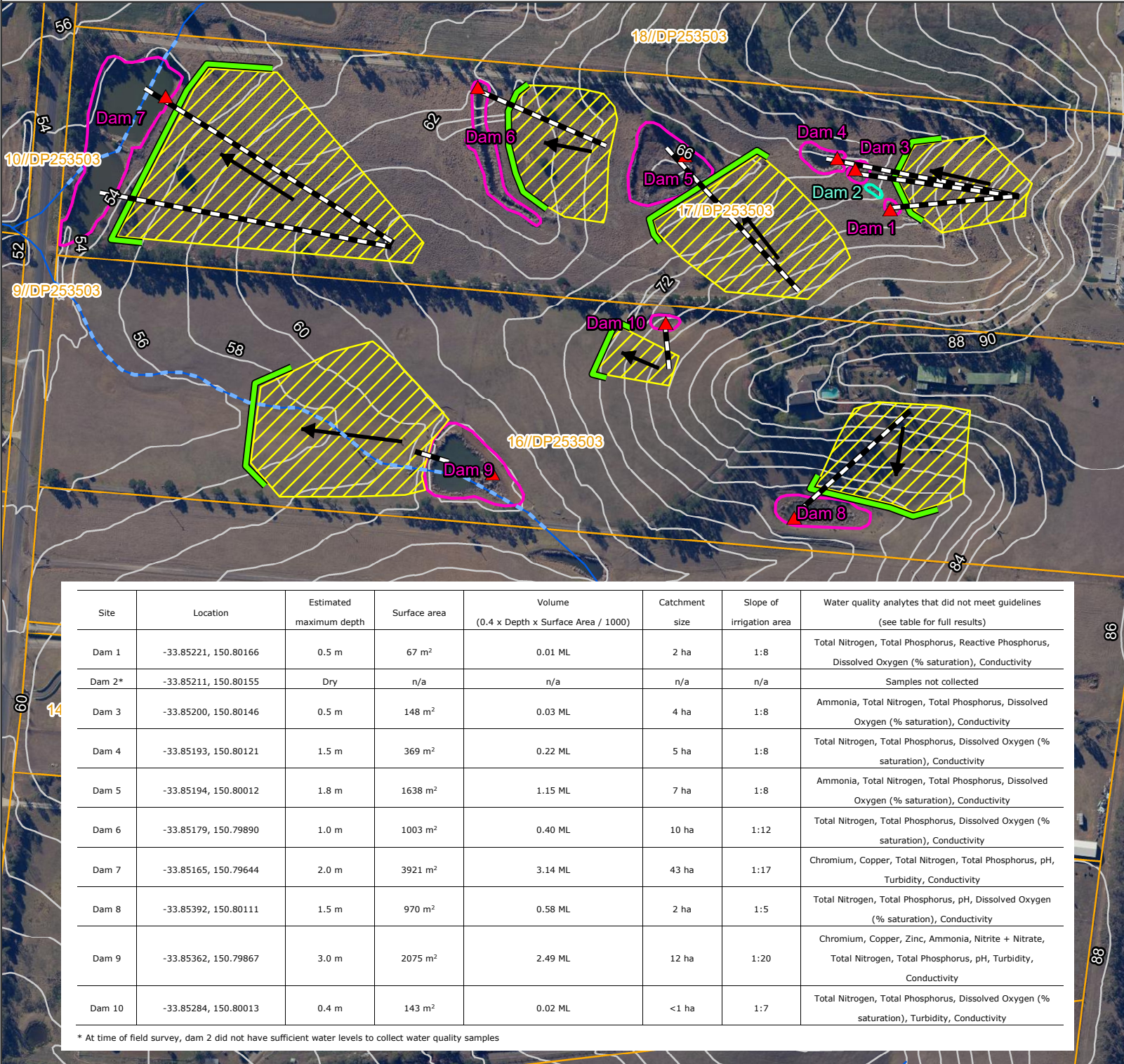


Dam Dewatering Plan: 270 Aldington Rd, Kemps Creek (Lot 16 DP253503 and Lot 17 DP253503)



