STATE OF COLORADO

Lennberg - DNR, Patrick <patrick.lennberg@state.co.us>

Approval of SWSP Renewal Request for the Timnath-Connell Pit (M-1999-050, Plan ID 3615)

1 message

Vargas-Johnson - DNR, Javier <javier.vargasjohnson@state.co.us> Mon, Apr 10, 2023 at 4:14 PM
To: tlwwater@msn.com
Cc: Michael Hein - DNR <michael.hein@state.co.us>, Louis Flink - DNR <louis.flink@state.co.us>, Dawn Ewing - DNR <Dawn.Ewing@state.co.us>, Mark Simpson - DNR <mark.simpson@state.co.us>, Patrick Lennberg - DNR <patrick.lennberg@state.co.us>

Dear Mr. Williams,

The Colorado Division of Water Resources has reviewed the application for the Timnath-Connell SWSP Renewal (DRMS Permit No. M-1999-050, Plan ID 3615). Please see the attached letter for the conditions of approval.

Please let me know if you have any questions or concerns.

Sincerely,

Javier Vargas-Johnson
Water Resources Engineer

COLORADO
Division of Water Resources
Department of Natural Resources

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Timnath-Connell 2023-2024.pdf
5036K

COLORADO
Division of Water Resources
Department of Natural Resources

April 10, 2023

Mr. Todd Williams, P.E.
Williams and Weiss Consulting, LLC
5255 Ronald Reagan Boulevard, Ste 220
Johnstown, CO 80534

RE: Timnath-Connell Substitute Water Supply Plan (WDID 0302526, Plan ID 3615)
Timnath-Connell Pit, DRMS Permit No. M-1999-050 (WDID 0303018)
Section 3, T6N, R68W, 6th P.M.
Water Division 1, Water District 3, Larimer County

Approval Period: April 1, 2023 through March 31, 2024
Contact Information for Mr. Williams: 303-653-3940; tlwwater@msn.com

Dear Mr. Williams:

We have reviewed your letter dated February 15, 2023 requesting renewal of the above referenced substitute water supply plan ("SWSP") in accordance with section 37-90-137(11), C.R.S., for a sand and gravel pit known as the Timnath-Connell Pit on behalf of Connell Resources ("Applicant"). The required fee of $257.00 for the renewal of this substitute water supply plan has been submitted (receipt number 10027279). The original substitute water supply plan for this site was approved on July 22, 1999, and was most recently approved on March 28, 2022 for operations through March 31, 2023.

SWSP Operation

The Timnath-Connell Pit is located in Section 3, Township 6 North, Range 68 West of the 6th P.M., south of the town of Timnath and west of the Cache la Poudre River. Mining operations at the Timnath-Connell Pit during this plan period will consist of the recycling of asphalt and concrete material, dust control, and reclamation activity. The reclamation activity proposed to occur at the Timnath-Connell Pit during this plan period is limited to the backfilling of previously mined areas. No additional mining of sand and gravel is proposed to occur at this site during this plan period, and no product is proposed to be washed at the site during this plan period. Depletions at the site during this plan period will be limited to evaporation from exposed groundwater surface areas and water used for dust control purposes. Replacement of depletions at the site will be made via delivery of Box Elder Ditch Company shares to an on-site recharge pond or fully consumable water leased from the Fort Collins-Loveland Water District. Operations at the site are projected to continue for another four years or more. The final reclamation plan for the site calls for a lined reservoir for the area west of the Box Elder Ditch and backfilling of the mined area to the east of the Box Elder Ditch. An 8.10-acre recharge pond and a 2.74-acre unlined pond will remain on site after reclamation.

Depletions

There are 6.03 acres of exposed groundwater remaining at the site and an 8.10-acre recharge pond. The 6.03 acres of groundwater currently exposed at the site consist of a total of 0.15 acres of dewatering trenches, a 0.53-acre dewatering sump, a 2.61-acre pond used to provide water for dust control purposes, and a 2.74-acre pond (see attached Map 1). Evaporative depletions were calculated using a gross annual evaporation of 39 inches, with a credit of 8.16 inches for effective precipitation (based on an average annual precipitation for the Northern Colorado Water Conservancy District's Loveland [2006-2015] and East Fort Collins [1994-2015] weather stations). Net evaporative depletions are calculated as 20.82 acre-feet per year for the 8.10-acre recharge pond and 15.50 acre-feet per year for the remaining 6.03 acres of exposed groundwater (see attached Tables 1 and 2). The evaporative loss from the recharge pond is deducted from the deliveries to the recharge pond in the given month prior to determining the net positive accretion or depletion from recharge into the pond and is thus not separately accounted for as a depletion in this SWSP.

It is anticipated that 0.80 acre-feet of water will be used for on-site dust control during this plan period, based on an estimate of 5 truckloads of 4,000 gallons of water per month. Water used for dust control purposes is assumed to be 100% consumed.

The Timnath-Connell Pit will not be mined for sand and gravel during this approval period, and no product will be washed at the site, therefore there will be no water lost in any mined product.

The total annual consumptive use from evaporation (excluding the recharge pond) and operational uses at the site is 16.30 acre-feet (see attached Table 4). The Alluvial Water Accounting System (AWAS) stream depletion model, developed by the Integrated Decision Support Group, was used to determine the lagged depletions from the Timnath-Connell Pit to the Cache la Poudre River from past and projected evaporation and operational losses at the site. The following parameters were used in the model:

- Distance from the centroid of the 6.03 acres of exposed groundwater to the river (X) = 2,218 ft
- Alluvial aquifer width (W) = 5,300 ft
- Specific yield (S) = 0.2
- Transmissivity (T) = 50,000 (gpd/ft)

Lagged stream depletions are estimated to total 16.31 acre-feet during this plan period, as shown on the attached Table 4.

The Applicant has continuously dewatered the Timnath-Connell Pit since 1999. Water pumped for dewatering is discharged into the adjacent recharge pond and the adjacent 2.74-acre unlined pond. This diversion into the recharge pond is not a part of the metered Box Elder Ditch shares that are also discharged into the recharge pond. The dewatering depletions are lagged to the river using the same parameters as the other lagged depletions from the Timnath-Connell Pit as described above. The dewatering accretions from the recharge pond are lagged to the river using the same parameters as given above for the mine site depletions with the exception of using a distance (X) from the centroid of the recharge pond to the river of 3,500 ft. This dewatering operation creates lagged accretions that mimic the lagged depletions. Thus at the cessation of dewatering the only

depletion that would impact the river is that which is attributable to the "first fill" of the pit. The Applicant intends to line the mined portion of the pit when mining activity is complete thereby eliminating the depletion caused by the "first fill". Should dewatering operations cease prior to the pit obtaining a liner approval from the Division Engineer, the Applicant must address the lagged depletions due to the "first fill".

Replacements

The operator proposes to provide replacement water for this pit using a combination of recharge of Box Elder Ditch Company shares and fully consumable water leased from the Fort Collins-Loveland Water District.

Recharge of Box Elder Ditch Company Shares

Connell Resources, Inc. owns a total of 4.0 shares out of 64 outstanding shares in the Box Elder Ditch Company ("BEDC") (WDID 0300926), representing 6.25% of the share ownership. The Applicant's 4.0 shares were historically used to irrigate 165 acres on the property known as the John Weitzel Farm, which includes the site of the Timnath-Connell Pit. The primary source of replacement water for this SWSP will be from recharge of 2.5 of these BEDC shares. The shares will be diverted into a recharge pit (WDID 0302003) located on the Timnath-Connell site. The recharge pit was constructed in an area of the mining site that was previously excavated for sand and gravel mining. The remaining 1.5 BEDC shares not delivered to recharge will continue to be used to irrigate the portion of the John Weitzel Farm still in agricultural production.

The pro-rata diversions available at the farm headgate for the 4.0 shares used on the John Weitzel property were estimated to total 379.71 acre-feet per year, based on the average headgate diversions for the Box Elder Ditch for the years 1950 to 2002, assuming a 10% ditch loss. The amount of water available for crop consumption was estimated to be 193.79 acre-feet, based on 55% field efficiency for flood irrigation. The potential crop consumptive use was calculated as 170.02 acre-feet per year, using the SPCU Model. Historical consumptive use for the 4.0 shares was determined as the lesser of the water available for crop consumption or potential crop consumptive use if a full water supply was available on a monthly basis, and was calculated as 168.84 acre-feet per year. Total return flow obligations from the use of the 4.0 shares were calculated as 183.50 acre-feet per year by subtracting the historical consumptive use from the pro-rata amount of diversions available at the farm headgate. One-third of the return flows (61.17 acre-feet) were assumed to occur as surface return flows and the remaining two-thirds (122.33 acre-feet) were assumed to occur as subsurface return flows. Subsurface return flows were lagged to the river using the AWAS stream depletion model with the following parameters:

- Distance from the centroid of the irrigated property to the river (X) = 3,300 ft
- Alluvial aquifer width (W) = 5,000 ft
- Specific yield (S) = 0.2
- Transmissivity (T) = 50,000 (gpd/ft)

The monthly net accretion/depletion for the 4.0 BEDC shares were calculated as the monthly diversions available at the farm headgate, minus the surface return flow obligation and lagged subsurface return flow obligation for that month. The monthly net accretion/depletion for the 2.5 BEDC shares to be delivered to recharge were calculated by pro-rating the monthly net accretion/depletion for the 4.0 BEDC shares.

The expected volume of water available for diversion into the recharge pond for the subject 2.5 shares is 220.21 acre-feet per year. This figure represents the pro-rata average headgate diversion less a 10% ditch loss. The pro-rata historical consumptive use credit for the 2.5 shares is estimated to total 105.52 acre-feet for this plan period and the pro-rata return flow obligation for the 2.5 shares is estimated to be 114.69 acre-feet. As indicated above, the evaporation losses from the recharge pond are estimated to total 20.82 acre-feet per year, resulting in a net amount of 199.39 acre-feet of water delivered to recharge. The delivery of water to recharge in the pond is not anticipated to increase the surface area of the pond or create additional evaporative depletions beyond those attributable to the groundwater exposed to the atmosphere in connection with the extraction of sand and gravel by open mining, therefore net evaporation may be used in calculating the volume of water lost to evaporation from the recharge pond instead of gross evaporation.

The lagged accretions from the Timnath-Connell recharge pond were estimated by the Applicant's consultant using the AWAS stream depletion model with the following parameters:

- Distance from the recharge pond centroid to the river (X) = 3,500 ft
- Alluvial aquifer width (W) = 5,300 ft
- Specific yield (S) = 0.2
- Transmissivity (T) = 50,000 (gpd/ft)

The lagged accretions to the Cache la Poudre River are projected to total 264.27 acre-feet during this plan period. This amount includes deliveries to recharge from previous years. Pursuant to previously submitted accounting, 286.54 acre-feet were diverted into the recharge site during the 2012 irrigation season, 257.27 acre-feet were diverted into the recharge site during the 2013 irrigation season, 502.69 acre-feet were diverted into the recharge site during the 2014 irrigation season, 406.81 were diverted into the recharge site during the 2015 irrigation season, 240.10 were diverted into the recharge site during the 2016 irrigation season, 317.95 acre-feet were diverted into the recharge site during the 2017 irrigation season, 229.69 acre-feet were diverted into the recharge site during the 2018 irrigation season, 252.31 acre-feet were diverted into the recharge site during the 2019 irrigation season, 258.41 acre-feet were diverted into the recharge site during the 2020 irrigation season, 486.28 acre-feet were diverted into the recharge site during the 2021 irrigation season, and 312.78 acre-feet were diverted into the recharge site during the 2022 irrigation season. In 2014, 2015, and 2021, long periods of no call on the Cache la Poudre River allowed for a considerable amount of free river water to be delivered into the recharge pond in addition to the historical yield of the 2.5 Box Elder shares. The summer and winter return flow obligations from the use of the 2.5 Box Elder Ditch shares will be maintained under this substitute water supply plan. A monthly breakdown of the stream depletions and accretions are shown in the attached Table 8. As shown in column (H), the net recharge accretion credits from the Box Elder Ditch shares are sufficient to cover both the return flow obligations from the use of the shares and the depletions from operations at the Timnath-Connell Pit.

Long Term Augmentation

In accordance with the letter dated April 30, 2010 (see attached) from the Colorado Division of Reclamation, Mining, and Safety ("DRMS"), all sand and gravel mining operators must comply with the requirements of the Colorado Reclamation Act and the Mineral Rules and Regulations for the protection of water resources. The final reclamation plan for this site includes both a lined reservoir and unlined ponds for the portion of the site west of the Box Elder Ditch, while all of the disturbed

areas to the east of the Box Elder Ditch will be backfilled. The successful completion of a lined reservoir will eliminate long-term depletions that would require an augmentation plan for the western portion of the site. After completion and approval of the reservoir liner, this area must continue to be covered by a valid SWSP until the lagged depletions from mining operations are no longer impacting the river.

A 2.74-acre unlined pond and the 8.10-acre recharge pond are proposed to remain on the site after final reclamation. The creation of permanent unlined ponds will result in long-term evaporation of groundwater which requires a long-term augmentation plan. The Applicant is required to obtain a water court approved augmentation plan to cover the long term-depletions associated with such groundwater ponds.

The April 30, 2010 letter from DRMS required that you provide information to DRMS to demonstrate you can replace long term injurious stream depletions that result from mining related exposure of groundwater. In accordance with approach nos. 1 and 3 identified in that letter, the Applicant holds a bond through DRMS in the amount of $532,504.72. The bond was increased to this amount pursuant to a site inspection and reclamation cost estimate conducted by DRMS staff on May 15, 2017. In addition, Connell Resources has confirmed that they understand that an augmentation plan must be filed three years prior to completion of mining at the site to address long-term depletions from the evaporation of groundwater from the unlined ponds. Connell Resources anticipates filing an application to the water court in 2023 or 2024.

