



WATERNSW
NSW DRILLERS LICENCE EXAMINATION
MODULE 'A'

NSW DRILLERS LICENCE EXAMINATION

MODULE A Standard Requirements for all Licences

Q1. Under the Water Act, 1912, as Amended, a bore is defined as: (Tick the correct answer)

- A natural opening in the ground that gives access to underground water.
- An opening in the ground, excavated for some other purpose, but that gives access to underground water.
- Any excavation or other work capable of obtaining or used to obtain supplies of sub-surface water.

Q2. The following shows the NSW Licence Classes with the National Equivalent

NSW	NATIONAL
Class 1	1
Class 2	1
Class 3	2
Class 4	2
Class 5	3
Class 6	3

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Total Mark Module A

STANDARD REQUIREMENTS FOR ALL LICENCES

Q3. The penalty for constructing any groundwater work without a Driller's Licence or for having the wrong class of licence, is up to \$550. In addition, a daily penalty applies which is equal to: (tick the correct answer)

- \$110.00
- the cost of the bore,
- clean up if the aquifer is polluted
- \$1,100.00 or
- 10 demerit points towards licence cancellation.

Q4. The Act states that a Licensed Driller must fully complete certain information relating to the completed work. In NSW these details are supplied on a "Form A" and include which categories of data (tick four items):

- Nature and thickness of strata drilled,
- Materials used and cost,
- Location, quantities and quality of all water supplies,
- Proposed use,
- The SWL of each supply relative to GL, and
- Total cost of bore construction.

Q5. A Driller's Licence may be cancelled for failure to provide the information requested on the "Form A". A \$220 fine may apply with an additional daily penalty of:

- \$110.00
- \$ 55.00 or
- 5 demerit points?

<h1>STANDARD REQUIREMENTS FOR ALL LICENCES</h1>

Q6. All Groundwater works must be licensed by the property owner before any construction commences. How long does the licence remain valid before it expires? (Tick the correct answer)

- 1 year,
- until the bore is finished
- 3 years, or
- indefinitely

Q7. A Bore Licence is required for works that extract groundwater but is a licence required for:

- | | | | | |
|---|-----|--------------------------|----|--------------------------|
| Works that only intercept (not produce) groundwater, | YES | <input type="checkbox"/> | NO | <input type="checkbox"/> |
| Deepening, enlarging, or altering an existing work | YES | <input type="checkbox"/> | NO | <input type="checkbox"/> |
| Disposal of waste into a hole that does not intersect groundwater, or | YES | <input type="checkbox"/> | NO | <input type="checkbox"/> |
| To measure SWL and sample groundwater? | YES | <input type="checkbox"/> | NO | <input type="checkbox"/> |

Q8. High yield bores must not be drilled where their use interfere with neighbouring supplies. Restrictions on bore location are usually stated on the Bore Licence, but what are typical minimum distances from the following:

- (a) property boundary m
- (b) a neighbour's irrigation bore m
- (c) Town Water supply bore m
- (d) a NOW piezometer, m
- (e) the high bank of a river, creek or wetland m

STANDARD REQUIREMENTS FOR ALL LICENCES

Q9. WaterNSW, Driller, and Landholder have different responsibilities in relation to groundwater works. Indicate (tick one box, each line) who is responsible for the following:

	WaterNSW	Driller	Landholder
Capacity for sand-free sustainable production	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regional groundwater resource management (aquifer safe yields, allocations, ceilings, embargoes, etc)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Issue of bore-construction permits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bore materials and construction appropriate to the expected service life	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Site access	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Test production estimates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A bore free of introduced biological contamination	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Groundwater-extraction licences	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Permits/licences to discharge to groundwater's systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Driller licences/permits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unobstructed bore to full depth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Contamination protection using grouting and seals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adequate bore development and minimum aquifer damage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Disinfection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q10. Why must the annular space around the casing at the surface be sealed?

- To support the casing string
- To prevent water from pressurised aquifers flowing from the annulus
- To prevent surface water from entering the bore
- To exclude oxygen from the bore that may promote bacterial growth

