



A.P. Kohut
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Date: January 19, 1981

File: 92G/1

Re: Fraser Valley Trout Hatchery
Summary of Groundwater Section's Involvement

At the request of J.C. Foweraker, the following is a historic summary of Groundwater Section's involvement with the well water supply at the Fraser Valley Trout Hatchery. The source of the following information was obtained from Groundwater file 92G/1. - F.V.T.H. correspondence.

- Sept. 12, 1966: - J.R. Simpson, Senior Civil and Structural Engineer, Dept. of Public Works requested E. Livingston, Chief of Groundwater Division, Water Investigations Branch for preliminary assessment of groundwater conditions at the proposed new fish hatchery at Abbotsford. In particular, he requested information as to groundwater potential, source, quality, pumping costs and cost estimates for a test drilling program.
- Sept. 22, 1966: Livingston's memo to Simpson:
- J.C. Foweraker (Senior Geological Engineer, Groundwater Division) is presently working in Lower mainland area and would make a preliminary reconnaissance of the area.
- Oct. 25, 1966: Livingston's memo to Simpson:
- A groundwater assessment as required would be expensive. However, based on existing data and a brief field examination of the area by J.C. Foweraker, it was recommended, as part of the next step in the investigation, to drill one or two test holes on the abandoned railway right of way nearby, at an estimated cost of 4,074.00, including testing.
- June 2, 1967: Simpson sent a letter to Pacific Water Wells Ltd., authorizing that firm to proceed with drilling a test hole at the hatchery.
- July 1967: Livingston (Groundwater Division) supervised drilling and testing of Test Well #1 by Pacific Water Wells Ltd.
- Sept. 26, 1967: J.C. Foweraker prepared a review of the groundwater investigations carried out by the Groundwater Division and others in connection with the F.V.T.H. Up to this time, only 1 test well drilled and tested, and spring discharge measurements taken by Water Supply Division.

- Sept. 29, 1967: J.C. Foweraker's memo to V. Raudsepp (Chief Engineer, Water Investigations Branch). Conclusions and Recommendations regarding water supply for the new F.V.T.H. include:
- Water supply requirement for min. of 10 cfs.
 - Total spring discharge adjacent to hatchery is 9.3 cfs.
 - Pumping test of test well #1 @ \approx 500 USgpm reduced spring discharge nearby.
 - Need more test wells to ascertain groundwater potential to supply 10 cfs.
 - Recommended either 1) drill 2-8" diam. test, and if successful, followed by 4-16" diam. production wells at approx. cost of \$32,000.00 or 2) drill 2-16" diam. test prod. wells and if successful followed by 2 more 16" diam. wells at cost of approx. \$26,000.00.
- Oct. 11, 1967: V. Raudsepp's memo to J.R. Simpson
- indicating completion of review of groundwater potential, enclosing J.C.F.'s memo of Sept. 29, 1967.
- Sept. 19, 1968: Mr. Webb (Deputy Minister of Public Works) requested Mr. Paget (Deputy Minister of Water Resources) for advice and assistance in continuing the groundwater program at the hatchery and particularly with drilling two test production wells.
- Sept. 20, 1968: V. Raudsepp's reply to Mr. Webb
- Groundwater Division to continue giving assistance.
- April 1969:
- Under J.C. Foweraker's supervision, drilled a 16" diam. test production well (Test Well No. 2).
 - Results indicated heterogeneous nature of aquifer. Recommended drilling several smaller diam. test holes.
 - Test Well Nos. 3, 4, 5, 6, followed by test production well No. 7 drilled April 25, 1969, and tested at constant rate of 1300 USgpm.
- June 19, 1969:
- Notes on results of pumping test of Well #7 by J. Parry (Groundwater Division), and recommendations for further exploration.
 - Withdrawal of 10 cfs possible; however two additional 16" diam. production wells needed to obtain 3000 USgpm. Estimated cost of construction approximately \$30,000.00.
 - Recommended that groundwater withdrawals be limited to 10 cfs for first year of operation to assess impact on springs and aquifer.
- June 25, 1969: B. Marr (Chief Engineer, W.I.B.) memo to J.R. Simpson.
- Report on results of pumping test of Well No. 7 and recommendations.

