



Curriculum Vitae

James Willey | A GHD Principal Senior Technical Director – Dams



Qualified. Bachelor of Engineering, Honours (Civil), Registered Professional Engineer Queensland

Connected. Institution of Engineers Australia, (Member), Australian National Committee on Large Dams (Associate Member)

Countries. Australia, Papua New Guinea, Malaysia, Bangladesh, United Kingdom

Relevance to project. James joined GHD in 2001 and is a Senior Technical Director – Dams based in Brisbane. He has 24 years of experience in a range of projects including embankment and concrete dam design, spillway design, dam and spillway upgrades and remedial works, dam safety, surveillance reviews, risk assessment and construction phase support.

In recent years, James has been closely involved with a series of projects at Paradise Dam focussed on the investigation, assessment and design of dam safety improvement works which is currently in the preliminary design phase as part of the detailed business case.

James was a key member of the design team for the Enlarged Cotter Dam, which at 87 metres high is the highest roller-compacted concrete dam in Australia. For this project, James led the spillway design package as well as providing input into other facets of the project, including the foundation grouting.

Other significant projects in which James has been involved include the design and construction of the Paradise, Kangaroo Creek, Googong and Jindabyne Dam Spillway Upgrades, detailed concept design for the Warragamba Dam Raising, tender design for Ruataniwha Dam (consortium successful as preferred tenderer), and various other dam and spillway upgrades including Maroon, Ewen Maddock, Eildon, Corella, Crooks and Wyndham Dams.

Paradise Dam Spillway Improvement – Essential Works Detailed Design | Queensland

Project Manager and Design Manager for the detailed design of the Essential Works package which is needed for short-term risk reduction for Paradise Dam, a 52 m high, 900 m long RCC structure. The key component of the work includes the lowering of the 315 m long primary spillway crest by 5-10 m, as well as modification of the outlet works to accommodate the lowered storage level.

Paradise Dam Spillway Improvement – Preliminary Design | Queensland

Project Manager and Design Manager for the preliminary design of the dam safety improvement project responsible for technical management and coordination of tasks including dam stability analyses, geological and geotechnical modelling, spillway hydraulic assessment including 2D and 3D CFD modelling, risk assessment, risk-based

design, review of options for optimisation of hydropower generation at the site, and preliminary design and documentation of the dam improvement works.

Warragamba Dam Raising – Detailed Concept Design | New South Wales

Responsible for spillway hydraulics design advice for the detailed concept design of the 14 m raising of an existing 142 m high concrete gravity dam and redesign of the main and auxiliary spillways, including CFD and 1:70 scale physical hydraulic modelling.

Cressbrook, Cooby and Perseverance Dams | Dam Engineering Services | Queensland

Lead Dams Engineer responsible for ongoing dam engineering services including annual, comprehensive and special dam safety inspections, dam safety reviews, acceptable flood capacity assessments, risk assessments, and



Curriculum Vitae

advice on and design of remedial works over the period from 2001 to present in relation to Toowoomba Regional Council's dams including Cressbrook (59 m high zoned earthfill dam), Cooby (32 m high concrete-faced rockfill dam) and Perseverance (56 m high zoned earth and rockfill dam) Dams.

Lake Mainit Hydropower Project | Philippines

James was responsible for undertaking a review of the hydraulic design of the power intake and tunnel, providing input into the optimisation of the intake, and undertaking the power study to determine energy generation potential.

Paradise Dam – Early Works Packages for Detailed Business Case | Queensland

Following on from the Preliminary Business Case, further tasks were undertaken including review of historical geological information and development of a three-dimensional engineering geological model, and review of previous hydraulic modelling and development of a validated CFD model. James was responsible for the technical coordination and project management of these tasks.

Paradise Dam Facility Strategy & Options Analysis and Preliminary Business Case | Queensland

Lead Dams Engineer for the review and development of options for the dam safety upgrade of Paradise Dam, and provision of input into development of a Preliminary Business Case in accordance with Building Queensland guidelines. This included full upgrade options retaining the dam in essentially its current configuration, permanent lowering of the primary spillway crest, replacement of the dam with a new structure, and complete decommissioning of the asset.

Burdekin Falls Hydroelectric Power Station Project | Queensland

Hydropower Engineer responsible for undertaking the power study to determine energy generation potential for the power station arrangements under consideration. The proposed power station would utilise irrigation and flood releases from the existing Burdekin Falls Dam. This work initially formed part of an overall fatal flaws assessment of the two previously-developed scheme arrangements and then led into a process to refine and select the reference project to carry forward into the Detailed Business Case.

