

City of Redmond

Temporary Construction Dewatering Operating Policy

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SUMMARY

This interdepartmental operating policy provides the administrative and procedural framework necessary to enact requirements within the *Redmond Municipal Code Temporary Construction Dewatering Policy* (RMC 13.25).

It is the joint interdepartmental Planning and Public Works policy to allow the temporary pumping of clean groundwater to aid in shallow sub-surface construction, subject to:

- Compliance with the requirements established within RMC 13.25.
- A determination by City review engineers, based on submitted development review documents, and that temporary construction dewatering (TCD) can occur in a manner which will maintain the City's ability to:
 - a) protect surface water quality and prevent flooding of property and streets by safely treat and convey stormwater runoff,
 - b) protect groundwater quality by managing the mobilization of contaminated groundwater, and
 - c) protect drinking water supply quantity by addressing TCD-related water quality issues and reductions in production at City water supply wells.
- The compliance with TCD-related conditional requirements.

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AUTHORIZATION

- As per RMC 13.25.060, the Public Works Director, Planning Director, or designees have the authority to require submittal of a *Temporary Construction Dewatering Feasibility Study* for all TCD projects which cannot demonstrate that their groundwater pumping discharges shall equal less than 500 gallons per minute. *Attachment A* of this policy details required elements for a complete Temporary Construction Dewatering Feasibility Study submittal.
- As per RMC 13.25.060C, the Public Works Director, Planning Director or designees have the authority to condition, deny, or allow TCD based on the review of a TCD feasibility study.
- As per RMC 13.25.070, an approved *Civil Site Construction Permit* is allowance to proceed with TCD subject to the City's acceptance of a completed *Temporary Construction Dewatering Plan*. *Attachment B* of this policy details required elements for a complete *Temporary Construction Dewatering Plan* submittal.
- As per RMC 13.25.070B, the Public Works Director, Planning Director, or designees have the authority to add TCD-related conditional requirements to the *Civil Site Construction Permit*. For City capital improvement projects (CIP), TCD-related conditions shall be included in the development construction project contract as a special provision.
- As per RMC 13.25.080, the Public Works Director, Planning Director, or designees may order the suspension of TCD for reasons detailed within that section of the municipal code.
- As per RMC 13.25.100, the Public Works Director, Planning Director, or designees have the right to determine if TCD activities are impairing drinking water production at one or more of the City's water supply wells, and collect reimbursement fees for the cost of replacement water needed to be purchased to replace lost production. *Attachment C* of this policy details the methodologies the City shall use to (a) determine if a development project(s) TCD is impairing City water supply well production and (b) calculate the cost of replacement water reimbursement fees.
- This operating policy will remain in effect until such time that the Public Works Department and Planning Department Directors either rescinds or modifies it.

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1. OVERVIEW

To achieve the City's vision, the City must balance the need to develop and grow with the need to protect the quality and quantity of the City's aquifer to maintain City water supply well production and treat and convey stormwater runoff. The design and livability of downtown could be impacted by TCD policies. Similarly, the City's aquifer, water supply wells, surface waters (water quality) and streets (flooding) could be impacted by TCD associated with the construction of structures that help to achieve the City's vision. This policy attempts to balance these concerns to achieve the City's vision as outlined in the Redmond Comprehensive Plan. This framework forms a delicate collaborative approach to ensuring both development and protection of our drinking water resources and stormwater runoff treatment and conveyance needs are achieved.

Temporary pumping of clean groundwater to aid in shallow sub-surface construction is generally allowed by the City of Redmond so long as the provisions within RMC 13.25 are met to the City's satisfaction and any conditional requirements placed on such activities are enacted. As detailed in *Attachments A and B*, TCD must be considered with respect to (a) capacity of stormwater runoff treatment and conveyance system, (b) potential effects to drinking water production at City water supply wells, and (c) mobilization of groundwater contaminants.

During construction, the City may require corrective actions and issue a Notice of Suspension of TCD as detailed in RMC 13.25.080, to ensure that issues arising from TCD are adequately addressed. The City intends to work with construction projects requiring TCD to help prevent issues from arising.

2. TCD POLICY APPLICABILITY

As per RMC 13.25.040, the City TCD requirements apply to all projects that cannot demonstrate that their TCD pumping rates will be less than 500 gallons per minute. In some locations, specific TCD-related issues identified in RMC 13.25 are not a concern. City development review engineers have the discretion to waive a development review submittal requirement if it is deemed that waiving the requirement will not reduce the City's ability to (a) maintain drinking water production, (b) manage contaminated groundwater, (c) convey stormwater runoff and (d) operate stormwater runoff treatment systems. For example, in Downtown Redmond, the review process must consider effects at the City water supply wells, groundwater contamination, stormwater conveyance, impairment of stormwater runoff treatment systems and other stormwater management needs such as operation and maintenance requirements. In the Overlake Neighborhood, the effect of TCD on the City water supply wells is not relevant

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because groundwater in that area is not hydraulically connected to the City's drinking water aquifer, and City review engineers therefore have justification for waiving submittal requirements that pertain to this concern.

