March 23, 2023
Manitoba Sustainable Development Client File No: 5577.00
Manitoba Sustainable Development EAL No: 3010

Attention: Kristy Forrestall, Environment Officer
Manitoba Environment, Climate and Parks
Environmental Compliance and Enforcement Branch
Box 13, 1129 Queens Avenue
Brandon, MB R7A 1L9

Dear Kristy Forrestall,

Reference: Daly Irrigation Development Project – 2022 Monitoring Report

On behalf of Daly Irrigation Development Group (DIDG; the Licencee), AgriEarth Consulting Ltd. (AgriEarth) submits the following 2022 monitoring report for the Daly Irrigation Development Project (the Project). This letter provides a summary and status of monitoring data collected in 2022, to meet the requirements of *Environment Act* Licence No. 3010 (the Licence), issued on July 5, 2012, and modifications to the monitoring requirements provided in a letter from Manitoba Conservation and Climate (formerly Manitoba Conservation and Water Stewardship) dated April 16, 2015.

The following information is presented:

- Upstream and downstream flows, volumes and rates of water pumped, and durations of pumping as prescribed by Clause 21 of the Licence.
- Results of the Dissolved Oxygen Monitoring Program as prescribed by Clause 22 of the Licence.
- Photographs of the Little Saskatchewan River riffle bed exposure immediately downstream of the diversion point of the Project as prescribed by Clause 23 of the Licence.

MEASUREMENT OF UPSTREAM AND DOWNSTREAM FLOW RATES

In accordance with Clause 21 of the Licence, flow rates are to be recorded upstream and downstream of the diversion point on a daily basis while irrigation is occurring when upstream flows are less than 6.0 m^3/s.

The upstream monitoring point is located at the Water Survey of Canada (WSC) Little Saskatchewan River near Rivers (05MF018) hydrometric station, close to the crossing of Highway 25 over Little Saskatchewan River. WSC flow and level data recorded at this station is used to monitor the river condition upstream of the diversion point.

Reference: Daly Irrigation Development Project – 2022 Monitoring Report

Flows downstream of the diversion point were estimated by subtracting the maximum daily pumping discharge from the average daily upstream flow rate. These rates were calculated on a daily basis throughout the irrigation period (June 15 to September 15, 2022).

Figure 1 shows the average daily upstream flow rates and the estimated downstream flow rates relative to the minimum in-stream flow of 0.524 m^3/sec prescribed in the Licence. Throughout the irrigation period the estimated average daily flows downstream of the diversion point were above the minimum instream flow requirement of 0.524 m^3/sec.

VOLUMES AND RATES OF WATER PUMPED

A summary of daily pump volumes and rates recorded at the diversion point are provided in Table 1. Flow meters on the pumps measure instantaneous flow rate, total daily volume and accumulated volumes over the season. As such, duration of pumping is not required to determine volume and rates.

The daily maximum pumping rate did not exceed the maximum pumping rate of 0.555 m^3/s specified by the Licence. The daily maximum pumping rate was 0.467 m^3/s and occurred on August 6, 2022.

A total volume of 437,292,000 US gallons or 1,342 ac-ft or 1,655,330 m^3 were pumped for irrigation in 2022.

DISSOLVED OXYGEN CONCENTRATION

In accordance with Clause 22 of the Licence, a Dissolved Oxygen (DO) Monitoring Program was implemented in spring of 2017 with deployment of the HOBO® U26-001 DO Logger. The purpose of the DO Monitoring Program is to determine if the Project is having an impact on DO concentration and fish habitat within the Little Saskatchewan River downstream from the diversion point. Under the monitoring program, DO is to be monitored when flow rates in the Little Saskatchewan River fall below 6 m^3/s. Impacts to fish habitat are conceivable when DO concentration drops to 2-4 mg/L. Fish kills may occur at DO concentrations of <2 mg/L. Optimal habitat conditions within the river are achieved at a DO concentration of 5-8 mg/L.

The DO logger installed on August 28, 2022 as Little Saskatchewan flows upstream of the diversion were approaching 6 m^3/s. Measurements were recorded between August 28 and November 22, beyond the end of the irrigation period which ended on September 15.

