Government of Western Australia
Department of Water and Environmental Regulation

Amendment Notice 2

Licence Number	L6764/1997/14
Licence Holder	Atlas Group Pty Ltd
ACN	009 061 063
File Number:	DER2011/000652
Premises	Atlas Group Pty Ltd 501 Alexander Drive MIRRABOOKA WA 6061 Lots 820 and 821 on Deposited Plan 404602
Date of Amendment	2 July 2019

Amendment

The Chief Executive Officer (CEO) of the Department of Water and Environmental Regulation (DWER) has amended the above Licence in accordance with section 59 of the *Environmental Protection Act 1986* (EP Act), as set out in this Amendment Notice. This Amendment Notice constitutes written notice of the amendment in accordance with section 59B(9) of the EP Act.

Jarrod Abrahams
A/MANAGER WASTE INDUSTRIES
REGULATORY SERVICES
an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA).

Definitions and interpretation

Definitions

In this Amendment Notice, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
ACN	Australian Company Number
Amendment Notice	refers to this document
BTEX	benzene, toluene, ethylbenzene and xylenes
Category/ Categories/ Cat.	categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
CEO	means Chief Executive Officer. CEO for the purposes of notification means: Director General Department Administering the *Environmental Protection Act 1986* Locked Bag 33 Cloisters Square PERTH WA 6850 info@dwer.wa.gov.au
CS Act	*Contaminated Sites Act 2003* (WA)
Delegated Officer	an officer under section 20 of the EP Act
Department	means the department established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DOH	Department of Health
DWER	Department of Water and Environmental Regulation
EP Act	*Environmental Protection Act 1986* (WA)
Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of and during this Review
Licence Holder	Atlas Group Pty Ltd
MAR	Mandatory Auditor's Report

Term	Definition
mg/L	means milligrams per litre
NEPM	National Environmental Protection Measure
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PFAS	per-fluoroalkyl and poly-fluoroalkyl substances
Prescribed Premises	has the same meaning given to that term under the EP Act.
Premises	refers to the premises to which this Amendment Notice applies, as specified at the front of this Amendment Notice.
PDSWA	Public Drinking Water Source Area
Risk Event	as described in *Guidance Statement: Risk Assessment*
UWPCA	Underground Water Pollution Control Area
µg/L	means micrograms per litre

Amendment Notice

This amendment is made pursuant to section 59 of the *Environmental Protection Act 1986* (EP Act) to amend the Licence issued under the EP Act for a prescribed Premises as set out below. This notice of amendment is given under section 59B(9) of the EP Act.

This notice relates to an amendment of Licence Condition 2.3.1 which specifies the requirements for ambient environmental quality monitoring on and off the Premises. No changes to the other conditions in the licence were requested by the Licence Holder. DWER has also identified that the Premises address and boundary need to be amended to become consistent with the current cadastral descriptions (legal land description).

The following guidance statements have informed the decision made on this amendment*:*

- *Guidance Statement: Regulatory Principles* (July 2015)
- *Guidance Statement: Setting Conditions* (October 2015)
- *Guidance Statement: Land Use Planning* (February 2017)
- *Guidance Statement: Decision Making* (February 2017)
- *Guidance Statement: Risk Assessment* (February 2017)
- *Guidance Statement: Environmental Siting* (November 2016)

Amendment description

On 5 November 2018 Atlas Group Pty Ltd (the Licence Holder) submitted an application to the Department of Water and Environmental Regulation (DWER) to amend Licence L6764/1997/14 (the Application). The Licence is for a Prescribed Premises Category 63 Class I inert landfill and 62 solid waste depot in Mirrabooka, Western Australia.

The scope of the Application relates to groundwater monitoring requirements in Licence Condition 2.3.1 which were implemented in a previous amendment on 4 December 2014. During preparation of this notice, DWER identified that the legal description of the Premises had changed from what is shown in the Existing Licence. DWER is taking the opportunity to amend the Premises address and boundary (shown in Schedule 1) in the Existing Licence accordingly.

Table 2 lists the documents and information provided with the Application and submitted as part of the assessment process.

Table 2: Documents and information submitted during the assessment process

Document/information description	Date received
Application Form (Amendment) signed by Manager Geoff VanDerMeulen and dated 2 November 2018 The following attachments and appendices were included with the Application Form: • Attachment 3A: Atlas Mirrabooka Inert Landfill and Solid Waste Depot Groundwater Requirements Review • Appendix A: Peer Review – Dr Richard Martin (Delayed Yield Pty Ltd) 2018 • Appendix B: Atlas Sampling and Analysis Plan, GHD 2011 • Appendix C: Atlas Landfill Groundwater Monitoring Report, GHD 2013	5 November 2018

