Goldenfields Water

Water Main Design and Construction Specification

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INFORMATION ABOUT THIS DOCUMENT

Date Adopted:	
Document Responsibility:	**Engineering Manager**

DOCUMENT HISTORY

DOCUMENT NO.	DATE AMENDED	SUMMARY OF CHANGES
1	20/01/2021	First Revision

FURTHER DOCUMENT INFORMATION AND RELATIONSHIPS

Related Legislation	NSW Local Government Act 1993 Local Government Amendment Bill 2019 NSW Local Government General Regulation 2005 WHS Act 2011 WHS Regulation 2017 Environmental Protection and Biodiversity Conservation Act 1999 Protection of the Environment Administration Act
Related Standards	WSAA Codes AS/NZS 2566.2:2002 Buried flexible pipeline Installation
Related Goldenfields Water Policies	PP007 Water Connection Policy PP008 Developer Charges Policy PP032 Easement and Acquisition Policy
Related Goldenfields Water Information	Water Service Connection Application Goldenfields Water Water Main Contractor List

Contents

DEFINITIONS

Contractor – Refers to a consultant or contractor engaged by the Developer to undertake design, construction or otherwise of the Water Supply Works

Developer – Refers to the Developer or owner requesting a service connection

Water Main Contractor List – Goldenfields Water maintains a list of Contractors that are approved to undertake the construction of Water Mains that will become the property of Goldenfields Water. This list can be found on Goldenfields Water's website

Water Service Connection Application – An application to connect to Goldenfields Water's existing water supply network. This form can be found on Goldenfields Water's website.

Water Supply Works – Any water supply augmentation works required to provide suitable supply to the development.

1 GENERAL

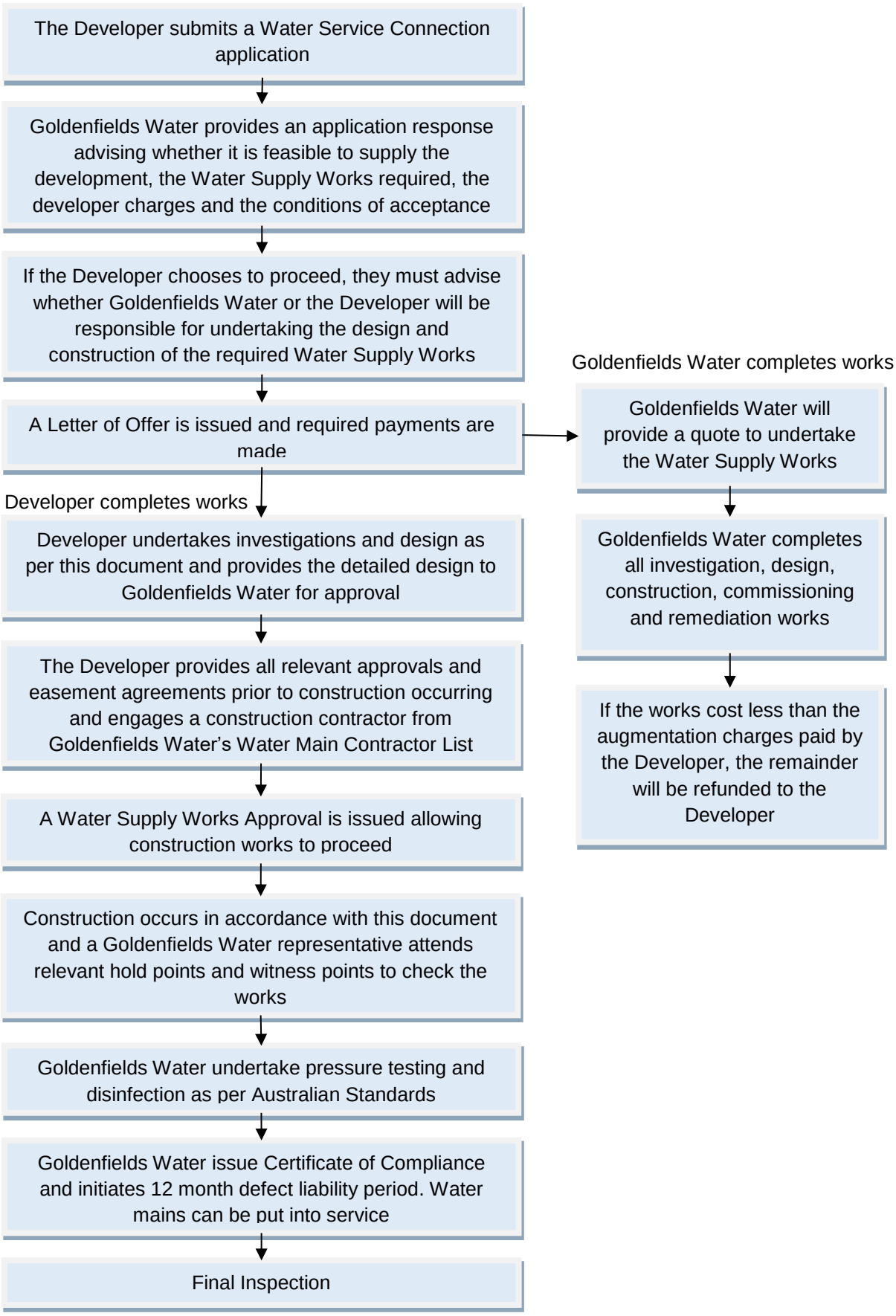
These specifications detail procedures and requirements for the design, construction and acceptance of water supply infrastructure built by others for incorporation into the systems controlled by Goldenfields Water.

The responsibility for adhering to this document lies with the Developer. Consultants and Contractors undertaking any works related to the requirements of this document are engaged by the Developer and are the responsibility of the Developer. Goldenfields Water will not become involved in any disputes between the Developer and their consultants and/or contractors.

