



2020 Update Research into the Expanse & Value of Australia's Underground Assets



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Contents

Introduction	3
Key Findings	4
Expanse of Underground Assets	
Methodology	6
New sources	7
Kilometre lengths 2020	9
Kilometre lengths 2018	10
Change in assets	11
Value of Underground Assets	
Methodology	13
Key assumptions	14
Kilometre cost 2020	15
Kilometre cost 2018	16
Change in cost	17
Construction component breakdown	18
Total value 2020	19
Total value 2018	20
Change in total value	21
Appendices	22

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Introduction

- Ø Dial Before You Dig Services (DBYD) is a group of not-for-profit entities whose members are organisations that own Australia's underground assets; this refers to pipes and cables that might carry gas, electricity, telecommunications, water and sewerage.
- Ø The Association of Australian Dial Before You Dig Services (AADBYDS) is the peak DBYD entity for Australia. AADBYDS provides a free referral service so that anyone planning to excavate can access information about the location of underground assets at the excavation site to ensure the protection of those assets from damage and/or disruption.
- Ø Since early 2016, AADBYDS has commissioned BIS Oxford Economics (formerly BIS Shrapnel) to undertake the following three research projects:
 - Ø **Profile of the Australian locating industry**; this included an industry size estimate, longevity and extent of locating operations, time spent on jobs, cost of locating services and other issues around legislation and non-commercial locators (Report February 2016)
 - Ø **Member Feedback on Locating Services**; an investigation into the perceptions and opinions of current DBYD Members, including potential future DBYD service offerings (Report March 2017)
 - Ø **Identifying the expanse and value of Australia's underground assets** and the importance of protecting those assets from unnecessary damage (Report April 2018).
- Ø The latest project, commissioned by AADBYDS in December 2019, is an update of 2018 research identifying the expanse and value of underground assets.

Key Findings

- Ø The 2020 update has incorporated some new and improved data sources; this augurs well for future tracking of underground assets.
- Ø The total length of underground assets across investigated segments is 794,525 km; this represents a 7.9% increase over the 2018 report.
- Ø Underground asset length peaks at 228,021 km in New South Wales (29%), followed by Victoria (192,156 km; 24%) and Queensland (147,594 km; 19%).
- Ø By segment, total kilometres range from a high 212,927 km (27%) for water pipes to 117,631 km (15%) for gas pipes.
- Ø The total value of underground assets at 2020 is estimated at \$388 billion, up from \$340 billion in 2018, on the back of increased length of assets and increased construction costs.
- Ø Water assets account for a high \$161.3 billion or 41% of the total value, followed by sewerage (\$91.9 billion; 24%) and electricity (\$74.2 billion; 19%).
- Ø Of the total assets, \$109.2 billion are located in New South Wales, \$99.7 billion in Victoria and \$74.6 billion across Queensland.
- Ø By states and segment, water assets in Victoria record the highest value at \$49.6 billion.






Expanse of Underground Assets

- § Methodology
- § New sources
- § Kilometre length of underground assets – 2020
- § Kilometre length of underground assets - 2018
- § Change in extent of underground assets

Methodology

Updating the physical expense of Australia's underground assets

- ∅ Having identified the most useful data sources through the 2018 research process, our initial steps were to investigate the extent to which the previous data had been updated.
- ∅ The key information sources used in 2018 and the updated data resulting from this project are outlined below:
 - q Gas: Australian Energy Regulator, report *State of the Energy Market 2013*.
Update  This report has not been updated.
 - q Electricity: Bureau of Infrastructure, Transport & Regional Economics (BITRE), report *Australia Infrastructure Statistics Yearbook 2017*.
Update  Neither of the 2018 or 2019 *Australian Infrastructure Yearbook* contain updated data on underground power cable lengths.
 - q Water and Sewerage: Bureau of Infrastructure, Transport & Regional Economics (BITRE), report *Australia Infrastructure Statistics Yearbook 2017*.
Update  Water and sewerage mains lengths data is no longer reported in the *Australia Infrastructure Yearbook*.
 - q Telecommunications: see Electricity (with no robust data, telecommunications utilised electricity asset lengths).
- ∅ Clearly we needed to identify alternative sources of information.
- ∅ Fortunately, we were able to locate databases/excel files relating to all sectors, although the degree of 'latest available' information did differ.

New sources

New sources identified for 2020 update

- ∅ With a lack of updated data available via the sources used in the 2018 report, we have identified alternative (and improved) data sources. These are outlined below.

Gas

- ∅ We utilised the gas pipeline register of the Australian Energy Market Commission (AEMC). The register lists all individual gas pipelines by state.
- ∅ By clicking through to each individual pipeline, additional information is available; in the majority of occasions this includes pipeline length.
- ∅ Where pipeline length was not provided we estimated the length using google maps distance between the start and finish points of the relevant pipeline.
- ∅ This source is live and should be considered best available; it will allow for consistent tracking over time, assuming it is maintained.

Electricity

- ∅ As noted, *The Australian Infrastructure Statistics Yearbook* has not updated underground (or overground) line data since 2015; each subsequent Yearbook concludes at 2015. The 2015 data was presented in the 2018 report as the latest available.
- ∅ However, through the 2019 Yearbook (online), we accessed a database/spreadsheet of historical underground line data, by state, up to 2015.
- ∅ We decided to utilise the historical data to provide an estimate of underground line lengths through to 2020. We calculated the mean growth rates over the 4 to 6 years leading up to 2015, excluding outliers, and applied that mean growth to the years from 2016 through to 2020, to provide us with a current power line length estimate. The growth rates are considered conservative.

