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# Sludge on Tap: Queensland's First Water Pollution Legislation, 1944–1985

JAN WEGNER

*School of Arts and Social Sciences  
James Cook University  
Cairns Campus  
PO Box 6811  
Cairns 4870  
Queensland, Australia  
Email: Janice.Wegner@jcu.edu.au*

## ABSTRACT

Before the environmental movement of the 1960s and 1970s, controls on water pollution in Australia were piecemeal, scattered through a number of Acts. These often regulated pollution by compromises with the polluters, rather than preventing it outright, unless a threat to public health could be proved. This situation characterised the first Act written specifically to control water pollution in the Australian state of Queensland, sparked by the pollution of the Herbert River with tin dredge effluent after 1944. Conditions imposed on the dredge operations were compromises, chosen for their utility for dredging rather than their effectiveness, and further legislation maintained the situation so that pollution of the river and water supplies drawn from it continued for 40 years. The Act, and the pollution episode which sparked it, are an example of a theme noticeable in some pre-1970s pollution cases: controls were imposed that were cheap to implement or useful to the polluting agency, but which were ineffective in stopping pollution outright. Unfortunately, in Queensland, that attitude persisted after other jurisdictions had moved to more environmentally sensitive styles of pollution management.

## KEYWORDS

Water pollution, dredging history, tin dredging

## INTRODUCTION

In 1939 the people of Ingham, a small sugar-growing town on the tropical east coast of far northern Australia, were able to celebrate their new town water supply. The water it drew from beneath the sandy bed of the nearby Herbert River was noted for its quality. In the summer of 1944, however, it became noticeably discoloured, a change attributed to dredging for tin in the upper reaches of the river. Tap water became a 'creamy opaque colour'<sup>1</sup> with residents' stomachs 'revolting against it';<sup>2</sup> housewives complained about their washing, and graziers along the river reported that their cattle refused to touch the water or died after drinking it. The sugar mills could no longer use river water for their boilers while recreation in the river almost ceased after a number of deaths, because bathers in trouble could not be found in the murky water nor could predatory crocodiles be spotted.<sup>3</sup> The Queensland State government promised that the dredging company would be required to contain the sludge. However, the pollution continued into the 1980s. There were a number of reasons for this. The sludge proved more difficult to deal with than expected, partly because of the tropical monsoonal climate, and there were economic reasons which made governments favour the continuation of dredging. Any solution considered acceptable by the dredging company had to be cheap and, preferably, useful for its operations. Official attitudes towards industrial pollution, common in Australia until the environmental movements of the 1970s, supported the rights of the polluters unless a public health hazard could be proved. Post-war Australia was desperate for industries that might provide jobs and attract migrants, particularly after the crises of the 1930s depression and the threat of invasion into the 'empty north' during World War Two, and was thus inclined to be lenient towards industrial polluters. The legislation passed in 1948 to control the dredging pollution, Queensland's first Act written specifically to address industrial pollution of waterways, embodied all of these factors. In particular this Act, and the way it was applied to the Herbert River pollution case, illustrates a number of trends in pre-1970s pollution controls in Australia: to settle for techniques that did not hamper the polluting industry, were cheap to implement, or suited that industry's working methods.

## WATER POLLUTION IN AUSTRALIA: THE CONTEXT

British settlement in Australia had imported European attitudes to streams, which were valued mainly for their economic uses. The channels were drains and waste removers while the water was a resource, and a scarce one in Australia as white explorers exploded hopeful myths about inland seas and mighty continent-spanning rivers. The aridity thus revealed, together with experience of devastating droughts gave colonial (later State) governments the impetus to survey existing surface water sources and supply more, through bores, wells,

dams and irrigation schemes. Greater government controls over water supplies were legislated to ensure public interests prevailed over private.<sup>4</sup> However in practice, private development interests usually coincided with government interests as the overall aim was to use water resources to encourage more intensive pastoral and agricultural use of the land. Ignorance of the fragility of that land led to over-clearing and over-grazing, leading to soil erosion and consequent silting of streams, but pollution of any other kind outside the cities was rare before World War Two apart from occasional cases of mining pollution. If no threat to public health was involved these were viewed with indifference, as waste disposal was a valid and acceptable use of waterways. The only exceptions were when the waste had an adverse effect on an equally profitable industry such as agriculture.<sup>5</sup> Even then, mines of particular value to a local or regional economy might be exempted. Victorian dredges which destroyed natural watercourses and agricultural land around the turn of the twentieth century had to contain their effluent by working outside of watercourses and were forced to re-soil mined areas, but the gold ore crushing machines of Gympie in Queensland in the same period could cover farmland downstream with a mantle of sand without official intervention.<sup>6</sup> Gympie was a leading gold mining centre and mining was far more important for the district and state economy than the farms affected. Even the nation's capital suffered from this *laissez-faire* attitude. Despite being the central feature in Canberra's carefully-planned townscape, Lake Burley-Griffin was polluted for over 30 years by acidic water with high levels of zinc and copper from mines upstream on the Molonglo River.<sup>7</sup>

The only pollution likely to result in government intervention was that affecting public health. The late eighteenth- to early nineteenth-century revolution in European public health, brought about by the miasma theory of disease causation, concentrated on preventing 'nuisances': things that stank, which indicated the presence of harmful miasmatic vapours. Governments tried to prevent them by disposing of sewage underground, filling swamps, and providing clean water supplies. Even after the germ theory of disease was accepted in the 1890s and testing by bacteriological count established soon after, water quality in Australia until 1950 was usually defined by reference to its smell, taste and turbidity: in other words, whether it constituted a 'nuisance'. Pollution identified by these criteria was likely to result from inadequate sewage disposal or organic industrial wastes such as those from sugar mills, tanneries, meatworks and canneries. Foul-smelling organic pollution was easy to spot as a 'nuisance' and could be dealt with by requiring the industry or sewage outlet to be located well away from urban water supplies. After World War Two the more developed states, particularly New South Wales and Victoria, had the increasingly difficult problem of industrial chemical waste to deal with. However post-war use of agricultural chemicals such as herbicides, chemical fertilisers and pesticides like DDT ensured that the more agriculturally-based states did not escape the consequences of chemical pollution either.<sup>8</sup> It was harder to prove that chemical

waste is harmful to humans, and as the burden of proof rested with the public rather than the polluter, little was done until the 1980s when research began to provide that proof and the standards for 'safe' levels of pollution.<sup>9</sup>

