מדינת ישראל

רשות המים

REQUEST FOR INFORMATION

Horizontal Directional Drilling of Water Wells

Nov, 2016

הרשות הממשלתית למים ולביוב ■ המסגר 14 ת"ד 20365 תל אביב-יפו 61203 ■ טל' 03-6369691 פקס' 03-6369761 ■ israelg10@water.gov.il

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1. Introduction

Ground water is one of the four main sources of water in Israel. The other three are Lake Kinneret (the Sea of Galilee), treated waste water and desalinated seawater.

The two major aquifers in Israel are: the Coastal aquifer (calcareous sandstone), and the Western Mountain aquifer (limestone). In these two aquifers, there are approximately 800 production wells. Over the years, there has been a gradual reduction in the number of production wells, due to the long period of exploitation and subsequent decrease in efficiency of the wells. Figure 1 shows a general map of Israel, and Figure 2 the area where the Coastal aquifer is situated.

The Israel Water Authority considers to replace a large number of the existing wells in the coming years, and in this context the evaluation of new drilling technologies, such as Horizontal Directional Drilling (HDD), is required, due to the statutory limits of replacement classical vertical wells. Therefore HDD method is required for higher productivity.

Because the method of horizontal pumping wells is not well known in Israel, as a first step the Israel Water Authority wishes to learn more about the technology, in order to explore the possibility of replacing old pumping wells with this technology.

2. Objective of the Request for Information (RFI)

The main objective of this RFI is to enable the Israel Water Authority to carry out a preliminary evaluation of the requested technology, both from a technical as well as an economic point of view, and to reach a decision as to its applicability in this particular case.

Due to the fact that, in the case of HDD, the expected cones of depression differ significantly from those in classical vertical wells, and as a result may cause less

interference between wells, it is expected that discharges will be considerably higher than in the case of vertical wells. Hence, the fundamental reason to proceed with this RFI is the premise that the discharges obtained from these wells may be twice as large, or even larger, than the discharges previously obtained from vertical wells, and hence may reduce the number of wells required, and may also achieve economies of infrastructure, such as connections to the water supply systems.

After evaluation of the information provided to the Water Authority, a decision will be made regarding the next stage, and, should HDD be shown to be a viable solution here in Israel, the Water Authority will proceed in stages to advance the matter.

3. Background Information

3.1 Topography

The coastal plain has a moderate topography, slowly rising from the west, from the Mediterranean Sea coast, eastwards towards the foothills, from 0 meters to 50 meters above sea level. The area mainly consists of sand dunes, sand, clay and calcareous sand; it is the major agricultural area of Israel, in addition to having a number of rural communities and large cities.

3.2 Hydrogeology

The underlying aquifer , as shown in Figures 3, 4 and 5, is of calcareous sandstone intercalated with lagunar tin and clay layers, separating, in some areas, the upper parts of the formation from the lower parts, generally in a non-continuous way.

The Calcareous Sandstone formation is placed on a thick clay layer - Saquiya formation.

The thickness of the calcareous sandstone formation decreases generally from the west, where it may be up to 140 meters (460 ft) thick, to the east where it may only be 25 meters (82 ft) thick.

3.3 Ground water hydrology

The Calcareous Sandstone aquifer receives its natural recharge from rain penetrating the aquifer, where it is exposed at the surface directly or where it is overlain by sand or sand dunes, as well as from natural drainage and the irrigation of wide agricultural areas.

Generally speaking, the aquifer can be defined as a phreatic aquifer, except for some singular cases where the intercalating clay layers create some sort of limited confinement.

In general, the horizontal hydraulic conductivity is fair-to-good, ranging from 15 m/day (50 ft/day) to 25 m/day (83 ft/day) in the areas where most production wells are present. Vertical hydraulic conductivity is generally considered to be 0.1 of horizontal conductivity.

Consequently, the transmissivity values are around 2,000 m^2/day (22,000 ft^2/day)

Due to the presence of the seawater/freshwater interface, production wells are generally located at a distance of 1.5 km (1 mile) from the coastline, in order to avoid sea water intrusion further inland.

Most production wells that are connected to the national water system and that are still in operation produce between 100 - 250 m^3/ hr (440 gpm - 1,100 gpm).

