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"Any country worthy of a future should be interested in its past." W. Kaye Lamb, 1937

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The Buntzen Lake Project 1901-06

Hydro-Electric Power For B.C.'s Lower Mainland

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In British Columbia's early 1900s, the use of water generated almost as many kilowatts of politics as it did of electrical energy. But although the politicking and wheeler-dealing surrounding the advent of the Coquitlam/Trout Lake power development has been written about several times in the past, this article proposes to describe, for the first time, the activities of the men who actually built the project—Johannes Buntzen and engineers Meredith, Hermon & Burwell.

Coquitlam Lake lay in the Railway Belt, an area set aside for administration by the federal government. It is some six miles north of Port Moody, where it drains a mountain watershed of approximately 100 square miles. In 1903 the average annual precipitation was thought to be 150 inches—a close approximation (today the figure given is 145 inches). What was known for sure was that it was wet, as all workers on the power project would soon be able to confirm.

Trout Lake sat in a pocket in the mountains above the Indian Arm, west and a little south of Coquitlam Lake, but with a 4000-foot-high range of mountains between the two lakes. In the very early days of Vancouver it had been named Lake Beautiful by a group of hikers who, by taking one initial from each of the girls' names in the party, formed the word BEAUTIFUL. It was then, and is now, a very beautiful lake—although in the years from 1902 until 1912, when construction was rampant, I doubt if it would have qualified for the name.

The Coquitlam Waterworks Company, incorporated in 1886, the unsuccessful candidate for the City of Vancouver's water supply, continued supplying the City of New Westminster until 1889 when the City took over the company's interests, and contracted to manage the waterworks. Thenceforth it would be known as the New Westminster Waterworks Company. It consisted of a low weir and intake at the south end of Coquitlam Lake—"500 feet downstream from the first riffle in the river, where it gets over the rim of the lake." There was a second intake lower down to draw water when the stream was low, and from the inlets a fourteen inch pipe ran south for twelve miles. The consulting engineer for the New Westminster Waterworks Company was Mr. A. McL. Hawkes, C.E., of Tacoma, Washington, an experienced and reliable man, who so described the workings in December 1901.

There was, of course, logging in the Coquitlam valley. Timber Berth "O" was granted in 1897, most of it in the vicinity of Trout Lake, and held by the British Columbia Mills, Timber and Trading Company

(successors to the Hastings Mill). Their surveyor was E. B. Hermon, of the Vancouver firm of Hermon & Burwell. It was without doubt this firm's first introduction to the area, and they were not tardy in realizing its potential.

In 1897, when the British Columbia Electric Railway Company (BCER) rose phoenix-like from the ashes of three earlier tramway companies, its policy had been for the Board of Directors in Britain (of whom R. M. Horne-Payne was the leading light) to control operations through a local manager in Vancouver. The first managing director, Frank Stillman Barnard, incorporated the Vancouver Power Company as a subsidiary, which had in its terms of reference the potential to generate hydroelectric power. This move had not been sanctioned by London, and Barnard resigned as managing director soon afterwards, although he remained a Board member.

His replacement, Johannes Buntzen, was a very dynamic and level-headed man. A Dane, he emigrated to British Columbia in the 1890s, originally working for Ross & Ceperley as head bookkeeper. As general manager of the BCER, Buntzen was both forward-looking and forthright, and quite prepared to push the Board into major decisions. He soon made his point—that the company must keep up with the demand for power, or be content to face competition.

Competition there was. The Stave Lake Power Company would be incorporated in 1901, for the purpose of selling power to the cities of Vancouver and New Westminster. That company's directors included several influential persons, among them Sir Charles Tupper, K.C. Without adequate financing, however, they never got past the starting gate, although for the next ten years they would waste no opportunity to harass their rival, the BCER.

As consultants for the Vancouver Power Company, Hermon & Burwell were investigating the Lake Coquitlam area in 1898. One field book, badly water damaged, shows their first measurement of river flow below the New Westminster Waterworks pipe intake: 26,000 miner's inches, taken February 3, 1898. Hermon went on to measure the flow monthly during that year, and in July ran a line of levels down the river from Coquitlam Lake, setting twenty-six bench marks.

