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Hydrological and water-use efficiency implications of geomorphological stratification in palaeochannels in the Northern Murray–Darling Basin

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Table S1. Profile descriptions for two deep cores outside the palaeochannel (Piezo 1) and inside the palaeochannel (Piezo 2). Samples were analysed at 0.5 m intervals, and therefore EC and pH measurements are averaged over the thickness of the identified horizon.

	Depth m	Description	EC _{1.5} μS cm ⁻¹	pH
Piezo 1	0.0 - 0.3	very dark grayish brown (10YR 3/2) clay	446	8.6
	0.3 - 3.0	dark grayish brown (10YR 4/2) clay with common CaCO ₃ nodules	363	8.6
	3.0 - 5.0	yellowish brown (10YR 5/4) clay with CaCO ₃ nodules and coarse Mn nodules	438	8.5
	5.0 - 6.3	light brownish gray (10YR 6/2) clay	337	8.3
	6.3 - 9.0	light yellowish brown (10YR 6/4) clay loam with common coarse subangular gravel	209	8.1
	9.0 - 9.3	strong brown (7.5 YR 5/6) sandy loam with common coarse subangular gravel	165	7.6
Piezo 2	0.0 - 1.0	dark brown (7.5YR 3/4) clay	225	8.3
	1.0 - 2.0	dark yellowish brown (10YR 4/4) clay loam	245	8.6
	2.0 - 4.2	dark yellowish brown (10YR 4/6) loam with common thin gravel lenses at 3.3m and grading to coarse sand at 4.0 m	123	8.0
	4.2 - 6.2	dark brown (7.5 YR 4/4) loamy coarse sand to sandy loam , common, thick coarse sand stringers , few thin clay lenses increasing with depth	84	7.8
	6.2 - 7.0	grey (2.5Y 6/1) clay loam with common coarse gravel	81	7.2
	7.0 - 8.0	light brownish gray (2.5Y 6/2) clay with common brownish yellow (10YR 6/6) inclusions and common fine gravel	89	6.8
	8.0 - 8.3	pale brown (10YR 6/3) clay loam with common coarse gravel	114	6.7
	8.3 - 9.3	strong brown (7.5YR 5/8) sandy loam with common medium to coarse angular gravel	71	7.0

Table S2. Hydraulic properties for the different soil textures in the VS2Di model as interpreted from Table S1. For the channel, nc means “no channel” and c means palæochannel.

Soil	depth (m)	Channel?	Ks (m/day)	Specific yield	saturated moisture	residual moisture	alpha	n
topsoil	0 - 0.5	nc	0.02739	0.05	0.4597	0.05664	0.0472	1.0889
topsoil	0 - 0.5	c	0.022143	0.07	0.4333	0.0459	0.558	1.0886
subsoil	0.5 - 1.0	c	0.0252	0.07	0.4304	0.048	0.518	1.097
subsoil	0.5 - 1.0	nc	0.04616	0.05	0.4577	0.0584	0.0427	1.097
subsoil	1.0 - 2.0	c	0.096	0.06	0.4575	0.057	0.0372	1.107
subsoil	1.0 - 2.0	nc	0.1092	0.09	0.4312	0.4312	0.0343	1.125
Channel	2.0 - 3.5	c	0.1807	0.11	0.4067	0.0412	0.0334	1.173
No- Channel	2.0 - 3.5	nc	0.0292	0.06	0.4426	0.0647	0.0549	1.093

