

رجاء لكل من استخدم هذه المذكرات الدعاء لابني أيمن بالشفاء من كل داء

## هندسة الري و الصرف

و

## طرق الري الحديث

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Sprinkler Irrigation -

Drop Irrigation -

Central Pivot Irrigation -

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## مقدمة

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كيفية التعامل مع منطقة لإقامة مشروع ري

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## كيفية قراءة الخريطة الكونتورية من وجهة نظر الري

### أنواع الترع

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**Main Canals** -2

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**Branch Canals** -3

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**Distributor Canals** -4

## أنواع المصارف:

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## قواعد تخطيط شبكات الري والصرف السطحي :

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20000-50000	8-5	25-10	300-80	
50000-10000	12-8	5-2	25-10	
4000-1000	16-12	2.5-1.5	5-2	
300-200	20-15	0.50-0.25	2-1	
50-20	30-20	0.30	1-0.25	
10-5	50-30	0.120	0.30-0.10	

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15	3-2	5	
10	15-9	10	
5	30-20	30	

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### المقنن المائي

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## مناوبات الري

أسباب وجود مناوبات الري

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المناوبة الثانية

7

7

المناوبة الثالثة

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420

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760 ( )

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**السدة الشتوية**

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**أمثلة لحساب المقنن المائي:**

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**مقنن الصرف :**

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**Drainage Duty**:  $V^3$ 

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$$/ \quad /^3 \quad 35 \leftarrow 25 =$$

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$$/ \quad /^3 \quad 20 \leftarrow 6 =$$

**Drainage Factor**

/

**تصميم القطاعات العرضية للترع والمصارف**

(Discharge)

.(K=1/n)

(Longitudinal Slope)

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$$Q = \frac{1}{n} \cdot R^{\frac{2}{3}} \cdot S^{\frac{1}{2}} \cdot A$$

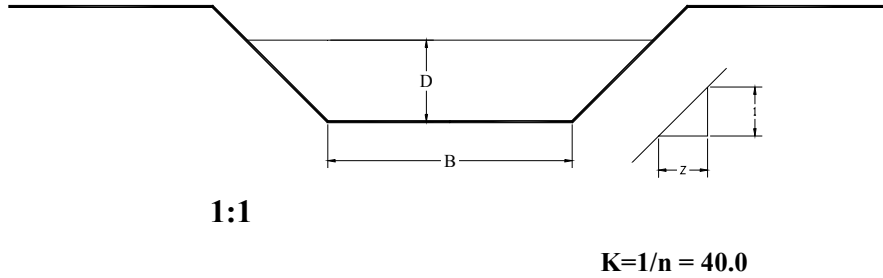
Where

Q Discharge of the water section

R Hydraulic radius = A/P



- P Wetted perimeter
- S Longitudinal Slope
- A Cross-sectional area of the water section.



$$\text{Area} = B * D + Z * D^2$$

$$P = B + 2D \sqrt{1 + Z^2}$$

: " "

Q, 1/n, Z, S

B,D

"Buckly"

B,D

:

$$D = \frac{(S+8)^2}{650} \cdot B$$

If D < 1.62 m

$$D = 0.10 \cdot \left( \frac{S}{2} + 4 \right) \cdot \sqrt{B}$$

If D > 1.62 m

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Buckly

S

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Manning

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Buckly

.Q, 1/n, Z and S

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Q

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$$Q = \frac{\text{Area Served}(\text{Fd}) * \text{Water Dutey}(\text{m}^3 / \text{Fd} / \text{Day})}{24 * 60 * 60} \quad \text{m}^3/\text{Sec.}$$

$$1/n = 40.0 \quad -2$$

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—:

$$Z=1$$

$$Z=1.5$$

$$Z=2.0$$

.Synoptic Diagram

-4

: B,D,Q

B m	D m	A =B(D+Z.D)	P =B+2D(1+Z) <sup>0.5</sup>	R A/P	Q = $\frac{1}{n} \cdot R^{\frac{2}{3}} \cdot S^{\frac{1}{2}} \cdot A$
1					
2					
3					
4					

