

Approach to Reducing Uncertainty in Flood level Estimation

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Engineering Theme

Defra / Environment Agency Joint R&D Programme



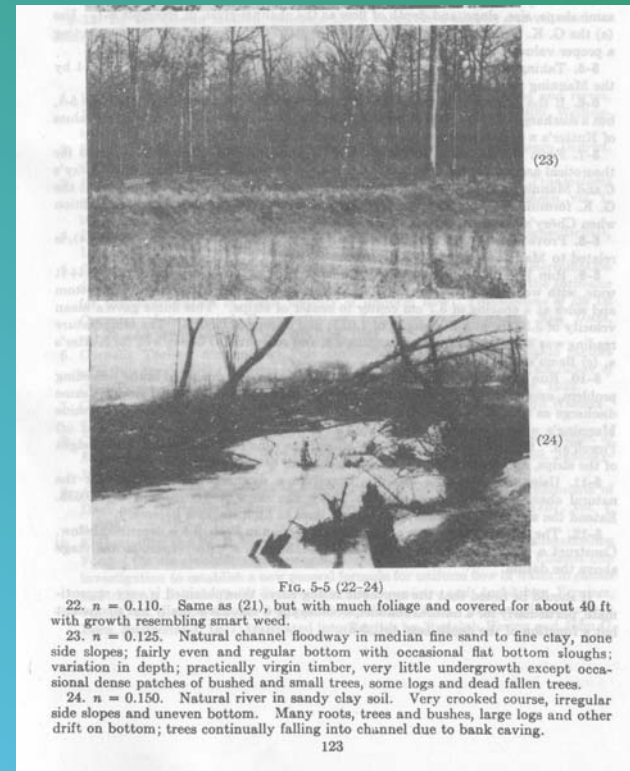
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TABLE 5-5. VALUES FOR THE COMPUTATION OF THE ROUGHNESS COEFFICIENT BY Eq. (5-12)

Channel conditions		Values	
Material involved	Earth	n_0	0.020
	Rock cut		0.025
	Fine gravel		0.024
	Coarse gravel		0.028
Degree of irregularity	Smooth	n_1	0.000
	Minor		0.005
	Moderate		0.010
	Severe		0.020
Variations of channel cross section	Gradual	n_2	0.000
	Alternating occasionally		0.005
	Alternating frequently		0.010-0.015
Relative effect of obstructions	Negligible	n_3	0.000
	Minor		0.010-0.015
	Appreciable		0.020-0.030
Vegetation	Severe	n_4	0.040-0.060
	Low		0.005-0.010
	Medium		0.010-0.025
	High		0.025-0.050
Degree of meandering	Very high	m_5	0.050-0.100
	Minor		1.000
	Appreciable		1.150
	Severe		1.300

Current practice - Users still turning to Ven Te Chow "Open Channel Hydraulics"



Conservation Service, 1955, sec. 5.

37. F. C. Scobey: Flow of water in irrigation and similar canals, *U.S. Department of Agriculture, Technical Bulletin No. 652*, February, 1939.

38. C. E. Ramser: Flow of water in drainage channels, *U.S. Department of Agriculture, Technical Bulletin No. 129*, November, 1929.



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Origins of conveyance estimation project

- Programme of excellent academic research on conveyance in UK Flood Channel Facility since 1990
- Poor take up of paper-based guidance by users
- Request by academics to new Defra / EA Joint Programme to support more research on basic hydraulics (1999)
- Interest of EPSRC in networking more closely with users
- Workshop held with users and academics to review various issues and options for conveyance-related research
- EPSRC-funded Network on Conveyance in River Floodplain Systems (NCRFS) set up by Profs Ervine and Pender in 2000



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NCRFS Network and Defra / EA Scoping Study

- Aims of the EPSRC-funded NCRFS were to
 - facilitate transfer of knowledge between researchers and users
 - exchange scientific information and promote new research
- Autumn 2000 floods highlighted need for improved application by users of current knowledge and techniques for flood level estimation
- Defra / EA provided support to NCRFS to carry out Scoping Study on next steps in Reducing Uncertainty in Flood Level Estimation
- Led by HR Wallingford (Paul Samuels) but with major involvement of network members in team and reviews



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Issues addressed by better conveyance estimation

Operating Authority activity	Consequence of poor conveyance estimation
Design of Flood Defence scheme and improvement works	Under capacity leading to potential failure below design standard Over capacity leading to potential sediment problems and excessive cost of works
Real time flood forecasting	Under- (over-) estimation of timing of flood peak / effects; inexact prediction of flood level and extent of inundation
Flow gauging – high flow rating estimated via conveyance equation	Incorrect flow estimation - influences flood forecasting and statistical estimation of flood flows for design. Latter impacts on perceived benefits of flood defence schemes
Maintenance dredging and vegetation management in rivers, channels and flood plains	Inadequate or excessive maintenance activities, possibly leading to unnecessary disruption to river habitats or undercapacity of channel leading to increased flood risk
Flood risk mapping	Indicative flood mapping inaccurate – uncertainty in flood risk / extent for planning; inadequate development control; poor confidence in flood risk maps



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Outcome of Scoping Study

- Five good reviews on (see Network and Project websites)
 - Factors affecting Conveyance
 - Data and Fieldwork
 - 1-D Modelling
 - 2 and 3-D Modelling
 - Blue Skies !
- Report concluded that significant (a) increase in accuracy, (b) saving in working time, and (c) reduction in uncertainty in flood level estimation achievable with existing knowledge
- Identification of (a) shorter-term targeted programme to produce CES, and (b) strategic programme of research
- See www.river-conveyance.net for details



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Conclusions of Scoping Study re CES

- The improved methods for conveyance estimation must be developed for delivery within software packages
- Existing datasets on real flood events should be drawn together and compiled for model validation
- UK-relevant parameters needed for hydraulic roughness
- Practical “uncertainty estimator” also needed
- Operating Authorities are in a position to promote the CES and specify or require its use in software
- Training needed to support implementation of improved methods



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Defra / EA research projects

- Reducing uncertainty in flood level estimation, Phase 2 (Targeted programme for CES)
 - led by HR-Wallingford; linked to Wallingford Software
 - started January 2002; completing June 2004

Related projects

- Afflux estimation system (bridges and culverts)
- Benchmarking and scoping of hydraulic models
- Establishing a performance based asset management system



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