Daily average, minimum, and maximum DO concentration and daily average temperature were calculated from the logger data and are summarized in Figure 2. The daily average DO concentration did not fall below the lower limit of the optimum range of 5 mg/L during the portion of the irrigation period monitored. The recorded minimum DO concentration was 6.0 mg/L on September 8, 2022. The average DO concentration over the portion of the irrigation period when DO was monitored was 9.1 mg/L.

Reference: Daly Irrigation Development Project – 2022 Monitoring Report

RIFFLE MONITORING

Under Clause 23 of the Licence, the Licencee is required to provide photographs of the riffle bed exposure in the Little Saskatchewan River downstream from the Project's diversion point during the irrigation season.

A trail camera was not installed for the 2022 monitoring season. However, an extensive record of photos across a wide range of flows has been inventoried over previous monitoring seasons since the commencement of the project in 2012.

The lowest estimated flow downstream of the diversion during the irrigation period and when pumping withdrawal was occurring was on September 12, 2022, when flow upstream of the diversion was 2.603 m^3/sec and an average of 0.047 m^3/sec was used for the Project, resulting in an estimated flow downstream of the diversion of 2.556 m^3/sec. This is an estimated 2.032 m^3/sec above the minimum instream flow rate of 0.524 m^3/sec. A photo from the 2019 monitoring season taken during a comparable flow rate is provided in Photo 1 (Attachment C).

Reference: Daly Irrigation Development Project – 2022 Monitoring Report

CLOSURE

This letter report was prepared by AgriEarth Consulting Ltd. The letter, including all contents and attachments, reflects the professional judgment of AgriEarth Consulting Ltd., and was developed based on existing and available information at the time it was published. Information provided by other parties was not verified by AgriEarth Consulting Ltd. Use of information in this report by a third party is done so at the sole responsibility and risk of the third party. AgriEarth Consulting Ltd. cannot be held responsible whatsoever for uses by the third party, including any costs or damages of any kind, if any, suffered by it or any other third party, as a result of decisions made or actions taken based on information in this document.

We trust the information presented satisfies the annual monitoring report requirements under the Licence. Should you have any questions on the information presented, please contact the undersigned.

Regards,

David Whetter, M.Sc., P.Ag.
Professional Agrologist
335 Elm Street
Winnipeg, MB R3M 3N6
c: (204) 799-4877
e: david.whetter@agriearth.ca

Attachment: Attachment A – Figures
Attachment B – Water Use Summary
Attachment C – Riffle Photos

c. Paul Adriaansen – Spud Plains Farms Ltd., Ray Redfern & Gary Pokotylo – Redfern Family Farms, Steve Saunderson – Choice Agri Ltd.; Bruce Webb & Jay Mak – Manitoba Environment, Climate and Parks

dw projects/didg_rivers/3_reports/reports/2022/let_didg_eal3010_monitoring_2022_final_20230323.docx