Buckly

D

B

$$D > 1.62$$

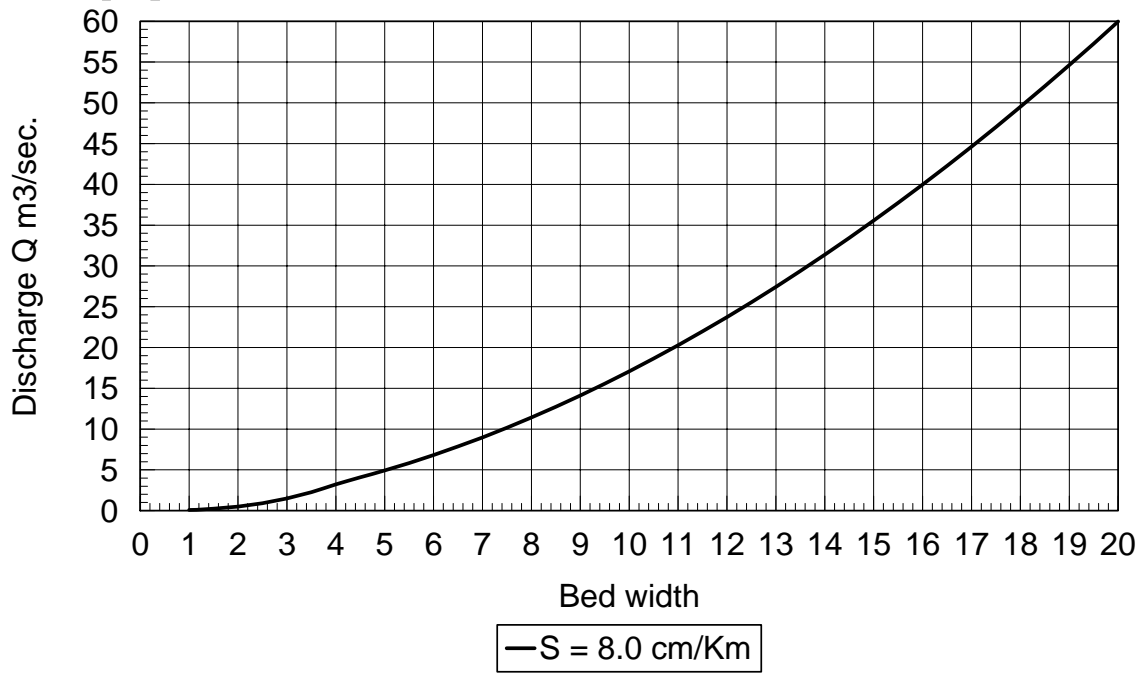
$$D < 1.62$$

:

B, Q



A



Side Slope 1:1, 1/n = 40.0

Q  
Buckly

1/n, S, Z

: BASIC

```
10  CLS:KEY OFF
20  PRINT "DESIGN OF WATER SECTIONS"
30  PRINT "BY USING MANING EQUATION"
40  PRINT "AND BUCKLY'S EMPRICAL EQUATIONS"
50  PRINT
60  INPUT "DISCHARGE OF THE CANAL IN M3/SEC";Q:PRINT
70  INPUT "LONGITUDINAL SLOPE IN CM/KM";S:PRINT
80  INPUT "MANING'S COEFFECIENT 1/n";K:PRINT
90  INPUT "SIDE SLOPE OF THE CANAL 1/S";SS:PRINT
100 B=.5
110 D=(S+8)^2/650*B
120 IF D <= 1.62 THEN 140
130 D=.1*(S/2+4)*(B)^.5
140 A=B*D+SS*D^2
150 P=B+2*D*(1+SS^2)^.5
160 R=A/P
170 QN=K*R^(2/3)*(S/100000!)^5*A
171 IF ABS(QN-Q) <=.001 THEN 190
180 B=B+.001:GOTO 110
190 PRINT "Q,B,D":PRINT QN,B,D
200 END
```