New sources

Water & Sewerage

- ∅ We utilised the database associated with the *Urban National Performance Report* from the Bureau of Meteorology.
- ∅ The database/spreadsheet provides both water and sewerage mains length for all lines connecting at least 10,000 properties.
- ∅ We sorted the information by state and summed the totals; data was available up to 2018.
- ∅ This source should be considered best available; it will allow for consistent tracking over time, assuming it is maintained.

Telecommunications

- ∅ As per 2018, there is no robust data relating to underground telecommunication cable length; our research in 2018 indicated electricity lines were the most accurate available to estimate telecommunications.

Kilometre length of underground assets - 2020

- ∅ The total length of underground assets across investigated segments is 794,525 km; this represents a 7.9% increase over the 2018 report.
- ∅ Underground asset length peaks at 228,021 km in New South Wales (29%), followed by Victoria (192,156 km; 24%) and Queensland (147,594 km; 19%).
- ∅ By segment, total kilometres range from a high 212,927 km (27%) for water pipes to 117,631 km (15%) for gas pipes.

2020 Report: Length of underground assets, cables and pipes (kms)

	NSW	VIC	QLD	SA	WA	TAS	NT	TOTAL
Gas ⁽¹⁾	35,673	33,569	13,770	10,561	19,165	1,444	3,449	117,631
Electricity ⁽²⁾	45,374	26,832	30,624	18,139	31,028	2,830	1,691	156,520
Telecoms ⁽²⁾	45,374	26,832	30,624	18,139	31,028	2,830	1,691	156,520
Water ⁽³⁾	52,394	65,422	40,040	28,271	18,635	6,327	1,838	212,927
Sewerage ⁽³⁾	49,205	39,501	32,536	8,977	14,910	4,747	1,052	150,928
Total	228,021	192,156	147,594	84,088	114,766	18,178	9,722	794,525

Sources:

(1) Australian Energy Market Commission (AEMC) Gas Pipeline Register

(2) Australian Infrastructure Statistics Yearbook 2019 database, combined with BIS Oxford Economics estimates

(3) Bureau of Meteorology, Urban National Performance Report database

Kilometre length of underground assets - 2018

∅ Expanse of underground assets as presented in the 2018 report:

2018 Report: Length of underground assets, cables and pipes (kms)

	NSW	VIC	QLD	SA	WA	TAS	NT	TOTAL
Gas ⁽¹⁾	33,389	32,325	9,141	9,655	19,867	1,464	2,269	108,110
Electricity ⁽²⁾	40,229	23,639	26,401	17,000	25,436	2,489	1,510	136,704
Telecoms	40,229	23,639	26,401	17,000	25,436	2,489	1,510	136,704
Water ⁽³⁾	50,902	63,724	38,976	27,393	18,283	6,231	1,869	207,378
Sewerage ⁽⁴⁾	47,458	39,269	31,334	9,240	14,835	4,435*	1,040	147,611
Total	212,207	182,596	132,253	80,288	103,857	17,108	8,198	736,507

Sources:

(1) Australian Energy Regulator (AER) State of Energy 2013

(2) Australian Infrastructure Statistics Yearbook 2017.

(3) Australian Infrastructure Statistics Yearbook 2017.

(4) Australian Infrastructure Statistics Yearbook 2017 and * TAS sewerage is an estimate as data not provided.

Change in extent of underground assets

- ∅ The following table indicates the change between the two research periods, 2018 and 2020.
- ∅ Please note, for electricity and telecommunications the data reported in the 2018 report was 2015 data; hence the table below is comparing our 2020 estimate with 2015 actual data, which explains the larger figures relative to gas, water and sewerage.

Length of underground assets, cables and pipes (kms) - Change 2018 to 2020 (%)

	NSW	VIC	QLD	SA	WA	TAS	NT	TOTAL
Gas	6.84	3.85	50.64	9.38	-3.54	-1.37	52.01	8.81
Electricity	12.79	13.51	16.00	6.70	21.99	13.70	12.01	14.50
Telecoms	12.79	13.51	16.00	6.70	21.99	13.70	12.01	14.50
Water	2.93	2.66	2.73	3.21	1.93	1.54	-1.66	2.68
Sewerage	3.68	0.59	3.84	-2.85	0.51	7.03	1.15	2.25
Total	7.45	5.24	11.60	4.73	10.50	6.25	18.59	7.88



Value of Underground Assets

- § Methodology
- § Key assumptions for estimating per kilometre construction costs
- § Per kilometre cost of constructing underground assets – 2020
- § Per kilometre cost of constructing underground assets – 2018
- § Change in cost of construction
- § Construction component breakdown
- § Total value of Australia's underground assets – 2020
- § Total value of Australia's underground assets – 2018
- § Change in total value

Methodology

Determining the value of Australia's underground assets

- Ø In 2018, after investigating a range of unsatisfactory and inconsistent options, we decided to engage a quantity surveyor (Capisce Qs) to provide construction cost estimates per kilometre for the five nominated underground assets (gas, electricity, telecommunications, water and sewerage).
- Ø Capisce Qs provided detailed analysis of the cost of construction across each segment.
- Ø To update our value estimate for the 2020 research, we once again engaged Capisce Qs to provide the latest cost estimates.
- Ø All basic assumptions across each sector (see Appendices) remain the same.
- Ø The total cost of construction included all elements of the process based on current market value and conditions. They are also based on construction in metropolitan areas (as opposed to greenfield or rural locations). And all pipes are assumed to be mains as opposed to service pipes to dwellings. For telecommunications fibre optic cable is assumed.
- Ø To obtain a final value for each underground asset segment, we multiplied the cost per kilometre of construction for each segment by the 2020 identified length of underground asset.

