

Alternating Currents:

Engineers and the Emergence of Canberra as the National Capital.

Greg Wood

Sir John Butters Oration
Institution of Engineers,
Old Parliament House, Canberra
6 November 2008

Personal Introduction.

Thank you for the invitation to speak to your Institution tonight. For me it's a double privilege; on my own account, and because my father, an electrical and mechanical engineer, was an Associate Member, as he was of your British counterpart.

As far as Dad was concerned, and he was right of course, engineers were the princes of any civilised society - the problem solving innovators whose ideas and creativity opened the way to progress.

Early on, with good reason, he despaired his son would follow his chosen field, a field none other could match. In the way of overly optimistic parents, I received my first train set at age three. A day later, I received my first patient explanation of the irreversible nature of metal stress and the principles of Hooke's Law and Young's modulus. It wasn't the last.

Our family home was littered with blueprints, T-squares, drawing boards, prototypes and patent applications. He was still successfully securing US patents at age 80.

Over the evening meal he would start to open up about his day at the Australian General Electric Co, (later AEI). Sir John Butters was amongst those I recall getting a mention. At issue was the tension between exemplary engineering and corporate profitability; the design-room versus the boardroom. I have no doubt that Sir John took it in his lengthy stride.

The Anonymous Engineer

Engineers have a genius for anonymity. Who invented the microchip, or the internet? Courtesy of them you can Google it when you get home. Stephen Jay Gould nails it:

Artists, politicians, and soldiers win plaudits and notoriety, though so many impose themselves only lightly and transiently upon the motors of social change. Scientists, engineers and technologists forge history and gain oblivion as a reward -- in large part as a consequence of the false belief that individuality has little relevance when a progressive chain of discoveries proceeds in logical and inexorable order.

The National Capital Story

The national capital story glints with politics and personalities as anyone watching David Headon's wonderful *ABC Stateline* tour of Canberra's earliest history discovers. I am also delighted to hear that Roger Pergrum's, *The Bush Capital*, is about to be re-issued. It's a must read.

Tonight however, I want to shift focus: from politics and parliament to practicalities and professions, at least to the extent that's ever possible.

My aim is to describe something of the role of the engineering profession in national capital site selection and in first developing Canberra. My focus is on the work of two engineers, Leslie Wade and Percy Owen, whose individuality and influence did have relevance. I am recklessly skimming over the important contributions of many others.

Owen was the First President of the Canberra Chapter of Engineers Australia. Wade is today unknown: beside all else he probably named Canberra.

Indicative of their historical significance, both are mentioned in the *Australian Dictionary of Biography*. Both are omitted from Brian Carroll's *The Engineers*, the Bicentenary history of Engineers Australia, implying that their demanding peers saw them as less influential than some others. I hope you may conclude that needs reassessment.

I particularly want to consider the judgements engineers made about the adequacy and quality of water supplies for the capital sites: water coming and water going. Water was, of course, the contentious, site determining, practicality that trumped all others. It is the issue that continues to profoundly weigh with us today.

As we are talking practicalities, I should briefly recall Australia a century ago.

Australia in 1900

In 1900, Australia was a rural economy, experiencing severe drought, recovering from a banking crisis and a depression.

It had just federated. That blindingly obvious step was narrowly won. NSW was lukewarm, WA tardy. For example, the residents of one country town, Queanbeyan, voted against Federation by 770 to 623.

The Commonwealth Parliament met for the first time in Melbourne on 9 May 1901. In the first ten years there were nine Prime Ministers. Differences between protectionists and free traders were the delineating political divide, initially at least. A decision on the location of the national capital was well down the Parliamentary agenda.

Apart from word-of-mouth, newspapers were the only source of information. Advertisements best illustrate everyday aspirations and preoccupations.

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Rail networks were expanding, each State with a different gauge.

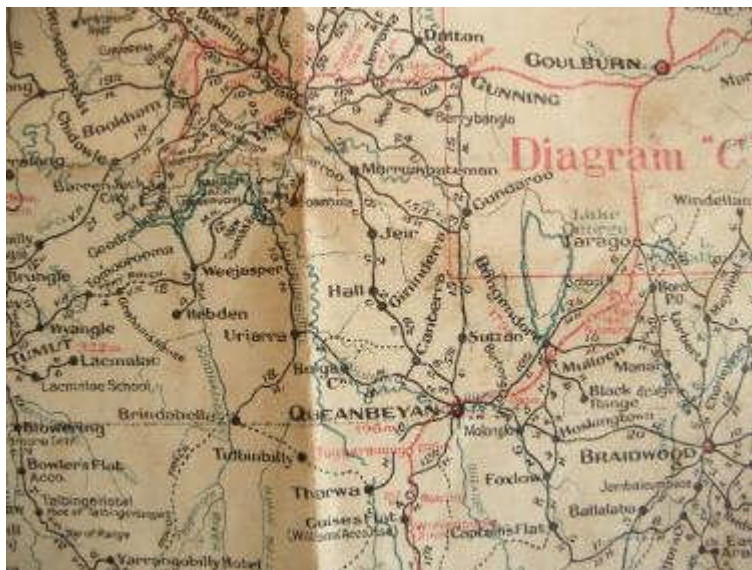
Cars were starting to appear but it was still the horse and buggy era. Driving was a challenge.



