1 Introduction

Background

The Upper Mississippi River-Illinois Waterway System (UMR-IWWS) Navigation (Feasibility) Study will evaluate the justification of providing additional lockage capacity at sites on the UMR-IWWS while maintaining the social and environmental qualities of the river system. The navigation system feasibility study will be accomplished by executing the Initial Project Management Plan (IPMP) outlined in USACE (1994). The IPMP outlines Engineering, Economic, Environmental, and Public Involvement Plans.

The Environmental Plan identifies the significant environmental resources on the UMR-IWWS and probable impacts in terms of threatened and endangered species; water quality; recreational resources; fisheries; mussels and other macroinvertebrates; waterfowl; aquatic and terrestrial macrophytes; and historic properties. It considers system-wide impacts of navigation capacity increases while also assessing, in preliminary fashion, potential construction effects of improvement projects. The physical forces studies reported herein are part of the Environmental Plan. One of the physical forces created by commercial tows is water level drawdown that results from the large amount of area of the channel that is occupied by the tow. Drawdown lasts about as long as it takes for the vessel to pass a given point on the bank. While most of the other physical forces from the tow are confined to the main channel, drawdown can propagate along backwater channels large distances from the main channel.

Objective

The purpose of this study is to determine if the UNET model (Barkau, 1992) can be used to determine the variation of water level drawdown along the length of a backwater channel as a result of passage of commercial tows in the main channel.

Approach

A generic backwater channel layout was evaluated in a 1:30 scale physical model and measured water level changes and velocity were compared to the computed results from the one-dimensional unsteady flow model, UNET. The

laboratory backwater is a highly idealized backwater but is a good test of UNET because it represents somewhat of a “worst case” since losses are minimal and reflections are large. To insure that the UNET model can be used for prototype conditions where losses are large and reflections are frequently small, the UNET model was then compared to measured water level and velocity changes on a backwater on the Lagrange Pool of the Illinois Waterway.