Queensland Competition Authority

Valuation of Queensland Rail's Below Rail Assets for the Coal Network

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Executive Summary

1. Objectives

The objectives set by the Queensland Competition Authority (QCA) in their Terms of Reference for the valuation of Queensland Rail's (QR) rail infrastructure serving the coal lines are as follows:

- To compile, in conjunction with QCA and QR, a database of rail infrastructure comprising of QR's coal rail network;
- To conduct an audit of QR's asset allocation methodology in respect of the rail infrastructure;
- To estimate the current replacement cost of the identified rail infrastructure applicable to the coal task commensurate with current day practices;
- To conduct an audit of QR's current assessment of standard lives and other assumptions required to estimate asset depreciation, and;
- To estimate the replacement cost of the identified rail infrastructure assuming the rail infrastructure consisted of standard gauge track applicable to the coal task commensurate with current day practices.

QCA nominated the Newlands, Goonyella, Blackwater, Moura and West Moreton corridors for valuation. The lines to be included in these corridors have been identified by QR.

2. Limitations

GHD, based upon its knowledge of the coal corridor infrastructure, identified early in the project that the information in the assets register, upon which QCA anticipated that the valuation was to be based, was not suitable.

This necessitated a number of changes to the methodology set out in GHD's proposal and on the timing of the project. The principal changes were as follows:

- The assets valued were identified from original source data, primarily plans, supplied by QR

  Impact:

  Delays were experienced in QR providing appropriate data.

  Additional unplanned work identifying assets.

- The structure of the data captured by GHD for the assets differs from that captured by QR through it asset validation process undertaken by Hatch & Associates.

  Impact:

  This will make the reconciliation of the assets identified by this project to those identified by QR more difficult.

- The assets register did not provide sufficient information from which to age the existing assets.

  Impact:

  The acquisition dates of the assets provided to the QCA are based upon a combination of the assets register information and supplementary data provided by QR.

3. QR (Hatch) Database Reconciliation.

A reconciliation of the QR Hatch databases and GHD's databases has been carried out. This has been a difficult task given the differences in their format, scope, contents and detail. In some instances the reconciliation has been item by item and other cases by an audit to determine a confidence level.

Some minor differences in track lengths and numbers of turnouts have been identified. Overall the material quantities in the two databases are very similar and any differences should have minimal impact on the valuations of each system.

4. Unit replacement costs

MEERA (Modern Engineering Equivalent Replacement Asset) principles have been adopted in establishing unit rates for the replacement of assets i.e. replacement value of the current design standards of the existing infrastructure using current best practices for construction.

Best practice has included adopting the most economic parcel of work for each group of assets. This practice spreads the overheads incurred in major projects in remote areas over the largest group of assets (i.e. minimises the unit costs).

Average unit cost rates have been adopted for the replacement of assets applicable to the line section. The unit rates adopted include:

- The cost of materials (including estimated volume discounts);
- Allowance for material wastage;
- Costs of contract direct labour ;
- Appropriate costs of working in remote areas;
- Estimate of profit and overhead recovery of a contractor; and,

- Costs of the principal for the engineering design, procurement and project management (EPCM) including supervision of the contractor and contract administration.

Unit rates have been based on greenfields principles i.e. the rates exclude the costs of construction work being carried out under traffic.

For the West Moreton corridor we have adopted different principles to establish the unit costs namely:

- A unit rate for earthworks based on 75% of the average rate for the four central Queensland Lines (this reflects the fact that these are not heavy haul lines and are currently built to much lower standards).

- A unit rate for trackwork based on 80% of the average Central Queensland lines (this reflects the extensive use of lighter rail and timber sleepers.

5. Written Down replacement costs

In the absence of an adequate asset register or condition information and following discussions with QCA the following information was sought:

- Acquisition date/age of the asset

- Potential Asset Life differences between the existing asset and the replacement asset.

5.1 The age of the assets

As part of our work each group of assets was allocated a standard economic life. This life was set on the assumption that the mines that are served by the coal corridors will require the service of the line for longer than the standard economic life of the assets.

Asset ages have been largely determined from QR's old asset register and data included in the QR's Line Section book. These dates include:

- Date of original construction including loops and duplications

- Date of track upgrades

- Date of electrification

However, some of the data in the old QR asset register is not able to be related directly to specific assets or is known to be in error. In many instances a best estimate has been utilised.

We have adopted the following principles in allocating a date of construction to assets:

Asset category	Assumption for construction date
Earthworks	Date of the original construction of the line

Track signaling & Communication assets	The later of the date of construction or the date of rebuild
Civil structures	The default for all assets was the later of the construction or rebuild date. However, bridge strengthening has not been assumed to change the build date of the asset.

6. Asset Values

Adopting the above principles the asset values of the coal corridors for narrow gauge track based on January 2000 valuation date are as follows:

	Narrow Gauge Track	
	Track km km	Gross Replacement Cost $"000
Blackwater	696	1,009,895
Goonyella	776	1,035,505
Moura	244	243,408
Newlands	203	213,000
Total of Specialised Coal Corridors	**1,919**	**2,501,808**

The comparable values for standard gauge are:

	Standard Gauge Track	
	Track km km	Gross Replacement Cost $'000
Blackwater	696	1,037,714
Goonyella	776	1,068,462
Moura	244	253,024
Newlands	203	221,618
Total of Specialised Coal Corridors	**1,919**	**2,580,818**

6.1 Confidence in asset values

The principles adopted have the following impacts on the reported asset values:

- Principles adopted that could result in a conservative valuation.
  - Greenfields valuation
  - Economic parcels of work spread the costs of set up over a maximum spread of assets
- Principles adopted that could inflate the reported replacement costs of assets

– For bridges and track openings all records in the assets register are assumed to be new assets.

We believe that based on the valuation principles set out in this report that the total value of assets reported is with a confidence level of +/- 5% and for each line section is within a confidence level of +/- 7.5%.

1. Introduction

1.1 Objectives

The objectives set by the Queensland Competition Authority (QCA) in their Terms of Reference for the valuation of Queensland Rail's (QR) rail infrastructure serving the coal lines are as follows:

- To compile, in conjunction with QCA and QR, a database of rail infrastructure comprising of QR's coal rail network;
- To conduct an audit of QR's asset allocation methodology in respect of the rail infrastructure;
- To estimate the current replacement cost of the identified rail infrastructure applicable to the coal task commensurate with current day practices;
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- To estimate the replacement cost of the identified rail infrastructure assuming the rail infrastructure consisted of standard gauge track applicable to the coal task commensurate with current day practices.

1.2 Extent of the Valuation

QCA required the valuation of the below rail infrastructure for following coal corridors:

Newlands	203.4 track km
Goonyella	775.7 track km
Blackwater	695.6 track km
Moura	244.3 track km
West Moreton	249 track km

All corridors, with the exception of the West Moreton corridor, are predominantly used for coal transport. Some sections are part of the main North Coast line and carry a range of passenger and other freight. The coal lines also carry small quantities of general freight.

The West Moreton corridor is primarily a passenger and general freight corridor, coal in this case being one component of the general freight. This line handles 2 major bulk commodities in unit trains, grain and coal.

A diagrammatic representation of each corridor is included in Appendix A.

1.3 Assumptions

QCA made the following assumptions based upon information from QR when setting the terms of reference for the project:

- QR would have completed an audit review of their asset database;
- Asset information for the coal lines was readily available;
- QR had a standard economic life for each category of assets;
- The assets register data was appropriate to use as a basis.

The project has experienced difficulty in each of these areas and this has materially impacted the conduct and timing of the project. GHD has liaised closely with QCA to overcome these difficulties and complete this project.

1.4 Extended Scope

The scope of the study was extended to assist QCA in a number of respects. These scope changes included:

- a comparison of the QCA database with that of a new QR asset database, for Central Queensland coal lines compilation of which was commenced after this QCA study was commissioned;
- a review of differences between the QCA valuations and those developed by QR internally based on the new QR asset database.

2. Identification of Network Assets

2.1 Introduction

QCA's terms of reference assumed that the QR asset register would be used as a basis of identifying and quantifying the assets to be valued. Following a review of QR's assets register, GHD identified that the "as built" plans and drawings would be a far more appropriate source of information from which to accurately identify and quantify the assets. The QR asset register did not contain sufficient information on which to develop a valuation of below rail assets. At the time of preparation of these estimates, Hatch Associates (incorporates BHP Engineering) was preparing a new Asset Register for QR which will render the existing register obsolete.

QR has divided each corridor into line sections each with a unique geographical starting and finishing point. In most cases these occur at major junctions or spur lines where chainages are clearly defined. In some cases these appear to be arbitrary and there may be some minor discrepancies between the GHD database and QR's. GHD has set out to allocate all assets to the appropriate line sections.

This section of the report provides a brief history of the development of each corridor and outlines the basis on which a database of rail infrastructure was developed by GHD from documentation provided by QR.

2.2 Description of the Systems

2.2.1 Newlands System

Details for each of the line sections in the Newlands system are as follows:

QR Section No.			Route Length	Total Track Length
	Start	**End**	**km**	**km**
NL 851	Abbot Point	Kali	13.2	16.0
NL 850	Kali	Durroburra	5.6	7.2
NL 848	Durroburra	Pring	3.6	9.9
NL 846	Pring	Collinsville	71.8	79.6
NL 632	Collinsville	Newlands	75.6	79.9
Collinsville Mine Branch				
CV 847	Collinsville	McNaughton	7.6	10.7
			177.4	203.4

The Newlands system extends from the Abbot Point coal export terminal unloading loop north of Bowen to the Newlands mine rail loop. The line presently services two coal mines, Newlands and Collinsville. It is a single track, narrow gauge, non electrified line with passing loops approximately 1500m in length. QR currently operate train consists comprising 4 diesel locomotives and 82 - 80t gross bottom dump coal wagons hauling 4600 net tonnes per trip.

A plan showing the extent of trackwork classified as Network Access and required for coal transportation and line maintenance is included in Appendix A.

The Abbot Point to Kaili and the Collinsville to Newlands sections were constructed between 1983 - 1984 as part of MIM's Newlands Abbot Point project. The line was constructed with 53kg rail on concrete sleepers. The rail unloading loop has a 310m radius and the loading loop at the mine 350m.

The Kaili to Durroburra Section is part of the North Coast line between Bowen and Townsville is thought to have been constructed sometime prior to 1924. No attempt has been made to ascertain the time of construction. The Main Line drawings date from 1954 and are likely have been redrawn from older plans.

The Pring to Collinsville section is believed to have been completed in February 1924 as part of a branch line off the North Coast Line from Merinda to Bowen Coalfield (Collinsville). The history of the line has not been investigated. Timber bridges were replaced with concrete bridges and culverts in 1982. At that time some of the track was upgraded to 53kg on timber sleepers whilst some short sections still remain with 41kg rail on timber sleepers.

The Collinsville to McNaughton section was reconstructed partially on a new alignment and upgraded to 47kg rail on timber sleepers on 150mm ballast. Some 53kg rail was also used. Minor temporary deviations were required at the time. The rail loop at Collinsville has a radius of 290m.

The track is restricted to 20t axle loads and a speed limit of 80kph. Turnouts generally are 53kg, 1:12.

Bridges are believed to be designed for M220 loadings.

An RCS (Remote Control Systems) signalling system operates the Abbot Point to McNaughton section and was built in 1984/1985. The McNaughton to Newlands section is a manual train order system.

2.2.2 Goonyella System

Details of each of the line sections in the Goonyella system are as follows:

Goonyella System

QR Section No.				Route Length	Total Track Length
		Start	End	km	km
GA	839	Darymple Loop	Dalrymple Jct	10.2	14.8
GA	838	Hay Point Loop	Dalrymple Jct	8.0	13.0
GA	837	Dalrymple Jct	Yukan	21.3	46.8
GA	621	Yukan	Hatfield	20.7	44.0
GA	441	Hatfield	Sth Walker Jct	77.5	159.4
SC	431	Sth Walker Jct	South Walker Ck Spur	2.8	2.8
GA	453	Sth Walker Jct	McArthur Jct	9.7	19.5
CS	452	McArthur Jct	Macarthur Mine Loop	5.1	5.3
GA	454	McArthur Jct	Coppabella	8.3	16.7
GA	443	Coppabella	Burton Mine Jct	22.7	35.9
BU	414	Burton Mine Jct	Burton Mine Loop	5.0	5.3
GA	444	Burton Mine Jct	Wotonga	5.6	8.0
GA	461	Wotonga	Moranbah Nth Jct	18.3	18.3
MZ	430	Moranbah Nth Jct	Moranbah North Loop	7.3	7.7
GA	462	Moranbah Nth Jct	Goonyella Jct	3.2	3.2
GA	746	Goonyella Jct	Goonyella Mine Loop	5.1	5.5
GA	745	Goonyella Jct	Riverside Jct	5.2	5.2
GA	747	Riverside Jct	Riverside Mine Loop	7.4	8.3
GA	731	Riverside Jct	North Goonyella Mine Loop	18.8	19.2
WA	748	Wotonga	Blair Athol Mine Jct	103.6	113.3
WA	749	Blair Athol Mine Jct	Blair athol Mine Loop	6.9	7.3
NP	760	Coppabella	Peak Downs Jct	43.7	48.5
PD	761	Peak Downs Jct	Peak Downs Loop	5.6	5.7
NP	762	Peak Downs Jct	Saraji Jct	21.1	23.7
SA	763	Saraji Jct	Saraji Baloon Loop	5.5	5.8
NP	764	Saraji Jct	Norwich Park Jct	43.2	48.9
NM	765	Norwich Park Jct	Norwich Park Loop	5.4	6.2
NP	766	Norwich Park Jct	German Creek Jct	21.7	26.8
GE	767	German Creek Jct	German Creek Loop	6.8	8.3
NP	768	German Creek Jct	Oaky Ck Jct	19.1	19.1
OK	769	Oaky Ck Jct	Oakey Ck Mine Loop	6.1	6.2
NP	614	Oaky Ck Jct	Gregory Jct	17.0	17.0
				568	776

A plan showing the extent of trackwork designated as Network Access and required for coal transportation and line maintenance is included in Appendix A. Network Access have included 2 sidings in the Jilalan Yard for arriving train storage. This provides some loaded train storage capacity should any unloading delays or interruptions occur at Dalrymple Bay or Hay Point. GHD has been made aware that yards throughout the coal network have been recently assigned to NAG and that QCA will make the necessary adjustments to the asset valuations to reflect this change.

The Goonyella system was originally developed with a single privately owned and operated export port facility at Hay Point servicing the Goonyella mine. The original line was constructed between 1969 and 1971 and operated with diesel locomotives. The port unloading facility incorporates dual car tipplers and a haulage system which can also accommodate bottom discharge wagons. It is the only export coal terminal on the east coast of Australia servicing gondola wagons. Peak Downs mine commenced railings in 1972 , Saraji in 1974 and Norwich Park in 1979.

The common user Dalrymple Bay export terminal was opened in 1983 with Blair Athol, German Creek and Oaky Creek mines commencing railings to the terminal in the same year. Both German Creek and Oaky Creek mines commenced railings a year earlier in 1982 exporting via the Central (Blackwater) line to Gladstone. Riverside mine also commenced exports in the same year. The Dalrymple Bay export coal terminal was designed for bottom dump wagons and therefore required a different wagon fleet to those mines exporting via Hay Point.

The Goonyella line to Goonyella mine, Saraji mine and Norwich Park mine was originally constructed with 107lb (53kg) on timber sleepers with bridges designed for E50 loadings (similar to M220). The line was duplicated to Coppabella in 1982 using 60kg rail on concrete sleepers and M250 bridges. The original timber sleepered track has been progressively upgraded with 60kg rail on concrete sleepers. The majority of this work was undertaken between 1983 and 1985.

The entire Goonyella system was electrified in 1987.

Passing loops have been added more recently at Mallawa, Ingston and Bundoora as have additional spur lines and loops for new mines as follows.

- North Goonyella 1993
- Burton 1996
- South Walker Creek 1997
- Moranbah North 1998
- McArthur 1999

Increasing export tonnages required the upgrading of the export terminals with the addition of a second unloading facility at Dalrymple Bay in 1993 and at Hay Point in 1998.

A RCS signalling system provides train control on the complete Goonyella system.

2.2.3 Blackwater System

Details of each of the line sections in the corridor are as follows:

QR Section No.			Route Length	Total Track Length
	Start	End	km	km
NC 752	Callemondah	South Gladstone	6.9	6.9
PG 755	Callemondah	Golding Loop	8.5	12.5
PG 603	Callemondah	Powerhouse Loop	3.3	9.8
NC 455	Callemondah	Fishermans Landing Jct	6.1	12.3
FL 434	Fishermans Landing Jct	Fishermans Landing	8.3	9.2
NC 456	Fishermans Landing Jct	East End Jct	14.8	30.0
NC 457	East End Jct	Bajool	48.3	102.1
NC 842	Bajool	Rocklands	28.2	57.0
CL 404	Rocklands	Gracemere	5.2	5.2
CL 405	Gracemere	Warren	20.3	29.2
ST 771	Warren	Stanwell Loop	4.9	4.9
CL 772	Warren	Duaringa	72.7	116.6
CL 773	Duaringa	Boonal Jct	75.9	102.7
BO 776	Boonal Jct	Yarrabee Branch	3.5	3.5
CL 777	Boonal Jct	Blackwater	9.1	10.8
LM 781	Blackwater	Taurus	14.0	13.4
LM 783	Taurus	Koorilgah Mine	5.5	5.9
LM 782	Taurus	to Laleham Mine	4.3	4.3
CL 778	Blackwater	Sagittarius	4.4	6.7
CU 774	Sagittarius	Curragh Loop	14.0	14.0
CL 779	Sagittarius	Rangal	3.5	3.5
KA 784	Rangal	Boorgoon Jct	9.6	11.5
KA 785	Boorgoon Jct	Kinrola Mine	10.9	10.9
KA 786	Boorgoon Jct	Boorgoon Loop	4.2	4.2
CL 780	Rangal	Burngrove	6.7	6.7
GG 787	Burngrove	Mackenzie	23.0	23.8
EN 789	Mackenzie	Ensham	14.9	14.9
GG 788	Mackenzie	Gordonstone Jct	29.1	34.0
GS 613	Gordonstone Jct	Gordonstone Mine	12.8	12.8
GG 790	Gordonstone Jct	Gregory Jct	8.7	8.7
GG 791	Gregory Jct	Gregory Mine	6.9	7.6
			488.6	695.6

Discrepancies between GHD's lengths and those in other databases result from differing definitions for the start and end of track sections. These discrepancies occur where the start and ends are not defined by turnouts. The QR definitions are not published. In a small number of cases this may result in a substantial discrepancy in the track lengths in one section but adjoining track section lengths compensate for this.

The Blackwater system has been developed on a very old rail network dating back to 1865 thru 1877 with the completion of the line from Rockhampton to Blackwater. The line was extended to Comet and Emerald over the next 2 years. The North coast line between Gladstone and Rockhampton was completed in 1903. It is likely some coal was railed as general freight during WWII from the Blackwater district.

The spur line to the Blackwater mine was opened in 1968 (Rangal to Kinrola) and to Laleham (South Blackwater mine) in 1970. Coal was exported from both the Barney Point and Auckland Point loading facilities in Gladstone. The branch line to Koorilgah was opened in 1973 and Boorgoon in 1975. The Gladstone Power station was constructed by the QEC in 1976-1981 with the Powerhouse loop constructed in 1971. The station has been supplied with coal principally from Blackwater (Boorgoon) and Curragh mines.

In 1980, a new common user export terminal, (R G Tanna Coal Terminal - RGTCT) commenced operating on reclaimed land at Clinton (Golding) in Gladstone. The terminal has grown significantly over the following years with several expansions of the rail loop to incorporate additional land reclamation areas and duplication of the unloading system. An additional loop was added in 1992.

The entire Blackwater system was electrified in 1987.

Coal mine related rail developments which followed the development of the Clinton terminal included

- Burngrove to Gregory 1980
- Boonal Loop (Yarrabee) 1981
- Saggitarius to Curragh 1983
- Stanwell Loop 1992
- Gordonstone Jct to Gordonstone 1992
- Mackenzie to Ensham 1997

The Central line to Blackwater and Comet was originally laid on timber sleepers and light rail. The introduction in 1970 of bottom dump unit coal trains serving Blackwater and South Blackwater mines necessitated track upgrading with replacement of timber bridges, sleepers and rail with concrete bridges, concrete sleepers and 53kg rail. Most of this work was undertaken in the early 1970's. Coal was exported from the Auckland Point and TDM Barry Point coal terminals The concrete bridges constructed at this time were designed for M160 loadings for 16 tonne axle loadings. The State government required each of the mines to fully fund their branch lines and loading loops as well as some increase in the main line capacity by way of new main line passing loops and signalling.

The RGTCT is a major coal export terminal which services primarily the Blackwater line mines but also mines on the Moura line. The terminal has the ability to blend two or more coals during ship loading. Some coal from mines on the Goonyella system is railed to Gladstone using Blackwater system trains for this purpose.

An RCS signalling system provides train control on the entire Blackwater system.

2.2.4 *Moura System*

Details of each of the line sections in the corridor are as follows:

QR Section No.			Route Length	Total Track Length
	Start	End	km	km
Moura System				
MA 754	Barney Pt	QAL Jct	2.6	6.9
MA 750	QAL Jct	Moura Sht Line Jct	1.1	1.1
MA 452 Part	Moura Sht Line Jct	10.2km	6.6	6.6
MA 433	10.2km	Byellee Jct	3.7	3.7
MA 756	Callemondah	Byellee Jct	2.1	2.1
MA 734	Byellee Jct	Graham	14.7	16.9
MA 420	Graham	Stirrat	10.9	10.9
MA 421	Stirrat	Annandale	80.1	88.3
MA 736	Annandale	Earlsfield	8.3	9.5
MA 606	Earlsfield	Moura Mine Jct	52.1	53.5
MA 743	Moura Mine Jct	Mine loop	5.6	5.9
Boundary Hill Mine				
MA 799	Annandale	Boundary Hill Loop	5.6	5.8
Callide Mine				
BI 737	Earlsfield	Dakenba	15.9	18.0
BI 738	Dakenba	Callide Mine	14.6	15.2
			223.9	244.3

The Moura rail coal system runs from Gladstone to the Moura mine. It includes the Boundary Hill spur and loading loop, the Callide Valley Branch line from Earlsfield to Dakenba, the Callide mine spur and loading loop and the Moura mine spur and loading loop. All lines are single track narrow gauge and are non electrified. The system currently services only 3 coal mines, Moura, Callide and Boundary Hill.