Attachments

Reference: Daly Irrigation Development Project – 2022 Monitoring Report

Attachment A

Figures

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Attachments

Reference: Daly Irrigation Development Project – 2022 Monitoring Report

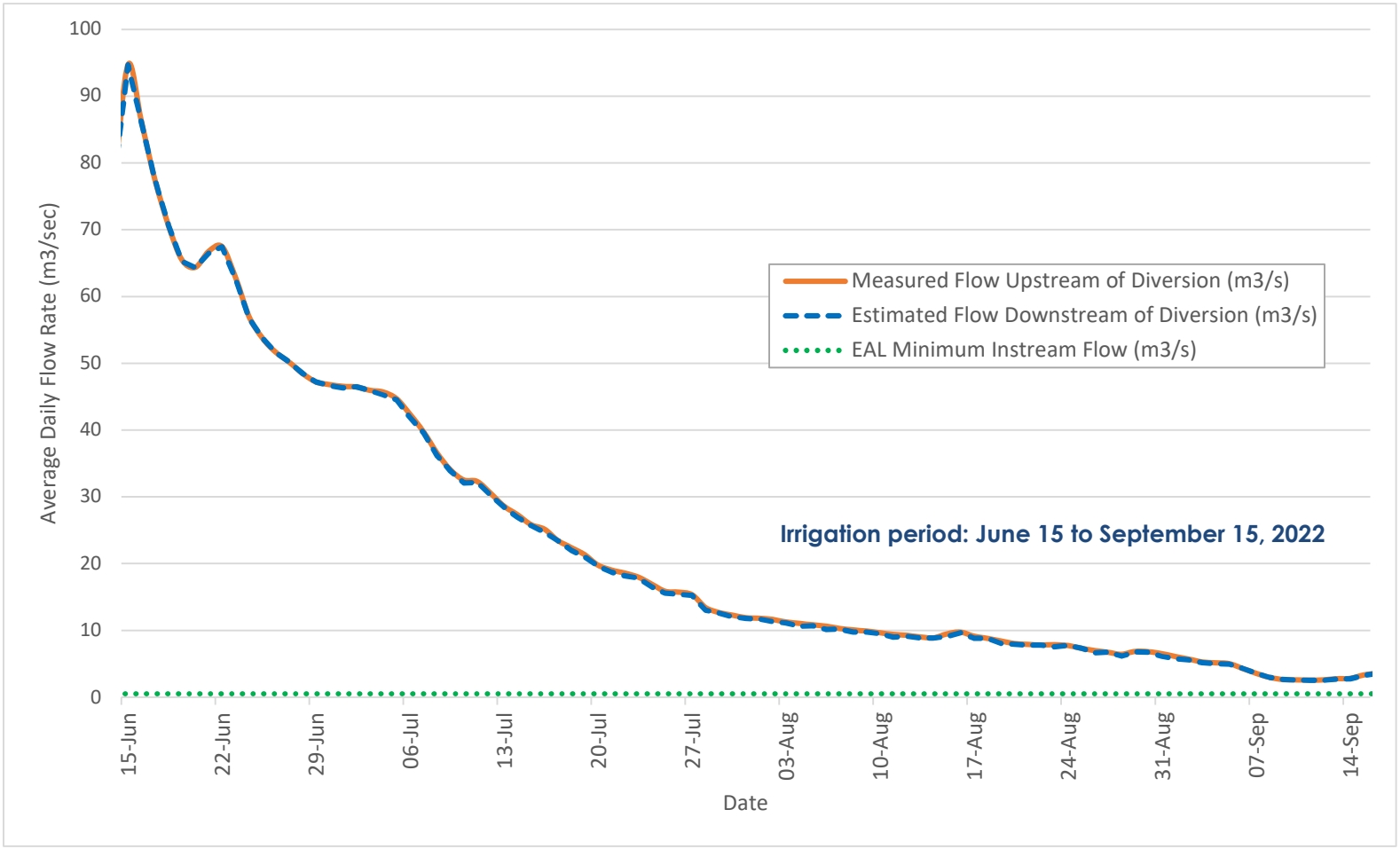

Figure 1: Average daily discharge upstream and downstream of diversion between June 15 and September 15, 2022