(The Prince's Highway between Bodalla and Moruya in 1905)



(Federal Parliamentarians visiting Canberra in 1910)



(A 1911 cyclist's map of the Canberra region. Note the absence of many now familiar roads such as the Federal Highway)

Each town relied on local suppliers for fresh farm produce, milk, meat, vegetables, and for hay, firewood, building materials. The new capital would need to do likewise.

Electricity was mainly used for factories, domestic and civic lighting, and tramways. Transmission of electricity was in its infancy. A long distance electricity grid wasn't feasible, though a gleam in the engineers' eye. Power had to be generated near the consumer.

Like the Commonwealth Parliament, the Federal bureaucracy was in its infancy. Only a few score worked in the diverse Home Affairs portfolio, the Department responsible for bringing the national capital into existence. In the early 1900s the Commonwealth drew on state government expertise: when it came to site selection, they of course relied on New South Wales.

A National Capital Site.

Section 125 of the Constitution was a sweetener to entice the less than enthusiastic New South Wales voters to support Federation. The national capital was to be in New South Wales, no closer than 100 miles to Sydney, in a Federal Territory of not less than 100 square miles. Until the capital was built, Parliament would meet in Melbourne. If those cunning Victorians played their cards prudently, that "temporary" arrangement could last "in perpetuity".

A national capital was seen as a statement of Australia's unity, aspirations, capacities and achievements...and the seat of government.

The Essential Site Requirements

Early in 1900, before Federation, an expert panel was asked to describe the essential requirements for the national capital. It responded:

From an architectural, sanitary, and engineering point of view, the...ideal site...should be a stretch of gently undulating country, the slopes of which [are] of sufficient fall for drainage purposes, and admitting of the construction of streets of easy grade. [It

should be] contiguous to a river, out of the reach of floods and free from fogs...the site itself surrounded by commanding hills...[It] should be within easy distance of an ample water supply, admitting of the creation and maintenance of the artificial lakes which should constitute a leading feature of its public gardens...In order that the sanitary conditions may be satisfactory, it is important that the subsoil should not be clay.... It would be advantageous for the city to have a north easterly aspect, and...be well sheltered.

In addition, according to our parliamentarians, press, and public opinion, it should:

- be readily accessible;
- have a cool climate;
- include productive farming land;
- be safe from armed attack, most particularly naval bombardment;
- have exemplary water supplies, satisfactory drainage;
- all to be achieved for next to no cost.

The argument for a cool climate capital was reached by somewhat racist reasoning, though endorsed by any one of us who has ever switched on air conditioning.

For some, a cool climate had added importance; trout fishing.

Water

As I said, water trumped all other practicalities.

The first requirement was pure water for day-to-day domestic use; for households, gardens, parks, city beautification. Which immediately posed a question: what's the expected population, what's their daily water consumption? Most commonly the calculations assumed a city of 20-25,000, requiring between 60-100 gallons per person per day for personal use. But everyone realised that, one day, the capital's population would surpass these numbers. By way of comparison Canberra's constrained level of summer consumption is around 160 megalitres a day: that's the equivalent of 110 gallons per person per day.

A second requirement was for ornamental water, again of reasonable cleanliness. As the 1900 quote shows, the idea long predated Burley Griffin.

The third potential requirement, preferable but not absolutely essential, was water for hydro power generation. Because long-distance electrical power transmission wasn't feasible, the source must be close to the city.

There was a trade off between these different uses. The more water was used for power generation, the less would be available for domestic or ornamental purposes, or vice versa.

Drainage

The quality of any water leaving the capital was also crucial. It was essential that the capital's sewerage and stormwater drainage not contaminate inland running rivers nor pollute the water supplies of downstream communities.

The Battle of the Sites

The battles of the sites: where to locate the capital. We should really use the plural: there were in fact many battles going on, simultaneously.

Firstly between NSW communities: some 50 laid claim.

Second, between influential politicians with constituent interests in play, were jousting most particularly former premiers Sir George Reid and Sir William Lyne, and Austin Chapman, the member for Eden Monaro.

Sir John Forrest's views carried weight, as did Sir John himself. Like Lyne and Reid, he had been a Premier, the first such in Western Australia, and also a celebrated explorer and WA Surveyor General. His CV, and the absence of a parochial agenda, gave him credibility.

Forrest had been Minister for Home Affairs, the portfolio responsible for national capital matters. There were fourteen ministers in sixteen years. With ten prime ministers before the outbreak of WWI, they together provided ample scope for contradictory views.

Fourth, it may shock you to learn that even the professions - architects, surveyors, engineers - were in contention, each claiming pre-eminence in decision making on the capital site.

Royal Commissions

Two royal commissions were held within a three-year period to assess national capital sites. Their intent was to provide a detached, informed, foundation for Parliament's decision. Each in turn, relied on numerous experts: architects, surveyors, engineers, meteorologists, cartographers and geologists.

The first enquiry, instigated by the New South Wales Government before Federation, was chaired by Alexander Oliver, who pared the 50 contending communities down to 23 that he personally inspected, and 14 on which he reported. Oliver's favoured capital site was the southern New South Wales town of Bombala, coupled with a Federal port at Eden. He also gave high marks to Yass and Orange (Canobolas). Later Oliver added Tumut to his shortlist. Come 1901, Oliver's useful report was pigeonholed by the Commonwealth Parliament which was feeling its oats and would reach its own conclusions, thank you very much.

In 1902, site inspection tours were undertaken separately by the Senate and House of Representatives. Publicly, they were referred to as a "picnic" but in reality can't have been. Deflated by weeks of bone jarring travel, confused by the innumerable options and the technical complexities, Parliament commissioned (another) royal commission to seek more data.

