

February 21, 2021

Manitoba Sustainable Development Client File No: 5577.00

Manitoba Sustainable Development EAL No: 3010

Attention: Kristy Forrestall, Environment Officer

Manitoba Conservation and Climate

Environmental Compliance and Enforcement Branch

Box 13, 1129 Queens Avenue

Brandon, MB R7A 1L9

Dear Ms. Forrestall,

Reference: Daly Irrigation Project – 2020 Monitoring Report

On behalf of Daly Irrigation Development Group (DIDG; the Licencee), AgriEarth Consulting Ltd. (AgriEarth) submits the following 2020 monitoring report for the Daly Irrigation Project (the Project). This letter provides a summary and status of monitoring data collected in 2020, as required by *Environment Act* Licence No. 3010 (the Licence), issued on July 5, 2012.

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.

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.

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 3 to September 23, 2020).

Reference: Daly Irrigation Project – 2020 Monitoring Report

Record-breaking rainfalls during the last week in June and first week of July resulted in extreme flows in the Little Saskatchewan River downstream of the dam on Lake Wahtopanah and upstream of the diversion point through the first week in July. The flow rate peaked above 300 m³/sec (Figure 1). The average daily upstream flow rates and the estimated downstream flow rates relative to the minimum in-stream flow of 0.524 m³/sec prescribed in the Licence are shown for May through September in Figure 1 and for the irrigation period in Figure 2. Throughout the irrigation period the estimated average daily flows downstream of the diversion point were above the minimum instream flow requirement of 0.524 m³/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 m³/s specified by the Licence.

A total volume of 282,902,152 US gallons, 1,070,901 m³/sec, or 868 ac-ft were pumped for irrigation in 2020.

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 HOB0® 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. 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. DO concentrations are to be monitoring when flow rates in the Little Saskatchewan River fall below 6 m³/s.

The DO logger was deployed on June 16; however, the logger could not be located for data retrieval in October due to being washed away from the extreme flows earlier in the season.

While flow rates fell below the monitoring threshold of 6 m³/s on June 15 to 27, they increased above this rate from June 18 to August 22, when they again fell below the threshold for the remainder of the irrigation period (August 23 to September 7).

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.

Reference: Daly Irrigation Project – 2020 Monitoring Report

A trail camera was installed in May 2020 prior to commencement of irrigation to record daily photographs of the riffle. However, the extreme flows in early July washed away the camera and the tree on which the camera was affixed. Therefore, riffle photos were not available for the 2020 season.

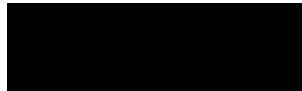
The lowest estimated flow downstream of the diversion during the irrigation period occurred on June 27, when flow upstream of the diversion was 3.178 m³/sec, an average of 0.1445 m³/sec was used for the Project, resulting in an estimated flow downstream of the diversion of 3.033 m³/sec. This is an estimated 2.509 m³/sec above the minimum instream flow rate of 0.524 m³/sec. A photo from the 2017 monitoring season taken during a comparable flow rate is provided in Photo 1 (Attachment C).

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,



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e: david.whetter@agriearth.ca

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

c. Ed Waldner – Daly Irrigation Development Group; Bruce Webb – Manitoba Sustainable Development

