Summary Letter

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November 7, 2022

TO:
Kameron Delashmutt
Central Land and Cattle Company, LLC
67525 SW Cline Falls Hwy
Redmond, Oregon 97756

FROM:
Jim Newton, P.E., R.G., C.W.R.E.

RE: 2022 THORNBURGH RESORT FISH AND WILDLIFE MITIGATION PLAN,

Dear Kameron:

This summary letter has been prepared by Jim Newton, PE, RG, CWRE, Principal of Cascade Geoengineering ("CGE") on behalf of Central Land and Cattle Company, LLC, owner, and developer of the Thornburgh Resort ("Thornburgh") to provide a simplified summary of the 2022 *"Thornburgh Resort Fish and Wildlife Mitigation Plan, Addendum #2 (2022 FWMP) Relating to Potential Impacts of Thornburgh's Reduced Ground Water Withdrawals on Fish Habitat"* dated August 16, 2022. The 2022 FWMP presented very detailed changes to the original 2008 FWMP that was approved by the Oregon Department of Fish and Wildlife (ODFW). Both the 2008 and 2022 FWMP provided mitigation to offset any potential impacts on fisheries and aquatic habitat and the specific measures to mitigate for any negative impacts.

Thornburgh estimated in 2008 the Resort's water needs at full build out were up to 2,129 AF per year, having consumptive use of 1,356 AF, and a maximum withdrawal rate of 9.28 cubic feet per second (cfs). The Thornburgh Resort revised water needs at full build out by reducing some water intensive amenities and reducing irrigated landscaping for resort facilities and individual homes. The Resort will also implement the use of improvements in the type and method of fixtures used in Resort buildings to reduce consumption. As a result of this Thornburgh is reducing its total water needs from 2,129 AF to 1,460 AF. A summary table of the 2008 estimated water demand and the 2022 revised water demand are shown below:

2008
Original Water Use Full Resort Build-Out

WATER USE		ANNUAL VOLUME	CONSUMPTIVE USE
Golf Courses		717 AF	645 AF
Irrigation		195 AF	117 AF
Reservoir Maintenance		246 AF	206 AF
Other Q/M		971 AF	388 AF
TOTALS	**9.28 CFS**	**2,129 AF**	**1,356 AF**

2022
Reduced/Revised Water Use at Full Resort Build-Out

WATER USE	ANNUAL VOLUME	CONSUMPTIVE USE
Golf Courses	501 AF	451 AF
Irrigation	111 AF	66 AF
Reservoir Maintenance	51 AF	43 AF
Other Q/M	797 AF	319 AF
TOTALS	**1,460 AF**	**882 AF**

The above reductions in estimated annual water usage reflect roughly a one-third in water savings at full buildout of the Resort. Further, the water used for mitigation of the new Resort water usage relies more on groundwater, groundwater that is intended to offset groundwater pumping that could reduce discharges of seeps and springs that contribute cool water to surface flows in the Deschutes River and Whychus Creek at gaining reaches of the River and Creek, respectively. A list of the water rights to be used for mitigation of the Resort water uses are shown below by the referenced name, volume and the water right certificate, transfer or otherwise a cancellation:

Water Rights: Certificated, Transfers, and Cancellations.

1. LeBeau (200 AF) – Surface Water POD: Certificate 95746 and transfer T-13857.
2. Big Falls Ranch (614.4 AF) – Surface Water: Certificate 96192 & 96190 and transfer T-12651 to a groundwater Point of Appropriation.
3. Big Falls Ranch (25.6 AF) – Groundwater POA: Certificate 87558.
4. Tree Farm (327.5 AF) – Groundwater POA: Certificate 94948 and Transfer T-13703.
5. Dutch Pacific (49.5 F) – Groundwater POA: Certificate 89259.
6. DRC Temporary Mitigation Credits – 6 AF of mitigation.
7. Three Sisters Irrigation District (1.51 cfs minimum 106 AF) – Surface water. Final order signed for instream transfer. This TSID water will only be used for quality mitigation, not as part of any OWRD mitigation or transfer program.

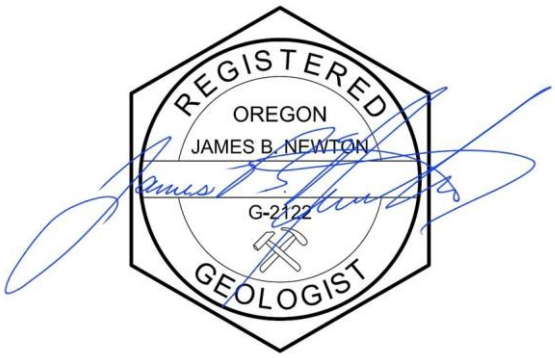
These above mitigative water rights, upon approval by the Oregon Water Resources Department, will provide mitigation for 1,217 AF of the 1,460 AF required for fully mitigation the estimated Resort water uses. The remaining approximately 243 AF of mitigation will be completed in the future, prior to the OWRD authorizing the full annual water use of 1,460 AF. If the additional 243 AF of mitigation is not necessary, or unavailable, the Resort will be limited to 1,217 AF annually.

Based on the detailed surface and groundwater modelling prepared by Four Peaks Environmental Consulting, and Resource Strategies, Inc., and the analysis of the impacts on Fish Habitat provided by Four Peaks (all submitted into the county written record as of the date of this letter), the mitigation of the Thornburgh Resort groundwater usage achieves compliance with DCC 18.113.070(D), Deschutes County's "No Net Loss/Degradation" standard as it pertains to fishery resources. Considering the reduced Thornburgh Resort water usage and superior mitigation of future Resort water uses provided by the 2022 FWMP and the ample technical support for the plan, the County should approve the Thornburgh 2022 FWMP.

THORNBURGH RESORT
2022 FISH AND WILDLIFE MITIGATION PLAN (2022 FWMP)

RELATING TO POTENTIAL IMPACTS OF THORNBURGH'S REDUCED GROUND WATER WITHDRAWALS ON FISH HABITAT

Renews: 1/1/2023



Renews: 5/1/2023

Prepared for:

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August 16, 2022
Reorganized and Updated November 7, 2022

Project: Thornburgh Resort

I. Introduction

This report was prepared by Jim Newton, PE, RG, CWRE, Principal of Cascade Geoengineering ("CGE") on behalf of Central Land and Cattle Company, LLC, owner, and developer of the Thornburgh Resort ("Thornburgh" or the "Resort") as an Addendum to the Thornburgh Resort and Wildlife Mitigation Plan regarding potential impacts on fisheries and aquatic habitat and the specific measures to mitigate for any negative impacts. It incorporates elements of and replaces the "Addendum Relating to Potential Impacts of Ground Water Withdrawals on Fish Habitat" dated April 21, 2008 (the "FWMP") developed by Newton Consultants, Inc. ("NCI") and supplements thereto.

II. Background

The Thornburgh Resort will have no direct impact on natural surface waters; there are no such resources on the property and the proposed source of water for the Resort is ground water pumped from wells on the Resort property, to be appropriated under a series of water rights approved by the Oregon Water Resources Department ("OWRD"). Use of ground water by the Resort is expected to indirectly impact flows in the Deschutes River because of a determination of hydraulic connection between surface and ground waters in the Deschutes Basin. This connection has been noted by the USGS and a determination confirming such was made by OWRD in connection with its evaluation and approval of one of Thornburgh's original water rights authorizing the appropriation of 2,129 acre-feet of ground water for the Resort.

As a result of the determination of hydraulic connection, Thornburgh was required to provide mitigation to offset impacts equal to the consumptive use in the "zone of impact" identified by OWRD, in this case the "General Zone" of impact. In addition to the OWRD requirements, Thornburgh voluntarily agreed it would address both flow and temperature concerns with measures set out in Section V: Mitigation and Enhancement Measures of the 2008 FWMP. Temperature concerns were addressed by using cooler water for a part of the Resort's OWRD mitigation. The cooler water was to be obtained by purchasing Big Falls Ranch ("BFR") water rights that entitled BFR to pump surface water from Deep Canyon Creek. This water, with a temperature of approximately 13 degrees C would be acquired over time as needed from Big Falls Ranch. Once acquired BFR would cease pumping the rights acquired by Thornburgh and thereby improve flows and cool the river. The remaining mitigation water would also be surface water, from COID and other sources, with an estimated temperature of 26 degrees C. The 2008 FWMP and other measures added to it during the review of the Final Master Plan (FMP) were determined to fully mitigate for any negative impacts on fish habitat and to achieve compliance with DCC 18.113.070(D), Deschutes County's "No Net Loss/Degradation" standard as it pertained to fishery resources.[1]

This cooler water, roughly 62% of the total mitigation promised by the 2008 FWMP, was found sufficient to fully mitigate for 100% of the thermal impacts to the Deschutes River (and to Whychus Creek as well according to ODFW) attributable to Thornburgh's pumping. Further, the

[1] This is a Deschutes County standard only.