Key assumptions for estimating per kilometre construction cost

- ∅ The cost estimates of laying down the asset have been provided for the five segments; the estimates have been developed considering the unique factors and conditions specific to each segment.
- ∅ Total cost of construction per km, including all elements of the process, are based on current market value and conditions. The costs are estimated based on the individual materials used and conditions specific to each segment.
- ∅ Further, within each the cost of laying the pipes/cables vary according to many other factors such as location, segment, pipe diameter, subsurface conditions etc. Therefore, various assumption about the length, location and the size of the pipes/cables have been made.
- ∅ The basic assumptions for the laying down the assets are as follows:
 - q Costs allow for all material supply and installation, assuming project being let are in excess of 10km
 - q The services will be running through metropolitan roads, exclusive of CBDs and highways
 - q All services will be installed in isolation, with no allowance for common trenching
 - q Allowance was made for distribution only, with no allowance was made for customer connections
 - q For telecommunications, fibre optic cable was assumed, as opposed to copper
 - q For all pipes cost has been provided for mains as opposed to service pipes to dwellings
- ∅ Additional assumptions, specific to each segment are presented in the Appendices.

Per kilometre cost of constructing underground assets - 2020

- ∅ The cost estimates for constructing the underground assets are presented below. Costs across each segment are disaggregated into the following components:
- q Material and equipment supply
 - q Civil works and installation
 - q Road works
 - q On costs
- ∅ The total cost of constructing a kilometer of each underground asset segment are:
- q Water \$757,563
 - q Telecommunications \$226,933
 - q Sewerage \$608,691
 - q Gas \$216,576
 - q Electricity \$474,380

2020 Report: Per kilometre cost of constructing underground assets (\$)

	Gas	Electricity	Tele-communication	Water	Sewerage
Material and equipment supply	32,500	231,590	69,451	268,667	109,750
Civil and installation	96,539	121,067	68,655	284,898	321,469
Road Restoration	60,541	62,592	60,541	109,569	101,599
On costs	26,996	59,131	28,287	94,430	75,873
Total	\$216,576	\$474,380	\$226,933	\$757,563	\$608,691

Per kilometre cost of constructing underground assets - 2018

∅ Per kilometre costs as presented in the 2018 report:

2018 Report: Per kilometre cost of constructing underground assets (\$)

	Gas	Electricity	Tele-communication	Water	Sewerage
Material and equipment supply	32,500	213,950	64,950	238,667	78,000
Civil and installation	92,241	115,676	65,598	272,213	307,156
Road Restoration	57,845	59,805	57,845	104,690	97,075
On costs	26,000	55,455	26,827	87,657	68,670
Total	\$208,586	\$444,886	\$215,220	\$703,227	\$550,901

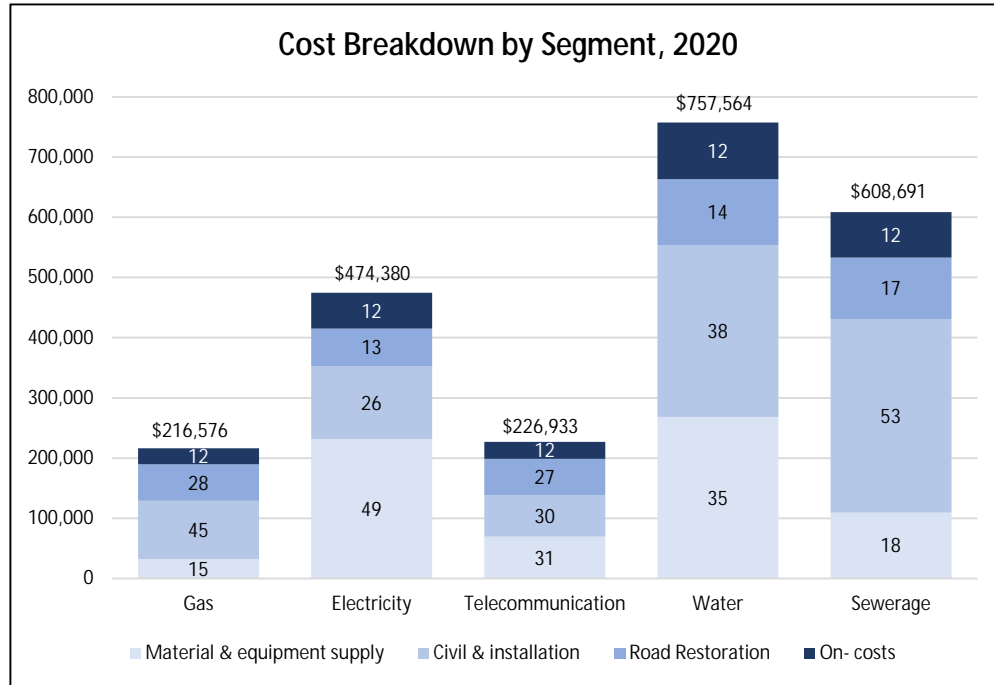
Change in per kilometre cost of underground assets

∅ The following table indicates the costs and percentage change between the two research periods, 2018 and 2020.

Per kilometre cost of constructing underground assets - Change 2018 to 2020 (\$)

	Gas	Electricity	Tele-communication	Water	Sewerage
Material and equipment supply	0	17,640	4,501	30,000	31,750
Civil and installation	4,298	5,391	2,957	12,685	14,313
Road Restoration	2,696	2,787	2,696	4,879	4,524
On costs	996	3,676	1,460	6,773	7,203
Total	7,990	29,494	11,713	54,336	57,790
Change 2018 to 2020	+ 3.8%	+ 6.6%	+ 5.4%	+ 7.7%	+ 10.5%

