



Sapphire Irrigation Consulting

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‘Limestone Park’ Irrigation Systems

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Irrigation systems specs

	'Hill' CP	'Flats' CP (part circle)	Lateral move
Irrigator make	Reinke	Reinke	Reinke, end-feed
Designed Flow Rate	20.0 L/s	18.3 L/s	18 L/s
Designed pressure (at centre)	33 psi, 228 kPa	16 psi, 110 kPa	15 psi, 103 kPa
Number of Spans	3 + overhang	3 + overhang	2 + overhang
Total length	150.4 metres	176.5 metres	135 metres
Emitter model	IWob UP3	IWob UP3	IWob UP3 #16 nozzle pack
Number of emitters along span – spec	Span 1: 11, Span 2: 16, Span 3: 16	Span 1: 12, Span 2: 21, Span 3: 21	Span 1: 16, Span 2: 21
Number of emitters along span – actual	Span 1: 11, Span 2: 16, Span 3: 16	Span 1: 12, Span 2: 20 , Span 3: 20	Span 1: 16, Span 2: 21
Wetted width (diameter) – end span	15.9 metres	14.0 metres	10.5 metres
Number of emitters on overhang	3	2	7
End gun	Nelson SR100 18deg 0.65	Nelson SR75 18deg 0.55	Nelson SR75 18deg 0.4
End gun radius – specified	33 metres	27.7 metres	22.8 metres
End gun radius – measured	25 metres	20 metres	25 metres
Pressure regulators	10 psi Senninger	10 psi Senninger	10 psi Senninger
Wetted area	9.6 ha	8.1 ha	22 ha



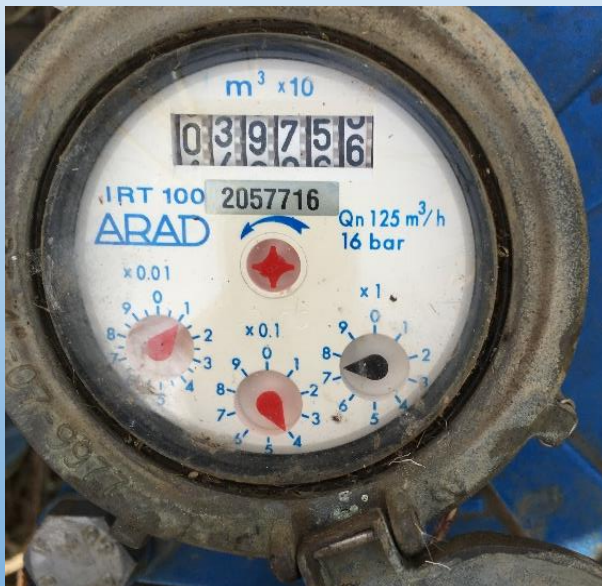
Pump specs

Brand:	Grundfos (river)	Stalker (well)
Model:	2RPSGC2C	65 HL
Inlet/Outlet:	80 x 50 – 250	N/A
Impeller size:	257 mm	271 mm
Suction lift:	5 m est	4 m est
Suction pipe:	8 m of 6 inch poly, foot-valve, coarse strainer plus shade cloth	4.1 m of 6 inch poly, foot-valve, coarse strainer, 90 degree gal curve, offset reducer
Motor:	Teco, 22 kW, 2935 rpm	Western Electric, 30 or 37 kW, 2955 rpm



Water meters

- **Water meter validation** April 2016 by Certified Meter Installer:
river meter reads +22.8%, well meter reads +9.9%
- Rex is either putting on less than planned or paying excess for water



	ARAD IRT 100 2057716 – River pump		ARAD – Well pump
	'Hill' centre pivot	'Flats' centre pivot	Lateral Move
Specified flow rate:	19.99 L/s	18.3 L/s	18.0 L/s
Measured flow rate:	23.8 L/s	16.7 L/s	22.2 L/s
Adjusted flow rate:	19.4 L/s	13.6 L/s	20.2 L/s
Difference specified to measured:	-3%	-25.7%	+12%

Irrigation performance

- Factors measured: uniformity (DU, CU), application amount, application rate, flow rate from sprinklers, total dynamic head (pressure), power use