John Kirkpatrick, a Sydney architect, was asked to weigh eight specified site possibilities: a ninth, Dalgety was added later. Kirkpatrick tiptoed through this political minefield. He avoided saying any one individual site had compelling claims, rather judging sites against a range of criteria. He implicitly concluded Albury had the strongest credentials, a suggestion attracting little interest from most NSW Members: it was closer to Melbourne than Sydney and the commercial spoils would gravitate south. Forget it.

Oliver's preferred site, Bombala, received the lowest ranking. Oliver wrote a disparaging, dismissive counter to Kirkpatrick's report. He then embarked on a self initiated tour of inspection, determined to come up with the perfect site. His health failing, until six weeks before his death, he searched NSW as if haunted. The NSW Government asked his widow if he had reached any clear conclusions. The battle was claiming casualties, though governmental insensitivity was alive and well.

In 1900, Oliver had inspected the Queanbeyan site, roughly today's central Canberra. Despite local enthusiasm he was not impressed. Queanbeyan was not among the sites Kirkpatrick was instructed to consider.

A Personal Prize

As Oliver shows, the experts involved in national capital site selection could become ensnared. Most saw participation as a privilege, nation-building, a patriotic endeavour, a professional pearl, offering the possibility of a place in history. A few, but very few, wanted no part of it. The architect of this building, John Smith Murdoch, tried to steer clear of Canberra (when it was eventually chosen) and came perilously close to succeeding.

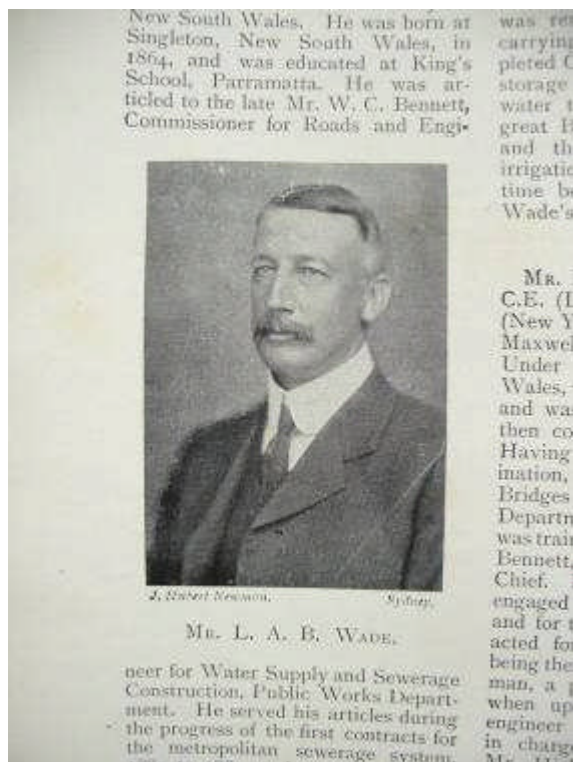
Two Engineers

By 1904 the two engineers I mentioned are already having an influence. Possibly one ensured Bombala's demise. I should introduce them. Both Wade and Owen were participants in the Battle of the Sites. Owen also featured in the Battle of the Plans, the contention between Walter Burley Griffin and the key departmental officials over the design of Canberra.

Leslie Wade

Banjo Paterson can introduce Leslie Wade. In May 1931 *The Sydney Morning Herald* published its Centenary Edition. The famous contributors included A B Paterson.

Paterson didn't reminisce about writing 'Waltzing Matilda' or 'The Man from Snowy River'. Rather he recounted how he had once gone to the Public Works Department of New South Wales and met two engineers, Leslie Wade and Ernest de Burgh. He doesn't give a date, but it was probably around 1903. He was under instructions from the proprietor to write an article encouraging the development of irrigation in New South Wales.



He states that Wade and his colleagues were as “overjoyed as the garrison of Lucknow” to discover there was media interest in irrigation:

"We have a scheme, said Mr Wade, but we cannot get any money to go on with it; the public do not know anything about it, and until you stir the public up the politicians will do nothing. If the Herald will take it up, we might get a start..."

"Dusty plans and specifications were hauled out of pigeon holes.

The publication of these maps and letterpress had immediate results. Politicians at a loss for a catchword found themselves repeating at their meetings, I believe in irrigation and in the Barren Jack dam....

Leslie Wade and Ernest de Burgh were public figures. Ernest De Burgh's name is just faintly resonant today: it graces a bridge in northern Sydney. Like Wade, for whom he then worked, he was a leading civil engineer who became intimately involved with the national capital site selection, and then over some decades, with Canberra.

Wade played rugby for NSW against England in the days before there was an Australian team. His brother, Charles, a lawyer, was to become Premier of New South Wales, striking the deal in 1909 over the size and shape of the Federal Territory.