1.87 cfs[2] of impacts to seeps and springs in the 2008 FWMP was mitigated for by leaving 1.97 cfs (equal to 105% of the impacts) of the Deep Canyon water in the river upstream of areas identified as critical fish habitat. Additionally, this mitigation was determined by the Oregon Department of Fish and Wildlife ("ODFW") to result in a net benefit to fisheries. Project opponents objected to the 2008 FWMP, claiming that no mitigation was provided to address a slight reduction in groundwater recharge to Lower Whychus Creek. Although Thornburgh and ODFW disagreed mitigation was needed in this location, Thornburgh volunteered to provide additional mitigation specifically for Whychus Creek by funding a part of a Three Sisters Irrigation District project. The County's hearing officer accepted this offer. The Whychus Creek mitigation was opposed by a project opponent but following an extensive, and protracted legal battle was proven to meet the No Net Loss standard, and provide additional benefits to habitat resources in Whychus Creek by increasing the flow of the creek many miles upstream of the cool water fish habitat found in Lower Whychus Creek, which is now completed.

III. Resort Water Supply and OWRD Mitigation

A. Resort Water Needs and Supply

Thornburgh's water supply is groundwater pumped from the Deschutes Aquifer from numerous wells located within the resort boundaries. That has not changed since the Resort was first approved in 2006. The Deschutes Aquifer is vast covering about 4,500 square miles with a thickness or depth of as much as 2,000 feet at points. The aquifer holds an immense water volume with very substantial flows through it. Annual recharge of the aquifer is about 3,800 cfs or more than 2,750,000 AF per year while annual usage is roughly 750,000 AF, the bulk of which is irrigation. Water generally travels north and east until it reaches Lake Billy Chinook.

The Resort's original plan anticipated 6 groundwater wells would be used. Presently, there are 8 potential groundwater wells. However, changes to Resort infrastructure may require additional well locations to be added or moved[3]. Any well within the Resort property will pump from the same regional aquifer to supply Thornburgh water for a variety of purposes, common among municipal and resort style communities in Central Oregon. As was noted from a David Newton in a memo dated August 24, 2021, the number or specific location of wells within the Resort property has no bearing on the mitigation plan or the efficacy of mitigation to offset pumped groundwater from the Resort's property. This conclusion has been verified by comprehensive groundwater modeling that was completed by Four Peaks Environmental Consulting ("Four Peaks"). Four Peaks determined that changing well locations at the Thornburgh property would have no change on the impacts felt from Thornburgh's pumping. *See* Four Peaks: Evaluation of the Impacts of Proposed Groundwater Pumping at Thornburgh Resort Project dated October 19, 2022, (Four Peaks GSFlow)

[2] The 1.87 cfs of impact was the total amount of impact to all seeps and springs in any location (Deschutes, Whychus, etc.) from Thornburgh pumping 2,129 AF of groundwater.
[3] The CMP began with 6 well locations that were changed in the approved FMP. The A-1 Tentative Plan approved another well location.

Thornburgh uses to be served by its wells include domestic and commercial uses, golf course, park and landscape irrigation, reservoir/pond maintenance and fire protection. Collectively, these uses are defined by the OWRD as "quasi-municipal" uses. In 2008, the Resort's water needs at full build out were estimated at 2,129 AF per year, having consumptive use of 1,356 AF, and a maximum withdrawal rate of 9.28 cfs as shown below. As defined by OAR 690-505-0605(2), *"Consumptive use" means the Department's determination of the amount of a ground water appropriation that does not return to surface water flows in the Deschutes Basin due to transpiration, evaporation or movement to another basin."*

1. Original Water Use Full Resort Build-Out

WATER USE	**ANNUAL VOLUME**	**CONSUMPTIVE USE**
Golf Courses	717 AF	645 AF
Irrigation	195 AF	117 AF
Reservoir Maint	246 AF	206 AF
Other Q/M	971 AF	388 AF
TOTALS	**9.28 CFS.**	**2,129 AF**	**1,356 AF**

Since the approval of the 2008 FWMP, issues regarding the use and conservation of water have become increasingly important to the region. As a result of this growing regional water awareness, Thornburgh has taken focused steps to reduce the Resort's water usage by roughly **one third**. This reduction of water use will be achieved by Thornburgh foregoing its right to develop some water intensive amenities and reducing irrigated landscaping for resort facilities and individual homes. The Resort will also implement the use of improvements in the type and method of fixtures used in Resort buildings. As a result of this Thornburgh is reducing its total water needs from 2,129 AF to 1,460 AF and its consumptive use from 1,356 to 882 AF, as shown in table 2 below.

2. Reduced Water Use at Full Resort Build-Out

WATER USE	**ANNUAL VOLUME**	**CONSUMPTIVE USE**
Golf Courses	501 AF	451 AF
Irrigation	111 AF	66 AF
Pond Maint.	51 AF	43 AF
Other Q/M	797 AF	319 AF
TOTALS	**1,460 AF**	**882 AF**

Thornburgh owns or controls numerous applications, permits and other certificated water rights for use as part of the Resort's water plans that may be used for consumptive water or mitigation water purposes. These include certificated water rights, transfers, and cancellations (See Section B below) and ground water applications and permits (See Section C). For further details see Attachment 1.

B. Water Rights: Certificated, Transfers, and Cancellations.

1. LeBeau (200 AF) – Surface Water POD: Certificate 95746 and transfer T-13857.
2. Big Falls Ranch (614.4 AF) – Surface Water: Certificate 96192 & 96190 and transfer T-12651 to a groundwater Point of Appropriation.
3. Big Falls Ranch (25.6 AF) – Groundwater POA: Certificate 87558.
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6. DRC Temporary Mitigation Credits – 6 AF of mitigation.
7. Three Sisters Irrigation District (1.51 cfs minimum 106 AF) – Surface water. Final order signed for instream transfer. This Whychus Creek TSID water will only be used for quality mitigation, not as part of any OWRD mitigation or transfer program (m).

C. Ground Water Rights: Permits and Applications.

8. GW Permit G-17036: Permit for 9.28 cfs (2,129 AF) of groundwater. Currently pending a contested case regarding extension of the permit.
9. GW Permit Application G-19139 (pending). Alternate permit for 9.28 cfs (2,129 AF) to replace G-17036 if needed.
10. Limited License Application LL-1879 (pending). Alternate permit for 4.5 cfs of groundwater for interim use during actions on #8-9 above.
11. Limited License Application LL 1917 (pending). A second alternate limited license for .453 cfs of groundwater (same amount and alternate to T-13703[4].

For any of the permits or applications in "C" above, OWRD requires mitigation under ORS 390.835 and related administrative rules in OAR 690-505-0500 *et seq.* This does not apply to the transfer of certificated water rights that have been fully developed. The functional effects of a transfer and a new fully mitigated pumping are essentially the same. Both result in the termination of the right to pump water in one location and both authorize pumping in the new location. The OWRD mitigation rules were adopted in response to a comprehensive study of ground water resources in the Deschutes Basin conducted by the United States Geological Survey ("USGS") and OWRD. (*Ground Water Hydrology of the Upper Deschutes Basin, Oregon,"* USGS Water Resources Investigation Report 00-4162, 2001). The study demonstrates hydraulic connection between the regional groundwater aquifer and surface water within the Deschutes Ground Water Study Area as shown on Figure 1. As a result, the rules require mitigation to offset the impact of ground water pumping on surface water flows.

In reviewing applications for new ground water rights, OWRD determines the total quantity of water to be diverted from groundwater and the amount of "consumptive use" associated with the proposed new use. The amount of mitigation required – or "mitigation obligation" – is equal to the annual amount of consumptive use. In addition to specifying the quantity of mitigation water required to offset consumptive use, OWRD identifies the "zone of impact" or location

[4] Now that the Tree Farm transfer has been approved this LL may not be required.

within the surface water system in which the impact of a proposed ground water use is expected to occur. Mitigation for any new groundwater permit used by Thornburgh is required in the "General Zone of Impact" which allows mitigation water to be obtained from any source in the Deschutes Basin above the Madras gage, located below Lake Billy Chinook. The broad geographic scope of the General Zone reflects findings in the USGS Study that most ground water within the basin flows toward the confluence area of the Crooked and Deschutes Rivers and discharges into the river and tributaries in an area just above Lake Billy Chinook.

Initially, OWRD determined the consumptive use, and mitigation obligation of permit G-17036 to be 851.6 AF (40%, of 2,129 AF). WaterWatch of Oregon protested that determination and Thornburgh voluntarily agreed to increase the consumptive use of individual elements of the permit which raised the overall mitigation requirement to 1,356 AF which in essence provides an additional 505 AF (over 50% extra) of mitigation. The application for the replacement permit G-19139 uses the same consumptive use rates applied by OWRD under the settlement. Under OWRD rules, mitigation for new groundwater permits must be provided in advance for the full amount of water to be pumped under the new permit for each phase of development.