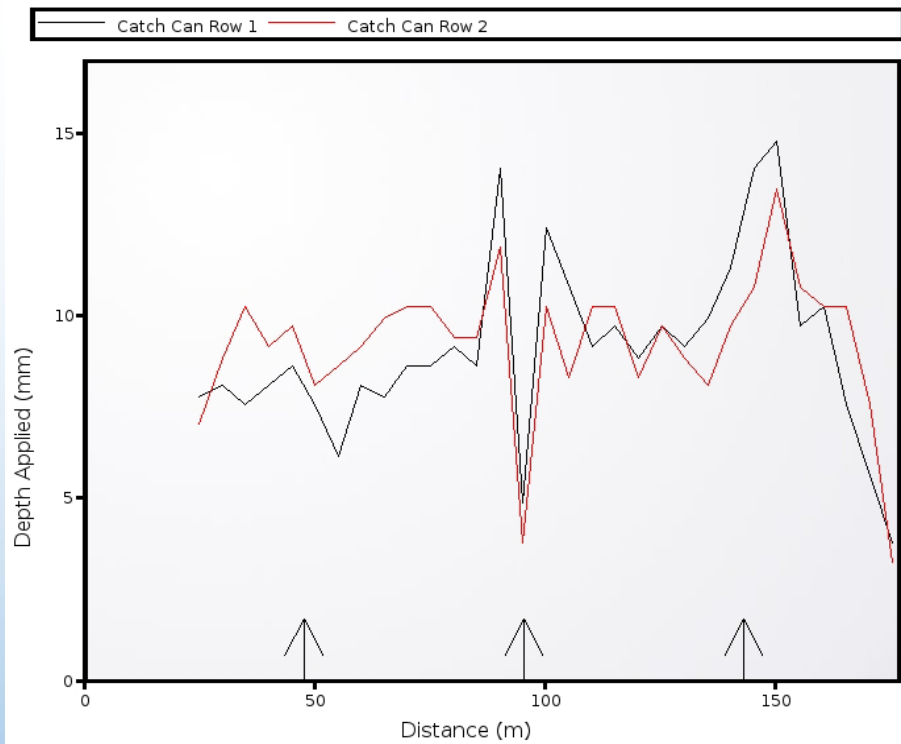
	Hill CP	Flats CP	Lateral Move
Depth setting – control panel	12.0 mm	12.0 mm	12.0 mm
Nominal Average Application Depth:	9.7 mm	10 mm	--
Measured Average Appl'n Depth:	9.0 mm	8.7 mm	44.1 mm
Difference between measured AAD and control panel:	-25%	-28%	+268%

Irrigation performance

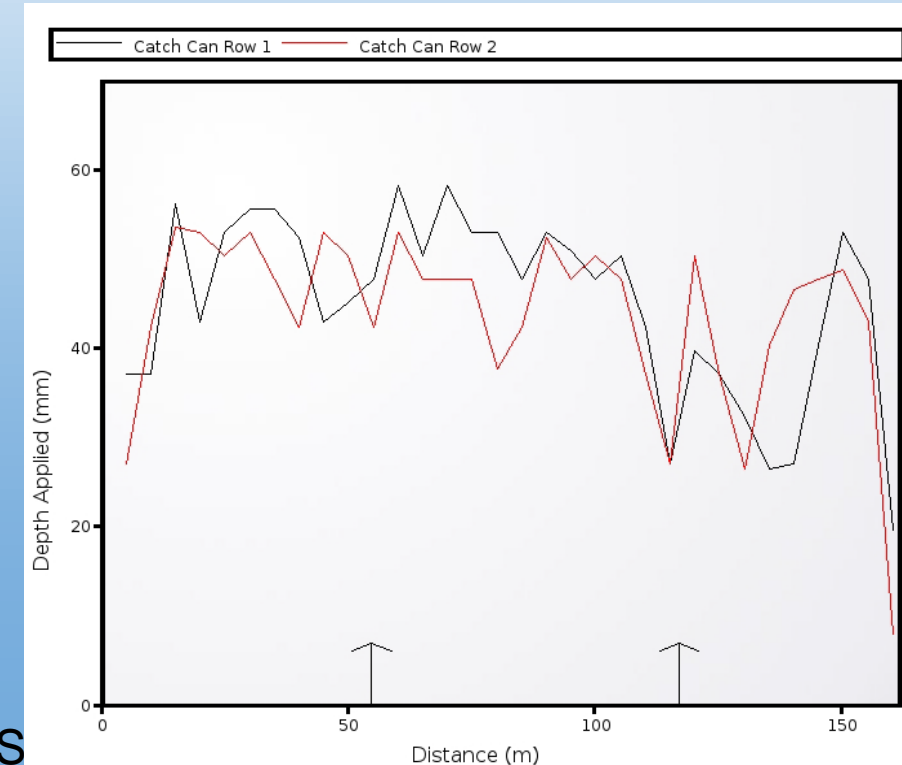
	Hill CP	Flats CP	Lateral Move
Distribution Uniformity:	65%	79%	68%
Coefficient of Uniformity:	83%	86%	82%

The benchmark for DU and CU is 90%.