Coal mined at Callide was first railed to Gladstone in 1953 following the construction of the line from Dakenba to Callide mine.

Coal was first hauled from mines in the Moura area including Kianga south of the town of Moura, through the town and then north via Mount Morgan. In 1967 a private export coal facility was constructed at Barney Point for Theiss Dampier Mitsui. In 1974 the Moura Short Line, as it was originally known, was opened linking Moura to Graham on the Callide Valley line. Moura coal was then exported through the export terminal at Barney Point and at Auckland Point in Gladstone.

The Moura Short Line is a single track line with 1 000m passing loops. It was originally constructed on timber sleepers using 47kg rail. It has been subsequently upgraded to 60kg rail on concrete sleepers. Bridges have been recently upgraded to M250 loadings. The system was upgraded to 80kph running in 1998. Culverts on most of the line are corrugated metal pipe (CMP), the exception being the Boundary Hill spur line and loop constructed in 1982/83 and the Moura mine loadout which was upgraded to a loading loop in 1993. These newer track sections are constructed with Reinforced Concrete Pipes (RCP's) and Reinforced Concrete Box Culverts (RCBC's). A rail flyover was created in Gladstone in 1981 to separate trains from the Moura and Blackwater systems.

Coal ceased to be exported through the Auckland Point terminal in 1990. All coal over the line is exported through BHP's Barney Point and the common user RGTCT.

The Barney Point terminal is a relatively small terminal and does not have a balloon loop. The terminal has a number of parallel sidings for train storage and a run round for diesel locomotives.

The line currently operates with 2 different train consists, one comprising 3 diesel locomotives and 63-80 t gross wagons and the other 4 diesel locomotives and 80 wagons. The net train capacities are nominally 3500 and 4500 tonnes respectively.

2.2.5 West Moreton

The West Moreton coal fields are support by rail infrastructure that operates primarily as a passenger and general freight network. The line has not been developed as a mineral railway. The track used for coal transport includes:

- Part of the dual gauge line servicing the Port of Brisbane.
- Metropolitan Urban Network.
- The old main line west from Ipswich to Toowoomba.
- Part of the Western Line from Toowoomba to Macalister.

At present the line services 2 mining areas:

- Wilkie Creek west of Dalby.
- Ebenezer, Jeebropilly and Rosewood areas south west of Ipswich.

Coal is presently transported to either Swanbank Power Station or the export coal terminal at Fisherman Islands.

Much of the line dates back to 1865/1868 (Ipswich-Toowoomba-Jondaryan, Dalby-Warra).

The Box Flat line to Swanbank was constructed in 1975, Lytton Junction to Fisherman Islands in 1980, Yarrowlea to Ebenezer 1990, and the Dutton Park to Lytton Junction dual gauge in 1997.

The metropolitan network was electrified in 1979 and 1980 and extended to Rosewood in 1993. However, all coal is hauled by diesel locomotives from each of the mines to either Swanbank Power Station or Fisherman Islands. Consequently electrification assets have been ignored.

The age of the existing earthworks, drainage systems, bridges etc are such that for much of the line west of Ipswich is well below the standards required for modern railway construction. Many culverts and bridges do not meet current design standards not only in their construction technology but also their elevation and flow capacity.

Similar comments apply to earthworks standards, rail alignment and track elevation. Significant axle and speed restrictions therefore apply to most of the track in the West Moreton system.

2.3 Data Sources

The prime sources of data used to identify the assets of the Central Queensland systems to be valued were:

1. An extract from QR's existing financial assets register

The assets register contained the following key information for each identified asset relating to this project:

- Classification of assets (see Appendix B for a list of the asset classifications)
- Line code and line description of the asset
- Km point of the asset (for non contiguous assets)
- Description
- Quantity (where applicable)
- Manufacturer (in some cases)

The register was found to have numerous obvious errors and some duplications. Asset descriptions in some cases were inadequate.

2. Plans and Information

During our work a number of different types of plans were provided by QR to supplement the data provided in the assets register. These plans included:

- Line Sections (as at 30 June 1999)
- "As built" civil Working Plan and Section drawings
- Electrical traction power Isolation diagrams
- Signalling drawings (SA Drawings)
- Communications and signalling Cable Layout drawings

GHD was aware that QR had produced information packs for potential 3rd party rail operators. GHD was not given access to such information by QR.

3. **Supplementary data**

   The GHD and Hatch work was carried out in parallel. The Hatch database was subsequently provided to GHD by QCA for comparative reasons.

2.4 Sources of Data - Track

Track information for the valuation has been derived from the Working Plan and Section drawings for each line together with Network Access drawings. QR provided GHD with copies of the Working Plan and Section drawings in A3 format or as Acrobat scanned image files on CD. Much of this information was of poor quality and was difficult to read. Information on many dawings was in imperial measurements ie track chainages in miles, chains, roods and links. Generally, route lengths, total track and turnout data has been based on the Network Access drawings. GHD has based the System Drawings in Appendix A on these QR reference plans.

The Working Plan and Section drawings show all track on the various lines. QR provided Network Access drawings that defined the tracks and sidings to be made available for network access by operators other than QR. These drawings were used to identify the track that is used by coal traffic and to exclude track solely used by non coal traffic general freight.

2.4.1 Main Line

GHD has quantified the following track components for each line sections:

- Rail
- Sleeper and fasteners
- Ballast

QR's track construction standards nominate the following quantum of components per track km:

- 2 km of welded rail
- 1500 sleepers and related fasteners
- 1500 m^3 of ballast

Track turnouts and crossings are separately identified. These have been identified from the track drawings. Assets (primarily turnouts) linking NAG coal network track to NAG non-coal network, QR operations or private track have been excluded and an equivalent length of standard track included.

Assumptions:

The track in situ is that defined in the construction standards.

2.4.2 Passing Loops, Yards and Sidings

The quantum of assets has been identified from the drawings. Based upon advice from QR the standard of track is the same as for the mainline track. The drawings in Appendix A sets out the yards, siding, passing loops included by GHD in the coal network infrastructure.

Assumptions

1. *The passing loops, yards and sidings used by the coal traffic are those set out in Appendix A.*
2. *The standard of track for passing loops, yards and sidings are the same as for the mainline.*

Note: A subsequent change in the scope of assets to be held by Network Access has occurred with all major sidings in the major yards now included. This change was made after GHD had completed its valuation and QCA are to make the necessary adjustments to include these sidings.

2.5 Sources of Data - Earthworks

The valuation of earthworks is a very significant component of the overall line cost and is arguably the most difficult to estimate accurately. For this reason GHD has obtained and used the Working Plan and Section Drawings to develop earthworks quantities for each cut and fill. The data relating to earthworks available from the drawings varies depending on the era in which they were produced. GHD has made various assumptions where necessary to interpolate or extrapolate the available data to develop a best estimate of the quantities.

Some of the issues that have been addressed are:

- Where possible GHD has sought to include the estimated total quantities of earthworks in cuttings that have been widened. Such volumes may not be reflected on the current Working Plan and Section drawings.
- GHD assumed that the vertical alignment of the track has been determined so there is a close balance between cut and fill quantities in accordance with normal good design practices.
- GHD assumed that there is minimal unsuitable material. The QR construction approach to embankments and the use of “top 600” capping allows a diversity of materials to be used.
- GHD assumed that were no locations where long mass hauls of material were required.

There was no information recorded on as built drawings indicating rock quantities.

Earthworks quantities are best estimates of the actual quantities for each of the line sections. QR has made several significant revisions to its Standard Cutting and Embankment cross sections over the last 30 years reflecting varying design standards. Each revision has led to greater earthworks quantities per lineal metre of track.

Earthworks include the "top 600mm" capping material on the formation (300mm in cuts) and cess drains in all cuttings. QR has adopted a policy of a high quality "top 600mm" to reduce the costs of formations. GHD considers this to be an appropriate trade off. We have valued the "top 600" based upon the QR specification.

Earthworks estimates also include for an all weather 4WD maintenance service road constructed adjacent to electrified lines. These roads typically follow the natural contours and may include concrete floodways at small stream crossings.

It should be noted that construction water can be a significant construction issue and cost in much of the Central Queensland region in which the coal lines are located.

Assumptions:

All widening of the earthworks have been reflected in the drawings provided and have been assumed to be constructed as part of a single stage development.

The top 600mm has been constructed in accordance with QR's current design standards.

2.6 Civil Structures

Civil structures consist of:

- Rail bridges
- Footbridges
- Culverts and other openings
- Fencing
- Retaining walls
- Drainage

All rail bridges have been identified from QR's Working Plan and Section Drawings. All bridges have been valued on the basis they are single track bridges.

All grade separated road over bridges with the road traffic over rail have been excluded from this valuation.

Retaining walls have been identified from drawings and the QR asset register.

Drainage for the mainline track has been assumed to be present in all relevant areas (i.e. in cuttings). Generally GHD has excluded yards from the valuation in accordance with the definition of NAG assets defined in the plan in Appendix A. Hence drainage in all yards has been deemed to be a QR asset. (Note: As a result of changes to Network Access assets main sidings at Jilalan, Callemondah, Coppabella. Some yards are to be included by QCA).

Buildings identified are those whose sole use is to accommodate (not support) infrastructure. These buildings relate to signalling, communications and electrical traction. Multi use buildings have not been included.

Fencing of the mainline has been assumed to be complete. It has been assumed that all yards are fenced.

Assumptions:

Road and other overbridges have not been included.

Drainage in yards has been excluded.

Rail bridges noted in the Working Plans and Section Drawings have been included.

2.7 Sources of Data – Signalling

Signalling is a network asset and consists of:

- Physical track side equipment.
- Central control system and software.
- Communication systems between trackside equipment and controls systems.
- Sole use buildings related to signalling.

The physical trackside equipment was identified from drawings provided by QR and other data supplied by them.

The central control systems and software in Mackay, Rockhampton, Callemondah and Townsville cover train control of the coal system and other lines and sidings. The estimated cost of these systems pertaining to the coal lines has been included.

Related communications equipment is included in the communication assets which are shared for various communications functions.

It is practice when constructing a signalling network to acquire spares as part of the procurement process. These spares fall under the financial definition of a capital spare and based upon the Australian Accounting standards should be capitalised and treated as a fixed asset. GHD has included in its identification and associated valuation a component of these capital spares. (It should be noted that QR will have other capital spares for other types of assets but these have been excluded).

Assumptions:

The drawings reflect the current signalling system.

2.8 Sources of Data - Electric Traction System

The electric traction system covers the Goonyella and Blackwater lines only. The Newlands and Moura Lines are not electrified. Coal traffic on the West Moreton line is diesel powered and the electric traction asset have therefore been excluded from the valuation.

The electric traction system covers the overhead wiring and support structures, the substations, switching and power distribution equipment and associated building structures and infrastructure. The monitoring and control of the power system has been included within the Communications System estimates.

QR provided GHD with Isolation Diagrams for the Goonyella and Blackwater Systems. There are 24 Diagrams relevant to the Blackwater System and 26 covering the Goonyella System. These diagrams are the single line power drawings for the system including the feeder substations. The primary information required from the "as built" drawings was the number of masts in each track section. The quantum of mast centres vary markedly with track curvature and on their proximity to the coast where masts are designed for higher wind loads.

An alternative approach was developed to provide a satisfactory level of accuracy. The Working Plan and Section Drawings track alignment were examined and cumulative distances determined by curve radii with each curve included in a band. An average mast spacing based upon current design criteria was assigned to each band of radii to determine the number of masts in each track section.

The power system included in the valuation excludes the 132kV supply system up to the bushings on the 132kV/25kV supply transformers as these are owned and controlled by Powerlink.

Assumptions:

Average mast spacings taking into account the differing design criteria have been adopted.

132 kV power supply system has been excluded.

2.9 Communications

The communications systems operated by QR are numerous and very limited information was provided by QR defining these systems. The asset register also contained only very limited information on which to develop an estimate.

It has therefore been necessary for GHD to make a significant number of assumptions in order to provide QCA with an estimate.

Assumptions:

- That a new communication system would be based on a duplicate fibre back bone extending to all signalling sections and stations.
- That all data, voice, SCADA and signalling control traffic is carried by the fibre network.
- That mobile radio networks, which use common infrastructure for above rail and some below rail activities is costed as an operation expenditure.

2.10 Categorisation of Assets

The assets identified have been categorised into the following groups:

- Track
- Earthworks
- Civil structures
- Signalling System
- Communications System
- Electrical traction system

Assets valued have been summarised within the GHD's assumed line sections.

2.11 QR's Classification and Unitisation of Assets

As noted above QCA anticipated that QR would have completed a stocktake of assets to verify the accuracy of the assets register prior to GHD's work commencing. Hatch (BHPE) was contracted by QR to commence this work in November 1999. QR and Hatch prepared a paper entitled "Classification, unitisation and valuation matrix. This paper proposed the basis that QR was to adopt in the identification of assets. This paper was discussed at a meeting on 18 November between QR, QCA and GHD. GHD accepted the proposed methodology and has endeavoured to complete the work using a similar matrix. However because GHD's work had already commenced when the paper was issued there are differences.

The Hatch work was completed in April 2000 and provided progressively to GHD in May 2000.

2.12 Third Party Assets

All NAG assets on the coal corridors regardless of their source of funding, have been identified and valued as part of this project.

Private sidings have been excluded.

2.13 West Moreton System

The West Moreton System is subject to a separate report to the QCA.

3. Description of GHD Databases

3.1 Track

A trackwork database was created for each line section for each of the Coal Systems. The line sections adopted are those set out in the Queensland Rail Line Section book as at 30th June 1999. This edition includes the following

Goonyella System

GA 461	Watonga to Moranbah North Junction
GA 462	Moranbah North Junction to Goonyella Junction

The above replace line section GA 744

Blackwater System

NC 455	Callemondah to Fisherman's Landing Jct.
NC 456	Fisherman's Landing Jct to East End Jct.
NC 457	East End Jct. to Bajool

The above replace line Section NC 840

Moura System

NC451, Moura Short Line Jct to 10.2km. This line section together with NC450 replace NC432.

The line sections have been established and are administered by QR's Survey Section of the Technical Services Group. They are not used by any of the specialist discipline branches ie Civil, electrification, signalling or communications and hence none of the specialist data available from each is classified in this manner.

The Line Section book tabulates the following data.

- haul distance length
- total line code length

- track km
- route km
- electrified route km
- electrified track km

The definition of the start and end point of each track section was not able to be identified clearly in all cases and hence are some discrepancies between the route lengths given in the Line Section data and the GHD data.

More substantial differences were encountered in the data for track km, in all cases the quantities measured by GHD being greater than that shown by QR. GHD generally determined track km from the differences in chainages with corrections for those locations where route changes may have lengthened or shortened the track. Passing loop and siding lengths have generally been determined from chainages given on the Network Access plans included in Appendix A. Where siding lengths only are shown these have been assumed to be effective lengths and 120m has been added for clearances for loop sidings and 60m for dead end sidings. In a number of cases insufficient information was available on these drawings and reference was made to the Working Plan and Section drawings chainage data. GHD has used its own data throughout the assessment and has not attempted to reconcile any differences.

The GHD plans included in Appendix A generally define the trackwork included in this evaluation. The plans exclude Network Access track not relevant to the coal system (green), is privately owned (orange) or is being deemed by QR Operations as its private operations trackwork (blue). Sidings required for maintenance of Network Access assets eg maintenance sidings are included in the GHD valuation. Generally turnouts for other uses eg QR Operations to blue trackwork, have been excluded from this valuation on the basis that they would be otherwise unnecessary. Some of these turnouts may be supplied at another party's cost with maintenance incorporated into the freight charges for these other commodities or services.

The GHD databases for each track section includes

- line section length and start and finish chainages
- total track length in km to 2 decimal places
- turnouts (including crossing angle) all 60kg

Sleepers, ballast, field welding etc have been determined from the rail length in each track section and sub section.

The following quantities have been adopted for the valuation

- Rail 60kg factory welded in 90m lengths
- Concrete sleepers with elastic rail fastener
- Sleeper spacing 665mm (1,500 sleepers per km)

- Ballast (concrete sleepers) 1.5cu.m per m.
- Thermit welds every 90 m in each rail ie 2 welds per 90m track

3.2 Earthworks

The earthworks database has been created for each section and sub-section of each line. It has been compiled by reference to each Working Plan and Section drawing. These drawings vary in the information they contain depending on the design and drafting standards applicable at the time they were prepared. Where there has been significant upgrading of old lines it is common to find new drawings have been prepared which replace the old ones. In some cases GHD has been provided with both the original and the current drawings.

The QR Working Plan and Section drawings fall into 3 categories:

- drawings containing earthworks quantities for each cut and fill
- drawings containing depth of cut and height of fill data
- drawings showing only natural ground levels

GHD has incorporated the data from the drawings or developed estimates of the earthworks quantities in each cut and fill based on the available data on the drawings. For earthworks quantities in locations where there is evidence of earthworks being carried out in stages, drawings have been reviewed to ensure the database contains an estimate of the total earthworks that have been undertaken by QR to achieve the current track alignment. This particularly relates to passing loops and duplication.

The database has been created by the inclusion of track section description, location and cut and fill data for each cut and each fill. A fill compaction factor of 90% has been assumed. The volumes of material in the top of the formation (top 600) has been determined on the basis of it being 300mm deep in cut and 600mm in fill as per QR's construction standards.

GHD has taken the view with civil design standards that those adopted by QR have evolved over many years of construction, maintenance and operations and that whilst other standards might be contemplated, the QR standards are proven.

GHD estimated earthworks quantities from this data by dividing each cut and fill into a number of sections, determined a cross sectional area at each section and then calculated volumes using the average of the section areas and the distance between them for each intermediate section and one third of the area of the end sections. A standard cross sectional profile with 6.0m formation and 1.5 batter slopes was assumed throughout.

The earthworks information on each drawing gives no indication of rock quantities. For the purpose of GHD's estimates it was assumed 30% of all cut volumes are rock.

3.3 Civil Structures

A number of databases were developed for civil structures by GHD for asset valuation. These covered:

- Culverts including underpass structures built from box culverts
- Bridges
- Crossings
- Weighbridges
- Fences
- Buildings

The culvert database includes the descriptive and chainage location of each structure. Separate fields were included for each type and each standard size of drainage structure and the number of head walls associated with it. The database was then populated with the total length of pipe or box culvert at each chainage location as determined from the Working Plan and Section drawings for each track section and sub-section.

Pipe culverts ranged in size from 500mm to 1 950mm diameter and box culverts from 450mm x 300mm to 3 000 x 1 800mm. In a very small number of cases culverts were not sized on the drawings or are of another construction. A unit rate for head walls and drainage structures for each type and size of structure was applied to the total quantities in each section to develop a total value.

3.4 Signalling Systems

A standardised database comprising all of the field elements incorporated in the signalling systems was developed and quantities in signalling sections were assessed from the drawings. The quantity of each item in each track section was then entered into each field. Contractors preliminaries, overhead and profit are included in the estimates for each item.

The signalling sections were created to as closely as possible reflect both the functional signalling zones and the various line sections being used for the valuation. In many instances a line section may involve up to 6 separate signalling zones, each with its own quantity take off and estimate. However, as most line sections start and end at turnouts, signalling equipment associated with that turnout will be physically located in 3 line sections. Some discretion with allocation of costs at these locations has been necessary. In such cases the majority of signalling costs have been included in the main line section nearest the port.

Centralised control centres are located in Townsville, Mackay, Rockhampton and Gladstone. It has been assumed that the floor space occupied by these control centres is rented space and no capital value has been placed on the floor area involved. Generally this floor space is a small component of the total building in which it is housed. The value of the central control system has been assigned across all line sections in proportion to the valuation allocated of signalling within each section.

3.4.1 Principles

The signalling systems for the Central Queensland coal systems are predominantly RCS, however there are sections that remain manual Train Order. The latter includes sections of the Moura and Newlands systems.

The Central Queensland Systems are controlled from Rockhampton, Mackay and Townsville with control of the Gladstone Area from Callemondah.

The estimate was based on use of similar equipment and principles as presently used except as further detailed below.

The equipment portion of the estimate includes the equipment and where appropriate the associated foundations, bonding, local cables, control relays and power supplies and installation costs of this equipment.

3.4.2 Assumptions

Power Points - Remote Operation

- The points have associated swing nosed crossings (SNX).
- Points and SNX would be electro hydraulic operated.
- The supply and installation of the electro hydraulic equipment and associated detectors has been included in the trackwork estimates.
- The estimate provides for the supply and installation of the external equipment and cabling to the points and the wiring of the points equipment.

Electrically Released Points

- The points would **not** have associated swing nosed crossings.
- Points and catch points are electro hydraulic operation.
- Points and catch points are controlled from a local panel.
- The supply and installation of the electro hydraulic equipment and associated detectors has been included in the trackwork estimates.
- The signalling estimate provides for the supply and installation of the external equipment and cabling to the points and the wiring of the points equipment.

Mechanical Trailable Facing Points

- The supply and installation of the trailable facing point equipment has been included in the trackwork estimates.

3.4.3 Train Detection

- DC track circuits have been allowed for over points and short tracks in the station yards.
- Jointless track circuits have been used for longer tracks as is the case at present.
- Track circuits with underground block and power cables have been allowed for in the short block sections.
- Axle counters have been allowed for in the long block sections with either optic fibre cable or radio linkage.

