92B-11-96

EVALUATION
DEAN PARK DEVELOPMENTS LTD.
WATER WELL

for

DISTRICT OF NORTH SAANICH

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R. B. Erdman, Geol.

February, 1975

B74-381

INTRODUCTION

Robinson Roberts and Brown Ltd., a firm of consulting groundwater geologists, North Vancouver, was requested by the District of North Saanich (letter dated November 22, 1974) to supervise the testing and evaluate the safe productive potential of a new well located in the Dean Park area owned by Dean Park Developments Ltd. (hereafter referred to as the Developer's well). Please see attached map for the well location.

An automatic water level recorder was set in the well for four weeks to establish the reaction of the water levels in the well to the winter rains. The well was then test pumped at various discharge rates to determine the safe productive capacity of the well. Measurements were made

during and after testing to determine whether or not the pumping of the subject well would affect the water level and discharge rate of the existing Dean Park System well (hereafter referred to as the District's well). These two wells are 664 feet apart.

DRILLING PROGRAM

Records from the engineering consultants to Dean Park Developments Ltd. (Kerr, Priestman & Associates Ltd.) and the drilling contractor (Ken's Drilling Ltd.) indicate that the subject well was drilled by air rotary method to a total depth of 625 feet. The ground elevation at the well is 410.7 feet above mean sea level so that the bottom of the well is almost 215 feet below sea level.

Reference to the drillers log and to the drilling summary made by Kerr, Priestman & Associates Ltd. will show that the well was drilled to a depth of 11½ feet with a 10-inch diameter bit. The top of the bedrock was encountered at a depth of 5½ feet. 8-inch I.D. casing was set into the 10-inch diameter hole and cemented in place to protect the well from contamination by surface or near surface waters. The well was drilled to a total depth of 625 feet using

an 8-inch diameter bit. The walls of the hole are essentially stable so that no casing was set in the bedrock hole.

Water was encountered in significant amounts in the fractured and fissured granitic bedrock at the following depths.

Depth	Cumulative Blowing Water Yield (Igpm)
160-165	10
330-335	18
355-357	25
400-417	50
530-542	60

The largest single increase in flow occured when the 400-417 zone was encountered and the flow increased from 30 to 50 Igpm.

When drilling was completed the static water level was reported to be at a depth of 12 feet below ground surface.

TESTING PROGRAM

The pump tests were conducted by a testing contractor (B. C. Aquifer Testing & Equipment of Victoria) under the supervision of Mr. R. B. Erdman of this office. Pumping commenced on January 9 and ended on January 16, 1975.

The initial pump discharge rate was 30 Igpm. This was maintained for 30 minutes after which the rate was increased to 60 Igpm. This discharge rate could only be maintained for three hours at which time mechanical problems developed and the test had to be terminated. The water level had dropped to a depth of 238 feet when pumping stopped.

Several other attempts were made to conduct a pump test but generator problems cut these short before sufficient information could be obtained.

On January 14, 1975, the final pump test was run at a discharge rate of 50 Igpm for 3,000 minutes (2 days). At the end of the test the water level was at a depth of 342.65 feet below ground surface. Please see the measurements attached to this report.

The District well was shut off at 0930 on January 15 and recovery levels were recorded throughout the remainder of the test on the Developer's well. A water level measuring device could not be lowered deeper than 180 feet in the District well. The numerous wires and pipes in the well prevented the sounding device from being lowered to deeper depths.

Examination of the recovery water level readings show that there was a slight increase in the rate of recovery of the District well immediately after the pump on the Developers' well was shut-off. The rate of recovery prior to the end of the pump test was 1.55 feet rise in 100 minutes while there was a 2.2 foot rise during the 100 minutes after the test ended. After the slight change in slope for the first 100 minutes after the pump was shut off the rate of recovery fell back to 1.6 feet of rise in the next 100 minutes. The above indicates that a slight amount of mutual interference will exist between the two wells when they are both pumped.

INTERPRETATION OF DATA

An automatic water level recorder was set in the well from December 3 to 27, 1974. The attached water level chart was abstracted from the recorder charts and shows that the static water level rose steadily throughout December from a depth of 26.8 feet to a depth of 13.1 feet below ground surface. Precipitation records from the Victoria International Airport for the month of December suggest that there is a slight relationship between rainfall in the vicinity of the well and the rise in the groundwater level.

Many months of records of the water level in this well will be needed before a correlation between the rise and fall of the groundwater levels and the rainfall pattern can be made. The water levels in some bedrock wells may lag behind the rainfall pattern by as much as 5 years.

