



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم



HANAA ALY



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شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

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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

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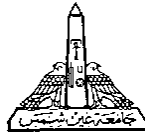
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Cairo 2020



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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

ACKNOWLEDGMENTS

Thanks to Allah who guides me to the straight path and paves the way for all my works.

I wish to express my deepest gratitude and sincerest appreciation to the supervision committee; **Prof. Dr. Yehia Kamal Abdel-Monim**, professor of Irrigation & Drainage Engineering, Faculty of Engineering, Ain Shams University, **Prof. Dr. Samy Abdel-Fattah Saad**, the Director of Hydraulic Research Institute, National Water Research Center, **Prof. Dr. Hoda Kamal Soussa**, professor of Water Resources Engineering, Faculty of Engineering, Ain Shams University, and **Prof. Dr. Ahmed Moustafa Moussa**, Head of River Engineering Department, Nile Research Institute, National Water Research Center for their support, continuous encouragement, helpful advice, valuable suggestions, guidance and constructive comments towards the successful completion of this study.

I would like to express my deep thanks and appreciation to all who have helped me in this study.

Finally, I would like to express my special thanks to my family, especially to my parents, my husband and my daughters for their endless support, patience and love. This study could not be done without their support.

Dalia Hassan Shehata

February, 2020

Table of Contents

Chapter 1: Introduction.....	1
1.1 General	1
1.2 Problem identification.....	2
1.3 Study objectives	2
1.4 Thesis Layout	3
Chapter 2: Literature Review.....	6
2.1 Introduction	6
2.2 Environmental risk assessment of contaminants spill	6
2.3 Spill Accidents in Nile River.....	7
2.4 Studies of Pollutant Spills in Water bodies	14
2.5 Summary	22
Chapter 3: Materials and Methods.....	25
3.1 Scope of the Work.....	25
3.2 Study Reach Description.....	26
3.3 Methodology	28
3.4 Data Collection.....	32
3.4.1 Collected Data for the Hydrodynamics Simulation	32
3.4.2 Collected Data for the Water Quality Simulation.....	32
Chapter 4: Hydrodynamics Modeling.....	34
4.1 HEC-RAS: hydrodynamic module.....	34
4.1.1 Model Description	34
4.1.2 Theory concept of HEC-RAS 1D Steady Flow Simulation.....	35
4.2 HEC-Geo RAS	39
4.3 GIS System: ArcGIS	40
4.4 Model setup	42
4.4.1 Topography of the Studied Reach	42

4.4.2 Building the Schematic of the Studied Reach	43
4.4.3 Importing GIS Data to HEC-RAS.....	52
4.5 Completing the Flow Data and Boundary Conditions	55
4.6 verification and calibration of Hydraulic Simulation in HECRAS.....	57
4.7 Exporting the HEC-RAS Results.....	59
Chapter 5: Mapping Analysis of Steady flow Simulations Results.....	60
5.1 Introduction.....	60
5.2 Water surface level	60
5.3 Water depth (The inundation depth)	65
5.4 Velocity Mapping	69
Chapter 6: Water Quality Modeling.....	76
6.1 Introduction.....	76
6.2 HEC-RAS: Water Quality module.....	77
6.3 Pollution Sources and Sinks in the Studied reach.....	78
6.4 Theory Concept of HEC-RAS Water Quality Simulation	83
6.5 Boundary and initial Condition Water Quality Data.....	86
6.6 Calibration of Water Quality Simulation in HECRAS	88
Chapter 7: Assessment of Longitudinal Dispersion Coefficient Computation in HEC-RAS.....	90
7.1 Introduction:.....	90
7.2 Computation models of Longitudinal Dispersion Coefficient.....	90
7.3 Comparative analysis of Longitudinal Dispersion Coefficient equations....	94
7.3.1 Dissolved Oxygen (DO).....	94
7.4 Biological Oxygen Demand (BOD).....	96
7.5 Nitrate (NO3).....	98
7.6 Phosphate (PO4)	100
7.7 Results of the Dispersion Coefficient equations analysis	101
Chapter 8: Modeling of Contaminants Spill in Nile River.....	102
8.1 Introduction.....	102

8.2 Spill Scenario Simulations	105
8.3 Phosphate Studies.....	108
8.4 Results and Analysis of Spill Modeling.....	109
8.4.1 Phosphate concentration in each water quality cell	109
8.4.2 Risk Assessment of receptors (DWTPs).....	117
8.4.2.1 Permissible limits of phosphate Drinking Water	117
8.4.2.2 Risk Assessment maps of DWTPs during Maximum and Minimum Flow 118	
8.4.3 Risk Matrix	125
Chapter 9: Conclusion and Recommendations	128
9.1 Summary	128
9.2 Conclusion.....	129
9.3 Recommendations for Future Work.....	131
Reference:	133

List of Figures

Figure 1: Phosphate Spill into Nile River in Qena City, 2015	9
Figure 2: Oil Spill from floating hotel into Nile River, Luxor City, Egypt, 2017.....	11
Figure 3 : Phosphate Spill from riverine unit in Assiut, 2017.....	11
Figure 4: Phosphate Spill in the Walidiya Canal, 2018.....	12
Figure 5 : Oil Spill in Esna City.....	13
Figure 6: The Applied integrated oil spill model and the GIS based impact assessment.....	16
Figure 7 : The “4-step-3-model” Framework Diagram.....	17
Figure 8 : Location of the Studied Reach.....	26
Figure 9 : Monitoring Stations located along the studied reach	27
Figure 10 : Water Level Gauges located within the study reach.....	28
Figure 11 : The Work Flow of the research methodology	31
Figure 12 : Sub- reaches segment between two cross sections (Rinde, 2015)	36
Figure 13 : Representation of the Energy Equation Terms (Brunner, 2016b).....	37
Figure 14 : HEC-GeoRAS toolbar in the ArcMAP	39
Figure 15: Process flow diagram for using HEC-RAS with GIS and HEC-GeoRAS (T.Ackerman, 2012)	41
Figure 16 : A Triangulated Irregular Network (TIN) for the Studied Reach	42
Figure 17 : Drawing Centerline of the Studied Reach	44
Figure 18 : Drawing Bank lines of the Studied Reach	45
Figure 19 : Cross-section Cut lines is perpendicular to the flow path of the studied reach..	47
Figure 20 : Geometric data plotting in HEC-RAS of cross-sections of Studied Reach	48
Figure 21 : Studied Reach Associated with Cross-sections in Arc GIS and HEC-RAS	49
Figure 22 : String Model for Geometric Cross-Section Interpolation.....	50
Figure 23 : Export Geometry data from ARC-MAP and Import it into Hec-RAS.....	53
Figure 24 : Ground Profile of the Studied Reach (Bed Levels)	53
Figure 25 : Cross Sections (River Stations) of Studied Reach in HEC-RAS.....	54
Figure 26 : Steady Flow Boundary Conditions of the Studied Reach	56
Figure 27 : Steady Flow Simulation of Studied Reach in HEC-RAS	56
Figure 28 : Comparison between the Measured and the Simulated Water Surface Profile for Different Flows	58