Development projects are subject to any requirements stemming from mandates separate and distinct from RMC 13.25. For example, TCD effluent from all projects—regardless of the project's pumping rate—must meet surface water discharge criteria as per the *Western Washington Phase II Municipal Stormwater Permit* (a.k.a. the National Pollution Discharge Elimination System (NPDES) permit).

3. TCD DEVELOPMENT PROJECT REVIEW PROCESS

Development projects are encouraged to initiate TCD planning early in the site planning process. Too often it is assumed that project subsurface work will occur during the optimal summer or early fall months when the groundwater is lowest. Schedule delays then occur and the need for TCD arises once permits are issued. With no pre-approved plan in place, this leads to additional delays while a TCD plan is drafted and routed for approval.

As per RMC 13.25.060, public and private development projects are required to complete a *Temporary Construction Feasibility Study* as detailed in *Attachment A*, and as part of site planning and entitlement review process submittals. Projects that submit a feasibility study which results in affirmation that TCD is necessary, must then submit a project specific *Temporary Construction Dewatering Plan*. As per 13.25.070, the TCD plan must include the items listed in *Attachment B*.

For private projects, the TCD plan must be submitted as part of their *Civil Site Construction Permit* submittal. TCD at private projects cannot start until this permit has been approved. For Redmond CIP, the TCD plan must be completed as part of the initial site design or construction plans/construction drawings. For CIP projects, the TCD cannot begin until the TCD plan is approved by the City Engineer. TCD Plan materials are reviewed by Environmental and Utility Services Division staff, Construction Inspectors, and City Stormwater Engineers.

4. SPECIFIC AREAS OF CONCERN

4.1 Water Quantity Impacts at City Water Supply Wells

The City operates water supply wells within the downtown area. The City of Redmond produces roughly 35-40% of its water supply from five water supply wells. Drinking water produced at City water supply wells is less expensive than purchasing water from Cascade Water Alliance. Each City water supply well operates at a specific rate (i.e. gallons per minute or gpm). Supplying water during the peak season demand period exceeds the possible production of the City water

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supply wells. The city minimizes its purchased water costs by pumping the City water supply wells roughly 22-hours per day at the maximum pumping rate. When TCD activities affect the expected pumping rate at a City water supply well, the City has to supplement that lost production by purchasing additional water.

Water withdrawals by others that impair Redmond's existing water rights for the City water supply wells are not allowed by state law. As per RMC 13.25.080, the City is authorized to require a reduction or stoppage of TCD activities that reduce Redmond's ability to produce drinking water from its water supply wells and the City or the City's wholesale water supplier has activated an emergency water response plan. Two of the supply wells are operated below their instantaneous water rights due to physical constraints of the wells construction without influence from TCD activities. As part of this operating policy, City water supply well performance is reviewed annually and the City will adopt expected production rates. Currently Supply Well 3 and Supply Well 4 are operated below the water right rate. Additional explanation and data are presented regarding this topic in *Attachment C*.

As per RMC 13.25.100, Redmond will (a) determine if TCD activities have impaired production at City water supply wells, and (b) calculate the cost of fees for replacement drinking water, in accordance with the procedure detailed in this policy's *Attachment C*. Because the City's purchased water costs are calculated based on water demand from June 1 to September 30, cost recovery will only be administered during this time period, which corresponds to peak season demand.

4.2 Water Quality Impairment at City Water Supply Wells

If TCD draws contamination to a City water supply well, the impacted City water supply well will be shut down if primary or secondary drinking water maximum contaminant levels (MCLs) are exceeded. Projects will pay the full cost of replacement water from the time the impacted City water supply well is shut down through the end of the cost recovery period or until water quality meets MCLs in accordance with the procedure detailed in this policy's *Attachment C*.

4.3 Reductions/Impacts to the Municipal Stormwater Conveyance System

As per 13.25.020.A.2, TCD discharges shall not diminish the stormwater carrying capacity of the municipal conveyance system. Development projects must determine the maximum TCD pump rate required for the project. They must also perform a backwater analysis using the peak estimated TCD pump rate to confirm that the municipal storm system has adequate capacity. During non-storm periods, the TCD pump rate shall not result in water stages in the stormwater system higher than those allowed by the 25-year storm. During storm periods the TCD pump rate may need to be reduced to allow for stormwater use of the conveyance system.

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Water shall not be allowed to stage to within six inches of any storm grate. Development projects shall install flow stage alarm devices at downstream junctions (example-catch basins). Development projects shall limit discharge from the site to the existing condition 10-year peak flow rate when the municipal conveyance stage is 90% of the non-surcharged total capacity.

4.4 Impacts to Stormwater Runoff Treatment Systems

Water shall not be allowed to cause impairment of public or private stormwater runoff treatment systems. Such impairment may be caused by creating a flow condition that prevents the treatment system from functioning as designed such as overwhelming a treatment system with flows that exceed its design capacity; causing excessive bypass of the treatment system; or otherwise impairing its ability to recover from a storm event. The Stormwater Engineer shall make the determination of whether proposed TCD will cause such a system impairment.