Document/information description	Date received
• Appendix D: Atlas Groundwater Laboratory Reports May and November 2014 • Appendix E: Atlas Groundwater Report – May 2015, Bioscope Environmental 2015 • Appendix F: Atlas Groundwater Report – November 2015, Bioscope Environmental 2015 • Appendix G: Atlas Groundwater Report – May 2016, Bioscope Environmental 2016 • Appendix H: Atlas Groundwater Report – November 2016, Bioscope Environmental 2017 • Appendix I: Atlas Groundwater Report – May 2017, Bioscope Environmental 2017 • Appendix J: Atlas Groundwater Report – November 2017, Bioscope Environmental 2018 • Appendix K: Atlas Groundwater Report – May 2018, Bioscope Environmental 2018 • Appendix L: Atlas Groundwater Trend Analysis 2017, Bioscope Environmental 2018 • Appendix M: Tabulated Atlas Groundwater Monitoring Results 2013-2018	
Response to Letter Issued 30 November 2018, signed by Manager Geoff Vandermeulen and dated 19 December 2018 The following attachments were included: • Attachment One: Information Request and Summary of Responses Provided • Attachment Two: Current Site Plan and Associated Figures • Attachment Three: Current Activities Onsite in Relation to Groundwater Monitoring • Attachment Four: Correspondence in Relation to Confirmation of Extension of Planning Approval • Attachment Five: Information on the Current and/or Ongoing Activities at the Premises and the Potential Emission or Discharge Sources from such Activities • Attachment Six: References	19 December 2018

Background

The Licence Holder operates a Category 62 solid waste depot and Category 63 Class I inert landfill site in the locality of Mirrabooka within the Perth metropolitan region. Sand quarrying commenced at the site in the late 1950s. Landfill activities have been carried out at the site since 1977, and previously both putrescible and inert wastes were accepted for burial. In 1997, the Premises was reclassified from a putrescible landfill to a Class I inert landfill only, due to the risk to groundwater from putrescibles being buried in unlined cells. The Premises continues to accept putrescible wastes for sorting only.

The Premises was classified under the CS Act as 'Possibly Contaminated – Investigation Required' in 2009 and the Licence Holder was served an Investigation Notice in October 2011. The groundwater investigation which was conducted as a result of the Investigation

Notice found that landfill leachate had impacted groundwater beneath the landfill site and approximately one kilometre offsite to the south-west into residential areas of Dianella and Mirrabooka.

The 2013 groundwater investigation identified that the relevant beneficial use of groundwater in the vicinity of the contaminant plume was domestic and council irrigation (GHD, 2013). This investigation found that the risks from identified compounds were low and further work was not required to quantify the risks to ecological and human receptors. This report was reviewed by the Contaminated Sites Auditor who concluded that "*Atlas has appropriately fulfilled their obligations under the Investigation Notice. It is concluded that identified groundwater impacts beneath and in the vicinity of the site are unlikely to represent unacceptable risks to human health and/or the environment*" (ERM, 2014). The Mandatory Auditor's Report included a recommendation that "*the site remain classified as 'Possibly Contaminated – Investigation Required' but the relevant details within the classification should be modified to reflect updated understanding as a result of the assessments recently undertaken"* (ERM, 2014).

Given the significant impact on groundwater quality in the area, in 2014 the Department of Health (DOH) recommended groundwater impacts continue to be monitored. This was recommended as there was only one year of sampling and analysis of the offsite plume, and some further analysis was required to confirm that the groundwater impacts were stable or improving. Synergies in the approach to licensing and monitoring required under the CS Act led to the licence being amended in December 2014 to include additional offsite groundwater sampling locations and analytical parameters in the licence conditions. The 2014 Decision Report recommended that offsite monitoring be undertaken for three years after which monitoring requirements could be reviewed, and potentially revised, based on the monitoring results.

The Licence Holder conducted biannual groundwater monitoring of the on and offsite bores in 2015, 2016 and 2017. In 2018, following three years of groundwater monitoring, the Licence Holder commissioned Bioscope Environmental, in consultation with Dr Richard Martin, to conduct a review of the groundwater monitoring requirements at the Premises (Bioscope Environmental, 2018; Delayed Yield, 2018). The review proposed several changes to the groundwater monitoring program and it is these changes which are the main subject of this Amendment Notice.

The north-eastern portion of the Premises is currently used by BGC Pty Ltd (BGC) as a concrete batching plant. This facility is operated by BGC and is under a separate DWER registration. The south-eastern portion of the Premises is operated as a brick and paving manufacturing plant and this activity is not related to the prescribed premises categories licensed under L6764/1997/14.

Proposed Amendments

Based on the findings of the 2018 groundwater monitoring review (Bioscope Environmental, 2018), the Licence Holder has requested an amendment to the Existing Licence. This amendment relates to monitoring requirements outlined in Condition 2.3.1. The changes proposed by the Licence Holder are summarised as follows:

- Reduction of the groundwater monitoring network from seven onsite bores and seven offsite bores to two onsite bores (BH7 and MW1-5) and three offsite bores (MW1-2, MW1-8 and MW1-9).
- Reduction of the sampling frequency from biannual to annual, with stipulation that annual sampling be undertaken during peak stress periods, after winter rains.
- Removal of polycyclic aromatic hydrocarbons (PAHs) (excluding naphthalene), polychlorinated biphenyls (PCBs) and organochlorine and organophosphate pesticides from the analytical suite of offsite bores.