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	5.0	1.0	
	5.0-2.0	0.50	
	2.0-1.0	20	
	1.0		
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50	%40		2000		-1
		12	6	%10	%
.		<sup>3</sup> 760		<sup>3</sup> 420	
2.0		<sup>2</sup> 3.75			
			0.025	1:1	

$$\text{Water Duty (m}^3/\text{Fd/Day)} = \frac{420}{6} * 0.40 * \frac{1}{1} + \frac{720}{6} * 0.50 * \frac{1}{2} = 58.0 \text{ m}^3/\text{Fd./Day}$$

$$\begin{aligned} \text{Actual Water Duty} &= 1.1 * \text{Theoretical Water Duty} \\ &= 1.1 * 58.0 = 63.8 \text{ m}^3/\text{Fd./Day.} \end{aligned}$$

$$Q (\text{m}^3/\text{Sec.}) = \frac{\text{Area Served} * \text{Water Duty}}{24 * 60 * 60}$$

$$Q = \frac{2000 * 63.8}{24 * 60 * 60}$$

$$Q = 1.477 \text{ m}^3/\text{s.}$$

\*\*\*\*\*

	%45	<sup>3</sup> 1.50			-2
			<sup>3</sup> 400	%5	%50
.		4	4	<sup>3</sup> 720	

$$Q (\text{m}^3/\text{Fd/Day}) = \frac{400}{4} * 0.45 * \frac{1}{1} + \frac{720}{4} * 0.50 * \frac{1}{2} = 90.0 \text{ m}^3/\text{Fd./Day}$$

$$\begin{aligned} \text{Actual Water Duty} &= 1.1 * \text{Theoretical Water Duty} \\ &= 1.1 * 90.0 = 99.0 \text{ m}^3/\text{Fd./Day.} \end{aligned}$$

$$Q (\text{m}^3/\text{Sec.}) = \frac{\text{Area Served} * \text{Water Duty}}{24 * 60 * 60}$$



$$1.50 = \frac{A * 99.0}{24 * 60 * 60}$$

Area Served = 1309.1 Fd.

\*\*\*\*\*

$$24.0^3 \quad -3$$

90

0.24

0.37

<sup>3</sup> 420

%70

$$.2 \times \times 0.7 \times = ( - ) =$$

$$= (0.37-0.24) * 0.70 * 0.90 * 4200.83 = 344.048 \text{ m}^3/\text{Fd.}$$

24.0 =

/ =

$$= 344.048 / 24.0 = 14.33 \text{ days.}$$

/ × =

$$= (14.00 * 24) / 420 = 0.80 = 80.0 \%$$

## أمثلة على الهدارات

	4.00= (1)						-1
:	4 3 2	12000	.	450 5000 3500			

Data of the problem:

$$B_1 = 4.0 \text{ m} \quad A_1 = 12000 \text{ Fd.}$$

$$A_2 = 3500.0 \text{ Fd.} \quad A_3 = 5000.0 \text{ Fd.} \quad A_4 = 450.0 \text{ Fd.}$$

Requirements :

weir breadth

Equation of clear over fall weir is

$$Q = \frac{2}{3} C_d \cdot B \cdot \sqrt{2g} \cdot H^{1.5}$$

$$Q_1 = \frac{2}{3} C_d \cdot B_1 \cdot \sqrt{2g} \cdot H^{1.5}$$

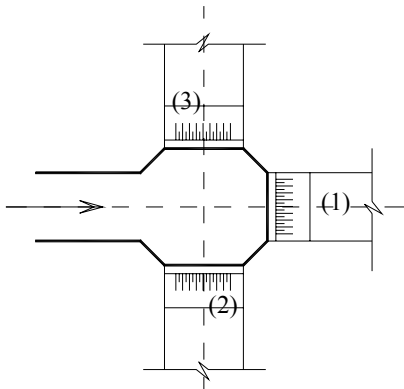
$$Q_2 = \frac{2}{3} C_d \cdot B_2 \cdot \sqrt{2g} \cdot H^{1.5}$$