Attachments

Reference: Daly Irrigation Project – 2020 Monitoring Report

Attachment A
Figures

Attachments

Reference: Daly Irrigation Project – 2020 Monitoring Report

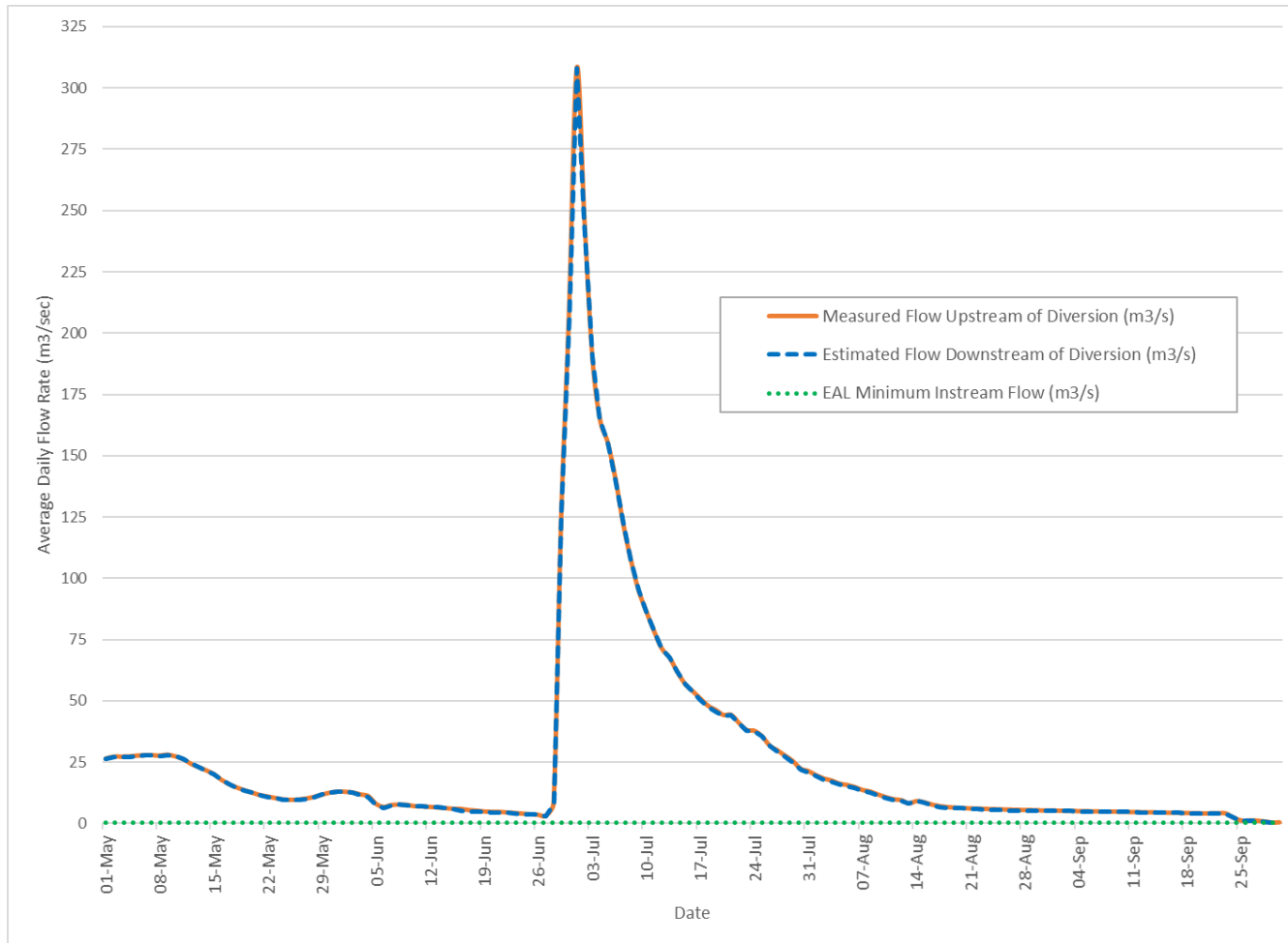


Figure 1: Average daily discharge upstream and downstream of diversion between May and September 2020