Conditions of Approval

I hereby approve this substitute water supply plan, in accordance with section 37-90-137(11), C.R.S., subject to the following conditions:

1. This plan shall be valid for the period of April 1, 2023 through March 31, 2024 unless otherwise revoked or superseded by a decree. If a court-decreed augmentation plan will not be obtained by the plan's expiration date, a renewal request must be submitted to this office with the statutory fee (currently $257) no later than **February 1, 2024.** If a renewal request is received after the expiration date of this plan, it may be considered a request for a new SWSP, in which case a $1,593 filing fee will apply.
2. The Applicant must replace all out-of-priority depletions resulting from operation under this SWSP, including those lagged depletions that occur to the stream after the expiration date of this SWSP.
3. Well permit 53419-F has been obtained for the current use and exposed pond surface area of the gravel pit in accordance with sections 37-90-137(2) and (11), C.R.S.
4. The total surface area of the groundwater exposed at the Timnath-Connell Pit (not including the recharge pond) must not exceed 6.03 acres, resulting in 15.50 acre-feet per year of evaporative loss.
5. The total amount of groundwater used for operational purposes at the Timnath-Connell Pit during this plan period shall not exceed 0.8 acre-feet used for dust control purposes. No product shall be mined at the site during this plan period.

6. Total consumption at the Timnath-Connell Pit shall not exceed the aforementioned amounts unless an amendment is made to this plan.

7. Approval of this plan is for the purposes as stated herein. Any additional uses of this water must first be approved by this office. Any future additional historical consumptive use credit given (e.g., agricultural water transfer) for this site must consider all previous credits given.

8. All pumping for dust control purposes shall be measured in a manner acceptable to the division engineer.

9. The water attributable to the 2.5 shares of the Box Elder Ditch Company must continue to be diverted in priority at the ditch and then measured into the Timnath-Connell recharge site. Adequate measuring devices acceptable to the water commissioner must be installed.

10. The Division of Water Resources will not acknowledge any recharge activity conducted without the knowledge of the water commissioner. The flow into the recharge site must be metered and equipped with a continuous flow recorder unless the water commissioner, in conjunction with the division engineer, determines adequate records may be kept without such equipment.

11. Water may be delivered to recharge only if the net impact of this plan is not negative. Water must first be delivered or exchanged to offset negative impacts of this plan before it may be diverted for recharge.

12. The replacement water which is the subject of this plan cannot be sold or leased to any other entity. As a condition of subsequent renewals of this substitute water supply plan, the replacement water must be appurtenant to this site until a plan for augmentation and/or liner approval is obtained for the entire site. All replacement water must be concurrent with depletions in quantity, timing, and locations.

13. All releases of replacement water must be sufficient to cover all out-of-priority depletions in time, place, and amount and must be made under the direction and/or approval of the water commissioner. The release of replacement water may be aggregated to maximize beneficial use. The water commissioner and/or the division engineer shall determine the rate and timing of an aggregated release. The Applicant is required to coordinate the delivery location of replacement water with the water commissioner to ensure the out-of-priority depletions are adequately replaced to prevent injury to other water rights.

14. In order to prevent injury to other water rights, the division engineer and water commissioner must be able to administer Applicants' replacement water past headgates on the river at times when those headgates would otherwise be legally entitled to divert all available flow in or "sweep" the Cache la Poudre River or its tributaries. Applicant shall not receive credit for replacement of depletions to the Cache la Poudre River below such diversion structures unless bypass and measurement structures are in place to allow the division engineer and water commissioner to confirm that Applicant's replacement water is delivered past the headgates. In the event that delivery past dry-up points requires the use of a structure for which a carriage or use agreement with a third party is required, Applicant shall be responsible for securing such agreement. Until such time as the Applicant provides a copy of the carriage or use agreement to the division engineer and water commissioner, no credit will be allowed for replacement of depletions to the Cache la Poudre River below such diversion structure.

15. The Division of Water Resources will not be responsible for any enforcement or administration of third party agreements that are not included in a decree of the water court.

16. The Applicant shall provide daily accounting (including, but not limited to diversions, depletions, replacement sources, and river calls) on a monthly basis. The accounting must be uploaded to the CDSS Online Reporting Tool within 30 days of the end of the month for which the accounting applies (https://dwr.state.co.us/Tools/reporting). Instructions for using the tool are available on the Division of Water Resources website on the "Services" → "Data & Information" page under the heading of Online Data Submittal. Accounting and reporting procedures are subject to approval and modification by the division engineer. Accounting forms need to identify the WDID number for each structure operating under this SWSP. Additional information regarding accounting requirements can be found in the attached Augmentation Plan Accounting Protocol. **NOTE:** Monthly accounting, even during the winter non-irrigation season, is required.

17. The name, address, and phone number of the contact person who will be responsible for the operation and accounting of this plan must be provided on the accounting forms submitted to the division engineer and the water commissioner.

18. The Applicant shall follow the attached Augmentation Plan Accounting Protocol and Division 1 Recharge Protocol for the operation of this SWSP, except that for the reasons described in this SWSP, evaporative losses from the recharge pond may be calculated based on net evaporation instead of gross evaporation so long as the surface area of the recharge pond does not exceed 8.10 acres.

19. Conveyance loss for delivery of augmentation water is subject to assessment and modification as determined by the division engineer.

20. The amount and location of the dry-up of the irrigated acreage associated with the subject 2.5 shares of the Box Elder Ditch Company has been previously documented and approved by the division engineer and water commissioner (see attached Map 2), therefore no annual reporting is required to verify dry-up.

21. Reclamation of the mine site will produce a permanent water surface exposing groundwater to evaporation, therefore an application for a plan for augmentation must be filed with the Division 1 Water Court at least three years prior to the completion of mining to include, but not be limited to, long-term evaporation losses. Granting of this plan does not imply approval by this office of any such court application(s). For the portion of the site proposed to be lined, replacement of lagged depletions shall continue until there is no longer an effect on stream flow.

22. The Timnath-Connell Pit has been continuously dewatered. Dewatering operations at this site create lagged accretions that mimic its lagged depletions due to the recharge of dewatering water. The Applicant intends to line the mined portion of the site when mining activity is complete, and none of the currently dewatered areas will be within the unlined lakes after reclamation. Therefore the site should not experience water loss associated with a "first fill" that occurs when unlined gravel pits are allowed to fill with groundwater. The Applicant proposes that in accordance with the current dewatering plan, once dewatering at the site ceases, there will not be any post-pumping depletions that must be addressed.

23. If dewatering of the Timnath-Connell Pit is discontinued prior to the completion of a liner, the pit would fill, creating additional depletions to the stream system and resulting in increased

evaporation. Additionally, should an augmentation plan not be obtained for the unlined ponds, long term depletions to the stream system would result. To assure that additional or long term depletions to the river do not occur, a bond for $532,504.72 for the lining or backfilling of the Timnath-Connell Pit was obtained in 2017 through DRMS.

24. The state engineer may revoke this SWSP or add additional restrictions to its operation if at any time the state engineer determines that injury to other vested water rights has occurred or will occur as a result of the operation of this SWSP. Should this substitute water supply plan expire without renewal or be revoked prior to adjudication of a permanent plan for augmentation, all excavation of product from below the water table, and all other use of water at the pit, must cease immediately.

25. In accordance with amendments to section 25-8-202(7), C.R.S., and "Senate Bill 89-181 Rules and Regulations" adopted on February 4, 1992, the state engineer shall determine whether the substitute supply is of a quality to meet requirements of use to which the senior appropriators receiving the substitute supply has normally been put. As such, water quality data or analysis may be requested at any time to determine if the requirement of use of the senior appropriator is met.

26. The decision of the state engineer shall have no precedential or evidentiary force, shall not create any presumptions, shift the burden of proof, or serve as a defense in any pending water court case or any other legal action that may be initiated concerning this plan. This decision shall not bind the state engineer to act in a similar manner in any other applications involving other plans, or in any proposed renewal of this plan, and shall not imply concurrence with any findings of fact or conclusions of law contained herein, or with the engineering methodologies used by the Applicant.

Should you have any questions or comments regarding this plan, please contact Michael Hein, Lead Assistant Division Engineer, in Greeley at 970-352-8712 or Javier Vargas-Johnson in Denver at 303-866-3581.

Sincerely,

for Jeff Deatherage, P.E.
Chief of Water Supply

Attachments:
Maps 1 and 2
Tables 1, 2, 4, and 8
April 30, 2010 DRMS letter
Augmentation Plan Accounting Protocol
Division 1 - South Platte River Administrative Protocol: Recharge

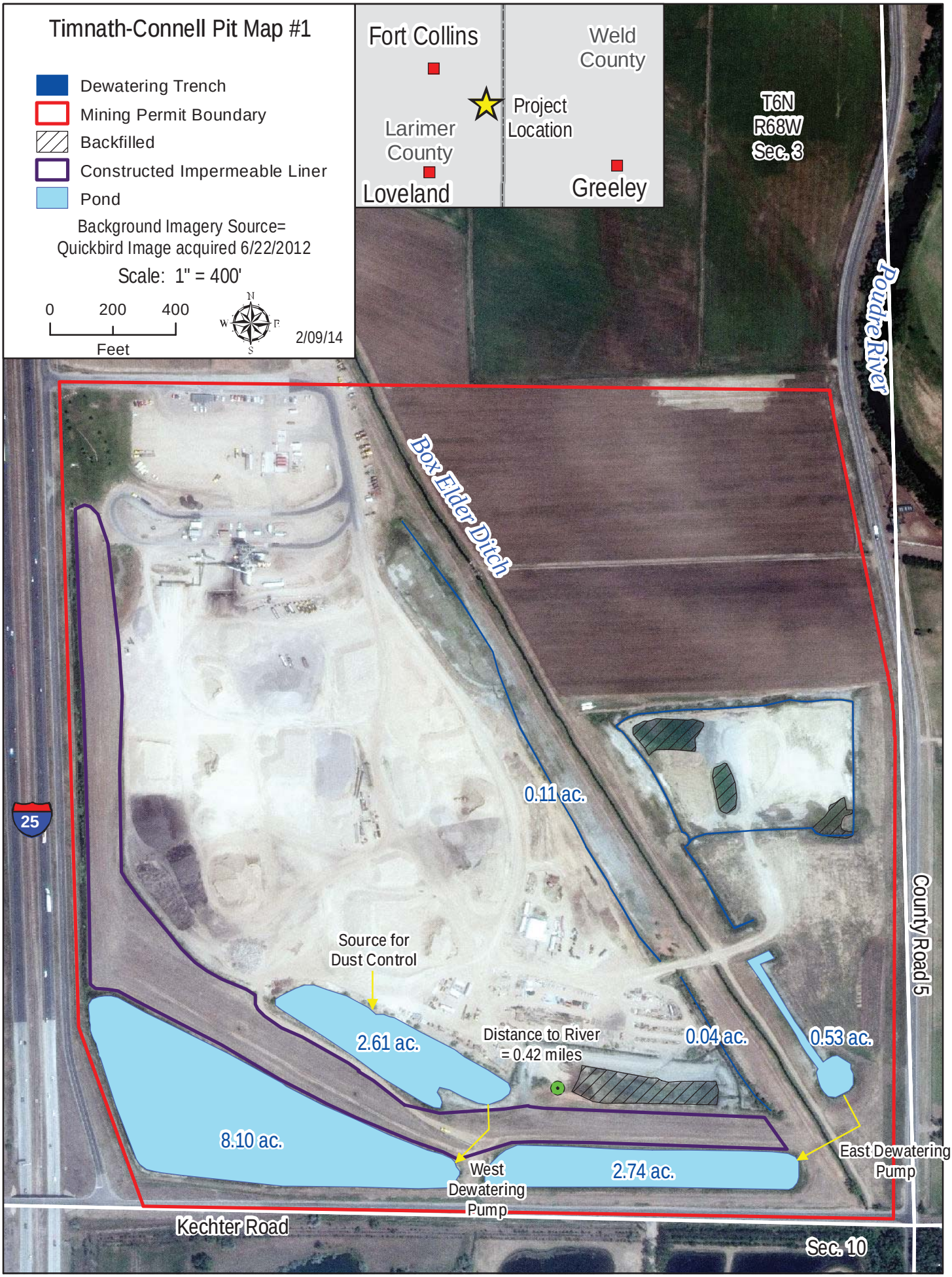
Cc: Michael Hein, Lead Assistant Division Engineer, Michael.Hein@state.co.us
1809 56th Avenue, Greeley, CO 80634, (970) 352-8712

Louis Flink, Tabulation/Diversion Records Coordinator, Louis.Flink@state.co.us

Mark Simpson, Water Commissioner, Water District 3, Mark.Simpson@state.co.us

Dawn Ewing, Accounting Coordinator, Dawn.Ewing@state.co.us

Patrick Lennberg, Division of Reclamation, Mining and Safety, patrick.lennberg@state.co.us


Timnath-Connell Pit Map #1
Dewatering Trench
Mining Permit Boundary
Backfilled
Constructed Impermeable Liner
Pond
Background Imagery Source=
Quickbird Image acquired 6/22/2012
Scale: 1" = 400'
0
200
400
Feet
N
W
E
S
2/09/14
Fort Collins
Weld County
Project Location
Larimer County
Loveland
Greeley
T6N
R68W
Sec. 3
Poudre River
Box Elder Ditch
0.11 ac.
25
Source for Dust Control
2.61 ac.
Distance to River
= 0.42 miles
0.04 ac.
0.53 ac.
8.10 ac.
West Dewatering Pump
2.74 ac.
East Dewatering Pump
County Road 5
Kechter Road
Sec. 10