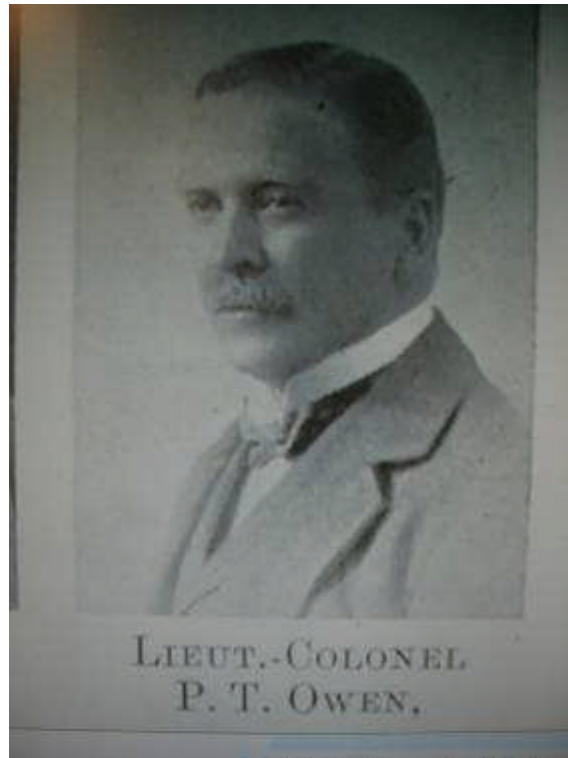
Leslie Wade was arguably the leading expert on water supply, water conservation and irrigation, and sewerage schemes of the era. That said, neither expertise in water engineering, nor the NSW Public Works Department of NSW, are obvious launching pads for a place in history.

As a relatively young man he had designed and built the Cataract Dam, then the largest concrete dam in the southern hemisphere, and the major source of Sydney's water supply. He had also been building Sydney's sewer system.

His dream was to develop the Murrumbidgee Irrigation Area, a project for which the Burrinjuck dam was the crucial ingredient. In between times, he assisted both the Oliver and Kirkpatrick inquiries as did a number of his New South Wales colleagues.

The expert's role could be tricky. For example, Kirkpatrick quizzed Wade at length about a conversation Wade had had with Australia's first Prime Minister, Sir Edmund Barton. Wade had indicated that the Bombala site, Oliver favoured, was compromised.

His reservations seem to have been twofold. First water would have to be pumped, not gravity fed, (ie flow naturally) to that site, most likely from the Delegate River. This would be costly. More importantly, most of the Delegate River catchment was in Victoria. Ipso facto, under Section of 125 of the Constitution, the catchment could not be within a Federal Territory and under direct Commonwealth control, a situation many, Wade included, saw as important. Almost certainly, the demise of the Bombala (and likewise the sites near Orange that Sir George Reid advocated) turned on his evidence.



Percy Owen

Owen in a long career encountered ups and downs, but the ups had a way of correlating with Canberra's progress. Maybe there was a causal link.

Owen initially had worked as a military engineer. He went to South Africa early in the Boer War, reaching the rank of colonel. In fact there were three people involved with national capital site selection who were colonels. Owen; Colonel David Miller, the first Secretary of the Department of Home Affairs another Boer War veteran; and the NSW Government Architect, Walter Liberty Vernon. Come 1910, Minister King O'Malley addressed the office boy as "colonel", to the boy's delight and Miller's chagrin.

A month after he took up the position of Director General of Works in the Home Affairs Department, Owen accompanied Deakin, Forrest, Chapman and others on a tour of southern sites. Charles Scrivener had been seconded from the NSW Government to provide yet another assessment of them. Like Scrivener, Percy Owen, was impressed by Dalgety. First, the Snowy offered an exceptional supply of uncontaminated water for domestic use. In addition, Owen, wrote that:

In the Snowy River (New South Wales) is possessed of a most valuable assetthe value of water power for generating electricity and the transmission of power by electricity is well-known at the present day. The probability of development during the next 100 years is impossible to foretell. However, it may safely be said that the existence of such a power in the vicinity of a city and Territory would be an advantage of the utmost importance ...'

More persuasively, Sir John Forrest noted then, and later, that at Dalgety,

"...there was good trout fishing in the river "

A Federal Territory: 1000 Square Miles

I should mention one other important issue under debate with relevance to the decision on water: the optimum size of the future Federal Territory.

In 1900, Alexander Oliver had favoured a Federal territory of 1000, rather than 100 square miles, on the grounds that if the land was leased this larger territory would provide the Commonwealth with income to fund the capital. King O'Malley took the argument one step further, both supporting leasing and as a way of counteracting land speculation.

Charles Scrivener, Leslie Wade and others favoured 1000 square miles for a different reason. They believed that the Commonwealth should control the catchments of the rivers that flowed through the capital or provided the capital its domestic water supply. Sovereignty was the first step to controlling pollution.

Parliamentary Consideration: 1903-04

When in October 1903 Parliament had first voted on the various site options The Senate supported Bombala, the House of Representatives, Tumut. Ten months later in August 1904, another vote was taken. Both House and Senate supported Dalgety. It was a miracle.

The reaction of the Premier of New South Wales, Sir Joseph Carruthers, was vehement. Dalgety was out of the question. It was too close to Melbourne, too far from Sydney. The proposed Federal port at Eden would draw maritime and commercial activity away from Sydney. It would involve the State government in heavy outlays on new, unprofitable, railways. The final straw was the Commonwealth's intention of securing 900 square miles for the Federal Territory. He went as far as implying NSW secession from the Federation. The net effect was a stand-off.

State Sites

As an olive branch, New South Wales offered three sites; Yass, Tumut and Lyndhurst. The Commonwealth rejected all three.

At this point the otherwise excellent histories become vague. Somehow, miraculously, during the next two years, Canberra emerges, seemingly out of nowhere. What Happened?