D. Thornburgh 2022 Mitigation Plan (includes OWRD Mitigation ("M") and No Net Loss Quality Mitigation ("m").

To achieve compliance with DCC 18.113.070(D), Thornburgh commits to reduce its water usage to a maximum of 1,460 AF, having a consumptive usage of no more than 882 AF. Further, Thornburgh commits to purchase the certificated water rights #1-5 in Section B above (all are both OWRD (M) and Quality (m) mitigation) and discontinue pumping water in the location appurtenant to the right. Thornburgh committed to and has acquired the TSID-Whychus Creek quality mitigation (m) water listed in #7 above. Thornburgh has transferred or will be seeking approvals to transfer the water rights in #1-4 to the Thornburgh wells. The transfers will change the place of appropriation, the place of use, and in the case of irrigation rights, the character of use from irrigation to quasi-municipal uses. Transferring a certificated water right does not require OWRD mitigation, as it eliminates the use of this transferred water right in its former location and allows it to be used, instead, on the Resort's property. Thornburgh's transfers, if approved, will total 1,167.5 AF. The first of which the Tree Farm, temporary transfer T-13703, was approved transferring 327.5 AF of quasi-municipal water from a well in west Bend to the Thornburgh wells. Transfer for the LeBeau and Big Falls Ranch water have been applied for and are pending. If any transfer is not approved, the water right could be cancelled in lieu of mitigation (both the groundwater and surface water rights) or transferred instream (just the surface water rights) for mitigation credits. Water Right #5 above, Certificate 89259, Dutch Pacific, for 49.5 AF groundwater is presently being cancelled in lieu of mitigation. When all the transfers and cancellations are complete, Thornburgh will be able to pump 1,217 AF[5]. To pump over 1,217 AF Thornburgh will transfer additional water rights to transfer to its property or provide additional mitigation (243 AF +/-).

Until Thornburgh's transfer applications are fully adjudicated it is unclear how much water will be pumped from G-17036, G19039, or any alternate "NEW" groundwater or limited license

[5] 1,223 AF including the 6 AF listed in #6 above that can be used as M mitigation.

permit.[6] What is clear, however, is that the Resort has agreed to reduce its water use from 2,129 AF to a maximum pumping of 1,460 AF and maximum consumptive use of 882[7] AF. For any portion of its water Thornburgh pumps under a new groundwater permit it will be required to provide mitigation for that new use prior to pumping. OWRD will require that these water rights are also in the general zone of impact.

The mitigation benefits provided under this plan occur at different times depending on whether the permit is appropriated from a groundwater source, i.e., Dutch, and Tree Farm permits or surface water permits that are diverted from the stream, i.e., the LeBeau permit. For permits appropriated from the ground, the mitigation event occurs when Thornburgh acquires the water right and files an assignment of water right with OWRD and does not pump water under the authority of the permit in advance of OWRD approval of a transfer or other mitigation measure. While the approval of a transfer (or an alternate described herein) is needed to allow groundwater pumping on the Resort property, it is not needed to achieve compliance with the 2022 FWMP for a permit appropriated from groundwater, or to meet the County's no net loss standard. In that case, the ownership, assignment, and a commitment to nonuse of the water rights under that permit until it is transferred or used for mitigation may be relied on to demonstrate compliance with the FWMP during a third stage development permit review.

Doing the measures outlined in this Section D will meet or exceed the No Net Loss standard as provided for in DCC 18.113.070(D) as for the reasons discussed in detail in the Sections below.

F. Groundwater Withdrawals and Quality Mitigation

In other resort approvals, OWRD mitigation was accepted as providing the entire mitigation needed to meet this standard for fish habitat. In the case of Thornburgh Resort, this standard has been redefined to require "water quality" mitigation. This was required even though all groundwater pumping in the Deschutes Basin affects groundwater discharges which impact stream flows. OWRD mitigation, by design, increases streamflow by either increasing groundwater discharge into the stream (cold groundwater mitigation directly via seeps and springs) or by leaving water in the stream (surface water mitigation), which typically has the benefit of reducing river and creek temperatures associated with the increase in water flow.

Further, in the Deschutes Basin, surface water generally originates as groundwater released by seeps and springs due to the hydrological connection. Snowpack melts in the mountains and seeps into the highly permeable and porous ground. Water then flows down-gradient in the aquifer to be discharged into streams as springs or seeps. In this basin a minimal amount of surface water is the result of run-off. Surface water that begins as ground water is often diverted or pumped from our streams to feed the basin's substantial irrigation system. Irrigation water that is not consumed, seeps back into the porous soil and down into the aquifer

[6] Any new water right or authorization won't impact the mitigation measures required as the source would remain the same regional aquifer.
[7] Applying OWRD standard practice of 40% to QM permits would result in consumptive use of 584 AF. This plan provides mitigation far more than that amount.

as return flows back to groundwater. Once returned to the aquifer, groundwater flows to the north and northeast until it is discharged back into streams and ultimately the Deschutes River as surface water.

Regardless of the type (surface or groundwater) or place of mitigation, streamflow in the basin has been shown to increase when surface water irrigation or groundwater use is discontinued. Increasing streamflow was the main purpose of the OWRD mitigation program and also a primary purpose of many of the basin's environmental actions and restoration programs. NCI noted this in the 2015-2017 remand of the FMP relating to TSID mitigation for Whychus Creek. Flow volumes in the upper Deschutes River are an important component of the current Habitat Conservation Plan for the Oregon Spotted Frog. Flow volume guarantees set to protect the frog have created substantial impacts on the operation of the basin's irrigation districts and a tremendous burden on some of farmers within the basin, including North Unit Irrigation District.

Opponents of Thornburgh have typically focused on groundwater as it relates to its ability to affect streamflow, particularly the thermal conditions or "quality" of the remaining flow resulting from groundwater pumping. More specifically, the areas below Lower Bridge on the Deschutes River and lower Whychus Creek where the discharge of significant amounts of cold groundwater, can dramatically lower stream temperatures result in improved water quality.

Quality Mitigation - 2008 FWMP:

In the 2008 FWMP, the reduction in groundwater discharge resulting from pumping was mitigated by providing surface water in the Deschutes River and its Deep Canyon Creek and Whychus Creek tributaries. In both cases, surface water mitigation was justified because it was cool. Water left in Deep Canyon Creek, is spring fed with a temperature of roughly 13 degrees C as it flows into the Deschutes River[8]. Adding the average mitigation flow of 1.97 cfs from the cool Deep Canyon Creek water rights more than replaced the average reduction of 1.87 cfs in seep and spring discharge claimed by the 2008 Yinger report commissioned by a project opponent. At the same time, Tetra Tech's Mass Balance Analysis estimated the temperature impact of these claimed reductions in streamflow, with mitigation as a minor temperature ***increase*** of 0.1 degrees C in the Deschutes River at Steelhead Falls and below the mouth of Whychus Creek, along with increased flows in the river from north Bend downriver. For the area around Lower Bridge Tetra Tech noted a zero-degree change which was rounded down from a minor impact. Even though there was up to a 0.1 degree C ***increase*** in temperature in two areas of critical fish habitat the mitigation plan was found to meet the no net loss standard because it replaced the loss of seeps and springs (1.97 vs. 1.87 cfs) and the temperature change was found to be of no impact to fish habitat in the Deschutes River.

Mitigation was required for Whychus Creek, despite the extremely minor impacts projected there by Mr. Yinger, because the 2008 hearings officer was concerned the Resort's "peak" summertime use of water might have greater impacts than modeled. The water in Whychus

[8] This was the temperature Tetra Tech, a key consultant for Thornburgh Resort, utilized to calculate thermal impacts during the 2008 FMP proceedings.

Creek at the TSID diversion has an average temp of about 13 degrees C[9]. The applicant's expert hydrogeologist David Newton, PE, CWRE, established that by scientific analysis that leaving more of that cool water in the creek from that point downstream increased the thermal mass of the creek causing it to heat less as it flows downstream. The NCI memo from October 2017 shows the maximum thermal impacts to lower Whychus Creek **without** mitigation, during the peak summertime temperatures and the creek at its lowest flow, to be 0.0042 degrees C. This is far less than what can be measured using technology available today. With the TSID surface water mitigation, the temperature was ***lowered*** in Whychus Creek (lowered by approximately 0.001, again in an amount too small to be measured)[10]. The TSID water also provided thermal benefits to the middle and upper parts of the creek as noted in the NCI memo, although those benefits were not considered to meet the standard due to the limited scope of the review on remand which focused on temperatures in Lower Whychus Creek only. The TSID mitigation in Whychus Creek was shown to meet the no net loss/degradation standard.