The communications links will be allowed for in the communications estimate.

3.4.4 Remote Warning Devices

Hot wheel detection, hot boxes, dragging equipment, wheel impact, flood level, are included in the signalling estimates.

3.4.5 Main Equipment Building and Power Supplies

It has been assumed that there will be a common prefabricated building for the main interlocking, communications and standby diesel generator power supply with a common battery and charger for the interlocking, axle counters and communications.

3.4.6 Interlockings

Interlockings will be processor based.

3.4.7 Operating Systems

Centralised Traffic Control with power signalling has been included in the signalling estimates. The communications links are included in the communications estimates as common data fibre cabling systems have been assumed.

3.5 Communications System

The communications system servicing the Central Queensland coal system includes optical fibre and microwave systems supporting control systems data and voice. A mobile radio system is also used but has been excluded as an above rail asset.

In a new system constructed today it is most likely that a redundant fibre system would be installed over most routes with minimal use of microwave. Voice communications as well as control and data would all be carried over these cables.

QR's communications systems are complex and a relatively simplistic approach was adopted by GHD to derive quantities in order to produce estimates. The database provides for dual fibre cable installation over the full route length of each line together with ancillary hardware, provision for PABX exchanges and control centres.

3.6 Electric Traction System

The electric traction data was sourced from the Isolation diagrams for both the Blackwater and Goonyella systems. These do not correspond in any way to the Line Sections by which the assets are required for the QCA valuation. Major items have been identified by chainage and included in the relevant section. Lesser items which were not recorded by chainage have been included into the most likely line section. Some minor discrepancies in allocation to adjoining sections may have occurred.

The assignment of power supply components to individual track sections does not reflect where the value may lie. For example a major Feeder Substation will supply power to a number of adjoining line sections but the major costs have been incorporated into the section in which they are located.

The electrical data was collected from the Electrical Isolation Diagrams in a standardised database comprising all of the major elements. This data has been entered into a database which incorporated each of the track sections of both the Blackwater and Goonyella Systems.

4. Audit of Queensland Rail's Asset Allocation Methodology

4.1 Introduction

GHD arranged, through Queensland Rail, to attend the offices of Hatch (ex BHP Engineering) on the 29 February 2000. The objective of attending these offices was to review the desktop evaluation which was being undertaken by Hatch to ensure that there are adequate processes in place and secondly to review processes which Hatch are to adopt for the physical inventory.

The audit was undertaken by Mr Ian Burrows of GHD. Mr Greg Ramsey of Hatch together with Mr Michael Speter of Queensland Rail also attended. During the review a number of issues arose that may impact any reconciliation between the Hatch and GHD work. These have been noted in this report.

4.2 Scope of Hatch Review

QR explained that the terms of reference provided to Hatch (the terms of reference were not provided to GHD), was that the inventory of the coal lines was for two purposes:

- to establish the inventory for valuation purposes; and
- to provide a base of information with which to build an asset management structure.

The asset identification was to be built around the matrix established by Queensland Rail for the identification of assets, the preliminary draft version of which was discussed with GHD in November 1999.

The discussions with QR and Hatch identified that the matrix had been enhanced subsequently and that some additional fields were added for each type of asset. The extended information captured by Hatch is significantly greater than that identified by GHD. The objectives of the Hatch assignment are also the capture appropriate information for long term asset management.

The Hatch team had divided the assets into five components for the identification namely:

- Bridges;
- Civil Works including culverts, draining and earthworks;
- Track;

- Signals and communications; and
- Overhead wiring.

Hatch has a two step approach to the task:

A) Desktop analysis of assets.

The desktop analysis was based broadly on similar information as provided by QR to GHD. Primarily, this information took the form of plans of varying types and these have been used by Hatch to identify the assets. Hatch did not provide any written documentation as to the procedures which were to be undertaken however, GHD's observation is that they have used senior staff with extensive experience in the specific assets and that it is unlikely that there will be any material omissions from their tasks. The process followed is that assets were identified by line section from documentation. Where anomalies were identified, these were compiled into a list of queries that were then sent to the QR infrastructure engineers responsible for those sections of track for resolution. The speed with which these matters have been resolved varies depending upon the individual asset manager.

Hatch was not responsible for identifying the dates of installation nor were they to undertake any work in relation to the condition of the assets or on the valuation of the assets.

B) Physical Identification

Hatch used two teams that travelled the entire length of the coal line assets. The prime focus was to identify from the asset register the fact that each asset exists and for the major assets eg. bridges to ensure that each bridge is recorded on the database. The process of ensuring that all assets are on the database can only be done on a sample basis eg. to identify whether every culvert or drain on the database will be an extremely time consuming and difficult process but any absences will not have a material impact on the value.

GHD did not participate in this process.

During the review GHD suggested that the asset listing established by Hatch should be sent to the QR engineer(s) responsible for the track section for an audit sign off to confirm the validity of the data identified. Both Hatch & QR saw merit in this process.

4.3 Bridges and Culverts

The bridges and culverts were identified from the as built drawings and these were compared, where appropriate, to the QR database. It should be noted that the track plans do not identify all bridges and culverts. The Hatch analysis identified a small number of locations where a culverts has been marked and has been replaced by a bridge. The original plans also identify a number of timber bridges which have now been updated to a concrete bridge (this agrees with the GHD analysis of all concrete bridges). On the Newlands line, the analysis identified four extra bridges.

GHD questioned the staff undertaking the work for Hatch as to whether it is a multiple track, whether they have used single bridges for each track or have a bridge with multiple tracks on it. The response that was received is that most of the bridges where there are multiple tracks are multiple single track bridges rather than multiple track bridges.

Audit Tests Undertaken

Review of all of the bridges and culverts on line codes NL851 and NL848

4.4 Signalling and Communications

The signalling and communications assets have been identified by a detailed analysis on a line by line section of the Signalling Arrangement or AS plans. These plans identified both the individual signals and also the extent of cabling for each signal. The Hatch analysis has identified the longitude signal cables along the track but where there is local cabling within a location, the extent of cabling has not been separately identified and is assumed to be part of the local asset. The cabling currently identified is based on a straight line between two points and takes no account of any deviations or track crossing of the cables. QR will consider whether a percentage factor should be added to the length of the cabling. It would appear unlikely that any adjustment for this additional length would be less than 5%.

In the yards the total signalling assets have been separately identified and no attempt has been made to separately identify signalling not relating to the coal tracks. QR are aware of this and proposed to undertake a separate allocation of the signalling relating to coal and non coal traffic.

The Hatch terms of reference has excluded all walk-in buildings relating to signalling and communications. However, these buildings are captured under a separate group of assets called facilities.

Hatch advised that there were a significant number of occupational track crossings.

All power supplies relating to signalling have been included in the signalling assets.

The communication assets have been based upon the communications database. Hatch had not been requested to identify sub components.

The signalling assets being identified are based on geographic locations and care must be taken to ensure that the crossovers and boundaries are clearly identified and all assets suitably identified. In the test which was carried out this boundary issue was satisfactory undertaken.

Audit Tests Undertaken

All assets on line NC756 were checked to the database.

4.5 Track

All track has been identified from the working plans. There is a difference between the kilometre points identified on the plans and the actual length of track ie. the true length however, there have been minor changes in some sections resulting from deviations and rationalisations. Hatch identified the true length of track between points. (Footnote. Refer Chapter 5 for explanation of differences between Hatch and GHD track lengths)

The turnouts from the track have been identified from the track plan. These identified the location of the turnout together with details of the turnout.

QR provided Hatch with some additional information relating to the weight and configuration of the track. This information was not provided to GHD but has subsequently been provided to QCA.

Hatch has identified all turnouts on lines regardless of whether the turnout relates the coal traffic or not. This has resulted in some differences between GHD analysis and the Hatch analysis.

Audit Tests Undertaken

A review of all the turnouts on the line section L837 was undertaken. In Jilalan yard there were a number of turnouts within the yard which have yet to be identified. The reason for them being outstanding was that the configuration of the turnouts was not noted on the track plans. However, a similar problem relating to the main line on the two tracks identified in Jilalan where the length of the track was not separately identified on the track plans. The method of Hatch ensuring that these questions are eventually picked up is that each track plan has been marked using a highlighting pen and those not highlighted are yet to be resolved. Using this process there is a risk that some areas of track maybe omitted.

4.6 Earthworks

The volume earthworks has been identified from the as built drawings and where the drawings identify the volume of cut and fill, these have been taken to be correct. In areas where this volume is not available a formula has been established between QR and Hatch which identifies the terrain type and this has then been used to estimate volumes per kilometre which in turn is multiplied by the length of the cutting. Cuttings and embankments have only been identified where the cut or fill is greater than 300 mm. It is believed that the GHD approach should give a more accurate result than the one adopted by QR.

Audit Tests Undertaken

The volumes for line codes L772 and FL434 were checked through to the excel spreadsheet.

4.7 Culverts

These have been identified from the working plans in a similar manner to bridges.

Audit Tests Undertaken

Line code L773 was tested.

4.8 Overhead Wiring

The assets relating the overhead wiring are based upon the track codes as noted in track descriptions. No attempt has been made to identify the number of masts etc, the differential between coastal and non coastal overhead wiring will be taken into account in the valuation process.

In terms of the power supply, each of the sub stations has been broken down into the various components, track section huts etc. In terms of volumes Goonyella has eight (8) sub stations and Blackwater five (5) major substations.

4.9 Comparison of the Findings of the Hatch Associates Study to the QR Asset Register

No comparison of the Hatch asset database and the QR Asset Register has been undertaken. This was deemed pointless given that:

- GHD was unable to use the QR database for any meaningful purpose
- A comparison was almost impossible given the QR database format.

The QR database contained many obvious errors e.g. entries in some cases contained data for the wrong system and many entries lacked sufficient detail to be of any real value.

4.10 Conclusions

The review of the work undertaken by Hatch on behalf of QR indicated a systematic approach to the development of a worthwhile asset database and that the audit result was satisfactory. Whilst some errors and omissions would inevitably be present, these should be very minor.

The scope of the database includes items outside the scope of the coal system as defined by the NAG drawings and therefore not all assets should be included by QR in any valuation of their assets. There will also be discrepancies in the line section in which some assets have been assigned e.g. turnouts to spur lines, etc.

5. GHD & Hatch Database Review

The Hatch databases created for QR was prepared in conjunction with QR personnel and was focussed on providing a valuable, accurate, detailed listing of QR below rail assets for the Central Queensland coal lines and related infrastructure.

GHD was requested to review the QR database to ensure that any significant discrepancies between the two databases were identified and resolved if possible. Where appropriate GHD should amend its database or notify QR of apparent errors in the Hatch data. This comparison was undertaken on all four central Queensland coal lines.

In general there was good correlation between the databases. For many asset types a comprehensive comparison was undertaken such that the quantity of each asset group in each track section were compared. For other assets an audit approach was taken as a detailed comparison was felt to be unwarranted.

The various asset types are dealt with in detail below.

5.1 Line Sections

The line sections included in each of the databases were compared and a number of discrepancies identified. These were as follows:

Newlands

NL845 Pring-Merinda. Included in Hatch database but excluded from GHD's. QR have agreed should be excluded.

Goonyella No discrepancies.

Blackwater

NC752 Included by Hatch. GHD had included in Moura System. GHD has incorporated in Blackwater.

GL434 Fisherman's Landing Junction to Fisherman's Landing. Included by Hatch but excluded by GHD. Now included in GHD database.

LM782 - Taurus to Laleham. Complete line included in the Hatch database. GHD had included only 4.34km. Hatch database adjusted as the line is a private spur.

EE435 - Aldoga to East End. Included in Hatch database but not GHD's. QR have agreed should be excluded.

Moura

MA754 - Barney Point - QAL Junction. Hatch had originally excluded this track section. GHD had included. QR have now included.

NC751 - Gladstone to South Gladstone. GHD had included. Hatch had excluded. GHD have now excluded.

MA450 - Included in Hatch database, but not GHD. QR have now excluded.

QL753 - QAL, Spur and Sidings. Excluded by Hatch & GHD on the basis of a private siding.

5.2 Track Lengths

A comparison of the track lengths of each track section for each of the four Central Queensland coal systems was carried out. The following resulted:

	GHD (km)	Hatch (km)	Diff (km)	%
Newlands	203.4	199.5	3.9	1.9
Goonyella	776	784.6	1.5	0.19
Blackwater	695.6	675.94	19.6	2.82
Moura	244.3	243.8	0.5	0.2

Newlands

The major discrepancy in the Newlands data relates to the track length included at Collinsville mine.

Goonyella

Good correlation throughout.

Blackwater

The major differences result from:

- inclusion of two additional Callemondah sidings in the GHD database
- a substantial error in the CL405 track length in the Hatch database (2.2 km Hatch 1.485 km old QR)
- combined CL404 and CL405 for GHD 34.3, Hatch 19.8 a discrepancy of 14.5 km
- the Hatch database originally included line section EE435

Taking account of the above the correlation of track lengths to the Blackwater System is very good <1.0 km.

Moura

Good correlation throughout, although some minor discrepancies.

Conclusion

Whilst the two databases did not match, the discrepancies were generally understood. Where appropriate, adjustments were made to GHD's database and the resultant discrepancies are deemed to be minor for the purposes of valuation of the below rail assets.

5.3 Turnouts

The number of turnouts in each system included in each of the databases have been compared. It is believed the differences, which are quite significant, relate almost entirely to the different philosophies adopted by QR/Hatch and GHD for identifying coal assets.

GHD has excluded all turnouts including main line turnouts whose presence is not required for a coal related activity. Turnouts for track maintenance sidings are included.

The comparison of the data is as follows:

	GHD	Hatch	Diff	%
Newlands	42	45	3	7
Goonyella	215	233	18	8
Blackwater	221	238	17	8
Moura	59	53	6	10

The Hatch database identifies turnouts in 67 classifications. GHD has adopted only 5.

5.4 Earthworks

The two approaches adopted by GHD and Hatch preclude any detailed comparison of earthworks. GHD considers its approach to be more rigorous than that adopted by QR and Hatch.

5.5 Culverts

Both GHD and Hatch have set out to identify all culverts in each system. Both organisations have used similar approaches.

An audit of several line sections has revealed only minor discrepancies.

5.6 Bridges

Both GHD and Hatch have identified rail bridges throughout each system and included each by name in the respective databases.

These have been checked against one another. GHD identified a small number of bridges found within the Hatch database that it had not identified from the drawings. The GHD database was subsequently amended. Several bridges identified in the GHD database and found missing in the Hatch database were notified to QR.

The databases can therefore be deemed to be identical.

5.7 Crossings

Level crossings, both public and occupational have been identified by both GHD and Hatch. The total number of crossings in each system compare favourably with minor discrepancies in some line sections. The differences between the databases is <2%.

5.8 Other Civil/Track/Structures Databases

The Hatch database includes section for some other elements of civil, track or structures. These have either been separately identified by GHD or are not deemed a below rail coal asset. These include such elements as:

- diamond crossings (none identified)
- road over bridges (excluded by GHD)
- footbridges (included by GHD)
- yard earthworks (excluded by GHD)

Note: Yard earthworks have subsequently been added by QCA to account for late changes in Network Access assets.

5.9 Signalling

Both GHD and Hatch have created database of field signalling assets using the same source information. A limited audit of several track sections indicate no significant discrepancies. The Hatch data has been categorised in greater detail in some areas. However GHD does not consider this would materially impact on quantities or valuation.

5.10 Train and Track Monitoring

Both GHD and Hatch have created databases for train and track monitoring. These databases have been compared and GHD has made some minor adjustments to its database to incorporate data it was unable to obtain from any other sources. As a result there is a good correlation of these assets.

5.11 Communications

Hatch has created a number of databases in the communications area. These include:

- SCADA

- Real Time Information Systems

These databases do no more than identify the presence or otherwise of systems and include no detail on which an estimate could be developed without a great deal of additional information. GHD has adopted a different approach to assessing the MEERA value for communications systems.

5.12 West Moreton

The database prepared by Hatch for QR did not include the West Moreton system.

6. Unit Values of Assets

6.1 Principles Adopted

GHD has adopted MEERA (Modern Engineering Equivalent Replacement Asset) principles in establishing unit rates ie. replacement value of the current design standards of the existing infrastructure using current best practices for construction. The modern equivalent engineering replacement asset in most cases is the same as the current asset as the majority of the lines are of relatively recent vintage.

The unit rates adopted have been based upon open market costs of undertaking the work and not QR's costs.

The unit rates adopted for the valuation are based upon an average replacement cost of each asset class using the most economic parcel of work. This economic parcel of work has been established to spread the overheads incurred in establishing work teams over a parcel of construction work that maximises the assets created without incurring excessive overhead cost that results from small parcels of work.

Average unit cost rates have been adopted for the replacement of assets applicable to the line section and hence may not be reflective of the replacement cost of any specific asset. The unit costs adopted include:

- The cost of materials (including estimated volume discounts);
- Allowance for material wastage;
- Costs of contract direct labour ;
- Estimate of profit and overhead recovery of a contractor;
- Costs of the principal for the engineering design, procurement and project management (EPCM) including supervision of the contractor and contract administration.

We have considered the implication of the unit replacement cost rates of the location of each of the rail corridors. With the exception of West Moreton the impact of the location has an immaterial impact on unit rates. The Central Queensland coal systems are all remote from the south east corner of the state but are within 300km of major regional centres such as Townsville, Mackay and Rockhampton. Historically there has been little, if any, discernible difference in tendered prices for comparable major railway construction tasks in the area of interest. They also involve significant transportation costs for materials sourced interstate or from the Brisbane area. We have therefore made no adjustments to unit rates for the location of the work except for West Moreton where a reduction in the rates has been included.

The basis of GHD's valuation is 1.1.2000.

6.2 Construction Strategy & Assumptions

For the purpose of this valuation a contracting strategy has been assumed as follows:

- The development of each of the coal systems does not occur concurrently.
- That each system is constructed in the most cost effective means possible.
- That such a large railway construction project will attract both local and international interest for all facets of the project.
- That proven, reliable and modern technologies and construction techniques are utilised for all facets of the project.
- That the lines are built without traffic and that duplicated line is built as duplicated line, i.e. there is no construction under traffic and no temporary works are necessary.
- That there are no scheduling issues or delays related to land acquisition, cultural clearance or as a result of environmental or other external factors.
- That construction takes place in a period of average weather conditions i.e. rainfall and wet day averages apply.
- That there are no other major competing railways or civil projects in Queensland which would cause a shortage of materials or construction resources which may impact adversely on time and cost.
- That earthworks contracts involve track lengths of between 50 and 70 km and that non railway infrastructure is similar to that currently existing.
- That specialist contractors would view the projects as sufficiently large that they would invest in specialist track laying, overhead wiring and other capital equipment similar to resources that may be presently owned by QR.
- That the construction of a number of 50-70 km long track sections concurrently does not impact on the cost or duration of each indiviudal project (this is a theoretical exercise and it is considered inappropriate to apply resource or other similar restrictions to such an exercise which would impact on time or cost).
- That design work and other preparatory work would be undertaken in advance and that the cost of such work is relatively immaterial in terms of the project cash flow.
- That any restrictions and regulations such as the Governments purchasing policy which may in any way hinder timely, cost effective implementation would not be applied if they led to higher project costs.

- That there are no major project delays as a result of latent conditions.
- That issues such as construction water are addressed well in advance of the start of construction.

For the purpose of establishing a theoretical construction program the following assumptions are considered reasonable:

- Corridor acquisition prior to project commencement
- That the land has been acquired and construction access is unrestricted.
- Long delivery or standard materials may be pre-ordered by the Principal and supplied as a free issue (or as a series of novated supply contracts).
- 50-70 km earthworks and civil structures contracts are completed in 15 months using a single camp and multiple workfronts and are completed on a staggered basis.
- Overhead mast foundations are constructed concurrently with earthworks.
- Track is laid at a rate of not less than 5 km/day and turnouts at the rate of at least 2 per day.
- Cabling for signalling and communications can occur concurrently with earthworks and other construction activities.
- Overhead mast and signal installation will occur concurrently with other activities.
- Overhead conductors will be strung at a rate of 5 km per day.

On the above basis construction of lines may be achieved in the following time frames.

Newlands	24 months
Goonyella	30 months
Blackwater	30 months
Moura	24 months

These project times are consistent with other private railway developments.

Project Cash Flow would normally follow an "S" curve with a greater proportion of the expenditure occurring in the latter part of the projects.

6.3 Contractor's Project On Costs

One of the significant costs of projects in central Queensland is the contractors establishment which includes a construction camp. Other establishment costs include the establishment of project offices, heavy and light plant, materials and personnel. Preliminaries also cover industrial relations costs, QA and environmental plans, project staffing and associated on costs including project vehicles. Camp standards have increased substantially over the past decade and are likely to be written into industrial agreements. For civil works the cost of camp establishment and operation have generally been allowed at a rate of 5% of the contract value. Other preliminary costs have been estimated at 7%. Overheads and profit have been allowed at 13% to give a total project on cost of 25%. These rates have been adjusted for other works to reflect lower site labour contents.

6.4 Owner's Project Initiation Costs

In the construction of a railway in today's environment there are material preliminary costs to be incurred by the Owner before commencement of design and construction. These costs would include:

- Environmental impact studies
- Preliminary route studies
- Preliminary design studies
- Mapping and survey
- Cultural surveys
- Native title issues

These preliminary costs can be substantial and take years to complete. The unit rates used in this valuation do not include most of these costs. Most relate to the tasks necessary to define the rail corridor and its acquisition ie acquisition of the land on which the railway is to be constructed. These costs are therefore directly associated with the property on which the railway is to be constructed are hence have been deemed not relevant to the valuation of Below Rail infrastructure.

6.5 Project Financing Costs

No assessment has been made of project financing costs at the request of the QCA. The data provided in Section 6.2 may be of value in making this assessment.