Minor tidal effects can be observed in the detailed pattern of the water level fluctuation from the automatic water level charts. These indicate that the "high tides" in the groundwater system lag the sea tide by approximately four hours. The amplitude of the "groundwater tides" is approximately 40% of the amplitude of the sea tides. The well is approximately 3/4 mile in a direct line from the sea coast. However, the length along the conduits of the fracture system between the well and the sea is probably considerably greater. We interpret the slight tidal effect of the groundwater system adjacent to the well to result from a loading and unloading effect on a practically impervious membrane covering the fracture system on the sea bottom. If sea water was physically entering and leaving the groundwater system the lag would be much greater than the four hours observed and the amplitude would be much less than 40%. There is no reason to expect sea water contamination of the water pumped from this well.

Drawdown and recovery water level measurements indicate that the transmissibility of the fracture system supplying water to the well ranges from 160 to 225 US gpd/ft. The storage factor is estimated from experience to be 0.002. Using a value for the transmissibility of 200 US gpd/ft and a storage factor of 0.002, the water level in this well is calculated to drop to a depth of 420 feet below ground surface after the well has been pumped at a discharge rate of 40 US gpm through a 200 day period of no recharge.

At the same time that the pumping water level in the Developer's well reaches a depth of approximately 420 feet there will be a 50 foot interference with the District's well. This will reduce the safe perennial yield of the District's well by 4 gallons per minute or approximately 5800 gallons per day.

WATER QUALITY

A water sample was collected just before the test pumping ended on January 16, 1975 and analysed by a commercial laboratory. The results of this analyses are enclosed. These results show that the water is potable.

Water samples collected at various times throughout the test and analysed by a field chemical kit showed that the water quality did not change with pumping.

RECOMMENDATIONS AND CONCLUSIONS

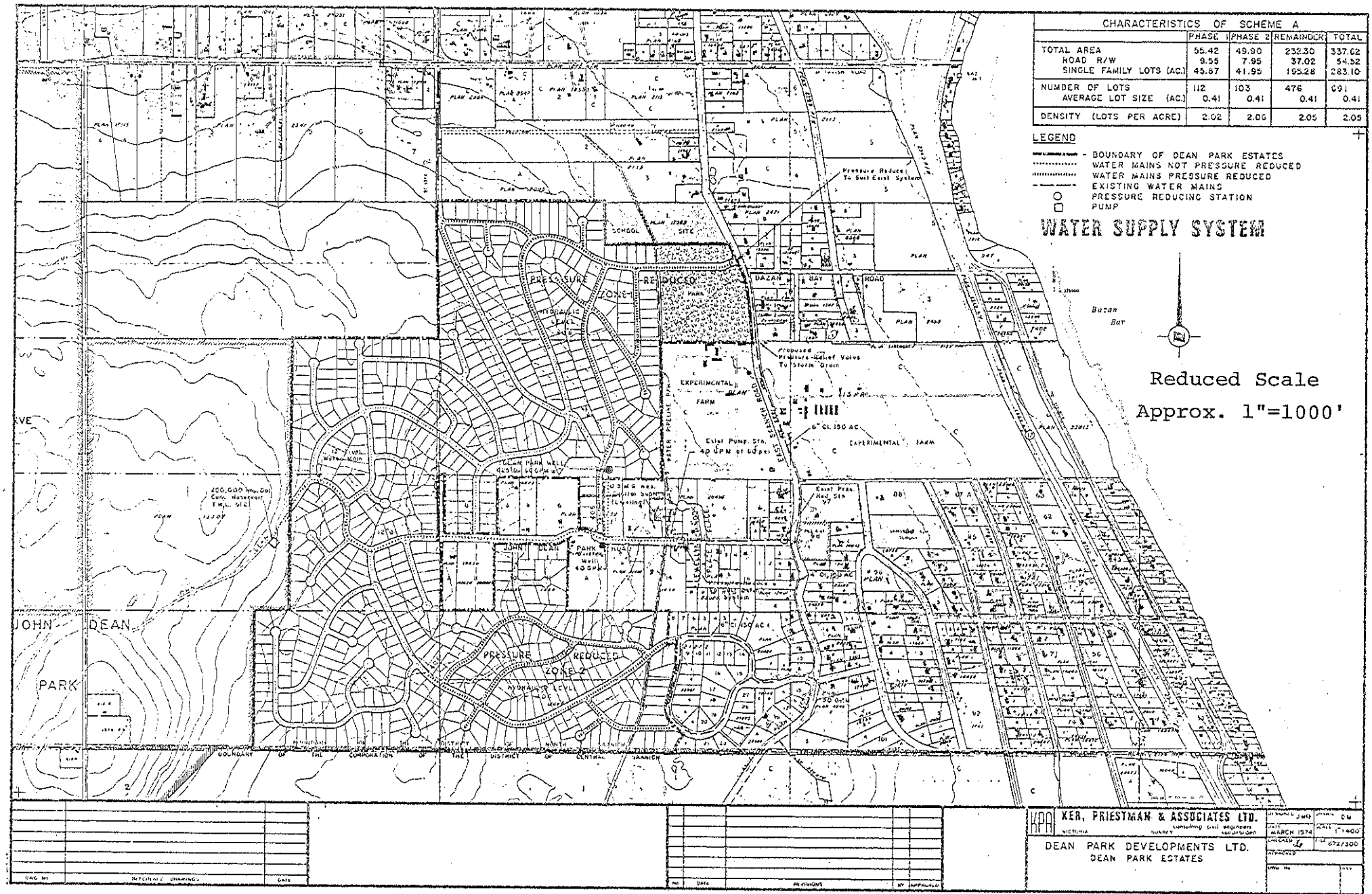
1. Based upon our analyses of available data we rate the safe productive potential of the Dean Park Development Ltd. well at 40 US gpm. If the well is pumped at this rate through a 200 day period of drought we estimate that the pumping water level in the well should not drop below at a depth of 420 feet.
2. The District's well should only be affected by the pumping of the Developer's well by a calculated discharge rate of 4 US gpm.
3. The water quality is excellent.
4. Contamination of the well water by sea water is considered to be very unlikely.
5. The pump set in the well should have the following characteristics:

Type - Submersible

Discharge Capacity - 40 US gpm from a depth of 420 feet and against the pressure head in the water system.

Suction Depth - 550 feet

6. This well must not be:
   a. Overpumped - the specific capacity of the well is slightly less than 0.1 gpm per foot of drawdown. Thus if the pump is allowed to discharge at only 15 gpm over the safe yield of 40 gpm the water level will drop an additional 150 feet and the pump will break suction.
   b. Rawhided - the pump discharge should be tuned to the actual requirements of the water system so that the pump can operate for several hours and then remain idle for several hours. If the pump is allowed to flash on and off the water may become turbid and pieces of rock might fall into the well.
   c. Recharged - Water must never be allowed to cascade into the well for even a few minutes.
7. Daily records should be kept of water levels and production rates during the first year of operation. These should be sent to us for analysis so that the safe productive capacity of the well can be reassessed after the first year of operation.


CHARACTERISTICS OF SCHEME A
PHASE 1 | PHASE 2 | REMAINDER | TOTAL
TOTAL AREA 55.42 | 49.30 | 232.30 | 337.02
ROAD R/W 9.55 | 7.95 | 37.02 | 54.52
SINGLE FAMILY LOTS (AC.) 45.87 | 41.35 | 195.28 | 283.10
NUMBER OF LOTS 112 | 103 | 476 | 691
AVERAGE LOT SIZE (AC.) 0.41 | 0.41 | 0.41 | 0.41
DENSITY (LOTS PER ACRE) 2.02 | 2.06 | 2.05 | 2.05
LEGEND
BOUNDARY OF DEAN PARK ESTATES
WATER MAINS NOT PRESSURE REDUCED
WATER MAINS PRESSURE REDUCED
EXISTING WATER MAINS
PRESSURE REDUCING STATION
PUMP
WATER SUPPLY SYSTEM
Reduced Scale
Approx. 1"=1000'
PRESSURE REDUCED ZONE 1
PRESSURE REDUCED ZONE 2
HYDRAULIC GRADE LEVEL
JOHN DEAN PARK
EXPERIMENTAL FARM
SCHOOL SITE
BAZAN BAY ROAD
Bazan Bay
Pressure Reduced To Salt East System
Proposed Pressure Relief Valve To Storm Drain
Exist Pump Sta. 40 GPM at 60 psi
Exist Pres. Red. Stn
6" Cl. 150 AC.
200,000 Imp. Gal. Conc. Reservoir T.W.L. 512
Dean Park Well (Disused) 40 GPM
Dean Park Reservoir Well 40 GPM
BOUNDARY OF THE CORPORATION OF THE DISTRICT OF NORTH SAANICH
BOUNDARY OF THE DISTRICT OF CENTRAL SAANICH
KER, PRIESTMAN & ASSOCIATES LTD.
consulting civil engineers
VICTORIA SURREY
DEAN PARK DEVELOPMENTS LTD.
DEAN PARK ESTATES
MARCH 1974
1"=400'
1572/300
DM