- Addition of benzene, toluene, ethylbenzene and xylenes (BTEX) to the analytical suite of onsite bores.

The intent of this Amendment Notice is to update the requirements for groundwater quality monitoring as addressed in Licence Condition 2.3.1 and shown in the 'Map of monitoring locations' in Schedule 1 of the Existing Licence. Consideration has been given to the monitoring changes proposed by the Licence Holder as well as advice from DWER's Contaminated Sites branch and Water Source Protection Planning branch and external advice provided by the DOH.

Planning approval

DWER understands that planning approval was due to expire on 31 December 2018. In December 2018, the Licence Holder provided evidence that an application to extend the existing Planning Approval was submitted to the City of Stirling on 23 March 2018. Further the Licence Holder provided DWER with correspondence from the City of Stirling to Rowe Group dated 13 June 2019 which indicated that the application would be determined under delegated authority by the end of June 2019. The Licence Holder has indicated that they will provide the determination of planning approval to DWER when it is available.

Amendment history

Table 3 provides the licence and amendment history for L6764/1997/14.

Table 3: Licence and amendments history

Instrument	Issued	Nature and extent of licence or amendment
L6764/1997/14	29/03/2012	Licence reissue
	01/05/2014	Licence amendment to REFIRE format
	04/12/2014	Licence amendment to groundwater monitoring regime including addition of offsite monitoring bores
	27/10/2015	Licence amendment to include the acceptance of Inert Waste Type 2
	29/04/2016	Licence amendment to change expiry date (Amendment Notice 1)
	02/07/2019	Amendment to revise groundwater monitoring requirements – subject of this amendment notice.

Location and receptors

Table 4 below lists the relevant sensitive land uses in the vicinity of the Premises which may be receptors relevant to the proposed amendment.

Table 4: Receptors and distance from activity boundary

Residential and sensitive premises	Distance from Prescribed Premises
Down-gradient residential and local government bore users (irrigation water)	Closest residents are 200 m to the south
Potential future drinking water supply: • Existing Integrated Water Supply Scheme (IWSS) bores M540, M510 and M34 which may be used for production in the future. • Priority 3 (P3) Public Drinking Water Supply Area (PDSWA).	• M540 is approximately 1.7 km west of the Premises. • M510 is approximately 1 km northwest of the Premises. • M34 is approximately 1.6 km northeast of the Premises. • The Premises is located within the P3 PDSWA

Table 5 below lists the relevant environmental receptors in the vicinity of the Premises which may be receptors relevant to the proposed amendment.

Table 5: Environmental receptors and distance from activity boundary

Environmental receptors	Distance from Prescribed Premises
Flora and fauna exposed to irrigation bore water	On the Premises and in Bush Forever areas adjacent the northern, western and southern boundaries of the Premises

Table 6 below provides brief descriptions of the geological and hydrogeological setting of the Premises.

Table 6: Geology and hydrogeology

Environmental aspect	Description
Topography	The natural ground surface of the Premises slopes towards the east. Most of the Premises is relatively flat with the exception of a steep incline in the western portion of the Premises.
Geology	Geological maps indicate that the surface geology of the Premises comprises sand derived from Tamala Limestone in the west and Bassendean Sand in the east. This is consistent with the geology observed during well installations in the superficial aquifer – pale yellow fine-medium grained quartz dominant sand, darkening with depth (GHD, 2013). These units are part of the superficial formations which range in thickness from approximately 40 to 80 m at the Premises (Salama *et al.*, 1989). The superficial formations at the Premises are underlain by the Osborne Formation with a highly irregular contact marked by intercalation of siltstones and fine glauconitic sand (Salama *et al.* 1989).
Hydrogeology	The superficial aquifer is present beneath the Premises at a depth ranging from 11.7 m below ground level (bgl) in the north-east to 42 m bgl in the south-west. Groundwater elevation monitoring at the Premises indicates groundwater flows to the south-west which is consistent with the regional groundwater flow direction. CSIRO investigations at the Premises indicate the saturated thickness of the superficial aquifer is approximately 20 to 30 m (Salama *et al.*, 1989). The depth to the Osborne Formation ranges from approximately 40-50 m in the north-east of the

Environmental aspect	Description
	Premises to 80 m in the south-west of the Premises. Based on tracer tests, the estimated range of groundwater flow velocities in the superficial aquifer at the Premises was 0.1-0.35 m/day (Salama *et al.,* 1989). Water level monitoring in the 1980s indicated that the hydraulic head increased with depth to a maximum in the central part of the superficial aquifer, possibly due to recharge further away in the Gnangara mound (Salama *et al.*, 1989). The hydraulic head was lowest at the base of the aquifer indicating possible leakage into the Osborne Formation (Salama *et al.*, 1989).