Knowing pollution is harmful was one thing; having the political will to act against it was another. Their small economic and population base, and sense of vulnerability as a European outpost on the fringe of Asia, made Australians anxious to develop at all costs. This was aggravated by high unemployment during the 1930s Depression, which hit Australia particularly hard, and the insecurity caused by Japan's near-invasion of the thinly-settled northern half of the continent during World War Two. Full employment, immigration and attracting industry became major policy determinants after the war. The result was a manufacturing boom in Victoria, New South Wales and South Australia and an agricultural and mining boom in all states and territories. Between 1960 and 1990, for example, Queensland's area under crop nearly tripled.<sup>10</sup> In the 1940s and 1950s there was little concern about the impact that development might have on the environment because Australians were still caught up in a frontier mentality, believing the country was too vast to be impacted by its small population. Pollution was something that happened in Europe or the U.S.<sup>11</sup> However immigration and an accelerating trend toward urbanisation boosted the size of the cities, burdening sewage disposal systems and aggravating industrial pollution. These, the increased use of chemicals noted earlier and pre-existing pollution hot-spots, ensured that by the 1960s Australian urban environments and many rivers were noticeably degraded. State and local governments recognised the growing problem but feared that stricter controls over industrial pollution would mean that the polluters would go elsewhere, taking their jobs and other economic benefits with them.<sup>12</sup> While some industries acted responsibly within the limits of the available technology for waste treatment, others took advantage of the competition for mills and factories and breached existing pollution controls with impunity. Local governments were also notorious for ignoring the law or their own by-laws when it came to outfalls from their own sewerage plants.<sup>13</sup> It has been suggested that the Commonwealth (Federal) government would have been less responsive to industry blackmail and better able to provide a co-ordinated approach. However, as land and therefore streams are State concerns under the Australian Constitution, the Federal government has rarely intervened in environmental issues apart from a few high-profile cases such as protecting rainforests through enforcement of their World Heritage listing status over State opposition. U.S.- style Federal leadership is therefore difficult and as inter-state rivalry is only bettered by rivalry between the State and Federal governments, co-operation over water issues is rare.<sup>14</sup> This has been worsened by internal divisions in responsibility so that until the 1980s State controls over water were notorious for being divided among a plethora of statutes and often-competing agencies. In 1969, Queensland had 15 Acts regulating water, of which 8 had clauses on pollution, and 18 government agencies which dealt

with these Acts.<sup>15</sup> Such divisions of responsibility have led to buck-passing on pollution incidents.<sup>16</sup>

Australians turned a blind eye to the deteriorating state of their rivers and coasts until it was forcibly brought to their attention in the late 1960s and early 1970s by a series of public figures, among them Prince Charles, and by the damning report of the 1970 Senate Select Committee on Water Pollution.<sup>17</sup> A spate of legislation followed, inspired by examples in Britain and the U.S., but most of it could only deal with obvious examples of gross pollution rather than that from multiple sources or agricultural runoff. The complexities of how pollutants, particularly chemicals, might behave in a natural environment over the long term were also beyond them.<sup>18</sup> Most of these acts were also hampered by low levels of monitoring, resourcing, prosecutions, expertise and the research needed to inform the agencies trying to enforce them.<sup>19</sup> The least-developed states were reluctant to let go of their pro-development ethos, particularly Queensland, anxious to catch up with New South Wales and Victoria and dismissive of concerns about pollution. Despite having a Clean Waters Act in 1971 Queensland did not have a single prosecution for pollution until the early 1980s. Its farmer and developer-dominated Government was hostile to the increasingly well organised and strident environmental movement, which had been transformed in the 1960s and early 1970s from a conservation movement preserving endangered areas and species to one concerned with whole ecologies. However, even in Queensland the environment was becoming a high-profile political issue, helped by rising concern over the impact of chemicals on public health and the effects of pollution on the state's booming nature-based tourism industry. The conservative government was voted out of office in 1989.<sup>20</sup> Between 1970 and 1990 all Australian state governments were becoming more sensitive to public concern and more exacting over pollution issues.<sup>21</sup> Until then, however, legislative responses to pollution were likely to be on a case by case basis and the conditions placed on the polluter were unlikely to be onerous. The Herbert River dredging case is characteristic of this tendency.

#### HERBERT RIVER POLLUTION: WHOSE FAULT?

The first attempt to deal with the Herbert River dredging pollution was local. In Queensland, local government had the responsibility for providing clean water supplies. After the link was made between discolouration of Ingham's water supply and dredging, the town's local authority, the Hinchinbrook Shire Council, took up the cudgels on behalf of its residents. Its first hurdle was to prove that the pollution did indeed originate with dredging, in the face of the dredging company's denials that it alone was responsible. Large-scale alluvial mining for tin had been occurring in the headwaters of the Herbert River from 1906, mostly by hydraulic sluicing using large hoses to wash tin-rich soil out

of stream banks, with one small bucket dredge operating after 1928. The usual quantity of dirt treated was 19–145,000 cubic metres annually.<sup>22</sup> Rising tin prices in the lead-up to World War Two attracted more interest and the old dredge was reconditioned by Tableland Tin Dredging NL, handling over 612,000 cubic metres a year after 1939.<sup>23</sup> It caused no noticeable pollution. However, its efforts paled beside the capacity of a larger machine, ‘Dredge No. 2’, introduced by the company in 1943 (see Figure 2). It disturbed one and a half to three million cubic metres a year, initially storing its effluent in settlement dams to conserve water. The major dam was released late in 1943 and the sludge was discharged directly into the creeks. It soon appeared in the lower reaches of the river after summer rain flushed it out of the headwaters. In 1957 Ravenshoe Tin Dredging Co. set another large dredge to work on a tributary of the Herbert, treating a further one and a half to two million cubic metres.<sup>24</sup> It was inevitable that the larger dredges would have an impact, but the question was to what extent.

