1

Early Birds

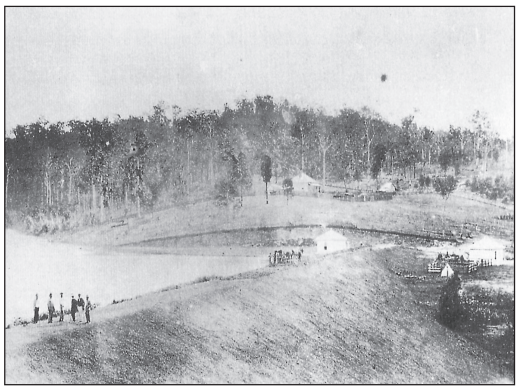
Prior to 1881, no Queensland Government had taken steps to manage or develop the State's water resources. As populations and demands for social amenities grew, however, pressure mounted for institutional arrangements to be implemented.

As with most colonial enterprises, the Moreton Bay Settlement was established in vague proximity to a water source and was then allowed to get on with it. The name Tank Street recognises the former focus of the area. With no reticulated supplies and no waste disposal systems, the township was soon faced with inadequate, polluted drinking water. Sick of cholera and other equally attractive complaints, the populace gradually began to demand a better service. Nevertheless, virtually no development of note occurred until Enoggera Dam was built in 1866 for Brisbane's water supply.[1]

Outside Brisbane, where the population was sparse, reticulated supplies were not even a pipe dream. The story of a state water authority really begins with the appointment of John Baillie Henderson on 1 October 1881 as a consulting engineer. Prior to this time, the functions of water supply, such as they were, had been conducted by the Harbours and Rivers Department.

Originally, settlements were simply sited near watercourses, usually close to a waterhole. Henderson's appointment as a consultant and the subsequent constitution of the Water Supply Department of Queensland with Henderson as Hydraulic Engineer ushered in a new era.

John Baillie Henderson (1836–1921) was born in London and educated in Scotland. Lured by stories of Australia and the goldfields, Henderson's father transplanted the family to Victoria in 1852. Young John went to the Bendigo goldfields, returning to Melbourne to gain employment as a surveyor followed by temporary government work as a road overseer. In 1866, he accepted a position in the Victorian Water Supply Department as an engineer and surveyor working on major provincial schemes such as the Geelong System and Coliban near Bendigo.



Enoggera Reservoir nearing completion 1866

In 1878, Henderson was dismissed from employment along with 200 other public servants after the Legislative Assembly refused to supply the Victorian Government.[2] This presumably prompted Henderson's move to Queensland, where he was appointed Resident Engineer of Northern Waterworks.[3]

On 1 October 1881, Henderson was appointed a consulting engineer on a salary of £200 per annum as well as Superintending Engineer for the Brisbane Board of Waterworks with a salary of £500. This role changed on 1 February 1883 when Henderson was appointed Hydraulic Engineer.

Henderson's tasks were formidable, as was his initial brief – to supply public roads and stock routes and to attend to the needs of the graziers on the western plains.[4] Provincial towns and municipalities were responsible for their own supplies, with financial and technical assistance from the State. Unlike earlier waterworks engineers in Queensland, such as William Highfield, Henderson was not responsible for design and construction but acted as a technical consultant.[5]

The Department of the Hydraulic Engineer, over which Henderson was given control, was initially very small. The office staff was limited to an accountant, a clerk and a junior clerk. The first Accountant was Richard O'Kelly, who was appointed from August 1882 until October 1883 on a salary of £150. He was succeeded by Christopher Gaynor, a new government employee, on 5 October 1883, on the increased salary of £250. Thomas Palmer, the Department's first Clerk, was also appointed on 5 October 1883. His stay was brief, as he was replaced the following year by William Hamilton, who became a casualty of the 1893 Depression and was retrenched on 1 August 1893. He received a temporary reprieve from unemployment as he was re-engaged as messenger for a short period, his salary reduced from £125 per annum to £60. The position of Junior Clerk, held by John Fitzgerald, lasted only one year.

Despite this shaky beginning, the Department grew steadily with appointments reflecting the workload and tasks required. In 1883 draftsman James Porteous joined the staff along with an overseer Henry Clinton, an inspector Duncan McLennan, a field assistant John McLean, an overseer of works James West and three overseers of boring operations, Walter Cox, John Gascoyne and William Peacock. Two overseers on the steam scoop were also employed – Henry Orr and James Bull, the latter on half pay during his passage from England.