Summary of External Advice

Water Source Protection Planning

Due to the location of the Premises within a PDWSA, internal advice was sought from the Water Source Protection Planning (WSPP) branch of DWER as to the proposed changes to groundwater monitoring. WSPP provided the following key points for consideration:

- The Premises is located in the Priority 3 (P3) West Mirrabooka Underground Water Pollution Control Area (UWPCA), which was constituted under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* on 1 June 2018.
- P3 areas are defined and managed to maintain the quality of the drinking water source for as long as possible with the objective of risk management. P3 areas occur within PDSWAs where the land is zoned for urban and commercial or light industrial uses. Within P3 areas, drinking water sources need to co-exist with higher intensity land uses compared to Priority 1 and 2 areas.
- The West Mirrabooka Drinking Water Source Protection Assessment (DOW, 2011) identifies chemicals and hydrocarbons (fuel and oil) hazards from leaks, spills, inappropriate waste disposal and contaminated stormwater runoff as a high to medium risk to the PDSWA.
- The Premises is not located in a wellhead protection zone.
- Production bores closest to the Premises are unconfined, and are therefore vulnerable to contamination from surface land uses. These bores are:
    - M540 – West Mirrabooka UWPCA – Perth Superficial Swan. This bore supplies water to the Integrated Water Supply Scheme (IWSS) and is approximately 1.7 km west of the Premises.
    - M510 – West Mirrabooka UWPCA – Perth Superficial Swan. This bore supplies water to the IWSS and is approximately 1 km northwest of the Premises.
    - M34 – Gnangara UWPCA – Perth Superficial Swan. This bore supplies water to the IWSS and is approximately 1.6 km northeast of the Premises.
- The Water Corporation regularly monitors the quality of raw water from the IWSS production bores and water supply sampling points within the West Mirrabooka UWPCA for microbiological, health-related and aesthetic characteristics. An assessment of the drinking water quality once treated is also made against the Australian Drinking Water Guideline (NHMRC, 2011).
- The West Mirrabooka Drinking Water Source Protection Assessment (DOW, 2011) identified groundwater flow as mainly in a westerly direction, discharging into the Indian Ocean at the coast. Contamination investigation reports identify the hydrocarbon plume underneath the site as migrating south-west from the Premises to an area outside of the West Mirrabooka UWPCA. This is away from the existing wellhead protection zones and production bores, but within the PDSWA.
- Despite the conclusion that *"the groundwater monitoring to the west of the site has confirmed that the impacted groundwater plume is not migrating towards the drinking water source*" (Bioscope Environmental, 2018), the risk to the PDSWA remains, although there seems to be no immediate risk to public health.
- It should be ensured that:

- The ongoing groundwater monitoring regime for the Premises can be used to verify the movement and concentration of the hydrocarbon residues between the site and Water Corporation's production bores (providing early warning for the Water Corporation and government).
- Water Corporation should be made aware of this site investigation, remediation and groundwater monitoring program.

Key Finding: Based on this advice, the Delegated Officer considers that public drinking water supply is a potential receptor of emissions from the Premises. There are two components to this receptor which should be considered in the risk assessment process:

- Existing IWSS production bores which are not currently in operation but may be commissioned by the Water Corporation in the future.

  Based on the south-westerly groundwater flow direction, these bores and their wellhead protection zones are not considered down-gradient of the Premises. As potential future groundwater extraction may alter groundwater flow paths, the ongoing groundwater monitoring regime should verify contaminant concentrations between the Premises and these bores.

- The P3 PDWSA which is managed to maintain the quality of the drinking water source for as long as possible with the objective of risk management.

  The Premises is located within a P3 PDWSA and licence conditions should therefore be consistent with the objective of groundwater contamination risk management.

The Delegated Officer notes that the Licence was amended in 2015 to allow acceptance and disposal of Inert Waste Type 2 (used tyres, rubber waste and plastics). In 2016, *Water quality protection note no. 25* was released by the former Department of Water, providing land use compatibility tables for PDSWAs. Based on this guidance, disposal of used tyres is considered an incompatible land use for a P3 PDSWA.

Department of Health

Advice was sought from the Department of Health (DOH) about the proposed changes to the groundwater monitoring program and potential implications for risks to public health. A summary of this advice is provided as follows:

- DOH supports continuation of groundwater monitoring as part of the licence conditions for a further three years commencing in 2019. This may be followed by a review of the results and reassessment of further monitoring requirements.
- Given the evidence of reducing contamination levels, the number of monitoring bores could be reduced, however DOH consider that insufficient justification was provided for the monitoring bores selected for ongoing sampling.
- DOH recommends two of the monitoring bores proposed to be removed from the monitoring network, onsite bore BH9 and offsite bore MW10, should continue to be sampled to provide additional reassurance as to the improving quality of groundwater.
- DOH consider that the justification for a reduced sampling frequency from biannual to annual at a time of peak groundwater stress (after rainfall) is insufficient. Further clarification is required around the timing of sampling, as this may vary with weather fluctuations, and will not readily allow comparison with historical monitoring data collected in May and November each year. Failing acceptable justification for the single annual monitoring event, the monitoring should continue for both May and November each year.

Key Finding: The Delegated Officer agrees with DOH that insufficient justification was provided for the monitoring bores selected for ongoing sampling. The monitoring network proposed by the Licence Holder would not allow adequate assessment of current and historical onsite sources and delineation of impacts between the Premises and potential receptors.