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Attachments

Reference: Daly Irrigation Development Project – 2022 Monitoring Report

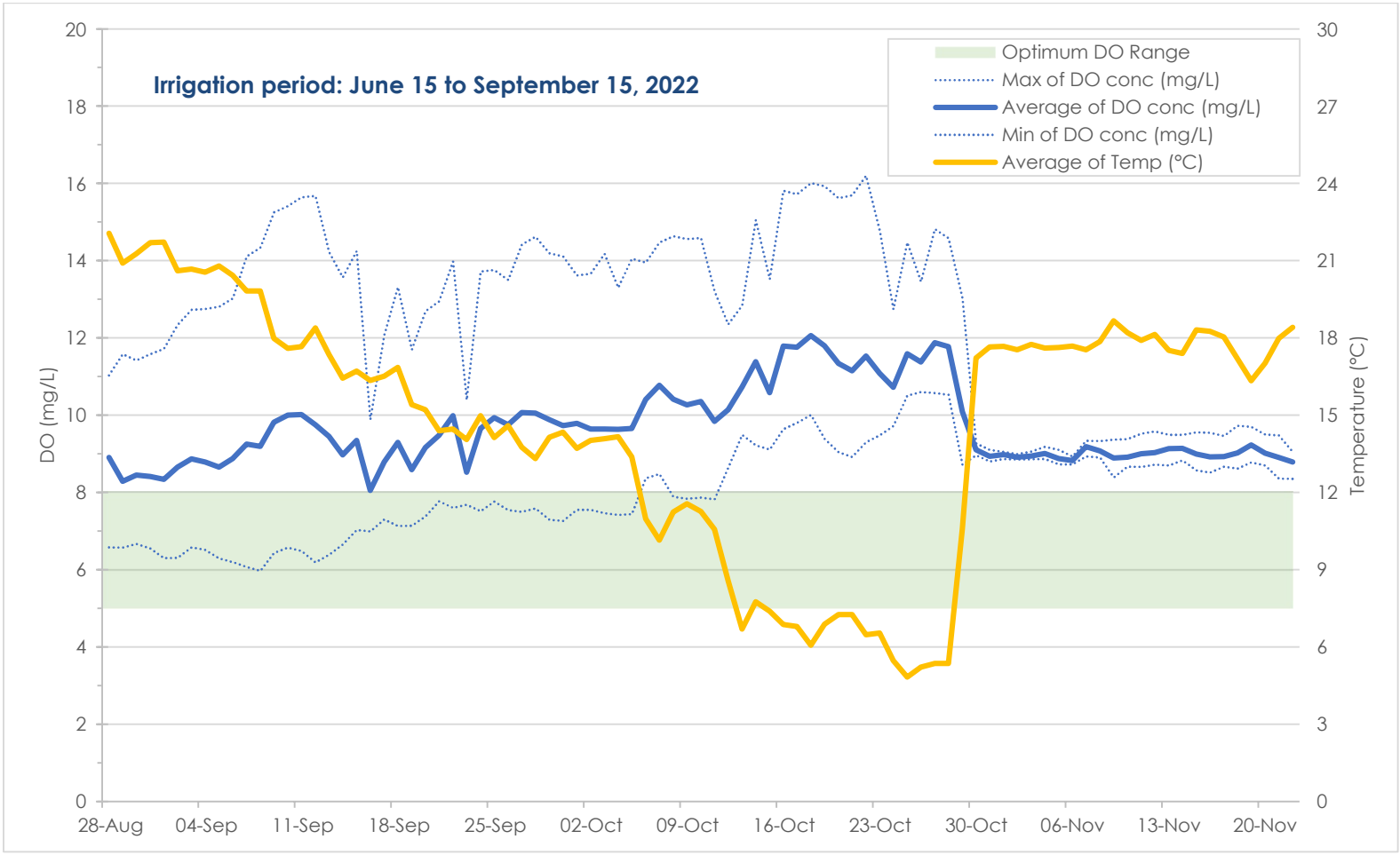

Figure 2: Daily dissolved oxygen concentration and temperature downstream of the diversion

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Attachment B

Water Use Summary

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Attachments

Reference: Daly Irrigation Development Project – 2022 Monitoring Report

Date	Spud Plains (Keyriver) Intake Location: NW 10-12-21W Pump Capacity: 2000 US gpm (0.1262 m³/s)		Redfern Intake Location: NW10-12-21W Pump Capacity: 2400 US gpm (0.1514 m³/s)		Spud Plains Intake Location: NW10-12-21W Pump Capacity: 4000 US gpm (0.2542 m³/s)		Total Volume Pumped (gal)	Total Volume Pumped (ac-ft)	Total Volume Pumped (m³)	Max Pumping Rate (gal/min)	Max Pumping Rate (m³/s)
	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)					
2022-06-14	0	0	0	0	0	0	0	0.0	0	0	0.000
2022-06-15	2,880,000	1,000	0	0	0	0	2,880,000	8.8	10,902	1,000	0.063
2022-06-16	0		0	0	0	0	0	0.0	0	0	0.000
2022-06-17	1,440,000	1,000	0	0	0	0	1,440,000	4.4	5,451	1,000	0.063
2022-06-18	0		0	0	0	0	0	0.0	0	0	0.000
2022-06-19	3,600,000	2,000	0	0	2,304,000	1,600	5,904,000	18.1	22,349	3,600	0.227
2022-06-20	0		0	0	0	0	0	0.0	0	0	0.000
2022-06-21	3,360,000	2,000	0	0	3,456,000	2,400	6,816,000	20.9	25,801	4,400	0.278
2022-06-22	0	0	0	0	0	0	0	0.0	0	0	0.000
2022-06-23	1,440,000	1,000	0	0	4,608,000	3,200	6,048,000	18.6	22,894	4,200	0.265
2022-06-24	2,880,000	2,000	0	0	3,456,000	2,400	6,336,000	19.4	23,984	4,400	0.278
2022-06-25	0	0	0	0	0	0	0	0.0	0	0	0.000
2022-06-26	0	0	0	0	0	0	0	0.0	0	0	0.000
2022-06-27	0	0	0	0	0	0	0	0.0	0	0	0.000
2022-06-28	0	0	0	0	0	0	0	0.0	0	0	0.000
2022-06-29	0	0	0	0	0	0	0	0.0	0	0	0.000
2022-06-30	1,440,000	1,000	0	0	2,304,000	1,600	3,744,000	11.5	14,173	2,600	0.164
2022-07-01	5,760,000	2,000	0	0	2,304,000	1,600	8,064,000	24.7	30,526	3,600	0.227
2022-07-02	0	0	0	0	0	0	0	0.0	0	0	0.000
2022-07-03	0	0	0	0	0	0	0	0.0	0	0	0.000
2022-07-04	2,880,000	1,000	2,904,000	2,200	11,520,000	4,000	17,304,000	53.1	65,503	7,200	0.454
2022-07-05	0	0	2,904,000	2,200	0	0	2,904,000	8.9	10,993	2,200	0.139
2022-07-06	2,880,000	1,000	2,904,000	2,200	11,520,000	4,000	17,304,000	53.1	65,503	7,200	0.454

