

Project Memo

Client:	Novo Resources Corp.	Date:	10 January 2021
Attention:	Chris Goti	From:	Zip Boniecki
Project No:	NOV019	Revision No:	1
Project Name:	Beatons Creek Project		
Subject:	Water Quality Trigger Values and Action Plan – Beatons Creek Project		

1 Introduction

This document outlines an update to the proposed groundwater quality management plan to be implemented by Novo Resources Corp. (Novo) at the Beatons Creek Project (the Project), near Nullagine, Western Australia. This includes the proposed methodology for establishing water quality trigger action levels from baseline water quality data (when available), as well as an action plan for managing any exceedances and potential impacts on the local groundwater system.

Interim water quality trigger values were developed by SRK in January 2018 based on sampling and water quality analysis conducted in November 2017 from 30 bores at the Project. Since this time water quality data have been collected on a monthly frequency between May 2018 to April 2019, and a quarterly frequency from May 2019 to present, from 8 of the existing bores and 7 new bores drilled in May 2018 (15 bores total). The monitoring bores that comprise the current monitoring network are presented in Table 1-1. The interim water quality trigger action levels have been updated where necessary for existing levels derived in 2018 and new trigger action levels have been created for newly drilled bores. The updated water quality trigger values are presented in Table 3-1.

Table 1-1: Current monitoring bore network

Bore ID	Comment
DS02A	Pre-2018 existing bores
DS04B	
NRB03	
NRB06	
NRB08	
NRB09	
NRB10	
NRB13	
WRDMB01	Constructed May 2018
WRDMB02	
WRDMB03	
WRDMB04	
WRDMB06	
WRDMB07	
WRDMB08	

2 Water quality action level value development

The proposed mining activities are located within the P1 source protection reserve for the Nullagine water supply; however, connection between the groundwater system and the municipal bores has not been established. Furthermore, baseline analytical results for some dissolved metals (from the existing (pre-mining) monitoring network at Beatons Creek exceed ANZECC & ARMICANZ (2000) drinking water quality guidelines for aesthetic, health and livestock. This suggests the use of the drinking water guidelines as triggers is not appropriate, and an alternative approach will be required in order to monitor potential impacts on the local groundwater system.

Water quality data collected since May 2018 have been reviewed to update the existing interim water quality trigger values and create new values for newly constructed monitoring bores. All analysis and trigger values are based on dissolved metals (field-filtered during sampling). Where baseline water quality of dissolved metals exceeds the drinking water guideline, trigger values have been developed as per the methodology described below.

2.1 Water quality action levels

Novo is proposing to establish water quality action levels derived using methodologies described in ANZECC & ARMICANZ: Appendix 7 (2000). This approach acts as an early warning mechanism to alert the Environmental Manager of a potential or emerging change that should be investigated. Whether the observed change in condition has biological and/or ecological significance can only be ascertained by conducting a more comprehensive investigation and analysis.

The methodology for developing new water quality action levels will need to ensure that the values derived reflect elemental concentrations that are likely to be outside the inherent variability in the historical water quality of the individual monitoring bore. The methodology proposed herein therefore uses the actual variability in observed data, and outlines a three-stage warning system using the average parameter value and the 80% and 95% confidence interval as the early warning and action levels, respectively, with a maximum threshold set at the 99% confidence level.

2.1.1 Early warning level (no action)

The early warning level is intended to provide an internal notification of potential issues within a monitoring bore. The early warning level is developed from the baseline water quality monitoring results and set at the mean ± 1 standard deviation. An exceedance of this level represents a result that is greater (or lesser) than 80% of all samples collected as part of the baseline water quality monitoring campaign.

The early warning action level is intended to act as an internal notification mechanism, and the following actions are tied to this level:

- The water quality parameter that exceeds the early warning level value is checked. This would include an assessment of equipment calibration (both field and laboratory), a review of the QA/QC laboratory data and the entry and reporting of the result, to ensure their accuracy.
- Novo's Environmental Manager is notified. No further action is required other than to record the exceedance and the location at which the exceedance occurred. If the early warning level value of the same parameter is exceeded at the same location on the subsequent sampling event, the actions required for exceedance of the action level trigger values should be carried out.