The Delegated Officer agrees that BH9 should not be removed from the monitoring network because it is well placed to monitor groundwater contamination associated with the putrescible landfill. MW1-1 and MW1-7 may provide more value in ongoing assessment of risks to receptors from historical contamination than MW1-10, further discussion is provided in the Decision section of this Amendment Notice.

DOH advice in relation to monitoring frequency differs from that provided by the Contaminated Sites section of DWER. Further discussion of this matter is provided in the Decision section of this Amendment Notice.

Contaminated Sites

The current site classification under the CS Act is 'Possibly Contaminated – Investigation Required'. This status relates to the requirement for further actions to be carried out, including soil investigation and landfill gas assessment. The current classification also includes an "action required" section which states that, "*In accordance with the recommendations of the MAR [Mandatory Auditor's Report], groundwater monitoring should continue as part of the landfill's licence under Part V of the Environmental Protection Act 1986 until otherwise notified.*" Contaminated Sites indicated that the intention of ongoing groundwater monitoring was to:

- Ensure that the groundwater contamination plume was stable or reducing;
- Verify the conclusions of the MAR in January 2014 regarding risk to human health in nearby residential properties; and
- Confirm that the Mirrabooka West PDSWA was not at risk.

Advice from the Contaminated Sites section of DWER was sought in relation to the requirements for ongoing monitoring of existing groundwater contamination. In preparing their advice, Contaminated Sites took into consideration the responses from DOH and Water Source Protection Planning.

Contaminated Sites indicated that the results of ongoing monitoring appear to show that the groundwater contamination plume is stable or reducing, and noted that concentrations of key contaminants of potential concern remain below site-specific criteria for risk to human health for nearby properties. The concentrations of substances in groundwater remain above background conditions, and may pose a risk to the environmental values of groundwater in the context of the PDSWA. Indicators of landfill leachate (such as potassium:chloride ratio, total recoverable hydrocarbons and ammonia) are relatively low in the groundwater monitoring bores along the western boundary of the leachate plume (MW1-1, MW1-7 and MW1-10). This suggests that the leachate plume does not currently pose a risk to existing drinking water abstraction bores. Contaminated Sites would expect a more detailed assessment to be carried out before concluding that natural attenuation processes are occurring.

Contaminated Sites provided the following key recommendations:

- Monitoring bores BH2S, BH7, BH12, MW1-3, MW1-10 and MW1-11 are removed from the monitoring program. Considering the plume extent and the results of groundwater monitoring to date (particularly potassium:chloride ratio, hydrocarbon and ammonia) Contaminated Sites is of the opinion that it would be more useful to retain MW1-7 rather than MW1-10, and BH9 rather than BH7.

- Pesticides, PCBs, MAHs and PAHs (except naphthalene) may be removed from the required monitoring parameters, unless those parameters are required to monitor existing activities.
- Contaminated Sites has no objection to the monitoring frequency being reduced from biannual to annual. As historical concentrations of ammonia and hydrocarbons appear to be slightly higher in May than November, it is recommended that annual sampling is conducted in May.
- PFAS are added to the monitoring parameters.

Key Finding: The Delegated Officer supports the Contaminated Sites recommendations in relation to reducing the sampling frequency and removal of pesticides, PCBs, MAHs and PAHs (excluding naphthalene) from the monitoring parameters.

Contaminated Sites' selection of monitoring bores was based on the objective of monitoring existing groundwater contamination on and off the Premises. The Delegated Officer determined that some additional monitoring bores are required to adequately assess potential impacts to groundwater from current activities on the Premises. Further discussion is provided in the Decision section of this Amendment Notice.

DWER is currently reviewing its position on PFAS monitoring requirements at landfills in the context of recent developments in the National Environmental Management Plan. Landfills accepting Special Waste Type 3 (solid wastes impacted by PFAS) are currently the only landfills which have licence conditions requiring the monitoring of PFAS. As the Premises is only licensed to accept Inert Waste Types 1 and 2 and putrescible waste, the Delegated Officer does not consider that there is sufficient grounds to add PFAS to the groundwater monitoring program at this time.

Notwithstanding DWER's licensing position, the Licence Holder should consider carrying-out monitoring for PFAS to the side of ongoing licence requirements and provide this information to DWER's Contaminated Sites Branch for consideration in the site classification and to assess the potential need for further investigation under the CS Act.

Risk assessment

Table 7 below describes the Risk Events associated with the amendment consistent with the *Guidance Statement: Risk Assessments*. As the proposed amendment relates to groundwater monitoring requirements, only Risk Events related to groundwater contamination are assessed. This table identifies whether the emissions present a material risk to public health or the environment, requiring regulatory controls.

DWER has given consideration to the following aspects in its risk assessment:

- Advice from Contaminated Sites, Water Source Protection Planning and the Department of Health.
- Past assessment of the risks from existing groundwater contamination by GHD (2013) and associated MAR (ERM, 2014).
- Assessment of groundwater contaminant trends and exceedances of applicable site specific licence criteria and water quality guidelines from 2013 to 2018 provided by Bioscope Environmental (2019).