4. Information requested from drilling companies

4.1 Horizontal directional drilling (HDD)

4.1.1 General information about company
The required information includes all details: name of company, year established, address, contact information,(tel., email, etc.) approximate volume of business, names of clients, certificates of completion where available, and any other information that the company considers of value.

4.1.2 Details of the type of equipment utilized in horizontal directional drilling.

4.1.3 Proposed drilling techniques, possible depths, angles, piers if necessary.

4.1.4 Techniques for the placement of gravel packs and necessary auxiliary equipment.

4.1.5 Techniques for placement of pumps, type of pumps, capacity in HP, discharges.

4.1.6 Possible limitations or shortcomings in the utilization of this method or in the operational stages

4.1.7 Estimated time for drilling given depths, distances, etc.

4.1.8 Estimated discharges, given the hydrological information in this document, considering drawdowns, interference between wells, etc.

4.1.9 Environmental problems encountered: Have any environmental problems been encountered in the implementation of this method?

4.1.10 the team's professional composition: Which groups of professionals, in your view, should participate and make up the team?

4.2 Collector Wells

4.2.1 General information regarding the company, address, contacts, years of operation, examples of similar projects carried out, certificates of completion**.**

4.2.2 Equipment at the company's disposal for such drillings, and availability for an extensive program.

4.2.3 Proposed systems and drilling techniques of collector wells, depth, extent, diameters, as well as the related vertical piers**.**

4.2.4 Techniques for the placement of gravel packs**.**

4.2.5 Placement of pumps, types, capacity, motors**.**

4.2.6 Possible limitations or restrictions in implementation and /or operatio.n

4.2.7 Estimated time for the construction of collector wells, taking into consideration determination of depths, diameters**.**

4.2.8 Estimated discharges, given the hydrological information provided, taking into consideration drawdowns and interference between wells**.**

4.2.9 Environmental problems encountered: Have any environmental problems been encountered in the implementation of this method?

4.2.10 the team’s professional composition: members of which professions, in your view, should participate and make up the team.

5. Information requested from consultants

5.1 Contact information, such as email address, fixed and mobile phone numbers.

5.2 Academic background, titles, year degree obtained, area of specialty, years as a consultant.

5.3 Information requested in this document from drilling companies concerning drilling technology, gravel pack placement, timetable for implementation, potential discharge size, based on the hydrogeological and hydrological information provided here.

6. Economic and financial aspects of the drilling technology and associated pumps

6.1 The information submitted should include approximate costs of drilling per meter (ft), as well as total price of work carried out for the completion of wells (except for materials), including drilling, placement of casings and gravel pack, withdrawal of pipes and placement of pumps, based on the hydrological and hydrogeological information provided in this document, for wells with large diameter.

6.2 In addition, cost information is requested concerning projects cited and carried out regarding the elements mentioned in subsection 6.1, including work and materials for specific depths, diameters, etc.

7. Expenses

All expenditure involved in the preparation of the information submitted shall be met by the company that responds to the RFI; in no case will the company be entitled to reimbursement or compensation for its work or for the information submitted.

8. Modifications

The Israel Water Authority reserves the right to carry out changes in this Request For Information, including the date of submission.

9. Analysis of information submitted

The Israel Water Authority will carry out a thorough analysis of the information submitted, and, to this end, will have the right to engage consultants who will work on its behalf. The Authority will have the right to approach all or some of the submitting companies, requesting clarifications and explanations and any other additional information that, in its opinion, can assist it in reaching the proper decision.

10. Utilization of Information

The Israel Water Authority will have the right to pass the information to its advisors and consultants, who are authorized by law to handle such information. Should the submitted information include confidential commercial or professional information, the submitting companies should specify this in its proposal, defining precisely which information is considered confidential, and which part, if any, should remain confidential. The Israel

Water Authority will not divulge or pass on any information submitted by one submitting company, to another company. Should the Authority decide in the future to call for an international tender, or to call for submission of proposals to carry out all or some of the work or projects, the previously submitted information will not be used in the subsequent call.