Map 2

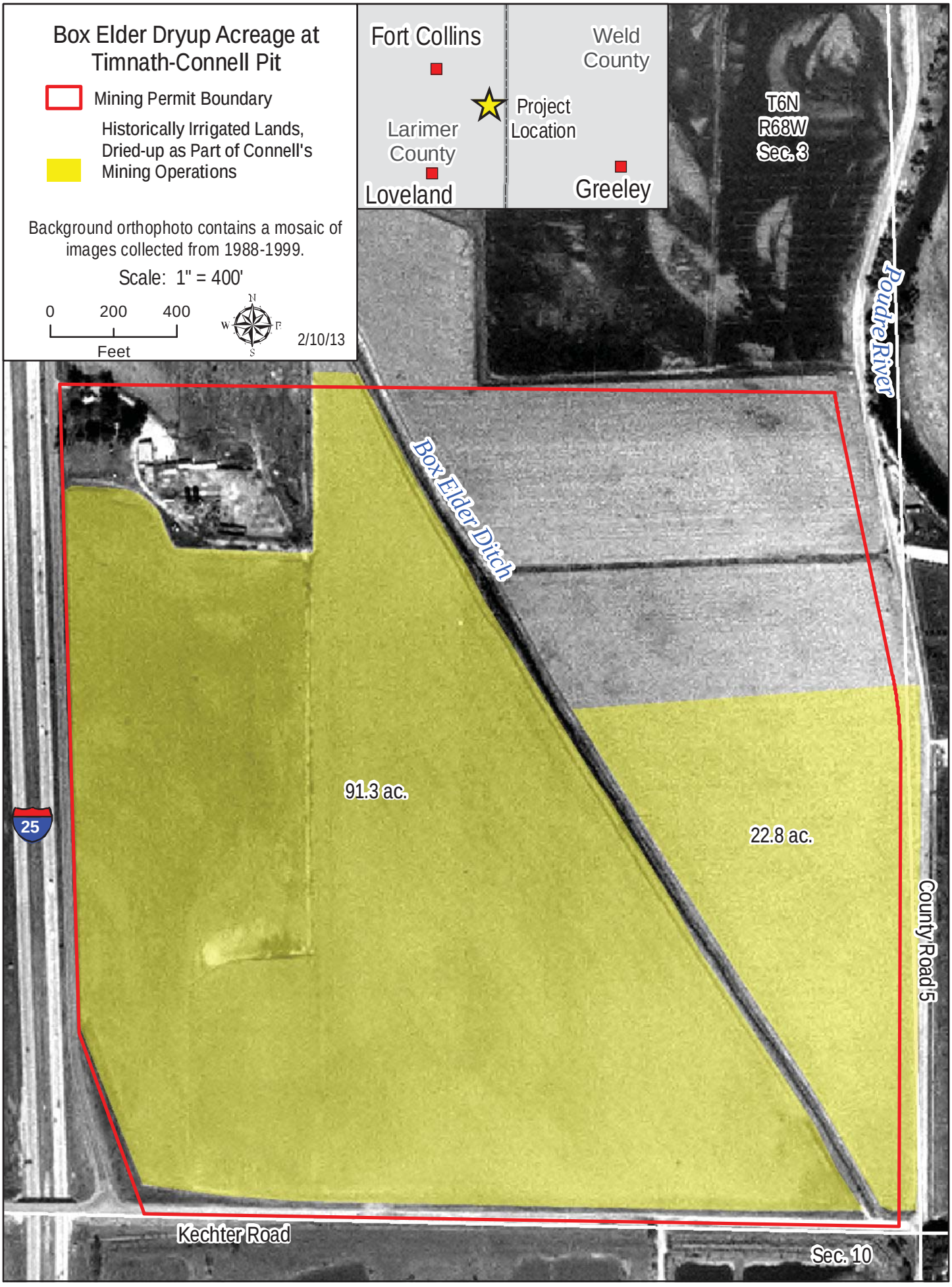

Box Elder Dryup Acreage at Timnath-Connell Pit
Mining Permit Boundary
Historically Irrigated Lands, Dried-up as Part of Connell's Mining Operations
Background orthophoto contains a mosaic of images collected from 1988-1999.
Scale: 1" = 400'
0
200
400
Feet
N
W
E
S
2/10/13
Fort Collins
Weld County
Project Location
Larimer County
Loveland
Greeley
T6N
R68W
Sec. 3
Poudre River
Box Elder Ditch
91.3 ac.
22.8 ac.
25
County Road 5
Kechter Road
Sec. 10

Table 1

Timnath-Connell Pit
Connell Resources

Prepared by: Williams and Weiss Consulting, LLC
Date Revised: 2/14/2023

Evaporative Loss - Timnath-Connell Recharge Pond

Total Exposted Water Surface Area[1] = 8.1 acres

		2023									2024			
		April	May	June	July	August	September	October	November	December	January	February	March	Totals
Distribution of Annual Evaporation[2]		0.09	0.12	0.15	0.15	0.14	0.10	0.07	0.04	0.03	0.03	0.035	0.055	1.00
Pond Evaporation[3]	inches	3.51	4.68	5.66	5.85	5.27	3.90	2.73	1.56	1.17	1.17	1.37	2.15	39.00
Effective Precipitation[4]	inches	1.12	1.73	0.90	0.91	0.67	0.92	0.69	0.28	0.17	0.16	0.21	0.39	8.16
Net Pond Evap	af/acre	0.20	0.25	0.40	0.41	0.38	0.25	0.17	0.11	0.08	0.08	0.10	0.15	2.57
Net Evaporation	**acre-feet**	**1.61**	**1.99**	**3.21**	**3.34**	**3.10**	**2.01**	**1.38**	**0.86**	**0.67**	**0.68**	**0.78**	**1.18**	**20.82**

Notes:
[1] See Map 1 for the delineation of the de-watering pond exposed water surface area.
[2]Distribution of Annual Evaporation per DWR Guidelines for gravel pits at elevations below 6,500 feet.
[3]Annual evaporation rate are taken from NOAA Technical Report NWS 33.
[4]Effecitive Precipitation = 0.7 * Avg. Precip.. Avg. Monthly Precip. = averaging monthly data from the Northern Colorado Water Conservancy District's Loveland (2006 - 2015) and East Ft. Collins (1994 - 2015) weather stations.

Table 2

Timnath-Connell Pit
Connell Resources

Prepared by: Williams and Weiss Consulting, LLC
Date Revised: 2/14/2023

Evaporative Losses within Mining Area

Total Exposted Water Surface Area[1] = 6.03 acres

		2023									2024			
		April	May	June	July	August	September	October	November	December	January	February	March	Totals
Distribution of Annual Evaporation[2]		0.09	0.12	0.15	0.15	0.14	0.10	0.07	0.04	0.03	0.03	0.035	0.055	1.00
Pond Evaporation[3]	inches	3.51	4.68	5.66	5.85	5.27	3.90	2.73	1.56	1.17	1.17	1.37	2.15	39.00
Effective Precipitation[4]	inches	1.12	1.73	0.90	0.91	0.67	0.92	0.69	0.28	0.17	0.16	0.21	0.39	8.16
Net Pond Evap	af/acre	0.20	0.25	0.40	0.41	0.38	0.25	0.17	0.11	0.08	0.08	0.10	0.15	2.57
Net Evaporation	**acre-feet**	**1.20**	**1.48**	**2.39**	**2.48**	**2.31**	**1.50**	**1.02**	**0.64**	**0.50**	**0.51**	**0.58**	**0.88**	**15.50**

Notes:

[1] See Map 1 for the delineation of the de-watering pond exposed water surface area.

[2]Distribution of Annual Evaporation per DWR Guidelines for gravel pits at elevations below 6,500 feet.

[3]Annual evaporation rate are taken from NOAA Technical Report NWS 33.

[4]Effecitive Precipitation = 0.7 * Avg. Precip.. Avg. Monthly Precip. = averaging monthly data from the Northern Colorado Water Conservancy District's Loveland (2006 - 2015) and East Ft. Collins (1994 - 2015) weather stations.

Table No. 4
Timnath-Connell Pit
Connell Resources

Prepared by: Williams and Weiss Consulting, LLC
Date Revised: 2/14/2023

Total Losses - Evaporative and Operational Losses and Lagged Depletions

Month	Evaporative Losses[1] (ac-ft)	Operational Losses[2] (ac-ft)	Total Consumptive Use[3] (ac-ft)	Lagged Stream Depletions[4] (ac-ft)
Apr-22	1.20	0.07	1.27	-1.12
May-22	1.48	0.07	1.55	-1.19
Jun-22	2.39	0.07	2.46	-1.30
Jul-22	2.48	0.07	2.55	-1.50
Aug-22	2.31	0.07	2.38	-1.65
Sep-22	1.50	0.07	1.56	-1.70
Oct-22	1.02	0.07	1.09	-1.61
Nov-22	0.64	0.07	0.71	-1.47
Dec-22	0.50	0.07	0.57	-1.33
Jan-23	0.51	0.07	0.57	-1.21
Feb-23	0.58	0.07	0.65	-1.13
Mar-23	0.88	0.07	0.95	-1.10
Total	15.50	0.80	16.30	-16.31

[1]Evaporative losses are calculated in Table 2.

[2]Operational losses are calculated in Table 3.

[3]Total consumptive use is total of evaporative and operational losses.

[4]Lagged stream depletions are calcuated using the AWAS stream where X = 2218 ft, W = 5,300 ft, S = 0.2, T = 50,000 gpd/ft.
Lagged depletions include lagged depletions from previous years hitting the Poudre River during the renewal period.

Connel Resources, Inc.
Timnath-Connell Pit SWSP

Prepared by: Williams and Weiss Consulting, LLC
Date Revised: 4/6/2023

Water Balance for CRI's SWSP

Month	Farm Headgate Diversions into CRI Recharge Pond (acre-feet) (A)	Evaporative Loss From Recharge Pond (acre-feet) (B)	Net Recharge (acre-feet) (C)	Lagged Timing of Net Recharge (acre-feet) (D)	Summer Return Flow Component (acre-feet) (E)	Winter Return Flow Component (acre-feet) (F)	Timnath-Connell Lagged Depletions (acre-feet) (G)	Monthly Excess or Deficit Realized at River (acre-feet) (H)	Monthly Supplies Leased from Ft. Collins (acre-feet) (I)	Total Monthly Excess or Deficit Realized at River (acre -feet) (J)
Apr-19	0.00	1.61	-1.61	15.83		6.73	1.13	7.97	0.00	7.97
May-19	0.00	1.99	-1.99	14.89	12.47		1.23	1.19	0.00	1.19
Jun-19	47.50	3.21	44.29	15.94	12.96		1.36	1.62	0.00	1.62
Jul-19	43.20	3.34	39.86	18.58	16.73		1.55	0.30	0.00	0.30
Aug-19	50.68	3.10	47.58	22.77	15.15		1.68	5.94	0.00	5.94
Sep-19	93.36	2.01	91.35	25.56	13.07		1.73	10.76	0.00	10.76
Oct-19	17.57	1.38	16.19	25.40		11.29	1.63	12.48	0.00	12.48
Nov-19	0.00	0.86	-0.86	23.45		8.92	1.49	13.04	0.00	13.04
Dec-19	0.00	0.67	-0.67	20.92		7.91	1.34	11.67	0.00	11.67
Jan-20	0.00	0.68	-0.68	18.63		7.16	1.22	10.25	0.00	10.25
Feb-20	0.00	0.78	-0.78	16.73		6.48	1.14	9.11	0.00	9.11
Mar-20	0.00	1.18	-1.18	15.12		6.00	1.11	8.01	0.00	8.01
Year-1 Tota	**252.31**	**20.82**	**231.49**	**233.82**	**70.38**	**54.48**	**16.61**	**92.35**	**0.00**	**92.35**
Apr-20	5.03	1.61	3.42	15.52		7.03	1.13	7.36	0.00	7.36
May-20	56.11	1.99	54.12	14.61	12.72		1.19	0.70	0.00	0.70
Jun-20	55.36	3.21	52.15	15.72	13.37		1.30	1.05	0.00	1.05
Jul-20	40.36	3.34	37.02	18.40	16.59		1.51	0.30	0.00	0.30
Aug-20	36.62	3.10	33.52	22.61	15.17		1.66	5.78	0.00	5.78
Sep-20	49.40	2.01	47.39	25.41	13.43		1.71	10.27	0.00	10.27
Oct-20	15.53	1.38	14.15	25.29		11.59	1.61	12.09	0.00	12.09
Nov-20	0.00	0.86	-0.86	23.37		8.90	1.48	12.99	0.00	12.99
Dec-20	0.00	0.67	-0.67	20.86		7.91	1.33	11.62	0.00	11.62
Jan-21	0.00	0.68	-0.68	18.56		7.16	1.21	10.19	0.00	10.19
Feb-21	0.00	0.78	-0.78	16.67		6.48	1.13	9.06	0.00	9.06
Mar-21	0.00	1.18	-1.18	15.07		5.99	1.10	7.98	0.00	7.98
Year-2 Tota	**258.41**	**20.82**	**237.59**	**232.09**	**71.28**	**55.06**	**16.36**	**89.39**	**0.00**	**89.39**
Apr-21	5.30	1.61	3.69	14.73		7.05	1.12	6.56	0.00	6.56
May-21	86.08	1.99	84.09	14.39	12.75		1.19	0.45	0.00	0.45
Jun-21	110.68	3.21	107.47	20.03	13.29		1.30	5.44	0.00	5.44
Jul-21	111.79	3.34	108.45	28.94	16.81		1.50	10.63	0.00	10.63
Aug-21	93.01	3.10	89.91	36.97	15.36		1.65	19.96	0.00	19.96
Sep-21	68.91	2.01	66.90	42.17	13.52		1.70	26.95	0.00	26.95
Oct-21	9.99	1.38	8.62	43.94		11.75	1.61	30.58	0.00	30.58
Nov-21	0.00	0.86	0.00	40.78		9.11	1.47	30.20	0.00	30.20
Dec-21	0.00	0.67	-0.67	35.93		8.09	1.33	26.51	0.00	26.51
Jan-22	0.02	0.68	-0.66	31.82		7.33	1.21	23.28	0.00	23.28
Feb-22	0.03	0.78	-0.75	28.55		6.63	1.13	20.79	0.00	20.79
Mar-22	0.47	1.18	-0.71	25.82		6.15	1.10	18.57	0.00	18.57
Year-3 Tota	**486.28**	**20.82**	**466.33**	**364.07**	**71.72**	**56.11**	**16.31**	**219.92**	**0.00**	**219.92**
Apr-22	5.30	1.61	3.69	23.49		7.05	1.12	15.32	0.00	15.32
May-22	29.98	1.99	27.99	21.92	12.75		1.19	7.98	0.00	7.98
Jun-22	81.95	3.21	78.74	22.76	13.29		1.30	8.17	0.00	8.17
Jul-22	107.29	3.34	103.95	27.89	16.81		1.50	9.58	0.00	9.58
Aug-22	52.39	3.10	49.29	35.03	15.36		1.65	18.02	0.00	18.02
Sep-22	24.77	2.01	22.76	37.63	13.52		1.70	22.41	0.00	22.41
Oct-22	11.10	1.38	9.72	36.02		11.75	1.61	22.66	0.00	22.66
Nov-22	0.00	0.86	-0.86	32.94		9.11	1.47	22.36	0.00	22.36
Dec-22	0.00	0.67	-0.67	29.47		8.09	1.33	20.05	0.00	20.05
Jan-23	0.02	0.68	-0.66	26.34		7.33	1.21	17.80	0.00	17.80
Feb-23	0.03	0.78	-0.75	23.73		6.63	1.13	15.97	0.00	15.97
Mar-23	0.47	1.18	-0.71	21.50		6.15	1.10	14.25	0.00	14.25
Year-4 Tota	**313.30**	**20.82**	**292.48**	**338.72**	**71.72**	**56.11**	**16.31**	**194.57**	**0.00**	**194.57**
Apr-23	2.42	1.61	0.81	19.55		7.05	1.12	11.38	0.00	11.38
May-23	29.64	1.99	27.64	18.14	12.75		1.19	4.20	0.00	4.20
Jun-23	42.77	3.21	39.56	18.87	13.29		1.30	4.28	0.00	4.28
Jul-23	69.60	3.34	66.27	21.31	16.81		1.50	3.00	0.00	3.00
Aug-23	50.02	3.10	46.92	25.34	15.36		1.65	8.33	0.00	8.33
Sep-23	20.34	2.01	18.33	27.88	13.52		1.70	12.66	0.00	12.66
Oct-23	5.22	1.38	3.84	27.22		11.75	1.61	13.86	0.00	13.86
Nov-23	0.21	0.86	-0.66	24.72		9.11	1.47	14.14	0.00	14.14
Dec-23	0.00	0.67	-0.67	21.96		8.09	1.33	12.54	0.00	12.54
Jan-24	0.00	0.68	-0.68	19.61		7.33	1.21	11.07	0.00	11.07
Feb-24	0.00	0.78	-0.78	17.68		6.63	1.13	9.92	0.00	9.92
Mar-24	0.00	1.18	-1.18	16.01		6.15	1.10	8.76	0.00	8.76
Year-5 Tota	**220.21**	**20.82**	**199.39**	**258.29**	**71.72**	**56.11**	**16.31**	**114.14**	**0.00**	**114.14**