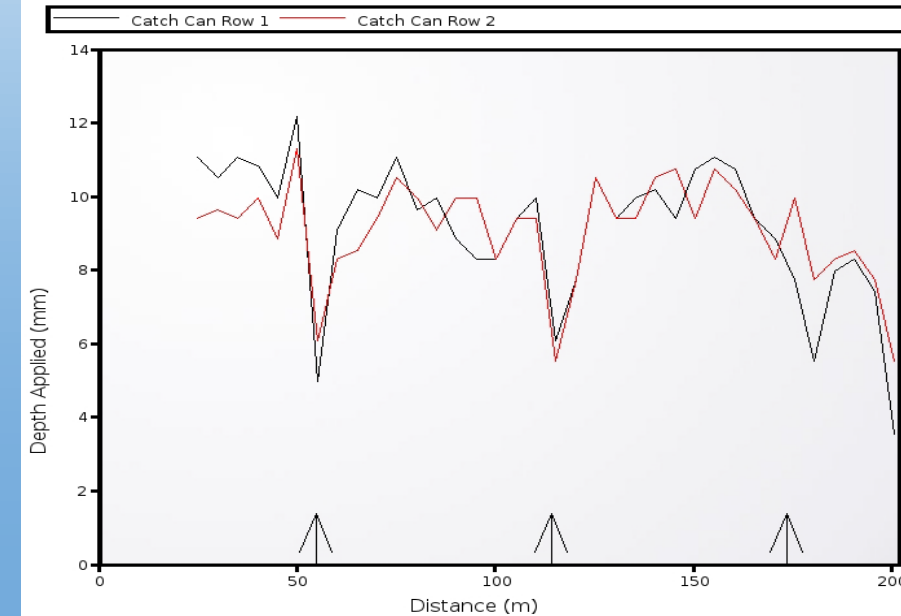
'Hill' CP



Lateral move



'Flats' CP



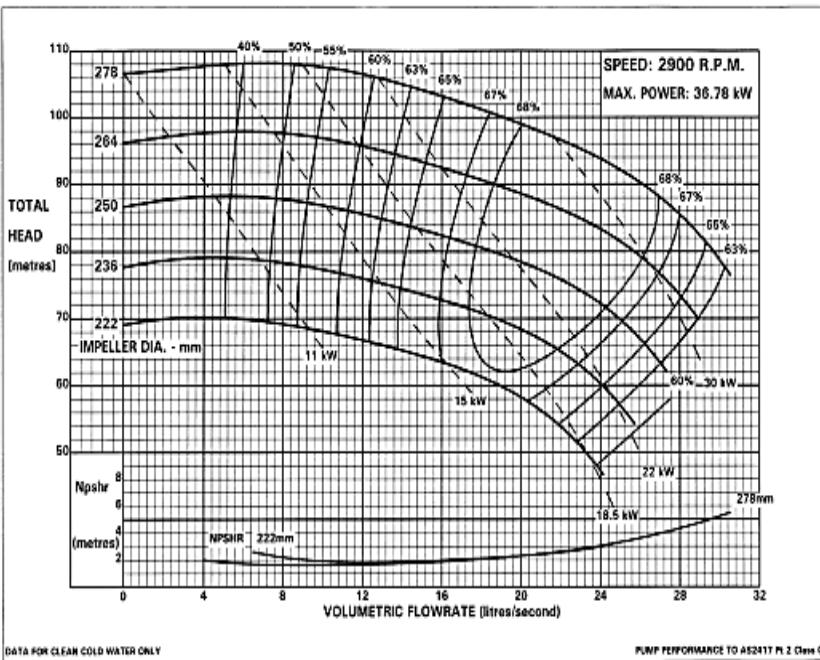
Irrigation performance

	Hill CP	Flats CP	Lateral Move
Pressure at centre/cart:	-6%	+41%	-33%
Pressure at end (above emitter):	O/H sprinkler 3: +98%	O/H sprinkler 2: +29%	O/H sprinkler 2: -100%
Emitter flow rate:	-20%	-11%	-15%
Average Application Rate:	32 mm/h	34 mm/h	36 mm/h



Pump performance

- Pump efficiency = (Flow × Head) ÷ (power consumed × motor efficiency)



	Hill CP	Flats CP	Lateral Move
Flow rate:	19.4 L/s	13.6 L/s	20.2 L/s
Total Head:	57.15 m	22.34 m	15 m
Power consumed:	25.7 kW	27 kW	-
Motor efficiency:	0.93 (93%)	0.93 (93%)	-
Pump efficiency:	46%	12%	-

Electric motor attached to the river pump rated at 22 kW – **burnout risk**



Irrigation performance – potential savings

	Irrigated Ha	Assumed ML pumped per season @CWU 5 ML/ha
Hill CP	9.5	47.5 ML
Flats CP	8.1	40.5 ML
LM	22	110 ML

