



STATE OF
COLORADO

Ebert - DNR, Jared <jared.ebert@state.co.us>

Coulson Temporary SWSP's

Peter Wayland <pwayland@weilandinc.com>

Fri, Apr 5, 2019 at 2:05 PM

To: "Comaniciu - DNR, Ioana" <ioana.comaniciu@state.co.us>

Cc: "Ebert - DNR, Jared" <jared.ebert@state.co.us>

Ioana,

The attorney (Sean Rutledge) we are working with to file the Coulson Gravel Ponds Augmentation Plan with water court has indicated he won't be able to file with water court until end of April or May. In the interim, I have attached revised updated individual Plans for Gardels, Brownwood and Kirtright for your review.

I expect to complete Challenger and update Bonser early this next week along with a company wide table for City of Loveland Lease water deliveries for each pit.

I'm using Adobe Document Cloud.

You can view "BROWNWOOD SSP 4-4-19.pdf" at: <https://documentcloud.adobe.com/link/track?uri=urn%3Aaaid%3Aascds%3AUS%3A2b47da88-a72c-4ccd-a2f5-c6dd1439791d>

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You can view "GARDELS SWSP 4-3-19.pdf" at: <https://documentcloud.adobe.com/link/track?uri=urn%3Aaaid%3Aascds%3AUS%3A808ca4b5-28ab-49cc-b92a-17f65cf8fb35>

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You can view "KIRTRIGHT SWSP 4-3-19.pdf" at: <https://documentcloud.adobe.com/link/track?uri=urn%3Aaaid%3Aascds%3AUS%3A09b06883-89ac-4893-a12d-e7ba9732b9c9>

Peter Wayland

Weiland, Inc

303.518.2182 m



**TEMPORARY SUBSTITUTE
WATER SUPPLY PLAN
GARDELS PIT**

Prepared for:

Coulson Excavating Co., Inc.
3609 N. County Road 13
Loveland, CO 80538

Prepared by:

Weiland, Inc.
PO Box 18087
Boulder, CO 80308

September 28, 2012
Updated October 6, 2014
Updated September 29, 2016
Updated April 4, 2019

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Compacted Clay Liner Approval Letter, Gardels West Reservoir

1.0 INTRODUCTION

1.1. LEGAL DESCRIPTION AND SITE LOCATION

The legal description of the Gardels Pit is North ½ Section 19, Township 5 North, Range 68 West of the 6th PM. The site location is shown in Figure 1 – Site Location Map.

1.2. BACKGROUND

This plan replaces the 2016 plan.

A permanent plan for augmentation of all of CEC's unlined gravel pit ponds tributary to the Big Thompson River has been completed. The plan is titled *Coulson Gravel Ponds Augmentation Plan (CGPAP)* and will be filed with water court no later than June 2019.

This temporary plan has been updated to include the evaporative loss depletion calculations from the CGPAP. To simplify this temporary plan, application of HCU credits from the Osborn Irrigation System have not been applied.

It is requested this plan be approved for 2 years in order to give ample time for the permanent augmentation plan to be adjudicated by water court.

The Gardels Pit property has been reclaimed to leave 2 unlined groundwater fed ponds. Ponds 1 and 2 have free water surface areas of 6.8 acres and 2.0 acres respectively for a total free water area surface of 8.8 acres. The Gardels pond areas are shown in **Figure 2 – Gardels Pit Pond Areas**. A mining cell to the west of the property (west pit) was lined with a compacted clay liner, which was tested for leakage and approved by the Office of the State Engineer (OSE) in October of 2012 (see Appendix I).

