

Decision on an application for resource consent under the Resource Management Act 1991



Discretionary activity

Application numbers: BUN60302371, LUC60302374 and WAT60302375

Applicant: Watercare Services Limited

Site address: The works will occur beneath numerous sites in the suburbs of Grey Lynn, Point Chevalier, Western Springs, Mount Albert, Mount Roskill, Avondale, Blockhouse Bay and New Windsor

Proposal:

Deviation of the central bulk wastewater interceptor from that previously consented in three separate locations referred to as: the Western Springs deviation, the May Road deviation, and the link sewer C deviation.

The reasons consent is required are:

Land use consents (section 9) – LUC60302374

Auckland Unitary Plan: Operative in Part (“AUP: OP”)

District

Infrastructure

- Undertaking earthworks in association with a network utility from 10m² to 2500m² and from 5m³ to 2500m³ within an outstanding natural features overlay (Western Springs deviation), is a restricted discretionary activity under rule E26.7.3.1(A114).
- Undertaking earthworks in association with a network utility from 10m² to 2500m² and from 5m³ to 2500m³ in a significant ecological area overlay (Western Springs and link sewer C deviations), is a restricted discretionary activity under rule E26.6.3.1(A117).
- Undertaking earthworks in association with a network utility from 10m² to 2500m² and from 5m³ to 2500m³ on a site and place of significance to Mana Whenua overlay (Western Springs deviation), is a discretionary activity under rule E26.6.3.1(A117).

Discharge permit (section 14) – WAT60302375

Auckland Unitary Plan: Operative in Part

Natural Resources

- The diversion of groundwater associated with tunnel works that exceeds the permitted activity standards set out in E7.6.1.10 in terms of diameter, area, length, depth (below natural groundwater levels), duration and separation from wetland management areas

overlays, is a restricted discretionary activity under rule E7.4.1(A28).

- Dewatering associated with a groundwater diversion that does not meet the associated permitted activity standards (as set out above), is a restricted discretionary activity under rule E7.4.1(A20).

DECISION

Having read the application, supporting documents, and the report and recommendations prepared on behalf of the Council, I am satisfied I have sufficient information to consider the matters required by the Resource Management Act 1991 ("RMA") and to make a decision on this application.

Pursuant to sections 104 and 104B of the RMA, the application is **GRANTED**.

The reasons for this decision are:

1. In terms of section 104(1)(a) of the RMA, the actual and potential adverse effects of the proposal will be of appropriately avoided, remedied or mitigated because the proposed works have been designed in a manner that is respectful of their surrounding environment with any adverse settlement, groundwater, ecological, natural character and cultural related effects appropriately mitigated by:
 - a. Implementation of detailed monitoring measures to quantify ground settlement and adjust the works as necessary to ensure that acceptable limits are not exceeded, with any building and structure damage that may result to be remedied as necessary;
 - b. The nature of the proposed works, which ensures that groundwater regimes will not be significantly altered and that aquifer recharge and capacity will not be diminished;
 - c. The retention of all future wastewater flows in the wastewater interceptor, which should ensure that adverse effects on groundwater quality will not result as a consequence of pipe leakages;
 - d. The underground nature of the proposed tunnelling works, which should ensure adverse ecological and natural character value effects will not result where they are located in significant ecological area and outstanding natural feature overlays;
 - e. On-going consultation and input from groups with Mana Whenua interest the area in terms ensuring that cultural values are recognised and provided for.
 - f. The positive effects in respect of:
 - i. Improving the capacity of Auckland's wastewater network, enabling future growth and development
 - ii. Public health and environmental value enhancement by improving the effective operation of Auckland's wastewater network, and
 - iii. Reducing wastewater overflow events, particularly with respect to urban streams and their coastal receiving environments.

2. In terms of section 104(1)(b) of the RMA, the proposal is consistent with relevant objectives and policies of the AUP: OP, particularly those in Chapters E7 'Taking, Using, Damming and Diversion of Water and Drilling', D9 'Significant Ecological Areas Overlay', D10 'Outstanding Natural Features Overlay and Outstanding Natural Landscapes Overlay' and D21 'Sites and Places of Significance to Mana Whenua Overlay' for the following reasons:
 - a. The proposed diversion of groundwater will have no effect on any existing surface flow regimes, including streams, rivers, lakes and wetlands, with any effects on groundwater flows being temporary and not resulting in any long-term impacts on aquifer recharge or water quality. Accordingly, the proposed works will not result in any reduction in water levels or quality or associated flow regimes, which should ensure that the water resources in the works areas and the benefits they provide to local habitats, people and communities, will not be compromised
 - b. A detailed monitoring regime is proposed to record water levels and pressures and the movement of ground, building and structures, which should ensure that settlement will be measured appropriately, with works adjusted as necessary to ensure that settlement levels remain within acceptable limits. In the instance that building and structure damage results as a consequence of ground settlement, including with respect to MOTAT, which contains a number of historic heritage buildings, appropriate remedial works will be implemented. This ensures that any adverse effects people and communities will be avoided or remedied.
 - c. The proposed groundwater diversions, as a consequence of their subsurface nature, will not result in any adverse flooding effects.
 - d. With the works being underground, there will be no open or unsealed excavations, with the tunnel to be fully sealed to minimise groundwater infiltration, while the tunnel walls will be designed to withstand the external ground pressures placed upon them, all of which ensures that long term adverse water quality or land stability effects will not result.
 - e. The underground nature of the tunnelling works with no above ground or near surface works proposed in the areas where the works extend into the significant ecological area and outstanding natural features overlays, ensures that adverse ecological and natural character value effects will not result.
 - f. Consultation and on-going liaison with Mana Whenua groups will ensure that any tangible and intangible cultural values will be recognised and provided for and that any adverse effects that may result are suitably addressed.
3. The application meets the relevant provisions of Part 2 of the RMA as the proposal achieves its purpose in terms of the sustainable management of natural and physical resources. It achieves this by allowing for implementation of the central wastewater interceptor project, which will enhance environmental values and the social and economic wellbeing of existing and future residents of the areas of Auckland it serves by reducing existing levels of leakage and improving infrastructure resilience and capacity, without adversely affecting: people and communities, particularly in respect of protection of buildings and structures from ground settlement and maintaining aquifer levels in terms of water quantity and quality; the receiving environment in respect of groundwater quality and

ecological, natural character and cultural values; and the character and amenity values of the environment in which the works are located.

CONDITIONS OF CONSENT

Pursuant to section 108 of the RMA, this consent is subject to the following conditions:

General

Note 1: These conditions apply to all the resource consents.

Note 2: Please note that the consent numbering system is not sequential and has been adopted to ensure consistency with the approved 'central interceptor main works' consent. Any condition numbers that have been skipped are not applicable to this consent.

Plans and Information

- 1.1 The works are to be carried out in general accordance with the plans and all information submitted with the application, detailed below, and all referenced by the Council as consent numbers BUN60302371, LUC60302374 and WAT60302375.
- a. Application form and Assessment of Environmental Effects, prepared by Jacobs New Zealand Limited, Revision 3, dated 12 June 2017.
 - b. Section 92 Response Cover Letter and associated attachments, dated 25 July 2017.
 - c. Section 92 Response Email, from Paul Futter of Watercare Services Limited, dated 4 August 2017.
 - d. Geotechnical Interpretive Report, prepared by Jacobs New Zealand Limited, Revision 6, dated 8 February 2017.
 - e. Memorandum titled 'Settlement implications due to revision of the Main Tunnel and Link Sewer C', prepared by Jeremy Tan, reference PWCIN-DEL-MEM-GT-J-100345, dated 27 March 2017.
 - f. Settlement Assessment, prepared by Jacobs New Zealand Limited, Revision 3, dated 15 March 2017.
 - g. Combined Settlement Report, prepared by Jacobs New Zealand Limited, Revision 0, dated 11 November 2016.
 - h. Assessment of Potential Groundwater Drawdown due to Construction Report, prepared by Jacobs New Zealand Limited, Revision 4, dated 30 September 2016.
 - i. Drawdown Estimation due to Link Sewer C Tunnel Construction, prepared by Jacobs New Zealand Limited, Revision 1, dated 3 November 2016.
 - j. Letter titled 'MOTAT Submission on Watercare's Deviation Application for the Central Interceptor', prepared by Shayne Cunis of Watercare Services Limited, dated 1 March 2018.
 - k. Plans as detailed below:

<i>Drawing No.</i>	<i>Title</i>	<i>Prepared by</i>	<i>Dated</i>
2012064.020,	PWCIN – Project Wide	Watercare	17 March 2017

Issue 1	Geotechnical Conditions – Geological Section, Main Tunnel	Services Limited	
2012064.021, Issue 1	PWCIN – Project Wide Geotechnical Conditions – Geological Sections, Link Sewer LS2	Watercare Services Limited	17 March 2017
2012064.022, Issue 1	PWCIN – Project Wide Geotechnical Conditions – Geological Section, Link Sewer LS3	Watercare Services Limited	17 March 2017
2012064.025, Issue 1	PWCIN – Project Wide General Pipe Plan – Sheet Location Plan – Corridors For N Main Tunnel and Link Sewer	Watercare Services Limited	17 March 2017
2012064.026, Issue 1	PWCIN – Project Wide General Pipe Plan – Layout Plan – Corridors For Main Tunnel and Link Sewers – Sheet 1	Watercare Services Limited	17 March 2017
2012064.029, Issue 1	PWCIN – Project Wide General Pipe Plan – Layout Plan – Corridors For Main Tunnel and Link Sewers – Sheet 4	Watercare Services Limited	17 March 2017
2012064.033, Issue 1	PWCIN – Project Wide General Pipe Plan – Layout Plan – Corridors For Main Tunnel and Link Sewers – Sheet 8	Watercare Services Limited	17 March 2017

Monitoring Fees

- 1.4 The consent holder is to pay the Council an initial consent compliance monitoring charge of \$960 (GST inclusive), plus any further monitoring charge(s) to recover the actual and reasonable costs incurred to ensure compliance with the conditions of this consent.

Advice Note:

The initial monitoring deposit is to cover the cost of inspecting the site, carrying out tests, reviewing conditions, updating files, etc., all being work to ensure compliance with the resource consent. In order to recover actual and reasonable costs, monitoring of conditions, in excess of those covered by the deposit, will be charged at the relevant hourly rate applicable at the time. The consent holder will be advised of the further monitoring charge. Only after all conditions of the resource consent have been met, will the Council issue a letter confirming compliance on request by the consent holder.

Lapse and commencement

1.33 Under section 125 of the RMA, the consents will lapse on 28 November 2028 unless:

- a. The consent is given effect to; or
- b. On application the Council extends the period after which the consent will lapse

4. Groundwater

(applies to consent WAT60302375)

Condition set for following chainage:

- (a) Main tunnel alignment between Balfron Avenue and May Road (Chainage 16+700 to 17+650)
- (b) Chamberlain Park to Western Springs (Chainage 22+480 to 22+900)
- (c) Link Sewer C (Chainage 0+100 to 3+250)

Definitions

Words in the dewatering conditions have specific meanings as outlined in the table below.

Monitoring Station	Means any monitoring point including a deformation pin, inclinometer, groundwater bore, deflection pin or other monitoring device required by this consent.
RL	Means Reduced Level.
Seasonal Low Groundwater Level	Means the annual lowest groundwater level – which typically occurs in summer.
Services	Include fibre optic cables, sanitary drainage, stormwater drainage, gas and water mains, power and telephone installations (including pylons) and infrastructure, road infrastructure assets such as footpaths, kerbs, catch-pits, pavements and street furniture.
Damage	Includes Aesthetic, Serviceability, Stability, but does not include Negligible Damage.

Category of Damage	Normal Degree of Severity	Description of Typical Damage (Building Damage Classification after Burland (1995), and Mair et al (1996))	General Category (after Burland – 1995)
0	Negligible	Hairline cracks.	Aesthetic

1	Very Slight	Fine cracks easily treated during normal redecoration. Perhaps isolated slight fracture in building. Cracks in exterior visible upon close inspection. Typical crack widths up to 1mm.	Damage
2	Slight	Cracks easily filled. Redecoration probably required. Several slight fractures inside building. Exterior cracks visible, some repainting may be required for weather-tightness. Doors and windows may stick slightly. Typically, crack widths up to 5mm.	
3	Moderate	Cracks may require cutting out and patching. Recurrent cracks can be masked by suitable linings. Brick pointing and possible replacement of a small amount of exterior brickwork may be required. Doors and windows sticking. Utility services may be interrupted. Weather tightness often impaired. Typical crack widths are 5mm to 15mm or several greater than 3mm.	Serviceability Damage
4	Severe	Extensive repair involving removal and replacement of walls especially over door and windows required. Window and door frames distorted. Floor slopes noticeably. Walls lean or bulge noticeably. Some loss of bearing in beams. Utility services disrupted. Typical crack widths are 15mm to 25mm but also depend on the number of cracks.	
5	Very Severe	Major repair required involving partial or complete reconstruction. Beams lose bearing, walls lean badly and require shoring. Windows broken by distortion. Danger of instability. Typical crack widths are greater than 25mm but depend on the number of cracks	Stability Damage

Table 1: Building Damage Classification

Note:

'Description of Typical Damage' applies to Masonry buildings only. The 'General Category' applies to all buildings.

- 4.1 This consent will expire on 28 November 2048 unless it has lapsed, been surrendered or been cancelled at an earlier date.

- 4.2 The consent holder must ensure that all excavation, dewatering systems, retaining structures and associated works for the construction of the tunnels, underground structures and associated works, including all temporary and permanent works, are designed, constructed and maintained so as to avoid, as far as practicable, any damage to buildings, structures and services (including road infrastructure assets such as footpaths, kerbs, catch-pits, pavements and street furniture).
- 4.3 Condition number deliberately not used.
- 4.4 At least 10 working days prior to the commencement of tunnelling the consent holder must advise the Team Leader, Compliance Monitoring Central, in writing, of the date of the proposed commencement of this work.
- 4.5 At least 10 working days following completion of tunnelling, the consent holder is to advise the Team Leader, Compliance Monitoring Central, in writing, of the date of completion.

Monitoring and Contingency Plan

- 4.6 Before commencement of tunnelling the consent holder is to prepare a Monitoring and Contingency Plan or Plans (M&CP) addressing groundwater and settlement monitoring for each of the relevant project stages. The M&CP is to demonstrate how the conditions of this consent will be implemented and must include the following:
- (a) details of the building risk assessment process and building condition surveys required by conditions 4.10 to 4.18 of this consent;
 - (b) details of the groundwater monitoring programme required by conditions 4.19 – 4.21, 4.23 and 4.25 of this consent;
 - (c) details of the ground surface settlement and building movement monitoring required by conditions 4.26 – 4.28, 4.31 and 4.34 of this consent;
 - (d) location plan of ground settlement and building deformation marks and the location of existing and proposed groundwater monitoring bores;
 - (e) condition number deliberately not used
 - (f) groundwater, deformation and settlement Alert and Alarm Levels (Trigger Levels), based on performance standards in 4.33, to be utilised for early warning of settlement with the potential to cause damage to buildings and services and details of the processes used to establish these triggers.
 - (g) details on the procedures for notification of the Team Leader, Compliance Monitoring Central in the event that Trigger Levels are exceeded;
 - (h) options for additional investigations and analyses to determine the potential for groundwater effects or settlement and for damage to structures, including additional groundwater or settlement monitoring and building condition surveys;
 - (i) details of the contingency measures to be implemented in the event of trigger levels being exceeded, including details on the practicable methodologies to avoid, remedy, or mitigate surface settlements with the potential to cause damage to buildings;
 - (j) details of methodology to be used to seal the tunnel as efficiently and effectively as possible, to avoid groundwater leakage into the tunnel network leakage and long-term groundwater drawdown effects;

- (k) a schedule of the buildings and structures identified in conditions 4.10 and 4.11 as being potentially at risk of damage due to tunnelling activities; and
 - (l) specific detail of proposed monitoring of pylons supporting overhead transmission lines being potentially at risk of damage due to tunnelling activities.
- 4.7 The consent holder is required to submit to the Team Leader, Compliance Monitoring Central for written approval:
- (a) at least 14 months prior to the Commencement of Dewatering for tunnelling of any project stage, those aspects of the M&CP dealing with pre-construction monitoring, including the pre-construction monitoring required by conditions 4.12, 4.13, 4.21 and 4.28; and
 - (b) at least 20 working days prior to Commencement of Dewatering for tunnelling of any project stage, the M&CP.
- 4.8 The consent holder must comply with the M&CP at all times.
- 4.9 The consent holder may amend the M&CP from time to time, as necessary for the project or any project stage. Any amendments to the M&CP must be approved by the Team Leader, Compliance Monitoring Central in writing prior to any such amendment being implemented.

Building condition surveys

- 4.10 The consent holder is to undertake a risk assessment to identify existing buildings and structures at risk of damage due to settlement caused by tunnelling activities. The risk assessment process is to be set out in the M&CP required by condition 4.6 and is to be based upon the final tunnel alignment and construction methodology, the groundwater and settlement monitoring required under this consent, and groundwater and settlement modelling completed using this data. The risk assessment must include:
- (a) identification of the zone of influence where differential settlements greater (steeper) than 1:1,000 due to tunnelling activities;
 - (b) identification of the building types within this zone, and their susceptibility to settlement induced damage; and
 - (c) identification of the buildings and structures at risk of damage due to tunnelling activities.
- 4.11 A schedule of the addresses of existing buildings and structures identified as being potentially at risk of damage through the building risk assessment process defined in condition 4.10 is to be included in the M&CP required by condition 4.6. The buildings on the Museum of Transport and Technology's site at 805 Great North Road ('MOTAT Site') identified in the diagram titled "Affected Buildings requiring pre- and post- condition surveys in association with the Central Interceptor" dated 28 February 2018 must be included on the schedule and included in the M&CP required by condition 4.6.

Pre-construction condition survey

- 4.12 The consent holder is to consult with owners of existing buildings and structures identified through the building risk assessment process defined in condition 4.10, and subject to the owner's approval on terms acceptable to the consent holder, undertake a detailed pre-construction condition survey of these structures to confirm their existing condition and enable the sensitivity of the existing buildings and structures to any groundwater and ground settlement

changes to be accurately determined. A detailed pre-construction condition survey of the buildings on the MOTAT Site identified in the diagram entitled "Affected Buildings requiring pre- and post- condition surveys in association with the Central Interceptor" dated 28 February 2018 is also to be undertaken. The survey must be completed at least three months prior to the Commencement of Dewatering of any project stage involving tunnelling. The intent of the survey is to assist in enabling the magnitude of allowable effects from changes in groundwater pressure and ground settlement movements to be reasonably determined.

The survey must include, but not necessarily be limited to, the following:

- (a) major features of the buildings and site developments, including location, type, construction, age and existing condition;
- (b) type and capacity of foundations;
- (c) existing levels of aesthetic damage;
- (d) existing level of structural distress or damage;
- (e) assessment of structural ductility;
- (f) susceptibility of structure to movement of foundations, including consideration of the local geological conditions; and
- (g) susceptibility of scheduled heritage buildings to movement of foundations.

A photographic record of the inspection is to be included.

Note:

'Commencement of Dewatering' means excavation below the groundwater table and/or commencing taking any groundwater from a tunnel excavation and/or dewatering prior to excavation).

- 4.13 Where neighbouring building/property owners indicate, to the satisfaction of the Team Leader, Compliance Monitoring Central, by way of a recommendation from a qualified and experienced vibration consultant, the presence of particularly sensitive structures (examples include old or brittle structures, vibration sensitive equipment, unusually heavy loads or settlement sensitive machinery) the consent holder is to undertake a full engineering assessment to determine what, if any, additional avoidance, design, remedial or monitoring works are required in this vicinity. The Team Leader, Compliance Monitoring Central may require an independent review of that assessment by a chartered professional engineer.
- 4.14 The building condition surveys required by this consent are to be undertaken by an independent and appropriately qualified person.

Post-construction condition surveys

- 4.15 Within six months of the Completion of Dewatering of any project stage involving tunnelling, unless otherwise agreed in writing with a building owner that such survey is not required, the consent holder (subject to the owner(s) approval on terms acceptable to the consent holder) is to undertake a post construction survey covering the matters identified in condition 4.12 for any building located in an area where differential settlement of greater (steeper) than 1:1,000 occurs between two adjacent settlement monitoring points measured in accordance with the M&CP and a pre-construction condition survey was undertaken in accordance with condition 4.12 or

condition 4.13. The consent holder may, if it is able to provide evidence to show the deformation was not caused by activities related to this consent, seek written approval from the Team Leader, Compliance Monitoring Central to waive this condition. If, since the pre-construction survey, any building damage is identified, the survey is to determine the likely cause of that damage.

Note:

'Completion of Dewatering' means when all the permanent tunnel lining is complete, and effectively no further groundwater is being taken for the construction of the tunnel.

- 4.16 At the direction of the Team Leader, Compliance Monitoring Central, and subject to the owner's approval on terms acceptable to the consent holder, the consent holder is to undertake an additional survey on any existing building or structure located within the zone of settlement influence determined under condition 4.10, on the buildings on the MOTAT Site identified in the diagram entitled "Affected Buildings requiring pre- and post- condition surveys in association with the Central Interceptor" dated 28 February 2018, or on any existing building or structure surveyed in accordance with condition 4.13, for the purpose of checking for damage and for following up on a report of damage to that building. The requirement for any such survey will cease six months after the Completion of Dewatering of any project stage involving tunnelling.
- 4.17 The consent holder is to ensure that a copy of the pre, post-construction and any additional building survey reports are forwarded to the respective property owner(s) and to the Team Leader, Compliance Monitoring Central (unless the property owner(s) has instructed the consent holder not to do so) within 15 working days of completing the reports.

Repair of damage

- 4.18 If the consent holder becomes aware of any Damage to buildings, structures or Services, potentially caused wholly, or in part, by the exercise of this consent, the consent holder must:
- (a) Notify the Team Leader, Compliance Monitoring Central and the asset owner within 5 working days of the consent holder becoming aware of the Damage.
 - (b) Engage an appropriately qualified engineering professional to prepare an interim report that: describes the Damage; identifies the cause of the Damage; identifies methods to remedy and/or mitigate the Damage that has been caused; identifies the potential for further Damage to occur; and describes actions that will be taken to avoid further Damage.
 - (c) Provide a copy of the interim report, prepared under (b) above, to the Team Leader, Compliance Monitoring Central and the asset owner within 10 working days of notification under (a) above.
 - (d) Undertake such repairs in accordance with the approved methodology, set out in the report prepared under condition 4.18 (b), at its (or its insurance providers) cost; subject to the approval of the asset owner; unless written approval for this damage is provided from the owners.

Groundwater monitoring

- 4.19 The consent holder must install and maintain groundwater monitoring boreholes at the locations described in the M&CP for the period required by the conditions of this consent. Should any of the monitoring bores be damaged and become in-operable or unsuitable for monitoring, then the

Team Leader, Compliance Monitoring Central is to be informed and a new monitoring bore is to be installed at a nearby location in consultation with the Team Leader, Compliance Monitoring Central.

- 4.20 The consent holder must monitor groundwater levels in the groundwater monitoring boreholes and keep records of the water level measurement and corresponding date. All water level data is to be recorded to an accuracy of at least $\pm 5\text{mm}$. These records are to be compiled and submitted to the Team Leader, Compliance Monitoring Central at six monthly intervals.
- 4.21 The consent holder is to monitor groundwater levels monthly in boreholes identified in the M&CP and keep records for a period of at least 12 months before the Commencement of Dewatering of any project stage involving tunnelling. The variability in groundwater levels over this period will be utilised to establish the seasonal groundwater level variability. The consent holder is to monitor groundwater levels monthly in the boreholes for a period of at least two months (three readings indicating steady state) before the Commencement of Dewatering of any project stage involving dewatering.
- 4.22 Prior to the Commencement of Dewatering of any project stage involving tunnelling, the consent holder is to assess the potential groundwater effects resulting from the exercise of this consent. The output of this assessment is to be used to define the expected groundwater level at each borehole and to establish groundwater Trigger Levels for each borehole that minimise the potential for damage to existing buildings or structures. The process for establishing groundwater Trigger Levels must be set out in the M&CP and is to be based on the final tunnel alignment and construction methodology, and any groundwater monitoring required under this consent, and shall be based upon groundwater modelling completed using this data. A factor of natural seasonal variability is to be allowed for in this review based on the survey completed under condition 4.21.
- 4.23 From Commencement of Dewatering of any project stage involving tunnelling, the consent holder is to monitor groundwater levels in each borehole at a minimum of monthly intervals and records are to be kept of each monitoring date and the corresponding water level in each borehole. In addition to the above, all boreholes located within 100 metres of the tunnel excavation face are to be monitored for groundwater level at least once every week. These records are to be compiled and submitted to the Team Leader, Compliance Monitoring Central at six monthly intervals.
- 4.24 All monitoring data obtained pursuant to condition 4.23 is to be compared with the predicted groundwater levels for each borehole. Where Trigger Levels are exceeded the actions set out in the M&CP are to be undertaken and the Team Leader, Compliance Monitoring Central must be notified within three working days, advising of the trigger exceedance, the risk of settlement causing damage to buildings, and details of the actions taken.
- 4.25 The consent holder must continue to monitor groundwater levels in each borehole at monthly intervals for a period of 12 months following Completion of Dewatering of any project stage involving tunnelling, or for a lesser period if groundwater levels in any particular borehole show either:
 - (a) recovery of the groundwater level to within 2 metres of the pre-construction groundwater level and is above trigger levels; or

- (b) a trend of increasing groundwater level in at least three consecutive monthly measurements and is above trigger levels, in which case monitoring at that borehole may cease.

After 12 months following the Completion of Dewatering of any project stage involving tunnelling, monitoring of groundwater levels is to continue at the direction of the Team Leader, Compliance Monitoring Central if groundwater levels are not recovering from construction effects and there is a risk of adverse effects.

Settlement monitoring

- 4.26 The consent holder is to establish and maintain a settlement monitoring network of Ground Settlement Monitoring Marks and Building Movement Marks to detect any deformation (vertical and/or horizontal movements) at the locations identified in risk assessment process in condition 4.10, and in the vicinity of the buildings on the MOTAT Site identified in the diagram entitled "Affected Buildings requiring pre- and post- condition surveys in association with the Central Interceptor" dated 28 February 2018. The locations are to be identified on a plan as required by the MC&P, and the marks must be maintained for the period required by the conditions of this consent.

The Ground Settlement Monitoring Marks are to be located generally as follows:

- (a) at least one mark within 5 metres of each of the groundwater monitoring boreholes described in condition 4.19; and
- (b) at locations along the alignment of the tunnels, such that:
 - (i) the marks are more closely spaced in areas of higher settlement risk, and more widely spaced in areas of low settlement risk, these areas being identified in the risk assessment carried out under condition 4.10;
 - (ii) the marks are of sufficient number and are located such that they provide a reliable basis for assessing, monitoring and responding to settlement risk during tunnelling construction work and for confirming compliance with the limits set out in condition 4.33; and
 - (iii) the marks shall extend out on each side of the tunnel alignment by at least 50 metres beyond the zone of influence identified in the risk assessment carried out under condition 4.10.

Building Movement Monitoring Marks

- 4.27 Subject to the owner's approval, and on terms acceptable to the consent holder, the Building Movement Monitoring Marks are to be located generally on or around buildings or structures identified in the risk assessment process under condition 4.10 and identified on a plan as required by the MC&P, as being at risk of damage due to settlement caused by tunnelling activities.

The final location and number of Building Movement Monitoring Marks is to take into account the number of buildings, building type and size, accessibility to survey the marks and the risk of damage due to ground settlement. Building Movement Monitoring Marks need not be installed on ancillary buildings such as garages and sheds or any other structure for which the Team Leader, Compliance Monitoring Central has given written approval.

Monitoring of Building Movement Monitoring Marks is to be twice to a vertical accuracy of +/- 2mm prior to the Commencement of Dewatering. Monitoring frequency from the Commencement of Dewatering will be defined in the GSCMP.

In the event of any of the monitoring marks required by condition 4.26 being destroyed or becoming inoperable, the consent holder must, unless otherwise agreed in writing by the Team Leader, Compliance Monitoring Central, replace the monitoring marks with new monitoring marks.

- 4.28 The consent holder is to survey and record the elevation of each ground Settlement Monitoring Mark and record the corresponding date. Ground Settlement Monitoring Marks are to be surveyed at least three times over a 12-month period prior to commencement of any project stage involving tunnelling to establish seasonal variability, and the minimum level of these baseline surveys is to be used to establish the pre-construction reference ground level. All surveys are to be completed to an accuracy of at least $\pm 2\text{mm}$ for level and $\pm 5\text{mm}$ for plan position, or as otherwise achieved by best practice precise levelling.

40.29 Condition number deliberately not used.

- 4.30 Prior to the Commencement of Dewatering of any project stage involving tunnelling, the consent holder is to assess the potential settlement effects resulting from the exercise of this consent. The output of this assessment is to be used to define the expected settlement levels and to establish settlement Trigger Levels (Alert Levels and Alarm Levels) that minimise the potential for damage to existing buildings or structures. The process for establishing settlement Trigger Levels is to be set out in the M&CP and is to be based upon the final tunnel alignment and construction methodology, any groundwater, deformation or settlement monitoring required by this consent, and groundwater and settlement modelling completed using this data. A factor of natural seasonal variability is to be allowed for in this review based on the survey completed under condition 4.28.

Note:

'Alert Level' is the Differential and Total Settlement Limit set at a threshold less than the Alarm Level, at which the consent holder shall implement further investigations and analyses as described in the M&CP to determine the cause of settlement and the likelihood of further settlement.

'Alarm Level' is the Differential and Total Settlement Limit set in condition 4.33, or which has the potential to cause damage to buildings, structures and services, at which the consent holder is to immediately stop dewatering the site and cease any activity which has the potential to cause deformation to any building or structure or adopt the alternative contingency measures approved by the Team Leader, Compliance Monitoring Central.

- 4.31 During construction in any project stage involving tunnelling, the consent holder is to survey the complete settlement network described in condition 4.26 at six monthly intervals and keep records of each date and the corresponding ground surface and building level. In addition to the above, all Ground Surface Monitoring Marks located within 50 metres of the excavated tunnel or the tunnel excavation face are to be monitored at least once every month. These records are to be compiled and submitted to the Team Leader, Compliance Monitoring Central at six monthly intervals.

- 4.32 The consent holder is to compare all settlement monitoring data obtained during tunnelling construction work with the pre-construction minimum levels in accordance with the M&CP. Where Trigger Levels are exceeded the appropriate actions as set out in the M&CP are to be undertaken and the Team Leader, Compliance Monitoring Central is to be notified within three working days, advising of the trigger exceedance, the risk of settlement causing damage to buildings, and details of the actions taken.
- 4.33 The consent holder is to use all reasonable endeavours to ensure that the exercise of this consent does not cause:
- (a) greater (i.e. steeper) than 1:1,000 differential building settlement (the Differential Settlement Limit) between any two adjacent settlement monitoring points required by this consent; and
 - (b) greater than 50mm total settlement (the Total Settlement Limit) at any settlement monitoring point required by this consent.
- 4.34 The consent holder is to continue to monitor the Ground Settlement Monitoring Marks at six monthly intervals for 12 months after Completion of Dewatering of any project stage involving tunnelling, or for a shorter period if approved by the Team Leader, Compliance Monitoring Central.

At 12 months following the Completion of Dewatering of any project stage involving tunnelling, monitoring of ground and settlement marks is to continue at the direction of the Team Leader, Compliance Monitoring Central if settlement marks have breached trigger levels and there is risk of adverse effects.

ADVICE NOTES

1. *Any reference to a number of days in this decision refers to working days as defined in section 2 of the RMA.*
2. *For the purpose of compliance with the conditions of consent, “the Council” refers to the Council’s monitoring inspector unless otherwise specified. Please contact monitoring@aucklandcouncil.govt.nz to identify your allocated officer.*
3. *The consent holder is responsible for obtaining all other necessary consents, permits, and licences, including those required under the Building Act 2004 and the Heritage New Zealand Pouhere Taonga Act 2014. This consent does not remove the need to comply with all other applicable statutes (including the Property Law Act 2007 and the Health and Safety at Work Act 2015), regulations, relevant bylaws, and rules of law. This consent does not constitute a building consent approval. Please check whether a building consent is required under the Building Act 2004.*
4. *If you disagree with any of the above conditions and/or disagree with the additional charges relating to processing of the application, you have a right of objection pursuant to sections 357A and/or 357B of the Resource Management Act 1991. Any objection must be made in writing to the Council within 15 working days of notification of this decision (in the case of s.357A) or additional charge(s) (in the case of s. 357B).*



Leigh McGregor
Duty Commissioner

23 March 2018