Borehole Data Standard for the Australian Coal Industry

ACARP Project C21003

Brett J. Larkin (GeoCheck Pty Ltd) &
David R. Green (Green Exploration & Mining Services Pty Ltd)

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ACARP

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CoalLog - Borehole Data Standard for the Australian Coal Industry

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1 Introduction

This Manual presents the “CoalLog” Borehole Data Standard for the Australian Coal Industry. This Standard will enable the recording of higher quality and more accurate borehole data. It has been developed cooperatively by representatives of coal exploration and mining companies, consultants, and software providers, in Queensland and NSW.

Provided in this Manual is the background and rationale for the development of this Standard, the principles on which it has been developed, and the key elements which are the code dictionaries, logging sheets and field definitions. The details of the data layout and use of the coding sheets is provided as well as descriptions of the codes. A full description of the field names, sizes, and other details are made available to enable a standard database and transfer format protocol to be implemented.

This Manual and its various components are provided as a hard copy and as a compilation of digital files, including spreadsheets of coding forms and documents of code dictionaries.

This project has been a collaborative effort by numerous people who are acknowledged later in this Manual. It has also been supported by the following companies.

Table 1 Supporting Companies

acQuire	Hanna Consulting Services
Anglo American Metallurgical Coal	I & I NSW
Aquila Resources	Insite Geology
Australian Mining Consultants	Maptek (Vulcan)
BMA Coal	Micromine (GeoBank)
Bowen Central Coal	Mincom
Centennial	Moultrie Database & Modelling
Coalpac	New Hope Coal
CSIRO	Palaris Consultants
Endocoal	Resolve Geo
Epsoft Computer Services	Rio Tinto Coal Australia
Foresoft (Prolog)	RocTec
Gemcom (Minex)	Runge
GEMS	Sherwood Geotechnical and Research Services
GeoCheck (LogCheck)	Snowden Mining Industry Consultants
Geotechnical Consulting Services	Vale
GeoTek Solutions	Xstrata

2 Why a Coding Standard is Required

Three mining software companies: Mincom, ECS (Minex software) and MapTek (Vulcan software) were established in Australia in the late 1970's. All three independently developed a system of coding sheets and dictionaries for the collection of coal exploration data. The three systems had a lot in common but also had significant differences. Many of these differences were quite arbitrary and purely the result of a lack of dialogue between the companies. From relatively early in their development, both ECS and Maptek enabled clients to define their own sheet formats and all three allowed clients to modify their dictionary. Even though many of ECS's and Maptek's clients had their own formats, the formats of all of the clients of each company were fairly similar. As Mincom probably had about 40% of all the clients including large players such as BHP and Rio Tinto and all their clients were using the same data format their format became the closest to a de facto standard within the industry.

Currently, there are probably between 20 and 30 different data formats being used and over 100 different dictionaries in the Australian coal industry. It has only been in recent years that even large organizations such as BMA, Anglo American and Rio Tinto have attempted to ensure that all their sites are using the same data format and dictionaries. Standardizing is never an easy process as old data needs to be converted to the new formats and dictionary codes. This is expensive and always entails some loss of information.

There are numerous drawbacks in the current situation:

1) The data collected today differs from that collected thirty years ago when the current systems were first developed. For instance, portion and parish are generally not recorded now nor are grain roundness, grain description or permeability and yet details such as environmental factors, depths of core runs and water flows are now routinely collected but are not adequately catered for in systems that were developed some time ago.

2) Much of today's data is collected by contractors who regularly move between clients. Often, when moving, they face changes in logging sheet formats and dictionaries. Frequently the same code will even have different meanings in different companies' systems. For example, SO is soil in some dictionaries and sooty coal in others, KL is core loss in some and kaolinite in others, while silt and siltstone are SL and ST in some and the reverse in others. This is an unnecessary source of data errors.

3) Most of the formats and dictionaries have been designed by one or two very experienced geologists, however, as no single geologist's experience covers every possible situation, all the formats and dictionaries have some deficiencies. A system that has been properly peer reviewed is far less likely to contain such deficiencies.

4) When companies obtain a new property, it is unlikely that previous data for the property will have the same format and dictionary as that used by the new owner. They, therefore, will generally undertake one of the following:

- convert all of the previously collected data to their format. Generally, this is expensive and results in some loss of information. Due to changes in ownership and changes in data formats some of the data at some sites has been converted up to four times. In future with the introduction of a standard, data in such situations would only need to be converted once;
- just strip out the tops and bottoms of seams, convert the lithologies and then discard the remaining data, or;
- completely ignore previous data.

5) It is not uncommon for historical data to be obtained without an accompanying dictionary. In these circumstances, one commonly attempts to work out what software system was originally used to store the data, compares the codes to a dictionary from that system, and then makes a reasonable guess for codes that do not concord with this dictionary.

6) When moving data from one software system to another, companies commonly face problems with multiple lithologies in a unit, multiple description lines for a lithology and comments.

7) Consultants spend vast amounts of time dealing with data being received in various formats and dictionaries from different clients or even from the same clients. The cost of this time is ultimately charged back to the clients.

2.1 Initial Development

An initial prototype was developed by senior GeoCheck staff: Andries Pretorius, Gary Ballantine and Brett Larkin using the following steps:

1) A spreadsheet was created to compare header, geological and geotechnical data sheets. A worksheet was established for each of these three data types. Each row in it showed a field type such as Lithology or Weathering and then showed the number of columns, if any, that each field occupied in various systems' sheets. Header and geological data sheets were included from a variety of sources as shown in Table 2.

Datasheet type	Company	Descendant system	Notes
Header and Geology	Anglo American Coal	Minex	New company wide system
	JB Mining Services	Vulcan CoalBor	used by a number of companies including Xstrata
	Mincom	Geodas	used by BHP, RioTinto and New Hope
	Vale	Vulcan CoalBor	
	Maptek	Vulcan CoalBor	
Geotechnical	Anglo American Coal	Standard geotechnical field logging sheet	
	BHP Billiton	Geotechnical sheet	as used at Togara South
	BMA	Geotechnical sheet	also used by Vale
	Insite Geology	Geotechnical sheet	as used by Joe Gough
	New Hope	Geotechnical sheet	as designed by Ross Seedsman

Table 2 Historical datasheet sources used in prototype development

2) Prototype header, geological and geotechnical data sheets were designed that were as close as possible to the examined sheets (*CoalLog Logging Sheets.xls*). Designing the sheets was a necessary prerequisite to developing a standard dictionary so as to define the required dictionary categories and the size for the codes in each category.

3) Prototype drilling, water observation and point load data sheets (CoalLog Logging Sheets.xls) were designed.

4) Spreadsheets were created to compare the various header, geological and geotechnical dictionaries. Each contained a worksheet for each category in the dictionary. These worksheets included the item description, code and from which dictionary it was derived. These were then sorted on description.

5) A spreadsheet was established for the new prototype dictionaries with a worksheet for each required category (*Lithology and Geotech Dictionaries Work File.xls*). The set of descriptions required for each category was selected from the other dictionaries and entered into the appropriate worksheet. In addition, a list was included at the bottom of each worksheet showing the descriptions from the other dictionaries that had been omitted along with recommendations on how they should be dealt with.

6) The spreadsheets comparing the current dictionaries were then examined to determine what code should be used for each included description. This was based on what was most commonly used in the current dictionaries.

7) The items in each category were then sorted by code and checked that no code was used more than once in the category.

8) An additional worksheet was created called *All Codes sorted on Description.* This contained a row for every item in every category of the prototype dictionary and included its code, description and category. The worksheet was then sorted on description. Where a description appeared in more than one category (e.g. quartz in Lithology, Minerals/Fossils and Infill Type and quartzose in Adjectives), it was checked that the same code had been used in each case. Where this was not the case, codes in the prototype were modified. Checks were made to ensure the code used did not conflict with another code in the category. This code would then also have to be changed and it may also need to be changed in other categories. Achieving this aim sometimes meant using codes that were not currently being used in any dictionary for the particular item.

9) Formatted Word documents of the header, geology and geotechnical dictionaries were created (*CoalLog Header Dictionary.doc, CoalLog Geology Dictionary.doc* and *CoalLog Geotech Dictionary.doc).* In these, items were sorted within each category by description. For some categories, such as Colour, this was alphabetical and for others such as Lithology and Weathering it was by their geological meaning.

2.2 Committee Meetings

An initial meeting was held in Brisbane in June 2010 to discuss the prototype. Twenty-six people attended the meeting including representatives from:

- coal mining companies including Anglo American, Aquila, BMA, EndoCoal, New Hope and Rio Tinto with apologies from Bowen Central Coal , Centennial Coal, Peabody and Xstrata
- geological data collection companies including Resolve and Moultrie
- geological software companies including acQuire, GeoCheck, Maptek, MicroMine, Mincom, Minex and Snowden
- consultants, including Paul Maconochie from GeoTek Solutions, John Simmons from Sherwood Geotechnical and Research Services, David Green from GEMS, with apologies from Joe Gough and Bret Leisemann
- the NSW Department of Industry and Investment (formerly Mines Department)

Useful feedback was also received by email on the prototype from Centennial Coal and Palaris Mining.

At this meeting it was decided that:

1) the set of principles outlined in Chapter 3 should be adhered to in the development of this standard.

2) there needed to be a specification for the actual layout of the sheets and the dictionary as well as the transfer of data between software systems. In particular, how to handle several lithologies recoded in a single unit, how depths were handled (tops and bases or only bases and whether they were recorded just on the first line of a unit or all lines) and how comments were handled.

3) there should be a standard on what information is recorded in the "Other Information" block of LAS files and the format for this information.

4) to establish four subcommittees to develop the standard viz.:
   - geology sheet and dictionary subcommittee chaired by David Green
   - geotech sheet and dictionary subcommittee chaired by John Simmons
   - software data transfer subcommittee chaired by Brett Larkin
   - LAS header subcommittee.

Over the next eighteen months, the Geology subcommittee met six times and was hosted by Anglo American, Snowdens, BMA, Aquila and ACARP. It included representatives from:

- coal mining companies: Anglo American, Aquila, BMA, Bowen Central , Centennial, Rio Tinto, Vale and Xstrata
- consulting companies: GEMS, GeoCheck, Moultrie, Resolve, Snowden
- government: NSW Department of Industry and Investment

Over this time, the Geotech subcommittee also met three times and was hosted each time by Rio Tinto. It included representatives from:

- coal mining companies: Anglo American, BMA, Rio Tinto
- consulting companies: AMC Consultants, GeoCheck, Geotechnical Consulting Services (GCS), GeoTek Solutions, Insite Geology, Resolve, Sherwood Geotechnical and Research Services.

Also over this time, the Data Transfer subcommittee met twice and was hosted by acQuire and Mincom. It included representatives from:

- coal mining companies: Vale
- geological software companies: acQuire, EpSoft, Gemcom, GeoCheck, MapTek, MicroMine, Mincom

Unfortunately, the LAS subcommittee did not meet as it included a number of people who were actively involved in the other subcommittees and could not afford any more additional time. It is envisaged that it will meet in the future as the work of the other subcommittees winds down (see Chapter 7: Future Developments)

There was a final meeting of all the subcommittees together in January 2012 to ratify this document before printing.

Following the release of Version 1.0, a review committee was established. This met twice to review and ratify the minor changes for Version 1.1.

3 Design Principles

The Standard has been designed based on the following principles:

1. **It has been developed for the Australian coal industry.**

   Even though other commodities or countries may find it useful, their requirements have not been taken into account. It has been developed by representatives of the Australian coal industry.

2. **Existing Standards have been incorporated.**

   All relevant existing Standards for describing geological or geotechnical data have been incorporated.

3. **It is for the capture of observations rather than interpretations.**

   Fields and codes have been developed only for the capture of observations. Interpretation of the data is not covered by this Standard.

4. **Minimize amount of data entry.**

   Fields and codes have been designed with the aim of minimizing the number of keystrokes required to enter data

5. **The coding sheets and data table layouts are flexible and comprehensive.**

   The Standard defines the fields that can be included in a coding sheet or data table. The order can be modified and fields can be omitted except for a very limited number of compulsory fields.

6. **The fields and dictionary codes are extremely comprehensive.**

   All necessary drilling, geological, and geotechnical data from a borehole can be recorded in the Standard. All included fields are of sufficient size and style to record logging data in common use. Fields which use codes from the dictionary have specified field lengths. Other fields, such as Hole Name, Depth, Seam Name etc., have specified maximum field lengths and a maximum number of places after the decimal point (Appendix A and *CoalLog Coding Sheet Specifications.xls*). The dictionary includes all necessary codes to enable comprehensive logging of boreholes in Australian coalfields (Appendix C and CoalLog Header Dictionary.doc, CoalLog Lithology Dictionary.doc, CoalLog Geotechnical Dictionary.doc). The Standard also includes descriptions of dictionary codes (Chapter 5).

7. **Recommended coding sheets are provided.**

   A coding sheet containing all the fields at their maximum field lengths will not fit onto a single A4 sheet of paper. Coding sheets with recommended fields less than the maximum which fit onto a single A4 sheet of paper have been provided (Appendix B and *CoalLog Coding Sheets.pdf*).

8. **The fields, field names and specifications, and dictionary codes are fixed.**

   Unique names have been given to Dictionary Categories and Data Fields and a set of Codes provided in a dictionary for most fields. If fields or dictionary items are changed or added to the database, it will not comply with the Standard. Any extract from a database which contains additional fields or dictionary codes must exclude non-compliant items.

9. Dictionary category names are unique across all data types.

Where the same dictionary category name is used in more than one data type, it refers to the same set of dictionary codes, For example, the category Defect_Type is used by both the Lithology and Geotechnical sheets and has a common set of codes for both sheets.

10. Codes for specific items are consistent across all fields wherever possible.

Where a description occurs in more than one coded field, it should have the same code in each field that it used. For example, "quartz" has the same code QZ in Lithologies, Minerals, Defect Infill Types, and as "quartzose" in Adjectives.

11. The most commonly used code is retained except where there is a conflict within the field.

As far as practically possible, the codes in most common use have been included in the Standard except where they are inconsistent (see previous principle) or are in use for another item.

12. There is only one way to record a particular feature.

Even though the standard is designed to be as comprehensive as possible, it also attempts to remove any redundancies between fields, and to minimise the amount of information stored in the Adjectives or Comments fields. Information that can be stored in a specific field (eg secondary lithology, minerals, geotechnical features, etc) should not be recorded elsewhere. This has resulted in a substantial reduction in the number of valid codes available in Adjectives. This should also enable an improvement with database searches and data compilation.

13. A standard dictionary is not provided for all fields.

Standardisation of some fields would require comprehensive compilation, revision, and agreement. Users may currently determine their own codes for:

Geological Organisation, and Geophysical Company on the Header sheet

Drilling Company, Rig Type, Bit Type, Drilling Fluid or Drill Size Name on the Drilling sheet

Seam Name, Stratigraphic Unit Name and Horizon Name on the Lithology sheet.

However, the Standard does specify recommended and maximum sizes for these fields.

14. Fields should record information unique to that record.

Redundant information should not be included in fields such as Seam and Sample Number, whose contents are not defined by the Standard. For example:

the Seam Name should not include Ply Name

Sample Number should not include Hole Name

If required, it is always possible to later combine information recorded in two separate fields into a single item but it is often very difficult if not impossible to modify or extract separate items of data that have been stored together.

15. Dates are recorded in DD/MM/YYYY format.

Note that in this format the "/" is included in the date.

16. Only the "base" or "to" depth is recorded.

Base depths of lithological units and rock mass units are recorded on the coding sheets as it is assumed that the "top" or "from" depth is the previous "base" depth. Where a "top" depth is not equal to the previous "base" depth, the user is required to add an additional record (eg Lithology = Not Logged (NL) or Not Recorded (NR)) explaining why no data exists for the interval. The base or middle depth of a defect can be recorded in the geotech sheet, but which of these conventions has been used must be clearly specified.

17. Secondary lithologies should be recorded where they comprise >10% of a unit.

To promote the collection of lithology data that can be searched, extracted, plotted, and used, the Standard encourages the recording of any distinct lithology which comprises >10% of a logged unit to be individually described. Most lithology codes have been removed from Adjectives. A Lithology Percentage must be recorded for each Lithology and these must add up to a total of 100% for the unit.

18. Geotechnical fields on the Lithology sheet should only be used when the Geotechnical sheet is not used.

If detailed information is collected for individual geotechnical features (on the Geotechnical coding sheet) it is expected that a Lithology sheet will also be completed, but it is not necessary to fill in the Geotechnical fields of this sheet.

19. All dips are recorded relative to the perpendicular to the core axis.

That is, if the borehole is vertical then the dip of any feature is measured from the horizontal.

20. Provision has been made for some frequently used historical codes to be retained but they should not be used.

Some dictionary items are included for historical data but should not be used for data collection in the future. For example, the term "Coal Inferior" is too vague as it is unclear what it is inferior to or how it is inferior. Is it because it is stony, weathered, heat affected, or something else? Consequently it cannot be easily converted to a "standard" code and needs to be retained. Dictionary items that are only for historical data are shown in the dictionary in a grey font rather than black.

21. Software using the standard must be able to support the full coding sheet formats and dictionaries.

The design specifications of CoalLog (Appendix A, and CoalLog Coding Sheet Specifications.xls) must be supported by any compliant software directly or by provision of conversion scripts to enable direct transfer of data.

22. The data transfer format does not rely on the order of its records.

The records in the data transfer format can be in any order without loss of meaning.

4 Data Layout

This standard defines data layouts (Appendix A & B) for hand written manual logging in situations where computerised field data capture techniques may not be available. The suggested templates are based on a standard A4 sheet size for the following data types:

Header

Geologists

Casing

Cementing

Drilling

Lithology

Water Observations

Rock Mass Units and Defects

Point Load Tests.

This chapter shows data recorded on the recommended sheet formats to demonstrate these layouts. A different layout can be used on the condition that it only contains fields listed in the specifications and they are less than or equal to the maximum field sizes in these specifications. In examining these sheets, it may be useful to refer to the relevant dictionary in Appendix C.

4.1 Header, Geologists, Casing and Cementing Logs

Figure 4.1 shows a completed Hole Status Sheet which includes Header, Geologists, Casing and Cementing Logs. Previously, the name of the geologist who logged the hole, the casing data, and cementing data were often recorded as part of the header but this had the disadvantage that there was only space for a single value for the entire hole. If any of these items changed going down the hole, there was no facility for recording multiple values and their depths.

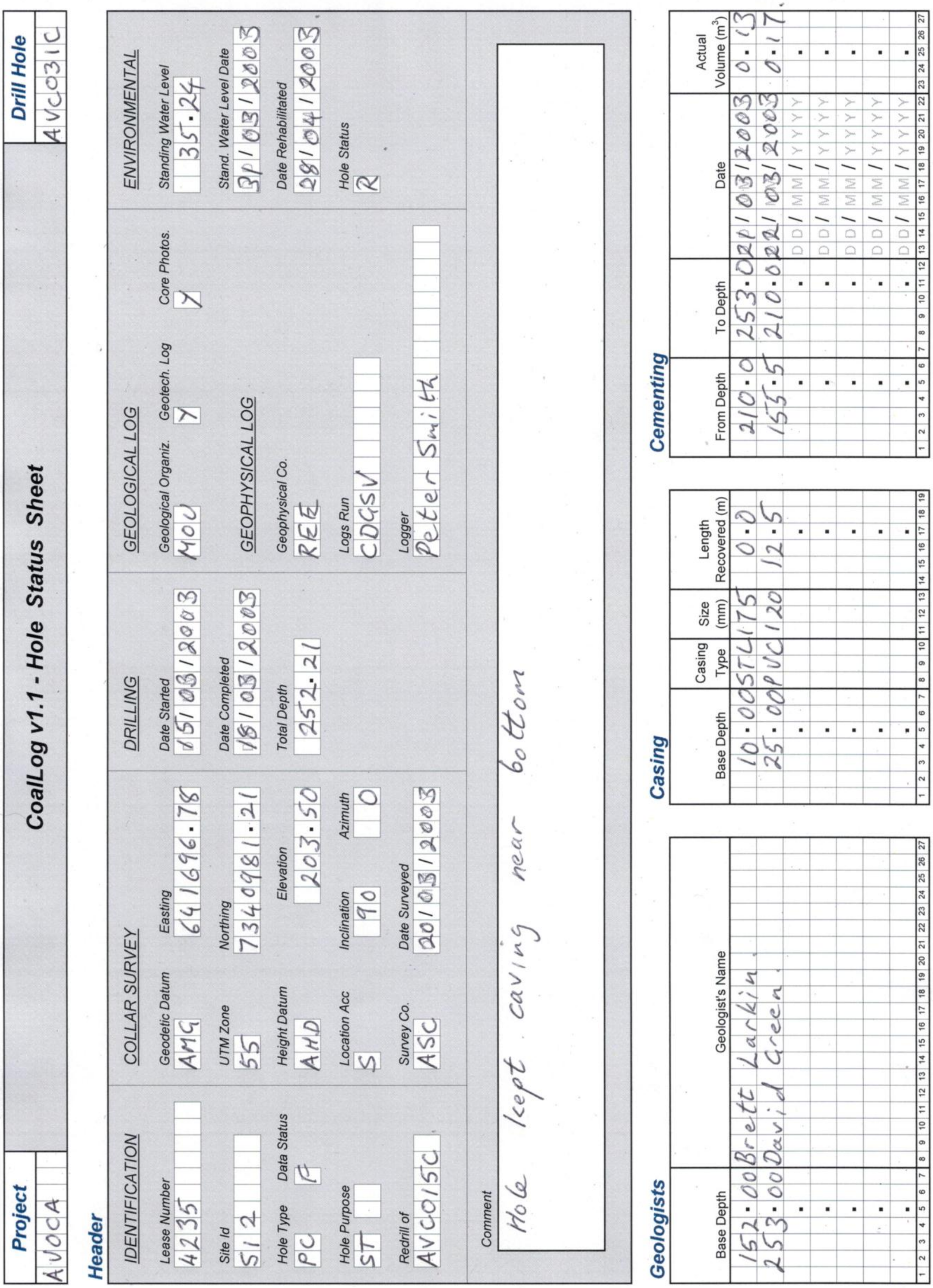
There are no compulsory fields in the Header data. Date Started and Date Completed can be omitted from the Header data if this information is recorded in a Drilling Log.

The only required field for the Geologists and Casing Logs is the Base Depth.

The Cementing Log differs from all others as it starts at the bottom of the hole and then progresses up the hole and is based on From and To rather than Base depths. From and To are the only required fields in this log.

4.2 Drilling Logs

Figure 4.2 shows a completed Drilling Log. A new line needs to be entered into this log every time any of the fields change in value. The only required fields in this log are Base Depth and Bit Type.



Project: AVOCA

CoalLog v1.1 - Hole Status Sheet

Drill Hole: AVC031C

Header

IDENTIFICATION
- Lease Number: 4235
- Site Id: SI2
- Hole Type: PC
- Data Status: F
- Hole Purpose: ST
- Redrill of: AVC015C

COLLAR SURVEY
- Geodetic Datum: AMG
- Easting: 641696.78
- UTM Zone: 55
- Northing: 7340981.21
- Height Datum: AHD
- Elevation: 203.50
- Location Acc: S
- Inclination: 90
- Azimuth: 0
- Survey Co.: ASC
- Date Surveyed: 20/03/2003

DRILLING
- Date Started: 15/03/2003
- Date Completed: 18/03/2003
- Total Depth: 252.21

GEOLOGICAL LOG
- Geological Organiz.: MOU
- Geotech. Log: Y
- Core Photos.: Y

GEOPHYSICAL LOG
- Geophysical Co.: REE
- Logs Run: CDGSV
- Logger: Peter Smith

ENVIRONMENTAL
- Standing Water Level: 35.24
- Stand. Water Level Date: 31/03/2003
- Date Rehabilitated: 28/04/2003
- Hole Status: R

Comment: Hole kept caving near bottom

Geologists

Base Depth	Geologist's Name
152.00	Brett Larkin
253.00	David Green

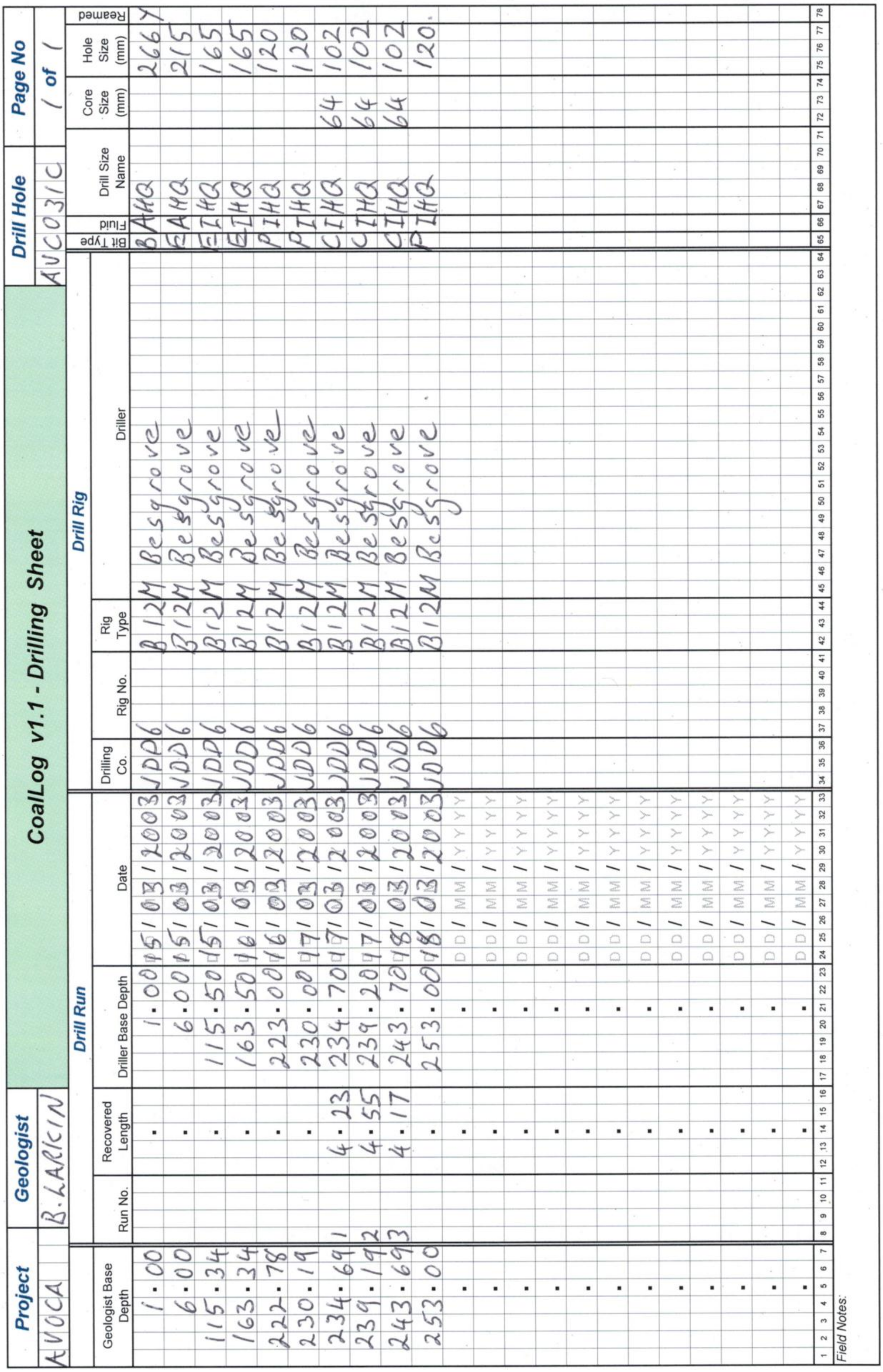
Casing

Base Depth	Casing Type	Size (mm)	Length Recovered (m)
10.00	STL	175	0.0
25.00	PVC	120	12.5

Cementing

From Depth	To Depth	Date	Actual Volume (m³)
210.0	253.0	21/03/2003	0.13
155.5	210.0	22/03/2003	0.17

Figure 4.1: Hole Status Sheet with example data



Project: AVOCA | **Geologist:** B. LARKIN | **CoalLog v1.1 - Drilling Sheet** | **Drill Hole:** AUC031C | **Page No:** 1 of 1

Geologist Base Depth	Run No.	Recovered Length	Driller Base Depth	Date	Drilling Co.	Rig No.	Rig Type	Driller	Bit Type	Fluid	Drill Size Name	Core Size (mm)	Hole Size (mm)	Reamed
1.00			1.00	15/03/2003	JDD	6	B12M	Besgrove	B	A	HQ		266	Y
6.00			6.00	15/03/2003	JDD	6	B12M	Besgrove	E	A	HQ		215	
115.34			115.50	15/03/2003	JDD	6	B12M	Besgrove	E	I	HQ		165	
163.34			163.50	16/03/2003	JDD	6	B12M	Besgrove	E	I	HQ		165	
222.78			223.00	16/03/2003	JDD	6	B12M	Besgrove	P	I	HQ		120	
230.19			230.00	17/03/2003	JDD	6	B12M	Besgrove	P	I	HQ		120	
234.69	1	4.23	234.70	17/03/2003	JDD	6	B12M	Besgrove	C	I	HQ	64	102	
239.19	2	4.55	239.20	17/03/2003	JDD	6	B12M	Besgrove	C	I	HQ	64	102	
243.69	3	4.17	243.70	18/03/2003	JDD	6	B12M	Besgrove	C	I	HQ	64	102	
253.00			253.00	18/03/2003	JDD	6	B12M	Besgrove	P	I	HQ		120	

Field Notes:

Figure 4.2: Drilling Sheet with example data

4.3 Lithology Logs

Figure 4.3 shows a completed Lithology Log. No fields are required on every line although Base Depth and Lithology are required on the first line of every new lithological unit.

Continuation Lines

It is common practice in Australian coal exploration data to have lithological units consisting of more than a single lithology (for example the unit with a Base Depth of 78.23 in Figure 4.3). It is also common to record more detail for a lithology than will fit onto a single line (for example the unit with a Base Depth of 48.05 in Figure 4.3).

Most systems also have facilities for recording comments similar to that at the bottom of Figure 4.3. Software will often require specific continuation flags to handle comments but these are not required by CoalLog. Whilst they have not been included in the recommended Lithology Sheets, some users may still need to add a continuation field to their logging sheets for use by their software.

For units with a single lithology, the Lithology % field should be left blank.

For units with multiple lithologies, (for example at Base Depth 78.23 in Figure 4.3) Lithology % is required on every line with a Lithology, and Interrelationship is required on every line with a Lithology that is followed by another Lithology. The sum of the Lithology %'s for the unit must add up to 100%.

Where the description for a unit does not fit onto a single line, it may be continued onto the next line as with the Sandstone with a Base Depth of 48.05. In both the case of multiple lithology lines and multiple description lines, the lines subsequent to the first line in a lithological unit may either have the Base Depth set to blank as in the example, or to the Base Depth of the unit.

A comment can be recorded as a separate line (or series of lines) on the logging sheet following the unit it references, as at the bottom of Figure 4.3. There is no limit on the size of individual comments and they may contain non-printable characters such as an "Enter" (generated by pressing the Enter key on the keyboard). Comments are generally stored in their own field in a database on the same record as the unit they reference.

Horizon Field on Lithology Sheet

A separate field has been included on the Lithology sheet for recording horizons. A Horizon is a zero thickness item such as base of Tertiary, base of weathering, water level, or top of a particular formation. It is entered on the record whose base depth matches the depth of the horizon, for example the water level at Base Depth 7.00 in Figure 4.3. Note that to specify the Horizon, it may be necessary to split a lithological unit in two, as in the example where the water level occurs within the basalt that lies between 1.00 and 10.00 metres.

Rather than having a separate formation name column, users who want to record formations should do so by entering either the “top of” or “base of” the formation in the Horizon field. These horizons should start with a “T” and a “B” respectively followed by a mnemonic for the formation.

Having a separate field for Horizon information has the following advantages:
It eliminates the need to allow for zero thickness units enabling software to flag any zero thickness units as erroneous.
As zero thickness units are now not valid, the same base depth repeated on subsequent lines can be used, if desired, as a flag to indicate the continuation of a unit.
It separates horizon information from seam/stratigraphic information. When examining data by eye or with computer software, it can be confusing when the two types of information are together, especially when there is a Horizon such as ’Water Level’ in the middle of a seam.

Lithological Qualifier
A field called Lithological Qualifier is included in the Lithology Sheet to control how a lithology is displayed on a graphic log. It is only used for coals, unconsolidated sediments, conglomerates and sandstones:
for coals, it includes brightness of the coal, or whether it is cindered, fusainous, sapropelic, etc.
for unconsolidated sediments, it includes clayey, silty, sandy, gravelly, and size categories for gravels and sands, (e.g., a gravel or silt may be described as sandy)
for conglomerates, it contains clast sizes
for sandstones, it contains grain sizes.

This enables software to produce a graphic log with the option of displaying lithologies just based on their lithology code, or on their lithology code and lithology qualifier combined. Similarly, it also enables reports or statistics to be generated on the lithology code alone, or the lithology code and qualifier combined.

Geotech Fields on Lithology Sheet
It is recommended that a full geotechnical log be completed on all cored sections of boreholes. However, where a full geotechnical log is not being recorded then the geotechnical characteristics of the rock can be recorded in the Estimated Strength, Bed Spacing, Defect Type, Defect Intact, Defect Spacing, and Defect Dip fields of the Lithology Sheet. When a full geotechnical log is being recorded these fields should be omitted from the Lithology Sheet, although Weathering should still be recorded in the Lithology log as well as the Geotechnical Log.

Defects
Each Defect entry can consist of Defect Type, Defect Intact, Defect Spacing and Defect Dip. If the entry refers to a single defect then the Defect Spacing must be left blank (e.g. the fault in the siltstone unit with a base depth of 31.41 in Figure 4.3). If the entry refers to a set of defects then a Defect Spacing must be entered (e.g. the three sets of joints occurring in the basalts with base depths of 24.53 and 28.92 in Figure 4.3).