Attachments

Reference: Daly Irrigation Project – 2020 Monitoring Report

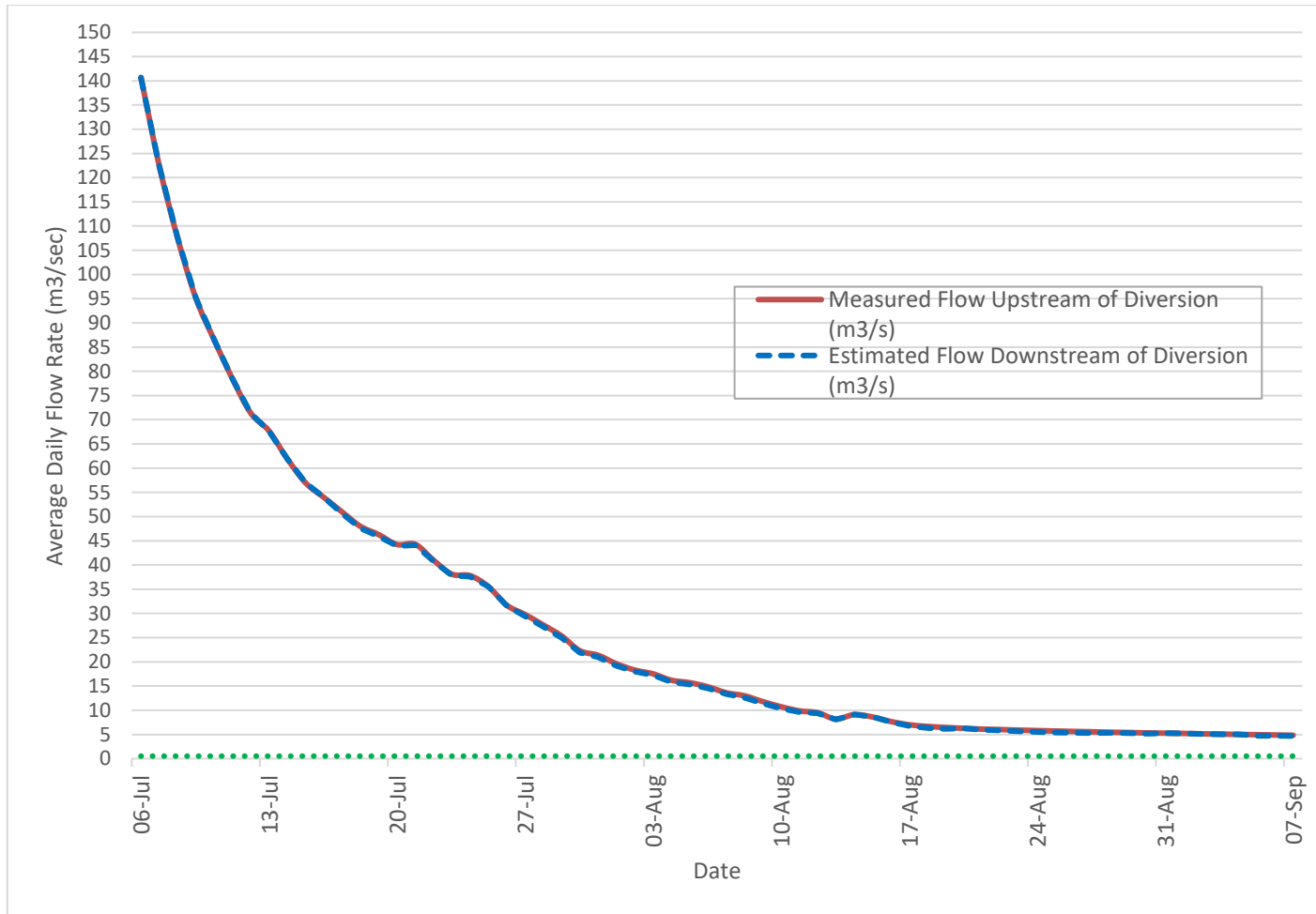


Figure 2: Average daily discharge upstream and downstream of diversion during the irrigation period