In these days of "high tech" and electronic distance measurement, it is perhaps hard to visualize the lot of the surveyor of 1901. While today we still have mountain and bush—and that coastal rain—to contend with, there is seldom any difficulty finding a bench mark (BM), even in a remote place. But at that

The author wishes to thank the firm of Hermon, Bunbury and Oke for use of their old field records, and Mr. George Brendack of Special Collections, UBC Library for access to the BCER's old files.



*Vancouver Power
Company's Power House
and Outflow c. 1905
BC Archives 24640*

time, differences in elevation had to be found from scratch, and any BMs set were carefully preserved for the surveyor's own reference.

To obtain the difference in elevation between Trout Lake and Coquitlam Lake was no mean feat at that time. Hermon & Burwell started their network at the Barnet wharf, where they set up a tide gauge and connected their elevations to a Canadian Pacific Railway (CPR) datum point near the Coquitlam railway bridge. Coquitlam Lake's height above sea level was then obtained by another seven miles of differential levels from the bridge up to the lake outlet. This line of levels was rerun in both directions to absolute precision in March 1902, before the final decision was made to construct.

The elevation of Trout Lake was somewhat easier to arrive at, by measuring up from tidewater. Burwell set up a tide gauge down in the Indian Arm, with a BM and water gauge in Trout Lake, and by correlating the tide gauges with the CPR datum and their own many miles of levels, the partners determined the relative difference in height between the

two lakes. So the project was born.

This was, briefly, to put a low dam at the Coquitlam Lake outlet (increasing the head and improving the intake for the New Westminster Waterworks Company); tunnel through the mountain, diverting Coquitlam Lake water into Trout Lake (which would also be dammed as a balancing reservoir); and run pipelines down to a powerhouse on the Indian Arm. The power would go via pole line to New Westminster and Vancouver, a well-devised scheme.

It goes without saying that the rights of the New Westminster Waterworks Company would have to be safeguarded, so Buntzen went to work on New Westminster city council, pointing out the blessings that would accrue from the Vancouver Power Company's aspirations. In mid-October 1901, A. McL. Hawkes made his report to the City, coming out in favour of the enterprise, and saying in part, "In my judgement . . . the construction of a dam would be a benefit to the City's water supply; and if the work could be carried out without any expense to the City, I would recommend it."

A Few Technical Terms

Water Recorder. In the early days of B.C.'s development, most resources could be applied for by "staking" - the posting of a notice on the ground, usually followed by publication of a similar notice (of "intention to apply") in a newspaper and the *BCGazette*, and then the official application to government. The Water Recorder was the Provincial Government bureaucrat who dealt with water licences claimed in this way.

Miner's Inch is 1.68 c. ft of water flow per minute.

Railway Belt. This was a strip of land extending 20 miles from, and on both sides of the centre-line of the CPR. It stretched from the BC/Alberta border as far as Port Moody, which until 1884 had been considered as the western terminus of the railway. At the time of Confederation, politicians of the day had agreed to convey this corridor (containing some of the most valuable land in the Province) to the Dominion Government. It was returned to B.C. in 1930.

The Water Clauses Consolidation Act was a massive Provincial statute, with a special section applicable to industrial power. Its authority in Railway Belt lands was challenged in 1906 by the Dominion Government, and the matter of which government had the right to adjudicate water resources was not resolved by the courts until 1913.

In the report he made certain stipulations: that the dam should be five feet high (ten feet was eventually agreed to); the intake should be extended beyond the dam; and that the lowest level of the diversion tunnel be six inches higher than the intake pipe; all of which Vancouver Power Company were quite willing to implement, and at their own expense.

Enough engineering data was now available for Buntzen to start action. He also had the backing of his Board in London, so after getting tentative agreement from New Westminster city council on 18 October 1901, he was ready for the next—very important—step. This was to obtain an official water record. Applications were made by the Vancouver Power Company under the *British Columbia Water Clauses Consolidation Act* on 23 August and 23 September 1901, for 5000 miner's inches of water from Lake Coquitlam, and 500 inches from Trout Lake. The repercussions were considerable.

By 4 December 1901 the spoils—5000 miner's inches of water from Coquitlam Lake, and all the water in Trout Lake, was issued to the Vancouver Power Company by the Lieutenant Governor in Council (i.e., the cabinet). This was, of course, only half of the war—the provincial half. The other half would be waged with the Dominion government, who had hardly started to flex their muscles yet. This would drag on much longer, although it did not retard the actual delivery of electric power.