These guidelines are additional requirements to the WSAA Water Supply Code of Australia Standards. In general, water mains shall comply with the Water Supply Code and AS/NZS 2566.2:2002 Buried flexible pipeline Installation.

All operation of Goldenfields Water's infrastructure by an external party is prohibited, including isolation valves, control valves, etc unless under the direct supervision of Goldenfields Water's nominated staff member/s for the project.

2 PROCESS


The Developer submits a Water Service Connection application
Goldenfields Water provides an application response advising whether it is feasible to supply the development, the Water Supply Works required, the developer charges and the conditions of acceptance
If the Developer chooses to proceed, they must advise whether Goldenfields Water or the Developer will be responsible for undertaking the design and construction of the required Water Supply Works
A Letter of Offer is issued and required payments are made
Goldenfields Water completes works
Goldenfields Water will provide a quote to undertake the Water Supply Works
Goldenfields Water completes all investigation, design, construction, commissioning and remediation works
If the works cost less than the augmentation charges paid by the Developer, the remainder will be refunded to the Developer
Developer completes works
Developer undertakes investigations and design as per this document and provides the detailed design to Goldenfields Water for approval
The Developer provides all relevant approvals and easement agreements prior to construction occurring and engages a construction contractor from Goldenfields Water's Water Main Contractor List
A Water Supply Works Approval is issued allowing construction works to proceed
Construction occurs in accordance with this document and a Goldenfields Water representative attends relevant hold points and witness points to check the works
Goldenfields Water undertake pressure testing and disinfection as per Australian Standards
Goldenfields Water issue Certificate of Compliance and initiates 12 month defect liability period. Water mains can be put into service
Final Inspection

3 SAFETY AND ENVIRONMENTAL MANAGEMENT SYSTEMS

The Contractor must comply with relevant WHS and environmental management legislation as well as any additional requirements as required by the relevant consent authority. This may include additional controls and documentation such as traffic control plans and/or a Review of Environmental Factors etc if required by the consent authority.

4 DESIGN

4.1 General

- The preference if for Water Supply Works to be constructed within the road reserve. Where this is not possible, the Developer must arrange for easements in favour of Goldenfields Water County Council and suitable access for Goldenfields Water to undertake maintenance
- Designs are to be in accordance with WSAA guidelines, relevant Australian Standards and other as noted within this document
- The designs must include both a plan view and a long section showing all pipework, fittings and ancillary features required to complete the works.
- The minimum pipeline diameter is 100mm except where Goldenfields Water staff have provided approval for a smaller diameter
- The design will include suitable connection details to existing Goldenfields Water infrastructure, tees, dead ends etc
- Thrust blocks are required at all bends, valves, tees, and end caps. The designs must clearly note the size of the thrust blocks required. Refer to Appendix A – Goldenfields Water Standard Drawings, Thrust Block Dimensions & Locations.

4.2 Service Location and relevant objects

All relevant services are to be located and shown on the design drawings. This includes undertaking a Dial Before You Dig, contacting the relevant local councils and contacting Goldenfields Water to determine approximate locations. Where services are in close proximity to the proposed construction works, on site location is required.

In addition to existing services, the design must show the following features

- Road features such as back of kerb or edge of bitumen and driveways
- Fence and lot boundaries
- Significant trees to be removed
- Existing valve or pit locations

4.3 Minimum cover and conduits

- DICL water pipeline in carriageways – minimum 600mm cover
- DICL and PVC water pipeline in non trafficable locations - minimum 450mm cover
- Services under 50mm in carriage ways - minimum 600mm cover
- Services under 50mm in non trafficable locations – minimum 450mm cover
- For services 50mm or larger use relevant cover for water pipelines

All levels are below the top of finished kerb level, or in the case of rural subdivisions, below edge of kerb/road shoulder. For water pipelines outside roadways levels shall be below final surface level.

Water service connections that cross roadways are to be placed in a conduit. Conduits shall be under bored in existing roads. Conduits shall be 100 mm PVC pipe of at least storm water quality (AS 1254).

Conduits shall have 600 mm cover under roads and are to extend 300 mm beyond the back of the kerb. Where no kerb is to be installed the conduit shall be installed 450 mm below the invert of the table drain,

and extend 1000 mm beyond the drain.

The conduit shall be installed so that it faces the boundary of 2 lots to enable 2 water services to be laid in the same conduit.

4.4 Underbores

Where required by the relevant authority or opted for by the Developer/Contractor, the design shall include details of the underbore such as the start and end locations, depth, sizing and method of underboring.

4.5 Customer Service Connections

The standard residential water service connection size is 20mm. All services will be laid at 90 degrees to the Water Supply Works so as to give an indication where the service lies relative to the location of the water meter.

4.6 Pressure Reducing Valves

All services that are connected to the Water Supply Works with an operating pressure **GREATER** than 90 metres head (900kpa) are to include a pressure reducing device prior to the meter. The pressure reducing device must be in accordance with Goldenfields Water's preferred device. Check with the Engineering Department for more details.

4.7 Pressure testing and disinfection of points

Suitable connection points shall be included to allow for pressure testing and disinfection of pipelines to occur. This is typically hydrants placed at the start and end of the development or suitable 25mm connection points. The determination of requirements will be made during the design review and approval phase in consultation with Goldenfields Water's Engineering Department.

4.8 Format of designs

- The detailed designs are to be provided in both pdf and unlocked CAD 2018 formats
- The designs must be in georeferenced in GDA co-ordinate system GDA 20, Zone 55
- Levels must be noted in Australian Height Datum (AHD)

5 WATER SUPPLY WORKS APPROVAL

A Water Supply Works Approval will be issued under Section 13 of the Local Government (General) Regulation 2005 once the following items have been completed.