Nothing courtesy of the Commonwealth government. Between the rejection of Dalgety in 1905, and the vote in the Federal Parliament in October 1908, not one piece of analysis was commissioned by the Commonwealth government. One paper did emerge, penned by Sir John Forrest, who on his own say-so, compared Dalgety and Canberra, finding firmly in favour of Dalgety.

What happened was that early in 1906, on instructions from Premier Carruthers, the NSW Government began to trawl for new sites. Those involved in the search included Arthur Lloyd, Chief Surveyor of the Public Works Department, Walter Liberty Vernon, the NSW Government Architect, and again, Leslie Wade. Together they authored a third, post Oliver post Kirkpatrick, spate of site analysis, reports and maps.

The maps, the natural means of conveying information about borders, sovereignty, site location, are especially informative. Normally site maps and expert studies were published as Commonwealth or NSW parliamentary papers. These particular plans, which were costly to print, were briefly displayed, then pigeon-holed and lost to sight, possibly for a century.

A survey of the country from Gundagai to Goulburn was undertaken by Chief Surveyor, Arthur Lloyd. This is encapsulated in a map dated 28 March 1906. It records 14 possible sites. As Scrivener once commented, capital sites “...are as thick as fallen leaves ...in autumn”.



Lloyd's map gives prominence to a site which Vernon favoured called Mahkoolma, located beside Wade's Burrinjuck Dam. But his accompanying report makes clear that he personally favours city sites 'J & K'. They coincide with today's central Canberra and Belconnen.

Maps, signed by Wade a week after Lloyd's map, show another stage in the thinking. Wade narrows the 14 Lloyd sites to three: water availability almost certainly decided the cut. Significantly, Wade includes the K site, and appends the name of a New South Wales county 'parish' to it, christening it '**Canberra**'. This is the first official (ie governmental) document of any genre I've seen that attaches the particular name 'Canberra' to this national capital site, and I've spent a lot of time looking. There is other collaborating evidence.





It's not that the name Canberra wasn't in use on maps over many years. But from the innumerable available options someone, very probably Wade, opted to call the site 'Canberra'. The name sticks: and in 1913, Lady Denman formally announces it as the capital's name. So, the engineering fraternity should take a bow. One of yours seems to have named the capital. Not that Wade made these claims: he obtained his satisfaction in more concrete ways... literally.

Carruthers forwarded the reports and maps to Alfred Deakin on 30 May 1906. The Government printed the texts but not the accompanying maps: these photos are of the hand coloured originals.

The Parliamentary Visit

New South Wales then invited Federal parliamentarians to visit these sites plus Dalgety, over two weekends and at NSW expense. The first visit took place on 13 August 1906.

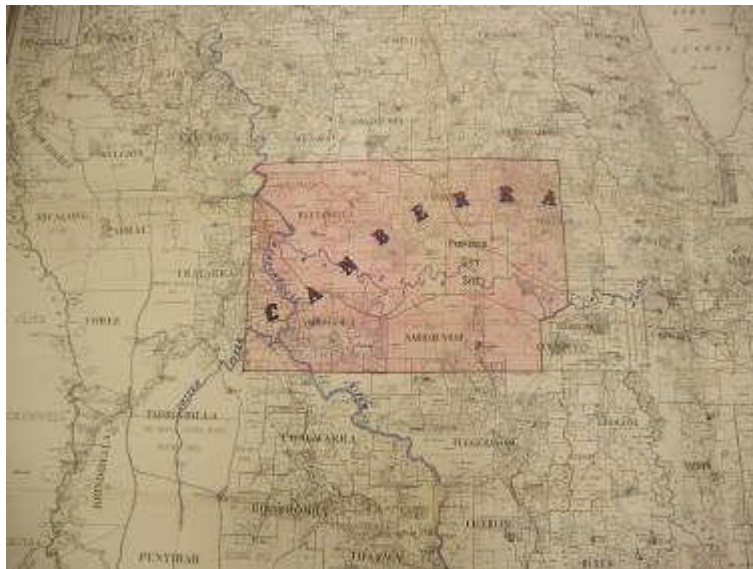
According to contemporary press reports the visit to Makhoolma was a disaster. The visit to Canberra, two days later, took place on a clear invigorating Canberra winter morning. Canberra "dazzled" and enters contention.

Canberra's Vulnerabilities

Prodded by surreptitious counsel from the Godfather of Canberra, former Labor Prime Minister John Christian Watson, the New South Wales government then used its in-house expertise to promote the feasibility of the Canberra site.

Compared to Dalgety, Canberra's particular vulnerability was, again, water. The NSW Government was contending with *the Bulletin* which ran a vigorous campaign for Dalgety and the Snowy, and an equally vigorous campaign disparaging the Canberra site.

A Vernon/Lloyd map, prepared in the aftermath of the 1906 Parliamentary visit, is an exercise in cartographic "spin", implying bountiful water supplies by colouring the rivers blue. In fact the region, west of the Murrumbidgee, was largely unknown. The Cotter hadn't been surveyed or accurately mapped. If you look closely, it's shown as an uncertain dotted line.



Similarly there was no credible data available as to the flows of the Molonglo, Queanbeyan, Cotter and Gudgenby rivers, the latter two the most likely sources of potable water. Leslie Wade, and a colleague, Stephen Weedon, made an initial assessment of water availability in September 1906. Another Wade/Weedon report followed in April 1907. Comparing the Gudgenby and the Cotter, Wade wrote:

Of the two I prefer the Cotter. The catchment area is rugged and uninhabited; the flow has not been known to fail in the dry seasons; the water carries a minimum quantity of silt in suspension...