6.6 Unit Rates Narrow Gauge

6.6.1 Track

The following track components that have been separately valued:

- 60kg rail
- Factory butt welds

- Field thermit welds
- Transport, handling of all materials
- Concrete sleepers including fasteners
- Track laying using TLM
- Ballast and ballast tamping
- Turnouts

QR has special rolling stock designed for track laying and it has been assumed that similar equipment would be used by a contracting organisation undertaking a large project. Appropriate allowances have been made for:

- Loss of material
- Overhead and profit of a contractor
- Supervision by the purchaser
- Design and documentation.

Appendix B sets out a breakdown of the unit costs of track.

Turnouts have been valued on the basis they are all SNX with electro hydraulic actuation. Turnouts for coal line service have been valued as 1:16 with 1:25 for any mainline junctions eg North Coast Line junctions. Turnouts for sidings and balloon loops have been assumed to be 1:12 as train speeds are low. Turnout rates include bearers, motor, position detectors, assembly, laying, jointing and ballast. Appendix B sets out the unit rates for turnouts.

6.6.2 Earthworks

Rates for earthworks have been established based upon current tenders for earthworks for coal line construction in central Queensland. There were significant variations in tendered rates. This reflected different inclusions by contractors and specific factors related to each offer. The rates developed for the QCA valuation reflect our best estimate of rates likely to be offered in the theoretical construction of the coal railway system.

Strip

The rate for stripping includes removal of topsoil, stockpiling, respreading on completed batters and revegetation. The rate allows for maintenance during the defects period.

Cut to Fill

The rate for cut to fill includes excavation, transport of fill, placement and compaction including the supply of water which, in some areas, is in limited supply and has to be transported considerable distances or is metered.

Borrow to Fill

As per Cut to Fill but sourced other than from cuts.

Borrow to Fill "Top 600"

The QR design approach requires a very tightly specified material for the "top 600". This invariably requires the blending of a range of diverse materials some of which are typically unavailable locally. Crushing and screening is required in order to meet the specification. Significant transport costs are involved in procuring much of this material and in its distribution on contracts involving longer track lengths. These elements have been included in our unit rate.

Remove and Replace Unsuitable Material

An allowance of 5% of cut earthworks volumes has been made for removal and replacement of unsuitable material. The rate makes provision for re-vegetation of the spoil.

Rock

Rock is broadly defined as material that cannot be removed using a single tyne ripper. No information is available from QR records indicating the extent of rock in historical earthworks contracts and so an estimate has had to be made.

Rock has been assessed as representing 30% of all cut quantities. This is an average figure that has proved accurate for many central Queensland rail projects.

Access and Service Roads

An all weather 4WD service road is required for all electrified track where a public road cannot provide direct access. Access is also required to all signals huts, substations and significant communications structures. These service roads typically incorporate concrete invert floodways across all minor watercourses.

Track Car Take Offs

Provision for track car takeoff has been incorporated with one takeoff every 1.2km. Track car takeoffs are part of the existing infrastructure but are no longer essential where high rail vehicles are used. However, for the purpose of this evaluation track car takeoffs have been included.

Machine Pads

Provision has been included in the civil works for Machine pads at the rate of one for every 3 track car takeoffs.

The unit rates adopted for each of the earthworks rates above are set out in Appendix C.

6.6.3 Civil Structures

Civil Structures include bridges, culverts, crossings and fences

Bridges

The valuation of bridges is based on M250 concrete prestressed ballasted bridges constructed on concrete piers with typically bored pier foundations. The estimate assumes that bridge contracts will include at least 3 bridges in the same geographic area. The valuation of bridges includes the following elements:

- geotechnical investigations
- foundations
- piers and headstocks
- concrete stressed beams
- refuges
- EPCM costs

The bridge cost excludes all elements of track including ballast.

QR's rail bridges are currently designed for M250 loadings which permits trains with 26t axles and speeds of up to 100kph. Older coal line bridges were built to M160 and M220. All M160 bridges on the Blackwater and Goonyella line have been strengthened to M250.

Most bridges are located west of the divide and cross perennial streams. Bridges are usually constructed in the drier months and use land based foundation and lifting equipment. The rates adopted for most bridges reflect these construction conditions.

A small number of bridges cross permanent watercourses and require the use of barge mounted piling equipment and cranage. Bridge foundation and pier designs are more expensive and there is substantially lower workforce productivity. This adds substantially to the cost of the structure.

Bridges associated with railways crossing over public roads also incur cost penalties associated with re-routing traffic over diversion works, additional safety expenditure and some productivity losses.

The QR records available to GHD do not make it clear which bridges fall into the above classes. GHD has therefore generally assumed that bridges fall into the first category unless the description strongly indicates otherwise. Eg Bruce Highway or Bowen River in which case the additional costs of construction related to the situation have been included.

Footbridges

Only footbridges independent of railway stations have been included. The rationale adopted by GHD is that a passenger station implies other line uses and the need for the footbridge is solely as a result of these other uses. Hence the need for such an asset is not directly attributable to coal transport.

Other Overbridges

Various conveyors, pipes and other services may cross the line at various locations. All such crossings have been assumed to be non QR assets.

Culverts

The location, size, number of parallel culverts, type and estimated length of all culverts have been assessed from the Working Plan and Section drawings. The culverts consist of:

- Reinforced concrete pipes (RCP)
- Corrugated metal pipes (CMP)
- Reinforced box culverts (RCBC)

GHD has developed unit rates per metre for each culvert type and size found in the system and for associated head walls and rip rap.

Level Crossings

At grade over rail crossings are provided on minor roads and for property access. Crossings of major roads are grade separated. These crossings involve various standards of warning systems which are included in the signalling estimate. For liability risk reasons QR have recently sought to minimise the number of occupational crossings on new developments and if constructed today there would be many fewer points of access. For this valuation the number of crossings included in the valuation is 100% of the number of existing crossings valued on the replacement cost of a similar standard crossing.

Rates have been prepared for both public road crossings and occupational crossings.

Fencing

It has been assumed that all of the corridors are fenced with 4 strand barbed wire stock fencing.

Retaining walls

A unit rate per sq. m of retaining wall has been adopted. It is recognised that the costs of retaining walls increase proportionally with the height however the height of retaining walls is not available. GHD believes that the absence of this information will not materially affect the valuation as the coal corridor’s terrain will not result in many high retaining walls.

Drainage

The value of cess drains (longitudinal) has been included in the earthworks.

Buildings

Buildings specific to various specialist areas ie signalling, electrification etc are included in these sections of the valuation.

Appendix F sets out the unit rates adopted for the civil structures.

6.6.4 Signalling System

The signalling system valuation has been carried out in considerable detail using an elemental approach. Values have been developed for each track section and sub section for each significant element of the system. Rates include EPCM and contractors preliminaries components of the cost. The rates adopted vary slightly but typical rates are included in Appendix F.

6.6.5 Electric Traction Systems

The electric traction system rates have been established for each of the elements identified in the asset database. The system has been assumed to be constructed on a single track basis ie large overhead gantry structures have been excluded. This assumption is considered justifiable as such structures are associated with multiple sidings which are not part of the NAG assets on which this valuation has been conducted. Should such sidings become NAG assets QCA should make some adjustments for large structures.

The unit rates adopted differentiate between overhead construction in coastal and inland areas reflecting the different mast spacings required to meet different design wind loadings. The number of masts per kilometre have been assessed for each track section and each sub section based on the length of straight track and curved track in various curve radii bands.

Different rates have been established for various combinations of overhead catenary and conductor and 25kV feeder wires. Section Insulators, neutral sections and isolators have also been costed.

Rates have also been established for the major power supply elements such as sub stations, auto transformers and associated switchgear and buildings. Some rates have been revised following advice from QR re some elements which have been replaced with a different design.

The values used for the valuation of the electric traction system are included in Appendix E.

6.6.6 Communications System

Unit rates have been established for fibre optic cabling and fibre equipment, associated hardware and PABX equipment. These rates reflect commercial equipment used by telecommunications which is a large volume industry at the present time.

6.7 Unit Rates Standard Gauge

The basis for assessment of a Standard gauge valuation is that it covers only a change in gauge. Train speeds, loco kW, train consists, design axle loads, wagon capacities and dimensions and track construction tolerances would remain as per narrow gauge. If the advantage of a broader gauge is to be assessed then it would be necessary to reassess many design issues such as power supplies, feeder substation capacities and locations, passing loop lengths and locations which would involve some increases of costs in some areas and some decreases. This would be a complex exercise involving design activities in all areas.

6.7.1 Track

Unit rates for Standard gauge track vary only slightly from the narrow gauge rates. A slightly longer and more costly sleeper and a corresponding minor increase in ballast quantities are the major differences.

Turnouts are more expensive due to the increase in length required for the wider gauge and slightly longer bearers.

6.7.2 Earthworks

Unit rates for earthworks remain the same for both narrow and standard gauge.

Earthworks quantities would increase slightly. Typically formation widths are increased from 6m to 6.5 m. The increase in the width of cuttings and embankments is even less significant. For the purpose of this valuation we have assumed an increase in earthworks quantities for Standard Gauge of 4.0%.

6.7.3 Civil Structures

There would again be some minor cost differences in the Civil structures. These include:

- longer culverts
- slightly wider level crossings

The major impact will result from an increase in the length of culverts. As most large culvers are supplied in modular 1 200mm lengths there will be instances where another culvert section is required. For the purpose of this valuation an increase in the length of all culverts of 3.5% has been assumed.

Bridge costs have not been adjusted as the ballasted bridge design adopted is equally suitable for use with Standard gauge track.

6.7.4 Signalling Systems

No cost adjustments have been made for signalling of a standard gauge line.

6.7.5 Communications System

No cost adjustments have been made for communications of a standard gauge line.

6.7.6 Electric Traction System

There are no apparent increase in costs arising from electrification of a standard gauge line. There may be some minor marginally higher costs associated with each turnout due to it being slightly longer but any adjustment would be so small as to be immaterial.

6.8 GHD Draft Report on Unit Rates Feed Back

In order to minimise the potential for ongoing arguments concerning rates, QCA issued to interested parties a Draft Report on Unit Rates prepared by GHD. This document was issued in March 2000 and comments were received in May 2000.

The following responses are made to some of the issues raised.

6.8.1 Modern Engineering Equivalent Replacement Asset

Comments were made on the basis on which GHD had assessed MEERA rates particularly concerning the fact that no allowance was made for the additional costs associated with staged construction under traffic.

GHD's approach has been one of assessing the MEERA cost of replacing existing below rail infrastructure on the basis of all of the infrastructure being constructed as a single greenfield development rather than in a stage approach. The point raises many issues, not only the obvious ones of duplication but also tasks such as upgrading or replacing trackwork, bridges signalling and communications assets in an operating system.

Upgrades can be undertaken for many reasons such as improved above rail efficiency, increased axle loadings, increased speed ratings for track, obsolete technology replacement or increasing tonnage capacity of the line.

Records do not exist for all of the works that have been undertaken for each below rail asset to allow such a complex assessment to be made even if it were relevant to a MEERA valuation. In some instances these works may have been undertaken at the end of the economic life of the component.

For example replacement of a timber bridge or the upgrading of a concrete bridge to carry higher axle loadings.

6.8.2 Greenfields Construction

The question has been raised as to whether GHD's valuation should be based on a Greenfields or Brownfields basis. GHD's approach has been on a Greenfield basis because it can be readily defined and understood.

Much of the Central Queensland coal network has been developed along long established rail corridors eg Moura and Blackwater systems and the Newlands Line to Collinsville which all date back more than 50 years. When constructed these were effectively greenfield developments. Much of the lines are located in very rural areas with little or no infrastructure. Very little railway construction work on the lines valued has occurred in urban areas where there is the potential for much higher costs as a result of existing infrastructure. Hence the difference between and Greenfield and a Brownfield approach would not be expected to be vastly different.

6.8.3 *Interest During Construction*

GHD acknowledge that there is a cost of funding rail infrastructure projects and that in a commercial environment high interest charges are incurred prior to the start of rail operations and the generation of a positive project cash flow.

QCA have indicated to GHD that it will take account of interest costs in its calculations.

6.8.4 *Preliminary Costs*

The development of a railway line requires a substantial period of time for a wide variety of project preliminary activities including, route studies, preliminary design studies, environmental studies, cultural and nature title issues legal costs. GHD has adopted the view that most of these costs are directly attributable defining the rail corridor and its acquisition. As the scope of the valuation undertaken by GHD excludes land and it has been assumed these costs will be reflected in valuations by others.

6.8.5 *Calibration of Costs*

The claim has been made that QR is in possession of rates for all elements of rail construction project by virtue of its regular calling of tenders in the market. GHD would not deny QR should have very good information pertaining to construction costs for all railway infrastructure.

However, GHD also has substantial historic data for many project elements having undertaken considerable project work for QR over the past 20 years including project management services on the electrification of the central Queensland coal lines, various spur lines including Ensham, the Northern Bowen rail link, Curragh, Laleham etc.

The GHD project team has also included ex QR personnel with a very good knowledge of QR costs, particularly for signalling. QR has engaged these personnel for similar tasks in recent times and accepted project cost estimates using their rates.

6.8.6 *Level Crossings*

GHD had proposed to incorporate only 50% of occupational crossing in the MEERA valuation but to adopt a higher valuation for each crossing. The intent was to reflect current QR practices of eliminating crossings wherever possible and increasing the sighting distances where new crossings are to be located. This was aimed at providing a consistent MEERA approach.

As a result of various arguments put forward, GHD revised its approach and has included all existing crossings at a valuation rate appropriate to their current standard of construction.

A comment has also been made that costs for level crossings adopted by GHD is high. GHD assessed the cost of occupational and public crossing with an appropriately experienced contractor in order to develop the cost of crossings. In addition to the actual crossing cost it was necessary to make provision for minor drainage and associated works which have not been included elsewhere. The rate reflects these provisions.

6.8.7 MEERA Valuation Principles

GHD has applied consistent MEERA Principles to the valuation with relatively long asset lives assigned. Operating and Maintenance costs are the subject of other reports on which the QCA will establish its decisions.

6.8.8 Trackwork Costs

The suggestion was made that lines with a design life of < 20 years and with < 600 MGT should be constructed with lower track standards. It was suggested up to 500 km of track might be constructed with timber sleepers and 50 kg rail.

To GHD's knowledge all of the rail infrastructure including mine spur lines have or will be in service for more than 20 years. To our knowledge no heavy haul coal line has become redundant to date and there is no indication that any mine will close within the foreseeable future. A number of mines have moved from open cut mining techniques to underground longwall operations and continue to produce and export coal. On this basis GHD considers that the standards it has adopted for the valuation are appropriate.

6.8.9 Turnout Costs

It has been suggested lower standards of turnouts could have been adopted on feeder lines. GHD has adopted the turnout angles identified on the NAG drawings as installed data. The turnout angles presently installed in the system reflect a reasonably consistent standard for turnouts which GHD considers appropriate.

6.8.10 Earthworks Costs

The use of "top 600" as the capping material for all trackwork has been questioned. GHD has determined quantities of top 600 material on the basis of 600 mm in fill and 300 mm in cut. This approach maximises the use of local material and minimises the quality of material that is classified and unsuitable for construction of all embankments. GHD is satisfied that this is in general a cost effective solution. There is no information available to GHD from QR records or any other known source on which to base any other assessment.

6.8.11 Machine & Track Car Takeoffs

It is suggested neither of the above are required for a MEERA railway. The GHD valuation has included provision for both. Machine pads are still used for track maintenance because much of the network is relatively remote and there are substantial distances between stations. Track car take offs exist throughout the existing system but are not used regularly, particularly close to the ports where volumes are highest. However GHD has retained the takeoffs in its MEERA estimates.

6.8.12 Access Roads

It has been suggested an access road running parallel to the track is unnecessary for the MEERA valuation. Access roads were introduced by QR at the time of electrification and have been an ongoing requirement. GHD's assessment of construction vs maintenance costs of rail infrastructure with a life in excess of 30 years suggests that such access roads are cost effective for electrified track but is not justified for non electrified track. The extent of the network that runs close and parallel to public roads is believed to be minimal although no basis for measuring this could be readily established and field inspections were excluded form the scope of GHD's work. In general such roads involve dressing up and capping of tracks built and used throughout construction and the costs included in the estimate reflects this.

6.8.13 Footbridges

It has been suggested footbridges should not be included in the MEERA valuation. GHD has only included footbridges where they are not associated with stations (assumed to be part of public access to stations). There are very few such bridges in the valuation.

6.8.14 Bridge Costs

It has been suggested double track bridges should be substantially lower in cost than single track. Current MEERA bridge designs involve rail beams supported on headstocks and piers. There is potential to adopt much heavier headstocks with fewer piers and not locate piers directly under the rail beams. However, the potential for savings is considered small and hence GHD has generally adopted single track bridges as the basis for the valuation.

6.8.15 Electric Traction System

It has been suggested that the track alignment and grades could be made straighter and steeper for an electrified line with a commensurate reduction in track length. GHD agrees that the alignment of new electrified track might be marginally shorter than the existing alignment. However, the basis of GHD's valuation has been on the existing track alignments. The time and cost of determining where minor track shortening could be achieved in each track section would be prohibitive and potentially require complete realignments of some sections to be examined. Design work would need to be undertaken to determine the new alignments and there is insufficient survey data available from any sources to do this.

6.8.16 Signalling System Costs

It has been suggested that signalling costs in Australia and overseas have become more competitive and that technology has reduced component types and spares, that testing and commissioning is less costly and that design for large greenfield projects can achieve substantial economies.

A suggestion was made that it may be possible to abandon line side signalling in favour of cab technology combined with radio links and GPS.

GHD has reviewed the rates adopted for all signalling components and some minor adjustments have been made. The use of alternative technologies as the basis for this MEERA valuation has been considered and in this case rejected. The technology adopted for valuation is modern line side signalling. GHD makes the observation that field construction costs in Central Queensland are higher than for other states with higher population as many of the lines being valued are in relatively remote areas where there is little to no accommodation, no mobile phone coverage or other infrastructure as might be anticipated in the Hunter Valley or Victoria. Construction camps are still required on all major projects in the areas of interest.

6.8.17 Communication Systems Costs

The comment has been made that communications infrastructure is shared between above rail and below rail and therefore the valuation should reflect this. GHD has attempted to provide a valuation of the infrastructure and believe QCA will make an assessment of the extent to which such costs might be discounted given their multiple uses.

6.8.18 Other Traffic

The comment is made that some track sections included in the coal network are used extensively for other traffic. Sections of the main northern line form part of the Newlands, Goonyella and Blackwater and Moura Systems. Similarly other traffic uses most of the coal network with the exception of the spur lines and loops at the various mines.

GHD concurs but this is a matter for QCA to considered in its assessment.

6.8.19 Track Gauge

It has been suggested that for a MEERA valuation, standard gauge track should have been assumed. GHD has provided in this report a standard gauge valuation. However this is based on similar axle loadings to the existing track. It is possible that an optimal MEERA valuation might be broad gauge with 35 t axle loadings. There would be major implications to train lengths and hence passing loop and lengths, traction power requirements, location and size of substations etc. It could even involve reverting to diesel rather than an electrified system. Such an evaluation would be an enormous and contentious undertaking and beyond the scope of GHD's engagement by QCA.

6.8.20 Average Rates

It has been suggested average rates should not have been used for many of the valuations but a range or rates or multiple rates should be established and applied according to particular characteristics of each track section.

GHD's scope was to prepare a valuation based on QR asset databases and other available documentation. In general this was not adequate or did not contain the necessary data to establish with any accuracy characteristics where various rates might be applied. It was therefore deemed appropriate to develop and apply average rates to all similar assets in each system.

6.8.21 Multiple Counting

It has been suggested there is a possibility of double counting of various assets or works. GHD has reviewed the scope of supply and installation of all works and work interfaces and is satisfied that there has not been double counting.

6.8.22 Yards

The exclusion of yards form the valuation was questioned. The scope of GHD's valuation was defined by those assets that had been classified as belonging to Network Access irrespective of whether they provided a workable track system or not. GHD's report make comment on this issue. Subsequent to GHD's valuation a number of yards have been added to Network Access assets. QCA is understood to have extended GHD's valuation to include these new assets.

6.8.23 Overhead Structure Spacings

The average spacing for overhead structure adopted by GHD has been questioned as being low. GHD sought to establish an estimate of the number of overhead support structures in each track section. This data was not readily available from QR and is not included in the recently developed asset database developed by Hatch for QR. GHD had assumed that mast spacings were all at the design maximum. In light of the comments GHD has included for a 10% increase in the number of masts by weighting the mast costs by 10%.

GHD's scope was to value the assets based on QR's asset register. Neither the old or new QR asset registers contain any data to allow assessment of the quantity of overhead structure installed. If a more accurate assessment is required it will be necessary to access the individual drawings for the whole of each line which are filed individually with the detailed design calculations for each subsection or conduct a field audit. There is no consolidated set of drawings containing this information. GHD considers the approach it has taken is appropriate given the scope and availability of data.

6.8.24 Mast and Conductor Costs

Some comments were received re mast and conductor costs.

The costs of masts and other overhead works including installation has been reviewed since the issue of the Rates report and in the light of comments received. A number of rates have been revised accordingly.

6.8.25 Power Supply

Various rates adopted by GHD and included in the Rates report have been revised in the light of further information from QR including changes to the design specifications of some components.

6.8.26 *Signalling Equipment*

Various comments have been made suggesting some of the rates used by GHD are low. GHD has reviewed the rates and made some minor adjustments. In response to specific comments GHD points out that points motors are included in the cost of turnouts. Cabling rates have been revised upwards as a result of a small increase in installation costs based on advice from installation contractors.

All rates used are consistent with rates QR has utilised and accepted in recent years from consultants provided project signalling estimates on their behalf.