Buntzen would continue to report regularly to Horne-Payne in England regarding events, and big decisions would always be made by the Board. Although the engineering reports were thus far favourable, there was a lot of money at stake. Two more eminent engineers visited the site in early 1902 and made their reports: Wynn Meredith, of the firm of Hunt & Meredith, and Robert F. Dobie were both from San Francisco. The report of a third engineer, Hugh L. Cooper of New York, was made as late as July 1902, and served merely as corroboration, as by that time construction was under way.

Part of Buntzen's letter to Horne-Payne of 14 March 1902 is quoted,

Before any of the engineers would give their final definite opinion, they insisted on having the respective elevations of Coquitlam Lake and Trout Lake determined with absolute accuracy . . . yesterday morning, at last Mr. Hermon succeeded after two weeks of great hardship, in finally determining the elevation, and I am glad to say, found it better than we had expected, the difference in altitude being that Coquitlam Lake is 32 feet higher than Trout Lake, making a splendid grade for a tunnel.

During the fall of 1901, Hermon & Burwell carried on with the mass of preliminary work required. Complete layout plans (showing lands required, tunnel, dam sites, and powerhouse site) were made. As early as September 1901, the firm had made application on behalf of the Vancouver Power Company to the Dominion Land Agent for the Crown land required.

All the applications for rights-of-way and other parcels of land were eventually approved except one. This was the parcel at the end of Coquitlam Lake that covered the proposed dam and new intake for the New Westminster Waterworks Company. The application for this parcel bore the words "if not already disposed of." Controversy over this parcel, which the Vancouver Power Company was determined to control, will only be mentioned here briefly. It dragged on for several years. On 10 December 1901, Buntzen writes of taking all necessary data, surveys, plans, and measurements furnished by Hermon & Burwell to Toronto, to prove to the prospective debenture holders the feasibility of the scheme.

The next step was the selection by the London Board of a Chief Engineer. There were four applicants, among them Wynn Meredith and A. McL. Hawks. The job was offered to Wynn Meredith in a long letter from Buntzen, 30 April 1902. It said in part, "As you are no doubt aware, the power scheme originated with Messrs Hermon & Burwell of this city, and so far all the preliminary work has been done by this firm, and we feel in duty bound to give them a substantial share of the engineering in connection with the development of the scheme."

The firm of Hunt & Meredith, of whom Wynn Meredith was chief engineer, were mechanical engineers specializing in hydroelectric design; and besides having had sole control of the Los Angeles system some years before, had handled the BCER's first project, the plant at Goldstream on Vancouver Island. The BCER itself—in particular R. H. Sperling—would obviously provide the expertise in electrical matters. E. B. Hermon and H. M. Burwell were both civil engineers of considerable experience, and E. B. Hermon was a graduate in mining engineering.

In May of 1902, Wynn Meredith arrived in Vancouver, setting up his office alongside that of Hermon & Burwell in the Inns of Court building. There can be little doubt that their overall ideas were in agreement, the proof being that Meredith's estimate of eighteen months to production of the first power was entirely accurate.



Field surveying up to this point had been preliminary in nature; now the detailed surveys necessary for engineering design (required immediately), and also for construction control would start. First and foremost was alignment of the tunnel, for which both east and west portals had already been selected.

The partners cooperated on this tough assignment. Portals at the Trout Lake and Coquitlam Lake ends of the proposed tunnel were tied to triangulation over nearby Tunnel Mountain (so named in the notes), after which the true line from portal to portal was cut out over the top of the mountain and precisely aligned. Maintaining alignment was no problem; on the west shore of Trout Lake, and on the east shore of Coquitlam Lake were alignment flags (the latter being on what is today called Coquitlam Island—an island that came into being by subsequent

raising of the lake to present-day levels). The field notes show that this work took six days. The partners must have had two things going for them—good weather and big crews, because even with modern instruments it would be hard to do it in less time.

