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WATER, SANITATION, ENVIRONMENT and DEVELOPMENT

Rehabilitation of urban wells in Ghana

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Introduction

As part of the Ghana Water and Sewerage Corporation's Urban Well Rehabilitation Programme, some seventeen (17) producing and non-producing wells were redeveloped and pump tested. These wells ranges in age from 20 years to 40 years and are located in 4 different regions in southern Ghana.

Wells that were found to have good yields (in excess of 100l/min.) from this exercise are intended to be incorporated into the existing system.

Data collection

Due to poor record keeping most relevant data on the wells were not readily available. This posed an early problem but after an intensive search, data on some of the wells were found. Available information on a few others however were scanty excluding design and constructional details.

Field conditions of wells

The wells can be categorised into three groups.

- those that have some sort of housing as shelter
- those with concrete well heads and
- those that had no structural protection whatsoever.

A number of them have been abandoned primarily due to either breakdown of pumps or inadequate power supply.

At the time of the exercise all the abandoned and non-producing wells capped; and most of the producing wells had no proper protection from the environment.

Objective

Wells were to be re-developed by air-flushing and jetting for a minimum period of 4 hours or until water is clear. Pump testing comprised multiple and constant rate pumping. Chemical analysis and bacteriological test were to be conducted during pump testing.

Operational problems

The wells had varied internal diameters (150 – 300mm) with depths ranging up to 300 meters. In carrying out the exercise a drilling rig was used on wells considered to have bigger diameters and great depths whilst a truck-mounted compressor was used on those that had smaller diameter (150mm) and are of shallow depths.

The use of these equipments however, brought to the fore some hindrances. The major one being accessibility. Apart from structures on wells, houses and trees have sprang up around some of these wells. In most cases trees were felled to the displeasure of owners. Roofs on wells were dismantled and in some cases concrete well heads were pulled down; but where necessary ramps were built to enable the vehicles to be mounted on wells. Another source of worry was with the production wells. Removal of pumps meant interrupting the community's water supply. Pump installation technicians were on stand-by duty for the removal and installation of pumps.

Development and pump testing

This was done by air-flushing until water was clear. Among materials flushed out were not only rust particles which indicated serious corrosion of steel casing and torch-out screens, which were used in the well construction but also filth and other undesirable foreign materials which had found their way into the wells.

One could not tell whether these wells had ever been maintained since they were installed. It is apparent however that most of the wells were exposed at one time or the other to the environment judging from the foreign materials flushed-out.

Pump testing operations included multiple rate tests of hourly duration and constant rate tests of up to 18 hours.

Data obtained from the tests were plotted and Transmisivity (T) and specific capacity (Q/s) were calculated; in the case of constant rate tests for the estimation fo well loss and well efficiency.

For the multiple rate well performance curves were plotted for the optimum yield to be determined. Predictable yields obtained from the analyses were compared with initial yields (where available).

Water quality

Due to the decayed foreign materials in most of the wells waters flushed out initially were blackish and with pungent smell.

However, the wells cleared during development. Chemical analysis registered high iron concentration ranging from 0.70mg – 14.4mg/1. This could not be of geological origin but rather imparted from corroded steel casing.

From Electrical Conductivity and Chloride tests, aquifers along the coast had not been intruded by sea water as suspected.

Bacteriological examination on samples isolated typical faecal organisms of E. Coli type I from 9 out of the 10 wells. Other non-faecal forms of coliforms, the Irregular types I & II were present in 8 out of the 10 samples. From the bacteriological test result it was evident that all the boreholes needed some disinfection before being put back into use.

Conclusion and recommendations

On account of good yields and possibility of disinfection most of the wells which were either installed with steel casing and screens that are now corroded and rotten or were left as open holes at the bottom sections are now to be re-lined with PVC casing in the second phase of the rehabilitation programme, after a longer term pumping test has been conducted and the quality of the water re-examined.

If upon re-examination of the quality, the bacteriological content is still high, then sanitizing of the catchment area of the well must be considered. In case this is not feasible, then the well must be abandoned and not be used anymore for public supply.

- The absence of a data bank in the water sector is proving detrimental to its development and there is the urgent need for one to ensure that vital information is not lost.
- In erecting structures at well sites consideration must be given to future rehabilitation works so as not to interfere with accessibility.