



Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	7/10/2022
Doc Title	Extraction Plan - Subsidence Monitoring Program for Stage1 and Stage2 mining		

RUSSELL VALE COLLIERY

REVISED PREFERRED UNDERGROUND EXPANSION PROJECT

Extraction Plan for PC07-PC08 and PC21-PC25 (Stage 1) and PC27-PC34 (Stage 2) mining

SUBSIDENCE MONITORING PROGRAM

RVC EC PLN 003

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Revisions

Property	Value
Approved by	Group Environment Manager
Document Owner	Group Environment Coordinator
Effective Date	

Revision history

Version	Date reviewed	Review team (consultation)	Nature of the amendment
Draft 1 (V1)	28/6/2021	Ken Mills (SCT) Stephen Wilson (SCT) Umwelt	Initial Draft for consultation with the Resource Regulator, TfNSW Endeavour Energy & TransGrid.
Draft 2 (V1)	17/09/2021	Robert Faddy-Vrouwe (WCL) Devendra Vyas (WCL)	Updated following consultation with TransGrid and Endeavor Energy
Draft 3 (V1)	06/10/2021	Richard Sheehan (WCL)	Final draft post receipt of consultation outcomes from Surveyor General, TransGrid, and completion of the TfNSW risk assessment.,
Final	19/11/2021	Richard Sheehan (WCL)	Final following consultation with regulatory bodies post submission.
Draft 1 (V2)	25/03/2022	SCT	Update of existing approved Stage1 SMP - Initial Draft for consultation
Draft 2 (V2)	08/04/2022	WCL	Update of existing approved Stage1 SMP - Initial Draft for consultation
Draft 2 (V3)	24/05/2022	WCL	Update of existing document post stakeholder consultation
F1	24/05/2022	WCL	Finalisation for submission to DPE
F2	7/10/2022	Umwelt	Amendments to address DPE RFI

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1 INTRODUCTION

1.1 Purpose

Condition C10 of Development Consent MP09_0013 for the Russell Vale Revised Preferred Underground Expansion Project (UEP) requires Wollongong Coal Limited (WCL) to prepare an Extraction Plan (EP) for second workings. This Subsidence Monitoring Program (SMP) has been prepared to satisfy **Condition C10(g)(i)** of MP09_0013 to support an extraction plan (EP) for second workings in the current EP for Stage1 panels (PC21, PC22-PC25 PC07, PC08,) and Stage2 (PC27-PC34) panels (refer to **Figure 1**). Conditional approval of the EP for Stage1 mining was received on 03 December 2021. This SMP incorporates all monitoring in the approved SMP for the Stage1 EP and extends the existing monitoring network to cover the planned mining in Stage 2 panels.

As per the approved author appointment by the Department of Planning, Industry and Environment (DPIE) on 20/01/2022, the initial draft for version 2 of this plan has been prepared by Steve Wilson of SCT. The initial draft of the plan has been updated by Richard Sheehan of WCL.

1.2 Project Background

WCL operates the Russell Vale Colliery (RVC) (formerly the NRE No.1 Colliery) located in the Southern Coalfield of New South Wales (NSW). The mine is located at Russell Vale, approximately 8 km north of Wollongong and 70 km south of Sydney, within the local government areas (LGAs) of Wollongong and Wollondilly in the Illawarra region of NSW.

RVC operates under the current project approval Development Consent MP09_0013 (the Development Consent) granted by the NSW Independent Planning Commission (IPC) on 8 December 2020. The approval, known as the Russell Vale Revised Preferred UEP, is based on the Revised Preferred Project Report and Response to Second PAC Review by Umwelt dated July 2019.

The approved workings are contained within Consolidated Coal Lease 745 (CCL 745).

The secondary workings for the remaining panels approved under Development Consent MP_09_0013 will be mined in a staged approach and will therefore be subject to future Extraction Plans (EP).

1.3 Scope

In accordance with Condition C10(g)(i), of MP09_0013, this SMP has been prepared as a component of the RVC EP for Stage1 and Stage2 mining to summarise the management of potential impacts to natural and built features located in proximity to the proposed bord and pillar workings defined as being 'second workings' under MP09_0013. This SMP includes the approved Stage 1 mining in Panels PC07, PC08 and PC 21 - PC25 and the planned mining in the Stage 2 Panels of PC27-PC34. Stage 1 consists of two distinct areas. Stage1(b) panels PC07, PC08 are located to the east of Mt Ousley Road (M1 - Princes Motorway) and Stage 1(a) Panels PC21-PC25 are located to the west of Mt Ousley Road and west of previous longwall mining areas. The planned Stage 2 Panels PC27-PC34 are located beyond PC21-25, further to the west of Mt Ousley Road. (Refer to **Figure 1**). The mining layouts for the Stage1 and Stage2 panels are those assessed for subsidence effects and impacts in SCT (2021) and SCT (2022b).

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Second workings in Stage 1(a) panels PC21-PC25 do not have any overlying built features (e.g. Mt Ousley Road, high voltage electricity transmission lines). The EP approval for Stage 1 mining requires PC21 to be mined and demonstrate that subsidence movements are within predicted levels and impacts are expected to be less than subsidence impact performances measures of MP09_0013 before mining in PC22-PC25 and PC07 - PC08 can commence.

This SMP details the monitoring of subsidence effects and impacts of the planned mining to inform the management of risks and environmental consequences to natural and built, surface and sub-surface features, in, or within the vicinity of, the EP Assessment Areas (Refer to EP Areas on Figure 1). Monitoring and assessment of compliance with the subsidence impact performance measures of the Development Consent and processes to avoid exceedance are included as part of the key component management plans required for an EP i.e. management plans for Water, Land, Biodiversity, Heritage, Built Features and Public Safety.

The Environment Protection Biodiversity Conservation (EPBC) Approval (2020/8702), approved on 31 August 2021, includes additional subsidence monitoring, management, and reporting requirements with a subsidence limit of 100mm at all upland swamps.

Vertical subsidence is expected to be less than 100mm and generally imperceptible over the majority of the EP Areas. Monitoring strategies using a distributed array of GNSS (GPS) units for accurate monitoring and LiDAR for broad-area monitoring of the bushland environment supported by conventional survey monitoring, visual inspections, underground roadway condition monitoring and other targeted monitoring is expected to be effective to manage subsidence impacts on the surface features within the EP Areas.

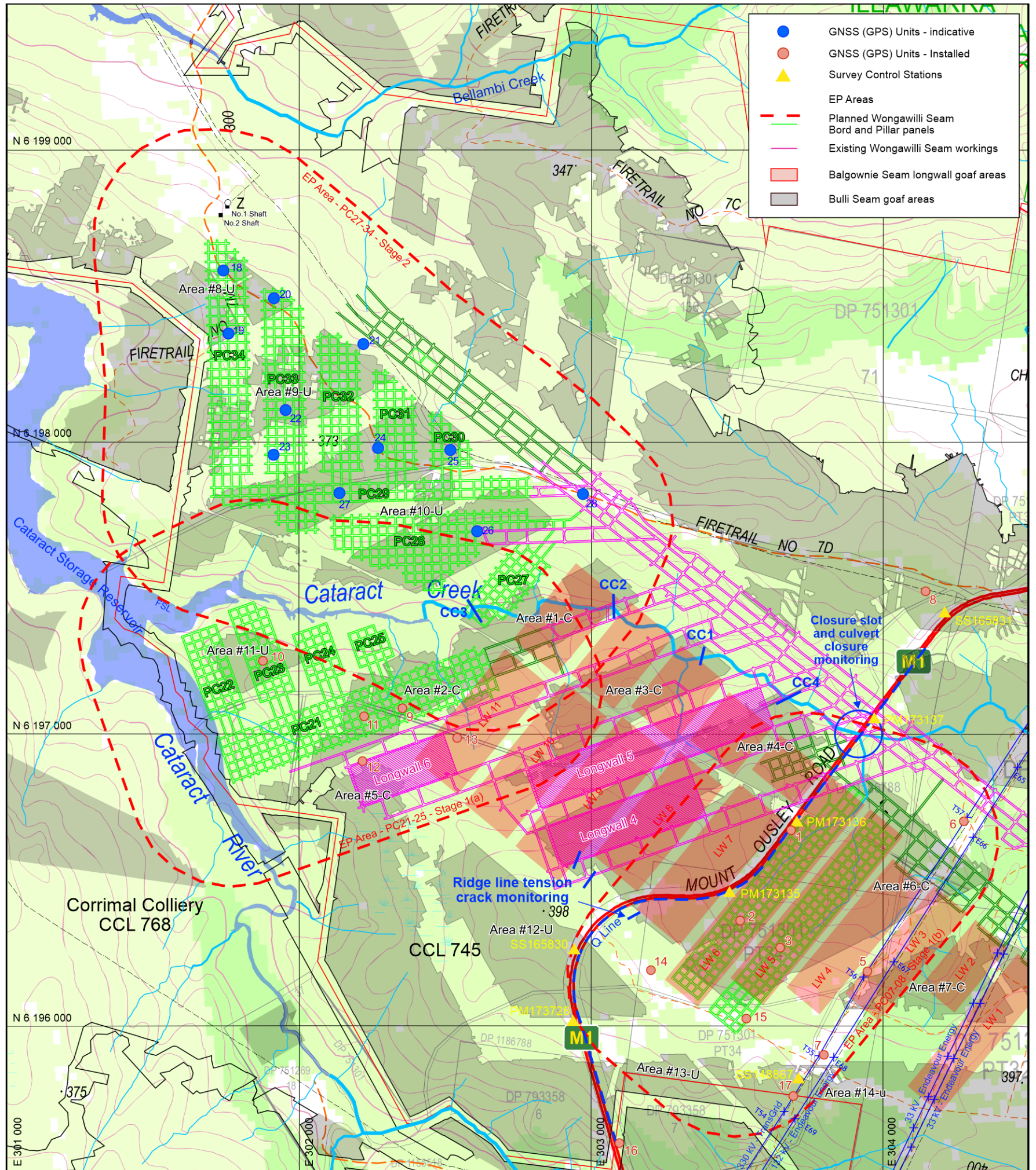
Natural features include upland swamps, watercourses, cliffs, steep slopes and rock face features, surface landform and groundwater. Management measures for these items are contained in the Upland Swamp Monitoring Program (USMP (RVC EC PLN 008)), Biodiversity Management Plan (RVC EC PLN 004) the Water Management Plan (WMP (RVC EC PLN 010)) and the Land Management Plan (LMP (RVC EC PLN 035)). The WMP includes both surface water and groundwater monitoring programs.

Heritage features within the EP Areas are limited to Aboriginal cultural heritage sites. Management measures for these items are contained in the Heritage Management Plan (HMP (RVC EC PLN 016)).

Built features identified within the EP Areas or in positions with potential to be affected by subsidence movements include Mount Ousley Road, the Cataract Storage Reservoir, overhead electricity transmission lines and minor infrastructure such as unsealed access road/four-wheel drive tracks and survey control stations. Management measures for these items are contained in the Built Features Management Plan (BFMP (RVC EC PLN 002)), WMP (groundwater monitoring program) and Public Safety Management Plan (PSMP (RVC EP PLN 009)).

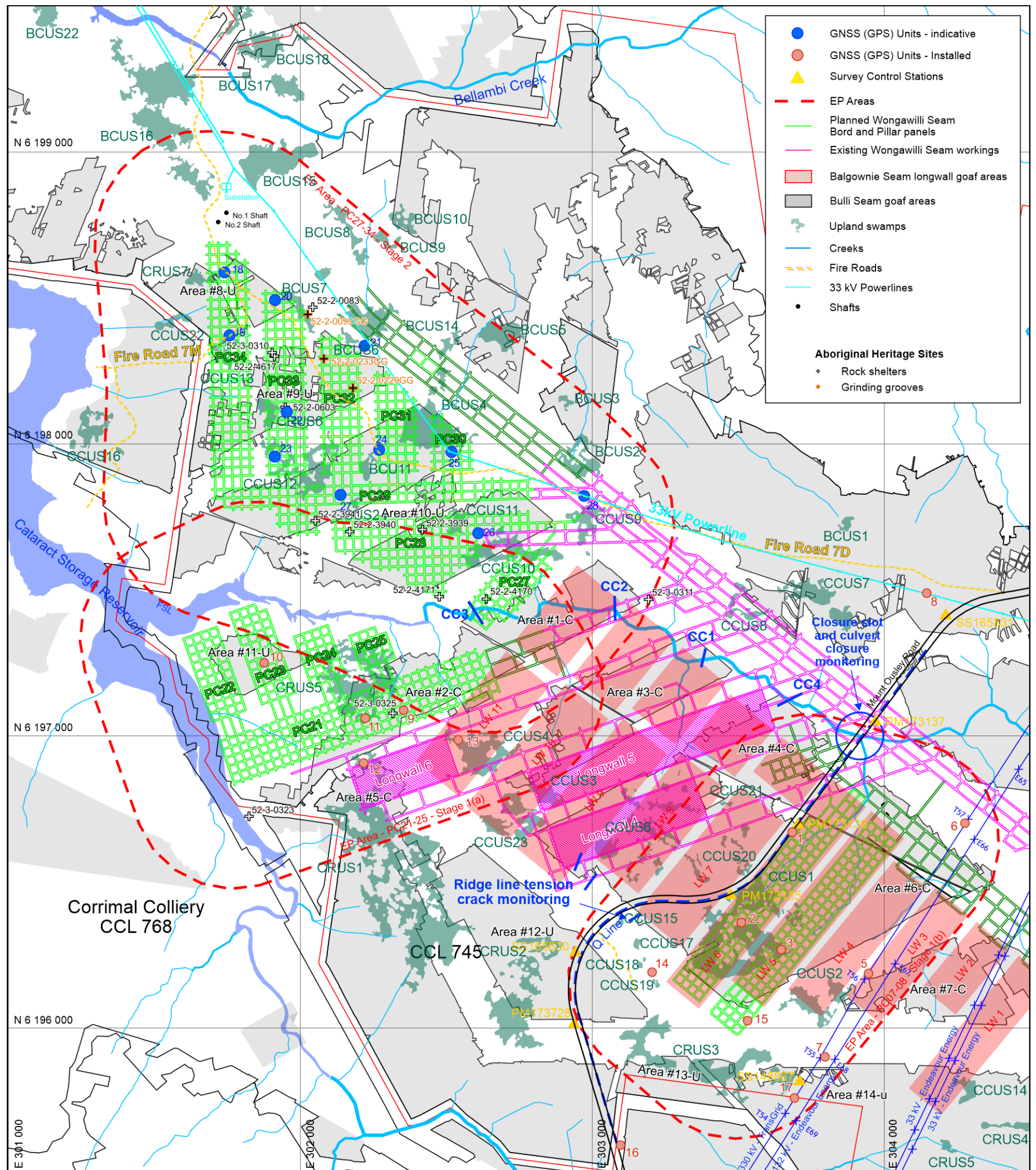
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Figure 1- Site plan of Russell Vale East superimposed on a 1:25000 topographic map with EP Assessment Areas and subsidence monitoring locations.



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Figure 2 - Surface features and subsidence monitoring locations.



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2 STATUTORY/REGULATORY REQUIREMENTS

This SMP has been prepared to address the requirements of:

- Development Consent (MP09_0013)
- EPBC Approval (2020/8702).

with reference to the Standards of the Survey and Drafting Directions for Mining Surveyors 2020 (NSW Mines).

This section describes the relevant sections of these conditions and associated legislation.

2.1 Development Consent Requirements

The development consent conditions in **Table 1** details where each component of the condition is addressed within this SMP.

Table 1 – Development consent requirements

Condition	Requirement	Section where addressed in this plan
Part A – Administrative Conditions		
Obligation to minimise harm to the environment		
A1	In addition to meeting the specific performance measures and criteria established under this approval, the Applicant must implement all reasonable and feasible measures to prevent, and if prevention is not reasonable and feasible, minimise, any material harm to the environment that may result from the construction and operation of the project, and any rehabilitation required under this consent.	This plan
Part C - Specific Environmental Conditions - Underground mining		
Subsidence Management Plan		
C10 (g) (i)	Subsidence Monitoring Program which has been prepared in consultation with NSW RR to:	
	Describe the ongoing conventional and non-conventional subsidence monitoring program, including consideration of contemporary subsidence monitoring methods such as InSAR (Interferometric Synthetic Aperture Radar) and LiDAR (Light Detection and Ranging);	Section 5.1
	provide data to assist with the management of risks associated with conventional and non-conventional subsidence;	Section 3 Section 4
	confirm the status of the Bulli Seam goaf areas yet to be confirmed as subsided through observation of project roadway conditions driven below the edges of these extracted goaf areas;	Section 4.2
	validate the conventional and non-conventional subsidence predictions;	Section 5

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	analyse the relationship between the predicted and resulting conventional and non-conventional subsidence effects and predicted and resulting impacts under the plan and any ensuring environmental consequences;	Section 5
	Ensure that the development does not cause exceedances of the maximum vertical subsidence limit in Table 7 and	Section 5
	<p>inform the adaptive management process in paragraph C10(g)(viii).</p> <ul style="list-style-type: none"> <i>appropriate triggers to warn of increased risk of exceedance of any performance measure;</i> <i>specific actions to respond to high risk of exceedance of any performance measure to ensure that the measure is not exceeded;</i> <i>adaptive management where monitoring indicates that there has been an exceedance of any performance measure, or where any such exceedance appears likely; and;</i> <i>an assessment of remediation measures that may be required if exceedances occur and the capacity to implement those measures;</i> 	Section 5.3
Part F – Environmental Management, Reporting and Auditing		
Incident notification		
F9	The Applicant must immediately notify the Department and any other relevant agencies immediately after it becomes aware of an incident. The notification must identify the development (including the development application number and name) and set out the location and nature of the incident.	Section 5.6 and 5.8
Non-compliance Notification		
F10	Within seven days of becoming aware of a non-compliance, the Applicant must notify the Department of the non-compliance. The notification must set out the condition of this consent that the development is non-compliance with, why it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance.	Section 5.6
Annual Review		
F11	By the end of March each year after the commencement of the development under this consent, or other timeframe agreed by the Planning Secretary, a report must be submitted to the Department reviewing the environmental performance of the development, to the satisfaction of the Planning Secretary. This review must:	Section 7.1
F11(a)	Describe the development (including any rehabilitation) that was carried out in the previous calendar year and the development that is proposed to be carried out over the current calendar year;	
F11(b)	Include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, including a comparison of these results against the:	

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F11(b)(i)	Relevant statutory requirements, limits or performance measures/criteria;	
F11(b)(ii)	Requirements of any plan or program required under this consent;	
F11(b)(iii)	Monitoring results of previous years; and	
F11(b)(iv)	Relevant predictions in the document/s listed in Condition A2(c) ;	
F11(c)	Identify any non-compliance or incident which occurred in the previous calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid recurrence;	
F11(d)	Evaluate and report on:	
F11(d)(ii)	Compliance with the performance measures, criteria and operating conditions of this consent;	
F11(e)	Identify any trends in the monitoring data over the life of the development;	
F11(f)	Identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and	
F11(g)	Describe what measures will be implemented over the next calendar year to improve the environmental performance of the development.	
F12	Copies of the Annual Review must be submitted to Wollongong City Council, Wollondilly Shire Council and made available to the Community Consultative Committee and any interested person upon request.	Noted
Independent Environmental Audit		
F13	Within one year of commencement of the development under this consent, and three years after, unless the Planning Secretary directs otherwise, the Applicant must commission and pay the full cost of an Independent Environmental Audit of the development. The audit must:	Section 7.2
F13(a)	Be prepared in accordance with the Independent Audit Post Approval Requirements (Department 2020 or as updated);	
F13(b)	Be led and conducted by a suitably qualified, experienced and independent auditor whose appointment has been endorsed by the Planning Secretary;	
F13(c)	Be conducted by a suitably qualified, experienced and independent team of experts (including any expert in field/s specified by the Planning Secretary) whose appointment has been endorsed by the Planning Secretary;	
F13(d)	Be carried out in consultation with the relevant agencies and the Community Consultative Committee;	
F13(e)	Assess the environmental performance of the development and whether it is complying with the relevant requirements in this consent, water licences and mining leases for the development	

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	(including any assessment, strategy, plan or program required under these approvals);	
F13(f)	Review the adequacy of any approved strategy, plan or program required under the abovementioned approvals and this consent;	
F13(g)	Recommend appropriate measures or actions to improve the environmental performance of the development and any assessment, strategy, plan or program required under the abovementioned approvals and this consent; and	
F13(h)	Be conducted and reported to the satisfaction of the Planning Secretary.	
F14	Within three months of commencing an Independent Environmental Audit, or other timeframe agreed by the Planning Secretary, the Applicant must submit a copy of the audit report to the Planning Secretary, and any other NSW agency that requests it, together with its response to any recommendations contained in the audit report, and a timetable for the implementation of the recommendations. The recommendations must be implemented to the satisfaction of the Planning Secretary.	Section 7.2
Monitoring and Environmental Audits		
F15	Any condition of this consent that requires the carrying out of monitoring or an environmental audit, whether directly or by way of a plan, strategy or program, is taken to be a condition requiring monitoring or an environmental audit under Division 9.4 of Part 9 of the EP&A Act. This includes conditions in respect of incident notification, reporting and response, non-compliance notification, compliance report and independent audit.	Section 7.2

2.2 Statement of Commitments

The Statement of Commitment outlined in **Table 2** details where each component of the commitment is addressed within this SMP.

Table 2 – Statements of Commitment

Statement of Commitment	Timing	Section Addressed
WCL will prepare a new Subsidence Monitoring and Management Plan (or equivalent) for the Revised Preferred Project within 3 months of approval. This plan will include a program of underground pillar stability monitoring as recommended by the subsidence peer reviewer.:	Within 3 months of approval	Section 4.2

2.3 EPBC Approval Requirements

The EPBC Approval (2020/8702) was granted by the Australian Government - Department of Agriculture, Water and the Environment (DAWE) on 31 August 2021.

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Conditions of the EPBC approval relating to the EP can be found in Section 1.4.3 of the main EP.

2.4 Consultation

2.4.1 Consultation During the Environmental Assessment Process

Extensive community and government consultation has been carried out prior to and during the preparation of the original environmental assessment, the Revised Preferred Project Report, the Submissions Report and other project-related assessment documentation. The primary objective of consultation was to keep the community, government agencies and other stakeholders informed and involved during project development process.

Community engagement was carried out in two phases and is summarised in Section 4.1.2 and Section 4.1.3 of the Revised Preferred Project Report.

A complete summary of previous and ongoing government agency and stakeholder consultation is provided in Table 4.5 of the Revised Preferred Project Report. Consulted parties included:

- the Department of Planning and Environment (DPE) (formerly the Department of Planning, Industry and Environment (DPIE);
- NSW Environment Protection Authority (EPA);
- Wollongong City Council (WCC); and
- WaterNSW.

2.4.2 Consultation During the Preparation of the Management Plan

This Plan has been prepared in consultation with NSW RR in accordance with **Condition C10(g)(i)**. An overview of proposed subsidence monitoring was presented to the NSW RR by SCT on 29 June 2021.

A draft version of this SMP plan will be distributed to the NSW RR following for review and any feedback incorporated. This plan may also be updated following the completion of consultation with TfNSW.

The feedback provided on the proposed SMP during consultation for Stages 1 and 2 is summarised within **Table 3** below.

Table 3 – Subsidence Management consultation

Stakeholder	Consultation Feedback	Relevant section where feedback is addressed in this Plan
Stage 1		
NSW Resources Regulator (NSW RR)	During consultation with key infrastructure agencies as (TfNSW, EE and TG) the NSW RR attended as an independent observer, noting that they expected compliance with the specific consent conditions.	No feedback

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Stakeholder	Consultation Feedback	Relevant section where feedback is addressed in this Plan
	No specific feedback on this management plan or response has been provided during the preparation of this management plan as their specific role in this process is that of an independent observer.	
DPIE (Planning)	Letter to the department advising on the proposed team for the development of the Extraction Plan including its sub-plans.	See DPIE response to this letter in Appendix A of the Extraction Plan.
Stage 2		
NSW Resources Regulator (NSW RR)	No specific comments on subsidence monitoring for Stage 2 provided.	N/A
DPE (Planning)	Ongoing consultation during EP preparation. DPE will review EP as part of approval processes.	N/A

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3 PREDICTED SUBSIDENCE EFFECTS

This section presents a summary of the forecast of subsidence effects, the likely impacts, surface subsidence monitoring methodologies appropriate to monitor the expected ground movements and underground geotechnical mapping suitable to confirm goaf formation in the overlying Bulli Seam.

3.1 Forecast of Subsidence Effects and Assessment of Impacts

The expected subsidence effects and impacts from the planned mining in the EP for Stage1 and Stage2 mining are presented in SCT (2021) and SCT (2022b). The recommended survey methodologies for measurement of the expected subsidence effects to satisfy the requirements of the Development Consent are also presented.

Vertical subsidence is expected to be less than 100mm and generally imperceptible over the majority of the EP Areas.

The Independent Advisory Panel Underground Mining (IAPUM 2020) suggests allowance for subsidence of up to 300mm to cover possible reactivation of goafs in both the Bulli and Balgownie Seams. A performance measure for vertical subsidence of not more than 300mm is included in the Development Consent.

Vertical subsidence of greater than 500mm is considered possible but unlikely, in small, isolated areas typically within and near the edges of Bulli Seam goaf areas where remnant pillars not already collapsed may become unstable. Where remnant pillars have been identified, the additional subsidence is expected to be less than 300mm over an area with a radius of approximately 50m in the unlikely event that these remnant pillars are still standing and were to collapse. The risk of any remnant pillars collapsing in the future exists regardless of the planned mining and the planned mining is not expected to materially change this risk.

Any changes to the surface from the low-level values of tilt and strain associated with less than 100mm of vertical subsidence are expected to be generally imperceptible.

Systematic horizontal ground movements from vertical subsidence are expected to be generally imperceptible. Ongoing low-level horizontal movements of the southern slope down to the Cataract Creek valley, a legacy of previous mining, are possible. Any far-field movements associated with relief of horizontal stress within the overburden strata are expected to be imperceptible having already occurred during previous mining. The monitoring network is design to capture any such movements to manage any impacts from these movements.

3.2 Assessment of Environmental Consequences

The detailed assessment of environmental consequences from the forecast of subsidence effects and impacts (SCT 2021 and SCT 2022b) on surface and sub-surface features to support the development of the EP for Stage1 and Stage2 mining are contained in the specific subsidence management plans/monitoring programs as listed in **Table 4**.



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Table 4 – Extraction Plan subsidence management plans/monitoring programs

Title	Location in main Extraction Plan
Extraction Plan for Stage1 and Stage2 mining - Main Document	N/A – Main document
Subsidence Monitoring Program	This plan (Appendix M of the main EP)
Built Features Management Plan	Appendix E
Public Safety Management Plan	Appendix F
Water Management Plan	Appendix G
Groundwater Management Plan	Appendix H
Biodiversity Management Plan	Appendix I
Swamp Monitoring Program	Appendix J
Land Management Plan	Appendix K
Heritage Management Plan	Appendix L

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4 PLANNING

4.1 Subsidence Monitoring Methodology

Subsidence effects monitoring is based on two relatively specific technologies supported by conventional subsidence monitoring ground surveys. One of these technologies provides high-accuracy, near-real-time point measurements, the other lower accuracy, infrequent measurements with broad area coverage. The results of this monitoring, combined with underground monitoring of geotechnical conditions, are expected to inform any adaptive management measures that may be required to avoid or minimise subsidence impacts and environmental consequences.

GNSS (GPS) units provide high-accuracy, continuous measurements in near-real-time at individual points. Remote sensing LiDAR surveys provides periodic surveys over the broader area of all of Russell Vale East.

The GNSS ground-based points are to be located at suitable locations above planned mining and in locations between proposed workings and specific natural or built features, including the critical infrastructure, above and adjacent to the planned mining. The units continuously measure movements in three dimensions with data available for review by WCL in near-real-time. The units continuously record positional data to an accuracy of better than $\pm 20\text{mm}$ (typically better than $\pm 10\text{mm}$ in ideal conditions). The units are programmed to record and transmit position data to a host site where it is filtered for data accuracy purposes. The data is available to WCL in near-real-time to track trends and provide early warning of potential to exceed triggers. Adaptive management measures can then be implemented where relevant triggers (identified in TARPs) are exceeded. In addition to vertical subsidence, the horizontal distances between individual GNSS units (#16), can be derived to measure valley closure effects over longer distances.

Broad-area remote sensing monitoring using LiDAR is to check for unexpected movements, particularly any that may be associated with any marginally stable remnant pillars in the overlying Bulli Seam. The planned LiDAR surveys have an accuracy of $\pm 200\text{mm}$ over the majority of the survey area. The RVE LiDAR survey area covers the planned bord and pillar panels in the EP for the Stage1 and Stage 2 mining and includes Mt Ousley Road including Picton Road interchange, the road cuttings and ridge line north of Cataract Creek crossing, the Illawarra Escarpment including Brokers Nose, the Powerline easements including the change of direction towers and Full Supply Level of Cataract Storage Reservoir. The LiDAR coverage also includes all upland swamps within 350 metres of the planned bord and pillar panels for this EP. LiDAR surveys are planned to be flown:

- Quarterly across the entire RVE LiDAR survey areas.
- Where initiated by a TARP investigation processes or as part of an adaptive management approach.

The ground measurement surveys include: the Mount Ousley Road pavement (southbound lane), closure monitoring across Cataract Creek including closure slot monitoring on the Mount Ousley Road pavement, culvert surveys, measurements at four closure locations on Cataract Creek. Surveys of tension cracks on the ridgeline south of Cataract Creek. Surveys of the Picton Road interchange bridge and nearby culverts are also included in the existing SMP and BFMP.

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Regular visual inspections by TfNSW are in addition to these ground surveys. Periodic ground surveys and inspections of the 330kV and 132kV powerline towers are included in the monitoring. These surveys are to measure relative positions of individual legs and tilt of the towers. The existing ground survey systems (attended surveys) for the monitoring of the major infrastructure approved in the SMP and BFMP for the EP for Stage1 have not changed for the planned Stage 2 mining.

The programs for monitoring subsidence effects and the management of impacts was developed in consultation with the asset owners (TfNSW, TG and EE).

Components of the existing subsidence effects monitoring via ground surveys, GNSS and LiDAR techniques are expected to identify the subsidence effects in all areas above and adjacent to the planned mining in this EP, including Bulli Seam goaf areas yet to be confirmed as collapsed and subsided, to inform an any adaptive management measure required to avoid or minimise subsidence impacts and environmental consequences. Geotechnical mapping of the observed stress conditions in the underground workings is expected to enhance the overall subsidence monitoring methodology.

4.2 Underground Monitoring

Due to the nature of the proposed workings, subsidence impacts in excess of 100mm are only considered feasible in the event of a pillar failure within overlying Bulli seam workings, a failure within the Wongawilli seam itself or goaf reactivation or settlement effects. These mechanisms and their potential to occur are discussed in detail in the Subsidence Assessments prepared for EP1 and EP2 (refer to Section 3.1 and SCT 2021 and SCT 2022b). The following describe underground monitoring used to inform these subsidence considerations.

4.2.1 Geotechnical mapping

Mapping of changes to the observed vertical and horizontal roadway conditions in the Wongawilli Seam is expected to be a strong indicator of the status of Bulli Seam goafs and the potential for greater than expected subsidence. Elevated stresses below the edges and under the areas shown as goaf (previously extracted areas) are expected to be apparent.

A program of ongoing regular roadway condition mapping by a geotechnical engineer overlain on the original Bulli Seam mine working plans and record tracing copies is expected to identify where Bulli Seam mine workings have been fully extracted and where they might still be standing.

There are currently seven of a total fourteen Bulli Seam goaf areas in the planned RVE mining area that have not been independently confirmed as collapsed following the secondary extraction of pillars. There is only one such unconfirmed area in the two EP Areas relevant to this SMP. All seven of the other goaf areas in the area are independently confirmed as collapsed.

The reporting of the underground roadway mining conditions by mining supervisors during each production shift in conjunction with the mapping by a geotechnical engineer on a weekly basis are considered a reliable technique to confirm the overlying goaf areas have already collapsed and subsided or not.

This geotechnical mapping, combined with surface measurements of subsidence effects will inform any changes to the mining layout geometry that may be required as part of the adaptive

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management approach. Adaptive management considerations are discussed further in **Section 5.3**.

4.2.2 Pillar stability

In addition to the monitoring of roadway conditions, pillar stability within the Wongawilli seam workings is also a key indicator of potential subsidence impacts. Due to the design of the mine plan, the risk of pillar collapse in the Wongawilli seam is considered to be remote.

Notwithstanding the extremely low risk of occurrence, such a failure would also be readily observable as part of the routine inspection processes described above. Such a failure would automatically trigger a review of the mining work in the area of the pillar failure to understand the cause of the failure. Inspections of the surface area over the pillar failure would also be undertaken to identify any surface manifestations from such a failure.

The absence of any pillar instability within the Wongawilli Seam workings (where there is no evidence of pillar instability risk in overlying workings demonstrated by the geotechnical mapping) is strongly indicative that vertical subsidence impacts greater than 100mm is unlikely to have occurred over these workings.

4.3 Measurement

The Survey and Drafting Directions for Mining Surveyors 2020 (S&DD 2020) require surveys to record surface movement including subsidence induced by mining, as directed by the Regulator. Such surveys shall be carried out in accordance with the standards set out in the S&DD (2020), or as otherwise directed by the Regulator.

Such surveys shall be carried out under the supervision of, and certified by, a Registered Mining Surveyor.

All subsidence survey data, including field notes, are to be kept at the mine in accordance with S&DD (2020). The Nominated Mining Surveyor shall make available, in a format specified by the Regulator all or any survey records or certified copies thereof.

The nominated mining surveyor will supply all subsidence effects monitoring data to the NSW RR in the manner and form and at the times required by the NSW RR.

4.4 Baseline Data

Surveys of the existing surface terrain and features (after the incremental subsidence from the Bulli, Balgownie and Wongawilli Seams) were conducted prior to the second workings in the Stage1 bord and pillar panels. Baselines will be established for the GNSS monitoring points of Stage 2 panels prior to the commencement of mining in these areas. Baseline subsidence monitoring from the GNSS units #1 to #17 up to 31 March 2022, except for GNSS#9 which only covers the period to 7 December 2021, is included in Appendix C. This monitoring is considered to reflect baseline conditions for EP1 and EP2 mining areas at those locations¹.

¹ Some shrink-swell soil effects can be seen in the monitoring data. As mining is yet to commence in the vicinity of all GNSS unit locations other than GNSS#9 (which monitors the early stages of PC21), a further review of baseline values will be undertaken prior to mining within 350m of each unit.

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4.5 Performance Measures, Indicators and TARPS for Subsidence Effects

The subsidence impact performance measures are specified in **Condition C1 Table 6** and **Condition C7 Table 7** of the Development Consent. For the non-caving mining method planned where the forecast of vertical subsidence is less than 100mm for the majority of the EP Areas and the upper limit of 300mm has been set as a performance measure, values of 100mm and 250mm for subsidence over the majority of the EP Areas are considered appropriate to activate trigger action response plans (TARPs) for the planned bord and pillar mining geometry.

The general vertical subsidence TARP for the majority of the surface terrain above the EP Areas is shown in **Appendix A**.

Similarly, 100mm additional closure from all mining in the Wongawilli Seam, is considered appropriate as a lower valley closure trigger for Cataract Creek with an upper level of 150mm consistent with the EPBC 2014/7259 approval conditions for Longwall 6 (400m). The total valley closure measurement TARP for Cataract Creek is shown in **Appendix A**. The trigger levels for the various measurements of incremental valley closure relative to the baseline surveys for bord and pillar mining are included in other TARPS.

Levels of vertical and horizontal movement below the maximum set out in the TARPS are considered appropriate as performance indicators for subsidence effects, notwithstanding an assessment of the impacts from the magnitude and extent of any greater movement than the maximum set.



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5 IMPLEMENTATION

This section details the implementation and application of subsidence monitoring strategies.

5.1 Subsidence Effects Monitoring

The locations of the planned subsidence effects monitoring installations and LiDAR coverage area are shown in **Figure 3**. A summary of the subsidence effects monitoring program, for the Stage1 and Stage 2 mining, consistent with the requirements of Development Consent and EPBC Approval 2020/8702 is included in **Table 5**.

The monitoring for built features has been agreed to by the asset owners during consultation and feedback. The monitoring detailed in **Table 5** is primarily the responsibility of WCL but also includes visual monitoring by TfNSW of their infrastructure.

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Figure 3 –Subsidence effects monitoring installations and LiDAR coverage area for natural and built features (source Umwelt 2022)

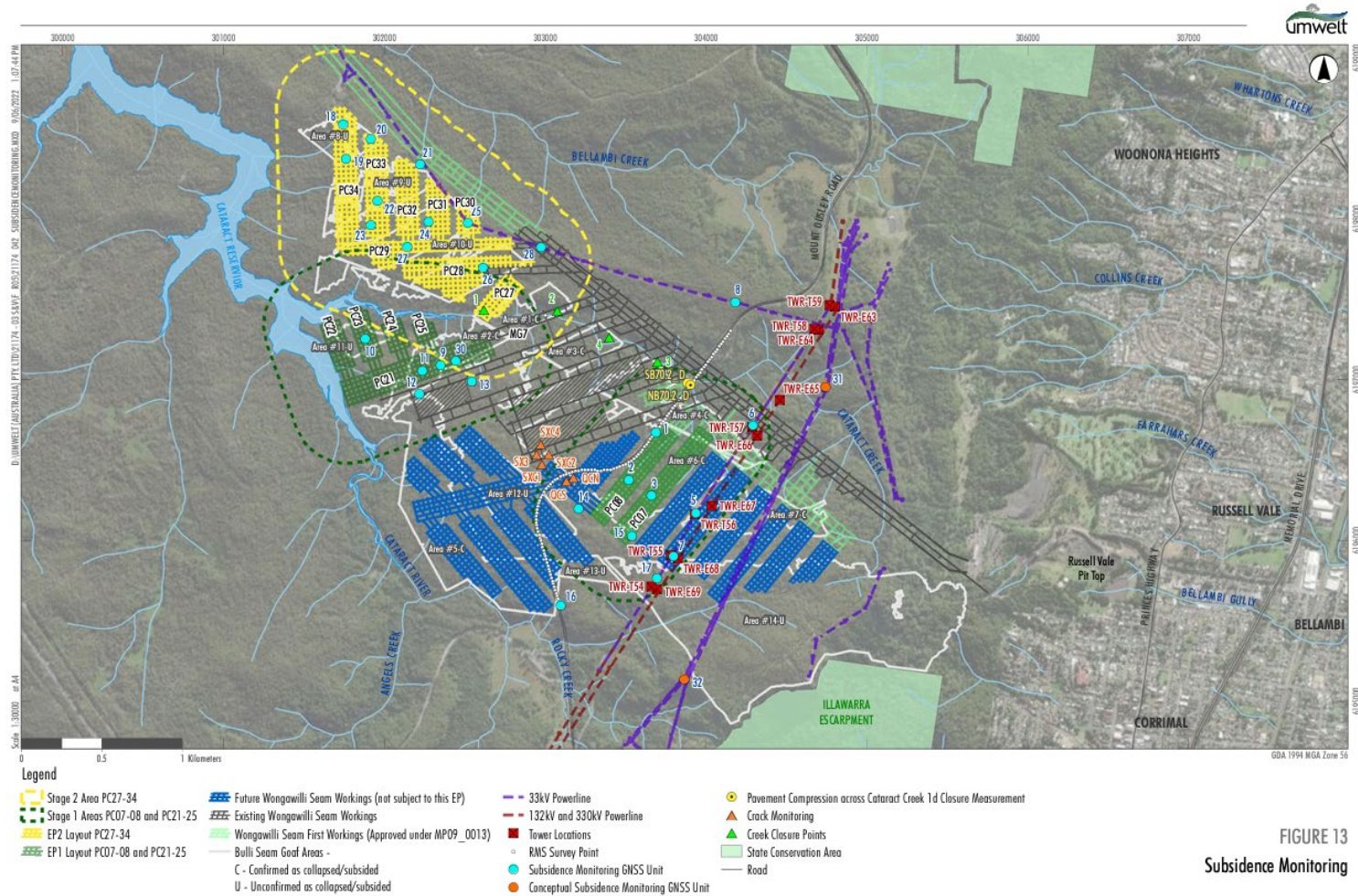


FIGURE 13
Subsidence Monitoring



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Table 5 – Subsidence Effects Monitoring Program

Note: near real-time GNSS readings = hourly readings -plotted as a daily average and filtered weekly

Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
GNSS Monitors							
PC08 M1 Mt Ousley Rd Upland Swamps	GNSS continuous Monitoring GNSS #1	General subsidence & valley closure Mt Ousley Pavement Upland Swamp: <ul style="list-style-type: none"> CCUS 20 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a nearreal-time basis Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a nearreal-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, GNSS data reviewed weekly during mining Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report
PC08 (Bulli & Balgownie goaf) M1 Mt Ousley Rd Upland swamps	GNSS continuous Monitoring GNSS #2	General subsidence Mt Ousley Rd Upland Swamps: <ul style="list-style-type: none"> CCUS 1 CCUS 20 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a nearreal-time basis, Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a nearreal-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
PC07 (Bulli & Balgownie goaf) Upland swamps	GNSS continuous Monitoring GNSS #3	General subsidence Upland Swamps: <ul style="list-style-type: none"> CCUS1 CCUS2 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis, Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report
TransGrid 330kV tower T56 Endeavour Energy 132KV tower E67. (Balgownie goaf)	GNSS continuous Monitoring GNSS #5	General subsidence & at powerlines	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis, Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
TransGrid 330kV KV Powerline tower T57 Endeavour Energy 132KV tower E66 (Bulli pillars)	GNSS continuous Monitoring GNSS #6	General subsidence & at powerlines	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis, Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) Baseline or second workings reporting – Status report
TransGrid 330kV Powerline tower T55 Endeavour Energy 132KV Tower E 68 (solid coal)	GNSS continuous Monitoring GNSS #7	General subsidence & at powerlines	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis, Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) Baseline or second workings reporting – Status report



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
WCL easement (Bulli goaf) M1 Mt Ousley Rd	GNSS continuous Monitoring GNSS #8	General subsidence & valley closure	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Monthly Status report
PC21 (Bulli goaf #2)	GNSS continuous Monitoring GNSS #9, #30	General subsidence	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis, Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC, DPE, EE, TG Status report



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
PC23 (Bulli goaf #11)	GNSS continuous Monitoring GNSS #10	General subsidence	1D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC, DPE, EE, TG Status report
PC21 (Bulli goaf #2) Upland swamps	GNSS continuous Monitoring GNSS #11	General subsidence Upland Swamp: <ul style="list-style-type: none"> CCUS5 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC, DPE, EE, TG Status report



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
PC21 (edge Bulli & Wongawilli goaf) Upland swamps	GNSS continuous Monitoring GNSS #12	General subsidence Upland Swamp: <ul style="list-style-type: none"> CRUS 1 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC, DPE, EE, TG Status report
PC21 (Balgownie goaf) Upland swamps	GNSS continuous Monitoring GNSS #13	General subsidence Upland Swamp <ul style="list-style-type: none"> CCUS 4 CCUS 3 CCUS 6 CCUS 23 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC, DPE, EE, TG Status report



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
PC08 (Bulli pillars) M1 Mt Ousley Rd	GNSS continuous Monitoring GNSS #14	General subsidence (Bulli pillars) Upland Swamps: <ul style="list-style-type: none"> CCUS 15 CCUS 17 CCUS 18 CCUS 19 CRUS 3 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report
PC07 (Bulli pillars) Upland swamps	GNSS continuous Monitoring GNSS #15	General subsidence (Bulli pillars) Upland Swamps: <ul style="list-style-type: none"> CCUS2 CRUS 3 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
M1 Mt Ousley Rd TfNSW- RMS Infrastructure- Picton Rd Bridge	GNSS continuous Monitoring GNSS # 16	General subsidence between second workings panels and RMS infrastructure at Picton Road interchange.	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report
TransGrid 330kV Powerline tower T54 & Endeavour Energy 132KV Tower E69	GNSS continuous Monitoring GNSS # 17	General subsidence & at powerlines	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
PC34 Fire Trail Upland Swamps	GNSS continuous Monitoring GNSS #18	General subsidence & at fire trail Upland Swamp: <ul style="list-style-type: none"> CRUS7 To the north of PC34 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining Quarterly for 12 months after cessation of mining	RR Subsidence Portal Website (20 days after period) TC Status report
PC34 Fire Trail Upland Swamps	GNSS continuous Monitoring GNSS #19	General subsidence & at fire trail Upland Swamps: <ul style="list-style-type: none"> CCUS13 Swamps to west of PC34 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
PC33 Fire Trail Upland Swamps	GNSS continuous Monitoring GNSS #20	General subsidence & at fire trail Upland Swamp: <ul style="list-style-type: none"> BCUS7 Swamps to north west of PC33 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report
PC32 Fire Trail Upland Swamps	GNSS continuous Monitoring GNSS #21	General subsidence Upland Swamp: <ul style="list-style-type: none"> BCUS6 Swamps to north-east of PC32 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
PC33 Fire Trail Upland Swam PC34 Fire Trail Upland Swamps	GNSS continuous Monitoring GNSS #22	General subsidence Upland Swamp: <ul style="list-style-type: none"> CRUS6 CCUS12 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report
PC33 Fire Trail Upland Swamps	GNSS continuous Monitoring GNSS #23	General subsidence Upland Swamp: <ul style="list-style-type: none"> CCUS12 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report



Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	7/10/2022
Doc Title	Extraction Plan - Subsidence Monitoring Program for Stage1 and Stage2 mining		

Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
PC31 Fire Trail Upland Swamps	GNSS continuous Monitoring GNSS #24	General subsidence Upland Swamps: <ul style="list-style-type: none"> BCUS11 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report
PC30 Fire Trail Upland Swamps	GNSS continuous Monitoring GNSS #25	General subsidence Upland Swamps: <ul style="list-style-type: none"> BCUS4 Swamps to the north-east of workings 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
PC28 Upland Swamps	GNSS continuous Monitoring GNSS #26	General subsidence Upland Swamps: <ul style="list-style-type: none"> CCUS10 CCUS11 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report
PC29 Upland Swamps	GNSS continuous Monitoring GNSS #27	General subsidence Upland Swamps: <ul style="list-style-type: none"> CCUS24 BCUS11 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
Mains Headings Fire Trail Upland Swamps	GNSS continuous Monitoring GNSS #28	General subsidence Upland Swamps: <ul style="list-style-type: none"> CCUS9 BCUS2 Swamps to the north-east/east of workings 	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report
PC21	GNSS continuous Monitoring GNSS #30	General subsidence	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
33 kV powerline at tension tower	GNSS continuous Monitoring GNSS #31	General subsidence 33 kV powerline	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report
33 kV powerline at tension tower	GNSS continuous Monitoring GNSS #32	General subsidence 33 kV powerline	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> During mining GNSS data recorded on a near real-time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	During Mining <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	RR Subsidence Portal Website (20 days after period) TC Status report



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
LiDAR							
Russell Vale East Coverage - including Mt Ousley Road, Picton Road interchange, Illawarra Escarpment, Powerlines and Cataract Reservoir	LiDAR	General subsidence - all surface features	3D +/- 200mm	As minimum, after each panel area (refer to Section 4.1) or annual or by TARP	WCL	As minimum, 3 months after each panel or annual or TARP survey	Website (20 days after survey) and email to DAWE, TfNSW-RMS, TG, EE, DPE, RR
Underground Monitoring							
All features	Geotechnical Mapping Wongawilli Seam pillar stability	General subsidence - all surface features	N/A	Daily	WCL	As minimum, 3 months after each panel or annual or TARP survey	Website (20 days after survey) and email to DAWE, TfNSW-RMS, TG, EE, DPE, RR
Infrastructure – TfNSW							
Mt Ousley Rd Carriageway General Carriageway–Cataract Creek (100m) Carriageway-Mt Ousley Road – tension zone at ridge	GNSS continuous Monitoring GNSS # 1, 2, 8, 14, 16	General Subsidence	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings for GNSS units (GNSS, 1, 2, 8, 14, 16). During mining <ul style="list-style-type: none"> Weekly During mining GNSS data recorded on a near real-time basis as per specific GNSS detail (GNSS, 1, 2 and or 8, 14, 16). Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis End of Panel Report (inclusive of sub panels) 	WCL	Prior to second workings <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> Mining area GNSS data to be reviewed weekly or as determined by Technical Committee, As required by TARP trigger. Post Mining <ul style="list-style-type: none"> Summary in End of Panel Report (inclusive of sub panels) 	Email to TfNSW, DPE, RR (in status report) Website (20 days after period) Status report End of Panel Report (inclusive of sub panels)



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
	Cataract Creek Valley Closure CC1- CC4	Valley Closure/ pavement compression	1D +/-3mm	Cataract Creek Valley Closure During Mining <ul style="list-style-type: none"> Valley closure at Cataract Creek: Relative movement between 1<->8 and 2<->8 Quarterly survey of CC1- CC4 valley closure, or in response to TARP trigger. Post Mining <ul style="list-style-type: none"> End of Panel survey 	WCL	Cataract Creek Valley Closure CT1- CT4 During Mining GNSS – between 1 and 8 and 2 and 8. <ul style="list-style-type: none"> Quarterly CT1-CT4 Post Mining <ul style="list-style-type: none"> consolidated in End of Panel Report (inclusive of sub panels) 	
	GNSS Relative movement between 14<->16 and 2<->16	Ground movement at tension zone on ridgeline	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings for GNSS units (GNSS, 1, 2, 8, 14, 16). During mining <ul style="list-style-type: none"> Weekly During mining GNSS data recorded on a near real-time basis as per specific GNSS detail (GNSS, 1, 2 and or 8, 14, 16). Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a real time basis End of Panel reporting (inclusive of sub panels) 	WCL	Prior to second workings <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> Mining area GNSS data to be reviewed weekly or as determined by Technical Committee, As required by TARP trigger. Post Mining <ul style="list-style-type: none"> Summary in End of Panel Report (inclusive of sub panels) 	



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
	Crackmeter Across slot on each carriageway	Pavement Compression Slot closure on southbound and northbound carriageways	1D +/- 1mm	Prior to second workings <ul style="list-style-type: none"> Monthly crack meter readings prior to second workings. During mining <ul style="list-style-type: none"> Weekly During mining with slot monitoring data recorded on a real time basis. Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a real time basis. End of Panel reporting (inclusive of sub panels) 	WCL	Prior to second workings <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> Mining area GNSS data to be reviewed weekly or as determined by Technical Committee, As required by TARP trigger. Post Mining <ul style="list-style-type: none"> Summary in End of Panel Report (inclusive of sub panels) 	
	GNSS Relative movement between 1<->8 and 2<->8	Valley closure at Cataract Creek:	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings GNSS data recorded on a near real-time basis as per specific GNSS detail (GNSS 1<->8 and 2<->8) During mining <ul style="list-style-type: none"> Weekly During mining GNSS data recorded on a near real-time basis as per specific GNSS detail (GNSS 1<->8 and 2<->8) Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis. End of Panel Report (inclusive of sub panels) 	WCL	Prior to second workings <ul style="list-style-type: none"> GNSS readings prior to second workings, During mining <ul style="list-style-type: none"> Mining area GNSS data to be reviewed weekly or as determined by Technical Committee, As required by TARP trigger. Post Mining <ul style="list-style-type: none"> Summary in End of Panel Report (inclusive of sub panels) 	



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
	Tension crack survey line survey SXC1 – SXC2, SXC3 – SXC4 and QCN – QCS	Tension crack monitoring	1D ±/- 3mm	Tension crack survey line survey During Mining <ul style="list-style-type: none"> In response to GNSS TARP trigger End of panel <ul style="list-style-type: none"> Within three months of completion of second workings panel 	WCL	Tension crack survey line survey <ul style="list-style-type: none"> TARP reporting End of Panel Report (inclusive of sub panels) - Within three months of completion of second workings panel. 	
	Q-line southbound pavement line survey	General subsidence and strain along southbound carriageway.	3D +/- 15mm	Q-line southbound pavement line survey During Mining <ul style="list-style-type: none"> In response to GNSS TARP trigger End of panel <ul style="list-style-type: none"> Within three months of completion of second workings panel 	WCL	Q-line southbound pavement line survey <ul style="list-style-type: none"> TARP reporting End of Panel Report (inclusive of sub panels) - Within three months of completion of second workings panel. 	
	TfNSW Drive through inspection	Drive through inspection by TfNSW Network Inspector -	carried out at traffic speed	TfNSW Drive through inspection During mining and Post Mining <ul style="list-style-type: none"> TfNSW undertake twice weekly drive-through inspections (done at traffic speed). 	TfNSW	TfNSW Drive through inspection Reporting by exception - report any new potentially mining related defects	



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
Bridges Picton Rd interchange - B7926 Steel Arch over Rocky Creek Culvert - B7932 Culvert over Cataract River - B814	GNSS continuous Monitoring GNSS #16	General horizontal ground movements Between second workings panels and RMS infrastructure at Picton Road interchange, and other bridges.	3D +/- <20mm	Prior to mining <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings for PC 07 and PC08, During Mining <ul style="list-style-type: none"> Weekly review during mining of GNSS data readings on a real time basis as per specific GNSS detail (GNSS 16), and monthly in all other areas. Post Mining <ul style="list-style-type: none"> Quarterly review for 12 months after cessation of mining 	WCL	Prior to second workings <ul style="list-style-type: none"> Baseline prior to second workings, During mining <ul style="list-style-type: none"> Weekly review during mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining- 	Email to TfNSW, DPE, RR (in status report) Website (20 days after period) Status report End of Panel Report (inclusive of sub panels)
	TfNSW Drive-through inspections:	TfNSW twice weekly drive through inspection	At traffic speed by TfNSW.	TfNSW Drive-through inspections: Twice weekly	TfNSW	TfNSW to report on new defects and comment on possible repairs required.	
	Prism Survey Existing monitoring prisms on Picton Rd Bridge. Culverts	Prism Survey <ul style="list-style-type: none"> Prism X,Y,Z movements between any pair of prisms. 	3D ±/-2mm 1D, +/-1mm	Prior to mining <ul style="list-style-type: none"> Baseline survey During Mining <ul style="list-style-type: none"> As required by TARP trigger Post Mining <ul style="list-style-type: none"> End of Panel Report (inclusive of sub panels) - Within three months of completion of second workings panel. 	WCL	During Mining <ul style="list-style-type: none"> As required by TARP Annual Post Mining Within three months of each panel	
	Visual inspection By TfNSW certified Bridge Engineer	General condition of bridge	-	Visual inspection After amber trigger and then as determined by TC	WCL	As required by TARP	



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
Culverts Cataract Creek Culverts (North and South)	GNSS continuous Monitoring GNSS #1, 2, 8, 14, and 16)	GNSS General subsidence and ground movement	3D +/- <20mm	Prior to Mining <ul style="list-style-type: none"> Quarterly review of continuous GNSS readings prior to second workings for PC 07 and PC08, During mining <ul style="list-style-type: none"> Weekly review of GNSS data recorded on a near real-time basis over active mining area, and monthly in all other areas, Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining 	WCL	Prior to second workings <ul style="list-style-type: none"> Baseline prior to second workings, During mining <ul style="list-style-type: none"> Weekly review during mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining <ul style="list-style-type: none"> Quarterly for 12 months after cessation of mining- 	Email to TfNSW, DPE, RR (in status report) Website (20 days after period) Status report
	Survey <ul style="list-style-type: none"> CC1-CC4: quarterly Q-line Culvert Prims 	Survey General subsidence along or nearby culverts	1D, +/- 3mm 3D, +/- 15mm 1D, +/- 1mm	During Mining <ul style="list-style-type: none"> As required by TARP trigger Post Mining <ul style="list-style-type: none"> Q-line Survey Within three months of completion of second workings panel. Post Mining <ul style="list-style-type: none"> Quarterly Cataract creek for 12 months after cessation of mining- 	WCL	<ul style="list-style-type: none"> As required by TARP 	
	TfNSW Drive-through inspections Visual inspection By TfNSW Engineer	General condition of culvert and any movements at joints	-	During mining and Post Mining TfNSW Drive through inspections TfNSW undertake twice weekly drive-through inspections (done at traffic speed).. Visual inspection After amber trigger and then as determined by TC	TfNSW	TfNSW Drive through inspection <ul style="list-style-type: none"> Reporting by exception - report any new potentially mining related defects As required by TARP Visual inspection After amber trigger and then as determined by TC	



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
Slopes ARL2 – 955771/ 95770/ 13482 ARL3 – 10839/ 13483/ 13484/ 13485	GNSS continuous Monitoring GNSS 1, 2, 8, 14, 16	GNSS Valley closure at Cataract Creek: Relative movement between 1<->8 and 2<->8 14<->16 and 2<->16 General subsidence GNSS 1, 2, 8, 14, 16	3D +/- <20mm	Prior to second workings <ul style="list-style-type: none"> Monthly GNSS readings prior to second workings for GNSS units (GNSS 1<->8 and 2<->8).and General Subsidence –GNSS 1, 2, 8, 14, 16 During mining <ul style="list-style-type: none"> Weekly During mining GNSS data readings on a near real-time basis as per specific GNSS detail (GNSS 1<->8 and 2<->8). General Subsidence – GNSS 1, 2, 8, 14, 16 Post Mining <ul style="list-style-type: none"> Data continued to be recorded on a near real-time basis. End of Panel Report (inclusive of sub panels). 	WCL	Prior to second workings <ul style="list-style-type: none"> Baseline prior to second workings, During mining <ul style="list-style-type: none"> Weekly review during mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post Mining Quarterly for 12 months after cessation of mining-	Email to TfNSW, DPE, RR (in status report) Website (20 days after period) Status report
	TfNSW Drive-through inspections	General condition of slope	-	During mining and Post Mining TfNSW Drive through inspections TfNSW undertake twice weekly drive-through inspections (done at traffic speed)..	TfNSW	TfNSW Drive through inspection <ul style="list-style-type: none"> Reporting by exception - report any new potentially mining related defects As required by TARP 	
	Visual inspection Inspection by geotechnical engineer	Inspection of slope to assess changes from previous condition.		Visual inspection After amber trigger and then as determined by TC Carry out visual inspection of slope to assess changes in slope condition.	WCL	Visual inspection After amber trigger and then as determined by TC	



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
TransGrid and Endeavour Energy infrastructure							
TransGrid 330kV towers	GNSS #5, 6, 7, and 17 Tower survey points	<ul style="list-style-type: none"> General Subsidence Leg diff measurements Tilt 	3D, +/- <20mm 1D ±2mm 0.5mm/m	Before mining Review of PC 21 subsidence data against predictions Continuous GNSS Data review monthly During Mining Continuous GNSS Data review weekly Tower Survey After each panel or annual or by TARP trigger	WCL	Within 3 months after each panel or annual or TARP survey*	Email to TransGrid, DPE, RR (in status report) Website (20 days after period) Monthly status report
Endeavour Energy 132kV Towers	GNSS #5, 6, 7, and 17 Towers survey points	Towers <ul style="list-style-type: none"> General Subsidence (GNSS) Leg diff measurements Tilt 	3D, +/- <20mm 1D ±2mm 0.5mm/m	Before mining Review of PC 21 subsidence data against predictions Continuous GNSS Data review monthly During Mining Continuous GNSS Data review weekly Tower Survey After each panel or annual or by TARP trigger	WCL	Within 3 months after each panel or annual or TARP survey*	Email to Endeavour Energy, DPE, RR (in status report) Website (20 days after period) Monthly status report
Endeavour Energy 33kV Towers	GNSS #31, #32 Towers survey points	Towers <ul style="list-style-type: none"> General Subsidence (GNSS) Tilt 	3D, +/- <20mm 1D ±2mm 0.5mm/m	Before mining Review of PC 21 subsidence data against predictions Continuous GNSS Data review monthly During Mining Continuous GNSS Data review weekly Tower Survey After each panel or annual or by TARP trigger	WCL	Within 3 months after each panel or annual or TARP survey*	Email to Endeavour Energy, DPE, RR (in status report) Website (20 days after period) Monthly status report



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Feature	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
Visual inspections and photos	TransGrid and Endeavour Energy Infrastructure	Inspect for visual damage	n/a	After each panel or annual or by GNSS TARP trigger	WCL	Within 3 months after each panel or annual or TARP survey*	Email to Endeavour Energy, TransGrid, DPE, RR (in status report) Website (20 days after period) Monthly status report
Survey Control Stations							
Mount Ousley Road Permanent marks (PM) and state survey mark (SS)	PM173135 PM173136 PM173728, PM173137 SS165830 SS14867 SS16583	Inspect for subsidence impacts	3D, ±2mm	Monitored via NRTK survey every 6 months during secondary workings.	WCL	Within 3 months after each panel or annual or TARP survey	Website (20 days after period) 6 Monthly status report

Notes – Reporting frequency excludes notification of incident or non-compliance.

Reporting includes an evaluation of the risk of the 100mm subsidence limit at swamps (EPBC 2020/8702) being reached or exceeded.

The control for each subsidence survey will be undertaken consistent with S&DD (2020) – *Each control survey and subsidiary survey must be planned, surveyed and analysed to ensure they satisfy the conditions to achieve a standard of accuracy as prescribed in ICSM (2007) SP 1 (version 1.7) to achieve Class "D" or better, and consideration of the impact of far-field effects on the stability of permanent survey marks.*

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5.2 Trigger Action Response Plans

In the event of an exceedance of a subsidence threshold, mining in the area of the observed exceedance will cease pending an investigation of the cause.

The monitoring of subsidence effects and impacts in conjunction with the Trigger Action Response Plans (TARPS) detailed in each of the management plans / monitoring programs provide:

- monitoring requirements (may include different locations);
- trigger levels that indicate a potential non-compliance or flag implementation of contingency measures;
- management and contingency actions (i.e. corrective and preventative actions) and reporting requirements;
- responsibilities; and
- timing.

TARPs detail how the various predicted subsidence impacts, monitoring components, performance measures, and responsibilities are structured to achieve compliance with the relevant statutory requirements. They also form the framework for adaptive management and contingency actions. These TARPS relate to subsidence related impacts and are based on the management of predicted impacts associated with subsidence up to the 300mm permitted under the development consent. This level of vertical subsidence is predicted to have no more than negligible impacts on any sites.

The TARP system provides a simple, transparent and useable reference of the monitoring of environmental performance and the implementation of management and/or contingency measures. Due to the nature of predicted impacts associated with the proposed second workings, Performance Measure TARPs have been established.

Table 6 below outlines the trigger level definitions to be applied to the Performance Management TARPs provided within **Appendix A** of this document, and the main EP.

Table 6 – Subsidence Trigger Level Descriptions

TRIGGER LEVEL	DESCRIPTION
Level 1	No exceedance of level 2 or level 3 triggers. Operations continue as normal. Less than 100mm recorded subsidence.
Level 2	Minor or persistent changes in monitoring results indicate potential alteration of the environment (could be natural or mining related) or impacts outside of predictions. Internal investigation of potential causes required to determine if there is potential to cause material harm due to mining operations. Exceedances of subsidence triggers may result on implementation of adaptive management measures.

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TRIGGER LEVEL	DESCRIPTION
	100mm to 300mm recorded subsidence.
Level 3	<p>Significant change in monitoring results indicates a likely alteration of the environment (could be natural or mining related) or impacts outside of predictions.</p> <p>Investigation into potential causes required to determine if material harm has been caused due to mining operations. External notification of <i>potential</i> incident required for Performance Measures TARPs.</p> <p>Exceedances of subsidence triggers will result on implementation of adaptive management measures.</p> <p>Greater than 100mm vertical subsidence at a Coastal Upland Swamp</p> <p>Greater than 300mm recorded subsidence.</p>

If monitoring indicates a Level 2 or 3 trigger has been reached, an investigation will occur in all circumstances. The nature of the investigation will depend on the feature being monitored, the location of the trigger exceedance and Trigger level exceeded among other matters. Different investigation options are discussed in detail in the management plans specific to the feature being monitored.

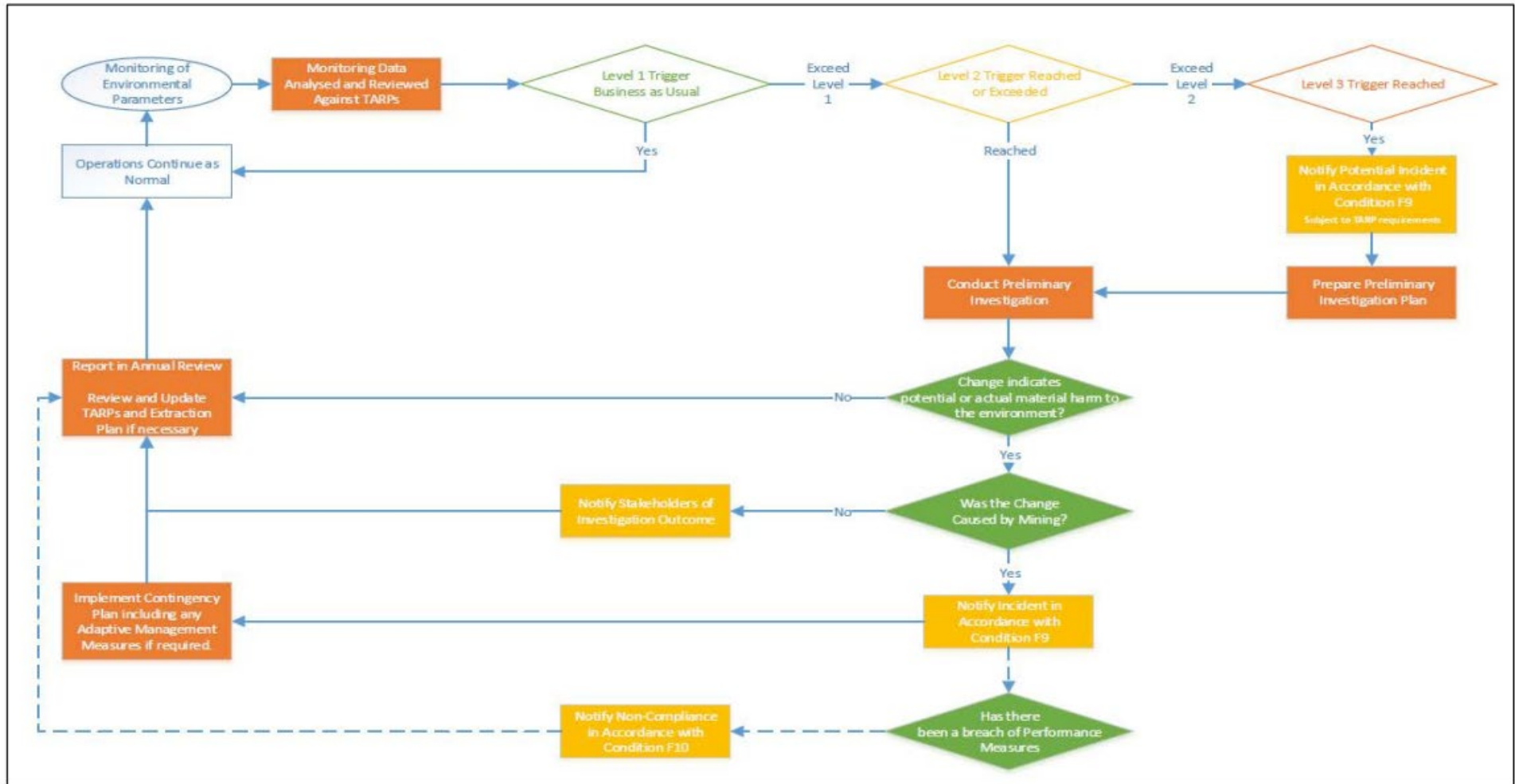
Note: Level 3 TARP triggers related to performance measures (referred to as 'Performance Measure TARPS') do not, of themselves, constitute an incident or non-compliance under the Development Consent. Investigations following a Level 3 trigger will determine whether an exceedance or non-compliance of the performance measures or Development Consent conditions is likely or has occurred.

In the unlikely event that investigations of Level 3 Performance Measure TARP trigger exceedances determine that material harm has occurred and is attributable to the development approved under the Development Consent, the contingency plan and adaptive management measures outlined within **Section 5.3** will be implemented. In certain cases, management measures may be implemented in the absence of any clear link between the approved development and the observed impact to mitigate adverse environmental outcomes. Response to matters which are identified as Incidents or Non-Compliances will be implemented in consultation with relevant stakeholders.

Figure 4 provides a flow chart covering the TARP Process as located in **Appendix A** of the main EP.

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Figure 4 – Performance Measure TARP Process



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5.3 Adaptive Management

Where investigations triggered by the Performance Measure TARPS indicate that the changed conditions of sites have been, or are likely to have been, caused by mining operations, the response to these impacts include adaptive management measures to ensure further impacts to the site will not occur or be mitigated or that impacts to future sites do not occur in the future. Where underground geotechnical mapping monitoring indicates there is potential for pillar instability in overlying Bulli Seam goaf areas, the measures to be adopted will depend on the nature of surface features present in the area immediately overlying the area, the likely extent of subsidence impacts based on a review of historical mine plans and the performance measures applicable to the overlying areas and features.

The purpose of this adaptive management measures are to implement additional measures where necessary to:

- enable potential impacts associated with higher than predicted subsidence impacts to be monitored; and/or
- the implementation of changes in mining operations to prevent performance criteria from being exceeded.

Due to the nature of the proposed mining and low likelihood of underground mining resulting in any impacts to the site provided subsidence impacts remain within predictions, the adaptive management measures (if any) to be implemented, will be considered in the investigation process. In circumstances where it is considered that a continuation of mining is unlikely to result in an exceedance of performance measures, adaptive management measures may not be necessary.

Adaptive management measures to be implemented in the event of a clear linkage between the mining authorised under the development consent and Historical and Aboriginal Cultural Heritage items or Upland Swamps will include a review of the design and layout of future mining within areas that may potentially impact on such items to avoid a recurrence of any such impacts.

Common adaptive management measures available include:

- stop mining and investigate causes of the exceedance of subsidence predictions or performance measures (or the potential to result in an exceedance).
- undertake a review of the panel design parameters in consultation with the resource regulator.

The Contingency Planning process set out in **Section 5.7** also covers this process.

WCL will assess and manage development-related risks to ensure that there are no exceedances of the criteria and/or performance measures in the development consent in accordance with Condition F4 of Part F. Any exceedance of the subsidence criteria and/or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation, notwithstanding offsetting actions taken. Where any exceedance of these criteria and/or performance measures has occurred, WCL will at the earliest opportunity:

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- take all reasonable and feasible steps to ensure the exceedance ceases and does not re-occur;
 - consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action;
 - within 14 days of the exceedance occurring, submit a report to the Secretary describing these remediation options and any preferred remediation measures or other course of action; and
 - implement remediation measures as directed by the Planning Secretary,
- to the satisfaction of the Secretary.

5.4 Subsidence Impacts Monitoring

Subsidence impacts monitoring is outlined in each of the key component subsidence management plans/monitoring programs of the main EP document and are attached as Appendix A to the main EP document. Specific subsidence effects monitoring TARPs are located in key component subsidence management plans/monitoring programs, as well as **Appendix A** of this SMP.

5.5 Interpretation and Analysis

GNSS monitoring results will be reviewed at least weekly by Group Environment Manager.

Review of underground mining conditions and pillar stability will be undertaken by the mining supervisor.

Further detailed interpretation of subsidence effects monitoring data for assessment of TARP actions, assessment of compliance with performance measures or indicators, and other reporting requirements, including the analysis of subsidence data in the annual review, will be undertaken by a competent subsidence specialist.

The interpretation of the monitoring results will include analysis of the predictions from the subsidence assessment for this EP to validate those forecasts in the assessment and provide an indication for further assessment of potential environmental effects where monitoring results differ from forecasts.

5.6 Incidents, Non-Compliances and Exceedances

According to the Development Consent:

- An 'incident' is defined as "an occurrence or a set of circumstances that causes or threatens to cause material harm and which may or not be or cause a non-compliance". Examples may include a breach of specific Development Consent criteria or performance measure.
- An 'exceedance' or 'non-compliance' is defined as "an occurrence, set of circumstances or development that is a breach of this consent".

In both circumstances, an Incident or Non-Compliance must be attributable to the development approved under the Development Consent.

Material harm is defined in the approval as:

"harm to the environment that:

- involves actual or potential harm to the health or safety of human beings or to the environment that is not trivial, or

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- results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding \$10,000 (such loss includes the reasonable costs and expenses that would be incurred in taking all reasonable costs and expenses that would be incurred in taking all reasonable and practical measures to prevent, mitigate or make good harm to the environmental)."

This definition excludes "harm" that is authorised under either this consent or any other consent.

The proposed 'second workings' which trigger the requirement for this EP are long term stable bord and pillar workings which are predicted to have only negligible subsidence effects. Incidents and associated reporting requirements will be managed through established procedures set out in Section 7.2 of the EP.

5.7 Contingency Plans

In accordance with Conditions C10 and F5 of the Development Consent, in the event of an incident, non-compliance or exceedance in accordance with the Development Consent conditions, WCL will implement the following general measures in conjunction with the RVC EMS and Pollution Incident Response Management Plan (PIRMP) (if required):

- The observation will be reported to the WCL Group Environment Manager as soon as possible;
- The observation will be recorded;
- An investigation will be undertaken to identify the cause of the observation;
- WCL will assess the observation in accordance with the TARP and where appropriate, implement any necessary safety of mitigations measures in accordance with the appropriate Management Plan/s;
- In the event of an exceedance of the performance measures or a non-compliance with the Development Consent, WCL will report the exceedance or non-compliance to DPE and other relevant stakeholders as soon as practicable after WCL becomes aware of the exceedance/non-compliance;
- In the event of an incident that has caused or has the potential to cause significant risk of material harm to the environment, WCL will notify DPE and other relevant agencies immediately after it becomes aware of the incident. A detailed report of the incident shall be provided to the Secretary of DPE within 7 days of the incident occurring consistent with Condition F10 of the Consent.
- The Group Environment Manager will investigate any potential contributing factors and identify an appropriate action plan to manage the identified impact(s), in consultation with specialists and/or relevant agencies if necessary;
- WCL will identify an appropriate action plan to manage the identified impact(s), in consultation with other specialists and/or key stakeholders;
- WCL will submit the proposed course of action to DPE for approval;
- WCL will implement the approved course of action to the satisfaction of DPE; and
- WCL will continue to monitor performance with the new action plan in place and, if successful will formalise these actions as part of the Management Plan.

Contingency measures will be developed in consideration of the specific circumstances of the issue and the assessment of consequences.

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5.8 Reporting

Reporting related to asset owners of built features and other key stakeholders is outlined in management plans and monitoring programs required for this EP by the Development Consent.

Reporting of the environmental performance of the development to DPE and any other relevant government agencies or interested parties (including local councils and community consultative committee) is required in the incident notification, non-compliance notification and annual review provisions of MP09_0013.

EPBC Approval 2020/8702 requires the measurement of vertical subsidence at swamps, within 350m of the second workings, at weekly intervals. The monitoring data and an evaluation of compliance with performance measures of MP09_0013 are required to be publish on the WCL website and submitted to DAWE following each three-monthly period.

For this EP for Stage1 and Stage2 mining, reporting to DPE and the NSW RR will be completed in accordance with the reporting framework requirements outlined in the Extraction Plan Guidelines (DPE 2015) are summarised in **Table 7**. Consistent with the provisions of DPE (2015) bimonthly reporting has been adjusted to align with the three-monthly reporting requirement of EPBC Approval 2020/8702.

Table 7 – Reporting framework for this SMP

Reporting Requirement	Summary	Reporting Method
Incident Reporting	Following any occasion of incident, in accordance with the conditions of consent and/or any requirements in the TARP(s);	Email or phone call – NSW RR/ DPE.
Quarterly Reporting	<ul style="list-style-type: none"> Quarterly subsidence impact reporting, following regular monthly inspections, but only if any new impact is identified. Impacts will be clearly distinguished between those which are within predictions, those which exceed predictions but remain within performance measures and/or performance indicators, and those which exceed performance measures and/or performance indicators. <p>Impact reporting must include a full description, location identification using aerial photos with longwall layout superimposed, good photos of the impact, and preliminary characterisation of the impact in accordance with the relevant TARPs.</p>	<p>Quarterly if new impacts are identified.</p> <p>NSW RR portal.</p> <p>Major Projects Planning Portal – DPE.</p>
Six-monthly Reporting	<p>Six-monthly reporting of all subsidence impacts and related environmental monitoring results, including:</p> <ul style="list-style-type: none"> a comprehensive summary of all impacts, including a revised characterisation according to the relevant TARP(s); any proposed actions resulting from Triggers being met in a TARP, or other actions; assessment of compliance with all relevant performance measures and indicators; and 	<p>NSW RR portal.</p> <p>Major Projects Planning Portal – DPE.</p>



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Reporting Requirement	Summary	Reporting Method
	a comprehensive summary of all quantitative and qualitative environmental monitoring results, including landscape monitoring, water quality data, water flow and pool level data, piezometer readings, etc.	
Annual Review	<ul style="list-style-type: none"> Annual Review (or Annual Environmental Management Report) reporting. Report to be based on each two successive six-monthly reports of impacts and environmental monitoring results. <p>A summary of subsidence effects monitoring results is also to be included.</p>	NSW RR portal. Major Projects - Planning Portal – DPE

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6 PLAN ADMINISTRATION

6.1 Roles and Responsibilities

To ensure adequate implementation of this SMP, various roles and key responsibilities listed in EP document have been assigned to relevant WCL personnel. In addition to generic responsibilities for WCL personnel, this SMP includes specific responsibilities for the nominated mining surveyor and other specialists.

It is also noted that additional responsibilities are referred to within the relevant management plans which form part of the overall EP. Environment and community management is regarded as part of the responsibilities of all Colliery personnel. The roles and function of the main personnel responsible for the implementation of environmental and community management including the plans, procedures and actions are outlined in WCL's Management Operating System.

6.2 Resources Required

In accordance with the WCL SYS POL 003 Environmental Policy, Management shall ensure that the appropriate resources are made available to achieve the implementation of this SMP.

It is the role of the Group Environment Manager to ensure that these requirements are communicated to WCL Management.

6.3 Training

Staff training will consist of three levels of applicable to different types of staff:

- Level 1 – High level training on environmental legislative requirements (management staff)
- Level 2 – Operational level training (project managers, supervisors, surface personnel, control room operators)
- Level 3 – Basic awareness of environmental management (underground staff, all personnel).

Targeted training will be provided as required for all workers relevant to their activities to provide them with the knowledge, skills and awareness to minimize environmental impacts where they are undertaking an activity with a high risk of potential environmental impact in accordance with **Condition A28** of the Development Consent

The Group Environment Manager/Site Environment Representative and Mine Training Manager will review the training program and monitor its implementation.

6.4 Inductions

All personnel, including contractors, sub-contractors and staff, are required to attend a compulsory site induction that includes an environmental component prior to commencement on site.

The environmental component will include an overview of:

- relevant details of this Management Plan, including purpose and objectives
- key environmental issues



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-
- conditions of environmental licences, permits and approvals
 - mitigation measures for environmental issues
 - incident response and reporting requirements.

A record of all environmental training and inductions will be maintained and kept on site. The Group Environment Manager or delegate may authorise amendments to the induction where required to address project modifications, legislative changes or amendments to this Management Plan or related documentation.

The Environment Manager/Site Environment Representative will review and endorse the induction program and monitor its implementation.

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7 AUDIT AND REVIEW

7.1 Annual Review

In accordance with **Condition F11** of the Development Consent, an Annual Review (AR) of the environmental performance of the project is prepared.

The AR will:

- describe the development (including rehabilitation) that was carried out in the previous calendar year and the development that is proposed to be carried out over the current year
- include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, including a comparison of these results against the:
 - relevant statutory requirements, limits or performance measures/criteria
 - requirements of any plan or program required under the Development Consent
 - monitoring results of previous years
 - relevant predictions in the EA documents listed in the Development Consent **Condition A2(c)**
- identify any non-compliance or incidence which occurred in the previous calendar year, and describe what actions were (or are being) taken to ensure compliance and avoid recurrence
- evaluate and report on compliance with the performance measures, criteria, and operating conditions of the development
- identify any trends in the monitoring data over the life of the development
- identify any discrepancies between the predicted and actual impacts of the development and analyse the potential cause of any significant discrepancies
- describe what measures will be implemented over the next calendar year to improve the environmental performance of the development.

7.2 Auditing

In accordance with Condition F13, Part F of the Development Consent, an Independent Environmental Audit will be undertaken by a suitably qualified auditor and include experts in any field specified by the Secretary within 12 months of the approval of the Development Consent and every three years after that.

This audit must:

- be prepared in accordance with the Independent Audit Post Approval Requirements (DPE 2020 or as updated)
- be led and conducted by a suitably qualified, experienced and independent auditor whose appointment has been endorsed by the Planning Secretary
- be conducted by a suitably qualified, experienced and independent team of experts (including any expert in field/s specified by the Planning Secretary) whose appointment has been endorsed by the Planning Secretary

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- include consultation with the relevant agencies and the CCC
- assess the environmental performance of the development and whether it is complying with the relevant requirements in the approval water licences and mining leases for the development (including any assessment, strategy, plan or program required under these approvals)
- review the adequacy of any approved strategy, plan or program required under the abovementioned approvals
- recommend appropriate measures or actions to improve the environmental performance of the development, and/or any assessment strategy, plan or program required under these approvals
- be conducted and reported to the satisfaction of the Planning Secretary.

In accordance with Part F14 of the Development Consent I, WCL would submit a copy of the audit report, along with responses to any recommendations contained within the report to the Planning Secretary. The audit and response to recommendations would be submitted within three months of the completion of the audit unless otherwise agreed by the Planning Secretary.

7.3 Plan Revision

In accordance with Condition F7 of the Development Consent, this SMP will be reviewed within three months of:

- the submission of an incident report as per Condition F9
- the submission of an annual review under Condition F11
- the submission of an Independent Environmental Audit under Condition F13
- any modification to the conditions of approval (unless the conditions require otherwise or as otherwise agreed with DPE).

The revision status of this SMP is indicated in the footer of each copy. Revisions to any documents listed within this SMP will not necessarily constitute a revision of this document.

Where revisions are required, the document would be submitted to DPE within six weeks of the review.

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8 DOCUMENT INFORMATION

8.1 Related Documents

This SMP is part of the overall EP for Stage1 and Stage2 documentation, including the main EP application document and the management plans/monitoring programs required by Development Consent.

Related documents are listed in the table below.

Title	Location in main Extraction Plan
Extraction Plan for Stage1 and Stage2 mining – Main Document	N/A – Main document
Built Features Management Plan	Appendix E
Public Safety Management Plan	Appendix F
Water Management Plan	Appendix G
Groundwater Management Plan	Appendix H
Biodiversity Management Plan	Appendix I
Swamp Monitoring Program	Appendix J
Land Management Plan	Appendix K
Heritage Management Plan	Appendix L



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9 REFERENCES

DPE c2015 "Guidelines for the Preparation of Extraction Plans" Draft 5 - undated and unpublished guidelines prepared by the then Department of Planning and Environment and NSW Trade & Investment – Division of Resources and Energy circa 2015.

IAPUM 2020 "Advice Re: Russell Vale Underground Expansion Project" - Independent Advisory Panel for Underground Mining – November 2020

SCT 2021 "Russell Vale Colliery: Subsidence Assessment for PC07-08 and PC21-25 Extraction Plan" SCT Report WCRV5285 – Rev3 - 23 June 2021.

SCT 2022b "Russell Vale Colliery: Extraction Plan Subsidence Assessment for PC27-34 (Stage 2) Mining" SCT Report 5385 – Draft2 – 4 March 2022.

APPENDIX A – SUBSIDENCE EFFECTS TARPS

Table 8 - General Subsidence TARP

Parameter	Location	Method	Trigger	Action	Responsibility
Vertical Subsidence	Surface terrain (non-swamp monitoring points)	GNSS units and LiDAR	<100 mm	Continue to monitor trends	Group Environment Manager Environmental Monitoring Team Nominated Mining Surveyor
			>100 mm, <250 mm	<ul style="list-style-type: none"> Group Environment Manager to inform subsidence specialist within 24hrs Continue to monitor trends 	Group Environment Manager Environmental Monitoring Team Nominated Mining Surveyor
			>250mm, <300 mm	<ul style="list-style-type: none"> Group Environment Manager to inform Subsidence specialist within 24hrs Subsidence specialist to assess and provide advice on potential impacts and actions required including any adaptive management measures, recognising the performance measure of 300 mm. 	Group Environment Manager Environmental Monitoring Team Nominated Mining Surveyor
Underground Subsidence	Roof Rib Pillar Surface	Underground roadway mining condition shift reports Mapping by a geotechnical engineer on a weekly basis	Normal Operation (level 1 triggers)		
			<ul style="list-style-type: none"> Continuous application of SMP parameters to the mine plan design including pillar and roadway dimension. 	<ul style="list-style-type: none"> Continuous review of GNSS subsidence monitoring data against alarm triggers (as described above). Review of LiDAR as it becomes available. Weekly review of subsidence data and roadway conditions via Strata committee. Daily recording of underground strata observations. 	Control Room Operator <ul style="list-style-type: none"> Monitor GNSS for alarms. Geotechnical engineer <ul style="list-style-type: none"> Attend weekly strata review. Weekly review of underground roadway mining shift condition reports. Mapping of underground roadways. Environmental Manager or delegate <ul style="list-style-type: none"> Present GNSS data at weekly strata meet. Mining Engineering Manager <ul style="list-style-type: none"> Conduct normal statutory duties Technical Services Manager <ul style="list-style-type: none"> Conduct normal duties
			Above normal Operations expectations (level 2 triggers)		
			Roof <ul style="list-style-type: none"> Sudden ingress of water into workings from roof where roadway was previously dry. Rib <ul style="list-style-type: none"> Sudden failure of rib in roadway, outbye of face, for length of roadway (>20m). Pillar <ul style="list-style-type: none"> Onset of floor heave in outbye roadway for length of roadway (>20m). Pillar Creep. Pillars formed below 2.11 FOS. Surface <ul style="list-style-type: none"> GNSS results identify subsidence >100 mm and <300 mm. LiDAR results identify abnormal/unexpected subsidence impacts. 	<ul style="list-style-type: none"> Actions as for Level 1. Investigate to determine if any surface subsidence TARP exceedance. Review detailed mine plan including pillar design for forward secondary workings. 	Geotechnical engineer <ul style="list-style-type: none"> Assist Strata Management Team to investigate, document and respond to underground triggers. Review of available underground roadway mining shift condition reports. Control Room Operator <ul style="list-style-type: none"> Notify Geotechnical Engineer of underground triggers. Notify Environmental Manager of GNSS alarm triggers. Mining Engineering Manager. <ul style="list-style-type: none"> Assess the need to review current mine plan in consultation with Geotechnical Engineer. Environment Manager or delegate <ul style="list-style-type: none"> Respond to triggers when notified by Control Room Operator. Co-ordinate monitoring of GNSS data relative to area. Consult with Mine surveyor. Determine extent and severity of any surface movement and communicate to Technical Services Manager Report to appropriate regulatory bodies where required. Technical Services Manager

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Parameter	Location	Method	Trigger	Action	Responsibility
					<ul style="list-style-type: none"> Participate in investigation as required by Mining Engineering Manager.
			Exceed Normal Operation (Level 3 Triggers)		
			Roof <ul style="list-style-type: none"> Roof fall above bolted horizon in working seam with the entire roadway obstructed by fall material and unable to determine extent of fall. Rib <ul style="list-style-type: none"> Failure of rib beyond bolted horizon, outbye of face, for length of roadway (>20m). Pillar <ul style="list-style-type: none"> Pillar Failure. Surface <ul style="list-style-type: none"> GNSS results identify subsidence >300 mm. LiDAR results identify abnormal/unexpected subsidence impacts. 	<ul style="list-style-type: none"> Actions as per Levels 1 and 2. Carry out immediate review of surface subsidence information to determine if any TARP exceedance. Review most recent LiDAR information available to identify any abnormal/unexpected subsidence impacts. Implement outcomes of detailed mine plan review, as necessary (i.e. adaptive management). 	Geotechnical engineer <ul style="list-style-type: none"> Assist Strata Management Team to investigate, document and respond to underground triggers. Control Room Operator <ul style="list-style-type: none"> Notify Geotechnical Engineer of underground triggers. Notify Environmental Manager of GNSS alarm triggers. Technical Services Manager <ul style="list-style-type: none"> Participate in investigation as required by Mining Engineering Manager. Mining Engineering Manager. <ul style="list-style-type: none"> Co-ordinate investigation and response to underground triggers. Assess the need to review current mine plan in consultation with Geotechnical Engineer. Subsidence Specialist <ul style="list-style-type: none"> Participate in investigation as required by Mining Engineering Manager.

Table 9 – Cataract Creek – cumulative Valley Closure TARP

Parameter	Location	Method	Trigger	Action	Responsibility
Valley Closure – Cataract Creek (total from previous and planned Wongawilli Seam mining)	CC1-CC4	Point to Point Survey measurement across Cataract Creek	<100 mm	Continue to monitor trends	Group Environment Manager Environmental Monitoring Team Nominated Mining Surveyor
			> 100 mm <150 mm	Group Environment Manager to inform subsidence specialist within 24hrs – Continue to monitor trends	Group Environment Manager Environmental Monitoring Team Nominated Mining Surveyor
			>150mm	Group Environment Manager to inform Subsidence specialist within 24hrs Subsidence specialist to assess and provide advice on potential impacts and actions including any adaptive management measures	Group Environment Manager Environmental Monitoring Team Nominated Mining Surveyor

Table 10 – Coastal Upland Swamp TARP – Stage 1 and 2

Feature	Trigger Monitoring Location	Unit/Parameters	Monitoring Frequency	Purpose	Criteria	Action/ Reporting	Reporting	Responsibility
CCUS1	GNSS#1 GNSS#2 GNSS#3	mm (vertical subsidence)	Daily (weekly average)	Monitor levels of vertical subsidence	Level 1	• Continue monitoring.	• Six monthly reporting in accordance with Extraction Plan approval.	Russell Vale Colliery (Group Environment Manager)
CCUS4	GNSS#13				<ul style="list-style-type: none"> No exceedance of Level 2 or Level 3 triggers. (< 50mm or 100mm at GNSS #1) 			
CCUS5	GNSS#11							
CRUS1	GNSS#12							
CCUS15 CCUS17 CCUS18 CCUS19	GNSS#14							
					Level 2:	<ul style="list-style-type: none"> Review potential cause Determine need for any changes to mine plan or mining method. Review subsidence predictions. Continue monitoring. Review frequency and location of monitoring and determine if additional monitoring is required. Report potential impact in six monthly reports. 	<ul style="list-style-type: none"> Six monthly reporting in accordance with Extraction Plan approval USMP Monitoring plan reviewed within one month of potential impact being identified. 	Russell Vale Colliery (Group Environment Manager)
					Level 3:	<ul style="list-style-type: none"> Immediately cease operations in any near active mining areas. Inform DPE and DAWE of performance criteria exceedance Investigate cause of potential exceedance. Revise underground mine plan/mining methods (if necessary). Inspect areas of swamp to identify any material surface impacts including slumping or surface cracking. Develop and implement impact mitigation and remediation measures in consultation with BCD, WaterNSW and DAWE. Review need for more frequent monitoring of groundwater and biodiversity features within affected swamp. Recommendation of operations subject to approval from Minister Report in annual reviews and six monthly reports to inform relevant agencies of results of monitoring. 	<ul style="list-style-type: none"> BCD, and DAWE notified of potential impact within 24 hours of impact being identified. Investigation of cause initiated within 24 hours week of impact being identified. Investigation results reported to BCD and DAWE within one week of completion. Groundwater and biodiversity monitoring plan for affected swamp reviewed within one week of impact being identified. Commence preparation of mitigation/ action and monitoring plan within one week of impact being identified (if required). Monthly updates of investigation progress to BCD and DAWE, if required. Six monthly reporting in accordance with Extraction Plan approval. 	Russell Vale Colliery (Group Environment Manager)

Feature	Trigger Monitoring Location	Unit/ Parameters	Monitoring Frequency	Purpose	Criteria	Action/ Reporting	Reporting	Responsibility
CCUS2	GNSS#3 GNSS#15 Underground observations in PC07 and PC08	mm (vertical subsidence)	Daily (weekly average)	Monitor levels of vertical subsidence	Level 1 <ul style="list-style-type: none"> No exceedance of Level 2 or Level 3 triggers. (< 50mm) 	<ul style="list-style-type: none"> Continue monitoring. 	<ul style="list-style-type: none"> Six monthly reporting in accordance with Extraction Plan approval. 	Russell Vale Colliery (Group Environment Manager)
CCUS20	GNSS#1 GNSS#2 Underground Observations in PC08 LiDAR							
CRUS3	GNSS#14 GNSS#15 Underground observations in PC07 and PC08				Level 2: <ul style="list-style-type: none"> >50mm observed subsidence at GNSS#14 and, GNSS#15; or >80mm observed at GNSS#2 and GNSS#3; or >100mm at GNSS#1 	<ul style="list-style-type: none"> Review potential cause and need for any changes to mine plan or mining method. Review subsidence predictions. Continue monitoring. Review frequency and location of monitoring and determine if additional monitoring is required. 	<ul style="list-style-type: none"> Six monthly reporting in accordance with Extraction Plan approval Monitoring plan reviewed within one month of potential impact being identified. 	
					Level 3: <ul style="list-style-type: none"> Strata failure in second workings within 350m of swamp. > 100mm subsidence observed in LiDAR relative to baseline (validated through underground monitoring or GNSS). 	<ul style="list-style-type: none"> Immediately cease operations in any near active mining areas. Inform DPE and DAWE of performance criteria exceedance Investigate cause of strata failure. Revise underground mine plan/mining methods (if necessary). Inspect areas of swamp to identify any material surface impacts including slumping or surface cracking. Develop and implement impact mitigation and remediation measures in consultation with BCD, WaterNSW and DAWE. Review need for more frequent monitoring of groundwater and biodiversity features within affected swamp. Recommendation of operations subject to approval from Minister 	<ul style="list-style-type: none"> BCD, and DAWE notified of potential impact within 24 hours of impact being identified. Investigation of cause initiated within 24 hours week of impact being identified. Investigation results reported to BCD and DAWE within one week of completion. Groundwater and biodiversity monitoring plan for affected swamp reviewed within one week of impact being identified. Commence preparation of mitigation/ action and monitoring plan within one week of impact being identified (if required). Monthly updates of investigation progress to BCD and DAWE, if required. Six monthly reporting in accordance with Extraction Plan approval. 	Russell Vale Colliery (Group Environment Manager)

Feature	Monitoring Location	Unit/Parameters	Monitoring Frequency	Purpose	Criteria	Action	Reporting	Responsibility
CCUS13	GNSS #19 Underground observations in PC34	mm (vertical subsidence)	Daily (weekly average)	Monitor levels of vertical subsidence	Level 1 <ul style="list-style-type: none"> No exceedance of Level 2 or Level 3 triggers. (i.e. subsidence < 50mm) 	<ul style="list-style-type: none"> Continue monitoring. 	<ul style="list-style-type: none"> Six monthly reporting in accordance with EP approval. 	Russell Vale Colliery (Group environment manager)
BCUS6	GNSS #21 Underground observations in PC32				Level 2 <ul style="list-style-type: none"> >50 mm observed subsidence at adjacent GNSS units 	<ul style="list-style-type: none"> Review potential cause Determine need for any changes to mine plan or mining method. Review subsidence predictions. Continue monitoring. Review frequency and location of monitoring and determine if additional monitoring is required. 	<ul style="list-style-type: none"> Six monthly reporting in accordance with EP approval USMP Monitoring plan reviewed within one month of potential impact being identified. 	Russell Vale Colliery (Group environment manager)
CRUS6 CCUS12	GNSS # 22 GNSS #23 GNSS #27 Underground observations in PC33							
BCUS11	GNSS #24 Underground observations in PC31							
BCUS4	GNSS #25 Underground observations in PC30							
CCUS10 CCUS11	GNSS #26 Underground observations in PC28							
Indirect GNSS units Stage 1 BCUS2 BCUS3 BCUS5 BCUS14 BCUS8 BCUS9 BCUS15 BCUS16					Level 3 <ul style="list-style-type: none"> >100 mm observed subsidence at adjacent GNSS units Strata failure observed underground in workings within 250 m of swamp extent LiDAR survey results indicate >100 mm subsidence 	<ul style="list-style-type: none"> Immediately cease operations in any near active mining areas. Inform DPE and DAWE of performance criteria exceedance Investigate cause of potential exceedance. Revise underground mine plan/mining methods (if necessary). Inspect areas of swamp to identify any material surface impacts including slumping or surface cracking. Develop and implement impact mitigation and remediation measures in consultation with BCD, WaterNSW and DAWE. Review need for more frequent monitoring of groundwater and biodiversity features within affected swamp. 	<ul style="list-style-type: none"> BCD, and DAWE notified of potential impact within 24 hours of impact being identified. Investigation of cause initiated within 24 hours week of impact being identified. Investigation results reported to BCD and DAWE within one week of completion. Groundwater and biodiversity monitoring plan for affected swamp reviewed within one week of impact being identified. Commence preparation of mitigation/ action and monitoring plan within one week of impact being identified (if required). Monthly updates of investigation progress to BCD and DAWE, if required. Six monthly reporting in accordance with EP approval. 	Russell Vale Colliery (Group environment manager)

Feature	Monitoring Location	Unit/Parameters	Monitoring Frequency	Purpose	Criteria	Action	Reporting	Responsibility
CCUS22 CCUS16					relative to pre-mining data (validated through underground monitoring or GNSS)	<ul style="list-style-type: none"> Report in annual reviews and six monthly reports to inform relevant agencies of results of monitoring. 		
Direct Stage 2 BCUS4 BCUS6 BCUS7 BCUS11 CCUS4 CCUS5 CCUS9 CCUS10 CCUS11 CCUS12 CCUS13 CCUS24 CRUS6 CRUS7	Adjacent GNSS units	mm (vertical subsidence)	Daily (weekly average)	Monitor levels of vertical subsidence	Level 1 <ul style="list-style-type: none"> No exceedance of Level 2 or Level 3 triggers. (i.e. subsidence < 50 mm) 	<ul style="list-style-type: none"> Continue monitoring. 	<ul style="list-style-type: none"> Six monthly reporting in accordance with EP approval. 	Russell Vale Colliery (Group environment manager)
					Level 2 <ul style="list-style-type: none"> >50 mm observed subsidence at adjacent GNSS units 	<ul style="list-style-type: none"> Review potential cause Determine need for any changes to mine plan or mining method. Review subsidence predictions. Continue monitoring. Review frequency and location of monitoring and determine if additional monitoring is required. 	<ul style="list-style-type: none"> Six monthly reporting in accordance with EP approval USMP Monitoring plan reviewed within one month of potential impact being identified. 	Russell Vale Colliery (Group environment manager)
					Level 3 <ul style="list-style-type: none"> >100 mm observed subsidence at adjacent GNSS units Strata failure observed underground in workings within 350 m of swamp extent LiDAR survey results indicate >100 mm subsidence relative to pre-mining data (validated through underground monitoring or GNSS) 	<ul style="list-style-type: none"> Immediately cease operations in any near active mining areas. Inform DPE and DAWE of performance criteria exceedance Investigate cause of potential exceedance. Revise underground mine plan/mining methods (if necessary). Inspect areas of swamp to identify any material surface impacts including slumping or surface cracking. Develop and implement impact mitigation and remediation measures in consultation with BCD, WaterNSW and DAWE. Review need for more frequent monitoring of groundwater and biodiversity features within affected swamp. Report in annual reviews and six monthly reports to inform relevant agencies of results of monitoring. 	<ul style="list-style-type: none"> BCD, and DAWE notified of potential impact within 24 hours of impact being identified. Investigation of cause initiated within 24 hours week of impact being identified. Investigation results reported to BCD and DAWE within one week of completion. Groundwater and biodiversity monitoring plan for affected swamp reviewed within one week of impact being identified. Commence preparation of mitigation/ action and monitoring plan within one week of impact being identified (if required). Monthly updates of investigation progress to BCD and DAWE, if required. Six monthly reporting in accordance with EP approval. 	Russell Vale Colliery (Group environment manager)
Indirect Stage 2 BCUS2 BCUS3	Nearest GNSS units	mm (vertical subsidence)	Daily (weekly average)	Monitor levels of vertical subsidence	Level 1 <ul style="list-style-type: none"> No exceedance of Level 2 or Level 3 triggers (i.e. subsidence < 50 mm) 	<ul style="list-style-type: none"> Continue monitoring. 	<ul style="list-style-type: none"> Reporting in accordance with EP approval. 	Russell Vale Colliery (Group environment manager)

Feature	Monitoring Location	Unit/Parameters	Monitoring Frequency	Purpose	Criteria	Action	Reporting	Responsibility
BCUS5 BCUS8 BCUS9 BCUS14 BCUS15 BCUS16 CCUS16 CCUS22					Stage 2 <ul style="list-style-type: none"> >50 mm observed subsidence at nearest GNSS units 	<ul style="list-style-type: none"> Review potential cause and need for any changes to mine plan or mining method. Review subsidence predictions. Continue monitoring. Review frequency and location of monitoring and determine if additional monitoring is required. 	<ul style="list-style-type: none"> Reporting in accordance with EP approval. Monitoring plan reviewed within one month of potential impact being identified. 	Russell Vale Colliery (Group environment manager)
					Stage 3 <ul style="list-style-type: none"> >100 mm observed subsidence at nearest GNSS units Strata failure observed underground in workings within 350 m of swamp extent LiDAR survey results indicate >100 mm subsidence relative to pre-mining data (validated through underground monitoring or GNSS) 	<ul style="list-style-type: none"> Immediately cease operations in any near active mining areas. Inform DPE and DAWE of performance criteria exceedance. Investigate cause of strata failure. Revise underground mine plan/mining methods (if necessary). Inspect areas of swamp to identify any material surface impacts including slumping or surface cracking. Develop and implement impact mitigation and remediation measures in consultation with BCD, WaterNSW and DAWE. Undertake LiDAR Survey to investigate where subsidence performance criteria exceeded. Review need for more frequent monitoring of groundwater and biodiversity features within affected swamp. 	<ul style="list-style-type: none"> BCD, and DAWE notified of potential impact within 24 hours of impact being identified. Investigation of cause initiated within 24 hours week of impact being identified. Investigation results reported to BCD and DAWE within one week of completion. Groundwater and biodiversity monitoring plan for affected swamp reviewed within one week of impact being identified. Undertake LiDAR survey of potentially affected area at soonest reasonable opportunity. Commence preparation of mitigation/ action and monitoring plan within one week of impact being identified (if required). Monthly updates of investigation progress to BCD and DAWE, if required. Six monthly reporting in accordance with EP approval. 	Russell Vale Colliery (Group environment manager)

Table 11 – Built Features – TransGrid TARP

Monitoring Site	Monitoring Details			Trigger			
	Instrument	Parameters	Frequency	Level	Action/Reporting	Timing	Responsibility
330KV Transmission Line 11 Dapto to Sydney South and Towers	330KV Single Circuit – Suspension Towers: 54, 55, 56, & 57.	<ul style="list-style-type: none"> Observable surface deformations - LiDAR Separation between tower legs – prism/ point Survey Vertical subsidence – GNSS # 5, 6, 7, 17 Tilt – prism/ point Survey 	<p>Prior to second workings</p> <ul style="list-style-type: none"> conduct baseline survey Prism/ point - Survey and GNSS continuous reading prior to second workings <p>During second workings within 350m of sites</p> <ul style="list-style-type: none"> Prism/ point - Survey After each panel or annual or by TARP trigger and LiDAR – Quarterly and GNSS - continuous During mining over active secondary extraction area GNSS data reviewed weekly <p><i>Monthly in all other areas, or as required by TARP trigger.</i></p> <p>Post mining</p> <ul style="list-style-type: none"> 12 months after completion of each panel. 	Observations within predictions			
				<p>Continuous Monitoring</p> <ul style="list-style-type: none"> <20 mm vertical subsidence; (GNSS) <p>Attended Survey</p> <ul style="list-style-type: none"> No observable surface deformations <5 mm leg vertical differential; and Tilt <1 mm/m. 	<ul style="list-style-type: none"> Data and report to: <ul style="list-style-type: none"> - TransGrid - RR subsidence portal 	Within 1 week following collection & processing of data, document report quarterly during secondary extraction.	<ul style="list-style-type: none"> Russell Vale Colliery (Group Environment Manager) Survey Manager
				Observations potentially exceed predictions.			
				<p>Continuous Monitoring</p> <ul style="list-style-type: none"> Vertical subsidence >20 mm (GNSS) <p>Attended Survey</p> <ul style="list-style-type: none"> Separation between tower legs (10 to 20 mm) and/or Tilt >1 mm/m Observable surface deformations 	<ul style="list-style-type: none"> Notify the following key stakeholders within 24 hours of becoming aware of the trigger: <ul style="list-style-type: none"> - TransGrid - Principal Subsidence Engineer – RR. Continue consultation with TransGrid 	Notify the Key Stakeholders, as appropriate, within 24 hrs of becoming aware of the trigger:	<ul style="list-style-type: none"> Russell Vale Colliery (Group Environment Manager) Survey Manager
				Observations continue to exceed predictions.			
				<p>Continuous Monitoring</p> <ul style="list-style-type: none"> Vertical subsidence greater than predicted maximum (Upper 95% CL – identified as 100mm) <p>Attended Survey</p> <ul style="list-style-type: none"> Separation between tower legs (>20mm) and/or Tilt >1 mm/m Observable surface deformations 	<ul style="list-style-type: none"> Notify the Key Stakeholders, as appropriate: <ul style="list-style-type: none"> - TransGrid - Principal Subsidence Engineer – RR. Implement adaptive management and contingency measures e.g. <ul style="list-style-type: none"> Confirm readings. Cease underground mining immediately and review mining options. Undertake additional 3D survey and check against pre-mining data and review against predictions. TransGrid and RVC to undertake joint visual inspections accordingly. Liaise with TransGrid regarding any action/s required. RVC to review mine planning for future mining areas to avoid further impacts. 	Notify the Key Stakeholders, as appropriate, immediately following awareness of trigger being met:	<ul style="list-style-type: none"> Russell Vale Colliery (Group Environment Manager) Survey Manager

Table 12 – Built Features – Endeavour Energy TARP

Aspect	Monitoring			Trigger			
	Sites	Parameters	Frequency	Level	Action/Reporting	Timing	Responsibility
132 kV Transmission Line 132 kV Single Circuit – Tower No. E66 to E69	<ul style="list-style-type: none">132 kV Single Circuit - Tower No. E66 to E69	<ul style="list-style-type: none">Observable surface deformations - LiDARVertical subsidence – GNSS # 5, 6, 7, 17Tilt – prism/ point SurveySeparation between tower legs – prism/ point Survey.	<p>Prior to second workings</p> <ul style="list-style-type: none">conduct baseline survey Prism/ point – Survey andGNSS continuous reading prior to second workings <p>During second workings within 350m of sites</p> <ul style="list-style-type: none">Prism/ point - Survey After each panel or annual or by TARP trigger andLiDAR – Quarterly andGNSS - continuous During mining over active secondary extraction area with data reviewed weekly Monthly in all other areas, or as required by TARP trigger. <p>Post mining</p> <ul style="list-style-type: none">12 months after completion of each panel.	Observations within predictions.			
				<p>GNSS unit</p> <ul style="list-style-type: none"><20 mm vertical subsidence <p>Attended Survey</p> <ul style="list-style-type: none">No observable surface deformations and/or<5 mm leg vertical differential and/orTilt <1 mm/m.	<ul style="list-style-type: none">Data and report to:<ul style="list-style-type: none">- Endeavour Energy- RR subsidence portal;	Within 1 week following collection & processing of data, document. Report quarterly during secondary extraction.	<ul style="list-style-type: none">Russell Vale Colliery (Group Environment Manager)Survey Manager
				Observations potentially exceed predictions.			
				<p>GNSS unit</p> <ul style="list-style-type: none">vertical subsidence >20 mm <p>Attended Survey</p> <ul style="list-style-type: none">Observable surface deformations and / orTilt >1 mm/m and/orSeparation between tower legs (10 to 20 mm)	<ul style="list-style-type: none">Notify the following key stakeholders within 24hours of becoming aware of the trigger:<ul style="list-style-type: none">- Endeavour Energy- Principal Subsidence Engineer – RR.Continue consultation with Endeavour Energy.Continue monitoring and increase the review of subsidence monitoring data to weekly.Undertake a review of the panel design parameters in consultation with Geotechnical advice.Inform key stakeholders of potential impact.Undertake site inspection of surface area to document and photograph any observed changes / impacts.Carry out attended survey.Investigate potential cause of observed changes in site condition and, if identified as potential caused by mining, review management procedures.	Notify the Key Stakeholders, as appropriate, within 24hrs of becoming aware of the trigger:	<ul style="list-style-type: none">Russell Vale Colliery (Group Environment Manager)Survey Manager
				Observations continue to exceed predictions.			
<p>GNSS units</p> <ul style="list-style-type: none">Vertical subsidence greater than 100mm (> 100 mm) <p>Attended Survey (132 kV Towers)</p>	<ul style="list-style-type: none">Notify the following key stakeholders within 24hours of becoming aware of the trigger:<ul style="list-style-type: none">- Endeavour Energy	<ul style="list-style-type: none">Notify the Key Stakeholders, as appropriate, immediately following	<ul style="list-style-type: none">Russell Vale Colliery (Group Environment Manager)Survey Manager				

Aspect	Monitoring			Trigger			
	Sites	Parameters	Frequency	Level	Action/Reporting	Timing	Responsibility
				<ul style="list-style-type: none"> Observable surface deformations and/ or Separation between tower legs (>20mm) and/or Vertical subsidence greater than predicted maximum (Upper 95% CL – identified as 100mm) 	<ul style="list-style-type: none"> Principal Subsidence Engineer – RR. <p>Monitoring and remediation action</p> <ul style="list-style-type: none"> Implement adaptive management and contingency measures e.g. <ul style="list-style-type: none"> Confirm readings. Continue monitoring and increase the review of Subsidence monitoring data for that area to daily. Stop mining in the impacted area immediately and investigate causes of the increased subsidence. Undertake a review of the panel design parameters in consultation with Geotechnical advice. Contact Endeavour Energy to undertake a joint site inspection of surface area to document and photograph any observed changes / impacts. Investigate potential cause of observed changes in site condition. Where the investigation identifies mining as a likely cause of the changes: <ul style="list-style-type: none"> Liaise with Endeavour Energy regarding any action/s required. Review mine planning for future mining areas to avoid further impacts 	awareness of trigger being met:	
33 kV Transmission Line 33 kV pylons within span between 132 kV tower E66-E69	33 kV pylons within span between 132 kV tower E66-E69	<ul style="list-style-type: none"> Observable surface deformations - LIDAR Vertical subsidence – GNSS # 31, # 32 Tilt – prism/ point Survey 	<p>Prior to second workings</p> <ul style="list-style-type: none"> conduct baseline survey Prism/ point – Survey and GNSS continuous reading prior to second workings <p>During second workings within 350m of sites</p> <ul style="list-style-type: none"> Prism/ point - Survey After 	Observations within predictions.			
				<p>GNSS unit</p> <ul style="list-style-type: none"> <50 mm vertical subsidence <p>Attended Survey</p> <ul style="list-style-type: none"> No observable surface deformations and/or Tilt <1 mm/m. 	<ul style="list-style-type: none"> Data and report to: <ul style="list-style-type: none"> Endeavour Energy RR subsidence portal 	<ul style="list-style-type: none"> Within 1 week following collection & processing of data, document. Report quarterly during secondary extraction. 	<ul style="list-style-type: none"> Russell Vale Colliery (Group Environment Manager) Survey Manager
				Observations potentially exceed predictions.			

Aspect	Monitoring			Trigger			
	Sites	Parameters	Frequency	Level	Action/Reporting	Timing	Responsibility
			each panel or annual or by TARP trigger and <ul style="list-style-type: none"> LiDAR – Quarterly and GNSS - continuous During mining over active secondary extraction area with data reviewed weekly Monthly in all other areas, or as required by TARP trigger. Post mining <ul style="list-style-type: none"> 12 months after completion of each panel. 	GNSS unit <ul style="list-style-type: none"> Vertical subsidence >50 mm Attended Survey <ul style="list-style-type: none"> Observable surface deformations and / or Tilt >1 mm/m 	<ul style="list-style-type: none"> Notify the following key stakeholders within 24hours of becoming aware of the trigger: <ul style="list-style-type: none"> Endeavour Energy Principal Subsidence Engineer – DRE. Continue consultation with Endeavour Energy Continue monitoring and increase the review of subsidence monitoring data to weekly. Undertake a review of the panel design parameters in consultation with Geotechnical advice. Inform key stakeholders of potential impact. Undertake site inspection of surface area to document and photograph any observed changes / impacts. Carry out attended survey Investigate potential cause of observed changes in site condition and, if identified as potential caused by mining, review management procedures. 	<ul style="list-style-type: none"> Notify the Key Stakeholders, as appropriate, within 24hrs of becoming aware of the trigger: 	<ul style="list-style-type: none"> Russell Vale Colliery (Group Environment Manager) Survey Manager
				Observations continue to exceed predictions.			
				GNSS units <ul style="list-style-type: none"> Subsidence greater than 100mm (> 100 mm) Attended Survey (of 132 kV Towers and 33kV poles) <ul style="list-style-type: none"> Observable surface deformations and/ or Vertical subsidence greater than predicted maximum (Upper 95% CL – identified as 100mm) 	<ul style="list-style-type: none"> Notify the following key stakeholders within 24hours of becoming aware of the trigger: <ul style="list-style-type: none"> Endeavour Energy Principal Subsidence Engineer – RR. Monitoring and remediation action <ul style="list-style-type: none"> Implement adaptive management and contingency measures e.g. <ul style="list-style-type: none"> Confirm readings. Continue monitoring and increase the review of Subsidence monitoring data for that area to daily. Stop mining in the impacted area immediately and 	<ul style="list-style-type: none"> Notify the Key Stakeholders, as appropriate, immediately following awareness of trigger being met: 	<ul style="list-style-type: none"> Russell Vale Colliery (Group Environment Manager) Survey Manager

Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	7/10/2022
Doc Title	Extraction Plan - Subsidence Monitoring Program		

Aspect	Monitoring			Trigger			
	Sites	Parameters	Frequency	Level	Action/Reporting	Timing	Responsibility
					<p>investigate causes of the increased subsidence.</p> <ul style="list-style-type: none"> - Undertake a review of the panel design parameters in consultation with Geotechnical advice. - Contact Endeavour Energy to undertake a joint site inspection of surface area to document and photograph any observed changes / impacts. • Investigate potential cause of observed changes in site condition. Where the investigation identifies mining as a likely cause of the changes: <ul style="list-style-type: none"> - Liaise with Endeavour Energy regarding any action/s required. - Review mine planning for future mining areas to avoid further impacts 		

Table 13 – Built Features – Transport for NSW (RMS) TARP

Monitoring Site	Monitoring Details			Trigger			
	Instrument	Parameters	Frequency	Level	Action/Reporting	Timing	Responsibility
M1/ Mt Ousley Rd Carriageway General Carriageway– Cataract Creek (100m) Carriageway- Mt Ousley Road – tension zone at ridge	GNSS GNSS 1, 2, 8, 14, 16	GNSS <ul style="list-style-type: none">Vertical Subsidence monitoring (real time) GNSS 1, 2, 8, 14, 16).Valley closure at Cataract Creek: Relative Hz movement between 1<->8 and 2<->8.Ground movement at tension zone: Relative Hz movement between 14<->16 and 2<->16.	GNSS <ul style="list-style-type: none">Real time monitoringData reviewed weekly during mining over active mining area or as required by TARP trigger or TC.Data reviewed monthly in all other areas, or as required by TARP trigger or TC.	Observations within predictions			
				GNSS <ul style="list-style-type: none">GNSS 1,2,8,14,16 Vertical subsidence not greater than 50mmValley Closure - GNSS 1<->8, 2<->8 Relative Hz movement between units not greater than 30mmGround Movement -GNSS 14<->16 and 2<->16 Relative Hz movement between units not greater than 30mm Crackmeter: Closure not greater than 30mm closure. Survey Quarterly CC1-CC4 or as determined by TC Drive through survey: No reports of potential or actual mining related damage to TfNSW infrastructure.	Continue to monitor as per monitoring plan	Ongoing	WCL
	Observations potentially exceed predictions.						
	Crackmeter <ul style="list-style-type: none">Across slot on each carriageway	Crackmeter <ul style="list-style-type: none">Slot closure on southbound and northbound carriageways	Crackmeter <ul style="list-style-type: none">Real time monitoringData reviewed weekly during mining over active mining area or as required by TARP trigger or TC.Data reviewed monthly in all other areas, or as required by TARP trigger or TC.	GNSS <ul style="list-style-type: none">GNSS 1,2,8,14,16 Vertical subsidence > 50mm, not greater than 100mmGNSS 1<->8 and 2<->8 Relative HZ movement between units > 30mm but not greater than 100 mm.	GNSS 1,2,8,14,16 (subsidence) <ul style="list-style-type: none">Carry out Q-Line surveyCarry out CC1-CC4 survey GNSS 1<->8 and 2<->8 <ul style="list-style-type: none">Carry out Q-Line surveyCarry out CC1-CC4 surveyCarry out visual road inspection GNSS 14<->16 and 2<->16	<ul style="list-style-type: none">Inform the Technical Committee within 7 days or 14 days noting trigger actionsInvestigation commences immediatelyNotify DPE of potential exceedance	WCL TfNSW - Carry out visual road inspection

Monitoring Site	Monitoring Details			Trigger			
	Instrument	Parameters	Frequency	Level	Action/Reporting	Timing	Responsibility
	Drive-through inspections: <ul style="list-style-type: none"> At traffic speed by TfNSW. 	Drive-through inspections: <ul style="list-style-type: none"> TfNSW to report on new defects and comment on possible repairs required. 	Drive-through inspections: <ul style="list-style-type: none"> Twice weekly 	<ul style="list-style-type: none"> GNSS 14<->16 and 2<->16 Relative Hz movement between units > 30mm but not greater than 100 mm. Crackmeter: >30mm, not greater than 100mm closure. Drive through inspections: Reports of potential mining related damage to TfNSW infrastructure. 	<ul style="list-style-type: none"> Carry out SXC1 – SXC2, SXC3 – SXC4 and QCN – QCS survey Carry out visual road inspection Crackmeter: <ul style="list-style-type: none"> Carry out Q-Line survey Carry out CT1-CT4 survey Carry out visual road inspection Drive through inspections: <ul style="list-style-type: none"> Inspect and determine cause of damage General <ul style="list-style-type: none"> Review underground mining Review results of Q-Line/CC1-CC4/Tension Crack monitoring surveys Commence investigation into potential red trigger exceedance Check slot closure and consider re-cutting slot. Technical Committee to meet to review monitoring data to decide on and to direct proactive action 		
	Survey <ul style="list-style-type: none"> CC1- CC4 Q-Line survey Tension crack monitoring SXC1 – SXC2, SXC3 – SXC4 and QCN – QCS 	Survey <ul style="list-style-type: none"> CC1- CC4: Valley closure at Cataract Creek Q-Line survey: General subsidence and strain along southbound carriageway. Tension crack monitoring: Relative movement between monitoring points. 	Survey <ul style="list-style-type: none"> CC1-CC4: Quarterly or as determined by TC Q-line Survey: After amber trigger and then as determined by TC Tension crack monitoring: After amber trigger and then as determined by TC 	Observations continue to exceed predictions.			
				<ul style="list-style-type: none"> GNSS 1,2,8,14,16 Vertical subsidence greater than 100mm GNSS 1<->8 and 2<->8 Relative Hz movement between units greater than 100 mm. GNSS 14<->16 and 2<->16 Relative Hz movement between units greater than 100 mm. Crackmeter: Greater than 100mm closure. Drive through inspections: Reports of actual mining related damage to TfNSW infrastructure. 	<ul style="list-style-type: none"> Implement adaptive management and contingency measures e.g <ul style="list-style-type: none"> Stop mining and review mining options. TfNSW to inspect pavement TfNSW to notify Traffic commander via TMC to enforce immediate speed restriction – enforced by traffic commander and NSW police Carry out surveys and inspections as for amber trigger Commence investigation into exceedance 	<ul style="list-style-type: none"> TfNSW pavement inspection and traffic commander notification within 2hrs Inform the Technical Committee within 24 hours WCL Investigation commences immediately Notify DPE within 48 hours Immediately Notify RR with written confirmation within 48hours 	WCL

Monitoring Site	Monitoring Details			Trigger			
	Instrument	Parameters	Frequency	Level	Action/Reporting	Timing	Responsibility
					<ul style="list-style-type: none"> TfNSW TC to meet to review monitoring data to decide on and to direct proactive action WCL and TfNSW to undertake visual inspections if safe to do so 		
Bridges Picton Rd interchange - B7926 Steel Arch over Rocky Creek Culvert – B7932 Culvert over Cataract River – B814	GNSS <ul style="list-style-type: none"> GNSS 16 	GNSS <ul style="list-style-type: none"> Absolute horizontal ground movements 	GNSS <ul style="list-style-type: none"> Real time monitoring Data reviewed weekly during mining over active mining area or as required by TARP trigger or TC. Data reviewed monthly in all other areas, or as required by TARP trigger or TC. 	Observations within predictions.			
				<ul style="list-style-type: none"> GNSS16 Absolute horizontal ground movements no greater than 30mm. Drive through survey: No reports of potential or actual mining related damage to TfNSW infrastructure 	Continue to monitor as per monitoring plan	Ongoing	WCL
	Observations potentially exceed predictions.						
	TfNSW Drive-through inspections: <ul style="list-style-type: none"> At traffic speed by TfNSW. 	TfNSW Drive-through inspections: <ul style="list-style-type: none"> TfNSW to report on new defects and comment on possible causes and action. 	TfNSW Drive-through inspections: <ul style="list-style-type: none"> Twice weekly 	<ul style="list-style-type: none"> GNSS 16 Total horizontal movement greater than 30mm. Drive through survey: Report of potential or actual mining related damage to bridge. 	<ul style="list-style-type: none"> GNSS 16 Carry out prism survey of the bridge Carry out visual bridge inspection Drive through survey: TfNSW to report on new defects and comment on possible causes and action. 	<ul style="list-style-type: none"> GNSS 16 Within 7 days Drive through survey: In accordance with TfNSW protocols Prism survey and inspection Within 7 days Visual bridge inspection Within 7 days 	WCL
	Prism Survey <ul style="list-style-type: none"> Existing monitoring prisms on Picton Rd Bridge. 	Prism Survey <ul style="list-style-type: none"> Prism X,Y,Z movements distance as measured between any pair of prisms. 	Prism Survey <ul style="list-style-type: none"> After amber trigger and then as determined by TC. 	General <ul style="list-style-type: none"> Review underground mining Bridge Engineer to review prism survey results and bridge inspection report and assess impacts on bridge. Commence investigation into potential red trigger exceedance. Technical Committee to meet to review monitoring data to decide on and to direct proactive action WCL and TfNSW to undertake visual inspections; 			
	Visual bridge inspection	Visual bridge inspection <ul style="list-style-type: none"> General condition of bridge 	Visual bridge inspection	Observations continue to exceed predictions.			

Monitoring Site	Monitoring Details			Trigger			
	Instrument	Parameters	Frequency	Level	Action/Reporting	Timing	Responsibility
	<ul style="list-style-type: none"> By TfNSW certified Bridge Engineer 		<ul style="list-style-type: none"> After amber trigger and then as determined by TC 	<ul style="list-style-type: none"> Structural defects noticeable. Advice from bridge engineer that bridge has become unsafe or is in an unserviceable condition. 	<ul style="list-style-type: none"> Implement adaptive management and contingency measures e.g. <ul style="list-style-type: none"> Stop mining and review mining options. TfNSW/bridge specialist to inspect bridge TfNSW to notify Traffic commander via TMC to enforce bridge and road closure – enforced by traffic commander and NSW police Commence investigation into exceedance Technical Committee to meet to review monitoring data to decide on and to direct proactive action WCL and TfNSW to undertake visual inspections; 	<ul style="list-style-type: none"> TfNSW/bridge specialist inspection and traffic commander notification within 2hrs Inform the Technical Committee within 24 hours Investigation commences immediately Notify DPE within 48 hours Immediately Notify RR with written confirmation within 48hours 	<p>WCL</p> <p>Engage bridge specialist for inspection and review</p> <p>TfNSW</p> <p>Inspection and Engineering review with specialist</p>
<p>Culverts</p> <p>Cataract Creek Culverts</p> <p>Multiple Culverts</p>	<p>GNSS</p> <ul style="list-style-type: none"> GNSS 1, 2, 8 	<p>GNSS</p> <ul style="list-style-type: none"> General vertical subsidence Valley closure at Cataract Creek: Relative movement between GNSS 1<->8 and 2<->8. 	<p>GNSS</p> <ul style="list-style-type: none"> Real time monitoring Data reviewed weekly during mining over active mining area. Data reviewed monthly in all other areas, or as required by TARP trigger. 	Observations within predictions.			
				<ul style="list-style-type: none"> GNSS 1,2,8 Vertical subsidence not greater than 100mm GNSS 1<->8, 2<->8 Relative Hz movement between units not greater than 30mm. Crackmeter: Closure not greater than 30mm closure. Drive through survey: No reports of potential or actual mining related damage to TfNSW infrastructure. 	Continue to monitor as per monitoring plan	Ongoing	WCL
				Observations potentially exceed predictions.			

Monitoring Site	Monitoring Details			Trigger			
	Instrument	Parameters	Frequency	Level	Action/Reporting	Timing	Responsibility
	Crackmeter <ul style="list-style-type: none">Across slot on each carriageway	Crackmeter <ul style="list-style-type: none">Slot closure on southbound and northbound carriageways	Crackmeter <ul style="list-style-type: none">Real time monitoringData reviewed weekly during mining over active mining area or as required by TARP trigger or TC.Data reviewed monthly in all other areas, or as required by TARP trigger or TC.	GNSS <ul style="list-style-type: none">GNSS 1,2,8 Vertical subsidence > 100mm, not greater than 280mm GNSS 1<->8 and 2<->8 <ul style="list-style-type: none">Relative Hz movement between units > 30mm but not greater than 100 mm. <ul style="list-style-type: none">Crackmeter: >30mm, not greater than 100mm closure. <ul style="list-style-type: none">TfNSW Drive through survey: Reports of potential mining related damage to TfNSW infrastructure.	GNSS 1,2,8 <ul style="list-style-type: none">Carry out prism survey of culvertCommence CC1-CC4 monitoringCarry out visual culvert inspection GNSS 1<->8 and 2<->8 <ul style="list-style-type: none">Carry out prism survey of culvertCommence CC1-CC4 surveyCarry out visual culvert inspection Crackmeter: <ul style="list-style-type: none">Carry out prism survey of culvertCommence CC1-CC4 surveyCarry out visual culvert inspection TfNSW Drive through survey: <ul style="list-style-type: none">Inspect and determine cause of potential damage General <ul style="list-style-type: none">Review underground miningCommence investigation into potential exceedanceTechnical Committee to meet to review monitoring data to decide on and to direct proactive actionConsider carrying out deformation analysis on culvert based on culvert prism survey and set upper limit for culvert deformation.WCL and TfNSW to undertake visual inspections	<ul style="list-style-type: none">Inform the Technical Committee within 7 days noting trigger actionsInvestigation commences immediatelyNotify DPE of potential exceedance.	WCL TfNSW Carry out visual road inspection
	Culvert prism survey Existing monitoring prisms on culverts	Culvert prism Survey General subsidence along or nearby culverts Deformation of culverts	Culvert prism Survey <ul style="list-style-type: none">After amber trigger and then as determined by TC.				
	CC1-CC4: Quarterly <ul style="list-style-type: none">Survey of closure points	CC1-CC4: Quarterly <ul style="list-style-type: none">Cataract creek valley closure monitoring	CC1-CC4: Quarterly <ul style="list-style-type: none">Carry out cataract creek survey				
	Visual inspection By TfNSW Engineer	Visual inspection General condition of culvert and any movements at joints	Visual inspection After amber trigger and then as determined by TC				
					Observations continue to exceed predictions.		
				<ul style="list-style-type: none">GNSS 1,2,8 Vertical subsidence greater than 280mmGNSS 1<->8 and 2<->8	<ul style="list-style-type: none">Implement adaptive management and contingency measures e.g.<ul style="list-style-type: none">Stop mining and review mining options.TfNSW to inspect pavement	<ul style="list-style-type: none">TfNSW pavement inspection and traffic commander notification within 2hrs	<ul style="list-style-type: none">WCL

Monitoring Site	Monitoring Details			Trigger			
	Instrument	Parameters	Frequency	Level	Action/Reporting	Timing	Responsibility
				Relative Hz movement between units greater than 100 mm. <ul style="list-style-type: none"> Crackmeter Greater than 100mm closure. Culvert deformation analysis Deformation exceeds permissible deformation upper limit. Drive through survey: Reports of significant actual mining related damage to TfNSW infrastructure. 	<ul style="list-style-type: none"> TfNSW to notify Traffic commander via TMC to enforce immediate speed restriction – enforced by traffic commander and NSW police Carry out prism survey of culvert if safe to do so Commence investigation into exceedance Technical Committee to meet to review monitoring data to decide on and to direct proactive action Consider strengthening culvert WCL and TfNSW to undertake visual inspections if safe to do so 	<ul style="list-style-type: none"> Inform the Technical Committee within 24 hours Investigation commences immediately Notify DPE within 48 hours Immediately Notify RR with written confirmation within 48 hours 	
Slopes ARL2 – 955771/ 95770/ 13482 ARL3 – 10839/ 13483/ 13484/ 13485	GNSS <ul style="list-style-type: none"> GNSS 1, 2, 8, 14, 16 	GNSS <ul style="list-style-type: none"> Valley closure at Cataract Creek: Relative movement between 1<->8 and 2<->8 GNSS 14<->16 and 2<->16 General vertical subsidence 	GNSS <ul style="list-style-type: none"> Real time monitoring Baseline readings measured prior to second workings Data reviewed weekly during mining over active mining area Data reviewed monthly in all other areas, or as required by TARP trigger. 	Observations within predictions.			
				<ul style="list-style-type: none"> GNSS 1,2,8,14,16 Vertical subsidence <150mm and/or GNSS 1<->8, 2<->8 Relative Hz movement between units not greater than 50mm GNSS 14<->16 and 2<->16 Relative Hz movement between units not greater than 50mm Drive through survey: No reports of potential or actual mining related damage to TfNSW infrastructure. 	Continue to monitor as per monitoring plan	Ongoing	WCL
				Observations potentially exceed predictions.			
				<ul style="list-style-type: none"> GNSS 1,2,8,14,16 	GNSS 1,2,8,14,16 (subsidence),		WCL

Monitoring Site	Monitoring Details			Trigger			
	Instrument	Parameters	Frequency	Level	Action/Reporting	Timing	Responsibility
	Drive-through inspections: At traffic speed by TfNSW.	Drive-through inspections: TfNSW to report on new defects and comment on possible repairs required.	Drive-through inspections: Twice weekly	Vertical subsidence >150mm and/or GNSS 1<->8, 2<->8 and GNSS 14<->16 and 2<->16 Relative Hz movement between units greater than 50mm. <ul style="list-style-type: none"> Drive through inspections: Reports of actual mining related damage to TfNSW infrastructure. 	GNSS 1<->8 and 2<->8, GNSS 14<->16 and 2<->16 <ul style="list-style-type: none"> Carry out Q-Line survey Carry out visual slope inspection Carry out SXC1 – SXC2, SXC3 – SXC4 and QCN – QCS survey Drive through inspections: <ul style="list-style-type: none"> Inspect and determine cause of damage Slope visual inspection Carry out visual Inspection of slope to assess changes in slope condition.	<ul style="list-style-type: none"> Inform the Technical Committee within 7 days or 14 days noting trigger actions Investigation commences immediately Notify DPE of potential exceedance 	
	Visual slope inspection Inspection by geotechnical engineer	Visual slope inspection Inspection of slope to assess changes from previous condition.	Visual slope inspection <ul style="list-style-type: none"> After amber trigger and then as determined by TC. 	Observations continue to exceed predictions.			
				<ul style="list-style-type: none"> Drive through inspections: Reports of significant ground movement or failure at slopes. 	<ul style="list-style-type: none"> Implement adaptive management and contingency measures e.g. <ul style="list-style-type: none"> Stop mining and review mining options. TfNSW to inspect pavement and slope TfNSW to notify Traffic commander via TMC to enforce immediate speed restriction – enforced by traffic commander and NSW police 	<ul style="list-style-type: none"> TfNSW pavement inspection and traffic commander notification within 2hrs Inform the Technical Committee within 24 hours Investigation commences immediately 	<ul style="list-style-type: none"> WCL

Monitoring Site	Monitoring Details			Trigger			
	Instrument	Parameters	Frequency	Level	Action/Reporting	Timing	Responsibility
					<ul style="list-style-type: none"> Carry out slope visual inspection to identify nature and scale of issues and possible solutions Commence investigation into exceedance Technical Committee to meet to review monitoring data to decide on and to direct proactive action WCL and TfNSW to undertake visual inspections; 	<ul style="list-style-type: none"> Notify DPE within 48 hours Immediately Notify RR with written confirmation within 48 hours 	

Table 14 – Continuous Monitoring TARP (Grey Triggers)

Monitoring Details			Trigger			
Instrument	Parameters	Frequency after Trigger	Level	Action/Reporting	Timing	Responsibility
GNSS units Crackmeter	Instrumentation functioning	After loss of power or signal	Observations within predictions.			
			GNSS units and crackmeters functioning	Continue to monitor as per monitoring plan	Ongoing	WCL
			Loss of power or signal from any instrument	Identify and rectify cause Report in next status report	Within 24 hours of loss	WCL



Site	Russell Vale Colliery	DOC ID	RVC EC PLN003
Type	Management Plan	Date Published	7/10/2022
Doc Title	Extraction Plan - Subsidence Monitoring Program		

APPENDIX B - CONSULTATION RECORDS

RVF22/403#40
MAAG0013970

Mr Simon Pigozzo

Via: Major Project Portal / Email

Dear Mr Pigozzo

**Re. Extraction Plan - Russell Vale Underground Expansion - RVC Revised UEP
Extraction Plan**

I refer to your request of 20 April 2022 for advice regarding the Russell Vale Underground Expansion - RVC Revised UEP Extraction Plan. The Resources Regulator has reviewed the request.

Limitations

The Extraction Plan is assessed and determined by DPIE under the conditions of the development consent. The Resources Regulator provides advice to DPIE to assist in the determination. In view of the high-level uncertainties in relation to the magnitude, nature, location, timing and duration of subsidence development due to the highly complicated conditions at the subject site as well as the existence of the Key Public Infrastructure located above the proposed extraction panels PC07 and PC08, we suggest that the Approving Authority consider and enforce relevant Conditions of Approval to ensure that the proposed mining of PC07 and PC08 be subject to:

1. The Proponent's undertaking of a specific review of the subsidence monitoring and any other relevant data collected during the mining of extraction panels PC21 to PC25 and PC27 to PC34. The objectives of the review are to up-date the Proponent's understanding of risks to the Key Public Infrastructure located above the proposed extraction panels PC07 and PC08 and, if warranted as a result of the review, to up-date the Proponent's risk management plans for the Key Public Infrastructure. The aforementioned review must include the representatives of the infrastructure operators, and
2. The infrastructure operators' endorsement of the Proponent's proposed risk management plans for the Key Public Infrastructure following the above-mentioned review.

Please note:

- The Key Public Infrastructure mentioned above is identified in Condition C7 of the Development Consent (i.e. MP09_0013, dated 8 December 2020);
- The aforementioned review may take place towards the end or after the completion of mining of extraction panels PC21 to PC25 and PC27 to PC34, and
- In discussing the Sequencing of Mining, the Proponent states that "Stage 2 second workings (PC27-PC34) may be undertaken concurrently with Stage 1a (PC21- PC25) and Stage 1b (PC07-PC08) second workings." In this case, it is critical to mine extraction panels PC21 to PC25 and PC27 to PC34 prior to the review as recommended above, considering the potentially severe consequences and any resulting community outrages if the Key Public Infrastructure is adversely affected by subsidence.

In addition, the holder of relevant mining leases is required to ensure that the rehabilitation commitments outlined in any approved Extraction Plan are included in the Mining Operations Plan / Rehabilitation Management Plan regulated by the Resources Regulator pursuant to the conditions of the mining leases under the Mining Act 1992. The holder of the mining leases must ensure the Mining Operations Plan / Rehabilitation Management Plan for the area covered by this 'RUSSELL VALE COLLIERY REVISED UNDERGROUND EXPANSION PROJECT, EXTRACTION PLAN, STAGES ONE and TWO - PC07, PC08 & PC21 to PC25 and PC27 to PC34 , RVE EC PLN 010 (dated 30 November 2021) ' is updated where necessary.

Regulatory requirements if approved

The authorisation holder is required to ensure that the rehabilitation commitments outlined in any approved Extraction Plan are included in the Mining Operations Plan / Rehabilitation Management Plan regulated by the Resources Regulator under the conditions of the mining lease and the *Mining Act 1992*. The authorisation holder must ensure the Mining Operations Plan / Rehabilitation Management Plan for the area covered by this Extraction Plan is updated where necessary.

The Resources Regulator may undertake assessments of the mine operators' proposed mining activities under the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and Regulation as well as other WHS regulatory obligations.

Subsidence associated with the proposed Extraction Plan will be regulated by under relevant provisions of WHS laws in particular Clause 33 and Clause 67 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* relating to High Risk Activities and Subsidence.

Background

The NSW Resources Regulator is responsible for compliance and enforcement of the Extraction Plan is so far as it relates to requirements under the Mining Act 1992 and Work Health and Safety legislation. This role principally relates to rehabilitation, workplace safety and public safety.

The Mining Act Inspectorate within the Resources Regulator undertake risk-based compliance and enforcement activities in relation to obligations under the *Mining Act 1992*. This includes undertaking assessment and compliance activities in relation to mine rehabilitation activities and determination of security deposits.

The Mine Safety Inspectorate within the Resources Regulator is responsible for ensuring the mine operators' compliance with the Work Health and Safety (WHS) legislation, in particular the effective management of risks associated with the principal hazards as specified in the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*.

Contact

Should you require any further information or clarification, please contact the Office of the Executive Director (ED.ResourcesRegulator@planning.nsw.gov.au)

Yours sincerely,



Peter Day
Executive Director
Resources Regulator
13 May 2022



Our Ref: 21174_Peter Day re NSWRR submission_V1.0

31 May 2022

Peter Day
Executive Director
NSW Resources Regulator

E| ED.ResourcesRegulator@planning.nsw.gov.au

Dear Peter

RE: NSW Resources Regulator Comments on Russell Vale Colliery Revised UEP Extraction Plan (RVF22/403#40, MAAG0013970)

I refer to your letter to Simon Pigozzo dated 13 May 2022 regarding the Russell Vale Colliery (RVC) revised Extraction Plan for the approved Russell Vale East mining area.

Thank you for providing a response, as requested by Wollongong Coal Limited (WCL) on 20 April 2022, for the revised Extraction Plan.

The extraction plan was revised to include extraction of the 'Stage 2' area, panels PC27–34. Based on the comments in the letter, we have assumed that the Resources Regulator has no specific concerns regarding the draft Extraction Plan insofar as it relates to the 'Stage 2' mining area (panels PC27–34).

As detailed in the current conditional approval of the 'Stage 1' Extraction Plan, mining is currently only approved in panel PC21 with further mining in PC22–25 and in PC07 and PC08 being subject to a review of subsidence monitoring in PC21 to confirm impact predictions. A minimum of 12 months groundwater monitoring within CCUS1 and the endorsement of the extraction plan by relevant infrastructure owners in the vicinity of PC07–08 is also required before mining can commence in PC07 and PC08.

A detailed submission to the Department of Planning and Environment is currently being prepared regarding the proposed approach to satisfying the subsidence monitoring requirements of this conditional approval.

Please do not hesitate to contact the undersigned on 1300 793 267 should you require clarification or further information.

Yours sincerely

David Holmes
Principal Environmental Consultant

E| dholmes@umwelt.com.au

cc Department of Planning and Environment

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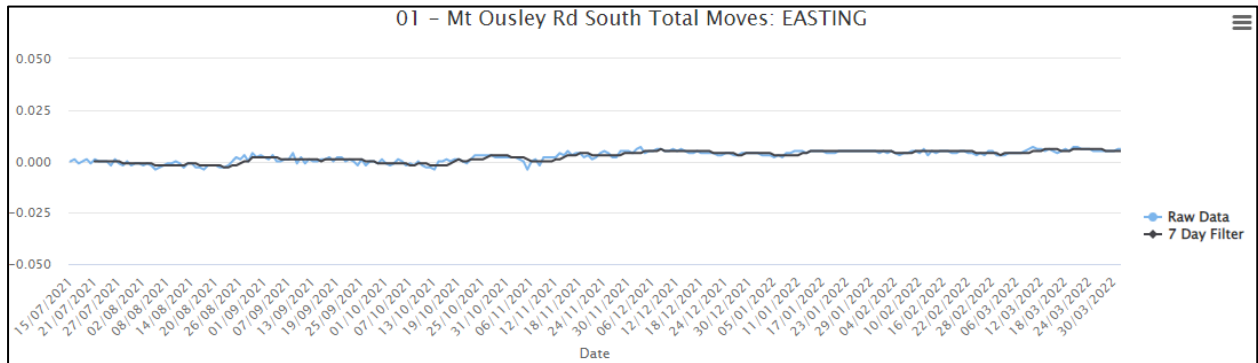
Site	Russell Vale Colliery	DOC ID	RVC EC PLN003
Type	Management Plan	Date Published	7/10/2022
Doc Title	Extraction Plan - Subsidence Monitoring Program		

APPENDIX C – BASELINE MONITORING DATA

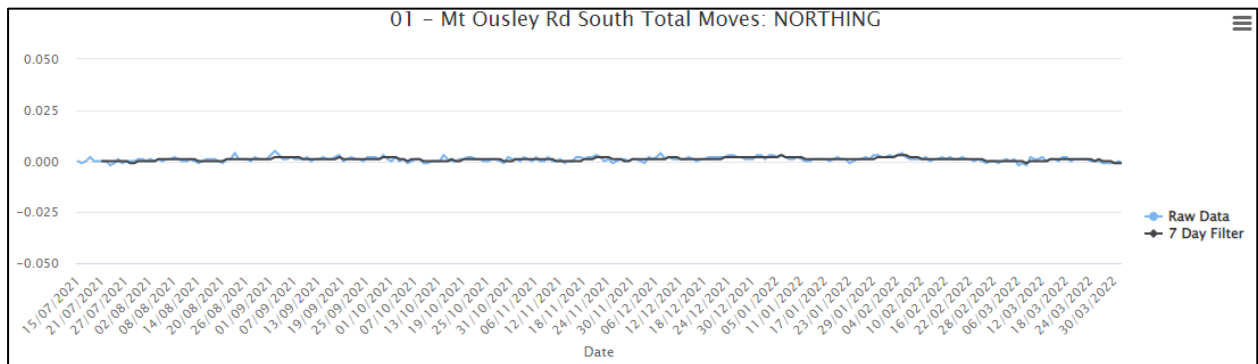
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #1- Mt Ousley Road South (CCUS 20)

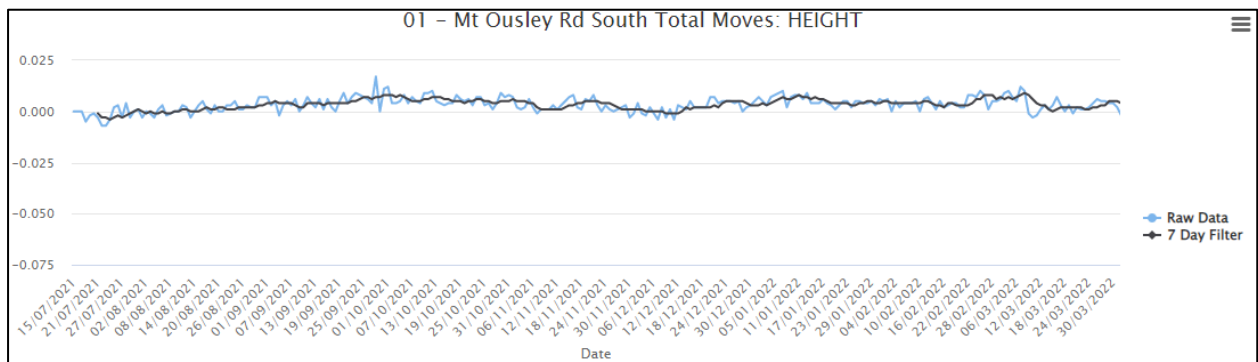
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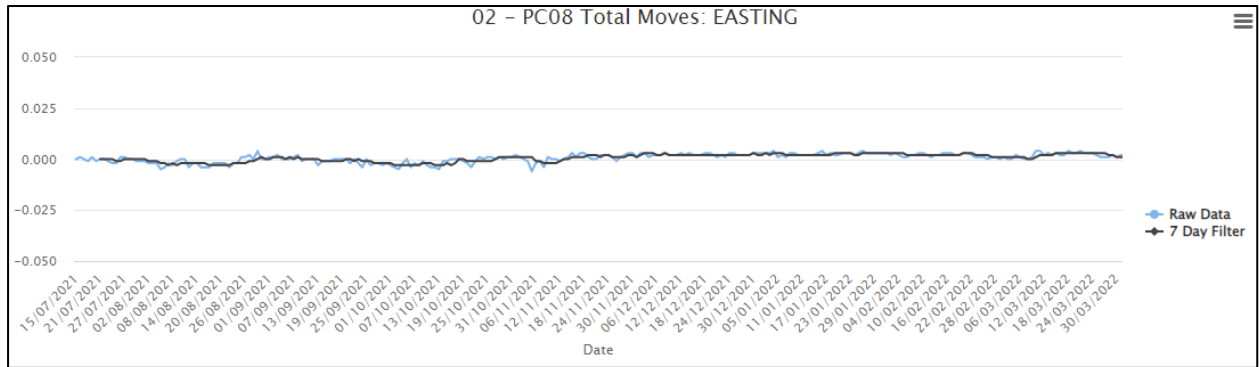
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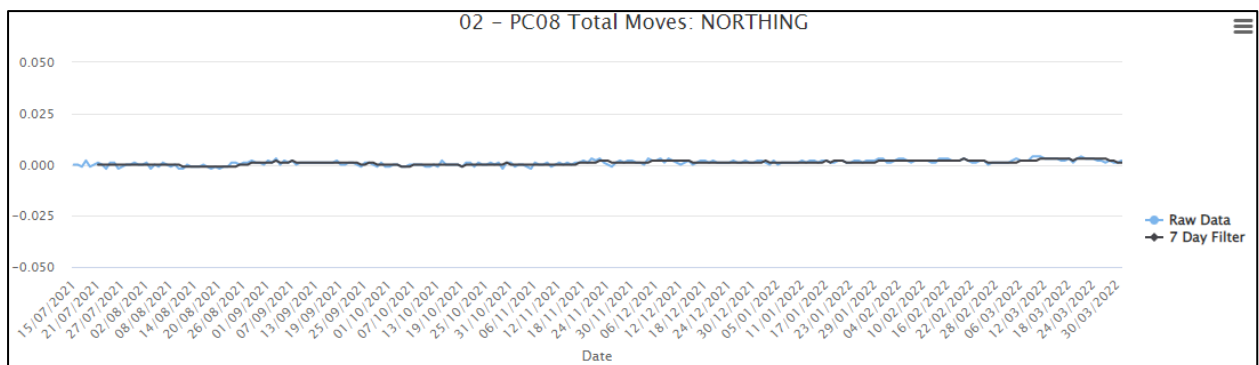
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #2 - PC08 (Bulli & Balgownie goaf)/ CCUS1/ CCUS 20)

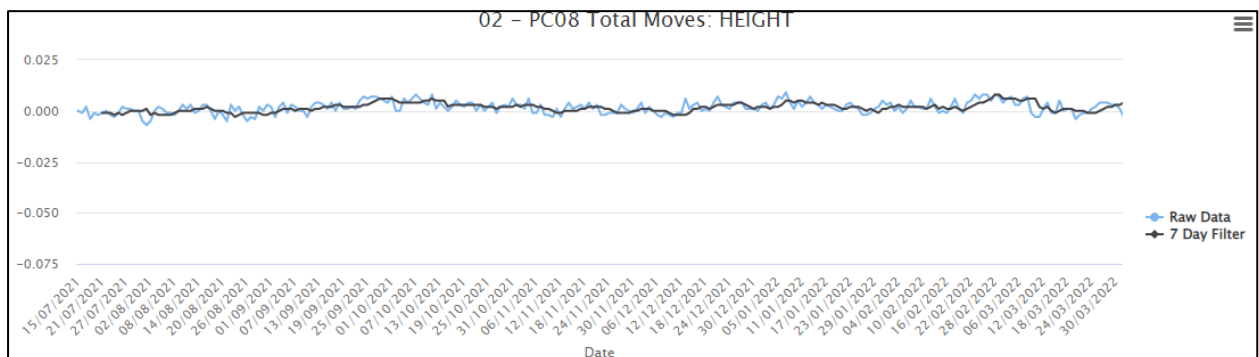
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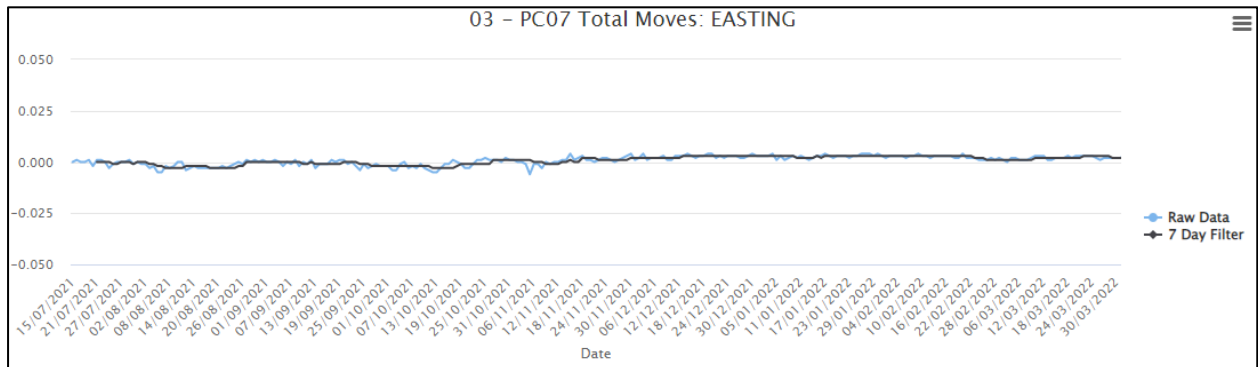
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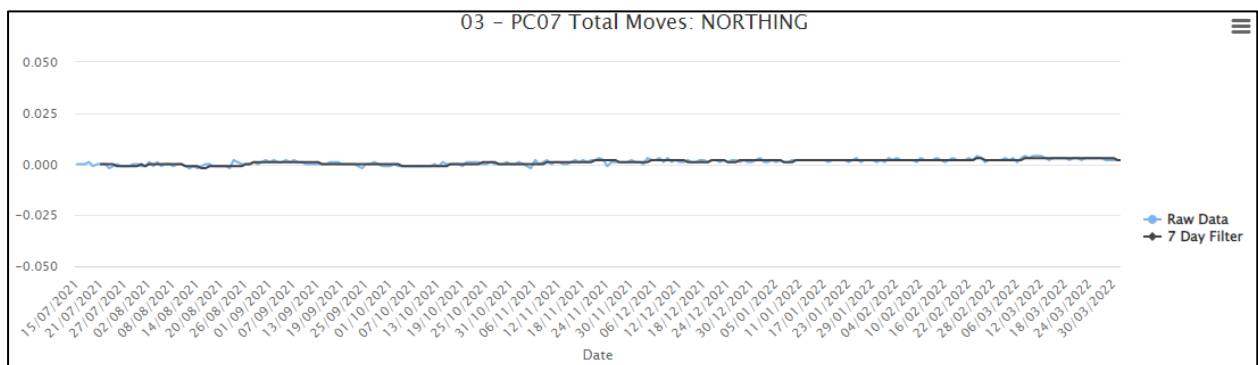
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #3 - PC07 (Bulli & Balgownie goaf)/ CCUS2 and CCUS 1)

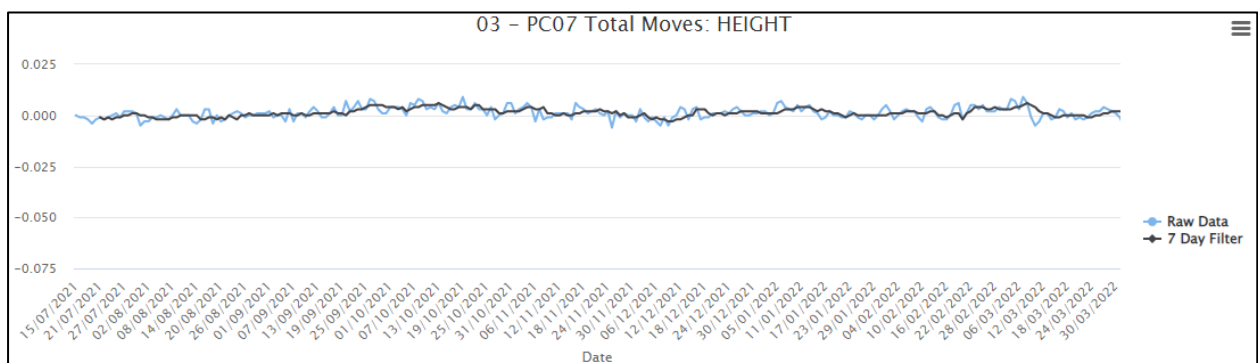
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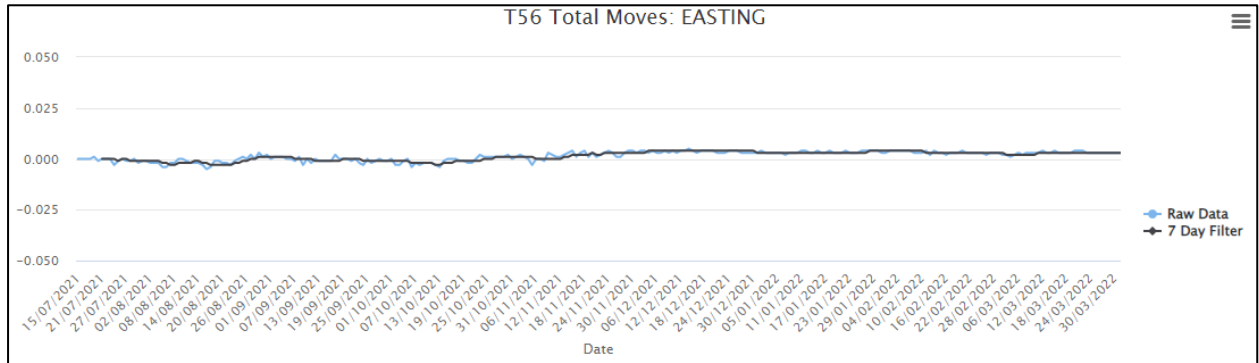
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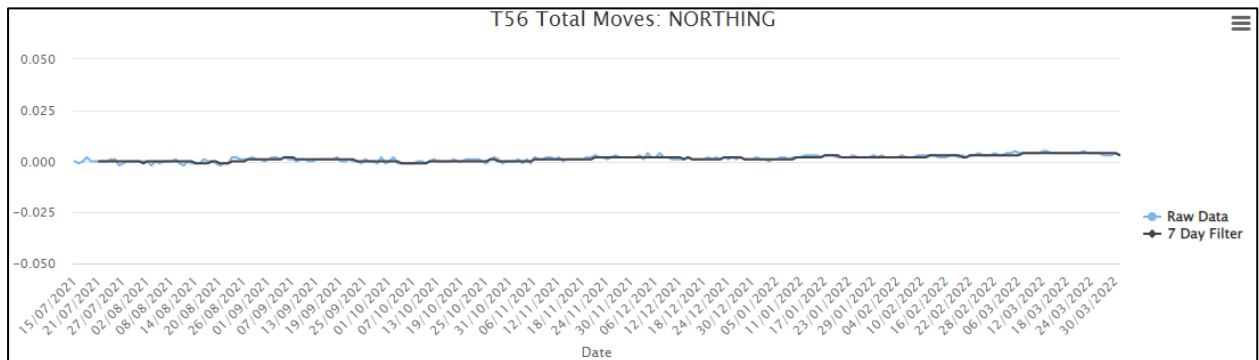
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #5 - TransGrid 330kV tower T56, Endeavour Energy 132 KV tower E69 and 33KV pylons (Balgownie goaf).

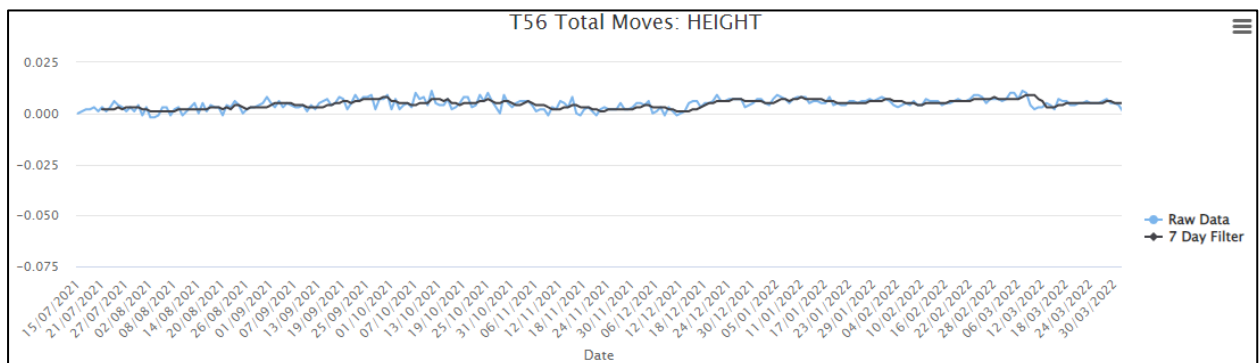
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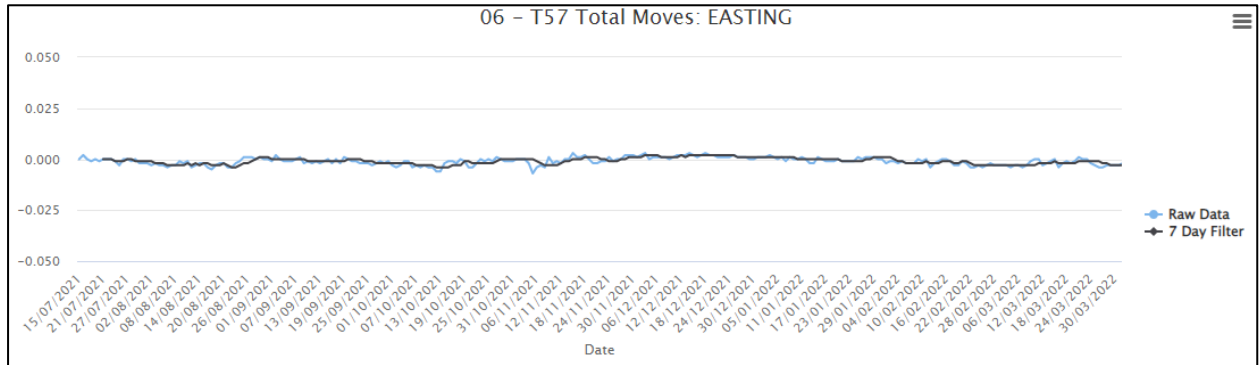
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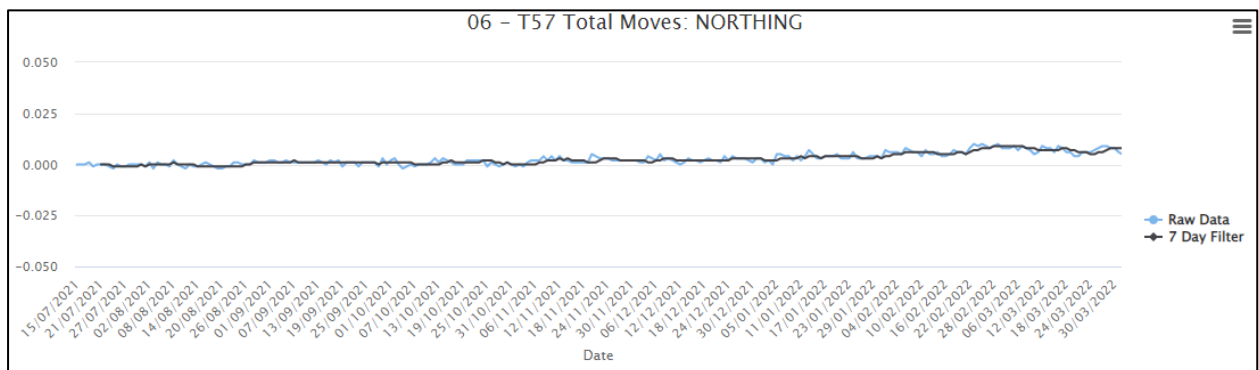
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #6 - TransGrid 330kV tower T57, Endeavour Energy 132 KV tower E66 and 33KV pylons, (bull pillars).

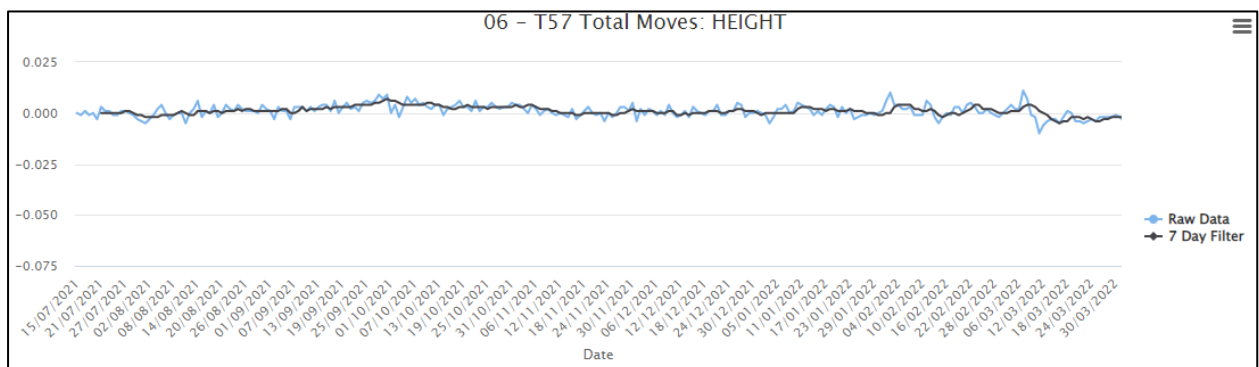
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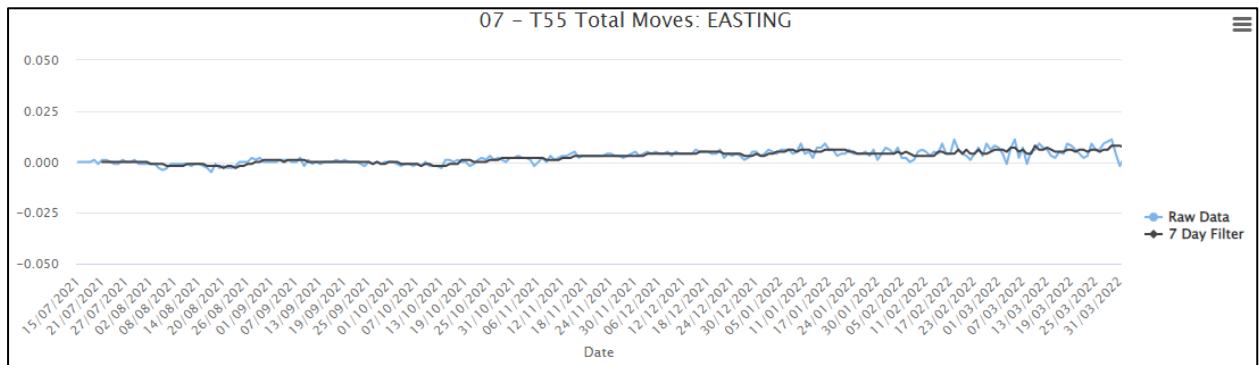
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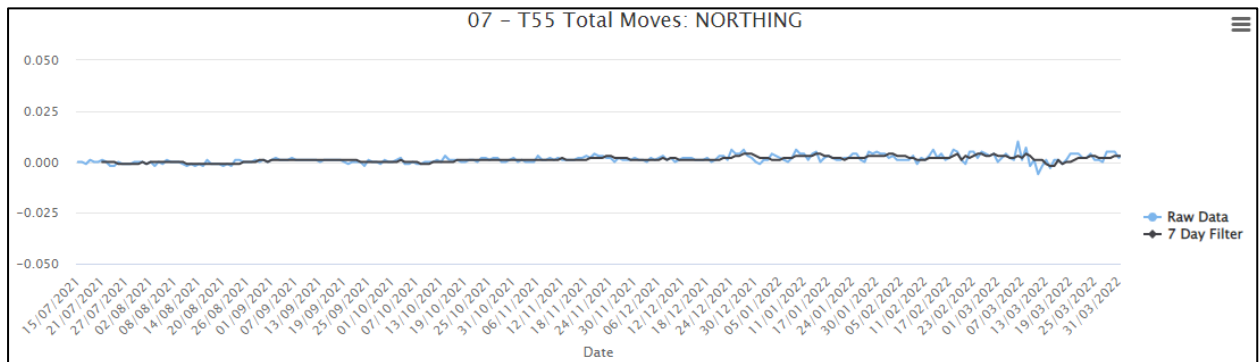
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #7 – TransGrid 330kV tower T55, Endeavour Energy 132 kV tower E68 and 33KV pylons (solid coal).

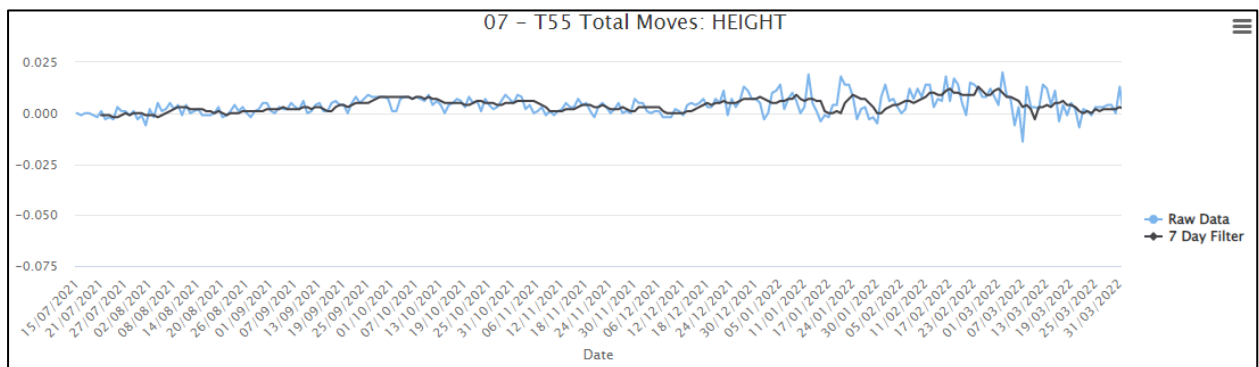
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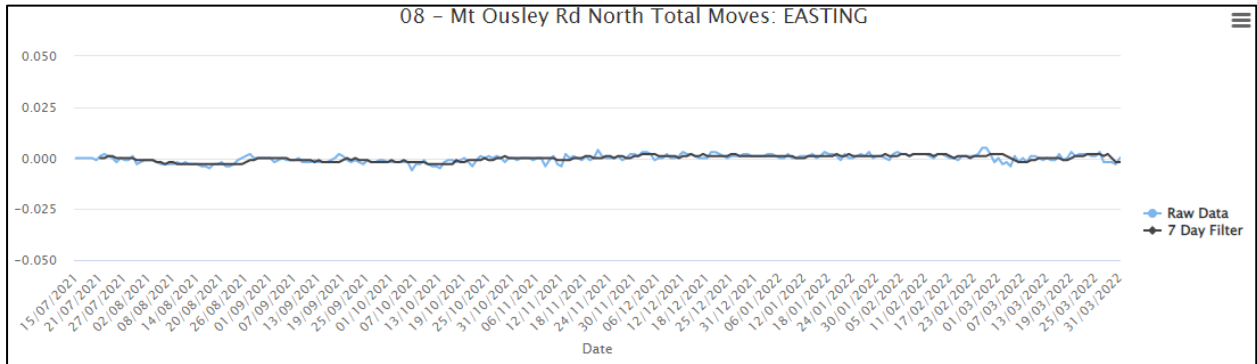
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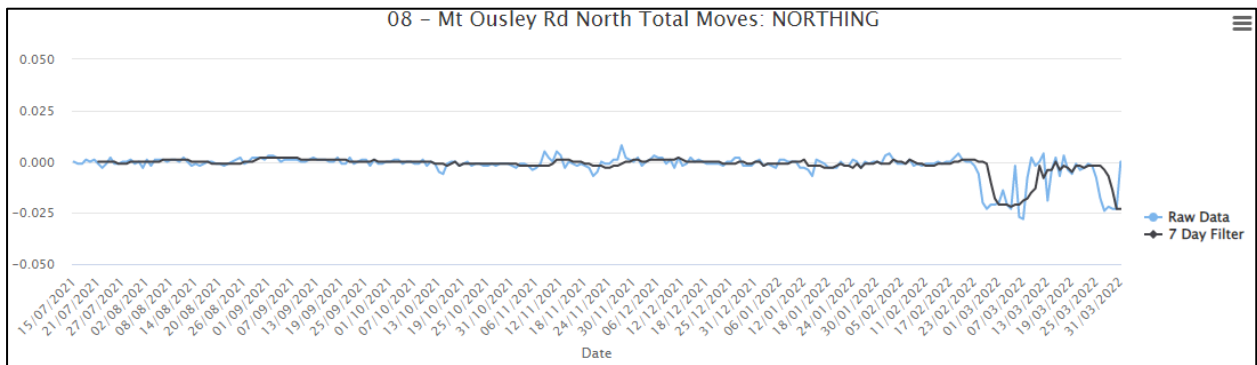
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #8 – Mt Ousley Rd north (Bulli goaf).

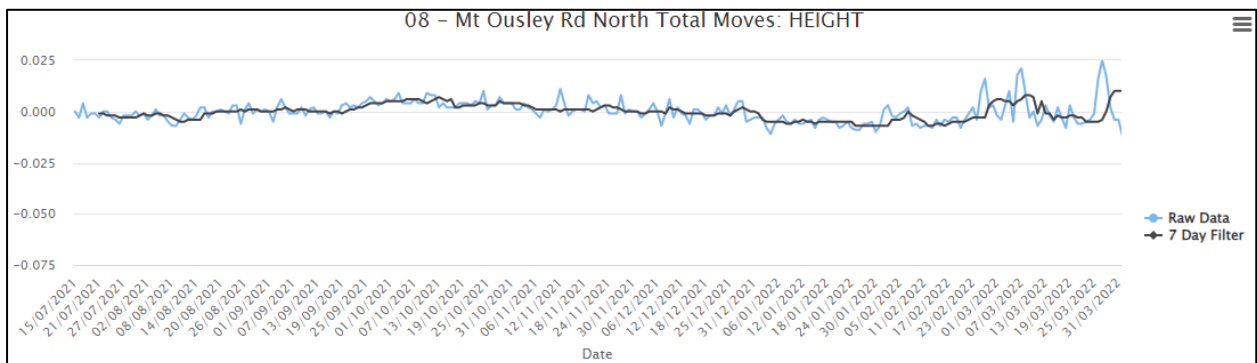
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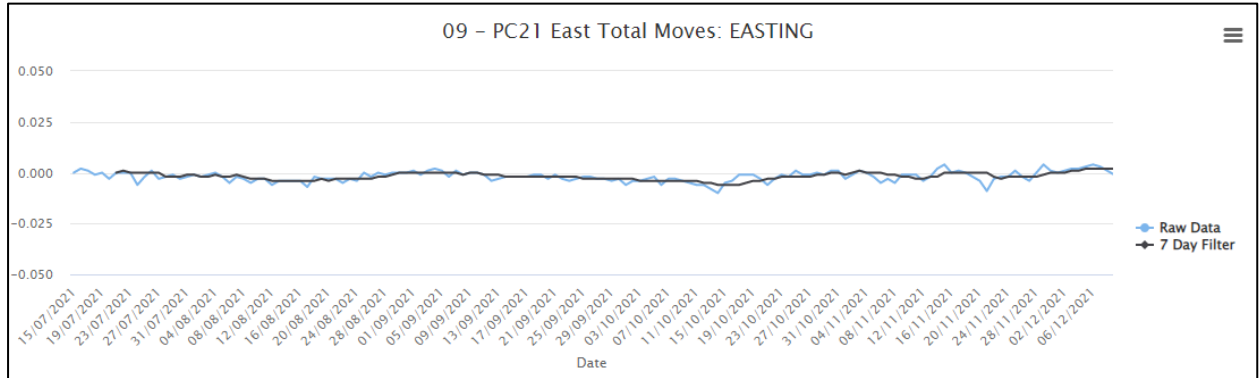
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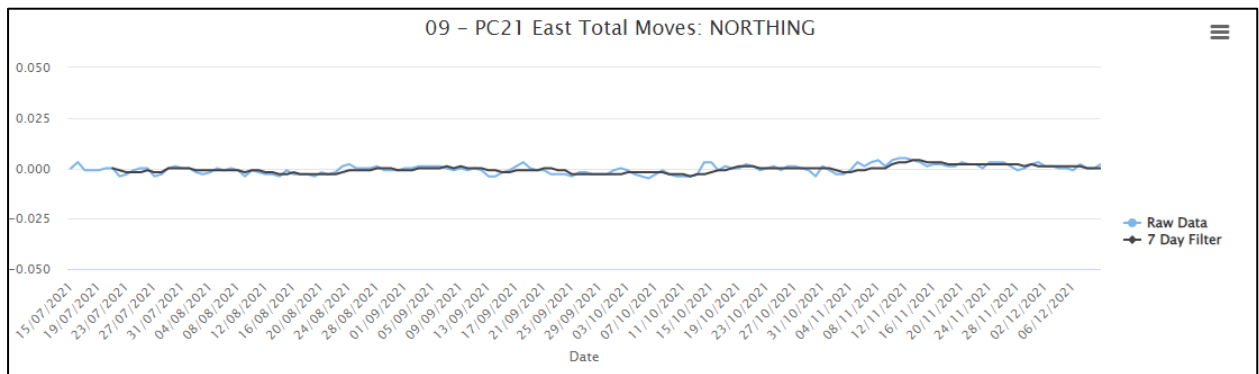
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #9 - PC21 East (Bulli goaf #2)

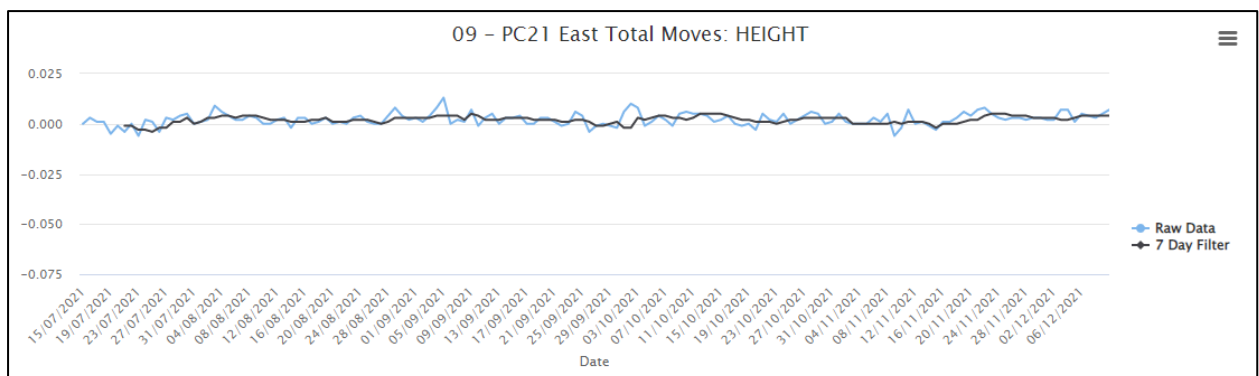
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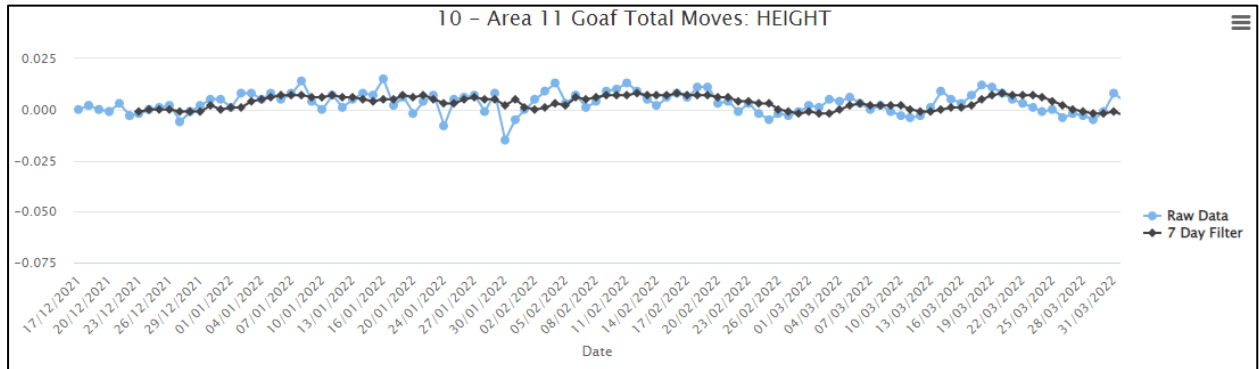




Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #10 PC23 (Bulli goaf #11)

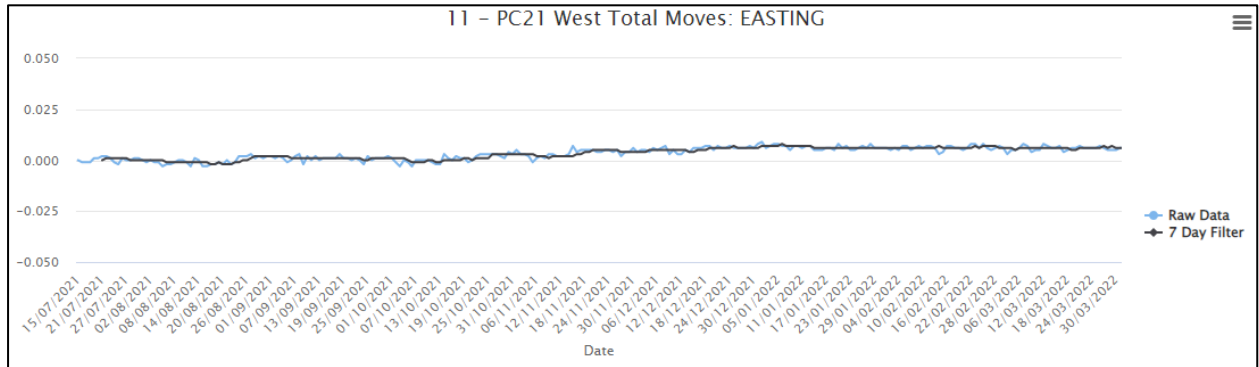
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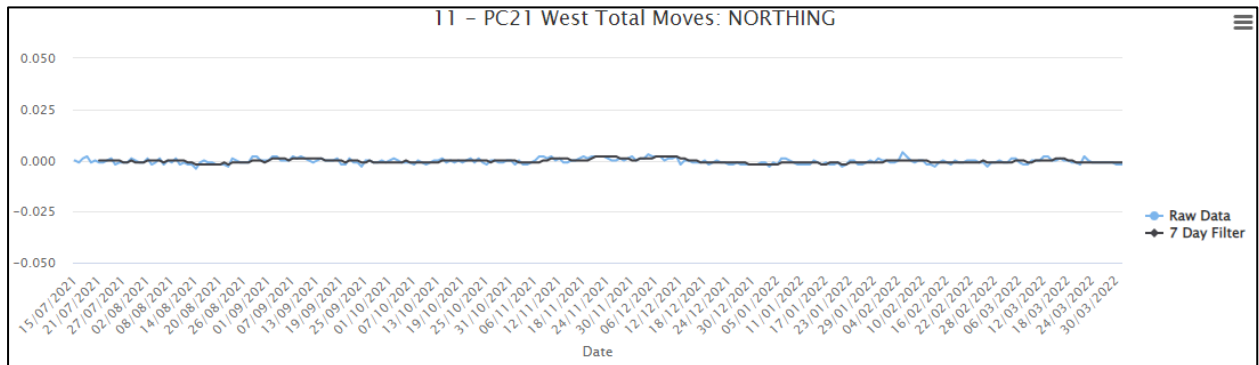
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #11 - PC21 west (Bulli goaf #2)/ CCUS 5)

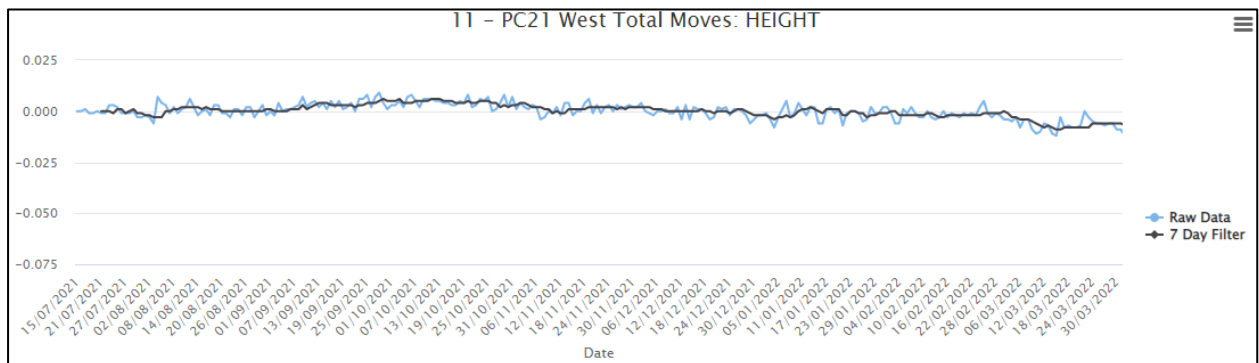
Easting



Northing



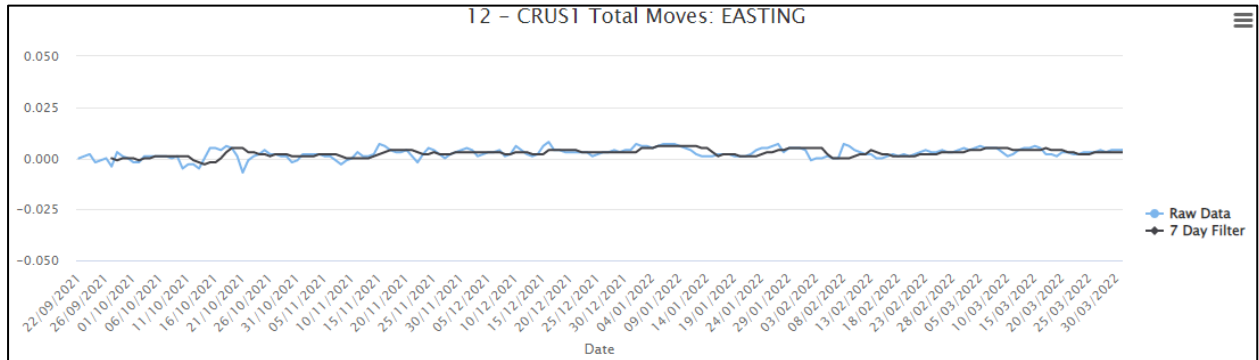
Height



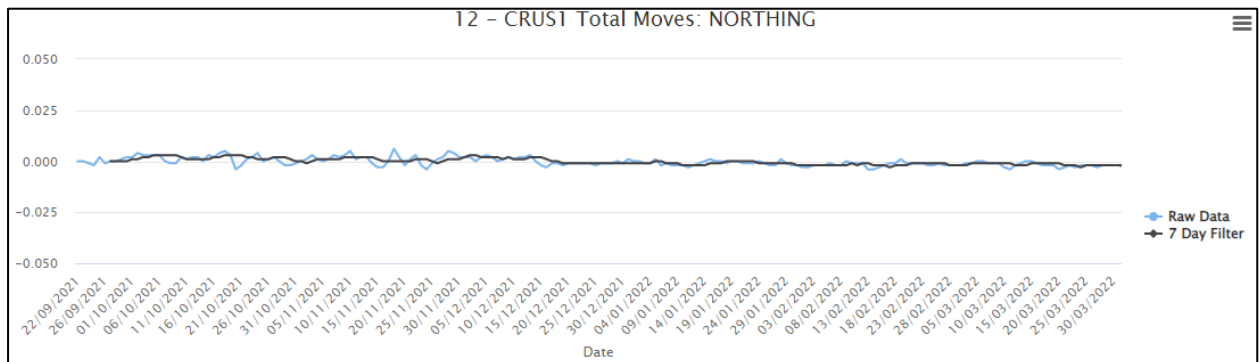
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #12 - South of PC21 (edge Bulli & Wongawilli goaf, CRUS 1)

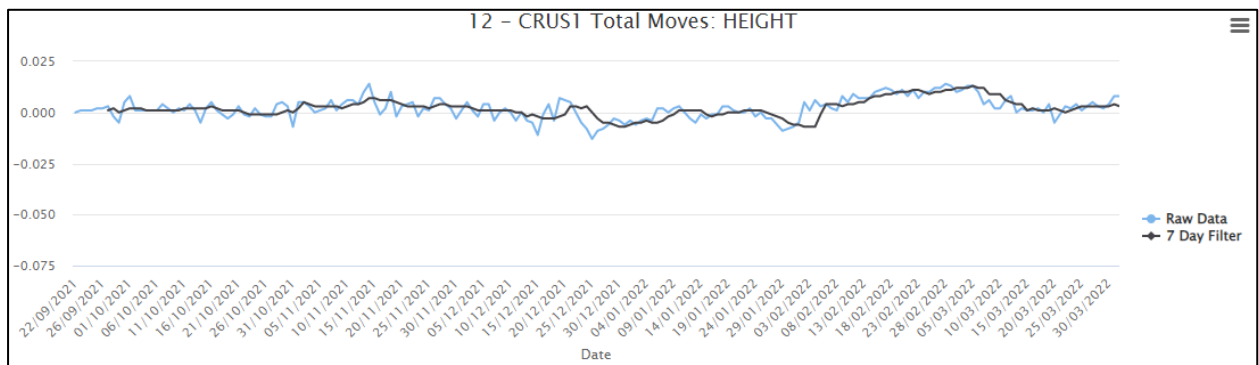
Easting



Northing



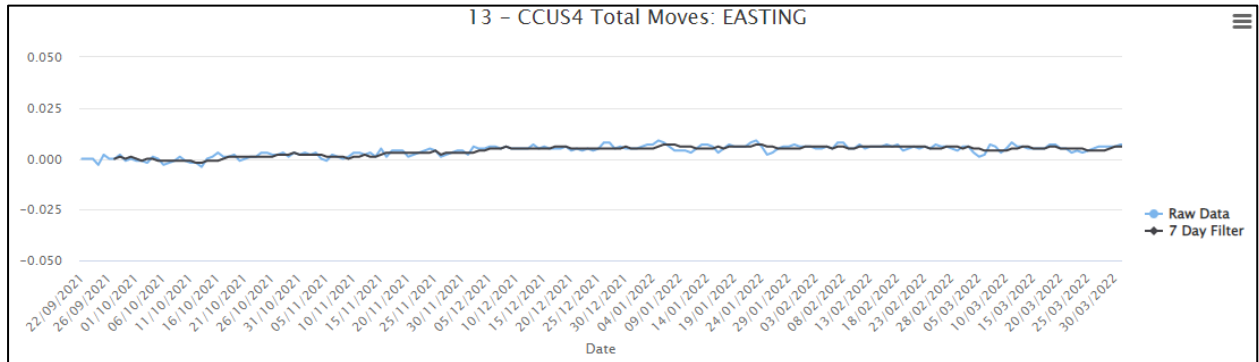
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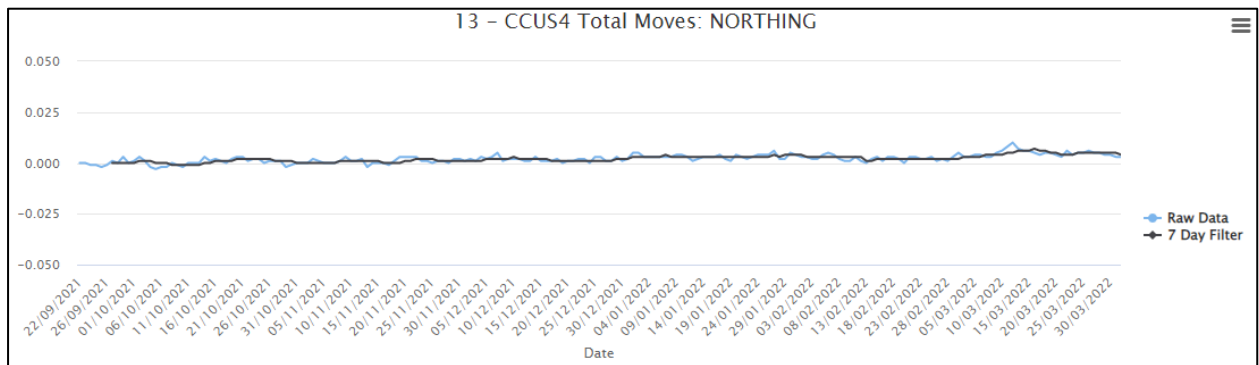
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #13 - South of PC21 (Balgownie goaf)/ CCUS 4/ CCUS 3/CCUS 6/ CCUS 23)

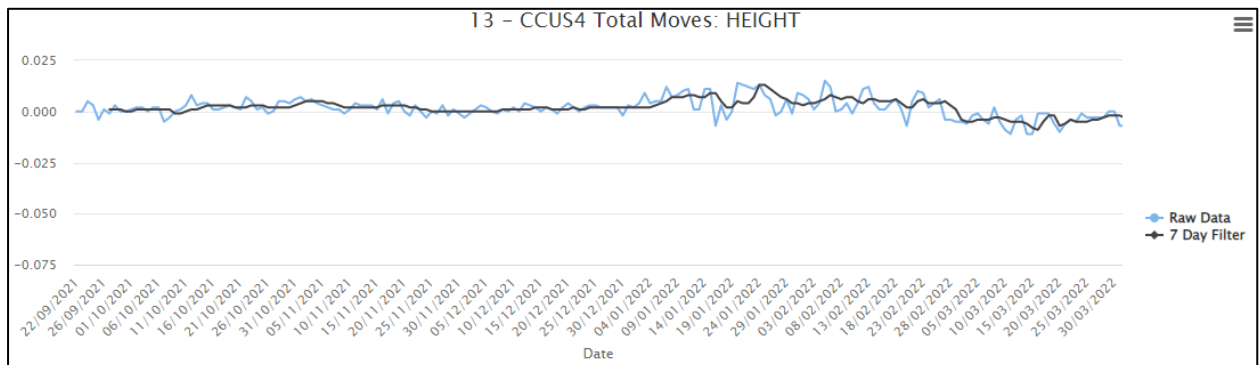
Easting



Northing



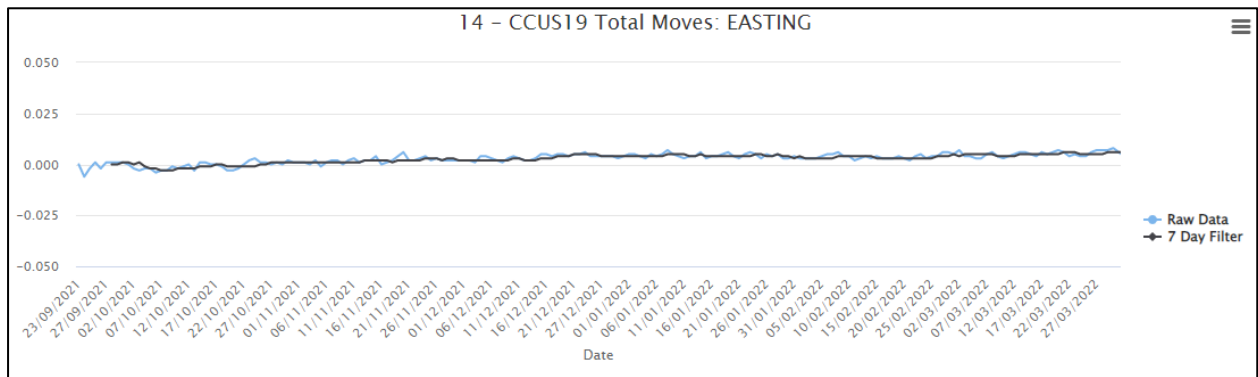
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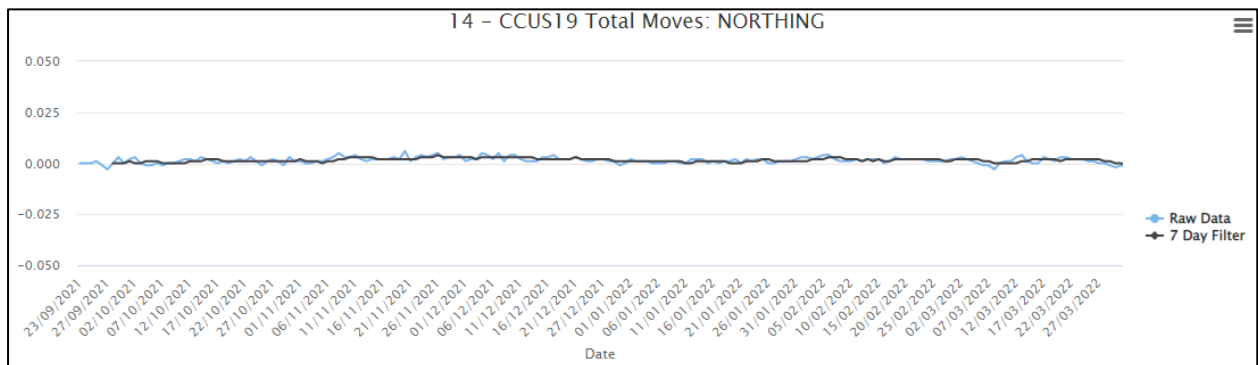
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #14 - West of PC08 (Bulli pillars, CRUS 19/ CCUS 15/ CCUS 14/ CCUS 17/CCUS 18/ CCUS 19/ CRUS 3)

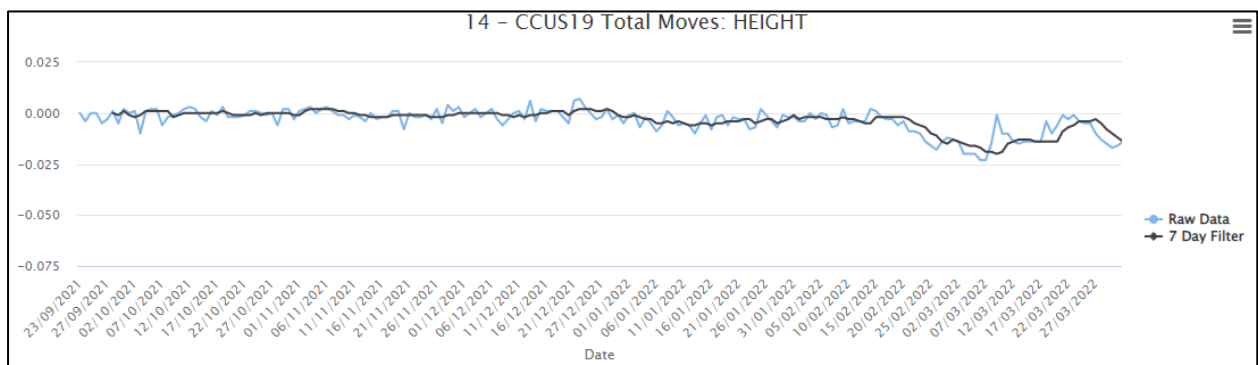
Easting



Northing



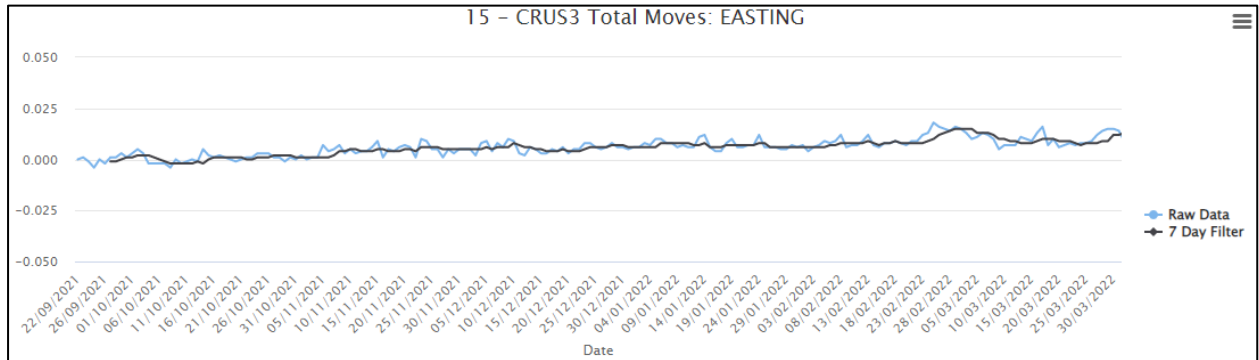
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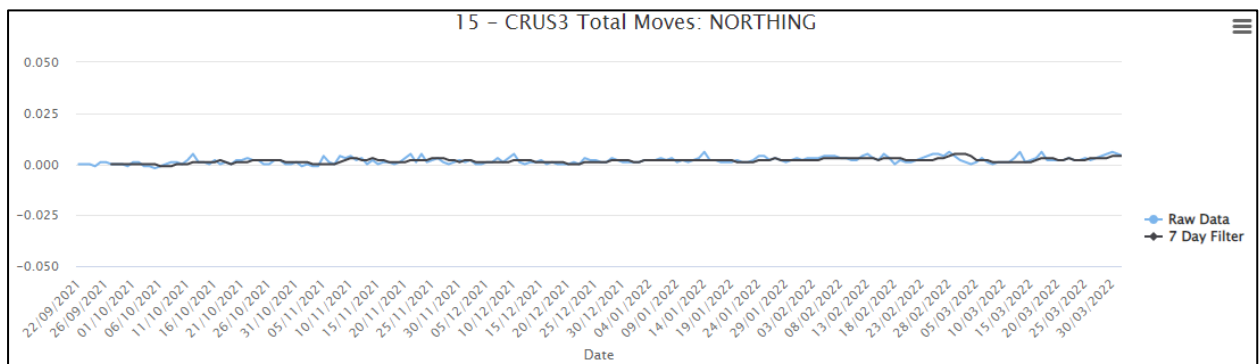
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #15 - South of PC07 (Bulli pillars, CRUS 3/ CCUS2)

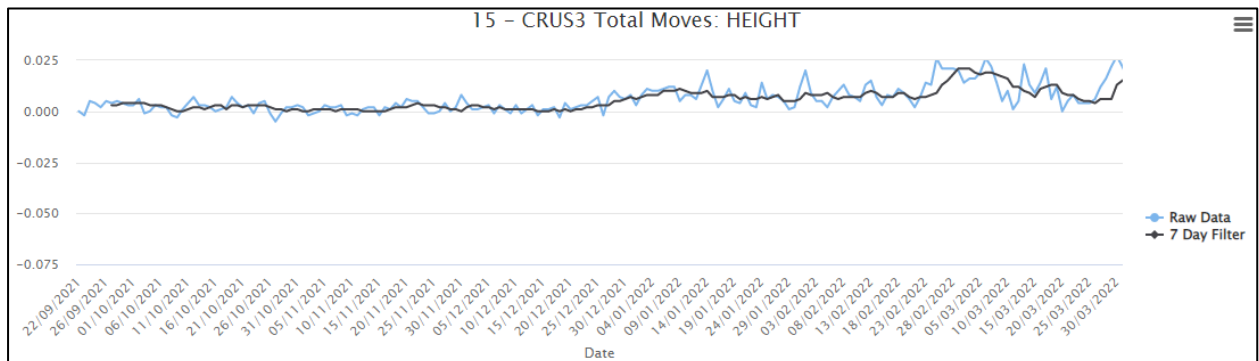
Easting



Northing



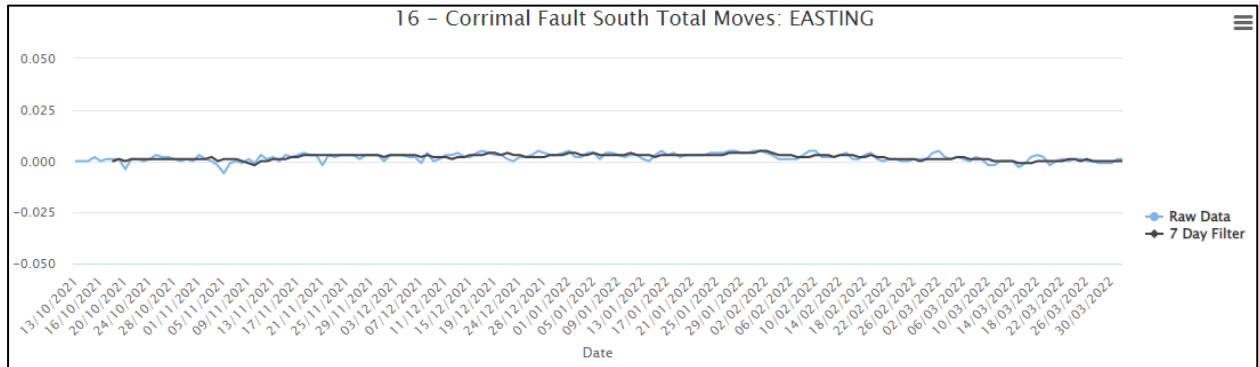
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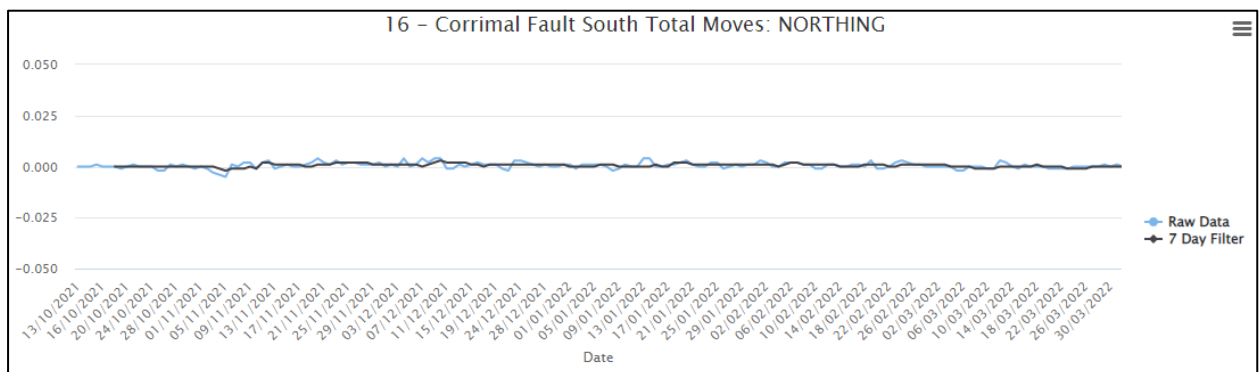
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #16 - RMS Infrastructure/ Corrimal Fault South

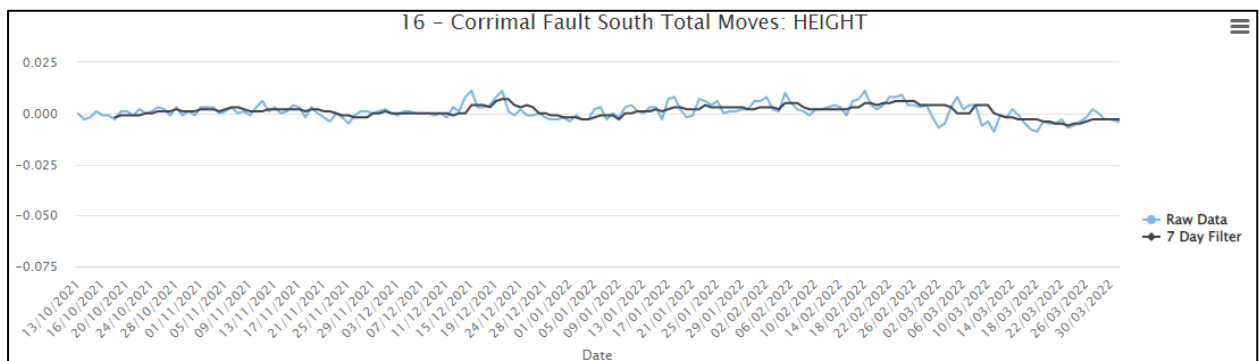
Easting



Northing



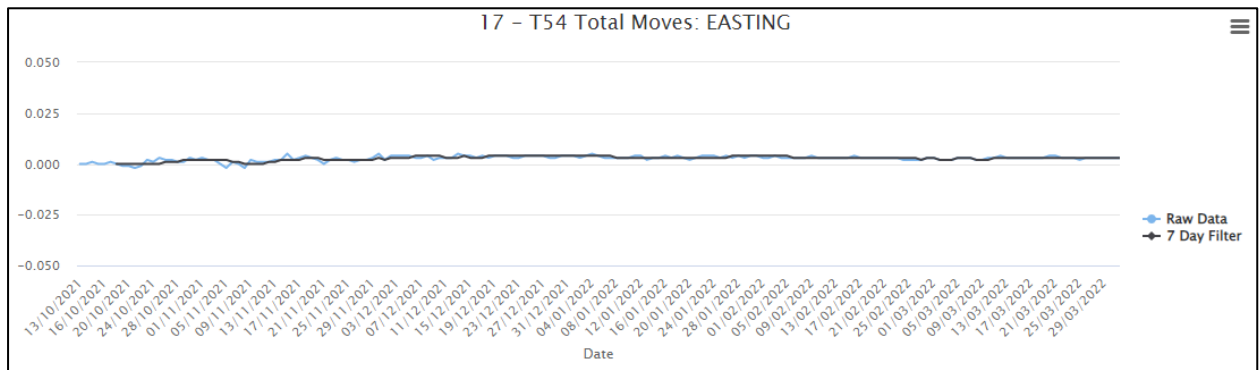
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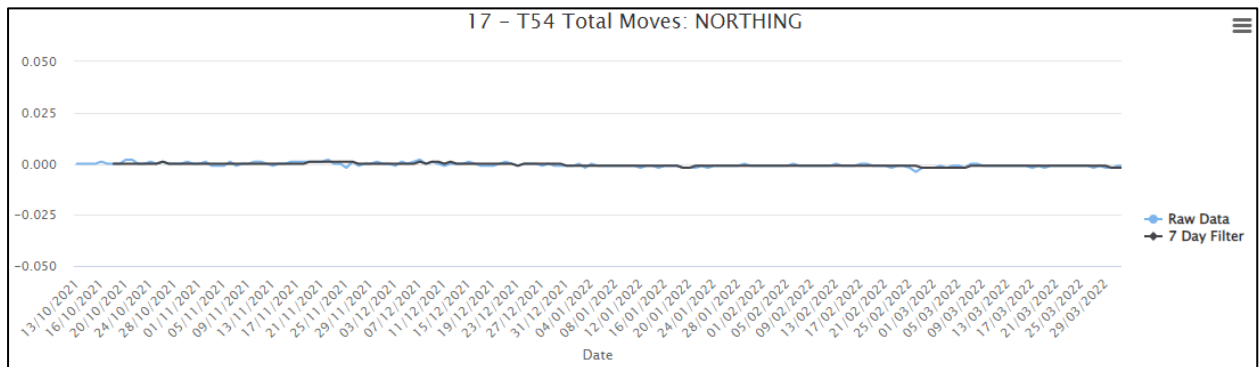
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #17 - TransGrid 330kV Tower 54, Endeavour Energy 132kV E69 Powerline Towers & 33KV pylons

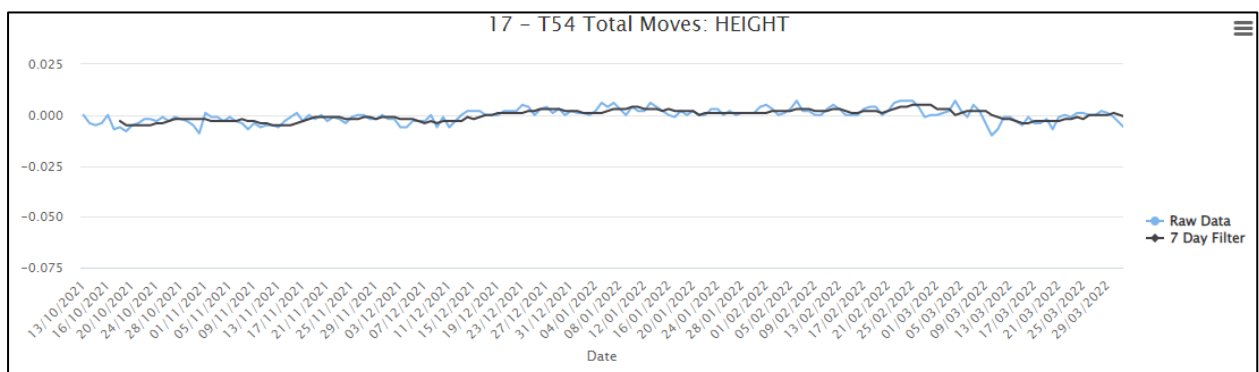
Easting



Northing



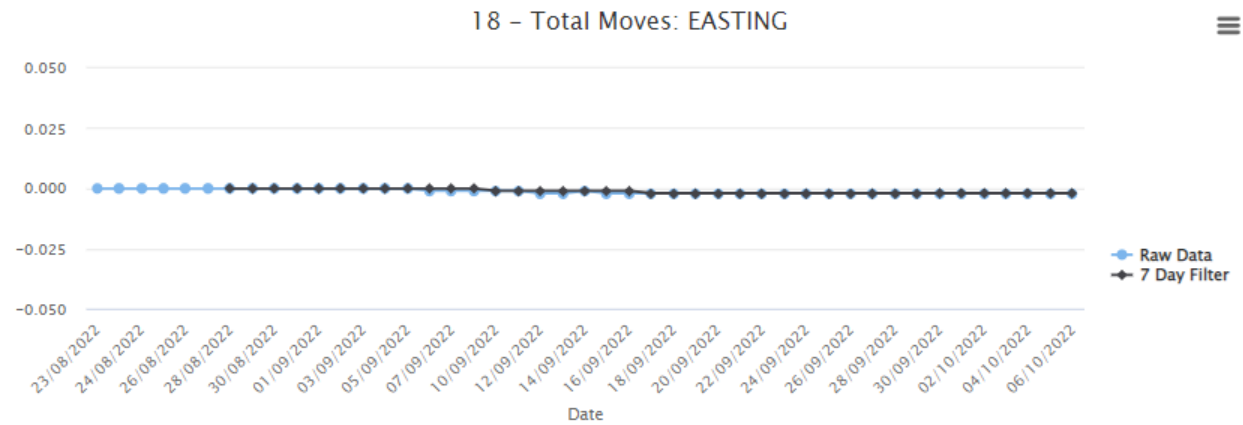
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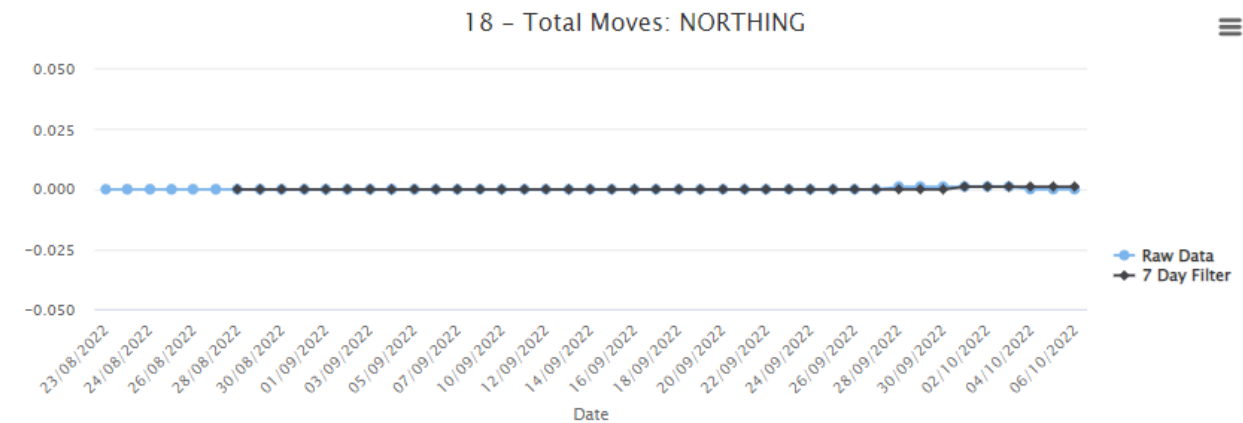
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #18 – PC34, Fire Trail, Upland Swamps (CRUS7, BCUS15, BCUS16)

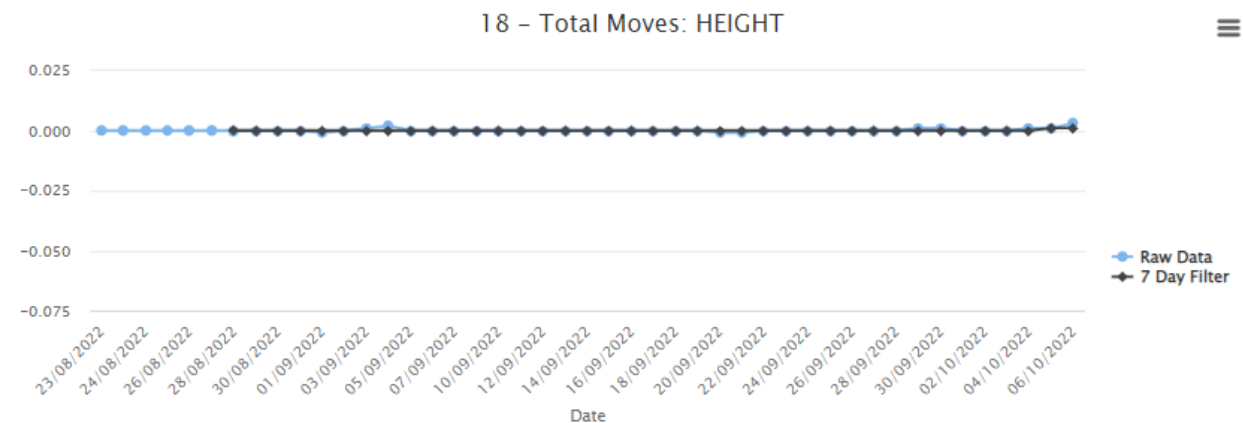
Easting



Northing



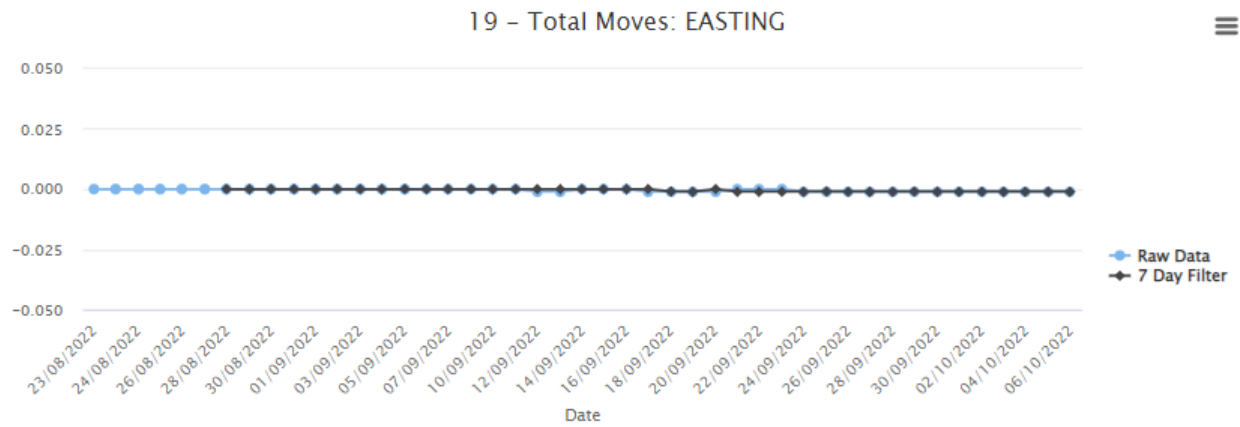
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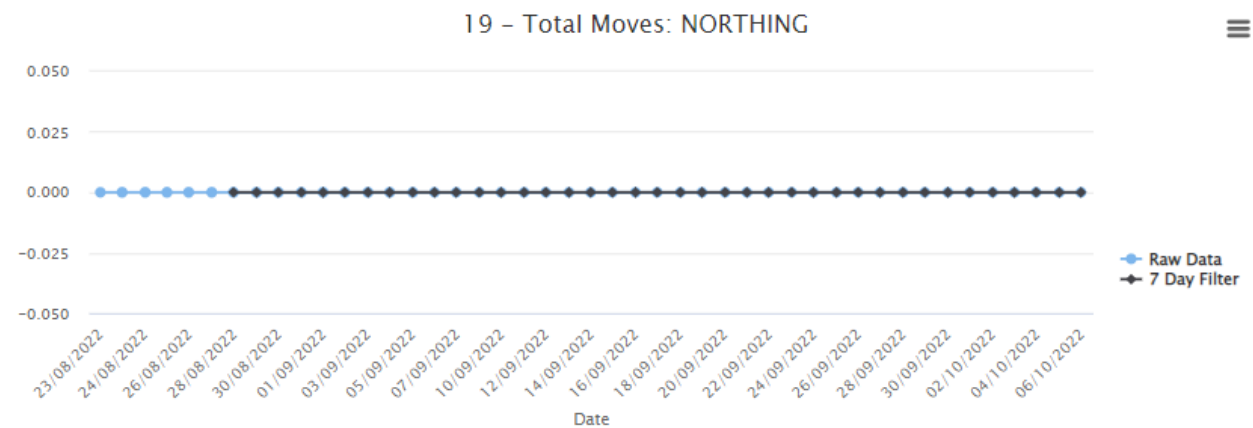
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #19 – PC34, Upland Swamps (CCUS13, CCUS16, CCUS22)

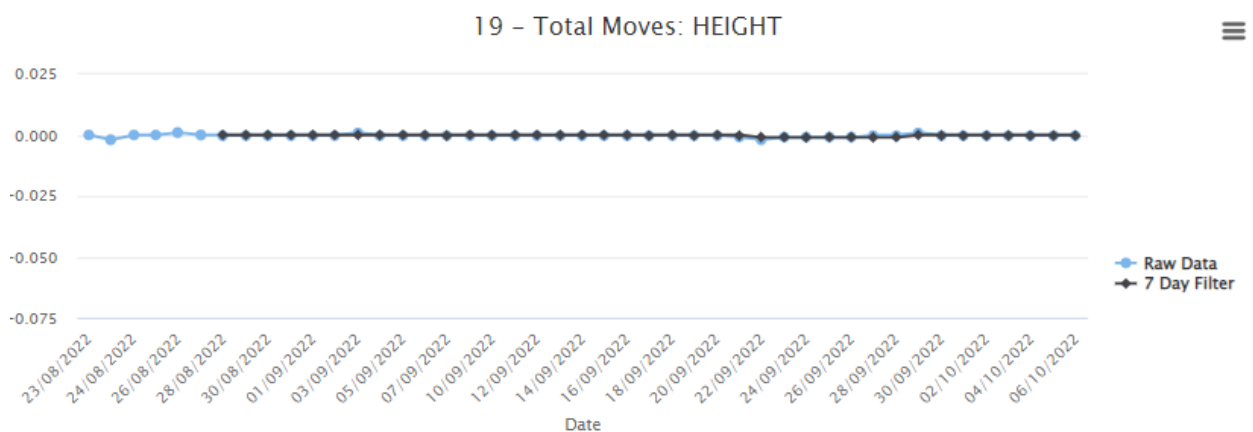
Easting



Northing



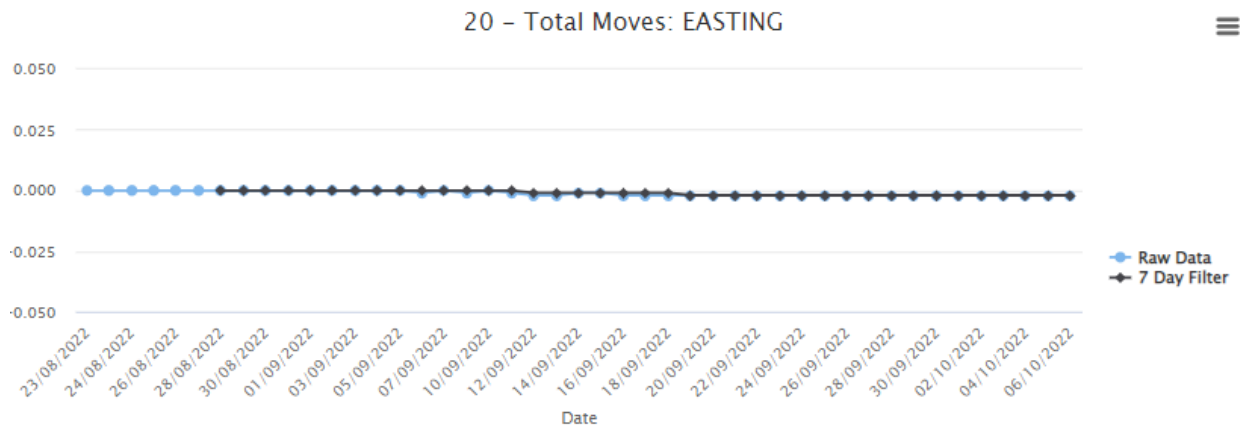
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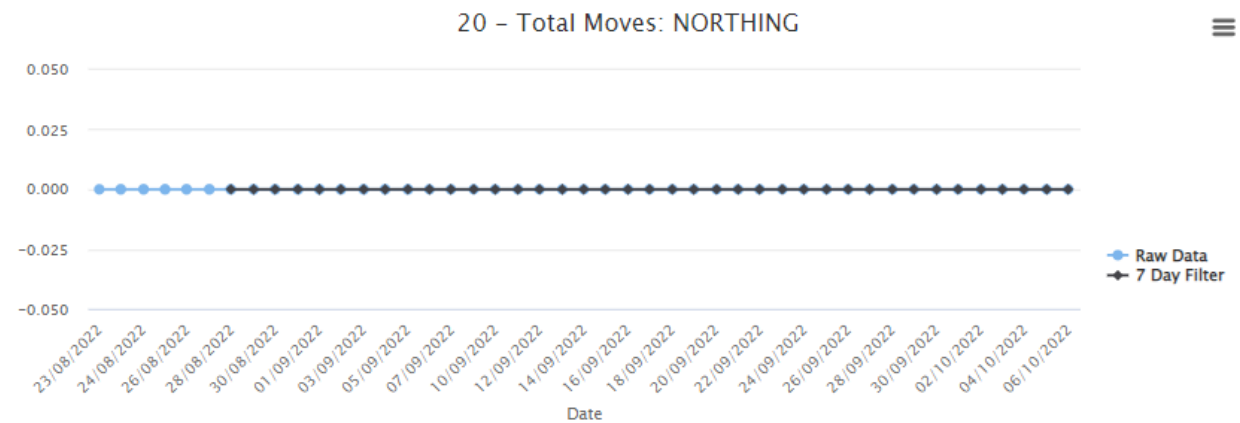
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #20 – PC33, Upland Swamps (BCUS7, BCUS8, BCUS9, BCUS10)

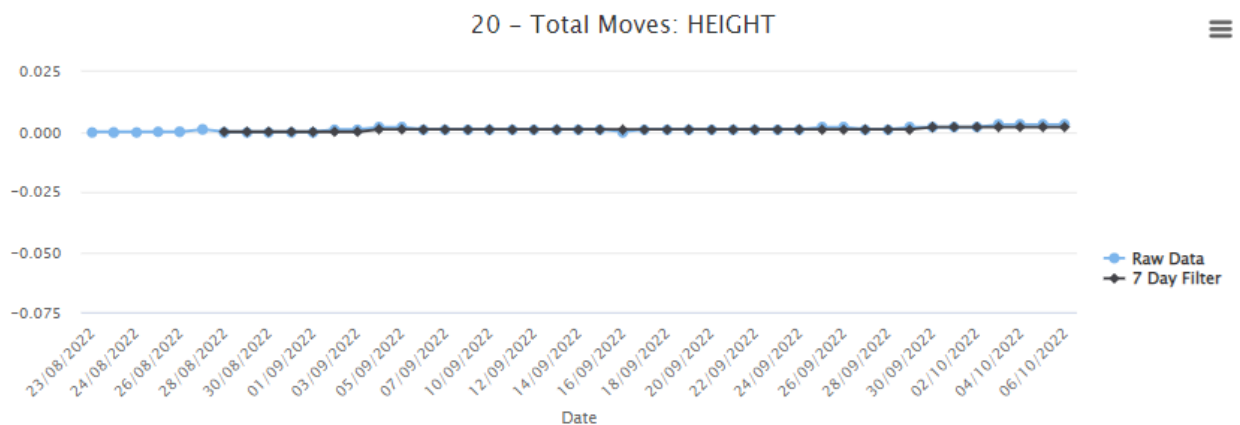
Easting



Northing



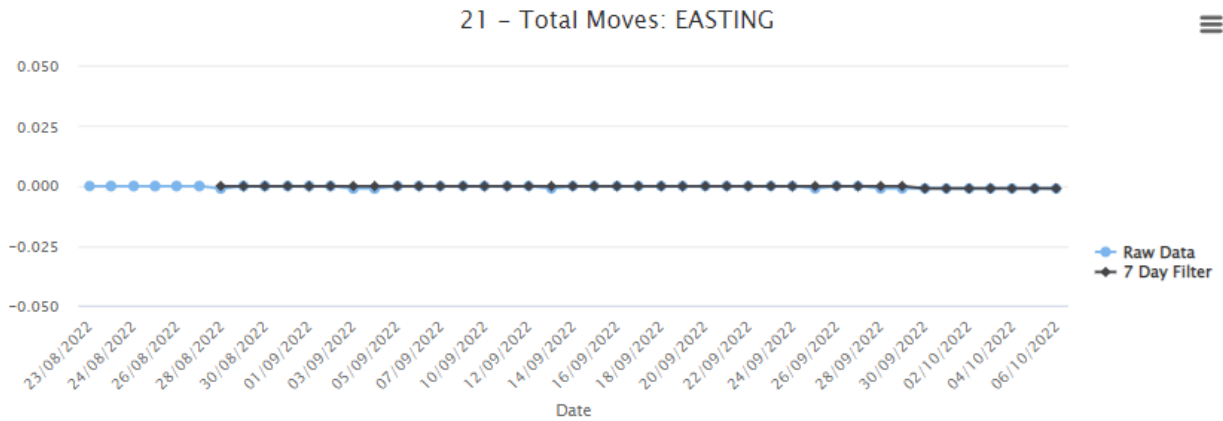
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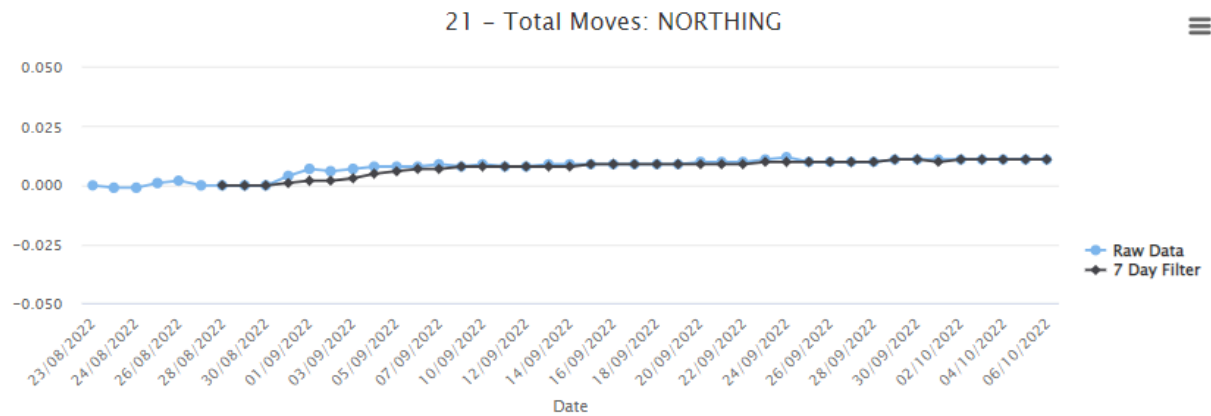
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #21 – Upland Swamps (BCUS5, BCUS6, BCUS14)

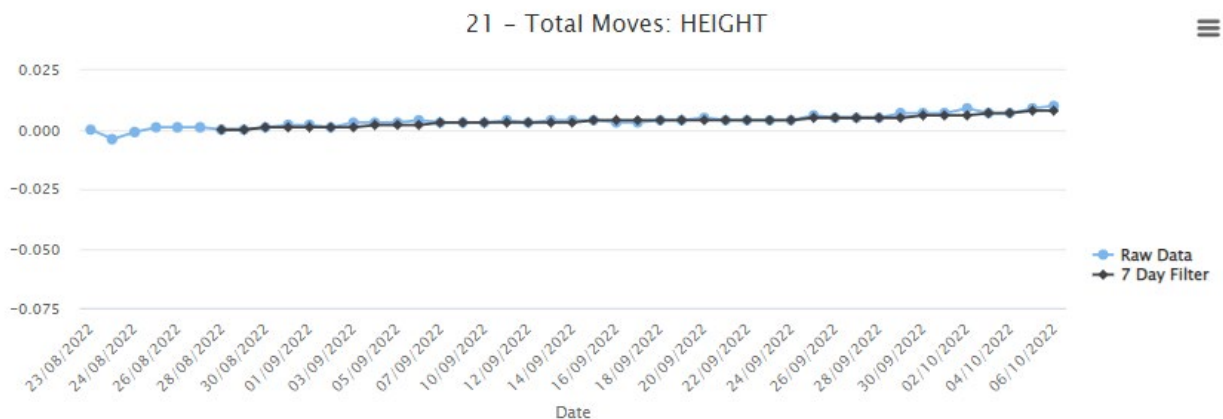
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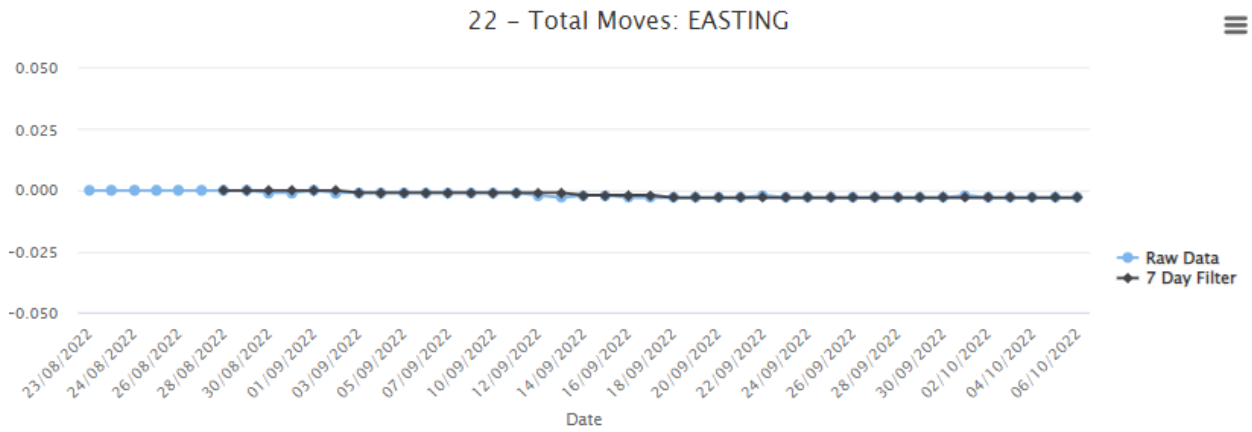


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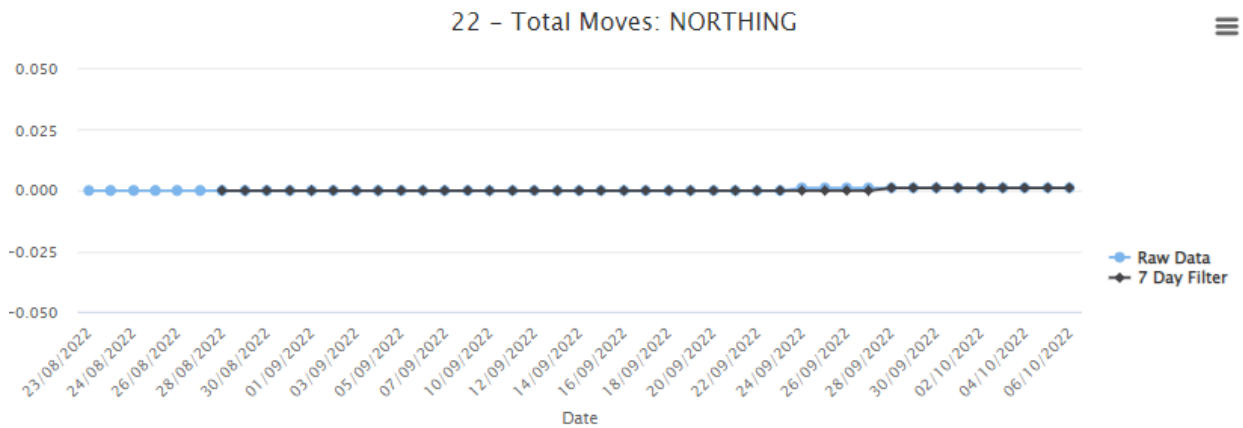


GNSS #22 – PC33 Upland Swamps (CRUS6)

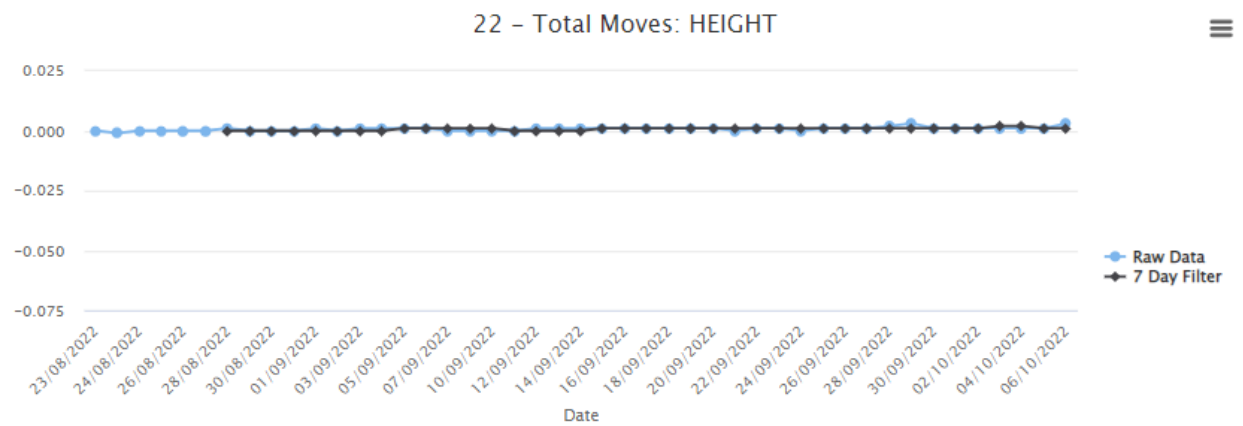
Easting



Northing



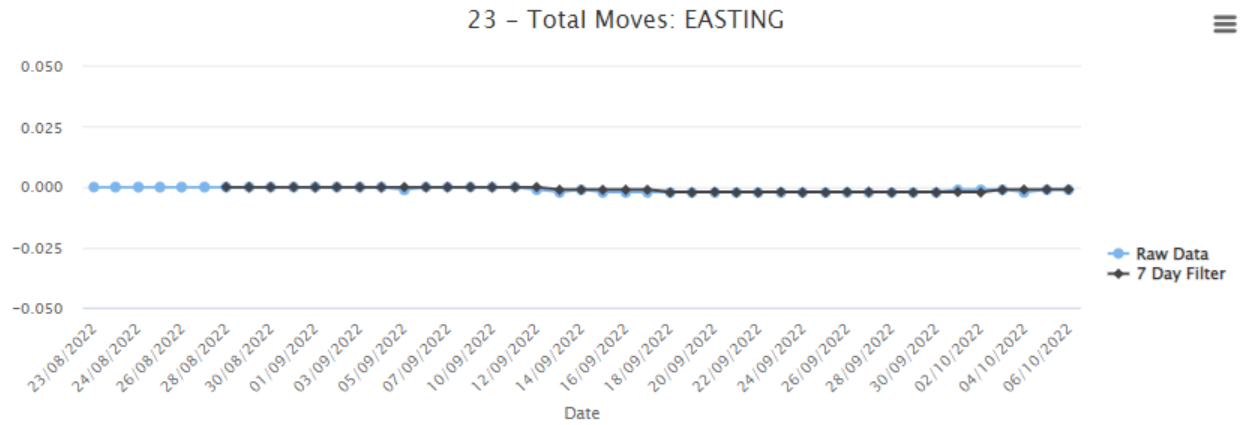
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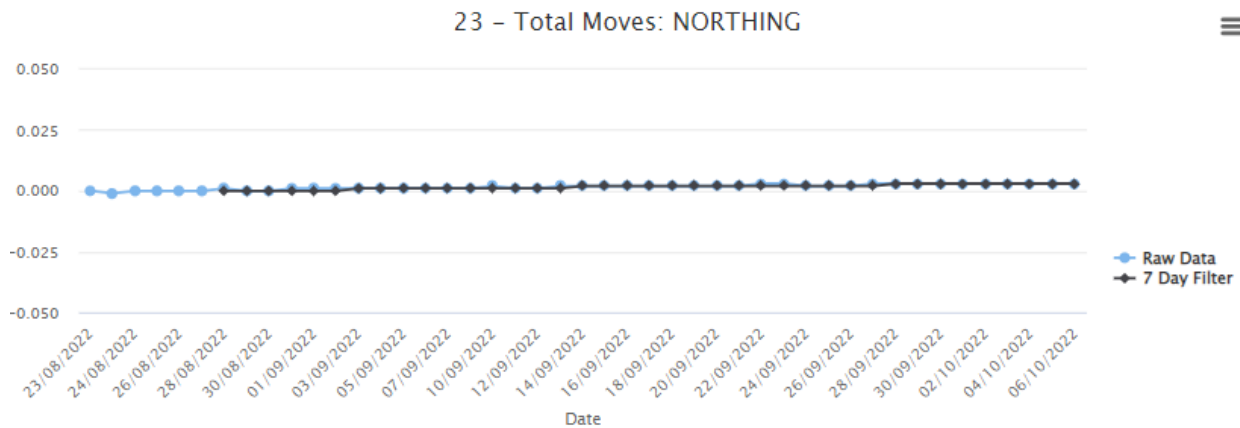
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #23 – PC33, Upland Swamps (CCUS12)

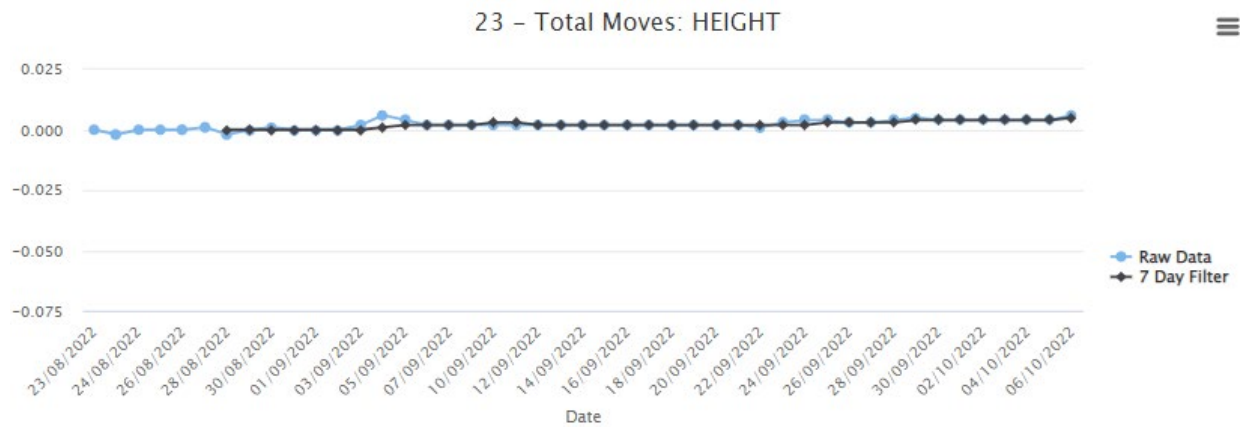
Easting



Northing

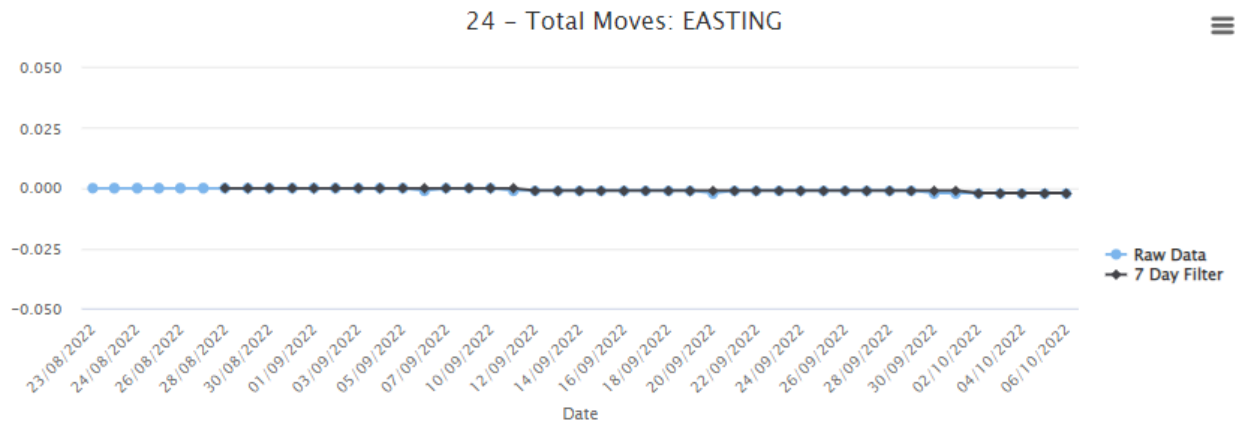


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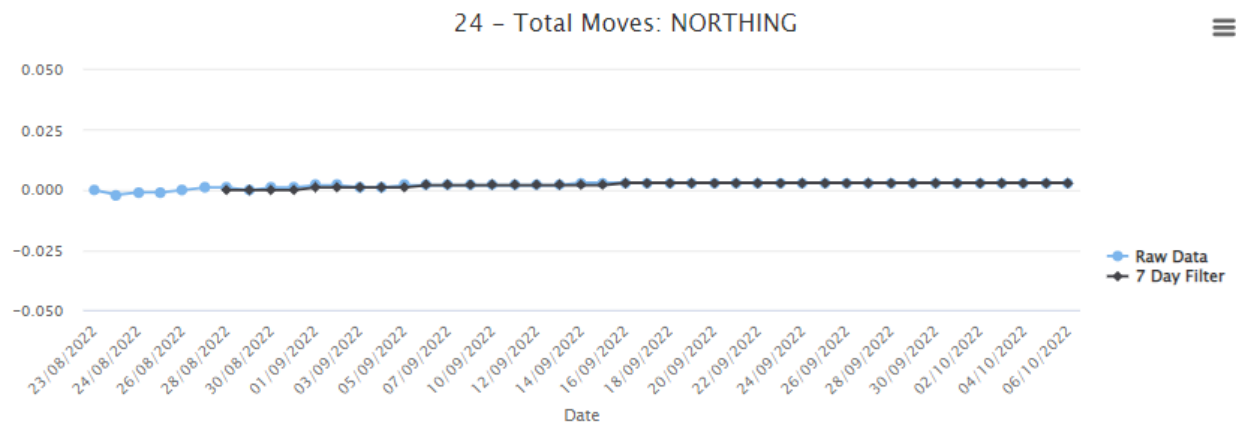


GNSS #24 – PC31, Upland Swamps (BCUS4, BCUS11)

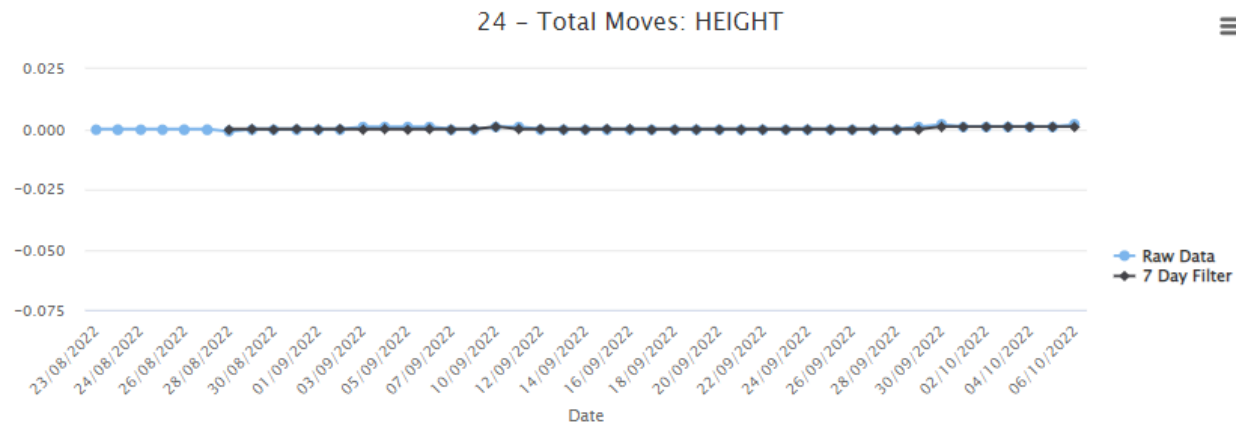
Easting



Northing



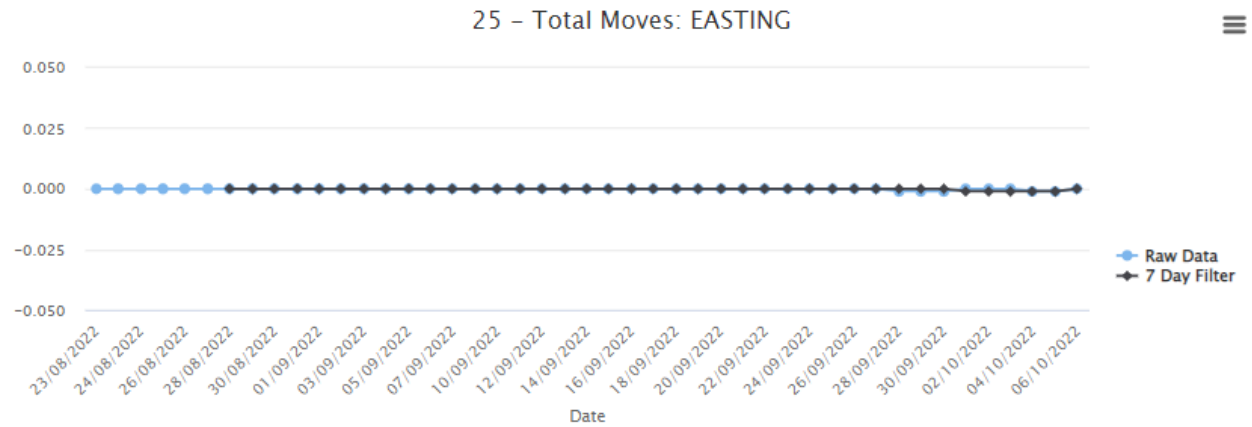
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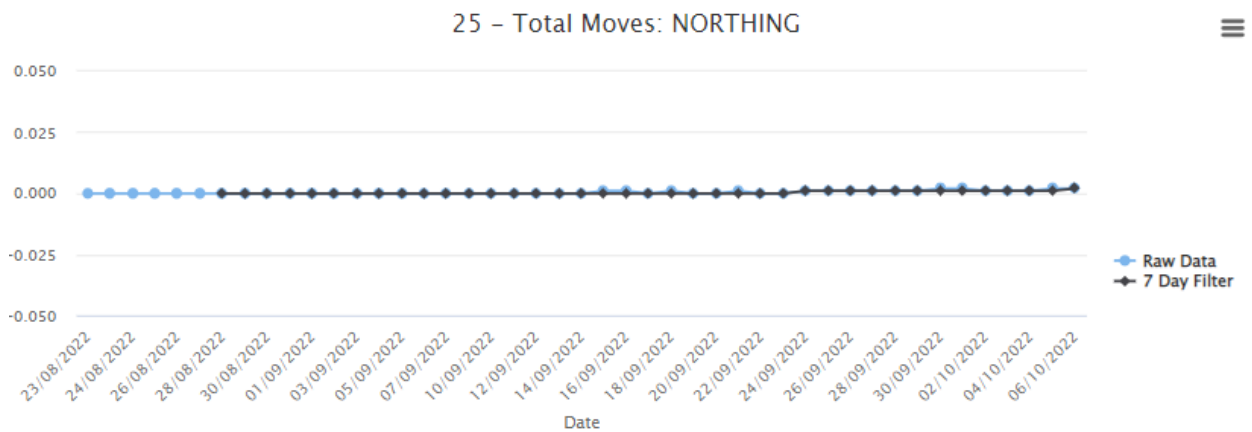
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #25 – PC30, Upland Swamps (BCUS4, BCUS3, BCUS2, BCUS5, BCUS14)

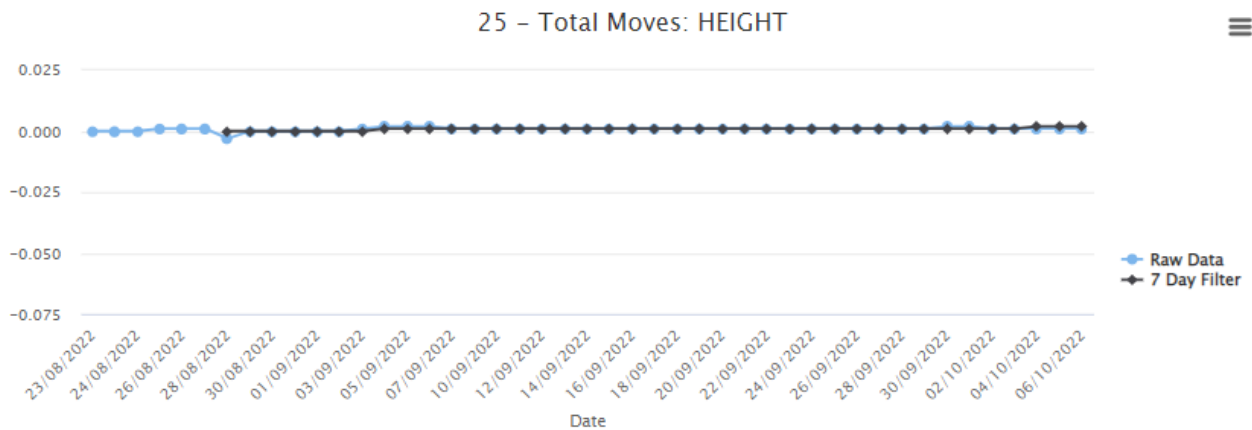
Easting



Northing

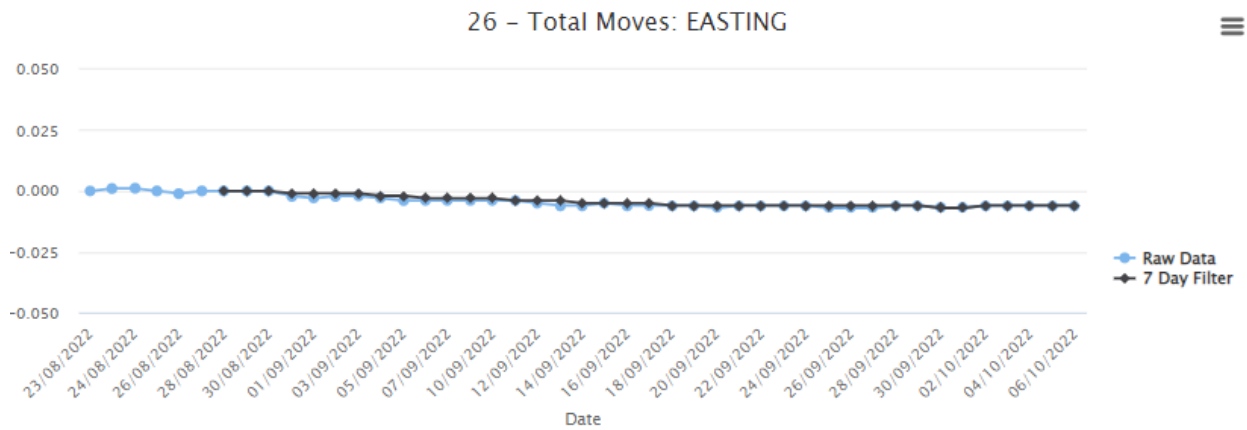


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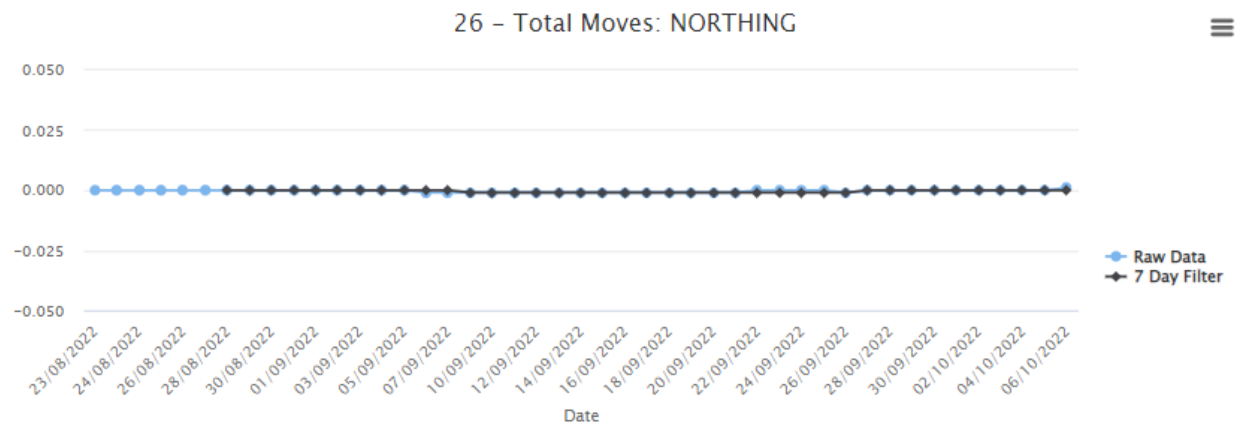


GNSS #26 – PC28, Upland Swamps (CCUS10, CCUS11)

Easting



Northing

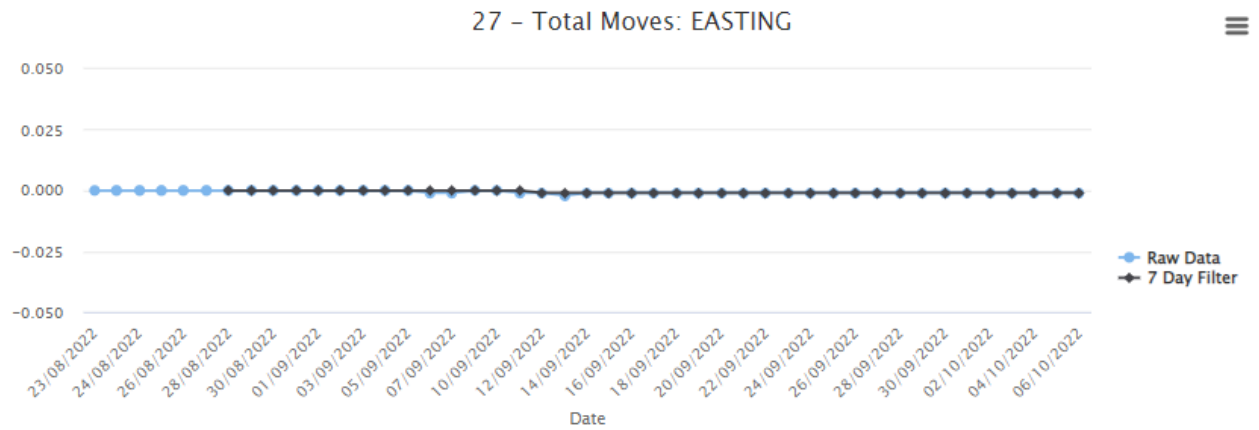


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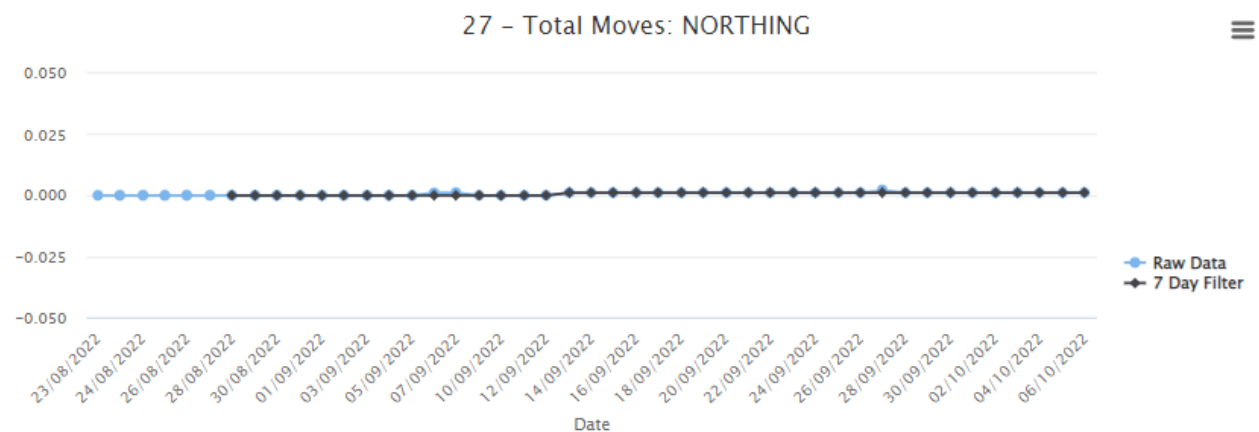


GNSS #27 – PC29, Upland Swamps (CCUS24, BCUS11, CCUS12)

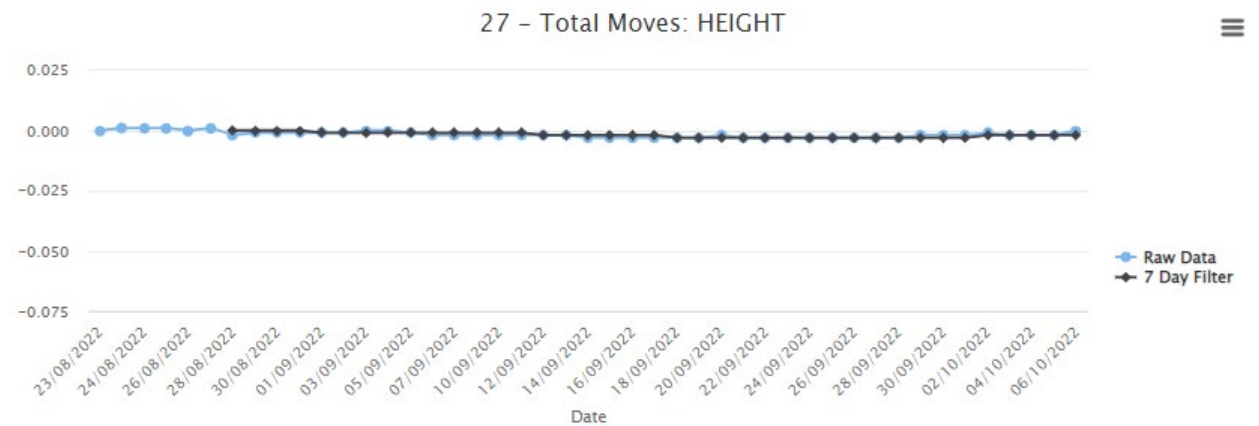
Easting



Northing

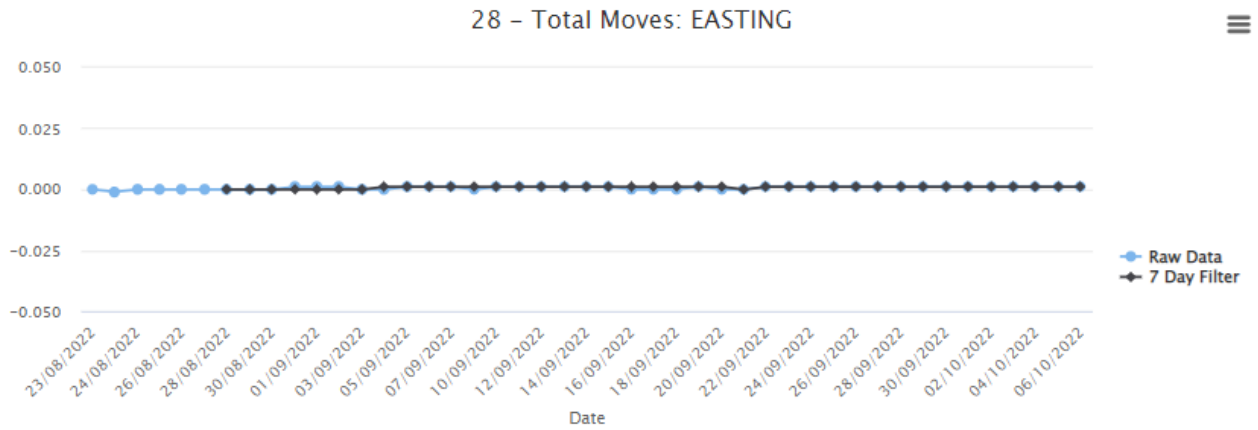


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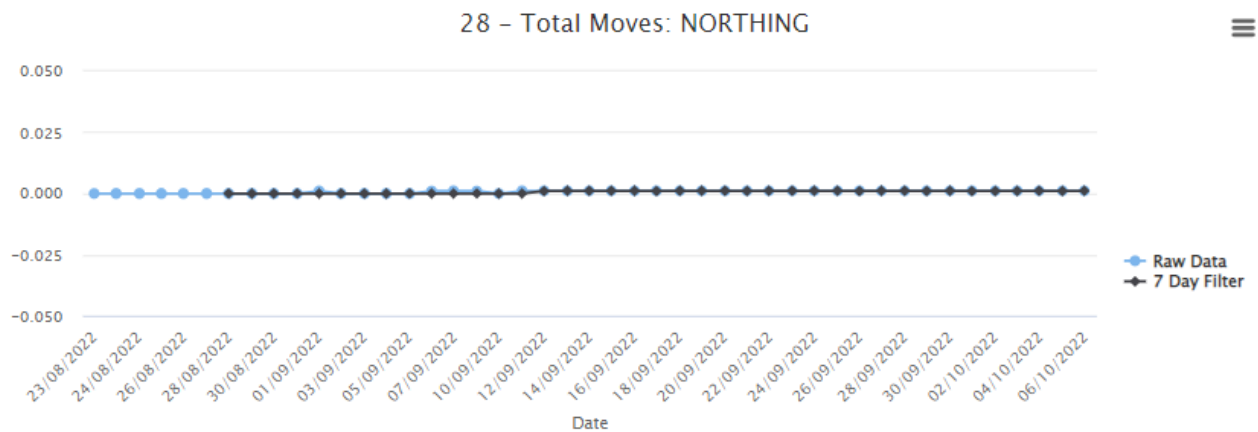


GNSS #28 – Upland Swamps (CCUS9, BCUS2, BCUS3)

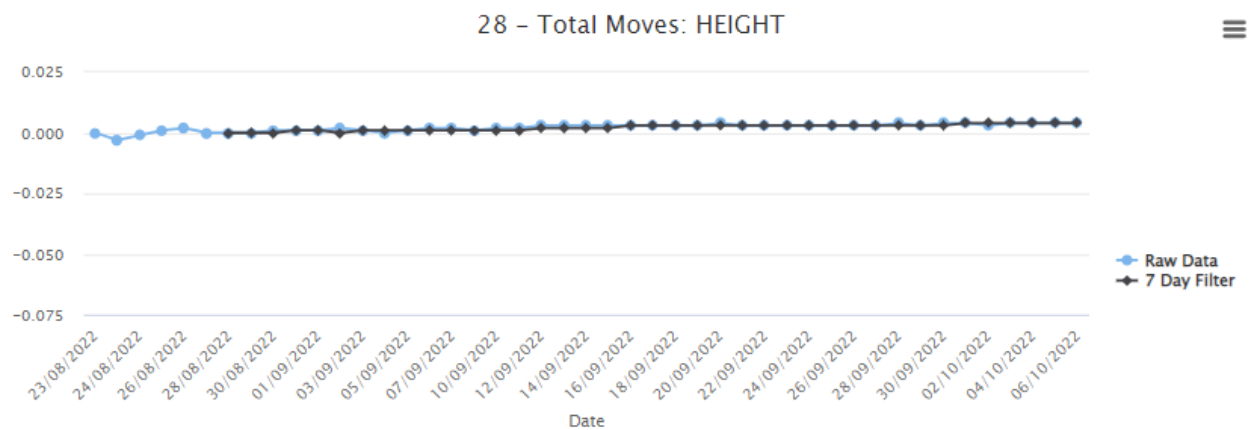
Easting



Northing



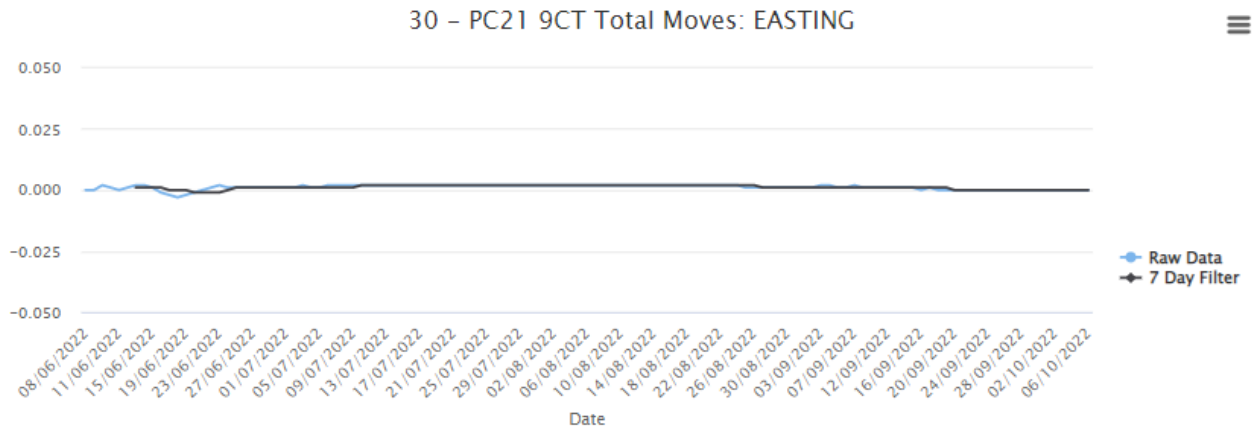
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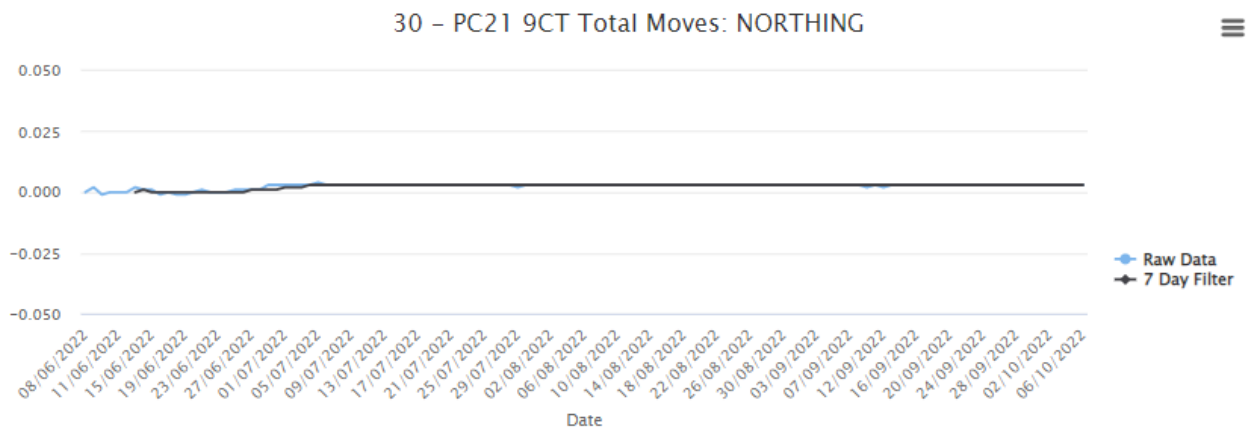
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #30 – PC21 9CT, Upland Swamps (CCUS4, CCUS5)

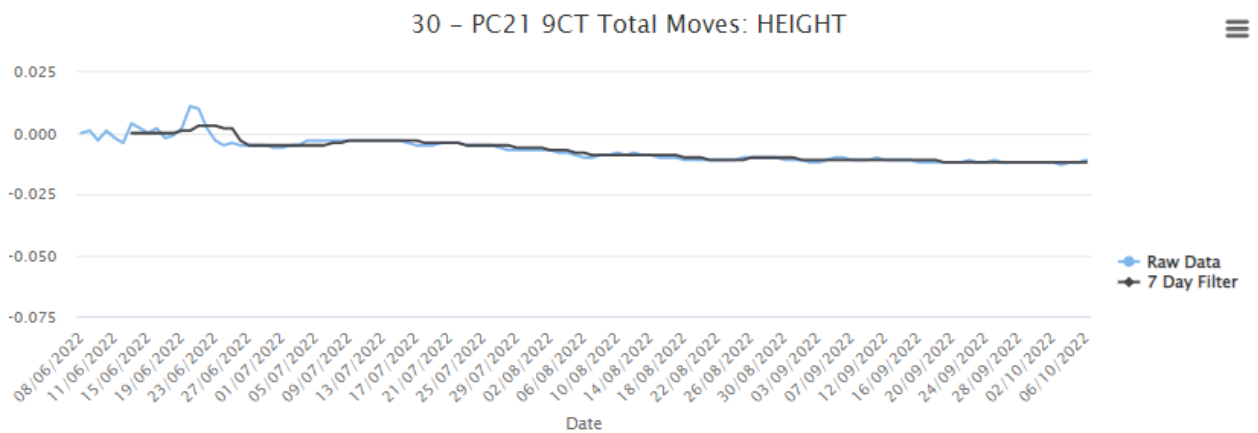
Easting



Northing



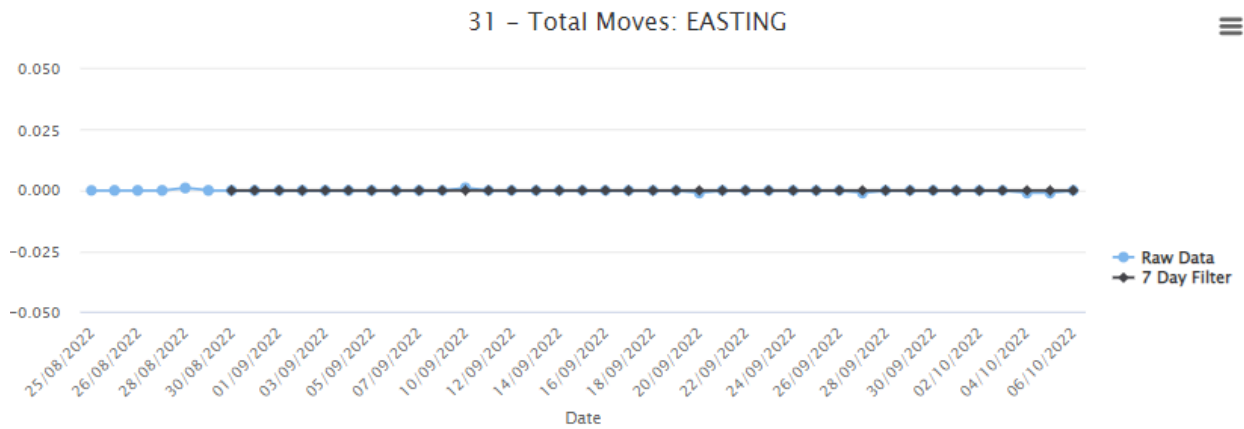
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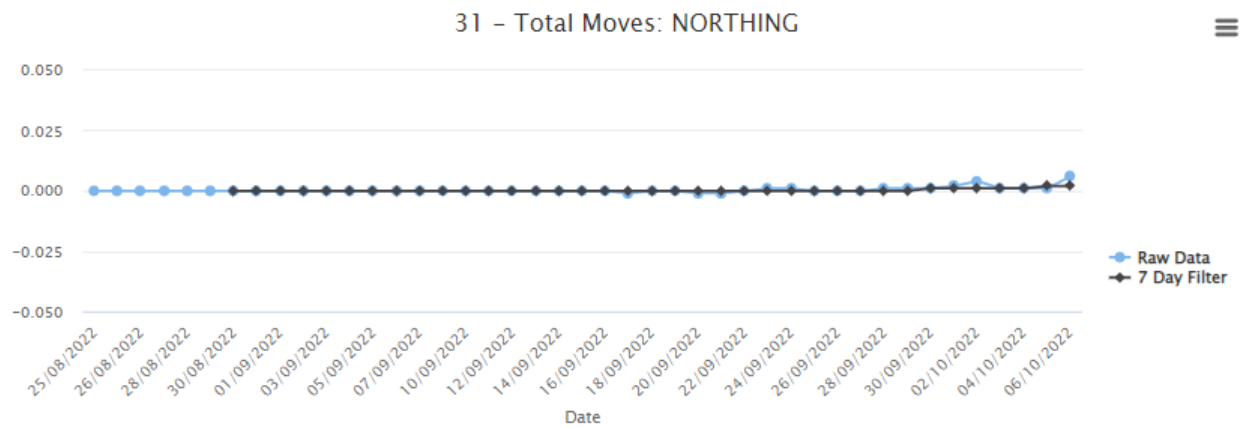
Site	Russell Vale Colliery	DOC ID	RVC EC PLN 003
Type	Management Plan	Date Published	08/04/2022
Doc Title	Baseline Data		

GNSS #31 – 132 kV Powerline

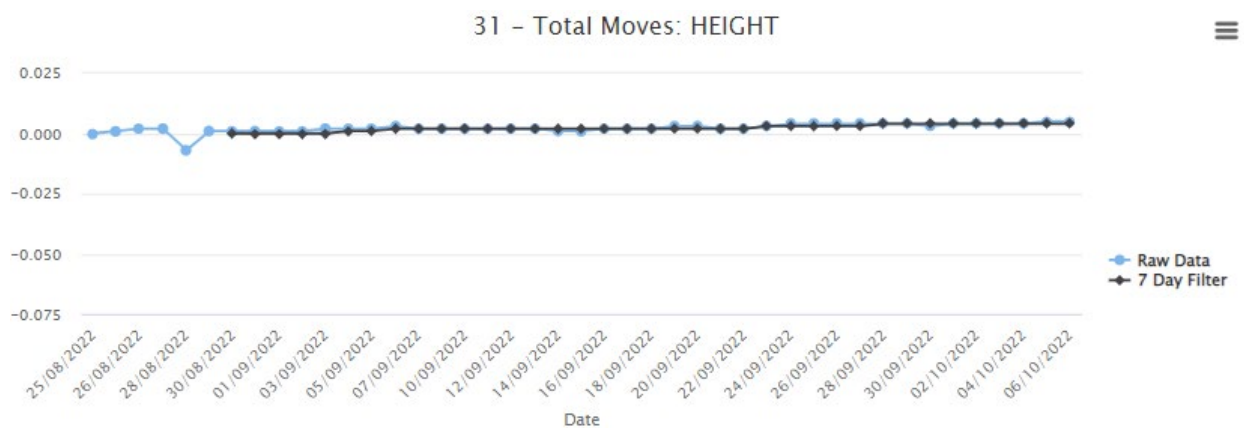
Easting



Northing

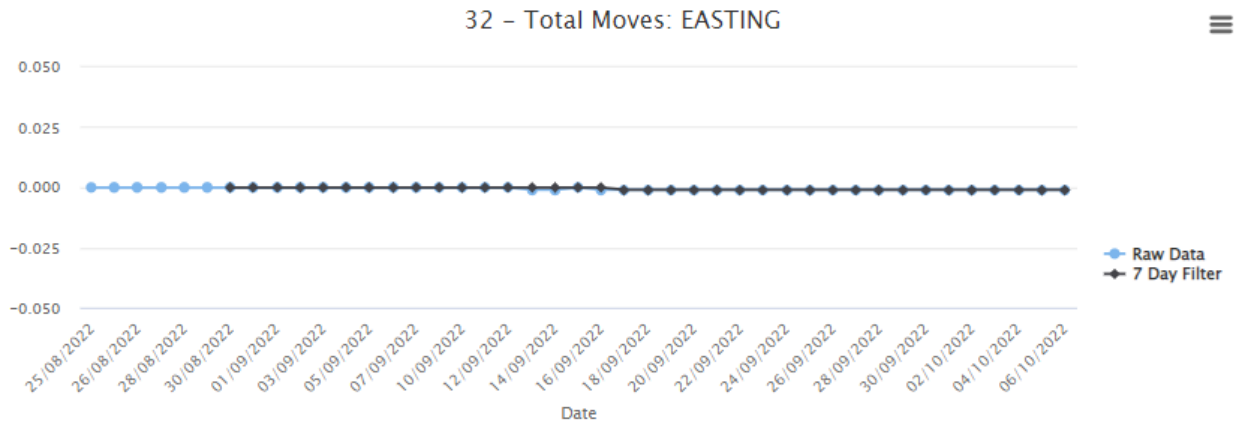


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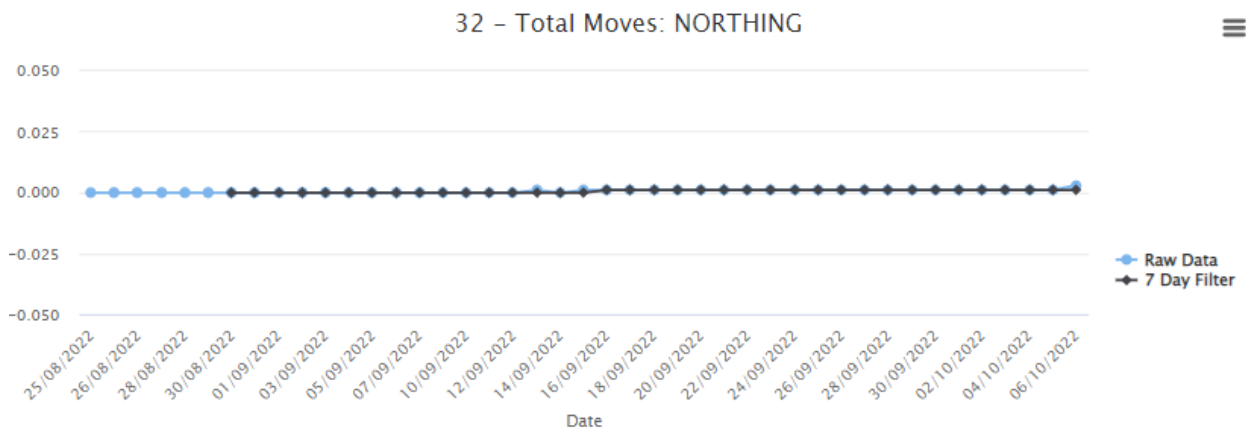


GNSS #32 – 132 kV Powerline

Easting



Northing



Height