Sept. - Oct. 1969: Construction of 16" diam. production well (well No. 8) and pumping test at 2000 USgpm.

Oct. 14, 1969:

- B. Marr's memo to J.R. Simpson
- Due to staff shortage and full field program, a full report of drilling & testing of Well #8 will not be available at present.
 - The combined capacity of Well Nos. 1,7,8 = 8 1/2 cfs.
 - Groundwater Division prepared to supervise drilling of one more production well to bring total capacity to 10 cfs., however, production well should not be in same area as well Nos 1,7,8, but located south of Vye Road or west of escarpment. Recommended test drilling first, to explore groundwater potential in these areas.

Nov. 3, 1969:

- Mr. Vernon (Chief of Fisheries Management) memo to J.R Simpson.
- 10 cfs. limit, as recommended by J. Parry is satisfactory for continuous year round basis.

Nov. 12, 1969:

- J.R. Simpson memo to B. Marr
- Request for an investigation of recommended areas to establish best drilling locations of further test wells.

Dec. 18, 1969:

D.M. Callan (Groundwater Division) report, recommending a drilling program west and south of present wells at est. cost of \$18,650.00 for 5 test holes. Reiterated recommendation that the total withdrawal be limited to 10 cfs. for the first year of operation.

Dec. 23, 1969:

- B. Marr memo to J.R. Simpson
- Enclosed report by Callan.

Dec. 31, 1969:

- J.R. Simpson's memo to B. Marr
- Necessary funds to continue further drilling in fiscal year not available.

Jan. 21, 1970:

J. Hall's (Groundwater Division) report on results of pumping test of Well No. 8. Recommended a combined long term test (3-10 days) of Wells No. 7 & 8 to assess aquifer effects.

Jan. 26, 1970:

- B. Marr's memo to J.R. Simpson
- To guarantee yield of 8.5 cfs. need to perform a long term combined pumping test of well Nos. 7 and 8. Also need to drill several wells west of well Nos 7 and 8 to serve as observation wells during the pumping test.

Feb. 4, 1970:

- J.R. Simpson's memo to B. Marr
- The high probability of obtaining 8 1/2 cfs makes it reasonable to proceed with pumping test, and further exploratory drilling.

- Feb. 17, 1970: - Drilling of Well No. 9 (south of Vye Road)
- Feb. 17, 1970: J.C. Foweraker's memo to B. Marr
- Recommended a hydrologic and groundwater study of the Abbotsford Uplands to ascertain recharge to the aquifer supplying hatchery.
- Mar. 31, 1970: Callan's report to B. Marr re: results of drilling Well No. 9. Results not very encouraging due to fine materials. Recommended drilling more test holes.
- Aug., 1970: Drilling of Well Nos. 10, 11 (obs. wells at west of Well Nos. 7, 8.)
- Sept. 8, 1970: Start of combined 8-day, pumping test of Well Nos. 7, 8 at rates of 1300, and 2000 USgpm, respectively.
- Dec. 3, 1970: D. Callan memo to B. Marr; B. Marr memo to J.R. Simpson.
- Preliminary analysis of the combined pumping test indicates (1) no effects in wells more than 2000 ft. away; (2) Sumas well, 1000 ft. north of Well No. 1 is not affected because of an apparent boundary; (3) the springs in the area will "dry-up" after 10 days of pumping.
- Jan. 11, 1971: - Meeting with J.C. Foweraker, D. Callan, H. Sparrow (Fish and Wildlife), J.R. Simpson, J. Buchanan and D. Barlow (Dept. of Public Works), as a result of the District of Sumas' protest regarding the establishment of a hatchery whose proposed groundwater withdrawals may endanger the future water needs for the district.
- Callan reported that the Uplands could yield 20 cfs. and that spring overflow = 9 cfs. He recommended that no more than 9 cfs. should be extracted from the base of the Uplands. He further recommended that since Well Nos. 7, 8 could produce a maximum of 5.7 cfs. on a continuous basis, then hatchery should restrict its needs to 5.7 cfs. and the remainder be made available for the District of Sumas' future needs.
- Jan. 22, 1971: Reports by D. Callan:
1 Results of the 8-day combined pumping test of Well Nos. 7 and 8. The maximum safe rate of pumping of Nos. 7 and 8 is 5.6 cfs.
2 Recommendations for the development of a groundwater aquifer at the FVTH. The safe annual yield from the aquifer feeding the base of the Uplands is 10.5 cfs.
- Mar. 30, 1971: Memo from K. Kiernan (Minister of Rec. & Con.) to Mr. Chant (Minister of Public Works).
- As a result of various meetings between provincial government and municipality of Sumas, the design of the hatchery will change to a re-circulation type using 5.6 cfs.