Defect Intact

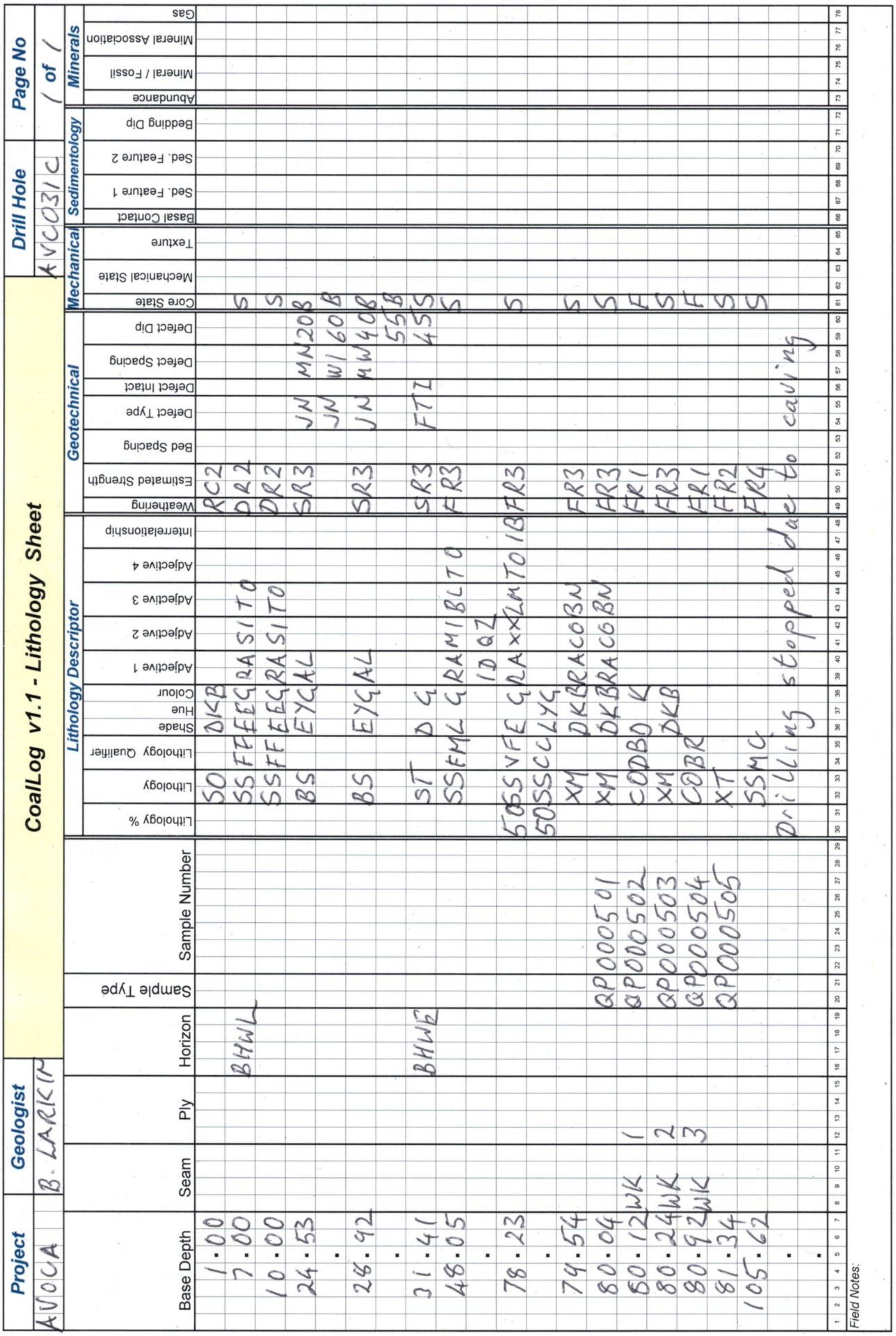
If the defect or defects are intact then an “I” must be entered in the Defect Intact column (e.g. the intact fault in the siltstone unit with a base depth of 31.41 in Figure 4.3). If the defect or defects are not intact then the Defect Intact column must be left blank (e.g. the three sets of non-intact joints in the basalts with base depths of 24.53 and 28.92 in Figure 4.3).

Defect Dip and Bedding Dip

The general convention in the Australian coal industry is that all dip angles should be recorded relative to the perpendicular to the core axis. In other words, if the borehole is vertical then the dip of any feature is measured from the horizontal.

Defect Dips

Where all the defects in a set of defects have the same dip, that dip is entered in the Defect Dip field on the same line as its Defect Type (e.g. the basalt with a base depth of 24.53 in Figure 4.3 consists of two sets of joints, one at 20° with moderately narrow spacing and another at 60° with wide spacing). Where the dips of the defects in a set of defects range between two angles, then both the minimum and the maximum dips should be recorded. The minimum dip angle must be entered in the Defect Dip field on the same line as its Defect Type, and the maximum dip angle should be entered on the next line with the Defect Type field on this line left blank, (e.g. the basalt with a base depth of 28.92 in Figure 4.3 consists of a set of moderately wide spaced joints ranging in dip between 40° and 55°).



CoalLog v1.1 - Lithology Sheet

Project	Geologist	Drill Hole	Page No
AVOCA	B. LARKIN	AVC031C	1 of 1

Base Depth	Seam	Ply	Horizon	Sample Type	Sample Number	Lithology %	Lithology	Lithology Qualifier	Shade	Hue	Colour	Adjective 1	Adjective 2	Adjective 3	Adjective 4	Interrelationship	Weathering	Estimated Strength	Bed Spacing	Defect Type	Defect Intact	Defect Spacing	Defect Dip	Core State	Mechanical State	Texture	Basal Contact	Sed. Feature 1	Sed. Feature 2	Bedding Dip	Abundance	Mineral / Fossil	Mineral Association	Gas
1.00							SO		D	K	B						R	C2																
7.00			BHWL				SS	FF	E	E	G	RA	SI	TO			D	R2						S										
10.00							SS	FF	E	E	G	RA	SI	TO			D	R2						S										
24.53							BS		E	Y	G	AL					S	R3		JN		MN	20	B										
.																				JN		WI	60	B										
28.92							BS		E	Y	G	AL					S	R3		JN		MW	40	B										
.																							55	B										
31.41			BHWE				ST		D		G						S	R3		FT	I		45	S										
48.05							SS	FM	L		G	RA	MI	BL	TO		F	R3						S										
												ID	QZ																					
78.23						50	SS	VF	E		G	RA	XX	LM	TO	IB	F	R3						S										
.						50	SS	CC	L	Y	G																							
79.54							XM		D	K	B	RA	CO	BN			F	R3						S										
80.04				QP	000501		XM		D	K	B	RA	CO	BN			F	R3						S										
80.12	WK	1		QP	000502		CO	DB	D		K						F	R1						F										
80.24	WK	2		QP	000503		XM		D	K	B						F	R3						S										
80.92	WK	3		QP	000504		CO	BR									F	R1						F										
81.34				QP	000505		XT										F	R2						S										
105.62							SS	MC									F	R4						S										
.						Drilling stopped due to caving																												
.																																		

Field Notes:

Figure 4.3: Lithology Sheet with example data

4.4 Water Observation Logs

Figure 4.4 shows a completed Water Log. A new line needs to be entered into this log for every water sample. Depth is required for every line and Test Type is required for all samples where either Flow Height or Flow Rate is recorded.

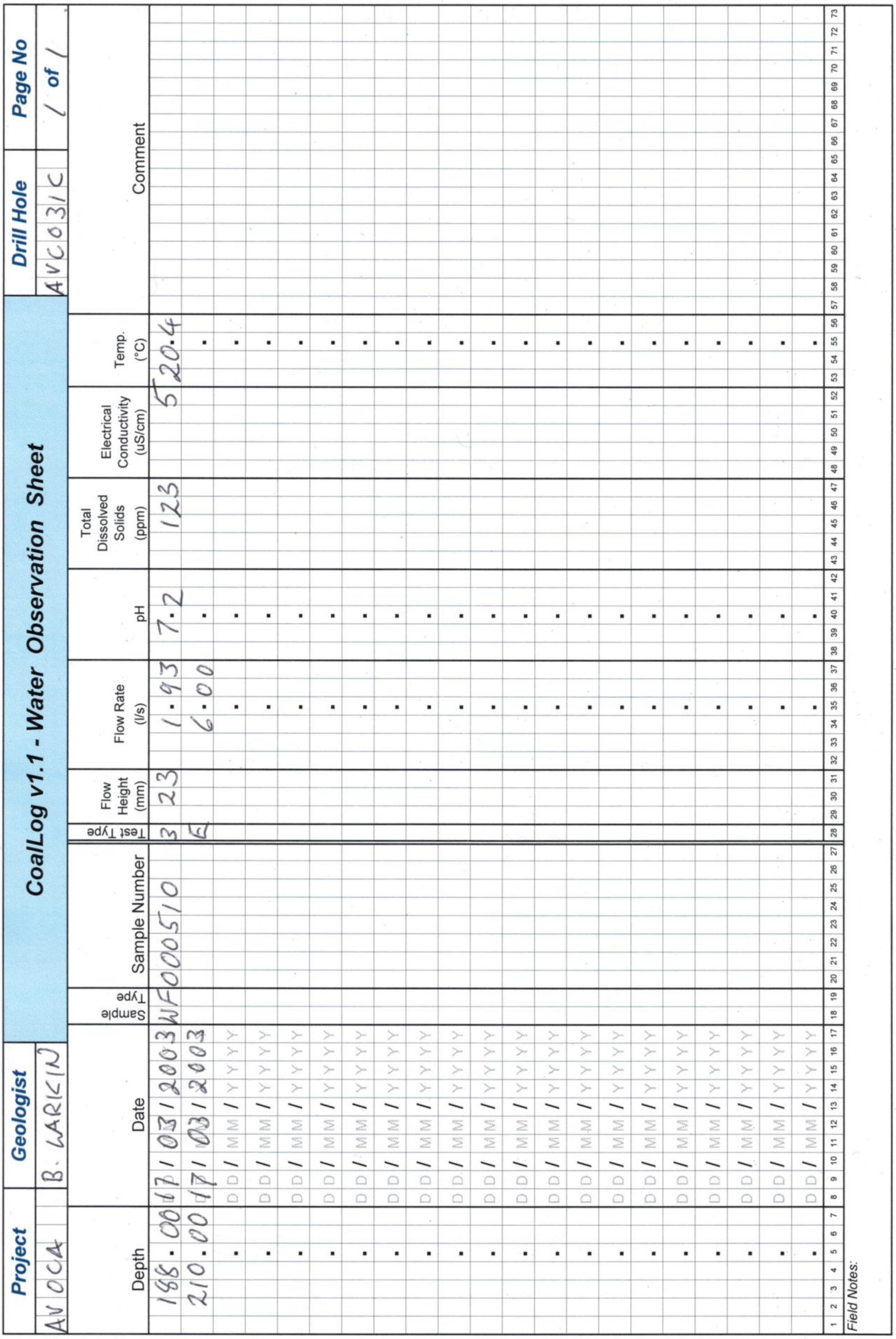


Figure 4.4: Water Observation Sheet with example data

4.5 Rock Mass Unit (RMU) and Defects Logs

Figure 4.5 shows a completed Rock Mass Unit and Defects Log. The left-hand side of the sheet contains data on each Rock Mass Unit in the hole and the right-hand side shows data on the individual defects.

Rock Mass Unit

A Rock Mass Unit is not a lithological unit but a unit with common geotechnical characteristics such as: weathering, strength, plasticity, or defect spacing throughout the entire unit. It may well consist of a group of adjacent lithological units which all have the same geotechnical characteristics e.g. sandstone interbedded with siltstone and siltstone interbedded with sandstone may be merged into a single RMU. If part of a single lithological unit has different geotechnical characteristics to the rest of the unit then it should be divided into a separate lithological unit for each rock mass unit, even though the lithology is the same throughout. For example, massive sandstone split into fresh and slightly weathered RMU's.

RMU Base Depth and Type are required for every RMU. Weathering and Estimated Strength are required for the RMU Types: broken zone (B), core with defects (D) and unbroken core (U).

Rock Mass Unit Type

The RMU Type is chiefly an indicator to software on what data must be recorded for the unit and how the RMU should be treated for the calculation of parameters such as RQD (Rock Quality Designation) and Fracture Frequency. For example, each of: Broken Zone, Core Loss, Open Hole and Unbroken Core, will not have any individual defect data but will have very different values for RQD and Fracture Frequency.

Defects

Any rock mass defect is a surface or zone at or within which the geomechanical properties are significantly different from those of the surrounding rock material and therefore potentially or actually exerts an influence on the rock mass strength. The geotechnical purpose of logging defects is to provide information for assessing the influence of the defect on rock mass strength and behaviour as reliably as possible.

Individual defect data must include Defect Depth, Defect Type, Defect Angle, Surface Shape, and Surface Roughness.

Where the RMU Type is 'core with defects' (D) then the individual defects within the RMU must be recorded. These must be recorded in the sheet after the previous RMU and before or on the line containing the RMU which they are within (e.g. the defects in the RMU between 232.39 and 235.75 in Figure 4.5).

The only other RMU Types that can have defect data are 'Broken Zones'. However, defect data for Broken Zones cannot have specified Defect Depths as any defect data applies to multiple defects throughout the zone.

<u>Defect Depth</u>

Defect Depths can be either recorded at the middle or the base of the defect although it must be clearly stated which convention has been used and there must be consistency across the entire data set.

<u>Defect Length</u>

The Defect Length is the length of core affected by the defect (e.g. the broken zone with a defect depth of 233.98 in Figure 4.5 affect 110mm of the core).

<u>Defect Intact</u>

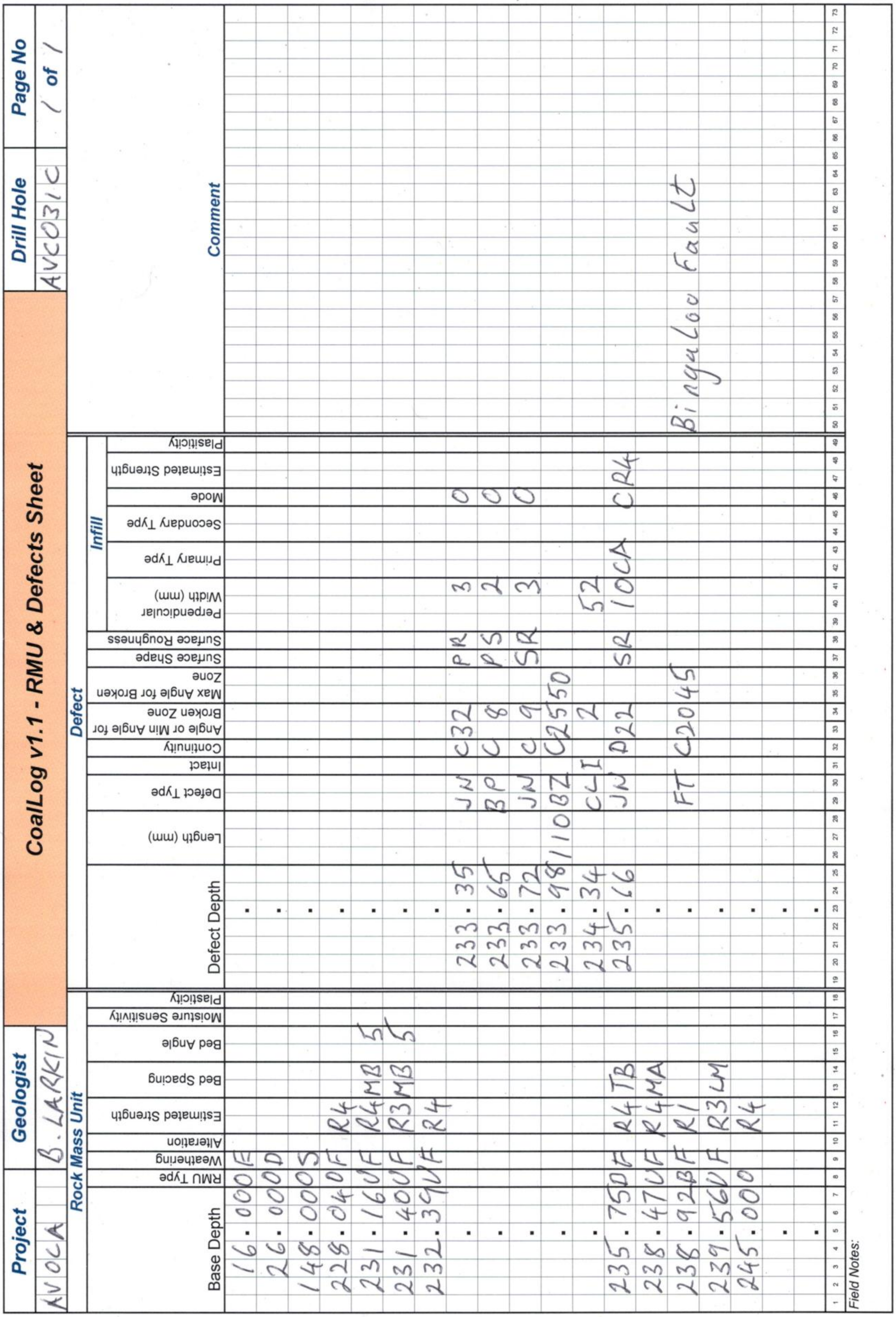
If the defect is intact then an "I" must be entered in the Defect Intact column (e.g. the intact clay band with a defect depth of 234.34 in Figure 4.5). If the defect or defects are not intact then the Defect Intact column must be left blank.

<u>Bed Angle; Angle or Minimum Angle for Broken Zone; Maximum Angle for Broken Zone</u>

The general convention in the Australian coal industry is that all dip angles should be recorded relative to the perpendicular to the core axis. Therefore, for vertical boreholes the dip of any feature is measured from the horizontal.

<u>Perpendicular Width</u>

Perpendicular Width is the width of material within the defect as measured perpendicular to the defect.



CoalLog v1.1 - RMU & Defects Sheet

Project	Geologist	Drill Hole	Page No
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Base Depth	RMU Type	Weathering	Alteration	Estimated Strength	Bed Spacing	Bed Angle	Moisture Sensitivity	Plasticity	Defect Depth	Length (mm)	Defect Type	Intact	Continuity	Angle or Min Angle for Broken Zone	Max Angle for Broken Zone	Surface Shape	Surface Roughness	Perpendicular Width (mm)	Primary Type	Secondary Type	Mode	Estimated Strength	Plasticity	Comment
16.00	0	E																						
26.00	0	D																						
148.00	0	S																						
228.04	0	F		R4																				
231.16	U	F		R4	MB	5																		
231.40	U	F		R3	MB	5																		
232.39	U	F		R4																				
									233.35		JN		C	32		P	R	3			O			
									233.65		BP		C	8		P	S	2			O			
									233.72		JN		C	9		S	R	3			O			
									233.98	110	BZ		C	25	50									
									234.34		CL	I		2				52						
235.75	D	F		R4	TB				235.66		JN		D	22		S	R	10	CA		C	R4		
238.47	U	F		R4	MA																			
238.92	B	F		R1							FT		C	20	45									Bingaloo Fault
239.56	U	F		R3	LM																			
245.00	0			R4																				

Field Notes:

Figure 4.5: Geotech Sheet with example data

4.6 Point Load Data Logs

Figure 4.6 shows a completed Point Load Data Log. Often when performing point load tests a single stick of core will be broken numerous times. In the example provided, each of the three sticks of core was broken seven times to achieve results. Each stick was initially broken in two using a diametral test, that is, breaking it perpendicular to the long axis of the core. Each of the two resulting sticks were then submitted to a second diametral test resulting in four sticks of core, and then these were each subjected to an axial test, that is they were loaded along the long axis of the core.

For each new stick of core, a line is recorded with a Base Depth, Sample Length, Sample State, Sample Type, and Sample Number. All of these, except Sample Type, are required for each new stick of core. For each individual test of the stick, a Test Sample Id, Test Type, Platen Separation, Width, Failure Load, and Failure Mode are required. In addition, the user can enter the base depth of the sub-sample.

As the only coded fields on this sheet are Sample Type which is given in the Lithology Dictionary and Sample State, Test Type and Failure Mode, which are all shown at the bottom of the coding sheet, no specific Point Load dictionary is provided in Appendix C.

Test Sample Id

Test Sample Id can be any sequence of numbers and/or characters. The only restriction is that each Test Sample Id for a single sample number must be unique.

Test Sample Midpoint Depth

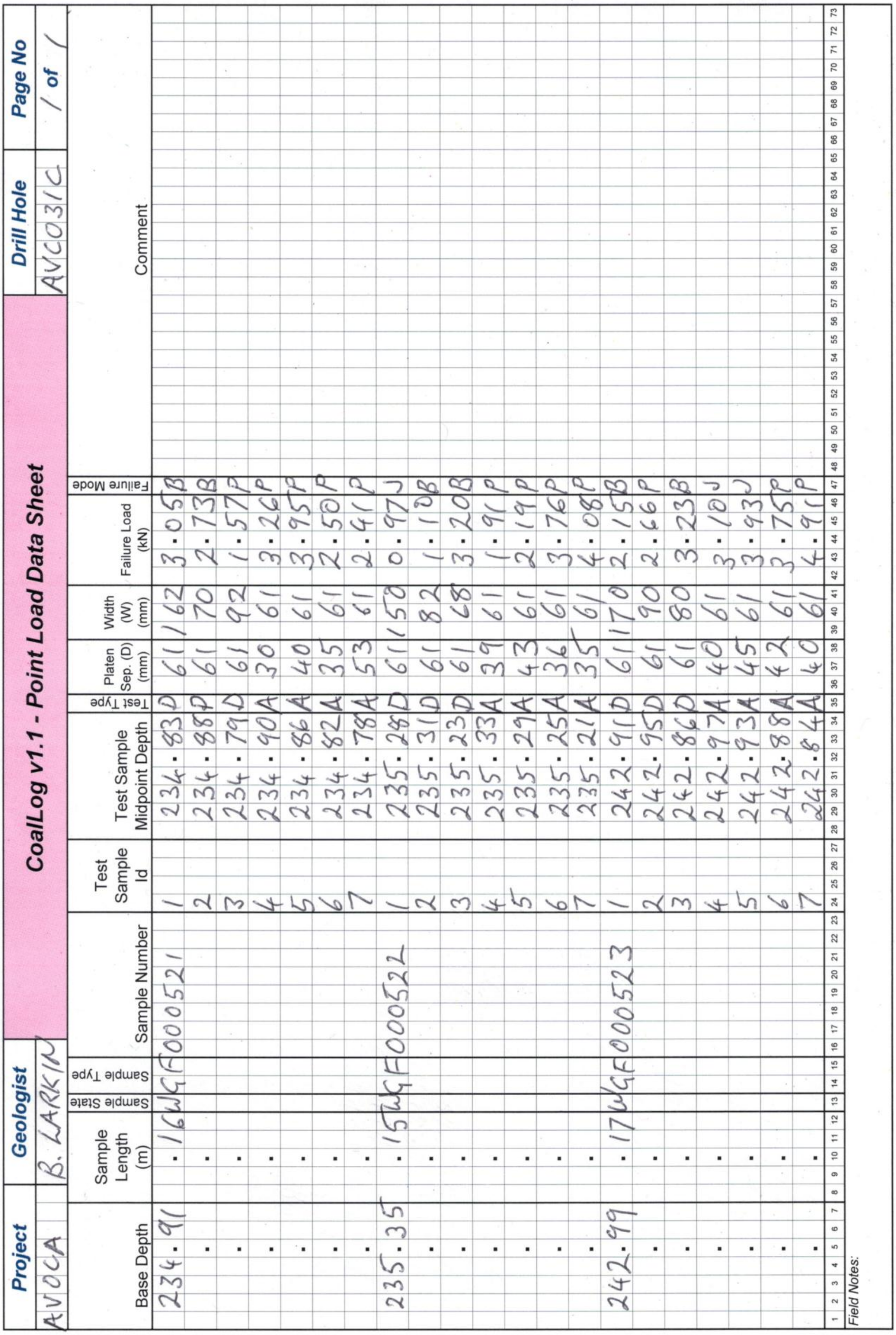
Test Sample Midpoint Depth is the depth of the midpoint of the Test Sample. This records the actual location of the test sample. This field may be omitted at the discretion of the user. Note that the length of the Sub Sample will be the Width described below for Diametral tests and the Platen Separation for Axial tests.

Platen Separation

Platen separation is the distance between the platens when the sample is mounted in the point load tester. For diametral tests, this is generally the core diameter and for axial tests it is the length of the sample.

Width

Width is the width of the sample perpendicular to the direction of the load. For diametral tests, this is generally the length of the sample and for axial tests it is the core diameter.



Project	Geologist	CoalLog v1.1 - Point Load Data Sheet	Drill Hole	Page No
AVOCA	B. LARKIN		AVC031C	1 of 1

Base Depth	Sample Length (m)	Sample State	Sample Type	Sample Number	Test Sample Id	Test Sample Midpoint Depth	Test Type	Platen Sep. (D) (mm)	Width (W) (mm)	Failure Load (kN)	Failure Mode	Comment
234.91	.16	W	GF	000521	1	234.83	D	61	162	3.05	B	
.	.				2	234.88	D	61	70	2.73	B	
.	.				3	234.79	D	61	92	1.57	P	
.	.				4	234.90	A	30	61	3.26	P	
.	.				5	234.86	A	40	61	3.95	P	
.	.				6	234.82	A	35	61	2.50	P	
.	.				7	234.78	A	53	61	2.41	P	
235.35	.15	W	GF	000522	1	235.28	D	61	150	0.97	J	
.	.				2	235.31	D	61	82	1.10	B	
.	.				3	235.23	D	61	68	3.20	B	
.	.				4	235.33	A	39	61	1.91	P	
.	.				5	235.29	A	43	61	2.19	P	
.	.				6	235.25	A	36	61	3.76	P	
.	.				7	235.21	A	35	61	4.08	P	
242.99	.17	W	GF	000523	1	242.91	D	61	170	2.15	B	
.	.				2	242.95	D	61	90	2.66	P	
.	.				3	242.86	D	61	80	3.23	B	
.	.				4	242.97	A	40	61	3.10	J	
.	.				5	242.93	A	45	61	3.93	J	
.	.				6	242.88	A	42	61	3.75	P	
.	.				7	242.84	A	40	61	4.91	P	

Field Notes:

Sample State: D = Dry, W = Wet   Test Type: D = Diametral, A = Axial, I = Irregular   Failure Mode: P = penetrative, J = joint, B = bedding plane

Figure 4.6: Point Load Data Sheet with example data

5 Dictionary Descriptions

This Chapter provides all of the dictionary items, their codes, descriptions, and a source of the description (where available). They are arranged in order of Header (blue), Lithology (yellow), and Geotechnical (green).

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
HOLE TYPE			
Fully cored	**FC**	Borehole cored from surface to total depth.	
Open/chip	**OC**	Borehole drilled using open-hole methods from surface to total depth.	
Partly cored	**PC**	Borehole chipped to target depths prior to coring.	
Reverse Circulation	**RC**	Borehole chipped to total depth using reverse circulation to return samples through the drilling rods.	
HOLE PURPOSE			
Coal Quality	**CQ**	Borehole drilled to obtain samples for laboratory testing and coal analysis.	
Environmental	**EN**	Borehole drilled to obtain samples of strata for laboratory analysis of parameters which may impact on the environment.	
Gas	**GS**	Borehole drilled for gas analysis. Typical applications include exploration, compliance and greenhouse gas emissions.	
Geotech	**GT**	Borehole drilled to investigate the geotechnical properties of the strata and provide samples for mechanical testing.	
Hydrological	**HY**	Borehole drilled to investigate water level or for piezometer installation.	
Lox	**LX**	Borehole drilled to obtain samples to determine the amount of oxidation of any coal seam by either visual and tactile or coal analysis methods.	
Service	**SV**	Borehole drilled to provide a conduit or access to and from mine workings for equipment or materials.	
Structure	**ST**	Borehole drilled to investigate the attitude of strata and the impact of any tectonic features.	
DATA STATUS			
Raw/Uncorrected	**R**	Not depth adjusted.	
Adjusted to geophysics	**A**	Data is adjusted to match geophysical logs.	
Seams adjusted to geophysics	**S**	Seams are adjusted to match geophysical logs.	
Corrected to verticality	**V**	Data adjusted to Verticality log.	
Final	**F**	All adjustments made to data.	
Unknown	**U**	Depth adjustment and completeness unknown.	
GEODETIC DATUM			
Australian Geodetic Datum	**AGD**	Australian Geodetic Datum 1984	http://www.icsm.gov.au/
Australian Mapping Grid	**AMG**	Australian Mapping Grid 1984 - projection based on AGD84	http://www.icsm.gov.au/

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
Geocentric Datum Australia	**GDA**	Geocentric Datum Australia 1994	http://www.icsm.gov.au/
Local Datum	**LOC**	Local datum used	
Map Grid Australia	**MGA**	Map Grid of Australia 1994 - projection based on GDA94	http://www.icsm.gov.au/
Universal Transverse Mercator	**UTM**	Universal Transverse Mercator Coordinate System	http://www.icsm.gov.au/
HEIGHT DATUM			
Australian Height Datum	**AHD**	Australian Height Datum as prescribed by the National Mapping Council of Australia	http://www.ga.gov.au/
Approximate Level	**APX**	Approximate level	
Local Datum	**LOC**	Local datum used	
LOCATION ACCURACY			
Approximate	**A**	Estimated height	
Barometric	**B**	Height determined using the barometric pressure	
Digitised	**D**	Digitally copied from plans	
GPS (hand held)	**G**	Height determined using a hand-held GPS device	
Surveyed	**S**	Height determined using survey instruments	
LOGS RUN			Firth, D., 1994, Log Analysis for Mining Applications: edited by Peter Elkington, Reeves Wireline Services.
Acoustic Scanner	**A**	Continuous borehole wall images produced from the amplitude and travel time of reflected sound energy.	
Caliper	**C**	Log of borehole diameter measured by a mechanical arm on the logging tool.	
Cement bond log	**B**	Cement bond log.	
Density	**D**	Log of material density, normally measured from a gamma ray source.	
Dipmeter	**I**	Log of formation dip angles produced from micro-resistivity and orientation measurements.	
Downhole Camera	**M**	Images captured by a televiewer along the length of the borehole.	
Full Waveform Sonic	**F**	Log of the time taken for sound energy to travel through the rock formation based on P-waves and S-waves.	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
Gyroscopic Verticality	**Y**	Log of borehole inclination and azimuth derived from a gyroscope and accelerometers.	
Natural Gamma	**G**	Log of naturally occurring gamma radiation.	
Neutron	**N**	Log of porosity derived from thermal neutron detection.	
Resistivity	**R**	Log of the resistance of the rock formation to an applied electrical current.	
Spontaneous Potential	**P**	Log of naturally occurring currents due to ionic activity between borehole fluid and rock formation.	
Sonic	**S**	Log of the time taken for sound energy to travel through the rock formation based on P-waves.	
Temperature	**T**	Log of borehole temperature.	
Verticality	**V**	Log of borehole inclination and azimuth derived from a magnetometer and accelerometers.	
X-Ray	**X**	Log of X-Ray	
HOLE STATUS			
Backfilled	**B**	Borehole has been backfilled from the surface.	
Casing removed	**X**	All casing has been removed from the borehole.	
Cemented	**N**	Borehole has been cemented.	
Completed	**C**	Borehole has been completed, with all necessary cementing and rehabilitation carried out.	
Equipment in Hole	**E**	Equipment has been left in the hole - the nature of the equipment and the depths should be recorded.	
Infrastructure	**I**	Borehole is being used for mining infrastructure.	
In Progress	**P**	Drilling is in progress.	
Mined	**M**	Borehole has been mined out.	
Piezometer	**Z**	A piezometer has been installed in the borehole to monitor water levels.	
Plugged	**G**	Borehole has been plugged near the surface.	
Rehabilitated	**R**	Borehole site has been fully rehabilitated.	
Water bore	**W**	Borehole has been left open for use as a water bore.	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
SAMPLE TYPE			
Coal quality raw ply (coal, roof, floor or parting)	**QP**	Section of a coal seam (coal, roof, floor or parting) that has been sampled for coal analysis purposes.	
Coal quality bulk sample	**QB**	Sample of a coal seam or ply not usually from bore core that is generally in excess of 1000 kg.	
Coal quality channel sample (underground)	**QU**	Sample of a coal seam (or more usually a series of plies) which is cut from the rib in underground workings for the purpose of coal analysis testing.	
Coal quality raw coal composite	**QR**		
Coal quality washability composite (pre clean coal analysis)	**QW**		
Coal quality clean coal composite	**QC**		
Coal quality sizing composite	**QS**		
Subset quality raw ply (coal, roof, floor or parting)	**BP**		
Subset quality raw coal composite	**BR**		
Subset quality washability composite	**BW**		
Subset quality clean coal composite	**BC**		
Quality standard raw ply (coal, roof, floor or parting)	**ZP**		
Quality standard raw coal composite	**ZR**		
Quality standard washability composite	**ZW**		
Quality standard clean coal composite	**ZC**		
Quality standard bulk sample	**ZB**		
Quality standard channel sample (underground)	**ZU**		

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
Quality duplicate raw ply (coal, roof, floor or parting) for repeat analysis	DP		
Quality duplicate raw coal composite for repeat analysis	DR		
Quality duplicate washability composite for repeat analysis	DW		
Quality duplicate clean coal composite for repeat analysis	DC		
Quality duplicate bulk sample for repeat analysis	DB		
Quality duplicate channel sample for repeat analysis	DU		
Loxline raw ply (coal, roof, floor or parting)	LP	Section of a coal seam (coal, roof, floor or parting) that has been sampled to determine the amount of oxidation of coal.	
Spontaneous combustion raw ply (coal, roof, floor or parting)	SP	Section of a coal seam (coal, roof, floor or parting) that has been sampled to determine the propensity of the coal to spontaneously combust.	
Spontaneous combustion bulk sample	SB	Sample of a coal seam or ply not usually from bore core that is generally in excess of 1000 kg and has been collected to determine the propensity of the coal to spontaneously combust.	
Spontaneous combustion channel sample	SU	Sample of a coal seam (or more usually a series of plies) which is cut from the rib in underground workings for the purpose of testing to determine the coal's propensity to spontaneously combust.	
Geotechnical sample - laboratory tested	GT	Sample of strata (overburden, coal, interburden or floor) collected for the purpose of laboratory testing to determine a mechanical property.	
Geotechnical sample - field tested	GF	Sample of strata (overburden, coal, interburden or floor) tested in the field to determine a mechanical property.	
Water quality sample - laboratory tested	WT	Sample of water collected from a borehole for the purpose of laboratory testing to determine water quality.	
Water quality sample - field tested	WF	Sample of water collected from a borehole and tested in the field to determine water quality.	