In the Crooked River, Yinger's 2008 study (Yinger 2008) noted roughly 13% of the impacts of flow reduction would be felt in the Crooked River, but neither Yinger nor ODFW voiced concerns about thermal impacts there. This may be because of the large groundwater discharges in the area and the fact that the temperatures of the groundwater discharging into the Crooked River at Opal Springs and Osborne are warmer (between 11.6 and 13.7 degrees C[11]) than the discharges noted into the Deschutes or Whychus (around 11 degrees C). ***See* Exhibit 6, OWRD Spring Temp**. Of note is the 2008 FWMP had no Crooked River mitigation. All 2008 mitigation was Deschutes River and Whychus Creek surface water mitigation. To better understand the impacts to the groundwater in the Crooked River from Thornburgh pumping, Four Peaks modeled the changes in discharge resulting from both the 2008 and 2022 FWMP while Newton provided mass balance analysis of both mitigation plans[12].

Quality Mitigation- 2022 FWMP:

A key improvement of the 2022 FWMP over the 2008 version is the increase in the percent of cold-water mitigation that is used to provide quality mitigation. As noted above the 2008 plan had 100% surface water comprised of the Deep Canyon water (roughly 62%) and other sources (roughly 38%) such as COID, etc. The Deep Canyon water was 13 degrees C entering the Deschutes River while the other surface water was 26 degrees C. This resulted in average temperature of the mitigation water of 18 degrees C where the mitigation enters the waterways. In comparison the 2022 plan used 85% cold groundwater at 11 degrees C and 15% surface water at 20.4 degrees C for an average of 12.5 degrees C where the mitigation enters the rivers and streams.

[9] 13 degrees C was the temperature used by Newton in the 2015-2017 remand cases on Whychus Creek to show compliance with the no net loss standard. Current data shows mean temperature of 9.3 degrees C. The lower the temperature the greater the benefits provided.
[10] Since the amounts cannot be measured, they cannot be verified and are simply theoretical. As such, whether positive or negative they are considered as no change.
[11] As recorded by OWRD staff and noted in Exhibit 6.
[12] Lucius Caldwell PhD., Four Peaks Fish Biologist analyzed the impacts.

While transferring water right certificates require no OWRD mitigation, changes in groundwater discharge could occur when moving from one location to the other that could affect compliance with DCC 18.113.070(D). In the CGE Memo dated August 12, 2022, the results of Yinger 2008 and the USGS report of 2004 provided the base from which we estimated the impacts from Thornburgh's pumping and the benefits resulting from stopping pumping at the transfer wells. The results were incorporated into the original version of this 2022 FWMP. We subsequently retained Resource Strategies, Inc. (RSI) to provide more specific information on thermal impacts based on flow data estimated in the CGE Memo 1. RSI used the QUAL2Kw, developed by the Department of Environmental Quality to assess impacts of the pumping and all mitigation on the Deschutes River from Wickiup Reservoir to Lake Billy Chinook, and in Whychus Creek from Sisters to the Mouth. RSI reported those results in the memo Flow and Temperature Modeling of the Deschutes River, dated October 2022 (RSI-1).

As mitigation (both M & m) in the 2022 FWMP is largely groundwater sources, Thornburgh retained Four Peaks Environmental Consulting to evaluate the impact of both the Thornburgh pumping and the cessation of pumping from the transfer well locations using the 2017 USGS GSFlow Model. The 2017 USGS GSFlow modeling program was developed by the USGS in conjunction with OWRD. It provides the most sophisticated and reliable means of determining the impacts of changes in groundwater discharge on stream flows in the Deschutes Basin. Additional details of the USGS model are included in the Four Peaks GSFlow Memo. ODFW subsequently requested additional information on specific impacts and benefits of the groundwater pumping and transfers. This information was provided to ODFW by Four Peaks. This data showed the transfers alone (w/o the surface water mitigation) resulted in net increases to flow in the Deschutes River from Crane Prairie to Lake Billy Chinook, a very minor decrease in flows on the Little Deschutes (excluding the 200 AF of LeBeau water) and Crooked Rivers, and an increase in flows in Whychus Creek from Sisters to its confluence with the Deschutes River, including increases in flows to the springs between Alders Springs and the mouth. The Whychus Creek increased discharge was due to the cancellation of the Dutch Pacific water right alone, excluding the benefits of the TSID water which has already been determined to achieve compliance with the no net loss/degradation standard. This information was provided to ODFW.

With new groundwater flow data from Four Peaks, RSI completed additional modeling to determine overall stream flows including flows from surface water mitigation and the resultant changes to temperature. The results of RSI's additional modeling were reported in Part II-Impacts of GSFlow-Based Changes in Stream Discharge, Dated October 22, 2022 (RSI-2). RSI-2 shows the addition of the LeBeau water south of LaPine, on average results in, increased flows to the river from there to Lake Billy Chinook, while the TSID water also provides additional cool water mitigation from Sisters, Oregon to the mouth. With all the "mitigation" included in the 2022 FWMP, the RSI-2 thermal and flow modeling shows an increase of flow and a decrease of temperature in all stretches of the Deschutes measured, including at Benham Falls, below Bend, near Lower Bridge, and near Culver. See RSI–2, Table 2, pg. 9. The benefits shown are accomplished with mitigation of 1,217 AF versus pumping of 1,460 AF.

Further, of the 937 AF of water already owned by Thornburgh and available for use, 200 AF is surface water not being pumped from the river south of LaPine[13], while 737 AF is groundwater that remains in the aquifer to flow to the streams, including the Deschutes River, Whychus Creek, and the Crooked River to increase flows and provide thermal benefits, long before the resort creates any impacts on the stream. This "advance" or "excess mitigation" achieved by not pumping the 937 AF of water rights accumulates benefits for decades[14] until the impacts from pumping are fully felt in the stream. As is discussed in more detail below this excess mitigation (benefits) accumulate to a substantial amount providing benefits to the streams and fisheries resources for years in advance of full pumping occurring at the Thornburgh Resort. This "excess mitigation" benefit is not relied on by the scientific modeling efforts that demonstrated compliance with the no net loss/degradation standard. All modeling assessed the impacts only after the full effects of the Thornburgh's maximum pumping have been achieved.

Because of the efficacy of the present plan, the 1,217 AF already mitigates for 119% (w/out the TSID or 198% with it) of the impacts to springs and seeps[15]. Also, any remaining mitigation or transfer water will come from within the General Zone of Impact and will not create an adverse impact on the fisheries habitat or the benefits shown herein.

G. Fish Habitat Potentially Affected by Ground Water Use

During the consultation process in 2008, ODFW identified two specific concerns with respect to potential impacts of ground water pumping on fish habitat: First, the potential for flow reduction due to hydraulic connection that could impact flows necessary for fish and wildlife resources in the Deschutes River system; and second, the potential for an increase in water temperature as a result of flow reductions from ground water pumping. In preparation for this 2022 FWMP Thornburgh discussed the changes with ODFW to understand what areas would currently be of concern. While the area from Lower Bridge to Lake Billy Chinook on the Deschutes is still important, other areas were also of concern. This included flow limitations on the Deschutes River from Bend to Lower Bridge, on Whychus Creek from Camp Polk Road upstream to Sisters, and in Indian Ford Creek, that empties into Whychus Creek. It also included 6 areas shown to have spring discharge, or cold water refugia, two each on Whychus Creek, the Deschutes and Crooked Rivers. This plan takes all those areas into account.

In the 2008 process, ODFW identified six species of fish that could potentially be impacted: Redband Trout, Bull Trout, Brown Trout, Mountain Whitefish, Summer Steelhead and Spring Chinook. While relevant to consider, more important is the habitat itself. In *Gould v. Deschutes County*, 233 Or App 623, 227 P3d 758 (2010) the Oregon Court of Appeals found that the no net loss standard refers to habitat, stating:

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[13] Thornburgh may allow farmers affected by the Habitat Conservation Plan and/or drought conditions to use some portion of water it doesn't currently need to authorize pumping on a temporary basis. When providing water for farm drought relief, that portion of Thornburgh's water will not be instream. Only the LeBeau water will be used for this program.

[14] Earlier CGE Memo dated August 12, 2022, noted this could take up to 95 years but assumed 50 years conservatively.

[15] This is regardless of how the water is used, whether transfer, cancellations, or transfer instream.

> "Thus, the context of DCC 18.113.070(D) strongly suggests that "fish and wildlife resources" refers not to species of fish and wildlife, but to the habitat that supports fish and wildlife. In light of that context, we conclude that DCC 18.113.070(D) allows a focus on fish and wildlife habitat to establish that "[a]ny negative impact on fish and wildlife resources will be completely mitigated so that there is no net loss or net degradation of the resource." That standard may be satisfied by a plan that will completely mitigate any negative impact on the habitat that supports fish and wildlife, without showing that each individual species will be maintained or replaced on a one-to-one basis."

