0	2	0	0	0	2	0	0	2	0	0	0	0
G8145093	3	0	0	0	0	3	0	0	0	3	0	0	3	0	0	0	0
G8145094	7	0	0	0	0	7	0	0	0	7	0	0	7	0	0	0	0
G8145095	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145096	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145097	2	0	0	0	0	2	0	0	0	2	0	0	2	0	0	0	0
G8145098	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145099	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145100	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145101	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145102	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0



	Conductivity (lab)	Conductivity (field)	Turbidity (lab)	Turbidity (field)	Temperature	pH (lab)	pH (field)	Total Suspend Solids	Volatile Suspend Solids	Nitrate	Nitrate/ Nitrite	Ammonia	Alkalinity	Dissolved Oxygen	Total Phosphorus	Dissolved Phosphorus	Reactive Silica
G8145145	1		0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
G8145146	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145147	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145148	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145149	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145150	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145151	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145152	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145153	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145155	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145156	2		0	0	0	2	0	0	0	2	0	0	2	0	0	0	0
G8145157	2		0	0	0	2	0	0	0	2	0	0	2	0	0	0	0
G8145158	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145159	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145160	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145161	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145162	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145163	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145164	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145165	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145166	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145167	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145168	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145169	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145170	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145171	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145172	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145173	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145174	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145175	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145176	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145177	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145178	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145179	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145180	2		0	0	0	2	0	0	0	2	0	0	2	0	0	0	0
G8145181	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145182	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145183	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145184	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145185	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145186	1		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
G8145187	2		0	0	0	2	0	0	0	0	0	0	2	0	0	0	0

G8145188	Conductivity (lab)	1	Conductivity (field)	0	Turbidity (lab)	0	Turbidity (field)	0	Temperature	10	pH (lab)	1	pH (field)	0	Total Suspend Solids	0	Volatile Suspend Solids	0	Nitrate	43	Nitrate/ Nitrite	0	Ammonia	0	Alkalinity	57	Dissolved Oxygen	0	Total Phosphorus	0	Dissolved Phosphorus	0	Reactive Silica	0
G8145189		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145190		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145191		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145192		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145193		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145194		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145195		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145196		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145197		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145198		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145199		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145200		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145201		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145202		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145203		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145204		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145205		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145206		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145207		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145208		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145209		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145210		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145211		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145212		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145213		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145214		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145215		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145216		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145217		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145218		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145220		2		0		0		0		0	2	2		0		0	0	0	0	0	0	0	0		2		0		0	0	0	0	0	
G8145221		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145222		65		0		0		0		10	65	1		0		0	0	0	0	0	0	0	0		57		0		0	0	0	0	0	
G8145223		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145224		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145225		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145226		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145227		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145228		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145229		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	
G8145230		1		0		0		0		0	1	1		0		0	0	0	0	0	0	0	0		1		0		0	0	0	0	0	



	Conductivity	Conductivity (lab)	Conductivity (field)	Turbidity	Turbidity (lab)	Turbidity (field)	Temperature	pH	pH (lab)	pH (field)	Total Suspend Solids	Volatile Suspend Solids	Nitrate	Nitrate/ Nitrite	Ammonia	Alkalinity	Dissolved Oxygen	Total Phosphorus	Dissolved Phosphorus	Reactive Silica
G8145281	1			0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145282	1			0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145283	1			0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145284	1			0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145285	1			0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145286	1			0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145288	1			0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145289	1			0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145290	1			0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145291	1			0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145294	1			0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145295	1			0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145296	1			0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145298	1			0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145300	1			0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145301	1			0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145302	1			0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145304	1			0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145315	2			0	0	0	0	0	2	2	0	0	2	0	0	2	0	0	0	0
G8145316	2			0	0	0	0	0	2	2	0	0	2	0	0	2	0	0	0	0
G8145318	1			0	0	0	1	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145319	1			0	0	0	1	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145320	2			0	0	0	1	0	2	2	0	0	2	0	0	2	0	0	0	0
G8145321	1			0	0	0	1	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145322	1			0	0	0	1	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145323	1			0	0	0	1	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145324	1			0	0	0	1	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145326	1			0	0	0	1	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145327	1			0	0	0	1	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145328	1			0	0	0	1	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145329	1			0	0	0	1	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145330	1			0	0	0	1	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145331	1			0	0	0	1	0	1	1	0	0	1	0	0	1	0	0	0	0
G8145332	1			0	0	0	1	0	1	1	0	0	1	0	0	1	0	0	0	0