- May 13, 1971: Official statement by K. Kiernan that hatchery would not exceed maximum of 5.6 cfs. withdrawal from the aquifer.
- Oct. 26, 1971: D. Callan's memo to B. Marr
- In reply to a request by the Ministry of Rec. & Con., Callan suggested that a large scale groundwater monitoring of the Abbotsford Upland aquifer to detect future depletion of groundwater would be too costly. He recommended the use of selected observation wells to provide hydrograph data that can be analyzed on a yearly basis. He suggested the use of observation wells WR4-62 and WR13-62 which would require deepening. The cost of deepening was estimated at \$3200.00.
- Feb. 28, 1972: B. Marr's memo to J.R. Simpson
- Enclosed notes by Callan giving recommended levels for pump settings in Well Nos. 1, 7, 8.
- July-Aug, 1972: Deepening and testing of Observation Wells WR4-62 and WR13-62
- Oct., 1972: Groundwater Division involved in monitoring water levels in hatchery wells during pumping test of Sumas' Municipal Well No. 2 located north of hatchery wells.
- Results showed no interference effects upon the hatchery wells.
- Apr. 8, 1974: D. Johanson (Technician, Groundwater Division) memo to J.C. Foweraker.
- Summary of Well data concerning District of Abbotsford wells.
- Dec. 2, 1976: J. Buchanan memo to P. Brady (Director, W.I.B.)
- Request assistance during testing of the recently installed pumps in Well Nos. 1, 7 at the hatchery.
- Dec. 20, 1976: J.C. Foweraker memo to H.I. Hunter (Chief, Hydrology Division).
- Results of meeting between Groundwater Section & Mr. Best of Public Works.
- J.C. Foweraker recommended:
1.) Wells be sounded for silt or sand.
2.) The bottom of the pump columns be at least several feet above the screen and packer.
3.) Water level recorder be installed.
4.) Sand tester be installed in Well Nos. 7, 8
5.) Flow meter required in each well.
6.) Proper pumping test be supervised by Groundwater.
- Jan. 10, 1977: Meeting between V. Pomaizl (Highways and Public Works) and Groundwater staff to discuss the retest of Well No. 7.

- Jan. 21, 1977: Under supervision of A.P. Kohut (Sr. Geological Engineer, Groundwater Section) and N. Lomas (Engineering Assistant), Well No.7 was retested.
- Feb. 4, 1977: A.P. Kohut's report to J.C. Foweraker, indicating normal well performance.
- Feb. 16, 1977: Kohut's memo to Foweraker
- According to L. Gilbert (Highways and Public Works), pump shaft in Well No. 7 has broken. Need to use Well No. 8, Temporarily.
- Feb. 21, 1977: Retest of Well No. 8 under supervision of A.P. Kohut and F. Chwojka (Technician).
- Mar. 22, 1977: Report by A.P. Kohut to J.C. Foweraker regarding retest of Well No. 8. Results indicate a reduction in well performance of between 11% and 22%. Some iron encrustation found on pump column.
- Mar. 25, 1977: J.C. Foweraker's memo to J. Buchanan
- Comments on retest of Well No. 8, doubts as to accuracy of flow meters installed. Recommended that a large capacity (2000 USgpm) standby well be constructed at the site.
- Apr. 7, 1977: A.P. Kohut's memo to J.C. Foweraker
- V. Pomaizl indicated that Well No. 1 is out of plumb and not straight; Well No. 7 may be silted, according to contractor; pumps in the wells may not have been properly installed; Well No. 8 pump is making noise.
- Apr. 20, 1977: L. Gilbert's memo to A.P. Kohut
- Results of Well No. 1 (Prod. Well #3) retest.
- May 25, 1977: J.C. Foweraker's memo to J. Buchanan
- Results and comments on analysis of encrustation material from Well No. 8 pump column.
- Nov. 4, 1977: Opening of Trout Hatchery.
- Nov. 21, 1977: R. Gillett (Chief Struct. Engineer, Public Works) memo to J.C. Foweraker.
- Concerned about continued groundwater supply for hatchery. Request report on monitoring: present and future; possible interference effects by other wells, especially Municipality of Abbotsford, effects of dry seasons on recharge; pumping equipment reliability and need for a standby well.