Construction component breakdown

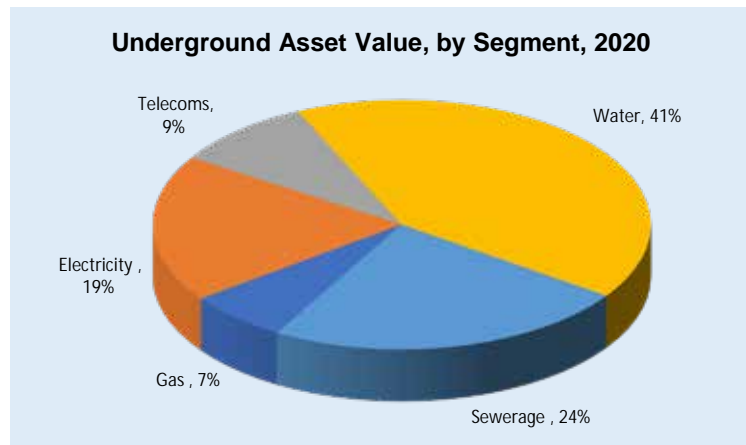


- ∅ The stacked bar chart highlights considerable variation of construction cost components across sectors.
- ∅ Material and equipment supply costs, range from a high 49% of electricity costs, down to just 15% of gas and 18% of sewerage costs.
- ∅ Civil works and installation reaches a peak of 53% of sewerage costs; this represents the highest proportion of costs across any segment.
- ∅ Road restoration peaks across gas and telecommunication (28% and 27% respectively).
- ∅ On costs record a consistent 12% across all five underground asset segments

Cost of construction component breakdown by segment, 2020 (%)

Description	Gas	Electricity	Tele-communication	Water	Sewerage
Material & equipment supply	15	49	31	35	18
Civil & installation	45	26	30	38	53
Road Restoration	28	13	27	14	17
On- costs	12	12	12	12	12
Total	100	100	100	100	100

Total value of Australia's underground assets - 2020



- ∅ The cost estimate of Australia's underground assets was calculated by multiplying segment construction costs per kilometre by the total length of each asset.
- ∅ The total value of underground assets at 2020 is estimated at \$388 billion, up from \$340 billion in 2018, on the back of increased length of assets and increased construction costs.
- ∅ Water assets account for a high \$161.3 billion or 41% of the total value, followed by sewerage (\$91.9 billion; 24%) and electricity (\$74.2 billion; 19%).
- ∅ Of the total assets, \$109.2 billion are located in New South Wales, \$99.7 billion in Victoria and \$74.6 billion across Queensland.
- ∅ By states and segment, water assets in Victoria record the highest value at \$49.6 billion.

Value of underground assets, 2020 (\$ millions)

	NSW	VIC	QLD	SA	WA	TAS	NT	TOTAL
Gas	7,725.9	7,270.2	2,982.3	2,287.3	4,150.6	312.7	747.0	25,475.9
Electricity	21,524.7	12,728.6	14,527.5	8,604.9	14,719.2	1,342.5	802.4	74,249.7
Telecoms	10,297.0	6,089.1	6,949.7	4,116.4	7,041.4	642.2	383.8	35,519.6
Water	39,691.8	49,561.4	30,332.9	21,417.1	14,117.2	4,793.1	1,392.4	161,305.8
Sewerage	29,950.6	24,043.9	19,804.4	5,464.2	9,075.6	2,889.5	640.3	91,868.5
Total	109,190.1	99,693.3	74,596.6	41,889.9	49,103.9	9,980.0	3,965.9	388,419.6

Total value of Australia's underground assets -2018

∅ The total value of underground assets as presented in the 2018 report:

Value of underground assets, 2018 (\$ millions)

	NSW	VIC	QLD	SA	WA	TAS	NT	TOTAL
Gas	6,964.5	6,742.5	1,906.7	2,013.9	4,144.0	305.4	473.3	22,550.2
Electricity	17,897.3	10,516.7	11,745.4	7,563.1	11,316.1	1,107.3	671.8	60,817.7
Telecoms	8,658.1	5,087.6	5,682.0	3,658.7	5,474.3	535.7	325.0	29,421.4
Water	35,795.7	44,812.4	27,409.0	19,263.5	12,857.1	4,381.8	1,314.3	145,833.8
Sewerage	26,144.7	21,633.3	17,261.9	5,090.3	8,172.6	2,443.2	572.9	81,319.0
Total	95,460.2	88,792.6	64,005.1	37,589.5	41,964.1	8,773.4	3,357.3	339,942.2

Change in total value of underground assets

Ø The following table indicates the change in total value of underground assets between the two research periods, 2018 and 2020.

Value of underground assets - Change 2018 to 2020 (\$ millions)

	NSW	VIC	QLD	SA	WA	TAS	NT	TOTAL
Gas	761.4	527.7	1,075.6	273.4	6.6	7.4	273.7	2,925.7
Electricity	3,627.4	2,212.0	2,782.0	1,041.8	3,403.0	235.1	130.6	13,432.0
Telecoms	1,638.9	1,001.5	1,267.6	457.7	1,567.0	106.5	58.8	6,098.2
Water	3,896.1	4,748.9	2,923.9	2,153.6	1,260.1	411.3	78.1	15,472.0
Sewerage	3,806.0	2,410.6	2,542.4	373.9	903.0	446.2	67.4	10,549.5
Total	13,729.9	10,900.7	10,591.6	4,300.4	7,139.7	1,206.5	608.6	48,477.4
Change	+ 14.4%	+ 12.3%	+ 16.5%	+ 11.4%	+ 17.0%	+ 13.8%	+ 18.1%	+ 14.3%



Appendices

- § Gas cost breakdown & assumptions
- § Electricity cost breakdown & assumptions
- § Telecommunication cost breakdown & assumptions
- § Water cost breakdown & assumptions
- § Sewerage cost breakdown & assumptions
- § 2018 cost breakdown

Gas construction cost breakdown & assumptions 2020...