(B) Evaporation from 8.1 acre recharge pond; assessed at gross evaporation rate [Column (B), Table No.1]
(C) = (A) - (B)
(D) Lagged timing of net recharge realized at the Poudre River during requested plan period from recharge model rur
(E) Irrigation season return flow component; Years 1 - 5 based on 2.5 Box Elder Ditch shares
(F) Winter return flow component; Years 1 - 5 based on 2.5 Box Elder Ditch shares
(G) Total combined lagged mining depletions during the requested plan period
(H) = (D) - (E) - (F) - (G)

STATE OF COLORADO

DIVISION OF RECLAMATION, MINING AND SAFETY
Department of Natural Resources

1313 Sherman St., Room 215
Denver, Colorado 80203
Phone: (303) 866-3567
FAX: (303) 832-8106

COLORADO DIVISION OF RECLAMATION MINING & SAFETY

April 30, 2010

Lafarge West, Inc.
10170 Church Ranch Way, Ste. 200
Westminister, CO 800210000

RE: Mining Operations with Exposed Ground water

To Whom It May Concern:

The Division of Reclamation Mining and Safety is responsible for ensuring that Sand and Gravel mining operators comply with the requirements of the Colorado Land Reclamation Act for the Extraction of Construction Materials (Act) and the Mineral Rules and Regulations of the Colorado Mined Land Reclamation Board for the Extraction of Construction Materials (Rules). Among these requirements are provisions for the protection of water resources. The Act requires that reclamation plans must ensure minimization of disturbances to the prevailing hydrologic balance, including disturbances to the quantity of water in the area affected by mining and in the surrounding areas. § 34-32.5-116(4)(h). Rule 3.1.6(1)(a) requires compliance with Colorado water laws and regulations governing injury to existing water rights both during and after mining. Permits must specify how the permittee will comply with applicable Colorado water laws and regulations governing injury to existing water right rights. Rule 6.3.3(j); Rule 6.4.5(2)(c). After an extensive review, the Division determined that several operators may not have appropriate permit conditions to address certain reclamation liabilities arising from impacts to water resources.

In September 2009 the Division of Water Resources (DWR) updated its Guidelines for Sand and Gravel Pits. These guidelines provide guidance on achieving compliance with state law regarding replacement of depletions from sand and gravel mining, thus the guidelines provide a benchmark for the protection of hydrologic balance required under the Act and Rules. As noted in the Guidelines, sand and gravel operations which expose groundwater without complying with state law create a reclamation liability by impacting available groundwater.

State law requires that any person exposing ground water must obtain a well permit from the SEO pursuant to § 37-90-137(11). Because exposed groundwater results in out-of-priority water depletions, operations which expose ground water must also eventually obtain a water-court approved augmentation plan. Currently, several operators do not have either an augmentation plan or bonding to provide an alternative method to mitigate injurious stream depletions that result from mining-related exposure of ground water. The Division has a statutory duty to ensure that lands affected by mining are reclaimed in a manner that complies with state law and to ensure that operators have sufficient bonding to achieve reclamation. In order to assist operators in achieving compliance with these requirements, the Division proposes that, by April 30, 2011, operators should contact the Division and agree upon a plan for achieving compliance.

The Division has identified four approaches for operators:

1. File a financial warranty that will ensure backfilling of the pit to cover the exposed ground water to a depth of two feet above the static ground water level or,

2. Obtain a court approved augmentation plan prior to exposing ground water or,

3. File a financial warranty to cover the cost of installing a clay liner or slurry wall that meets the Division of Water Resources requirements for preventing ground water exposure or,

4. Obtain approval from the Division of Water Resources that acknowledges compliance with the SEO's requirements pursuant to § 37-90-137(11).

The Division will work with operators on an individual basis as they move to implement one of these plans. It is likely that options 1 and 3 will require the submittal of a technical revision or an amendment to the existing permit depending on the nature of the current mining and reclamation plan and the proposed changes. Increased financial warranties, as a result of these modifications, may be posted in a phased manner not to exceed three years. Amendments or revisions currently under review will be required to be approved by April 30, 2011 and may use the phased financial warranty approach described above. New applications going forward or presently under review by the Division will be required to meet the requirements of one of the options 1-4 at the time of application approval. Failure of affected operators to initiate contact with the Division and gain compliance as described above could result in an enforcement action being issued by the Division.

If you have any questions, please contact Tony Waldron at 303-866-3567, extension 8150.

cc:

M2006064	Shields at Fossil Creek Mine	M1983031	Stromquist Pit
M1994002	Andrews S & G #5 (Burlington Pit)	M1974072	Chantala Pit
M2006018	North Bank Resources	M1985218	Rich Pit
M2006073	Sundance Sand and Gravel Resource	M1985206	Boone-Martin Pit
M2009082	Parsons Mine	M1995022	Andrews #2
M1977081	Greeley West Pit	M1990144	Boone-Fillmore Pit
M2003091	Duckworth Pit	M1997087	Hartman Pit
M2000113	Mamm Creek Sand & Gravel	M2001094	Shaw Pit
M2001090	River Valley Resource	M2002009	Beeman Pit #1
M2000016	Riverbend Operation	M1981307	Fountain Pit
M1979134	Powers Pit	M1977439	Home Office Mine
M1977036	Greeley 35th Ave Pit	M1979191	Three Bells Pit
M2000034	Reichert Pit	M1982182	Port of Entry Pit
M2001051	North Taft Hill Expansion Site	M2002081	Overland Ponds
M1974015	Lyons Pit	M1981088	McCoy Pit
M1974004	Specification Aggregates Quarry	M1982034	Miller Pit
M1987176	Hamm Pit	M1996082	Blair Mesa Pit
M1988042	Cottonwood Pit	M1980136	Chambers Pit
M1990112	State Pit	M1977098	Sievers Pit
M1979002	North Delta Pit	M1983013	Latham - Burkett Pit
M1979159	Brose Pit	M1979097	East Rigden Pit
M1998014	Gypsum Ranch Pit	M1991035	Bluestone Pit
M1999088	Kyger Pit	M1986159	Courtner Pit
M1998075	Andrews #3 (Mock Pit)		

M1974070	Nelson Pit
M2000002	Tanabe Pit
M1994045	Bluestone Pit
M1986079	M & G Pit

COLORADO
Division of Water Resources
Department of Natural Resources

Augmentation Plan Accounting Protocol
June 2022

Accounting is an administrative tool to confirm water use is in accordance with a decree or other approval including that any required replacement is made to the stream system at the correct time, location, and amount. This guideline is subordinate to any decree language or Division Engineer specific accounting requirements. It describes basic augmentation plan accounting scenarios. Accounting for more complex scenarios can build on the fundamentals described herein.

Contents

1. Background and definitions

A thorough description of augmentation plans for well pumping is available in the Beginners Guide to Augmentation Plans for Wells. The following terms are used in this document:

- **Diversions** are withdrawals from a well, stream, or pond/reservoir.
- **Depletions** are the volume of reduced streamflow caused by a diversion. Lagged depletions are those that occur at a later time than when water is diverted by well pumping or groundwater pond evaporation due to the timing of water movement through the subsurface between the well/groundwater pond and the stream.
- **Hydrobase** is DWR's database of water information.
- **Colorado's Decision Support Systems ("CDSS")** is a State of Colorado website (https://cdss.colorado.gov/) providing access to water data and tools.
- **Replacement water** is a volume of water provided to the stream system to replace depletions and satisfy the unmet needs of senior water rights. Replacement water is typically provided from a reservoir release or another source that has been contracted for the purpose of replacing depletions. Replacement water may also be provided in the form of historic consumptive use ("HCU") credits derived from a change of water right where the use of a water right was changed to augmentation.
- **Transit loss** is the diminishment of the amount of water in a stream as water travels from upstream to the downstream location.
- **Priority Admin Number** indicates the seniority of a water right; equal to the number of days between a water right's priority date and the earliest decreed priority, December 31, 1849. For example, the Priority Admin Number for a water right with a priority date of May 5, 1950 is 36650.00000. The lower the Priority Admin Number, the more senior the water right. The five digits to the right of the period are used when the postponement doctrine applies to a water right due to a delay in decreeing the water right in the court (read more about this in the Administrative Call Standard, Appendix A).
- **Administrative Call** is a term that indicates there are unfulfilled downstream water rights "calling" for curtailment of upstream junior water rights to fulfill their need. In accounting, when the downstream Administrative Call is from a senior water right (with a lower Priority Admin Number), diversions/depletions are out-of-priority and replacement water must be provided.
- **Balance** is the amount of replacement water minus the depletions and obligations, not considering the Administrative Call. The balance may be negative when the diversions resulting in the depletions are in priority.
- **Net Effect** is the amount of replacement water minus the depletions and obligations, considering the Administrative Call. When the net effect is zero or positive, it shows that the Augmentation Plan prevented injury by replacing all out-of-priority diversions/depletions.

2. Methods to submit accounting

a. Accounting and Reporting Uploader (preferred)

The preferred method to submit accounting is through the use of the CDSS Accounting and Reporting Uploader tool. To set up an online account, call or email the Division contacts for the appropriate Water Division as shown in Table 1. Additional information is available on DWR's website under Data and Information/Online Data Submittal.

b. Email

Submit via email to the Water Commissioner and the Division Accounting email shown in Table 1. File names for accounting sheets should include the 7 digit Augmentation Plan WDID assigned by the Division Engineer's office.

3. Timing of accounting submittal

Accounting must be submitted as specified by your decree, DWR administrative approval (SWSP, Replacement Plan, etc.), or as requested by the Division Engineer or designated representative(s). If timing is not specified, submit accounting with the timing shown in Table 1.[1]

Table 1. Accounting Submittal Emails and Phone Number by Division

Division	Accounting Question & Submittal Email	Contact Phone Number	Standard Submittal Timing
1 - South Platte	Div1Accounting@state.co.us	970-352-8712	30 days after the end of the reporting month
2 - Arkansas	water.reporting@state.co.us	719-542-3368	10 days after the end of the reporting month*
3 - Rio Grande	kevin.boyle@state.co.us	719-589-6683	10 days after the end of the reporting month
4 - Gunnison	gregory.powers@state.co.us	970-249-6622	10 days after the end of the reporting month
5 - Colorado	dnr_div5acct@state.co.us	970-945-5665	10 days after the end of the reporting month
6 - Yampa/White	brian.romig@state.co.us	970-846-0036	Annually by November 15 or as needed upon request
7 - San Juan/ Dolores	dnr_div7acct@state.co.us	970-247-1845	10 days after the end of the reporting month**
Designated Ground Water Basins	chris.grimes@state.co.us	303-866-3851 ext. 8253	Annually by February 15 for the prior year

*for approvals deemed critical for administration; all others (including simple subdivisions) bi-annual readings before and after the irrigation season

**for approvals deemed critical for administration; annual submittals for others

[1] For proper administration, Water Commissioners may request regular and direct submission of water data in addition to accounting submittals described herein.