2.0 GARDELS PIT DEPLETIONS/REPLACEMENT

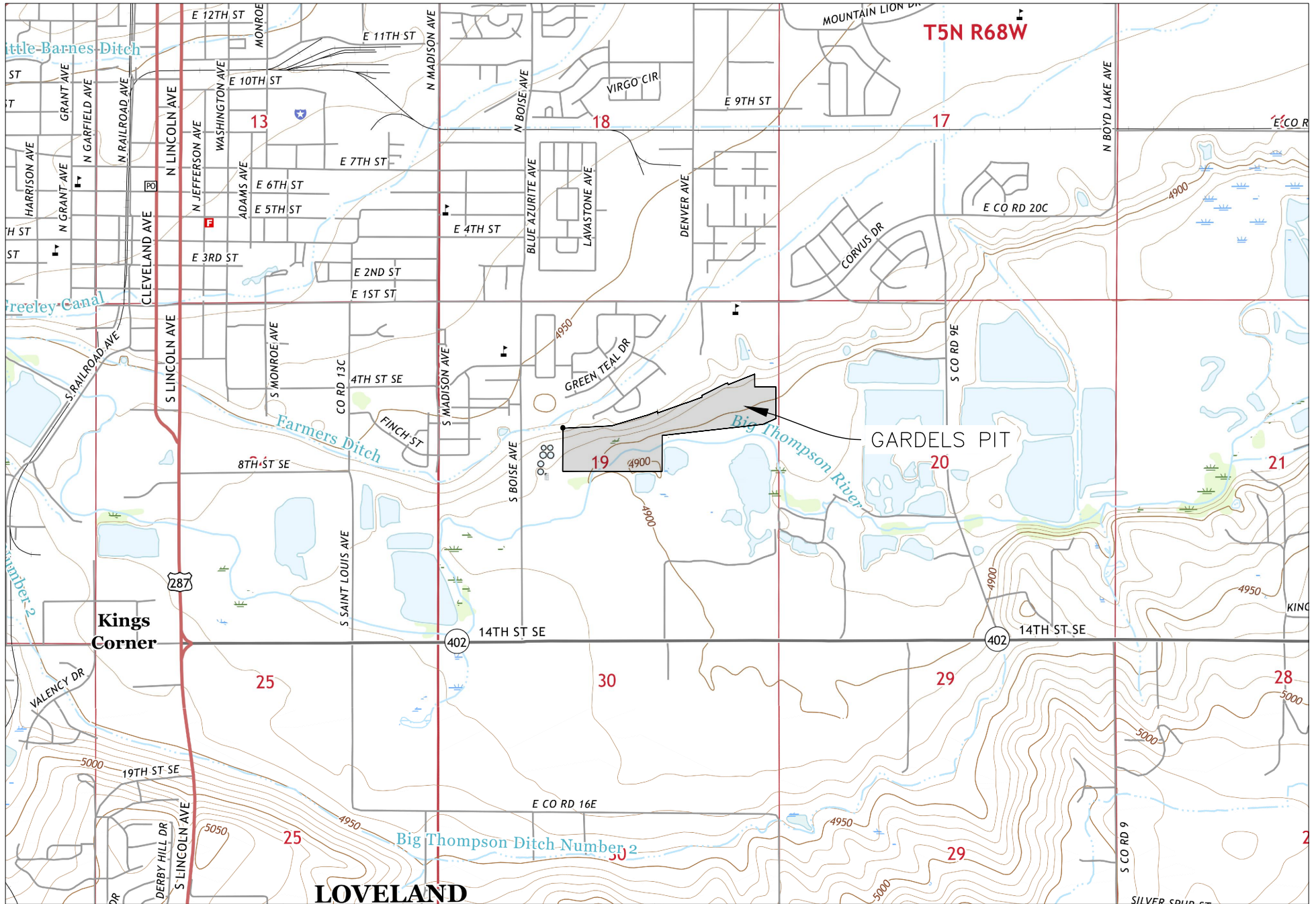
2.1. EVAPORATIVE LOSS DEPLETIONS

The evaporative loss calculations are given in **AI.1 Evaporative Loss Worksheet - Gardels Pit**. The monthly fraction of annual evaporation is based on the Guidelines for Substitute Water Supply Plans for elevations below 6500 ft published by the OSE. The annual free water surface evaporation is taken from NOAA Technical Report NWS 33. After applying precipitation credit, the net evaporative depletions were lagged utilizing the IDS AWAS program. Transmissivity was set to 20,000 g.p.d./ft. and is based on the published Colorado DWR CDSS GIS layer. The distance to the aquifer boundary was set to 1,400 ft, which is based on the Atlas of Sand, Gravel & Quarry Aggregate Resources, Colorado Front Range. The IDS AWAS output is given in **AI.2 Gardels IDS AWAS Model Output**. The annual net evaporation rate for the Gardels Ponds is calculated to be **19.45 acre-ft./yr.**

2.2. REPLACEMENT

The total monthly depletions given in are equal to the stream replacement values due to the fact that the point of replacement will occur at the City of Loveland's Waste Water Treatment Plant which is adjoining the Gardels Pit property to the west. The replacement water source shall be fully consumable WWTP effluent water leased from the City of Loveland by CEC.

