GUIDELINES FOR
WORK-AS-EXECUTED REPORTS for
Completed Dam Works

Version 2.0

December 2009

Tasmania
Explore the possibilities

Department of Primary Industries, Parks, Water & Environment

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1. BACKGROUND

1.1 Introduction

These Guidelines have been produced to assist dam owners and consultants in the preparation of **Work-as-Executed Reports for Completed Dam Works** which is a standard condition of all dams required of the *Permit to Construct a Dam under Section 157* of the *Water Management Act 1999* ("the Act").

The *Water Management (Safety of Dams) Regulations 2003* ("the Regulations") require that a person or persons undertaking Work as Executed Reports must do so in accordance with relevant competency standards as required by the hazard category of the dam and the height of the dam.

Compliance with these legislative requirements is mandatory, however, it needs to be remembered these guidelines, as far as practicable, are provided only to assist in ensuring the person or persons who certify the supervised construction of the dam are able to efficiently meet their responsibilities and the Department's requirements. These Guidelines are therefore provided only to assist with the preparation of the report in this regard and responsibility to ensure appropriate reporting is undertaken belongs to the person or persons who certify the Report.

There are two basic formats for the preparation of the Work-as-Executed Report, as defined under Section 7 - Required Competency Standards of the Regulations. These are:

- For Dams which have Very Low and Low hazard categories and are up to 10 metres in height; and for Dams which have Very Low hazard categories and are between 10 to 25 metres in height. **Proforma – FORM A (refer to Appendix 2)** should be used.

- For all other dams, a stand-alone report is required. **Proforma – FORM B (refer to Appendix 3)** is provided only to assist with the preparation with the higher standard of reporting required; but must not be used alone as the standard reporting format. Form B is provided only to assist with detailing the minimum requirements which will be acceptable by the Department and only prompts the person undertaking the report by proving the base level information required to be reported upon and included in the more detailed stand alone report format.

1.2 Qualifications of Persons preparing Work-as-Executed Reports

The table below (Table 1) is taken from the Regulations Section 7 - Required Competency Standards and prescribes the required minimum qualifications for persons who prepare Work-as-Executed reports.

Table 1 *Minimum qualification of Persons preparing Work-as-Executed Reports*

Dam Height:	Hazard Category:	Qualifications:
For Dams less than 10 metres in height	Very Low	Any person
	Low	Engineer with Class B Competency
	Significant and High C	Engineer with Class A Competency
	High A,B and Extreme	Expert team
For dams 10 metres or higher but less than 25 metres	Very Low	Engineer with Class B Competency
	Low, Significant, High C	Engineer with Class A Competency
	High A,B and Extreme	Expert team
Dams greater than 25 metres in height	All Dams	Expert Team

1.3 Limitations

These guidelines indicate the minimum standard for Work-as-Executed reports for acceptance by the Department of Primary Industries, Parks, Water & Environment. A Work-as-Executed Report that does not address the basic requirements of these guidelines will generally be referred back to the dam owner for revision.

2. CONTENTS OF WORK-AS-EXECUTED REPORTS

2.1 Report FORM A

To be used for Very Low and Low hazard category dams up to 10 metres in height and for dams which have Very Low hazard category between 10 to 25 metres in height.

The following items must be detailed in the Work-as-Executed report and they are included here as headings for the format of the report:

1. Details of the Permit to Construct a Dam under Section 157:
   a) Owner, address and other personal details
   b) Details of the constructed dam complying with the Permit to Construct a Dam
   c) Details and comparison of as-constructed works with the design
   d) As constructed dam specifications/dimensions

2. Details of Dam Owner
3. Details of the Contractor
4. Details of the Supervising Engineer *(if applicable)*
5. Details of preconstruction report consultant *(if applicable)*
6. Construction Dates
7. Confirm Location of Construction
8. Schematic Drawings of the Dam Detailing as Constructed Measurements:
   a) Cross sections measurements;
   b) Details of the executed completed dam works;
      (i) *Crest length*
      (ii) *Dam height*
      (iii) *Crest width*
      (iv) *Batters*
      (v) *Capacity*
      (vi) *Maximum depth of material stripped under the embankment*
      (vii) *Depth of topsoiling placed on the batters*
      (viii) *Maximum depth of crowning above maximum embankment height*
   c) If required, further written explanation and notes detailing execution of the completed dam works.
9. Dam Levels Confirming Benchmark (reduced level), Dam Crest (reduced level), Spillway Invert (reduced level) and Outlet Pipe (reduced level).