Paradise Dam Improvement Project Stage 2 | Queensland

Lead Designer and Project Manager for the concept and detailed design of improvement and strengthening works including reinforcement of the toe of the main spillway, protection works for the left abutment, upgrade of the access crossing in the discharge channel and other minor works. The project also included extensive CFD modelling of the proposed works to assess possible impacts on fish species. Construction phase design advice was provided to assist the client throughout the construction period.

Ewen Maddock Dam Concept Selection and Preliminary Design | Queensland

Design Engineer for dam and spillway upgrade to address deficiencies including inadequate spillway capacity, high risk of piping and foundation liquefaction potential. Involved in development of concept options for upgrade, coordination of CFD modelling of the spillway, input to structural analysis and design of spillway components, input into design of other features including the dam embankment raising/strengthening.

Kangaroo Creek Dam Upgrade | South Australia

Spillway Design Manager for flood capacity upgrade of 63 m high concrete-faced rockfill dam and side-channel spillway. Tasks include coordination of CFD and physical hydraulic modelling, input to structural analysis and design of spillway components, input into design of other features including the dam embankment raising and spillway cut slope stabilisation.

Glen Niven Dam Stabilisation | Queensland

Lead Designer for project including failure impact assessment, preliminary assessment of dam/spillway upgrade options, geotechnical investigations and detailed design.

Paradise and Fairbairn Dam Failure Impact Assessments | Queensland

Dams Engineer responsible for the development and modelling of breach hydrographs as an input to the failure impact assessments and, for Paradise Dam, overview of the development of potential life loss estimates based on the hydraulic modelling.



Curriculum Vitae

Middle Creek Dam Upgrade | Queensland

Lead dams engineer for assessment of upgrade requirements for a 26 m high earth and rockfill dam. Tasks include detailed risk assessment, identification and development of risk mitigation measures, preparation of a concept design for the upgrade of the dam and spillway, preparation of the detailed design and tender documentation, assistance during tender phase and provision of design support throughout construction.

Awoonga Dam Acceptable Flood Capacity Upgrade | Queensland

Design Manager for investigations, concept and detailed design, and construction phase services for a staged upgrade of Awoonga Dam to provide the Acceptable Flood Capacity including raising of an existing saddle dam, the spillway abutment and the main dam crest and construction of a new saddle dam and auxiliary spillway channel. James also provided site and design assistance during the construction phase.

Awoonga Dam Spillway Hydraulic and Structural Analyses | Queensland

Technical Lead responsible for coordinating an assessment of the structural stability and the hydraulic performance of the spillway. The structural stability is being reviewed through a 3D finite element analysis of the structure taking into account measured foundation pore pressures to assess the need for any required strengthening. The review of the hydraulic performance follows large floods experienced in 2010/11 and 2013. This analysis includes 2D and 3D CFD modelling of the spillway, assessment of erosion potential and prediction of the spillway's performance over the full range of design floods.

Ruataniwha Water Storage Scheme | Hawke's Bay, New Zealand

Design Engineer for the tender design of an 80 m zoned earth and rockfill irrigation dam including diversion works, outlet works and spillway. James was responsible for the hydraulic and structural design of the spillway including coordination of CFD modelling of the spillway options, as well as providing input into other aspects of the design of the dam embankment and other structures. James was also closely involved in the design of the diversion arrangement consisting of a 5 m diameter tunnel which was then to be fitted out to carry the outlet works.

Bulk Water Alliance | Enlarged Cotter Dam | Australian Capital Territory

Senior engineer on the design team with responsibility for design of the spillway works for the 87 m high roller-compacted concrete dam, diversion risk modelling, input into the structural/geotechnical design of the main dam, two saddle dams (approximately 11 m and 16 m high) and other project features. The spillway design package for which James was responsible included the hydraulic design, input to and coordination of CFD modelling to optimise the spillway layout, management of a physical scale model study, input to and coordination of the structural design of the spillway works and assessment of downstream impacts including rock erosion. During construction, he has been closely involved in the foundation grouting for the main dam and saddle dams using the GIN method and provision of design advice for spillway components.

Central Highlands Regional Council | Nogo River Weir Remedial Works | Queensland

Lead Engineer responsible for undertaking an inspection in response to observed sinkhole on the upstream abutment, developing design for repair of sinkhole and other structural deficiencies, and provision of advice during remedial works construction.