North Australian streams are normally very turbid during the summer monsoons (the ‘wet season’), with a high clay content. However, they clear rapidly as the rains ease off in April. The first proof that the clay was dredge effluent was the continued turbidity of the river in the dry seasons; the second was comparison with water from other rivers in the area. The Shire Council consistently found that turbidity in the Herbert was far worse than in other major streams during floods. For example, in the wet season of 1970, Herbert River turbidity was measured at 200 standard units while in the nearby Stone River it was ten.<sup>25</sup> It was soon agreed by all concerned that the clay came from the dredge, though even after measures were taken to control the problem there were wrangles every year between the Shire Council and the mining companies. The latter alleged that pollution was unavoidable in the wet season because of flooding in the sludge storage dams, and clay still being leached out of the old dredge waste (tailings). Evading some of the blame in this fashion is not unusual. Other polluters have argued that even if they stopped their activities immediately, the problem would persist for a while, so they might as well continue.<sup>26</sup>

## PROBLEM AND SOLUTIONS

Admittedly the dredging sludge, a colloidal clay, proved to be a difficult problem. Colloidal clays are very finely divided and can have properties, such as mutually repelling particles, which make them hard to settle. One glass of polluted water kept in a local politician’s office had not cleared after three years.<sup>27</sup> The first solution suggested by the Queensland Mines Department was dilution of the slimes, which made little obvious difference, and was impossible anyway because of the large amount of water needed, the lack of sites near the dredges for water storage dams, and the low annual rainfall in the area. A Government committee set up to investigate the pollution suggested pumping the waste into

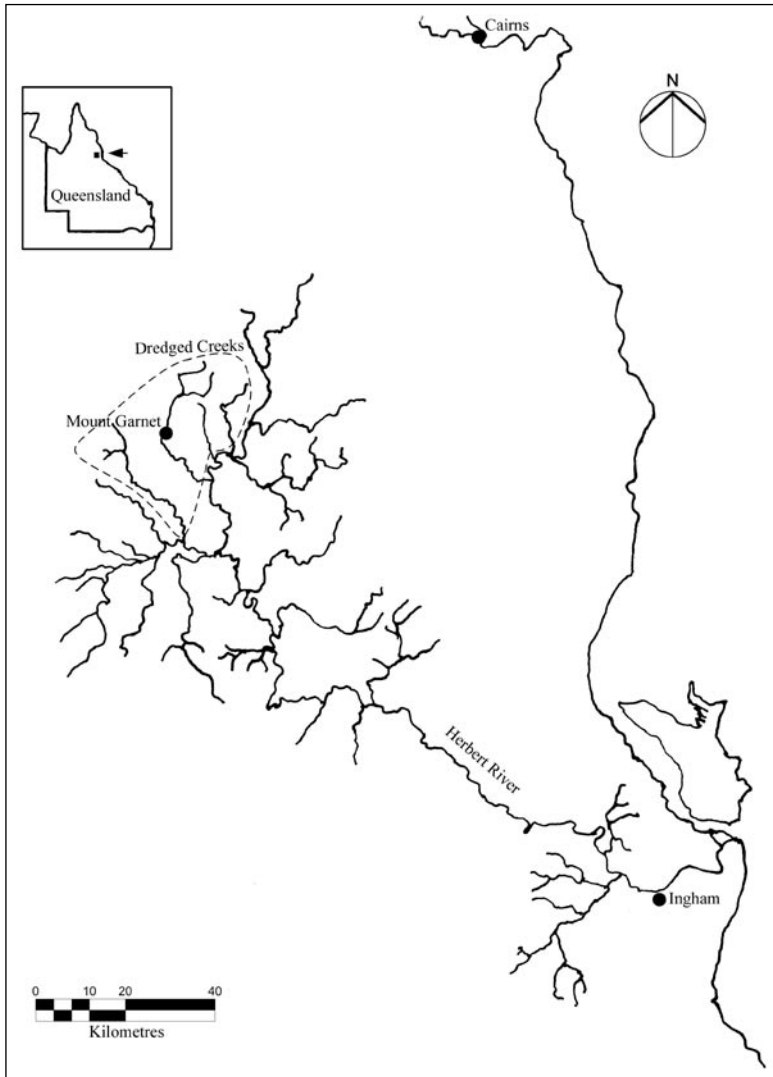


FIGURE 1. Locality map

the nearby headwaters of the Mitchell River. This was vetoed by the dredge company because of cost, and by the State government because the Mitchell was a much longer river, even if settlement along it was sparse.<sup>28</sup> Two engineers commissioned by the Queensland government recommended dispersal and absorption over nearby grazing land.<sup>29</sup> A trial showed that ponding occurred over time, either because the clay sealed the surface of the soil or because the ground



became waterlogged.<sup>30</sup> Chemically-aided settlement, another recommendation by the various reports, was more attractive to the dredging company because it allowed storage and re-use of water, an important factor in an area where surface water becomes scarce for most of the year. Some agents which effectively flocculated the clay to make it easier to settle out were identified by the company, the Mines Department, and a number of experts. However, the cost of the chemicals made the solution uneconomic for the company.<sup>31</sup> Ultimately settlement dams or bunds were the easiest solution, holding the effluent long enough for some settlement by gravity to occur. The company gained the benefit of recirculated water, but it was less than satisfactory for residents downstream, because bunds could only be built across watercourses and were therefore likely to be damaged and washed out during heavy rainfall. The dry tropics of Australia has nearly all of its rainfall concentrated in two to three months of the year, inevitably causing floods during the wet season. The company and the State government argued that wet season flooding would dilute the slimes and quickly sweep them out to sea, preventing them from becoming a nuisance, though in fact pollution of the Ingham water supply occurred every year during the 'wet'.<sup>32</sup>