- Ø Allowance for single DN150 pipeline
- Ø Assumption the pipe will be Polyethylene and not steel
- Ø Isolation valves allowed for at every 1km
- Ø No allowance for any pressure or flow monitoring to pipeline

Gas - 2020					
Distribution pipework, laid in road					
Assume the use of a 150mm HDPE Pipe using open trenching. The cost shall allow for the provision of butt welded joints per 100m.					
Description	Quantity	Unit	Rate	Total	Comment
Material and Equipment Supply					
Supply DN150 HDPE pipe	1,000	m	30	30,000	
Supply marker warning tape	1,000	m	1	1,000	
Isolation Valves	1	ea	1,500	1,500	1 per 1km
Sub-Total for Material and Equipment Supply	1,000	m	33	32,500	
Civil and Installation					
Trenching, 600mm wide, 1200mm deep	720	m3	59	42,199	
50mm sand bedding	30	m3	31	942	
Laying pipes, inclusive of valves	1,000	m	42	41,864	
Backfill around with selected fill - 150mm above pipe	162	m3	28	4,587	
Backfill with excavated material	520	m3	13	6,528	
Surface Marker	10	ea	42	419	spaced at 100m
Sub-Total for Civil and Installation	1,000	m	97	96,539	
Road Restoration					
Saw cut existing site	2,000	m	5	10,466	
Remove existing asphalt	600	m2	9	5,652	
175mm PM2 sub-base	105	m3	65	6,813	
175mm PM1 base course	105	m3	78	8,242	
50mm Asphalt	72	tonne	293	21,099	
Traffic management	11	days	1,026	11,282	
Credit on backfill	-240	m3	13	-3,014	
Sub-Total for Road Restoration	1,000	m	61	60,541	
On Costs					
Testing & commissioning	1	item	3,792	3,792	
Contractor Preliminaries - 12%	1	item	23,205	23,205	
Sub-Total for On Costs	1,000	m	27	26,996	
TOTAL - Contract Cost - Gas	1,000	m	216.58	216,576	

Electricity construction cost breakdown & assumptions 2020...

- Ø It was assumed that there is no requirement for thermal fill for electrical trench backfill
- Ø Allowance for single DN150 conduit, no allowance for any spare conduit
- Ø Allowance was made for cable pits every 500m
- Ø Allowance was made for a Ring Main Unit every 3km
- Ø Allowance was made for inline joints every 1km
- Ø No allowance was made for terminations at either end of the cable
- Ø No allowance for transformers or substations

Electricity - 2020					
Description	Quantity	Unit	Rate	Total	Comment
33kV underground cable is to be installed within road using 240mm2 33kV Cu XLPE 3 core cable. Assume the use of a 150mm PVC conduit using open trenching. The cost shall allow for the provision of at least one set of straight joints per km and pits at 500m.					
Material and Equipment Supply					
Supply DN150 PVC power conduit	1,000	m	17	17,255	
Supply marker warning tape	1,000	m	1	1,000	
Supply 240mm2 33kV CU 3 Core Cable	1,050	m	182	190,575	5% allowed for waste & bends
Supply cable pits & lids	2	ea	750	1,500	1 per 500m
Supply Ring Main Unit	0.33	ea	60,000	20,000	1 per 3km
Inline Jointing Kit	1	ea	1,260	1,260	1 per 1km
Sub-Total for Material and Equipment Supply	1,000	m	232	231,590	
Civil and Installation					
Trenching, 600mm wide, 1700mm deep	1,020	m3	59	59,782	
Shoring drag box	1,000	m	6	6,280	
50mm sand bedding	30	m3	31	942	
Laying conduit & installing pits	1,000	m	8	8,373	
Backfill around with selected fill - 50mm above conduit	102	m3	28	2,892	
Backfill with excavated material	870	m3	13	10,927	
Pull cable	1,000	m	28	28,258	
Completing inline jointing	1	ea	2,512	2,512	
Installation of ring main units	0.33	ea	2,051	684	
Surface Marker	10	ea	42	419	spaced at 100m
Sub-Total for Civil and Installation	1,000	m	121	121,067	
Road Restoration					
Saw cut existing site	2,000	m	5	10,466	
Remove existing asphalt	600	m2	9	5,652	
175mm PM2 sub-base	105	m3	65	6,813	
175mm PM1 base course	105	m3	78	8,242	
50mm Asphalt	72	tonne	293	21,099	
Traffic management	13	days	1,026	13,334	
Credit on backfill	-240	m3	13	-3,014	
Sub-Total for Road Restoration	1,000	m	63	62,592	
On Costs					
Testing & commissioning	1	item	8,305	8,305	
Contractor Preliminaries - 12%	1	item	50,826	50,826	
Sub-Total for On Costs	1,000	m	59	59,131	
TOTAL - Contract Cost - Power	1,000	m	474.38	474,380	

Telecommunication construction costs breakdown & assumptions 2020...

- ∅ Allowance for single DN100 conduit, no allowance for any spare conduit
- ∅ Allowance was made for cable pits every 500m
- ∅ Allowance was made for inline joints every 2km
- ∅ No allowance was made for terminations at either end of the cable
- ∅ No allowance was made for any booster amplifiers