Ewen Maddock Dam | Concept Design, Detailed Design and Construction Phase Services | Queensland

Job Manager and Lead Designer for the assessment and design of remedial works for an earthfill embankment on alluvial foundations with high foundation pore pressures, development of detailed design and documentation and provision of advice during construction. Scope of remedial works includes relief wells, drainage collection network and a sand blanket and toe berm over the downstream foundation.

Bulk Water Alliance | Googong Dam Spillway | Australian Capital Territory

Continuing on from the Googong Dam Spillway Rock Protection Project listed below, responsible for provision of design advice during construction and input into construction methodology. The spillway successfully passed the flood of record less than one month after the completion of construction.



Curriculum Vitae

Googong Dam Spillway Rock Protection | Australian Capital Territory

Project manager and Lead Designer for assessment of rock erosion mechanisms, development/comparison of options for repairing erosion in the unlined rock spillway channel, management of technical review panel, project and technical management of a physical spillway model study and detailed design and documentation of the adopted option. The project also involved design and documentation for the upgrade of dam safety instrumentation networks for Googong Main and Saddle Dams and Corin Dam.

Ted Pukallus Weir Remedial Works | Queensland

Lead engineer for assessment of and design of remedial works for a water supply weir damaged in January 2011 floods, including provision of design advice through construction. The project involved the reinstatement of the upper 1.2 m of the weir which had failed during the flood event.

DEWS Non-Commercial Asset Audit Inspections | Queensland

Project Director and Dams Engineer for annual audit inspections of 21 dams and weirs across Queensland.

Wide Bay Water Dam Safety Inspections and Documentation | Queensland

Project manager and lead dams engineer for dam safety inspections of Wide Bay Water's headworks infrastructure (including Lenthall Dam, 800 ML effluent storage dam and Teddington Weir) and preparation of dam safety documentation from 2007 to the present.

Boulder Creek Weir Remedial Works | Queensland

Lead Engineer for assessment and design of remedial works for Tully water supply weir including concrete buttressing of the downstream face for stability.

Safety Review for Little Nerang Dam | Queensland

Lead dams engineer for 20-year dam safety review of 44 m high concrete gravity dam.

Corella, Crooks and Wyndham Dams | Dam Engineering Services | Queensland

Provision of a range of dams engineering services to the Department of Energy and Water Supply on Corella Dam (23 m high gunite-faced rockfill dam), Crooks Dam (13 m high embankment dam) and Wyndham Dam (14 m high embankment dam). The services provided have included comprehensive dam safety inspections, 20-year safety reviews, failure impact assessments, design (concept through detailed) of upgrade works and provision of construction phase assistance.

Review of Wave Overtopping of Pond Walls | Alcan Gove

Assessment of wave heights, freeboard, rip-rap requirements and overtopping discharges to estimate potential for failure of embankments by wind-generated waves.

Preliminary Stability Assessment of Haweswater and Thirlmere Dams, United Kingdom

Tasks included the static and pseudostatic analysis of a 37 m high hollow gravity buttress dam and 20 m high concrete gravity dam under normal operating, flood and seismic conditions.

Preliminary Assessment of Puddle Clay Core Dams | United Kingdom

Tasks included preliminary assessment of old puddle clay core embankment dams, including Ridgegate, Blackstone Edge, Delph and Bottoms, in terms of operational performance, potential for piping and slope stability.

Pre-Feasibility Study for Pumped Storage Hydropower Project | Southern Queensland

Project Manager and Civil Design Engineer for a feasibility assessment of a pumped storage scheme with capacities of 100 MW to 500 MW utilising existing dams.

Eildon Dam Improvement Project | Victoria

James was responsible for the project and technical management of the scale physical hydraulic model study of the spillway which focussed on the investigation of options to improve the efficiency of the existing structure and to increase the overall discharge capacity to meet the current design requirements.



Curriculum Vitae

Jindabyne Dam New Spillway and Outlet Works | New South Wales

Design Manager for the design of upgrade works for Jindabyne Dam including retrofitting a chute, flip bucket and plunge pool to the existing spillway structure and construction of an auxiliary spillway controlled by 7.6 m high Hydroplus Fusegates (the tallest to be constructed in the world at that time) and an intake tower (constructed within the reservoir) and tunnel to pass environmental releases of up to 58 m³/s. In addition to overall design coordination, James was responsible for the hydraulic design of the existing and new spillways and provided input to the development of layouts and structural design of all structures. The project included a scale physical hydraulic model of the spillway for confirmation of the performance of the chute, flip bucket and plunge pool.