10. Construction Information required to be provided:

    a) *Foundation* - Preparation and conditions encountered.

    b) *Keyway* - Description and dimensions, location and summary of work undertaken detailing how site conditions were determined and suitably addressed in their construction.

    c) *Construction Methods* - Description of the construction of the structure or the embankment, defining the construction methods employed (eg. materials used, compaction effort applied, method to compact, summarising the overall suitability in executing the work).

    d) *Record Keeping* - A written record and visual assessment of the dam whilst being constructed needs to be undertaken and provided in the Work-as-Executed Report (ie. all information about the dam, particularly including the often forgotten materials specification and placement, needs to be recorded). It is recommended the Work-as-Executed Report and associated photographic record *(see below for listing of the recommended photographs to be provided)* is completed whilst the dam is being constructed.

11. Soil Material – Description of the soil material encountered during dam works:

    a) *Materials* - The type of clay, sand, gravel or rock used in construction – description of the suitability of the materials must be supplied, how it was placed and managed, as well as basic classification of the materials or description of any variances in the material types should they change.

    b) *Moisture Content* - Summary about the moisture content describing any wet or dry materials encountered that could affect overall material suitability for structural integrity and impermeabiity.

    c) *Compaction* - Provide details of how compaction was undertaken, measured and/or tested (if undertaken) so to demonstrate suitability. Details of compaction equipment used, number of passes applied and summary of the suitability is a requirement.

    d) *Cohesiveness* - Detail any apparent problems due to pervious areas or materials encountered.

    e) *Comments* - Description of the overall suitability of materials used in the keyway, embankment and those encountered in the spillway and return slope; and any local geology and whether there are fossilised or active landslips, potentially dispersive soils etc at or around the dam site need to be described.

12. Outlet Works – Description and summary of the method of installation of the outlet pipe; including size of the trench, number and spacing of baffle plates, the method for joining pipes, method of bedding backfilling and compaction around the pipe *and* the location of concrete anchor blocks.

13. Spillway – Summary of the sizing of the spillway; detailing the as-constructed spillway dimensions and their relationship to ensure that design floods can reasonably pass in the flood capacity requirements. Provide a description of the as-constructed spillway and return slope construction. Report upon outlet widths/depths, spillway protection methods and overall suitability.

14. Spring Flows – Provide the number, flow rate, location and size of any springs and details of the measures taken to manage them within the embankment, spillway and return slope footprint which may have been encountered while constructing the dam.

15. Fish Ladder – Describe the method of construction, length and gradient and comment about the structural suitability.

16. Attachments *(if applicable)*

Photographic Record (where considered applicable) of:

a) Embankment footprint after stripping the top soil from the dam site

b) Open keyway trench

c) Initial foundation construction

d) Open outlet pipe trench

e) Backfilling and compacting around the outlet pipe

f) Embankment construction at various heights

g) Upstream and downstream batters

h) Completed embankment

i) Spillway and return slope

j) Other photographs if applicable

17. Preconstruction Conditions of the Dam Permit

- Dam Works Practices Plans *and;*
- Environmental Water Quality Requirements

➢ These are reporting requirements specifically listed in the individual Work-as-Executed Report relating directly to compliance to the related permit conditions for the dam.

➢ These are to be confirmed in the report as meeting the permit conditions by tick off and providing details and / or reporting about the implementation of the associated actions taken.

➢ Once ticked, the associated reports, plans or details need to be provided forming part of the Work-as-Executed Report.

18. Certification by the Person who supervised construction of the dam

The Department will only accept Work-as-Executed Reports provided the dam is suitably constructed ensuring its integrity is demonstrated as being structurally safe and suitably constructed.

The information submitted in the report must be signed off by the person who supervised its construction that it complies with the conditions and specifications on the *Permit to Construct a Dam under Section 157* of the *Water Management Act 1999; and* be true and correct according to the following;

- The final dam works must comply with the conditions and specifications of the permit except where specifically stated in this report.
- All preconstruction conditions, Dam Works Practices Plans & Environmental Water Quality Requirements as required by the permit are undertaken and verified as being undertaken; *and*
- All information, reports, plans and details submitted with this report are true and correct.