Engineering parlance underground has its own language. For instance, the roof of the tunnel is known as “the back,” and in it survey marks known as “spads” are set for controlling alignment and grade; they usually stay there unmoved, apart from the one nearest the face which might get hit by a flying rock. When tunneling, the sequence of events is simple—the miners drill and blast, followed by the muckers who clear up the mess, ready for the miners again. In between shifts, the engineer has to get in to set alignment and grade; he usually does it after the muckers have finished, although miners working on contract

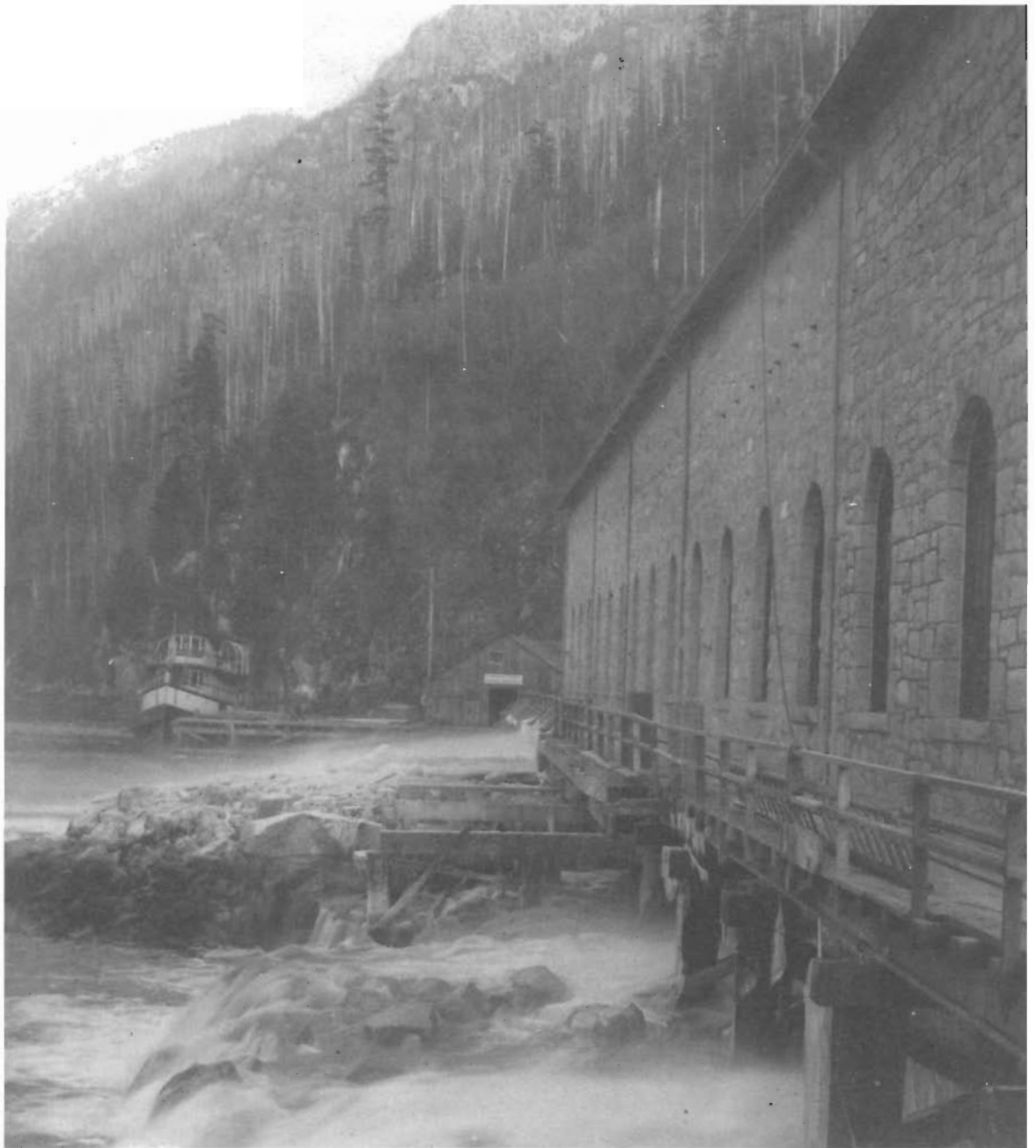
Vancouver Power Company's tunnel c. 1905. Standing on the left, H.M. Burwell. Holding the lantern, D.K. Campbell, contractor. CVA OUT.P.440,N155

Water and Politics

While the surveyors were doggedly working in the pouring rain, Johannes Buntzen was trying to steer the water applications through the political maze in Victoria. He was a man well aware of the powers of political persuasion, as indeed were all the directors of the BCER. No sooner had the water records been staked, than the Honourable. W.C. Wells, Chief Commissioner of Lands & Works received Buntzen's detailed letter. It was an excellent letter, and attended to the only two really relevant points - first that the City of New Westminster (the only prior interest) had agreed to the power company's proposals, and secondly that the money was all there and ready to be used (subject to the granting of the 5000 and 500 miner's inches of water to Vancouver Power Co as the sole licensee).