6.8.27 *Communications Equipment*

Comments have been made re the lack of unit rates for a diverse range of various communication assets. QR's asset register on which GHD was to base its valuation provides insufficient detail on which to determine an asset list on which to apply valuations. The more recent Hatch database refers to complete communications systems as single line entries. The gross value of these assets is relatively modest in terms of the total asset value and GHD has adopted a simplistic valuation approach given the lack of data.

It is understood QR has provided to QCA a more detailed valuation it has developed internally on its current communications systems for each of the coal systems and QCA will consider both this information and that provided by GHD in determining its assessment of asset values.

6.9 Review of GHD Valuations by QR

QCA sought to identify any major discrepancies between the valuation prepared by GHD and ones prepared by specialist QR branches with a view to resolving any major conflicting areas. The QR valuation totals were provided to GHD and substantial GHD data was provided to QR.

The methods of evaluation differed between QR and GHD in some cases very significantly and so direct comparison was not possible. Hence in most cases only valuation totals for major elements of each system were compared.

The following results:

Trackwork

QR did not seek to disagree with GHD's valuation of trackwork.

Earthwork

QR did not seek to disagree with GHD's valuation of earthworks.

Civil Structures

QR did not seek to disagree with GHD's valuation of civil structures.

Electrification

Discussion between GHD and QR indicated QR had made changes to the design in some of its major substation components and GHD costings included some items that are no longer QR assets.

As a consequence some of the rates included in GHD's Draft Rates report have been adjusted.

The comparison of the two electrified systems revealed GHD's estimates for power supply were generally higher than QRs but QR had higher overhead costings. The total costs for electrification on the Goonyella system compared favourably. However GHD's estimates for the Blackwater system were substantially lower than QR's and resolution of the difference could not be reached.

Signalling

A number of discussions between GHD and QR took place on signalling valuations for all lines.

As a result a small number were adjusted by GHD most notably cabling. There was reasonable correlation between the totals for the various lines, in all cases GHD valuations being lower than QR's.

However, there was again a large valuation discrepancy between GHD and QR on the signalling costs on the Blackwater line which could not be resolved.

Communications

QR provided GHD with a detailed valuation of its various communications systems. GHD had adopted a very simple approach to a MEERA communications system due to the relatively low value of these assets and the complexity of establishing an asset database of all the system components. GHD based its valuation on fibre based communication networks.

GHD's valuation for communication assets compared favourably with QR's.

7. Asset Lives

7.1 Introduction

Asset lives are used for two key accounting functions:

1. Assessing the written down value of assets by establishing the quantum of the asset that has been consumed at a point of time.
2. Assessing the depreciation charge to be expensed over a financial reporting period. (Depreciation expense means an expense recognised systematically for the purpose of allocating the depreciable amount of a depreciable asset over its useful life[1].)

Assessing the lives of infrastructure assets such as rail corridors is more complex than for assets such as buildings, plant and equipment etc. Infrastructure is characterised as long-lived assets that experience periodic refurbishment that extends their lives. In consequence infrastructure assets have no defined lifespan. What gives infrastructure assets their longevity is that they are composite, or systems of assets. They comprise a number of components and sub components that are highly interdependent, all of which would be deemed integral to the provision of the economic benefit but each of which can be individually replaced to enable the life of the asset to continue.

7.2 Factors Influencing the Lives of Coal Rail Infrastructure

Various studies have been undertaken by numerous organisations into the future of the Queensland export coal industry, with particular regard to global warming and the Kyoto agreement. The extent of commercial resources of coal in Queensland is sufficient to maintain current or even higher export tonnages for at least 50 years and potentially much longer. Unfortunately there is not a consistent view on the subject of coal as an environmentally sustainable energy source. Because of the conflicting information relating to the life of the mines we have assumed that the demand for the infrastructure will continue over a period greater than either the technological or economic life of the asset.

It is important in assessing the lives of the assets in the future that this matter be resolved.

1. Technological life

Technological life could be based on the entire network e.g. the development of an economic alternative method of transportation of coal to the port, or alternatively, the technological life of a component e.g. the adoption of a satellite signalling and train control system.

[1] Extracted from ICAA Members' Handbook December 1999 issue, AAS 4.

There is no alternative method of transportation of coal currently being considered at this time.

The fundamental technology of rail track infrastructure has changed little since the inception of railways, (the technology of construction has changed as have some of the materials). The only significant technology change taking place relates to signalling and communications systems. Since these represent only a relatively small proportion of the value of the infrastructure being valued the impact of technology changes on the asset replacement values will be small. We have taken account of current technology changes in our assessment of asset lives.

The economic life of the asset (i.e. its life to replacement)

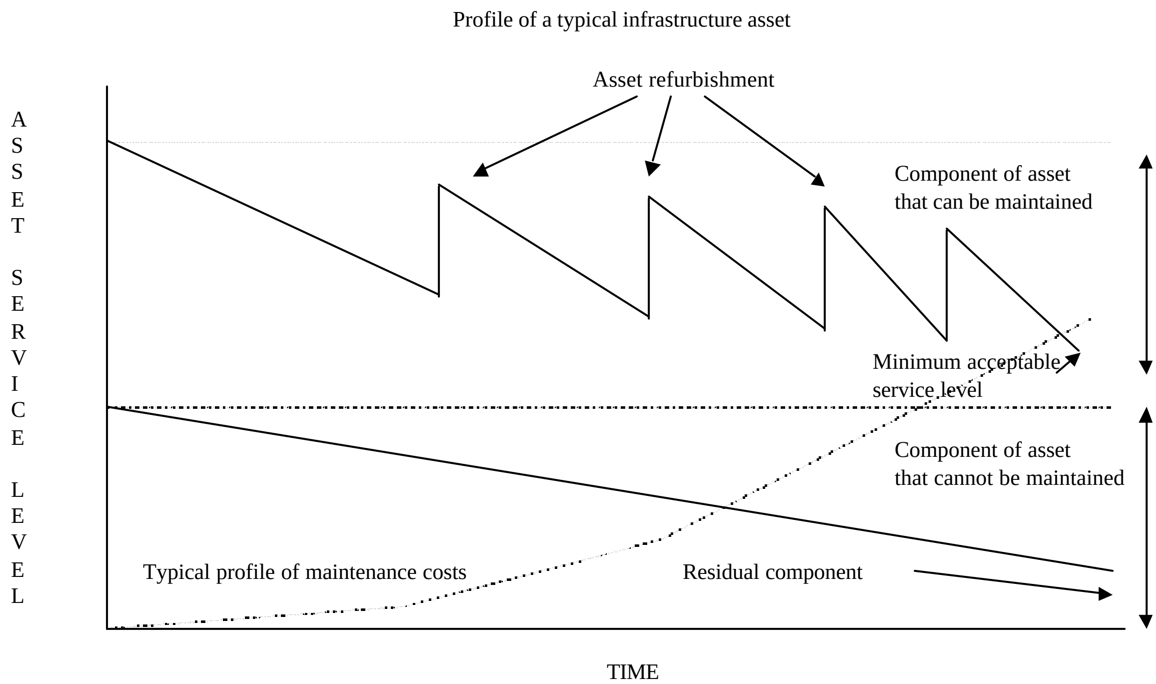
The economic life of an asset before it is replaced is materially influenced by corporate policies relating to its ongoing maintenance e.g. an organisation may adopt a policy of minimising maintenance and be prepared to replace it when it can no longer provide service, whereas an alternative would be to undertake extensive maintenance to extend the economic life of the asset. QR adopts a policy of continuing maintenance to maximise the lives of assets.

Measuring the cost of asset usage

The accounting policies adopted for the refurbishment/rehabilitation expenditure on infrastructure may have a material impact on the cost of asset usage as expensed in the operating statement of an entity. If refurbishment/rehabilitation expenditure is expensed, then to provide an appropriate measure of the costs of asset usage, the asset life should be set to a longer period than if these costs are capitalised.

7.3 Profile of Infrastructure Asset Values

Infrastructure assets are characterised by periodic refurbishment that partially replenishes the life of the asset. In the case of railway infrastructure re railing, re sleepering, ballast cleaning are examples of refurbishment activities. The generic profile of the service level (and hence by implication the value) of infrastructure assets over time can be shown as follows:



7.4 Condition or Usage Based Depreciation

Whilst asset lives have been the prime source of asset depreciation an alternative approach for infrastructure assets is to adopt a condition based methodology. This methodology assesses depreciation based on a change in the condition of assets. This change over a period may either reduce or increase the value of the asset. The costs of work to change the asset's condition under this methodology are all expensed. It should be noted that the Urgent Issues Group of the Institute of Chartered Accountants has recently issued a paper on the compliance of condition based depreciation to the Accounting Standards.

Asset lives that are used for the calculation of depreciation are mostly commonly expressed in time periods. The Australian Accounting Standards require that "the *depreciable amount* of a *depreciable asset* must be allocated on a systematic basis over its *useful life.* The depreciation method applied to an *asset* must reflect the pattern in which the asset's future economic benefits are consumed or lost by the *entity*.[2]" Appropriate usage based depreciation would therefore comply with the AAS4. (Australian Accounting Standard 4) In the case of rail corridors tonnage of traffic has a material influence on the depreciation of the track (rail, sleepers, fasteners, ballast) whereas other infrastructure depreciates primarily on time.

If usage based depreciation is to be considered it will require a technical understanding of the impact of load on the asset and also a management system within the organisation that provides the measure of the factors influencing the depreciation. Both of these factors are beyond the scope of this study.

7.5 QR's Current Lives of Assets and Financial Accounting Policies

QR is currently undertaking a review of the asset lives. We understand that this review is considering:

- The economic lives of mines
- The physical lives of the component assets
- The technological life of assets
- The unitisation of asset components

QCA provided a list of the asset lives adopted by QR for the depreciation of infrastructure.

QR provided extracts from the Investment and Accounting Manuals. The instructions in these manuals require that expenditure be accounted for in accordance with Finance Administration and Audit Act 1977, Public Finance Standards and Australian Accounting Standards. QR's manuals define a fixed asset as:

> "items of property, plant and equipment and infrastructure which can be independently perform the functions for which they were acquired and have:
>
> 1. A useful life of greater than 1 year
> 2. An acquisition cost or valuation of greater than $500."

The policies and procedures included in the manuals are of a typical generic nature and little guidance is given as to the accounting treatment of a number of rail specific infrastructure activities that could be classified as either operating or capital expenditure that will have a significant impact on the life of an asset component. QR has advised us as of the following accounting treatment for the key activities relating to rail infrastructure:

- Ballast cleaning.

[2] Extracted from ICAA Members' Handbook December 1999 issue, AAS 4.

This process cleans the dirt from the ballast and replaces lost ballast and therefore prolongs the ballast's life. QR expense the cost of ballast cleaning.

- Periodic rail and sleeper replacement programs.

  QR advises that programmed replacement may be capitalised depending upon the extent of the work else these costs are expensed.

- Refurbishment of signalling and communications equipment.

  QR advises that these costs are expensed.

- Identification of quantum of components to retire on replacement.

  QR advises that an estimate of assets replaced is made and an appropriate adjustment made in the ledger.

- Track geometry corrections.

  QR advises that these costs are expensed.

- Bridge beam replacements.

  These costs may either be capitalised or expensed.

- Component replacement for communication and signalling.

  These are generally expensed although upgrading of signalling and interlocking may be capitalised.

- Rail grinding.

  These costs are expensed.

The majority of the expenditure is expensed however there are some minor areas where expenditure was incurred to ensure the asset reaches its maximum economic life is capitalised. Since the extent of this is minor this has not influenced the proposed lives of assets.

We understand that QR's corporate policy is to continue to maintain its assets until it becomes uneconomic to do so i.e. maximise the economic life. The accounting policies reflect that only expenditure of a nature that enhances the service capacity or extends the useful life of assets is capitalised.

These policies have been taken into account when recommending asset lives.

7.6 Proposed Asset Lives

GHD has proposed asset lives based upon a technical assessment of the assets based upon the following premise:

- QR maintains its policies of continued maintenance of assets to maximise their useful lives.

- QR maintains the policy of the capitalisation of expenditure where either the service capacity or design life of the asset is increased.
- The demand for the service capacity of the assets will continue for a period greater than the technical life of the asset.

QCA in their terms of reference requested an assessment of lives. Whilst it is technically possible to assign a technical life to each asset, from a financial perspective is not a practical process and we have therefore assigned lives to broad groups of asset. Our recommended asset lives are as follows:

Asset Group	Proposed Life	Basis of Assessment	Notes
Earthworks	100	Design criteria	Includes top 600mm
Track			The composite life of the standard design track for the 60 kg coal lines is approx 40 years.
Rail	10-50	These lives reflect the differing 10 - 50 yrs taking into account the differing lives, based upon usage of straights and curves. It assumes that regular maintenance is carried out.	Consideration should be given to a usage based depreciation with an upper age limit.
Sleepers & fasteners	50	Concrete sleepers have not been used long enough to confirm whether the design life will be achieved.	The fasteners are an integral part of the sleeper.
Ballast	50	Design criteria.	Assumes that ballast cleaning will continue to refurbish the ballast.
Turnouts & crossings	20	Design criteria.	
Civil Structures			
Bridges (non timber)	100	Design Criteria	
Bridges (timber)	50	Recognises the shorter life of the timber bridge and the typical life assigned by other similar organisations.	Rail bridges on the coal corridors are all concrete. Only some of the footbridges are timber.
Buildings	20	Design life of the specific structures included in the coal corridors.	The short life reflects that the building structures relating to the coal infrastructure are primarily small equipment huts of a demountable style.
Culverts, pipes & openings	100	Design Criteria	

Asset Group	Proposed Life	Basis of Assessment	Notes
Drainage	50	Design Criteria	Cess drains are included as part of the "top 600mm of earthworks.
Fencing	15	Practical Life	
Access roads	50	Practical Life	
Retaining walls	100	Design Criteria	Retaining walls should have the same life as the earthworks they retain.
Signalling			
Interlocking	10	Technological Life	
Signals	30	Technological and Practical Life	
Level crossings	30	Practical Life	
Track side detection equipment	30	Technological and Practical Life	
Signalling huts	30	Design Life Compatible with Signalling Technology	
Cabling & pole routes	35	Based upon the "Policy Guidelines for Valuation of Network Assets of Electricity Network Business - NSW Treasury Technical Paper 1995".	
Communication systems			
Cables	30	Based upon the "Policy Guidelines for Valuation of Network Assets of Electricity Network Business - NSW Treasury Technical Paper 1995".	
Power distribution	50	Based upon the "Policy Guidelines for Valuation of Network Assets of Electricity Network Business - NSW Treasury Technical Paper 1995".	

Asset Group	Proposed Life	Basis of Assessment	Notes
Electric Traction			
Contact & catenary wire	25	Design critera.	
25kV Conductors	50	Based upon the "Policy Guidelines for Valuation of Network Assets of Electricity Network Business - NSW Treasury Technical Paper 1995".	
Masts & Foundations	50	Based upon the "Policy Guidelines for Valuation of Network Assets of Electricity Network Business - NSW Treasury Technical Paper 1995".	
Traction substations & sectioning huts	40	Based upon the "Policy Guidelines for Valuation of Network Assets of Electricity Network Business - NSW Treasury Technical Paper 1995".	

7.7 Benchmarking of Asset Lives

GHD has compared the asset lives adopted by other public and private sector rail owners.

In making comparisons to the private sector it should be recognised that taxation implications may have a significant impact on the depreciation rates adopted.

Differing organisations have adopted different approaches to the basis of depreciation. Some have a single composite rate of depreciation that is applied to all or groups of assets whereas others have identified individual components of the infrastructure and allocated economic lives to each component.

A comparison of the useful lives of the key assets is as follows:

Queensland Rail
Benchmarking of Asset Lives for Material Asset Components

Assumptions

Infrastructure will be maintained to maximise its useful
The demand for the service potential of the assets will exceed the asset's
All expenditure incurred that does not change the service potential or extend the lives as nominated below is expensed when

Assets Category	**GHD Proposed Life Years**	**QR (1998/99) Life in Years**	**SRA Life in Years**	**Westrail Life in Years**	**Bayside Life in Years**	**ATO (Prime Cost) Life in Years**
Asset sub category						
Track						
Rail (all weights)	30	50 yrs for all railway track	20	40	50 years for all track sidings and crossings.	Permanent way given a 7.7 year life (13% prime cost.
Sleepers Concrete	50		50	40		
Fastners	50		40	40		
Ballast	50		10	40		
Turnouts	20	20	25			
Crossings	20		20	40		
Earthworks						
Earthworks	100	99	250	40	50	
Top 600 mm	100		75	40	50	
Civil Structures						
Buildings (brick & Stone)	50		78	50		
Foot bridges - timber	50	50	60	30	60	
Foot bridges - concrete	100	100	120	75	60	
Foot bridges - steel	100	100	60	50	60	
Underbridges -Concrete, brick	100	100	120	75	60	
Underbridges -Steel, wrought	100	100	60	50	60	
Underbridges -timber	50	50	45	30	60	
Culverts and pipes	100	100	150	75 Concrete	60	
Drainage	50	50	75			
Fencing	15	20	30	30		
Access Roads	50					
Retaining Walls	10	100	100		60	
Signalling Systems						
Interlocking	10	10		40		
Signals	30	30	30	40	40	
Level crossings	30	30	15	40	40	
Track side detection	30		15	15		
Signal location huts	30		30	40	20 Supervisory & Control	
Cabling and Route	35	20	30	20		
Communication systems						
Cables	30		30			
Power distribution (batteries, rectifiers, converters, inverters etc).	50		10	25		
Voice communications	10		7	Various 8 to 40		
Other equipment	10		10-25	Various 8 to 40		
Electric train systems						
Wires	50	50	60	40	30	
Masts	50	50	80	40	15	
Traction substations and sectioning	40	20	40	40	50	

8. Asset Values

8.1 Principles of Valuation – Replacement Costs

The current replacement costs of assets commensurate with current day practices has been calculated adopting the following:

- Identification of assets as set out in Sections 2 and 3.
- The unit rates as set out in Section 6.

A summary of the valuations for narrow gauge track for each line section for each coal system by each broad asset category is provided in Appendix H of this report. A summary for Standard gauge replacement costs is provided in Appendix I.

Detailed supporting data for each data entry in the cost elements in Appendix H is contained in Appendix J.

A condensed summary of this data is contained in Table 8.1 below.

The gross replacement value of the Central Queensland coal line below rail assets has been assessed to be $2,501,808 M.

The average cost per track kilometre for each of the lines are as follows.

Blackwater	$1,452,000
Goonyella	$1,335,000
Moura	$996,000
Newlands	$1,047,000

The accuracy of these estimates is dependent on a large number of variables, in particular the accuracy of the assumptions made in measuring quantities and the derivation of rates for valuation. It is therefore very difficult to determine the likely accuracy in an analytical manner. Based on our current knowledge we would believe the accuracy of the total valuation to be within ± 5% and individual line sections within ± 7.5%.

Table 8.1
Summary of Current MEERA Replacement Values by Line Sections

$ '000

COAL SYSTEM	Total Value $ '000	Track	Earthworks	Civil Structures	Electrification	Signalling	Communications
Blackwater	1,009,895	353,970	164,498	182,777	198,306	95,644	14,700
Goonyella	1,035,505	372,703	179,418	138,264	244,969	81,049	19,102
Moura	243,408	101,028	71,822	42,757	3,139	20,615	4,046
Newlands	213,000	95,248	40,963	58,684	-	13,351	4,754
Total	**2,501,808**	**922,949**	**456,701**	**422,482**	**446,414**	**210,659**	**42,602**

Note. The above table contains minor discrepancies caused by rounding.

8.2 Principles of Valuation – Written Down Replacement Costs

There are three factors that impact the written down value of the assets namely:

1. Age of asset.

   The terms of reference requested an age profile of the assets in each sub category. This requirement was based on the premis that QR's fixed assets register would be used as a basis for the valuation. As noted in Sections 2 and 3 GHD has used primarily plans and other data as the source for the asset information. We believe that, until the asset register is updated based upon the asset audit currently being undertaken, the use of these sources of data provides more accurate data on which to value the assets. Accordingly we have had to adopt a different technique than that foreshadowed in the terms of reference to identify an appropriate age profile and associated written down value of each subgroup of assets.

For each line section there are three key dates that can be applied to the assets namely:

- Construction date

  This is the date that the line was originally constructed. For lines that have not been rebuilt this date has been used as the base date of installation.

- Rebuild date

  In a number of cases the line has been rebuilt after its original build. In these cases earthworks have been identified as being the date of construction and all other assets (except overhead wiring) the re build date has been used as a base date.

- Electrification date

  This date has been used as a base date for all overhead wiring.

The age of all assets have been determined from QR asset register which is known to be incomplete and contains errors. In many cases it has been necessary to assume an age or an average age as data is not available for all assets of a particular type.

The dates adopted for the construction have all been based upon these base dates.

8.3 Track, Civils, Buildings, Earthworks and Electrification

For all but the West Moreton corridor and the small sections of the mainline used by coal traffic, the infrastructure has been built or reconstructed specifically for coal traffic and the date of construction for the major sections of each corridor is known. Most of the coal rail infrastructure corridors have been constructed within the last 30 years and as such the majority of these types of assets will be the originally constructed assets.

The material exception to this is for the rail component of track where some re railing has taken place. Other assets may have been added to the systems subsequent to construction. We believe that these assets will represent a small percentage of the total and hence should not have a material impact on the asset values.

The replacement of assets such as rail has been established from the QR asset register.

For other assets in this group the assets register was reviewed for each class of asset and, based upon the date of capitalisation, any asset changes/replacements of a material value were identified.

Track lengths in individual line sections have been listed separately where relaying has taken place with the date of relaying used to determine the current asset value.

The categories of assets where the service potential of the existing asset differs from the MEERA asset and the adjustments made to reflect this are as follows:

- Track

  All track has been assumed to be 60 kg even where it is known to be otherwise. The difference is the value of track laid with 60 kg as opposed to 53 kg rail is <$12/m.