2.2 Report FORM B

To be used to develop the stand alone Work-as-Executed Reports to be undertaken by Class A, C and Expert teams

The following items need to be considered in the Works-as-Executed report as a ***minimum requirement*** for these types of dams; and they are included here as suggested headings for the format of the report:

- Introduction
- Details of the constructed dam complying with the Permit to Undertake Dam Works
- Confirm location of construction
- Details and comparison of as-constructed works with the design
- As-constructed dam specifications/dimensions:-
    - Schematic drawings of the dam detailing as constructed measurements;
    - Plan and cross sections measurements;
    - Written explanation and notes detailing execution of the completed dam works;
    - Dam levels confirming benchmark (reduced level), dam crest (reduced level), outlet pipe (reduced level).
- Construction Dates
- Photographic records - at the critical zones of construction
- Description of the dam works construction program
- Construction Information required to be provided:-
    - Preconstruction – details confirming methods undertaken to ensure matters specific to the dam are addressed.
    - Foundation – preparation and conditions encountered.
    - Keyway – description and dimensions, location and summary of work undertaken detailing how site conditions were determined and suitably addressed in their construction.
    - Full description of the construction of the structure or the embankment, defining the construction methods employed and locations (eg materials management, jointing processes, geo-fabrics and mattresses, drainage of all completed zones, filters, density testing with summary of their suitability and all details of the methods employed in locating and executing these types of works).
    - Outlet pipe – description and summary of the method of installation of the outlet pipe, including size of the trench, number and spacing of baffle plates, the method for joining pipes, method of bedding backfilling and compaction around the pipe *and* the location of concrete anchor blocks.
    - Spillway – summary of the sizing of the spillway; detailing the as constructed spillway dimensions and their relationship to ensuring that design floods can reasonably pass in meeting the flood capacity requirements. Provide topographical assessment and description of the as-constructed spillway and return slope design, ensuring gradient, outlet widths/depths and spillway protection methods are fully reported.

- Materials – Description of material encountered during dam works:
  - Borrow and materials description.
  - Full summary of materials used in construction. Provide full reporting about moisture content, compaction, cohesiveness and any apparent problems due to pervious areas or materials encountered.
  - Detailed recording and visual assessment of the dam whilst being constructed (ie provide all information about materials specification and placement).
  - Detailed assessment of the geotechnical conditions encountered at the dam site and their likely impact on the structural integrity of the dam. This may include undertaking density testing, subsoil probing such as drilling, backhoe test pits, ground penetrating radar or other methods considered suitable for determining the overall suitability for the dam.
  - Description of the local geology and whether there are fossilised or active landslips, potentially dispersive soils etc at or around the dam site.
- Fill Material:
  - The type of material used or encountered in all construction phases ie in all zones of construction from preconstruction site preparation through to the full completion of dam construction.
  - Details of and recording and assessment, summarising all materials tested and used.
  - Photographic records where appropriate.
- Spring Flows
  - Provide the number, flow rate, location and size of any springs; and details of the measures taken to manage them within the embankment, spillway and return slope footprint which may have been encountered while constructing the dam.
- Attachments *(if applicable)*
  - As constructed drawings of:-
    - *a)* Locality plan(s)
    - *b)* Detailed plan view(s)
    - *c)* Embankment – cross sectional view(s)
    - *d)* Spillway details including any control structures
    - *e)* Return slope cross sections
    - *f)* Other applicable drawings
    - *g)* Associated construction notes

- Photographs (where considered applicable) of:-

    a) Embankment footprint after stripping the top soil from the dam site
    b) Open keyway trench
    c) Initial foundation construction
    d) Open outlet pipe trench
    e) Backfilling and compacting around the outlet pipe
    f) Embankment construction at various heights
    g) Upstream and downstream batters
    h) Completed embankment
    i) Spillway and return slope
    j) Other photographs if applicable.