2.1.2 Action level

The action level is established to identify when further action by Novo is required. The action level is developed from the baseline water quality monitoring results and set at the mean ± 2 standard deviations. An exceedance of this level represents a result that is greater than 95% of all samples collected as part of the baseline water quality monitoring campaign.

When the action level is exceeded, the following actions are proposed:

- The water quality parameter that exceeds the action level value is checked. This would include an assessment of equipment calibration (both field and laboratory), a review of the QA/QC laboratory data and the entry and reporting of the result, to ensure their accuracy.
- Following checking of the sampling procedure and analytical data acquired, reported and entered, if the action value is still exceeded, the water quality of the monitoring bore which had the exceedance will be retested within 7 days after identification and confirmation of the exceedance.
- If the second sample also exceeds the action level, the actions required for exceedance of the threshold level values should be carried out.

- All action level exceedances will be recorded and reported as part of the Annual Environmental Review.
- The exceedance will be reported to the DMIRS case officer.

2.1.3 Threshold level

The threshold level is established as a regulatory exceedance level for Novo. The threshold level is set at the mean ± 3 standard deviations of baseline sampling data. An exceedance of this level represents a result that is greater (or lesser) than 99% of all samples collected as part of the baseline water quality monitoring campaign.

When the threshold level is exceeded, the following actions are proposed:

- The water quality parameter that exceeds the threshold level value is checked. This would include an assessment of equipment calibration (both field and laboratory), a review of the QA/QC laboratory data and the entry and reporting of the result, to ensure their accuracy.
- Following the checking of the sampling procedure and analytical data acquired, reported and entered, if the action value is still exceeded, the water quality of the monitoring bore which had the exceedance will be retested within 7 days after identification and confirmation of the exceedance.
- If the second sample also exceeds the threshold level, then the following actions are required:
 - An investigation of the exceedance should be carried out and reasons for the exceedance identified. This would typically include assessing trends in the data and potential sources of the exceedance (e.g. new activities upgradient of the monitoring bore).
 - The exceedance will be reported to the DMIRS case officer.
- The results of the investigation will be reviewed with the DMIRS case officer to determine whether further investigation is warranted and whether remedial actions need to be implemented.
- All threshold level exceedances will be recorded and reported as part of the Annual Environmental Review.

2.2 Ongoing monitoring and action value updates

Action trigger levels should be reviewed and updated annually to include new monitoring bores as part of the annual aquifer review process. New monitoring data for each monitoring bore that have been acquired in that year will be recorded and compared with the average value that has been used to derive the trigger values. If there is a continuing trend with respect to a parameter value obtained for a particular monitoring bore, an investigation may be required.

Furthermore, it is expected that trigger levels may require updating as further investigative and analytical work (solute transport modelling) is conducted at the Project.

3 Updated water quality action levels

For bores where dissolved metals do not exceed the ANZECC (2000) Health Related Drinking Water Guidelines (DWG), Novo proposes to use the DWG as threshold level values, with early warning and action levels set to 80% and 95% of the DWG, respectively. For those monitoring bores which have parameters currently exceeding the DWG, Novo proposes to use the developed water quality trigger values as per the methodology described above. Ongoing review of water quality action levels will be conducted during ongoing quarterly sampling and as greater understanding of the site is developed.

Current water quality action levels for bores within the active monitoring network are shown in Table 3-1.

Yours sincerely

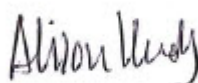
SRK Consulting (Australasia) Pty Ltd

Signed by:



Zbigniew Boniecki
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Signed by:



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Table 3-1: Water quality action levels for Beatons Creek monitoring bores

Triggers in mg/L	DS02A			DS04B			NRB03		
	Early warning	Action taken	Threshold	Early warning	Action taken	Threshold	Early warning	Action taken	Threshold
Antimony	0.0024	0.00285	0.003	0.0024	0.00285	0.003	0.0024	0.00285	0.003
Arsenic	0.008	0.0095	0.01	0.008	0.0095	0.01	0.008	0.0095	0.01
Barium	1.6	1.9	2	1.6	1.9	2	1.6	1.9	2
Beryllium	0.048	0.057	0.06	0.048	0.057	0.06	0.048	0.057	0.06
Boron	3.2	3.8	4	3.2	3.8	4	3.2	3.8	4
Cadmium	0.0016	0.0019	0.002	0.0016	0.0019	0.002	0.0016	0.0019	0.002
Chromium (hexavalent)	0.04	0.0475	0.05	0.04	0.0475	0.05	0.04	0.0475	0.05
Copper	1.6	1.9	2	1.6	1.9	2	1.6	1.9	2
Lead	0.008	0.0095	0.01	0.008	0.0095	0.01	0.008	0.0095	0.01
Manganese	0.610	0.762	0.914	1.005	1.210	1.415	0.4	0.475	0.5
Mercury	0.0008	0.00095	0.001	0.0008	0.00095	0.001	0.0008	0.00095	0.001
Molybdenum	0.04	0.0475	0.05	0.04	0.0475	0.05	0.04	0.0475	0.05
Nickel	0.016	0.019	0.02	0.017	0.024	0.031	0.117	0.130	0.143
Selenium	0.008	0.0095	0.01	0.008	0.0095	0.01	0.008	0.0095	0.01

Triggers in mg/L	NRB06			NRB08			NRB09		
	Early warning	Action taken	Threshold	Early warning	Action taken	Threshold	Early warning	Action taken	Threshold
Antimony	0.0024	0.00285	0.003	0.0024	0.00285	0.003	0.0024	0.00285	0.003
Arsenic	0.020	0.028	0.036	0.008	0.0095	0.01	0.008	0.0095	0.01
Barium	1.6	1.9	2	1.6	1.9	2	1.6	1.9	2
Beryllium	0.048	0.057	0.06	0.048	0.057	0.06	0.048	0.057	0.06
Boron	3.2	3.8	4	3.2	3.8	4	3.2	3.8	4
Cadmium	0.0016	0.0019	0.002	0.0016	0.0019	0.002	0.0016	0.0019	0.002
Chromium (hexavalent)	0.04	0.0475	0.05	0.046	0.064	0.081	0.04	0.0475	0.05
Copper	1.6	1.9	2	1.6	1.9	2	1.6	1.9	2
Lead	0.008	0.0095	0.01	0.008	0.0095	0.01	0.008	0.0095	0.01
Manganese	0.635	0.718	0.801	0.868	1.036	1.205	0.673	0.795	0.917
Mercury	0.0008	0.00095	0.001	0.0008	0.00095	0.001	0.0008	0.00095	0.001
Molybdenum	0.04	0.0475	0.05	0.04	0.0475	0.05	0.04	0.0475	0.05
Nickel	0.016	0.019	0.02	1.932	2.153	2.373	0.046	0.061	0.076
Selenium	0.008	0.0095	0.01	0.008	0.0095	0.01	0.008	0.0095	0.01

Triggers in mg/L	NRB10			NRB13			WRDMB01		
	Early warning	Action taken	Threshold	Early warning	Action taken	Threshold	Early warning	Action taken	Threshold
Antimony	0.0024	0.00285	0.003	0.0024	0.00285	0.003	0.023	0.036	0.049
Arsenic	0.008	0.0095	0.01	0.008	0.0095	0.01	0.018	0.026	0.035
Barium	1.6	1.9	2	1.6	1.9	2	1.6	1.9	2
Beryllium	0.048	0.057	0.06	0.048	0.057	0.06	0.048	0.057	0.06
Boron	3.2	3.8	4	3.2	3.8	4	3.2	3.8	4
Cadmium	0.0016	0.0019	0.002	0.016	0.018	0.021	0.0016	0.0019	0.002
Chromium (hexavalent)	0.04	0.0475	0.05	0.04	0.0475	0.05	0.04	0.0475	0.05
Copper	1.6	1.9	2	1.6	1.9	2	1.6	1.9	2
Lead	0.008	0.0095	0.01	0.027	0.030	0.033	0.008	0.0095	0.01
Manganese	0.4	0.475	0.5	8.967	9.984	11.001	0.4	0.475	0.5
Mercury	0.0008	0.00095	0.001	0.0008	0.00095	0.001	0.0008	0.00095	0.001
Molybdenum	0.04	0.0475	0.05	0.04	0.0475	0.05	0.04	0.0475	0.05
Nickel	0.065	0.076	0.086	10.654	11.601	12.549	0.035	0.062	0.089
Selenium	0.008	0.0095	0.01	0.008	0.0095	0.01	0.008	0.0095	0.01