4. Overall organization of accounting spreadsheet and required information per tab

a. Overall organization

The following are typical spreadsheet tab names in accounting. See the example and screenshots section for an overview of what this might look like:

i. Contact/Plan Information tab
ii. Input tab(s)
iii. Depletions & Obligations tab
iv. Replacement tab
v. Summary tab
vi. DWR tab
vii. DWR Meters tab
viii. Version/Notes tab

Fewer or additional tabs as necessary for more simple or complex accounting, subject to approval by the Division Engineer

b. Contact/Plan Information Tab

The accounting must provide the contact information including name and email address for:

i. The party(s) responsible for submitting the accounting
ii. The plan administrator and/or the plan attorney
iii. Water court case number (format of YYCWXXXX), SWSP name and 4-digit Plan ID, or Ground Water Commission Order represented in the accounting.
iv. The 7-digit overall WDID(s) associated with the augmentation plan (not the individual structure WDIDs).[2]

c. Input Tab(s)

When possible, all cells showing diversion of water (well pumping and stream diversions) should be located on one or multiple input tabs as shown below. Cells with regular input, such as meter readings and reservoir releases, should be shaded a specifically identified color to distinguish them from cells that use formulas to convert or summarize the input.

Depending on the specific operation, the following may be included on Input tabs:

i. Estimated water use or evaporation:

When meters or measurement structures are not required, water consumption is estimated based on counts (number of homes, number of domestic animals, acreage of pond surface area, etc.) multiplied by a factor. Include a column or row for each of the following that are relevant to the augmentation plan:

1. Type of use: single family dwellings, domestic animals, area of lawn and garden (include units - square feet or acres), area of pond evaporation (include units - square feet or acres), etc.
2. Count or area input value for each type: the number of homes or domestic animals or the area (square footage or acres of home lawn and garden irrigation or pond surface evaporation). [this is the "Input" that could change regularly]

[2] Colorado Decision Support System Tools (https://dwr.state.co.us/Tools) can be used to find WDIDs (see Structures), court case numbers (see Water Rights), and other supporting information.

3. Factor to convert input to consumption in acre-feet.
4. Acre-feet of consumption.

ii. Well diversion data using flow meters:

Enter raw readings or measurements (e.g., from totalizing flow meters) and how those raw readings or measurements are converted to volumes of water. There should be one row or column for each well with a meter as described below. Once the spreadsheet formulas have been established, generally only the meter reading is entered with every submittal. The well and meter information may be located in a separate well & meter information tab (see example and screenshots section).

1. Well WDID
2. Well Permit Number
3. Priority Admin Number
4. Flow Meter Serial Number
5. Reading Date
6. Reading[3] [this is the "Input" that will change regularly]
   Enter reading exactly as shown on the face of the meter as a non-negative integer.
7. Comment
   a. When a meter rolls over (such as from 999 to 000), is replaced or reset[4] , add a comment stating the old meter serial number, the maximum number before the rollover or replacement and then enter the number on the face of the meter at the end of the reporting period. Update the meter information section with the new meter's serial number.
8. Meter information:
   a. Make
   b. Model
   c. The units represented by the digits on the meter (such as gallons or acre-feet)
   d. Multiplier for meter reading (if applicable)
      i. Residential well meters typically have a multiplier of 1.0 with units of gallons. Readings should generally report all numbers on the face of the meter (including non-rotating digits) with a multiplier of 1.0.
      ii. Larger agricultural or commercial wells typically read in acre-feet and typically have a decimal multiplier. For instance, with a multiplier of 0.001, a meter reading of 123456 represents 123.456 acre-feet.
   e. Correction factor
      i. This is a multiplier used when a meter test shows a need to correct the installed meter to an accurate reading. This will be 1.0 when there is not a test showing a need for correction.
9. Acre-feet pumped
   Use a formula to convert from the meter reading to acre-feet using the multiplier and correction factor. To convert meter readings in gallons to acre-feet, divide by 325,851.

iii. Well diversion data using Electricity Consumption

For wells approved to use power records and a Power Conversion Coefficient (PCC) to estimate water pumped, the accounting information is similar to well diversion data using flow meters (section 4.c.ii) above with the following replacements (instead of 6. "Reading" and 8. "Meter information):

[3] A comment on the Meter Reading cell is used to note "Actual, Estimated, Corrected, or Calculated" for all wells subject to measurement rules when the entry is not based on a reading taken on the actual date specified.
[4] Resetting a meter may be prohibited by local well measurement rules.

6. Power meter reading [this is the “Input” that will change regularly]
8. Power Meter Information
    a. PCC

iv. Surface diversion data

Include a column or row for each surface diversion with the following information:

1. Diversion structure name or a.k.a.
2. Structure WDID
3. Measured flow through the measurement structure and units
    a. If more than one water right is diverted through the structure, there should be adjacent columns for each. Each source should have a designated column or row and labeling should include the measuring structure WDID and the source of the water (e.g. case number).
    b. If there is a multiplier that adjusts the standard measurement-flow relationship to reflect the actual measurement-flow relationship of the specific structure (“shift”), the adjusted value should be reflected in a separate column.
4. Priority Admin Number
5. Storage and release

If the diversion is to storage, which will be followed by a release of water, follow the instructions in the Reservoir Accounting Guideline.

v. Administrative Call (are diversions in-priority?)

In portions of Colorado, there may be times when depletions are in-priority, and do not require replacement. Depletions are in-priority when water rights on the stream system that are senior to the diversion have enough water and are not “calling” for more water.

1. **Simplified (percent of month administrative call)**
   For certain basic accounting, such as subdivision well depletions, the Division Engineer may allow or apply an estimate of the days of expected administrative call each month. Typically, replacement water is provided based on projected call days, which is later compared to actual administrative call data to ensure that adequate replacement was provided. In this case, the accounting should have an input field either for the number of call days or the percentage of days in the month with a call.
2. **Daily record of administrative call**
   Provide a column that shows whether depletions are either “IN” or “OUT” of priority each day.
    - Locations with minimal call variation: In areas with minimal variation in the call, the Division Office may not require a formula comparing Priority Admin Numbers, but will accept manual entries of “IN” or “OUT” of priority each day.
    - All other locations: “IN” or “OUT” of priority is determined daily using formulas comparing the Priority Admin Number of depletions to the Priority Admin Number of the calling water right in each depleted stream reach. Include a column for each of the following:
        - The Priority Admin Number of the calling water right. Calling structure information can be obtained programmatically from:
            - CDSS REST services - insert a link that pulls the required information directly from DWR’s database.
            - CDSS Administrative Calls tool.

          DWR accounting staff can provide guidance on incorporating this information within an accounting spreadsheet.

- The Name of the calling water right
- "In" or "Out"-of-priority either for all structures covered by the accounting or for each structure in its own column. Use a formula to compare the Priority Admin Number of the calling structure to the Priority Admin Number of the structure(s) in the accounting.

d. Depletion & Obligation tab

Used to (1) convert well pumping (and groundwater pond evaporation) to lagged depletions impacting the stream and (2) show lagged depletions that are out-of-priority, and (3) include any additional water obligations of the plan for augmentation.

i. Calculate lagged depletions - Although well pumping and modeling may use a monthly step function to determine the depletions from pumping, the monthly result may, if requested by the Division Office or required by decree, then be divided by the number of days in the month in order to calculate a daily impact for daily water administration.
   1. Well Pumping (or groundwater pond evaporation) - Reference back to the Input tab for the acre-feet of water pumped or evaporated.
   2. Consumption factor (%) - If the decree or approval describes that a percentage of the water pumped is consumed and only the consumed amount is replaced.
   3. Acre-feet consumed - Multiply the acre-feet pumped by the consumption factor.
   4. Delay Factors - show factors that convert pumping in one month to depletions in future months. These may be percentages per month, that total 100 percent over an extended period of time.
   5. Depletions - a formula that combines previous months and present month pumping with the delay factors to determine depletions impacting the stream this month and in future months.

ii. Out-of-priority depletions are combined into one column for each reach considering the administrative call information included on the Input tab.

iii. Return flow obligations (if applicable): Replacement water sources changed from a historical irrigation use usually have a return flow obligation that must also be tracked in accounting. Return flow obligations are similar to depletions because they must be replaced in time, place, and amount. Depending on decree language and preference, return flow obligations may be included under the replacement tab in section 4.e. below. For each replacement source with return flow obligations, include the following:
   - the basis and volume of the return flow obligation,
   - the location of the return flow obligation,
   - replacement of the return flow obligation.

e. Replacement tab

List each structure providing replacement water, transit loss information, and volumes released:

i. Structure providing replacement water: name of reservoir, ditch, well, leased or other replacement water, its WDID, and the water court decree allowing its use for augmentation or replacement. For instructions on accounting for replacement using recharge accretions, refer to specific recharge guidance.

ii. Replacement water travel distance (miles)
the distance from the point of release to the location of the out-of-priority depletion where replacement is owed

iii. Transit loss percent per mile (%)

iv. Total transit loss (%)
v. Volume released (acre-feet)
vi. Transit loss volume (acre-feet)
vii. Volume delivered (acre-feet) - equal to volume released minus transit loss volume
viii. Return flow obligations (acre-feet): Depending on decree language as described above, these may be included here instead of in the depletion tab. See description under section 4.d. above.

f. Summary Tab

The Summary Tab is used to calculate the Net Effect of the Plan on each impacted stream reach. The summary should reference back to information and formulas in the other spreadsheet tabs. The summary tab compares obligations, replacements and that replacements equal or exceed obligations in time, place, and amount. The Summary tab should only summarize data and calculations located in other tabs of the accounting. It should not contain manual entries, input data, or make calculations that are used in other tabs.

The Summary Tab should contain the following for each impacted stream reach (typically on a daily basis or as required by the division office):

i. Total depletions and obligations
ii. Total replacement
iii. Balance - Total replacement minus total depletions and obligations, which may be negative when the diversions resulting in the depletions are in priority.
iv. Net Effect - Total replacement minus out-of-priority depletions and obligations. If the net effect is negative, the Plan resulted in injury.

g. DWR tab for Diversion Record Data Import

A tab titled **"DWR"** can be used to convert data input or numbers calculated in other tabs into rows that represent diversion record water classes, which DWR staff can upload to create official diversion records. When appropriate, DWR staff will develop this tab or work with plan owners to develop this tab, ensure it follows DWR's standard format and utilizes water classes according to the Diversion Records Standard. This format is necessary to allow the records to be imported directly into Hydrobase.

h. DWR Meters tab for Meter Reading Data Import

A tab titled **"DWR Meters"** can be included for use in bulk uploading meter readings. This calculates pumping totals in compliance with well rules or to meet other Division-specific requirements. In order for this tab to be bulk uploaded into Hydrobase, the columns in this tab must be formatted as shown in the "User Guide - How to Bulk Upload Meter Readings".

i. Version/Notes tab

A tab to document changes in accounting formulas and the date of those changes.

5. Requirements and recommendations for all tabs

a. Accounting should show how raw input data is manipulated using formulas to determine the resulting impact on the river. Accounting must therefore include a functional spreadsheet (ie no pdfs) showing all operations, formulas, etc. to clearly show calculations.

b. The use of a water year of November 1 through October 31 is required unless specifically decreed otherwise. When a different water year is required by decree, DWR may request additional months of data in the accounting to include the November 1 through October 31

time period, resulting in more than 12 months of data being reported.

c. For all tabs other than the Summary tab, include running accounting for the entire water year without monthly subtotals. Monthly subtotals commonly result in errors in the spreadsheet. The Summary tab can be used as a place to show monthly totals.

d. Date fields should be complete dates (month, day, and year, recognized as a date value by the spreadsheet software) but may be formatted to display as desired.

e. Use consistent cell color shading to clearly identify the different types of information, such as manual input cells and formula cells (provide a legend for data types, see example below)

f. Enter "0" in cells to document no diversion or use, rather than blanks, hyphens, or another character.

g. When a formula is overwritten with a manual entry, the cell should be highlighted and a comment added for the reasoning.

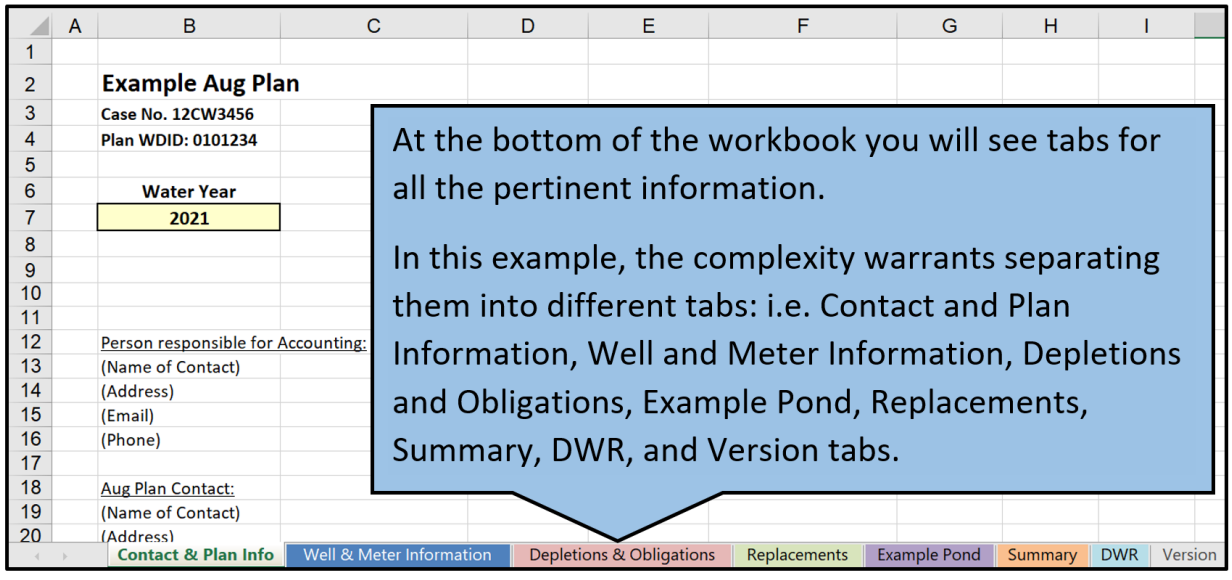
h. When there are multiple stream reaches involved, organize accounting from upstream to downstream.

i. Footnotes should be utilized, as necessary, to describe the basis for formulas, calculations imposed on the raw input data, and column descriptions.