In its consultation with Thornburgh regarding these issues, ODFW recognized that the OWRD groundwater mitigation program was specifically designed to identify and mitigate for the impacts of flow reduction because of new groundwater pumping in the basin. Although the OWRD rules and USGS study on which the rules are based do not directly address temperature issues, ODFW also recognized that with the flow replacement required under OWRD rules the potential impact to temperature because of the Thornburgh project – or any similar individual project – is expected to be negligible. However, ODFW expressed a concern about the potential for cumulative impacts from on-going groundwater development in the basin, over time. Although cumulative impacts may be a concern, Thornburgh does not need to mitigate for the impacts of others in order to achieve compliance with the no net loss standard. That standard is based solely on impacts created by Thornburgh's groundwater pumping which were acknowledged to be negligible in 2008.

ODFW reviewed the 2008 FWMP and determined that it would, without placing TSID mitigation water in Whychus Creek, offer a net benefit for fish habitat. Nonetheless, TSID mitigation water was required by the County's hearings officer. On appeal of the FMP and 2008 FWMP opponents claimed without success, that the TSID mitigation water was "hot water" that would harm fish habitat in lower Whychus Creek, and that temperature impacts (of 0.1 degree C) to the Deschutes River violated the no net loss standard. As a result of the challenges, NCI undertook extensive mass balance analysis in 2015-2017 of the impacts *without* mitigation that showed maximum thermal impacts of 0.004 degrees C in Whychus Creek under the peak summertime temperatures and the lowest summertime flows. NCI also provided an analysis of the TSID mitigation that showed keeping water instream in upper Whychus Creek offsets the thermal impact of groundwater pumping by the resort and slightly reduces the temperature of water in lower Whychus Creek, more than 15 miles downstream[16]. The NCI studies resulted in affirmance of the FWMP because it demonstrated compliance with the no net loss standard.

The principle illustrated by the results of the 2015-2017 studies – that increasing the flow of rivers and streams upstream by not diverting for irrigation use both increases volume and lowers temperatures downstream – is also a principle adopted in this 2022 FWMP[17]. From the

[16] The TSID mitigation reduced temperatures slightly throughout Whychus Creek starting from the TSID diversion where the water was left in stream.

[17] In addition to the TSID water this plan also will leave 200 AF of water in the Little Deschutes River south of LaPine.

point that surface water withdrawals cease and aren't being pumped from surface water, stream flows are increased reducing thermal impact, and decreasing how much or how fast stream temperatures rise, in turn lowering stream temperatures downstream.

Thornburgh also retained Four Peaks to evaluate the impacts of the 2022 FWMP on the fisheries resources. Lucius Caldwell, Ph.D., prepared 4 different reports that analyzed the impact to fisheries habitat as follows:

a. Evaluation of the Fish habitat Impacts of Proposed Groundwater Pumping at Thornburgh Resort Project (Four Peaks Fish 1), that was based on the flow and thermal impacts of the results of RSI-1,
b. Updated Evaluation of the Fish Habitat Impacts of Proposed Groundwater Pumping at Thornburgh Resort Project, to include Modeled Changes in Surface Water Resulting from Changes in Groundwater Discharge, dated October 24, 2022 (Four Peaks Fish 2). This report analyzed the impacts following completion of the RSI-2 report that was based on the Four Peaks GSFlow report.
c. Evaluation of Flow and Temperature Mass Balance Calculations of the Little Deschutes River dated October 24, 2022 (Four Peaks Fish Little Deschutes). This analyzed impacts to the Little Deschutes River based on GSFlow data prepared by Four Peaks and the thermal mass balance analysis completed by Cascade Geoengineering, and:
d. Evaluation of Flow and Temperature Mass Balance Calculations of the Crooked River dated October 24, 2022 (Four Peaks Fish Crooked River). This analyzed impacts to the Crooked River below Osborne Canyon and at Opal Springs based on GSFlow data prepared by Four Peaks and the thermal mass balance analysis completed by Cascade Geoengineering.

In total, Four Peaks concluding the following:

- Little Deschutes River-below LaPine: May include a slight flow increase (0.2-0.8 cfs) that improves habitat quantity slightly and a slight decrease in habitat quality,
- Deschutes River-Benham Falls: A slight increase in habitat quantity and improvement in habitat quality,
- Deschutes River-below Bend: Zero to a very slight increase in habitat quantity and zero to a very slight improvement in habitat quality,
- Deschutes River-near Lower Bridge: A very slight increase in habitat quantity and habitat quality will be unaffected to a slight improvement due to reduction in temperature,
- Deschutes River-near Culver: A very slight increase in habitat quantity and improvement in habitat quality,
- Whychus Creek: A slight increase in habitat quantity and improvement in habitat quality,
- Crooked River-Osborne Canyon: Flows will be reduced an average of 0.07%, while temperature will be reduced an average of 0.001%, amounts not likely to cause a reduction in habitat quality or quantity, and:
- Crooked River-Opal Springs: Flows will be reduced an average of 0.02%, while temperature will be reduced an average of 0.003%, amounts not likely to cause a

reduction in habitat quality or quantity. In all cases the values listed above are too small to measure. *See* Four Peaks Fish reports.

In recent discussions ODFW voiced concerns about specific impacts to discharges at 6 spring and seep locations ODFW felt would provide cold water refugia, 2 each on the Deschutes River, 2 on Crooked River, and 2 on Whychus Creek, the latter they were interested in receiving further temperature analysis on. Four Peaks and RSI provided further materials that, as expected, showed increased flows in each of the spring site at Whychus Creek and the Deschutes River along with very slight reductions in the Crooked River. For example, the average reduction to groundwater in any one cell measured by the GSFLow model was -0.008 cfs at Osborne Canyon and -0.011 cfs at Opal Springs, amounts that are immeasurable and not scientifically meaningful[18]. In sum, the expert reports show a slight benefit in net habitat quantity and quantity.

H. Thornburgh Mitigation: DCC 18.113.070(D) - The No Net Loss Standard.

The proposed mitigation measures are designed to ensure no net loss of habitat quantity or quality and net benefits to the resource and are comprised of three categories including:

A) elements that reduce demand on water resources and thus reduce impacts on the fisheries habitat (Item 1 below):
   1. limit groundwater pumping to a maximum of 1,460 AF annually, which is more than a 30% reduction in originally approved water usage.

B) elements that ensure compliance with the no net loss standard of DCC 18.113.070 (D) (Items 2-5 below):
   2. Use 1,217 AF of water rights described herein to authorize pumping of groundwater from wells on the Thornburgh property by transfer, cancellation or other permanent mitigation (e.g., mitigation credits).
   3. Comply with requirements for Water Right Permits, Certificates, or Transfers of water rights described herein, or others hereinafter acquired. Provide mitigation when needed in advance of pumping as required by OWRD mitigation rules.
   4. For additional supply or mitigation over the water rights specifically identified in this plan, use mitigation credits, BFR surface water, BFR ground water, or any other water source in the Deschutes General Zone of Impact that will discharge water into (or leave it in) the Deschutes or Crooked Rivers or their tributaries, to supply or mitigate for any unmet needs the resort will have. The amount of water needed is the 1,460 AF of total pumping less the amount of water transferred, cancelled, or converted to mitigation credits, and:
   5. Provide 106 AF of mitigation in Whychus Creek from the TSID diversion downstream by funding the completed TSID piping project called for by the 2008 FWMP that completely mitigates all impacts to Whychus Creek.

C) Elements that provide advance or excess mitigation not needed to meet DCC 18.113.070(D) (Items 6-7 below).

[18] Tetra Tech in their 2017 report, page 8, cited the EPA 2003 report which noted that temperature changes less than 0.25 degrees C were of no consequence to fish.

6. Let unused water rights remain in the groundwater or stream to increase flows and reduce temperatures of the streams in advance of creating impacts except as provided to others for drought relief at Thornburgh's sole discretion.
7. Thin up to 5,000 acres of Juniper forests onsite and on BLM Lands.

Section A:

1. **Limit Pumping to a Maximum of 1,460 AF Annually:**

Ensure all pumping for the resort does not exceed a maximum combined volume of 1,460 AF. This is more than a 30% reduction in the amount of water Thornburgh is currently approved to use. This will dramatically reduce the level of potential impacts, creating less demand and strain on the region's water resources. To ensure compliance, Thornburgh will submit as part of the annual Mitigation Report summaries of the resort's annual water reports that are required to be provided to OWRD. These summaries will detail the resort's annual water use for any permit supplying water to the Thornburgh Resort.