Monthly accounting will be submitted to the Division 1 office electronically (dnr_div1accounting@state.co.us). A sample accounting worksheet is given as **AI.3 Sample Accounting Worksheet – Gardels Pit**



REVISIONS			
REV	DESCRIPTION	DATE	APPROVED

LOVELAND

WSE Welland, Inc.
Environmental & Engineering

PO BOX 18087
BOULDER, CO 80530
ph 303-443-9521

**GARDELS PIT - TEMPORARY
SUBSTITUTE WATER SUPPLY PLAN**

LARIMER COUNTY, CO

PREPARED FOR:
COLSON EXCAVATING, CO., INC.

**FIGURE 1
SITE LOCATION MAP**

SCALE 1"=2,000'	DWG NO. SITE LOC.DWG	REV REV
DRAWN BY CTW	CHECKED BY PFW	DATE 04/03/2019
SHEET 1 OF 1		



AERIAL PHOTOGRAPHY DATE: AUGUST 27, 2017

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED



PO BOX 18087
BOULDER, CO. 80308
ph 303-443-9521

COULSON GRAVEL PONDS
AUGMENTATION PLAN

LARIMER COUNTY

COULSON EXCAVATING CO., INC.

FIGURE 2 - GARDELS PIT
POND AREAS

SCALE 1"=150'	DWG NO. FIGURE 4.DWG	REV REV
DRAWN BY: CTW	CHECKED BY: PFW	DATE: 01/16/2019
		SHEET 1 OF 1

APPENDIX I

AI.1 Evaporative Loss Worksheet - Gardels Pit

1 of 2

Pond 1 Surface Area: 6.80 acres

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8) Net	(9) Net
Month	Monthly Distribution	Free Water Surface Evaporation	Gross Evaporation Rate	Surface Area	Gross Evaporation	Average Monthly Precip.	Effective Precip. Credit	Evaporative Loss (unlagged)	Evaporative Loss (lagged)
		[ft./yr.]	[ft./mo.]	[acres]	[acre-ft./mo.]	[ft./mo.]	[acre-ft./mo.]	[acre-ft./mo.]	[acre-ft./mo.]
Jan	0.030	3.270	0.098	6.80	0.00	0.04	0.00	0.00	0.32
Feb	0.035	3.270	0.114	6.80	0.78	0.05	0.24	0.54	0.44
Mar	0.055	3.270	0.180	6.80	1.22	0.12	0.57	0.65	0.56
Apr	0.090	3.270	0.294	6.80	2.00	0.17	0.81	1.19	0.85
May	0.120	3.270	0.392	6.80	2.67	0.22	1.05	1.62	1.22
June	0.145	3.270	0.474	6.80	3.22	0.14	0.67	2.55	1.83
Jul	0.150	3.270	0.491	6.80	3.34	0.13	0.62	2.72	2.25
Aug	0.135	3.270	0.441	6.80	3.00	0.11	0.52	2.48	2.34
Sep	0.100	3.270	0.327	6.80	2.22	0.13	0.62	1.60	1.98
Oct	0.070	3.270	0.229	6.80	1.56	0.10	0.48	1.08	1.54
Nov	0.040	3.270	0.131	6.80	0.89	0.06	0.29	0.60	1.10
Dec	0.030	3.270	0.098	6.80	0.00	0.05	0.00	0.00	0.60
totals			3.270		20.90	1.32	5.87	15.03	15.03

Notes:

- (1) = SEO Monthly fraction of evaporation for elevations below 6500 ft from Guidelines for Substitute Water Supply Plans.
- (2) = Free Water Surface Evaporation from NOAA Technical Report NWS 33 = Class A Pan Evaporation * Kp, where Kp = 1.0.
- (3) = Column (1) * Column (2).
- (4) = Total Free Water Surface Area (see Figure 2 - Gardels Pit Pond Areas).
- (5) = Column (3) * Column (4). For months where Mean Ave. Temp. <32, ice cover = 0.0 Evap.
- (6) = From All.1 Precipitation Data.
- (7) = (Column (6) * 70%) * Column (4)
- (8) = Column (5) -Column (7).
- (9) = Column (8) Lagged utilizing AWAS program (See All.2).