Telecommunication - 2020					
Communication conduit laid in road, with 432 core ribbon fibre Assume the use of a 100mm PVC communications conduit using open trenching. The cost shall allow for the provision of at least one set of straight joints per 2km and pits at 500m.					
Description	Quantity	Unit	Rate	Total	Comment
Material and Equipment Supply					
Supply DN100 PVC communications conduit	1,000	m	8	8,120	
Supply marker warning tape	1,000	m	1	1,000	
Supply 432 core ribbon fibre	1,050	m	56	58,968	5% allowed for waste & bends
Supply cable pits & lids	2	ea	550	1,100	1 per 500m
Inline Jointing Kit	0.50	ea	525	263	1 per 1km
Sub-Total for Material and Equipment Supply	1,000	m	69	69,451	
Civil and Installation					
Trenching, 600mm wide, 1150mm deep	690	m3	59	40,441	
50mm sand bedding	30	m3	31	942	
Laying conduit & installing pits	1,000	m	7	6,698	
Backfill around with selected fill - 50mm above conduit	82	m3	28	2,321	
Backfill with excavated material	570	m3	13	7,159	
Pull cable	1,000	m	7	7,326	
Completing inline jointing	1	ea	6,698	3,349	
Surface Marker	10	ea	42	419	spaced at 100m
Sub-Total for Civil and Installation	1,000	m	69	68,655	
Road Restoration					
Saw cut existing site	2,000	m	5	10,466	
Remove existing asphalt	600	m2	9	5,652	
175mm PM2 sub-base	105	m3	65	6,813	
175mm PM1 base course	105	m3	78	8,242	
50mm Asphalt	72	tonne	293	21,099	
Traffic management	11	days	1,026	11,282	
Credit on backfill	-240	m3	13	-3,014	
Sub-Total for Road Restoration	1,000	m	61	60,541	
On Costs					
Testing & commissioning	1	item	3,973	3,973	
Contractor Preliminaries - 12%	1	item	24,314	24,314	
Sub-Total for On Costs	1,000	m	28	28,287	
TOTAL - Contract Cost - Telecommunications	1,000	m	226.93	226,933	

Water construction cost breakdown & assumptions 2020...

- Ø Allowance for PN16 pipework
- Ø Isolation valves allowed at 5,000m spacing
- Ø Air valves allowed at 600m spacing
- Ø Scour/hydrant valves allowed at 500m spacing
- Ø No allowance for pumping stations or water storages
- Ø No allowance for surge mitigation has been allowed (either PSV's or Surge vessels)
- Ø No allowance for any pressure or flow monitoring to pipeline

Water - 2020					
Pressure pipeline, laid in road Assuming the use of 600mm DN600 GRP pipe using open trenching average cover of 1.2m. The cost shall allow for the provision of stop valves at 5km.					
Description	Quantity	Unit	Rate	Total	Comment
Material and Equipment Supply					
Supply DN600 GRP pipe	1,000	m	240	240,000	
Supply marker warning tape	1,000	m	1	1,000	
Air Valves, including all fittings	1.7	ea	3,400	5,667	Spaced at 600m
Scour Valve / Fire Plugs, including all fittings	2.0	ea	7,500	15,000	Spaced at 500m
Isolation Valve, including all fittings	0.2	ea	35,000	7,000	1 per 5km
Sub-Total for Material and Equipment Supply	1,000	m	269	268,667	
Civil and Installation					
Trenching, 1200mm wide, 1900mm deep	2,280	m3	59	133,630	
Shoring drag box	1,000	m	10	10,466	
100mm sand bedding	120	m3	31	3,768	
Laying pipes	1,000	m	92	92,101	
Installation of isolation valves	0.2	ea	15,699	3,140	including thrust restraints
Installation of air valves	1.7	ea	1,675	2,791	
Installation of scour valves	2.0	ea	3,977	7,954	
Backfill around with selected fill - 300mm above pipe	617	m3	28	17,443	
Backfill with excavated material	1,260	m3	10	13,187	
Surface Marker	10	ea	42	419	spaced at 100m
Sub-Total for Civil and Installation	1,000	m	285	284,898	
Road Restoration					
Saw cut existing site	2,000	m	5	10,466	
Remove existing asphalt	1,200	m2	9	11,303	
175mm PM2 sub-base	210	m3	65	13,627	
175mm PM1 base course	210	m3	78	16,484	
50mm Asphalt	144	tonne	293	42,199	
Traffic management	20	days	1,026	20,513	
Credit on backfill	-480	m3	10	-5,024	
Sub-Total for Road Restoration	1,000	m	110	109,569	
On Costs					
Testing & commissioning	1	item	13,263	13,263	
Contractor Preliminaries - 12%	1	item	81,167	81,167	
Sub-Total for On Costs	1,000	m	94	94,430	
TOTAL - Contract Cost - Water	1,000	m	757.56	757,563	

Sewerage construction costs breakdown & assumptions 2020...

- Ø Allowance for gravity main
- Ø Manholes allowed at 500m spacing
- Ø Assuming average depth of cover of 2m
- Ø No allowance for re-lift pumping stations
- Ø No allowance for vents or odour mitigation

Sewer - 2020					
Gravity pipeline, laid in road					
Assume the use of a 450mm RC Pipe using open trenching with average cover of 2m, The cost shall allow for the provision of manholes at 500m.					
Description	Quantity	Unit	Rate	Total	Comment
Material and Equipment Supply					
Supply DN450 RCP pipe	1,000	m	100	100,000	
Supply marker warning tape	1,000	m	1	1,000	
Manhole allowance	2	ea	4,375	8,750	1 per 1km
Sub-Total for Material and Equipment Supply	1,000	m	110	109,750	
Civil and Installation					
Trenching, 1000mm wide, 2550mm deep	2,550	m3	59	149,454	
Shoring drag box	1,000	m	14	13,606	
100mm sand bedding	100	m3	31	3,140	
Laying pipes, inclusive of valves	1,000	m	117	117,219	
Installation of manhole	2	ea	1,570	3,140	
Backfill around with selected fill - 300mm above pipe	591	m3	28	16,699	
Backfill with excavated material	1,700	m3	10	17,792	
Surface Marker	10	ea	42	419	spaced at 100m
Sub-Total for Civil and Installation	1,000	m	321	321,469	
Road Restoration					
Saw cut existing site	2,000	m	5	10,466	
Remove existing asphalt	1,000	m2	9	9,419	
175mm PM2 sub-base	175	m3	65	11,356	
175mm PM1 base course	175	m3	78	13,737	
50mm Asphalt	120	tonne	293	35,166	
Traffic management	25	days	1,026	25,642	
Credit on backfill	-400	m3	10	-4,186	
Sub-Total for Road Restoration	1,000	m	102	101,599	
On Costs					
Testing & commissioning	1	item	10,656	10,656	
Contractor Preliminaries - 12%	1	item	65,217	65,217	
Sub-Total for On Costs	1,000	m	76	75,873	
TOTAL - Contract Cost - Sewer	1,000	m	608.69	608,691	

Gas construction cost breakdown 2018...