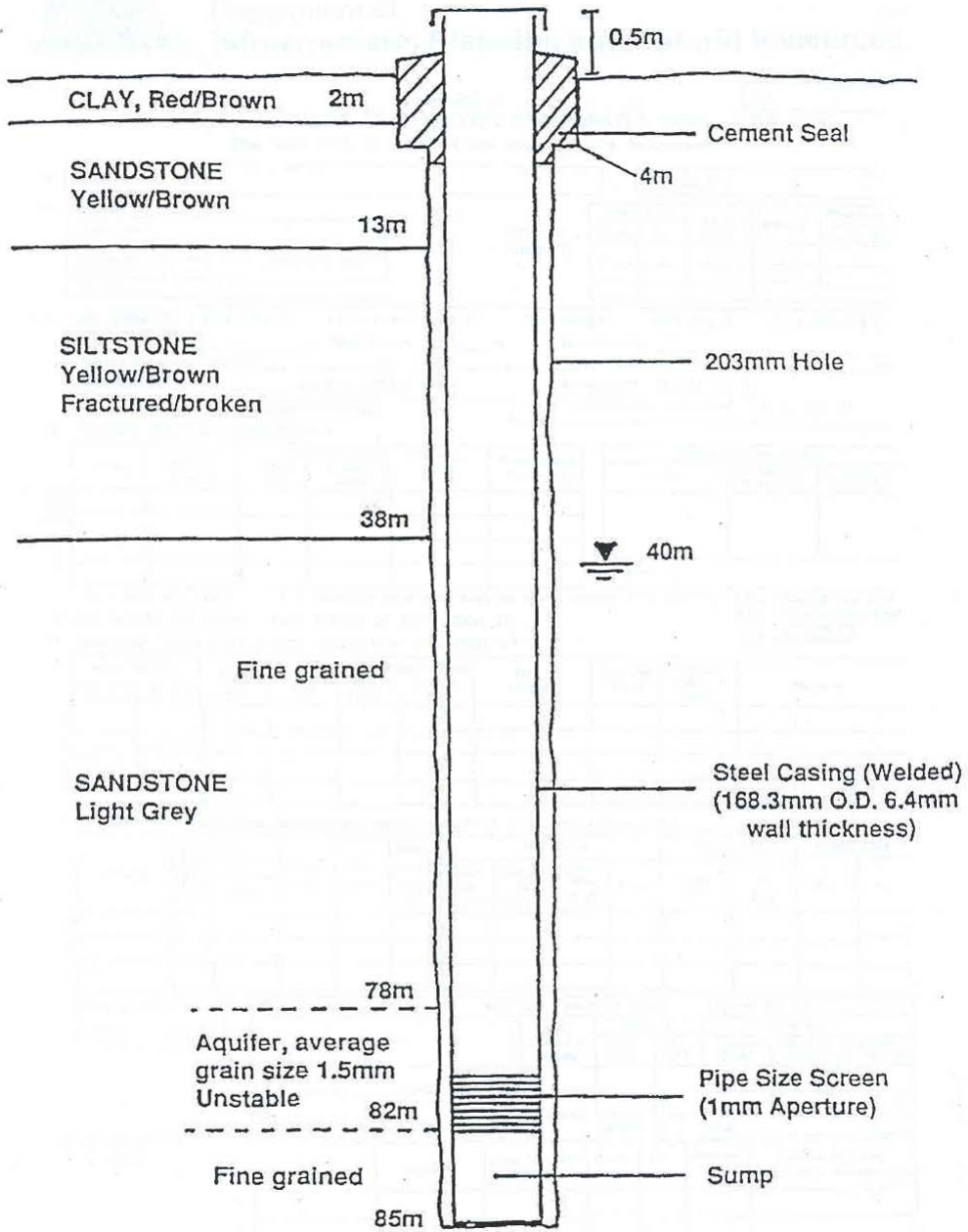
STANDARD REQUIREMENTS FOR ALL LICENCES

Q11. Fill in the attached Bore Completion Report using the information provided below and on the attached diagram. (Note: For the purpose of this exercise, there is no need to complete details relative to the name or address of the Bore Licence, Bore Location or Licence Number, or Driller's Name and Licence Number)

- The bore is to be used for Stock and Domestic purposes.
- The drilling was carried out on 12/4/2010 using an Air Rotary Rig. Casing and screen installation and development took place on the following day.
- Drilling was undertaken using a 222mm (8 ¾") blade bit and air blast to refusal at 4m and a Down-Hole Hammer with a 203mm (8") bottom bit for the full depth of the hole.

Water inflows were first encountered at 78m and a short (1/2 hour) air-lift test was carried out at 82m yielding 3L/s with 25m of Draw Down. A conductivity test gave a reading of 160 us/cm. Drilling was continued to 85m with no additional water.
- Flow rates from the bore were measured using a V-Notch Weir Board.
- At commencement of the second day, the SWL was measured at 40m below surface.
- In order to obtain maximum yield from the hole, a pipe size, stainless steel (Type 304), wire wound screen was used, its length being 40% of aquifer thickness. This screen was welded to the casing using appropriate weld rings.
- The completed bore was developed by air-lifting for 1 hour.
- A final one hour air-lift test conducted during development yielded 3 L/s with a Draw Down of 25m, and tests on water samples obtained provided the following results: pH = 7.8, conductivity = 160us/cm; Temp = 18 degree C.
(Note: us/cm X 0.640 = mg/L or ppm)
- The bore was disinfected by adding a chlorine solution to the bore on completion.
- Both water and formation samples were obtained, to be passed on to the Water Authority.