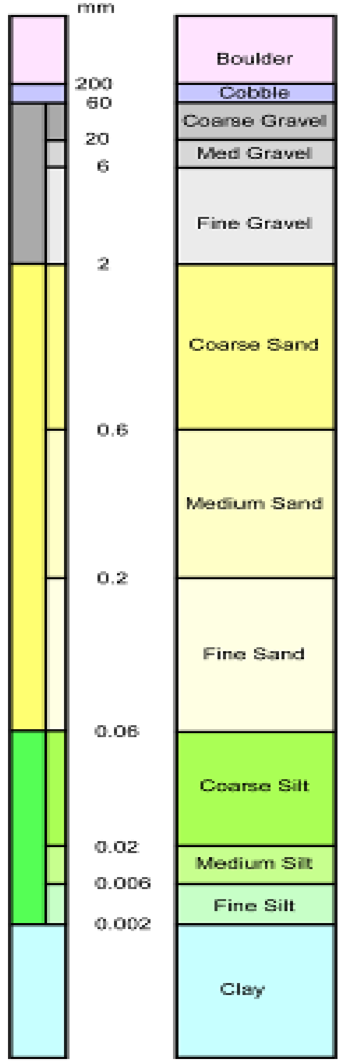
CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
Gas sample - exploration (virgin)	**ME**	Sample of strata (overburden, coal, interburden or floor) from an exploration borehole collected for the purpose of laboratory testing to determine seam gas content.	
Gas sample - compliance (drained)	**MD**	Gas sample taken from undrained virgin ground.	
Environmental sample - soil	**ES**	Gas sample taken from coal that has been drained, commonly in an underground mine.	
Environmental sample - overburden characterisation (compliance)	**EO**	Sample of strata (overburden, coal, interburden or floor) collected for the purpose of laboratory testing to determine mineralogical properties for environmental purposes (e.g. overburden characterisation).	
Environmental sample - reactive ground	**ER**	Sample of strata (overburden, coal, interburden or floor) collected for the purpose of laboratory testing to determine if reactive ground is present.	
INTERVAL STATUS			
Raw/Uncorrected	**R**	Not depth adjusted.	
Adjusted to geophysics	**A**	Data is adjusted to match geophysical logs.	
Unknown	**U**	Depth adjustment and completeness unknown.	
LITHOLOGY			
Unconsolidated Sediments		see following Figure for comparison with Wentworth scale.	
Clay	**CL**	majority of particles are less than 0.002 mm	AS1289
Silt	**SI**	majority of particles are between 0.002 and 0.06 mm	AS1289
Sand	**SA**	majority of particles are between 0.06 and 2 mm	AS1289
Gravel	**GV**	majority of particles are between 2 and 60 mm	AS1289
Cobbles	**OB**	majority of particles are between 60 and 200 mm	AS1289
Boulders	**BO**	majority of particles are greater than 200 mm	AS1289
Alluvium	**AL**	Alluvial deposit (product of river or stream action).	Oxford Dictionary of Earth Sciences
Colluvium	**CV**	Weathered rock debris that has moved downhill via creep or surface wash.	Oxford Dictionary of Earth Sciences
Diatomaceous Earth	**DE**	Deposit consisting of diatoms (unicellular algae that can be single, colonial, or filamentous).	Oxford Dictionary of Earth Sciences
Fill/Spoil	**FI**	Any unconsolidated material that has been deposited by equipment or other human activity.	

3. PARTICLE SIZE TERMINOLOGY[1]

As published in Field Geologist's Manual (2001) with AS classification added

	U.S. Standard sieve mesh	Grain diameter (mm)		Phi (φ) units	Wentworth size class
GRAVEL	Use wire squares	4096		−12	Boulder
		1024		−10	
		256		−8	
		64	64	−6	Cobble
		16		−4	Pebble
	5	4	4	−2	
	6	3.36		−1.75	Granule
	7	2.83		−1.5	
	8	2.38		−1.25	
	10	2.00	2	−1.0	
SAND	12	1.68		−0.75	Very coarse sar
	14	1.41		−0.5	
	16	1.19		−0.25	
	18	1.00	1	0.0	
	20	0.84		0.25	Coarse sand
	25	0.71		0.5	
	30	0.59		0.75	
	35	0.50	½	1.0	
	40	0.42		1.25	Medium sand
	45	0.35		1.5	
	50	0.30		1.75	
	60	0.25	¼	2.0	
	70	0.210		2.25	Fine sand
	80	0.177		2.5	
	100	0.149		2.75	
	120	0.125	⅛	3.0	
	140	0.105		3.25	Very fine sand
	170	0.088		3.5	
	200	0.074		3.75	
	230	0.0625	1/16	4.0	
SILT	270	0.053		4.25	Coarse silt
	325	0.044		4.5	
		0.037		4.75	
		0.031	1/32	5.0	
		0.0156	1/64	6.0	Medium silt
	Use	0.0078	1/128	7.0	Fine silt
	pipette	0.0039	1/256	8.0	Very fine silt
MUD	or	0.0020		9.0	
	hydro-	0.00098		10.0	Clay
	meter	0.00049		11.0	
		0.00024		12.0	
		0.00012		13.0	
		0.00006		14.0	

Australian Standard AS 1289



CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
Fireclay	**FC**	(syn: underclay) A layer of fine-grained (usually clay) lying immediately below a coal seam, the soil in which the coal forming plants were rooted; often siliceous or aluminous; a clay that can withstand high heat without deforming or disintegrating, i.e. kaolin.	www.webref.org/geology
Loam	**LO**	Any soil that is a mix of sand, silt, and clay, without a majority of any grain size.	Oxford Dictionary of Earth Sciences
Mud	**MD**	A mixture of silt and clay primarily mixed with water, can contain particles of other dimensions such as sand.	www.webref.org/geology
Soil	**SO**	Natural unconsolidated mineral and organic matter occurring above bedrock on the surface of the Earth; any loose, soft, deformable material.	Oxford Dictionary of Earth Sciences
Carbonaceous Sediments			
Coal	**CO**	Carbon rich mineral deposit formed from the accumulation of organic matter and containing less than 50% ash yield on combustion; coal streaks brown (low rank) to black (high rank) when scratched with a metal tool.	Oxford Dictionary of Earth Sciences (mod)
Lignite	**LG**	(USA)~70% carbon, high moisture and volatile content, between peat and bituminous coal in rank; a type of brown coal; contains at least 20% water.	Sedimentary Geology by Prothero and Schwab
Brown Coal	**BC**	(Europe) A low-rank coal which is brown or brownish-black, but rarely black. It commonly retains the structures of the original wood. It is high in moisture, low in heat value, and cracks badly upon drying; contains between 10% and 20% water; range from lignite to subbituminous in rank.	www.webref.org/geology
Peat	**PE**	Unconsolidated but partially compacted accumulation of plant remains in varying states of decomposition, consisting of high moisture and volatile matter content, and ~60% carbon (dry ash free); the precursor to coal.	Sedimentary Geology by Prothero and Schwab (mod)
Oil Shale	**OS**	Any fine grained sedimentary rock that produces substantial quantities of oil when heated.	Sedimentary Geology by Prothero and Schwab
Tar Sand	**TS**	(syn: oil sand) Oil reservoir where the volatiles have escaped and the rock has become impregnated with hydrocarbon residue.	Oxford Dictionary of Earth Sciences
Coaly Claystone Coaly Mudstone Coaly Sandstone Coaly Shale Coaly Siltstone	**ZC** **ZM** **ZS** **ZH** **ZT**	Please refer to the clastic sedimentary rock descriptions - coaly is an adjective to describe any sedimentary rock that does not have a black streak (streak is usually dark grey to brown) when scratched with a metal tool, but is dark grey to black with coal inclusions; a rock that is between 50-75% ash.	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
Carbonaceous Claystone Carbonaceous Mudstone Carbonaceous Sandstone Carbonaceous Shale Carbonaceous Siltstone	**XC** **XM** **XS** **XH** **XT**	Please refer to the clastic sedimentary rock descriptions - carbonaceous is an adjective to describe any sedimentary rock that does not have a black streak (streak can be any colour) when scratched with a metal tool, but has coal inclusions; a rock that is between ~>75% ash.	
Clastic Sedimentary Rocks			
Conglomerate	**CG**	Sedimentary rock mostly composed of subrounded, subangular, and rounded clasts greater than 2 mm.	
Sandstone	**SS**	Sedimentary rock mostly composed of individual grains or clasts between 0.06 and 2 mm.	
Siltstone	**ST**	Sedimentary rock mostly composed of individual grains or clasts between 0.002 and 0.02 mm.	
Claystone	**CS**	Sedimentary rock mostly composed of individual grains or clasts less than 0.002 mm.	
Breccia	**BR**	Sedimentary rock mostly composed of angular clasts greater than 2 mm.	
Fault Breccia	**FB**	The assemblage of angular fragments resulting from the crushing, shattering, or shearing of rocks during movement on a fault; a friction breccia. It is distinguished by its cross-cutting relations, by the presence of fault gouge, and by blocks with slickensides; angular to subangular fragments of crushed rock, up to several meters in size, filling a fault.	www.webref.org/geology
Mudstone	**MS**	Intermediary between claystone and siltstone; any sedimentary rock mostly composed of particles less than 0.02 mm.	Sedimentary Geology by Prothero and Schwab
Sedimentary Rock, undifferentiated	**SU**	Any sedimentary rock.	
Shale	**SH**	Any mudrock that shows fissility.	Sedimentary Geology by Prothero and Schwab
Tillite	**TI**	A sedimentary rock formed from glacial debris.	Oxford Dictionary of Earth Sciences
Chemical Sedimentary Rocks			
Calcrete	**CC**	(syn: caliche) Carbonate horizon formed in a soil in a semi-arid region by the precipitation of $CaCO_3$ carried in solution, develops over several thousand years with initial stages being nodular, and mature stages massive to laminar.	Oxford Dictionary of Earth Sciences
Carbonate	**CB**	Sedimentary rocks composed of >95% calcite or dolomite.	Oxford Dictionary of Earth Sciences

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
Chalk	**CK**	Porous, fine grained sedimentary rock composed predominantly of the calcareous skeletons of micro organisms.	Oxford Dictionary of Earth Sciences
Chert	**CH**	Chalcedonic nodules or irregular masses that occur in a sedimentary environment, often in association with black shales and spillites.	Oxford Dictionary of Earth Sciences
Cone in Cone Carbonate	**KK**	A secondary structure occurring in marls, limestone, ironstones, coals, etc. It is a succession of small cones of approx. the same size one within another and sharing a common axis.	www.webref.org/geology
Dolomite	**DM**	(syn: dolostone) A sedimentary rock composed of >90% dolomite ($CaMg(CO_3)_2$, $(CaFe(CO_3)_2$, $(CaMn(CO_3)_2)$.	Oxford Dictionary of Earth Sciences
Ferricrete	**FK**	Deposit which can develop into a hardened mass of sesquioxides of iron, especially in subtropical zones.	Oxford Dictionary of Earth Sciences
Fossil Wood	**FW**	Silicified wood; wood that has turned into a rock through fossilization.	www.webref.org/geology
Ironstone	**IS**	Iron rich sedimentary rock.	Oxford Dictionary of Earth Sciences
Kaolinite	**KA**	(syn: dickite, nacrite, kaolin) A group of clay minerals belonging to the 1:1 group of phyllosilicates which represent the final product from the chemical weathering of feldspars including low temperature hydrothermal reactions; a rock predominately composed of kaolin minerals.	Oxford Dictionary of Earth Sciences
Laterite	**LA**	Weathering product of rock composed of hydrated iron and aluminium oxides and hydroxides, clay minerals, and some silica, formed in humid, tropical areas.	Oxford Dictionary of Earth Sciences
Limestone	**LS**	Sedimentary rocks composed of calcite or dolomite.	Oxford Dictionary of Earth Sciences
Limonite	**LI**	Secondary weathering mineral from iron, may accumulate to give an iron rich deposit.	Oxford Dictionary of Earth Sciences
Silcrete	**SC**	Deposit which can develop into a hardened mass of silica, especially in subtropical zones.	Oxford Dictionary of Earth Sciences
Tonstein	**TN**	A compact kaolinite and or smectite rich mudstone which develops as a palaeosol and is frequently found as thin bands within or near coal seams; laterally extensive occurrences are believed to be a product of weathered volcanic ash.	Oxford Dictionary of Earth Sciences
Igneous			
Igneous Rock, undifferentiated	**IG**	Any igneous rock.	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
Volcanic Rock, undifferentiated	**VR**	Any extrusive igneous rock, e.g. rhyolite, andesite, basalts.	An Introduction to Igneous and Metamorphic Petrology by Winter
Intrusive Rock, undifferentiated	**IN**	Any intrusive igneous rock, e.g. granitoids and gabbros.	
Acid Volcanic	**AV**	Any extrusive igneous rock >66 wt.% silica	An Introduction to Igneous and Metamorphic Petrology by Winter
Intermediate Volcanic	**IV**	Any extrusive igneous rock 52-66 wt.% silica	
Basic Volcanic	**BV**	Any extrusive igneous rock 45-52 wt.% silica	
Acid Intrusive	**AI**	Any intrusive igneous rock >66 wt.% silica	
Intermediate Intrusive	**II**	Any intrusive igneous rock 52-66 wt.% silica	
Basic Intrusive	**BI**	Any intrusive igneous rock 45-52 wt.% silica	
Andesite	**AN**	A basic extrusive igneous rock >65% plagioclase, <20% quartz.	An Introduction to Igneous and Metamorphic Petrology by Winter
Basalt	**BS**	An intermediate extrusive igneous rock >65% plagioclase, <20% quartz.	
Dolerite	**DO**	Medium grained basalt/gabbro.	
Granite	**GR**	An intrusive igneous rock >20% quartz, <65% plagioclase, >10% alkali feldspar (normalized).	
Granodiorite	**GD**	An intrusive igneous rock >20% quartz, 65-90% plagioclase (normalized).	
Gabbro	**GB**	An intrusive igneous rock composed of plagioclase and pyroxenes.	
Rhyolite	**RH**	An acidic extrusive igneous rock >20% quartz, <65% plagioclase.	
Tuff	**TF**	A sedimentary or igneous rock made of igneous fragments < 2 mm (ash) deposited by pyroclastic or water processes.	Oxford Dictionary of Earth Sciences
Tuffite	**TT**	A tuff containing 75% to 25% pyroclastic material	IUGS
Metamorphic			
Basement Undifferentiated	**BU**	Highly folded metamorphic or igneous rocks, overlain by relatively undeformed sedimentary rocks; non-prospective rocks below prospective strata.	Oxford Dictionary of Earth Sciences
Gneiss	**GN**	A metamorphic rock displaying gneissose structure (layered/banded generally with dark minerals and felsics).	An Introduction to Igneous and Metamorphic Petrology by Winter
Metamorphic Rock, undifferentiated	**MM**	Any metamorphic rock.	
Phyllite	**PH**	A metamorphic rock displaying schistosity in which very fine phyllosilicates impart a silky sheen to the foliation surface.	An Introduction to Igneous and Metamorphic Petrology by Winter

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
Quartzite	**QT**	A metamorphic rock composed predominately of quartz.	An Introduction to Igneous and Metamorphic Petrology by Winter
Schist	**SZ**	A metamorphic rock displaying schistosity in which inequant minerals show a preferred orientation.	An Introduction to Igneous and Metamorphic Petrology by Winter
Slate	**SL**	A very fine grained metamorphic rock with well developed cleavage, cleavage surfaces are dull.	An Introduction to Igneous and Metamorphic Petrology by Winter
Minerals			
Calcite	**CA**	Usually white but can also be colourless, grey, red, green, blue, yellow, brown, orange. White streak, vitreous lustre. Perfect rhombohedral cleavage. Low Mohs hardness (3). Dissolves in cold dilute HCl.	
Pyrite	**PY**	Pale brass-yellow, tarnishes darker and iridescent. Crystals are usually cubic, faces may be striated, but also frequently octahedral and pyritohedron. Often inter-grown, massive, radiated, granular, globular and stalactitic. Very hard (6-6.5). Metallic lustre. Paramagnetic. Metallic glistening lustre.	
Quartz	**QZ**	Colourless/White. No cleavage. Very hard (7). Occurs as drusy, fine-grained to microcrystalline, massive crystals. Conchoidal fracturing. Transparent to nearly opaque. Vitreous lustre but can also be observed as waxy-dull when massive.	
Siderite	**SD**	A carbonate mineral of iron, sometimes of importance as an ore. Crystals typically found as brown to tan rhombohedrons in clusters, faces often curved or composites; more often found as medium to dark brown massive fine grained material or as massive crystalline material with exposed curved cleavage surfaces. Relatively hard (3.75-4.25). Vitreous or silky to pearly lustre. Translucent to subtranslucent. Most often found in bedded sedimentary deposits with a biological component, with shales, clays and coal beds.	
Talc	**TA**	Light to dark green, brown, white in colour. Almost always in foliated masses, rarely platey to pyramidal crystals. Very soft (1). Waxlike or pearly lustre. Translucent. White to very pearly green streak. Usually found in metamorphic rocks with abundant carbonate minerals associated.	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
Other			
Core Loss	**KL**	No core recovered for a section	
Old Workings	**OW**	Void caused by mining	
Non Coal	**NC**	Not coal, including overburden and interburden	
No Recovery	**NR**	No returns from drilling	
Not Logged	**NL**	Drilled but not logged	
Void	**VD**	Empty space other than old workings	
LITHOLOGY QUALIFIER			
Coals			
bright (>90%)	**BR**	>90 % bright coal	
bright with dull bands (60-90%)	**BB**	60-90 % bright coal	
interbanded dull and bright bands(40-60%)	**BD**	40-60 % bright coal	
mainly dull with frequent bright bands (10-40%)	**DB**	10-40 % bright coal	
dull with minor bright bands (1-10%)	**DM**	1-10 % bright coal	
dull (<1%)	**DD**	<1 % bright coal	
bright	**C1**	>90 % bright coal	
bright with dull bands	**C2**	60-90 % bright coal	
interbanded dull and bright bands	**C3**	40-60 % bright coal	
mainly dull with frequent bright bands	**C4**	10-40 % bright coal	
dull with minor bright bands	**C5**	1-10 % bright coal	
dull	**C6**	<1 % bright coal	
mid-lustrous to bright	**M1**	As described	
mid-lustrous	**M2**	As described	
mid-lustrous to dull	**M3**	As described	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
anthracite	**AN**	Coal that is >90 % carbon with little moisture or volatiles, highest ranked coal.	Sedimentary Geology by Prothero and Schwab
cindered	**CI**	Partially to mostly burned coal.	www.dictionary.com
coked	**KC**	Coal containing the solid carbonaceous residue derived from incomplete burning of coal.	Oxford Dictionary of Earth Sciences
cannel (torbanite, bog)	**CT**	A sapropelic coal formed from spores and algae.	Oxford Dictionary of Earth Sciences
dull conchoidal	**DC**	Fine grained uniform bituminous coal with a dull, greasy lustre and conchoidal fracture containing a high percentage of volatiles.	Oxford Dictionary of Earth Sciences
extremely weathered	**EW**	Sooty or clayey black sediment that is formed from decomposed coal, usually unconsolidated.	general understanding
fusainous	**FU**	Containing fossilized charcoal produced by the burning of plant material in an anaerobic environment.	Oxford Dictionary of Earth Sciences
heat affected	**HA**	Changing characteristics assumed to be caused by heat.	general understanding
inferior	**IF**	Syn: stony coal	
sapropelic	**SP**	Syn: cannel coal.	
stony	**SY**	Coal that is 40-60 % ash, will still streak black with a metal tool, but feels to heavy to be coal, very dull.	general understanding
undifferentiated	**CU**		
weathered	**WE**	Oxidized, coal is still blocky and consolidated.	general understanding
Conglomerates		NB descriptions are different to those in common use (Wentworth scale).	
granular	**GG**	Containing grains 2 to 20 mm in size.	AS1289
granular to pebbly	**GP**	Containing grains 2 to 60 mm in size.	AS1289
granular to cobbly	**GO**	Containing grains 2 to 200 mm in size.	AS1289
granular to bouldery	**GU**	Containing grains 2 to >200 mm in size.	AS1289
pebbly	**PP**	Containing grains 20 to 60 mm in size.	AS1289
pebbly to cobbly	**PO**	Containing grains 20 to 200 mm in size.	AS1289
pebbly to bouldery	**PU**	Containing grains 20 to >200 mm in size.	AS1289
cobbly	**OO**	Containing grains 60 to 200 mm in size.	AS1289
cobbly to bouldery	**OU**	Containing grains 60 to >200 mm in size.	AS1289
bouldery	**UU**	Containing grains >200 mm in size.	AS1289

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
Sandstones / Sand / Gravel		Also applies to carbonaceous sandstone (XS) and coaly sandstone (ZS)	
very fine grained	VV	NB descriptions are different to those in common use (Wentworth scale).	
very fine to fine grained	VF		
very fine to medium grained	VM		
very fine to coarse grained	VC		
very fine to very coarse grained	VX		
fine grained	FF	Consists of grains ranging from 0.06 to 0.20 mm in size for Sandstone or Sand, and from 2 to 6 mm for Gravel.	AS1289
fine to medium grained	FM	Consists of grains ranging from 0.06 to 0.60 mm in size for Sandstone or Sand, and from 2 to 20 mm for Gravel.	AS1289
fine to coarse grained	FC	Consists of grains ranging from 0.06 to 2.00 mm in size for Sandstone or Sand, and from 2 to 60 mm for Gravel.	AS1289
fine to very coarse grained	FX		
medium grained	MM	Consists of grains ranging from 0.20 to 0.60 mm in size for Sandstone or Sand, and from 6 to 20 mm for Gravel.	AS1289
medium to coarse grained	MC	Consists of grains ranging from 0.20 to 2.00 mm in size for Sandstone or Sand, and from 6 to 60 mm for Gravel.	AS1289
medium to very coarse grained	MX		
coarse grained	CC	Consists of grains ranging from 0.60 to 2.00 mm in size for Sandstone or Sand, and from 20 to 60 mm for Gravel.	AS1289
coarse to very coarse grained	CX		
very coarse grained	XX		
very fine grained (VV)	S1	Consists of individual grains of sediment, or lithified particles ranging from 0.0625 – 0.125mm in diameter.	Udden-Wentworth, 1922
fine grained (FF)	S2	Consists of individual grains of sediment, or lithified particles ranging from 0.125 – 0.250mm in diameter.	Udden-Wentworth, 1922
fine to medium grained (FM)	S3	Consists of individual grains of sediment, or lithified particles ranging from 0.125 – 0.50mm in diameter.	Udden-Wentworth, 1922
medium grained (MM)	S4	Consists of individual grains of sediment, or lithified particles ranging from 0.25 – 0.50mm in diameter.	Udden-Wentworth, 1922

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
coarse to very coarse grained (CX)	**S5**	Consists of individual grains of sediment, or lithified particles ranging from 0.50 – 2mm in diameter.	Udden-Wentworth, 1922
Interbedded, fine and coarse	**S6**	Consists of interbedded layers of individual grains of sediment, or lithified particles ranging from 0.125 – 0.25mm and 0.50 – 1mm in diameter. units	
medium to coarse grained (MC)	**S7**	Consists of individual grains of sediment, or lithified particles ranging from 0.25 – 1mm in diameter.	Udden-Wentworth, 1922
coarse grained (CC)	**S8**	Consists of individual grains of sediment, or lithified particles ranging from 0.50 – 1mm in diameter.	Udden-Wentworth, 1922
very coarse grained (XX)	**S9**	Consists of individual grains of sediment, or lithified particles ranging from 1 – 2mm in diameter.	Udden-Wentworth, 1922
Unconsolidated Sediments			
clayey	**CL**	Having clay sized particles (<0.002 mm).	
silty	**SI**	Having silt sized particles (between 0.002 and 0.06 mm).	
sandy	**SA**	Having sand sized particles (between 0.06 and 2 mm).	
gravelly	**GV**	Having gravel sized particles (between 2 and 60 mm).	
Tuff/Tuffite			
clay sized	**CS**	Having clay sized particles (<0.002 mm).	
mud sized	**MS**	Having clay and silt sized particles (<0.06 mm).	
silt sized	**TS**	Having silt sized particles (between 0.002 and 0.06 mm).	
sand sized	**SS**	Having sand sized particles (between 0.06 and 2 mm).	
SHADE			
light	**L**	Pale or whitish	
light to medium	**A**	Pale to intermediate	
light to dark	**C**	Pale to blackish	
medium	**E**	Intermediate	
medium to dark	**B**	Intermediate to blackish	
dark	**D**	Blackish	
banded	**N**	Alternating light and dark pattern	
mottled	**M**	A mixture of two or more colours with no discernable pattern, often with amorphous shapes	
speckled	**S**	Spotted	
variegated	**V**	Marked with patches or spots of different colours	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
HUES / COLOUR			
blackish / black	**K**		
bluish / blue	**L**		
brownish / brown	**B**		
buff	**F**		
creamy / cream	**C**		
greenish / green	**E**		
greyish / grey	**G**		
orangey / orange	**O**		
pinkish / pink	**P**		
purplish / purple	**U**		
reddish / red	**R**		
whitish / white	**W**		
yellowish / yellow	**Y**		
LITHOLOGY ADJECTIVE			
Quantity			
abundant	**AB**		
decreasing in abundance	**DA**		
detrital	**DE**	Minerals in sedimentary rocks, which were derived from pre-existing igneous, metamorphic or sedimentary rocks.	The Penguin "Dictionary of Geology"
highly	**HI**		
in part	**IP**		
increasing in abundance	**IA**		
irregular	**IR**		
large	**LR**		
minor	**MN**		
moderately	**MO**		
occasional	**OC**		
rare	**RA**		
slightly	**TY**		
sparse	**SE**		
sporadic	**SP**		
strongly	**TG**		

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
thick	**TK**		
thin	**TH**		
very	**VE**		
Appearance			
altered	**AL**	Mineral or rock properties and/or appearance has been changed by the effects of heat, weathering or metasomatic fluids.	
bright	**BR**	High lustre or shiny; when used to describe coal composition refers to vitrain band.	
clear	**LC**	Transparent	
coarser	**XC**	Grain size of material is greater than the remainder of main rock type. Only for use where the coarser component is less than 10% of unit.	
conchoidal	**CC**	Form of fracturing which takes the form of a curved, concentric ribbed surface.	The Penguin "Dictionary of Geology"
dull	**DD**	Low lustre; when used to describe coal composition refers to the granular or attrital matrix to the vitrain bands.	
fault gouge	**FT**	Rock material that has been ground to a uniform clay or fine silt particle size in a fault zone.	The Penguin "Dictionary of Geology"
finer	**FF**	Grain size of material is less than the remainder of main rock type. Only for use where the coarser component is less than 10% of unit.	
hard	**HR**		
heat affected	**HA**	Mineral or rock properties and/or appearance has been altered by the effects of heat from a metamorphic or igneous source.	
interbanded	**IB**	Alternating stratum or lamina conspicuous because they differ in colour and/or grainsize from adjacent layers.	
lustrous	**LU**	Reflecting light efficiently without glitter or sparkle	
opaque	**OP**	Does not reflect or transmit light.	Concise Oxford Dictionary
resinous	**RS**	Has appearance of resin, which is a plant secretion with a translucent sheen.	
soft	**SO**		
translucent	**TL**	Transmitting light but not transparent.	Concise Oxford Dictionary

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
Lithological			
acidic	**AC**	Igneous rock containing more than 66 wt.% silica (SiO2), most of the silica being in the form of silicate minerals, but with the excess of about 10% as free quartz. Typical acid rocks are granites, granodiorites, and rhyolites.	*Oxford Dictionary of Earth Science (mod)*
arenitic	**AR**	Containing or showing characteristics of Arenite: a sandstone type where less than 15 % of rock is mud matrix.	Oxford Dictionary of Earth Science
arkosic	**AK**	Containing quartz and 25 % or more of feldspar.	Oxford Dictionary of Earth Science
basaltic	**BS**	Containing or showing characteristics of Basalt: a dark-coloured, fine-grained, extrusive, igneous rock composed of plagioclase feldspar, pyroxene, and magnetite, with or without olivine, and containing not more than 52 wt. % silica (SiO2).	*Oxford Dictionary of Earth Science (mod)*
basic	**BC**	Rock with a relatively high concentration of iron, magnesium, and calcium, and with 45–52 wt. % of silica (SiO2). Examples include gabbro and basalt.	*Oxford Dictionary of Earth Science (mod)*
bentonitic	**BE**	Montmorillonite-rich clay formed by the breakdown and alteration of volcanic material.	Oxford Dictionary of Earth Science
calcareous	**CA**	Containing more than 30 % calcium carbonate.	Oxford Dictionary of Earth Science
carbonaceous	**XX**	Resembling or containing carbon. Pure carbon occurs naturally as diamond, graphite, fullerene, and as the amorphous carbon black. Charcoal, produced by the destructive distillation of organic matter, is also a pure form of carbon.	Oxford Dictionary of Earth Science
carbonate	**CB**	A sedimentary rock with 95 % or more of either calcite or dolomite, and is synonymous with limestone.	Oxford Dictionary of Earth Science
chloritic	**CR**	Containing or showing characteristics of Chlorite: a group of phyllosilicate (sheet silicate) minerals with the general composition (Mg,Fe,Al)6[(SiAl)4O10](OH)8 and related to the micas; sp. gr. 2.6–3.3; soft and green; platy or tabular *habit; occur in low grade metamorphic rocks of greenschist facies and as an alteration product of ferromagnesian minerals in igneous rocks.	Oxford Dictionary of Earth Science
clayey	**CL**	Containing or showing characteristics of Clay: In the Udden–Wentworth scale, particles less than 4 µm in size.	Oxford Dictionary of Earth Science
coaly	**CO**	Containing or comprising of Coal: a carbon-rich mineral deposit formed from the remains of fossil plants.	Oxford Dictionary of Earth Science
conglomeritic	**CG**	Containing or showing characteristics of Conglomerate: a coarse grained (rudaceous) rock with rounded clasts that are greater than 2mm in size.	Oxford Dictionary of Earth Science

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
dolomitic	**DM**	Containing or showing characteristics of Dolomite: a widely distributed rock-forming mineral, CaMg(CO3)2; sp. gr. 2.8–2.9; hardness 3.5–4.0; trigonal; usually white or colourless, but can be yellowish and brown; white streak; vitreous lustre; crystals are usually rhombohedral with curved.	Oxford Dictionary of Earth Science
feldspathic	**FS**	Containing 25 % or more of feldspar.	Oxford Dictionary of Earth Science
ferruginous	**FE**	Of, containing, or similar to iron.	Oxford Dictionary of Earth Science
fossiliferous	**FO**	Containing fossils: anything ancient or the remains of a once-living organism.	Oxford Dictionary of Earth Science
glauconitic	**GC**	Containing or showing characteristics of Glauconite: a member of the mica group, with the composition (K,Ca,Na)_2(Fe3_,Al,Mg,Fe2_)4[(Si,Al)4O10]2(OH)4; sp. r. –3.0; hardness 2; monoclinic; olive green, yellowish, or blackish green; dull lustre; granular; occurs in marine sediments as aggregates up to 1 mm in diameter.	Oxford Dictionary of Earth Science
graphitic	**GP**	Containing or showing characteristics of Graphite: sp. gr. 2.1; hardness 2; greyish-black; feels soft and greasy; good basal cleavage; scaly, columnar, granular, or earthy; occurs in veins and may be disseminated through rocks as a result of metamorphism of original carbon-rich sediments.	Oxford Dictionary of Earth Science
illitic	**IL**	Containing or showing characteristics of Illite (hydromuscovite): a clay mineral and member of the 2 : 1 group of phyllosilicates (sheet silicates) with the formula K1–1.5 Al4[Si7–6.5 Al1–1.5 O20](OH)4; sp. gr. 2.6–2.9; hardness 1–2; monoclinic; crystals form tiny flakes.	Oxford Dictionary of Earth Science
intermediate	**IM**	Igneous rock whose chemical composition lies between those of basic and acidic rocks. The limits are not fixed rigidly and a number of schemes exist that are based on modal mineralogy and the whole rock chemistry.	Oxford Dictionary of Earth Science
intrusive	**IN**	Applied to a body of rock, usually igneous, that is emplaced within pre-existing rocks. Intrusions are classified according to their size, their shape, and their geometrical relationship to the enclosing rocks.	Oxford Dictionary of Earth Science
iron stained	**ID**	Stained red-orange by the element Iron: Fe, sp. gr. 7.5; hardness 4.5; grey; massive or granular; malleable.	Oxford Dictionary of Earth Science