5.1 Design Approval

Detailed designs to undertake the Water Supply Works are completed in accordance with this document. and have been approved by Goldenfields Water engineering staff. Where designs are not completed in accordance with this document Goldenfields Water staff will request changes to be made. If this occurs, updated designs with the incorporated changes must be provided to Goldenfields Water for approval prior to a Water Supply Works Approval being issued.

5.2 Agreements

The Developer must supply to Goldenfields Water:

- Written agreements for permission for the construction of the pipelines by other authorities such as road and rail authorities as required by the design.
- Signed easement agreements where the pipeline is to be constructed in private property

- Written agreement for a contractor from Goldenfields Water's Water Main Contractor List to undertake the construction works

5.3 Payments

The following payments/deposits as per Goldenfields Water fees and charges prior to the Water Supply Works Approval being issued.

- Design review
- Site inspections (Minimum of 4 required, however depending on design and staging, additional may be required)
- Pressure testing
- Disinfection
- Cutting in of new mains

In addition to the above payments a defects liability bond equal to 5% of the total cost of civil works shall be paid in the form of a deposit or bank guarantee. The total cost of civil works shall be calculated based on the length of pipeline multiplied by Goldenfields Water's relevant unit rate. The bond shall be held for the duration of the construction and defects liability period.

6 CONSTRUCTION

6.1 General Conditions

The Developer can only engage a Contractor that is on Goldenfields Water's Water Main Contractor List. Contractors that are not currently on the list may request to be added to the list.

The Developer shall be responsible for ensuring their engaged contractor meets all relevant legislative requirements and have suitable insurance such as Public Liability Insurance and Workers Compensation Insurance.

The Contractor shall keep the site of the works clean and tidy at all times and pay continuous attention to the removal of litter, waste materials, garbage and refuse. Under no circumstances shall the Contractor dispose of any material or goods, construction debris, rubbish or like material on or around the site. All such materials shall be removed from the site regularly and disposed of by the Contractor at its own expense.

The Contractor must make the site available to inspection by Goldenfields Water staff at all times. Goldenfields Water have set hold and witness points that the Contractor must adhere to as noted below in section 6.4. Notification of achieving hold and witness points is required at least 48 hours prior on business days.

6.2 Interconnection

Once all required documentation is received and approved, Goldenfields Water staff will provide a connection point for construction. Goldenfields Water will undertake works required to connect to the existing live water mains. Such work will be at the expense of the Developer and charged at actual cost.

The starting point shall normally consist of a flanged stop valve of the same class and size as the existing main. **The Contractor shall not, in any circumstances operate the stop valve or use water from the connection point as this presents a contamination risk to Goldenfields Water.**

6.3 Variation to designs

Where a variation to the design is proposed, approval of Goldenfields Water is to be obtained in writing prior to construction occurring. Unapproved variations may need to be rectified at the Developer's cost.

6.4 Hold and Witness Points

The Contractor must provide 2 business days' notice to the relevant Goldenfields Water staff member of meeting a hold or witness point. The Contractor must make the point available for inspection between the hours of 8:30-4:30 Monday to Friday.

Failure to provide Goldenfields Water with the required notice may result in delays or the Contractor being required to expose the works at their cost.

The following hold points and witness points apply:

Hold Point	Visual inspection of all material and product receipts/certification required prior to start of construction.
Witness Point	Visual inspection of jointing and bedding of pipes, bends, connectors, valves and appurtenances before back fill.
Hold Point	Visual inspection of all thrust blocks, formed prior to concrete pour.
Witness Point	Visual inspection of service connection
Hold Point	Pressure test, disinfection microbe testing
Hold Point	Construction completion inspection
Hold Point	Completion of 12 month defects liability period and final hand over

Goldenfields Water may reject all or any part of any works or materials which do not comply with the Standards and relevant Specifications and/or the Approved Plans and Specifications and may require such works to be completed to meet such Standards and Approvals including the removal and replacement of all or any part of non-complying works.

6.5 Dial Before You Dig

Excavation shall not commence until all Dial Before You Dig requirements are fulfilled and all other services have been located.

6.6 Materials

The Contractor shall transport, deliver, store, handle, protect, finish, adjust, prepare for use, and provide manufactured items in accordance with the current written recommendations and instructions of the manufacture or supplier.

For the whole quantity of each material or product, the Contractor shall use the same manufacturer or source and provide consistent type size, quality and appearance. All material dockets will be provided to Goldenfields Water for checking prior to use in construction. Goldenfields Water has the right to reject any materials that appear to be incorrect, damaged, or otherwise unsuitable despite what the dockets may indicate.

Note:

- Pipeline cannot be older than 12 months from manufacture
- PVC pipeline must be of the type PVC-O
- DICL pipeline must be sleeved as per manufacturers specifications

6.7 Excavation

Do not commence any excavation until all equipment and materials necessary to complete the work are on site. Excavation shall be kept to the minimum possible while meeting the minimum cover requirements. The Contractor is required to follow all necessary safety procedures such as benching and shoring if required.

6.8 Laying

Clean and examine all pipe line materials before installation. Firmly embed the pipe barrels in the bedding material, forming a dug out in the bedding material to accommodate the pipe socket. Lay the pipe continuously with the sockets in the direction work is going. When joining PVC pipe to DICL pipe do not join a metal spigot to a PVC socket.

DICL and PVC pipe can be deflected at the joints, not exceeding maximum degrees specified by the manufacturer. Joint deflection can be used to deflect the pipe around unmovable obstacles such as rock floaters. Each length of pipe must be laid straight and is not permitted to be pulled into a curve.

For changes of direction where deviation is greater than that which can be obtained from the pipe collars, socket bends or connectors must be used. See Appendix A “Goldenfields Water Standard Drawing, Typical Installations & Valve Arrangements”.

DICL pipe must be installed within a protective polythene sleeve as per manufactures specification.