Section A Anticipated Results: A reduction of more than 31% of the pumping volume and nearly 35% reduction in the consumptive use of the Thornburgh Resort. This reduction reduces every impact that Thornburgh's water usage could possibly create and is the driving principle behind this amended 2022 FWMP.

Section B:

2. **Use OWRD Water Rights Certificates and Permits for Pumping or Mitigation:**

Thornburgh will use the OWRD water rights certificates, permits, and approvals described in Section B above and on Attachment 1 to allow it to pump groundwater to serve Resort uses. As the water rights listed Thornburgh currently owns 937 AF with another 280 AF under contract for a total of 1,217 AF[19] as follows:

a. GW Certificate 94948, Transfer T-13703. Tree Farm, 327.5 AF.
b. SW Certificate 96192 & 96190. Big Falls Ranch (BFR), 614.4 AF, 360 AF owned, 254.4 AF under contract. This is Deep Canyon Creek surface water with a groundwater POA.
c. SW Certificate 95746, Transfer application T-13857. LeBeau, 200 AF.
d. GW Certificate 87558. BFR, 25.6 AF of groundwater is under contract.
e. GW Certificate 89259. This is a groundwater right for 49.5 AF Thornburgh owns.

All these water rights are Certificated and do not require further OWRD mitigation. Thornburgh will either transfer these certificated rights to be used directly to pump groundwater from Thornburgh wells or it will use them indirectly as mitigation for groundwater pumping at Thornburgh either under permit G-17036, permit application

[19] Thornburgh has another 6 AF in temporary credits leased from the DRC which may be terminated at some point in the future.

G-19039, or an alternate replacement permit for a lower volume of pumping. A list of possible permits and applications is provided above in Section C and on Attachment 1.

3. Comply w/OWRD Mitigation Rules: Provide Mitigation Before Pumping:

Any mitigation required for any groundwater permit, whether permanent or as a Limited License that appropriates water from wells at the Thornburgh property, will be provided prior to pumping water under that permit, as required by OWRD rules. Mitigation, when or if needed, will be provided by either cancellation of water rights in lieu of mitigation, or transferring the existing surface water rights to instream rights. By providing mitigation water from the conversion or transfer of existing water rights, Thornburgh will be restoring natural stream or groundwater flows to the system at or above an area of impact from Thornburgh wells, much of which will occur during the time period when stream flows are typically the lowest and temperatures are warmest.

4. For Remaining Water Use BFR, COID, or Other Water Benefitting Deschutes or Crooked Rivers:

The water rights described in **1.** above will provide up to 1,217 AF of the resort's total water needs of 1,460 AF leaving at least 243 AF of additional water needed.[20] For any additional water needed over and above the 1,217 AF, Thornburgh will use some combination of: i) BFR surface water (Deep Canyon or Makenzie Canyon); ii) BFR ground water; iii) COID mitigation water or credits; or iv) other ground or surface water or credits that both discharge water into either the Crooked River or Deschutes River or its tributaries and meet the requirements of the OWRD mitigation program. Analysis by Cascade Geoengineering, LLC shows: i) using additional BFR water with groundwater points of appropriation will comply with the no net loss standard and have no impact to fish habitat; and ii) the transfer of other groundwater rights that discharge cool groundwater into area streams and rivers will provide thermal benefits to the rivers and streams; and iii) other surface water placed instream above areas of concern will provide thermal mass that will serve to cause cooling during the critical summertime period when stream temperatures are highest and flows the lowest. Regardless of where the remaining 243+/- AF (1,460-1,217) [21] of water rights or mitigation comes from this plan has already mitigated for the full impacts to seeps and springs.[22]

5. **Provide 106 AF of Additional Whychus Creek Mitigation (TSID)**:

[20] If there was some reduction in the amount Thornburgh is allowed to transfer under the LeBeau water right, like the 7% reduction expected in the NUID transfer, the amount of additional water required could be increased somewhat.

[21] The numbers contained in this, and the following section account only for the 1,217 AF of water described above, and do not include additional water or mitigation flows of at least 243 AF, which will further increase stream flows, irrespective of the source or location of that mitigation.

[22] If all 243 AF of additional water was from a surface water source the resulting % of total mitigation comprised of groundwater would be 69.7%, still greater than the 0% of groundwater and 61.7% of cool Deep Canyon water in the 2008 FWMP.

Thornburgh has already provided 106 AF of Three Sisters Irrigation District water for additional mitigation in Whychus Creek as was required by Condition #39 of the FMP approval. Thornburgh has made the required payment arrangements, TSID has completed the project, and OWRD has executed the final order transferring the water instream.

Section B Anticipated Results: Collectively, the measures in this Section B demonstrate Thornburgh Resort's continual compliance with Deschutes County's no net loss/degradation standard in DCC 18.113.070(D), specifically as it pertains to impacts to fisheries and aquatic habitat in the following ways:

a. Provide a net increase in the discharge of cold ground water via seeps and springs stream flow in the Deschutes River from Crane Prairie reservoir downstream to Culver, including at two spring locations of concern to ODFW above and below the mouth of Whychus Creek,
b. Provide a net increase in the discharge of cold ground water via seeps and springs in Whychus Creek from Sisters to the mouth, including at important "ODFW" spring locations at Alder Springs and the mouth,
c. Add cold groundwater discharge versus the 2008 FWMP to the Crooked River, including in important "ODFW" spring areas near Osborne Canyon and Opal Springs,
d. Increase net flows in the Little Deschutes River from south of LaPine into the Deschutes River,
e. Increase net flows of the Deschutes River from the confluence with the Little Deschutes onto Lake Billy Chinook,
f. Reduce net stream temperatures throughout the Deschutes River as noted in "e" above,
g. Increase net flows of Whychus Creek from Sisters to the mouth,
h. Reduce net stream temperatures of Whychus Creek as noted in "g" above,
i. Reduce the thermal impacts in the Crooked River as compared to the 2008 FWMP to levels immeasurable, including in spring areas noted by ODFW,
j. Increase habitat quantity in the Little Deschutes River,
k. Increase habitat quantity and improve habitat quality in virtually all areas of Whychus Creek and the Deschutes River, and:
l. Reduce the impacts in the Crooked River over the 2008 FWMP to levels so small as to be immeasurable, and not likely to cause a change in the quality or quantity of fish habitat.

Further details are found in CGE Memos 1 and 2, Four Peaks GSFlow, RSI Memo's 1 and 2, and Four Peaks Fish Memo's 1 and 2, and Four Peaks - Little Deschutes and Crooker River Fish Memo's. These elements a through l above are based on steady state conditions, the point in the future when 100% of the impacts from Thornburgh pumping have been realized in the form of streamflow reductions. As noted here and in previous memos this event may not occur for decades into the future after Thornburgh's pumping begins. Measure C-6 below discusses the excess or advance mitigation being provided to the fisheries resource. net benefits to the fisheries resources.

Section C:

6. **Leave Water Rights Instream or In the Aquifer Until Needed for Resort Uses:**

Thornburgh intends to pump water only as needed. When not needed, it will allow mitigation water flow underground and in the area's streams and rivers, providing advance benefits for impacts to occur at some point in the future. Advance or excess mitigation accumulates from providing mitigation prior to pumping but also during the transient period before impacts are fully realized in the stream.

Anticipated Results: The net results described in Section B above assume steady state conditions, the point in time when full pumping is occurring and the reductions in groundwater discharge into the streams are fully realized. As noted above and in the CGE memo, steady state conditions will not occur for as long as 95 years or more[23]. Until then, Thornburgh will provide substantial amounts of excess mitigation, likely resulting in un-required benefits during this timeframe. Assuming it will only take 50 years for steady state conditions to occur, Cascade has calculated that Thornburgh will discharge 71,771 AF of water into the system while creating impacts/withdrawals on the system of 47,117 AF, and excess benefit/discharges of 24,654 AF additional water over impacts in that transient than required. In sum the benefits provided by this are over 52% greater than the impacts created in the first 50 years of this 2022 FWMP, and equal nearly 17 years of full pumping of 1,460 AF.

Increasing stream flow 52% more than the impacts will translate into further temperature reductions in each of the streams affected. This situation will be most pronounced (nearly 100% excess) in the early years and gradually narrow as the difference between benefits and impacts narrows until steady state conditions are attained.

During periods of severe water shortage, Thornburgh may work with OWRD as to request usage of excess mitigation water that may be used to benefit farmers in significantly impacted irrigation districts, including the North Unit Irrigation District that supports up to 58,000 acres of farmed land in Jefferson County. As discussed above, Thornburgh has applied to temporarily transfer 200 AF of water to the North Unit Irrigation District. Under this exception, until the water rights are pumped by Thornburgh or used as mitigation, Thornburgh would like to be allowed to offer free use of its LeBeau irrigation water to farmers severely impacted by drought. Thornburgh does not intend this as a business, rather it is envisioned as an act of goodwill and a benefit to actual farm uses in the area. Further, any water excesses provided by Thornburgh is purely excess mitigation water that is not needed to mitigate for Thornburgh pumping. As such it will not have a negative impact on fisheries habitat although it could have a very positive impact on farmers. This temporary usage by others may be accomplished by temporary transfers on an annual basis when excess mitigation may be available.