$$\frac{Q_1}{Q_2} = \frac{B_1}{B_2} = \frac{A_1}{A_2}$$

$$B_2 = 1.167 \text{ m}$$

$$B_3 = 1.667 \text{ m}$$

$$B_4 = 0.15 \text{ m}$$



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1300 1400 2500 3 2 1 -

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$$1/n = 40 -$$

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0.5

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$C_d$  -2

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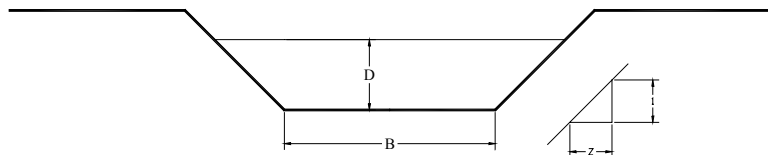
$$Q = \frac{\text{Water Duty} * \text{Area Served}}{24 * 60 * 60}$$

$$Q = \frac{40.0 * 2500.0}{24 * 60 * 60} = 11574 \text{ m}^3/\text{s}.$$

$$Q = \frac{1}{n} . R^{\frac{2}{3}} . S^{\frac{1}{2}} . A$$

$$\text{Area} = B * D + Z * D^2$$

$$P = B + 2D \sqrt{1 + Z^2}$$



and by using the computer program



$$B = 1.57602, D = 1.173529$$

. 20

2-1

$$B = 1.60 \text{ m}$$

$$A_1 = A_2, 1.17353(1.576 + 1.17353) = D_2(1.60 + D_2)$$

$$3.23 = 1.60 D_2 + (D_2)^2.$$

$$D_2 = 1.1664 \text{ m.}$$

(1)

$$h \text{ (head of water over the weir)} = 1.1664 / 3 = 0.38 \text{ m}$$

. 0.5

(1)

$$B = 1.60 - 0.50 = 1.10 \text{ m}$$

$$\frac{Q_1}{Q_2} = \frac{B_1}{B_2} = \frac{A_1}{A_2}$$

$$\frac{2500}{1400} = \frac{1.10}{B_2}$$

$$B_2 = 0.616 \text{ m.},$$

$$B_3 = (1300 / 2500) * 1.10$$

$$B_3 = 0.572 \text{ m.}$$

$$Q = \frac{2}{3} C_d \cdot B \cdot \sqrt{2g} \cdot H^{1.5}$$

$$1.1574 = 0.667 * C_d * 1.10 * 4.43 * (0.38)^{0.50}$$

$$C_d = 0.57$$

=

$$\frac{Q_1}{Q_2} = \frac{A_1}{A_2}$$

$$Q_2 = (1400 / 2500) * 1.1574 = 0.65 \text{ m}^3/\text{s.}$$

$$Q_3 = (1300 / 2500) * 1.1574 = 0.602 \text{ m}^3/\text{s.}$$

$$\text{Total discharge} = 1.1574 + 0.65 + 0.602 = 2.41 \text{ m}^3/\text{s.}$$







$$6.154 = 0.667 * 0.65 * 4.0 * (2 * 9.81)^{0.5} * (H)^{1.5}$$

$$H = 0.863 \text{ m.}$$

$$10.0 =$$

$$1.13 - 10.0 = \text{“Sill level”}$$

$$\text{Sill level} = 8.87$$

$$9.733 = 0.863 + 8.87 =$$

:

$$\frac{Q_B}{Q_C} = \frac{B_B}{B_C} \quad 2 / 3 = 4.0 / B_C \quad \mathbf{B_C = 6.0 \text{ m}}$$

$$\frac{Q_C}{Q_D} = \frac{B_C}{B_D} \quad 2.0 = 6.0 / B_D \quad \mathbf{B_D = 3.0 \text{ m}}$$