6.9 Valves and Hydrants

All valves and hydrants will be placed as per approved designs by Goldenfields Water, in the event that valves and/or hydrants require to be relocated to avoid obstructions, written consent must be gained from Goldenfields Water’s Engineering Department prior to changes being made.

- All valves and hydrants are to be covered by approved surface boxes.
- Clearance between the top of a valve or hydrant, and the underside of the surface box is to be between 80 mm and 150 mm.
- Where pipe cover exceeds 450 mm hydrant tees with risers are required.
- The surface box shall be supported on bricks, concrete blocks, or PVC pipe founded above the pipe bedding.
- Surface box supports must not be allowed to rest on the water main.
- Fill material under surface boxes shall be compacted in layers not exceeding 150 mm to reduce the amount of settlement.
- Hydrants are to be located at 60 m intervals. This may be altered slightly with the consent of Goldenfields Water’s nominated project manager to ensure the hydrant is away from driveways or other obstructions, or to enable it to be located at a high or low point of the main.
- Where a water main finishes at a dead end a hydrant/flushing bend shall be installed to enable the main to be completely flushed.
- Reflective hydrant and valve markers are required to mark locations of all valves and hydrants.
- The markers are to be fixed to the kerb, fences, power poles, or to approved posts set in the foot way.
- All stop valves are to be **anti-clockwise closing**.

See Appendix A "Goldenfields Water Standard Drawing", Typical Installations & Valve Arrangements" for typical valve installs.

6.10 Customer Service Connections

- All services will be laid at 90 degrees to the water main so as to give an indication where the service lies relative to the location of the water meter.
- All services are to be copper. Services that are connected to mains with an operating pressure greater than 140 metres head (1400kpa) are to be installed using copper tube which conforms with AS 4020 Grade "B" specifications.
- All tapping bands will be of the "gun metal" type and will have a brass main cock and ferrule.
- The service line must include the tapping band, copper piping, union connector, elbow, CIM valve (lockable isolation valve and nipple as specified in Appendix A
- All service lines are to be risen to a height which will allow meters are to be installed 350mm above the finished ground level.
- Joints of service connections are to be kept to the minimum required.
- Joints are not to be made in any service pipes under roads or within 2 metres of the shoulder of the road.

6.11 Bedding/Backfill

When backfilling, detectable marker tape must be installed 300mm above the pipe and be easily accessible to allow attachment of pipe detection equipment at valve pits.

In some locations the pipe may need to be encased in concrete, e.g. under creeks. In such cases the pipe must have the concrete carefully poured around it, and the concrete allowed to cure before being put into use. Where the pipeline crosses roads the relevant Local Council may require stabilised sand to be used as backfill material. The relevant Local Council will need to be contacted to determine this requirement.

Native material may be used for bedding providing the material is tested and 100% of the test material pass through a 19mm sieve and 75% + or – 25% pass through a 2.36mm sieve. If native material is used for back fill, the material must be free of all vegetation. If testing fails suitable material is to be imported. Compaction in 150mm layers is required on backfilling to the full trench depth to achieve at least 95%.

See below table for location of compaction tests

Length of Construction	Number of Tests	Location of Test
0-5km	3	Start, Middle, End
>5km	At least 3	Start, End, every 2.5km

Records of compaction test must be submitted with the Works As Executed documentation.

6.12 Thrust Blocks

Thrust blocks are required at all bends, valves, tees, and end caps. Refer to Appendix A - Goldenfields Water Standard Drawings, Thrust Block Dimensions & Locations.

All thrust blocks are to be poured in place. Trench walls are to be trimmed to provide good bearing area and concrete is to have a minimum compressive strength of 20 MPa.

When forming and pouring thrust blocks:

- Valves and fittings must not be buried in concrete.
- All joints shall be kept clear of concrete.
- A protective barrier is to be maintained between the concrete and any fitting (i.e. polythene membrane).

6.13 Clearances

Minimum clearance requirements between water mains and other utility services:

Proposed utility service	Minimum horizontal clearance between pipe barrels		Minimum vertical clearance between pipe barrels
	Existing water main size		
	≤ DN 200	>DN 200	mm
Water mains	500	600	500
Electricity conduits and cables	1000	1000	1000
Gas mains	500	600	500
Telecommunication conduits and cables	500	600	500
Fiber Optic Cable	4000	4000	2000
Drains	500	600	500
Sewers	500	500	500
Kerbs	500	600	500

NOTES:

1. Vertical clearances apply when water mains cross one another and utility services, except in the case of sewers when a vertical separation shall always be maintained, even when the water main and sewer are parallel. The water main shall always be located above the sewer to minimize the possibility of backflow contamination in the event of main break. In the case of no other alternative and the main must cross under the sewer or drain the main will be sleeved and seal from possible contamination in the event of a main break.
2. Clearances from kerbs shall be measured from the outside of the barrel of the water main to the nearest point of the kerb.
3. If a relocation of any service is required the Contractor will bear the cost of such relocation. All damages caused by the Contractor to existing services shall be rectified by the Contractor at no cost to the Principal. The Contractor shall mark up on an appropriate work-as-executed drawing all existing and relocated services.

6.14 Pressure testing and disinfection of mains

All pressure testing and disinfection of the Water Supply Works will be conducted by Goldenfields Water staff as per the relevant Australian standards.

For pressure testing of PVC and DICL material a calculation on the material, size and length of the pipeline is used to determine the amount of allowable make up water that can be added to for the pipeline to pass the test. Water is pumped into the pipeline to achieve the required testing pressure. If a pressure drop

occurs additional water is added to bring the pipeline back to the test pressure. If at the end of the test the additional water added is less than the calculated allowable make up water, the test has passed. If the pipeline does not hold pressure, the leak must be identified and rectified prior to another test occurring.

For each failed test the Developer will be charged for subsequent testing.

For disinfection this requires the pipeline to be flushed and then sterilized by filling the Water Supply Works with between 5 and 10 mg/L of chlorine. After 24 hours water samples are taken and the chlorine residual must be greater than 2.5 mg/l.