One example of a system that has a flow limitation is the Redmond Way Water Quality Facility. Within the Redmond Way Stormwater drainage area (Attachment A, Appendix 1), total TCD discharge from all projects shall not exceed 1470 gallons per minute in order to maintain compliance with the City's Municipal Separate Storm Sewer System (MS4) NPDES permit requirements.

4.5 Management of Contaminated Groundwater

State and federal law identifies procedures for site specific investigations to determine the likelihood of groundwater contamination. Furthermore, the federal Clean Water Act's NPDES program and other mandates prohibit the discharge of contaminated effluent in waters of the state or into the municipal stormwater system. TCD activities must not draw contaminated groundwater across property boundaries. At a minimum, a Phase I Environmental Site Assessment is required to determine the past site uses within the TCD radius of influence and evaluate the potential that contaminated soil or groundwater may be encountered or migrated during construction.

ATTACHMENT A: TEMPORARY CONSTRUCTION DEWATERING FEASIBILITY STUDY

As per RMC 13.25.060, projects that will require temporary construction dewatering (TCD) at a rate greater than 500 gpm must complete a *Temporary Construction Dewatering Feasibility Study*. Private development projects must submit the items listed below along with the standard materials required for *Site Plan Entitlement* to satisfy this requirement. Redmond capital improvement projects must consider the items listed below during preliminary project design.

A complete *Temporary Construction Dewatering Feasibility Study* will include the following information:

1. GEOTECHNICAL

- a. Describe site stratigraphy to a depth at least ten feet below lowest point of excavation.
- b. Describe thickness of the primary aquifer providing groundwater to the site.
- c. Describe seasonal high and low groundwater stages.
- d. Calculate the transmissivity of the dominant strata and describe the method of calculation.
- e. Calculate the TCD pump rate to dewater the project for both the seasonal high and seasonal low groundwater stages.
- f. Provide a predictive calculation to determine the vertical and horizontal limits of groundwater drawdown at both the seasonal high and seasonal low groundwater stages.
- g. Conduct a Phase I Site Assessment: review available environmental assessments and geotechnical data to determine if groundwater contamination may adversely affect TCD. Part of your inquiry should include contacting the City of Redmond Environmental and Utility Services Division for City data related to contaminants near the project site.

If the Phase I Site Assessment identifies a known contamination plume or potential contamination based on past historical site use, further actions will be required during site entitlement to mitigate potential plume migration. This may include but not limited to: project monitoring plan, treatment of pumped contaminated groundwater or alterations to the project's site design to reduce underground excavation depth.

2. PROJECT

- a. Identify the depth of the lowest finished floor and bottom of excavation (BOE); include depth of construction crane base and elevator pits.

ATTACHMENT A: TEMPORARY CONSTRUCTION DEWATERING FEASIBILITY STUDY

- b. Identify the area that will need to have the groundwater lowered.
- c. Provide a preliminary figure showing number and depth of TCD well points, or equivalent.
- d. Show the discharge path for the pumped water to a receiving body (river or lake).
- e. Provide preliminary conveyance calculations demonstrating the receiving conveyance can handle the TCD flow rate and the 10-year storm flow.
- f. Provide a backwater analysis that demonstrates the TCD project discharge combined with the 10-year storm event storm flow does not cause a hydraulic grade to rise within six-inches of the grate of any downstream catch basin.
- g. Provide analysis that demonstrates the TCD pump rate shall not result in water stages in the stormwater system higher than those allowed by the 25-year storm.
- h. Demonstrate TCD project will not impair stormwater runoff treatment systems. The City Stormwater Engineer shall make the determination of whether the proposed TCD project will cause stormwater runoff treatment system impairment.
- i. Within the Redmond Way stormwater drainage area, total TCD discharge from all projects shall not exceed 1470 gpm in order to maintain compliance with the City's MS4 NPDES permit requirements. The Redmond Way stormwater drainage area is shown in the map in Appendix 1 of this Attachment.
- j. TCD discharge to the sanitary sewer is not permitted.

