APPENDIX B: CONCORDANCE TABLE FOR TECHNICAL ASSESSMENT REPORT TO SUPPORT AN APPLICATION FOR GROUNDWATER USE IN BC

Technical Report Components	Technical Assessment Level				Additional Notes	Complete (Y, N, N/A)	Notes (e.g., relevant report section or justification)
	1	2	3	4			
1. Introduction of the Project							
Description of the project, site, and study area including locations of current and proposed *groundwater* diversions.	✔	✔	✔	✔	Including *water district* and precinct.	Select	
Pertinent background information.	✔	✔	✔	✔		Select	
Location plans (text description and drawing).	✔	✔	✔	✔	Include the following: - Latitude and longitude or UTM coordinates and UTM zone, - Basic topographic features, - *Location description* of any current and proposed test-production and observation *well(*s), other *licensed works*; and, - The property, described by the site address, legal description, or parcel identifier number (PID), where the *well(s)* are located.	Select	
Description of the operation, the quantity of water proposed for use, including justification for that quantity, any proposed variation in timing, rate of diversion, and storage requirements, if applicable.	✔	✔	✔	✔		Select	
The proposed *water use purpose(s)*.	✔	✔	✔	✔		Select	
Description of the appurtenant land, *mine*, or *undertaking*.	✔	✔	✔	✔		Select	
If the project is an expansion of an existing project, adequate context about how this phase relates to existing project phases.	✔	✔	✔	✔	Identify and explain whether the expanded project would surpass the EAO trigger of 75 L/s; and, Identify supplemental *licences*/sources.	Select	

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	1	2	3	4			
2. Physical and Hydrologic Setting							
Description of the physical setting of the area.	–	✔	✔	✔	Include topography and watershed characteristics.	Select	
Description of the climate of the area and a summary of relevant available climate data.	–	✔	✔	✔	Specifically, precipitation figures, preferably monthly.	Select	
Description of nearby *streams*, lakes, springs, and *wetlands* in the area.	–	✔	✔	✔	Include relevant *stream* or spring flow data and, where appropriate, include a comparison of long-term streamflow and rainfall data.	Select	
Description of the *aquatic ecosystem* and any significant aquatic values.	–	✔	✔	✔	e.g., *sensitive stream*, *protected fish population, fish habitat* or protected species.	Select	
Description of how climate change is considered in rendering a *professional* opinion on long-term sustainability of the withdrawal.	–	–	✔	✔	Prediction scenarios available through usage of the Pacific Climate Impacts Consortium's (PCIC) Climate Explorer, area-specific Agricultural Water Demand Models, the Province of BC's Climate Strategy, "Regional Extension Notes" or other relevant tools and information.	Select	
3. Hydrogeological Setting							
Description of the local geology.	–	✔	✔	✔	e.g., based on soil, surficial geology, and bedrock geology mapping.	Select	
Summary of data on neighbouring *wells diverting groundwater*.	–	✔	✔	✔	information from the GWELLS database	Select	
Summary of data on neighbouring *wells diverting groundwater*.	–	–	–	✔	Field survey for a field-based report	Select	
Identification and description of the *aquifer*.	–	✔	✔	✔	e.g., from GWELLS, from *well construction reports* in GWELLS, and information on local hydrogeology from other sources	Select	
In coastal regions, indication of the distance from the ocean.	–	✔	✔	✔		Select	
Location of all relevant local groundwater discharge and recharge zones.	–	✔	✔	✔	e.g., springs, *wetlands*, *streams*, lakes.	Select	
Available data on groundwater levels to understand groundwater flow direction and fluctuations over time.	–	✔	✔	✔	e.g., from nearby Provincial observation *well*(s) and/or monitored *well*s.	Select	

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Hydrogeological maps and cross-sections illustrating the hydrogeology and groundwater flow.	–	✔	✔	✔	Cross-sections should be scaled and show measured groundwater elevations to aid in understanding hydraulic connection between *groundwater* and surface water, hydraulic gradients, interpretation of geologic and hydrogeologic units.	Select	
Any available values for the hydraulic properties of the source *aquifer* (e.g., hydraulic conductivity, transmissivity, and storativity).	–	✔	✔	✔	Include a description of where the estimates were obtained, and any uncertainty associated with the values.	Select	
Identification of any known issues with the source *aquifer* or with other sources in the area.	–	✔	✔	✔	e.g., declining water levels, water allocation restrictions, *flowing artesian wells*.	Select	
Information on any other source(s) potentially hydraulically connected to the source *aquifer* and relevant attributes.	–	✔	✔	✔	e.g., *stream* size and streamflow, supply issues.	Select	
4. Well Information							
For registered *wells*, provision of the *well tag number* and/or well ID plate number.	✔	✔	✔	✔	Can be found online using the GWELLS application.	Select	
For new *wells*, provision of *well construction report*.	✔	✔	✔	✔		Select	
Location of the *well(s)*.	✔	✔	✔	✔	Include the latitude and longitude coordinates of each *well* in decimal degrees with a minimum of five decimal places OR UTM coordinates including UTM zone.	Select	
A cross-sectional diagram of each *well*.	–	✔	✔	✔	Include *casing*, screens, and *screen assembly*.	Select	
Survey elevation of the *well*.	–	✔	✔	✔	Include the method of survey and accuracy.	Select	
Lithological details.	✔	✔	✔	✔	Include in the above *well* cross-sectional diagram.	Select	
Water Levels.	✔	✔	✔	✔	To be determined from a reference point and include the dates of measurement.	Select	