Pond 2 Surface Area: 2.00 acres

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Month	Monthly Distribution	Free Water Surface Evaporation	Gross Evaporation Rate	Surface Area	Gross Evaporation	Average Monthly Precip.	Effective Precip. Credit	Evaporative Loss (unlagged)	Evaporative Loss (lagged)	Net Evaporative Loss (lagged) Pond 1 + 2
		[ft./yr.]	[ft./mo.]	[acres]	[acre-ft./mo.]	[ft./mo.]	[acre-ft./mo.]	[acre-ft./mo.]	[acre-ft./mo.]	[acre-ft./mo.]
Jan	0.030	3.270	0.098	2.00	0.00	0.04	0.00	0.00	0.06	0.38
Feb	0.035	3.270	0.114	2.00	0.23	0.05	0.07	0.16	0.14	0.58
Mar	0.055	3.270	0.180	2.00	0.36	0.12	0.17	0.19	0.17	0.73
Apr	0.090	3.270	0.294	2.00	0.59	0.17	0.24	0.35	0.28	1.13
May	0.120	3.270	0.392	2.00	0.78	0.22	0.31	0.47	0.39	1.61
June	0.145	3.270	0.474	2.00	0.95	0.14	0.20	0.75	0.61	2.44
Jul	0.150	3.270	0.491	2.00	0.98	0.13	0.18	0.80	0.71	2.96
Aug	0.135	3.270	0.441	2.00	0.88	0.11	0.15	0.73	0.70	3.04
Sep	0.100	3.270	0.327	2.00	0.65	0.13	0.18	0.47	0.55	2.53
Oct	0.070	3.270	0.229	2.00	0.46	0.10	0.14	0.32	0.41	1.95
Nov	0.040	3.270	0.131	2.00	0.26	0.06	0.08	0.18	0.28	1.38
Dec	0.030	3.270	0.098	2.00	0.00	0.05	0.00	0.00	0.12	0.72
totals			3.270		6.14	1.32	1.72	4.42	4.42	19.45

Notes:

- (1) = SEO Monthly fraction of evaporation for elevations below 6500 ft from Guidelines for Substitute Water Supply Plans.
- (2) = Free Water Surface Evaporation from NOAA Technical Report NWS 33 = Class A Pan Evaporation * Kp, where Kp = 1.0.
- (3) = Column (1) * Column (2).
- (4) = Total Free Water Surface Area (see Figure 2 - Gardels Pit Pond Areas).
- (5) = Column (3) * Column (4). For months where Mean Ave. Temp. <32, ice cover = 0.0 Evap.
- (6) = From All.1 Precipitation Data.
- (7) = (Column (6) * 70%) * Column (4)
- (8) = Column (5) -Column (7).
- (9) = Column (8) Lagged utilizing AWAS program (See All.2).
- (10) = Pond 1, Column (9) + Pond 2, Column (9).

APPENDIX II

Description: LOVELAND NCWCD

Time Series Identifier: USC00055236.NOAA.Precip.Month **Data Source:** NOAA
Located in Water Division, District: 1, 4 **Measurement Type:** Precip
Located in County, State: LARIMER, CO **Data Interval:** Monthly
Located in HUC: 10190006 **Data Units:** IN
Latitude, Longitude 40.435000 , -105.085000
Elevation: 5,079.99

Time Series Creation History:

Available Data: 1989 To 2017
Selected Time Series From: 1989-01 To 2017-12

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1989	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	2.21	NC
1990	1.00	0.14	0.54	0.67	0.67	4.56	0.97	2.89	0.29	1.67	1.43	2.37	17.19
1991	0.49	0.73	0.58	0.45	0.03	0.25	0.83	2.04	2.06	3.05	1.47	1.12	13.10
1992	0.65	1.71	0.03	0.48	0.02	3.05	1.17	1.19	1.88	1.48	2.86	0.00	14.52
1993	0.17	1.11	0.30	0.38	0.84	1.43	2.14	1.12	2.55	1.04	0.95	2.70	14.71
1994	2.01	1.23	0.18	0.41	0.80	0.56	2.53	1.28	2.91	1.07	1.77	0.72	15.47
1995	0.81	0.69	0.44	0.21	0.94	0.69	3.16	6.80	3.44	0.82	0.18	1.84	20.02
1996	0.16	0.63	0.11	1.10	0.28	1.51	0.85	2.76	1.56	2.44	0.70	2.74	14.86
1997	0.48	0.72	0.09	0.91	0.77	0.67	3.26	2.57	2.61	1.98	3.11	2.24	19.41
1998	1.25	0.46	0.28	0.12	0.28	2.05	1.99	2.05	1.32	1.09	0.54	0.90	12.34
1999	3.43	0.89	NC	0.45	0.06	0.67	NC	1.83	2.26	1.70	1.85	1.57	NC
2000	1.05	0.72	0.16	0.09	0.28	1.11	0.71	1.50	1.22	0.89	0.60	1.85	10.17
2001	0.57	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2002	NC	NC	NC	NC	NC	NC	NC	NC	NC	0.29	0.47	1.95	NC
2003	0.94	0.61	0.01	0.01	0.97	3.92	2.54	2.63	2.99	0.76	1.58	0.31	17.26
2004	0.09	0.55	0.37	0.47	0.88	0.47	1.96	2.04	2.48	2.66	2.06	2.04	16.06
2005	1.34	1.78	0.21	1.07	0.51	0.78	3.20	2.26	2.61	0.53	0.92	0.37	15.58
2006	3.19	0.11	0.29	0.11	0.59	1.61	0.14	0.71	0.10	1.59	1.72	0.37	10.54
2007	2.22	0.62	1.01	1.03	0.39	1.67	1.96	1.55	0.25	1.15	1.87	1.58	15.28
2008	1.43	0.39	1.57	0.04	0.36	1.14	0.80	1.89	1.32	0.52	2.58	1.43	13.47
2009	0.63	0.07	0.68	0.58	0.26	1.31	4.92	2.02	2.32	2.14	1.34	1.16	17.42
2010	2.28	0.71	1.34	0.23	0.76	2.11	3.30	1.97	2.44	2.50	0.73	0.06	18.42
2011	0.54	0.76	0.33	0.46	0.84	0.29	2.30	4.63	1.67	2.31	0.16	1.64	15.91
2012	1.45	0.88	1.41	0.18	1.45	0.01	0.50	1.62	0.11	2.12	0.08	1.19	11.01
2013	0.81	0.49	0.33	0.08	1.04	1.26	3.22	3.24	1.44	1.32	1.11	6.63	20.96
2014	1.24	0.46	0.50	1.81	0.40	1.22	0.58	5.32	0.65	2.91	2.68	1.46	19.23
2015	0.92	1.04	0.81	0.30	1.57	0.37	2.74	6.44	2.66	1.19	1.02	0.05	19.10
2016	2.24	1.80	1.36	0.52	1.26	2.85	2.30	2.23	0.23	1.08	0.80	0.25	16.92
2017	0.46	0.24	0.72	0.91	0.46	0.67	2.42	4.11	0.39	0.44	1.91	1.86	14.59
2018	1.50	0.57	0.38	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC

Notes:

Years shown are water years.

A water year spans October of the previous calendar year to September of the current year (all within the indicated water year).

Annual values and statistics are computed only on non-missing data.

NC indicates that a value is not computed because of missing data or the data value itself is missing.

Description: LOVELAND NCWCD

Time Series Identifier: USC00055236.NOAA.Precip.Month **Data Source:** NOAA
Located in Water Division, District: 1, 4 **Measurement Type:** Precip
Located in County, State: LARIMER, CO **Data Interval:** Monthly
Located in HUC: 10190006 **Data Units:** IN
Latitude, Longitude 40.435000 , -105.085000
Elevation: 5,079.99

Time Series Creation History:

Available Data: 1989 To 2017
Selected Time Series From: 1989-01 To 2017-12

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Min:	0.09	0.07	0.01	0.01	0.02	0.01	0.14	0.71	0.10	0.29	0.08	0.00	10.17
Max:	3.43	1.80	1.57	1.81	1.57	4.56	4.92	6.80	3.44	3.05	3.11	6.63	20.96
Mean:	1.19	0.74	0.54	0.50	0.64	1.39	2.02	2.64	1.68	1.51	1.35	1.52	15.74

Notes:

Years shown are water years.