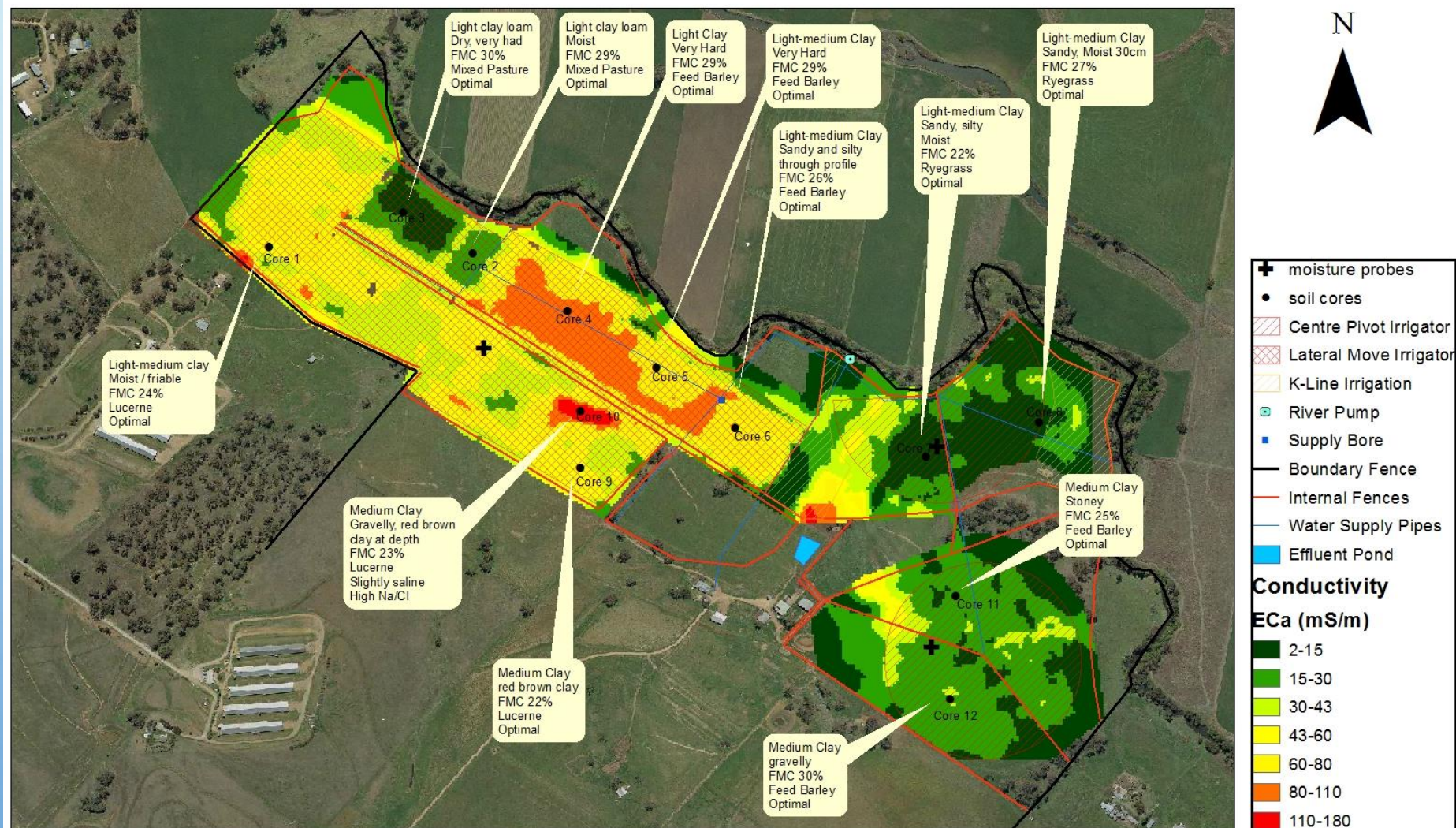


	Running costs saving per season		Cost of new pump	Seasons to pay back	
	@ 0.14 \$/kWh	@ 0.25 \$/kWh		@ 0.14 \$/kWh	@ 0.25 \$/kWh
Pump eff 70%	\$4,267	\$7,618	\$8,195	1.9	1.1

Irrigation scheduling

Soil moisture monitoring – selected sites by 'majority' soil type from EM survey

Limestone Park' Rex Tout - Irrigation, EM Survey and Soil Type



Irrigation scheduling

Soil moisture monitoring

- One site for each system
 - ‘Hill’ CP: 15 and 40 cm, rain gauge
 - ‘Flats’ CP: 15, 40, 120 cm
 - Lateral move: 15, 40, 120 cm
- ‘Watermark’ porous-media tension blocks – indicate plant stress
- ‘Tain’ loggers, telemetry, internet graphics



Irrigation scheduling