By this time, the Stave Lake Power Co had become aware of such happening, and also made application for a water record on the lake (of 10,000 miner's inches); and if there was any question of the Provincial Water-Recorder using his own discretion in adjudicating the matter, it was promptly overruled by his superiors in the Lands & Works Ministry. In fact, by October 23rd, the Water Recorder noted that three other Municipalities had also joined New Westminster in applying for water rights - Delta, Richmond and Coquitlam. He also reported that "opposition was developing".

Opposition was a fairly mild word to describe the bickering that took place at the subsequent inquiry in which both E. B. Hermon and A. McIlwain gave their expert opinions; but at least all parties had a chance to sound off. It seemed that if the object of the Stave Lake Company was simply to delay proceedings, it was succeeding. Buntzen then sent another letter,



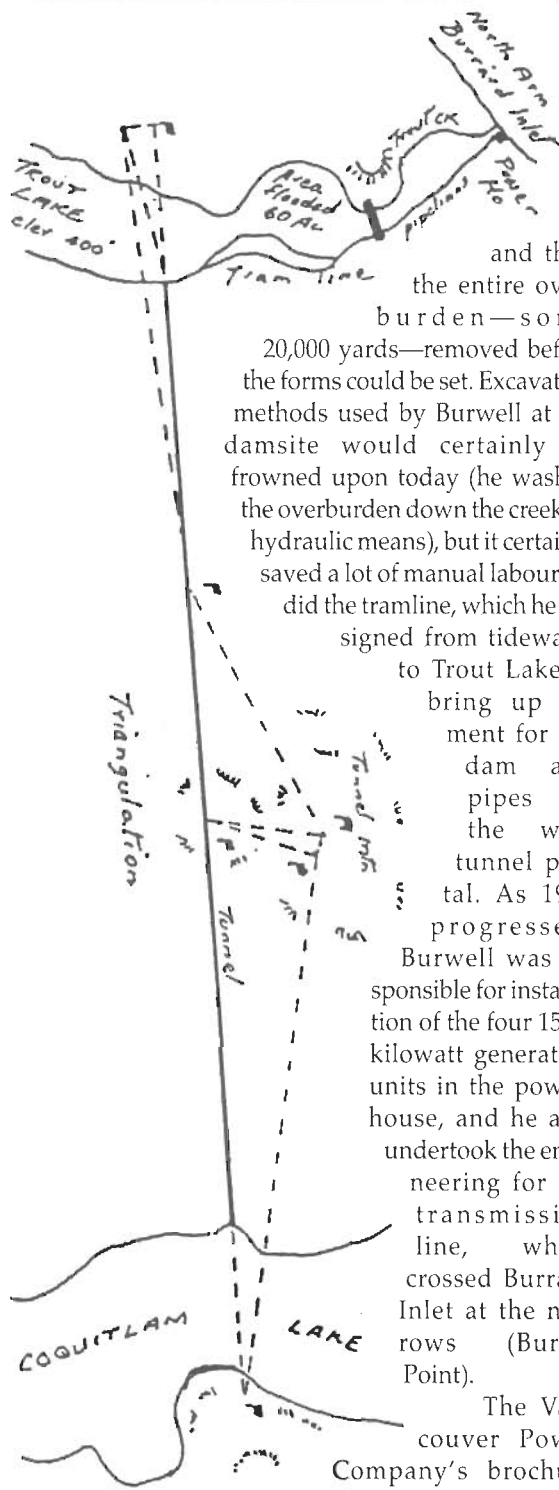
often resent the time taken, and are not averse to throwing rocks at him to hurry up the process.

The tunnel was designed with a slight change of grade at the halfway point to facilitate drainage, which is always a problem underground. The Coquitlam tunnel was really no different from other tunnels but, let us not forget, there were no modern conveniences such as mucking machines, just a lot of men with shovels filling up the handcars to push back out to the portal, and all workers used carbide lamps—a temperamental device that often went out at the crucial moment. Special underground words were sure to be used on those occasions.

So much for that first tunnel from lake to lake. It was started in January 1903, driven from both ends.