Site	Location	Estimated maximum depth	Surface area	Volume (0.4 x Depth x Surface Area / 1000)	Catchment size	Slope of irrigation area	Water quality analytes that did not meet guidelines (see table for full results)
Dam 1	-33.85221, 150.80166	0.5 m	67 m ²	0.01 ML	2 ha	1:8	Total Nitrogen, Total Phosphorus, Reactive Phosphorus, Dissolved Oxygen (% saturation), Conductivity
Dam 2*	-33.85211, 150.80155	Dry	n/a	n/a	n/a	n/a	Samples not collected
Dam 3	-33.85200, 150.80146	0.5 m	148 m ²	0.03 ML	4 ha	1:8	Ammonia, Total Nitrogen, Total Phosphorus, Dissolved Oxygen (% saturation), Conductivity
Dam 4	-33.85193, 150.80121	1.5 m	369 m ²	0.22 ML	5 ha	1:8	Total Nitrogen, Total Phosphorus, Dissolved Oxygen (% saturation), Conductivity
Dam 5	-33.85194, 150.80012	1.8 m	1638 m ²	1.15 ML	7 ha	1:8	Ammonia, Total Nitrogen, Total Phosphorus, Dissolved Oxygen (% saturation), Conductivity
Dam 6	-33.85179, 150.79890	1.0 m	1003 m ²	0.40 ML	10 ha	1:12	Total Nitrogen, Total Phosphorus, Dissolved Oxygen (% saturation), Conductivity
Dam 7	-33.85165, 150.79644	2.0 m	3921 m ²	3.14 ML	43 ha	1:17	Chromium, Copper, Total Nitrogen, Total Phosphorus, pH, Turbidity, Conductivity
Dam 8	-33.85392, 150.80111	1.5 m	970 m ²	0.58 ML	2 ha	1:5	Total Nitrogen, Total Phosphorus, pH, Dissolved Oxygen (% saturation), Conductivity
Dam 9	-33.85362, 150.79867	3.0 m	2075 m ²	2.49 ML	12 ha	1:20	Chromium, Copper, Zinc, Ammonia, Nitrite + Nitrate, Total Nitrogen, Total Phosphorus, pH, Turbidity, Conductivity
Dam 10	-33.85284, 150.80013	0.4 m	143 m ²	0.02 ML	<1 ha	1:7	Total Nitrogen, Total Phosphorus, Dissolved Oxygen (% saturation), Turbidity, Conductivity

* At time of field survey, dam 2 did not have sufficient water levels to collect water quality samples

Analyte	Dam 1	Dam 2	Dam 3	Dam 4	Dam 5	Dam 6	Dam 7	Dam 8	Dam 9	Dam 10	ANZ Guidelines	Units
Date	27/09/2023	27/09/2023	27/09/2023	27/09/2023	27/09/2023	27/09/2023	27/09/2023	27/09/2023	27/09/2023	27/09/2023		
Time	9:45 AM	9:50 AM	10:02 AM	10:06 AM	10:25 AM	10:54 AM	11:11 AM	12:08 PM	12:41 PM	12:28 PM		
Total Metals (water)											ANZG (1)	
Arsenic	0.001	dry	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.002	0.003	0.013	mg/L
Cadmium	<0.0001	dry	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	mg/L
Chromium	<0.001	dry	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.004	<0.001	0.001	mg/L
Copper	<0.001	dry	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	0.006	<0.001	0.0014	mg/L
Lead	<0.001	dry	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	0.0034	mg/L
Mercury	<0.0001	dry	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0006	mg/L
Nickel	<0.001	dry	0.002	<0.001	<0.001	<0.001	0.002	<0.001	0.006	0.002	0.011	mg/L
Zinc	<0.005	dry	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.011	<0.005	0.008	mg/L
Nutrients											ANZG (2)	
Ammonia as N	<0.01	dry	0.03	<0.01	0.05	<0.01	<0.01	<0.01	0.24	0.01	0.02	mg/L
Nitrite + Nitrate as N	<0.01	dry	<0.01	<0.01	0.02	<0.01	<0.01	0.03	0.38	<0.01	0.04	mg/L
Total Nitrogen as N	1.5	dry	1.4	0.7	1.5	0.9	0.9	1.1	1.9	2.4	0.35	mg/L
Total Phosphorus as P	0.18	dry	0.08	0.03	0.08	0.04	0.09	0.06	0.09	0.16	0.025	mg/L
Reactive Phosphorus as P	0.04	dry	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	mg/L
Biological											ANZG (3)	
Faecal Coliforms	<2	dry	6	2	48	130	10	<2	26	6	1000	CFU/100mL
Physicochemical											ANZG (2)	
Temperature	14.17	dry	14.21	17.22	18.17	17.88	18.87	20.75	21.54	18.93		°C
pH	7.05	dry	7.35	7.51	7.51	7.6	8.17	10.17	8.2	7.56	6.5 - 8	pH units
Dissolved Oxygen (% saturation)	13.3	dry	3.1	62.8	41.5	44.5	88.1	224.1	106.6	32.3	85 - 110	% sat
Turbidity	24.6	dry	4.3	2.7	2.4	3.8	120	10.2	145	58	50	NTU
Conductivity	3990	dry	4120	1830	3940	3090	2210	1890	2580	5500	300	µS/cm
Salinity	2.1	dry	2.2	0.9	2.1	1.6	1.1	1	1.3	3		ppt