A water year spans October of the previous calendar year to September of the current year (all within the indicated water year).

Annual values and statistics are computed only on non-missing data.

NC indicates that a value is not computed because of missing data or the data value itself is missing.

Description: LOVELAND NCWCD

Time Series Identifier: USC00055236.NOAA.TempMean.Month **Data Source:** NOAA
Located in Water Division, District: 1, 4 **Measurement Type:** MeanTemp
Located in County, State: LARIMER, CO **Data Interval:** Monthly
Located in HUC: 10190006 **Data Units:** F
Latitude, Longitude 40.435000 , -105.085000
Elevation: 5,079.99

Time Series Creation History:

Available Data: 1989 To 2017
Selected Time Series From: 1989-01 To 2017-12

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Average
1989	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	60.06	NC
1990	50.00	39.82	25.10	33.73	31.04	36.69	47.62	54.29	68.63	69.00	68.94	64.69	49.13
1991	49.82	41.16	22.05	23.76	38.08	41.54	46.61	57.87	66.30	70.41	69.35	60.78	48.98
1992	49.34	34.18	31.96	30.95	38.60	41.36	52.74	58.40	64.46	68.29	66.39	63.00	49.97
1993	51.89	32.05	24.13	24.15	27.60	41.61	46.54	57.76	63.58	69.29	66.97	57.42	46.92
1994	47.32	32.72	32.03	31.85	28.69	42.70	47.28	60.43	69.95	70.55	70.62	63.76	49.83
1995	49.63	35.89	33.30	31.23	35.26	40.52	44.25	50.59	62.75	70.39	73.61	60.59	49.00
1996	49.43	41.18	32.89	25.87	33.15	36.67	48.63	58.02	67.43	71.44	69.38	60.04	49.51
1997	50.76	36.38	33.23	25.49	31.47	41.90	41.99	57.33	66.89	71.65	69.14	63.73	49.16
1998	50.08	35.25	30.95	33.46	35.09	37.60	46.50	59.15	62.23	72.78	71.53	66.85	50.12
1999	49.89	42.77	NC	33.76	39.63	43.78	NC	55.24	64.63	73.18	70.74	58.59	NC
2000	50.46	44.64	35.80	33.08	39.31	41.41	51.30	60.82	66.61	75.05	73.19	63.19	52.91
2001	50.01	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2004	NC	NC	NC	NC	29.99	45.01	47.45	59.35	62.02	69.19	66.71	60.88	NC
2005	49.87	36.83	30.55	30.94	34.74	39.23	46.44	55.33	65.30	73.77	69.33	62.41	49.56
2006	50.54	40.78	27.89	35.46	29.32	37.01	50.85	59.26	70.71	74.04	71.14	57.20	50.35
2007	48.42	38.25	26.85	19.51	28.49	44.17	45.74	57.29	66.45	75.10	72.97	62.96	48.85
2008	51.46	39.18	22.68	25.07	32.25	38.16	44.20	54.81	64.60	72.23	67.97	58.94	47.63
2009	48.48	41.09	24.08	30.87	35.58	39.54	44.56	57.21	62.62	68.55	66.75	60.67	48.33
2010	41.11	38.77	21.51	26.54	26.37	38.59	46.67	52.20	66.34	71.61	70.72	62.69	46.93
2011	52.16	36.51	32.57	26.42	25.78	41.21	46.45	51.18	65.65	73.70	73.45	61.45	48.88
2012	50.22	37.26	24.30	33.02	27.75	46.14	52.28	57.58	71.28	75.21	70.83	63.30	50.76
2013	47.07	38.46	28.96	26.88	27.89	35.64	40.52	55.90	67.99	71.66	71.13	64.12	48.02
2014	46.59	38.26	26.21	28.07	25.75	38.70	47.69	56.17	65.28	71.35	68.73	61.80	47.88
2015	52.66	33.57	30.27	30.97	33.11	41.86	48.14	51.89	68.05	71.09	70.81	65.96	49.87
2016	54.49	37.39	27.33	28.01	35.64	40.67	47.92	52.91	69.97	73.16	69.03	62.97	49.96
2017	54.89	43.60	24.38	27.30	39.40	45.72	47.89	54.60	67.55	73.34	68.29	62.32	50.77
2018	47.24	42.14	30.63	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Min:	41.11	32.05	21.51	19.51	25.75	35.64	40.52	50.59	62.02	68.29	66.39	57.20	46.92
Max:	54.89	44.64	35.80	35.46	39.63	46.14	52.74	60.82	71.28	75.21	73.61	66.85	52.91
Mean:	49.76	38.33	28.32	29.02	32.40	40.70	47.09	56.22	66.29	71.84	69.91	61.94	49.27

Notes:

Years shown are water years.