Attachments

Reference: Daly Irrigation Development Project – 2022 Monitoring Report

Date	Spud Plains (Keyriver)		Redfern		Spud Plains		Total Volume Pumped (gal)	Total Volume Pumped (ac-ft)	Total Volume Pumped (m^3)	Max Pumping Rate (gal/min)	Max Pumping Rate (m^3/s)
	Intake Location: NW 10-12-21W		Intake Location: NW10-12-21W		Intake Location: NW10-12-21W						
	Pump Capacity: 2000 US gpm (0.1262 m^3/s)		Pump Capacity: 2400 US gpm (0.1514 m^3/s)		Pump Capacity: 4000 US gpm (0.2542 m^3/s)						
	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)					
2022-07-07	0	0	2,904,000	2,200	0	0	2,904,000	8.9	10,993	2,200	0.139
2022-07-08	3,120,000	2,000	2,904,000	2,200	3,456,000	2,400	9,480,000	29.1	35,886	6,600	0.416
2022-07-09	0	0	2,904,000	2,200	0	0	2,904,000	8.9	10,993	2,200	0.139
2022-07-10	2,880,000	1,000	2,904,000	2,200	11,520,000	4,000	17,304,000	53.1	65,503	7,200	0.454
2022-07-11	0	0	2,904,000	2,200	0	0	2,904,000	8.9	10,993	2,200	0.139
2022-07-12	1,440,000	1,000	0	0	4,608,000	3,200	6,048,000	18.6	22,894	4,200	0.265
2022-07-13	0	0	2,904,000	2,200	0	0	2,904,000	8.9	10,993	2,200	0.139
2022-07-14	2,880,000	2,000	2,904,000	2,200	3,456,000	2,400	9,240,000	28.4	34,977	6,600	0.416
2022-07-15	0	0	2,904,000	2,200	0	0	2,904,000	8.9	10,993	2,200	0.139
2022-07-16	2,880,000	1,000	2,904,000	2,200	11,520,000	4,000	17,304,000	53.1	65,503	7,200	0.454
2022-07-17	0	0	0	0	0	0	0	0.0	0	0	0.000
2022-07-18	1,440,000	1,000	2,904,000	2,200	4,608,000	3,200	8,952,000	27.5	33,887	6,400	0.404
2022-07-19	2,880,000	1,000	0	0	11,520,000	4,000	14,400,000	44.2	54,510	5,000	0.315
2022-07-20	0	0	2,904,000	2,200	0	0	2,904,000	8.9	10,993	2,200	0.139
2022-07-21	1,440,000	1,000	2,904,000	2,200	2,304,000	1,600	6,648,000	20.4	25,165	4,800	0.303
2022-07-22	2,880,000	2,000	2,904,000	2,200	3,456,000	2,400	9,240,000	28.4	34,977	6,600	0.416
2022-07-23	0	0	2,904,000	2,200	0	0	2,904,000	8.9	10,993	2,200	0.139
2022-07-24	2,880,000	1,000	1,914,000	1,450	11,520,000	4,000	16,314,000	50.1	61,755	6,450	0.407
2022-07-25	1,440,000	1,000	1,914,000	1,450	2,304,000	1,600	5,658,000	17.4	21,418	4,050	0.256
2022-07-26	2,880,000	2,000	1,914,000	1,450	2,304,000	1,600	7,098,000	21.8	26,869	5,050	0.319
2022-07-27	0	0	1,914,000	1,450	0	0	1,914,000	5.9	7,245	1,450	0.091
2022-07-28	2,880,000	1,000	1,914,000	1,450	11,520,000	4,000	16,314,000	50.1	61,755	6,450	0.407
2022-07-29	0	0	1,914,000	1,450	0	0	1,914,000	5.9	7,245	1,450	0.091