The area of the catchment above the proposed point of storage is 110 square miles but, owing to the roughness and inaccessibility of the mountain ranges bordering the catchment, no records of rain or snow fall have been taken...

Taking the catchment area with the character of the catchment, I am satisfied that the Cotter River will supply all requirements of a federal capital city, up to a quarter of a million inhabitants.

For an initial estimate it was creditably accurate. He also added,

"...this area presents possibilities as to a national park and the stream is especially suited to trout".

Uncharacteristically, he was now playing politics.

A spate of NSW reports followed from de Burgh, who started to calculate flows and assess dam sites; Vernon, on building materials; Corin provided options for dams and water supply systems; Pridham, on the Naas and Gudgenby rivers. But, to use a Sir Humphreyism, it would have been a highly courageous government that took a decision on the capital based simply on assumptions.

Gauges were installed on the Cotter early in 1908. De Burgh reported that the discharge in August 1908 was sufficient to supply Sydney, then 620,000 people, for the equivalent of 333 days. The numbers may have been accurate, but the reading greatly exaggerated the Cotter's normal supply capacity. These days, one can only wish.

Parliament Again

In October 1908, the House of Representatives, and subsequently the Senate, voted again. At their disposal, the NSW reports. It was close run but they relegated Dalgety and voted to have the capital in the Yass-Canberra region, knowing this almost certainly meant Canberra.

Scrivener's Assessment

At which point, at Commonwealth insistence, Charles Scrivener again becomes involved to provide an independent "second opinion" of the New South Wales assessments. Scrivener would have been in total agreement with his instructions regarding water. The Federal capital Territory should...

"...include the catchment of the water supply for the capital. Such water supply must be of sufficient magnitude to place the question of volume at all seasons and purity beyond doubt."

Scrivener assessed six sites and concluded that "...of the sites in the Yass-Canberra area Canberra was the best". That's a qualified endorsement: it implies there were better sites elsewhere.

Scrivener proposed a Federal Territory shaped like an extracted wisdom tooth, the Cotter, Molonglo, and Queanbeyan catchments and the town of Queanbeyan to be within Federal control



A subsequent report by Scrivener was more equivocal, implying stronger doubts about the Cotter's supply capabilities, particularly their cost. Premier Charles Wade and Scrivener's NSW counterparts reacted with hostility and consternation: ultimately the row blew over.

A departmental advisory board, comprising Miller, Owen, Vernon as well as Scrivener recommended Canberra for the national capital site. The Government and the Parliament agreed.

Commonwealth/NSW Negotiations

From the Commonwealth's perspective, the Federal/State negotiations over the shape and design of the Federal Territory were all about control over water.

The New South Wales government opposed the inclusion of the town of Queanbeyan, and the Queanbeyan and Molonglo river catchments. Instead it ceded the Gudgenby, Naas, and Paddy's River catchments, in addition to the Cotter River catchment, to the Commonwealth. Not obvious from a map, the Commonwealth secured riparian rights, but not sovereignty, over the Queanbeyan and Molonglo rivers. New South Wales also undertook to ensure these catchments weren't polluted.

One provision, that particularly mattered to Percy Owen, gave the Commonwealth the right to generate and transmit electrical power to Canberra from anywhere in New South Wales. It was the genesis of Commonwealth involvement in the Snowy Mountains Scheme.

Percy Owen and his Commonwealth colleagues were centre stage and back in the game.

In the way of incoming governments, King O'Malley thought his predecessors had botched these negotiations and again sought the inclusion of the Molonglo and Queanbeyan Rivers within the Territory. The attempt was unsuccessful: it is an interesting story in its own right.

The City: A National Capital

The newly created Federal Territory had...1714 people...150 landholders...miscellaneous livestock and...and millions, possibly billions, of rabbits.

Queanbeyan Council serviced 200 miles of road, (most in bad condition), 4 bridges, (all in good condition), 2 street lights, (the village of Hall was the biggest settlement), 14 toilets (the duplicate pan variety). It was a modest beginning.

From concept to concrete

The last, purpose-built, national capital anywhere was Washington, a hundred years earlier. Where do you begin?

What population are we talking about? By when? Will Parliament remain the same size? (There was speculation it may have to accommodate six new states). How many government departments? How large a resident bureaucracy? How many children do bureaucrats have on average?

Where, how, will we generate electricity? Can the city construction begin before we can pipe clean water? Pump water or use gravitation? Do we need one of these newfangled airports?

What will all this do to the national economy and the Commonwealth budget? How many workers will we need? By when?

Accommodated where? How do we prevent disease in the workers camps?

Will this be a farming centre? a horticultural centre? an industrial centre?

Where do we put the military college?

Do we do design the city ourselves or do we hold an international competition? Could we built Parliament House first, and the rest of the city later?

Timetable

Alfred Deakin wanted the city built within three years: not possible in Owen's judgment. Nevertheless Canberra should be operative as capital by 1916, at the very least to allow Parliament to meet there. Those involved felt the pressure to perform, quickly.

The first step involved was extensive surveying, Charles Scrivener's responsibility. Scrivener also had the vexatious task of land acquisition. Construction was Owen's business.

Owen's Schema

In 1910 Owen defined a schema, a schedule, for capital construction. It involved four, at times overlapping, stages. In essence it proposed to put in place temporary infrastructure, to enable the permanent infrastructure required **outside** the city (eg water supply) , then the infrastructure needed **within** the city limits (eg roads etc) , and finally build the city itself.