Table 7: Risk assessment for proposed amendments during operation

Risk Event					Consequence rating	Likelihood	Risk	Reasoning	Regulatory controls (refer to conditions of the granted instrument)
Source/ Activities	**Potential emissions**	**Potential receptors**	**Potential pathway & receptor (impact)**	**Applicant controls**					
Historic putrescible landfill	Leachate to groundwater	Beneficial use of groundwater offsite (irrigation and potential drinking water supply)	Seepage of leachate to groundwater Extraction of groundwater for irrigation	Ongoing monitoring of groundwater elevation and quality	Local scale, low level impact to amenity **Minor**	Beneficial use of ground-water already affected **Almost Certain**	**High**	The Delegated Officer considers the primary risk from degraded groundwater being used for irrigation is potential impacts to amenity. These may include corrosion of copper pipes and fittings, orange/brown staining on surfaces, clogging of irrigation systems or damage to sensitive plants. Previous investigations concluded that groundwater contamination did not pose unacceptable health risks through irrigation bore use (GHD, 2013; ERM, 2014). Drinking water supply bores are cross-gradient from the Premises and are not currently operational. Commencing production from nearby IWSS bores in P3 PDSWA would trigger an external risk and quality assessment process.	Ongoing monitoring of ambient groundwater required
		Beneficial use of groundwater onsite (irrigation)	Seepage of leachate to groundwater Extraction of groundwater for irrigation	Production bores onsite are up or cross hydraulic gradient of landfill area	N/A	N/A	N/A	The Delegated Officer considers that risks to employees, visitors or contractors of the Licence Holder are managed as part of exposure risk assessments and prevention strategies required under other State legislation.	N/A

Risk Event					Consequence rating	Likelihood	Risk	Reasoning	Regulatory controls (refer to conditions of the granted instrument)
Source/ Activities	**Potential emissions**	**Potential receptors**	**Potential pathway & receptor (impact)**	**Applicant controls**					
Historic putrescible landfill continued...	Leachate to groundwater continued…	Remnant native vegetation onsite and offsite	Seepage of leachate to groundwater Extraction of groundwater for irrigation	Production bores onsite are up or cross hydraulic gradient of landfill area	N/A	N/A	N/A	The Delegated Officer considers the risk pathway to remnant native vegetation is incomplete based on: • The ecological value of remnant vegetation on the Premises is low. • Impacts of onsite irrigation are unlikely to extend beyond the Premises boundary. • Irrigation is unlikely to occur in the Bush Forever area.	N/A
Current Class I inert landfill	Leachate to groundwater	Beneficial use of groundwater offsite (irrigation and potential drinking water supply)	Seepage of leachate to groundwater Extraction of groundwater for irrigation	Ongoing monitoring of groundwater elevation and quality	Local scale, low level impact to amenity **Minor**	Risk event could occur at some time **Possible**	**Medium**	The history of groundwater contamination at the Premises and the unlined nature of the landfill cell indicate there is a high likelihood of leachate infiltration to groundwater. However, the Delegated Officer considers that the waste types disposed to this landfill cell have a low potential to produce contaminated leachate which presents a risk to receptors.	Inert Waste Types 1 and 2 are the only wastes permitted for disposal in licence conditions. Ongoing monitoring of ambient groundwater required
		Beneficial use of groundwater onsite (irrigation)	Seepage of leachate to groundwater Extraction of groundwater for irrigation	Production bores onsite are up hydraulic gradient of landfill area	N/A	N/A	N/A	The Delegated Officer considers that risks to employees, visitors or contractors of the Licence Holder are managed as part of exposure risk assessments and prevention strategies required under other State legislation.	N/A

Risk Event					Consequence rating	Likelihood	Risk	Reasoning	Regulatory controls (refer to conditions of the granted instrument)
Source/ Activities	**Potential emissions**	**Potential receptors**	**Potential pathway & receptor (impact)**	**Applicant controls**					
Current Class I inert landfill continued…	Leachate to groundwater continued…	Remnant native vegetation onsite and offsite	Seepage of leachate to groundwater Extraction of groundwater for irrigation	Production bores onsite are up hydraulic gradient of landfill area	N/A	N/A	N/A	The Delegated Officer considers the risk pathway to remnant native vegetation is incomplete based on the same reasons presented for the putrescible landfill source.	N/A
General site operations including Waste Transfer Facility	Contaminated stormwater Unforeseen spills from hydrocarbon storage areas or vehicles	Beneficial use of groundwater offsite (irrigation and potential drinking water supply)	Seepage of contaminated stormwater/spills to groundwater Extraction of groundwater for irrigation	Operational areas are mostly on hardstand Fuel storage is above ground and has secondary bunding	Mid level, local scale **Moderate**	Risk event will probably not occur **Unlikely**	**Medium**	The Delegated Officer considers that appropriate stormwater and spill management practices and controls on waste sorting activities, as required by the licence conditions, adequately mitigate the potential risk from these sources.	Conditions outlining stormwater and spills management. Unloading and sorting of putrescible waste is restricted to enclosed areas and limited timeframes. Ongoing monitoring of ambient groundwater required
		Beneficial use of groundwater onsite (irrigation)	Seepage of contaminated stormwater/spills to groundwater Extraction of groundwater for irrigation	Operational areas are mostly on hardstand Fuel storage is above ground and has secondary bunding	N/A	N/A	N/A	The Delegated Officer considers that risks to employees, visitors or contractors of the Licence Holder are managed as part of exposure risk assessments and prevention strategies required under other State legislation.	N/A