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
kaolinitic	**KA**	Containing or showing characteristics of Kaolinite (dickite, nacrite, China clay, kaolin): a group of clay minerals belonging to the 1 : 1 group of phyllosilicates (sheet silicates), and with the general formula $Al_4[Si_4O_{10}](OH)_8$; sp. gr. 2.6–2.7; hardness 2.0–2.5; monoclinic; white, greyish, or stained a variety of colours; dull earthy lustre; occurs as a secondary mineral produced by the alteration of aluminosilicates, especially alkali feldspars; is widely distributed in igneous rocks, gneisses, and pegmatites, and in sedimentary rocks.	Oxford Dictionary of Earth Science
lateritic	**LA**	Containing or showing characteristics of a Laterite: a weathering product of rock, composed mainly of hydrated iron a*nd aluminium oxides and hydroxides, and clay minerals, but also containing some silica.*	Oxford Dictionary of Earth Science
limonitic	**LI**	Containing or showing characteristics of Limonite: $FeO(OH).nH_2O$; sp. gr.2.7–4.3; hardness 4.0–5.3; yellowish-brown to reddish-brown; normally earthy lustre; usually amorphous; occurs as a secondary mineral from the weathering of iron in rocks and mineral deposits.	Oxford Dictionary of Earth Science
lithic	**LT**	Comprising of more than 25% rock fragments.	Oxford Dictionary of Earth Science
loamy	**LO**	Containing or showing characteristics of Loam: a class of soil texture composed of sand, silt, and clay, which produces a physical property intermediate between the extremes of the three components.	Oxford Dictionary of Earth Science
manganiferous	**MG**	Containing or showing characteristics of the element Manganese: a gray-white or silvery brittle metallic element, occurring in several allotropic forms, found worldwide, especially in the ores pyrolusite and rhodochrosite and in nodules on the ocean floor.	The American Heritage® Dictionary of the English Language, Fourth Edition
marly	**MR**	Containing or showing characteristics of a Marl: a pelagic or hemipelagic sediment, typically found interbedded with purer oozes in beds up to 1.5m thick, with a composition intermediate between a non-biogenic sediment and a calcareous or siliceous ooze. It is 30 % clay and 70 % microfossils, at least 15 % of its volume being siliceous microfossils.	Oxford Dictionary of Earth Science
metamorphosed	**MM**	Having undergone metamorphism: the process of changing the characteristics of a rock in response to changes in temperature, pressure, or volatile content.	Oxford Dictionary of Earth Science

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
micaceous	**MI**	Containing Micas: a group of phyllosilicates (sheet silicates) with a 2 : 1 atomic structure; the group is characterized by the silicon oxygen tetrahedral layers of composition [Si4O10]n and a general composition may be written (K,Na)2Y6[Z4O10]2(OH,F)4, where Y _ Mg, Fe, Fe3_, or Al, and Z _ Si or Al; the micas include muscovite, biotite, phlogopite, glauconite, lepidolite, and zinnwaldite, the brittle micas, and also the related minerals talc, stilpnomelane, and pyrophyllite.	Oxford Dictionary of Earth Science
muddy	**MD**	Containing or showing characteristics of Mud, an argillaceous or clay-bearing deposit	Oxford Dictionary of Earth Science
oxidised	**OX**	Having undergone oxidation, a reaction in which oxygen combines with, or hydrogen is removed from, a substance.	Oxford Dictionary of Earth Science
peaty	**PE**	Containing or showing characteristics of Peat: an organic soil or deposit; in Britain, a soil with an organic soil horizon at least 40 cm thick. Peat formation occurs when decomposition is slow owing to anaerobic conditions associated with waterlogging. Decomposition of cellulose and hemicellulose is particularly slow for Sphagnum plants, which are characteristic of such sites, and hence among the principal peat-forming plants.	Oxford Dictionary of Earth Science
phosphatic	**PP**	Containing or showing characteristics of phosphates, a rock or deposit made up largely of inorganic phosphate, commonly calcium phosphate.	Oxford Dictionary of Earth Science
pyritic	**PY**	Containing or showing characteristics of Pyrite (fool's gold): a sulphide mineral, FeS2; sp. gr. 4.9–5.2; hardness 6.0–6.5; cubic; pale brass-yellow, does not tarnish; greenish-black streak; metallic lustre; crystals cubic, pyritohedra (pentagonal dodecahedra), octahedra, or combinations of the two; cleavage poor basal {001}; occurs with other sulphide ores genetically associated with basic and ultrabasic rocks, and together with pyrrhotine and chalcopyrite; very widely distributed in a great variety of environments, and found in igneous rocks as an accessory mineral, in sedimentary rocks (especially black shales), as nodules in metamorphic rocks, and common in hydrothermal veins.	Oxford Dictionary of Earth Science

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
quartzose	**QZ**	Comprising of Quartz (rock crystal): a widely distributed rock forming silicate mineral SiO_2 sp. gr. 2.65; hardness 7; trigonal; commonly colourless or white, but can occur in a variety of colours; vitreous lustre; crystals usually six-sided prisms terminated by six-faced pyramids, the prisms often striated, also occurs extensively in massive form; no cleavage; conchoidal fracture; found in many igneous and metamorphic rocks, extensively in clastic rocks, and a common gangue mineral in mineral veins.	Oxford Dictionary of Earth Science
sandy	**SA**	Containing or showing characteristics of sand: in AS1289 scale, particles between 0.06 and 2 mm.	AS1289
shaly	**SH**	Showing characteristics of Shale: a fine-grained, fissile, sedimentary rock composed of clay-sized and silt-sized particles of unspecified mineral composition.	Oxford Dictionary of Earth Science
shelly	**HY**	Contains a large proportion of shell or shell fragments.	Oxford Dictionary of Earth Science
sideritic	**SD**	Contains or showing characteristics of Siderite (chalybite, spathose iron): $FeCO_3$; sp. gr. 3.8–4.0; hardness 3.5–4.5; trigonal; grey to grey-brown or yellowish-brown, translucent when pure; white streak; vitreous lustre; uneven fracture; crystals rhombohedral with curved faces, but also occurs massive, granular, fibrous, compact, botryoidal, and earthy in habit; cleavage perfect rhombohedral {1011}; widespread in sedimentary rocks, especially clays and shales where it is concretionary and makes clay into ironstone, also as a gangue mineral in hydrothermal veins together with other metallic ores and as a replacement mineral in limestone; dissolves slowly in cold, dilute hydrochloric acid, which effervesces when warmed.	Oxford Dictionary of Earth Science
siliceous	**SC**	Containing, resembling, relating to, or consisting of Silica: Silicon dioxide (SiO_2) which occurs naturally in three main forms: (a) crystalline silica includes the minerals quartz, tridymite, and cristobalite; (b) cryptocrystalline or very finely crystalline silica includes some chalcedony, chert, jasper, and flint; and (c) amorphous hydrated silica includes opal, diatomite, and some chalcedony. Coesite and stishovite are two high density polymorphs of quartz which rarely occur in nature.	The American Heritage® Dictionary of the English Language, Fourth Edition
silicified	**SF**	Has been converted into or impregnated with Silica: refer to *siliceous* for definition of Silica.	The American Heritage® Dictionary of the English Language, Fourth Edition
silty	**SI**	Containing or showing characteristics of Silt: in the Udden–Wentworth scale, particles between 4 µm and 62.5µm in size.	Oxford Dictionary of Earth Science

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
smectitic	**SM**	Containing or showing characteristics of Smectite: a family of clay minerals that includes montmorillonite and bentonite.	Oxford Dictionary of Earth Science
sooty	**SX**	Covered with or as if with soot. Blackish or dusky in colour.	The American Heritage® Dictionary of the English Language, Fourth Edition
stony	**SY**	Covered with or full of stones; resembling stone, as in hardness.	Oxford Dictionary of Earth Science
sub arenitic	**AM**	A sandstone type where 15 % to 25 % of rock is lithic or feldspathic (arkose).	
tillitic	**TI**	Containing or showing characteristics of a Tillite: a lithified deposit of boulder clay or till produced by the action of glaciers.	Oxford Dictionary of Earth Science
tonsteinous	**TN**	Containing or showing characteristics of a Tonstein: a compact, kaolinite-rich mudstone, which developed as a kaolinitic and or smectitic palaeosol, and is frequently found as thin bands within coal seams or resting directly above the coal. Some tonsteins are laterally extensive and are believed to be the product of weathered volcaniclastic ash.	Oxford Dictionary of Earth Science
tuffaceous	**TF**	Containing or showing characteristics of a Tuff: the compacted (lithified) equivalent of a volcanic ash deposit, which has been generated and emplaced by pyroclastic processes or was water lain, and in which the grain size of the pyroclasts is less than 2 mm.	Oxford Dictionary of Earth Science
vitrainous	**VI**	Of or like the coal lithotype Vitrain: black with brilliant, glassy lustre, conchoidal fracture, and cubic *cleavage. It is clean and structureless, and occurs in thin bands or lenses.	Oxford Dictionary of Earth Science
volcanic	**VO**	Produced by or discharged from a volcano.	The American Heritage® Dictionary of the English Language, Fourth Edition
Inclusions		Portions of one mineral or rock type enclosed within another rock type.	The Penguin "Dictionary of Geology"
bands	**BN**	Stratum or lamina conspicuous because they differ in colour and/or grainsize from adjacent layers.	The Penguin "Dictionary of Geology"
blebs	**BL**	Small, usually rounded inclusions of one material in another.	The Penguin "Dictionary of Geology"
clasts	**CT**	The individual constitutents of detrital sedimentary rocks produced by the physical disintegration of a larger rock mass.	The Penguin "Dictionary of Geology"
cobbles	**OO**	Sediment with a diameter of 60 to 200 mm.	
concretions	**CI**	Rounded or irregular masses formed by the concentration of certain constituents of sediments around a central nucleus during diagenesis.	The Penguin "Dictionary of Geology"

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
disseminated	**DS**	Where fine particles of minerals or rock fragments are dispersed through an enclosing rock.	The Penguin "Dictionary of Geology"
fragments	**FR**	Pieces broken off from a larger whole; broken pieces.	Collins Dictionary
grains	**GN**	The particles or discrete crystals which comprise a rock or sediment.	The Penguin "Dictionary of Geology"
granules	**GG**	Sediment with a diameter of 2 to 20 mm.	
laminae	**LM**	A layer in a sedimentary rock less than 1cm in thickness that is visually separable from other layers above and below by a discrete change in lithology.	The Penguin "Dictionary of Geology"
layers	**LY**	Beds or stratum of rock.	The Penguin "Dictionary of Geology"
lenses	**LN**	A band or bed of sedimentary rock that is thick in the central part and thins towards the edges.	The Penguin "Dictionary of Geology"
matrix	**MX**	The finer grained material in which larger grains are embedded.	The Penguin "Dictionary of Geology"
nodules	**ND**	A spherical, oval, or similarly rounded concretion not exceeding 200 mm in diameter.	
partings	**PA**	Thin layers of usually fine grained sediment that separates, and along which two coarser grained sedimentary beds readily separate. Also used to describe siliciclastic beds within coal seams	The Penguin "Dictionary of Geology"
pebbles	**PB**	Sediment with a diameter 20 to 60 mm.	
pellets	**PT**	Ovoid particles of sediment, commonly composed only of calcium carbonate, which range in size from 0.20 to 6.0 mm.	
phases	**PH**	Sections of rock which differ in some minor respect from the dominant rock type.	The Penguin "Dictionary of Geology"
pods	**PO**	A generally cylindrical inclusion that decreases at both ends.	The Penguin "Dictionary of Geology"
stringers	**SG**	Thin layers of usually fine grained sediment or coal that traverse through a different rock mass.	The Penguin "Dictionary of Geology"
traces	**TR**	Thin irregular discontinuous layers of usually fine grained sediment or coal that traverse through a different rock mass.	The Penguin "Dictionary of Geology"
wisps	**WP**	Thin irregular discontinuous layers of usually fine grained sediment or coal that traverse through a different rock mass.	The Penguin "Dictionary of Geology"
Preposition			
and	**ET**		
as	**AS**		

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
of	**OF**		
on	**ON**		
with	**WI**		
Position			
alternating	**AT**		
near base of unit	**BU**		
near middle of unit	**MU**		
near top and base of unit	**XU**		
near top of unit	**TU**		
tends to	**TT**		
throughout	**TO**		
LITHOLOGY INTERRELATIONSHIP			
coarsening up to	**CU**	Increase in grain size in sedimentary rock from base of the bed to its top. Termed reverse grading and is characteristic of some alluvial fan deposits.	Collins Dictionary of Geology (1990 edition)
disseminated with	**DS**	Widely dispersed throughout rock.	www.merriam-webster.com
fining up to	**FU**	Decrease in grain size in sedimentary rock from base of the bed to its top. Termed normal grading and is characteristic of some turbidites and many sedimentary beds deposited in waning flow conditions.	Collins Dictionary of Geology (1990 edition)
interbedded with	**IB**	Being positioned between or alternated with other layers of dissimilar character.	Collins Dictionary of Geology (1990 edition)
intercalated with	IC	Existing or introduced between subordinate layers of a different type. It applies especially to layers of one kind of material that alternate with thicker strata of another material, e.g. Beds of shell intercalated with sandstone.	Collins Dictionary of Geology (1990 edition)
interlaminated with	**IL**	Being positioned between or alternated with other laminations of dissimilar character.	Collins Dictionary of Geology (1990 edition)
intermixed with	**IM**	Existing with lithology(s) of a different type in no regular fashion and not forming regular structures.	Collins Dictionary of Geology (1990 edition)
irregularly interbedded with	**IR**	Being irregularly positioned between or alternated with other layers of dissimilar character.	Collins Dictionary of Geology (1990 edition)

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
with bands of	**BN**	Stratum or lamina distinguishable from adjacent layers by colour or lithological difference.	Collins Dictionary of Geology (1990 edition)
with boulders of	**BO**	Containing sediment with a diameter greater than 200 mm.	
with cement of	**CM**	Chemically precipitated mineral matter that is part of the cementation process.	Collins Dictionary of Geology (1990 edition)
with clasts of	**CT**	Individual fragments of another rock mass; a constituent of a bioclastic or pyroclastic rock.	Collins Dictionary of Geology (1990 edition)
with cobbles of	**OO**	Containing sediment with a diameter of 60 to 200 mm.	
with fragments of	**FR**	Parts broken off, detached or incomplete of another rock, bioclastic or pyroclastic material.	Collins Dictionary of Geology (1990 edition)
with granules of	**GG**	Containing sediment with a diameter 2 to 20 mm.	
with lenses of	**LN**	Discontinuous curved lenses (thick in middle, thinner at edges) of finer sediments (mud or silt) deposited in the troughs or draped over ripples in cross-laminated sands.	Collins Dictionary of Geology (1990 edition)
with matrix of	**MX**	The groundmass of an igneous rock or the finer grained material enclosing larger grains in a sedimentary rock.	Collins Dictionary of Geology (1990 edition)
with nodules of	**ND**	Rounded concretionary mass or lump.	Collins Dictionary of Geology (1990 edition)
with pebbles of	**PB**	Containing sediment with a diameter 20 to 60 mm.	
with pods of	**PO**	An elongate or lenticular inclusion.	
with wisps of	**WP**	Thin strip or fragment.	www.merriam-webster.com
WEATHERING			AS 1726-1993
Residual soil	**R**	Soil developed on extremely weathered rock: the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.	
Extremely weathered	**E**	Rock is weathered to such an extent that it has ‘soil’ properties, i.e. it either disintegrates or can be remoulded, in water.	
Highly weathered	H		
Distinctly weathered	**D**	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.	
Moderately weathered	M		

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
Slightly weathered	**S**	Rock is slightly discoloured but shows little or no change of strength from fresh rock. Usually penetrative weathering along defect surfaces.	
Weathered	**W**	Degree of weathering not assessed.	
Fresh	**F**	Rock shows no sign of decomposition or staining.	
ESTIMATED STRENGTH		see Geotechnical Dictionary for details	
BED SPACING		see Geotechnical Dictionary for details	
DEFECT INTACT		see Geotechnical Dictionary for details	
DEFECT TYPE		see Geotechnical Dictionary for details	
DEFECT SPACING			
extremely wide (>2 m)	**EW**	> 2 m	Anon, 1977. The description of rock masses for engineering purposes. Report by the Geological Society Engineering Group Working Party. Q. Jl. Engng Geol. 10 pp355-388. Table 5.
very wide (600-2000 mm)	**VW**	600-2000 mm	
wide (200-600 mm)	**WI**	200-600 mm	
moderately wide (60-200 mm)	**MW**	60-200 mm	
moderately narrow (20-60 mm)	**MN**	20-60 mm	
narrow (6-20 mm)	**NA**	6-20 mm	
very narrow (<6 mm)	**VN**	<6 mm	
CORE STATE			
Overdrilled core	**O**	The driller attempts to push more core into the core barrel than will fit, resulting in a series of helical fractures up the core. It often results in the core being unable to be retrieved intact from the barrel, as the helical fractures expand and lock in the splits. Core often crushed and pulverised. Typically picked up in crushed or broken state on the subsequent core run.	common observation
Solid core	**S**	No breaks or defects, solid continuous core. Two or less mechanical breaks per metre.	common observation
Broken core	**B**	Broken in part, some defects, with core in relatively good condition and intact. Three to five mechanical breaks per metre.	common observation
Very broken core	**V**	Core is badly broken throughout the section. Six to 20 mechanical breaks per metre.	common observation

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
Fragmented core	**F**	Core is fragmented and very badly broken up, original structures not easily determinable; any section of core that is broken in such a way that the original defects can only be identified with difficulty. More than 20 mechanical breaks per metre.	common observation
Crushed core	**C**	Core has been crushed down to small fragments, no original structures remain intact.	common observation
Cuttings	**K**	Rock chip fragments from open hole drilling	common observation
MECHANICAL STATE			
Slaking		The crumbling and disintegration of materials due to wetting or drying	
Non slaking	**NS**	Does not disintegrate or crumble when exposed to moisture and drying.	American Geological Institute Glossary of Geology
Low slaking	**LS**	Small degree of disintegration and crumble when exposed to moisture and drying. Slight to mild surface and edge spall, surface slightly swollen.	
Medium slaking	**MS**	Moderate degree of disintegration and crumble when exposed to moisture. Breakdown of pile of small flakes, some swelling and some flocculation.	
High slaking	**HS**	Disintegrates and crumbles easily when exposed to moisture and drying.	
Plasticity			
Non plastic	**NP**	Non-plastic, cannot be moulded, even if moisture is added.	
Low plasticity	**LP**	Material can be moulded but does not form a continuous worm when water added and moulded.	Monroe, James S., and Reed Wicander. The Changing Earth: Exploring Geology and Evolution, 2nd ed.
Intermediate plasticity	**IP**	Worm can be formed when water added and moulded, but crumbles when thinned out.	
High plasticity	**HP**	Will form a thin worm when water added and moulded between hands	
Other			
brecciated	**BR**	Coarse sedimentary rock consisting of angular or nearly angular fragments larger than 0.08 in. (2 mm). Breccia commonly results from processes such as landslides or geologic faulting, in which rocks are fractured.	Britannica Concise Encyclopedia. 1994-2008
brittle	**BL**	Likely to break, snap, or crack, when subjected to pressure. Easily damaged or disrupted; fragile.	Britannica Concise Encyclopedia. 1994-2008
cleated	**CE**	Open fractures / joints in the coal, specific to coal lithology.	American Geological Institute Glossary of Geology

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
disintegrates on wetting	**DW**	Disintegrates and crumbles easily when exposed to moisture. High degree of slaking.	
expanding clay	**EX**	Large volume change or swelling when exposed to water.	
fissile	**FS**	Refers to the property of rocks to split along planes of weakness into thin sheets. This is commonly observed in shales and in slates and phyllites, which are foliated metamorphic rocks. The fissility in these rocks is caused by the preferred alignment of platy phyllosilicate grains due to compaction, deformation or new mineral growth.	B. Biju-Duval, Sedimentary Geology
fissured	**FI**	Contains long narrow openings; cracks or clefts, has fissures present.	Britannica Concise Encyclopedia. 1994-2008
flaky	**FL**	Rock is flaky (muscovite / biotite like appearance), tends to form or break off in flakes, scale like appearance.	B. Biju-Duval, Sedimentary Geology
fractured	**FR**	A fracture is any local separation or discontinuity plane in a geologic formation, such as a joint or a fault that divides the rock into two or more pieces. A fracture will sometimes form a deep fissure or crevice in the rock.	American Geological Institute Glossary of Geology
friable	**FB**	Friability (or friable) is the ability of a solid substance to be reduced to smaller pieces with little effort. A friable substance is any substance that can be reduced to fibres or finer particles by the action of a small pressure or friction on its mass. Poorly cemented.	
indurated	**IN**	Hardened due to baking or by pressure and cementation.	Penguin Dictionary of Geology
micro faulted	**MF**	Very small scale faulting. Micro-faults are typically of sub-millimetre length, but have been logged up to a maximum of 10 mm in size.	American Geological Institute Glossary of Geology
non-cleated	**NC**	No cleats present within coal.	
powdery	**PO**	Material is powdery in nature, breaks down to powder when scraped (i.e. Kaolinite).	
puggy	**PU**	Soft, pulverized clay-like material, is typically uncemented or unconsolidated and can be easily dug away with your hands. Often found as fault gouge. Easily deformed.	American Geological Institute Glossary of Geology
sheared	**SH**	The unit is sheared. Shear is the response of a rock to deformation usually by compressive stress and forms particular textures. Shear can be homogeneous or non-homogeneous, and may be pure shear or simple shear. The process of shearing occurs within brittle, brittle-ductile, and ductile rocks. Within purely brittle rocks, compressive stress results in fracturing and simple faulting.	American Geological Institute Glossary of Geology

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
slickensided	**SK**	A slickenside is a smoothly polished surface caused by frictional movement between rocks along the two sides of a fault. This surface is normally striated in the direction of movement.	Encyclopedia Americana. 1920
sticky	**ST**	Having the sticky properties of an adhesive, tacky nature when wet.	
subfissile	**SF**	Less fissile or sub, will split along planes but tends to be more blocky and hard. Fissile refers to the property of rocks to split along planes of weakness into thin sheets. This is commonly observed in shales and in slates and phyllites, which are foliated metamorphic rocks. The fissility in these rocks is caused by the preferred alignment of platy phyllosilicate grains due to compaction, deformation or new mineral growth.	Sedimentary Rocks. Pettijohn, F. J., Harper& Brothers New York 1957
TEXTURE			
amorphous	**AM**	Lacking definite form.	www.dictionary.com
amygdaloidal	**AG**	Cavity in an extrusive igneous rock filled with secondary crystalline minerals.	Oxford Dictionary of Earth Sciences
aphanitic	**AP**	Mineral grains too small to be seen unaided by the naked eye.	Oxford Dictionary of Earth Sciences
chalky	**CK**	Containing chalk.	see chalk defintion
cherty	**CH**	Containing chert.	see chert definition
concretionary	**CI**	Containing concretions, spherical or elliptical produced as a result of local cementation within a sediment.	Oxford Dictionary of Earth Sciences
crystalline	**XL**	Having crystals.	
earthy	**EA**	Having a non-metallic lustre of porous aggregates such as clays, laterites and bauxite.	Oxford Dictionary of Earth Sciences
equigranular	**EQ**	All grains being the same size.	www.webref.org/geology
fibrous	**FB**	Having an appearance similar to fibres (stringy).	
flaggy	**FG**	Fissility with layers 1 to 5 cm thick.	www.webref.org/geology
flow banded	**FL**	A structure of igneous rocks that is esp. common in silicic lava flows. It results from movement or flow, and is an alternation of mineralogically distinct layers.	www.webref.org/geology
glassy	**GS**	Having a glass like appearance, translucent.	
granular	**GG**	Being 2 to 20 mm in size.	AS1289
gritty	**GT**	Containing a coarse sand fraction	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
nodular	**ND**	Containing nodules, a spherical or elliptical concretion; the habit of a mineral to grow in concentric spheres or ellipses due to chemical precipitation.	Oxford Dictionary of Earth Sciences
oolitic	**OO**	Containing ooids, sub-spherical sand sized carbonate particle made of concentric rings of calcium carbonate around another particle.	Oxford Dictionary of Earth Sciences
pelletal	**PT**	A concretionary texture characterized by minute pellets of colloidal or replacement origin and closely resembling oolites.	www.webref.org/geology
pisolitic	**PS**	A spherical to sub-spherical inorganic carbonate particle 0.02 to 1000 mm in diameter characterized by concentric lamination, some are similar to ooids, others are formed subaerial environments in calcrete.	Oxford Dictionary of Earth Sciences
platey	**PL**	Intermediate between laminar and flaggy.	
porphyritic	**PR**	Containing large well formed crystals in fine grained groundmass.	Oxford Dictionary of Earth Sciences
schistose	**SZ**	Inequant minerals showing preferred orientations.	An Introduction fo Igneous and Metamorphic Petrology by Winter
soapy	**SO**	Having a very smooth, greasy or oily texture	www.webref.org/geology
vesicular	**VS**	Having vesicles, ellipsical/spherical/cylindrical voids found in extrusive igneous rocks.	Oxford Dictionary of Earth Sciences
vitreous	**VT**	Glassy lustre.	
vuggy	**VU**	(syn: vughy) Pore spaces formed by solution, can have secondary mineralization.	Oxford Dictionary of Earth Sciences
waxy	**WX**	Smooth with a resinous lustre.	
BASAL CONTACT			
basal contact open or readily parts	**B**	Lithological boundary sharp, rock mass units readily separate.	
basal contact deformed	**D**	Lithological boundary plane deformed by post-depositional deformation.	
erosional basal contact	**E**	An unconformity that separates older rocks that have been subjected to erosion from younger sediments that cover them; specif. disconformity. Contact sharp, shows features such as rip-up clasts, scour surfaces and truncated bedding in the underlying unit.	Dictionary of Mining, Mineral and Related Terms
faulted at basal contact	**F**	Lithological boundary sharp, evidence of post-depositional movement on boundary plane.	
gradational basal contact	**G**	Unit boundary indistinct, marked by a change in grain size or composition.	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
sharp and irregular basal contact	**I**	Lithological boundary sharp, non-planar.	
jointed at basal contact	**J**	Geotechnical defect occurs at rock mass unit boundary.	
sharp and oblique basal contact	**O**	Lithological boundary sharp, at angle to bedding.	
sharp and planar basal contact	**P**	Lithological boundary sharp, flat, parallel to bedding plane.	
fractured at basal contact	**R**	Geotechnical defect occurs at rock mass unit boundary.	
sheared at basal contact	**S**	Rock mass units separated at boundary due to post-depositional stress.	
sharp and undulose basal contact	**U**	Lithological boundary sharp, non-planar due to undulating surfaces at the time of deposition.	
SEDIMENTARY FEATURE			
Bedding			
contorted bedding	**CT**	Contorted bedding typically occurs in cross-laminated sediments, with the lamination deformed into small anticlines and sharp synclines.	Miall. Andrew D. Principles of Sedimentary Basin Analysis
convoluted bedding	**CV**	Convolute bedding typically occurs in cross-laminated sediments, with the lamination deformed into rolls, small anticlines and sharp synclines. Such convolutions are commonly asymmetric and overturned in the palaeocurrent direction, typically confined to a single layer of sediment.	McGraw-Hill (2003) Dictionary of Geology
current bedding	**CB**	Current bedding or cross stratification is an internal sedimentary structure of many sand-grade, and coarser, sedimentary rocks and consists of a stratification at an angle to the principal bedding direction.	Pyroclastic density currents and the sedimentation of ignimbrites By Michael J. Branney, B. Peter Kokelaar, Geological Society of London
diffuse bedding	**DF**	Diffuse bedding is marked by size and concentration grading of different sedimentary materials, it ranges from trains of single clasts to units over 200 mm thick. There is no sharp bedding planes and the lithofacies typically locally transitional into massive bedding.	Pyroclastic density currents and the sedimentation of ignimbrites By Michael J. Branney, B. Peter Kokelaar, Geological Society of London
disturbed bedding	**DB**	Any bedding which has been disturbed including convolute and contorted bedding. Convolute bedding produced by subaqueous slumping, water injection or expulsion, or lateral movement of newly deposited sediment.	McGraw-Hill (2003) Dectionary of Geology
flasar bedding	**FL**	In some areas of ripple formation, the ripples of silt and sand move periodically and mud is deposited out of suspension at times of slack water. Flasar bedding is characterised by cross laminated sand containing mud streaks, usually in the ripple troughs.	Miall. Andrew D. Principles of Sedimentary Basin Analysis, Reineck, H.E.; Wunderlich, F. (1968). "Classification And Origin Of Flaser And Lenticular Bedding". Sedimentology

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
graded bedding	**GB**	Bedding characterized by a systematic change in grain or clast size from the base of the bed to the top. Most commonly this takes the form of normal grading, with coarser sediments at the base, which grade upward into progressively finer ones. Reverse grading can occur.	Monroe, James S., and Reed Wicander. The Changing Earth: Exploring Geology and Evolution, 2nd ed.
lenticular bedding	**LB**	In some areas of ripple formation, the ripples of silt and sand move periodically and mud is deposited out of suspension at times of slack water. Lenticular bedding is where mud dominates and is interbedded with cross-laminated sand occurring in isolated lenses. Lenticular bedding is classified by its large quantities of mud relative to sand, whereas a flaser bed consists mostly of sand.	Miall. Andrew D. Principles of Sedimentary Basin Analysis, Reineck, H.E.; Wunderlich, F. (1968). "Classification And Origin Of Flaser And Lenticular Bedding". Sedimentology
penny bands	**PB**	Thin clay/claystone bands within coal.	McGraw-Hill (2003) Dictionary of Geology
planar bedding	**PL**	Consists of parallel bedded units with essentially planar bounding surfaces.	Miall. Andrew D. Principles of Sedimentary Basin Analysis
poorly developed bedding	**PD**	Bedding planes are poorly defined and difficult to distinguish.	
ripple bedding	**RI**	A bedding surface characterized by ripple marks, refer to ripple marks.	American Geological Institute Glossary of Geology
wavy bedding	**WB**	In some areas of ripple formation, the ripples of silt and sand move periodically and mud is deposited out of suspension at times of slack water. Wavy bedding is where thin-ripple cross-laminated sandstones alternate with mud rock.	Miall. Andrew D. Principles of Sedimentary Basin Analysis
well developed bedding	**WD**	Bedding is well defined and surfaces easily identified.	
Cross Bedding			
high angle cross bedding (>30°)	**HX**	Cross bedding where the angle of repose of the cross bed set is greater than 30 degrees from the horizontal.	Middleton, G., 2003, Encyclopedia of Sedimentary Rocks
medium angle cross bedding (10°-30°)	**MX**	Cross bedding where the angle of repose of the cross bed set is between 10 and 30 degrees from the horizontal.	Middleton, G., 2003, Encyclopedia of Sedimentary Rocks
low angle cross bedding (<10°)	**LX**	Cross bedding where the angle of repose of the cross bed set is less than 10 degrees from the horizontal.	Middleton, G., 2003, Encyclopedia of Sedimentary Rocks

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
cross bedding	**XB**	Cross bedding refers to (near-) horizontal units that are internally composed of inclined layers. The original depositional layering is tilted and the tilting is not a result of post-depositional deformation. Cross beds or "sets" are the groups of inclined layers, and the inclined layers are known as cross strata. Cross bedding forms when small-scale erosion occurs during deposition, cutting off part of the beds. Newer beds then form at an angle to older ones.	Middleton, G., 2003, Encyclopedia of Sedimentary Rocks
fine cross bedding	**FX**	Fine, small scale cross bedding (refer to cross bedding).	
tabular cross bedding	**TX**	Tabular (planar) cross beds consist of cross bedded units that have large horizontal extent relative to set thickness and that have essentially planar bounding surfaces. The foreset laminae of tabular cross beds have curved laminae that have a tangential relationship to the basal surface.	Middleton, G., 2003, Encyclopedia of Sedimentary Rocks
trough cross bedding	**RX**	Trough cross beds have lower surfaces which are curved or scoop shaped and truncate the underlying beds. The foreset beds are also curved and merge tangentially with the lower surface.	Middleton, G., 2003, Encyclopedia of Sedimentary Rocks
Laminations			
large scale cross laminations (>2 m)	**LL**	Large cross laminations are ripples with a height greater than one meter, and a thickness equivalent to one meter or greater. Some ripples that may fit this category would be high energy river-bed bars, sand waves, epsilon cross bedding and Gilbert-type cross bedding.	Greeley, Ronald, and James D. Iversen. Wind as a Geological Process On Earth, Mars, Venus and Titan (Cambridge Planetary Science Old). New York: Cambridge UP, 1987
medium scale cross laminations (200 - 2000 mm)	**ML**	Medium cross laminations are ripples with a height greater than ten centimetres, and less than one meter in thickness. Some ripples that may fit this category would be current-formed sand waves, and storm-generated hummocky cross stratification.	Greeley, Ronald, and James D. Iversen. Wind as a Geological Process On Earth, Mars, Venus and Titan (Cambridge Planetary Science Old). New York: Cambridge UP, 1987
small scale cross laminations (<200 mm)	**SL**	Small cross laminations are ripples set at a height less than ten centimetres, while the thickness is only a few millimetres. Some ripples that may fit this category are wind ripples, wave ripples, and current ripples.	Greeley, Ronald, and James D. Iversen. Wind as a Geological Process On Earth, Mars, Venus and Titan (Cambridge Planetary Science Old). New York: Cambridge UP, 1987
wavy laminations	**WL**	Very small cross lamination means that the ripple height is roughly one centimetre or less. It is lenticular and wavy lamination.	Greeley, Ronald, and James D. Iversen. Wind as a Geological Process On Earth, Mars, Venus and Titan (Cambridge Planetary Science Old). New York: Cambridge UP, 1987

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
Shape			
angular grains	**AG**	Grains are angular, have sharp edges, minor smooth sections, edges not so pronounced, refer to diagram.	Pettijohn, 1973
subangular grains	**GG**	Sharp edges have been smoothed to some extent, but the grain is still distinctly angular, but edges not so pronounced, refer to diagram.	Pettijohn, 1973
very angular grains	**VG**	Grains are very angular, have numerous sharp edges, no smooth sections, refer to diagram.	Pettijohn, 1973
subrounded grains	**BG**	Grains are relatively smooth, with occasional sharp edges and minor angularity, refer to diagram.	Pettijohn, 1973
rounded grains	**RG**	Grains are smooth, with no sharp edges, but some minor angularity, refer to diagram.	Pettijohn, 1973
well rounded grains	**WG**	Grains are smooth, without any sharp edges, refer to diagram.	Pettijohn, 1973
bladed grains	**DG**	All dimensions are very different, belt like, longer and thinner than tabular.	Th. Zingg, 1935
prolate grains	**LG**	Grains are elongated at the poles, cigar shaped.	Th. Zingg, 1935
tabular grains	**TG**	Grains have a flat, plane surface shape.	Th. Zingg, 1935
angular fragments	**AF**	Fragments have sharp edges, minor smooth sections, edges pronounced, refer to roundness and sphericity diagram.	Pettijohn, 1973
subangular fragments	**GF**	Sharp edges have been smoothed to some extent, but the grain is still distinctly angular, but edges not so pronounced, refer to roundness and sphericity diagram.	Pettijohn, 1973
very angular fragments	**VF**	Fragments have numerous sharp edges, no smooth sections, refer to roundness and sphericity diagram.	Pettijohn, 1973
subrounded fragments	**BF**	Fragments are relatively smooth, with occasional sharp edges and minor angularity, refer to roundness and sphericity diagram.	Pettijohn, 1973
rounded fragments	**RF**	Fragments are smooth, with no sharp edges, but some minor angularity, refer to roundness and sphericity diagram.	Pettijohn, 1973
well rounded fragments	**WF**	Fragments are smooth, without any sharp edges, refer to roundness and sphericity diagram.	Pettijohn, 1973
angular pebbles	**AP**	Pebbles have sharp edges, minor smooth sections, edges not so pronounced, refer to roundness and sphericity diagram.	Pettijohn, 1973
subangular pebbles	**GP**	Sharp edges have been smoothed to some extent, but the grain is still distinctly angular, but edges not so pronounced, refer to roundness and sphericity diagram.	Pettijohn, 1973