[23] The 2004 USGS model estimated impacts of 100% were reached in year 80 after full pumping is begun. It will take at least 15 years, and perhaps 20-25 years until Thornburgh is fully occupied and pumping at those levels.

7. **Thin Juniper Forests Onsite and On BLM Lands.**

Thornburgh, as part of its development and wildlife mitigation plans, will thin up to 5,000 acres of Juniper forests, returning the land to the condition of the historic old growth forest that was prevalent in the 1930's. This measure is required and detailed as part of the approved Wildlife Mitigation Plan that addresses impacts to terrestrial wildlife habitat. While discussed here it is not separately required by the 2022 FWMP nor is it needed to achieve compliance with the no net loss/degradation standard for aquatic wildlife, including fish. Juniper is a native species that, has increase substantially throughout Oregon because of increased human settlement within Oregon. Juniper is now often seen as invasive by means of a likely 10-fold increase in prevalence that has been shown to reduce water capture, retention, and recharge to the area surrounding these increased stands of Juniper. Studies show a strong correlation between Juniper removal and increased spring discharges with estimates that may be upwards of 1 acre-foot of increased discharge resulting from the removal 4-5 acres of Juniper forests. Deschutes and Crook Counties are both looking at Juniper removal as a method to benefit water.

Anticipated Results: Experts, such as Tim DeBoodt, Crook County Natural Resource Policy Coordinator, report that the reduction of between 4-5 acres of Juniper trees can save, or return 1 AF of water, ideally in the form of increased ground seepage that may result in increases in spring flow. While it is hard to quantify the exact water savings that will occur, with studies showing the possibility to save up to 1 AF for every 4-5 acres of Juniper reduction, thinning thousands of acres could provide a significant benefit to nearby stream flows.

VII. CONCLUSION

DCC 18.113.070.D requires that any negative impact on fish and wildlife resources be completely mitigated so that there is no net loss or net degradation of the resource. This Addendum to the Thornburgh Wildlife Mitigation Plan, referred to as the 2022 FWMP, amends the 2008 FWMP (as it was updated) and addresses potential impacts to fishery resources because of ground water pumping and identifies specific mitigation measures. The potential for loss of habitat due to reduced surface water flows was quantified in connection with the OWRD review of Thornburgh's application for a water right permit. Under OWRD rules, Thornburgh is required to fully mitigate for consumptive use associated with Resort development. Consumptive use represents the amount of water not otherwise returned to the Deschutes River system after initial appropriation or diversion. The OWRD mitigation program is based on estimates of impact and modeling, the program is specifically intended to replace stream flows lost due to groundwater use.

The 2008 FWMP was developed in consultation with ODFW to address two specific areas of concern regarding the potential for negative impacts: the potential for a loss of habitat due to reduced surface water flows in the impacted areas, and the potential for loss of habitat due to increased temperature from reduced stream flow or loss of inflow from springs. As part of the development of this plan, discussions with ODFW took place to understand the current priorities

to ODFW to protect species and related habitat. While the area of the Deschutes River from Lower Bridge to Lake Billy Chinook remained important to ODFW, other issues presented concerns to the agency. ODFW expressed concern with limited flows of the Deschutes River between Bend and the Lower Bridge area, and of Whychus Creek between Sisters and Camp Polk Road and in Indian Ford Creek. Also important to ODFW was the distance in the stream the mitigation change will improve, as longer stream reaches are better.

As described above this 2022 FWMP has numerous sources providing benefits and mitigation, several that provide benefits over a significant distance, including areas of concern to ODFW. For example: 1) the LeBeau water increases flow in the Deschutes River for 137.7 miles; 2) The Tree Farm water is cold groundwater discharges that increase flows in the Deschutes River from Bend downstream through the stretch of concern to ODFW and onto the lake; 3) The Dutch Pacific water is benefitting Indian Ford Creek and Whychus Creek around Sisters to the mouth; 4) TSID water adds cool surface water above Sisters to the mouth of Whychus Creek at the Deschutes River. All of these sources increase flows that add to the thermal mass which in turn reduces temperatures in their respective stream and river reaches, ultimately providing benefits down to Lake Billy Chinook.

The potential for an increase in stream temperature resulting in a negative impact to fish and wildlife resources was also evaluated. Regarding Whychus Creek, the TSID water was shown to fully mitigate any potential peak temperature impact and lower the stream temperatures in not only Lower Whychus Creek, but throughout Whychus Creek to the mouth, which includes the area of concern to ODFW. Increasing the groundwater discharges from the Dutch Pacific water will further increase the reduction in temperature and the thermal benefits being provided to Whychus Creek.

Regarding the Deschutes River, the 2008 FWMP increased flows between Bend and Lake Billy Chinook by adding warmer surface water in Bend and cooler surface water from Lower Bridge to Lake Billy Chinook. These additions resulted in temperature change of 0 degrees C above Lower Bridge down towards Steelhead Falls, and an increase in the temperature of 0.1 degrees C at Steelhead Falls to below Whychus Creek. Even with those slight increases in temperature providing cool water mitigation equal to 105% of the impacts to seeps and springs fully mitigated for any reduction in groundwater. Increasing the percentage of benefits to seeps and springs coming from cool water sources (includes groundwater, Deep Canyon Water, TSID water) to 195% presently from 155% in the 2008 FWMP naturally provides far greater benefits than previously approved.

In developing recommendations for this plan, it was clear any potential change in stream temperature attributable to Thornburgh's proposed ground water use under steady state conditions, whether positive or negative, would be at levels not measurable with available equipment and technology. Although the changes being discussed will, in almost all cases, result in an increase in stream flows and a reduction in stream temperatures, they are not significant enough to result in any quantifiable negative impact to fish habitat at any time. However, the massive influx of excess flows provided during the transient period will further increase stream flows and further lower temperatures in all the affected reaches for decades

into the future as the actual impacts to stream flows gradually increase from Thornburgh's groundwater pumping until steady state conditions are attained.

By committing to fully utilize the water sources as described herein, and to comply with the conditions of this 2022 FWMP, any potential negative impacts to fish habitat resources because of the Thornburgh Resort development will be completely mitigated such that there is no net loss or degradation of habitat quantity or quality. In fact, it will likely provide a slight net benefit when steady state conditions are achieved many decades from now. During the transient period, Thornburgh will provide significant additional benefits to the quantity and quality of fish and aquatic habitat. As such this 2022 FWMP will exceed the no net loss/degradation standard set by DCC 18.113.070(D).

ATTACHMENT 1
THORNBURGH WATER RIGHTS INVENTORY

Certificated Water Rights, Transfers & Cancellations.

1. Surface Water Certificate 95746 (4/30/1902) and Transfer application T-13857 (LeBeau) –This certificate authorizes the use of 4 acre-feet per acre of irrigated land of surface water from the Little Deschutes River, a tributary of the Deschutes River, to irrigate 50 acres of land, for a total authorized use of 200 AF of water. Transfer application T-13857 has requested the POD of this right currently at River Mile 56 on the Little Deschutes arm of the Deschutes River be moved to a POA on wells located at the Thornburgh Resort, located generally west of RM 143, roughly 105[24] river miles from the point on the Deschutes River closest to the Thornburgh Resort. Further, the transfer seeks to change in the character of use from irrigation to Quasi-Municipal. These proposed changes to the certificated water right do not require OWRD mitigation. This water is currently in the river and is being allowed to flow from its point of diversion all the way to Lake Billy Chinook, about 137.7 river miles. *See* Map 2. The added flow will provide thermal benefits that cool the Little Deschutes arm of the Deschutes River and the Deschutes River throughout those reaches.

2. Surface Water Certificates 96192 and 96190 (4/13/1967) and Transfer T-12651 to Groundwater POA – Big Falls Ranch ("BFR") (Deep Canyon Creek Groundwater POA). These certificates authorize the use of 4 acre-feet of surface water per acre of irrigated lands from Deep Canyon Creek onto of 153.6 acres of land, for a total volume of 614.4 AF of water. This is certificated water that requires no OWRD mitigation. The POAs of this water are wells located at Big Falls Ranch. 90 acres of this irrigated land has been assigned to Pinnacle Utilities, LLC as of the date of this 2022 FWMP and is currently left in the ground. An application to transfer all 153.6 acres of water to wells at the Thornburgh Resort along with a change to the character of use from irrigation to Quasi-Municipal is pending.