#### LEGISLATING THE SOLUTION: THE MINING ACTS AMENDMENT ACT 1948

The settlement dam solution was one of the dredge lease conditions embodied in the Mining Acts Amendment Act of 1948. This legislation was based on precedents in the state of Victoria, which in 1905 had imposed conditions on gold dredges to keep their sludges out of streams by using settlement dams.<sup>33</sup> It is historically significant as the first Queensland Act written principally to control water pollution.<sup>34</sup> It amended the Mining Acts 1868–1940 by providing for dredging leases, their rehabilitation, and sludge abatement thereon. Where water used for dredging would enter a watercourse, the matter was to be referred to the Minister who would set conditions to 'prevent or mitigate' damage to that watercourse. These conditions could include settlement dams, treatment of polluted water, or standards for allowable discharges. The Minister could however grant exemptions from anti-pollution conditions if they were likely to cause excessive costs for the miner, or not be in 'the public interest'.<sup>35</sup> The dredging lease holder had to pay a sum to the Treasury to meet claims for compensation or the cost of alternative water supplies, and this sum would be the limit of potential claims. The Act took away the power of complainants to bring action in common law against polluters because observance of the lease conditions by the miner was a defence. Breaches of the conditions were punishable by forfeiture of the lease, not compensation to those affected. On top of that, the Minister could even declare the watercourse too polluted for other uses and exempt the

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miner from all conditions, following the example set by New Zealand in 1875.<sup>36</sup> Naturally the Minister concerned was the Minister for Mines.

#### SETTING CONDITIONS UNDER THE ACT: MITIGATION OR PREVENTION?

The Minister and his Department had good reasons not to be too strict on the dredgers. In 1944 there was still an urgent need for metals for the war effort, and even in 1948 Australia was still 20 per cent short of its tin needs. Tableland Tin Dredging NL was the biggest producer of tin in the State, producing a quarter of Australia's output.<sup>37</sup> In addition, the company was being financed by Government-guaranteed overdrafts totalling £160,000.<sup>38</sup> By the 1950s the tin dredges were among the largest mining ventures in Queensland. There were other strategic considerations, as noted earlier. The dredges were in the lightly-populated far north of the country, which had nearly proved to be Australia's Achilles heel during the war with Japan. Queensland saw populating the north as a defence priority and to attract population, jobs were needed. Employment was also high on the agenda of every Australian government thanks to the lessons of the 1930s



FIGURE 2. 'No. 2 Dredge', Tableland Tin Dredging N.L., 1946. (Source: *Queensland Government Mining Journal* (47, 21 October 1946): 298.)

depression. Unsurprisingly, the Minister decided that the public interest would best be served by allowing dredging to continue and setting conditions which would mitigate, but not prevent, pollution. The company had to impound the effluent in bunds for a minimum of seven days before releasing the water, a useless provision as settlement took far longer, and had to rehabilitate the old tailings to prevent more clay being scoured out by floods. This meant changing dredging methods to re-soil the stony wastes of tailings, and then planting trees on them.<sup>39</sup> Settlement aided by chemicals would have been far more effective but the Department of Mines was afraid that more stringent conditions might spark a lawsuit by the company, deter investors interested in Queensland mining, or make dredging uneconomic.<sup>40</sup> Dredging is a method of mining large areas of ground with low mineral values as cheaply as possible and the company complained that even these minimal conditions were prohibitively expensive.<sup>41</sup>

The dredging companies did not observe the conditions even to the satisfaction of a sympathetic Mines Department and in 1951 a further amendment to the Act to tighten up provisions was followed by legal action, when Tableland Tin NL was fined for wilfully breaching a holding dam and polluting a creek.<sup>42</sup> However, pollution during the wet season was tolerated until the price of tin plummeted in 1985 and put the miners out of business. Curiously, despite this convincing demonstration that bunds or storage ponds to contain pollution do not work well in tropical Australia, they have been the major pollution control mechanism for mining in that region, including uranium mining.<sup>43</sup>

## OTHER LEGAL AVENUES

In view of the State's failure to prevent pollution, the Shire Council wanted to take legal action but found its rights to be unclear. Historically, pollution could be dealt with by local or State government, depending on the current legislation and the type of pollution, or river users could claim common-law rights to compensation through State courts. The Health Act of 1937 had given local government the power to abate 'nuisances' polluting watercourses, even those originating outside its boundaries.<sup>44</sup> However, 'nuisance' was usually defined in legislation as a substance harmful to health or deemed to be offensive, particularly referring to smell. The miasma or 'stink' theory of disease transmission may have been largely rejected by 1900, but it cast a shadow well into the twentieth century in Queensland government affairs.<sup>45</sup> The dredge effluent did not qualify as a miasmatic 'nuisance'. Nor would a suit for damages work. Over the 1920s and 1930s the State had increasingly gathered control over watercourses into its own hands so that the common law rights of water users had been largely vested in the Crown through the Water Acts, 1926–1936. The State Commissioner for Irrigation and Water Supply had the major responsibility for dealing with pollution of waterways, and the 1927 Mining Acts Amendment Act had