Figures

Figure 1: Map of Israel

Figure 2: Location of Calcareous Sandstone in the Coastal Aquifer

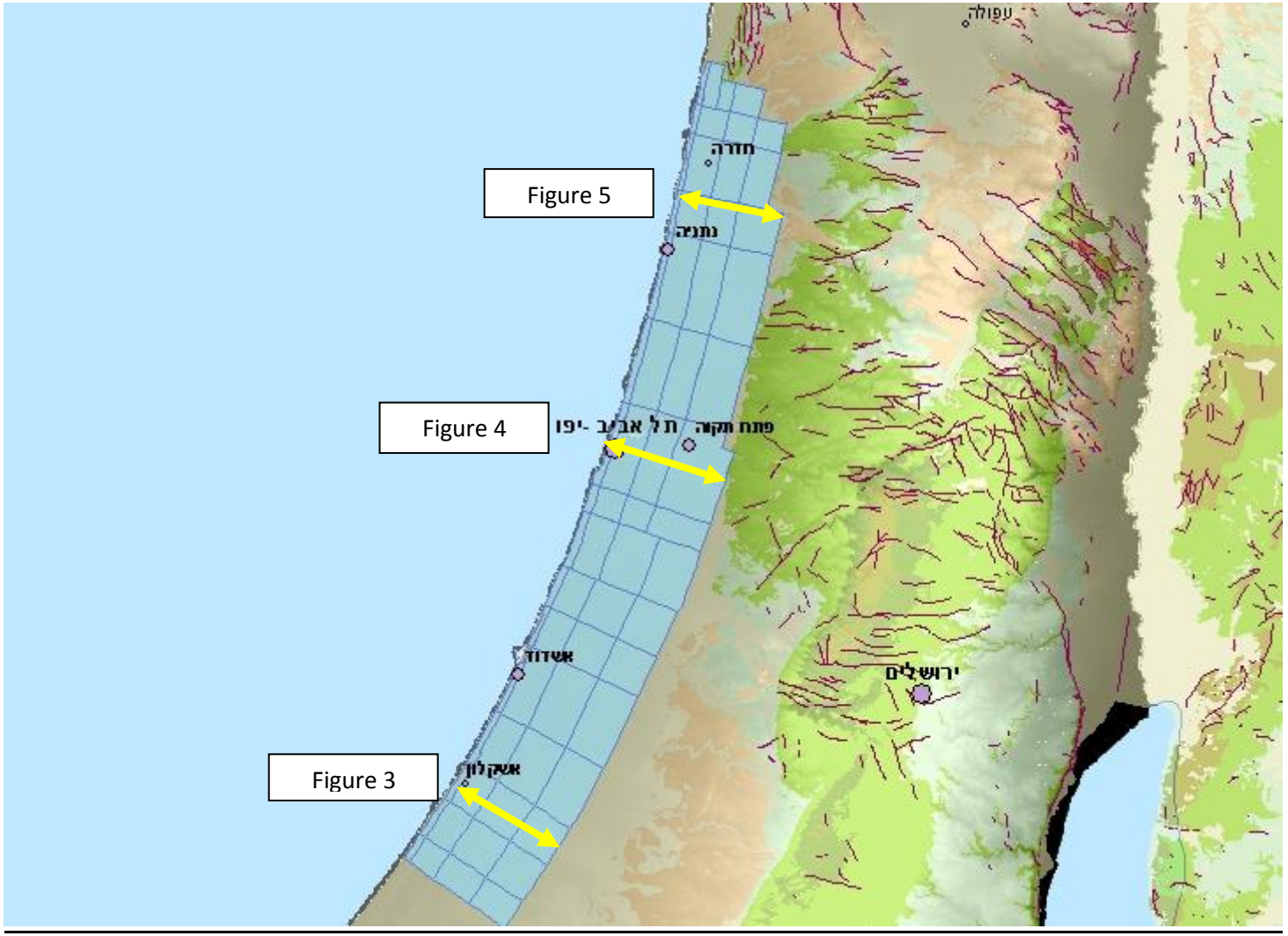


Figure 3: West-East Hydrological Cross-Section Southern Coastal aquifer

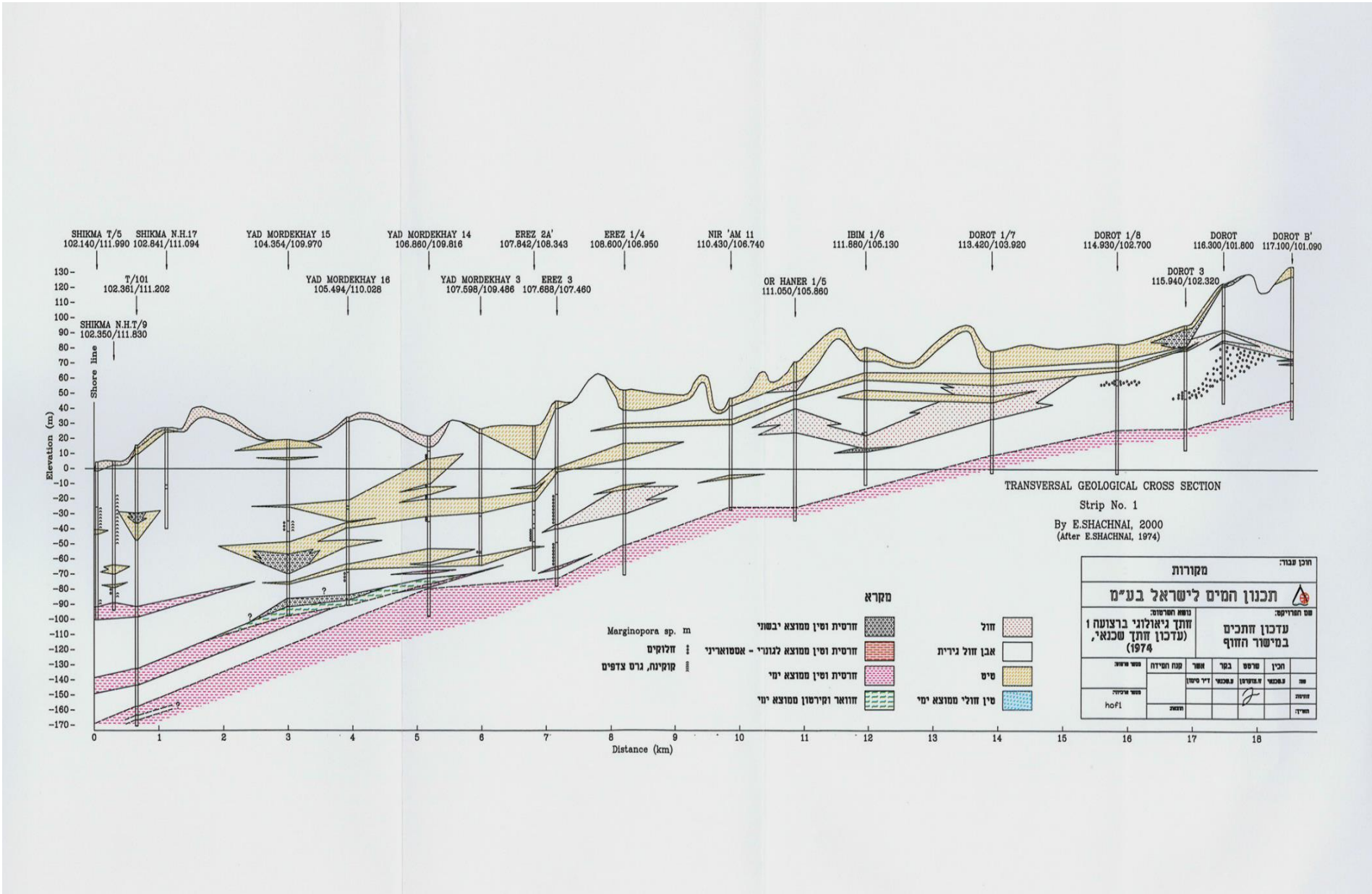


Figure 4: West-East Hydrological Cross-Section Central Coastal aquifer

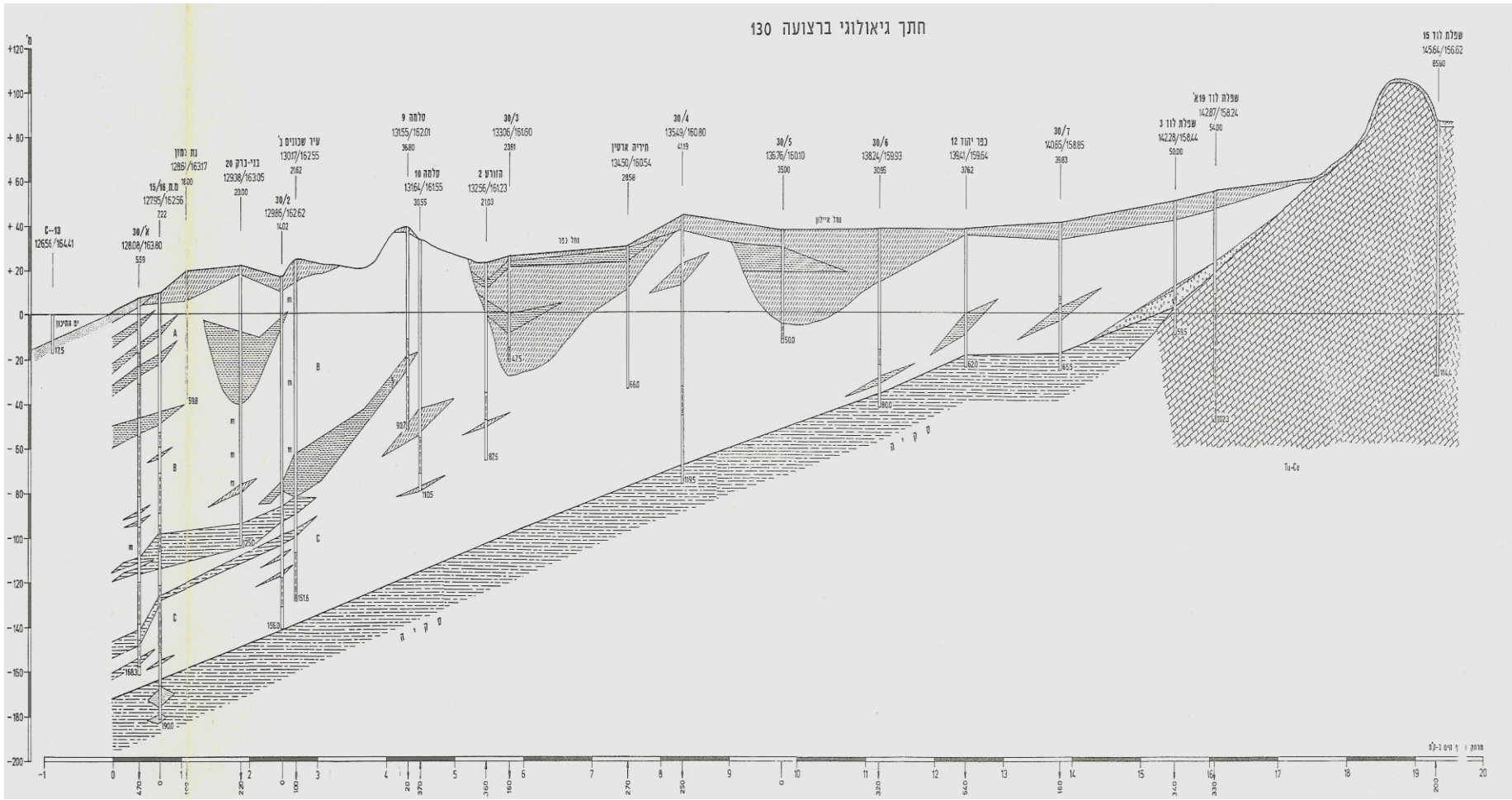