Transferring this water will leave it in the ground at Big Falls Ranch that because of the hydraulic connection to the streams will increase flows of 11 degree C groundwater into the Deschutes River, Whychus Creek, and the Crooked River. See Four Peaks GSFlow Report. This cool groundwater will provide thermal benefits cooling the rivers and creeks and providing greater benefits than provided by the 2008 FWMP. In the alternative, if not approved for transfer, this water right could be cancelled in lieu of mitigation for any groundwater permit or Limited License application to serve the Resort. Cancelling a groundwater certificate leaves the water in the aquifer so it can return to streams and rivers. Lastly, the POA could be returned to a POD in Deep

[24] The Little Deschutes arm, merges into the Deschutes River at RM 192.5 on the Deschutes River. LeBeau POD is at RM 56 on the Little Deschutes arm, which is roughly at the equivalent of Deschutes RM 246.5. The Thornburgh POA is west of Deschutes RM 143. Round Butte Dam is roughly 137.7 miles from the LeBeau POD.

Canyon Creek from where it could be transferred to an instream right with mitigation credits issued for groundwater or limited license applications[25].

3. Ground Water Certificate 87558 (BFR) – This certificate authorizes the use of 4 acre-feet per acre of irrigated land from groundwater wells located at Big Falls Ranch. The certificate allows the ranch to use a total of 25.6 AF of water to irrigate 6.4 acres. This certificated water requires no OWRD mitigation. Thornburgh intends to transfer all 6.4 acres of irrigated lands to wells at the Thornburgh Resort and to change the type of use from irrigation to Quasi-Municipal. Leaving this 11 degree C groundwater in the ground at Big Falls Ranch will increase flows in the same manner as the BFR water in #2 above. See Map 2. As noted above it cannot be converted to an instream right the same way surface water rights can but it could be cancelled in lieu of mitigation if needed.

4. Ground Water Certificate 94948 (1/30/1995), Transfer T-13703 (Tree Farm) – This certificate authorizes the appropriation of 0.453 cfs Year-Round for Quasi-Municipal uses for a total of 327.5 AF of water use. This certificated water right does not require mitigation. Transfer T-13703 was approved by OWRD which changed the POA of this water right from wells located in the Tree Farm subdivision west of Mt. Washington Drive in Bend to wells on the Thornburgh property. It also changed the Point of Use (POU) from the Tree Farm subdivision to Thornburgh wells. The transfer will result in cessation of pumping at the present POA which increases the flow of cold 11 degrees C groundwater into the Deschutes River by .453 cfs. At present it can be used per the transfer order, or in the alternative it could be cancelled in lieu of mitigation for groundwater permit or Limited License applications. An application for a permanent transfer will soon be filed as well.

5. Ground Water Certificate 89259 (3/18/1998) – Dutch Pacific – 16.5 acres or 49.5 acre-feet of irrigation water (ground) that was pumped from a well in Sisters. This is a certificated water right that doesn't require mitigation. The place of impact from pumping at this location is in Whychus Creek and Indian Ford Creek that flows into Whychus Creek near Sisters. *See* Four Peaks GSFlow. For approximately 3 years Thornburgh has allowed all 16.5 acres of this water to remain instream and is presently cancelling it in-lieu of mitigation. This effectively moves the point of appropriation and place of use which will provide added flow of cold 11 degrees C groundwater into Indian Ford Creek and Whychus Creek from above Sisters down Indian Ford and Whychus Creek to the mouth and on into the Deschutes River towards Lake Billy Chinook. This 16.5 acres of irrigation (49.5 AF) of cool water will provide thermal benefits to the

[25] While our analysis does not rely on the flows provided by Deep Canyon Creek to achieve compliance with the no net loss/degradation test, changing the mitigation source from 13-degree surface water flows in the creek to 11 degrees C groundwater flows into area waterways is clearly beneficial. Also not accounted for is the fact that pumping from Deep Canyon Creek has completely ceased, allowing Deep Canyon Creek to flow to the Deschutes River.

stream that will cool the creek and mitigate for all the impacts to Whychus Creek from Thornburgh pumping. Leaving this water in the stream will add flow and cool Whychus Creek from above Sisters all the way to the Lake.

6. Three Sisters Irrigation District Mitigation Water: 106 acre-feet (1.51 cfs) of Whychus Creek irrigation water (surface). This is surface water diverted at the TSID diversion near the town of Sisters. See Map 2, pp., 5. It is being left in the creek at that point and will provide flow and thermal benefits of the cool 13 degrees C surface water to Whychus Creek all the way to the Deschutes River and then downward into Lake Billy Chinook. The TSID mitigation is 1.51 cfs of flow that is left in the creek for a portion of the irrigation season. In low flow years that may only be 90 days. In heavy flow years that may be 150 days or so. Depending on the flow in Whychus Creek, the actual volume of mitigation water from the rights being purchased by Thornburgh could be as high as 200-250 AF, instead of the 106 AF required to mitigate as determined by Yinger 2008. As noted above, the 106 AF need was determined by Yinger who modeled stream impacts using 2,355 AF of water at 100% consumptive use whereas Thornburgh's current plan reduces pumping to 1,460 AF and consumptive use to 882 AF. The TSID water was shown to mitigate for the full impact of 106 AF of stream reduction at Whychus Creek. The TSID mitigation secured by Thornburgh, is presently in the creek.

7. Temporary Mitigation Credits (DRC) – 6 acre-feet of temporary credits from the Deschutes Resource Conservancy have been in place since 2013. For nearly 10 years these credits have increased flow to the Deschutes River in advance of pumping any groundwater under the OWRD permit. Excess mitigation has been accumulating since then. Thornburgh intends to cancel the use of these temporary credits at some point in the future. They are not considered in the efficacy of this 2022 FWMP rather are excess or advance mitigation.

Groundwater Permits, GW, and LL Applications:

8. Ground Water Permit G-17036 – This permit authorizes up to 9.2 cfs and 2,129 AF for Quasi-Municipal uses including irrigation of golf courses, homes and commercial areas, and maintenance of reservoirs. Period of use is Year-Round except for the seasonal limits placed on irrigation use by the permit. The rate and volume are further limited by the corresponding mitigation provided. The maximum volume for irrigation of 320 acres of golf courses shall not exceed 717 AF annually. The amount of golf course irrigation specifically under this right is limited to a diversion of 2.24 AF for each acre irrigated during the irrigation season of each year. The amount of water allowed to be used for reservoirs under this permit is 246 AF. The fully developed Mitigation Obligation for this right is 1,356 AF annually, to be provided within the General Zone of Impact. Mitigation is to be provided prior to each stage of development under the permit.

In 2013, Thornburgh posted 3.6 acre-feet of mitigation credits (6 AF of water) as the initial mitigation and the permit was issued. Due to unforeseen delays, Thornburgh was required to apply for an extension of the permit, which was granted in 2018 with OWRD

issuing a Proposed Final Order and Final Order granting approval. When a suit was filed against OWRD at the Oregon Court of Appeals OWRD withdrew its final order and sent the approval (as noted in the Proposed Final Order (PFO)) to a contested case hearing. On July 26, 2022, OWRD issued a superseding proposed final order proposing denial of the extension, but the permit remains non-cancelled (valid) as of the date of this 2022 FWMP. Thornburgh filed a protest to this PFO seeking a contested case hearing which is pending.

Permit G-17036 is the first permit Thornburgh acquired. Due to litigation opposing the permit and the lengthy delays involved at OWRD, Thornburgh developed alternatives to pump groundwater from the Resort's wells with little reliance on this or other OWRD groundwater and limited license permits, or applications as described below.

9. Ground Water Permit Application G-19139 (pending) – This permit application was for the use of 9.28 cfs of year-round Quasi-Municipal water having the same limitations and mitigation requirements as permit G-17036. It was filed at the suggestion of OWRD staff as a potential replacement to permit G-17036 pending the contested case. The POA of this application is 8 wells located on the Thornburgh property. The application is pending. If not approved, Thornburgh will file a petition for judicial review.

10. Limited License Application LL-1879 -- This limited license application was for the use of 4.5 cfs of year-round water. The application was filed to provide preliminary use of some of the water permitted by G-17036 pending the resolution of the contested case on the extension. OWRD denied the application, and Pinnacle has filed a petition for judicial review in Deschutes County Circuit Court. If the limited license is approved, this will require mitigation for the life of the limited license, which can be done more informally than is required for permanent permits or certificates.

11. Limited License Application LL-1917 (pending) – This limited license application was for the use of 0.453 cfs of year-round water. The amount requested is the same amount of water as will be transferred under the authority of T-13703. It was filed as an alternative to the use of the water in T-13703, as a challenge to the transfer is reviewed by the court system. The application is pending. If approved, this will require mitigation for the life of the limited license, which can be done more informally than required for permanent permits or certificates.