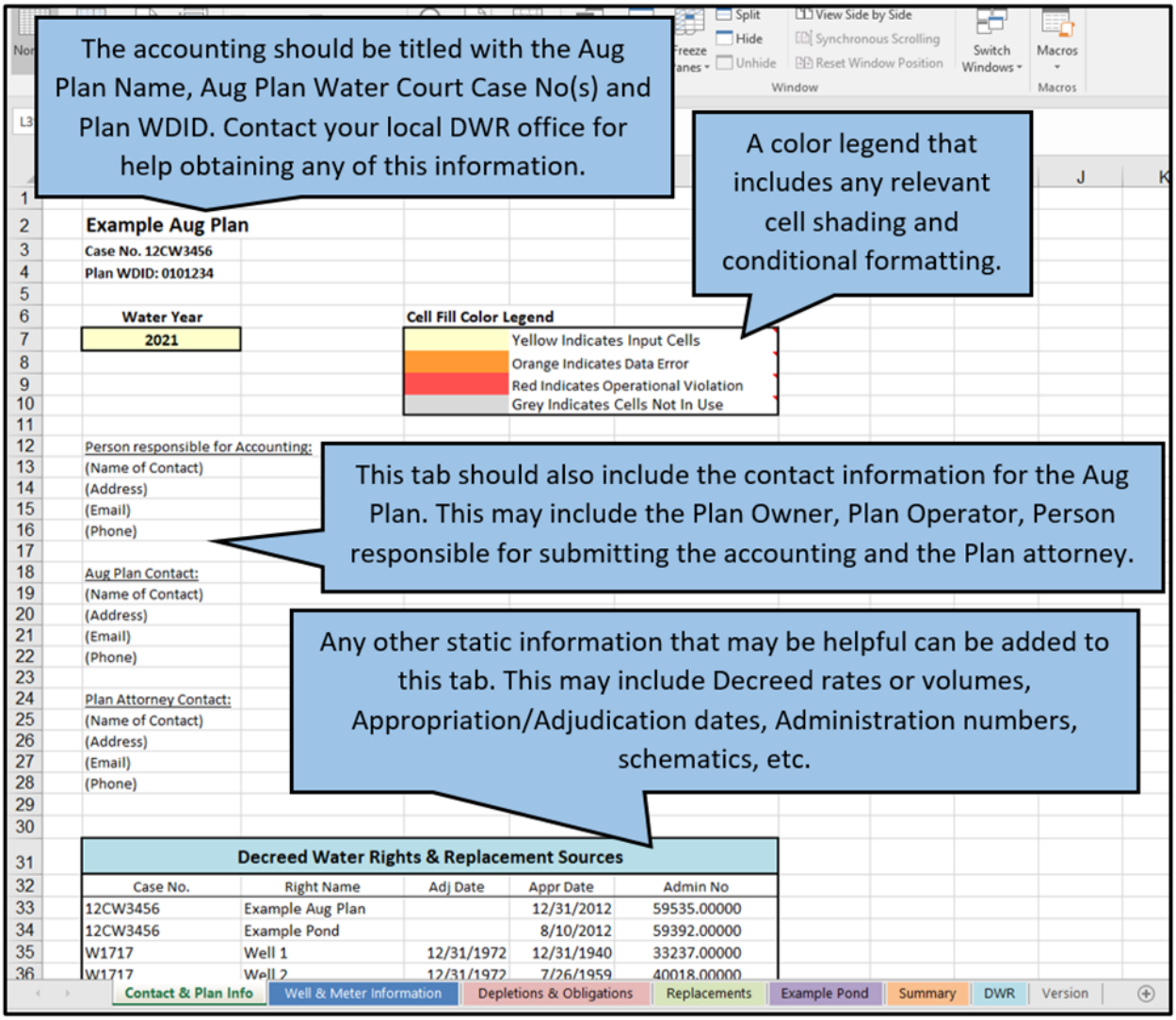
6. Example, Screenshots, and Spreadsheet Templates

Water users may request spreadsheet templates from their local division office for use as examples of how accounting may be assembled, but are responsible for developing their own functional accounting customized for their own Plan requirements. Note that example and actual accounting may have slightly different organization than what is described above.

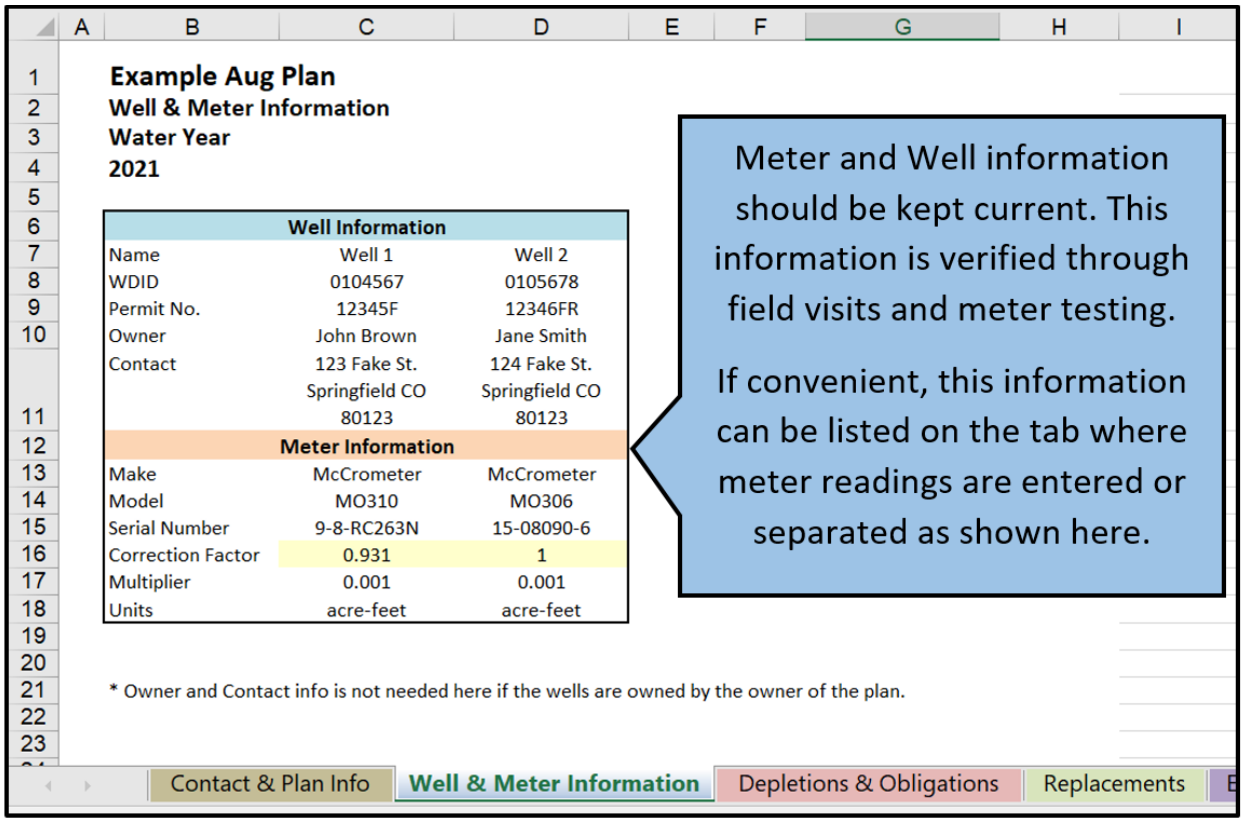
a. (List of relevant tabs)



b. (Contact & Plan Information)



c. (Well & Meter Information)



Example Aug Plan
Well & Meter Information
Water Year
2021

Well Information		
Name	Well 1	Well 2
WDID	0104567	0105678
Permit No.	12345F	12346FR
Owner	John Brown	Jane Smith
Contact	123 Fake St. Springfield CO 80123	124 Fake St. Springfield CO 80123
Meter Information		
Make	McCrometer	McCrometer
Model	MO310	MO306
Serial Number	9-8-RC263N	15-08090-6
Correction Factor	0.931	1
Multiplier	0.001	0.001
Units	acre-feet	acre-feet

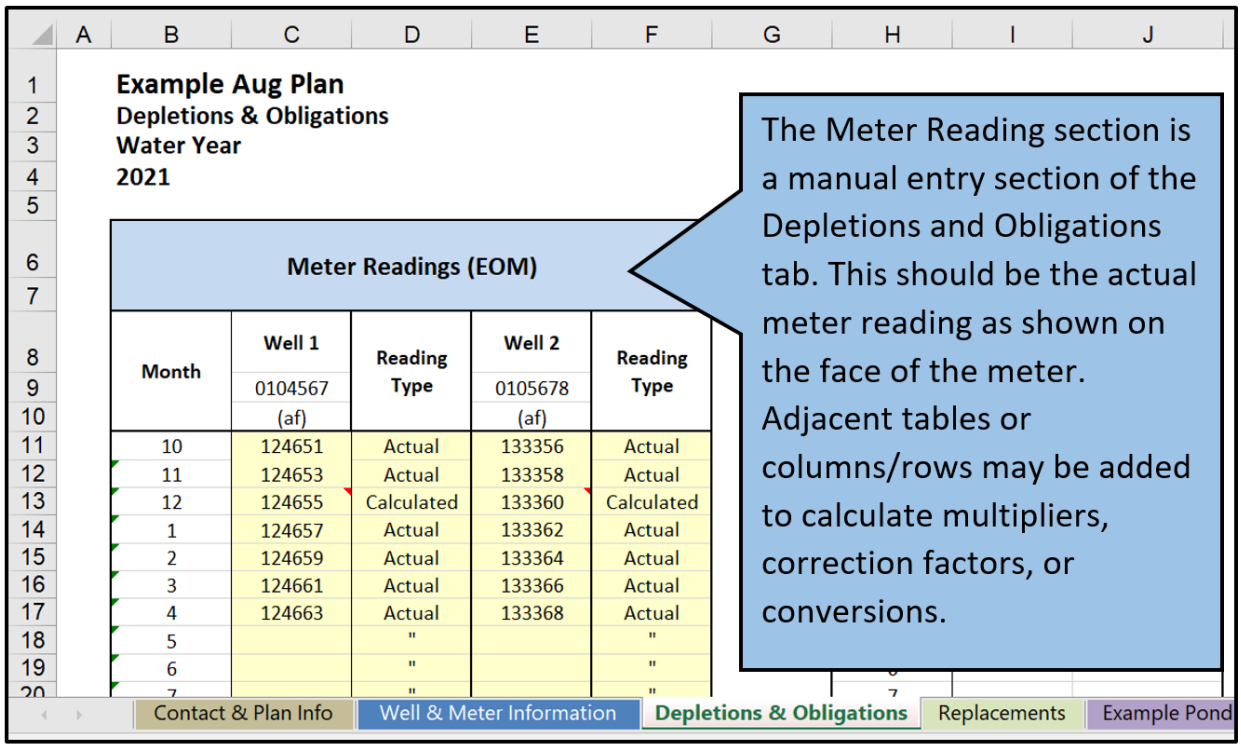
Meter and Well information should be kept current. This information is verified through field visits and meter testing.

If convenient, this information can be listed on the tab where meter readings are entered or separated as shown here.

* Owner and Contact info is not needed here if the wells are owned by the owner of the plan.

Contact & Plan Info | Well & Meter Information | Depletions & Obligations | Replacements

d. (Depletions & Obligations) - in this example, the Depletions & Obligations tab includes cells for entering meter readings, calculating well pumping over the period, and converting that to lagged depetions.



Example Aug Plan
Depletions & Obligations
Water Year
2021

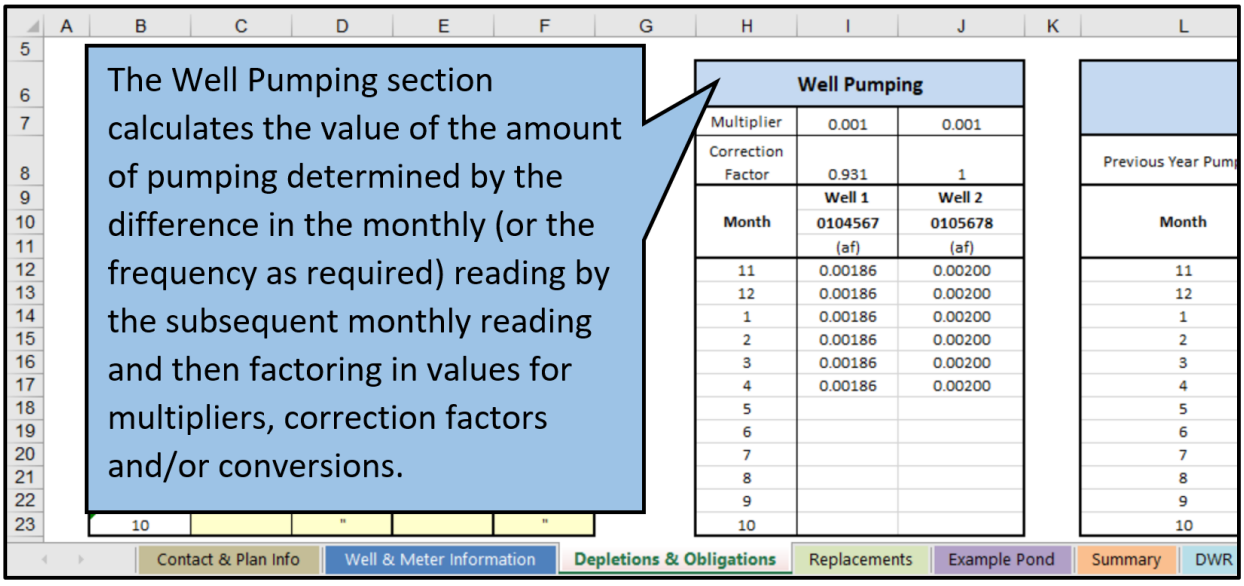
Meter Readings (EOM)

Month	Well 1 0104567 (af)	Reading Type	Well 2 0105678 (af)	Reading Type
10	124651	Actual	133356	Actual
11	124653	Actual	133358	Actual
12	124655	Calculated	133360	Calculated
1	124657	Actual	133362	Actual
2	124659	Actual	133364	Actual
3	124661	Actual	133366	Actual
4	124663	Actual	133368	Actual
5		"		"
6		"		"

The Meter Reading section is a manual entry section of the Depletions and Obligations tab. This should be the actual meter reading as shown on the face of the meter. Adjacent tables or columns/rows may be added to calculate multipliers, correction factors, or conversions.