The Federal Capital Design Competition

A snapshot of Owen's thinking comes in 1911 in the conditions governing the international competition for the city design, the competition Burley Griffin won.

The population of the initial city was to be assumed to be 25,000 persons.

Besides indicating sites for the major public buildings, Parliament House, offices etc, competitors were to designate areas for: government factories, a central railway station,

military barracks, a central power station, and a gasworks. Later on the conditions noted that..."it is probable that the manufacture of military equipment and other productions for Commonwealth use will be undertaken within the Territory." This was not simply a city for parliament and public servants.

Two sites for possible weirs across the Molonglo for an ornamental lake were described, as was the expected annual evaporation from extensive water surfaces. (40 inches (1 metre) annually) The competition notes recorded that in some seasons the Molonglo River stopped flowing. Therefore..."regulating weirs will be constructed on the Molonglo and Queanbeyan to control floodwaters and to maintain a constant (water) level behind any weir."

Sewerage would be carried by water and gravitation and delivered to a treatment works six miles west of Camp Hill. The intent was specifically defined.

The central power station was to be a steam plant using coal: a suitable site must be provided on competitor's plans.

On a close reading the competition papers signalled one other intent. They stated that "the premiated (i.e. prize-winning) designs shall become the property of the government for its unrestricted use either in whole or in part." Later, that: "...the government by its own officers will give effect to the adopted design." Miller, Scrivener, Owen and their colleagues intended to design and build the city.

The Battle of the Plans.

That was the genesis of the battle of the plans, Burley Griffin versus departmental officials. Arguing that no one design was fully satisfactory, and with Home Affairs Minister King O'Malley's and then Cabinet's endorsement, Miller, Scrivener, John Smith Murdoch, Percy Owen and others developed their own alternative, cheaper to build, national capital design, taking this bit from Burley Griffin that bit from somewhere else and throwing in thoughts of their own. Scrivener was the dominant influence.

The plan may have had some practical and cost merits. Aesthetically, compared to Burley Griffin's thoroughbred, it was a committee-compromised camel.

Relations between Burley Griffin, deeply protective of his design, and these passionately committed officials, were always destined to end up on the rocks. The decisive intervention by the Minister William Kelly disbanded the Departmental Board and put Burley Griffin in charge of Canberra's design and construction, surrounded by a sea of organisational ambiguity and professional resentment. Later asked what he thought would happen, Kelly said, "...he expected harmony to prevail". Burley Griffin notwithstanding, Owen believed Kelly told him he remained responsible for building the city. Disputation lasted three years.

Ultimately, unnecessarily, with the country at war, and with the conscription debate raging, a Royal Commission was established. Its processes were a travesty.

Owen and Burley Griffin

On my reading Owen was very conscious of the government's expectation of early occupation, funding constraints, and rising construction costs: he wanted to get the job done. He was technically conservative, always leaving a considerable margin for error. Under no circumstances would his capital lack for water in a drought, electricity, or access.

Burley Griffin was attracted to the latest thinking and to the technological cutting edge. He noted that

“the city offered “a rare opportunity for taking advantage of the latest developments in science and utilising the best available ideas regarding sanitation and other matters.”

He would countenance no “perversions” of his plan. He made no bones that, in his view, those now involved were second rate.

Sewerage.

We’re now entering an area where anything is probably more than you ever wanted to know. The point of greatest disputation, triggering a total breakdown between the Owen and Burley Griffin, was over the sewerage system for the city.

In 1914, Owen was building, in my layman's terms, a traditional sewerage system, a water fed gravitation system, treatment to occur six miles out of town. Construction was proving extremely expensive and the exact treatment process hadn't been finalised.

Burley Griffin advocated the Emscher system. This would have had sewage stored and treated in tanks in each suburb. With solids and fluids separated, the effluent, ie treated fluids, would be applied to public gardens or allowed to outflow into streams, hence ultimately into the ornamental lake, shortly to grace the Molonglo.

Noble Anderson, one of the engineers advising Griffin, in Royal Commission evidence, said:

“People who are not too fastidious do not mind drinking the effluent from sewerage. If the sewerage farm be at all effective the water running off it will not be any more offensive than the water running down the Molonglo at present.”

It’s an issue we face today.

However his benchmark was not a reassuring one. For Departmental officials the Molonglo was a longstanding concern. Queanbeyan, had had typhoid outbreaks, and posed public health problems for Canberra, the reason why Scrivener and O'Malley wanted control over river and town. According to one 1910 assessment, the Molonglo:

“...is polluted by the drainage of Queanbeyan. The local cemetery is ...situated on the bank of the Queanbeyan River a most insanitary arrangement; the night soil depot of the township is situated within the catchment area of the Molonglo though well removed from the river itself.”

Owen vigorously opposed Burley Griffin on this issue and vice versa. The Royal Commission ticked the Emscher system. I gather it was partially installed, then abandoned. Prima facie its long-term cumulative effects would seem likely to have been detrimental, particularly once the lake went in. As far as I can gather Australian cities have opted for variants on Owen’s approach. On that matter, history would support his judgement.