3. WATER QUALITY

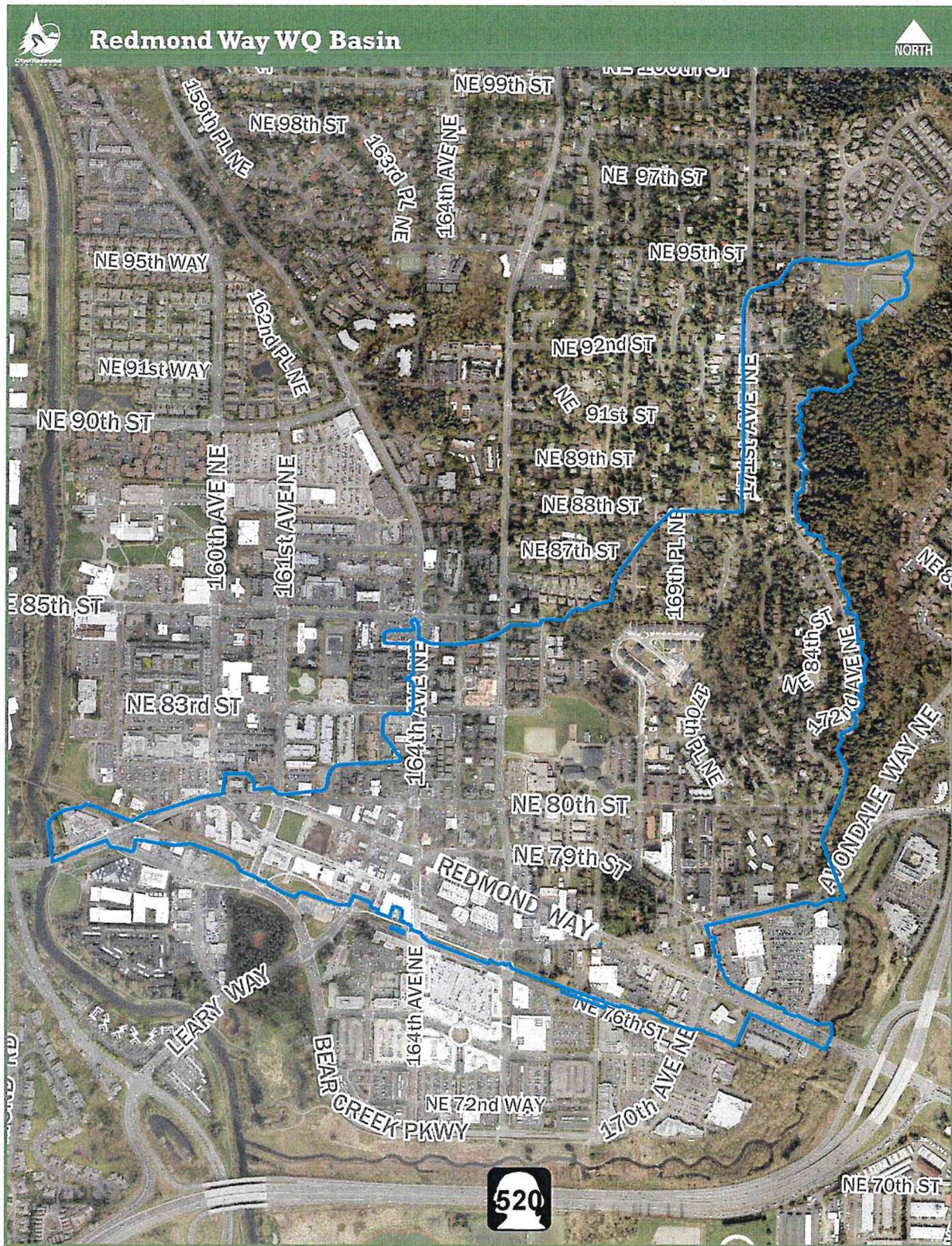
- a. Review available environmental assessments and geotechnical data within the proposed radius of influence to determine if groundwater contamination may adversely affect TCD feasibility. Part of your inquiry should include contacting the Environmental and Utility Services Division for City data related to contaminants in the vicinity of the project site.
- b. If this review identifies a known contamination plume or potential contamination on the project site based on past historical site use, further actions may be required during site plan entitlement to ensure discharge water meets surface water quality criteria. This may include water quality monitoring and treatment of pumped contaminated groundwater or alterations to the project's design to reduce excavation depth in and near contaminated areas.

ATTACHMENT A: TEMPORARY CONSTRUCTION DEWATERING FEASIBILITY STUDY

- c. If a contaminant is identified within the proposed radius of influence, the development project must predict the transport of contaminants towards the site and its effect on receptors (City water supply wells, other groundwater users, property owners) and outline how the project will prevent the mobilization of the identified contaminant. TCD activities shall not cause a contaminant plume to move across property boundaries or move the contaminant plume into a groundwater flow path towards a City water supply well.

ATTACHMENT A: TEMPORARY CONSTRUCTION DEWATERING FEASIBILITY STUDY

Appendix 1: The Redmond Way stormwater drainage area is outlined in blue on the map below.



ATTACHMENT B: TEMPORARY CONSTRUCTION DEWATERING PLAN

As per RMC 13.25.070, projects that submitted a *Temporary Construction Dewatering (TCD) Feasibility Study* which results in affirmation that temporary dewatering is necessary greater than 500 gpm, must submit a project specific *Temporary Construction Dewatering Plan*. This attachment details submittal requirements that must be included with the TCD plan. For private projects the following information must be submitted as part of the *Civil Site Construction Permit* submittal. For Redmond capital improvement projects (CIP), TCD plans must consider the following listed items as part of the final project design. For private projects, TCD cannot begin until the construction permit has been issued. For CIP, TCD cannot begin until the City Engineer has accepted the final design.