Contact & Plan Info | Well & Meter Information | Depletions & Obligations | Replacements | Example Pond

e. (Depletions & Obligations)



The Well Pumping section calculates the value of the amount of pumping determined by the difference in the monthly (or the frequency as required) reading by the subsequent monthly reading and then factoring in values for multipliers, correction factors and/or conversions.

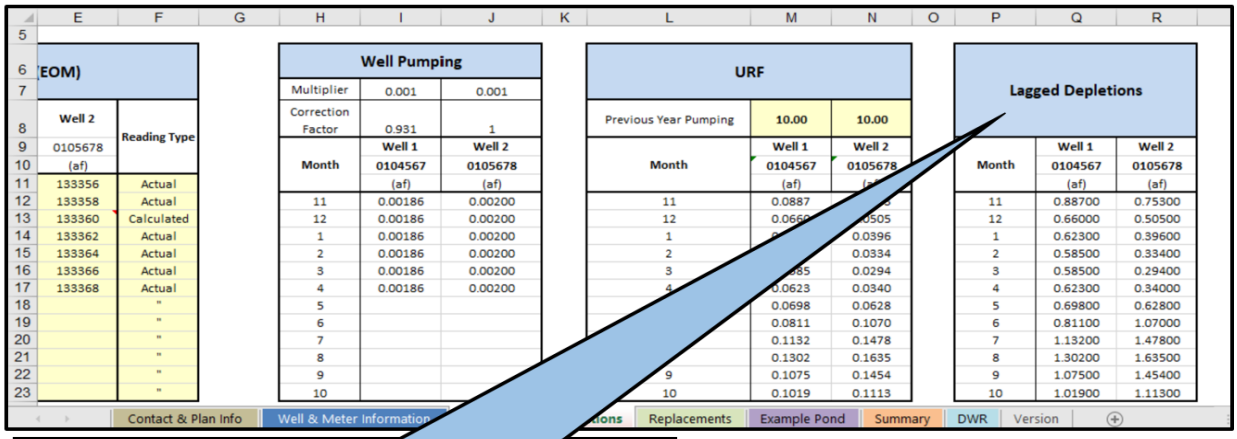
Well Pumping

Multiplier	0.001	0.001
Correction Factor	0.931	1
Month	Well 1 0104567 (af)	Well 2 0105678 (af)
11	0.00186	0.00200
12	0.00186	0.00200
1	0.00186	0.00200
2	0.00186	0.00200
3	0.00186	0.00200
4	0.00186	0.00200
5		
6		
7		
8		
9		
10		

Previous Year Pump
Month
11
12
1
2
3
4
5
6
7
8
9
10

Contact & Plan Info | Well & Meter Information | Depletions & Obligations | Replacements | Example Pond | Summary | DWR

f. (Depletions & Obligations) - calculate lagged depletions for the month



(EOM)	
Well 2 0105678 (af)	Reading Type
133356	Actual
133358	Actual
133360	Calculated
133362	Actual
133364	Actual
133366	Actual
133368	Actual

Well Pumping		
Multiplier	0.001	0.001
Correction Factor	0.931	1
Month	Well 1 0104567 (af)	Well 2 0105678 (af)
11	0.00186	0.00200
12	0.00186	0.00200
1	0.00186	0.00200
2	0.00186	0.00200
3	0.00186	0.00200
4	0.00186	0.00200
5		
6		
7		
8		
9		
10		

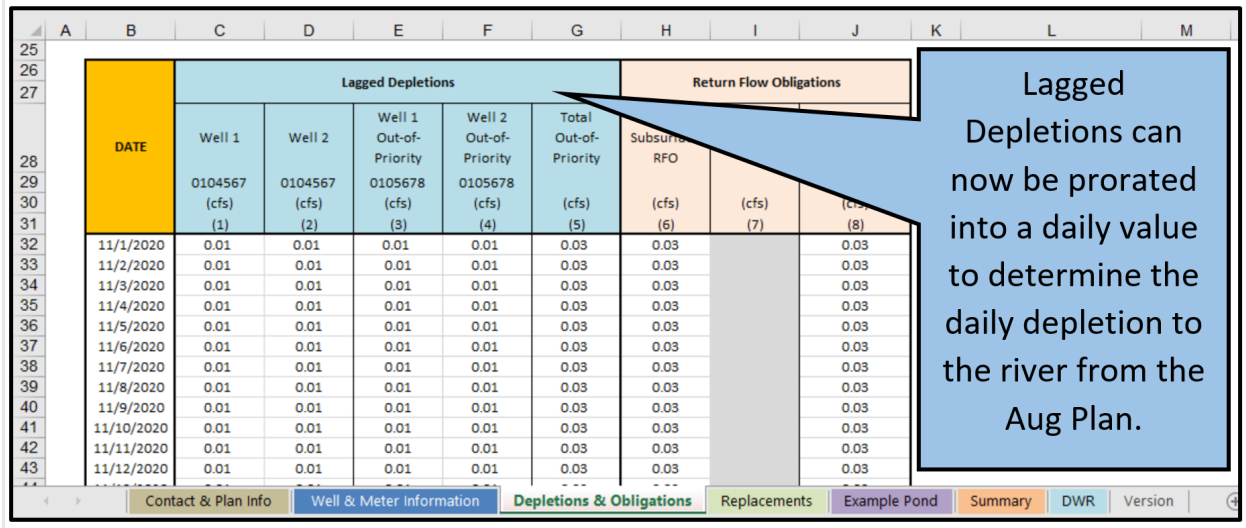
URF		
Previous Year Pumping	10.00	10.00
Month	Well 1 0104567 (af)	Well 2 0105678 (af)
11	0.0887	
12	0.0660	0505
1		0.0396
2		0.0334
3	585	0.0294
4	0.0623	0.0340
	0.0698	0.0628
	0.0811	0.1070
	0.1132	0.1478
	0.1302	0.1635
9	0.1075	0.1454
10	0.1019	0.1113

Lagged Depletions		
Month	Well 1 0104567 (af)	Well 2 0105678 (af)
11	0.88700	0.75300
12	0.66000	0.50500
1	0.62300	0.39600
2	0.58500	0.33400
3	0.58500	0.29400
4	0.62300	0.34000
5	0.69800	0.62800
6	0.81100	1.07000
7	1.13200	1.47800
8	1.30200	1.63500
9	1.07500	1.45400
10	1.01900	1.11300

Contact & Plan Info | Well & Meter Information | ...ions | Replacements | Example Pond | Summary | DWR | Version

Lagged Depletions should be calculated utilizing the Well Pumping data and the lagging method established by the relevant decree or SWSP (Stream depletion Factors or Glover Parameters).

g. (Depletions & Obligations) - convert monthly lagged depletions to daily

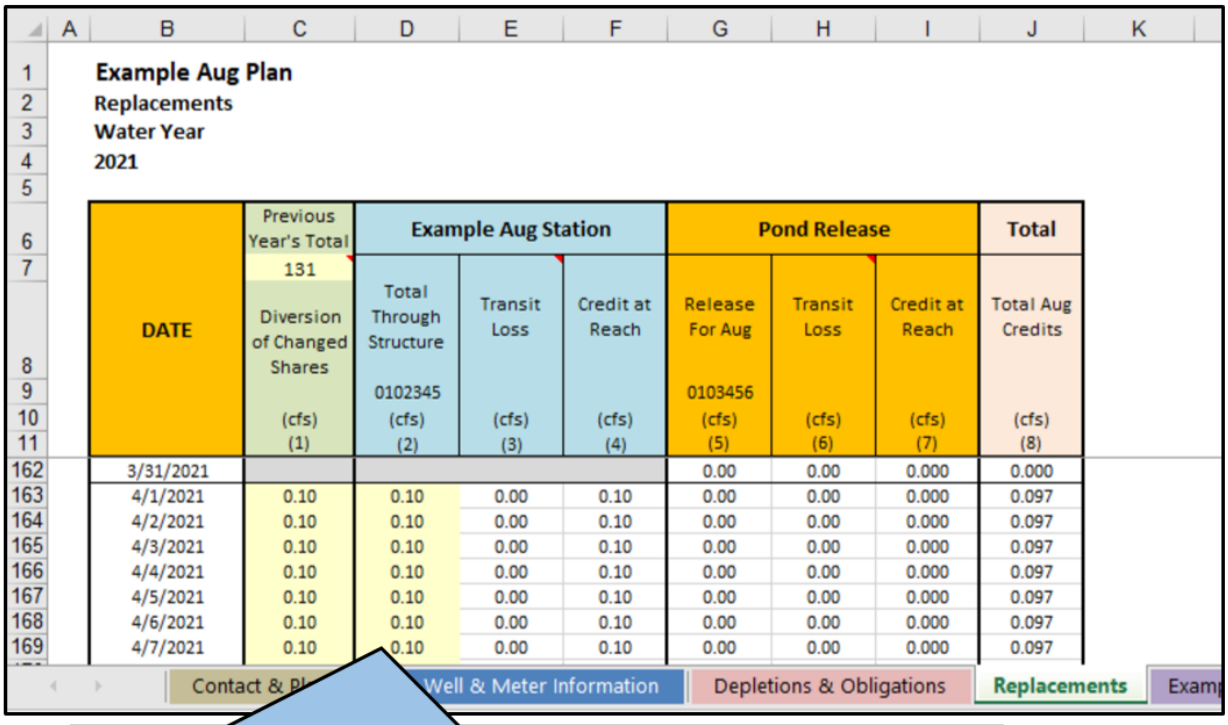


DATE	Lagged Depletions: Well 1 0104567 (cfs) (1)	Well 2 0104567 (cfs) (2)	Well 1 Out-of-Priority 0105678 (cfs) (3)	Well 2 Out-of-Priority 0105678 (cfs) (4)	Total Out-of-Priority (cfs) (5)	Return Flow Obligations: Subsurf... RFO (cfs) (6)	(cfs) (7)	(cfs) (8)
11/1/2020	0.01	0.01	0.01	0.01	0.03	0.03		0.03
11/2/2020	0.01	0.01	0.01	0.01	0.03	0.03		0.03
11/3/2020	0.01	0.01	0.01	0.01	0.03	0.03		0.03
11/4/2020	0.01	0.01	0.01	0.01	0.03	0.03		0.03
11/5/2020	0.01	0.01	0.01	0.01	0.03	0.03		0.03
11/6/2020	0.01	0.01	0.01	0.01	0.03	0.03		0.03
11/7/2020	0.01	0.01	0.01	0.01	0.03	0.03		0.03
11/8/2020	0.01	0.01	0.01	0.01	0.03	0.03		0.03
11/9/2020	0.01	0.01	0.01	0.01	0.03	0.03		0.03
11/10/2020	0.01	0.01	0.01	0.01	0.03	0.03		0.03
11/11/2020	0.01	0.01	0.01	0.01	0.03	0.03		0.03
11/12/2020	0.01	0.01	0.01	0.01	0.03	0.03		0.03

Contact & Plan Info | Well & Meter Information | Depletions & Obligations | Replacements | Example Pond | Summary | DWR | Version

Lagged Depletions can now be prorated into a daily value to determine the daily depletion to the river from the Aug Plan.

h. (Replacements)



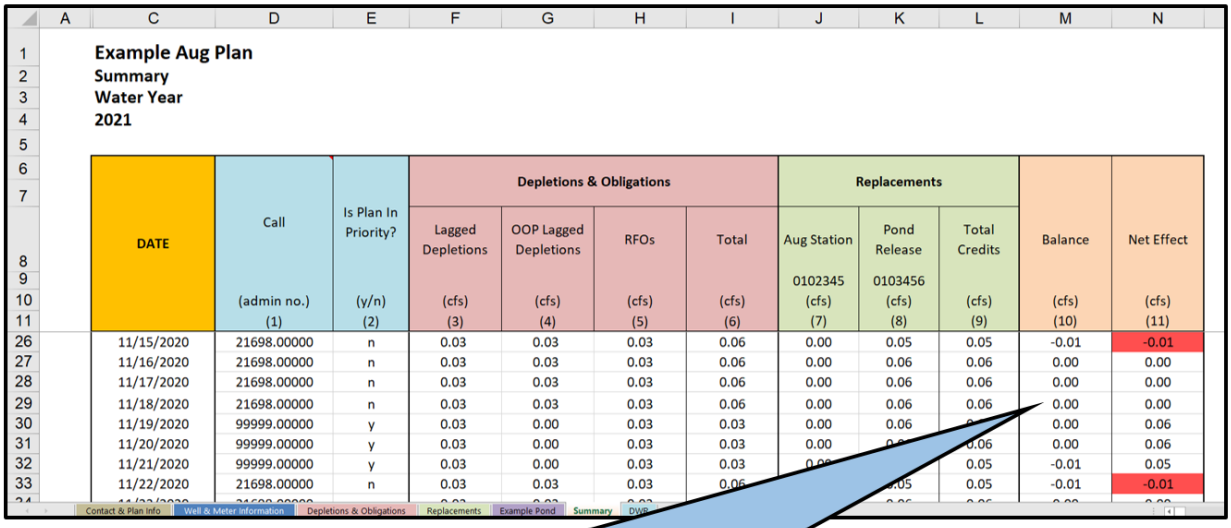
Example Aug Plan
Replacements
Water Year
2021

DATE	Previous Year's Total	Example Aug Station			Pond Release			Total
	131							
	Diversion of Changed Shares	Total Through Structure 0102345	Transit Loss	Credit at Reach	Release For Aug 0103456	Transit Loss	Credit at Reach	Total Aug Credits
	(cfs) (1)	(cfs) (2)	(cfs) (3)	(cfs) (4)	(cfs) (5)	(cfs) (6)	(cfs) (7)	(cfs) (8)
3/31/2021					0.00	0.00	0.000	0.000
4/1/2021	0.10	0.10	0.00	0.10	0.00	0.00	0.000	0.097
4/2/2021	0.10	0.10	0.00	0.10	0.00	0.00	0.000	0.097
4/3/2021	0.10	0.10	0.00	0.10	0.00	0.00	0.000	0.097
4/4/2021	0.10	0.10	0.00	0.10	0.00	0.00	0.000	0.097
4/5/2021	0.10	0.10	0.00	0.10	0.00	0.00	0.000	0.097
4/6/2021	0.10	0.10	0.00	0.10	0.00	0.00	0.000	0.097
4/7/2021	0.10	0.10	0.00	0.10	0.00	0.00	0.000	0.097

Contact & Pl... | Well & Meter Information | Depletions & Obligations | Replacements | Exam...