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already made the Water Act of 1926 subservient to the Mining Act for water use rights.<sup>46</sup> Even the Health Acts Amendment Act of 1948, which was the State's second piece of legislation to control industrial pollution of water, could not override conditions set under the Mining Act. In any case, its only standard for determining pollution was a 'noxious or offensive odour', which again did not apply to the dredging sludge.<sup>47</sup> In fact the Mining Act Amendment Act of 1948 was the first in Queensland to describe pollution as 'impure' discharges rather than 'noxious', thus allowing Government action to control them.<sup>48</sup> However, as noted earlier, the Act stated that if the polluter complied with the conditions set by the Minister for Mines, this would be a defence against suit for damages.<sup>49</sup> The people on the lower Herbert River therefore had to rely on the State to act on their behalf, and the only thing likely to galvanise the State into stopping pollution was the threat to Ingham's water supply. The Department of Mines, Department of Health, and the Irrigation and Water Supply Commission all analysed the polluted water and found that while the creamy-coloured stream issuing from Ingham's taps was unacceptable as drinking water, the clay was inert and unlikely to harm anyone.<sup>50</sup> Even the increasingly sophisticated tests available in the 1960s to 1980s did not raise warning flags over the Herbert River dredge slimes, despite the affinity of colloidal clay for heavy metals.<sup>51</sup> Indeed, one gains the impression from Mines Department correspondence that the dredge pollution question was one of aesthetics. The three agencies concerned recommended setting up a treatment plant for the Ingham water supply.

## THE DRAWBACKS OF COMPROMISE: PARTIAL AND SHORT-TERM SOLUTIONS

The Shire Council astutely realised that accepting a treatment plant for Ingham could give a green light for uncontrolled pollution, and could have even worse consequences if the sludge sealed the river off from the water supply's intake well by saturating the sand banks which normally filtered the water clean. Also, a treatment plant would not help graziers whose cattle were deteriorating on the river pastures – their best land. Salt-assisted settlement of the clay was noticed in the tidal reaches of the Herbert and there were concerns that increased silting would aggravate the district's already formidable flooding problems. Aquifers in the flood plain of the Herbert seemed to be drying up, particularly in wells close to the river, leading the Shire engineer to speculate that the clay was sealing the aquifers off from the river. The Council also argued against the loss of the river for future domestic, agricultural, commercial and industrial demands. For example, the potential for large-scale irrigation by river water would be lost, as sludge would build up over the irrigated soil and make it unusable.<sup>52</sup> At that stage no-one considered the smothering effects of the clay on riverine and marine organisms, though fish kills had occurred when the pollution first

began and fishermen did notice an appreciable decline in fish numbers by 1948.<sup>53</sup> The Shire Council held out for stricter controls, relying on political pressure to achieve what it wanted: a complete cessation of dredging. However the Queensland government had other priorities as listed above and the mining companies were able to use the option of water treatment plants to head off criticism and prevent unfavourable publicity by the media outside the district. All they had to do was show their willingness to fund treatment plants; it was hardly their fault if the Shire refused them. Short-term solutions of this type have been offered by other polluters. The most notorious was the California debris case, where soil washed down from alluvial gold mining in the mountains was covering farmland downstream to the treetops and causing massive flooding problems. The miners offered to build or raise levée banks for the major towns downstream, a solution that would have aggravated flooding in the long term.

#### THE ENVIRONMENTAL MOVEMENT, NEW LEGISLATION, AND MORE COMPROMISE

The new environmental movement of the 1960s and 1970s galvanised public support for environmental protection nation-wide and governments, initially reluctant, were forced to respond. Like other States reacting to conservationist pressure, overseas developments and the landmark 1970 Senate Select Committee report on Water Pollution, Queensland produced a Clean Waters Act in 1971. The new Act held out some hopes to Ingham and the other water users along the river. It provided a Water Quality Council with local government representation and set standards for licensed discharges into watercourses. However, uncertainty about those standards and their enforcement, small fines, no penalty for 'accidental' pollution, exemptions, industry and government representatives dominating the membership of the regulatory body, and the lack of will to prosecute under the notoriously conservative and pro-development Bjelke-Petersen Government all made the Act toothless.<sup>54</sup> The dredge companies were granted licences for discharging their sludges into waterways under this Act; this meant that pollution in the Herbert River was now being monitored by two government agencies under two Acts, but little changed. The new Act attracted severe criticism from conservationists and was seen as lagging behind environmental protection controls in other Australian states and overseas.<sup>55</sup>

#### THE RATIONALE FOR COMPROMISE

The people of the lower Herbert were handicapped by more than State government concern for a major mining enterprise creating wealth and jobs in an economically depressed and 'empty' corner of the State. There was no clear

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threat to health, and as noted earlier, only the prospect of a more valuable use of the land, such as agriculture, being injured by pollution might otherwise induce an Australian government to impose severe restrictions on mining or industry.<sup>56</sup> There seemed to be no immediate threat to the Hinchinbrook Shire's sugar industry from the sludge. In Australia, economics at that stage ignored amenity value such as recreational use of the river, and tourism was a very minor industry on the Herbert. The Queensland government's stance was not as extreme as that expressed by the company, to the effect that rivers could not be kept indefinitely for water supplies. However, it is clear that the State held a view common to most governments at the time: that streams were there to be used, and that waste disposal was a legitimate use. Therefore, any controls over the pollution had to be economically feasible for the polluter. This meant that the polluter had considerable influence over the choice of control, so that decisions were based on compromise rather than effectiveness.