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5. Methodology for Assessing the Adequacy of the Supply							
Pumping Test Requirement							
24-hour test (minimum).	–	–	✔*	–	If near the end of the required time for the test, boundary conditions or other anomalies are observed, the test may need to be extended to capture the full impact (judgement of a *professional* must be exercised).	Select	
48-hour test (minimum).	–	–	✔*	–		Select	
72-hour test (minimum).	–	–	–	✔		Select	
Additional Observation *well*.	–	–	–	✔		Select	
Description of the *pumping test* design and field procedures.	–	–	✔	✔	Details should include the following: - Date of the test; - *Static water level* in the pumping *well* and observation *well*(s), if any; - Pump type; - Depth of the pump; - Maximum available drawdown (and depth of major water bearing fractures, if applicable); - Pumping rate(s) of the step and constant rate *pumping tests*; - Location where the *pumping test* water was discharged; - Method of flow measurement and control; - Method of water level measurements and water levels/times recorded during the pumping and recovery test; - Duration of all components of the test (i.e., step-rate test, constant rate *pumping test*, and recovery test); and - General observations made during the *pumping test* (e.g., weather conditions, nearby pumping activities).	Select	
Description of the roles of the personnel/contractors involved with the test, including details related to roles in the test design, supervising the test, analysis, and interpretation of test data.	–	–	✔	✔		Select	

Technical Report Components	Technical Assessment Level				Additional Notes	Complete (Y, N, N/A)	Notes (e.g., relevant report section or justification)
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6. Results used for Assessing the Adequacy of the Supply							
Analysis of hydraulic properties of the *aquifer* and discuss the methodology used to determine the parameters. Calculated parameters should be in the range expected for the ENV mapped *aquifer* type and logged sediments.	–	–	✔	✔	Include hydraulic conductivity (K), transmissivity (T), and storativity (S) or specific yield (S_y), and any other relevant parameters, and a description of the methodology used to determine these parameters (i.e., analytical solutions or numerical models).	Select	
Where a *pumping test* was done, calculation of the long-term yield of the pumping *well*.	–	–	✔	✔	Determined using 100-day or modified Moell Q20 method, as described in Ministry of Environment (1999) and Maathuis and van der Kamp (2006), respectively.	Select	
Use of derivative analysis	–	–	✔	✔	Noise reduction and smoothing parameters should be discussed	Select	
Identification of likely boundary conditions inferred from observed pumping response and discussion on how they affect the analysis of long-term *well* capacity.	–	–	✔	✔	e.g., connectivity to *streams*, change in *aquifer* thickness or *aquifer* hydraulic conductivity, *aquifer* limit/boundary, leaky *aquifers*, delayed yield, *aquifer* mining effects.	Select	
Explanations of any deviations in the results from an ideal test response.	–	–	✔	✔	e.g., precipitation event, boundary conditions, pumping rate variation, equipment malfunctions.	Select	
Analysis of well interference, including a sensitivity analysis of the results of the distance-drawdown analysis.	–	–	✔	✔	Either measured directly or based on calculated drawdown from distance-drawdown analysis.	Select	
Assumptions of the analysis and major uncertainties.	–	–	✔	✔		Select	