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
subrounded pebbles	**BP**	Pebbles are relatively smooth, with occasional sharp edges and minor angularity, refer to roundness and sphericity diagram.	Pettijohn, 1973
rounded pebbles	**RP**	Pebbles are smooth, with no sharp edges, but some minor angularity, refer to roundness and sphericity diagram.	Pettijohn, 1973
very angular pebbles	**VP**	Pebbles have numerous sharp edges, no smooth sections, refer to roundness and sphericity diagram.	Pettijohn, 1973
well rounded pebbles	**WP**	Pebbles are smooth, without any sharp edges, refer to roundness and sphericity diagram.	Pettijohn, 1973
Sorting		Segregation by grain sizes. "Poor" means a wide range of grain sizes such as silty sandy gravel; "good" means a narrow range of grain sizes such as sand.	
well sorted	**WS**	Refers to a sedimentary deposit or rock composed of grains that are of similar size and/or density, narrow range of grain sizes such as sand.	
moderately sorted	**MS**	Refers to a sedimentary deposit or rock composed of similar (but not same) sizes of sediment grains.	
poorly sorted	**PS**	Refers to a sedimentary deposit or rock composed of many different sizes of sediment grains from one another, "Poor" means a wide range of grain sizes such as silty sandy gravel. Smaller particles fill the gaps between larger particles.	
bimodal sorting	**BS**	Refers to a sedimentary deposit or rock having or exhibiting two contrasting modes or forms. Contains particles / grains of two distinct sizes and populations, common in coarse gravels.	
polymodal sorting	**YS**	Refers to a sedimentary deposit or rock having or exhibiting two or more contrasting modes or forms. Contains particles / grains of two or more distinct sizes and populations, common in coarse gravels.	
coarsening upwards	**CU**	Refers to a sedimentary deposit or rock where the grain sequence coarsens upwards, with fine grained material at the base of the unit and coarsening up the sequence.	
fining upwards	**FU**	Refers to a sedimentary deposit or rock where the grain sequence fines upwards, with coarse grained material at the base of the unit and fining up the sequence.	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
Permeability/Porosity			
impermeable (<0.1 mD)	**IR**	Does not allow fluid to pass through it; 0.0001 to 0.1 mD	Bear, 1972
low permeability (0.1-10 mD)	**LP**	Allows some fluids to pass through it; 0.1 to 10 mD.	Bear, 1972
medium permeability (10-10000 mD)	**MP**	Allows moderate amount of fluids to pass through it; 10 to 10000 mD.	Bear, 1972
high permeability (>10000 mD)	**HP**	Allows significant amount of fluids to pass through it; 10000 to 10^{+8} mD.	Bear, 1972
permeable	**PE**	Allows fluid to pass through it. Permeability is a measure of the ability of a porous material to allow fluids to pass through it. Permeability is typically determined in the lab by application of Darcy's law under steady state conditions and is measured in Millidarcy's (mD).	Bear, 1972
porous	**PO**	The unit is porous. Porosity or void fraction is a measure of the void (i.e., "empty") spaces in a material, and is a fraction of the volume of voids over the total volume, between 0–1, or as a percentage between 0–100 %. Porosity of a porous medium (such as rock or sediment) describes the fraction of void space in the material, where the void may contain, for example, air or water. It is defined by the ratio.	
Cracks			
dessication cracks	**DC**	Desiccation cracks are sedimentary structures formed as muddy sediment dries and contracts. Desiccation mud cracks are usually continuous, polygonal, and have U- or V- shaped cross sections that would have been filled in with sediment from above.	Jackson, J.A., 1997, Glossary of Geology (4th ed.), American Geological Institute, Alexandria, VA
intraformational cracks	**IC**	A crack confined to a sedimentary layer lying between undeformed beds. Being or occurring within a geologic formation: originating more or less contemporaneously with the enclosing geologic material.	Britannica Concise Encyclopedia. 1994-2008
mud casts/cracks	**MC**	Mud Casts form when organic material (flora and/or flora) has been buried in sediments before decomposing. The weight of the sediments leaves an impression of the organism in the sediment, the cast forms when the organic material decomposes and new materials fill the spaces and solidify into rock (i.e. Fossils). Mud cracks are sedimentary structures formed as muddy sediment dries and contracts. Mud cracks are usually continuous, polygonal, and have U- or V- shaped cross sections that would have been filled in with sediment from above.	Jackson, J.A., 1997, Glossary of Geology (4th ed.), American Geological Institute, Alexandria, VA

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
shrinkage cracks	**SC**	A sedimentary structure developed by the shrinkage of sediment related to desiccation. A small crack produced in fine-grained sediment or rock by the loss of contained water during drying or dehydration. They commonly occur in thin mudstones interbedded with sandstones.	Pettijohn, F.J.; Potter, P.E. (1964). Atlas and Glossary of Primary Sedimentary Structures. Berlin: Springer-Verlag.
syneresis cracks	**YC**	Syneresis cracks (also known as subaqueous shrinkage cracks) are a sedimentary structure developed by the shrinkage of sediment during drying. Syneresis is the expulsion of a liquid from a gel-like substance. Syneresis cracks are formed by the contraction of clay in response to changes in the salinity of a liquid surrounding a deposit. Syneresis cracks, however, are usually discontinuous, spindle or sinuous in shape, and have U- or V- shaped cross sections that have been filled in with sediment from above or below.	Pettijohn, F.J.; Potter, P.E. (1964). Atlas and Glossary of Primary Sedimentary Structures. Berlin: Springer-Verlag.
Structures			
bioturbated	**BT**	Displaced and mixed sediment particles (i.e. sediment reworking) and solutes by fauna (animals) or flora (plants). This includes burrowing, ingestion and defecation of sediment grains, construction and maintenance of galleries, and infilling of abandoned dwellings, that displace sediment grains and mix the sediment matrix.	Encyclopædia Britannica. 2010
boudinage	**BD**	Boudinage describes structures formed by extension, where a rigid tabular body is stretched and deformed amidst less competent surroundings. The competent bed begins to break up, forming sausage-shaped boudins. In three dimensions, the boudinage may take the form of ribbon-like boudins or chocolate-tablet boudins, depending on the axis and isotropy of extension. They range in size from about 20 m thick to about 1 cm.	Encyclopædia Britannica. 2010
bounce marks/prod casts	**PC**	Bounce marks are rows of more symmetrical marks due objects being swept or bounced along the bottom of a stream during the formation of the material. Prod casts show where an object has dug down into the clay and then been plucked out again by the current. As a result the steep side of prod marks is the downstream side.	Petroleum Geology By Knut Bjorlykke, Per Avseth
burrowing	**BW**	A form of bioturbation, where displaced and mixed sediment particles and solutes by fauna (animals) in the form of burrowing, formed by the ingestion and defecation of sediment grains and infilling of abandoned dwellings, that displace sediment grains and mix the sediment matrix.	Encyclopædia Britannica. 2010

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
climbing ripples	**CR**	The synthetic laminae commonly left (but not isolated to) by wind-ripples are called climbing ripples, reflecting that the deposits have the appearance of having been created by the translation of the ripple surface. They form when several trains of ripples are superimposed on each other and they seem to 'climb', by generating stratigraphic surfaces that are tilted in an up current direction.	Glossary of Geology, American geological Institute
colloidal iron deposit	**CI**	Has iron particles dispersed evenly throughout the unit. A colloid is a substance microscopically dispersed evenly throughout another substance.	
compaction feature	**CF**	Contains structures or features resulting from compaction. Features such as folds can be generated in a younger sequence by differential compaction over older structures such as fault blocks and reefs.	
flame structures	**FS**	A flame structure is a type of soft-sediment deformation that forms in unlithified sediments. Flame structures consist of sharp-crested wave or flame-shaped plumes of mud that have risen irregularly upward into an overlying layer, generally a rapidly deposited sand. The flames, though irregular in shape are generally overturned predominately in one direction, which is the paleocurrent direction of the overlying rock.	Encyclopedia of sediments and sedimentary rocks By Gerard V. Middleton
imbricate clasts	**IM**	A deposit of similarly orientated clasts, often regularly overlapping, or shingling, of non-spherical geometry and the result of their deposition by fluids.	The dictionary of physical geography By David S. G. Thomas, Andrew Goudie
load cast	**LC**	An irregularity at the base of an overlying stratum, usually sandstone, that projects into an underlying stratum, usually shale or clay.	The dictionary of physical geography By David S. G. Thomas, Andrew Goudie
pebble lag	**PG**	Conglomerates/pebbles confined to the basal part of a channel fill sequence. High energy water flow suspended and carried the pebbles in the stream. When the water energy decreased, the stream was no longer powerful enough to carry the pebbles and they were deposited resulting in the pebble lag formation.	The dictionary of physical geography By David S. G. Thomas, Andrew Goudie
reworked	**RW**	Any geologic material that has been removed or displaced by natural agents from its origin and incorporated in a younger formation.	Encyclopædia Britannica. 2010

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
ripple marks	**RM**	A pattern of wavy lines formed along the top of a bed by wind, water currents, or waves. One of a series of small marine, lake, or riverine topographic features, consisting of repeating wavelike forms with symmetrical slopes, sharp peaks, and rounded troughs.	Encyclopædia Britannica. 2010
rip-up clasts	**RU**	Rip-up clasts are created by vigorous flows of sediment, entraining and redepositing underlying sedimentary beds, or beds eroded from the sides of a channel. A few of these clasts are preserved as mudstone. They may also be called mudstone clasts, intraformational or intrabasinal clasts, or clay chips.	Encyclopædia Britannica. 2010
rootlet beds	**RB**	An estuarine type deposit of clay, sand, and gravel, the upper part of which was subsequently weathered into a soil and penetrated by small roots forming a Rootlet Bed.	
scour and fill	**SF**	Structure formed during the process of first digging out and then refilling a channel instigated by the action of a stream or tide; refers particularly to the process that occurs during a period of flood. Flows of sediment are repeatedly eroded, then filled channels (scours) in the underlying sediment.	Allen, John R. L. Sedimentary Structures, Their Character and Physical Basis. Vol. 2. Amsterdam: Elsevier Scientific Pub., 1982
sedimentary dyke	**DY**	A clastic/sedimentary dyke is a seam of sedimentary material that fills a crack in and cuts across sedimentary strata. Clastic dykes form rapidly by fluidized injection (mobilization of pressurized pore fluids) or passively by water, wind, and gravity (sediment swept into open cracks). Clastic dykes are commonly vertical or near-vertical. Centimetre-scale widths are common, but thicknesses range from millimetres to metres. Length is usually many times width.	The dictionary of physical geography By David S. G. Thomas, Andrew Goudie
slumping	**SP**	Slump structures are mainly found in sandy shales and mudstones, but may also be in limestones, sandstones, and evaporites. They are a result of the displacement and movement of unconsolidated sediments, and are found in areas with steep slopes and fast sedimentation rates.	Allen, John R. L. Sedimentary Structures, Their Character and Physical Basis. Vol. 2. Amsterdam: Elsevier Scientific Pub., 1982
soft sediment deformation	**DE**	Soft-sediment deformation structures develop at deposition or shortly after, during the first stages of the sediment's consolidation. The most common places for soft-sediment deformations to materialize are in deep water basins with turbidity currents, rivers, deltas, and shallow-marine areas.	Allen, John R. L. Sedimentary Structures, Their Character and Physical Basis. Vol. 2. Amsterdam: Elsevier Scientific Pub., 1982

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
stylolites	**ST**	Stylolites (Greek: stylos, pillar; lithos, stone) are serrated surfaces at which mineral material has been removed by pressure dissolution, in a process that decreases the total volume of rock. Insoluble minerals like clays, pyrite, oxides remain within the stylolites and make them visible. Stylolites usually form parallel to bedding, because of overburden pressure.	Allen, John R. L. Sedimentary Structures, Their Character and Physical Basis. Vol. 2. Amsterdam: Elsevier Scientific Pub., 1982
varving	**VV**	A varve is a demonstrably annual sedimentary deposit, with each varve representing a yearly cycle of deposition. The depositional environment is normally aquatic, although varves can be deposited sub aerially. Clastic varves normally consist of fine grained sediments deposited in low energy environments when inflow of water and sediment is low and coarser sediment deposited in response to large inflows, producing the dark and light couplets typically associated with glaciolacustrine varves.	Encyclopedia of sediments and sedimentary rocks By Gerard V. Middleton
water escape structures	**WE**	Water escape or soft-sediment deformation structures develop at deposition or shortly after, during the first stages of the sediment's consolidation. Water escape structures include convolute bedding, flame structures, slump structures, dish structures, pillar structures and sole markings.	Allen, John R. L. Sedimentary Structures, Their Character and Physical Basis. Vol. 2. Amsterdam: Elsevier Scientific Pub., 1982
Position			
in part	**IP**	Forming a proportion; partially; not completely.	
near base of unit	**BU**	Located towards the base of the unit.	
near middle of unit	**MU**	Located near the middle of the unit.	
near top and base of unit	**XU**	Located both near the top and the base of the unit.	
near top of unit	**TU**	Located towards the top of the unit.	
throughout	**TO**	Distributed completely throughout the unit.	
ABUNDANCE			
abundant	**A**	A component present in the range of 30 to 60 %.	Dictionary of Mining, Mineral and Related Terms
secondary	**D**	A mineral deposit formed when a primary mineral deposit is subjected to alteration through chemical and/or mechanical weathering.	Dictionary of Mining, Mineral and Related Terms
accessory	**E**	Applied to minerals occurring in small quantities in a rock. The presence or absence of these minor minerals does not affect the classification or the naming of the rock.	Dictionary of Mining, Mineral and Related Terms
minor	**M**	An element present in the range of 0.1% to 1%.	Dictionary of Mining, Mineral and Related Terms

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
sporadic	**P**	Occurring irregularly	
rare	**R**	Trace occurrence only	
MINERALS / FOSSILS			
Minerals			Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
ankerite	**AN**	White, grey or reddish-yellowish brown in colour. Relatively hard (3.5-4). Rhombohedral crystals. Vitreous or pearly lustre. Sub-conchoidal fractures.	http://www.mindat.org/min-239.html
apatite	**AP**	White to grey green globular masses or reniform at times with a sub-fibrous, scaly, or imperfectly columnar structure or as fibrous crusts.	http://www.mindat.org/min-29229.html
bauxite	**BA**	White, grey, yellow, red in colour with a dull to earthy lustre. Pisolitic structure. Usually produces a white streak, however this can vary if the specimen is stained.	http://geology.com/minerals/bauxite.shtml
biotite	**BT**	Black/dark brown/dark green usually platy appearance. Perfect basal cleavage. White to grey streak. Vitreous lustre.	
calcite	**CA**	Usually white but can also be colourless, grey, red, green, blue, yellow, brown, orange. White streak, vitreous lustre. Perfect rhombohedral cleavage. Low Mohs hardness (3). Dissolves in cold dilute HCl.	http://geology.com/minerals/calcite.shtml
carbonate	**CB**	White in colour. Soft and brittle. Fizzes violently with diluted HCl.	
chalcedony	**CD**	Varying colours dependent on embedded minerals - multicoloured not uncommon Waxy/dull lustre. White streak. No observable cleavage. Very hard (6.5-7). Usually fibrous.	http://www.mindat.org/min-960.html
chalcopyrite	**CC**	Brass yellow often tarnished. Metallic lustre. Greenish black streak. Poor/indistinct cleavage. Appears similar to pyrite however is softer.	http://www.mindat.org/min-955.html
chert	**CH**	Rock. Very hard. Microcrystalline structure (Quartz). Conchoidal fracture. Varying colours. Can occur as nodules, concretionary masses and layered deposits.	
chlorite	**CR**	Varying shades of green, yellow, pink - usually lightly coloured. Vitreous to pearly lustre. Perfect basal cleavage. Relatively soft (2-2.5).	
clay	**CL**	Very fine grained sediment with platy minerals. Soft.	
common opal	**OP**	Varying colours. White streak. Hard (5.5-6.5). Conchoidal/splintery fracture. No cleavage. Alteration mineral.	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
dickite	**DI**	White or slightly tinted. Transparent. Waxy feel with a satiny lustre. Soft (2-2.5). Perfect cleavage.	http://www.mindat.org/min-1287.html
dolomite	**DM**	Colourless, white, grey, reddish-white, brownish white or pink in colour. Hard (3.5-4). Usually occurring as small clusters of small rhombohedral crystals. Sub-conchoidal fracture. Fizzes gently with HCl - if crushed will fizz more noticeably.	
epidote	**EP**	Yellowish-green, green, brownish-green or black in colour. Very Hard (6). Colourless streak. Irrregular/uneven fracture. Found in regional and contact metamorphic rocks.	http://www.mindat.org/min-1389.html
feldspar	**FS**	White (plagioclase) to pink (K-feldspar) in colour. Very hard. Simple twinning sometimes observable for plagioclase. Rectangular. Common mineral in granite.	
galena	**GA**	The major ore mineral of lead. Grey in colour - sometimes tarnished. Usually cubic in shape. Metallic/dull lustre. Opaque. Soft (2.5).	
garnet	**GR**	Rhomb shaped, commonly red however can be observed as a green/yellow colour. Glassy. Very hard.	
glauconite	**GC**	Dark-olive green. Platy-micaceous mineral. Very soft (2). Indicative of shallow marine/coastal shelf environment.	
goethite	**GO**	Primary hydrothermal mineral, bog and marine environments. Brownish black, yellow-brown, reddish brown in colour. Hard (5-5.5). Minerals form prismatic needle-like crystals but more often massive. Opaque to sub translucent. Dull lustre. Uneven to splintery fracture.	http://en.wikipedia.org/wiki/Goethite
graphite	**GP**	Grey-black in colour. Very soft (1-2). Usually occurs in flakes but can also be observed as tabular or granular. Metallic/earthy lustre. Black streak.	
gypsum	**GY**	White to colourless; impurities can give it a coloured hue. Can be nodular but more often found as a fibrous or laminated (flat) crystal. Common twinning visible in hand specimen. Soft (1.5-2). Distinctive evaporitic deposit.	
haematite	**HE**	A major ore mineral of iron, also found as an accessory mineral in many rocks; rather variable in its appearance - it can be in reddish brown, ochrous masses, dark silvery-grey scaled masses, silvery-grey crystals, and dark-grey masses, to name a few. They all have a rust-red streak.	http://www.mindat.org/min-1856.html
heavy minerals	**HM**	As, Cd, Cu, Pb, Ni, Ag	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
illite	**IL**	A common clay mineral. Found in a wide variety of environments. Grey-white to silvery-white or greenish-grey in colour. Prismatic crystals - similar to mica. Pearly to dull lustre. White streak. Translucent. Very soft (1-2).	http://en.wikipedia.org/wiki/Illite
ilmenite	**IM**	An iron-titanium oxide ore mineral, also occurring as an accessory mineral in many rocks. Iron-black or black in colour. Very hard (5-6). Granular to massive crystals but can also occur as lamellar exsolutions in haematite or magnetite. Metallic-submetallic lustre. Black streak. Weakly magnetic.	http://en.wikipedia.org/wiki/Ilmenite
iron oxide	**IO**	Comes in three main forms (Fe, Fe2 and Fe3). Usually all display "earthy" colours yellow/orange/red/brown/black.	http://en.wikipedia.org/wiki/Iron_oxide
ironstone	**IS**	Grey on fresh surface. Usually reddish-brown when weathered. Sedimentary rock. Can occur in a red and black banded form.	http://en.wikipedia.org/wiki/Ironstone
kaolinite	**KA**	Found largely in masses - clay beds - with a whitish, pale yellow to light brown colour. Relatively soft (2-2.5). Translucent-opaque. Waxy lustre.	http://www.mindat.org/min-2156.html
limonite	**LI**	Various shades of brown and yellow. No visible crystals. Occurs as a fine grained aggregate or powdery coating. Relatively hard (4-5.5) although can be very soft if heavily weathered.. Yellowish brown-red streak. Earthy lustre.	http://en.wikipedia.org/wiki/Limonite
magnetite	**MT**	Black, grey in colour. Occurs as octahedral, finely granular to massive crystals. Hard-Very Hard (5.5-6.5). Metallic lustre. Highly magnetic.	http://en.wikipedia.org/wiki/Magnetite
manganese	**MG**	Silvery grey to steel-grey in colour. Very hard (6.5). Metallic lustre. Dark grey streak.	http://www.mindat.org/min-11478.html
marcasite	**MC**	Tin-white on fresh surface, pale bronze-yellow, darkening on exposure, iridescent tarnish. Tabular or pyramidal crystals, often with curved faces; it may also be stalactic, globular, or reniform with a radiating internal structure. Very hard (6-6.5). Metallic lustre. Dark-grey to black streak. Frequently found replacing organic matter, forming fossils, in sedimentary beds, particularly coal beds. May be intergrown with or replaced by pyrite.	http://en.wikipedia.org/wiki/Marcasite
mica	**MI**	Translucent to black sheet silicates characterised by a platy morphology and perfect basal cleavage. Breaks in thin sheets. Common types are Muscovite (white). Biotite (black). Often found in granites. Soft.	
montmorillonite	**ML**	White, buff, yellow, green, rarely pale pink to red in colour. White streak. Dull, earthy lustre. Soft (1-2). Prismatic crystal structures not visible in hand specimen due to fine grained nature.	http://www.mindat.org/min-2821.html

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
muscovite	**MV**	White mica. White, grey, silvery in colour. Massive to platy crystals. Vitreous, silky, pearly lustre. Hardness: 2-2.5. Appears most commonly as sparkly flecks in rocks.	http://www.mindat.org/min-2815.html
olivine	**OL**	Yellow-yellow-green, bottle/olive green to black in colour. Massive to granular crystals. Translucent/transparent. No cleavage. "Curving cracks" (conchoidal fractures) sometimes visible under hand lens. Very hard (6.5-7). Vitreous lustre. White streak. Common in basalts and can be found infilling vesicles.	
opaque minerals	**OM**	A mineral appearing black in thin section transmitted plane-polarized light.	
orthoclase	**OR**	Colourless, greenish, greyish, yellow, white or pink in colour. Can be anhedral or euhedral. Grains are commonly elongate with a tabular appearance. Vitreous lustre (pearly on cleavages). Transparent to translucent. Typically displays multiple twinning. Hard (6). White streak. Common in granites.	http://en.wikipedia.org/wiki/Orthoclase
phosphates	**PP**	An igneous or sedimentary rock with a high concentration of phosphate minerals, commonly the francolite-apatite series.	
plagioclase	**PG**	A series of feldspars with compositions ranging from Na- rich to Ca- rich. Generally white in colour although some display iridescence (Labradorite). All forms are hard (6) and display a white streak. Elongate crystals (needle-like in some cases).	
pyrite	**PY**	Pale brass-yellow, tarnishes darker and iridescent. Crystals are usually cubic, faces may be striated, but also frequently octahedral and pyritohedron. Often inter-grown, massive, radiated, granular, globular and stalactitic. Very hard (6-6.5). Metallic lustre. Paramagnetic. Metallic glistening lustre.	http://en.wikipedia.org/wiki/Pyrite
quartz	**QZ**	Colourless/White. No cleavage. Very hard (7). Occurs as drusy, fine-grained to microcrystalline, massive crystals. Conchoidal fracturing. Transparent to nearly opaque. Vitreous lustre but can also be observed as waxy-dull when massive.	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
siderite	**SD**	A carbonate mineral of iron, sometimes of importance as an ore. Crystals typically found as brown to tan rhombohedrons in clusters, faces often curved or composites; more often found as medium to dark brown massive fine grained material or as massive crystalline material with exposed curved cleavage surfaces. Relatively hard (3.75-4.25). Vitreous or silky to pearly lustre. Translucent to subtranslucent. Most often found in bedded sedimentary deposits with a biological component, with shales, clays and coal beds.	http://www.mindat.org/min-3647.html
silica	**SC**	Found as mainly as the chemical compound silica dioxide (SiO2). It is the main constituent of Quartz (sand) and can also be found in the walls of diatoms.	
sulphides	**SU**	Metal sulphide compounds which make up the single most important group of ore minerals, classified by crystal structure.	
talc	**TA**	Light to dark green, brown, white in colour. Almost always in foliated masses, rarely platey to pyramidal crystals. Very soft (1). Waxlike or pearly lustre. Translucent. White to very pearly green streak. Usually found in metamorphic rocks with abundant carbonate minerals associated.	http://en.wikipedia.org/wiki/Talc
vivianite	**VV**	Colourless, very pale green, becoming dark blue, dark greenish blue, indigo-blue, then black with oxidation. Usually found as deep blue to deep bluish green prismatic to flattened crystals, most crystals rather small to microscopic, larger ones rather rare. Fibrous fracture. Soft (1.5-2). Vitreous lustre (pearly on the cleavage) can be dull when earthy colour. Transparent to translucent.	http://www.mindat.org/min-4194.html
zeolite	**ZE**	Generally white to colourless in the pure state but often coloured by the presence of iron oxides or other impurities. Occur in amygdales and fissures in basic volcanic rocks, as authegenic minerals in sedimentary rocks, in tuffs and in low grade metamorphic rocks as a result of hydrothermal alteration. Morphology is variable as is hardness and lustre.	http://en.wikipedia.org/wiki/Zeolite
Fossils			
bivalves	**BI**	Equivalve aquatic mollusc of the class Bivalvia. Bivalves have a shell consisting of two asymmetrically rounded halves called valves that are mirror image of each other, joined at one edge by a flexible ligament called the hinge.	Collins Dictionary of Geology (1990 edition) & Wikipedia

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
brachiopods	**BR**	Aquatic mollusc with two bilaterally symmetrical valves of unequal size, the pedicle valve and the brachial valve. A brachiopod is sessile (fixed to a stratum) by a stalk called the pedicle.	Collins Dictionary of Geology (1990 edition)
bryozoans	**BZ**	Aquatic invertebrate characterised mainly by colonial growth and an encrusting, branching or fanlike structure forming a colony (zooarium) a few cm across.	Collins Dictionary of Geology (1990 edition)
carbonaceous remains	**XR**	Plant fragments that have undergone some form of coalification.	
carbonaceous root traces	**RC**	Roots of plant organisms that have undergone coalification commonly found in close proximity to coal seams.	
charcoal	**FB**	Dark grey/black residue/solid formed from the incomplete combustion of organic material usually in the absence of oxygen. It is extremely light and can sometimes display plant structure.	Wikipedia
coprolites	**CP**	Fossilised faecal pellets or castings of animal droppings.	Collins Dictionary of Geology (1990 edition)
faecal remains	**FR**	Remnants of whole fossilised faecal pellets or castings of animal droppings.	
foraminifera	**FM**	Protozoa. An informal name for minute aquatic or parasitic protists that consist of a single cell or a colonial aggregate of cells. Generally difficult to view in hand specimen due to their size.	Collins Dictionary of Geology (1990 edition)
fossil wood	**FW**	A material formed by the silica permineralisation of wood in such a manner that the original shape and structural detail (grain, growth rings etc) are preserved. The silica is generally in the form of chalcedony or opal.	Collins Dictionary of Geology (1990 edition)
fossils	**FO**	Umbrella term for the preserved traces or remains of organisms from the remote geological past.	Wikipedia
gastropods	**GT**	Aquatic (marine or fresh water) and terrestrial mollusc that secrete a single calcareous shell, closed at the apex. The shell typically is spirally coiled either dextral or sinistral, although in some forms only the protoconch is coiled and the fully grown shell is cap-shaped. Modern varieties include winkles, whelks, limpets, snails and slugs.	Collins Dictionary of Geology (1990 edition)
marine fossils	**MF**	Umbrella term for the preserved traces or remains of organisms from the remote geological past that occupied marine environments.	Wikipedia
pelycepods	**PE**	marine or freshwater molluscs having a soft body with platelike gills enclosed within two shells hinged together - (see *Bivalves*).	Wikipedia
plant fragments	**PF**	Parts broken off, detached or incomplete fossil remains of plant material.	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
plant impressions	**PI**	Fossil imprint of plant material (leaves, woody parts) in lithified sediments, typically mudstones or siltstones.	
resin	**RS**	*Amber.* Fossil tree resin that has achieved a stable state after ground burial, through chemical change and the loss of volatile constituents. Usually orange in colour and very hard.	Collins Dictionary of Geology (1990 edition)
resin aggregates	**RA**	An aggregate of resin.	
root traces	**RT**	Trace fossil impressions/marks made by roots in surrounding sediment.	
rootlets	**RO**	Roots of plant organisms that have undergone fossilisation.	
sediment filled root traces	**SR**	Sediment that has infilled voids left after the removal of root structures.	
shells	**HY**	Shells of terrestrial or aquatic organisms that have not undergone fossilisation.	
woody fragments	**WF**	Parts broken off, detached or incomplete of woody parts of plant material that has not undergone fossilisation.	
MINERAL ASSOCIATION			
amorphous	**AM**	A mineral with no regular arrangement of atoms (not crystalline).	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
bands	**BN**	Thin layers or stratum of rock, noticeable by differing properties to adjacent layers.	McGraw Hill, 2003, Dictionary of Geology and Mineralogy, Second Edition, McGraw-Hill Companies Inc, New York, USA
cement	**CM**	Any chemically precipitated material occurring in the interstices of clastic rocks.	McGraw Hill, 2003, Dictionary of Geology and Mineralogy, Second Edition, McGraw-Hill Companies Inc, New York, USA
clasts	**CT**	Particles of rock which have been derived from weathering and erosion.	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
coarse grains	**CC**	Grains ranging from 0.50 mm to 2.0 mm in diameter.	
coating	**OU**	A surface film of another mineral on a rock/mineral.	
concentrated at base	**CB**	Feature occurs predominantly at base of unit.	
concentrated at top	**CN**	Feature occurs predominantly at top of unit.	
concretions	**CI**	A nodule without a concentric structure. Usually on a larger scale than a nodule.	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
cone in cone structure	**KK**	A mineral structure in the form of a series of nested, concentric cones.	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
crystals	**XL**	A regular arrangement of atoms making up a crystalline solid, formed from the processes of nucleation and precipitation from solution.	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
detrital	**DE**	Particles derived from an existing rock by weathering or erosion.	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
disseminated	**DS**	Where the described feature is dispersed throughout the host rock.	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
fibrous	**FB**	A texture with the appearance of a mass of fibres (e.g.: asbestos).	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
fine grains	**FF**	Grains ranging from 0.625 mm to 0.25m m in diameter.	
fragments	**FR**	Descriptive of broken particles of clasts.	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
grains	**GN**	Particles or discrete crystals which make up a sediment or rock.	McGraw Hill, 2003, Dictionary of Geology and Mineralogy, Second Edition, McGraw-Hill Compnaies Inc, New York, USA
in blebs	**BL**	Small, usually spherical inclusions within a rock mass.	McGraw Hill, 2003, Dictionary of Geology and Mineralogy, Second Edition, McGraw-Hill Compnaies Inc, New York, USA
in cavities	**CV**	In naturally formed caverns within rock, commonly resultant of dissolution.	Stow, D.,2005, Sedimentary Rocks in the Field, Manson Publishing Ltd, London, U.K
in cleat	**CE**	In closely spaced joining within coal.	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
in pods	**PO**	of elongate, lenticular shape.	McGraw Hill, 2003, Dictionary of Geology and Mineralogy, Second Edition, McGraw-Hill Companies Inc, New York, USA
in veins	**VN**	A mineralised body formed by complete or partial infilling of a fracture within a rock.	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
in vesicles	**VS**	Gas filled cavity in a magma or volcanic rock. If mineralised then known as *Amygdales.*	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
in vughs	**VU**	In small irregular cavities within intrusive rock or carbonate sediments.	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
infilling fault discontinuities	**FD**	Infilling of the plane or surface of a fault.	
infilling of burrows	**IB**	Infilling of a cavity created by the passage/burrowing/nesting of an organism.	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
infilling vesicles	**IV**	Infilling of cavities in a magma or volcanic rock which were formed by the entrapment of gas bubbles during solidification.	McGraw Hill, 2003, Dictionary of Geology and Mineralogy, Second Edition, McGraw-Hill Companies Inc, New York, USA
intercalations	**IC**	A type of interbedding, specifically where layers of one material alternate with thicker layers of another material (e.g.: beds of shell intercalated in sandstone).	Lapidus, D., and Winstanley, I.,1987, Collins Dictionary of Geology, Fcats on File Publications, New York, U.S.A
laminae	**LM**	Thin (less than 1 cm) layer of sediment/sedimentary rock, noticeable by differing properties to adjacent layers.	McGraw Hill, 2003, Dictionary of Geology and Mineralogy, Second Edition, McGraw-Hill Companies Inc, New York, USA
lenses	**LN**	A feature which is lens-shaped, thick in the middle and converges towards the edges.	McGraw Hill, 2003, Dictionary of Geology and Mineralogy, Second Edition, McGraw-Hill Companies Inc, New York, USA
matrix	**MX**	The fine grained material separating clasts in a sedimentary rock.	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
microflakes	**MF**	Platelet shaped grains of microscopic scale.	
nodules	**ND**	Irregular, spherical to ellipsoidal, flattened to cylindrical bodies, composed commonly of calcite, siderite, pyrite, gypsum and chert.	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
on bedding planes	**BP**	On the surfaces separating beds in a sediment.	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
on fracture planes	**FP**	On the surfaces of discontinuities where separation has occurred.	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
on joints	**JN**	On the surfaces of discontinuities where no shear displacement has occurred.	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
oolites	**OO**	A rock composed mainly of ooids. A small type of carbonate or iron coated grain with cortex of concentric fine laminae, lacking biogenic features and a nucleus, often a shell fragment or sand grain.	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
pebbles	**PB**	Rounded rock fragments of 2 mm - 64 mm in diameter.	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
pellets	**PT**	Small ovoid to spherical particles with no internal structure.	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.
phenocrysts	**PH**	Large mineral grains within the fine grained matrix of an igneous rock, representing two cooling phases (slow and fast).	Keary, P., 2001, Dictionary of Geology, Second Edition, Penguin Books, London.