## COMPROMISE BY USING METHODS USEFUL TO THE POLLUTER

One type of compromise was to choose a control method that was also useful to the polluter, an aspect of responses to pollution which has not been sufficiently emphasised in the literature on this subject. There are occasional examples in the nineteenth and early twentieth centuries. One of the most notorious was the California mining debris case noted earlier. In the end, the agreed solution was debris dams in the mountains, which were acceptable to the miners because they could store water for hydraulic mining as well. In the long term these dams were not effective because they filled up or broke in floods, so the problem was merely mitigated and did not cease until mining did.<sup>57</sup> Gillis noted that timber mill waste was discharged into Canadian rivers for nearly 50 years and that decreasing pollution was due more to millers finding uses for the waste than to enforcement of anti-dumping laws.<sup>58</sup> The early case of mining pollution in Queensland between 1901 and the First World War referred to earlier in this paper saw a number of large gold ore crushing mills in Gympie, in the south-east of the state, discharging tonnes of waste sand ("tailings") into the Mary River. The sand choked the river, worsening floods, which also deposited the tailings up to a metre deep over valuable river flats used for dairying and cropping. The State refused to prosecute, using persuasion instead. Eventually some of the mills agreed to stack their tailings on their leases, but only because the new cyanide process was making re-treatment of tailings profitable.<sup>59</sup> Similarly, settlement dams or bunds were an acceptable compromise for the Herbert River dredges. These machines needed a lot of water. They are basically boats, floating in a stream or artificial pond. A chain of buckets on a long ladder excavates the soil beneath the water in front of the dredge, with the spoil or tailings dumped behind it, so that the dredge – and its pond – works its way along the alluvial deposits

being mined. The excavated soil is put through a series of water-based treatments to recover the valuable mineral. In an area which receives good rainfall for only a few months of the year, storing, settling and reusing waste water was useful. There were drawbacks. Because the clay was so difficult to settle, the water in the bunds could become so thick that it interfered with effective tin recovery.<sup>60</sup> However, this was a temporary problem, until rain fell and either diluted the water or swept the problem away – occasionally with human assistance. Incidents of deliberate release of sludge occurred regularly, sometimes with the permission of the Mines Department.<sup>61</sup> In the later period of their operations, though, the dredging companies did become more conscientious, experimenting further with dispersal on land and chemical settlement. Had the industry survived the drop in tin prices, chemically aided settlement would probably have been the next step in mitigating the pollution, particularly as pollution controls strengthened after the advent of more environmentally-conscious governments in Queensland in the 1980s and 1990s.

## CONCLUSION

Residents on the lower Herbert River put up with 40 years of opaque brown tap-water because the State government held control over Queensland's waterways, but was reluctant to use its powers against economically significant industry. Once it was determined that the dredge effluent was not obviously harmful to health, until the late 1980s there was little chance that dredging would be stopped. Regardless of the political party in power, the Queensland government was pro-development and anxious to reverse a decline in the mining industry, once an economic mainstay of the State and an industry which had long been able to attract population to the vulnerable north. Thus its first legislation specifically written to control water pollution allowed for compromises, which were used by the dredging companies to minimise the expense and maximise the usefulness to industry of the conditions set by the Minister for Mines. In this Queensland was little different to other past governments which hesitated to be overly prescriptive with economically or politically powerful industries. It was characteristic particularly of Australian governments before 1970. They lagged behind the rest of the world, seeing rivers as economic resources to be used unless such use clearly endangered human health and safety, or threatened more valuable industries. Queensland however persisted with this attitude even after mirroring the spate of anti-pollution legislation in the rest of the country, subverting its own Clean Waters Act of 1971 by refusing to prosecute polluters until the tin dredges were already falling silent.

## NOTES

<sup>1</sup> *Herbert River Express* (hereafter *HRE*) 9 Nov. 1944.

<sup>2</sup> *HRE*, 26 Aug. 1944.

<sup>3</sup> H.G. Strom, Report to the Government of Queensland on the Mitigation of the Pollution of the Herbert River, North Queensland (hereafter Strom Report), 1948, 6 (Hinchinbrook Shire Council (hereafter HSC) Collection); *Queensland Parliamentary Debates* (hereafter *QPD*) Vol. CXCII 1st session 1947–1948, second reading of the Mines Acts Amendment Bill, 2295; *HRE*, 18 Nov. 1944, 3 Feb. 1945, 19 Feb. 1946. The cattle deaths might be explained by a finding from a dead pig which had been drinking from the river, and whose intestines were reported as ‘full of slime’. *QPD* Vol CXCII 1st session 1947–1948: 2295.

<sup>4</sup> S.R. Dovers and D.G. Day, ‘Australian Rivers and Statute Law’, *Environmental and Planning Law Journal* 5, 2 (1988): 100; J.M Powell, *Plains of Promise, Rivers of Destiny: Water Management and the Development of Queensland, 1824–1990* (Brisbane: Boolarong Press, 1991), 31–2.

<sup>5</sup> David Grinlinton, ‘The “Environmental Era” and the emergence of “Environmental Law” in Australia – a survey of environmental legislation and litigation 1967–1987’, *Environmental and Planning Law Journal* 7, 2 (1990): 77; Nicholas Brunton, ‘Water Pollution Law in New South Wales and Victoria: current status and future trends’, *Environmental Planning and Law Journal* 11, 1 (1994): 39.

<sup>6</sup> M.E.W. Girgis, ‘Industry and Environment: dredging up the past’, (Hons. diss. in History, University of Melbourne, 1994); G. Ramsay, *Pollution in the Mary River: a History of an Unaddressed Wrong* (Gympie: Gympie Times, 1908).

<sup>7</sup> Don Whittington, *The Effluent Society: Pollution in Australia* (Melbourne: Nelson, 1970): 94.

<sup>8</sup> Derek Whitelock, *A Dirty Story: Pollution in Australia* (Melbourne: Sun Books, 1971): 81–3, 87, 90, 97, 100, 104; Brunton, ‘Water pollution law’, 39; Powell, *Plains of Promise*, 35, 38, 308–9.