❖ Preconstruction Conditions of the Dam Permit

- Dam Works Practices Plans *and;*
- Environmental Water Quality Requirements
    - These are reporting requirements to be included in the Work-as-Executed Report relating directly to compliance to the related permit conditions for the dam.
    - These are to be confirmed in the report as meeting the permit conditions by tick off and providing details and / or reporting about the implementation of the associated actions taken.
    - Once ticked, the associated reports, plans or details need to be provided forming part of the Work-as-Executed Report. These may include:

<u>Dam Works Code – 2007 – *Requirements*</u>

- Dam Works Practices Plans – *Works to clear and Convert Land*

a) Building access to the forest

i. Planning and locating roads
ii. Road design
iii. Road construction
iv. Upgrading existing roads and tracks
v. Quarries and borrow pits
vi. Bridge, causeway and ford construction
vii. Road maintenance
viii. Water supply and other significant catchments

b) Harvesting of timber

i. Design, planning and equipment considerations
ii. Wet weather limitations
iii. Snig track landings
iv. Water Quality and water course protection (streamside vegetation at a dam site is to be cleared last)
v. Steep country harvesting

c) Conservation of natural and cultural values *(refer Note 3)*

   i. Soils (applicable to building access to the dam and other associated dam works)

   ii. Water quality and flow (streamside vegetation at a dam site is to be cleared last)

   iii. Geomorphology (in relation to karst)

d) Establishing and maintaining forests

   i. Use of chemicals

   ii. Fire management *(refer Note 5)*

   iii. Pest, disease and weed control

e) Management of fuel, oils, rubbish and emissions

   i. Use of fuel, grease and oils

   ii. Disposal of rubbish

   iii. Smoke, noise and dust

f) Other

   i. Details of any glossary, references or bibliography used *(refer Note1)*

   ii. List of the appendices, referred to from the Forest Practices Code – 2000 *(refer Note 2)*

   iii. Details of any actions or implementation as approved for historic or cultural purposes *(refer Note 4)*

NOTES – Works to clear and convert land

(Note 1) All Glossary, References and Selected Bibliography as adopted by the Forest Practices Code 2000 apply

(Note 2) All Appendices to parts of the Forest Practices Code 2000 apply

(Note 3) Impacts on natural values addressed through conditions on a dam works permit. Conditions may prescribe specific actions or actions in accordance with a relevant management plan

(Note 4) In addition to the approval under the Water Management Act 1999, a dam works proposal may require approval under the Aboriginal Relics Act 1975 and Historic Cultural Heritage Act 1995.

(Note 5) Fuel burning in dry eucalypt forest should follow recognised industry practice such as outlined in Using Low Intensity Fire in Land Management. High intensity burns should be prepared and accredited procedures complied with, such as those outlined in High Intensity Burning. Person responsible for the planning and conduct of high intensity burns (including windrow burns) adjoining areas with flammable fuels should hold appropriate competency accreditation. Burning in Karst Areas – near cave entrances and sinkholes will be avoided. High intensity burning will be avoided where degradation of significant karst features is likely to result, such as sites with vulnerable karst soils on slopes above 12%.

- Dam Works Practices Plans – *Offsets*

  a) Improved reservation of a site

     i. Details of the Conservation Covenant

     ii. Details of the transfer of land to the Crown for a reservation

     iii. Details of a formal management agreement

  b) Management actions that aim to benefit natural values at an existing site

     i. Details of the areas protected

     ii. Details of the area remediated or improved natural values to provide conservation outcome.

     iii. Details of fenced areas

  c) Restoration or revegetation of sites to provide a direct conservation benefit

     i. Details of the creation of foraging habitat for threatened species

     ii. Details of the actions facilitating the recovery of areas with the potential to revegetate naturally

  d) Other specific protection provisions

     i. Other agreed actions to increase knowledge regarding a natural value where a threat may exist

     ii. Other agreed action to increase protection or viability

- Guidelines and Standards *(refer to Dam Works Code - 2007)*

  a) Algal Management Plan for In-stream Storage

     i. Management Level 1

        (i) Restrict stock access and human contact.
        (ii) Restrict extractions for stock watering purposes.
        (iii) Advise downstream users.
        (iv) Monitor the storage more frequently to see if algal bloom progresses.
        (v) If a scum exists take a sample and send to a laboratory5 for identification.