Risk Event					Consequence rating	Likelihood	Risk	Reasoning	Regulatory controls (refer to conditions of the granted instrument)
Source/ Activities	**Potential emissions**	**Potential receptors**	**Potential pathway & receptor (impact)**	**Applicant controls**					
		Remnant native vegetation onsite and offsite	Seepage of contaminated stormwater/spills to groundwater Extraction of groundwater for irrigation	Production bore currently in use for irrigation and dust suppression onsite (PB3) is up hydraulic gradient of operational area	N/A	N/A	N/A	The Delegated Officer considers the risk pathway to remnant native vegetation is incomplete based on the same reasons presented for the putrescible landfill source.	N/A

Decision

The Delegated Officer has assessed the Application based on a review of the risks from current and historical activities at the Premises and consideration of advice from DOH and the Contaminated Sites and Water Source Protection Planning sections of DWER. DOH and Contaminated Sites provided differing recommendations in relation to changes to the groundwater monitoring network and sampling frequency. Contaminated Sites advice is provided with the object of protecting human health, the environment and environmental values, in accordance with the CS Act. The Delegated Officer therefore considers that the recommendations provided by Contaminated Sites were made with appropriate consideration of risks to human health, even where they differ from those provided by DOH.

The decision for each of the proposed amendments to the groundwater monitoring program is provided in the following sections. The Delegated Officer has determined that these amendments will reduce the scope of groundwater monitoring required by the Licence while retaining a groundwater monitoring program which allows suitable ongoing assessment of the risks to receptors from historical and current activities at the Premises.

Monitoring Frequency

The Licence Holder requested that the groundwater sampling frequency in Table 2.3.1 of the Licence was reduced from biannual to annual, with annual events to occur after winter rains. Based on advice from Contaminated Sites, the Delegated Officer considers an annual sampling frequency is appropriate.

Maintaining consistent sampling timing with the current groundwater monitoring program will more readily allow comparison between future and historical monitoring results. As historical results show higher concentrations of key contaminants occurring in May than November, the Delegated Officer has determined that annual sampling should be conducted during May or June each year.

Monitoring Parameters

The Licence Holder requested that PCBs, organochlorine pesticides, organophosphate pesticides and PAHs (excluding naphthalene) were removed from the monitoring parameter list in Table 2.3.1. The justification provided for this amendment was that these parameters were not detected above the laboratory detection limits from 2013 to 2017. DWER reviewed the analytical data from January 2013 to May 2018 provided in Appendix M of the Application and found that PAHs and organochlorine pesticides were detected above the laboratory detection limit as follows:

- PAHs (other than naphthalene) were detected at BH9 in November 2014: 0.86 µg/L indeno(1,2,3.cd)pyrene and 0.78 µg/L benzo(g,h,i)perylene.
- Organochlorine pesticides which were detected in groundwater include DDD[1] (0.052 µg/L at BH7 and 0.026 µg/L at BH9 in November 2013), heptachlor[1] (0.005 µg/L at BH1 in November 2013) and beta-BHC (0.7 µg/L at MW1-3 in May 2015).

PCBs, organochlorine pesticides, organophosphate pesticides and PAHs (excluding naphthalene) were not detected in groundwater samples from November 2015 to May 2018. Based on these results, the Delegated Officer concludes that these parameters may be removed from the monitoring requirements outlined in Table 2.3.1 of the Licence.

Monitoring Network

The Licence Holder proposed several changes to the groundwater monitoring network. The Delegated Officer's decision and justification for each of the proposed changes is presented in

[1] November 2013 laboratory reports were not provided in the Application. These laboratory reports were therefore not reviewed to confirm detections of DDD and heptachlor shown in Appendix M of the Application.

Table 8.

