شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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جامعة عين شمس

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قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

HANAA ALY

AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
CIVIL ENGINEERING
IRRIGATION AND HYDRAULICS DEPARTMENT

Management of Contaminants Spills in Watercourses

A Thesis

Submitted in Partial Fulfillment of the Requirements for the
Degree of Doctor of Philosophy
In
Civil Engineering
Irrigation and Hydraulics Department

Submitted by
Dalia Hassan Mohamed Shehata
B. Sc. in Civil Engineering
M. Sc. in Civil Engineering (Irrigation and Hydraulics), 2014
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Cairo 2020

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Date: February 2020

STATEMENT

This thesis is submitted as a partial fulfillment of Doctor of Philosophy Degree in Irrigation and Hydraulics Engineering, Civil Engineering, Faculty of Engineering, Ain shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

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THESIS SUMMARY

Most watercourses are subjected to the threats of contaminant spills. The Nile River is the main water source for all Egyptian cities around its banks, especially in Upper Egypt where no rainfall exist. The southern reach of the Nile receives considerable amounts of agricultural, industrial and municipal wastewater at different sites along its mainstream.

The goal of this research is to provide a risk assessment to evaluate contamination crisis due to a spill event as to enable decision-makers to take mitigation actions. As well as, a Risk Matrix provides a quick response that can be taken immediately after a spill is detected. This assessment aids in understanding and studying the effects of spill especially on drinking water supply.

A one-dimensional model is created in HEC-RAS to simulate the hydrodynamics of the river and evaluate the water quality variability in a reach of 144 km long selected and schematized on the Nile River.

Following model calibration, a comparative analysis was performed to determine the accurate values of dispersion coefficients based on the real measured data at several monitoring stations located along the studied area.

A simulation of Contaminant spill in the studied reach of the Nile River was performed to determine the vulnerable area and assess the correspondent real travel time. Two scenarios of spill event were chosen and studied using the HEC-RAS hydrodynamic and water quality modules.

The spill scenarios were run to simulate the transport of 500 tons of spilt phosphate into the Nile River.

Results of spill simulation revealed that the travel time of spilt phosphate lies between 66 to 96 hours to cross the studied reach according to the flow condition. The higher the dispersion coefficient, the faster the pollutant spread and the lower pollutant concentration in the study reach.

An integrated system consists of risk assessment maps and risk matrix was concluded and spill characteristics are recorded at different downstream recipients.

Key words: Contaminants Spill – Water Quality Modeling – Dispersion Coefficient – Risk Assessment – Risk Matrix

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Dalia Hassan Shehata

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