6.15 Restoration of all works

The Contractor shall restore and/or reinstate all works for existing services, surfaces, driveways, footpaths and kerb and gutters to their pre-existing condition or better.

Prior to practical completion, the Contractor shall remove from the site and all access areas used by it for the purpose of the Contract, all temporary works, plant, buildings, rubbish, unused material, construction facilities and other material and equipment belonging to it and its Sub-Contractors or used under its direction and leave the site and such other areas clean and tidy to the satisfaction of the Principal.

The Developer is responsible for maintaining all restored surfaces and improvements in a satisfactory condition until the end of the defects liability period.

7 CERTIFICATE OF COMPLIANCE

7.1 Test Results

All testing must have passed prior to issuing a Certificate of Compliance. The Developer must provide compaction test results as noted within the Section 6.12 above.

7.2 Additional Payments

Any additional costs incurred must be paid prior to issuing a Certificate of Compliance. These may include but are not limited to:

- Cost of reviewing variations (at cost)
- Cost of attending additional inspections (per inspection)
- Cost of additional pressure testing of pipelines (as per the fees and charges)

7.3 Certificate of Compliance

Once the above has been completed, Goldenfields Water will issue a Certificate of Compliance. Once this has been issued the Water Supply Works can be put into service.

7.4 Defect Liability Period

The Defect Liability Period of twelve months minimum commences on the day the Certificate of Compliance is awarded. The Defect Liability Period will extend to such a time that final inspection is completed and accepted.

During the Defect Liability Period, the Developer must arrange a Contractor to attend site within 7 days to attend to minor defects as requested to do so by the Principal. Issues not rectified within this timeframe may be done so by Goldenfields Water and charged at cost to the Developer.

In the occurrence of a leak or safety issue Goldenfields Water have the right to rectify the matter immediately which will be charged at cost to the Developer.

8 FINAL INSPECTION

8.1 Works as Executed Drawings

The Develop shall provide 'Works As Executed' drawings showing the correct location of all key features including but not limited to pipes, valves, hydrant points and other fittings, pipe bends and take offs, inlet and outlet structures, pits, profile of earth works, runs of pipe work, etc. The information produced by the final survey should be sufficient to accurately locate all works both above and below ground.

The Works as Executed drawings are to be provided in the following format within 28 days of construction works being completed on site

- The works as executed drawings are to be provided in both pdf and unlocked AutoCAD 2018 formats
- The designs must be in georeferenced in GDA co-ordinate system GDA 20, Zone 55
- Levels must be noted in Australian Height Datum (AHD)

8.2 Easements

Where construction did not occur in the road reserve, easements shall be created in favour of Goldenfields Water over any public water infrastructure located in private property. The width of the easement shall normally be 3 metres for pipes up to 450 mm diameter laid in properties within the urban boundaries as determined by Goldenfields Water. In non urban areas easements shall be 6 metres wide.

For larger diameter pipes and other special circumstances each situation is to be assessed individually to determine easement width to the satisfaction of the General Manager.