A complete *Temporary Construction Dewatering Plan* will include the following materials:

1. GEOTECHNICAL REPORT

Provide a geotechnical engineering report including the standard geotechnical information and the following:

- a. Discuss how subsurface work is to be accomplished. Clearly identify proposed shoring, footings, crane footings, basements, parking levels, elevator pits, underground utilities, vaults, etc. Describe the maximum depth (elevation) of the bottom of excavation (BOE).
- b. Describe site stratigraphy to a depth at least ten feet below the BOE or to the depth of any proposed TCD well (whichever is lower elevation).
- c. Describe the hydrogeological characteristics of the site stratigraphy (geologic description, porosity, etc.) and aquifer characteristics (aquifer thickness, range of anticipated groundwater elevations, transmissivity, specific capacity, test pumping rates, etc.).
- d. Conduct site specific groundwater monitoring (elevation and quality) if inadequate data is available from adjacent locations. Provide a table with seasonal high and low groundwater stages identifying potential impacts to groundwater stages due to past or current TCD projects in the vicinity.
- e. Determine the seasonal high groundwater design elevation; include how this value was determined. Building should be constructed water tight to one foot above this elevation.

2. DEWATERING DESIGN

- a. Specify method of lowering the groundwater (TCD well points, sumps, etc.).

ATTACHMENT B: TEMPORARY CONSTRUCTION DEWATERING PLAN

- b. Specify number and size of pumps, pump screen depth, pump layout, calculated TCD project pump rate (provide calculations and assumptions).
- c. Provide the TCD pump rate needed to dewater the entire construction area at the seasonal low and seasonal high groundwater elevations.
- d. Perform a predictive analysis of the potential impact of extended TCD to City water supply well(s) within the radius of influence of the project. Present the information graphically and in table form with separate analysis for seasonal high and seasonal low water elevations at the site.
- e. Determine the duration of the proposed TCD required to complete the various phases of construction
- f. Determine the discharge point (storm drain, ground, stream, etc.) and site-specific discharge limits and any proposed treatment measures to ensure the limits are met. Ensure that discharge velocities or volumes will not violate permits, or impair stormwater runoff treatment systems, as approved by the City Stormwater Engineer in Attachment A, Section 2.h.
- g. Provide a site cross-section figure to include all proposed subsurface structures, groundwater range and geological characteristics.
- h. Prepare a figure to show construction site layout. Include:
 - i. Withdrawal system, TCD well-points, sump, ring trench, pumps, generator, discharge lines, etc.
 - ii. Proposed features including: shoring, tiebacks, footings, crane footings, basements, parking levels, elevator pits, underground utilities, vaults, maximum depth (elevation) of excavation, etc.
 - iii. Show pump discharge connection to discharge point(s)
- i. Groundwater level will be monitored continuously on an hourly basis in at least three monitoring wells prior to for a minimum of one month and during TCD activities to determine radius of influence of pumping. Data will be recorded weekly and provided to the City bi-weekly through completion of the TCD project until water levels have recovered to pre-TCD levels. The monitoring well may be located on site or off site. This requirement may be waived in the event the City elects to conduct multi-project related groundwater level monitoring. Provide a figure showing the location of the proposed monitoring well in relation to the projected drawdown/radius of influence for the project.

ATTACHMENT B: TEMPORARY CONSTRUCTION DEWATERING PLAN

- j. Prepare spill prevention and response plans that include fueling procedures and secondary containment for construction heavy equipment, vehicles, and power generation equipment. All equipment shall be placed above ground, within secondary containment devices; details shall be incorporated within the design and construction plan.

3. FLOW RATE LIMITATIONS

TCD effluent shall not diminish the stormwater carrying capacity of the municipal conveyance system.

- a. Provide conveyance calculations demonstrating the receiving conveyance can convey the maximum predicted TCD discharge flow rate when no stormwater is present.
- b. Flow stages in all municipal stormwater pipes shall not rise within six inches of catch basin grates.
- c. Projects shall install flow stage alarm devices at downstream junctions (example-catch basins). Site development project shall be responsible for monitoring the entire affected storm system for the duration of the TCD.
- d. Plan for limiting TCD discharge rates if storm system flow capacity is exceeded and potential impacts to the construction project.
- e. Address how construction may be impacted by sudden shut-down of TCD system (as a result of power loss, storm event or cessation of pumping due to adverse impacts to water supply or storm system overload, etc.).
- f. If discharge is to an infiltration facility, provide design details and infiltration calculations.
- g. If emergency power source will be provided, provide spill containment and fueling plan. Show location on site plan.

4. WATER QUALITY

- a. Review available Phase I and II Environmental Assessments, Critical Areas Reports and include in the *Combined Civil Review* submittals. Provide a discussion of any environmental conditions that may affect:
 - i. water quality in TCD discharges from the project site