Cressbrook Dam Spillway Investigation | Toowoomba City Council | Queensland

Consequence assessment for breach scenarios, risk analysis, initial screening workshop, preliminary design and costing of remedial options and preparation of report detailing study recommendations.

Ujat Sediment Control Structure | Indonesia

Investigation of borrow areas, analysis of geotechnical test results, embankment dam design, assistance with the structural design of the reinforced concrete spillway and diversion culvert and input to the preparation of the design report and specifications. The final arrangement included a 100 m high zoned earth and rockfill embankment.

Other related areas of interest

- Dam design including remedial works and upgrades from preliminary through to detailed for embankment and concrete dams
- Hydraulic structure design including spillways and outlet works
- Dam safety and surveillance reviews

Publications:

- BAKER, C., LADIGES, S., BUCHANAN, P., WILLEY, J. & BARKER, M., 2017, "Construction Flood Risk Strategies for Dam Upgrades" in *Proc of ANCOLD Conference – Great Expectations for New and Existing Dams – Ageing Dams, New Ideas*, Hobart, TAS, 26-27 October 2017.
- EWING, T., JONKER, M. & WILLEY, J., 2015, "Efficient and cost-effective modelling and analysis of hydraulic structures using CFD" in *Proc of ANCOLD Conference – Contemporary Challenges for Dams*, Brisbane, QLD, 5-6 November 2015.
- LADIGES, S., WILLEY, J., NORBERT, M. & BARCLAY, A., 2013, "Case Studies of Foundation Grouting using the GIN Method at the Enlarged Cotter Dam" in *Proc. of NZSOLD/ANCOLD Conference – Multiple Uses of Dams and Reservoirs – Needs, Benefits and Risks*, Rotorua, New Zealand, 13-15 November 2013.
- WILLEY, J., EWING, T., WARK, R. & LESLEIGHTER, E., 2012, "Complementary use of physical and numerical modelling techniques in spillway design refinement" in *24th Congress on Large Dams*, Kyoto, Japan, 6-8 June, 2012.
- WILLEY, J., BUCHANAN, J.P., O'ROURKE, M. & GREENTREE, B., 2010, "Googong Dam Spillway – Remedial works to repair extensive rock erosion" in Garcia, R.R. et al (eds), *Dam Maintenance and Rehabilitation II*, CRC Press/Balkema, Leiden, The Netherlands.
- GREENTREE, B., BAMFORTH, D., O'ROURKE, M. & WILLEY, J., 2010, "Googong Dam Spillway Upgrade – Construction Challenges and Alliance Framework" in *Proc. of ANCOLD Conference on Dams – Dam Decisions: Past Experiences, Future Challenges*, Hobart, TAS, 3-7 November, 2010.
- WILLEY, J., EWING, T., LESLEIGHTER, E. & DYMKE, J., 2010, "Numerical and physical modelling for a complex stepped spillway" in *International Journal on Hydropower & Dams*, Vol 17, Issue 3, 2010.
- WILLEY, J., EWING, T., LESLEIGHTER, E. & DYMKE, J., 2010, "Refinement of the hydraulic design of a complex stepped spillway through numerical and physical modelling" in *Proc. of 3rd Int. Conf. on Water Resources and Renewable Energy Development in Asia*, Kuching, Malaysia, March 2010.
- WILLEY, J., BARKER, M. & TABATABAEI, J., 2008, "Risk assessment in spillway remedial works design and construction and monitoring at Googong Dam" in *Proc. of ANCOLD Conference on Dams: Dams and Water for the Future*, Gold Coast, QLD, November 2008.
- HAMPTON, I., AMGHAR, M. & WILLEY, J., 2004, "Hydraulic model study for Eildon Dam Improvement Project" in *Proc. of ANCOLD/NZSOLD Conference on Dams*, Melbourne, VIC, November 2004.
- CRICHTON, A., WILLEY, J., BELL, G. & FRANZMANN, A., 2004, "Jindabyne Dam spillway upgrade and outlet works" in *Proc. of ANCOLD/NZSOLD Conference on Dams*, Melbourne, VIC, November 2004.
- WILLEY, J.C. & LITWINOWICZ, A., 2002, "Management of creep settlement in dumped rockfill by surcharging" in *Proc. of 5th ANZ Young Geotechnical Professionals Conference*, Rotorua, New Zealand, March 2002.