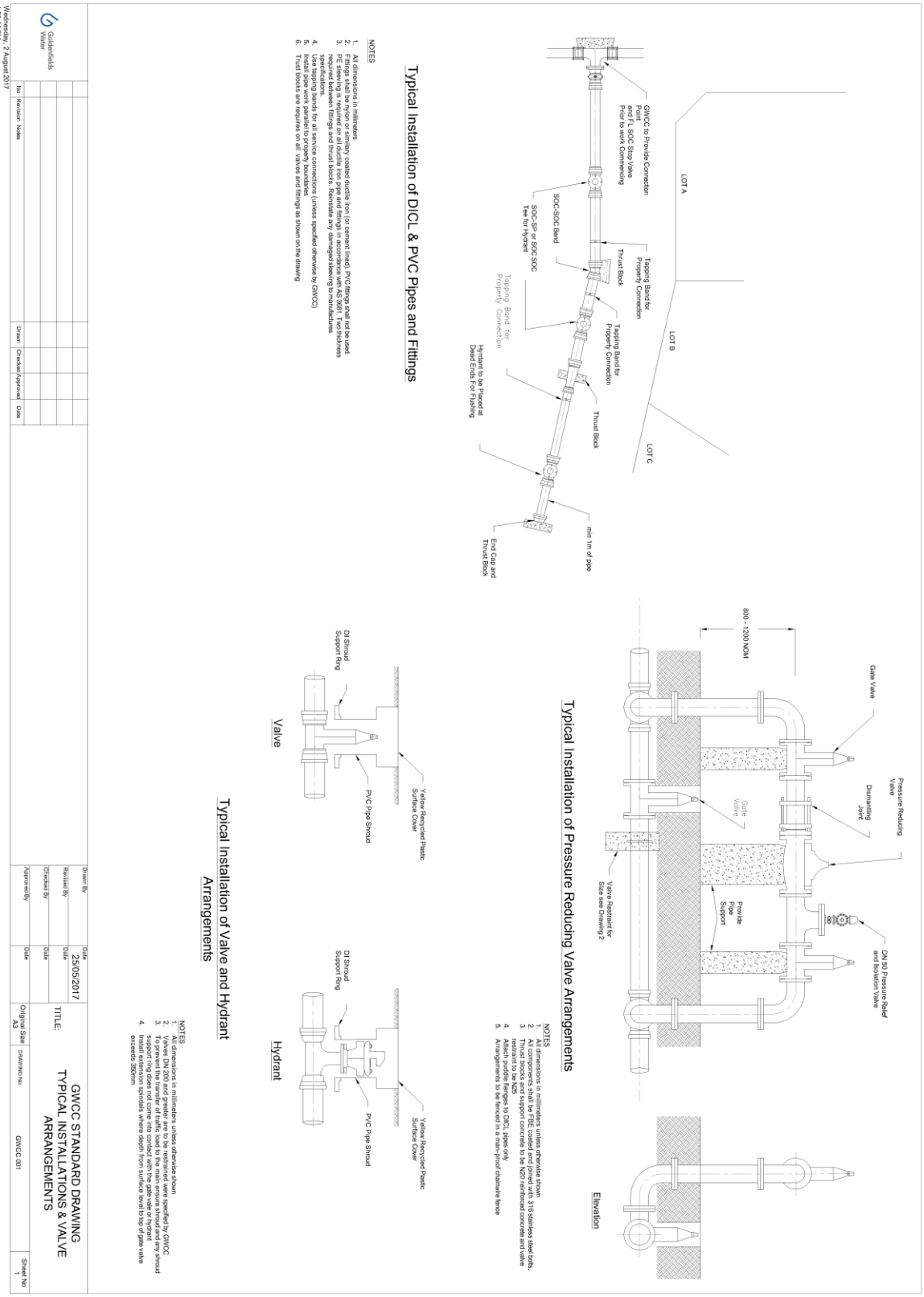
8.3 Final Inspection

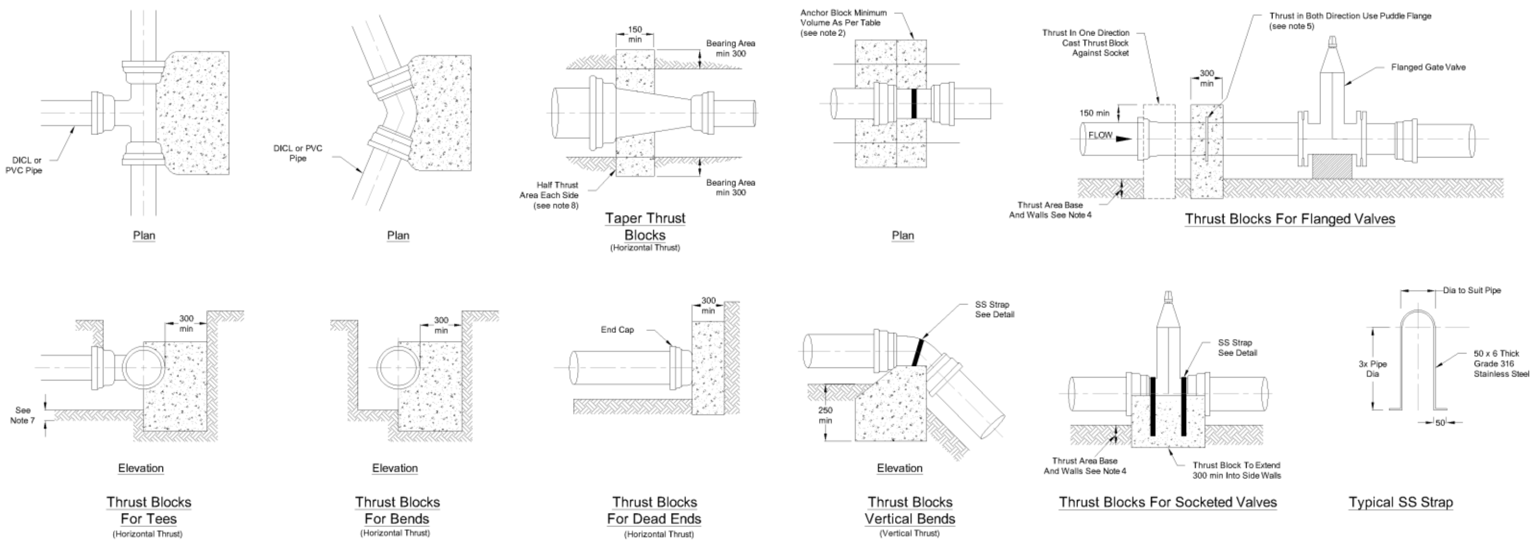
It is the Developer's responsibility to request the Goldenfields Water staff (in writing) to conduct an onsite inspection to confirm that any outstanding items and subsequent defects are satisfactorily completed. A staff member will attend site within 5 days of receiving and inspection request.

8.4 Return of Defects Liability Bond

Upon the successful completion of the above requirements the Defects Liability Bond (or remainder thereof) will be returned/refunded to the Developer.

APPENDIX A GOLDENFIELDS WATER STANDARD DRAWINGS





Thrust and Anchor Blocks For Horizontal Bends and Dead Ends

Minimum Thrust Area for blocks in Square Meters (m^2) Design Pressure 1000 kPa (NOM 100m Head)

Soil Classification And Allowable Horizontal Bearing Pressure Of Ground (See Note 3)

For Horizontal Thrust On Trench Walls Where The Cover Over the Pipe Is 450 or Greater	90°&60° Horizontal Bends			45°&30° Horizontal Bends			22.5° Horizontal Bends			11.25° Horizontal Bends			Tees & Dead Ends		
	Stiff Clay Medium Dense Clean Sand	VeryStiff Clay Dense Sand/Gravel Decomposed Rock	Hard Clay Sound Rock	Stiff Clay Medium Dense Clean Sand	VeryStiff Clay Dense Sand/Gravel Decomposed Rock	Hard Clay Sound Rock	Stiff Clay Medium Dense Clean Sand	VeryStiff Clay Dense Sand/Gravel Decomposed Rock	Hard Clay Sound Rock	Stiff Clay Medium Dense Clean Sand	VeryStiff Clay Dense Sand/Gravel Decomposed Rock	Hard Clay Sound Rock	Stiff Clay Medium Dense Clean Sand	VeryStiff Clay Dense Sand/Gravel Decomposed Rock	Hard Clay Sound Rock
PBH kPa	50	100	200	50	100	200	50	100	200	50	100	200	50	100	200
Nominal Diameter Of Fitting															
100	0.34	0.17	N	0.18	N	N	N	N	N	N	N	N	0.24	0.12	N
150	0.70	0.35	0.18	0.38	0.19	N	0.20	N	N	N	N	N	0.50	0.25	0.12
200	1.20	0.60	0.30	0.64	0.32	0.16	0.34	0.17	N	0.16	N	N	0.84	0.42	0.21
225	1.52	0.75	0.38	0.81	0.41	0.21	0.42	0.22	0.11	0.22	N	N	1.06	0.53	0.27
250	1.80	0.91	0.45	0.98	0.49	0.25	0.50	0.25	0.12	0.26	0.13	N	1.28	0.64	0.32
300	2.66	1.33	0.66	1.44	0.72	0.36	0.74	0.37	0.18	0.36	0.18	N	1.88	0.94	0.47
375	4.04	2.02	1.01	2.18	1.09	0.55	1.12	0.56	0.28	0.56	0.28	0.14	2.86	1.43	0.72