Attachments

Reference: Daly Irrigation Project – 2020 Monitoring Report

Attachment B
Water Use Summary

Attachments

Reference: Daly Irrigation Project – 2020 Monitoring Report

Date	Keyriver		Redfern		Sundance (Pump 1)		Sundance (Pump 2)		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		Intake Location: NW10-12-21W						
	Pump Capacity: 2400 US gpm (0.1514 m ³ /s)		Pump Capacity: 2400 US gpm (0.1514 m ³ /s)		Pump Capacity: 2400 US gpm (0.1514 m ³ /s)		Pump Capacity: 1600 US gpm (0.1001 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)	Volume Pumped (gal)	Max Pumping Rate (gal/min)					
2020-06-02	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-06-03	2,089,542	2,363	0	0	2,081,800	2,347	0	0	4,171,342	12.8	15,790	4,710	0.297
2020-06-04	3,402,648	2,356	0	0	3,130,447	2,327	1,201,372	1,411	7,734,467	23.7	29,278	6,094	0.384
2020-06-05	3,428,906	2,378	0	0	3,071,131	2,375	481,257	1,386	6,981,294	21.4	26,427	6,139	0.387
2020-06-06	1,247,649	2,374	0	0	1,082,076	2,179	0	0	2,329,725	7.1	8,819	4,554	0.287
2020-06-07	0	0	0	0	0	0	0	3	0	0.0	0	3	0.000
2020-06-08	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-06-09	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-06-10	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-06-11	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-06-12	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-06-13	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-06-14	1	0	0	0	0	0	0	3	1	0.0	0	3	0.000
2020-06-15	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-06-16	1,782,244	2,338	1,982,754	2,278	1,685,800	2,316	1,015,497	1,626	6,466,295	19.8	24,478	8,558	0.540
2020-06-17	3,408,261	2,313	3,118,364	2,256	2,914,552	2,373	1,567,429	1,360	11,008,605	33.8	41,672	8,302	0.524
2020-06-18	1,804,871	2,338	1,817,737	2,330	2,964,172	2,315	0	0	6,586,780	20.2	24,934	6,983	0.441
2020-06-19	0	0	0	0	3,061,563	2,399	0	0	3,061,563	9.4	11,589	2,399	0.151
2020-06-20	0	0	1,214,768	2,375	738,346	2,024	0	0	1,953,114	6.0	7,393	4,399	0.278
2020-06-21	0	0	3,094,546	2,203	0	0	0	0	3,094,546	9.5	11,714	2,203	0.139
2020-06-22	0	0	3,082,748	2,254	0	0	0	0	3,082,748	9.5	11,669	2,254	0.142



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	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)					
2020-06-23	0	0	2,130,101	1,602	0	0	0	0	2,130,101	6.5	8,063	1,602	0.101
2020-06-24	0	0	1,276,303	1,654	0	0	0	0	1,276,303	3.9	4,831	1,654	0.104
2020-06-25	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-06-26	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-06-27	0	0	1,651,838	2,291	0	0	0	0	1,651,838	5.1	6,253	2,291	0.145
2020-06-28	0	0	1,964,323	2,286	0	0	0	0	1,964,323	6.0	7,436	2,286	0.144
2020-06-29	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-06-30	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-07-01	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-07-02	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-07-03	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-07-04	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-07-05	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-07-06	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-07-07	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-07-08	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-07-09	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-07-10	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-07-11	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-07-12	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-07-13	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000