ATTACHMENT B: TEMPORARY CONSTRUCTION DEWATERING PLAN

- ii. water quality at City water supply wells within the radius of influence of the project
- b. Contact Redmond Environmental and Utility Services Division for a listing of potential contaminants in the vicinity.
- c. Prepare National Pollution Discharge Elimination System (NPDES) compliant discharge parameter table showing appropriate discharge concentrations for regulated parameters (pH, Turbidity, VOCs, contaminants, etc.).
- d. If the project site is known to have contaminants in the groundwater, design a best management practice to ensure discharge water quality meets permitted discharge limits for the receiving water. TCD plans identifying groundwater quality issues shall include the following:
 - i. Sampling Plan with QA/QC that addresses identified contaminants.
 - ii. Remediation Plan with contaminant disposal plan.
 - iii. Copies of permits (discharge, NPDES), Consent Decrees, Notice of Voluntary Cleanup, etc. from Washington Department of Ecology.
 - iv. Test results for all samples submitted for analysis.
 - v. Documentation that drilling is conducted using decontaminated equipment, non-toxic drilling fluids (if required) and secondary containment for hazardous materials. Any additives require Safety Data Sheets approvals by the City's Environmental and Utility Services Division.
 - vi. Treatment plan (if necessary) for pumped water to meet state discharge requirements for the receiving waters.
 - vii. Type of construction materials or products utilized for construction of subsurface construction, which may include Safety Data Sheet submittals.
- e. If a contaminant is identified within the proposed radius of influence of a TCD area, the project must assess the construction site for groundwater contamination prior to TCD, and monitor the groundwater quality during TCD:
 - i. At the construction site.
 - ii. At the point of withdrawal to ensure it complies with surface water quality standards at the downstream point of discharge. (NOTE: in cases where a surface water quality standard has not been established for the contaminant of concern, use MTCA Method B Groundwater Protective of Surface Water Criteria to determine an appropriate standard.)
 - iii. Between the TCD site and the identified plume to determine if there is a migration of the plume toward the site.

ATTACHMENT B: TEMPORARY CONSTRUCTION DEWATERING PLAN

- iv.* At a point between the TCD site and the City water supply well.

- f. Should the TCD draw contamination toward a City water supply well and create an exceedance of the maximum contaminant levels (MCL) for drinking water quality standards, the following actions shall be required:
 - i.* Cease or limit TCD activities to mitigate contamination migration.
 - ii.* Reimburse the City for the cost of any replacement water the City needs to purchase from Cascade Water Alliance to make up for lost production at the City water supply well as described in Attachment C: City Water Supply Well Production Characteristics and Water Supply Cost Recovery Calculations. Projects will be responsible for the cost of replacement water for successive years if the City water supply well continues to be impacted.
 - iii.* Develop a Contamination Mitigation Plan to mitigate all impacts to the City water supply well and cease mobilization of contamination.

5. TCD RECORD KEEPING

The following information is required to be recorded on site and provided to the Redmond Environmental and Utility Services Division (groundwater@redmond.gov) throughout the dewatering project:

- a. TCD development project name, contact information

- b. Start date and end date of pumping

- c. Duration of TCD project

- d. TCD pump rates and run times

- e. Well construction specifications

- f. Results of any required groundwater elevation or quality monitoring

- g. Plan for decommissioning of TCD wells

- h. Submittal of records to Ecology and the City of Redmond Environmental and Utility Services Division

ATTACHMENT C: CITY WATER SUPPLY WELL PRODUCTION CHARACTERISTICS & WATER SUPPLY COST RECOVERY CALCULATIONS

As per RMC 13.25.100, the City shall (a) determine if TCD activities are impairing drinking water production (quality or quantity) at one or more of the City water supply wells, and (b) collect reimbursement fees for the cost of replacement water needed to be purchased to replace lost production related to quality or quantity impacts. This attachment details the methods used by the City to identify if production at the City water supply wells are impaired, and to calculate the cost of replacement water reimbursement fees.

The City of Redmond produces roughly 35-40% of its water supply from five City water supply wells. This water is less expensive to produce than purchasing water from Cascade Water Alliance. Each City water supply well operates at a specific rate (i.e. gallons per minute or gpm) based on the City's water right. Supplying water during the peak season demand period exceeds the possible production of the City water supply wells. The City minimizes its purchased water costs by pumping the City water supply wells roughly 22 hours per day at the maximum pumping rate allowed by the City's water right. This maximum pumping rate allowed by the City's water right is referred to as the water right Q_i . When TCD activities affect the water right Q_i of a City water supply well, the City must supplement that lost production by purchasing additional water.

Based on both historical proven pumping rates and the above described water demand scenario, the City has calculated the expected pumping rates and expected weekly production for each City water supply well, based on pumping 22 hours per day. When TCD activities affect the expected pumping rate of a City water supply well, the City will calculate the lost production by subtracting the actual water produced from the expected production. The lost production will then be multiplied by the Cascade Water Alliance rate. Because the City's purchased water costs are calculated based on water demand from June 1st to September 30th, cost recovery will only be administered during this time period, which corresponds to peak season demand. If TCD activities cause a contaminant plume to be drawn to the City water supply wells, the project may be charged for successive years during the cost recovery period if the City water supply wells continue to be impacted from contamination mobilized by the project.