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
radial filaments	**FL**	Fine thread-like structures which radiate from a central point (similar to spokes on a wheel).	McGraw Hill, 2003, Dictionary of Geology and Mineralogy, Second Edition, McGraw-Hill Companies Inc, New York, USA
replacement	**RE**	The growth of a new mineral within the body of a pre-existing mineral by simultaneous solution and deposition.	McGraw Hill, 2003, Dictionary of Geology and Mineralogy, Second Edition, McGraw-Hill Companies Inc, New York, USA
replacing fossils	**RF**	The substitution of organic fossil material (shell, bone, tissue) with inorganic material or minerals.	McGraw Hill, 2003, Dictionary of Geology and Mineralogy, Second Edition, McGraw-Hill Companies Inc, New York, USA
resinous	**RS**	An appearance or lustre like resembling that of resin, commonly shown by sphalerite, opal, pitchstone, amber and native sulphur.	McGraw Hill, 2003, Dictionary of Geology and Mineralogy, Second Edition, McGraw-Hill Companies Inc, New York, USA
rhombs	**RH**	Minerals of rhombus shape (parallelogram - 4 equal length sides, with no 90 degree internal angles), e.g. diamond shape.	
staining	**SN**	Discoloration of rock, particularly common on fracture surfaces through which fluid flow has occurred.	
traces	**TR**	Describes a feature observed in a small quantity, or a record of previous activity, .e.g. trace fossils.	McGraw Hill, 2003, Dictionary of Geology and Mineralogy, Second Edition, McGraw-Hill Companies Inc, New York, USA
wisps	**WP**	Fine irregular wispy features.	
GAS			
trace (<1 m^3/t)	**T**	< 1 m^3/t	
low gas present (1-5 m^3/t)	**L**	1 – 5 m^3/t	
moderate gas present (5-10 m^3/t)	**M**	5 – 10 m^3/t	
high gas present (10-15 m^3/t)	**H**	10 – 15 m^3/t	
very high gas present (>15 m^3/t)	**V**	> 15 m^3/t	
H_2S not detected	**N**	No hydrogen sulphide detected	
H_2S present	**P**	Hydrogen sulphide detected	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
RMU TYPE		Any defect less than 200 mm thick is logged as a defect.	The RMU Type is chiefly an indicator to software on what data must be recorded for the RMU and how the unit should be treated for the calculation of parameters such as RQD (Rock Quality Designation) and Fracture Frequency. **RQD** **Fracture Frequency**
broken zone	**B**	Zone greater than 200 mm with numerous defects, and individual defects are difficult to delineate.	0 arbitrary high number
core loss	**L**	Core drilling but no core returned.	0 arbitrary high number
core with defects	**D**	Individual defects can be identified and described.	calculated directly from the defects
not recorded	**N**	No geotechnical information has been recorded for the unit.	blank blank
open hole drilling	**O**	Only chip returns. Only geotechnical information possibly available is weathering and estimated strength.	blank blank
soil properties	**S**	Unconsolidated material.	0 blank
unbroken core	**U**	Core not containing any breaks.	100 0
WEATHERING		see Lithology Dictionary for details	
ALTERATION		As distinct from WEATHERING which is a special and common case of alteration at surface and near-surface temperatures and pressures associated with air and water; is more common in volcanic and metamorphic rock types.	AS 1726-1993 and Oxford Dictionary of Earth Sciences: Change produced in a rock by chemical or physical action.
extremely altered	**E**	Rock is altered to such an extent that it has 'soil' properties, i.e. it either disintegrates or can be remoulded, in water	
distinctly altered	**D**	Rock strength and mineralogy usually changed by alteration. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.	
slightly altered	**S**	Rock is slightly discoloured but shows little or no change of strength from fresh rock. Usually penetrative alteration along defect surfaces	
altered	**A**	Degree of alteration not assessed	
fresh	**F**	Rock shows no sign of decomposition or staining.	

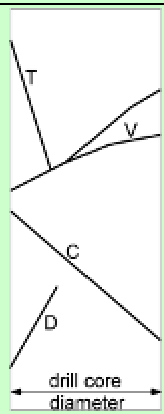
CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
ESTIMATED STRENGTH			
Unconsolidated Cohesive			AS1726-1993 Table A4
Very soft	**C1**	s_u < 12 kPa; exudes between the fingers when squeezed in hand	
Soft	**C2**	s_u 12 - 25 kPa; can be moulded by light finger pressure	
Firm	**C3**	s_u 25 - 50 kPa; can be moulded by strong finger pressure	
Stiff	**C4**	s_u 50 - 100 kPa; cannot be moulded by fingers, can be indented by thumb	
Very stiff	**C5**	s_u 100 - 200 kPa; can be indented by thumb nail	
Hard	**C6**	s_u > 200 kPa; can be indented with difficulty by thumbnail	
Unconsolidated Cohesionless			AS1726-1993 Table A5
Very loose	**S1**	Density Index <15 %; easily dissociated with flicks of finger nail.	
Loose	**S2**	Density Index 15 % - 35 %; easily penetrated by knife blade, readily dissociated by scratching with finger nail.	
Medium dense	**S3**	Density Index 35 % - 65 %; penetrated by knife only with firm pressure, readily indented by thumb pressure, dissociated with difficulty by scratching with finger nail.	
Dense	**S4**	Density Index 65 % - 85 %; difficult to indent by thumb pressure, dissociated readily by knife blade.	
Very dense	**S5**	Id > 85 %; cannot be indented by thumb pressure, dissociated only by firm pressure with knife blade.	
Rock			Adapted from Anon, 1977. The Description of rock masses for engineering purposes. Report by the Geological Society Engineering Group Working Party. Q. Jl. Engng Geol. 10 pp355-388.
Extremely low strength rock	**R1**	UCS < 1 MPa; may be broken by hand and remoulded (with the addition of water if necessary) to a material with soil properties.	
Very low strength rock	**R2**	UCS 1 - 5 MPa; crumbles under a single firm hammer blow, can be peeled with a knife.	
Low strength rock	**R3**	UCS 5 - 10 MPa; breaks under a single firm hammer blow, scored but not peeled with a knife.	
Medium strength rock	**R4**	UCS 10 - 25 MPa; breaks under 1 to 3 hammer blows, can be scratched but not scored with a knife.	
High strength rock	**R5**	UCS 25 - 50 MPa; breaks under 3 to 5 hammer blows, hard to scratch with a knife, can be scratched with tungsten-tipped tool, hard sound when struck with hammer.	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
Very high strength rock	**R6**	UCS 50 - 100 MPa; breaks under 1 hammer if resting on solid surface, cannot be scratched by knife, scratched with difficulty by a tungsten-tipped tool, dull ringing sound when struck with hammer.	
Extremely high strength rock	**R7**	UCS > 100 MPa; difficult to break with hammer even if resting on solid surface, bright ringing sound when struck with hammer.	
BED SPACING		NB descriptions are twice size of those in common use	
massive/absent bedding	**MA**	No bedding evident within Rock Mass Unit	Adapted from Anon, 1977. The Description of rock masses for engineering purposes. Report by the Geological Society Engineering Group Working Party. Q. Jl. Eng Geol. 10 pp355-388. Table 5.
very thickly bedded (> 2 m)	**VB**	> 2 m	
thickly bedded (600-2000 mm)	**CB**	600-2000 mm	
medium bedded (200-600 mm)	**MB**	200-600 mm	
thinly bedded (60-200 mm)	**TB**	60-200 mm	
very thinly bedded (20-60 mm)	**UB**	20-60 mm	
thickly laminated (6-20 mm)	**LM**	6-20 mm	
thinly laminated (< 6 mm)	**LL**	<6 mm	
irregular spaced bedding	**IR**	Bedding spacing encompasses at least two separation classes	
MOISTURE SENSITIVITY			
not sensitive	**N**	No change to fragments.	common observation
low sensitivity	**L**	Slight fracturing of fragments, slight rounding of edges, surfaces are clean and not sticky.	common observation
medium sensitivity	**M**	Fragments break into smaller pieces, edges become rounded and surfaces are slightly sticky.	common observation
high sensitivity	**H**	Fragments show marked disintegration, surfaces are sticky and fragments disintegrate when rolled between fingers.	common observation

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
PLASTICITY			
Non plastic	**N**	Visual-Tactile: Behaves as a cohesionless material which may exhibit a dilatancy reaction when shaken but which cannot be moulded into a plastic solid including being rolled into a 3 mm diameter thread. Laboratory: Either or both the Plastic Limit and Liquid Limit cannot be determined by the test methods.	AS1726-1993
Brittle	**B**	Visual-Tactile: Behaves as a cohesive material but does not exhibit a dilatancy reaction and cannot be remoulded into a 3 mm thread. Laboratory: The Plastic Limit may or may not be measurable but the Liquid Limit cannot be measured by the test methods.	AS1726-1993
Low plasticity	**L**	Visual-Tactile: Behaves as a cohesive material, may or may not exhibit dilatancy, and feels smooth but gritty. Dried crumbs are easily broken down by finger pressure, dries rapidly from a thin film on a finder to a powdery consistency.Laboratory: Has measureable Plastic and Liquid Limits and the Liquid Limit is 35% or less. Can be subdivided into low plasticity silt (Plasticity Index below A-Line on Casagrande Plot) and low plasticity clay (Plasticity Index above A-Line on Casagrande Plot).	AS1726-1993
Intermediate plasticity	**I**	Visual-Tactile: Behaves as a cohesive material, may or may not exhibit dilatancy, and feels smooth. Dried crumbs can be ruptured with moderate finger pressure, dries slowly from a thin film on a finger to a cake consistency. Laboratory: Has measureable Plastic and Liquid Limits and the Liquid Limit is greater than 35% but not greater than 50%. Can be subdivided into intermediate plasticity silt and clay based on position relative to A-Line on Casagrande Plot.	AS1726-1993
High plasticity	**H**	Visual-Tactile: Behaves as a cohesive material, will not readily exhibit dilatancy, and feels very smooth like butter or grease. Dried crumbs are difficult to rupture with strong finger pressure, dries very slowly and in a sticky manner from a thin film on a finger to a hard cake consistency. Laboratory: Has measureable Plastic and Liquid Limits and the Liquid Limit is greater than 50%. Can be subdivided into high plasticity silt and clay based on position relative to A-Line on Casagrande Plot.	AS1726-1993

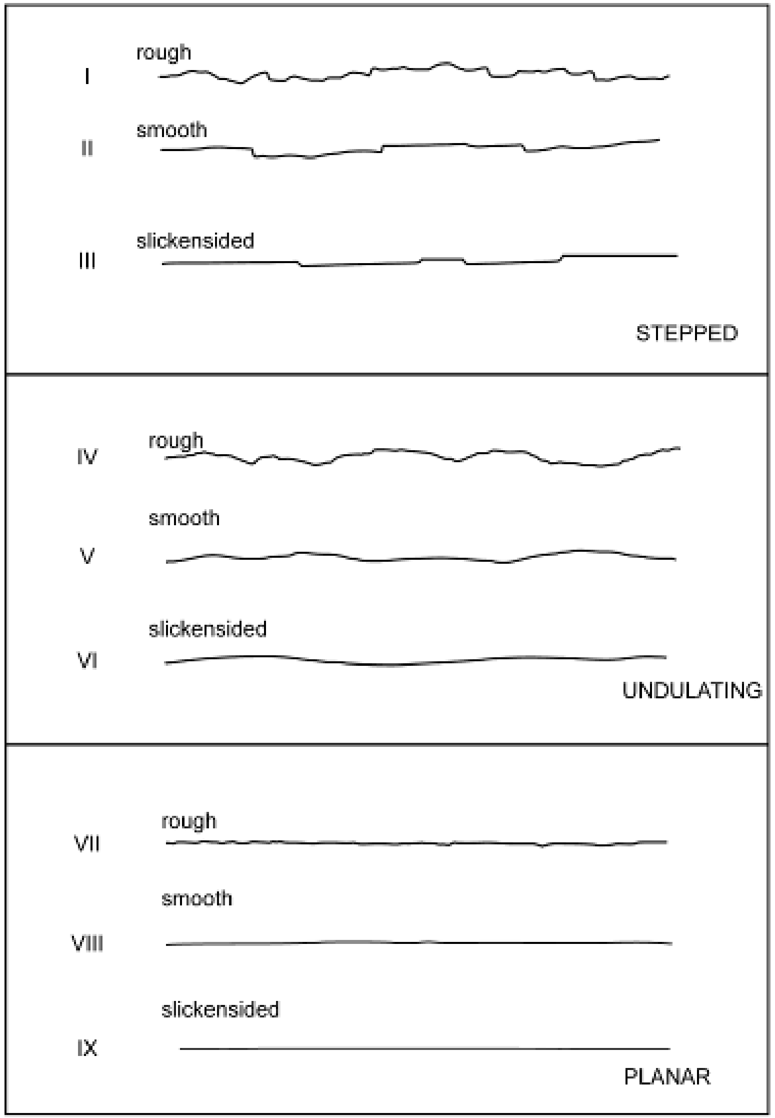
CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
DEFECT TYPE			
Natural			
Bedding plane	**BP**	Bedding in sedimentary rocks and some volcanic rocks is a visible arrangement of mineral grains of similar composition or lithic grains of similar size into approximately parallel layers.	Oxford Dictionary of Earth Sciences
Broken zone	**BZ**	Section of core fragmented along natural defects into pieces mostly < core diameter size; not completely disaggregated by drilling or handling.	common observation
Clay band	**CL**	Band or seam of any type of clay that may be the product of rock substance weathering or alteration.	common observation
Coal cleat	**CE**	A distinct feature of most coal seams developed as variably spaced structures that tend to be orthogonal to each other and to bedding in the coal.	Oxford Dictionary of Earth Sciences
Contraction fracture	**CF**	Generally curviplanar features developed in volcanic lavas or in country rock adjacent to intrusive dykes and sills.	common observation. Brittle shear fracture: W D Ortlepp 1967. Rock Fracture and Outbursts. SAIMM.
Cross bedding	**XB**	Cross-bedding is a feature commonly observable in sandstones deposited in floodplain, nearshore and aeolian environments; cross-bedding and true bedding exhibit distinctly different angles relative to each other over short vertical distances.	Oxford Dictionary of Earth Sciences
Dyke	**DY**	A feature of igneous origin, cuts across country rock. Baked margin on both sides.	Oxford Dictionary of Earth Sciences
Fault	**FT**	A geological structure within a rockmass along which relative movement is discernible; faults as defects in core can be from <1 mm to > 1m thickness.	Oxford Dictionary of Earth Sciences
Foliation	**FO**	The visible fabric developed in regional metamorphic rocks such as phyllite, schist and gneiss (other terms are cleavage, schistosity, gneissosity).	Oxford Dictionary of Earth Sciences
fracture (undifferentiated)	**FR**		
Joint	**JN**	A discernible rockmass structure developed from tectonic or thermal contraction processes along which no relative movement is obvious.	G Mandl 2005. Rock Joints the Mechanical Genesis. Springer.
Shear zone	**SH**	A region, narrow compared with its length, within which rocks have undergone intense deformation. The two end-members are brittle shear and ductile shear, and both may occur as parallel or conjugate sets; has variable thickness and comprises roughly parallel boundaries separating a section of core with closely spaced to very closely spaced joints	Oxford Dictionary of Earth Sciences; AS1726-1993, Table A10

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
Sill	**SI**	A feature of igneous origin, intruded within layers of country rock.	Oxford Dictionary of Earth Sciences
Softened zone (non-tectonic)	**SO**	Zone with any shape having reduced rock substance strength and possibly also discolouration.	common observation
Vein	**VN**	A feature of igneous origin usually comprising one main mineral (e.g. quartz or calcite), generally with irregular shape and variable thickness; some healed joints at core scale may be veins at outcrop or face exposure scale.	Oxford Dictionary of Earth Sciences
Induced			
Discing	**DS**	Generally a result of poor drilling equipment or practice in closely bedded or laminated rock types producing discs of core broken along bedding or other structure normal to the core axis.	common observation
Drilling induced break	**DB**	A core break identified as being caused by drilling, extrusion from the inner tube or handling; core breaks are not always easily distinguishable from natural defects but mostly have irregular shape and rough surface.	common observation
Drilling induced broken zone	**DZ**	Section of core fragmented by drilling and/or handling into pieces mostly < core diameter size up to twice core diameter size.	common observation
DEFECT INTACT			
Intact	**I**	Can be applied to any Natural Defect except for 'broken zone' or 'coal cleat'. Does not contribute to RQD	
DEFECT CONTINUITY			
continuous across core width	**C**	Extends through core diameter	
discontinuous across core width	**D**	Does not extend through core diameter	
divaricates	**V**	Joint splits into two	
truncated within core width	**T**	Ends against another structure	



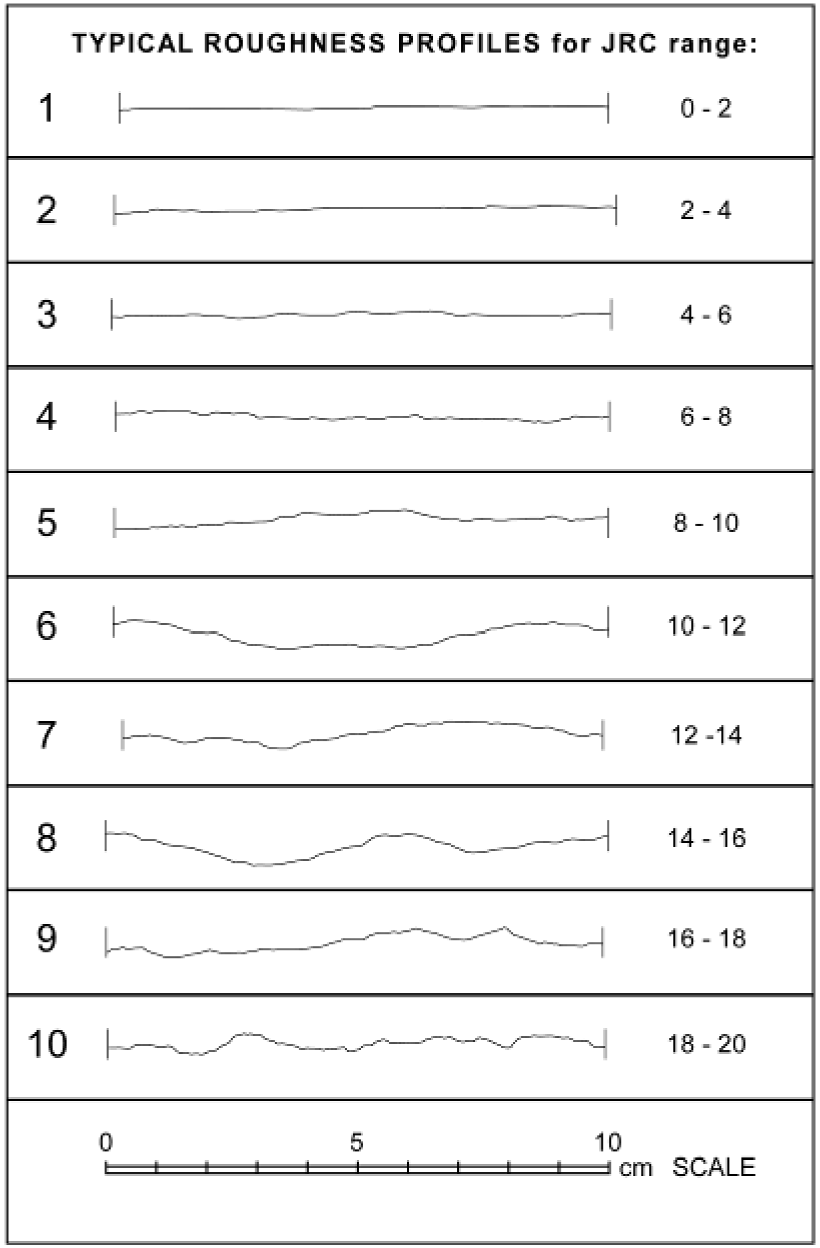
CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
DIP ORIENTATION METHOD			
directly measured from reference line	**D**		
estimated	**E**		
indirectly measured	**I**		
measured from televiewer	**A**	Measured from acoustic or optical scanner	
SURFACE SHAPE		The shape of the defect surface across the core.	from ISRM, 1981 (Fig 17 below), Suggested methods for the quantitative description of discontinuities in rock masses and common observations
concave/convex	**C**	one trough or crest across a core width	
irregular	**I**	many sharp troughs and crests in all directions across a core width	
planar	**P**	a surface with no obvious curves or irregularities across the core width	
stepped	**S**	distinct steps in any direction across the core width	
undulose	**U**	rounded crests and troughs in one or more directions across the core width	
SURFACE ROUGHNESS		Inherent surface roughness and shape relative to the mean plane of a logged defect	from ISRM, 1981 (Fig 19 below), Suggested methods for the quantitative description of discontinuities in rock masses
polished	**P**	smooth but without striations - reflects light	
rough	**R**	rough to touch - sandpaper feel	
slickensided	**K**	striations visible on defect surface that may or may not be polished (the angle of the striations to the dip direction of the defect should be noted)	
smooth	**S**	smooth to feel but not polished or slickensided	

JRC		joint roughness coefficient



V

ISRM, 1981, Fig 17 Typical roughness profiles and suggested nomenclature. The length of each profile is in the range 1 to 10 metres. The vertical and horizontal scales are equal.



ISRM,1981, Fig 19 Roughness profiles and corresponding range of JRC values associated with each one.

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
INFILL TYPE			
apatite	**AP**	White to grey green globular masses or reniform at times with a sub-fibrous, scaly, or imperfectly columnar structure or as fibrous crusts.	
calcite	**CA**	Usually white but can also be colourless, grey, red, green, blue, yellow, brown, orange. White streak, vitreous lustre. Perfect rhombohedral cleavage. Low Mohs hardness (3). Dissolves in cold dilute HCl.	
carbonaceous remains	**XR**	Plant fragments that have undergone some form of coalification.	
carbonate	**CB**	White in colour. Soft and brittle. Fizzes violently with diluted HCl.	
chlorite	**CR**	Varying shades of green, yellow, pink - usually lightly coloured. Vitreous to pearly lustre. Perfect basal cleavage. Relatively soft (2-2.5).	
clay	**CL**	Very fine grained sediment with platy minerals. Soft.	
coal	**CO**	Carbon rich mineral deposit formed from the accumulation of organic matter and containing less than 50% ash yield on combustion; coal streaks brown (low rank) to black (high rank) when scratched with a metal tool.	
crushed rock	CU	breccia.	
dickite	**DI**	White or slightly tinted. Transparent. Waxy feel with a satiny lustre. Soft (2-2.5). Perfect cleavage.	
fossils	**FO**	Umbrella term for the preserved traces or remains of organisms from the remote geological past.	
glauconite	**GC**	Dark-olive green. Platy-micaceous mineral. Very soft (2). indicative of shallow marine/coastal shelf environment.	
gypsum	**GY**	White to colourless; impurities can give it a coloured hue. Can be nodular but more often found as a fibrous or laminated (flat) crystal. Common twinning visible in hand specimen. Soft (1.5-2). Distinctive evaporitic deposit.	
haematite	**HE**	A major ore mineral of iron, also found as an accessory mineral in many rocks; rather variable in its appearance - it can be in reddish brown, ochrous masses, dark silvery-grey scaled masses, silvery-grey crystals, and dark-grey masses, to name a few. They all have a rust-red streak.	
illite	**IL**	A common clay mineral. Found in a wide variety of environments. Grey-white to silvery-white or greenish-grey in colour. Prismatic crystals - similar to mica. Pearly to dull lustre. White streak. Translucent. Very soft (1-2).	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
iron oxide	**IO**	Comes in three main forms (Fe, Fe2 and Fe3). Usually all display "earthy" colours yellow/orange/red/brown/black.	
kaolinite	**KA**	Found largely in masses - clay beds - with a whitish, pale yellow to light brown colour. Relatively soft (2-2.5). Translucent-opaque. Waxy lustre.	
limonite	**LI**	Various shades of brown and yellow. No visible crystals. Occurs as a fine grained aggregate or powdery coating. Relatively hard (4-5.5) although can be very soft if heavily weathered. Yellowish brown-red streak. Earthy lustre.	
magnetite	**MT**	Black, grey in colour. Occurs as octahedral, finely granular to massive crystals. Hard-Very Hard (5.5-6.5). Metallic lustre. Highly magnetic.	
manganese	**MG**	Silvery grey to steel-grey in colour. Very hard (6.5). Metallic lustre. Dark grey streak.	
marcasite	**MC**	Tin-white on fresh surface, pale bronze-yellow, darkening on exposure, iridescent tarnish. Tabular or pyramidal crystals, often with curved faces; it may also be stalactic, globular, or reniform with a radiating internal structure. Very hard (6-6.5). Metallic lustre. Dark-grey to black streak. Frequently found replacing organic matter, forming fossils, in sedimentary beds, particularly coal beds. May be intergrown or replaced by pyrite.	
mica	**MI**	Translucent to black sheet silicates characterised by a platy morphology and perfect basal cleavage. Breaks in thin sheets. Common types are Muscovite (white). Biotite (black). Often found in granites. Soft.	
montmorillonite	**ML**	White, buff, yellow, green, rarely pale pink to red in colour. White streak. Dull, earthy lustre. Soft (1-2). Prismatic crystal structures not visible in hand specimen due to fine grained nature.	
other	**OT**		
plant fragments	**PF**	Parts broken off, detached or incomplete fossil remains of plant material.	
pyrite	**PY**	Pale brass-yellow, tarnishes darker and iridescent. Crystals are usually cubic, faces may be striated, but also frequently octahedral and pyritohedron. Often inter-grown, massive, radiated, granular, globular and stalactitic. Very hard (6-6.5). Metallic lustre. Paramagnetic. Metallic glistening lustre.	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
quartz	**QZ**	Colourless/White. No cleavage. Very hard (7). Occurs as drusy, fine-grained to microcrystalline, massive crystals. Conchoidal fracturing. Transparent to nearly opaque. Vitreous lustre but can also be observed as waxy-dull when massive.	
sand	**SA**	Majority of particles are between 0.06 and 2 mm.	
siderite	**SD**	A carbonate mineral of iron, sometimes of importance as an ore. Crystals typically found as brown to tan rhombohedrons in clusters, faces often curved or composites; more often found as medium to dark brown massive fine grained material or as massive crystalline material with exposed curved cleavage surfaces. Relatively hard (3.75-4.25). Vitreous or silky to pearly lustre. Translucent to subtranslucent. Most often found in bedded sedimentary deposits with a biological component, with shales, clays and coal beds.	
silt	**SI**	Majority of particles are between 0.002 and 0.06 mm.	
talc	**TA**	Light to dark green, brown, white in colour. Almost always in foliated masses, rarely platey to pyramidal crystals. Very soft (1). Waxlike or pearly lustre. Translucent. White to very pearly green streak. Usually found in metamorphic rocks with abundant carbonate minerals associated.	
zeolite	**ZE**	Generally white to colourless in the pure state but often coloured by the presence of iron oxides or other impurities. Occur in amygdales and fissures in basic volcanic rocks, as authegenic minerals in sedimentary rocks, in tuffs and in low grade metamorphic rocks as a result of hydrothermal alteration. Morphology is variable as is hardness and lustre.	
INFILL MODE			
absent	**A**	no obvious staining or mineral coating on defect surface across full core width	
blebs	**L**	discrete circular to irregular shaped particles or grains adhered to defect surface	
breccia	**B**	angular fragments or clasts in finer grained clayey or cemented matrix	
gouge	**G**	a mixture of fine grained cohesive and non-cohesive material (rock flour) formed during fault movement	
healed (cemented)	**H**	intact fault, joint, bedding or foliation with non-clay mineral infill (e.g. calcite, limonite or quartz)	

CoalLog Dictionary v1.1			
Item	**Code**	**Description**	**Source**
open	**O**	defect surfaces not in contact	
rubble	**R**	fragmented material constituting broken zones or fault zones	
surface completely coated	**C**	defect surface across full core width has mineral coating	
surface partly coated	**P**	defect surface across part of core width has mineral coating	
surface staining	**S**	defect surface is stained rather than coated (most commonly by limonite)	
trace	**T**	<10% of defect surface across core width has mineral coating	

6 Data Transfer Format

6.1 Introduction

Each of the software vendors who handle coal exploration data in Australia allow their users to have their own set of data fields and dictionary codes, however, each vendor has their own conventions for the data structure and associated transfer files. This variability in conventions is most apparent in how each system handles a single lithological unit consisting of multiple lithologies and/or multiple records. This variability has also greatly hindered the transfer of data between systems even where two systems have the same fields and dictionary codes. To overcome this, a standard transfer format has been incorporated into the CoalLog Standard. This format has its own conventions. To be compatible with the Standard, software vendors do not have to adopt these conventions internally but must provide a set of utilities to import and export data to and from their system using these conventions. This chapter explains these conventions.

6.2 CSV File Format

Comma delimited files, commonly referred to as CSV files are used for the data transfer. The possibility of using XML format files was discussed in the preparation of this standard. XML format has the advantage that the files are self-documenting and so data files can also include the relevant dictionary and validation rules along with the data in a single file. The main disadvantages are that they would require considerably more effort on the part of the software vendors to create import/export utilities, and users using general spreadsheet or database programs such as Excel or Access to store their data would require specific import/export utilities to be written.

Unfortunately, there is no standard that defines CSV files and so there can be some slight variations amongst systems. The following from Shafranovich, 2005 documents the format as used by most implementations of CSV files. Note that in this description CR and LF refer to the ASCII characters denoted by the numbers 13 and 10 respectively:

1. Each record is located on a separate line, delimited by a line break (CRLF). For example:

```
aaa,bbb,ccc CRLF
zzz,yyy,xxx CRLF
```

2. The last record in the file may or may not have an ending line break. For example:

```
aaa,bbb,ccc CRLF
zzz,yyy,xxx
```

3. There maybe an optional header line appearing as the first line of the file with the same format as normal record lines. This header will contain names corresponding to the fields in the file and should contain the same number of fields as the records in the rest of the file. For example:

```
field_name,field_name,field_name CRLF
aaa,bbb,ccc CRLF
zzz,yyy,xxx CRLF
```

4. Within the header and each record, there may be one or more fields, separated by commas. Each line should contain the same number of fields throughout the file. Spaces are considered part of a field and should not be ignored. The last field in the record must not be followed by a comma. For example:

```
aaa,bbb,ccc
```

5. Each field may or may not be enclosed in double quotes. If fields are not enclosed with double quotes, then double quotes may not appear inside the fields. For example:

```
"aaa","bbb","ccc" CRLF
zzz,yyy,xxx
```

6. Fields containing line breaks (CRLF), double quotes, and commas should be enclosed in double-quotes. For example:

"aaa","b CRLF
bb","ccc" CRLF
zzz,yyy,xxx

7. If double-quotes are used to enclose fields, then a double-quote appearing inside a field must be escaped by preceding it with another double quote. For example:

```
"aaa","b""bb","ccc"
```

The CoalLog Standard makes two departures from the description above:
As opposed to item 3 above, it is compulsory to have a header in a CoalLog Standard CSV file
As opposed to item 4 above, it is acceptable to have fewer fields on a particular record than defined by the file header. For example, all four data records below are acceptable:

```
field_name,field_name,field_name CRLF
aaa,bbb,ccc CRLF
xxx,, CRLF
yyy, CRLF
zzz CRLF
```

In many countries, commas are used as the decimal point marker. In these countries, CSV format files often use a different field separator, commonly a semi-colon (;). As the CoalLog Standard is for the use of the Australian Coal Industry, there is no requirement for software to be able to support field separators apart from a comma.

6.3 CSV File Fields and Header Line

To make this Standard as flexible as possible, only a minimal number of fields are compulsory and fields may be in any order. Each field has been given a standard name and these have been listed in the Data Table Specifications provided in Appendix A. The data transfer files must include a header line on the first line of the file using the standard field names. This header line defines both the fields in the file and their order. The standard field names are a maximum of 15 characters and do not contain any blank characters within their name. Even though all the field names are shown in the specification in a mixture of upper and lower case, the user may list them in the file header in upper case, lower case, or any mixture of the two.

The user may include non-CoalLog fields in the file. These though will be generally ignored by other applications using the file. Any columns in the file that are for non-CoalLog fields must also be given a name on the header line. These names should start with the string *Custom_*. They may be longer than 15 characters but must not contain any blanks.

Hole_Name is required for all data tables. The following fields must be included in the data transfer file though some of them may not need to have data in them on every record. For more information regarding which data is required on every record see Section 6.8 on Validation later in this Chapter.