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2020-07-14	0	0	0	0	0	0	0	0	0.0	0	0	0	0.000
2020-07-15	0	0	0	0	0	0	0	0	0.0	0	0	0	0.000
2020-07-16	0	0	0	0	0	0	0	0	0.0	0	0	0	0.000
2020-07-17	562,363	1,595	2,026,970	2,189	1,152,000	1,600	0	0	3,741,333	11.5	14,162	5,384	0.340
2020-07-18	2,076,250	1,546	3,057,010	2,214	3,456,000	2,400	0	0	8,589,260	26.4	32,514	6,160	0.389
2020-07-19	669,473	1,439	3,040,041	2,376	3,456,000	2,400	0	0	7,165,513	22.0	27,124	6,215	0.392
2020-07-20	0	0	2,905,919	2,316	1,728,000	2,400	0	0	4,633,919	14.2	17,541	4,716	0.298
2020-07-21	0	0	2,996,000	2,256	0	0	0	0	2,996,000	9.2	11,341	2,256	0.142
2020-07-22	0	0	3,147,717	2,239	0	0	0	0	3,147,717	9.7	11,915	2,239	0.141
2020-07-23	0	0	3,087,293	2,328	1,152,000	1,600	0	0	4,239,293	13.0	16,047	3,928	0.248
2020-07-24	0	0	1,428,020	2,169	1,152,000	1,600	0	0	2,580,020	7.9	9,766	3,769	0.238
2020-07-25	0	0	0	0	0	0	0	0	0.0	0	0	0	0.000
2020-07-26	0	0	1,984,404	2,065	0	0	0	0	1,984,404	6.1	7,512	2,065	0.130
2020-07-27	1,133,494	1,657	2,918,404	2,136	1,728,000	2,400	0	0	5,779,898	17.7	21,879	6,193	0.391
2020-07-28	2,195,355	1,640	2,982,546	2,275	3,456,000	2,400	0	0	8,633,901	26.5	32,683	6,315	0.398
2020-07-29	2,183,757	1,638	2,912,849	2,237	3,456,000	2,400	0	0	8,552,606	26.2	32,375	6,275	0.396
2020-07-30	2,139,763	1,601	2,903,879	2,259	3,456,000	2,400	0	0	8,499,641	26.1	32,175	6,260	0.395
2020-07-31	1,772,192	1,643	2,857,515	2,306	3,456,000	2,400	0	0	8,085,708	24.8	30,608	6,349	0.401
2020-08-01	1,123,892	1,555	2,900,647	2,380	3,456,000	2,400	0	0	7,480,539	23.0	28,317	6,335	0.400
2020-08-02	0	0	3,019,152	2,314	3,456,000	2,400	0	0	6,475,152	19.9	24,511	4,714	0.297
2020-08-03	0	0	2,959,535	2,108	3,456,000	2,400	0	0	6,415,535	19.7	24,285	4,508	0.284



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	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)					
2020-08-04	866,589	1,583	2,726,384	2,124	3,456,000	2,400	0	0	7,048,973	21.6	26,683	6,107	0.385
2020-08-05	796,593	1,549	2,772,344	2,274	3,456,000	2,400	0	0	7,024,936	21.6	26,592	6,223	0.393
2020-08-06	0	0	2,760,869	2,367	3,456,000	2,400	0	0	6,216,869	19.1	23,533	4,767	0.301
2020-08-07	0	0	2,764,121	2,275	3,456,000	2,400	0	0	6,220,121	19.1	23,546	4,675	0.295
2020-08-08	1,001,469	1,560	2,818,142	2,239	3,456,000	2,400	0	0	7,275,611	22.3	27,541	6,199	0.391
2020-08-09	2,075,594	1,549	2,834,061	2,272	3,456,000	2,400	0	0	8,365,654	25.7	31,667	6,221	0.393
2020-08-10	560,893	1,389	2,649,636	2,177	3,456,000	2,400	0	0	6,666,530	20.5	25,236	5,966	0.376
2020-08-11	0	0	2,114,242	1,620	1,728,000	2,400	0	0	3,842,242	11.8	14,544	4,020	0.254
2020-08-12	0	0	2,097,556	1,588	0	0	0	0	2,097,556	6.4	7,940	1,588	0.100
2020-08-13	0	0	1,052,101	1,593	0	0	0	0	1,052,101	3.2	3,983	1,593	0.101
2020-08-14	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-08-15	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-08-16	0	0	0	0	1,152,000	1,600	0	0	1,152,000	3.5	4,361	1,600	0.101
2020-08-17	0	0	1,257,859	2,198	2,304,000	1,600	0	0	3,561,859	10.9	13,483	3,798	0.240
2020-08-18	578,326	961	2,758,606	2,284	2,304,000	1,600	0	0	5,640,932	17.3	21,353	4,845	0.306
2020-08-19	949,249	769	1,960,162	2,267	1,152,000	1,600	0	0	4,061,411	12.5	15,374	4,636	0.293
2020-08-20	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-08-21	481,288	985	0	0	1,152,000	1,600	0	0	1,633,288	5.0	6,183	2,585	0.163
2020-08-22	365,654	778	0	0	2,304,000	1,600	0	0	2,669,654	8.2	10,106	2,378	0.150
2020-08-23	0	0	1,162,040	2,186	2,304,000	1,600	0	0	3,466,040	10.6	13,120	3,786	0.239
2020-08-24	0	0	2,857,657	2,276	2,304,000	1,600	0	0	5,161,657	15.8	19,539	3,876	0.245