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$$Q = \frac{\text{Water Duty} * \text{Area Served}}{24 * 60 * 60}$$

$$\mathbf{Q_C = 13.846 \text{ m}^3/\text{s.}}$$

$$\mathbf{Q_B = 9.23 \text{ m}^3/\text{s.}}$$

$$\mathbf{Q_D = 6.923 \text{ m}^3/\text{s.}}$$

$$9.23 = \frac{50.0 * \text{Area Served}}{24 * 60 * 60} = A_B = 9.23 * 1728.0 \quad \mathbf{A_B = 15,949.44 \text{ Fd.}}$$

$$13.846 = \frac{50.0 * \text{Area Served}}{24 * 60 * 60} = A_C = 13.846 * 1728.0 \quad \mathbf{A_C = 23,925.88 \text{ Fd.}}$$

$$6.923 = \frac{50.0 * \text{Area Served}}{24 * 60 * 60} = A_D = 6.923 * 1728.0 \quad \mathbf{A_D = 11,962.94 \text{ Fd.}}$$

:( )

$$6.154 = \frac{50.0 * \text{Area Served}}{24 * 60 * 60} = A_B = 6.154 * 1728.0 \quad \mathbf{A_B = 10,634.11 \text{ Fd.}}$$

$$9.23 = \frac{50.0 * \text{Area Served}}{24 * 60 * 60} = A_C = 9.23 * 1728.0 \quad \mathbf{A_C = 15,949.44 \text{ Fd.}}$$

$$4.615 = \frac{50.0 * \text{Area Served}}{24 * 60 * 60} = A_D = 4.615 * 1728.0 \quad \mathbf{A_D = 7,974.72 \text{ Fd.}}$$

## التخزين

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240 - 260 - 200 - 105 - 88 - 44 - 60 - 50 - 130 - 180 - 200 - 235 .  
/ <sup>3</sup> 50

.(Hydrograph)

( <sup>3</sup> ) :

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Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
9.40	12.2	4.5	0.5	0.5	0.2	0.0	0.2	1.6	0.7	7.2	9.2

( <sup>3</sup> ) :

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2.70	2.70	3.0	3.0	3.30	3.0	2.70	2.70	3.0	3.60	3.30	3.0

(Tabulation)

Month	$Q_{In}$	$Q_{Out}$	$Q_{In} - Q_{Out}$	$\Sigma Q_{In} - Q_{Out}$	Reservoir	Wast
Jan	9.40	2.70	6.70	6.70	16.80	0.0
Feb	12.20	2.70	9.50	16.20	17.60	8.70
Mar	4.50	3.00	1.50	<b>17.70</b>	17.60	1.50
Apr	0.50	3.00	-2.50	15.20	15.10	0.0
May	0.50	3.30	-2.80	12.40	12.30	0.0
Jun	0.20	3.00	-2.80	9.60	9.50	0.0
Jul	0.00	2.70	-2.70	6.90	6.80	0.0
Aug	0.20	2.70	-2.50	4.40	4.30	0.0
Sep	1.60	3.00	-1.40	3.00	2.90	0.0
Oct	0.70	3.60	-2.90	<b>0.10</b>	0.00	0.0
Nov	7.20	3.30	3.90	4.00	3.90	0.0
Dec	9.20	3.00	6.20	10.20	10.1	0.0

( /<sup>3</sup> ) : -3

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
105	265	235	140	80	90	145	175	260	230	140	90

(Mass flow curve)

: 1941 1921 3 -4

Year	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926
Inflow	18.9	20.9	22.6	23.6	34.3	35.8	37.0	25.0	22.0	15.0	13.2	17.6	18.2	16.0	25.0
Outflow	28.5	34.5	19.0	19.0	19.0	19.0	28.2	14.3	19.6	22.2	18.1	18.0	18.0	21.3	18.0