Values in red are above or outside trigger values

Water sample collection was undertaken by Eco Logical Australia and samples analysed by Australian Laboratory Services (ALS)

(1) 95% Level of Protection for Freshwater

(2) Default trigger values for lowland rivers in south-east Australia (values for NSW & Vic east flowing coastal rivers)

(3) Guidelines for recreational water quality and aesthetics: Secondary contact

Water quality

Water testing and a brief field survey occurred on 27 September 2023, using a calibrated water quality meter and samples analysed at ALS Laboratories Smithfield. Water quality analytes that did not meet the adopted ANZ guidelines are summarised in the table to the left, including minor exceedance of some heavy metals and minor to moderate exceedance of nutrients. Faecal Coliform count met the guidelines, therefore, the water is suitable for secondary human contact during dewatering. Sediment testing is recommended after dewatering to ensure suitability for re-use.

Dewatering method

The works could be completed at any time of the year, provided that daytime temperature does not exceed 36°C during the final stages (to prevent stress to fauna and ecologists). Water should be pumped and slowly irrigated across the adjacent grassland prior to the removal of any vegetation. The intake pipe should be caged or shielded to minimise injury to aquatic fauna. Pumped water should be released at the highest ground and allowed to infiltrate the soil with minimal overland flow, using AS/NZS 1547:2012 Onsite domestic wastewater management as a guide to calculate flow rate. If soil becomes saturated, irrigation should be adjusted accordingly or repositioned. A large irrigation area would reduce soil saturation and minimise concentrated application of contaminants into the soil. Sediment controls, such as a silt fence or hay bales, are recommended to filter sediments from any excess overland flow. The bottom sludge material and any remaining turbid water should be excavated and dried onsite. All turbid water and sediment must be prevented from entering other waterbodies. Breaching the wall is not recommended as water collects clays and fines from the wall structure, resulting in turbid flows offsite.

Timeline of fauna relocation to be coordinated with Dam Decommissioning Work Method Procedure (or similar) and Project Aquatic Ecologist

Day 1	Day 2 - 5 (or longer)	Day 6	Day 7 - 8	Ongoing
Install erosion controls, such as silt fence (see map on left), hay bales and/or geotextile fabric, and prepare flat pump pad near the deepest end. The pump intake head is best positioned on a floating device above the deepest part of dam, held in position with ropes spanning the dam. It is difficult to move the pipe when the water is low, so it's easiest to install when dam is full. Test discharge to ensure no erosion/sedimentation occurs. Avoid disturbing vegetation (grass) where water will travel. Notify Project Aquatic Ecologist to explain type of equipment in place and likely dewatering timeframe.	Pump water and irrigate overland at a rate allowing infiltration to the soil. Check sediment controls if irrigation saturates soil causing surface runoff. Adjust pumping rate to slow runoff. Update Project Aquatic Ecologist and send photos of water level to coordinate timing of fauna relocation.	During final 0.3 m of dewatering allow Project Aquatic Ecologist to rescue fauna in one day. Contractor must be able to pump all remaining water that day. Ecologist will instruct excavator operator to dig a solid surface around pump pit and carve steps for safe access up the bank. A suitable pump, excavator and communication with site staff is essential. Water will become turbid as it lowers and when ecologists trample sediment. This water should be discharged overland and away from drainage lines. To allow rapid fauna rescue, the pump inlet needs to be large enough to suck sediment (e.g. 4 - 6 inch). Earthworks machinery can push sediment across the dam to assist final fish capture (adjusted to suit conditions and ecologist's instructions). Grade escape ramp for fauna hidden in bottom sediment overnight. Project Aquatic Ecologist to advise on ramp design (slope and location).	Leave escape ramp for fauna trapped overnight (minimum two nights).	Remove sediment and wall and commence construction.