Table 3 Mandatory fields to include in data transfers

Data Table Name	Required Fields
Header	`Hole_Name`;
Geologists	`Hole_Name`; `From_Depth`; `To_Depth`
Casing	`Hole_Name`; `From_Depth`; `To_Depth`
Cementing	`Hole_Name`; `From_Depth`; `To_Depth`
Drilling	`Hole_Name`; `From_Depth`; `To_Depth`
Lithology	`Hole_Name`; `From_Depth`; `To_Depth`; `Litho_Type`; `Litho_Perc`*
Water Observations	`Hole_Name`; `Test_Depth`
RMU & Defects	`Hole_Name`; `From_Depth`; `To_Depth`; `RMU_Type`; `Defect_Depth`; `Defect_Type`
Point Load	`Hole_Name`; `From_Depth`; `To_Depth`; `Sample_State`; `Sample_Sub_Id`; `PL_Test_Type`; `Platen_Sep`; `Width`; `Failure_Load`; `Failure_Mode`

* Litho_Perc field is only required where the data has lithological units consisting of more than one Litho_Type

6.4 Transfer of Dictionaries

Any transferred data should also be accompanied by a copy of the relevant dictionary as a CSV file. Even though the CoalLog Standard provides a standard dictionary there are a number of reasons why a user's dictionary may vary from the Standard:

The user may have only used a subset of the items in the standard dictionary.
The standard dictionary does not define codes for:
Geological Organisation, and Geophysical Company on the Header sheet
Drilling Company, Rig Type, Bit Type, Drilling Fluid, or Drill Size Name on the Drilling sheet
Seam Name, Stratigraphic Unit Name, and Horizon Name on the Lithology sheet

Note that where the same category name appears in the specifications in Appendix A for more than one data type, (e.g. Est_Strength in both the Lithology and Defect data types), the same set of dictionary codes apply for both. Therefore, one dictionary file can be generated covering all the data types, or separate dictionary files can be produced for each data type.

6.5 Naming Convention for Transfer Files

The CSV files of data should be given a name with the format “dataSet_dataType.csv” where:
“dataSet” is a name provided by the user.
Where a file contains the data for a single hole “dataSet” should be the Hole_Name for the hole. Where a file contains all the data for a project then it should be the Project_Name for the project. Where the data contains more than one hole but not the entire project this should be a meaningful name. For example, a range of holes, a section line name, a drill hitch date range, an EPC reporting period, etc.
“dataType” is given by the Table below for the various sheets:

Table 4 Naming convention for “dataType” during file transfer

Data Table Name	Data Type for Naming Files
Header	Headers
Geologists	Geologists
Casing	Casing
Cementing	Cementing
Drilling	Drilling
Lithology	Litho
Water Observations	WaterObservations
RMU & Defects	Defects
Point Load	PointLoads

For example, the file containing the Lithology data for hole TST0023 would be called TST0023_Litho.csv.

Dictionaries covering all data types should be named “dataSet_Dictionary.csv” and dictionaries for specific data types should be named “dataSet_Dictionary_dataType.csv”.

Where the data for all data types for a particular data set are zipped together the resulting compressed file should be called “dataSet.zip” or “dataSet.rar” etc. with the appropriate file extension for the compression format.

6.6 Date and Logical Data

Date fields in the data such as Date Rehabilitated in the Header data are transferred in the format dd/mm/yyyy. For example, the 6th February 2010 would be exported as 06/02/2010.

Logical fields, such as Core Photographed in the Header data are transferred as True, False, or blank. The True and False can be in upper case, lower case, or a mixture of the two.

6.7 Continuation Lines in the Lithology Data

Since the advent of recording coal exploration lithological data in Australia on computers, there has been the convention that a single lithological unit between two depths may contain more than one lithology, and that for each lithology it may be necessary to use multiple records in order to describe it. Also in most systems, there has been no maximum limit on the number of lithologies in a unit or the number of records that are used to describe an individual lithology. In addition, most systems also had a methodology for the user to store free format comments with a unit without a limit on the size of these comments. Various software packages have had various conventions for how these multiple lithologies, multiple records, and free format comments are denoted. Therefore, an essential part of CoalLog is providing a standard way of indicating this type of data.

Multiple Lithologies in a Lithological Unit

To denote multiple lithologies in a single unit, the transfer file needs to contain a record for each lithology containing the "from" and the "to" depth of the lithological unit, a record sequence flag, the individual lithology, and the percentage of the unit that consists of this lithology. Each record in a unit must be assigned a unique record sequence flag value which can be the numbers 0 to 9 or the upper case letters A to Z. This flag will denote the order of the records within a lithological unit with the numbers 0 to 9 coming first in order, followed by the letters A to Z in order. Note also that the lithology percentages must add to 100% and that two different lithologies within a unit may actually have the same Litho_Type but may be different in other ways. For example, a lithological unit consisting of 40% medium to coarse grained quartzose sandstone, 35 % siltstone, and 25% fine to medium grained arkosic sandstone would be recorded as follows:

Table 5 Example of coding multiple lithologies within one interval

From Depth	To Depth	Record Sequence Flag	Lithology %	Lithology	Lithology Qualifier	Shade	Hue	Colour	Adjective 1
19.82	23.56	1	40	SS	MC	L		B	QZ
19.82	23.56	2	35	ST		D		G	
19.82	23.56	3	25	SS	FM	D	E	G	AK

Usually the record sequence flags would use each of the numbers and then each of the letters but there is no requirement in CoalLog to use every one of the available values in the sequence. The only requirement is that the record sequence flag for each record in a unit is unique within the unit and that they are in order. For example, the first record in the unit could have the flag 3, the second 6, the third C and the fourth K. In addition, usually the first lithology listed in a unit will be the one which is the largest component of the unit, the second lithology the second largest etc, but this is not a requirement of this Standard.

It is anticipated that the From_Depths and Record Sequence Flags would be generated automatically by the export utility.

Multiple Records within a Lithology

Where a single lithology within a lithological unit consists of multiple records, the conventions explained above for Multiple Lithologies in a Lithological Unit are also used for the From_Depths, To_Depths and Record

Sequence Flags but the values in the Lithology and Lithology Qualifier fields are left blank on the record continuing the description of a lithology. For example, a lithological unit consisting of three lithologies where the first lithology has a colour of light brown to medium yellow would be recorded as follows:

Table 6 Example of coding single lithologies with multiple records

From Depth	To Depth	Record Sequence Flag	Lithology %	Lithology	Lithology Qualifier	Shade	Hue	Colour	Adjective 1
19.82	23.56	1	40	SS	MC	L		B	QZ
19.82	23.56	2				M		Y	
19.82	23.56	3	35	ST		D		G	
19.82	23.56	4	25	SS	FM	D	E	G	AK

Comment Lines

Before the widespread use of database systems for storing coal exploration data it was kept in text files. Comments were placed on their own separate lines within the file. Since the introduction of relational databases to handle this data, comments have generally been stored in their own field within the depth of the database record they refer to which removes the necessity to have a specific continuation type to denote comments. Most database systems require a maximum specified size for each field, however CoalLog has no restriction on the size of individual comments. The user is also free to include non-printable characters such as <NewLines> and <Tabs> in comments. In order for some systems to handle this lack of restrictions, it may be necessary for them to split individual comments over several records.

6.8 Data Validation on Importing CoalLog Data

Importing of data meeting this Standard should satisfy the following conditions and be rejected if it does not.

All Data Types:

all required fields are included in the data transfer file
all character data apart from the comments must be in upper case
all coded data matches a code in the relevant dictionary provided in Appendix C of this document

Header Data

each record will have a unique hole name

Data containing From_Depth and To_Depth

every record within the file must have a From_Depth and To_Depth (except for the Defect data type where records with Defect data and no Rock Mass Unit data must not have a From_Depth or a To_Depth)
the To_Depth on each record must be greater than the From_Depth
records must cover all depths from 0.00 to the maximum To_Depth (except for Cementing or Point Load data). Where there are missing intervals, the user needs to add records to explain why they are missing. For example, a Litho_Type of NL for Not Logged or NR for No Recovery
there must not be any overlapping depth intervals within the hole

Lithological Data

every record must have a unique key consisting of From_Depth, To_Depth, and Record Sequence Flag

the first record within a lithological unit as defined by the Record Sequence Flag must specify a Litho_Type

where a lithological unit consists of multiple lithologies a percentage must be specified for each lithology

where a lithological unit consists of multiple lithologies, their percentages must sum to 100%

Water Observation Data

every record must have a Test_Depth specified

Defect Data

every record must have either a From_Depth and a To_Depth, and/or a Defect Depth

where a record contains a From_Depth, a To_Depth, and a Defect_Depth then the Defect_Depth must be greater than the From_Depth and less than or equal to the To_Depth

every record with a From_Depth and a To_Depth must have an RMU_Type specified

every record with Rock Mass Unit data must have a From_Depth and a To_Depth specified

every record with a Defect_Depth must have a Defect_Type specified

every record with Defect data must have a Defect_Depth specified

Point Load Data

every record must have From_Depth, To_Depth, Test_Sample_Id, Sample_State, PL_Test_Type, Platen_Sep, Width, Failure_Load, Failure_Mode specified

every record must have a unique key consisting of From_Depth, To_Depth, and Test_ Sub_Id

Note that this Standard explicitly does not require the records to be in order and so on importing the records it may be necessary to sort them on depth, and then in the case of Lithology data on the Record Sequence Flags for each Lithological Unit.

6.9 References

Shafranovich,Y., 2005, “Common Format and MIME Type for Comma-Separated Values (CSV) Files”, October 2005, <http://www.ietf.org/rfc/rfc4180.txt>

7 Future Developments

Whilst this Code is fixed and all companies are discouraged from making modifications, it will not be static. A regular review of the codes, descriptions, etc will be undertaken with a clear pathway for submissions to be made. A committee of industry representatives (CoalLog Review Committee) will meet regularly to review, revise, and reissue the Code via a web based system hosted by the Australasian Institute of Mining and Metallurgy (AusIMM), see Appendix D.

It is intended that further updates will be released annually. Some scope will exist for more urgent changes if a fundamental flaw is determined that will have substantial impact on a majority of users.

Rules & Procedures for Updates

As a key aspect of this Code is the fixing of some items such as field names, field sizes, etc which have been standardised to enable data transfer there will need to be clear and compelling reasons to make changes. Additions and changes to codes (and descriptions) are possible but will require close examination of relevant standards, consistency within CoalLog, and the lack of conflict with other codes.

Before any new or updated code is submitted the following checks are required:
Does the proposed item already exist in another field?
Is the proposed item consistent with a relevant Standard (which should be referenced)
Does the proposed code already exist in the field?
Is the proposed code consistent with the use of the item in other fields?

If these checks determine that the item and code are unique, or it is of such significance and importance that its inclusion is justified, then it can be submitted to the CoalLog Review Committee.

Company Names, Datums, and Tools

Currently CoalLog does not provide standard names for companies (Drilling, Geological, Geophysical, etc). There are a number of well known and industry wide service providers who could be allocated a standard logging code in future editions of CoalLog. Some fields (eg Geophysical Logs, Datums, Sample Types, etc) as well as companies may also require new codes in future at the time they are introduced. A procedure will be established to enable a standard code to be issued as required. It is proposed to allocate this responsibility to a Government Department who will be able to provide a unique code within a short time frame to enable consistency.

Formation/seam names

As with the previous section, there are currently no standard codes in CoalLog for Formation or Seam names. These are often very similar from one company to another and a standard set could be produced in future versions of the Code. As some graphical software allocates particular colours or line types to some Formations or Seams there is also the possibility of adopting these in the Code.

Data submission to Government Departments

Data submitted to Government Departments will only need to be in digital format which will reduce time and cost of producing English language logs and plots.

Plotting symbols

Standards currently exist for the plotting of most lithologies in stratigraphic columns and on plans. These are used in whole or part by all graphical software used by the majority of companies. However there are some variations which cause confusion and lead to misinterpretation. Future issues of CoalLog will contain standard plotting symbols which will be adopted and enforced by the major software providers. These can then be implemented by all companies.

Training

The primary purpose of CoalLog is to standardise the use of codes for coal logging in Australia. It has sanitised the dictionaries used by many companies and removed invalid descriptions and duplications. Consequently it now provides a resource for training in correct logging procedures and consistent logging practices across the industry. It can be incorporated into individual companies training packages or developed into an industry standard resource for training.

Standard geophysical log codes (LAS)

Numerous mnemonics are used by the various geophysical logging companies for the variety of geophysical log traces that are provided in a LAS file. This leads to confusion and error. It is proposed to create a standard system for naming these logs which will be systematic and allocate unique names.

Las files also provide for the recording of metadata about the borehole and the logs run. However these data fields are often not consistently completed and various formats (e.g. dates, coordinates, etc) are used. Data collection and transfer will be considerably improved if key fields are required to be filled and agreed formats are used.

This will require the cooperation of the logging companies and consensus with the majority of clients.

8 Contacts

ACARP	www.acarp.com.au/
AGI Glossary of Geology	www.agiweb.org/pubs/pubdetail.html?item=300156
AIG	www.aig.org.au/
AusIMM	www.ausimm.com.au/
BBGG	content.cqu.edu.au/FCWViewer/view.do?site=258
GSA	www.gsa.org.au/
Geoscience Australia	www.ga.gov.au/
Geoscience Portal	www.geoscience.gov.au/
Geological Survey of QLD	mines.industry.qld.gov.au/geoscience/default.htm
Global Standards	www.saiglobal.com/online/
ICSM (survey datums)	www.icsm.gov.au/
NSW Geological Survey	www.dpi.nsw.gov.au/minerals/geological
QLD Dept of Mining	mines.industry.qld.gov.au/mining/default.htm
Webref – geology	www.webref.org/geology/geology.htm

9 Acknowledgements

The creation of CoalLog has benefited from the vast wealth of experience provided by those who have contributed including:

Table 7 Contributors to CoalLog Development

Emma ANDREWS	Catherine GRUNDY	Nick MOORE
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Jared ARMSTRONG	Peter HANDLEY	Mark MUSK
David ARNOTT	Pat HANNA	Mary NOWLAND
Gary BALLANTINE	John HOELLE	Dan PAYNE
Mark BIGGS	Paul HOUYKAAS	David PLACE
Tim BROWNE	Cameron HUDDLESTONE-HOLMES	Andries PRETORIUS
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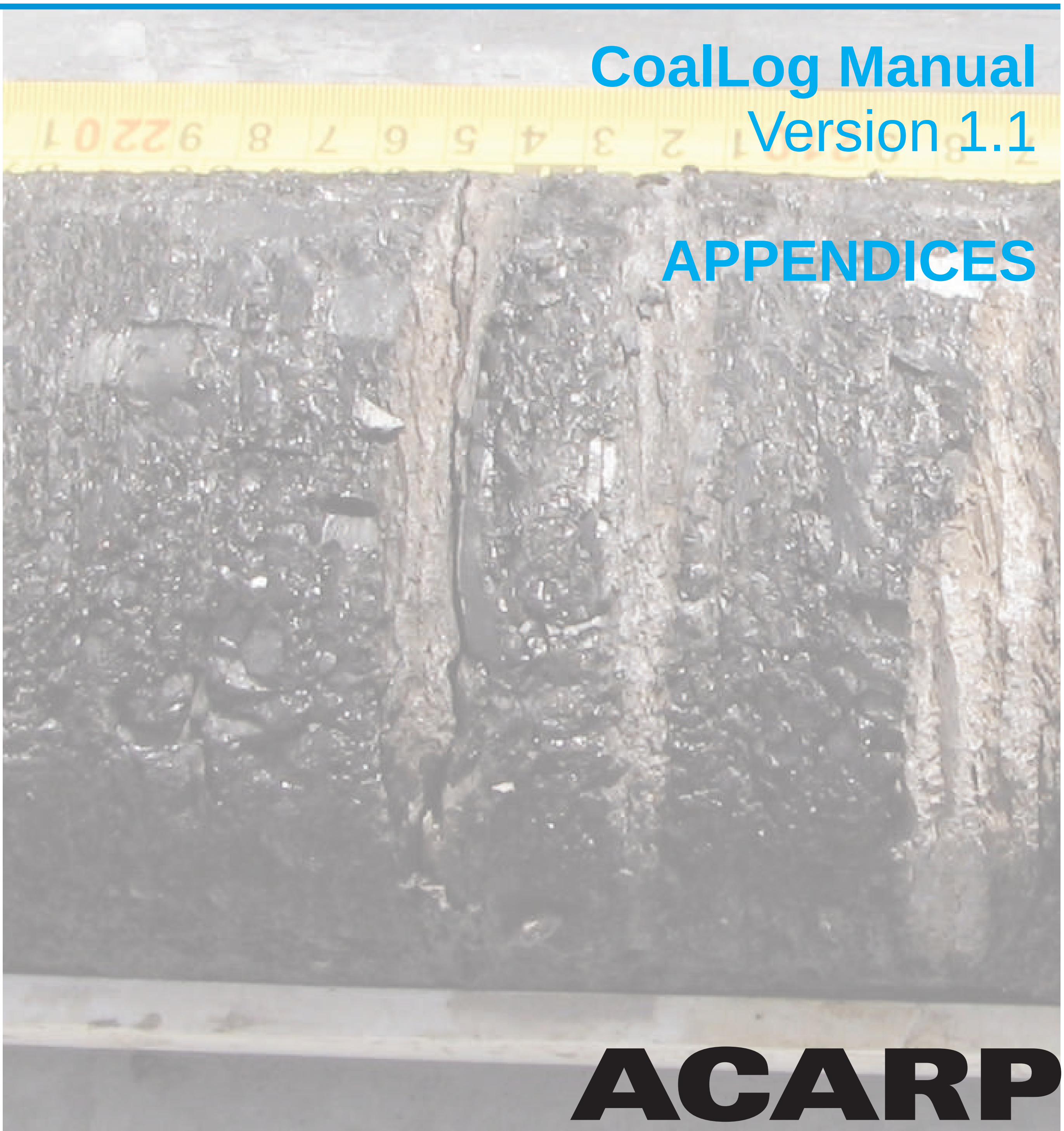
Jo COPPARD	Mambwe KASANGULA	Daniel RIGG
Paul DAMEN	Jason KEYS	Christine ROBERTSON
Grenville DAVIES	Mark LAYCOCK	Gordon SAUL
Robert EPPS	Brett LARKIN	John SIMMONS
Steve FILMER	Grahame LINDSAY	Johann van WIJK
Nicole FOLEY	Charles LORD	Kate WALKER
Chris GLOVER	Paul MACONOCHIE	Samantha WALSH
Joe GOUGH	Ibo MANGO	Barry WARD
Steve GRAHAM	Stella MARTINEZ	
David GREEN	Alison MCQUILLAN	

Borehole Data Standard for the Australian Coal Industry

ACARP Project C21003

Brett J. Larkin (GeoCheck Pty Ltd) &
David R. Green (Green Exploration & Mining Services Pty Ltd)

September 2012



CoalLog Manual
Version 1.1

APPENDICES

Appendix A: CoalLog Data Type Specifications

Introduction

The following tables list for each data type all the fields as defined by the CoalLog standard. The following columns are shown in these tables:

Field Description, describes each of the fields.

Field Name, is a standard name for the field. These Field Names are a maximum of 15 characters, do not contain any blanks and are not case sensitive. There is no requirement to use these names internally but they are required for the header of csv files used for data transfer.

Field Type, describes the data type for the field and can be:

C for character data

N for numeric data

L for logical data (true or false)

D for date data which will be in the format DD/MM/YYYY

Recommended Field Length is the length that the CoalLog standard recommends for the field. Where a numeric field includes digits to the right of the decimal point its size will be shown in the format *n.d* where *n* is the total length of the field including the decimal point and *d* is the number of digits after the decimal point. For example, 8.2 denotes a field 8 characters long with 5 characters to the left of the decimal point and 2 characters to the right. For fields showing a Dictionary Category and the dictionary codes are defined by the CoalLog standard, the Recommended Field Length is obligatory. For other fields, the user may have a field length more or less than the recommended length but it must not exceed the Maximum Field Length.

Maximum Field Length is the maximum size for each field for data to meet the CoalLog standard. For software to meet the standard, it must be able to support these maximum lengths. Where the maximum length is greater than the recommended length then it is shown in red in the following tables.

Dictionary Category is the name of the category in the dictionary listing the valid codes for the field. As with the Field Names, these are a maximum of 15 characters, do not contain any blanks and are not case sensitive.. Where the same category name appears for more than one data type, for example Est_Strength in both the Lithology and Defect data, the same set of codes are valid for both data types.

Note that the CoalLog standard does not specify Recommended or Maximum field lengths for comments.

Dictionary

Field Description	Field Name	Field Type	Recommended Field Length	Maximum Field Length
Dictionary Category	Category	C	15	15
Code	Code	C	8	16
Description	Description	C	60	60
Comment	Comment	C		

Header Data

Field Description	Field Name	Field Type	Recommended Field Length	Maximum Field Length	Dictionary Category
Project	Project_Name	C	8	16	
Drill Hole Name	Hole_Name	C	8	16	
Lease Number	Lease_No	C	10	10	Lease_No
Site Id	Site_Id	C	8	16	
Hole Type	Hole_Type	C	2	2	Hole_Type
Data Status	Data_Status	C	1	1	Data_Status
Hole Purpose 1	Hole_Purpose_1	C	2	2	Hole_Purpose
Hole Purpose 2	Hole_Purpose_2	C	2	2	Hole_Purpose
Geodetic Datum	Geodetic_Datum	C	3	3	Geodetic_Datum
UTM Zone	Utm_Zone	N	2	2	
Height Datum	Height_Datum	C	3	3	Height_Datum
Location Accuracy	Location_Acc	C	1	1	Location_Acc
Easting	Easting	N	9.2	9.2	
Northing	Northing	N	10.2	10.2	
Elevation	Elevation	N	7.2	7.2	
Hole Inclination at Collar	Inclination	N	3	3	
Hole Azimuth at Collar	Azimuth	N	3	3	
Date Started	Start_Date	D	10	10	
Date Completed	Complete_Date	D	10	10	
Total Depth	Total_Depth	N	7.2	8.3	
Redrill of Hole	Hole_Redrilled	C	8	16	
Geological Logging Organization	Geolog_Organiz	C	3	3	Geolog_Organiz
Geotech Log Recorded	Geotech_Log	L	1	1	
Core Photographed	Core_Photos	L	1	1	
Geophysical Logging Company	Geophys_Company	C	3	3	Geophys_Company
Geophysical Log 1	Geophys_Log_1	C	1	1	Geophys_Log
Geophysical Log 2	Geophys_Log_2	C	1	1	Geophys_Log
Geophysical Log 3	Geophys_Log_3	C	1	1	Geophys_Log
Geophysical Log 4	Geophys_Log_4	C	1	1	Geophys_Log
Geophysical Log 5	Geophys_Log_5	C	1	1	Geophys_Log
Geophysical Log 6	Geophys_Log_6	C	1	1	Geophys_Log
Geophysical Log 7	Geophys_Log_7	C	1	1	Geophys_Log
Geophysical Log 8	Geophys_Log_8	C	1	1	Geophys_Log
Geophysical Log 9	Geophys_Log_9	C	1	1	Geophys_Log
Geophysical Log 10	Geophys_Log_10	C	1	1	Geophys_Log
Geophysical Log 11	Geophys_Log_11	C	1	1	Geophys_Log
Geophysical Log 12	Geophys_Log_12	C	1	1	Geophys_Log
Geophysical Logger	Geophys_Logger	C	20	20	
Standing Water Level	Sw_Level	N	7.2	7.2	
Standing Water Level Date	Sw_Level_Date	D	10	10	
Date Rehabilitated	Rehab_Date	D	10	10	
Hole Status	Hole_Status	C	1	1	Hole_Status
Comment	Comment	C			

Geologists Data

Field Description	Field Name	Field Type	Recommended Field Length	Maximum Field Length	Dictionary Category
Project	Project_Name	C	8	16	
Drill Hole Name	Hole_Name	C	8	16	
From Depth	From_Depth	N	7.2	7.2	
To Depth	To_Depth	N	7.2	7.2	
Geologist's Name	Geologist	C	20	20	
Comment	Comment	C			

Casing Data

Field Description	Field Name	Field Type	Recommended Field Length	Maximum Field Length	Dictionary Category
Project	Project_Name	C	8	16	
Drill Hole Name	Hole_Name	C	8	16	
From Depth	From_Depth	N	7.2	7.2	
To Depth	To_Depth	N	7.2	7.2	
Casing Type	Casing_Type	C	3	3	Casing_Type
Casing Size	Casing_Size	N	3	3	
Length Recovered	Length_Recov	N	6.2	6.2	
Comment	Comment	C			

Cementing Data

Field Description	Field Name	Field Type	Recommended Field Length	Maximum Field Length	Dictionary Category
Project	Project_Name	C	8	16	
Drill Hole Name	Hole_Name	C	8	16	
From Depth	From_Depth	N	6.1	6.1	
To Depth	To_Depth	N	6.1	6.1	
Cementing Date	Cementing_Date	D	10	10	
Actual Volume	Volume	N	5.2	5.2	
Coments	Comment	C			

Drilling Data

Field Description	Field Name	Field Type	Recommended Field Length	Maximum Field Length	Dictionary Category
Project	Project_Name	C	8	16	
Drill Hole Name	Hole_Name	C	8	16	
From Depth	From_Depth	N	7.2	8.3	
To Depth	To_Depth	N	7.2	8.3	
Driller Base Depth	Drill_To_Depth	N	0	8.3	
Run Number	Run_No	N	4	4	
Recovered Length	Recov_Length	N	5.2	6.3	
Drilling Date	Drill_Date	D	10	10	
Drilling Company	Drill_Company	C	3	3	Drill_Company
Rig Number	Rig_No	C	5	5	
Rig Type	Rig_Type	C	3	3	Rig_Type
Driller	Driller	C	20	20	
Bit Type	Bit_Type	C	1	1	Bit_Type
Drilling Fluid	Drill_Fluid	C	1	1	Drill_Fluid
Drill Size Name	Drill_Size_Name	C	5	5	Drill_Size_Name
Core Size	Core_Size	N	3	3	
Hole Size	Hole_Size	N	3	3	
Reamed	Reamed	L	1	1	
Comment	Comment	C			

Lithology Data

Field Description	Field Name	Field Type	Recommended Field Length	Maximum Field Length	Dictionary Category
Project	Project_Name	C	8	16	
Drill Hole Name	Hole_Name	C	8	16	
From Depth	From_Depth	N	7.2	8.3	
To Depth	To_Depth	N	7.2	8.3	
Record Sequence Flag	Record _Seq_Flag	C	1	1	
Recovered Thickness	Recovered_Thick	N	0	8.3	
Seam	Seam	C	4	16	Seam
Ply	Ply	C	4	16	Ply
Horizon	Horizon	C	4	16	Horizon
Sample Type	Sample_Type	C	2	2	Sample_Type
Sample Number	Sample_No	C	8	16	
Interval Status	Interval_Status	C	0	1	Interval_Status
Lithology Percentage	Litho_Perc	N	2	2	
Lithology	Litho_Type	C	2	2	Litho_Type
Lithology Qualifier	Litho_Qual	C	2	2	Litho_Qual
Shade	Shade	C	1	1	Shade
Hue	Hue	C	1	1	Hue
Colour	Colour	C	1	1	Colour
Adjective 1	Adjective_1	C	2	2	Adjective
Adjective 2	Adjective_2	C	2	2	Adjective
Adjective 3	Adjective_3	C	2	2	Adjective
Adjective 4	Adjective_4	C	2	2	Adjective
Lithology Interrelationship	Litho_Interrel	C	2	2	Litho_Interrel
Weathering	Weathering	C	1	1	Weathering
Estimated Strength	Est_Strength	C	2	2	Est_Strength
Bed Spacing	Bed_Spacing	C	2	2	Bed_Spacing
Defect Type	Defect_Type	C	2	2	Defect_Type
Defect_Intact	Defect_Intact	C	1	1	Defect_Intact
Defect Spacing	Defect_Spacing	C	2	2	Defect_Spacing
Defect Dip	Defect_Dip	N	2	2	
Core State	Core_State	C	1	1	Core_State
Mechanical State	Mech_State	C	2	2	Mech_State
Texture	Texture	C	2	2	Texture
Basal Contact	Basal_Contact	C	1	1	Basal_Contact
Sedimentary Feature 1	Sed_Feature_1	C	2	2	Sed_Feature
Sedimentary Feature 2	Sed_Feature_2	C	2	2	Sed_Feature
Bedding Dip	Bedding_Dip	N	2	2	
Mineral & Fossil Abundance	Min_Fos_Abund	C	1	1	Min_Fos_Abund
Mineral & Fossil Type	Min_Fos_Type	C	2	2	Min_Fos_Type
Mineral & Fossil Association	Min_Fos_Assoc	C	2	2	Min_Fos_Assoc
Gas	Gas	C	1	1	Gas
Comment	Comment	C			

Water Observation Data

Field Description	Field Name	Field Type	Recommended Field Length	Maximum Field Length	Dictionary Category
Project	Project_Name	C	8	16	
Drill Hole Name	Hole_Name	C	8	16	
Test Depth	Test_Depth	N	7.2	7.2	
Test Date	Test_Date	D	10	10	
Sample Type	Sample_Type	C	2	2	Sample_Type
Sample Number	Sample_No	C	8	16	
Flow Test Type	Flow_Test_Type	C	1	1	Flow_Test_Type
Flow Height	Flow_Height	N	3	3	
Flow Rate	Flow_Rate	N	6.2	6.2	
pH	Ph	N	5.2	5.2	
Total Dissolved Solids	Tot_Disolv_Sol	N	5.2	5.2	
Electrical Conductivity	Elec_Conduct	N	5.2	5.2	
Temperature	Temperature	N	4.1	4.1	
Comment	Comment	C			

Point Load Data

Field Description	Field Name	Field Type	Recommended Field Length	Maximum Field Length	Dictionary Category
Project	Project_Name	C	8	16	
Drill Hole Name	Hole_Name	C	8	16	
From Depth	From_Depth	C	7.2	8.3	
To Depth	To_Depth	N	7.2	8.3	
Sample Length	Sample_Length	C	5.2	6.3	
Sample State	Sample_State	C	1	1	Sample_State
Sample Type	Sample_Type	C	2	2	Sample_Type
Sample Number	Sample_No	C	8	16	
Test Sample Id	Test_Id	C	4	4	
Test Sample Depth	Test_Mid_Depth	N	7.2	8.3	
Test Type	PL_Test_Type	C	1	1	PL_Test_Type
Platen Separation	Platen_Sep	N	3	3	
Width	Width	N	3	3	
Failure Load	Failure_Load	N	5.2	5.2	
Failure_Mode	Failure_Mode	C	1	1	Failure_Mode
Comment	Comment				

Rock Mass Unit and Defect Data

Field Description	Field Name	Field Type	Recommended Field Length	Maximum Field Length	Dictionary Category
Project	Project_Name	C	8	16	
Drill Hole Name	Hole_Name	C	8	16	
From Depth	From_Depth	N	7.2	8.3	
To Depth	To_Depth	N	7.2	8.3	
RMU Type	Rmu_Type	C	1	1	Rmu_Type
Weathering	Weathering	C	1	1	Weathering
Alteration	Alteration	C	1	1	Alteration
Estimated Strength	Est_Strength	C	2	2	Est_Strength
Bed Spacing	Bed_Spacing	C	2	2	Bed_Spacing
Bed Dip	Bed_Dip	N	2	2	
Moisture Sensitivity	Moist_Sensitive	C	1	1	Moist_Sensitive
Plasticity	Plasticity	C	1	1	Plasticity
Defect Depth	Defect_Depth	N	7.2	8.3	
Defect Core Length	Defect_Length	N	3	3	
Number of Defects	Defects_No	N	0	2	
Defects Spacing	Defects_Spacing	N	0	3	
Defect Type	Defect_Type	C	2	2	Defect_Type
Defect Intact	Defect_Intact	C	1	1	Defect_Intact
Defect Continuity	Defect_Contin	C	1	1	Defect_Contin
Defect Dip or Min Dip Broken Zone	Defect_Dip_1	N	2	2	
Max Dip Broken Zone	Defect_Dip_2	N	2	2	
Dip Orientation	Dip_Orient	N	0	3	
Dip Orientation Method	Dip_Orient_Meth	C	0	1	Defect_Dir_Meth
Surface Shape	Shape	C	1	1	Shape
Surface Roughness	Roughness	C	1	1	Roughness
Joint Roughness Coefficient	JRC	N	0	2	
Perpendicular Width	Perp_Width	N	3	3	
Primary Infill Type	Infill_Type_1	C	2	2	Infill_Type
Seconday Infill Type	Infill_Type_2	C	2	2	Infill_Type
Infill Mode	Infill_Mode	C	1	1	Infill_Mode
Infill Estimated Strength	Infill_Est_Str	C	2	2	Est_Strength
Infill Plasticity	Infill_Plast	C	1	1	Plasticity
Comment	Comment				

Appendix B: CoalLog Coding Sheets (recommended)

Project	CoalLog v1.1 - Hole Status Sheet	Drill Hole

Header

IDENTIFICATION

Lease Number

Site Id

Hole Type

Data Status

Hole Purpose

Redrill of

COLLAR SURVEY

Geodetic Datum

Easting

UTM Zone

Northing

Height Datum

Elevation

Location Acc

Inclination

Azimuth

Survey Co.

Date Surveyed DD / MM / YYYY

DRILLING

Date Started DD / MM / YYYY

Date Completed DD / MM / YYYY

Total Depth

GEOLOGICAL LOG

Geological Organiz.

Geotech. Log

Core Photos.

GEOPHYSICAL LOG

Geophysical Co.

Logs Run

Logger

ENVIRONMENTAL

Standing Water Level

Stand. Water Level Date DD / MM / YYYY

Date Rehabilitated DD / MM / YYYY

Hole Status

Comment

Geologists

Base Depth	Geologist's Name
.	
.	
.	
.	
.	
.	
.	
1 2 3 4 5 6 7	8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

Casing

Base Depth	Casing Type	Size (mm)	Length Recovered (m)
.			.
.			.
.			.
.			.
.			.
.			.
.			.
1 2 3 4 5 6 7	8 9 10	11 12 13	14 15 16 17 18 19

Cementing

From Depth	To Depth	Date	Actual Volume (m^3)
.	.	DD / MM / YYYY	.
.	.	DD / MM / YYYY	.
.	.	DD / MM / YYYY	.
.	.	DD / MM / YYYY	.
.	.	DD / MM / YYYY	.
.	.	DD / MM / YYYY	.
.	.	DD / MM / YYYY	.
1 2 3 4 5 6	7 8 9 10 11 12	13 14 15 16 17 18 19 20 21 22	23 24 25 26 27

Project	Geologist	CoalLog v1.1 - Drilling Sheet	Drill Hole	Page No
				of

	Drill Run				Drill Rig									
Geologist Base Depth	Run No.	Recovered Length	Driller Base Depth	Date	Drilling Co.	Rig No.	Rig Type	Driller	Bit Type	Fluid	Drill Size Name	Core Size (mm)	Hole Size (mm)	Reamed
.		.	.	DD/MM/YYYY										
.		.	.	DD/MM/YYYY										
.		.	.	DD/MM/YYYY										
.		.	.	DD/MM/YYYY										
.		.	.	DD/MM/YYYY										
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1 2 3 4 5 6 7	8 9 10 11	12 13 14 15 16	17 18 19 20 21 22 23	24 25 26 27 28 29 30 31 32 33	34 35 36	37 38 39 40 41	42 43 44	45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64	65	66	67 68 69 70 71	72 73 74	75 76 77	78

Field Notes:

Project	Geologist	CoalLog v1.1 - Lithology Sheet	Drill Hole	Page No
				of

						Lithology Descriptor											Geotechnical							Mechanical			Sedimentology				Minerals			
Base Depth	Seam	Ply	Horizon	Sample Type	Sample Number	Lithology %	Lithology	Lithology Qualifier	Shade	Hue	Colour	Adjective 1	Adjective 2	Adjective 3	Adjective 4	Interrelationship	Weathering	Estimated Strength	Bed Spacing	Defect Type	Defect Intact	Defect Spacing	Defect Dip	Core State	Mechanical State	Texture	Basal Contact	Sed. Feature 1	Sed. Feature 2	Bedding Dip	Abundance	Mineral / Fossil	Mineral Association	Gas
.																																		
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1 2 3 4 5 6 7	8 9 10 11	12 13 14 15	16 17 18 19	20 21	22 23 24 25 26 27 28 29	30 31	32 33	34 35	36	37	38	39 40	41 42	43 44	45 46	47 48	49	50 51	52 53	54 55	56	57 58	59 60	61	62 63	64 65	66	67 68	69 70	71 72	73	74 75	76 77	78

Field Notes:

Project	Geologist	CoalLog v1.1 - Water Observation Sheet	Drill Hole	Page No
				of

Depth	Date	Sample Type	Sample Number	Test Type	Flow Height (mm)	Flow Rate (l/s)	pH	Total Dissolved Solids (ppm)	Electrical Conductivity (uS/cm)	Temp. (°C)	Comment
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
.	DD/MM/YYYY					.	.			.	
1 2 3 4 5 6 7	8 9 10 11 12 13 14 15 16 17	18 19	20 21 22 23 24 25 26 27	28	29 30 31	32 33 34 35 36 37	38 39 40 41 42	43 44 45 46 47	48 49 50 51 52	53 54 55 56	57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73

Field Notes:

Test Type: 3 = 305mm Board, 6 = 610mm Board, 9 = 914mm Board, E = Estimate, V = V-Notch O = Observed Wet D = Driller Injected

CoalLog v1.1 - RMU & Defects Sheet

Project	Geologist	Drill Hole	Page No
			of

Rock Mass Unit									Defect															
																		Infill						
Base Depth	RMU Type	Weathering	Alteration	Estimated Strength	Bed Spacing	Bed Angle	Moisture Sensitivity	Plasticity	Defect Depth	Length (mm)	Defect Type	Intact	Continuity	Angle or Min Angle for Broken Zone	Max Angle for Broken Zone	Surface Shape	Surface Roughness	Perpendicular Width (mm)	Primary Type	Secondary Type	Mode	Estimated Strength	Plasticity	Comment
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Field Notes:

Project	Geologist	CoalLog v1.1 - Point Load Data Sheet	Drill Hole	Page No
				of

Base Depth	Sample Length (m)	Sample State	Sample Type	Sample Number	Test Sample Id	Test Sample Midpoint Depth	Test Type	Platen Sep. (D) (mm)	Width (W) (mm)	Failure Load (kN)	Failure Mode	Comment
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Field Notes:

Sample State: D = Dry, W = Wet

Test Type: D = Diametral, A = Axial, I = Irregular

Failure Mode: P = penetrative, J = joint, B = bedding plane

Appendix C: CoalLog Dictionaries

CoalLog v1.1 - Header, Water Observation & Point Load Dictionary

HEADER SHEET

HOLE TYPE

Fully cored	FC
Open/chip	OC
Partly cored	PC
Reverse Circulation	RC

HOLE PURPOSE

Coal Quality	CQ
Environmental	EN
Gas	GS
Geotech	GT
Hydrological	HY
Lox	LX
Service	SV
Structure	ST

DATA STATUS

Raw/Uncorrected	R
Adjusted to geophysics	A
Seams adjusted to geophysics	S
Corrected to verticality	V
Final	F
Unknown	U

GEODETIC DATUM

Australian Geodetic Datum	AGD
Australian Mapping Grid	AMG
Geocentric Datum Australia	GDA
Local Datum	LOC
Map Grid Australia	MGA
Universal Transverse Mercator	UTM

HEIGHT DATUM

Australian Height Datum	AHD
Approximate Level	APX
Local Datum	LOC

LOCATION ACCURACY

Approximate	A
Barometric	B
Digitized	D
GPS (hand held)	G
Surveyed	S

LOGS RUN

Acoustic Scanner	A
Caliper	C
Cement Bond Log	B
Density	D
Downhole Camera	M
Dipmeter	I
Full Waveform Sonic	F
Gyroscopic Verticality	Y
Natural Gamma	G
Neutron	N
Resistivity	R
Spontaneous Potential	P
Sonic	S
Temperature	T
Verticality	V
X-Ray	X

HOLE STATUS

Backfilled	B
Casing removed	X
Cemented	N
Completed	C
Equipment in Hole	E
Infrastructure	I
In Progress	P
Mined	M
Piezometer	Z
Plugged	G
Rehabilitated	R
Water bore	W

WATER OBSERVATION SHEET

TEST TYPE

305mm Board	3
610mm Board	6
914mm Board	9
Driller Injected	D
Estimate	E
Observed Wet	W
V-Notch	V

POINT LOAD SHEET

SAMPLE STATE

Dry	D
Wet	W

TEST TYPE

Axial	A
Diametral	D
Irregular	I

FAILURE MODE

Bedding Plane	B
Joint	J
Penetrative	P

CoalLog v1.1 - Lithology Dictionary

SAMPLE TYPE

Coal Quality

raw ply (coal, roof, floor or parting)	QP
bulk sample	QB
channel sample (underground)	QU

Loxline

raw ply (coal, roof, floor or parting)	LP

Spontaneous Combustion

raw ply (coal, roof, floor or parting)	SP
bulk sample	SB
channel sample	SU

Geotechnical Sample

laboratory tested	GT
field tested	GF

Water Quality Sample

laboratory tested	WT
field tested	WF

Gas Sample

exploration (virgin)	ME
compliance (drained)	MD

Environmental Sample

soil	ES
overburden characterisation (compliance)	EO
reactive ground	ER

INTERVAL STATUS

raw/uncorrected	R
adjusted to geophysics	A
unknown	U

LITHOLOGIES

Unconsolidated Sediments

Clay	CL
Silt	SI
Sand	SA
Gravel	GV
Boulders	BO
Alluvium	AL
Colluvium	CV
Diatomaceous Earth	DE
Fill/Spoil	FI
Fireclay	FC
Loam	LO
Mud	MD
Soil	SO

Carbonaceous Sediments

Coal	CO
Lignite	LG
Brown Coal	BC
Peat	PE
Oil Shale	OS
Tar Sand	TS
Coaly Claystone	ZC
Coaly Mudstone	ZM
Coaly Sandstone	ZS
Coaly Shale	ZH
Coaly Siltstone	ZT
Carbonaceous Claystone	XC
Carbonaceous Mudstone	XM
Carbonaceous Sandstone	XS
Carbonaceous Shale	XH
Carbonaceous Siltstone	XT

Clastic Sedimentary Rocks

Conglomerate	CG
Sandstone	SS
Siltstone	ST
Claystone	CS
Breccia	BR
Fault Breccia	FB
Mudstone	MS
Sedimentary Rock, undifferentiated	SU
Shale	SH
Tillite	TI

Chemical Sedimentary Rocks

Calcrete	CC
Carbonate	CB
Chalk	CK
Chert	CH
Cone in Cone Carbonate	KK
Dolomite	DM
Ferricrete	FK
Fossil Wood	FW
Ironstone	IS
Kaolinite	KA
Laterite	LA
Limestone	LS
Limonite	LI
Silcrete	SC
Tonstein	TN

Igneous

Igneous Rock, undifferentiated	IG
Volcanic Rock, undifferentiated	VR
Intrusive Rock, undifferentiated	IN
Acid Volcanic	AV
Intermediate Volcanic	IV
Basic Volcanic	BV
Acid Intrusive	AI
Intermediate Intrusive	II
Basic Intrusive	BI
Andesite	AN
Basalt	BS
Dolerite	DO
Granite	GR
Granodiorite	GD
Gabbro	GB
Rhyolite	RH
Tuff	TF
Tuffite	TT

Metamorphic

Basement Undifferentiated	BU
Gneiss	GN
Metamorphic Rock, undifferentiated	MM
Phyllite	PH
Quartzite	QT
Schist	SZ
Slate	SL

Minerals

Calcite	CA
Pyrite	PY
Quartz	QZ
Siderite	SD
Talc	TA

Other

Core Loss	KL
Old Workings	OW
Non Coal	NC
No Recovery	NR
Not Logged	NL
Void	VD

LITHOLOGY QUALIFIERS

Coals

bright (>90%)	BR
bright with dull bands (60-90%)	BB
interbanded dull and bright (40-60%)	BD
mainly dull with frequent bright bands (10-40%)	DB
dull with minor bright bands (1-10%)	DM
dull (<1%)	DD
bright (>90% bright coal)	C1
bright with dull bands (60-90% bright coal)	C2
Interbanded dull and bright (40-60% bright coal)	C3
mainly dull with frequent bright bands (10-40% bright coal)	C4
dull with minor bright bands (1-10% bright coal)	C5
dull (<1% bright coal)	C6
mid-lustrous to bright	M1
mid-lustrous	M2
mid-lustrous to dull	M3
anthracite	AN
cindered	CI
coked	KC
cannel (torbanite, bog)	CT
dull conchoidal	DC
extremely weathered	EW
fusainous	FU
heat affected	HA
inferior	IF
sapropelic	SP
stony	SY
undifferentiated	CU
weathered	WE

Conglomerates

granular	GG
granular to pebbly	GP
granular to cobbly	GO
granular to bouldery	GU
pebbly	PP
pebbly to cobbly	PO
pebbly to bouldery	PU
cobbly	OO
cobbly to bouldery	OU
bouldery	UU

Sandstones / Sand / Gravel

very fine grained	VV
very fine to fine grained	VF
very fine to medium grained	VM
very fine to coarse grained	VC
very fine to very coarse grained	VX
fine grained	FF
fine to medium grained	FM
fine to coarse grained	FC
fine to very coarse grained	FX
medium grained	MM
medium to coarse grained	MC
medium to very coarse grained	MX
coarse grained	CC
coarse to very coarse grained	CX
very coarse grained	XX
very fine grained (VV)	S1
fine grained (FF)	S2
fine to medium grained (FM)	S3
medium grained (MM)	S4
coarse to very coarse grained (CX)	S5
Interbedded, fine and coarse	S6
medium to coarse grained (MC)	S7
coarse grained (CC)	S8
very coarse grained (XX)	S9

Unconsolidated Sediments

clayey	CL
silty	SI
sandy	SA
gravelly	GV

Tuff / Tuffite

clay sized	CS
mud sized	MS
silt sized	TS
sand sized	SS

SHADES

light	L
light to medium	A
light to dark	C
medium	E
medium to dark	B
dark	D
banded	N
mottled	M
speckled	S
variegated	V

HUES / COLOURS

blackish / black	K
bluish / blue	L
brownish / brown	B

CoalLog v1.1 - Lithology Dictionary

buff	F
creamy / cream	C
greenish / green	E
greyish / grey	G
orangey / orange	O
pinkish / pink	P
purplish / purple	U
reddish / red	R
whitish / white	W
yellowish / yellow	Y

ADJECTIVES

Quantity

abundant	AB
decreasing in abundance	DA
highly	HI
in part	IP
increasing in abundance	IA
large	LR
minor	MN
moderately	MO
occasional	OC
rare	RA
slightly	TY
sparse	SE
sporadic	SP
strongly	TG
thick	TK
thin	TH
very	VE

Appearance

altered	AL
bright	BR
clear	LC
coarser (<10% of unit)	XC
conchoidal	CC
dull	DD
fault gouge	FT
finer (<10% of unit)	FF
hard	HR
heat affected	HA
interbanded	IB
irregular	IR
lustrous	LU
opaque	OP
resinous	RS
soft	SO
translucent	TL

Lithological

acidic	AC
arenitic	AR
arkosic	AK
basaltic	BS
basic	BC
bentonitic	BE
calcareous	CA
carbonaceous	XX
carbonate	CB
chloritic	CR
clayey	CL
coaly	CO
conglomeritic	CG
detrital	DE
dolomitic	DM
feldspathic	FS
ferruginous	FE
fossiliferous	FO
glauconitic	GC
graphitic	GP
illitic	IL
intermediate	IM
intrusive	IN
iron stained	ID
kaolinitic	KA
lateritic	LA
limonitic	LI
lithic	LT
loamy	LO
manganiferous	MG
marly	MR
metamorphosed	MM
micaceous	MI
muddy	MD
oxidised	OX
peaty	PE
phosphatic	PP
pyritic	PY
quartzose	QZ
sandy	SA
shaly	SH
shelly	HY
sideritic	SD
siliceous	SC
silicified	SF
silty	SI
smectitic	SM
sooty	SX
stony	SY
sub arenitic	AM
tillitic	TI
tonsteinous	TN
tuffaceous	TF
vitrainous	VI
volcanic	VO

Inclusions

bands	BN
blebs	BL
clasts	CT
cobbles	OO
concretions	CI
disseminated	DS
fragments	FR
grains	GN
granules	GR
laminae	LM
layers	LY
lenses	LN
matrix	MX
nodules	ND
partings	PA
pebbles	PB
pellets	PT
phases	PH
pods	PO
stringers	SG
traces	TR
wisps	WP

Preposition

and	ET
as	AS
of	OF
on	ON
with	WI

Position

alternating	AT
near base of unit	BU
near middle of unit	MU
near top and base of unit	XU
near top of unit	TU
tends to	TT
throughout	TO

LITHOLOGY INTERRELATIONSHIPS

coarsening up to	CU
disseminated with	DS
fining up to	FU
interbedded with	IB
intercalated with	IC
interlaminated with	IL
intermixed with	IM
irregularly interbedded with	IR
with bands of	BN
with boulders of	BO
with cement of	CM
with clasts of	CT
with cobbles of	OO
with fragments of	FR
with granules of	GR
with lenses of	LN
with matrix of	MX
with nodules of	ND
with pebbles of	PB
with pods of	PO
with wisps of	WP

WEATHERING

residual soil	R
extremely weathered	E
highly weathered	H
distinctly weathered	D
moderately weathered	M
slightly weathered	S
weathered	W
fresh	F

ESTIMATED STRENGTHS

Unconsolidated Cohesive

very soft	C1
soft	C2
firm	C3
stiff	C4
very stiff	C5
hard	C6

Unconsolidated Cohesionless

very loose	S1
loose	S2
medium dense	S3
dense	S4
very dense	S5

Rock

extremely low strength rock	R1
very low strength rock	R2
low strength rock	R3
medium strength rock	R4
high strength rock	R5
very high strength rock	R6
extremely high strength rock	R7

BED SPACINGS

massive/absent bedding	MA
very thickly bedded (> 2 m)	VB
thickly bedded (600-2000 mm)	CB
medium bedded (200-600 mm)	MB
thinly bedded (60-200 mm)	TB
very thinly bedded (20-60 mm)	UB
thickly laminated (6-20 mm)	LM
thinly laminated (< 6 mm)	LL
irregular spaced bedding	IR

DEFECT TYPES

Natural

bedding plane	BP
broken zone	BZ
clay band	CL
coal cleat	CE
contraction fracture	CF
cross bedding	XB
dyke	DY
fault	FT
foliation	FO
fracture (undifferentiated)	FR
joint	JN
shear zone	SH
sill	SI
softened zone (non-tectonic)	SO
vein	VN

Induced and Non-Intact

discing	DS
drilling induced break	DB
drilling induced broken zone	DZ

DEFECT INTACT

intact	I

DEFECT SPACING

extremely wide (>2m)	EW
very wide (600-2000mm)	VW
wide (200-600mm)	WI
moderately wide (60-200mm)	MW
moderately narrow (20-60mm)	MN
narrow (6-20mm)	NA
very narrow (<6mm)	VN

CORE STATES

overdrilled core	O
solid core	S

fragmented core	F
broken core	B
very broken core	V
crushed core	C
cuttings	K

MECHANICAL STATES

Slaking

non slaking	NS
low slaking	LS
medium slaking	MS
high slaking	HS

Plasticity

non plastic	NP
low plasticity	LP
intermediate plasticity	IP
high plasticity	HP

Other

brecciated	BR
brittle	BL
cleated	CE
disintegrates on wetting	DW
expanding clay	EX
fissile	FS
fissured	FI
flaky	FL
fractured	FR
friable	FB
indurated	IN
micro faulted	MF
non-cleated	NC
powdery	PO
puggy	PU
sheared	SH
slickensided	SK
sticky	ST
subfissile	SF

TEXTURES

amorphous	AM
amygdaloidal	AG
aphanitic	AP
chalky	CK
cherty	CH
concretionary	CI
crystalline	XL
earthy	EA
equigranular	EQ
fibrous	FB
flaggy	FG
flow banded	FL
glassy	GS
granular	GG
gritty	GT
nodular	ND
oolitic	OO
pelletal	PT
pisolitic	PS
platey	PL
porphyritic	PR
schistose	SZ
soapy	SO
vesicular	VS
vitreous	VT
vuggy	VU
waxy	WX

BASAL CONTACTS

basal contact open or readily parts	B
basal contact deformed	D
erosional basal contact	E
faulted at basal contact	F
gradational basal contact	G
sharp and irregular basal contact	I
jointed at basal contact	J
sharp and oblique basal contact	O
sharp and planar basal contact	P
fractured at basal contact	R
sheared at basal contact	S
sharp and undulose basal contact	U

SEDIMENTARY FEATURES

Bedding

contorted bedding	CT
convoluted bedding	CV
current bedding	CB
diffuse bedding	DF
disturbed bedding	DB
flasar bedding	FL
graded bedding	GB
lenticular bedding	LB
penny bands	PB
planar bedding	PL
poorly developed bedding	PD
ripple bedding	RI
wavy bedding	WB
well developed bedding	WD

Cross Bedding

high angle cross bedding (>30°)	HX
medium angle cross bedding (10°-30°)	MX
low angle cross bedding (<10°)	LX
cross bedding	XB
fine cross bedding	FX
tabular cross bedding	TX
trough cross bedding	RX

Laminations

large scale cross laminations (>2m)	LL
medium scale cross laminations (200 – 2000mm)	ML
small scale cross laminations (<200mm)	SL
wavy laminations	WL

Shape

very angular grains	VG
angular grains	AG
subangular grains	GG
subrounded grains	BG
rounded grains	RG
well rounded grains	WG
bladed grains	DG
prolate grains	LG
tabular grains	TG
very angular fragments	VF
angular fragments	AF
subangular fragments	GF
subrounded fragments	BF
rounded fragments	RF
well rounded fragments	WF
very angular pebbles	VP
angular pebbles	AP
subangular pebbles	GP
subrounded pebbles	BP
rounded pebbles	RP
well rounded pebbles	WP

Sorting

well sorted	WS
moderately sorted	MS
poorly sorted	PS
bimodal sorting	BS
polymodal sorting	YS
coarsening upwards	CU
fining upwards	FU

Permeability/Porosity

impermeable (<0.1mD)	IR
low permeability (0.1-10mD)	LP
medium permeability (10-10000mD)	MP
high permeability (>10000mD)	HP
permeable	PE
porous	PO

Cracks

dessication cracks	DC
intraformational cracks	IC
mud casts/cracks	MC
shrinkage cracks	SC
syneresis cracks	YC

Structures

bioturbated	BT
boudinage	BD
bounce marks/prod casts	PC
burrowing	BW
climbing ripples	CR
colloidal iron deposit	CI
compaction feature	CF
flame structures	FS
imbricate clasts	IM
load cast	LC
pebble lag	PG
reworked	RW
ripple marks	RM
rip-up clasts	RU
rootlet beds	RB
scour and fill	SF
sedimentary dyke	DY
slumping	SP
soft sediment deformation	DE
stylolites	ST
varving	VV
water escape structures	WE

Position

in part	IP
near base of unit	BU
near middle of unit	MU
near top and base of unit	XU
near top of unit	TU
throughout	TO

ABUNDANCES

abundant	A
secondary	D
accessory	E
minor	M
sporadic	P
rare	R

MINERALS / FOSSILS

Minerals

ankerite	AN
apatite	AP
bauxite	BA
biotite	BT
calcite	CA
carbonate	CB
chalcedony	CD
chalcopyrite	CC
chert	CH
chlorite	CR
clay	CL
common opal	OP
dickite	DI
dolomite	DM
epidote	EP
feldspar	FS
galena	GA
garnet	GR
glauconite	GC
goethite	GO
graphite	GP
gypsum	GY
haematite	HE
heavy minerals	HM
illite	IL
ilmenite	IM
iron oxide	IO
ironstone	IS
kaolinite	KA
limonite	LI
magnetite	MT
manganese	MG
marcasite	MC
mica	MI
montmorillinite	ML
muscovite	MV
olivine	OL
opaque minerals	OM
orthoclase	OR
phosphates	PP
plagioclase	PG
pyrite	PY
quartz	QZ
siderite	SD
silica	SC
sulphides	SU
talc	TA

vivianite	VV
zeolite	ZE

Fossils

bivalves	BI
brachiopods	BR
bryozoans	BZ
carbonaceous remains	XR
carbonaceous root traces	RC
charcoal	FB
coprolites	CP
faecal remains	FR
foraminifera	FM
fossil wood	FW
fossils	FO
gastropods	GT
marine fossils	MF
pelycepods	PE
plant fragments	PF
plant impressions	PI
resin	RS
resin aggregates	RA
root traces	RT
rootlets	RO
sediment filled root traces	SR
shells	HY
woody fragments	WF

MINERAL ASSOCIATION

amorphous	AM
bands	BN
cement	CM
clasts	CT
coarse grains	CC
coating	OU
concentrated at base	CB
concentrated at top	CN
concretions	CI
cone in cone structure	KK
crystals	XL
detrital	DE
disseminated	DS
fibrous	FB
fine grains	FF
fragments	FR
grains	GN
in blebs	BL
in cavities	CV
in cleat	CE
in pods	PO
in veins	VN
in vesicles	VS
in vughs	VU
infilling fault discontinuities	FD
infilling of burrows	IB
infilling vesicles	IV
intercalations	IC
laminae	LM
lenses	LN
matrix	MX
microflakes	MF
nodules	ND
on bedding planes	BP
on fracture planes	FP
on joints	JN
oolites	OO
pebbles	PB
pellets	PT
phenocrysts	PH
radial filaments	FL
replacement	RE
replacing fossils	RF
resinous	RS
rhombs	RH
staining	SN
traces	TR
wisps	WP

GAS

trace (<1m^3/t)	T
low gas present (1-5m^3/t)	L
moderate gas present (5-10m^3/t)	M
high gas present (10-15m^3/t)	H
very high gas present (>15 m^3/t)	V
H_2S not detected	N
H_2S present	P

CoalLog v1.1 –RMU and Defects Dictionary

RMU TYPES

broken zone	B
core loss	L
core with defects	D
not recorded	N
open	O
soil properties	S
unbroken core	U

WEATHERING

residual soil	R
extremely weathered	E
highly weathered	H
distinctly weathered	D
moderately weathered	M
slightly weathered	S
weathered	W
fresh	F

ALTERATION

extremely altered	E
distinctly altered	D
slightly altered	S
altered	A
fresh	F

ESTIMATED STRENGTH

Unconsolidated Cohesive

very soft	C1
soft	C2
firm	C3
stiff	C4
very stiff	C5
hard	C6

Unconsolidated Cohesionless

very loose	S1
loose	S2
medium dense	S3
dense	S4
very dense	S5

Rock

extremely low strength rock	R1
very low strength rock	R2
low strength rock	R3
medium strength rock	R4
high strength rock	R5
very high strength rock	R6
extremely high strength rock	R7

BED SPACING

massive	MA
very thickly bedded (> 2m)	VB
thickly bedded (600-2000mm)	CB
medium bedded (200-600mm)	MB
thinly bedded (60-200 mm)	TB
very thinly bedded (20-60mm)	UB
thickly laminated (6-20mm)	LM
thinly laminated (< 6mm)	LL
irregular spaced bedding	IR

MOISTURE SENSITIVITY

non sensitive	N
low sensitivity	L
medium sensitivity	M
high sensitivity	H

PLASTICITY

non plastic	N
brittle	B
low plasticity	L
intermediate plasticity	I
high plasticity	H

DEFECT TYPES

Natural

bedding plane	BP
broken zone	BZ
clay band	CL
coal cleat	CE
contraction fracture	CF
cross bedding	XB
dyke	DY
fault	FT
foliation	FO
fracture (undifferentiated)	FR
joint	JN
shear zone	SH
sill	SI
softened zone (non-tectonic)	SO
vein	VN

Induced and Non-Intact

discing	DS
drilling induced break	DB
drilling induced broken zone	DZ

DEFECT INTACT

intact	I

DEFECT CONTINUITY

continuous across core width	C
discontinuous across core width	D
divaricates (splits)	V
truncated within core width	T

DIP ORIENTATION METHOD

directly measured from reference line	D
estimated	E
indirectly measured	I
measured from televiewer	A

SURFACE SHAPE

planar	P
undulose	U
concave/convex	C
irregular	I
stepped	S

SURFACE ROUGHNESS

polished	P
slickensided	K
smooth	S
rough	R

INFILL TYPE

apatite	AP
calcite	CA
carbonaceous remains	XR
carbonate	CB
chlorite	CR
clay	CL
coal	CO
crushed rock	CU
dickite	DI
fossils	FO
glauconite	GC
gypsum	GY
haematite	HE
illite	IL
iron oxide	IO
kaolinite	KA
limonite	LI
magnetite	MT
manganese	MG
marcasite	MC
mica	MI
montmorillonite	ML
other	OT
plant fragments	PF
pyrite	PY
quartz	QZ
sand	SA
siderite	SD
silt	SI
talc	TA
zeolite	ZE

INFILL MODE

absent	A
blebs	L
breccia	B
gouge	G
healed (cemented)	H
open	O
rubble	R
surface completely coated	C
surface partly coated	P
surface staining	S
trace	T

Appendix D: Downloadable CoalLog Files

The following files will be available from the AusIMM CoalLog web page:
http://www.ausimm.com.au/content/default.aspx?ID=451

`CoalLog v1.1 Modifications.PDF`

A list of the v1.1 modifications to the original CoalLog v1.0

`CoalLog v1.1 Manual.PDF`

Full colour copy of the complete CoalLog manual as distributed during the rollout seminars

`CoalLog v1.1 Logging Sheet Specifications.XLS`

The coding sheet / data table specification (as per Appendix A of the full manual) to assist the database manager to set up the appropriate database tables

`CoalLog v1.1 Logging Sheets.XLS`

Templates for hardcopy coding sheets (as per Appendix B of the full manual) with which database manager(s) can remove fields and/or columns to customize design

`CoalLog v1.1 Recommended Logging Sheets.PDF`

Recommended hardcopy coding sheets (as per in Appendix B of the full manual) which can be ready printed to A4 landscape paper for field data collection.

`CoalLog v1.1 Recommended Logging Sheets Data Entry Template.XLS`

Template for data entry into Excel of data that has been recorded on the recommended coding sheets.

`CoalLog v1.1 Dictionaries Work File.XLS`

Work file used for setting up and validating the standard. It contains a worksheet for each dictionary category with the dictionary items shown three times: firstly sorted by code, then by description and finally by meaning. Each worksheet also contains a list of category items that have been dropped from the category along with suggested replacements. Thr spread sheet also contains a worksheet showing all items from all categories and is sorted by description for checking that an item has the same code in every category that it is used.

`CoalLog v1.1 Dictionaries.DOC`

A4 landscape layout of code dictionaries sheets with translations (as per Appendix C of the full manual), from which the database manager(s) can remove items and provide in printed format for field logging.

`CoalLog v1.1 Dictionaries.PDF`

A4 landscape layout of code dictionaries sheets with translations (as per Appendix C of the full manual)

`CoalLog v1.1 Dictionaries.CSV`

Code dictionaries with translations and field designation in comma delimited format for import into software

`CoalLog v1.1 Dictionaries Descriptions.XLS`

Dictionary descriptions as shown in Chapter 5 of the manual

```
CoalLog v1.1 Test Header Data.CSV
CoalLog v1.1 Test Geologists Data.CSV
CoalLog v1.1 Test Casing Data.CSV
CoalLog v1.1 Test Cementing Data.CSV
CoalLog v1.1 Test Drilling Data.CSV
CoalLog v1.1 Test Lithology Data.CSV
```

```
CoalLog v1.1 Test Water Flows Data.CSV
CoalLog v1.1 Test RMU & Defect Data.CSV
CoalLog v1.1 Test Point Load Data.CSV
```

Test data sets in CoalLog format for testing software import utility.

```
CoalLog v1.1 Test Messy Lithology Data.CSV
```

Test Lithology Data but with rows and columns in random order and some difficult comments

Appendix E: Revision History

CoalLog Version 1.1 includes the following changes to the previous version:

<u>Header Data</u>

- Site Id — maximum length increased from 8 to 16 characters. Recommended field length unchanged at 8 characters. (correction)
- Location Accuracy — Accuracy changed to Location Accuracy to distinguish from vertical accuracy. Field name and dictionary category changed from Survey_Accuracy to Location_Acc (clarification)
  D digitised (addition)
- Survey Co. — add to header as a 3 character field with field name of Survey_Company (addition)
- Survey Date — add to header as a date field with field name of Survey_Date (addition)
- Logs Run — X log of X-Ray added (addition)
- Hole Status — N cemented (in some V1.0 files cemented was incorrectly denoted as M) (correction)

<u>Drilling Data</u>

- Geologist Base Depth — rename Base Depth to Geologist Base Depth in Drilling Sheet. Renamed Geologist Base Depth in field description. Field name remains To_Depth. (clarification)
- Driller Base Depth — Driller Base Depth field added to maximum Drilling Sheet. This new field has a recommended field size of 7.2 and maximum of 8.3. It has the field name Drill_To_Depth (addition)
- Recovered Thickness — change field description of Recovered Thickness to Recovered Length. Field name changes to Recov_Length (clarification)

<u>Lithology Data</u>

- Lithologies — TT tuffite (addition)
- Lithology Qualifiers — the Lithology Qualifiers for sandstone (SS) also apply to:
  - carbonaceous sandstone (XS)
  - coaly sandstone (ZS)
  - gravel (GV)
  - sand (SA) (clarification)

  for Tuff/Tuffite the following codes have been added:

CS	clay sized	(addition)
MS	mud sized	(addition)
TS	silt sized	(addition)
SS	sand sized	(addition)

- Lithological Adjectives XC coarser (<10% of unit) (addition)
  FF finer (<10% of unit) (addition)
- Core State K cuttings (addition)
- Sedimentary Feature the following Laminations descriptions had their scales changed to be consistent with the thickness units in AS1289:
  LL large scale cross laminations changed from >1m to >2m (correction)
  ML medium scale cross laminations changed from 100-1000mm to 200mm to 2m (correction)
  SL small scale cross laminations changed from <100mm to <200mm (correction)
- Mineral Associations MF microflakes (addition)
- Gas the units for gas volumes changed to match common use:
  T trace changed from $<10m^3/m^2$ to $<1m^3/t$ (correction)
  L low gas present changed from $10\text{-}25m^3/m^2$ to $1\text{-}5m^3/t$ (correction)
  M moderate gas present changed from $25\text{-}70m^3/m^2$ to $5\text{-}10m^3/t$ (correction)
  A abundant gas present (removed)
  H high gas present ($10\text{-}15m^3/t$) (addition)
  V very high gas present ($>15m^3/t$) (addition)

Water Observation Data

- Water Flow Sheet renamed to Water Observation Sheet to better reflect the information being collected (clarification)
- Flow Test Type W observed wet (added)
  D driller injected water (added)
- Total Dissolved Solids recommended length remains 5 characters but without decimals. Maximum length 6 characters also without any decimals (correction)
- Electrical Conductivity recommended length remains 5 characters but without any decimals. Maximum length 6 characters also without any decimals (correction)

Geotechnical Dictionary

- Dip Orientation Method in some v1.0 dictionary files the Dip Orientation Method category had the name Dip_Dir_Meth instead of Dip_Orient_Meth (correction)

Geotechnical Data

- RMU Type heading on Logging Sheet changed from Type to RMU Type (clarification)
- Defect Type heading on Logging Sheet changed to from Type to Defect Type (clarification)

- Dip Orientation — in some v1.0 files this was referred to as Dip Direction instead of Dip Orientation and had the field name Defect_Dir instead of Dip_Orient (correction)
- Dip Orientation Method — in some v1.0 files this was referred to as Dip Direction Method instead of Dip Orientation Method and had the field name Defect_Dir_Meth instead of Dip_Orient_Meth (correction)

Data Transfer Format

Any non CoalLog fields present in a CoalLog data transfer file should have a column name starting with "Custom_"

Test Data Files

The file CoalLog Test RMU and Defect Data.csv had an error in it. The RMU To_Depth and From_Depth of 231.04:

5	AVC031C	148	228.04	O	F		R4			
6	AVC031C	228.04	231.16	U	F		R4	MB	5	
7	AVC031C	231.16	231.04	U	F		R3	MB	5	
8	AVC031C	231.04	232.39	U	F		R4			

should have been 231.40:

5	AVC031C	148	228.04	O	F		R4			
6	AVC031C	228.04	231.16	U	F		R4	MB	5	
7	AVC031C	231.16	231.4	U	F		R3	MB	5	
8	AVC031C	231.4	232.39	U	F		R4			