Table S1. Basic information of the control gates in the Jingshi section of the MRP.

Control gate No.	Stake No.	Gate bottom elevation (m)	Single hole width (m)	Number of holes
G48	970 + 379	70.403	6.6	3
G49	980 + 116	67.787	6.0	3
G50	1002 + 169	66.721	6.0	3
G51	1017 + 385	65.344	6.0	3
G52	1036 + 963	64.554	5.5	3
G53	1046 + 196	63.785	5.5	3
G54	1071 + 847	65.151	7.0	3
G55	1085 + 024	61.643	6.0	3
G56	1112 + 074	60.588	7.8	2
G57	1121 + 840	60.783	5.0	3
G58	1136 + 825	57.492	5.0	2
G59	1157 + 652	55.764	5.5	2
G60	1172 + 353	55.596	5.4	2
G61	1197 + 669	55.974	—	2

Table S2. Basic information of the diversion gates in the Jingshi section of the MRP.

Diversion gate No.	Stake No.	Diversion gate No.	Stake No.
F63	983 +866	F69	1079 + 569
F64	1007 + 496	F70	1104 + 313
F65	1030 + 769	F71	1117 + 631
F66	1036 + 023	F72	1156 + 414
F67	1061 + 371	F73	1180 + 707
F68	1070 + 370	F74	1195 + 724
F86	1121 + 720		

Table S3. Basic information of the exit gates in the Jingshi section of the MRP.

Exit gate No.	Stake No.	Exit gate No.	Stake No.
T42	977+801	T48	1096 + 976
T43	993+346	T49	1110 + 179
T44	1015+126	T50	1135 + 088
T45	1044+822	T51	1157 + 002
T46	1077+350	T52	1184 + 713
T47	1084+675	T53	1197 + 636

Table S4. Basic information of the channels in the Jingshi Section of the MRP.

Channel pool No.	Entrance	Outlet	Entrance bottom elevation (m)	Outlet bottom elevation (m)	Bottom width (m)	Slope coefficient	Design roughness
C1	G48	G49	70.403	69.821	10.0–22.2	2.5–3.0	0.014
C2	G49	G50	69.987	69.129	18.0–23.5	2.0–3.0	0.014
C3	G50	G51	68.879	68.360	18.0–21.5	2.5–3.0	0.014
C4	G51	G52	67.574	66.513	18.0–22.0	2.5–3.0	0.014
C5	G52	G53	66.284	65.998	15.0–16.5	3.0	0.014
C6	G53	G54	65.985	65.151	18.7–23.0	2.0–2.5	0.014
C7	G54	G55	65.151	64.264	18.5–23.0	2.0–2.5	0.014
C8	G55	G56	64.140	61.525	15.0–23.0	1.0–2.5	0.014
C9	G56	G57	61.143	60.783	18.5–22.5	0.75–2.5	0.014
C10	G57	G58	60.679	59.877	14.5–20.0	1.0–2.5	0.014
C11	G58	G59	59.767	58.649	7.5–12.5	0.8–2.5	0.014
C12	G59	G60	58.542	57.788	7.5–12.1	0.75–2.5	0.014
C13	G60	G61	57.696	55.974	7.5–13.0	0.75–2.5	0.014

Table S5. The initial state and constraint conditions of the control gate.

Gate No.	Initial water level (m)	Target water level (m)	Initial opening (mm)
G48	76.49	76.58	1010
G49	74.89	74.97	940
G50	73.82	73.89	930
G51	72.53	72.58	850
G52	71.31	71.36	1070
G53	70.48	70.52	1010
G54	69.4	69.44	720
G55	68.58	68.61	590
G56	65.92	65.93	1300
G57	65.21	65.21	480
G58	64.07	64.05	1030
G59	62.86	62.83	880
G60	61.99	61.99	640
G61	60.14	60.16	/