Approvals and permits

This dam removal is part of Development Approval (DA). If the dam is licensed with Water NSW, they require notification of dam decommissioning to remove it from the register. To check status refer to Website: www.water.nsw.gov.au/Water-licensing/Applications/default.aspx; Email: Customer.Helpdesk@water.nsw.com.au; Phone: 1300 662 077. The DA conditions of consent should state that an ecologist is present to relocate fauna. This will only be performed by a person with the following licenses/approvals: Section 37 Fisheries Management Act 1994 (for fish) and an Animal Research Authority (issued by the Secretary's Animal Care & Ethic Committee). If there is no DA condition specifying an ecologist or qualified wildlife handler be presenter, then a Biodiversity Conservation Licence - Biodiversity Conservation Act 2016 is required to relocate turtles, frogs and wetland birds.

Biodiversity

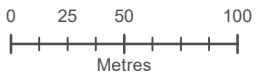
During a brief field survey, the following fauna species were observed: *Anas superciliosa* (Pacific Black Duck), *Ardea ibis* (Cattle Egret), *Chenonetta jubata* (Australian Wood Duck), *Crinia signifera* (Common Eastern Froglet), *Phalacrocorax melanoleucos* (Little Pied Cormorant) *Porphyrio porphyrio* (Purple Swamphen) and *Tachybaptus novaehollandiae* (Australasian Grebe). Based on dewatering activities nearby, the following native aquatic fauna could inhabit the site: *Anguilla australis* (Shortfin Eel), *Anguilla reinhardtii* (Longfin Eel), *Chelodina longicollis* (Eastern Long-necked Turtle) and *Philypnodon grandiceps* (Flathead Gudgeon). Pest species may also occur, including *Carassius auratus* (Wild Goldfish) and *Gambusia holbrooki* (Eastern Gambusia). Pest species *Cyprinus carpio* (European Carp) were observed in dam 5 and dam 6 during the field survey. Dominant native macrophytes and sedges included: *Azolla filiculoides* (Azolla), *Eleocharis sphacelata* (Tall Spikerush), *Juncus* sp. (Juncus), *Ludwigia peploides* subsp. *montevidensis* (Water Primrose), *Typha domingensis* (Narrow-leaved Cumbungi) and *Vallisneria australis* (Ribbonweed). No noxious aquatic weeds were observed.