Attachments

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	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)	Volume Pumped (gal)	Max Pumping Rate (gal/min)					
2020-08-25	703,310	1,014	2,858,546	2,249	2,304,000	1,600	0	0	5,865,856	18.0	22,205	4,863	0.307
2020-08-26	918,793	769	2,751,960	2,342	2,304,000	1,600	0	0	5,974,752	18.3	22,617	4,711	0.297
2020-08-27	0	0	2,793,677	2,382	1,152,000	1,600	0	0	3,945,677	12.1	14,936	3,982	0.251
2020-08-28	0	0	2,608,828	2,271	0	0	0	0	2,608,828	8.0	9,875	2,271	0.143
2020-08-29	0	0	2,649,455	2,148	0	0	0	0	2,649,455	8.1	10,029	2,148	0.136
2020-08-30	0	0	1,194,525	2,112	0	0	0	0	1,194,525	3.7	4,522	2,112	0.133
2020-08-31	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-09-01	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-09-02	0	0	0	0	576,000	800	0	0	576,000	1.8	2,180	800	0.050
2020-09-03	0	0	0	0	576,000	800	0	0	576,000	1.8	2,180	800	0.050
2020-09-04	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-09-05	632,572	993	0	0	1,728,000	2,400	0	0	2,360,572	7.2	8,936	3,393	0.214
2020-09-06	321,491	762	0	0	3,456,000	2,400	0	0	3,777,491	11.6	14,299	3,162	0.200
2020-09-07	0	0	0	0	1,728,000	2,400	0	0	1,728,000	5.3	6,541	2,400	0.151
2020-09-08	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-09-09	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-09-10	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-09-11	0	0	0	0	0	0	0	0	0	0.0	0	0	0.000
2020-09-12	0	0	0	0	1,152,000	1,600	0	0	1,152,000	3.5	4,361	1,600	0.101
2020-09-13	0	0	0	0	2,304,000	1,600	0	0	2,304,000	7.1	8,722	1,600	0.101
2020-09-14	0	0	0	0	1,152,000	1,600	0	0	1,152,000	3.5	4,361	1,600	0.101

Attachments

Reference: Daly Irrigation Project – 2020 Monitoring Report

Date	Keyriver		Redfern		Sundance (Pump 1)		Sundance (Pump 2)		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		Intake Location: NW10-12-21W						
	Pump Capacity: 2400 US gpm (0.1514 m ³ /s)		Pump Capacity: 2400 US gpm (0.1514 m ³ /s)		Pump Capacity: 2400 US gpm (0.1514 m ³ /s)		Pump Capacity: 1600 US gpm (0.1001 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)	Volume Pumped (gal)	Max Pumping Rate (gal/min)					
2020-09-15			0	0	0	0			0	0.0	0	0	0.000
2020-09-16			0	0					0	0.0	0	0	0.000
2020-09-17			0	0					0	0.0	0	0	0.000
2020-09-18			0	0					0	0.0	0	0	0.000
2020-09-19			0	0					0	0.0	0	0	0.000
2020-09-20			0	0					0	0.0	0	0	0.000
2020-09-21			0	0					0	0.0	0	0	0.000
2020-09-22			921,030	1,628					921,030	2.8	3,486	1,628	0.103
2020-09-23			465,051	822					465,051	1.4	1,760	822	0.052
2020-09-24			0	0					0	0.0	0	0	0.000
Total	41,272,480	-	119,290,230	-	118,073,887	-	4,265,554	-	282,902,152	868.2	1,070,901	8,558	0.540

Attachments

Reference: Daly Irrigation Project – 2020 Monitoring Report

Attachment C
Riffle Photos

Attachments

Reference: Daly Irrigation Project – 2020 Monitoring Report



Photo 1: Photo from July 12, 2017 during pumping withdrawal ($3.064 \text{ m}^3/\text{sec}$) estimated downstream of diversion) to provide a visual reference (approximation) of the lowest flow rate downstream of the diversion in 2020 (June 27, 2020; $3.033 \text{ m}^3/\text{sec}$).