Attachments

Reference: Daly Irrigation Development Project – 2022 Monitoring Report

Date	Spud Plains (Keyriver)		Redfern		Spud Plains		Total Volume Pumped (gal)	Total Volume Pumped (ac-ft)	Total Volume Pumped (m^3)	Max Pumping Rate (gal/min)	Max Pumping Rate (m^3/s)
	Intake Location: NW 10-12-21W		Intake Location: NW10-12-21W		Intake Location: NW10-12-21W						
	Pump Capacity: 2000 US gpm (0.1262 m^3/s)		Pump Capacity: 2400 US gpm (0.1514 m^3/s)		Pump Capacity: 4000 US gpm (0.2542 m^3/s)						
	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)					
2022-07-30	1,440,000	1,000	1,914,000	1,450	2,304,000	1,600	5,658,000	17.4	21,418	4,050	0.256
2022-07-31	0	0	1,914,000	1,450	0	0	1,914,000	5.9	7,245	1,450	0.091
2022-08-01	0	0	2,904,000	2,200	0	0	2,904,000	8.9	10,993	2,200	0.139
2022-08-02	1,440,000	1,000	2,904,000	2,200	2,304,000	1,600	6,648,000	20.4	25,165	4,800	0.303
2022-08-03	0	0	2,904,000	2,200	0	0	2,904,000	8.9	10,993	2,200	0.139
2022-08-04	2,880,000	1,000	2,904,000	2,200	11,520,000	4,000	17,304,000	53.1	65,503	7,200	0.454
2022-08-05	0	0	2,904,000	2,200	0	0	2,904,000	8.9	10,993	2,200	0.139
2022-08-06	2,880,000	2,000	2,904,000	2,200	4,608,000	3,200	10,392,000	31.9	39,338	7,400	0.467
2022-08-07	0	0	2,904,000	2,200	0	0	2,904,000	8.9	10,993	2,200	0.139
2022-08-08	1,440,000	1,000	2,904,000	2,200	2,304,000	1,600	6,648,000	20.4	25,165	4,800	0.303
2022-08-09	0	0	2,904,000	2,200	0	0	2,904,000	8.9	10,993	2,200	0.139
2022-08-10	0	0	2,904,000	2,200	0	0	2,904,000	8.9	10,993	2,200	0.139
2022-08-11	2,880,000	2,000	2,904,000	2,200	3,456,000	2,400	9,240,000	28.4	34,977	6,600	0.416
2022-08-12	0	0	2,904,000	2,200	0	0	2,904,000	8.9	10,993	2,200	0.139
2022-08-13	1,440,000	1,000	0	0	2,304,000	1,600	3,744,000	11.5	14,173	2,600	0.164
2022-08-14	0	0	0	0	0	0	0	0.0	0	0	0.000
2022-08-15	2,880,000	1,000	1,914,000	1,450	11,520,000	4,000	16,314,000	50.1	61,755	6,450	0.407
2022-08-16	0	0	1,914,000	1,450	0	0	1,914,000	5.9	7,245	1,450	0.091
2022-08-17	2,880,000	2,000	1,914,000	1,450	2,304,000	1,600	7,098,000	21.8	26,869	5,050	0.319
2022-08-18	0	0	0	0	0	0	0	0.0	0	0	0.000
2022-08-19	1,440,000	1,000	1,914,000	1,450	4,608,000	3,200	7,962,000	24.4	30,139	5,650	0.356
2022-08-20	0	0	1,914,000	1,450	0	0	1,914,000	5.9	7,245	1,450	0.091
2022-08-21	0	0	1,914,000	1,450	0	0	1,914,000	5.9	7,245	1,450	0.091