APPLICANTS NAME _____

FORM A PARTICULARS OF COMPLETED BORE

Driller's Licence no:
 Class of Licence:
 Driller's Name:
 Assistant Driller's Name:
 Contractor:
 New bore Replacement bore
 Deepened Enlarged
 Reconditioned Other (specify)
 Final Depth _____ m

1 **Work Licence No:** BL **2**
 Name of Licensee:
 Intended Use:
 Completion Date:

DRILLING DETAILS 3			
From (m)	To (m)	Hole Diameter (MM)	Drilling Method Code

WATER BEARING ZONES 4											
From (m)	To (m)	Thickness (m)	SWL (m)	Estimated Yield (L/s)		Test method code	DDL at end of test (m)	Duration		Salinity (Conductivity or TDS)	
				Individual Aquifer	Cumulative			Hrs	mm	Cond (µS/cm)	TDS (mg/L)

CASING/LINER DETAILS 5											
Material Code	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Method of Fixing Code	Casing Support Method Code					
								Type of casing bottom Code			
						Centralisers installed: No <input type="checkbox"/> Yes <input type="checkbox"/> (indicate on sketch)					
						Sump installed: No <input type="checkbox"/> Yes <input type="checkbox"/> From _____ m To _____ m					
						Pressure cemented: No <input type="checkbox"/> Yes <input type="checkbox"/> From _____ m To _____ m					
Casing Protector						Casing Protector cemented in place: No <input type="checkbox"/> Yes <input type="checkbox"/>					

WATER ENTRY DESIGNS 6											
General							Screen		Slot Details		
Material Code	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Opening type Code	Fixing Code	Aperture (mm)	Length (mm)	Width (mm)	Alignment Code	

GRAVEL PACK 7											
Type		Grade		Grain size (mm)		Depth (m)		Quantity Litres or m ²			
				From	To	From	To				
Rounded <input type="checkbox"/>		Graded <input type="checkbox"/>									
Crushed <input type="checkbox"/>		Ungraded <input type="checkbox"/>									
Bentonite/Grout seal: No <input type="checkbox"/> Yes <input type="checkbox"/>											
Method of placement of Gravel Pack Code _____											

BORE DEVELOPMENT 8											
Chemical used for breaking down drilling mud No <input type="checkbox"/> Yes <input type="checkbox"/> Name: _____											
Method	Bailing/Surging <input type="checkbox"/>	Jetting <input type="checkbox"/>	Airlifting <input type="checkbox"/>	Backwashing <input type="checkbox"/>	Pumping <input type="checkbox"/>	Other:					
Duration	hrs	hrs	hrs	hrs	hrs	hrs					

DISINFECTION COMPLETION 9											
Chemical/s used				Quantity applied (litres)				Method of application			

PUMPING TESTS ON COMPLETION 10											
Test Type	Date	Pump intake depth (m)	Initial Water Level (SWL) (m)	Pumping rate (L/s)	Water Level at end of pumping (DDL) (m)	Duration of Test (hrs)	Recovery				
							Water level (m)	Time taken (hrs) (min)			
Multi stage (Stepped drawdown)	Stage 1										
	Stage 2										
	Stage 3										
Single stage (constant rate)											
Height of measuring point above ground level: _____ m			Test Method Code _____			See Code Table 4					

For NOW use only	G	W									
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APPLICANTS NAME _____

FORM A PARTICULARS OF COMPLETED BORE

Work Licence No: BL

WORK PARTLY BACKFILLED OR ABANDONED 11

Original depth of work:metres Is work partly backfilled: No Yes
 Is work abandoned: No Yes Method of abandonment: Backfilled Plugged Capped
 Has any casing been left in the work: No Yes From..... (m) To (m)

Sealing / fill type code	From Depth (m)	To depth (m)	Sealing / Fill type Code	From Depth (m)	To depth (m)

Site chosen by: Hydrogeologist Geologist

DRILLER'S ROCK/STRATA DESCRIPTION (LITHOLOGY) 13

Depth			Description	WORK CONSTRUCTION SKETCH
From (m)	To (m)			

WORK NOT CONSTRUCTED BY DRILLING RIG

Method of Excavation: Hand dug Back hoe Dragline Dozer Bailing Other: _____ 14

Depth (m)	Length (m)	Width (m)	Diameter (m)	Lining material	Dimensions of liner (m)	From Depth (m)	To Depth (m)