     ii. Management Level 2

        (i) Notify the local Regional Water Management Officer (RWMO) and Environmental Health Officer.
        (ii) Ban stock and human access to the water body.
        (iii) Ban drinking water extraction.
        (iv) Stop downstream release of water from the storage if possible.
        (v) If water cannot be contained place a notice in your local newspaper advising of risks.
        (vi) Advise downstream users to avoid drinking or allowing stock access.
        (vii) If sample not already taken, take one and send to laboratory for identification.

b) Effluent or waste water liners

i. In-situ testing carried out to Australian Standard; AS 1289
ii. Earthworks and construction carried out to Australian Standard; AS 3798
iii. Stormwater and weed control in place during construction
iv. Engineer in-charge responsible for
v. Supervising liner installation and quality control
vi. Supervising all technical staff involved
vii. Conducting quality control tests and sampling in the field
viii. Signing off all quality control testing
ix. Proving all documentation of all relevant activities including engineering design, construction and quality assurance.
x. Lagoon wastewater constituents from trade wastes or other constituents of the wastewater stream checked for liner compatibility and risk of mitigation to groundwater.

- **Giant Freshwater Lobster *(refer to Dam Works Code - 2007)***

Provide the following;

a) Name of Consultant

b) The survey and the relocation requirement *(see Note 1)*

c) Implementation of any actions undertaken

i. Survey and Capture all sizes of lobster before and disturbance
ii. Search and capture undertaken in 2-day period before construction commencement
iii. Survey and capture in undertaken 50 metres upstream and downstream of the proposed dam
iv. Survey undertaken in any other part of the watercourse likely to be disturbed by the dam
v. Consultant was satisfied all lobsters had been captured before commencement of dam
vi. Search and capture operations not undertaken in elevated floods when water is turbid

(Note 1) – Provided as per Attachment 3 of the Permit to undertake Dam Works

- Wedge-tailed Eagles *(refer to Dam Works Code - 2007)*

Provide the following;

a) Name of consultant who undertook report

b) The survey report

c) Details of and Implementation of any actions undertaken

- Goshawk *(refer to Dam Works Code - 2007)*

Provide the following;

a) Name of consultant who undertook report

b) The survey report

c) Details of and Implementation of any actions undertaken

- Masked Owl *(refer to Dam Works Code - 2007)*

Provide the following;

a) Name of Consultant

b) The survey report

c) Details of and Implementation of any actions undertaken

- Sediment and Erosion Control Plan

a) Provide confirmation sediment and erosion control plan been approved by the Regional Water Management Officer

b) Provide details of the implementation

- Certification by the Person who supervised construction of the dam.

The Department will only accept Work-as-Executed Reports provided the dam is suitably constructed ensuring its integrity is demonstrated as being structurally safe and suitably constructed.

The information submitted in the report must be signed off by the person who supervised its construction that it complies with the conditions and specifications on the Permit to Construct a Dam under Section 157 of the Water Management Act 1999; and be true and correct according to the following;

- The final dam works must comply with the conditions and specifications of the permit except where specifically stated in this report.
- All preconstruction conditions, Dam Works Practices Plans & Environmental Water Quality Requirements as required by the permit are undertaken and verified as being undertaken; *and*
- All information, reports, plans and details submitted with this report are true and correct.

3. GENERAL INFORMATION

Work-as-Executed Reports must be submitted within 14 days of the completion of the dam.

The Report must be submitted to:

Section Head (Dam & Water Administration)

Water Management Branch

Department of Primary Industries, Parks, Water & Environment

GPO Box 44

HOBART TAS 7000

Email: bill.shackcloth@dpipwe.tas.gov.au

Or; hand delivered to:

Section Head (Dam & Water Administration)

Water Management Branch

Department of Primary Industries, Parks, Water & Environment

Ground Floor

Marine Board Building

1 Franklin Wharf

HOBART TAS 7001

Telephone & email enquiries:

Sam Ditchfield – Dam Safety Engineer	Ph: (03) 6233 3347 or 0419 057 862
	Email: Sam.Ditchfield@dpipwe.tas.gov.au
David Krushka – Dam Safety Project Officer	Ph: (03) 6336 5450 or 0428 387 817
	Email: David.Krushka@dpipwe.tas.gov.au

