REPORT

HYDRAULIC CALCULATION

Project: Drainage Channels Design
Author of the study: David González
Date: 06/01/2023

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METHODOLOGY OF CALCULATION

SPATIALLY VARIED FLOW

Spatially varied flow is defined as that where the water flow rate varies along the course flow.

Two cases are possible:

- Flow with increasing discharge
- Flow with decreasing discharge

In case of an intake structure consisting of the set grating + channel, we will have to consider the first case with a uniform inflow throughout the channel length and corresponding to the captured flow rate.

The flow profile computation methodology is based on the integration by finite steps and takes into consideration the loss of energy of water flow due to wall friction (headloss) and due to impact of both incoming and throughout the channel flow (impact loss).

Governing equations of this type of flow are those of continuity (1) and momentum (2), where:

$$\bar{u}\frac{dA}{dx} + A\frac{d\bar{u}}{dx} = q$$

$$\frac{dy}{dx} = \frac{S_0 - S_f - (2Q/gA^2)\cdot(dQ/dx)}{1-(Q^2/gA^2D)}$$

Q is the discharge (flow rate throughout the length of channel)
q flow per unit length
A is flow section
u is average velocity of flow in longitudinal direction
y is depth of flow
S_o is channel slope
S_f is friction slope
D is ratio between section A and flow width T (hydraulic depth)
g is gravitational acceleration

In this type of calculation should be checked if flow is critical throughout the channel (it may happen that within a channel run, flow is supercritical in a line and subcritical in another line)

If this doesn't happen, the flow at the given discharge condition is critical at every section throughout the full length of the channel will be then imposed and above equations are integrated by finite steps.

For more detailed information, we recommend to consult the following bibliography:

Open-Channel Hydraulics
Theory and analysis of gradually and spatially varied flow
FrenchR. H., 1985.

Open-Channel Hydraulics
VenTe Chow, 1987

Open Channel Flow
F.M. Henderson, 1966

DETAILS OF THE PROJECT

Hydrauliccalculation´sauthor: David González

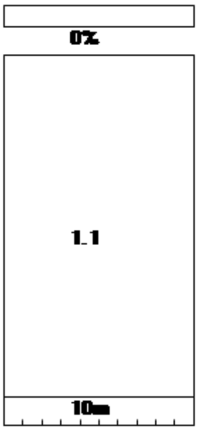
Designer notes:

PROJECT	Drainage Channels Design		
Run quantity	Description	Model	Quantity
1	L1 - L1 (10.00m)	KVE150.10R	10

INPUT DATA

Rain intensity	90mm/h
Kinematicviscosity	1.3E-06

INPUT DATA(L1)



SECTION	SLOPE	AREA	SURFACE	SURFACE RUNOFF
1	0.00	1.1	180m2	1.00
		1.2	0m2	1.00

NUMERICAL RESULTS (L1)

Run	Length (m)	Filling %	Total flow(l/s)	Max velocity (m/s)	Section	Model	Quantity
L1	10.00	51.58	4.5	0.72	1	KVE150.10R	10

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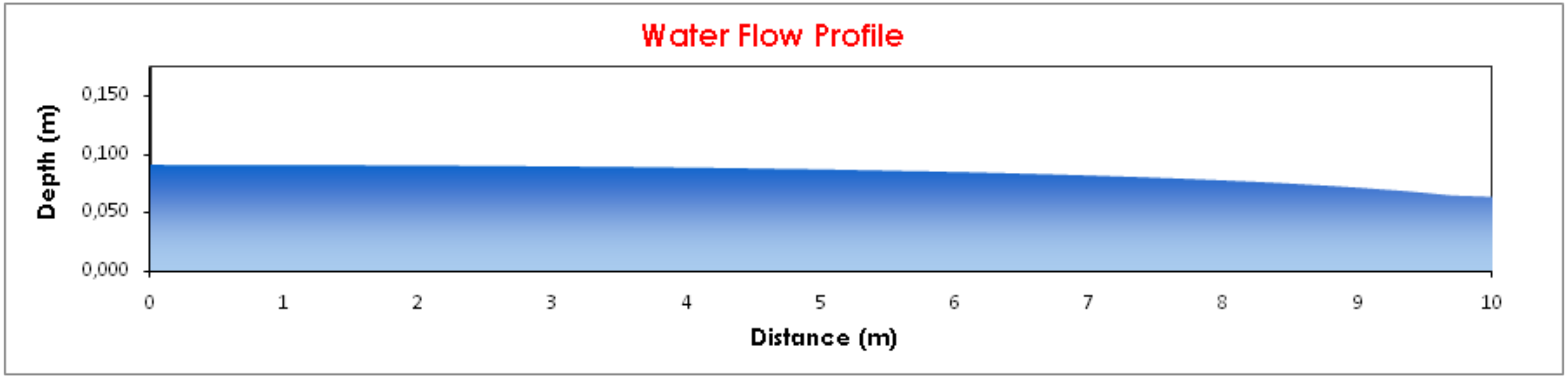
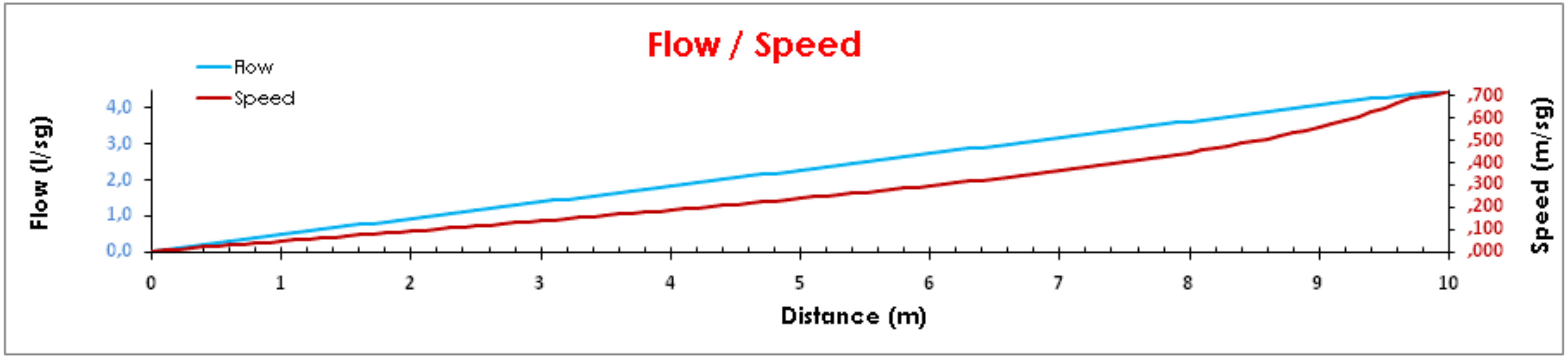
GRAPHIC RESULTS (L1)

KVE150.10R(10m)





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