Triggers in mg/L	WRDMB02			WRDMB03			WRDMB04		
	Early warning	Action taken	Threshold	Early warning	Action taken	Threshold	Early warning	Action taken	Threshold
Antimony	0.007	0.013	0.018	0.0024	0.00285	0.003	0.0024	0.00285	0.003
Arsenic	0.007	0.010	0.013	0.016	0.020	0.024	0.045	0.057	0.070
Barium	1.6	1.9	2	1.6	1.9	2	1.6	1.9	2
Beryllium	0.048	0.057	0.06	0.048	0.057	0.06	0.048	0.057	0.06
Boron	3.2	3.8	4	3.2	3.8	4	3.2	3.8	4
Cadmium	0.0016	0.0019	0.002	0.001	0.002	0.003	0.0016	0.0019	0.002
Chromium (hexavalent)	0.04	0.0475	0.05	0.04	0.0475	0.05	0.04	0.0475	0.05
Copper	1.6	1.9	2	1.6	1.9	2	1.6	1.9	2
Lead	0.008	0.0095	0.01	0.008	0.0095	0.01	0.008	0.0095	0.01
Manganese	1.076	1.521	1.967	3.423	4.845	6.268	5.549	7.044	8.538
Mercury	0.0008	0.00095	0.001	0.0008	0.00095	0.001	0.0008	0.00095	0.001
Molybdenum	0.04	0.0475	0.05	0.04	0.0475	0.05	0.04	0.0475	0.05
Nickel	0.021	0.035	0.049	0.920	1.382	1.843	1.113	1.347	1.580
Selenium	0.008	0.0095	0.01	0.008	0.0095	0.01	0.008	0.0095	0.01

Triggers in mg/L	WRDMB06			WRDMB07			WRDMB08		
	Early warning	Action taken	Threshold	Early warning	Action taken	Threshold	Early warning	Action taken	Threshold
Antimony	0.0024	0.00285	0.003	0.0024	0.00285	0.003	0.0024	0.00285	0.003
Arsenic	0.024	0.031	0.037	0.008	0.0095	0.01	0.008	0.0095	0.01
Barium	1.6	1.9	2	1.6	1.9	2	1.6	1.9	2
Beryllium	0.048	0.057	0.06	0.048	0.057	0.06	0.048	0.057	0.06
Boron	3.2	3.8	4	3.2	3.8	4	3.2	3.8	4
Cadmium	0.0016	0.0019	0.002	0.0016	0.0019	0.002	0.0016	0.0019	0.002
Chromium (hexavalent)	0.04	0.0475	0.05	0.04	0.0475	0.05	0.04	0.0475	0.05
Copper	1.6	1.9	2	1.6	1.9	2	1.6	1.9	2
Lead	0.008	0.0095	0.01	0.008	0.0095	0.01	0.008	0.0095	0.01
Manganese	4.308	5.273	6.237	3.113	3.577	4.040	3.579	4.344	5.109
Mercury	0.0008	0.00095	0.001	0.0008	0.00095	0.001	0.0008	0.00095	0.001
Molybdenum	0.04	0.0475	0.05	0.04	0.0475	0.05	0.04	0.0475	0.05
Nickel	0.016	0.019	0.02	0.022	0.028	0.033	0.101	0.130	0.160
Selenium	0.008	0.0095	0.01	0.008	0.0095	0.01	0.008	0.0095	0.01

Note: Highlighted cells indicate alternative guidelines.