- Dec. 5, 1977: Meeting between Public Works, Fish and Wildlife and Groundwater staff, re:
- 1.) Monitoring of production and observation wells.
 - 2.) Maintenance of hatchery wells.
 - 3.) Standby well. Since Well NOs. 1, 7 (or Prod. Well No. 3,2, resp.) could provide 1500 USgpm in case of failure in Well No. 8 (Prod. Well No. 1) then a back-up well was not justified.
- Dec. 20, 1977: J.C. Foweraker's reply to R. Gillett's memo of Nov.21, 1977.
- Monitoring of water levels being done.
 - Further observation wells not needed at present.
 - Below normal precipitation during recharge periods may have reduced available drawdowns in the Production Wells.
 - Declining trend in performance of Prod. Well No. 1 not known at present; need for another retest.
 - Standby well should be considered.
- May, 1978: Groundwater Section took over monitoring responsibility of hatchery observation wells.
- Jan. 31, 1979: M. McDiarmid (Superintendent of Mechanical Operations at F.V.T.H.) reported to Fish & Wildlife that the pumping levels in the production wells have reached their lowest levels and therefore increased withdrawals is not recommended. McDiarmid suggested the reason for the decrease in the available drawdown was a result of below normal recharge by precipitation.
- Apr. 20, 1979: H.I. Hunter's memo to H. Sparrow (Fish & Wildlife)
- J.C. Foweraker recommends that the obs. wells at the hatchery continue to be maintained by the Groundwater Section, that the production wells be monitored by hatchery staff (BCBC); and that a review of existing production well data be made to assess the effects of hatchery withdrawal upon the aquifer.
- May 1, 1979: Meeting between Simmons, Murray (Asst. Deputy Ministers of Environment), J.C. Foweraker and H. DeBeck (Comptroller of Water Rights) regarding present and future status of groundwater supply at the hatchery.
- May 8, 1979: Meeting between BCBC, Fish and Wildlife and Groundwater personnel regarding the present and future status of groundwater supply at the hatchery. As a result, BCBC requested Groundwater Section to prepare a report on the present status of pumping and monitoring data available; present use and future needs up to 5.6 cfs.; and recommendations. They also requested Groundwater Section to retest Prod. Well No. 1 for performance.
- May 16, 1979: Retest of Prod. Well No. 1 under the supervision of M. Zubel (Groundwater Section) and F. Chwojka (Technician).

June 26, 1979:

Report by M. Zubel to A.P. Kohut re: Production Well Performance and Data Analysis of F.V.T.H. wells, including results of retest of Prod. Well No. 1, preliminary cost estimate for the construction of a large capacity standby well. The reasons for recommending a standby well are as follows:

THE PROBLEM: The performance of Prod. Well No. 1 declined from 96.2 USgpm/ft. in 1970 to 66.1 USgpm/ft. in 1979. This decline coupled with a limited amount of available drawdown in the well as a result of a too high pump intake setting (i.e. 70 ft. as opposed to a possible 115 ft. below ground), and below normal declines in the regional water levels between 1976 and 1979 (resulting in less available drawdown for pumping), has seriously restricted the amount of water that could be safely pumped out of Prod. Well No. 1. Unless the performance of Prod. Well No. 1 is improved by redevelopment and the pump intake is lowered to approximately 115 ft. in order to increase the available drawdown and hence increase the safe yield, then the amount of water that can be safely pumped from Prod. Well No. 1 will decrease and the water supply to the hatchery will be seriously restricted. Should well No. 1 fail for any reason, the remaining production wells would not be able to make up enough water to carry over the hatchery water requirements.