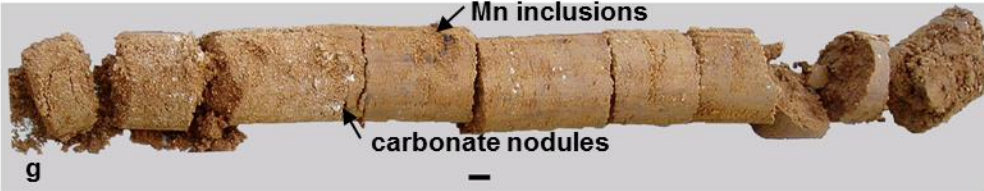
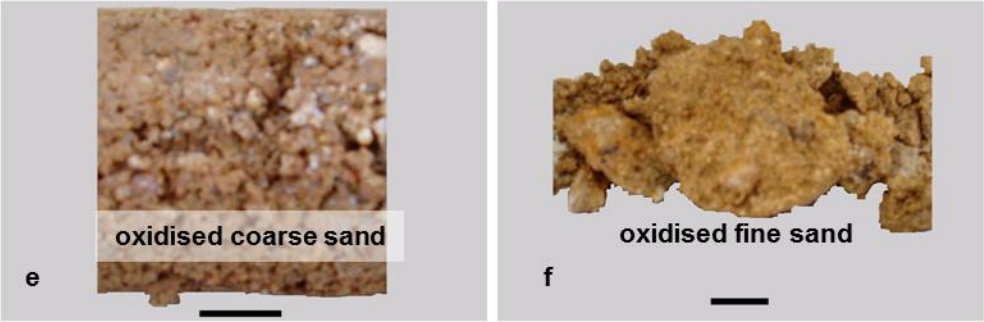
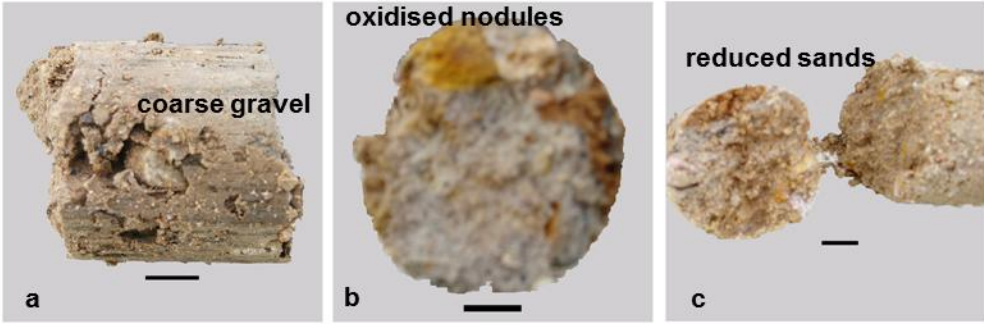


Figure S1. Subsections of cores from Piezo 2 (inside the palæochannel). Beneath the channel (a,b,c,d) a reduced layer of clay exists, which contains several deposits of coarse angular gravel and nodules of oxidised material. The top of the palæochannel (e,f,g) shows highly-oxidised fine and coarse sand with manganese inclusions and small carbonate nodules. The thick gravel deposit below the clay (h,i) contains significant amounts of sub-angular to sub-rounded gravel, similar in appearance to the thick deposit of gravel found below.

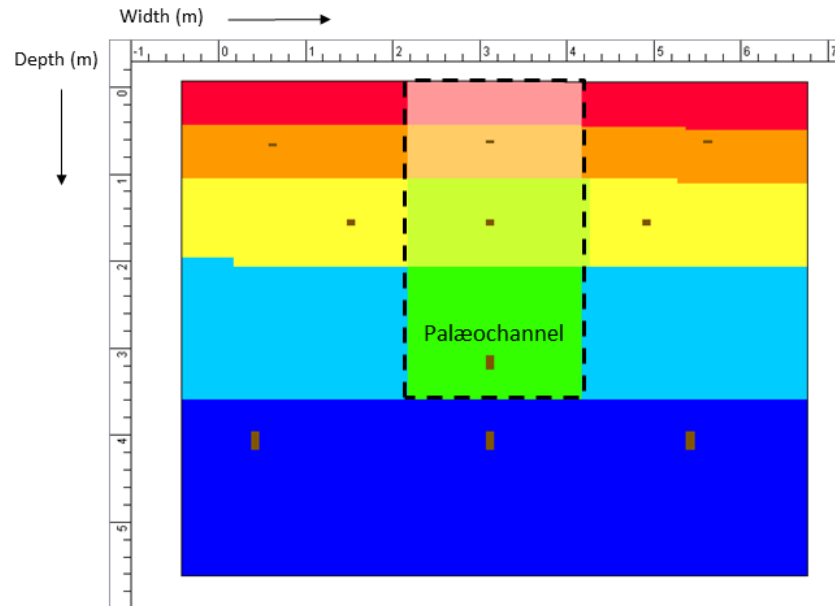


Figure S2. Cross section of the conceptualised palaeochannel system in VS2Di indicating the Soil Texture map with the location of observation points. The scale of the system is in meters. Each colour is a different soil texture (Table S2). Palaeochannel data for hydraulic properties are applied in the middle section of the domain (approximately indicated by the black dashed line), while the rest of the domain is parameterised with “no-channel” hydraulic properties