'N' - See Note 5

NOTES HORIZONTAL THRUST BLOCKS

1. All dimensions in millimeters unless otherwise specified
2. Cast the thrust area of all thrust blocks against a clean face of undisturbed natural soil. Thrust blocks are not to interfere with other services
3. Maximum soil bearing capacity to be used is 100 kPa
4. Do not use standard thrust blocks as specified in:

   - Very soft, Soft or Firm Clay
   - Loose Clean Sand
   - Uncompacted Fill or Refuse

   A geotechnical assessment and individual design is required for these soils
5. The nominal thrust area 'N' to be acheived by pouring concrete the full length of the fitting and extending from the floor of the trench to above the fitting (see also note 7)
6. Test pressures other then 1000 kPa increase the the minimum thrust area by the ratio of the design pressure except were:
   - MIN thrust area is <0.1m^2 and
   - 'N' appears in the table and design pressure is above 1000 kPa calculate the area
7. Finish thrust blocks approximately 100 above the top of the fitting or bearing pad and extend to the floor of the trench or deeper if necessary to achieve the required thrust area. Maximum encasement to be 180°
8. The minimum thrust area for taper thrust blocks to be equal to the difference between the thrust areas for dead ends of equivalent diameter to those of each side of taper
9. For downward vertical thrust the allowable bearing pressure for various soils may be taken as twice that for horizontal thrust shown
10. When pouring concrete against fittings place a membrane of polyethylene between the fitting and concrete to prevent damage to the fitting. Joints to be clear of concrete
11. Concrete thrust blocks and anchors for valves to be as shown
12. Concrete to be minimum 25MPa Normal Grade, with a maximum slump of 100mm. Rapid Set is only to be used on mains of 100mm diameter or less, and PN Rating of 16 or less.

Thrust and Anchor Blocks For Verticle Bends and Gate Valves

Minimum Block Volume For Anchorage Verticle Bends

For test Pressure of 1000kPa (See Note 2)

Pipe DN	Concrete Volume m^3 11.25° Bends	22.5° Bends	45° Bends
100	N	N	0.3
150	N	0.3	0.6
200	0.2	0.5	1.1
225	0.3	0.6	1.4
250	0.3	0.7	2.5
300	0.4	1.1	3.8
375	0.7	1.8	5.8

'N' - No Additional Restraint Required (compacted trench fill sufficient)

NOTES VERTICAL THRUST BLOCKS

1. All dimensions in millimeters unless otherwise shown
2. Anchor blolcks in the table are designed for a test pressure of 1000 kPa (100m). Adjust concrete volume to suit actual test pressure
3. Where DI pipes and fittings with restrained joints are used thrust blocks may not required
4. Where specified provide concrete thrust blocks for stop valves. Thrust area to be as for dead ends as shown in table for horizontal thrust.
5. Install puddle flanges on class K12 DICL pipe.
6. Locate anchor block centrally around bend
7. Key anchor block into base of trench a minimum depth of 250
8. Pour concrete against a solid excavation face
9. Use grade N20 concrete
10. Keep concrete clear of all bolts nuts and pipe joints

Goldenfields Water

No	Revision Notes	Drawn	Checked	Approved	Date

Drawn By | Date 25/05/2017
Revised By | Date
Checked By | Date
Approved By | Date

TITLE: GWCC STANDARD DRAWING
THRUST BLOCK DIMENSIONS & LOCATIONS

Original Size A3 | DRAWING No: GWCC 002 | Sheet No 2

Wednesday, 2 August 2017
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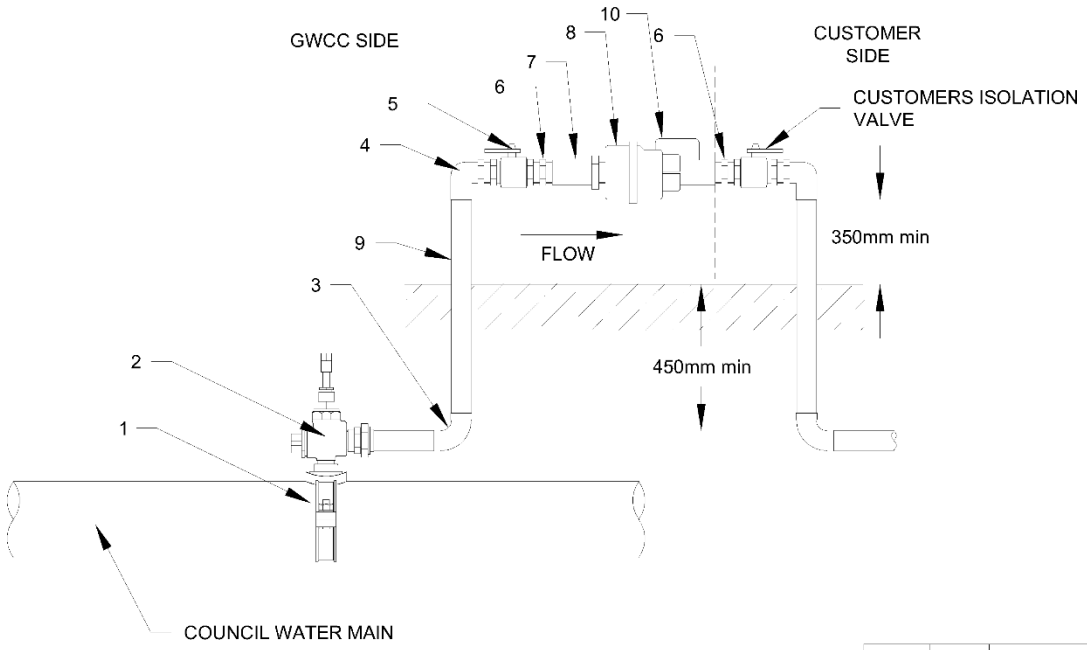