In order to carry out redevelopment work on Prod. Well No. 1, a standby source of water would also be needed for the hatchery. This source could not come from the combined pumping of well Nos. 2 and 3 as originally expected (see Dec. 5, 1977, item 3 comment). This was proven during the latest pumping re-test of Prod. Well No. 1, in which the hatchery was not able to sustain a shut-down of Prod. Well No. 1 for more than 15 minutes even with Prod. Well Nos. 2 and 3 operating at near maximum capacity.

RECOMMENDATION: In order to a.) ensure a continuous supply of water necessary to safely operate the hatchery while remedial work is carried out on Prod. Well No.1; and b.) to ensure a back-up water supply in case of future breakdowns in Well Nos. 1, 2 or 3, a standby well is needed.

Feb. 15, 1980:

Letter from B.C.B.C. to P. Brady
- BCBC have received authorization to proceed with upgrading well system and request Groundwater Section's assistance with construction of new standby well and remedial work on other wells, based on recommendations in June 26, 1979 report by M. Zubel.

- Apr. 21, 1980: Meeting between B.C.B.C., Fish and Wildlife, Water Supply Section and Groundwater personnel regarding drilling contract details; mechanical contract details; site visit and location of proposed standby well. It was decided that the well should be 20" - diam. and capable of yielding 2500 USgpm (5.6 cfs.).
- May 30, 1980: Final draft of well drilling contract prepared by Groundwater Section and submitted to Water Supply Section for forwarding to BCBC.
- July, 1980: Following minor revisions, BCBC sent out tenders for bids.
- July 17, 1980: Analysis of bids by Groundwater Section and recommendations.
- Aug. - Oct. 1980: Drilling, construction and testing of 20" - diam. well at 2500 USgpm, under supervision of M. Zubel and F. Chwojka.
- Nov. 1980: Request by B. Marr (Deputy Minister of Environment) to P. Brady to investigate Treasury Board re-submission by BCBC for increase funds for upgrading well supply at hatchery due to unanticipated cost increases.
- Nov. 26, 1980: J.C. Foweraker memo to P. Brady
- Review of Treasury Board Submission and comments.
- Dec. 3, 1980: M. Zubel's memo to A. Kohut
- Table of comparison between original preliminary cost estimates and actual cost of drilling standby well, including reasons for differences between preliminary and actual cost.
- Jan., 1981: Report by M. Zubel on Drilling, Construction and testing of F.V.T.H. Standby Production Well No. 4, including recommendations.

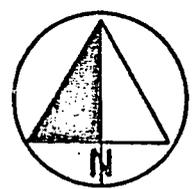
Marc Zubel.

M. Zubel
Geological Engineer
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(formerly Well#2)
F.V.T.H.
PROD. WELL NO. 3 (formerly Well#1) OLD HATCHERY SITE
F.V.T.H.
 (formerly Well#6)
PROD. WELL NO. 2 (formerly Well#7)
GROUNDWATER OBS. WELL NO. 3 (formerly Well#3)

F.V.T.H.
PROD. WELL NO. 1 (formerly Well#8)
OBS. WELL NO. 4 (formerly Well#4)
F.V.T.H. STANDBY PROD. WELL NO. 4

GROUNDWATER OBS. WELL NO. 5 (formerly Well#5)



RESERVOIR

GAS PIPE LINE R/W

DIRT ROAD

RIVERSIDE ROAD

FRASER VALLEY TROUT HATCHERY

FISH PONDS

VISITOR'S PARKING

VYE ROAD



Province of British Columbia
 Ministry of Environment
 INVENTORY AND ENGINEERING BRANCH

PLAN LOCATION OF
 FRASER VALLEY TROUT HATCHERY
 STANDBY PRODUCTION WELL NO. 4

SCALE: VERT.
 HOR. 1" = 250' (approx.)

DATE
 DEC. 1980

M. ZUBEL ENGINEER

FILE No. 92 G/I (33) DWG No. FIGURE *