Attachments

Reference: Daly Irrigation Development Project – 2022 Monitoring Report

Date	Spud Plains (Keyriver)		Redfern		Spud Plains		Total Volume Pumped (gal)	Total Volume Pumped (ac-ft)	Total Volume Pumped (m^3)	Max Pumping Rate (gal/min)	Max Pumping Rate (m^3/s)
	Intake Location: NW 10-12-21W		Intake Location: NW10-12-21W		Intake Location: NW10-12-21W						
	Pump Capacity: 2000 US gpm (0.1262 m^3/s)		Pump Capacity: 2400 US gpm (0.1514 m^3/s)		Pump Capacity: 4000 US gpm (0.2542 m^3/s)						
	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)					
2022-08-22	0	0	0	0	0	0	0	0.0	0	0	0.000
2022-08-23	2,880,000	1,000	0	0	11,520,000	4,000	14,400,000	44.2	54,510	5,000	0.315
2022-08-24	0	0	0	0	0	0	0	0.0	0	0	0.000
2022-08-25	0	0	0	0	0	0	0	0.0	0	0	0.000
2022-08-26	2,880,000	2,000	0	0	4,608,000	3,200	7,488,000	23.0	28,345	5,200	0.328
2022-08-27	0	0	0	0	0	0	0	0.0	0	0	0.000
2022-08-28	1,440,000	1,000	0	0	4,608,000	3,200	6,048,000	18.6	22,894	4,200	0.265
2022-08-29	0	0	1,914,000	1,450	0	0	1,914,000	5.9	7,245	1,450	0.091
2022-08-30	0	0	1,914,000	1,450	0	0	1,914,000	5.9	7,245	1,450	0.091
2022-08-31	2,880,000	1,000	1,914,000	1,450	11,520,000	4,000	16,314,000	50.1	61,755	6,450	0.407
2022-09-01	2,880,000	1,000	1,914,000	1,450	6,912,000	2,400	11,706,000	35.9	44,312	4,850	0.306
2022-09-02			1,914,000	1,450			1,914,000	5.9	7,245	1,450	0.091
2022-09-03			1,914,000	1,450			1,914,000	5.9	7,245	1,450	0.091
2022-09-04			1,914,000	1,450			1,914,000	5.9	7,245	1,450	0.091
2022-09-05			1,914,000	1,450			1,914,000	5.9	7,245	1,450	0.091
2022-09-06			0	0			0	0.0	0	0	0.000
2022-09-07			0	0			0	0.0	0	0	0.000
2022-09-08			0	0			0	0.0	0	0	0.000
2022-09-09			0	0			0	0.0	0	0	0.000
2022-09-10			0	0			0	0.0	0	0	0.000
2022-09-11			0	0			0	0.0	0	0	0.000
2022-09-12			990,000	750			990,000	3.0	3,748	750	0.047
2022-09-13			990,000	750			990,000	3.0	3,748	750	0.047

Attachments

Reference: Daly Irrigation Development Project – 2022 Monitoring Report

Date	Spud Plains (Keyriver)		Redfern		Spud Plains		Total Volume Pumped (gal)	Total Volume Pumped (ac-ft)	Total Volume Pumped (m^3)	Max Pumping Rate (gal/min)	Max Pumping Rate (m^3/s)
	Intake Location: NW 10-12-21W		Intake Location: NW10-12-21W		Intake Location: NW10-12-21W						
	Pump Capacity: 2000 US gpm (0.1262 m^3/s)		Pump Capacity: 2400 US gpm (0.1514 m^3/s)		Pump Capacity: 4000 US gpm (0.2542 m^3/s)						
	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)					
2022-09-14			990,000	750			990,000	3.0	3,748	750	0.047
2022-09-15			990,000	750			990,000	3.0	3,748	750	0.047
2022-09-16			0	0			0	0.0	0	0	0.000
Totals	**95,040,000**	**-**	**130,284,000**	**-**	**211,968,000**	**-**	**437,292,000**	**1,342**	**1,655,330**	**7,400**	**0.467**

agriearth consulting ltd.

Attachment C

Riffle Photos

Attachments

Reference: Daly Irrigation Development Project – 2022 Monitoring Report

Photo 1: Photo from May 19. 2019 (2.566 m^3/sec estimated flow downstream of diversion) to provide a visual reference (approximation) of the lowest estimated flow rate downstream of the diversion in 2022 when pumping withdrawal was occurring during the irrigation period (September 12, 2022; 2.556 m^3/sec).

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