A water year spans October of the previous calendar year to September of the current year (all within the indicated water year).

Annual values and statistics are computed only on non-missing data.

NC indicates that a value is not computed because of missing data or the data value itself is missing.

Pond 1

Boundary Condition	Dist. To Alluvial Boundary	Transmissivity	Specific Yield	X to Well
	[ft.]	[g.p.d./ft.]	[nd]	[ft.]
Alluvial Aquifer	1400	20,000.00	0.2	410.5

Time	Dep. Rate	Vol. of Dep.	Vol. of Dep.
[month]	[c.f.s.]	[acre-ft.]	[acre-ft.]
1	0	0	0
2	0.0059	0.247	0.247
3	0.008	0.693	0.447
4	0.015	1.475	0.782
5	0.022	2.649	1.174
6	0.034	4.453	1.804
7	0.039	6.688	2.235
8	0.039	9.018	2.330
9	0.030	10.992	1.974
10	0.023	12.526	1.534
11	0.016	13.628	1.102
12	0.007	14.225	0.598
13	0.004	14.548	0.323
14	0.008	14.988	0.440
15	0.010	15.550	0.562
16	0.016	16.401	0.851
17	0.022	17.617	1.215
18	0.034	19.445	1.829
19	0.039	21.696	2.250
20	0.039	24.035	2.339
21	0.030	26.014	1.979
22	0.023	27.551	1.538
23	0.016	28.655	1.104
24	0.007	29.254	0.599
25	0.004	29.577	0.323
26	0.008	30.018	0.441
27	0.010	30.580	0.563
28	0.016	31.431	0.851
29	0.022	32.647	1.216
30	0.034	34.475	1.829
31	0.039	36.726	2.250
32	0.039	39.065	2.339
33	0.030	41.044	1.979
34	0.023	42.581	1.538
35	0.016	43.685	1.104
36	0.007	44.284	0.599

Pond 2

Boundary Condition	Dist. To Alluvial Boundary	Transmissivity	Specific Yield	X to Well
	[ft.]	[g.p.d./ft.]	[nd]	[ft.]
Alluvial Aquifer	1400	20,000.00	0.2	254.7

Time	Dep. Rate	Vol. of Dep.	Vol. of Dep.
[month]	[c.f.s.]	[acre-ft.]	[acre-ft.]
1	0	0	0
2	0.0021	0.0998	0.0998
3	0.003	0.252	0.152
4	0.005	0.520	0.269
5	0.007	0.905	0.385
6	0.011	1.506	0.601
7	0.012	2.213	0.708
8	0.012	2.917	0.704
9	0.009	3.466	0.548
10	0.006	3.874	0.409
11	0.004	4.151	0.277
12	0.001	4.269	0.118
13	0.001	4.330	0.061
14	0.003	4.466	0.136
15	0.003	4.639	0.173
16	0.005	4.921	0.282
17	0.007	5.314	0.393
18	0.011	5.919	0.605
19	0.012	6.630	0.710
20	0.012	7.335	0.706
21	0.009	7.884	0.549
22	0.006	8.294	0.409
23	0.004	8.571	0.278
24	0.001	8.689	0.118
25	0.001	8.750	0.061
26	0.003	8.886	0.136
27	0.003	9.060	0.173
28	0.005	9.341	0.282
29	0.007	9.734	0.393
30	0.011	10.340	0.605
31	0.012	11.050	0.710
32	0.012	11.755	0.706
33	0.009	12.305	0.549
34	0.006	12.714	0.409
35	0.004	12.992	0.278
36	0.001	13.110	0.118