- Bridges

  All rail bridges in the coal network are concrete. Whilst they may be of a differing design, the MEERA asset lives will be the same as the MEERA asset.

  Some of the existing footbridges have been identified as timber. These have been given a useful life of a timber bridge (ie 50 years).

- Other civils, buildings and electrification

  There are no material differences in the service potential of the MEERA asset as compared to the existing asset.

8.4 Signalling and Communications

The same principles as above were applied to the signalling and communication assets however the complexity of undertaking the work was far greater due to:

- Technology changes and the economic life of the assets will mean that a greater percentage of the assets will have been changed.
- The description in the asset register will make it more difficult to identify changes.
- This group of assets is subject to component changes that can, in some cases, change the entire nature of the asset e.g. whilst the asset casing remains the same

the components may be today's technology. The cost of these changes is generally expensed and hence identification of such changes is difficult and the written down value can only be based upon the data provided.

As noted above GHD's valuation has been based upon the plans (signalling) and to link the identified component back to the register is difficult. We have therefore assessed the age profile of assets as follows:

- The date of installation for the signalling and communication assets has been assumed to be the date of construction of the line section with the exception that, where the technology of the asset valued did not exist as at that date, then GHD has applied a date based upon either our knowledge of the network or our knowledge of the date of use of the technology.

- For assets constructed after the date of construction GHD has relied on QR's asset register for the date of construction/replacement. In most cases an average has been adopted as it has not been possible to identify the age of all individual assets.

  e.g.

  If the asset register identifies an upgrade to a track circuit then if that upgrade represents 5% of the value of the asset then it is unlikely to impact its age profile, if however it represents 75% of the asset's replacement value then it is likely to have a material impact on its age profile.

The service potential of the MEERA asset does not differ from the existing asset hence no adjustment is necessary.

8.5 Assets with Expired Lives

Implementing the principles outlined above may result in an existing asset having an expired life. This could result from:

- The asset lasting longer than the standard economic life.
- The asset being refurbished or replaced without the cost being separately recognised in the financial asset register.
- The date of installation being erroneous.

GHD would propose that assets falling into this category be assigned a remaining life of 5 years or 15% of the asset life, whichever is the lower value. eg. Fences.

Appendix A

Coal Line Diagrams

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Appendix A Diagrams not included

Appendix B

Unit Replacement Costs - Track

1. Principles

Unit replacement costs have been estimated for each of the following components of track.

- ballast,
- sleepers,
- rails,
- elastic rail fasteners,
- rail welding,
- turnouts.

The rate includes handling, transportation, laying, tamping, design and construction supervision. The estimate has been prepared on the basis of rates that would be anticipated to be tendered to a large rail company/corporation which has ongoing bulk supply contracts for all track materials.

The rates have been based on construction techniques that are appropriate to construction of substantial track lengths in a greenfield situation with rail access for the delivery of the various construction materials. The rates may differ materially from current rates as the greenfield approach ignores the costs of maintaining traffic.

2. Track Standard

QR's Standards for track design have been assumed. This includes ballast profile, construction tolerances and welding standards.

3. Rail

The following assumptions have been made:

- The unit rate includes delivery to a central fusion butt weld fabrication facility located at Gladstone and Mackay most probably by sea.
- There is rail access to the facility.
- The facility is capable of off loading and storing quantities of rail, including storage of welded lengths.
- A special unit train capable of delivering 360m welded rail lengths to the site.

The unit costs of 60kg hot rolled section rail from steel mills under a large, regular delivery, long term take or pay contract could not be ascertained from commercial sources. It is known that the cost of rail in one off supply contracts is approx AU$1,100/tonne. It has been assumed that the contract price for rail under a contract such as QR may enter into is likely to be around $900/tonne delivered to Gladstone or Mackay by sea ie a discount of 22%. Industry sources indicate BHP hot rolled products are marketed in Asia to Australian owned fabrication facilities for

$600/tonne. It is likely high quality imported rail could be purchased from other major steel mills for approx. $900/tonne.

4. Concrete Sleepers

Prestressed concrete sleepers are typically contracted for in substantial quantities on an as needs basis. In the past sleeper supply to QR has been tendered by companies who have established manufacturing facilities or companies prepared to establish new facilities for the contract. The latter appear to have been successful on a number of occasions in the past. Hence, we have assumed that sleepers will be manufactured in a major regional coastal centre such as Townsville, Mackay, Rockhampton, Gladstone or Brisbane and that transport costs will determine the most appropriate manufacturing location.

The unit cost of each sleeper includes a pair of elastic rail spikes and rail pads. GHD has estimated the cost of sleeper supply to be $65 each with 1,500 sleepers required per track km. Concrete sleepers are assumed to have a mass of 300kg each.

5. Ballast

QR has established rail ballast quarries at a number of sites in central Queensland and has supplied ballast to rail laying contractors. For the purpose of this valuation we have assumed these quarries will be the sources of the required ballast.

For the purpose of this valuation we have estimated the cost of ballast to be $12 per cubic metre and that 1 500 cu.m. are required per track km. The bulk density of ballast has been assumed to be approximately 1.65t/cu.m.

6. Transportation of Materials

All track construction materials must be transported from the point of supply to the construction site. We have assumed this will be done in the most efficient manner ie using task specific rolling stock. Hence rail, sleepers and ballast trains will be utilised for material transport to the construction site and where appropriate, placement. GHD has assumed that a transport cost of $0.10 per tonne km is a reasonable freight such as rail and sleepers and $0.08 for ballast.

Freight costs will vary depending on the track section involved and the material source. For the purpose of this evaluation GHD has assumed the following as average transport distances.

Rail from fabrication facility	150km	$15/tonne
Sleepers from manufacture facility	150km	$15/tonne ($450 per 100)
Ballast from quarry	150km	$12/tonne ($20/cu.m.)

7. Track Laying

It has been assumed track laying will be carried out using track laying machines.

8. Engineering, Procurement and Construction Management (EPCM)

There are various activities and tasks that must be undertaken by the railway infrastructure owner in the development of a new railway e.g.:

- Design;
- Tender documentation;
- Calling Tenders;
- Tender assessment and recommendations;
- Contract Award and Contract documentation;
- Contract Administration including progress payments;
- Quality inspections during manufacture;
- QA monitoring;
- Final testing for tolerance;
- Warranty period inspections and reporting.

An estimate of these costs has been included in the unit rates.

9. Contractors Costs and Supply Markups

There are two options to be considered for the supply of materials namely the material to be supplied by the contractor or by the principal. The replacement costs used have assumed supply of material by the contractor.

In a commercial environment where track construction is carried out by a specialist contractor, material supply items including purchasing costs, supply management, insurances, financial costs and risks of various types. They will also include contract supervision and administration costs and a contribution to corporate overheads and profit. Preliminaries costs include the cost of construction camps. Large contracts would be expected to be very competitively bid and hence overhead margins and profit would be modest.

10. Rail Rate

The following table provides a breakdown of the makeup of the trackwork rate for narrow gauge track.

1 km Section Narrow Gauge Track 60kg Rail

Item	Quantity per km		Unit rate	$
Rail				
Rail	120	tonne	$900	108,000
Factory Welding	72.9		$75	5467
Field Welds	6.11		$400	2444
Transport	18,000	tonne km	$0.10	1,800
Sub Total				**117,711**
Sleepers				
Supply	1500		$65	97500
Transport	67 500	tonne km	$0.10	6 750
Sub Total				**104,250**
Ballast				
Ballast Supply	1500	cu.m.	$11	16,500
Transport	382500	tonne km	$0.10	38,250
Sub Total				**54,750**
Track Laying				
Lay	1000	m	95	95,000
Direct costs of material and labour				**371,711**
Preliminaries incl. Camp				36,500
Rail Markup	0.75%			883
Sleeper Markup	2%			2,085
Ballast Markup	3.50%			1,916
Survey				2500
Construction Management				4,000
Overheads & Profit				25,000
Total Contract Price				**444,595**
Owner's costs				
EPCM				2,500
Owners Costs				2,000
TOTAL COSTS PER KM				**449,095**

Unit Rate for Rail per km	$189,000
Unit Value of Sleepers per km	$170,000
Unit Value of Ballast per km	$ 90,000

11. Turnouts

QR advised that mainline turnouts for all Central Queensland coal system track are to be 60kg SNX with all turnouts on concrete bearers and to be procured complete with electric motors. High Speed mainline turnouts are 1:25, mainline turnouts 1:16 and low speed mainline turnouts 1:12. Maintenance sidings and the like are 1:81/2.

Installation costs include labour and equipment.

The following unit costs are used in the evaluation.

Description	**1:8½** **$**	**1:12** **$**	**1:16** **$**	**1:25** **$**
Supply Cost	63,000	75,000	95,000	150,000
Transport	3,200	3,500	4,000	5,000
Ballast	1,300	1,500	2,000	2,500
Installation	8,500	9,000	9,500	10,500
Sub Total	**76,000**	**89,000**	**110,500**	**168,000**
Markup (3%)	1,900	2,250	2.850	4,500
TOTAL	**77,900**	**$91,250**	**$113,350**	**$172,500**
ADOPT	**78,000**	**$92,000**	**$114,000**	**$173,000**

Appendix C

Unit Replacement Cost - Earthworks

1. Principles

Earthworks for the Central Queensland coalfields lines have been generally constructed on land that has adequate bearing capacity and has not required special construction techniques. Generally cuts are balanced to fills during the design of the vertical alignment to avoid any major borrow pits or importation of material. In most instances mass hauls have been kept to modest haul distances.

The established QR earthworks design approach has been to require a tightly controlled capping material to the formation and in doing so allow a very wide range of materials to be used for embankments. This has proved to be a cost effective approach.

In addition to the rail formation the earthworks also incorporate a maintenance service road within the railway easement. These roads are typically constructed as all weather 4WD roads. The roads exclude bridges and culverts but incorporate low level floodway crossings over normally dry watercourses. Short sections of these roads, typically alongside portion of loading and unloading loops are constructed at grade and incorporate culverts.

Track car takeoffs and machine pads are typically provided at regular intervals along the track for maintenance purposes and have been included in the earthworks estimates.

2. Rates

The rates adopted have been based upon recent tendered prices for similar constructions in Central Queensland.

Earthworks designs prepared by QR, GHD and other consultants in Queensland have been based on a limited number of geotechnical boreholes in major cuts. This data has rarely provided an accurate forecast of the quantity of rock as defined by QR. GHD’s and QR’s experience over the past 20 years has clearly indicated that a budget estimates for rock based on 30% of all major cuts provides the most accurate average forecast. Hence our estimates for rock quantities is based on this well established figure.

The formation capping material or “top 600” as it is frequently known is relatively expensive to produce as it has a very stringent specification and must be produced by blending a number of imported materials. In some cases these may be sourced locally but most often a major proportion must be transported considerable distances.

Service roads for 4WD access generally follow the surface contours and require minimal earthworks. Concrete inverts to watercourse crossings are usually provided

The following average rates have been utilised in this valuation.

Description	Rate	Unit
Strip	$4	cu.m
Cut to Fill or Spoil	$5	cu.m
Borrow to Fill	$5	cu.m
Borrow to Fill Top 600	$25	cu.m
Removal and replace unsuitable	$8	cu.m
Extra Over for Rock	$3	cu.m
Track Car Take Offs	$1 000	each
Machine Pads	$3 000	each
Access Road Typical	$45,000	km

Appendix D

Unit Replacement Costs - Civil Structures

1. Principles

Civil Structures for the below rail assets include foot and rail bridges, drainage structures, headwalls, underpasses, occupational and level crossings, buildings, retaining walls and fencing. The unit rates adopted are, for all but initial items, an average unit rate taking account of normal geotechnical factors. For assets of a material value, specific construction has been given to the geotechnical factor.

2. Bridges

QR has a standard bridge design concept that is suitable for most applications on the coal rail system. These bridges comprise prestressed concrete beams with a ballasted deck. Almost all bridges in the coal rail system span seasonal watercourses. This permits land based construction techniques for foundation piling and piers and land based cranage for placement of major beams. A small number of bridges are located over permanent water and higher rates have been adopted to allow for the more costly construction techniques, particularly for piling and piers.

GHD has experience in the design and construction of a large number of rail bridges in Southern, Central and North Queensland over more than 30 years. This knowledge has been used to establish typical construction costs for a contract that includes 3 or 4 bridge structures in a geographic area.

These costs exclude the costs of track, signalling and any communications assets that may be located on the bridge structure.

The unit values adopted have recognised the additional costs of construction over a permanent water course.

Bridges over Seasonal Water	$10 000 per lineal metre single track
Bridges over Major Roads	$15 000 per lineal metre single track
Bridges over Permanent Water	$16 000 per lineal metre single track

3. Culverts

GHD has been responsible for the design and construction management of railway culverts in Central and North Queensland. GHD maintains a cost database which provides optimal selection of single and multiple Reinforced Concrete Pipe (RCP), reinforced concrete box culverts (RCBC) and Corrugated Metal Pipe (CMP).

Standard culvert designs are used throughout the coal systems. All are designed as long life low maintenance structures. Steel CMP culverts are installed in a small number of locations, particularly for large culverts under deep fills.

The following rates have been utilised for culverts.

Reinforced Concrete Pipe

Size	$/m	Headwall
300	$ 106	$ 1,000
375	$ 124	$ 1,000
450	$ 153	$ 1,000
525	$ 176	$ 1,000
600	$ 205	$ 1,000
675	$ 240	$ 1,000
750	$ 272	$ 1,000
825	$ 305	$ 1,000
900	$ 357	$ 1,200
1050	$ 446	$ 1,300
1200	$ 543	$ 1,400
1350	$ 629	$ 1,500
1500	$ 732	$ 1,750
1650	$ 834	$ 1,800
1800	$ 948	$ 2,000
1950	$ 1,099	$ 2,250
2100	$ 1,290	$ 2,500
2400	$ 1,618	$ 2,750
2700	$ 1,670	$ 3,000
3000	$ 1,763	$ 3,500
4350	$ 2,154	$ 5,000
4500	$ 2,206	$ 5,250

Reinforced Concrete Box Culverts

SIZE		$/m	
Width	Height		Headwall
300	300	$ 362	$ 750
450		$ 452	$ 750
600		$ 527	$ 750
750		$ 592	$ 750
900		$ 657	$ 750
1200		$ 850	$ 750
450	375	$ 451	$ 750
600		$ 526	$ 750
750		$ 592	$ 750
450	450	$ 455	$ 750
600		$ 558	$ 750
750		$ 626	$ 750
900		$ 691	$ 1,000
1050		$ 795	$ 1,000
1200		$ 890	$ 1,050
1500		$ 1,050	$ 1,100
600	600	$ 566	$ 1,200
750		$ 663	$ 1,300
900		$ 729	$ 1,350
1200		$ 929	$ 1,430
1350		$ 1,070	$ 1,500
1500		$ 1,181	$ 1,550
1800		$ 1,410	$ 1,600
2400		$ 1,798	$ 1,650
2700		$ 1,976	$ 1,700
900	750	$ 809	$ 1,750
1200		$ 1,029	$ 2,600
1500		$ 1,337	$ 2,800
1800		$ 1,638	$ 3,000
825	825	$ 820	$ 1,750
900	900	$ 952	$ 1,750
1200		$ 1,245	$ 2,200
1500		$ 1,573	$ 2,800
1800		$ 1,921	$ 3,000
2100		$ 2,222	$ 3,100
2400		$ 2,594	$ 3,200
1200	1200	$ 1,495	$ 2,260
1500		$ 1,909	$ 5,500
1800		$ 2,329	$ 5,800
2100		$ 2,652	$ 6,100
2400		$ 3,092	$ 6,400
2700		$ 3,411	$ 6,700
3000		$ 4,002	$ 7,000
4500		$ 6,000	$ 7,300
1500	1500	$ 2,297	$ 6,900
1800		$ 2,717	$ 7,200
2100		$ 3,091	$ 7,500

SIZE		$/m	
Width	Height		Headwall
2400		$ 3,553	$ 7,800
3000		$ 4,538	$ 8,100
1800	1800	$ 2,955	$ 8.900
2100		$ 3,411	$ 9,200
2400		$ 3,918	$ 9,500
2700		$ 4,295	$ 9,800
3000		$ 4,980	$ 10,150
4500		$ 7,500	$ 10,500
2100	1950	$ 3,636	$ 10,700
2100	2100	$ 3,844	$ 10,700
2400		$ 4,417	$ 11,100
3000		$ 5,541	$ 11,900
1100	2400	$ 3,092	$ 14,000
2400		$ 4,784	$ 16,500
2700		$ 4,987	$ 17,000
3000		$ 5,547	$ 17,400
2700	2700	$ 4,692	$ 19,500
3000		$ 5,229	$ 20,500
3000	3000	$ 5,328	$ 22,650
4500		$ 7,500	$ 24,000
5100		$ 8,500	$ 26,000
3300	3300	$ 6,062	$ 24,000
3000	3750	$ 5,385	$ 24,000
4800	3900	$ 8,000	$ 30,000
3000	4500	$ 10,000	$ 33,000
4500		$ 12,000	$ 43,000
5100		$ 14,000	$ 46,000
5400	4800	$ 20,000	$ 50,000

Corrugated Metal Pipe

SIZE	$/m	Headwall
300	$ 186	$ 1,000
375	$ 236	$ 1,000
450	$ 278	$ 1,000
600	$ 439	$ 1,690
750	$ 544	$ 1,891
900	$ 648	$ 2,103
1050	$ 777	$ 2,326
1200	$ 878	$ 2,560
1350	$ 984	$ 2,806
1500	$ 1,089	$ 3,063
1650	$ 1,186	$ 3,331
1800	$ 1,289	$ 3,610
1950	$ 1,389	$ 3,901
2100	$ 1,483	$ 4,203
2250	$ 1,581	$ 4,516
2400	$ 1,678	$ 4,840
2550	$ 1,767	$ 5,176
2700	$ 1,861	$ 5,523
2850	$ 1,954	$ 5,881
3000	$ 2,040	$ 6,250
3300	$ 1,416	$ 7,023
3600	$ 2,442	$ 7,840
4000	$ 2,719	$ 9,000
4200	$ 2,842	$ 9,610
4500	$ 3,038	$ 10,563
4800	$ 3,233	$ 11,560
5000	$ 3,352	$ 12,250
5100	$ 3,394	$ 12,603

4. Crossings

At grade over rail crossings have been provided by QR on minor roads and for property access. These crossings involve various standards of warning systems which are included in the signalling estimate. Policies in regard to the provision of occupational crossings have changed markedly over relatively recent times due to the perceived risk exposure. Higher train speeds are requiring greater sighting distances which has also impacted on the locations now deemed suitable. As a result a new coal rail system built today would have many fewer occupational crossings and those crossings that would be provided would be much more likely to incorporate warning systems. Hence there would be fewer crossings but they would involve higher overall costs.

However, QCA requested GHD place a valuation on the total number of current operational crossings and hence valuation has been made on the replacement cost of a similar standard as opposed to a MEERA valve.

Public Road crossings	$38 000
Occupational Crossings	$ 16 000

5. Fencing

Generally the Central Queensland coal lines are fenced on both sides to exclude stock entry. Fences are typically 4 strand barbed wire.

Fencing costs $3 700 per km

6. Buildings

No general buildings have been identified in the valuation. Buildings associated with signalling, electrification and communications have been included within these sections. Space for control rooms in major centres has been assumed to be rented space.

Appendix E

Unit Replacement Costs – Electric Traction

1. Principles

The electric traction electrification system comprises the power supply system and the overhead system which includes 25kV distribution conductors and the catenary system. The rates indicated in this Appendix represent estimated current replacement costs for a narrow gauge heavy haul rail system. The estimates are for a greenfield rail development ie. construction is not carried out under traffic. It has been assumed that the stringing of conductors will be undertaken after the trackwork is completed which would allow conductors and high level work to be carried out from a rail mounted platform.

2. Overhead System

The overhead system comprises the supporting masts, the overhead conductor and catenary support system, overhead 25kV feed wires and earth conductor and switching.

2.1 Masts

The majority of the coal system uses single track masts. Duplicate track has been constructed as two single tracks with separate supporting structures and catenaries. This construction approach also applies to passing loops. In major sidings different construction standards may have been adopted. However, in most instances such sidings have not been included as part of the coal network. Hence the QCA valuation has adopted single track construction as the basis for all valuations.

The spacing of masts is dependent on a number of factors, the most significant being curve radii and wind load criteria. The measurement of quantities has not counted individual masts but instead each track section has been classified into lengths in various radii classes. Average mast spacings have then been assigned to each radii classification.

The table below shows the classes adopted.

Track Radii	Coastal Region Average Mast Spacings (metres)	Inland Region Average Mast Spacings (metres)
Straight	63	68
>1 400m	63	68
>1 000m to 1400m	60.5	60.5
>600m to 1 000m	53	55
>350m to 600m	44	44.5
>300m to 350m	38	38.5
>250m to 300m	35	36
>200m to 250m	31.5	32.5

Estimates were developed for the various overhead configurations in service in Central Queensland Coal System.

The following table indicates the rates developed by GHD for the replacement cost of an individual mast. The additional costs associated with fixed end structures have been factored into these rates.

Components	**$**
Foundation	1,350
Fabricated Mast	1,100
Transport of Materials	90
Mast Installation	600
Fixed Ends	150
Cantelevers & Dressing	1,060
Cant & Dressing Install	1,175
Unit cost of mast	**$5,525**

The contract cost per mast including Preliminaries, Construction, Management, overheads and profits, EPCM and owners cost is $7,164.

The above rates provide a cost of masts per kilometre of track as shown in the table below but include a 5% allowance for additional masts.