Aquatic fauna handling procedure

- NOTICE:** The Aquatic Ecologist is to notify DPI Fisheries of the activity 48 hours prior to fish relocation (unless an agreement is in place), including locations of dewatered and relocation sites (see regional office contacts <https://www.dpi.nsw.gov.au/contact-us/local-office>). Fisheries require permits to be carried by the licensed ecologist, who should also display a sign clearly showing licence number (if working in public areas, especially when releasing fauna to local creek).
- PLANNING:** The dewatering schedule should allow time for fish rescue, especially during the final 0.3 m water depth or as advised by Aquatic Ecologist. Fauna should be captured in one day, so pumps need to be of an adequate size and placed in an area free from mud and debris (e.g. inside excavator bucket or screened sump pit). If wetland birds are observed nesting, or young birds (chicks) are using the dam, advise the Aquatic Ecologist immediately for advice. Depending on species and age, birds may be able to relocate themselves. Chicks will need temporary refuge during dewatering, or works may need to be postponed.
- CAPTURE:** Fish are to be collected by hand nets during the final day of dewatering. This is most effective when the water is <0.3 m deep. Dissolved Oxygen concentration will drop rapidly as water volume decreases, especially in warm water or if lots of fish are present. Larger bodied fish should be targeted first. Wetland birds will scavenge for small fish in the shallows (e.g. Gambusia). Most small fauna will likely remain uncaptured in the dam until the water becomes very shallow (especially eels and turtles). Eels are best captured by large hand nets in water <0.3 m deep, although they burrow into mud. When the water is extremely low, turtles and fish may head towards the intake pump (placed in deepest part). This area should be monitored to intercept fauna (stand in water next to intake on hard surface). Turtles will burrow into mud and may require observation and rescue the following morning but can also move themselves to suitable nearby habitat if an escape ramp is graded. Frogs can be collected by hand using a freezer/snap-lock bag if observed or heard around the fringe. Hygiene protocols are to be followed and each frog stored in a separate bag. For safety, at least two people are required when wading and handling heavy tubs of water/fish up banks (excavator should dig access steps/ramp).
- RELOCATE:** Native fish healthy enough for relocation are to be contained and transported in an aerated tub/bank to an appropriate waterbody. DPI Fisheries advise that the host location should be large enough to accommodate additional fish, especially predatory eels. Additional release sites may be needed. Do not overstock tubs or leave in direct sun for extended periods. Aeration can be provided by battery aquarium pumps or manual turbulence if only stored for a short period. Turtles can be transported in a shaded tub with a wet hessian bag placed inside for moisture and support during transport. Frogs can be transported in an inflated freezer/snap-lock bag containing leaves moistened with bottled water or dam water. Tadpoles can be transported in small buckets with dam water.
- RELEASE:** Water from the receiving waterbody should be mixed slowly over 5 - 10 minutes with the tank water to allow fish to acclimatise to the new water quality. Eels are less susceptible to changes in water quality. Care should be taken when releasing fauna not to also transfer weeds or invasive species (e.g. Carp eggs and Gambusia). Transfer animals via hand nets, rather than tipping the tub with water in the host waterbody. Eels can be released on land a few metres from the edge and pointed towards the water. Frogs are to be released in dense shade alongside water in the nearest protected riparian corridor.
- PESTS:** Exotic fish (e.g. Carp, Gambusia) are to be intercepted, euthanised and disposed of in accordance with the ecologist's Animal Research Authority (issued by the Secretary's Animal Care & Ethic Committee). Exotic *Trachemys scripta elegans* (Red-eared Slider Turtle) are to be contained humanly and DPI immediately notified (Biosecurity Line - 1800 680 244). They will collect the live turtle from the ecologist.
- POST-DEWATERING:** An escape ramp should be graded to allow trapped fauna to escape overnight. The Project Aquatic Ecologist will advise on ramp design (slope and location) on the day. Sediment should be left up to two nights to allow hidden fauna to emerge, unless the ecologist confirms there are no fauna remaining (site specific assessment). Earthworks staff should notify the Project Aquatic Ecologist if stranded fish or turtles are observed post-dewatering.
- REPORTING:** The Project Aquatic Ecologist should prepare a summary report suitable for submission to Council within 7 days of completing the aquatic fauna relocation works. The report would detail that the works have been completed according to this aquatic fauna handling procedure, and would include information relating to the location of the dam, the licences held by the staff involved in the works, the number and type of native species relocated, location of release point/s for native fauna and the number and type of exotic species dispatched. Photographic evidence of various steps in the procedure should be included.

- ▲ Water quality sample point
- ➡ Direction of slope
- ➡ Recommended pump position
- ➡ Recommended erosion control
- Not a river (pending DPE-Water approval)
- 1:25,000 waterway mapping (DPE-Water)

- Contours (2 m)
- Dam
- Dry dam
- Recommended irrigation area
- Cadastre
- Key Fish Habitat (DPI Fisheries)



Datum/Projection:
GDA2020 MGA Zone 56
Project: 23SYD-5214 Date: 16/10/2023