Year	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941
Inflow	23.5	20.5	18.9	24.0	27.0	29.5	25.2	21.5	19.3	21.6	26.0	25.8	21.4	19.0	23.0
Outflow	25.1	19.5	26.0	27.7	18.0	18.0	18.0	17.0	17.0	17.0	22.0	18.0	20.0	31.0	20.0

(Hurst's Equation for Century Storage)

$$\frac{R}{\sigma} = \left( \frac{N}{2} \right)^K \dots\dots\dots (1)$$

:  
=R  
=N  
=K  
=σ

0.72

(Standard deviation)



$$\sigma = \left( \frac{\sum_{i=N}^{i=1} (Q_i - Q_m)^2}{N} \right)^{\frac{1}{2}} \dots\dots\dots (2)$$

and  $Q_m = \frac{\sum_{i=N}^{i=1} Q_i}{N} = \frac{691.3}{30} = 23.043$

Q <sub>In</sub>	18.9	20.9	22.6	23.6	34.3	35.8	37	25
Q <sub>In</sub> -Q <sub>m</sub>	-4.1433	-2.1433	-0.4433	0.5567	11.2567	12.7567	13.9567	1.9567
(Q <sub>In</sub> -Q <sub>m</sub> ) <sup>2</sup>	17.16693	4.593735	0.196515	0.309915	126.7133	162.7334	194.7895	3.828675

Q <sub>In</sub>	22	15	13.2	17.6	18.2	16	25	23.5
Q <sub>In</sub> -Q <sub>m</sub>	-1.0433	-8.0433	-9.8433	-5.4433	-4.8433	-7.0433	1.9567	0.4567
(Q <sub>In</sub> -Q <sub>m</sub> ) <sup>2</sup>	1.088475	64.69467	96.89055	29.62951	23.45755	49.60807	3.828675	0.208575

Q <sub>In</sub>	20.5	18.9	24	27	29.5	25.2	21.5	19.3
Q <sub>In</sub> -Q <sub>m</sub>	-2.5433	-4.1433	0.9567	3.9567	6.4567	2.1567	-1.5433	-3.7433
(Q <sub>In</sub> -Q <sub>m</sub> ) <sup>2</sup>	6.468375	17.16693	0.915275	15.65547	41.68897	4.651355	2.381775	14.01229

Q <sub>In</sub>	21.6	26	25.8	21.4	19	23		
Q <sub>In</sub> -Q <sub>m</sub>	-1.4433	2.9567	2.7567	-1.6433	-4.0433	-0.0433		
(Q <sub>In</sub> -Q <sub>m</sub> ) <sup>2</sup>	2.083115	8.742075	7.599395	2.700435	16.34827	0.001875		

And  $\sigma = 5.5382$

(1)

$$\frac{R}{5.5382} = \left( \frac{30}{2} \right)^{0.72}$$

**R = 38.918**

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$$\text{Log} \frac{S}{R} = -0.08 - 1.05 \left( \frac{Q_m - Q_d}{\sigma} \right)$$

:  
=S  
= Q<sub>d</sub>

.(The draft)

$$Q_d = \frac{\sum \text{Outflow}}{N} = \frac{631}{30} = 21.033$$

$$\text{Log} \frac{S}{38.918} = -0.08 - 1.05 \left( \frac{23.0433 - 21.0333}{5.5382} \right)$$

**S (The Starage Capacity) = 13.461**

: ( 30 = ) -5  
(<sup>3</sup> )

Period	1	2	3	4	5	6	7	8	9	10	11	12
Inflow	8.20	7.70	7.90	7.90	17.3	30.5	28.5	20.0	12.8	13.6	10.8	9.4

:  
10 4 /<sup>3</sup> 12  
4 11  
: