

# Western Springs College

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## Health, Safety and Environment Summary Report

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**Prepared by**  
**ChanceryGreen Environment Law & Strategy and**  
**Golder Associates (NZ) Limited**

**Education Infrastructure Service**  
**Ministry of Education**

**December 2014**

# 1. BACKGROUND & SCOPE OF REPORT

ChanceryGreen and Golder Associates (NZ) Limited were engaged by the Ministry of Education (*the Ministry*) to undertake a review of the health, safety and environmental matters relevant to the current and future use of the site and buildings at Western Springs College (located at 100-102 Motions Road, Western Springs, Auckland), (*the Site* or *WSC*).<sup>1</sup>

The review was commissioned in conjunction with the proposed redevelopment of the Western Springs College site, and addresses the current and possible future health, safety and environment considerations associated with the Site.

This summary report sets out our main findings on the health, safety and environment matters at the Site. Our findings are limited to the scope of our engagement. Except where otherwise stated, we have not undertaken our own independent investigations. We reviewed available information including investigations undertaken, assumptions made, and proposals advanced by other consultants appointed by the Ministry. Our report does not extend to an assessment of the consenting requirements (and/or consenting risks) associated with any redevelopment of the Site.

## 2. OVERVIEW AND FACTUAL BACKGROUND

### 2.1 Site Setting

The Site occupies an area of slightly over 10 hectares, located between the Motions and Meola Creeks. Documented geological records show the Site to be underlain by basalt originating from the lava flows that emanated from the Three Kings, Mount Eden and Mount Albert volcanoes.

### 2.2 Historical Development of WSC

It is common knowledge that the land presently occupied by WSC (and the adjacent Seddon Fields and MOTAT site) was previously used as a landfill site.

In the 1920s a basalt quarry was opened at the Site. While there are only very limited records, it is understood that the majority of the quarrying was located in the south-west corner of the WSC site. This quarrying continued until approximately WWII. Following WWII, rubbish/waste began to be dumped at the quarry, and across the wider Motions Road and Meola Road landfill sites (i.e. the area roughly encompassing WSC, MOTAT2, Seddon Fields and Meola Reef Reserve).<sup>2</sup> The exact nature of waste dumped is largely unknown, however there are reports of organic residential waste, building waste, roading asphalt,

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<sup>1</sup> The Site is legally described as Pt Allotment 20 Section 9 Suburb of Auckland.

<sup>2</sup> There is anecdotal evidence to suggest that landfilling commenced at the wider Motions Road landfill site earlier, perhaps from the early 1900s. We have not located any determinative record of landfilling operations, however.

concrete, reinforcing, and car parts being dumped.<sup>3</sup> Infilling took place between the 1930s and early 1960s. No waste manifests or formal documentation has been sighted by us, regarding the wastes placed in the landfill. Inspection of historic borehole and trial pit logs suggests the landfilled waste was highly heterogeneous and comprise a mix of inert and organic materials such as wood, putrescible waste (domestic refuse), paper, and cloth/material.

Landfilling of the Site continued until the early 1960s, when a clay cap of variable quality and thickness was placed across the site. There is also suggestion that post-closure of the landfill, refuse continued to be illegally dumped at the Site.<sup>4</sup> The thickness of refuse across the Site has been measured from boreholes as between 0m and 9m.<sup>5</sup>

A school (then Seddon High School) was first established on the Site in the early-mid 1960s.<sup>6</sup> It seems from the information available that landfilling operations across the wider landfill continued post-construction of the school through until the mid 1970s. Investigation work<sup>7</sup> has identified domestic, commercial and demolition wastes at the Site.

### 2.3 Current site and uses

The Site is currently used by Western Springs College, which has a student roll of approximately 1300.<sup>8</sup> The student body is comprised of both a mainstream teaching unit and a Maori language immersion unit – Nga Puna O Waiorea (Rumaki) for specialist education.

There are also approximately 45 special needs students who are accommodated in the School's Learning Support Department. We understand that WSC has a reputation for positively supporting students with disabilities, Autistic Spectrum Disorder and other learning support needs, and that this has been reflected in growing student numbers.<sup>9</sup> Students with learning support needs require a higher level of supervision.

The School's roll continues to increase, although the estimated rates of change vary depending on modelling used. The Concept Design for redevelopment (dated July 2014) is to accommodate 2000 students.

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<sup>3</sup> GHD 'Western Springs College: Geotechnical Desk Study and Options Assessment', March 2007 at page 11.

<sup>4</sup> Ibid.

<sup>5</sup> Babbage Consultants Limited 'Western Springs College for Ministry of Education: Landfill Effects Management Options Assessment', December 2008 at page 3.

<sup>6</sup> Interview with WSC Principal Ken Havill on 4 July 2014, and supported by the GHD 'Western Springs College: Geotechnical Desk Study and Options Assessment', March 2007 at page 1.

<sup>7</sup> Tonkin & Taylor, 1994, 'Old Auckland Landfills' (Report 3).

<sup>8</sup> 4 July 2014 interview with WSC Principal Ken Havill and WSC Board of Trustees Chair. It was also noted that the school roll had doubled in the decade prior to 2013. The WSC Principal suggested a roll of over 1800 (then planned by the redevelopment Masterplan), was a conservative estimate.

<sup>9</sup> Learning Support (A2) annual department report for 2013. The Annual Report makes it clear that WSC is becoming known for its learning support department and the options offered to those students. In 2013, the number of students recorded as requiring ongoing support from the learning support team at WSC averaged 45 students each term. The availability of enough rooms/learning space for students who require learning support is also a challenge identified by WSC in its annual report.

In addition to high school student use, we understand that school buildings are used outside normal school hours for a range of other 'community' uses, such as continuing education night classes, and hireage for private use.

A caretaker resides on the Site.

## 2.4 Site Zoning and Resource Consent History

### **Site zoning**

Pursuant to the Operative District Plan,<sup>10</sup> the Site is zoned 'Special Purpose Activity Zone 2'. This zoning applies to primary, intermediate, secondary and tertiary educational and other specialised research facilities. It is intended to provide a degree of flexibility in the range of activities permitted, reflecting the multi-purpose community nature of the education and research facilities in the zone.

There is no notation in the Operative District Plan of the filled ground underlying the Site, or its previous use as a landfill. Indeed, while the Plan contains a notation for 'Former Landfill Areas', none of the former Meola or Motions Road landfill areas are notated as such.

The Site is also subject to a designation by the Ministry.<sup>11</sup> The designation is not well detailed in the Operative District Plan, but extends to educational purposes, and is subject to four general conditions relating to pruning or removal of trees, works within the drip line of trees, car parking and lapse date.

As the Proposed Auckland Unitary Plan (*PAUP*) has now been publicly notified, it is of relevance also. Under the PAUP, the Site is zoned 'Special Purpose'. The purpose of this zone is to allow the continued operation and further development of schools and associated facilities. Again, the Ministry's designation of the Site as a secondary school is noted, and seven "standard conditions" applying to "All Education Designations" are listed. The PAUP notes that several overlays apply to the Site, noting Meola Creek and estuary as an Outstanding Natural Feature, and presence of indicative streams, Western Springs volcanic aquifer, and natural hazards (coastal inundation). The PAUP also notes that the Site (and surrounding area) is subject to a 'Treaty Settlement alert layer'. There is no reference in the PAUP to the former landfill underlying the Site.

### **Resource consents for leachate discharge and collection**

Auckland City Council applied for resource consents in 1996 to discharge leachate into ground and groundwater beneath a closed sanitary landfill and to divert leachate to a collection system. There were two applications: one relating to the Motions Road landfill on the area between Meola Road, Motions and Meola Creeks, and Motions Road (i.e. including the WSC site, MOTAT2 and Seddon Fields reserve); and a separate application for that part of the landfill to the north of Meola Road. The applications noted that the Meola and Motions Roads landfills were among 10 former landfill sites (out of approximately 85 sites) prioritised by Auckland City Council for evaluation of ground and surface water.

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<sup>10</sup> Operative Auckland District Plan – Isthmus Section.

<sup>11</sup> Ibid, designation reference C05-02. We note for completeness that it appears that the relocation of the Point Chevalier kindergarten to the Site is not provided for in the designation, as was suggested as a possibility by WSC staff during our meeting.

The resource consents were granted by Auckland Regional Council on 15 April 1996. The resource consents for Motions Road authorised site re-contouring, partial recapping and retrofitting of leachate interception trenches, together with continued discharges of leachate both to ground/groundwater, and into a collection system.

The resource consents were amended by Auckland Regional Council at an unknown date, because the resource consent to divert leachate to a collection system was no longer required. The new consent (reference 25048), has conditions relating to a range of matters. These include visual inspections and monitoring and reporting of leachate, water chemistry, and water quality across a range of parameters. The consent expires on 31 December 2016.

In an April 2013 document, Auckland Council identifies as one of four major remediation projects over the next decade:<sup>12</sup>

*“Motions Road: This will involve capping improvements, gas management, and rehabilitation of areas affected by leachate release, differential settlement, and slope instability. It will cost \$5 million.”*

### 3. HEALTH, SAFETY & ENVIRONMENT RECOMMENDATIONS

We make the following recommendations regarding the management of existing health, safety and environment matters at WSC. These include the following priority issues.

#### 3.1 Health and Safety Systems and their implementation at WSC

Our recommendation is that the school introduce a revised health and safety policy. This will help with the development of WSC’s health and safety culture and guide decisions around health and safety. We also recommend that hazard management should be treated as a priority. Dedicated resource should be allocated to developing, implementing and updating a health and safety plan for the school, covering all relevant hazards - including in particular, asbestos, polychlorinated biphenyls (PCBs), moulds, contaminated land, landfill gas, subsidence, traffic and building maintenance. In this regard, ChanceryGreen and Golder have:

- Discussed with school representatives, including the HSE Committee, the opportunities for improvements to ensure compliance with legal obligations and ensure that all individuals take greater responsibility for one another’s health and safety.
- Prepared (in draft) a revised health and safety policy for consideration and implementation by WSC. That policy, together with associated procedures, has been discussed at a workshop with a number of WSC staff (including the Principal, laboratory manager, caretaker and school nurse) on 1 December 2014.
- Assisted in development of operating procedures for specific hazards at the Site (including landfill gas and asbestos containing materials (ACM)). For example, in relation to day to day management of landfill gas risk, new procedures have been

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<sup>12</sup> Auckland Council, ‘Closed Landfills – Asset management plan summary’, April 2013.

drafted and training has been provided to staff in order that they can use a newly purchased gas meter to monitor for the presence of landfill gas at WSC.

- Preparing (in draft) a new external contractor agreement for WSC. This was also discussed at the workshop held on 1 December 2014. Once finalised, the new external contractor agreement will assist the awareness both of WSC and contractors regarding site-specific hazards. Key among these are that any maintenance work involving ACMs should be restricted to contractors that hold a Restricted Certificate of Competence and undertaken in accordance with relevant regulations, guidelines and standards.

**Issue:** Health and safety management at WSC and policy and procedures for WSC (encompassing various responsibilities and procedures for specific hazards including asbestos, landfill gas and contaminated land).

**Problem:** Policies and procedures require management direction and implementation by WSC in order to foster a sound health and safety culture. Specialist advice also necessary for specific risks such as hazardous materials (ACMs/PCBs/landfill gas/contaminated land).

**Action/resolution:** Draft policies and associated procedures have been prepared for WSC's consideration and input. External contractor agreement has also been prepared in draft for WSC. Workshop session held with WSC staff and management in order to assist in finalising policy and associated procedures.

Hazardous materials survey (ACMs, PCBs and lead paint) and landfill gas survey have been undertaken. Specific management plans have then been prepared for dealing with these specific risks.

Since the school and playing grounds were established, there have been ongoing problems with ground settlement, disruption to underground services, surface ponding and drainage, despite attempts to remediate/rectify the problems.<sup>13</sup> The history of settlement and associated problems is relatively well-documented. A 2007 report<sup>14</sup> identifies settlement up to 600mm underneath buildings. A similar level of differential settlement up to 100mm occurred over four years (from 2003 to 2007) at the tennis courts.

We understand that several rounds of rectification works have been carried out at WSC to remediate/ameliorate effects associated with settlement. Many of the utilities now run above ground. The playing fields were extensively re-levelled using imported clay fill in 1998, and in 2005 the northern playing field was re-levelled for a second time.<sup>15</sup> We are advised by the WSC Principal that the school receives annual funding from the Ministry towards this.<sup>16</sup>

The expert assessments we have reviewed suggest that settlement of pavements, walkways and playing fields will continue on the Site.

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<sup>13</sup> 4 July 2014 interview with WSC Principal Ken Havill and Board of Trustees chairperson.

<sup>14</sup> GHD, 'Western Springs College, Geotechnical Desk Study and Options Assessment', March 2007, p7.

<sup>15</sup> GHD 'Western Springs College: Geotechnical Desk Study and Options Assessment', March 2007, at page 11.

<sup>16</sup> 4 July 2014 interview with WSC Principal Ken Havill and Board of Trustees chairperson.

The engineering solution proposed for any school redevelopment is to dig out the fill below the walkways and paved areas and replace with compacted material (gravel). Without remediation of walkways, paved outdoor areas and playing fields, the ongoing maintenance costs at the school will remain high, and the use of these areas may remain restricted. Settlement is particularly a problem on the western playing field which is largely unused during the year due to ponding issues. We recommend that alternative engineering solutions for reducing settlement on the playing fields should be investigated as part of any redevelopment.

Subsequent to our initial involvement, a site survey has been undertaken to identify and label potential hazards associated with ground settlement. Paving works have been undertaken to rectify the majority of the slip/trip hazards at the site, and prevent ponding of water on major pathways around the school.

**Issue:** Ground settlement around WSC buildings and grounds.

**Problem:** Ground settlement (differential settlement), has caused ponding of water on fields and grounds around WSC (especially on the south-western fields, which are unusable for large periods of the year), and has resulted in uneven surfaces on walkways and paved outdoor areas, which gives rise to potential trip/slip hazards.

**Action/resolution:** A site survey has been completed of walkways and paved areas around WSC to identify and label trip/slip hazards. Paving works have also been undertaken such that the majority of slip/trip hazards at the site have been rectified and ponding of water on major pathways has been prevented.

Ongoing site monitoring and maintenance will be required.

### 3.2 Landfill gas emissions

The former use of the Site gives rise to potential risks associated with landfill gas emissions. In simple terms, as organic refuse materials decompose, gases are generated. These gases naturally migrate through the ground along pressure gradients and escape. Landfill gas can migrate via:

- upward migration through the ground, and especially through preferential pathways such as building piles and services; and
- lateral migration – for example, through higher permeability layers in soil/refuse/bedrock.

Generally speaking, there are two categories of human health risk arising from landfill gas escape – explosion/fire, and asphyxiation risk through inhalation of gases. Although it appears that landfill gases are still being generated on the Site, monitoring has not shown any concentrations within school buildings considered harmful to the health and safety of the school community. The risk appears to have been mitigated by the current design of

buildings with buildings allowing ventilation below and within. Other environmental and/or nuisance effects include the possibility of strong odour emissions.

#### *Assessment of landfill gas risk*

Golder was commissioned to undertake an assessment of landfill gas at WSC. That assessment focused initially on landfill gas within the Rumaki, in particular the Wharenui, and the caretaker's residence, as these buildings and uses were identified as 'higher risk', due to the presence of people overnighiting. At both locations, no significant gas has been detected during that monitoring period.

The results of the school-wide assessment by Golder and the landfill gas measurements recorded will form part of a separate report to be finalised shortly. In that report Golder assesses the landfill gas risk to WSC as 'moderate'. This risk characterisation is based on an assessment of gas screening values against 'best practice' standards, adjusted to take account of the concentrations of methane measured. Based on this risk rating, general users of school buildings (students, staff and visitors undertaking routine activities) are not considered at risk from landfill gas. However, because of their overnight/residential use, the Wharenui and the Caretaker's residence are deemed to be a more sensitive use, and so additional levels of protection are recommended, such as intermittent monitoring (using handheld equipment), or installation of a monitoring system.

The Golder report will provide an assessment of current risks to WSC, in order to inform procedures for health, safety and environmental management related to landfill gas. It is also intended to establish a 'baseline' assessment of the landfill gas characteristics at the School, to better inform contractors/designers for the possible redevelopment.

### **3.3 Development of an integrated landfill management plan**

A landfill management plan, which includes operating procedures is to be produced that focuses on potential environment, health and safety risks at WSC, associated with the landfill, specifically landfill gas. As noted above, these workstreams are underway, and deliverable outcomes include:

- a register of 'high risk' buildings, locations and activities;
- a portable gas meter (this has been purchased by the Ministry and supplied to WSC) and suitable training on the use of that meter provided to nominated WSC staff;
- a management plan including specific procedures to assist in managing activities at the school with a higher risk (for example, maintenance activities and work in confined spaces); and
- a revised external contractor agreement related to landfill gas (and other hazards).

**Issue:** Landfill gas at WSC site.

**Problem:** Landfill underlying WSC continues to generate landfill gas. Exposure to landfill can be harmful to site users. No comprehensive landfill gas monitoring and survey had been undertaken previously to fully assess risk.

**Action/resolution:** On the Ministry's instruction, landfill gas monitoring has been undertaken throughout WSC, including in those areas considered 'higher risk areas' – confined spaces; Rumaki (Wharenui), and Caretaker's residence. Based on the monitoring results, the Rumaki (Wharenui) and Caretaker's residence are considered safe to occupy, however, ongoing monitoring of those areas is recommended.

A formal landfill gas survey report for WSC is expected to be released by Golder Associates shortly.

The Ministry purchased a gas meter for delivery and use at WSC and training on use of that meter has been provided to WSC staff representatives (including the caretaker).

A contaminated land and landfill gas management plan has been drafted and will be provided to WSC shortly, so that procedures are in place for managing landfill gas risks associated with the range of activities (including maintenance works such as confined space entry and hot works) that are undertaken at the site. The recommendations in the contaminated land and landfill gas management plan include:

- Sealing penetrations through ground level floors;
- Additional protection for Wharenui and Caretaker's residence, such as intermittent monitoring (using handheld equipment), or installation of a monitoring system;
- Restrictions on earthworks;
- Ongoing and regular inspections; and
- Off-site monitoring to complement existing on-site monitoring wells.

### 3.4 Creation of a formal ACM / hazardous materials Register

Asbestos consultants were commissioned to undertake a comprehensive ACM survey of buildings on the Site.<sup>17</sup> Based on the results of that survey and identification of ACMs at the Site, a draft asbestos register and asbestos management plan have been produced and provided to WSC. The register identifies areas around the school buildings where specific management of ACM is required on an ongoing basis.

Remedial works have also been undertaken in one area of the school where external panels containing ACMs were found to be in a damaged/vandalised state. On instructions from the Ministry, a certified contractor undertook necessary work to remove and safely dispose of the ACMs in accordance with relevant regulations. Testing of both the surrounding soil and air monitoring was also undertaken returning safe results before the surrounding area was cleared for use.<sup>18</sup> However, there are some other immediate recommendations, such as minor works to close up classroom ceiling spaces which potentially expose friable ACM. We

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<sup>17</sup> CEDA Environmental Services were instructed in September 2014.

<sup>18</sup> Works undertaken by Nikau Contractors Ltd, under supervision of CEDA.

understand this is still to be actioned. We recommend that WSC implements a robust programme of active maintenance.

Some lead paint has been identified in certain buildings on the Site. This is not uncommon for school buildings of this age of construction. The locations of lead paint have also been documented in a survey, and a register provided to the school, with the recommendation that regular maintenance checks occur where other lead paint could become exposed. Procurement of any painting contractors should include a requirement for containing and removing all lead paint removed from surfaces in order to prevent exposure to staff and students to lead, as well as preventing contamination of ground and stormwater from lead paint chips.

Experts also identified the presence of PCBs in some light fittings at the school. One such light fitting was leaking PCBs. The suspected locations of PCBs have now been recorded and provided to WSC. We understand removal of all PCBs is scheduled to occur over the summer break.

**Issue:** Presence of asbestos containing materials, lead paint and PCBs at WSC site.

**Problem:** Hazardous materials are present in the buildings at WSC (in construction materials, finishings and light fittings) and need to be managed as hazards in order to eliminate or minimise any associated risks.

**Action/resolution:** Ministry instructed specialist certified asbestos contractors to survey all WSC buildings to identify locations of hazardous materials. An asbestos register identifying these locations, and an asbestos management plan have been produced for WSC.

Remedial works by a certified contractor have been undertaken on one WSC building where asbestos was present and in a damaged/vandalised state. Soil and air testing were undertaken (returning safe results) prior to that area being reopened for use.

Maintenance works are required in other areas of the school to reduce exposure risk to asbestos. Those works have been communicated to the Ministry and WSC for action.

Known or suspected locations of lead paint and PCBs have been recorded. PCB removal is to occur over the 2014/15 summer break. Lead paint will require regular maintenance checks.

### 3.5 Contamination of land

As a brownfields site, the Site is known to contain contaminated land as a consequence of the landfilling undertaken historically. As noted above, we understand that issues related to the former landfill use of the Site are relatively well known, although the exact nature of, and potential effects associated with the landfill are less well understood. Testing of potential contamination undertaken at the Site to date is described as “limited”,<sup>19</sup> which we consider to

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<sup>19</sup> Davis Langdon, Ministry of Education Existing Estate Health and Safety Review, 23 May 2014, p2.

be a fair assessment. A small number of cover material soil samples were recovered during geotechnical investigations undertaken in March 2014 and have undergone limited testing.<sup>20</sup> All samples yielded concentrations below the NES Soil Contaminant Standards<sup>21</sup> for recreational use. There is no reliable data on the nature or depth of the 'cap' overlying the landfill material.

To fully characterise the landfill, and to assist in better understanding the risks posed (to current school operations and the proposed redevelopment), we recommend that a more comprehensive study of the 'cap', top layer of soil and the groundwater leachate regime be undertaken. This will also inform and assist decisions around redevelopment of WSC and manage activities at the school in its current state.

**Issue:** Soil contamination at WSC

**Problem:** There is limited information available regarding the nature or depth of the capping layer overlying landfill material at the site. Landfill materials and groundwater leachate regime are not well understood.

**Action/resolution:** Characterisation of underlying landfill materials and capping materials, as well as groundwater regime is recommended in order to be able to assess the level of risk posed to current school uses, and to inform any site redevelopment.

Recommendations have been made that footwear be required on the WSC fields and that additional health and safety precautions be adopted for any activities involving ecological restoration works on the Meola Creek banks.

A contaminated land and landfill gas management plan has been drafted and will be provided to WSC so that procedures are in place for managing contaminated land risks associated with the range of activities undertaken at the site.

### 3.6 Indoor Air Quality Related to Building Weathertightness

Three buildings on the Site are known to have weathertightness issues due to the materials and construction methods used. These buildings are TAPAC, the Library additions, and the Administration Block additions. In a series of reports produced in 2011-12, the buildings were noted as not satisfying the performance requirements of the Building Code. Following our review, the Ministry commissioned air quality consultants to undertake monitoring of these three buildings in September 2014. We understand certain areas affected with moulds within these buildings were recently cleaned by specialists. We are advised by the Ministry that following cleaning and subsequent further air quality monitoring, the spaces have been reopened for use. We are also advised that it has now instigated an ongoing air quality monitoring regime for these buildings.

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<sup>20</sup> Thirteen soil samples were collected from seven boreholes drilled around the WSC buildings, with samples collected from depths ranging between 0.25m below ground level (bgl) and 1.6m bgl. All samples were analysed for a range of metals, PAHs and select samples were tested for ACMs.

<sup>21</sup> *Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health*, Wellington, Ministry for the Environment, as incorporated into reg 7 of the Soil Contamination NES.

**Issue:** Weathertightness of parts of three buildings at WSC (TAPAC, Library additions, Administration Block additions)

**Problem:** Weathertightness and associated moisture in buildings giving rise to non-compliance with Building Code leading to the need to manage any potential health risks associated with moulds.

**Action/resolution:** Buildings were vacated and specialist cleaning has occurred. Air quality monitoring undertaken to ensure buildings are safe for occupation. Ministry has instigated ongoing air quality monitoring regime.

## 4. ISSUES FOR REDEVELOPMENT

Based on the information reviewed and provided that management measures and contingency plans proposed are in place, we consider that the health, safety and environment risks at the Site during and post redevelopment are likely to be acceptable - *provided that* they are managed comprehensively and holistically. All parties involved in a redevelopment must devote time and resources in the manner or scale necessary to assess, identify, manage and monitor the risks present at the Site. Redevelopment will require a significantly high level of attention to, and management of, health safety and environmental matters.

### 4.1 Lack of Comprehensive Site Contamination Information

Monitoring of potential contamination and/or landfill gas risks at WSC has been carried out at the instruction of various parties including Auckland Council (and its predecessor organisations), WSC, and the Ministry. However, this work was often limited in scope and/or extent. Further, there appeared to be no clear 'baseline' set of recorded data for the Site. Instead, the various studies have drawn on previous monitoring results and interpretations, and/or undertaken additional monitoring by taking small subsets of data. Accordingly, this 'snapshot' approach makes it difficult to understand (for example) the extent, location and depth of refuse material and contamination at the Site, or the complex interrelationships between natural soils/fill/waste, in-ground gas, groundwater/leachate and surface water.

A significant amount of environmental investigation has been undertaken by the team commissioned by the Ministry in the last two years to support the proposed redevelopment, including geotechnical reviews and boreholes to determine depth to rock (basalt). These investigations have principally focussed on ground engineering issues. Additional work on land contamination is needed to better inform the development process and establish the full life cycle cost of the redevelopment proposal.

### 4.2 Landfill Gas Assessment

Previous reports indicate that specific protection measures required during the redevelopment will need to be determined following a detailed landfill gas risk assessment undertaken for proposed works. The combination of fill excavation, compaction of material for pathways, pile driving and partial capping of the Site with impermeable cover (in particular large footprint buildings) is likely to significantly change the landfill gas and leachate regime(s) at the site. Construction-related landfill gas issues can be adequately

managed during the work programme by a competent contractor. However, it represents a major constraint to the physical works and will impact upon cost and programme.

Golder is shortly about to complete an assessment of landfill gas at the Site. The purpose and outcome of the assessment should be used to gain a better understanding of the gas characteristics of, and risks posed by, the wider Motions Road closed landfill. This will enable robust decisions to be made regarding current management of landfill gas issues and management/mitigation over the project life cycle.

Post-development, landfill gas at the Site will require monitoring and management in the long term. The combination of excavation of fill, piling of foundations and partial capping of the site with impermeable cover (in particular large footprint buildings) is likely to significantly change the landfill gas and leachate regimes at the site.

### **4.3 Risk Associated with Expiry of Leachate Discharge Consent**

Discharges of leachate to ground/groundwater from the former landfill underlying the Site are currently authorised by resource consent. That consent is held by Auckland Council, and expires in December 2016. Depending on the outcomes of hearings on the PAUP, new resource consents may be required to authorise ongoing discharges. There are numerous complicating factors which mean that, in our view, a new application for resource consent will not be straightforward. These include: the sensitivity of the receiving environment (including the Meola Creek, which is noted as an 'Outstanding Natural Feature'); the nature of continued discharges; and anticipated community/stakeholder response to an application (noting that the Site is identified in the PAUP as subject to a Treaty settlement alert layer). Further, while the current consent is held by Auckland Council, we consider that there is potential liability for the Ministry (as owner) and/or WSC or its Board of Trustees (as occupier) in the event that Council does not apply for new resource consent prior to expiry of the current consent or consents only the landfilled area under its ownership/control.

It is possible that resource consent for ongoing discharges of leachate from the Site after December 2016 is required, but not granted. More likely, resource consent may be granted, subject to conditions. Conditions could include, for example, retrospective installation of leachate collection channels, treatment and appropriate (off site) disposal. Conditions are likely to be more stringent on capping management, developments and planting. The risk is that the Ministry may find itself committed to a redevelopment of the Site, only to later discover there are additional costs, or the Ministry is limited in the development in order to avoid, remedy or mitigate adverse effects associated with leachate from the former landfill. Such costs are very difficult to estimate at this time. The proposed remedial and construction works, if they affect the landfill (for example, cap or leachate regime) will need careful consultation with Auckland Council amongst others.

### **4.4 Treatment of playing fields**

In order for the full value of the redevelopment to be realised by WSC, we consider some form of ground improvement should also be implemented for the playing fields. The western playing fields are unusable for most of the school year due to ponding. This is despite funds being made available and utilised annually by WSC for the cost of ongoing repair works.

While ponding on the northern field is no longer as common (funding having been applied there for a number of years), the School's preference is to have an all-weather turf.<sup>22</sup>

#### 4.5 Landfill Effects on Construction Design

The former landfill material underlying the Site is such that careful construction design is required.

Given uncertainty regarding the landfill refuse and capping, we suggest that caution is required with regards any 'scraping' or excavation of capping and/or landfill refuse material at the Site. The risks extend from contact, to airborne dust and particulates (which we discuss separately below). Issues of existing residual contamination of the cap/cover material and potential/likely contamination of these materials during the redevelopment need to be factored into the Ministry's business case. For example, an area of buried asbestos is assumed to be "50m x 50m in size and 2m depth" for contingency purposes.<sup>23</sup> However we have not reviewed sampling results to indicate that the proportion or overall volumes of soil potentially containing ACM can be estimated to any degree of certainty. Given the limited sampling of the Site, and the proposed Stage One and Two construction areas proposed in the MasterPlan document, we consider it unlikely that the extent of ACM will be known until excavation occurs.

Another implication for construction practices associated with the former landfill is risks of landfill gas. Previous construction of buildings at the Site has (directly/indirectly) allowed free venting of air/landfill gas below the buildings, which has likely mitigated against localised gas concentrations.

There are significant constraints with the existing Site that will require management in design and construction of any redevelopment. These include:

- Piling through former landfill refuse to underlying basalt;
- Compaction of building platforms and paths/walkways to prevent future settlement;
- Structural design to allow for possible future differential settlement;
- Monitoring of landfill gas, asbestos and other contaminants during construction and procedures to follow in the event that threshold limits are reached;
- Engineering controls to manage landfill gas; and
- Design of Stage One mainstream learning block to allow for its occupation and use during construction of Stage Two of the redevelopment.

#### 4.6 Construction Staging and Considerations

In the event the Ministry determines to redevelop the current Site, then there are numerous considerations, which should be taken into account in scoping and undertaking works. The proposed timing of redevelopment is not clear to us, as we understand options are still being considered. We understand generally, however, that the current intention is to carry out Stage One as a standalone project. During construction of Stage Two, we understand that the intention is to continue to conduct normal WSC operations, including in the new building

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<sup>22</sup> Discussion with WSC Principal Ken Havill on 4 July 2014.

<sup>23</sup> Tonkin & Taylor, *Western Springs College – Contaminated land and landfill gas redevelopment implications*, letter 17 April 2014, section 2, p4.

constructed during Stage One. This may have implications for the design, consenting and construction of Stage Two, although we are unable to quantify those implications at this time. We detail key issues below.

- We consider that certain effects, in particular odour, dust/particulates, and noise, will be significant during construction. Mitigation measures (wetting of soil, covering materials during transport) will assist to reduce the amount of dust/particulates generated. An acoustic barrier may have some (likely minimal) effect on dispersal. Timing of construction (i.e. seasonal variation of soil conditions) will also affect the levels of dust and particulates generated. Internal air quality monitoring will also be required in the classrooms during demolition of any building containing ACM or in the event that ACM is identified during the excavation of waste. The WSC 'food centre' is located with a large outdoor (covered, but open-sided) seated area. We have no information as to what steps are proposed to avoid adverse effects at this area. These matters will need to form part of a comprehensive construction management plan that details how demolition/construction works will be managed so as to avoid or mitigate effects on school users, if the Site is to remain in use during the construction period. This may extend to relocating students during the construction period to ensure separation distances between learning spaces and construction works.
- Similarly, any staged construction will need to provide for newly constructed buildings to have design features that would allow for safe occupation while other facilities/buildings are being constructed nearby. In particular, design and costings should provide air conditioning (with HEPA filters) and additional acoustic protection. The ability to override the automated functioning of ventilation/filtration systems is also recommended in order to prevent ingress of particulates/dust during construction (especially during prevailing winds).
- Development works involving subsurface excavation will significantly disturb the refuse fill materials underlying WSC. This may change the landfill gas and leachate regime. Landfill gas risks at the Site will accordingly need to be monitored and managed on the site during any redevelopment to eliminate or minimise risks to contractors, students and staff during construction. Increased monitoring and management will be needed during, and following, the construction programme to address potential landfill gas risks should engineering solutions be sufficient to ensure this can be done safely.

#### 4.7 Costing implications due to underlying site conditions

As the Site is constructed on an unlined former landfill, the environmental effects associated with that former use will continue to require monitoring and management of health, safety and environment matters. In addition, given the physical constraints due to its former landfill use, the cost of redevelopment of the current Site will be substantially higher than a 'greenfield' site. The Ministry will need to ensure this is covered fully in the business case.