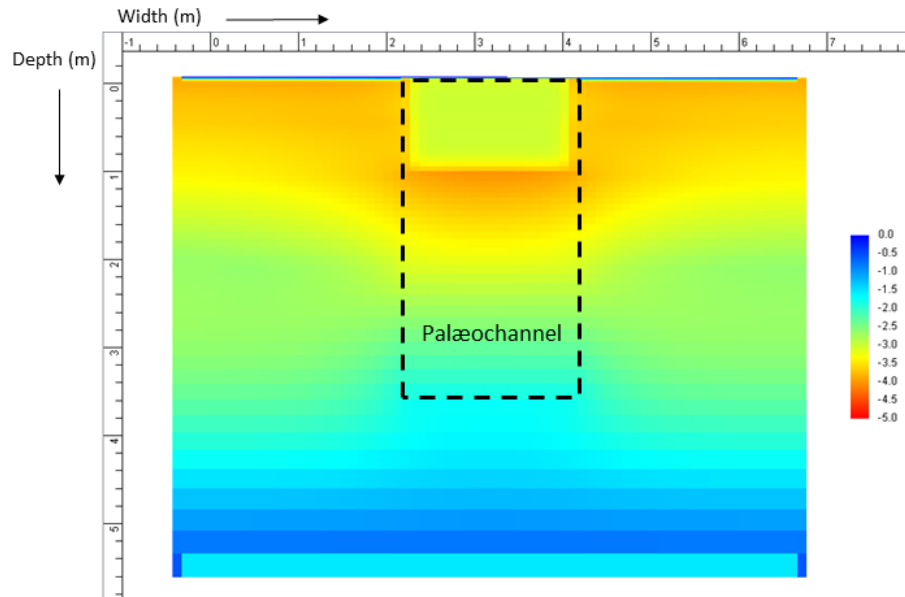


Figure S3. Cross section of the pressure head equilibrium profile after 24 hours of drainage of the initial conditions and at the start of the irrigation infiltration (with a groundwater table at 6 m depth). The colour scale on the left indicates the pressure head in m in the profile being 0 for saturated and negative for drier conditions. Approximate location of the palaeochannel sediments is indicated by the dashed black line.

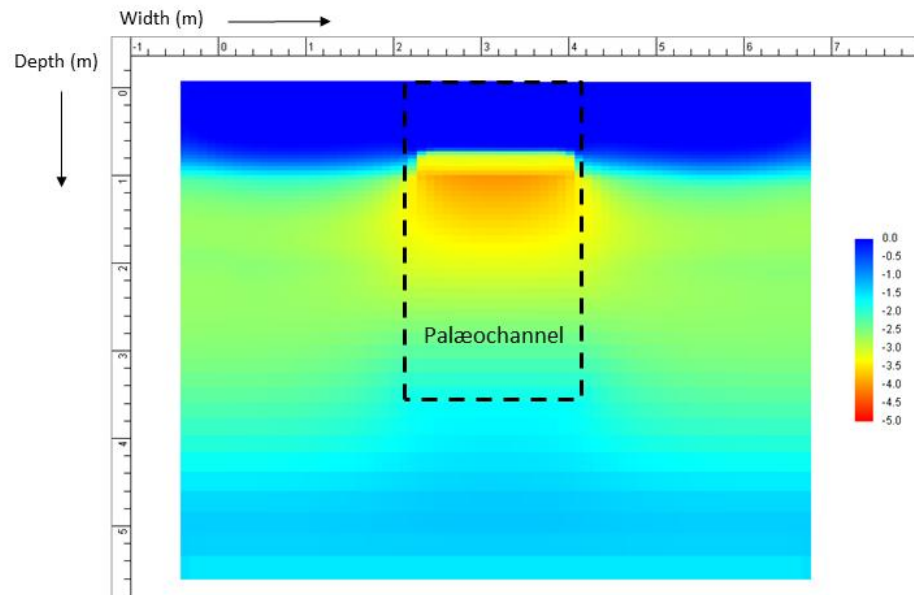


Figure S4. Cross sectional profile of the pressure head after 8 hours with 10 mm pressure head of surface irrigation. Colour scale on the left represents pressure heads in m in the profile. Approximate location of the palaeochannel sediments is indicated by the dashed black line.

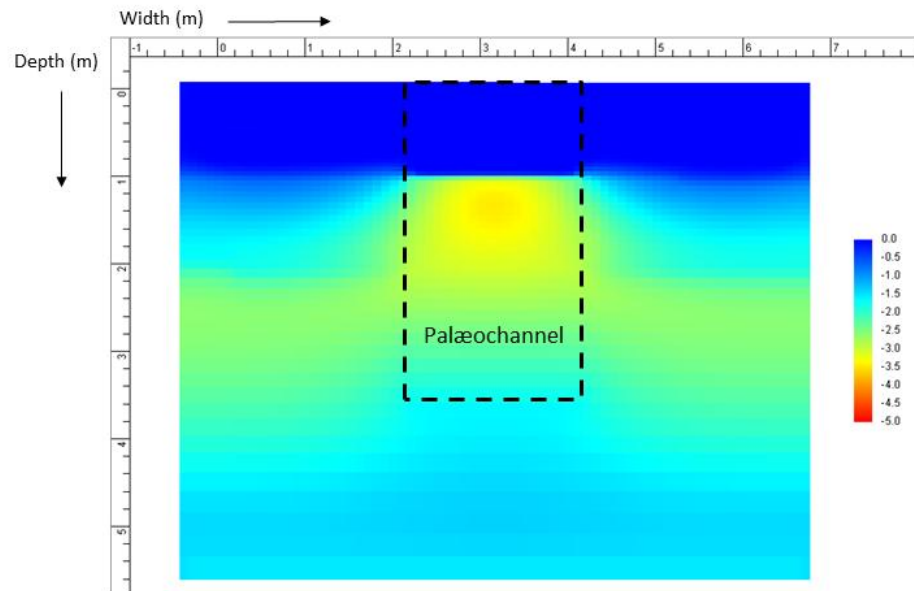


Figure S5. Cross sectional profile of the pressure heads at the end of 12 hours of irrigation with 10 mm of pressure head. This is 36 hours in model time. Colour scale represents pressure heads in m in the profile. Approximate location of the palæochannel sediments is indicated by the dashed black line.

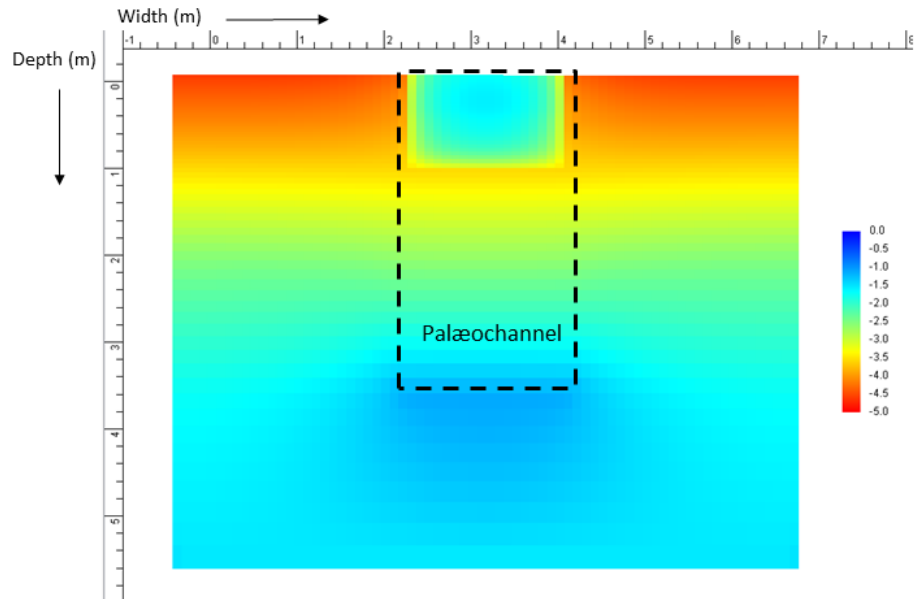


Figure S6. Cross sectional profile with final simulated pressure heads after 96 hours of transpiration post irrigation, 136 hours in model time. Colour scale represents pressure heads in m in the profile. Approximate location of the palæochannel sediments is indicated by the dashed black line.