The remaining work was undertaken by wages staff – foremen, gangers, engine drivers, scoopmen, blacksmiths, labourers and cooks – who were employed locally where possible on weekly or daily wages.

The positions available were reflective of the technology at the time, most notably steam scoop staff and blacksmiths. As equipment was introduced, so were new positions. James Arnold, overseer, was appointed in 1885 with responsibility for the American well boring machinery. Similarly with new knowledge and technology came new positions, namely the appointment of John Rankin and James Bull as Overseers of Boring.

Presumably to cope with the workload throughout a far flung state, district officers were appointed. Duncan McLennan was made Officer-in-Charge of Winton District, William McKinnon, Officer-in-Charge of Muttaburra District and John Hargreaves, Officer-in-Charge of Hughenden District. Multiskilling would appear not to be a modern concept as Christopher Gaynor was appointed Clerk and Storekeeper of the Western District, before becoming an overseer. The title of District Engineer was first bestowed in 1886 with the appointments of William MacKinnon, John Hargreaves and Richard Unsworth.

Frederick Charles Lea, gratefully acknowledged by Henderson for his assistance in Head Office, was appointed Chief Clerk and Accountant in April 1884, a position he filled until 1896 when he transferred to the Government Savings Bank. Lea's staff had increased to three clerks by 1886. Other sections of the department had grown with the appointment of four draftsmen in 1885– 86.[6]

Excavating a drain with a 'Bucyrus' steam shovel

Henderson's plan to provide water for the west was to excavate large tanks at key locations, using, for the first time in Queensland, mechanised earth moving equipment. Two sets of Fowler equipment, each comprising two traction engines hauling a scoop that dragged between them, were imported

from Britain. His plan was created with no reliable data about rivers, creeks or water tables, as none were available. He merely hoped they would fill and replenish. Henderson assumed personal control of the project, spending endless hours travelling all over Queensland.[7]

Henderson was seemingly tireless, frequently pushing himself to the limit. In 1884, he covered 10,000 miles in four months, chiefly in remote western Queensland. Travelling around western Queensland was extremely difficult as the mode of travel was coach or horseback. In 1886, Henderson reported that he travelled from Hughenden to Cloncurry by Cobb & Co.'s coach *under arrangements that gave me special facilities for acquiring knowledge of the existing supply of water and of the further works etc, necessary for meeting the exigencies of all traffic on that road*.[8]

A principal duty was providing water for the stock routes and, during the first years of the Department's work, resources were deployed to survey the main western roads to determine the work required. The surveyors' work required travelling long distances in remote areas, faced with the prospect of food and water shortages and accidents. Indeed, in June 1908 a junior surveyor was killed on the job.[9] Perhaps not surprisingly then, Henderson had *considerable difficulties ... procuring suitable engineering surveyors*. Despite this, three survey parties were formed in November 1907.

An early bore pool stock route facility

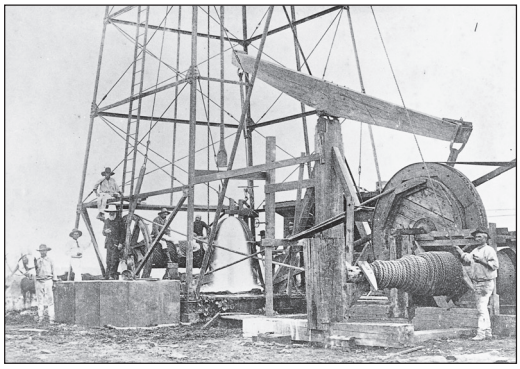
Staff also had to endure extreme weather conditions. Bore Inspector Maurice Bernays experienced very severe temperatures whilst working between Charleville and Barringun for three weeks in January 1896. The *shade temperature reached 118°F on three consecutive days, the lowest reading during that period being 101°F at 3.30 a.m.*[10]

When camping reserves were created, the Department assumed responsibility for the provision of water supply and, in particular, tanks. Additional staff was required to maintain the tanks and by 1886 caretakers had been placed in charge of all tanks that were fenced. Caretakers were paid 50/- weekly and their duties were to *take care of the works and all government property placed in their keeping, to prevent anything being done that will waste or foul the water, to perform any needful repairs possible for them to execute, to supply the public with water, collect the rates according to scale sanctioned by you . . . and remit the proceeds monthly*.[11]