Gas - 2018					
Distribution pipework, laid in road					
Assume the use of a 150mm HDPE Pipe using open trenching. The cost shall allow for the provision of butt welded joints per 100m.					
Description	Quantity	Unit	Rate	Total	Comment
Material and Equipment Supply...					
Supply DN150 HDPE pipe	1,000	m	30	30,000	
Supply marker warning tape	1,000	m	1	1,000	
Isolation Valves	1	ea	1,500	1,500	1 per 1km
Sub Total for Material and Equipment Supply	1,000	m	33	32,500	
Civil and Installation...					
Trenching, 600mm wide, 1200mm deep	720	m3	56	40,320	
50mm sand bedding	30	m3	30	900	
Laying pipes, inclusive of valves	1,000	m	40	40,000	
Backfill around with selected fill - 150mm above pipe	162	m3	27	4,383	
Backfill with excavated material	520	m3	12	6,238	
Surface Marker	10	ea	40	400	spaced at 100m
Sub Total for Civil and Installation	1,000	m	92	92,241	
Road Restoration...					
Saw cut existing site	2,000	m	5	10,000	
Remove existing asphalt	600	m2	9	5,400	
175mm PM2 sub-base	105	m3	62	6,510	
175mm PM1 base course	105	m3	75	7,875	
50mm Asphalt	72	tonne	280	20,160	
Traffic management	11	days	980	10,780	
Credit on backfill	-240	m3	12	-2,880	
Sub Total for Road Restoration	1,000	m	58	57,845	
On Costs...					
Testing & commissioning	1	item	3,652	3,652	
Contractor Preliminaries - 12%	1	item	22,348	22,348	
Sub Total On Costs	1,000	m	26	26,000	
TOTAL - Contract Cost - Gas	1,000	m	209	208,586	

Electricity construction cost breakdown 2018...

Electricity - 2018					
33kV underground cable is to be installed within road using 240mm ² 33kV Cu XLPE 3 core cable.					
Assume the use of a 150mm PVC conduit using open trenching. The cost shall allow for the provision of at least one set of straight joints per km and pits at 500m.					
Description	Quantity	Unit	Rate	Total	Comment
<i>Material and Equipment Supply...</i>					
Supply DN150 PVC power conduit	1,000	m	17	17,000	
Supply marker warning tape	1,000	m	1	1,000	
Supply 240mm ² 33kV CU 3 Core Cable	1,050	m	165	173,250	5% allowed for waste & bends
Supply cable pits & lids	2	ea	750	1,500	1 per 500m
Supply Ring Main Unit	0.33	ea	60,000	20,000	1 per 3km
Inline Jointing Kit	1	ea	1,200	1,200	1 per 1km
Sub Total for Material and Equipment Supply	1,000	m	214	213,950	
<i>Civil and Installation...</i>					
Trenching, 600mm wide, 1700mm deep	1,020	m ³	56	57,120	
Shoring drag box	1,000	m	6	6,000	
50mm sand bedding	30	m ³	30	900	
Laying conduit & installing pits	1,000	m	8	8,000	
Backfill around with selected fill - 50mm above conduit	102	m ³	27	2,763	
Backfill with excavated material	870	m ³	12	10,440	
Pull cable	1,000	m	27	27,000	
Completing inline jointing	1	ea	2,400	2,400	
Installation of ring main units	0.33	ea	1,960	653	
Surface Marker	10	ea	40	400	spaced at 100m
Sub Total for Civil and Installation	1,000	m	116	115,676	
<i>Road Restoration...</i>					
Saw cut existing site	2,000	m	5	10,000	
Remove existing asphalt	600	m ²	9	5,400	
175mm PM2 sub-base	105	m ³	62	6,510	
175mm PM1 base course	105	m ³	75	7,875	
50mm Asphalt	72	tonne	280	20,160	
Traffic management	13	days	980	12,740	
Credit on backfill	-240	m ³	12	-2,880	
Sub Total for Road Restoration	1,000	m	60	59,805	
<i>On Costs...</i>					
Testing & commissioning	1	item	7,789	7,789	
Contractor Preliminaries - 12%	1	item	47,666	47,666	
Sub Total On Costs	1,000	m	55	55,455	
TOTAL - Contract Cost - Power	1,000	m	445	444,886	

Telecommunication construction cost breakdown 2018 ...