Other Links and Contacts

- The Water Management (Safety of Dams) Regulations 2003 and the *Water Management Act 1999* are available at:

  http://www.thelaw.tas.gov.au/

- ANCOLD

  http://www.ancold.org.au/

ANCOLD Publications

ANCOLD publications referred to in this information sheet are available from:

ANCOLD, C/- Goulburn-Murray Water, PO Box 165, TATURA VIC 3616

Phone: 03 5833 5644; e-mail: ancold@g-mwater.com.au

APPENDIX 1 – Competency Definitions

Draft changes for defining the required competency standards for undertaking Dam Safety Activities under the Safety of Dams Regulations:

	Qualifications	**Alternative Qualification and Experience**
Owner	*A person* must be the Dam Owner.	
Any Person	*A person* must be the dam owner *or;* any other person undertaking the activity.	
Class B	*A person must meet either of the following to qualify for competency;* (A) Have Advanced Diploma in Civil or Agricultural Engineering[1]; *and* be an associate *or* officer member of the Institution of Engineers, Australia with a minimum of 5 years experience[2] specific to dam engineering and construction; *or* (B) Have a 4 year degree in Civil or Agricultural Engineering[1]; *and* be a graduate member of the Institution of Engineers, Australia; *and* have a minimum of 2 years experience[2] specific to dam engineering.	[1]Persons with alternative qualifications may seek approval to undertake dam safety activities at Class B competency by writing to the Manager, Water Management Branch, DPIW, providing details of their qualifications training and relevant experience[2]. [2]A Person has experience if he or she has undertaken investigation, design, construction and day-to -day safety management of dams of a height, type and hazard category similar to the relevant dam
Class A	*A person must have, as a minimum,* a 4 year degree in Civil Engineering[1]; *and* be a member of the Institution of Engineers, Australia; *and* be registered[2] on the National Professional Engineers Register (NPER) in an appropriate branch of engineering;	[1]Persons with alternative qualifications may seek approval to undertake dam safety activities at Class A competency by writing to the Manager, Water Management Branch, DPIW, providing details of their qualifications training and relevant experience[3]. [2]Persons not registered but eligible for registration may seek approval to undertake dam safety activities at Class A competency by writing to the Manager, Water Management Branch, DPIW, providing details of their training and experience[3]. [3]A Person has experience if he or she has at least 5 years experience in general Civil Engineering or equivalent undertaking investigation, design, construction, surveillance and safety management of dams; *and* must have experience in dam technology appropriate to the height, type and hazard category to the relevant dam.

	Qualifications	Alternative Qualification and Experience
Class C	*A person must have, as a minimum,* have a 4 year degree in engineering[1] or science[1]; be a member of the Institution of Engineers, Australia; *and* be registered[2] on the National Engineering Technologists Register (NETR); *or* equivalent professional body; *and* have demonstrated further specialist qualifications one of the following engineering disciplines; Geotechnical, Hydrological, Mechanical, Electrical, Environmental or other specialist field relevant to the particular dam	[1]Persons with alternative qualifications may seek approval to undertake dam safety activities at Class C competency by writing to the Manager, Water Management Branch, DPIW, providing details of their qualifications training and relevant experience[3]. [2]Persons not registered but eligible for registration may seek approval to undertake dam safety activities at Class C competency by writing to the Manager, Water Management Branch, DPIW, providing details of their training and experience[3]. [3]A Person has experience if he or she has at least 5 years experience in a specialist aspect of dam technology appropriate to the height, type and hazard category to the relevant dam.
Expert Team	*A Team of Experts must* as a minimum be made up of at least 3 specialists; with at least one of the persons having as a minimum Class A competence *and the* two other persons collectively having Class C competence, with specialist qualifications in structural, geotechnical or other engineering skill area appropriate to the specific dam. The team shall consist of persons who collectively have a knowledge and understanding of the causes and modes of dam failure. Selection of other persons who have professional expertise shall be undertaken in the following areas in so far as they relate to the requirements of the relevant dam activity; (A) engineering surveying (B) hydrology (C) hydraulics (D) engineering geology (E) soil and rock mechanics (F) evaluation of properties of materials (G) dam design (H) structural design) (I) mechanical design (J) construction practices (K) instrumentation (L) any other areas the Minister or Assessment Committee considers relevant.	