<sup>9</sup> Fran Baum, *The New Public Health: an Australian Perspective* (Melbourne: OUP, 1998): 243, 252–5.

<sup>10</sup> Richard Grant and Elim Papadikis, ‘Transforming environmental governance in a “laggard” state’, *Environmental and Planning Law Journal* 21, 2 (2004): 147.

<sup>11</sup> Whitelock, *A Dirty Story*, 83; Powell, *Plains of Promise*, 313, 363.

<sup>12</sup> Whittington, *Effluent Society*, 3, 8, 124; Powell, *Plains of Promise*, 166–7, 259, 282; Whitelock, *A Dirty Story*, 81–82, 90.

<sup>13</sup> Whitelock, *A Dirty Story*, 97; Whittington, *Effluent Society*, 103, 110, 114, 129.

<sup>14</sup> Derek Whitelock, *Conquest to Conservation: History of Human Impact on the South Australian Environment* (Netley, South Australia: Wakefield Press, 1985): 109; Whittington, *Effluent Society*, 61, 136, 144.

<sup>15</sup> D.W. Connell, *Water Pollution: Causes and Effects: Australia and New Zealand* (Brisbane: University of Queensland Press, 1993): 169; Whitelock, *A Dirty Story*, 114; Whittington, *Effluent Society*, 125–9.

<sup>16</sup> Whittington, *Effluent Society*, 126, 128.



<sup>17</sup> Don Garden, *Australia, New Zealand and the Pacific: an Environmental History* (California: ABC-Clio, 2005): 122–4.

<sup>18</sup> Baum, *New Public Health*, 243.

<sup>19</sup> Whittington, *Effluent Society*, 2, 8, 103, 129; Whitelock, *A Dirty Story*, 114; Brunton, ‘Water Pollution Law’, 57.

<sup>20</sup> Grant and Papadakis, ‘Transforming environmental governance’, 146–7; Garden, *Australia, New Zealand and the Pacific*, 122–4; David Turton, ‘Licensed to Spill: a legal history of Queensland’s Clean Waters Act 1971’ (B.A. Hons. diss. in History, James Cook University, 2007); Powell, *Plains of Promise*, 84, 172–5, 180–1, 291–2, 308–9.

<sup>21</sup> Dovers and Day, ‘Australian Rivers’, 106.

<sup>22</sup> R.S. Kerr, ‘The Advent of Tin Dredging in Eastern Australia’, *Australian Historical Archaeology* 7 (1989): 70–71; *Annual Reports of the Department of Mines* (hereafter *AR Mines*) 1928–1940.

<sup>23</sup> *AR Mines*, 1937–1942. This dredge ceased work after capsizing in 1942.

<sup>24</sup> *AR Mines*, 1928–1966; State Mining Engineer to Inspector of Mines Herberton, 16 Nov. 1949, A/8415 Queensland State Archives (hereafter QSA).

<sup>25</sup> Shire Clerk, Pollution of Herbert River by Mining Sludge, 18 May 1971, unpublished report (HSC Collection).

<sup>26</sup> See for example T.J. Hearn and R.P. Hargreaves, *The Speculator’s Dream: Gold Dredging in Southern New Zealand* (Allied Press, 1985): 67.

<sup>27</sup> *QPD* Vol. CXCII 1st session 1947–48: 2294.

<sup>28</sup> Report by Committee Investigating Herbert River Pollution, Oct. 1948; Deputy Co-ordinator General to Chief Secretary, 28 Oct. 1949; Inspector of Mines, Herberton to State Mining Engineer, 2 Dec. 1949, A/8415 QSA.

<sup>29</sup> Strom Report; Jack Mulholland, Report to the Government of Queensland on the Herbert River Pollution (hereafter Mulholland Report), Feb. 1950, A/8415 QSA.

<sup>30</sup> State Mining Engineer to Under-secretary for Mines, 3 Aug. 1950, A/8416 QSA.

<sup>31</sup> H.E. Clayton to State Mining Engineer, 7 Nov. 1949 and to Co-ordinator of Public Works, 14 Nov. 1949; Inspector of Mines, Herberton to State Mining Engineer, 2 Dec. 1949, A/8415 QSA; interviews with E. Boggiano, Regional Engineer, Water Quality Control Council, 20 Oct. 1982 and Dr. Chris Cuff, Department of Geology, James Cook University, 8 Aug. 1980. ‘Flocculation’ means that the particles clump together.

<sup>32</sup> Strom Report, 27; Shire Clerk, Pollution of Herbert River by Mining Sludge, 18 May 1971 (HSC Collection).

<sup>33</sup> R.G. Supple, ‘Cock’s Eldorado Dredge’, in *Australasian Conference on Engineering Heritage 1994* (Institute of Engineers, 1994): 156; Barry McGowan, ‘Mullock Heaps and Tailing Mounds: the environmental effects of alluvial mining’, in *Proceedings of the Australian Mining History Association Conferences 1997–2000*, ed. Patrick Bertola and Karen Miller (Perth: AMHA, 2001): 94; Girgis, ‘Industry and Environment’, 23, 29, 34.

<sup>34</sup> An Act to Amend “The Mining Acts, 1898 to 1940”, in certain particulars (Mining Acts Amendment Act of 1948) s. 8.

<sup>35</sup> Mining Acts Amendment Act of 1948. s. 183E, s. 183B (5).