PLEASE ATTACH COPIES OF THE FOLLOWING IF AVAILABLE 15

Geologist log No <input type="checkbox"/> Yes <input type="checkbox"/>	Laboratory analyst of water sample No <input type="checkbox"/> Yes <input type="checkbox"/>	Pumping test (s) No <input type="checkbox"/> Yes <input type="checkbox"/>
Geophysical log No <input type="checkbox"/> Yes <input type="checkbox"/>	Sieve analysis of aquifer material No <input type="checkbox"/> Yes <input type="checkbox"/>	Installed pump details No <input type="checkbox"/> Yes <input type="checkbox"/>

LOCATION OF BORE 16

Lot No DP no

Work Location Coordinates: Easting Northing Zone

GPS: No Yes >> AMG/AGD or MGA/GDA (see explanation)

Please mark the work site with "X" on the DIPNR CLID map or supply a sketch map of the location. Attach the map to this Form A package.

SIGNATURES 17

Driller Signature: _____ Licensee Signature: _____

Date: _____ Date: _____

NOTE: If not enough space is provided use a separate piece of paper. Provide details of works location, Drillers Licence Number and Work Licence Number.

CODE TABLE												
DRILLING METHOD									3			
1	Auger - Hollow Flight				9	Rotary - Percussion - (Down Hole Hammer)						
2	Auger - Solid Flight				10	Rotary - Percussion - Foam injection						
3	Cable Tool - Drill and Drive Casing				11	Rotary - Reverse circulation - Air						
4	Cable Tool - Mud stabilised				12	Rotary - Reverse circulation - Mud						
5	Rotary Air				13	Rotary - Coring						
6	Rotary - Air/foam				14	Jetted - Air						
7	Rotary - Mud				15	Jetted - Water						
8	Rotary - Water				16	Other - See page 2, NO 11						
WATER BEARING ZONE									4			
TEST METHOD					FLOW MEASURING DEVICE							
1	Airlift		6	Pump - Helical Rotor		A	Container of known volume		F	Weir - Rectangular		
2	Bailer		7	Pump - Jet		B	Flow meter		G	Weir - V Notch - 60°		
3	Pump - Centrifugal		8	Pump - Turbine		C	Flume		H	Weir - V Notch - 90°		
4	Pump - Cylinder		9	Freeflow		D	Orifice, plate & manometer		I	Other		
5	Pump - Electric submersible					E	Ultra sonic meter					
CASING / LINER DETAILS									5/6			
MATERIAL						METHOD OF FIXING						
1	A.B.S.		6	PVC - Class 12		11	Steel - Stainless		1	Glued	6	Welded - Butt
2	Aluminium		7	PVC - Class 15		12	Steel - Stainless 304		2	Kwik-lock	7	Welded - Collar
3	Concrete cylinder		8	PVC - Class 18		13	Steel - Stainless 316		3	Packer	8	Other
4	Fibre glass (FRP)		9	Steel - ERW		14	Other		4	Riveted		
5	PVC - Class 9		10	Steel - Galvanised					5	Screwed		
CASING SUPPORT METHOD					TYPE OF CASING BOTTOM							
1	Driven into small hole		5	Held in clamp		1	Open end		5	Casing shoe		
2	Seated on bottom		6	Other		2	End cap		6	Wash down shoe		
3	Seated on backfill					3	Plug - concrete		7	Cementing shoe		
4	Cemented					4	Plug - wood		8	Other		
WATER ENTRY DESIGN									6			
OPENING TYPE						SLOT ALIGNMENT						
1	Casing - Bridge slot		7	Casing - Plasma-cut slot		D	Diagonal					
2	Casing - Drilled holes		8	Casing - Perforated in hole		H	Horizontal					
3	Casing - Hand sawn slot		9	Screen - gauze / mesh		V	Vertical					
4	Casing - Louvre slot		10	Screen - round wire		For MATERIAL and FIXING Codes Please refer to CASING DETAILS code table						
5	Casing - Machine slotted		11	Screen - wedge wire								
6	Casing - Oxy cut slot											
GRAVEL PACK - METHOD OF PLACEMENT									7			
1	Poured or shovelled into annulus		2	Placed through tremie pipe		3	Reverse circulated					
WORK PARTLY BACKFILLED OR ABANDONED - SEALING MATERIAL									11			
1	Cement grout		3	Bentonite		5	Clay		7	Gravel		
2	Concrete		4	Drilled cuttings		6	Sand		8	Coarse stone		
DRILLER'S ROCK STRATA DESCRIPTION									15			
Reporting sequence	1	2	3	4	To save confusion, write the full name of colour and abbreviate the following : light = lt, dark = dk, fine grained = fg, medium grained = mg, coarse grained = cgr. texture can relate to : weathered, fractured, broken, hard, soft etc.							
	Rock type	Colour	Grain size	Texture								
Example	Sandstone	Dk Grey	mg	Fractured								