The contract was given to Ironside, Rannie & Campbell, who employed over 175 men, and sometimes as many as 300, probably housed at J. J. Nickson's camp. They worked in eight-hour shifts—days, nights, and holidays. In April 1905, the two ends of the tunnel met in traditional fashion, with a closing error of seven eighths of an inch in alignment, and 1 3/4 inch in grade.

The partners had divided their responsibilities on the rest of the project, with E. B. Hermon looking after the Coquitlam Lake end—dam, clearing contracts, and tunnel, while H. M. Burwell undertook work for the powerhouse, pipelines (penstocks), and Trout Lake Dam. This dam was an engineering project in its own right, as drilling had to be done to bedrock



and then the entire overburden—some 20,000 yards—removed before the forms could be set. Excavation methods used by Burwell at the damsite would certainly be frowned upon today (he washed the overburden down the creek by hydraulic means), but it certainly saved a lot of manual labour. So did the tramline, which he designed from tidewater to Trout Lake to bring up cement for the dam and pipes for the west tunnel portal. As 1903 progressed, Burwell was responsible for installation of the four 1500-kilowatt generating units in the powerhouse, and he also undertook the engineering for the transmission line, which crossed Burrard Inlet at the narrows (Burn's Point).

The Vancouver Power Company's brochure gives credit to three men in particular for this undertaking: Mr. J. Buntzen, general manager of the BCER, Mr. R. H. Sperling, advising electrical engineer, and Mr. R. M. Horne-Payne, the chairman of the BCER. In the last paragraph it names the engineers: Mr. Wynn Meredith of San Francisco, chief

engineer for the Company, and Messrs Hermon & Burwell of Vancouver, engineers in charge of construction.

Power from the project was being received in Vancouver by December 1903 (before completion of the tunnel), and in December 1904 the BCER's old steam plant on Union Street in Vancouver was closed except for emergencies. It was without doubt a most successful and efficient undertaking.

It is interesting to quote some of the April 1905 statistics. The Coquitlam Lake dam was eleven feet high. The tunnel was nine feet square, and 12,775 feet long. The Trout Lake dam was fifty-four feet high. But no engineering work remains static; it is always being improved upon. By the time the original specifications had been carried out, plans had already been made to enlarge the tunnel (it is now twice its original size) and raise the Coquitlam Lake dam. Today the lake level is at least seventy feet higher than in 1902.

Nearly all these improvements would be made after Johannes Buntzen had left British Columbia. He has been called the "grand-daddy of electricity in British Columbia," a label well earned. His services to the BCER were recognized in April 1905, when he became managing director of the company. By all accounts, he was a modest and fairly retiring man. On the other hand, there was no doubt as to his popularity in the city and throughout the whole company as well, to the extent that he was even made an honorary member of the International Brotherhood of Street Railway Employees. There would be no labour troubles while he was at the helm. During his time in Vancouver he was a strong supporter of the arts in music and literature, although this is less well known. He even had time to sit on a Royal Commission on Taxation in 1905, together with F. Carter-Cotton, R. G. Tatlow and D. R. Kerr—all political gentlemen. But then Buntzen himself was also a political animal, and without his flair for politics his hydroelectric venture might have had a rougher passage.

There are still fifteen other Trout Lakes in British Columbia, according to the *Gazetteer*. Johannes Buntzen could not have received better recognition for his services than to have this one named after him. From a small beginning, the Lake Buntzen hydroelectric development was not slow to grow; even by 1911 it was producing 15,000 kilowatts. It now boasts two power stations and an output of over twelve times its original output. And the lake is still as beautiful as it originally was.

Water and Politics continued

this time to the Provincial Secretary, 9 November 1901, protesting the Stave Lake Company's delaying tactics. Altogether, governmental deliberations dragged on from 19 September until 4 December of 1901.

In fact the cabinet had little alternative but to grant the Vancouver Power Company's application. The company had priority of staking (for what that was worth there was plenty of water, the money was in the bank, and the power was necessary for future of the Lower Mainland. A.E McPhillips K.C. (who, as a director of the Vancouver Power Company, was handling all their legal business) put the matter succinctly in another letter to the Provincial Secretary, on 27 November, 1901;

It is apparent that the time has come for the Lt. Governor in Council to act in the matter, to prevent retarding of actual construction of a large work, which will be of great public advantage. ■

Engineering Details from the Vancouver Power Company's brochure. (this page)

Vancouver Power company's Power House and Outflow c.1905 (opposite page)

BC Archives 31162