Coastal masts

Track Radius	**Average Coastal Mast Spans (m)**	**Average Masts per km**	**Mast Costs per km ($)**
Straight and >1 400m	63	15.9	117,000
>1 000m to 1 400m	60.5	16.5	121,000
>600m to 1 000m	53	18.9	139,000
>350m to 600m	44	22.7	167,000
>300m to 350m	38	26.3	194,000
>250m to 300m	35	28.6	211,000
>200m to 250m	31.5	31.7	233,000

Inland Masts

Track Radius	**Average Inland Mast Spans (m)**	**Average Masts per km**	**Mast Costs per km ($)**
Straight and >1 400m	68	14.7	108,000
>1 000m to 1 400m	60.5	16.5	121,000
>600m to 1 000m	55	18.2	134,000
>350m to 600m	44.5	22.5	166,000
>300m to 350m	38.5	26.0	202,000

>250m to 300m	36	27.8	216,000
>200m to 250m	32.5	30.8	227,000

2.2 Overhead Conductors

The masts support the overhead system which comprises a catenary support and contact wire via a cantilever. The masts may also support 25kV feed wires and an earth wire.

The following table provides the estimated costs of these various components.

Items	Materials Supply $	Units	Transport $	Installation $	Total $
Overhead Conductor and Catenary					
Contact (107 Cu)	6,000	$/km	200	3,000	9,200
Catenary (7/3.75 Cu)	5,000	$/km	100	3,500	8,600
Balance weights and tensioning	1,650	$/km	50	2,000	3,700
Droppers	2,000	$/km	100	2,300	4,400
					32,600
Overhead Feed Wire					
1FW (19/4.22 Al) including insulators	4,800	$/km	40	3,360	8,300
2FW (19/4.22 Al) including insulators	9,600	$/km	80	6,420	161,100
3FW (19/4.22 Al) including insulators	14,400	$/km	360	8,640	23,400
EW (Al 7/4.22)	1,500	$/km	50	1,350	2,900

2.4 Section Insulators

Section Insulator have been valued at $3,500 each

2.5 Neutral Sections

Neutral Sections have been valued at $7,000 each

2.6 Insulated Overlaps

Insulated Overlaps have been valued at $9,000 each.

3. Power Supply

3.1 Substations

There are 6 feeder Stations in the Blackwater System and 7 in the Goonyella system. All are 2 - 30MVA substations with the exception of Coppabella and Rangal which are both 3 - 30MVA. GHD provided project management services to QR for the MLE projects and has been able to access some of the archived cost records for the project The estimated replacement values for the feeder substations are based on escalation of the 1986 costs. These estimates exclude assets now assigned to Powerlink including the 132kV supply and compensators.

The valuation rates adopted for the feeder Stations are

2 - 30MVA	Single Track	$4,278,000
	Double Track	$4,478,000
3 - 30MVA	Double Track	$6,128,000

3.2 Track Section Cabins

There are 5 Track Section Cabins in Blackwater system and 7 in the Goonyella System. Each incorporates either 2 or 4 autotransformers. As with the estimates for Feeder Stations 1986 costs have been escalated.

The values adopted for the QCA valuation are

Single Track	$1,290,000
Double Track	$1,480,000

3.3 Autotransformers

Autototransformers have been valued at $342,000 each

3.4 Power Supply Cubicles

Power Supply cubicles have been valued as follows

Single Circuit Breaker	$35,000
Double Circuit Breaker	$55,000

3.5 Auxiliary Transformers

Auxiliary Transformers have been valued at $20,000 each.

3.6 Track Coupler Unit

Track coupler units have been valued at $910,000.

3.7 Switches

Switches have been valued as follows

Single Pole Manual	$4,000
Single Pole Motorised	$12,000
Double Pole Manual	$7,000

Double Pole Motorised	$16,000

All the above figures exclude contractors and owners on costs which have been added as follows:

Preliminaries	12%
Construction Management	2.5%
Overhead and Profit	9%
EPCM	4%
Owners Costs	1%

Appendix F

Unit Replacement Costs - Signalling

Signalling costs have been estimated using a set of rates which have been adjusted where appropriate for each track section. The following list is indicative of the base rates used but reference should be made to individual data sheets for any detailed verification.

Component		$
Signal-3 aspect with JI (or side bracket), shunt and DSI.		16,800
Signal-3 aspect with JI (or side bracket) and shunt.		14,300
Signal-3 aspect with JI (or side bracket)		12,300
Signal-3 aspect with shunt		9,900
Signal-2 aspect with shunt		8,800
Signal-2 aspect with DSI		8,300
Signal-3 aspect		8,000
Signal-2 aspect		6,900
Signal-single aspect with shunt		4,900
Signal-independent shunt		4,200
Blue Lights		800
Electric Points		4,600
Electric release points		5,900
DC Track Circuits		3,900
Jointless Track Circuits		9,000
Insulated Joints		1,800
Axle counter		41,600
Half Booms		61,000
Flashing lights		23,900
Additional side flashing light		5,000
Signage		300
Housings	small	3,800
	medium	6,800
	large	8,700
	hut	12,000
	SER/CER/ALT room	31,500
ATP Tags		150
ATP Encoder and Radio		60,000
Cabling	between points	45
	points to approach	35
	block	30
Alternator and SER power supply		30,000
Regional board power supply		20,000
Interlocking	small	80,000
	medium	100,000
	large	150,000
Design and Documentation	small	160 000
	medium	200,000
	large	300,000
Site super & accom., & vehicles	small	360,000
	medium	400,000
	large	550,000
Test & Commission	small	60,000
	medium	50,000
	large	120,000
Spares	small	20,000
	medium	20,000
	large	40,000

Appendix G

Unit Replacement Costs Communications

Blackwater

QR Section No.				Route Length	Built	Fibre		Terminal Equipment		Local Cabling		Communications	MEERA $
		Start	End	km		Route	$		$		$	$	
NC	752	Callemondah	South Gladstone	6.9	1980	13.7	164,928	0	-			5,706	170,634
PG	755	Callemondah	Golding Loop	8.5	1980	17.0	203,832	1	40,000	2	6,000	7,052	256,884
PG	603	Callemondah	Powerhouse Loop	3.3	1971	6.6	78,768	1	40,000	2	6,000	2,725	127,493
NC	455	Callemondah	Fishermans Landing Jct	6.1	1980	12.3	147,576	2	80,000	4	12,000	5,106	244,682
FL	484	Fishermans Landing Jct	Fishermans Landing	8.3	1994	16.5	198,408	1	40,000	2	6,000	6,865	251,273
NC	456	Fishermans Landing Jct	East End Jct	14.8	1980	29.7	356,280	3	120,000	6	18,000	12,327	506,607
NC	457	East End Jct	Bajool	48.3	1980	96.6	1,158,672	7	280,000	14	42,000	40,089	1,520,761
NC	842	Bajool	Rocklands	28.2	1980	56.5	677,664	5	200,000	10	30,000	23,447	931,111
CL	404	Rocklands	Gracemere	5.2	1980	10.3	123,768	1	40,000	2	6,000	4,282	174,050
CL	405	Gracemere	Warren	20.3	1980	40.6	487,752	5	200,000	10	30,000	16,876	734,628
ST	771	Warren	Stanwell Loop	4.9	1992	9.8	117,600	0	-	-	-	4,069	121,669
CL	772	Warren	Duaringa	72.7	1980	145.4	1,744,397	9	360,000	18	54,000	60,355	2,218,751
CL	773	Duaringa	Boonal Jct	75.9	1980	151.8	1,821,288	10	400,000	20	60,000	63,015	2,344,303
BO	776	Boonal Jct	Yarrabee Branch	3.5	1981	6.9	83,208	1	40,000	2	6,000	2,879	132,087
CL	777	Boonal Jct	Blackwater	9.1	1980	18.1	217,632	1	40,000	2	6,000	7,530	271,162
LM	781	Blackwater	Taurus	14.0	1970	28.0	335,880	1	40,000	2	6,000	11,621	393,501
LM	783	Taurus	Koorilgah Mine	5.5	1973	11.0	132,000	1	40,000	2	6,000	4,567	182,567
LM	782	Taurus	to Laleham Mine	4.3	1970	8.7	104,184	1	40,000	2	6,000	3,605	153,789
CL	778	Blackwater	Sagittarius	4.4	1968	8.8	105,528	0	-	-	-	3,651	109,179
CU	774	Sagittarius	Curragh Loop	14.0	1983	27.9	335,088	1	40,000	2	6,000	11,594	392,682
CL	779	Sagittarius	Rangal	3.5	1968	7.1	84,792	1	40,000	2	6,000	2,934	133,726
KA	784	Rangal	Boorgoon Jct	9.6	1968	19.2	230,664	2	80,000	4	12,000	7,981	330,645
KA	785	Boorgoon Jct	Kinrola Mine	10.9	1968	21.8	261,648	1	40,000	2	6,000	9,053	316,701
KA	786	Boorgoon Jct	Boorgoon Loop	4.2	1975	8.4	100,848	1	40,000	2	6,000	3,489	150,337
CL	780	Rangal	Burngrove	6.7	1980	13.5	161,472	1	40,000	2	6,000	5,587	213,059
GG	787	Burngrove	Mackenzie	23.0	1980	46.1	553,032	2	80,000	4	12,000	19,134	664,166
EN	789	Mackenzie	Ensham	14.9	1980	29.8	357,720	1	40,000	2	6,000	12,377	416,097
GG	788	Mackenzie	Gordonstone Jct	29.1	1980	58.2	697,848	2	80,000	4	12,000	24,145	813,993
GS	613	Gordonstone Jct	Gordonstone Mine	12.8	1992	25.7	308,136	1	40,000	2	6,000	10,661	364,797
GG	790	Gordonstone Jct	Gregory Jct	8.7	1982	17.5	209,904	1	40,000	2	6,000	7,262	263,166
GG	791	Gregory Jct	Gregory Mine	6.9	1980	13.8	165,408	1	40,000	2	6,000	5,723	217,131
				481.7			$11,737,925	$	2,640,000		#######	400,000	14,950,997

Goonyella

QR Section No.		Start	End	Route Length km		Fibre Route	$	Terminal Equipment	$	Local Cabling	$	Telecommunications $	MEERA $
GA	839	Darymple Loop	Dalrymple Jct	10.2	1994	20.4	244,800	1	40,000	2	36,000	8,079	$ 328,879
GA	838	Hay Point Loop	Dalrymple Jct	8.0	1998	16.0	191,400	1	40,000	2	36,000	6,316	$ 273,716
GA	837	Dalrymple Jct	Yukan	21.3	1982	42.6	511,248	8	320,000	16	288,000	16,872	$ 1,136,120
GA	621	Yukan	Hatfield	20.7	1982	41.4	496,272	4	160,000	8	144,000	16,377	$ 816,649
GA	441	Hatfield	Sth Walker Jct	77.5	1982	155.0	1,860,480	7	280,000	14	252,000	61,398	$ 2,453,878
SC	431	Sth Walker Jct	South Walker Ck Spur	2.8	1996	5.6	67,200	1	40,000	2	36,000	2,218	$ 145,418
GA	453	Sth Walker Jct	McArthur Jct	9.7	1971	19.5	233,784	1	40,000	2	36,000	7,715	$ 317,499
CS	452	McArthur Jct	Macarthur Mine Loop	5.1	1998	10.2	122,232	2	80,000	4	72,000	4,034	$ 278,266
GA	454	McArthur Jct	Coppabella	8.3	1982	16.7	200,040	2	80,000	4	72,000	6,602	$ 358,642
GA	443	Coppabella	Burton Mine Jct	22.7	1982	45.5	545,496	3	120,000	6	108,000	18,002	$ 791,498
BU	414	Burton Mine Jct	Burton Mine Loop	5.0	1996	10.1	120,648	1	40,000	2	36,000	3,982	$ 200,630
GA	444	Burton Mine Jct	Wotonga	5.6	1971	11.2	134,952	1	40,000	2	36,000	4,454	$ 215,406
GA	461	Wotonga	Moranbah Nth Jct	18.3	1971	36.6	438,960	1	40,000	2	36,000	14,486	$ 529,446
MZ	430	Moranbah Nth Jct	Moranbah North Loop	7.3	1998	14.6	175,200	2	80,000	4	72,000	5,782	$ 332,982
GA	462	Moranbah Nth Jct	Goonyella Jct	3.2	1971	6.4	76,992		-	-	-	2,541	$ 79,533
GA	746	Goonyella Jct	Goonyella Mine Loop	5.1	1971	10.2	121,824	1	40,000	2	36,000	4,020	$ 201,844
GA	745	Goonyella Jct	Riverside Jct	5.2	1983	10.5	125,472	2	80,000	4	72,000	4,141	$ 281,613
GA	747	Riverside Jct	Riverside Mine Loop	7.4	1983	14.9	178,560	2	80,000	4	72,000	5,893	$ 336,453
GA	731	Riverside Jct	North Goonyella Mine Loop	18.8	1993	37.7	451,992	2	80,000	4	72,000	14,916	$ 618,908
WA	748	Wotonga	Blair Athol Mine Jct	103.6	1983	207.2	2,486,304	1	40,000	2	36,000	82,051	$ 2,644,355
WA	749	Blair Athol Mine Jct	Blair athol Mine Loop	6.9	1983	13.7	164,760	1	40,000	2	36,000	5,437	$ 246,197
NP	760	Coppabella	Peak Downs Jct	43.7	1972	87.3	1,047,648	4	160,000	8	144,000	34,573	$ 1,386,221
PD	761	Peak Downs Jct	Peak Downs Loop	5.6	1972	11.2	134,376	2	80,000	4	72,000	4,435	$ 290,811
NP	762	Peak Downs Jct	Saraji Jct	21.1	1974	42.3	507,504	2	80,000	4	72,000	16,748	$ 676,252
SA	763	Saraji Jct	Saraji Baloon Loop	5.5	1974	11.1	133,080	1	40,000	2	36,000	4,392	$ 213,472
NP	764	Saraji Jct	Norwich Park Jct	43.2	1979	86.5	1,037,424	4	160,000	8	144,000	34,236	$ 1,375,660
NM	765	Norwich Park Jct	Norwich Park Loop	5.4	1979	10.8	129,984	1	40,000	2	36,000	4,290	$ 210,274
NP	766	Norwich Park Jct	German Creek Jct	21.7	1983	43.3	520,104	3	120,000	6	108,000	17,164	$ 765,268
GE	767	German Creek Jct	German Creek Loop	6.8	1982	13.6	162,672	1	40,000	2	36,000	5,368	$ 244,040
NP	768	German Creek Jct	Oaky Ck Jct	19.1	1982	38.3	459,096	2	80,000	4	72,000	15,151	$ 626,247
OK	769	Oaky Ck Jct	Oakey Ck Mine Loop	6.1	1982	12.3	147,288	1	40,000	2	36,000	4,861	$ 228,149
NP	614	Oaky Ck Jct	Gregory Jct	17.0	1982	34.0	408,144	1	40,000	2	36,000	13,469	$ 497,613
				568			13,647,936	31	2,680,000		2,394,000	450,000	19,101,936

Moura

QR Section No.	Start	End	Route Length km	Built	Fibre Route	$	Terminal equipment	$	Local Cabling	$	Telecommunications $	MEERA $
Blackwater System Connection from NC455 to MA 750 to Parana and Barney Point												
NC 752	Callemondah	Gladstone	6.872	1980		82,464	0	-	-	-	4,400	86,864
NC 751	Gladstone	Sth Gladstone	4.369	1969		52,428	1	40,000	2	36,000	2,800	131,228
Moura System												
MA 754	Barney Pt	QAL Jct	2.6	1974		31,200	1	40,000	2	36,000	1,700	108,900
MA 750	QAL Jct	Moura Sht Line Jct	1.05	1974		12,600		-	-	-	700	13,300
MA 432 Part	Moura Sht Line Jct	10.2km	6.587	1974		79,044	0	-	-	-	4,300	83,344
MA 433	10.2km	Byellee Jct	3.684	1974		44,208	1	40,000	2	36,000	2,400	122,608
MA 756	Callemondah	Byellee Jct	2.096	1983		25,152	1	40,000	2	36,000	1,400	102,552
MA 734	Byellee Jct	Graham	14.706	1974		176,472	1	40,000	2	36,000	9,400	261,872
MA 420	Graham	Stirrat	10.927	1974		131,124	1	40,000	2	36,000	7,000	214,124
MA 421	Stirrat	Annandale	80.146	1974		961,752	5	200,000	10	180,000	51,200	1,392,952
MA 736	Annandale	Earlsfield	8.313	1968		99,756	1	40,000	2	36,000	5,400	181,156
MA 606	Earlsfield	Moura Mine Jct	52.065	1968		624,780	1	40,000	2	36,000	33,300	734,080
MA 743	Moura Mine Jct	Mine loop	5.562	1968		66,744	1	40,000	2	36,000	3,600	146,344
Boundary Hill Mine												
MA 799	Annandale	Boundary Hill Loop	5.647	1981		67,764	1	40,000	2	36,000	3,700	147,464
Callide Mine												
BI 737	Earlsfield	Dakenba	15.892	1968		190,704	1	40,000	2	36,000	10,200	276,904
BI 738	Dakenba	Callide Mine	14.581	1968		174,972	1	40,000	2	36,000	9,400	260,372
			235.097					680,000		612,000	150,000	4,264,064

Newlands

QR Section	Start	End	Rebuild/ duplication date	Route Length	Route Cabling	Terminal equipment		Local Cabling		Telecommunicatio	MEERA $
					($' 000)		($' 000)		($' 000)	($' 000)	($' 000)
NL 851	Abbot Point	Kali	1984	13.19	317	2	80	4	72	1.2	398
NL 850	Kali	Durroburra	1983	5.589	134	1	40	2	36	0.5	175
NL 848	Durroburra	Pring	1985	3.609	87	1	40	2	36	0.3	127
NL 846	Pring	Collinsville	1985	71.813	1,724	4	160	8	144	6.5	1,890
NL 632	Collinsville	Newlands	1985	75.6	1,814	3	120	3	54	6.8	1,941
											-
NL 847	Collinsville	McNaughton	1984	7.6	91	1	40	1	18	0.7	223
TOTAL					4,167		480		360	16	$ 4,754

Appendix H

Valuation Summary - Narrow Gauge

Blackwater System

VALUATION SUMMARY

QR Section No.				Route Length	Total Track Length	Total	Track	Earthworks	Civil Structures	Electrification	Signalling	Communications
		Start	End	km	km	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000
NC	752	Callemondah	Sth Gladstone	6.9	6.9	8,245	3,605	1,140	1,390	1,171	939	
PG	755	Callemondah	Golding Loop	8.5	12.5	22,578	6,619	6,253	4,803	2,485	2,161	257
PG	603	Callemondah	Powerhouse Loop	3.3	9.8	26,290	5,780	6,190	5,372	7,760	1,060	127
NC	455	Callemondah	Fishermans Landing Jct	6.1	12.3	30,280	6,400	2,284	13,742	4,415	3,194	245
FL	434	Fishermans Landing Jct	Fisherman's landing	8.3	9.2	19,876	4,620	5,121	4,071	4,234	1,829	
NC	456	Fishermans Landing Jct	East End Jct	14.8	30.0	38,674	14,988	4,578	8,072	8,832	1,697	507
NC	457	East End Jct	Bajool	48.3	102.1	124,967	55,950	12,674	17,160	24,168	13,494	1,521
NC	842	Bajool	Rocklands	28.2	57.0	74,700	27,377	7,425	19,640	12,496	6,831	931
CL	404	Rocklands	Gracemere	5.2	5.2	25,890	2,890	5,394	5,677	9,277	2,478	174
CL	405	Gracemere	Warren	20.3	29.2	39,506	14,900	5,439	6,365	7,059	5,008	735
ST	771	Warren	Stanwell Loop	4.9	4.9	11,365	2,665	4,009	2,697	1,026	847	122
CL	772	Warren	Duaringa	72.7	116.6	204,890	68,488	43,735	39,060	36,518	14,871	2,219
CL	773	Duaringa	Boonal Jct	75.9	102.7	132,776	48,898	15,481	16,765	35,984	13,305	2,344
BO	776	Boonal Jct	Yarrabee Branch	3.5	3.5	4,631	1,752	616	1,041	708	382	132
CL	777	Boonal Jct	Blackwater	9.1	10.8	13,307	5,077	1,877	710	3,870	1,501	271
LM	781	Blackwater	Taurus	14.0	13.4	16,056	6,480	2,769	2,003	2,530	1,880	394
LM	783	Taurus	Koorilgah Mine	5.5	5.9	7,577	2,912	806	1,416	1,088	1,172	183
LM	782	Taurus	to Laleham Mine	4.3	4.3	5,394	1,950	815	584	1,707	184	154
CL	778	Blackwater	Sagittarius	4.4	6.7	9,323	3,498	612	1,580	1,906	1,618	109
CU	774	Sagittarius	Curragh Loop	14.0	14.0	16,038	6,701	2,776	1,833	2,241	2,094	393
CL	779	Sagittarius	Rangal	3.5	3.5	7,496	1,593	1,117	540	3,366	746	134
KA	784	Rangal	Boorgoon Jct	9.6	11.5	14,510	5,448	2,201	2,822	1,688	2,020	331
KA	785	Boorgoon Jct	Kinrola Mine	10.9	10.9	13,505	5,002	2,106	2,145	2,136	1,800	317
KA	786	Boorgoon Jct	Boorgoon Loop	4.2	4.2	5,863	2,074	846	1,259	727	806	150
CL	780	Rangal	Burngrove	6.7	6.7	6,284	260	1,337	1,997	1,660	817	213
GG	787	Burngrove	Mackenzie	23.0	23.8	35,412	11,267	6,037	9,139	4,444	3,861	664
EN	789	Mackenzie	Ensham	14.9	14.9	22,695	7,121	5,913	4,734	2,530	1,981	416
GG	788	Mackenzie	Gordonstone Jct	29.1	34.0	36,090	15,813	6,993	2,847	6,782	2,841	814
GS	613	Gordonstone Jct	Gordonstone Mine	12.8	12.8	14,584	6,135	2,775	1,262	2,227	1,820	365
GG	790	Gordonstone Jct	Gregory Jct	8.7	8.7	10,236	4,195	2,764	996	1,925	93	263
GG	791	Gregory Jct	Gregory Mine	6.9	7.6	10,860	3,512	2,413	1,057	1,347	2,314	217
				488.6	695.6	1,009,895	353,970	164,498	182,777	198,306	95,644	14,700