Input information should be shaded differently than the calculated (cells with formulas) cells. Please provide a legend with the color/shading scheme.

i. (Summary) - daily



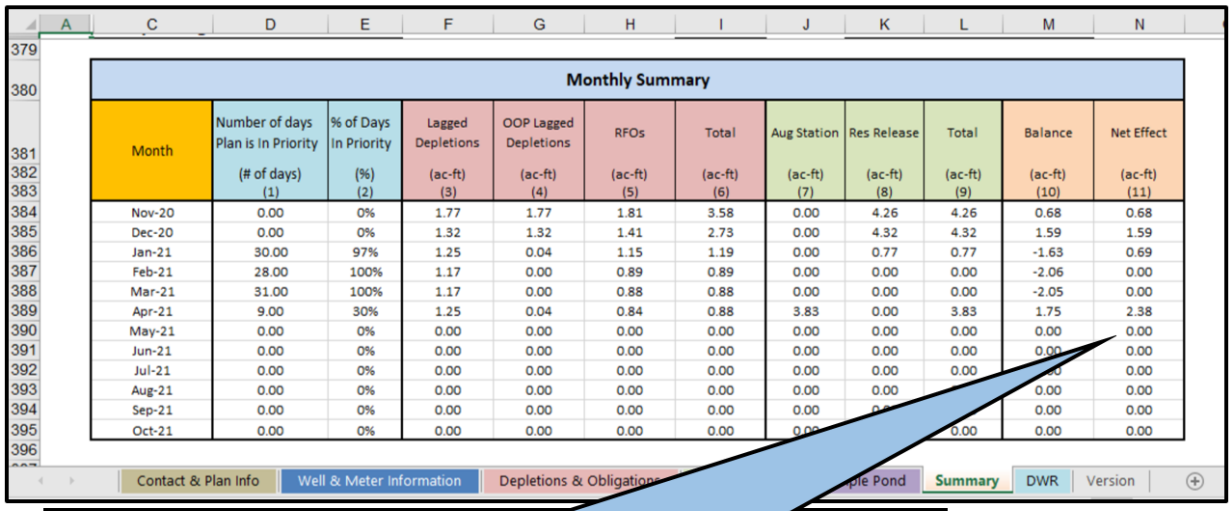
Example Aug Plan
Summary
Water Year
2021

DATE	Call (admin no.) (1)	Is Plan In Priority? (y/n) (2)	Depletions & Obligations: Lagged Depletions (cfs) (3)	Depletions & Obligations: OOP Lagged Depletions (cfs) (4)	Depletions & Obligations: RFOs (cfs) (5)	Depletions & Obligations: Total (cfs) (6)	Replacements: Aug Station 0102345 (cfs) (7)	Replacements: Pond Release 0103456 (cfs) (8)	Replacements: Total Credits (cfs) (9)	Balance (cfs) (10)	Net Effect (cfs) (11)
11/15/2020	21698.00000	n	0.03	0.03	0.03	0.06	0.00	0.05	0.05	-0.01	-0.01
11/16/2020	21698.00000	n	0.03	0.03	0.03	0.06	0.00	0.06	0.06	0.00	0.00
11/17/2020	21698.00000	n	0.03	0.03	0.03	0.06	0.00	0.06	0.06	0.00	0.00
11/18/2020	21698.00000	n	0.03	0.03	0.03	0.06	0.00	0.06	0.06	0.00	0.00
11/19/2020	99999.00000	y	0.03	0.00	0.03	0.03	0.00	0.06	[illegible]	0.00	0.06
11/20/2020	99999.00000	y	0.03	0.00	0.03	0.03	0.00	[illegible]	0.06	0.00	0.06
11/21/2020	99999.00000	y	0.03	0.00	0.03	0.03	[illegible]	[illegible]	0.05	-0.01	0.05
11/22/2020	21698.00000	n	0.03	0.03	0.03	0.06	[illegible]	[illegible]	0.05	-0.01	-0.01

Contact & Plan Info | Well & Meter Information | Depletions & Obligations | Replacements | Example Pond | Summary | DWR

The Balance column is the balance of Replacements and actual Depletions/Obligations regardless of whether the plan is in or out of priority. It is calculated by subtracting Depletions and Obligations from Replacements.

j. (Summary) - a monthly summary table may be added at the bottom of the Summary tab below the daily summary



Monthly Summary

Month	Number of days Plan is In Priority (# of days) (1)	% of Days In Priority (%) (2)	Lagged Depletions (ac-ft) (3)	OOP Lagged Depletions (ac-ft) (4)	RFOs (ac-ft) (5)	Total (ac-ft) (6)	Aug Station (ac-ft) (7)	Res Release (ac-ft) (8)	Total (ac-ft) (9)	Balance (ac-ft) (10)	Net Effect (ac-ft) (11)
Nov-20	0.00	0%	1.77	1.77	1.81	3.58	0.00	4.26	4.26	0.68	0.68
Dec-20	0.00	0%	1.32	1.32	1.41	2.73	0.00	4.32	4.32	1.59	1.59
Jan-21	30.00	97%	1.25	0.04	1.15	1.19	0.00	0.77	0.77	-1.63	0.69
Feb-21	28.00	100%	1.17	0.00	0.89	0.89	0.00	0.00	0.00	-2.06	0.00
Mar-21	31.00	100%	1.17	0.00	0.88	0.88	0.00	0.00	0.00	-2.05	0.00
Apr-21	9.00	30%	1.25	0.04	0.84	0.88	3.83	0.00	3.83	1.75	2.38
May-21	0.00	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jun-21	0.00	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jul-21	0.00	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	[illegible]	0.00
Aug-21	0.00	0%	0.00	0.00	0.00	0.00	0.00	0.00	[illegible]	0.00	0.00
Sep-21	0.00	0%	0.00	0.00	0.00	0.00	0.00	[illegible]	[illegible]	0.00	0.00
Oct-21	0.00	0%	0.00	0.00	0.00	0.00	[illegible]	[illegible]	0.00	0.00	0.00

Contact & Plan Info | Well & Meter Information | Depletions & Obligations | [illegible]ple Pond | Summary | DWR | Version

Net Effect is the Balance or Net Impact value with the priority of the plan included. Plans considered in priority may not be required to replace depletions. This column represents whether the Aug plan shows injury to the river or has sufficiently replaced its uses.

COLORADO
Division of Water Resources
Department of Natural Resources

ADMINISTRATIVE PROTOCOL
Recharge
Division One - South Platte River Basin
Revised May, 2022

The purpose of recharge is to intentionally introduce water into a tributary aquifer through percolation from the surface. The introduction of water to the aquifer causes a like amount of groundwater to discharge at a surface stream in a specific location and time as "accretions" or "recharge credits" available for beneficial use. Recharge as used in this document does not include artificial recharge of the Denver Basin or nontributary aquifers. A Recharge Structure can be:

- A section of ditch, the infiltration from which can be reasonably modeled as a single source of water.
- A single pond or a group of ponds that receive water from the same delivery location and the infiltration from which can be reasonably modeled as a single source of water.

1. Recharge credits/accretion including timing, location, and amount are determined only in accordance with decrees of the court or written administrative approvals, including Substitute Water Supply Plans (SWSPs). SWSP or water court applications should include the following information about each Recharge Structure:
    a. map(s) showing the locations of:
        i. diversion point(s)
        ii. Recharge Structure
        iii. measurement structures (inflow, outflow, staff gage);
    b. listing of the court case number for the decree(s) authorizing the diversion of water into the Recharge Structure and use of the water in a plan for augmentation, if any
    c. the maximum water surface area of the structure or stage-area capacity curve developed for each Recharge Structure;
    d. for ditch structures, if the ditch is divided into more than one Recharge Structure, an explanation of how the volume delivered to an upstream reach will be allocated to downstream Recharge Structures in the ditch.
2. The division engineer will assign the Recharge Structure a WDID number. The WDID number is the identification number that will be used for the administration of the structure and must be included in all correspondence and accounting.

3. Prior to commencement of construction, the owner/operator of the Recharge Structure must obtain water commissioner's approval of proposed equipment, installation and construction. Prior to any diversion into the Recharge Structure, the owner/operator must obtain the water commissioner's written approval of the final construction and equipment installation, as further described below.

a. The flow into each Recharge Structure must be equipped with a measurement device and a continuous flow data recorder, unless the water commissioner in conjunction with the division engineer determines adequate records may be kept without such equipment. Refer to the Administrative Protocol and Functional Standards - Surface Water Headgates and Measuring Devices, for minimal suggested equipment installation and operation.
b. If the Recharge Structure is designed to discharge water via a surface outlet, such discharge must also be equipped with a measurement device and a continuous flow recorder.
c. Each Recharge Structure must have a staff gage, or other devices as required, installed to provide a reading of the surface water elevation in the Recharge Structure.[1] The gage installation should be such that the gage registers the lowest water level in the Recharge Structure. The staff gage must be readable from a readily accessible location. The gage shall have permanent demarcations of 0.01 feet, with the whole feet (1.00 feet) clearly and easily identifiable.

4. All Recharge Structures must be maintained in such a way as to minimize consumptive use of the water by vegetation. Existing vegetation shall be mowed or removed prior to and during the running of water into the Recharge Structure. Crops may not be planted in a Recharge Structure during the same irrigation year that it is used as a Recharge Structure without prior approval from the water commissioner or division engineer.

5. The timing and quantity of recharge credits/accretions is estimated by applying the lagging parameters (or Unit Response Functions "URFs") in the decree or SWSP to the volume of water infiltrated into the ground (*Infiltrated Volume* as calculated below). One common method for determining the volume of water infiltrated for any time period can be determined by using a daily mass balance calculation, in acre-feet, and solving for the residual volume (R) of unmeasured flows[2] as follows. Other methods for determining the volume of water infiltrated into the ground may be considered on a case-by-case basis:

[1] Unless an alternate method of measuring or estimating the change in storage has been approved by the Division Engineer.
[2] For more information on the mass-balance equation as it applies to ponds or reservoirs, please refer to Guideline 2019-3, Reservoir Accounting Guideline

$$R = \Delta Storage - Meas.\ Inflow + Meas.\ Outflow + Evaporation + ET$$

where,

a. R represents the net sum of all unmeasured flow. When R is positive, it represents the volume of unmeasured inflows (i.e., no recharge occurred) and when negative, it represents the volume of unmeasured outflow (i.e., recharge volume) that infiltrated into the ground and can be used, with the lagging parameters, to determine the amount of recharge credit.
b. $\Delta Storage$ is the change in storage volume compared to a previous measurement, typically based on staff gage readings and the stage-capacity table.
c. $Meas.\ Inflow$ is the volume of water delivered into the recharge structure,
d. $Meas.\ Outflow$ is the volume of water discharged from the recharge structure,
e. $Evaporation$ is the volume of water lost to evaporation (see item 6, below),
f. ET is the volume of water lost from the consumption by vegetation located within the recharge structure. Appropriate vegetative consumptive use values, based on publications of actual plant water use, should be used depending on the type of plants that are found to exist, subject to DWR approval.

6. Gross Evaporative losses from the Recharge Structure must be subtracted from the volume of water delivered to the Recharge Structure. Evaporative losses must be accounted for every day the Recharge Structure has a visible water surface. If the Recharge Structure does not have a stage-surface area curve approved by the water commissioner, the maximum surface area of the Recharge Structure must be used to determine the evaporative losses, unless a different method is approved. Gross evaporation should be estimated using the processes described for off-channel reservoirs in Guideline 2019-3 - Reservoir Accounting Guideline. Monthly evaporation estimates may be prorated for days when there is no visible water surface. A lack of visible water surface is determined from a field inspection. Days with no water surface may be entered from the date of field inspection until the next date of water delivery.

7. Any structure that intercepts groundwater must be permitted as a well and included in a plan for augmentation or SWSP approved by the State Engineer. The Division Engineer strongly recommends avoiding Recharge Structures that intercept groundwater, in order to simplify the accounting process.