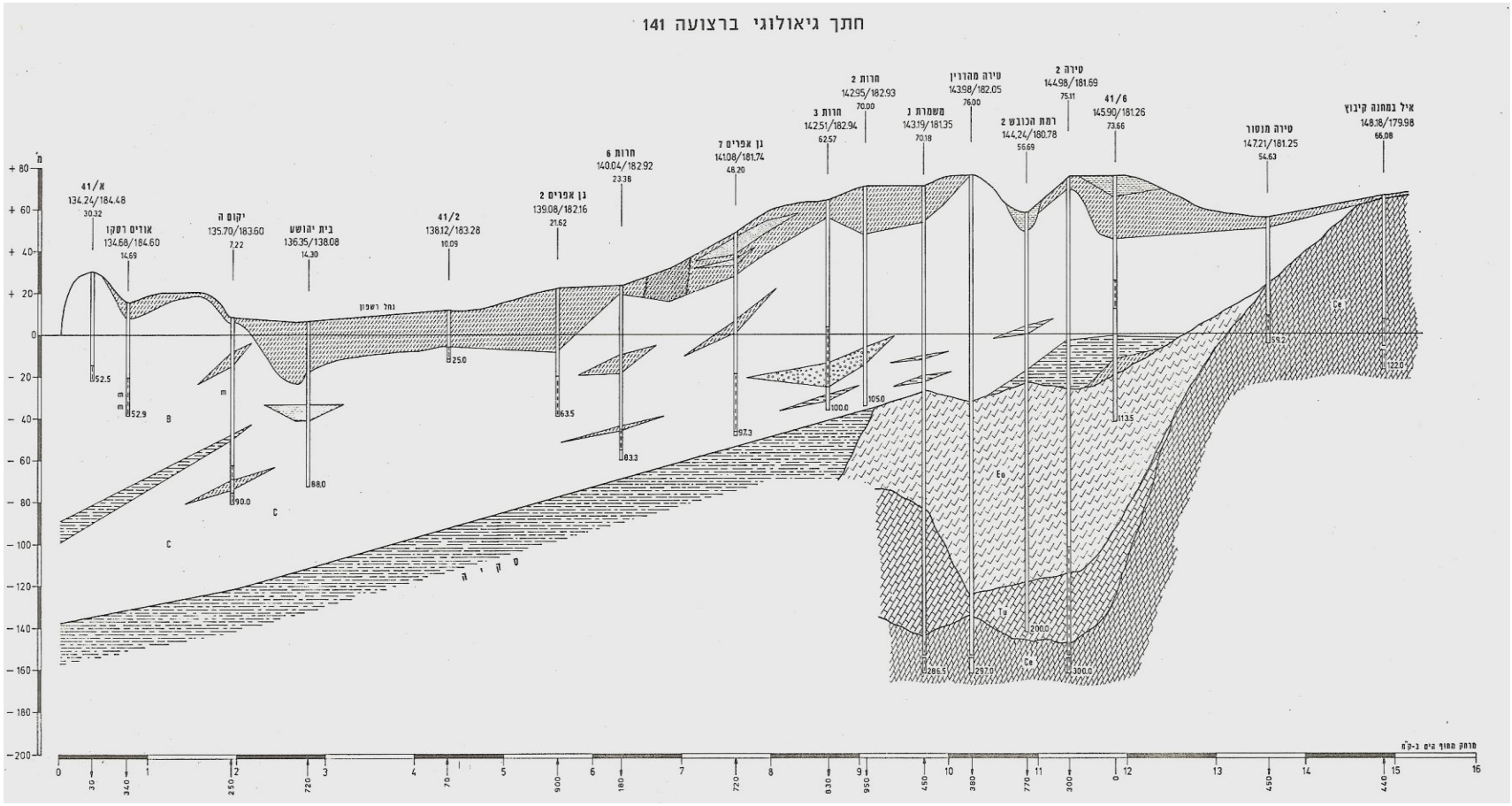


Figure 5: West-East Hydrological Cross-Section Northern Coastal aquifer



1. RFI Procedural Provisions

1.1. **WA's Website** – this RFI as well as any Clarifications to be issued shall be uploaded to the WA Website: www.water.gov.il/Hebrew/Tenders/Pages/default.aspx.

1.1. **WA's POC –** Mrs. **Raya Beliy,** email address: Michrazim@water.gov.il.

1.2. **RFI Schedule**

1.2.1. **RFI Publication** – march 20, 2017.

1.2.2. **Responder Registration** – shall be done with the WA's POC as of RFI Publication until Submission Date.

1.2.3. **Last Date for Clarifications sought by Responders** – May 15, 2017.

1.2.4. **Last date for Issuance of Clarifications by the WA -** May 29, 2017.

1.2.5. **Submission Date** – July 2, 2017. RFI Responses shall be made to the WA's POC's email address. Responders shall hold the sole responsibility to be provided with the WA's POC's confirmation that the RFI Response was adequately received.

The WA may, at any time and at its sole discretion, change any of the dates provided herein.