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(General)

approved  
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open file

W. J. J. J.  
Fiedler

September 7, 1949

LH

To: The Director  
From: Chief Hydraulic Engineer  
Subject: Approval and transmittal of report

Attached is a letter for your signature, addressed to Mr. J. R. Simpson of the Federal Housing Administration, transmitting a copy of a letter from Mr. M. L. Brashears, Jr., concerning ground-water conditions at Levittown, Long Island, New York. The letter has been reviewed and appears to be satisfactory. I recommend that you approve it for release to the open file and transmit it to Mr. Simpson. Please indicate your approval on the routing slip attached to the original of this letter and return it to the Ground Water Branch. It is understood that Mr. Brashears wishes to supply a copy of the letter to Mr. R. M. Leggett, consulting geologist for the Levitt interests, and a copy is being sent to Mr. Brashears for that purpose.

C. G. Paulsen  
Chief Hydraulic Engineer

Copy to: Mr. Brashears  
Mr. Simpson

CHH:ainness:bjs

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Mr. J. K. Simpson

Federal Housing Authority

My dear Mr. Simpson:

In response to your recent inquiry, concerning the ground-water conditions in the Levittown area, Nassau County, Long Island, N. Y.:

I take pleasure in sending you herewith a copy of a letter to the Chief of the Ground Water Branch from Mr. M. L. Brashears, Jr., district geologist in charge of ground-water investigations in New York and New England, together with a copy of a memorandum from the files of the Nassau County Health Department, data on nitrogen content of the water from the Levittown wells, and a copy of Bulletin GW-12 of the New York Water Power and Control Commission.

Very truly yours,

*Julian R. Sears*

Acting Director

cc:Chairman:bjs

NY 64

COPY

To: Chief, Ground Water Branch, Washington, D. C.      Date: August 31, 1949

From: M. L. Brashears, Jr., Mineola, N. Y. (NY)

Subject: Ground-water conditions at Levittown, L. I., N. Y.

Reference is made to your office memoranda of July 27th and August 31st requesting information as to ground-water conditions at Levittown, Long Island and an opinion as to the possibility of contamination of public supply wells due to percolation of cesspool effluent.

Levittown consists of about 8,000 houses (eventually about 11,000 houses) lying within an area of about 5 square miles, and built on a Pleistocene outwash plain having a low slope. The coarse glacial sands and gravels are about 100 feet thick and overlie a thick series of alternating beds of Cretaceous sand and clay. Bedrock lies about 1,100 feet below land surface. In the Levittown area, the glacial deposits are immediately underlain by beds of clay and sandy clay. The ground water in the glacial deposits exists, therefore, under water table conditions, whereas that in the Cretaceous deposits is confined and is under artesian pressure. The depth of the water table in Levittown ranges from about 15 to 60 feet below land surface. Its surface lies from about 40 to 70 feet above sea level. The altitude of the piezometric surface for the deeper aquifers is everywhere in the area lower than that of the water table, being lowest in the deepest aquifer.

Water for public consumption in Levittown is obtained from six wells owned and operated by the builder of the houses. Two additional wells, wells 7 and 8, are being constructed. Two shallow wells, wells 1 B and 2 B, which furnish water to stores in Levittown, are also operated by the builder. Four of the public water supply wells, wells 1, 2, 3, and 4, tap shallow glacial beds. According to the well drilling contractor, the tops of the screens of these wells range from about 40 to 65 feet below land surface, and the water table at the time of drilling lay from about 15 to 35 feet below land surface. Logs of these wells indicate that beds of coarse sand and gravel extend from the tops of the screens up to the land surface. The specific capacity of the shallow wells ranges from 32.4 to 57.5 gallons per minute per foot, whereas that for the deep wells is 13.0 and 14.3

Two of the public supply wells, wells 5 and 6, tap Cretaceous artesian aquifers at depths of 274 and 219 feet below land surface. The static water level in both of these wells was about 25 feet below land surface just after they were cased in. According to present plans, wells 7 and 8 will be screened in water table beds at depths approximating those of wells 1 to 4.

According to records of the builder of Levittown, the average pumpage of ground water is about 3,000,000 gallons per day. Except for that part which is evaporated, the well water is returned to the ground by means of cesspools (a small number of septic tanks are in use), or is used for irrigating lawns. Plot plans and maps based on land surveying performed by the builder indicate the minimum horizontal distance between supply wells and cesspools to be slightly more than 200 feet. Water is also returned to the ground by means of 13 recharge basins (shallow pits dug into the highly permeable glacial deposits). These basins are used to dispose of storm sewer water, and are normally dry except for a relatively short period following each heavy rainstorm.

Long time weather records indicate an average yearly precipitation for Long Island of slightly more than 42 inches, or the equivalent of about 2,000,000 gallons



per day per square mile. Estimates by various engineers and geologists, who have studied conditions on Long Island, indicate that from 50 to 60 per cent of total precipitation percolates to the water table. On the basis of these data, the average recharge to the water table lying beneath the 5 square mile area covered by Levittown should amount to about 5,500,000 gallons per day. In the opinion of the writer, actual recharge probably at least equals the computed recharge as the surficial deposits at Levittown have high porosity and the slope of the land surface is low. The headwaters of several small brooks lie in the southern part of Levittown, but no streams cross the area. Natural surface drainage is therefore extremely low.

As the water returned to the ground by cesspools is somewhat less than the average pumpage of 3,000,000 gallons per day and as average recharge is estimated to be about 5,500,000 gallons per day, it would appear that the cesspool effluent is liberally diluted as it percolates to the water table. In addition, considerable quantities of ground water are continually moving into the Levittown area from the north and escaping to the south, as the southward sloping water table has locally a hydraulic gradient of about 10 feet per mile. In the vicinity of pumping wells, downward percolating cesspool effluent would tend to recycle, and result in less than average dilution from precipitation. Conversely, in the vicinity of recharge basins, dilution would tend to be above average.