Total ($'000)	**$**	**1,009,895**
Av Rate per km Track ($'000)	**$**	**1,452**
Av Rate per Route km of Track ($'000)	**$**	**2,067**

Goonyella

VALUATION SUMMARY

QR Section No.		Start	End	Route Length km	Total Track Length km	Total Gross MEERA Value $ '000	Track Gross MEERA Value $ '000	Earthworks Gross MEERA Value $ '000	Civil Structures Gross MEERA Value $ '000	Electrification Gross MEERA Value $ '000	Signalling Gross MEERA Value $ '000	Communications Gross MEERA Value (Guess) $ '000
GA	839	Darymple Loop	Dalrymple Jct	10.2	14.8	19,135	7,620	2,857	2,313	3,899	2,116	329
GA	838	Hay Point Loop	Dalrymple Jct	8.0	13.0	20,258	8,184	2,855	3,578	2,931	2,437	274
GA	837	Dalrymple Jct	Yukan	21.3	46.8	65,017	25,047	8,373	7,278	17,509	5,675	1,136
GA	621	Yukan	Hatfield	20.7	44.0	76,512	21,686	30,189	6,158	10,707	6,955	817
GA	441	Hatfield	Sth Walker Jct	77.5	159.4	197,728	75,776	19,706	35,265	50,542	13,985	2,454
SC	431	Sth Walker Jct	South Walker Ck Spur	2.8	2.8	3,340	1,430	837	152	453	323	145
GA	453	Sth Walker Jct	McArthur Jct	9.7	19.5	20,094	9,205	2,355	1,133	4,526	2,557	317
CS	452	McArthur Jct	Macarthur Mine Loop	5.1	5.3	7,433	2,585	1,611	440	1,707	812	278
GA	454	McArthur Jct	Coppabella	8.3	16.7	16,909	8,170	1,423	1,561	3,890	1,506	359
GA	443	Coppabella	Burton Mine Jct	22.7	35.9	42,686	16,976	9,200	2,478	8,837	4,405	791
BU	414	Burton Mine Jct	Burton Mine Loop	5.0	5.3	7,261	2,756	1,438	888	1,015	963	201
GA	444	Burton Mine Jct	Wotonga	5.6	8.0	8,776	3,943	1,223	517	1,353	1,525	215
GA	461	Wotonga	Moranbah Nth Jct	18.3	18.3	25,205	8,214	3,584	4,403	6,967	1,506	529
MZ	430	Moranbah Nth Jct	Moranbah North Loop	7.3	7.7	11,799	3,816	3,184	1,749	1,421	1,297	333
GA	462	Moranbah Nth Jct	Goonyella Jct	3.2	3.2	3,858	1,330	942	357	711	439	80
GA	746	Goonyella Jct	Goonyella Mine Loop	5.1	5.5	7,295	2,941	839	907	1,371	1,036	202
GA	745	Goonyella Jct	Riverside Jct	5.2	5.2	11,980	2,550	3,932	2,043	1,205	1,969	282
GA	747	Riverside Jct	Riverside Mine Loop	7.4	8.3	11,409	3,455	2,884	2,333	1,767	632	336
GA	731	Riverside Jct	North Goonyella Mine	18.8	19.2	24,332	8,855	6,022	3,029	4,255	1,552	619
WA	748	Wotonga	Blair Athol Mine Jct	103.6	113.3	143,786	50,409	23,902	19,465	39,225	8,139	2,644
WA	749	Blair Athol Mine Jct	Blair athol Mine Loop	6.9	7.3	10,945	3,530	3,514	827	1,190	1,637	246
NP	760	Coppabella	Peak Downs Jct	43.7	48.5	70,870	23,494	8,817	11,855	20,817	4,500	1,386
PD	761	Peak Downs Jct	Peak Downs Loop	5.6	5.7	7,854	3,044	1,674	830	1,097	918	291
NP	762	Peak Downs Jct	Saraji Jct	21.1	23.7	37,173	11,586	5,886	3,948	13,323	1,753	676
SA	763	Saraji Jct	Saraji Baloon Loop	5.5	5.8	6,355	2,766	713	913	993	756	213
NP	764	Saraji Jct	Norwich Park Jct	43.2	48.9	60,502	23,002	4,748	9,220	18,330	3,827	1,376
NM	765	Norwich Park Jct	Norwich Park Loop	5.4	6.2	7,048	3,302	1,054	698	984	799	210
NP	766	Norwich Park Jct	German Creek Jct	21.7	26.8	32,347	12,745	5,601	4,124	5,898	3,214	765
GE	767	German Creek Jct	German Creek Loop	6.8	8.3	12,336	3,586	4,403	1,211	1,518	1,374	244
NP	768	German Creek Jct	Oaky Ck Jct	19.1	19.1	25,145	8,591	5,057	4,531	5,847	493	626
OK	769	Oaky Ck Jct	Oakey Ck Mine Loop	6.1	6.2	13,475	4,293	5,195	1,501	1,164	1,093	228
NP	614	Oaky Ck Jct	Gregory Jct	17.0	17.0	26,645	7,814	5,400	2,561	9,517	856	498
				568	775.7	1,035,506	372,703	179,418	138,264	244,969	81,049	19,102

Total ($'000)	**$**	**1,035,506**
Av Rate per km Track ($'000)	**$**	**1,335**
Av Rate per Route km of Track ($'000)	**$**	**1,823**

Moura System

Valuation Summary

QR Section No.				Route Length	Total Track Length	Total	Track	Earthworks	Civil Structure	Electrification	Signalling	Communications
		Start	End	km	km	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000
MA	754	Barney Pt	QAL Jct	2.6	6.9	10,786	3,636	2,441	406	1,242	2,951	109
MA	750	QAL Jct	Moura Sht Line Jct	1.1	1.1	2,656	472	335	159	191	1,486	13
MA	451	Moura Sht Line Jct	10.2km	6.6	6.6	10,774	3,052	1,564	3,350	1,295	1,429	83
MA	433	10.2km	Byellee Jct	3.7	3.7	3,118	1,495	896	604		-	123
MA	756	Callemondah	Byellee Jct	2.1	2.1	3,047	1,033	1,127	373	411	-	103
MA	734	Byellee Jct	Graham	14.7	16.9	16,325	7,921	3,637	1,783		2,721	262
MA	420	Graham	Stirrat	10.9	10.9	12,063	5,002	2,624	3,483		740	214
MA	421	Stirrat	Annandale	80.1	88.3	80,233	28,930	30,648	13,539		5,723	1393
MA	736	Annandale	Earlsfield	8.3	9.5	7,729	4,448	1,340	531		1,229	181
MA	606	Earlsfield	Moura Mine Jct	52.1	53.5	54,673	24,391	19,236	8,344		1,967	734
MA	743	Moura Mine Jct	Mine loop	5.6	5.9	6,262	2,875	1,142	557		1,541	146
Boundary Hill Mine												
MA	799	Annandale	Boundary Hill Loop	5.6	5.8	6,063	2,295	2,318	834		468	147
Callide Mine												
BI	737	Earlsfield	Dakenba	15.9	18.0	15,459	8,357	2,247	4,224		354	277
BI	738	Dakenba	Callide Mine	14.6	15.2	14,220	7,120	2,267	4,568		5	260
				223.9	244.3	243,408	101,028	71,822	42,757	3,139	20,615	4,046

Total ($'000)	**$ 243,408**
Av Rate per km Track ($'000)	**$ 996**
Av Rate per Route km of Track ($'000)	**$ 1,087**

Newlands System

VALUATION SUMMARY

QR Section No.		Start	End	Route Length km	Total Track Length km	Total Gross MEERA Value $ '000	Track Gross MEERA Value $ '000	Earthworks Gross MEERA Value $ '000	Civil Structures Gross MEERA Value $ '000	Signalling Gross MEERA Value $ '000	Communications Gross MEERA Value $ '000
NL	851	Abbot Point	Kali	13.2	16.0	16,028	7,469	3,155	3,855	1,151	398
NL	850	Kali	Durroburra	5.6	7.2	12,559	3,347	1,104	5,256	2,676	175
NL	848	Durroburra	Pring	3.6	9.9	13,801	5,372	2,319	4,001	1,983	127
NL	846	Pring	Collinsville	71.8	79.6	73,616	37,050	13,194	15,454	6,029	1,890
NL	632	Collinsville	Newlands	75.6	79.9	85,068	36,818	18,163	27,915	231	1,941
Collinsville Mine Branch											
CV	847	Collinsville	McNaughton	7.6	10.7	11,928	5,192	3,028	2,203	1,282	223
				177.4	203.4	213,000	95,248	40,963	58,684	13,351	4,754

Total ($'000)	**$**	**213,000**
Av Rate per km Track ($'000)	**$**	**1,047**
Av Rate per Route km of Track ($'000)	**$**	**1,201**

Appendix I

Valuation Summary - Standard Gauge

Blackwater System

QR Section No.				Route Length	Total Track Length	Total	Track	Earthworks	Civil Structures	Electrification	Signalling	Communications
		Start	End	km	km	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000
NC	752	Callemondah	Sth Gladstone	6.9	6.9	8,245	3,822	1,185	1,409	1,171	939	
PG	755	Callemondah	Golding Loop	8.5	12.5	22,578	7,016	6,503	4,905	2,485	2,161	257
PG	603	Callemondah	Powerhouse Loop	3.3	9.8	26,290	6,127	6,437	5,474	7,760	1,060	127
NC	455	Callemondah	Fishermans Landing Jct	6.1	12.3	30,280	6,784	2,375	13,761	4,415	3,194	245
FL	434	Fishermans Landing Jct	Fisherman's landing	8.3	9.2	19,876	4,897	5,326	4,078	4,234	1,829	
NC	456	Fishermans Landing Jct	East End Jct	14.8	30.0	38,674	15,888	4,761	8,172	8,832	1,697	507
NC	457	East End Jct	Bajool	48.3	102.1	124,967	59,307	13,181	17,421	24,168	13,494	1,521
NC	842	Bajool	Rocklands	28.2	57.0	74,700	29,019	7,722	19,795	12,496	6,831	931
CL	404	Rocklands	Gracemere	5.2	5.2	25,890	3,063	5,610	5,774	9,277	2,478	174
CL	405	Gracemere	Warren	20.3	29.2	39,506	15,794	5,656	6,462	7,059	5,008	735
ST	771	Warren	Stanwell Loop	4.9	4.9	11,365	2,825	4,169	2,703	1,026	847	122
CL	772	Warren	Duaringa	72.7	116.6	204,890	72,597	45,484	39,487	36,518	14,871	2,219
CL	773	Duaringa	Boonal Jct	75.9	102.7	132,776	51,832	16,100	17,072	35,984	13,305	2,344
BO	776	Boonal Jct	Yarrabee Branch	3.5	3.5	4,631	1,857	641	1,061	708	382	132
CL	777	Boonal Jct	Blackwater	9.1	10.8	13,307	5,382	1,952	715	3,870	1,501	271
LM	781	Blackwater	Taurus	14.0	13.4	16,056	6,869	2,880	2,014	2,530	1,880	394
LM	783	Taurus	Koorilgah Mine	5.5	5.9	7,577	3,087	839	1,425	1,088	1,172	183
LM	782	Taurus	to Laleham Mine	4.3	4.3	5,394	2,067	848	595	1,707	184	154
CL	778	Blackwater	Sagittarius	4.4	6.7	9,323	3,708	637	1,596	1,906	1,618	109
CU	774	Sagittarius	Curragh Loop	14.0	14.0	16,038	7,103	2,887	1,859	2,241	2,094	393
CL	779	Sagittarius	Rangal	3.5	3.5	7,496	1,688	1,162	543	3,366	746	134
KA	784	Rangal	Boorgoon Jct	9.6	11.5	14,510	5,775	2,290	2,852	1,688	2,020	331
KA	785	Boorgoon Jct	Kinrola Mine	10.9	10.9	13,505	5,302	2,191	2,160	2,136	1,800	317
KA	786	Boorgoon Jct	Boorgoon Loop	4.2	4.2	5,863	2,198	880	1,268	727	806	150
CL	780	Rangal	Burngrove	6.7	6.7	6,284	276	1,391	2,037	1,660	817	213
GG	787	Burngrove	Mackenzie	23.0	23.8	35,412	11,943	6,278	9,217	4,444	3,861	664
EN	789	Mackenzie	Ensham	14.9	14.9	22,695	7,548	6,149	4,776	2,530	1,981	416
GG	788	Mackenzie	Gordonstone Jct	29.1	34.0	36,090	16,761	7,273	2,923	6,782	2,841	814
GS	613	Gordonstone Jct	Gordonstone Mine	12.8	12.8	14,584	6,503	2,886	1,291	2,227	1,820	365
GG	790	Gordonstone Jct	Gregory Jct	8.7	8.7	10,236	4,447	2,874	1,010	1,925	93	263
GG	791	Gregory Jct	Gregory Mine	6.9	7.6	10,860	3,723	2,510	1,068	1,347	2,314	217
				488.6	695.6	1,037,714	375,208	171,078	182,777	198,306	95,644	14,700

Total ($'000)	**$ 1,037,714**
Av Rate per km Track ($'000)	**$ 1,492**
Av Rate per Route km of Track ($'000)	**$ 2,124**

Goonyella System

QR Section No.	Start	End	Route Length km	Total Track Length km	Total Gross MEERA Value $ '000	Track Gross MEERA Value $ '000	Earthworks Gross MEERA Value $ '000	Civil Structures Gross MEERA Value $ '000	Electrification Gross MEERA Value $ '000	Signalling Gross MEERA Value $ '000	Communications Gross MEERA Value $ '000
GA 839	Darymple Loop	Dalrymple Jct	10.2	14.8	19,803	8,115	2,971	2,372	3,899	2,116	329
GA 838	Hay Point Loop	Dalrymple Jct	8.0	13.0	20,964	8,716	2,969	3,638	2,931	2,437	274
GA 837	Dalrymple Jct	Yukan	21.3	46.8	67,024	26,675	8,708	7,321	17,509	5,675	1,136
GA 621	Yukan	Hatfield	20.7	44.0	79,303	23,095	31,397	6,332	10,707	6,955	817
GA 441	Hatfield	Sth Walker Jct	77.5	159.4	203,601	80,701	20,494	35,424	50,542	13,985	2,454
SC 431	Sth Walker Jct	South Walker Ck Spur	2.8	2.8	3,469	1,523	871	154	453	323	145
GA 453	Sth Walker Jct	McArthur Jct	9.7	19.5	20,801	9,804	2,449	1,148	4,526	2,557	317
CS 452	McArthur Jct	Macarthur Mine Loop	5.1	5.3	7,668	2,753	1,676	443	1,707	812	278
GA 454	McArthur Jct	Coppabella	8.3	16.7	17,534	8,701	1,480	1,597	3,890	1,506	359
GA 443	Coppabella	Burton Mine Jct	22.7	35.9	44,196	18,079	9,568	2,516	8,837	4,405	791
BU 414	Burton Mine Jct	Burton Mine Loop	5.0	5.3	7,504	2,935	1,496	894	1,015	963	201
GA 444	Burton Mine Jct	Wotonga	5.6	8.0	9,086	4,199	1,272	522	1,353	1,525	215
GA 461	Wotonga	Moranbah Nth Jct	18.3	18.3	25,915	8,748	3,728	4,436	6,967	1,506	529
MZ 430	Moranbah Nth Jct	Moranbah North Loop	7.3	7.7	12,178	4,064	3,311	1,752	1,421	1,297	333
GA 462	Moranbah Nth Jct	Goonyella Jct	3.2	3.2	3,986	1,417	980	361	711	439	80
GA 746	Goonyella Jct	Goonyella Mine Loop	5.1	5.5	7,521	3,132	873	908	1,371	1,036	202
GA 745	Goonyella Jct	Riverside Jct	5.2	5.2	12,306	2,716	4,089	2,046	1,205	1,969	282
GA 747	Riverside Jct	Riverside Mine Loop	7.4	8.3	11,752	3,680	2,999	2,336	1,767	632	336
GA 731	Riverside Jct	North Goonyella Mine Loop	18.8	19.2	25,195	9,430	6,263	3,076	4,255	1,552	619
WA 748	Wotonga	Blair Athol Mine Jct	103.6	113.3	148,304	53,686	24,858	19,751	39,225	8,139	2,644
WA 749	Blair Athol Mine Jct	Blair athol Mine Loop	6.9	7.3	11,316	3,759	3,655	828	1,190	1,637	246
NP 760	Coppabella	Peak Downs Jct	43.7	48.5	72,936	25,022	9,170	12,041	20,817	4,500	1,386
PD 761	Peak Downs Jct	Peak Downs Loop	5.6	5.7	8,121	3,242	1,741	832	1,097	918	291
NP 762	Peak Downs Jct	Saraji Jct	21.1	23.7	38,225	12,340	6,122	4,012	13,323	1,753	676
SA 763	Saraji Jct	Saraji Baloon Loop	5.5	5.8	6,574	2,946	741	924	993	756	213
NP 764	Saraji Jct	Norwich Park Jct	43.2	48.9	62,296	24,497	4,938	9,328	18,330	3,827	1,376
NM 765	Norwich Park Jct	Norwich Park Loop	5.4	6.2	7,309	3,517	1,096	702	984	799	210
NP 766	Norwich Park Jct	German Creek Jct	21.7	26.8	33,442	13,574	5,825	4,166	5,898	3,214	765
GE 767	German Creek Jct	German Creek Loop	6.8	8.3	12,764	3,819	4,579	1,230	1,518	1,374	244
NP 768	German Creek Jct	Oaky Ck Jct	19.1	19.1	25,979	9,150	5,259	4,604	5,847	493	626
OK 769	Oaky Ck Jct	Oakey Ck Mine Loop	6.1	6.2	13,978	4,572	5,403	1,517	1,164	1,093	228
NP 614	Oaky Ck Jct	Gregory Jct	17.0	17.0	27,412	8,322	5,616	2,604	9,517	856	498
			568	775.7	1,068,462	396,929	186,595	139,818	244,969	81,049	19,102

Total ($'000)	**$**	**1,068,462**
Av Rate per km Track ($'000)	**$**	**1,377**
Av Rate per Route km of Track ($'000)	**$**	**1,881**

Moura System

QR Section No.				Route Length	Total Track Length	Total	Track	Earthworks	Civil Structures	Electrification	Signalling	Communications
[redacted]		Start	End	km	km	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000
MA	754	Barney Pt	QAL Jct	2.6	6.9	11,116	3,854	2,539	420	1,242	2,951	109
MA	750	QAL Jct	Moura Sht Line Jct	1.1	1.1	2,702	500	349	165	191	1,486	13
MA	451	Moura Sht Line Jct	10.2km	6.6	6.6	11,026	3,235	1,627	3,356	1,295	1,429	83
MA	433	10.2km	Byellee Jct	3.7	3.7	3,260	1,585	932	620		-	123
MA	756	Callemondah	Byellee Jct	2.1	2.1	3,161	1,095	1,172	380	411	-	103
MA	734	Byellee Jct	Graham	14.7	16.9	16,962	8,396	3,783	1,799		2,721	262
MA	420	Graham	Stirrat	10.9	10.9	12,481	5,302	2,729	3,496		740	214
MA	421	Stirrat	Annandale	80.1	88.3	83,411	30,666	31,874	13,755		5,723	1393
MA	736	Annandale	Earlsfield	8.3	9.5	8,057	4,715	1,393	538		1,229	181
MA	606	Earlsfield	Moura Mine Jct	52.1	53.5	57,031	25,855	20,006	8,469		1,967	734
MA	743	Moura Mine Jct	Mine loop	5.6	5.9	6,486	3,048	1,188	564		1,541	146
Boundary Hill Mine						-	-	-	-			
MA	799	Annandale	Boundary Hill Loop	5.6	5.8	6,309	2,433	2,411	849		468	147
Callide Mine						-	-	-	-			
BI	737	Earlsfield	Dakenba	15.9	18.0	16,150	8,858	2,337	4,325		354	277
BI	738	Dakenba	Callide Mine	14.6	15.2	14,872	7,547	2,358	4,702		5	260
				223.9	244.3	253,024	107,090	74,695	43,438	3,139	20,615	4,046

Total ($'000)	**$**	**253,024**
Av Rate per km Track ($'000)	**$**	**1,036**
Av Rate per Route km of Track ($'000	**$**	**1,130**

Newlands System

VALUATION SUMMARY

QR Section No.				Route Length	Total Track Length	Total	Track	Earthworks	Civil Structures	Signalling	Communications
		Start	End	km	km	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000	Gross MEERA Value $ '000
NL	851	Abbot Point	Kali	13.2	16.0	16,693	7,955	3,281	3,909	1,151	398
NL	850	Kali	Durroburra	5.6	7.2	12,875	3,565	1,148	5,311	2,676	175
NL	848	Durroburra	Pring	3.6	9.9	14,299	5,721	2,411	4,057	1,983	127
NL	846	Pring	Collinsville	71.8	79.6	76,752	39,458	13,722	15,653	6,029	1,890
NL	632	Collinsville	Newlands	75.6	79.9	88,556	39,211	18,890	28,283	231	1,941
Collinsville Mine Branch											
CV	847	Collinsville	McNaughton	7.6	10.7	12,444	5,529	3,149	2,260	1,282	223
				177.4	203.4	221,618	101,439	42,601	59,473	13,351	4,754

Total ($'000)	**$ 221,618**
Av Rate per km Track ($'000)	**$ 1,090**
Av Rate per Route km of Track ($'000)	**$ 1,249**