ITEM NO.	QYT.	DESCRIPTION	REMARK
10	1	REMOTE READING DEVICE	
9		COPPER PIPE HARD DRAWN	CUT TO SUITE, SIZE TO SUITE TAPPING
7	2	NSW METER COUPLINGS 65mm	TO SUITE TAPPING SIZE
6	1	NIPPLE	TO SUITE TAPPING SIZE
5	1	F & F LOCKABLE ISOLATION VALVE	TO SUITE TAPPING SIZE
4	1	NO. 13 "VIEGA" ELBOW	TO SUITE TAPPING SIZE
3	1	NO. 64 "VIEGA" BENT UNION CONNECTOR	TO SUITE TAPPING SIZE
2	1	MAIN COCK STANDARD TPFNRs	TO SUITE TAPPING SIZE
1	1	TAPPING BAND	TO SUITE MATERIAL & SIZE OF MAIN

Goldenfields Water

No.	Revision Notes	Drawn	Checked	Approved	Date

Wednesday, 2 August 2017
2:06:16 PM

Drawn By | Date 25/05/2017
Checked By | Date
Approved By | Date
Approved By | Date

TITLE: GWCC STANDARD DRAWING COPPER SERVICE ARRANGEMENT

Original Size A3 | DRAWING No: gwcc-ss | Sheet No 3

APPENDIX B GOLDENFIELDS WATER INSPECTION AND TEST PLANS

Water Main Construction: Inspection and Test Plan

Customer: Contract Number: Contract/Project Name: GWCC Staff Name:	INSPECTION AND TEST PLAN for: *(Insert work activity)* Work area: (Insert work area)				Insert Contractor Identification and/or Logo
Description	Characteristics	Timing	Requirement	HP / WP /O	GWCC Sign off Y/N?	Comments
Materials	Ensure materials are to specifications / standards. All materials on-site for project.	Prior to construction and At each delivery	Materials dockets provided, Certificate of Compliance or Materials stamped.	HP		
			Materials meet Construction plan / WSAA / AS requirements	HP		
			Visually inspect pipe and fittings to ensure they comply with standards and do not appear to be damaged or unsuitable	HP		
Services	All existing services identified / located. Clearances achieved between mains	Before excavation	Dial Before You Dig and evidence of Council services located by desktop	O		
			Services identified above are located on site prior to excavation occuring	O		
Pipeline installation	Mains are laid in correctly	Prior to backfill	Pipes, valves and fittings are laid in correct location as per approved designs	WP		
			Pipe is laid at correct depth to achieve required cover and clearances	WP		
			Sockets point toward the direct the pipeline was laid	WP		
			Pipe lengths are straight and joints don't exceed allowable deflection	WP		
			For DICL pipelines, the pipe is sleeved properly	WP		

Water Main Construction: Inspection and Test Plan

			Thrust blocks sizing complies with WSA standards and designs	HP		
			Valve pit surface box does not rest on the pipe	O		
			Visual inspection of service connections	WP		
Backfill	Backfill material is appropriate and compaction achieved		Backfill material meets required sieve test	O		
			Marker tape installed 300mm above pipeline	O		
			Compaction is undertaken in 150mm layers	O		
			Compaction tests are received and have passed	O		
			Topsoil is used for top 100mm	O		
Commissioning	Pipeline suitable for use	Prior to being put into service	Disinfection of mains pass test	HP		
			Pipeline passes pressure tests	HP		
Remediation	Site is restored	Prior to practical completion	Restore and reinstate services, surfaces, driveways, kerb, roadways, green space to pre-existing condition	HP		
			All rubbish, unused material, temporary works etc removed from site	HP		
Practical Completion	All works completed and required documentation received	Prior to practical completion	All outstanding payments have been made	HP		
			Works as Executed drawings have been received	HP		

All hold points have been approved and to the best of my knowledge, the remaining items noted above have been completed in a compliant manner.

Staff Name:
Date:

APPENDIX C INDICATIVE COST ITEMS

Goldenfields Water Fees and Charges

The following fees and charges are required for each project:

- Design review
- Site inspections (Minimum of 4 required, however depending on design and staging, additional may be required)
- Pressure testing
- Disinfection
- Cutting in of new mains

The following additional fees and charges may be required:

- Review of variations
- Additional inspections
- Additional testing

Defects Liability Bond

A defects liability bond equal to 5% of the total cost of civil works shall be paid in the form of a deposit or bank guarantee. The total cost of civil works shall be calculated based on the length of pipeline multiplied by Goldenfields Water's relevant unit rate. The bond shall be held for the duration of the construction and defects liability period.

External Cost Items

The Developer should consider the following costs when considering whether to undertake design and construction:

- Investigation, survey and design
- Construction
- Compaction testing
- Works as Executed drawings
- Environmental investigations (if required)
- Easement compensation and registration (if required)
- Traffic control (if required)
- Other as required by the Consent Authority