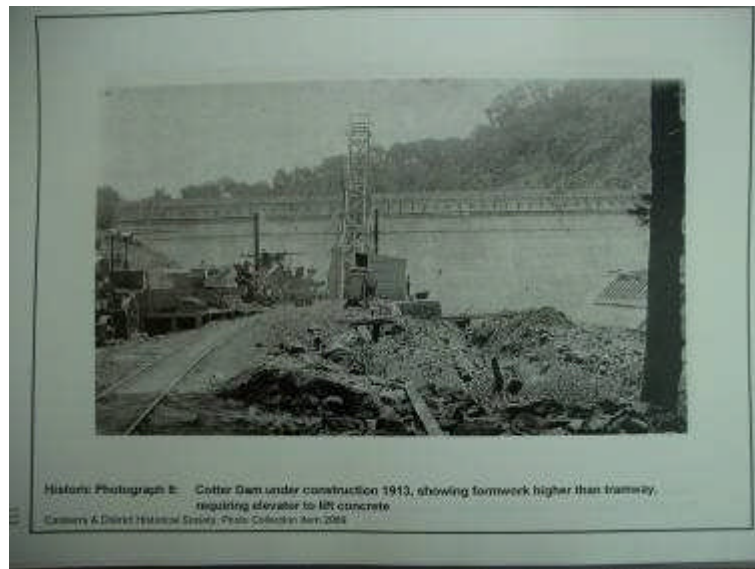
Cotter Dam

Less clear cut was water supply. Owen was extremely wary of optimistic water supply assumptions; you had to assume on the minimum. Cotter flows of less than Canberra’s expected daily requirement (for an assumed 20,000 population) had now been recorded.

Alone of the Departmental Board, he opposed an ornamental lake, Burley Griffin’s expansive lake design a particular concern. He personally advocated a “ribbon of water”, a river by any

other name, running through the city but he met universal opposition from his departmental colleagues.

In 1913 construction of the Cotter Dam was well advanced. Burley Griffin, and experts called as witnesses were highly critical of the dam and associated pumping station. The shape of the dam wall was alleged to be suspect, possibly unsafe (not so): a tunnel constructed under the Murrumbidgee River to carry water to the pumping station was unnecessary and expensive (correct): the dam's storage capacity was excessive (arguable).



(Above photos are copied from Keith Baker's excellent heritage history of the Cotter)

More fundamentally, a dam sited some 11 miles up the Cotter River, could feed water to the city by gravitation, by water race or by pipe. It could also generate hydro power and supply much cheaper water and power to the city than the Cotter with its pumping system.

The Commission's bottom line conclusion was that had gravitation been chosen initially it would have meant a greater capital cost outlay but provided Canberra with water at a cheaper unit cost. However, replacing the Cotter scheme as now built wasn't justified.

Other Findings

The Commission's findings on departmental officials' relations with Burley Griffin found against Owen and his colleagues, overall a valid response to the wrong question. The question not asked would have been along the lines of ...“what were you smoking, Minister, when you created that administrative design?” Other findings on finances and technicalities went 50/50, partly critical, partly supportive of Owen. But virtually everyone caught up in the royal commission was wounded by it.

Percy Owen remained involved with Canberra for another twelve years, initially at a discount. He can't have welcomed Ernest de Burgh's appointment to the Federal Capital Advisory Committee ahead of him, though, with encouragement, he remained as chief engineer.

One major contribution during these years comes laced with irony. In the early 1920s, the Advisory Committee under Sir John Sulman started to veer away from the Griffin plan. Percy Owen blew the whistle. The response locked in the Griffin plan as the one and only touchstone for Canberra's future development.

Fishing the Cotter

One final glimpse. Fishing and picnicking in the Cotter catchment was prohibited: a 10 pound fine for fishing, 20 for picnicking. The caretaker at the Cotter Dam, one, Mr Louis Ritter, was one of those appointed to police the ordinance.

By the mid 1920s the dam surrounds were being planted with pine. On 20th November 1929 the forestry officer at Uriarra, very protective of his charges, wrote:

“I have to report that Ritter still continues to bring people up in the boat and land them at the top of the dam and then go fishing up the river...On 20/11/29 he landed Col Owen at the top of the dam (who) then went fishing and would take no notice of me telling him to stop fishing.”

A few weeks later:

“...Amateur fishermen who have been recently conducted by Ritter into the prohibited area include Mr Blakey and Col Owen.” Mr Blakey was the Minister for Home Affairs.

After suggesting a series of somewhat draconian penalties, the writer loses his nerve:

“...it is recommended ... that the question be referred to the Minister for Home Affairs for a ruling as to whether or not the valuable dam reserve on the Cotter reservoir is to be adequately protected.”

Around this time the files indicate that, the law notwithstanding, the Department of Home Affairs was handling Mr Ritter's boat bookings.

The Minister meanwhile became seriously concerned that there was an oversupply of fish in the Cotter reservoir, a clear risk to water purity and hence health. The matter required corrective action, by him personally.

Eventually a new Minister, tougher regulations, Canberra's water purity had to be guaranteed. But Sir John Forrest and Leslie Wade's concern that the national capital must

have trout, continued to drive the government's policy agenda twenty years later. Percy Owen was keeping it there.

Conclusion.

There's a lot more that could be said about both Wade and Owen. They profoundly influenced the Canberra we encounter today. I mentioned they are profiled in the *Australian Dictionary of Biography* but not in the Institution's Bicentenary history *The Engineers*. It's time for a second edition.

If there was a better site for the capital, it's now an irrelevance: you can't turn back the clock.

Wade's initial judgement as to the water supplies available to Canberra has proven surprisingly accurate. Water, of course, remains a profound concern: we are looking to good engineering and good economics to guide us through. As an economist, I have more confidence in the former, and pass that on to you as an expression of professional gratitude.