

Using Remote Sensing Technology to Determine Environmental Impacts and to Select New Sewage Dumping Site in Jeddah

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Introduction

Sewage water, if dumped in a bad way, helps in polluting environment. The dumpsite near Jeddah City is located to the northeast of the city within the hilly area. The area is elevated than the city's expansion trend.

Numerous problems were created due to dumping of the sewage water in that area, e.g. rising of water table in many territories, especially in the eastern part of the city.

Aquifers are the fundamental hydrogeologic units in which groundwater contamination occurs. Sewage disposal on or below land surface contribute to groundwater pollution through infiltration of the wastewater.

There are many impacts of groundwater pollution by sewage such as environmental, social and economical. The viruses and bacterial organisms penetrate the soil to reach the saturated zone and create a serious health impact.

Previous Studies

In 1992, Roobol et al., located and mapped the dumping sites of raw, untreated sewage and other liquid wastes in the high region east of Jeddah. In the coastal zone offshore from downtown Jeddah, El Rayis (1989), studied the heavy metal pollution of sewage outfall. In 1993, Swolfs considered the sewage wastes as hazardous wastes and responsible about rising groundwater in many cities in

the Kingdom of Saudi Arabia and gave Jeddah city as an example, hence, health problems on the inhabitants. Swolfs and Bankher (1993), indicated that east of Jeddah near south Briman, the sanitary landfill is now about 80 percent full during the period of 12 years.

Methods of Study

During this study, environmental impact created from both old- and current-sewage dumping sites were exhibited to understand the extent of the problem. New dumping site among number of proposed sites for dumping sewage was selected and studied carefully based on various scientific parameters. This site is located to the south of the city between Wadi Al Khumrah and Wadi Fatima.

During the first phase of the project, relevant available geological, structural, environmental, hydrogeological, engineering, hydrological and remote sensing data were collected, reviewed and presented.

During the second and third phases of the project, necessary hydrological and hydrogeological data were collected in the field, and laboratorial analysis as well as office work were undertaken to fulfill targets sought in these phases. Engineering geological investigations were also carried out both in the field and laboratory; and the results were incorporated and integrated with the remote sensing data and findings, which were analyzed for the benefit of the project.

Engineering geological map was prepared for the study area where rock and soil classifications were illustrated.

Results an Discussions

Three periods of sampling groundwater within the duration of the project showed that groundwater of Jeddah City is contaminated by wastewater. High concentration of nitrate and phosphorus is supported by high count of E.Coli, fecal coliform and total count of bacteria. The potential environmental hazard is very obvious and remedial solutions should be taken as soon as possible.

Satellite remotely sensed data studies showed that the city of Jeddah is penetrated by numerous wadis that are crossing the city from east-to-west and that most of the urban expansion was observed to be in these wadis. It was found also that geological structural lineaments having many preferred orientations, but the alignments following the Red Sea direction are the most dominant.

Conclusion and Recommendation

The geological structural lineaments which are mostly antecedant to the main Red Sea rift system, form random passages for sewage water to flow in all directions freely, thus causing wide and scattered pollution.

The study shows that the grounwater of Jeddah is contaminated with wastewater and it contains high concentration of nitrate and phosphorus which is supported by high count of E. Coli, fecal coliform and total count of bacteria.

As an urgent safety need to protect health hazards, the followings are recommended :

- It is necessary to complete the sewage system in the city of Jeddah as early as possible
- Construction of underground dam is needed in the upper part of Wadi Bani Malik area to avoid problems from the current dumping site

- Water in the wells located to the east of Jeddah city should not be used for human purposes, domestic animals or for agricultural purposes.
- Selection of new dumping sight, away from the city is highly recommended.

References

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استخدام الاستشعار عن بعد لتحديد التأثير البيئي لموقع تفريغ مياه الصرف الصحي في جدة و لاختيار موقع جديد

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المستخلص : تقع منطقة تفريغ مياه الصرف الصحي في شرق مدينة جدة في منطقة جبلية وبالطبع فإن هذا الموقع مرتفع عن المدينة وإتجاه النمو فيها، ولقد نتجت مشاكل عديدة بسبب تفريغ مياه الصرف الصحي أو أي مواد سائلة أخرى بالمنطقة مثل ارتفاع منسوب المياه الجوفية في كثير من أحياء مدينة جدة المنتشرة على السهل الساحلي، ومن المعلوم إن تلوث المياه الجوفية يؤثر على البيئة والمجتمعات والاقتصاد، علاوة على الفيروسات والبكتيريا المتسربة عن طريق التربة والتي تصل إلى نطاق التشبع وهذا كله يؤدي إلى مشاكل صحية خطيرة.

في هذه الدراسة تم عرض التأثير البيئي لكل من مواقع مرامي النفايات السائلة القديمة والحالية لتفهم أبعاد المشكلة وأيضاً تم عرض الوضع الحالي لهذه المشكلة وتم أيضاً اختيار موقع جديد (يقع في جنوب مدينة جدة) من عدة مواقع مقترحة لرمي نفايات الصرف الصحي ودرست دراسة مكتبية اعتماداً على معايير علمية عديدة.

أظهرت نتائج تحليل عينات المياه الجوفية التي جمعت ثلاث مرات أثناء المدة المحددة لمشروع البحث أن المياه الجوفية لمدينة جدة ملوثة بمياه المخلفات. وتوصي الدراسة بضرورة إقامة شبكة للصرف الصحي بمدينة جدة وإنشاء سد تحت أرضي في أعالي وادي بني مالك لإنتقاء الأضرار الناتجة من المشاكل التي قد تنتج عن موقع رمي النفايات السائلة الحالي علاوة على عدم الاستفادة من المياه للإستخدام الآدمي من الآبار الموجودة في مدينة جدة خاصة الآبار التي تقع في شرق مدينة جدة.