1. DETERMINING EXPECTED PRODUCTION RATES AND QUANTITY

Each of Redmond's water supply wells has a certificated water right, providing the water right Q_i . In order to ensure equity regarding the expected production from each City water supply well, the City reviewed multiple years' worth of production data, captured by the water system's Supervisory Control and Data Acquisition (SCADA) system. Supply Wells 1, 2, and 5 have historically proven to operate at their specific water right Q_i . Supply Wells 3 and 4 have not consistently produced water at their water right Q_i , thus the City reviewed summer peak

ATTACHMENT C: CITY WATER SUPPLY WELL PRODUCTION CHARACTERISTICS & WATER SUPPLY COST RECOVERY CALCULATIONS

season pumping rates to adopt a historically proven expected pumping rate. The City will review the adopted expected pumping rates annually to ensure continued accuracy; accounting for the potential influence TCD may have on the historical data. Table 1 below specifies the precise adopted expected pumping rates.

Table 1. Expected weekly productions at City water supply wells.

Supply Well	Water Right Qi (gpm)	2019 Expected Pumping Rate (gpm)	2019 Expected Weekly Production (Gallons)
1	900	900	8,316,000
2	500	500	4,620,000
3	480	450	4,158,000
4	800	360	3,326,400
5	1000	1000	9,240,000

The expected pumping rate is converted into an expected weekly total production. Based on the water demand scenario described above, the City has based the expected weekly production on pumping the City water supply well 22 hours per day; consciously acknowledging that a City water supply well may need to be taken offline for short time periods for maintenance or other unexpected issues. If in a given week a catastrophic failure of a component takes a City water supply well out of service for extended periods of time, the City will adjust the expected weekly production accordingly. This calculation will be performed based on captured SCADA system data.

2. PRODUCTION LIMITS FOR CITY WATER SUPPLY WELL OPERATION

The City has a limited ability to adjust the pumping rate at each City water supply well as shown in Table 2. The City water supply well will be shut down if TCD activities reduce the production to an unsustainable level or outside the operating limits of the City water supply well, the TCD project will pay for 100% of water production.

Table 2. Production limits for City water supply well operation. The lowest operational limit of each City water supply well is indicated as Shut off point.

Supply Well	100%	90%	80%	70%	60%	50%
1	900 gpm	810 gpm	720 gpm	630 gpm	540 gpm	Shut off point
2	500 gpm	450 gpm	400 gpm	350 gpm	300 gpm	Shut off point
3	450 gpm	405 gpm	360 gpm	315 gpm	270 gpm	Shut off point
4	360 gpm	324 gpm	288 gpm	Shut off point	Shut off point	Shut off point

ATTACHMENT C: CITY WATER SUPPLY WELL PRODUCTION CHARACTERISTICS & WATER SUPPLY COST RECOVERY CALCULATIONS

5	1000 gpm	900 gpm	800 gpm	700 gpm	600 gpm	Shut off point
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Supply Well 4 does not have the same variable frequency drive technology as the other City water supply wells, thus the City has less flexibility in reducing the pumping rate at this location without causing excessive wear on other components at the facility.

3. PLANNING LEVEL INFORMATION

The initial cost estimates derived from information provided in the attachment are designed to aid in financial planning. Final cost recovery charges will be assessed based on the actual TCD projects impact to lost water production. The City has established and will communicate City water supply well drawdowns and threshold pumping water levels, as shown in Table 3. This information along with a TCD project's feasibility study is intended to aid in estimating water level drawdowns and lost water production recovery costs.

Table 3. City water supply well operation and construction data related to limiting factors.

Supply Well	Limiting Factor	Top of Bowls (ft - el)	Top of Screen (ft - el)	Well Shut Down Depth (ft - el)	Impact Level (ft - el) low level for pumping	Potential Impact Level (ft - el) low level for pumping	Summer Draw Down from Static (ft)	Non- pumping min water level (ft - el)
1	Pump Inlet	5.61		5.61	6.61	7.61	13.8	6.61+13.8=20.41
2	Pump Inlet	4.36		4.36	5.36	6.36	21.0	5.36+21.0=26.36
3	Pump Inlet	40.36		40.36	41.36	42.36	10.5	41.36+10.5=51.86
4	Top of Screen		1.01	1.01	2.01	3.01	22.0	2.01+22=24.01
5	Top of Screen		27.07	27.07	28.07	29.07	1.4	28.07+1.4=29.47

4. COST RECOVERY CALCULATION

Once the project is underway and real-time production data is collected via the City's SCADA system, a final weekly charge will be calculated and assessed. The current pumping water level and rate will be recorded before the project is underway. The total weekly expected production will also be calculated and recorded. The City water supply well system will be adjusted, if

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available and necessary, to operate the City water supply well(s) at a reduced capacity. The new water level and production rate will be recorded on a weekly basis.

Associated charges will be based on current Cascade Water Alliance (CWA) demand charges. For 2019, an increase of 1 MGD for the peak summer months (June 1 to September 30) will cost \$961,727. Thus, these factors have been extrapolated to develop the equal charges for replacing City water supply well water with CWA supply. The current CWA demand share charge will be used for fee calculation.