Technical Report Components	Technical Assessment Level				Additional Notes	Complete (Y, N, N/A)	Notes (e.g., relevant report section or justification)
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Discussion of the effects of the proposed diversion on *aquifer* supply.	–	–	✔	✔	- The likely main constraints on the supply *aquifer* [i.e., limited available drawdown or permeability, water budget limit, hydraulically connected to a *stream*, legal considerations (e.g., *Water Objective*, *Water Sustainability Plan*)]; - Any evidence that limits are being approached (i.e., potential hydraulic connection to *streams* with a notation or restriction (e.g., fully recorded, declining *groundwater* levels); - Climate change; and - Other data from the *applicant* related to site specific conditions (e.g., neighbouring *wells* with concerns).	Select	
7. Discussion							
7.1. Likelihood of Hydraulic Connection							
Discussion of the likelihood of hydraulic connection to specific *streams*, including rationale and whether pumping is likely to impact the quantity of water in the *streams*.	–	✔	✔	✔	Discuss how the assessment was done (e.g., 3D numerical model, Hunt VBA routine).	Select	
If the *aquifer* is likely hydraulically connected, an assessment of the apportioned demand on each likely hydraulically connected *stream*.	–	✔	✔	✔	Reference: Determining the Likelihood of Hydraulic Connection, Guidance for the Purpose of Determining the Effect of Apportioning Demand from Diversion of Groundwater on Specific Streams (Wei et al., 2016).	Select	
Any evidence that there is a likelihood of hydraulic connection to any other *aquifer*(s).	–	✔	✔	✔	Review of aquifer reports from GWELLS	Select	
Identification of the main uncertainties and assumptions associated with the hydraulic connectivity analysis, and discussion of how they are addressed in the technical assessment or via additional data gathering and monitoring.	–	–	✔	✔	Such as analysis of the time lag until impact to a *stream* (e.g., Stream Depletion Factor, Hunt VBA routine).	Select	
7.2. Conceptual Site Model							
Description of the conceptual model for the *well* and *aquifer*.	–	✔	✔	✔	Present and discuss the main processes that govern water availability. More complex *applications* such as Level 4 may benefit from an illustration.	Select	

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7.3. Assessment of Potential Impacts							
Assessment of the supply and demand of the *groundwater* resource.	–	✔	✔	✔	- Include an assessment of the *well* capability to provide the quantity of *groundwater* required on a long-term basis; - An assessment of how the proposed diversion will likely affect the available drawdown in the *well* and water availability in the *aquifer*; - If connected to another *aquifer*, assess how the proposed diversion will likely affect the *groundwater* level and water availability of the connected *aquifer*; and, - Water chemistry analysis for areas where there is a potential for salt water intrusion or mixing of different qualities of water and known anthropogenic impacts.	Select	
Discussion of whether pumping could adversely impact other *licensed* and/or domestic *groundwater* users.	–	✔	✔	✔	- Discuss proposed monitoring and data requirements to confirm the initial predictions and those necessary to identify likely future adverse effects; and - Provide hydrographs and historic production information for expansion of ongoing projects or for areas where well interference is known to exists	Select	
Discussion of potential impacts of the proposed *groundwater* diversion on connectivity to nearby surface water users and uses.	–	✔	✔	✔	Discuss whether *aquifers* are hydraulically connected to nearby *streams* and if pumping will impact the quantity of water in those *streams*. If hydraulically connected, provide an assessment of how the proposed *groundwater* diversion will affect *environmental flow needs*, and discuss possible proposed mitigation measures.	Select	
7.4. Issues Related to Proposed Works, Land, Public Safety, and Environment							
Description of major *works* and any joint *works*.	✔	✔	✔	✔	Potential agreement established between parties.	Select	
Discussion of land access.	✔	✔	✔	✔	Information related to trespassing issues and consent to trespass including any evidence of legal authority to trespass (e.g., easement).	Select	
Discussion of how artesian flow will be controlled (if present).	✔	✔	✔	✔		Select	
Discussion of known water quality concerns in the site area.	✔	✔	✔	✔	e.g., naturally high arsenic, anthropogenic nitrate, saline water intrusion.	Select	
Discussion of issues with siting the *well*, including any alternative specifications related to siting the *well*.	✔	✔	✔	✔	- Regulated setbacks in GWPR (s. 18); - Regulated setbacks in Health Hazard Regulation (s. 8); and, Other considerations (e.g., *wellhead* protection, flood protection, *well pits* (GWPR s.36), easy and safe access).	Select	

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	1	2	3	4			
8. Conclusion and Recommendations							
Summary of the details of the technical assessment for the proposed water *licence* for *groundwater* use.	✔	✔	✔	✔		Select	
Provision of recommendations and/or management approaches regarding the *application*.	✔	✔	✔	✔	Describe whether the impacts of taking the water as assessed to be acceptable, manageable, or unacceptable. If the impacts are identified as manageable, describe how the taking of the water will be managed to reduce potential future impacts.	Select	
Environmental flow needs assessment.	✔**	✔**	✔**	✔	May be required by SDM (for any level) if hydraulically connected to a *stream*.	Select	
Other							
Raw data provided in digital format.	–	✔	✔	✔	Including, but not limited to, *pumping test* data and analytical chemistry results.	Select	
Signed and sealed by the relevant professional(s).	–	✔	✔	✔	As per professional practice requirements of the relevant professional association.	Select	

NOTES:

If data is not available, a detailed explanation should be provided.

✔ indicates required field

– indicates field not required

✔* indicates one of these fields is required (refer to section 4.1)

✔** indicates may be required, if hydraulically connected