Telecommunication - 2018					
Communication conduit laid in road, with 432 core ribbon fibre					
Assume the use of a 100mm PVC communications conduit using open trenching, The cost shall allow for the provision of at least one set of straight joints per 2km and pits at 500m.					
Description	Quantity	Unit	Rate	Total	Comment
<i>Material and Equipment Supply...</i>					
Supply DN100 PVC communications conduit	1,000	m	8	8,000	
Supply marker warning tape	1,000	m	1	1,000	
Supply 432 core ribbon fibre	1,050	m	52	54,600	5% allowed for waste & bends
Supply cable pits & lids	2	ea	550	1,100	1 per 500m
Inline Jointing Kit	0.50	ea	500	250	1 per 1km
Sub Total for Material and Equipment Supply	1,000	m	65	64,950	
<i>Civil and Installation...</i>					
Trenching, 600mm wide, 1150mm deep	690	m3	56	38,640	
50mm sand bedding	30	m3	30	900	
Laying conduit & installing pits	1,000	m	6	6,400	
Backfill around with selected fill - 50mm above conduit	82	m3	27	2,218	
Backfill with excavated material	570	m3	12	6,840	
Pull cable	1,000	m	7	7,000	
Completing inline jointing	1	ea	6,400	3,200	
Surface Marker	10	ea	40	400	spaced at 100m
Sub Total for Civil and Installation	1,000	m	66	65,598	
<i>Road Restoration...</i>					
Saw cut existing site	2,000	m	5	10,000	
Remove existing asphalt	600	m2	9	5,400	
175mm PM2 sub-base	105	m3	62	6,510	
175mm PM1 base course	105	m3	75	7,875	
50mm Asphalt	72	tonne	280	20,160	
Traffic management	11	days	980	10,780	
Credit on backfill	-240	m3	12	-2,880	
Sub Total for Road Restoration	1,000	m	58	57,845	
<i>On Costs...</i>					
Testing & commissioning	1	item	3,768	3,768	
Contractor Preliminaries - 12%	1	item	23,059	23,059	
Sub Total On Costs	1,000	m	27	26,827	
TOTAL - Contract Cost - Telecommunications	1,000	m	215	215,220	

**Water construction cost breakdown
2018...**

Water - 2018					
Pressure pipeline, laid in road					
Assuming the use of 600mm DN600 GRP pipe using open trenching average cover of 1.2m, The cost shall allow for the provision of stop valves at 5km.					
Description	Quantity	Unit	Rate	Total	Comment
Material and Equipment Supply...					
Supply DN600 GRP pipe	1,000	m	210	210,000	
Supply marker warning tape	1,000	m	1	1,000	
Air Valves, including all fittings	1.7	ea	3,400	5,667	Spaced at 600m
Scour Valve / Fire Plugs, including all fittings	2.0	ea	7,500	15,000	Spaced at 500m
Isolation Valve, including all fittings	0.2	ea	35,000	7,000	1 per 5km
Sub Total for Material and Equipment Supply	1,000	m	239	238,667	
Civil and Installation...					
Trenching, 1200mm wide, 1900mm deep	2,280	m3	56	127,680	
Shoring drag box	1,000	m	10	10,000	
100mm sand bedding	120	m3	30	3,600	
Laying pipes	1,000	m	88	88,000	
Installation of isolation valves	0.2	ea	15,000	3,000	including thrust restraints
Installation of air valves	1.7	ea	1,600	2,667	
Installation of scour valves	2.0	ea	3,800	7,600	
Backfill around with selected fill - 300mm above pipe	617	m3	27	16,666	
Backfill with excavated material	1,260	m3	10	12,600	
Surface Marker	10	ea	40	400	spaced at 100m
Sub Total for Civil and Installation	1,000	m	272	272,213	
Road Restoration...					
Saw cut existing site	2,000	m	5	10,000	
Remove existing asphalt	1,200	m2	9	10,800	
175mm PM2 sub-base	210	m3	62	13,020	
175mm PM1 base course	210	m3	75	15,750	
50mm Asphalt	144	tonne	280	40,320	
Traffic management	20	days	980	19,600	
Credit on backfill	-480	m3	10	-4,800	
Sub Total for Road Restoration	1,000	m	105	104,690	
On Costs...					
Testing & commissioning	1	item	12,311	12,311	
Contractor Preliminaries - 12%	1	item	75,346	75,346	
Sub Total On Costs	1,000	m	88	87,657	
TOTAL - Contract Cost - Water	1,000	m	703	703,226	

Sewerage construction cost breakdown 2018...

Sewer - 2018					
Gravity pipeline, laid in road					
Assume the use of a 450mm RC Pipe using open trenching with average cover of 2m, The cost shall allow for the provision of manholes at 500m.					
Description	Quantity	Unit	Rate	Total	Comment
Material and Equipment Supply...					
Supply DN450 RCP pipe	1,000	m	70	70,000	
Supply marker warning tape	1,000	m	1	1,000	
Manhole allowance	2	ea	3,500	7,000	1 per 1km
Sub Total for Material and Equipment Supply	1,000	m	78	78,000	
Civil and Installation...					
Trenching, 1000mm wide, 2550mm deep	2,550	m3	56	142,800	
Shoring drag box	1,000	m	13	13,000	
100mm sand bedding	100	m3	30	3,000	
Laying pipes, inclusive of valves	1,000	m	112	112,000	
Installation of manhole	2	ea	1,500	3,000	
Backfill around with selected fill - 300mm above pipe	591	m3	27	15,956	
Backfill with excavated material	1,700	m3	10	17,000	
Surface Marker	10	ea	40	400	spaced at 100m
Sub Total for Civil and Installation	1,000	m	307	307,156	
Road Restoration...					
Saw cut existing site	2,000	m	5	10,000	
Remove existing asphalt	1,000	m2	9	9,000	
175mm PM2 sub-base	175	m3	62	10,850	
175mm PM1 base course	175	m3	75	13,125	
50mm Asphalt	120	tonne	280	33,600	
Traffic management	25	days	980	24,500	
Credit on backfill	-400	m3	10	-4,000	
Sub Total for Road Restoration	1,000	m	97	97,075	
On Costs...					
Testing & commissioning	1	item	9,645	9,645	
Contractor Preliminaries - 12%	1	item	59,025	59,025	
Sub Total On Costs	1,000	m	69	68,670	
TOTAL - Contract Cost - Sewer	1,000	m	551	550,901	



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