## SLUDGE ON TAP

- <sup>36</sup> Hearn and Hargreaves, *The Speculator's Dream*, 63. Tasmania's mining law also permitted this, as did similar 1923 legislation in Pennsylvania to allow pollution in 'low quality' waters. Whittington, *Effluent Society*, 129; N.S. Shifran, 'Pollution management in the Twentieth Century', *Journal of Environmental Engineering* 131, 5 (2005): 677.
- <sup>37</sup> *A.R.Mines* 1944; *QPD* Vol. CXCII 1947–1948 1st session, 2202, 2290.
- <sup>38</sup> Report of the Bureau of Industry, *Queensland Parliamentary Papers* 1945–46, 844.
- <sup>39</sup> Strom Report, 9–10, 28, 29, Appendix B 6–7; Addition to Regulations under the Mining Acts, 1898–1948, 24 Nov. 1949; T. Peak, Water Supply Engineer to Mining Engineer in Charge, 21 Oct. 1949; Endorsement to mining lease, undated: A/8415 QSA. Rehabilitation of tailings was the main purpose of most early environmental legislation concerning dredging in Victoria and New South Wales, mainly in the hope of recovering good agricultural land.
- <sup>40</sup> Under-secretary for Mines to Solicitor-General, 23 Feb. 1950; Co-ordinator-General to Chief Secretary, 28 Oct. 1949; T. Peak, Water Supply Engineer to Mining Engineer in Charge, 21 Oct. 1949, A/8415 QSA. Ironically, sugar mill waste – often a river pollutant – might have been a very effective flocculant to aid settlement. Interview with Chris Cuffe, 8 Aug. 1980.
- <sup>41</sup> Inspector of Mines, Herberton to State Mining Engineer, 6 Jan. 1950, A/8415 and 1 Aug. 1950, A/8416 QSA.
- <sup>42</sup> Solicitor-general to Under-secretary for Mines, 27 Feb. 1950, A/8415 QSA; Mining Act Amendment Act of 1951, s. 183B; *A.R.Mines*, 1952.
- <sup>43</sup> See for example J. Leggate, 'Water pollution control at Ranger', in *Proceedings of the North Australian Mine Rehabilitation Workshop No. 9*, ed. J.W. Laurie (Weipa: Comalco, 1985): 250.
- <sup>44</sup> Health Act of 1937, s. 21, 78, 87. Its rather circular definition of 'nuisance' included 'any ... watercourse ... in such a state as to be a nuisance or injurious or prejudicial to health'. See s.77.
- <sup>45</sup> For its impact on health legislation in Queensland see Jan Wegner, 'Nightcarts and Nuisances: local government and health in north Queensland, 1879–1945' in *Health and Healing in Tropical Australia and Papua New Guinea*, ed. Roy MacLeod and Donald Denoon (Townsville: James Cook University, 1991).
- <sup>46</sup> Michael Drew, 'Queensland Mining Statutes 1859–1930' in *Readings in North Queensland Mining History* Vol. II, ed. K.H. Kennedy (Townsville: History Department, James Cook University, 1982): 21; HSC Minutes, 14 Dec. 1944, Finance Committee Minutes 9 Feb. 1945, Health Committee Minutes 7 Feb. 1945; Opinion ex parte The Council of the Shire of Hinchinbrook, W.G. Mack, 3 April 1945, HSC Collection.
- <sup>47</sup> Health Acts Amendment Act of 1948 s. 3(a).
- <sup>48</sup> Mining Acts Amendment Act of 1948 s.183B(2).
- <sup>49</sup> Mining Acts Amendment Act of 1948 s.183B (9).
- <sup>50</sup> *HRE*, 28 July 1945, 19 Feb. 1946; HSC Minutes 19 April 1945, Health Committee 13 April 1945. A report in 1966 found samples of river and tap water with 75–327 Jackson Turbidity Units. The U.S. standard for drinking water at the time was 5, and the WHO maximum was 50. Report by M.A. Simmonds, consulting analyst to the HSC, 8 March 1966, in Submission by the HSC to the Senate Select Committee on Water Pollution, Townsville 23 July 1969, Appendix C.

<sup>51</sup> Interview with E. Boggiano, 20 Oct. 1982.

<sup>52</sup> *HRE* 3 July 1945, 25 Aug. 1945, 2 Oct. 1945, 17 Jan. 1946; HSC Minutes, 26 June 1945; Mulholland Report, 4; Strom Report, 406.

<sup>53</sup> Strom Report, 6; *QPD* Vol. CXCII 1st session 1947–1948: 2293.

<sup>54</sup> W.E. Westman, 'The Queensland Clean Waters Act, 1971: a critical review', *Operculum* 2, 2 (1972): 32–6; G.G. Miller, J.D. Davie, E.J. Heurle, 'An assessment of Queensland's progress towards cleaner waters', *Operculum* 5, 1 (1976): 5, 11–14; David Turton, 'Licensed to Spill'.

<sup>55</sup> See for example Mark Plunkett and Peter Sheehy, 'The Water Report' in Public Interest Research Group, *Legalised Pollution: the State of Queensland* (Brisbane: University of Queensland Press, 1973): 54, 56, 72–79.

<sup>56</sup> In the Victorian case, though the dredge product was more valuable in the short term, legislators recognised that good agricultural land would be valuable forever. Supple, 'Cock's Eldorado Dredge', 156.

<sup>57</sup> R.L. Kelly, *Gold Versus Green: the Hydraulic Mining Controversy in California's Sacramento Valley: a Chapter in the Decline of Laissez-Faire* (Glendale, California: Arthur H. Clark Co., 1959): 56–74, 132, 136, 215, 231.

<sup>58</sup> R.P. Gillis, 'Rivers of Sawdust: the battle over industrial pollution in Canada', *Journal of Canadian Studies* 21, 1 (Spring 1986): 85, 87–99.

<sup>59</sup> Ramsay, *Pollution in the Mary River*.

<sup>60</sup> Report of the Inspector of Mines, *AR Mines* 1951.

<sup>61</sup> J.V. Way, Shire Engineer, Pollution of Herbert River by Mining Sludge, unpublished report, 29 Jan. 1974; Submissions by the Hinchinbrook Shire Council to the Senate Select Committee on Water Pollution, July 1969, HSC Collection.