All.3 Sample Accounting Sheet - Gardels Pit

2019							
MONTHLY WATER ACCOUNTING WORKSHEET							
Gardels M-2005-033 WDID 0402547							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Gross	Net Unit	Exposed	Net	Total Net	Actual	
Month	Evaporation	Evaporation	Groundwater	Evaporation	Evaporation/ Lagged Replacement	Replacement Delivery	Net Effect On Stream
	[ft]	[ft]	[acres]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
January	0.00	0.00	8.80	0.00	0.38	0.38	0.00
February	0.11	0.08	8.80	0.70	0.58	0.58	0.00
March	0.18	0.10	8.80	0.84	0.73	0.73	0.00
April	0.29	0.18	8.80	1.54	1.13	1.13	0.00
May	0.39	0.24	8.80	2.10	1.61	1.61	0.00
June	0.47	0.38	8.80	3.31	2.44	2.44	0.00
July	0.49	0.40	8.80	3.52	2.96	2.96	0.00
August	0.44	0.36	8.80	3.21	3.04	3.04	0.00
Septembe	0.33	0.24	8.80	2.08	2.53	2.53	0.00
October	0.23	0.16	8.80	1.40	1.95	1.95	0.00
November	0.13	0.09	8.80	0.78	1.38	1.38	0.00
December	0.00	0.00	8.80	0.00	0.72	0.72	0.00
TOTALS	3.07			19.47	19.45	19.45	0.00

Notes:

- (1) = (Monthly fraction of evaporation) for elevations below 6500 ft per SEO guidelines X (39.24 inches per year) Gross free water surface evaporation from NOAA Technical Report NWS 33
- (2) = Column (1) - 70% of average precipitation (1989-2017) as recorded at NCWCD Loveland
- (3) = Sum of all pond surface areas
- (4) = Column (2) X Column (3)
- (5) = Lagged Stream Depletion as Determined by IDS AWAS
- (6) = Actual Monthly Replacement Delivery By the City of Loveland at Boise Ave.
- (7) = Column (6) - Column (5). Positive number indicates accretion



DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER RESOURCES

October 4, 2012

John W. Hickenlooper
Governor

Mike King
Executive Director

Dick Wolfe, P.E.
Director/State Engineer

David L. Nettles, P.E.
Division Engineer

WEILAND, INC.
PETER WAYLAND
P.O. BOX 18087
BOULDER, CO 80308

**RE: COMPACTED CLAY LINER APPROVAL
GARDELS WEST RESERVOIR (WDID 0403396)
GARDELS PIT, DRMS M-2005-033 (WDID 0403019)
S19-T5N-R68W, WATER DIVISION 1, WATER DISTRICT 4**

Dear Peter:

The purpose of this letter is to approve the lining of the west mining cell of the Gardels Pit. This reservoir is located in the SESENW of Section 19, Township 5 North, Range 68 West of the 6th P.M. and is a part of the Gardels Pit (DRMS M-2005-033). This compacted clay liner leak test commenced June 15, 2012 and concluded on September 14, 2012. A site inspection was done by our office on October 2, 2012.

Your report dated October 1, 2012 provides the liner summary and leak test result. The test data provided indicates that **the reservoir has been lined to the design standard** referenced in the August 1999 State Engineer Guidelines for Lining Criteria for Gravel Pits (1999 SEO Guidelines). **Meeting the design standard requires that during reservoir operations all water inflows and outflows for the liner perimeter enclosed area be accounted for on a monthly basis.**

With this liner approval, the Gardels West Reservoir is now classified as a lined reservoir in accordance with the 1999 SEO Guidelines. Water shall not be impounded in the reservoir except pursuant to lawful diversions allowed by statute or decree. At all other times, all inflow of water into the reservoir from any source, including precipitation and ground water inflows shall be removed to prevent illegal storage of water. Prior to ANY use of this site, the owner or operator will need to coordinate with Jason Smith, District 4 Water Commissioner, to review operations, measurement structures, stage-storage curves, and accounting.

Please contact me at the number below if you have any questions.

Sincerely,

Jonathan M. Hernandez, P.E.
Water Resource Engineer

ec: Jason Smith, District 4 Water Commissioner (Jason.Smith2@state.co.us)
WDID File (0403396, 0403019)

Water Division 1 • Greeley

810 9th Street, Suite 200 • Greeley, CO 80631 • Phone: 970-352-8712 • Fax: 970-392-1816
www.water.state.co.us