Construction of bores along the stock routes was a major task and much of this was completed by contractors through tenders called in local papers. Early bores were drilled on the St George and Cunnamulla Road, Winton and Bradleys' Creek. The latter was a *complete success* as the bore yielded 441 gallons an hour. Constructed at a time of drought, the bore was much appreciated with one resident declaring in 1883 *but for this bore, the road to Winton would now be closed*.[12]

To assist in their work, the Department employed the latest technology available. Henderson had an obvious preference for up-to-date machinery. The Department owned a steam scoop, but its dependency on water as its power source proved a serious impediment in times of drought. Use of muddy water also caused the engines to fail, necessitating a complete overhaul. As the scoop weighed 15 tons, moving it between jobs or for repair was hard work and on sandy soils it could travel an average of only 9 miles daily.[13]

Adopting advice from experts, the Department purchased 'Tiffin' machines for boring. These proved less suitable for the work than expected. One was made in Victoria and was inferior to the two American models. The Department also utilised a small Australian water auger and a large improved auger made by Wright and Edwards (built to the Department's specification at a cost of £1,100/16/6). The small auger was considered well suited for depths of 300 feet while the improved Wright and Edwards's auger was used for greater depths. A 'Pennsylvania Walking Beam Rig' boring machine, capable of piercing to a depth of 2,500 feet (800m), was constructed by the Department. Diamond drills were in use on the coast country where the rocks were hard and dense, but these were mainly used by private companies.[14]



Pennsylvania Walking Beam Rig

The early drilling rigs were steam powered, hence their locations near water or where little water carting was required. Each bore was equipped with windmill, steam engine and pumps and required up to 200 cords of timber each year, which had to be hauled.[15] Two or three galvanised tanks of 20,000 to 30,000 gallons (91,000 to 136,000 litres) were constructed at sites. These were later replaced with turkey's nest constructions. Steam engines were used until after World War II, with internal combustion engines being gradually introduced.

Despite employing the 'latest equipment', the work was hard and dangerous. The greatest problem encountered when drilling was the lack of water on site for men and horses. The inland was hot, dry land with little or no surface water. A report of drilling on the Winton to Hughenden route described the forbidding nature of the area and the enormity of the task involved for men and horses. The bore was drilled with the large water auger at 'Stacks', 66 miles from Winton. After two hours, little water had been obtained. The water in the bore was not available for camp use and so water had to be carted from distances of 7 and 18 miles, until the horse could stand the strain no longer. As these supplies failed, understandably the *foreman and men under him, getting terrified of perishing for want of water, left the work and could not be induced to return.* The report concluded *work has been suspended until sufficient rain falls*.[16]

Horses were not infrequent casualties of the harsh conditions. One year Henderson reported that three horses were written off the stud list during the year – two drowned in floods, and one died from the effects of a strain in boggy ground.[17] Again in 1886, Henderson reported the *effect of the drought upon the Department's horses has been felt; two have been lost or stolen, and nine have died*.[18] Of the 106 horses owned by the Department, twelve died in the first three years.[19]

The isolation of the drilling sites made the work risky and tedious. Much time was lost in travel. Working on a bore near Winton, one blacksmith was made to travel 65 miles to undertake repairs, alterations and sharpen his tools. On *one occasion he had to abandon his equipment and hasten back to Winton, where he arrived in an exhausted condition, having nearly perished from thirst.*[20] Too much water during tank sinking had its dangers too and in 1884 Henderson reported that he had found contractors unwilling to tender for tank construction where they feared the excavations might be flooded by storm water while the work was in progress. Henderson conceded that the fear was reasonable, as recent rain had flooded most of the works under construction. His solution was to import an engine and centrifugal pump.

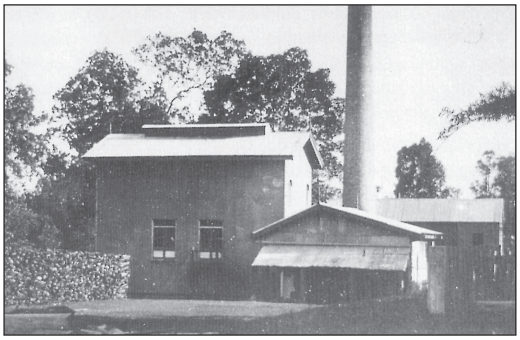
Recruiting staff proved difficult, a constant theme in Henderson's reports. In 1886, he bemoaned *the firm state of the labour market, the difficulty of finding reliable and suitable men ... caused me to despair of ever carrying on this branch of the department's business with satisfaction even to myself*.[21]

In 1889, Henderson again reported that *scarcity of steady, practical, and thoroughly competent drillers to meet the demand is again experienced. So far as I can learn there are at present only about 50 'American drillers' in the colonies, of whom but a small percentage seem to be really first-class competent men who could be entrusted with the care and management of boring machinery and deep boring*

operations. I repeat, the supply of competent drillers is much less than the demand for them, and to this, I think, is due the difficulty experienced in obtaining eligible tenders. If the demand for artesian bores in this colony is to be met, something must be done to bring out, or to induce a sufficient number of intelligent and competent drillers to come from Europe or America and remain here.[22]

Whilst designing and constructing water facilities for local authorities was not officially the responsibility of Henderson and his Department, providing advice occupied much of Henderson's time. Work for local authorities in the early years included providing plans and specifications for an overshot dam for Tambo Divisional Board, supplying contact drawings for a windmill, pump and tank in Roma and directing surveys for the new reservoir at Gold Creek. Much time was spent inspecting plans and grant applications submitted by local authorities for comment and assistance.

Reticulated water supplies were provided to Brisbane in 1866, Ipswich in 1878, Maryborough in 1881, Charters Towers in 1891 and Cairns in 1891. This work continued to grow. The Department assumed responsibility for the design of extensions to Toowoomba's waterworks. In 1901, the Cairns Municipal Council requested that Henderson visit and formulate a scheme for supplying the town's water from Freshwater Creek. In some cases, such as Gympie, the Department was directly employed to design and construct town waterworks in 1901. Similarly in 1904, the Department was employed to construct a bore in Blackall for the municipal authority.



Teddington pumping station near Maryborough. Note the timber billets providing fuel for the boilers.

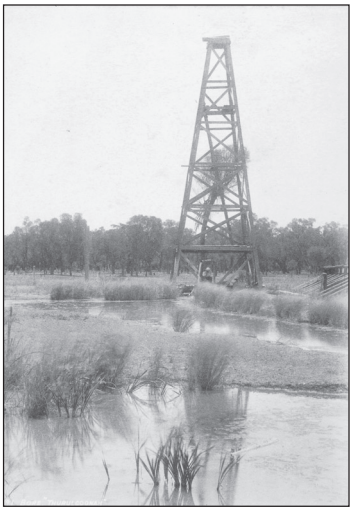
While busy constructing water facilities (tanks and bores) on stock routes and advising on and constructing many municipal projects, Henderson and his Department's energies were soon to be diverted in part to a new project – artesian water supply.

Use of underground water is as old as civilisation itself with the ancient Asian, Middle Eastern and American societies developing the technology to build wells. Artesian wells derive their name from the French province of Artois, where methods of well sinking through impermeable rocks were introduced in the thirteenth century. By the eighteenth century its potential, particularly agricultural, was recognised throughout Europe. In the 1850s and 1860s boring technology was well established and by 1870 artesian supplies were serving North American and African towns.[23]

Private developers in America seized on this technology when colonising America. Large tracts of dry land were opened up and by the early 1890s approximately 17,000 wells had been constructed.[24] Canada also embraced these developments.

In Australia the first important flowing bore was sunk in NSW in 1878. Growing acceptance of artesian water in Queensland was promulgated by Robert Logan Jack (1845–1921). Born in Ayrshire, Scotland, on 10 September 1845, he was educated at Edinburgh University before joining the Geological Survey of Scotland and specialising in the mapping of important coal measures. Appointed Geological Surveyor for northern Queensland in 1876, Logan Jack began work in Townsville. Within three years he was promoted to Government Geologist. His research on the Great Artesian Basin was directly applied to the early development of that resource by government and private enterprise.[25]

Despite growing world-wide acceptance of the potential of artesian water, John Henderson remained unconvinced of its advantages and obstinately refused to investigate the resource. Public pressure finally forced him to collaborate with Logan Jack and authorise the drilling of a trial deep bore. With characteristic obstinacy, however, he refused to employ one of the experienced crews working elsewhere in Australia but built his own rig and employed an American overseer who proved to be incompetent.[26]



The first artesian bore in Queensland at Thurulgoona station

Drilling for what became the Government's first successful bore commenced in 1886 at Blackall. But before it was completed, an American drilling company engaged Canadian driller JS Loughead and struck an excellent flow at Thurulgoona station near Cunnamulla. The property was owned by Simon Fraser's Squatting Investment Company.[27] Fraser was an immigrant from Nova Scotia via Victoria. His grandson would take his place in Australia's history in 1975 when he became Prime Minister – John Malcolm Fraser.[28]

After visiting the site and observing the findings himself, Henderson began to change his views on artesian water. However, he did not abandon his earlier plan but continued to build tanks on stock routes and in townships. By the end of 1888, some 23 tanks had been constructed.[29]

Once converted, Henderson embraced the search for artesian water. He employed JS Loughead, who completed a government bore at Barcaldine in November 1887. The Barcaldine Bore produced Queensland's first major artesian supply at 691 feet (211 metres) with an estimated daily flow of 175,000 gallons (796,000 litres).

A vigorous drilling programme was established which ensued over the following decade. By December 1892, there were 19 government bores completed or under way in Queensland. Private investment led to much greater development of artesian water. By the end of 1899, 524 bores had been sunk, 505 of which were successful.

Increased staff numbers were required throughout the 1880s to deal with the added work of dealing with local authorities, divisional boards and artesian water. Knud Lyne Rahbek was appointed Divisional Board Engineer and Municipalities in March 1886, followed by District Engineers Percy Childs (1888) and Duncan McLennan (1889), and Overseers of Works Herbert Panton and Walter Smith (both in 1889).

How the accommodation coped with the increasing numbers is not known. Prior to 1926, the Department was located in cramped premises in Adelaide Street or in a lane between what is now the David Jones and Woolworths Buildings in Adelaide Street, Brisbane. Overcrowding was a problem in busy times as testified by Henderson's 1899 report. *A busy year for the Department, one of extreme drought, demand for water conservation and works to ameliorate the drought increased.* So too did the surveys and work involved in preparing plans for a regulating reservoir on the Brisbane River. *This kept the whole of the field and office staffs extremely busy. . . taxing our resources to the utmost*. The office was congested owing to the limited accommodation available.[30]

The influx of staff was halted with the onset of the 1890s economic depression and Henderson reported that his department, along with others, had *suffered large reductions in the field and office staffs* between 1892 and 1893 which created extra work for those remaining.[31] Clerk and Storekeeper William Hamilton and his equivalent in the Western District, Robert Hunter, who was employed in 1888, were both retrenched in 1893. William England who joined the Department in 1889 as a clerk on a salary of £100 was retrenched in August 1893, but was re-engaged as a messenger on £60 per annum. The fate of retrenchment in 1893 also befell Herbert Panton and Walter Smith, both overseers, and Knud Rahbek. The year 1893 was certainly grim, as in February a severe flood hit Brisbane and Henderson's office and the store attached were inundated with water which rose 11 feet above the floor. Many records were destroyed or severely damaged and *much inconvenience and trouble* was experienced in the aftermath.[32]

Despite the staff reductions, the Department's workload continued to grow. In 1894, with the worst of the Depression behind him, Henderson found it possible to recruit new staff, some of whom were temporary. Henderson's annual report in 1895 stated that further staff increases and better, more extensive office

accommodation were needed. Herbert Panton was reappointed and Warren Weedon was appointed as a new clerk and storekeeper. August 1885 saw the appointment of Cyrus John Richard Williams, as Acting Assistant Engineer, second to Henderson. His position was made permanent in July 1896, until his retrenchment in 1902 when the position was dispensed with. In 1899 John Hargreaves was appointed as a clerk and storekeeper. By 1902, he was a clerk and engineer and, in 1916, he was appointed as Hydraulic Engineer.

One particular growth area in personnel was Statistical Inspectors of Bores, with the appointment of Maurice Borton Bernays and John Alfred Griffiths, both in November 1895. Considering their working conditions and lifestyle, these men must have equalled Henderson in terms of fortitude. Their diaries and progress reports are full of tales of difficulties and courage, all delivered in a manner which suggests it was all in a day's work. Take, for example, the report for February 1896 by Inspector John Griffiths. On 21 February he sent F Olsen to the head station (9 miles distant) for rations. Unable to cross the flooded Diamantina, Olsen returned. The next day he made a second attempt to cross the river but after swimming one deep channel he had to return, after six hours riding, without rations. Having only one meal left, the team decided to return to Bore No. 2 and travelled 14 miles with horses and packs only. En route, they were informed by passing musterers that Bore No. 2 was without rations also. With the musterers' assistance, they crossed the river and found rations.[33]

Enterprise would also appear to be a necessary characteristic in field staff. Again in February 1896, Griffiths reported that he had to repair his tents, make a brace for bits and a hook slider for the weir gauge at a stockman's camp 50 miles from the head station on Brighton Downs Run. How he made the repairs is mystifying, as he reported that there were no carpenters' tools available.[34]

Problems with floods pervade the reports. On 10 January 1911, A Nimmo reported that it rained all day and owing to want of timber, their tent could not be properly erected to keep out water. They packed the buggy and started for Nerada woolshed. The horse was unable to pull in black soil so they covered the buggy and walked to Nerada. They arrived very wet at noon, having walked eight miles. The following day it was still raining, so they obtained two draft horses from the Station Manager and moved the buggy to the woolshed and camped there.

Things did not improve. On 20 January 1911, a storm wet the inside of the tent and the following day was spent drying clothes and blankets, obtaining more timber and re-erecting the tent.[35]

Water plagued Charlie Ogilvie's men too. (Ogilvie joined the Department in 1913 and served for many years, becoming one of the 'characters' of the organisation as will be seen presently.) In March 1911 they reported that before the repairs and tests of the bore they were working on were completed, *the second spell of wet weather set in and we were held up in the woolshed for three weeks, during which only the No 1 Bore was tested*.[36]

Survival was not the only concern for the inspectors, as they had to keep up with their paperwork at all times. A daily diary was kept and various data had to be collected, tabulated, computed and transferred to Brisbane to Head Office. Perhaps wet weather and repairs provided a chance to catch up. A Nimmo arrived in Blackall on 20 September 1911 to have his buggy wheels repaired and to engage a cook. The next two days were spent at the Blackall Lands Office completing duplicate levels and correspondence.[37] Records had to be extracted from station records, wages paid, accounts compiled and charts drawn up. This work was often completed after a hard day in the field.

The amount of data collected by the Department increased on 1 July 1903 when the Weather Bureau again came under the control of the Government through the Hydraulic Engineer. Clement Wragge was appointed Queensland's Government Meteorologist in 1886 and undertook or collaborated on pioneering meteorological work in Tasmania, NSW, New Guinea and the Pacific. His Queensland work was well regarded nationally. By 1893 he had established 16 first order meteorological stations, 36 second order stations and 45 third order stations, as well as 398 rain stations. He provided regular weather reports and forecasts.[38] A great advocate of the science of weather forecasting, Wragge campaigned for the collection of Australia-wide meteorological data.

In 1903 the Department of Water Supply took charge of the Weather Bureau with the *object of continuing the rainfall records alone*. However, Henderson was *strongly of the opinion that it would be calamitous* to break the continuity of the meteorological data collected, which would render it useless and *made every effort to maintain the work unbroken.* Through *the unselfish efforts of the meteorological staff,* namely clerks Edgar Fowler and John Hartshorn, Henderson was able to continue the record keeping without increasing expenditure.[39] A position of Compiler of Meteorological Records was added to the staff in 1907, first occupied by G Johns.

On 1 January 1908 the meteorological and flood warning work was transferred to the Commonwealth Government. Despite his reputation, when the new Commonwealth Government took responsibility for meteorology, Wragge was overlooked as its head. Perhaps he had annoyed too many colleagues with his irascible

temper. Or perhaps his reputation had taken a battering when, in Charleville in September 1902 he attempted to end the long drought with a rainmaking experiment. Embracing an Aboriginal belief that persistent noise attracted rain, one afternoon Wragge bombarded the unresponsive skies with the noise of six Italian cannon firing at regular intervals. No rain fell. Wragge soon departed for New Zealand.[40] Bernie Credlin commented that in his experience there is a popular belief that wartime artillery barrages are followed by rain.[41]

Irrigation was initially given little attention under Henderson, who appeared sceptical about its prospects. The Lands Department was its advocate in the 1880s, driven by two Ministers whose constituencies included large sugar cane plantations.[42]

Irrigation had commenced in the Logan River Valley in the 1880s, where the irrigation of fodder crops allowed consistent milk production from dairy herds and a more reliable supply of horticultural produce for the Brisbane market.[43] Irrigation of sugar cane began in the Burdekin delta in 1884 using surface water lagoons.[44]

Despite departmental reluctance, in the late 1880s irrigation engineers A Rigby and William McKinnon were commissioned to undertake investigations of potential irrigation districts. William McLeod McKinnon had a varied career within the Department. Appointed in 1884 as a surveyor, he became Officer-in-Charge of Muttaburra District the following year. In 1886 he was appointed District Engineer.

McKinnon's three reports investigated the Pioneer River, the Lower Burdekin and Flinders River (near Hughenden), while Rigby produced 12 major reconnaissance reports covering an immense area. The principal rivers he examined were the Barwon–Macintyre–Severn from below Goondiwindi to Texas, the Balonne and Condamine and their tributaries from above Warwick to below St George, the Warrego, the Albert and the Logan, the Dawson, Dee, Nogoa, the Burnett and Elliott, Johnston, and the Pioneer rivers.

Rigby alluded to the crying need for accurate river gauging, contour maps, rainfall data and comprehensive hydrological surveys, but was ignored. While his work and *contribution to landscape change was not immediately apparent*, according to Powell *it became tangible in later years, and stands today as a unique legacy*.[45]

After the passage of the *Irrigation Act 1891,* Henderson became an irrigation supporter.[46] He probably played an important role in arranging for American engineer Elwood Mead (1858–1936) to visit Queensland in 1909 to study the State's irrigation resources and to advise the Government on their development. Mead had recently ended a distinguished career in federal water management administration in America to become Chairman of Victoria's State Rivers and Water Supply Commission.[47] He

decreed that the time for the comprehensive development of irrigation had not yet arrived, citing a lack of need and knowledge among farmers and irrigators as deterrents. The time would come though and he advised the State to devise a code of water laws. State control of surface and underground water, streams, rivers and reservoirs was needed.[48] According to Ray Whitmore, after Mead's report Henderson retreated to his original sceptical position.[49]

Mead's advice, however, prompted the *Rights in Water and Water Conservation and Utilization Act* which gave the Crown the right to the use, flow and control of water in any watercourse, lake or well. Artesian bores were to be strictly monitored and controlled. Bore Water Supply Areas and Boards were constituted and the first community irrigation project was commenced in the Inkerman district on the Burdekin River. The Act fell far short of what Henderson considered necessary, but it became his responsibility to administer it.

Stream gauging, although recommended by Rigby and McKinnon, continued to be ignored. While commended by Henderson and successive Commissioners, it remained the poor relation. Powell argues that it was less glamorous than weather forecasting, incapable of quick returns, had no charisma and no spruiker.[50] However, with the growth of irrigation and a steadily increasing number of applications for irrigation being sent to the Department, the lack of accurate stream gauging data was becoming an impediment to good decision making. In 1901 Henderson complained that in dealing with applications for irrigation for agriculture he was *very much embarrassed by the absence of previous river gaugings extending over a number of years; in fact, none at all had been made ... This state of affairs is not as it should be.* He added that it was imperative that Queensland rivers and streams should be *continuously measured in a proper and systematic manner.*[51]

While Henderson conceded there was a cost in training staff and implementing systems, there were long-term benefits in establishing this section. After all, the concept was not new. Stream gauging had been taking place on the Murray River in Victoria since 1865 and by 1890 regular staff were employed in Victoria and New South Wales for this purpose. Finally in 1909, stream gauging commenced in Queensland under the Hydraulic Engineer.

Engineer A Morrison was appointed as a stream gauger and engineering surveyor on 1 March 1909. Fellow gauger and engineer G Croker and stream gauging computer RM Gale soon joined him. The hydraulic survey section was larger with hydraulic surveyors J Kelly in Brisbane and C Ogilvie in Charleville and levellers A Sharp in Winton, W Nimmo in Tambo (not to be confused with Dr WHR Nimmo, who was later Commissioner of Irrigation and Water Supply) and E Edwards in Charleville.

In 1911, Swedish-born Hugo EA Eklund (1878–1950) joined the Conservation of Water Section. In November 1916, he was appointed Executive Engineer in Charge, Irrigation Works, for the Inkerman project. Perhaps in Eklund, stream gauging had a champion. In his 1920 report, Eklund described stream gauging as the *foundation of all irrigation work – it is the engineer's balance sheet.* He continued *stream gauging is the most important of all water conservation work, and any engineer undertaking water conservation work in Queensland will be seriously handicapped because stream gauging did not commence till 1909, when it should have been the first work a Water Supply department turned its attention to.*[52]

The stream gauging section was certainly industrious and between 1909 and 1920 this small branch continued to compile vital data. Between 1909 and December 1919, 784 measurements had been taken. By 1910 there were 14 gauging stations on 13 streams and a system of local, voluntary gauge readers had been established. The number of gauges reached 50 in 1920.

Steps were made to increase this work with 12 new gauging stations and 12 rainfall stations established in 1920.[53] Between 1920 and 1924 a further 950 measurements were taken, an acceleration which probably reflected the increased interest in irrigation. However, the branch employed only six staff members in 1920 and there was no significant increase until the late 1940s.[54]

As suggested above, the passage of the *Rights in Water and Water Conservation Utilization Act* and the advent of a stream gauging branch compelled the recruitment of staff. Henderson had eight offices and field staff which in 1910 were augmented by the employment of a structural draftsman, as well as two surveyors and three levellers on the Western Hydraulic or Artesian Survey.[55] A mechanical draftsman and an inspector of ironwork were employed, along with a junior draftsman and junior clerk to assist with the water conservation work. In 1914, Henderson had 48 staff under him. Not known for his skills in delegation, Henderson was no longer able to employ his preferred management style of administering everything himself. This may have worked when he had 10 staff but problems arose when the staff grew bigger. *An organisational structure had to be devised, it was difficult to find qualified people and an age of 75 years was hardly the best time of life at which to face up to such problems*. Ray Whitmore considers it remarkable that Henderson did not retire until 1916.[56]

Henderson was difficult to work for, regarded by many of the staff as a *martinet, or at least as a stern, rather remote father figure. It is said that when he finally retired the staff thanked him for his "firm and just rule".*[57] Many of his staff stayed short periods, but those who stayed remained a long time. Frederick Weber, Draftsman,

Compiler and Lithographer was appointed to the position in 1884 and John Hargreaves, MSE, was appointed in 1899. Both were there in 1916, as was Charles Edward Deshon, MSE, engineer and authorised surveyor, who joined the Department in 1895, was retrenched in 1902, and was reappointed in August 1906. In 1929 he was in charge of Town Water Supply.[58]

John Baillie Henderson

Henderson's recruitment drive brought some new faces to the Department who were to have an impact on the place. Such men, and indeed they were all men, included Draftsman, WF Kearton, Engineering Surveyor FJ Calvert and Assistant Engineer, PC Tibbits.

The year 1916 marked the end of an era with the retirement of John Baillie Henderson. When he retired, 32 townships had been supplied with reticulated water, about half of them relying on artesian water. There was adequate expertise to plan and construct new schemes within fixed budgets and agreed time frames. Artesian water flowed freely in central and western Queensland. Stock routes had been supplied with water and flood warning procedures were in place. Basic elements of water conservation and utilisation had been put in place and a start had been made on the routine collection of meteorological and hydrological data. Much of the credit should go to Henderson.[59] According to Powell, *Henderson raised the political and bureaucratic profile of water management and left an impressive legacy which was recognised by his immediate successors.*[60]

QUEENSLAND IRRIGATION COMMISSION HEADQUARTERS STAFF

DECEMBER 1922

(Back row) ET Abell (Records Clerk), AE Oram (Senior Clerk), WA Conroy (Computer), RL Wragge (Stream Gauger), MH Shenton (Accounts Branch) EV Stevens (Accountant)

(Third row) WC Ross (Storekeeper), J Ogden (Streamgaugers Asst), AF Sharp (Hydraulic Surveyor), ER Taylor (Draftsman), AF McHenry (Commissioner's Sec) WC Fairley (Asst Mech Eng), PJ Kenny (Transport), G Irons (Inspector)

(Second row) A Lamb (Insp. Works), WW Bond (Chief Draftsman), NM Austin (Typiste), J Burnett (Asst Records Clerk), AEI Penhallurick (Typiste), EA Earle (Mail Clerk), WF Kearton (Draftsman), WH Patterson (Draftsman)

(Front row) FJ Calvert (Eng. Stream Gauging), PC Tibbits (Eng. Art. Bores), CE Deshon (Eng. Water Supply), AF Partridge (Commissioner), BE Shaw (Supv. Irrig. Eng), GT Chapman (Chief Clerk), C Douglas (Mech. Eng.)