Analyses of water pumped from wells 1 to 6 at Levittown show it to be bacteriologically fit for human consumption. As far as can be determined, the Nassau County Department of Health is not greatly concerned as to potential contamination of this type. However, the Nassau County Department of Health has shown great concern as to the nitrate content of the well water at Levittown because it feels cyanosis (blue babies) may be induced. (Attached is an explanation of this feature as copied from the files of the Nassau County Department of Health, and also a table showing the nitrate content of Levittown well water). Sometime in the past, the New York State Department of Health apparently indicated that a nitrate content of above 10 parts per million was dangerous with respect to cyanosis. It is my understanding that since then the State Department of Health has indicated there are no good data to back up this opinion. In any case, the State Department of Health has not objected to the use of Levittown well water, even though analyses show in some cases nitrate content of over 10 parts per million. It is also my understanding that the State Department of Health is conducting experiments to determine the safe limit of nitrate content. These experiments, although not yet complete, are pointing in a general way to a safe limit of several times 10 parts per million. A casual examination of recent analyses for public water supply wells in areas adjoining Levittown show nitrate contents of more than 10 parts per million in some of them. Water from one contained 24.4 parts per million of nitrate. Some engineers feel that a part of the nitrate content of these and the Levittown wells is the result of downward leaching of inorganic fertilizer. The Levittown area was formerly potato land. On Long Island, usual practice calls for use of one ton of fertilizer per acre per year. Any nitrate effect at Levittown due to fertilizer leaching should now diminish from year to year.

Attached is a copy of New York Water Power and Control Commission Bulletin GW-13 for Mr. Simpson. This report contains a map showing the water-table contours in Nassau County and the location of observation wells for which water level measurements are available.

/s/ M. L. Branshears, Jr.,  
District Geologist

**Nitrate content (expressed as parts per million of nitrogen)  
of well water pumped into public supply distribution system at  
LEVITTOWN, NASSAU COUNTY, NEW YORK**

| Well No. 1<br>(N 2402)      | Well No. 2<br>(N2403)       | Well No. 3<br>(N 2590)    | Well No. 4<br>(N 2591)   | Well No. 5<br>(N 3194)   | Well No. 6<br>(N 3195)   |
|-----------------------------|-----------------------------|---------------------------|--------------------------|--------------------------|--------------------------|
| 8.0 <u>a/</u><br>11-26-47   |                             |                           |                          |                          |                          |
| 13.5 <u>b/</u><br>July 1948 | 13.5 <u>b/</u><br>July 1948 | 5.0 <u>a/</u><br>10-13-48 |                          |                          |                          |
| 9.5 <u>c/</u><br>Dec. 1948  | 9.5 <u>c/</u><br>Dec. 1948  |                           |                          |                          |                          |
| 8.0 <u>a/</u><br>4-20-49    | 14.0 <u>a/</u><br>4-20-49   |                           |                          |                          |                          |
| 12.0 <u>a/</u><br>7-18-49   | 15.0 <u>a/</u><br>7-18-49   | 8.0 <u>a/</u><br>7-1-49   |                          |                          |                          |
| 9.1 <u>d/</u><br>7-29-49    | 9.5 <u>d/</u><br>7-29-49    | 5.5 <u>d/</u><br>7-29-49  | 9.5 <u>d/</u><br>7-29-49 | 1.1 <u>d/</u><br>7-29-49 | 0.5 <u>d/</u><br>7-29-49 |

a/ Collected by Nassau County Department of Health. Analyzed by New York State Department of Health Laboratory, Albany, N. Y.

b/ Collected and analyzed for owner by Lindsay Laboratory, New York, N. Y.

c/ Collected and analyzed for owner by Pease Laboratory, New York, N. Y.

d/ Collected and analyzed for owner by Koreom Laboratory, New York, N. Y.

Cyanosis due to methemoglobinemia may occur in infants with gastrointestinal disturbances who receive boiled water which comes from poorly constructed dug or drilled wells with defective casings. The water may contain large amounts of nitrate compounds which, when ingested, are converted by bacterial action to nitrites. The nitrite ion is absorbed and oxidizes hemoglobin to methemoglobin.

The intravenous administration of methylene blue in the dosage of 1 to 2 mg. for each kilogram of body weight promptly relieves the infant's cyanosis and distress.

In all probability certain instances are incorrectly interpreted as being due to congenital heart disease, an abnormality of the respiratory tract, diaphragmatic hernia, or enlargement of the thymus.

While the cyanosis is still in effect the blood will be chocolate colored and spectroscopic examination will reveal a well-marked methemoglobin band. If the water is removed from the infant's formula, the cyanosis will disappear in 24-36 hours.

Sparkling clear well water though bacteriologically "pure" may have a dangerously high nitrate content. Even boiling the water will not protect a susceptible infant.

If cyanosis is observed a formula containing the least possible water -- preferably an acidified, boiled, undiluted milk should be prescribed. Use distilled water until the infant is at least 2 months old.

Although the fact that the infant possesses much less oxidizable hemoglobin than the adult is probably the most important single factor in making him more susceptible to nitrate compounds, other factors may conspire to render nitrates more toxic. Thus the bacterial flora may include more nitrate converters than in the adult. Gastrointestinal disturbances in infancy are more common than in adulthood, and the delicate mucosa may be injured more easily.

Any water having a nitrate concentration in excess of 10 parts per million is regarded as unsafe for infants.

(From files of Nassau County Department of Health. Source unknown)