Weekly Fee = (Current CWA demand share charge for 1MGD)/122 days/1,000,000 x (Expected Weekly Production – Actual Weekly Production)

Three examples are provided to assist in financial planning, found in Appendix 1 at the end of this Attachment. Example A shows cost for a 10% loss in production at each well, Example B shows cost for a 25% loss in production in each well, and Example C shows cost for the complete shutdown of a well. It is important to note that while this information is helpful, there is some variability in the aquifer system. Thus, the drawdown and calculated effect on production compared to the dewatering drawdown are estimates only. Field verification will be required for accuracy.

5. UNFORSEEN PRODUCTION INTERRUPTIONS

The City's SCADA system captures all pumping related data and while the City works to maximize production of the City water supply wells during the peak summer months, occasionally unforeseen problems do occur like power outages or equipment failures. If the City experiences a loss in production due to an event unrelated to TCD, the City will account for this loss in the calculated final cost recovery charge. A project will not be responsible for lost production unrelated to TCD activities when identified by water operations as being related to a mechanical, communication, or power supply failure.

6. MULTIPLE PROJECT CALCULATION

When multiple TCD projects are operating at the same time within the zone of influence of a City water supply well, the weekly cost recovery charge will be split equally amongst projects. Projects will be identified as influencing the City water supply well through one of two mechanisms. Either the identification of drawdown at a City water supply well during the startup and stabilization of a TCD project or drawdown impacts identified in a project's feasibility study will link a project to the cost recovery charge.

7. POST-PROJECT DEWATERING COST RECOVERY PERIOD

Cost recovery charges will be applied to TCD projects from June 1 to September 30 during active TCD and until either a) the time that the impacted City water supply well can be adjusted

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to operate at the water right Qi or b) 2 months after the TCD project is complete or c) until October 1, whichever is the least. The City has determined through model analysis using best available science that TCD impacts to City water supply well production extend beyond the active TCD period. The City determined that the post-project dewatering recovery period can range between 2 and 4 months based on analysis of past TCD project water level data and project specific groundwater modeling. Post-project TCD cost recovery charges will also be applied to TCD projects that impact production at City water supply wells prior to the June 1 cost recovery period. For example, a TCD project that stops dewatering on May 15 would be responsible for cost recovery from June 1 until July 15 if the expected pumping rate is not attainable at the impacted City water supply well.

8. CITY WATER SUPPLY WELL WATER QUALITY IMPACTS – COST RECOVERY

Cost recovery charges will be applied to TCD projects that draw contamination to a City water supply well. The impacted City water supply well will be shut down if primary or secondary drinking water maximum contaminant levels (MCLs) are exceeded. Projects will pay the full cost of replacement water from the time the impacted City water supply well is shut down through the end of the cost recovery period or until water quality meets MCLs, whichever is least. Projects may be charged for successive years during the cost recovery period if the City water supply wells continue to be impacted from contamination drawn to the City water supply well by the project. See Example C in Appendix 1 for cost implications related to complete shut down for each City water supply well.

ATTACHMENT C: CITY WATER SUPPLY WELL PRODUCTION CHARACTERISTICS & WATER SUPPLY COST RECOVERY CALCULATIONS

Appendix 1: Cost Recovery Examples

Example A. 10% loss in production. Dollar amounts based on 2019 Cascade Water Alliance rates. Future calculations will use current Cascade Water Alliance rates.

Supply Well	gpm	Expected weekly Production (Gal)	10% loss of Production (Gal)	Weekly Charge 10% increment	4 month total charge
1	900	8,316,000	7,484,400	\$ 6,556	\$ 111,444
2	500	4,620,000	4,158,000	\$ 3,642	\$ 61,913
3	450	4,158,000	3,742,200	\$ 3,278	\$ 55,722
4	360	3,326,400	2,993,760	\$ 2,622	\$ 44,577
5	1000	9,240,000	8,316,000	\$ 7,284	\$ 123,826

Example B. 25% Loss in Production. Dollar amounts based on 2019 Cascade Water Alliance rates. Future calculations will use current Cascade Water Alliance rates.

Supply Well	gpm	Expected weekly Production (Gal)	25% loss of Production (Gal)	Weekly Charge 25% increment	4 month total charge
1	900	8,316,000	6,237,000	\$16,389	\$ 278,609
2	500	4,620,000	3,465,000	\$9,105	\$ 154,783
3	450	4,158,000	3,118,500	\$8,194	\$ 139,305
4	360	3,326,400	2,494,800	\$6,556	\$ 111,444
5	1000	9,240,000	6,930,000	\$18,210	\$ 309,566

Example C. Complete Well Shutdown. Dollar amounts based on 2019 Cascade Water Alliance rates. Future calculations will use current Cascade Water Alliance rates.

Supply Well	gpm	Expected weekly Production (Gal)	>25% loss to Production (Gal)	Weekly Charge 100% increment	4 month total charge
1	900	8,316,000	0	\$ 65,555	\$ 1,114,437
2	500	4,620,000	0	\$ 36,419	\$ 619,131
3	450	4,158,000	0	\$ 32,778	\$ 557,218
4	360	3,326,400	0	\$ 26,222	\$ 445,775
5	1000	9,240,000	0	\$ 72,839	\$ 1,238,263