Table 8: Outcome of proposed changes to monitoring network

Monitoring Bores	Licence Holder Proposal	DWER Decision
MW1-5	Retain	Retain to monitor groundwater up hydraulic gradient of the Premises.
MW1-2	Retain	Remove as BH2S will be used monitor groundwater directly down hydraulic gradient of the current landfill cell and MW1-8 and MW1-9 will be retained to monitor offsite groundwater quality.
MW1-8 & MW1-9	Retain	Retain to monitor offsite groundwater quality and plume concentrations and stability.
BH7	Retain	Remove from the monitoring network as BH9 is considered more suitable for monitoring the putrescible landfill (based on higher historical concentrations at BH9 than BH7).
MW1-1 & MW1-7	Remove	Retain to provide ongoing assessment of risk between Premises and IWSS production bores.
MW1-3 and MW1-11	Remove	Remove from the monitoring network as MW1-2, MW1-8 and MW1-9 are considered sufficient for monitoring offsite groundwater quality and plume concentrations and stability.
MW1-10	Remove	Remove from the monitoring network as MW1-1 and MW1-7 are better placed to monitor the risk of groundwater contamination migrating towards IWSS production bores.
BH2S	Remove	Retain in the monitoring network to monitor onsite shallow groundwater quality associated with the current landfill cell.
BH2D	Remove	Retain in the monitoring network to monitor onsite groundwater quality associated with the current landfill cell and putrescible landfill.
BH9	Remove	Retain in the monitoring network to monitor onsite groundwater quality associated with the putrescible landfill.
BH12	Remove	Retain in the monitoring network to monitor onsite groundwater quality associated with the Waste Transfer Facility and general site operations.

Licence Holder's comments

The Licence Holder was provided with the draft Amendment Notice on 11 June 2019. Comments received from the Licence Holder have been considered by the Delegated Officer as shown in Appendix 2.

Amendment

1. The Licence is amended by insertion of the red text and removal of the strikethrough text in Table 2.3.1 as follows.

Table 2.3.1: Monitoring of ambient groundwater quality				
Monitoring point reference and location	**Parameter**	**Units**	**Averaging period**	**Frequency**
“Onsite” monitoring bores BH2S BH2D MW1-1 MW1-5 ~~BH7~~, BH9 BH12 “Offsite” monitoring bores ~~MW1-2,~~ ~~MW1-3,~~ MW1-7 MW1-8 MW1-9 ~~MW1-10, and~~ ~~MW1-11~~	Standing water level (SWL)[1]	M(AHD) and M(BGL)	Spot sample	~~Six monthly~~ Annually (May-June)[2]
	pH	-		
	Total dissolved solids	mg/L		
	Arsenic			
	Cadmium			
	Chromium			
	Copper			
	Iron			
	Manganese			
	Nickel			
	Lead			
	Potassium			
	Zinc			
	Chloride			
	Nitrate			
	Ammonia			
	Total nitrogen			
	Total phosphorus			
	Total organic carbon			
	Total recoverable hydrocarbons			
	Naphthalene			
	Benzene			
	Toluene			
	Ethylbenzene			
	Xylenes			
~~“Onsite” monitoring bores~~ ~~BH2D~~ ~~MW1-1, and~~ ~~MW1-5~~ ~~BH2S,~~ ~~BH7,~~ ~~BH9, and~~ ~~BH12~~	~~Benzene~~	~~mg/L~~	~~Spot sample~~	~~Six monthly~~
	~~Toluene~~			
	~~Ethylbenzene~~			
	~~Xylenes~~			
	~~Organochlorine and Organophosphate Pesticides~~			
	~~Polycyclic Aromatic Hydrocarbons (PAHs)~~			
	~~Polychlorinated Biphenyls (PCBs)~~			

Note 1: SWL shall be determined prior to collection of water samples.

Note 2: 2019 annual groundwater monitoring may be undertaken in June or July.

2. The Premises address on Page 1 of the Existing Licence is amended by insertion of the red text and removal of the strikethrough text as follows:

Atlas Group Pty Ltd
501 Alexander Drive
MIRRABOOKA WA 6061
Being ~~Lot 1 on Diagram 36381~~ Lots 820 and 821 on Deposited Plan 404602 as depicted in Schedule 1

3. The ‘Premises map’ and ‘Map of monitoring locations’ in Schedule 1 of the Existing Licence are replaced with the following maps:

Premises map

Map of monitoring locations

Appendix 1: Key documents

	Document title	In text ref	Availability
1	Licence L6764/1997/14	L6764/1997/14	accessed at www.dwer.wa.gov.au
2	Bioscope Environmental, 2018. *Atlas Mirrabooka Inert Landfill and Solid Waste Depot Groundwater Monitoring Requirements Review*	Bioscope Environmental 2018	DWER records (A1735699)
3	Bioscope Environmental, 2019. *Atlas Mirrabooka Landfill Summary Comparison of Groundwater Monitoring Data for 2013-2018*	Bioscope Environmental 2019	DWER record (A1767535)
4	Delayed Yield, 2018. Letter to Geoff Vandermeulen.	Delayed Yield 2018	DWER record (A1735700)
5	DER, July 2015. *Regulatory Principles.* Department of Environment Regulation, Perth.	DER 2015a	accessed at www.dwer.wa.gov.au
6	DER, October 2015. *Setting Conditions.* Department of Environment Regulation, Perth.	DER 2015b	accessed at www.dwer.wa.gov.au
7	DER, November 2016. *Environmental Siting.* Department of Environment Regulation, Perth.	DER 2016	accessed at www.dwer.wa.gov.au
8	DER, February 2017. *Guidance Statement: Risk Assessments*. Department of Environment Regulation, Perth.	DER 2017a	accessed at www.dwer.wa.gov.au
9	DER, February 2017. *Guidance Statement: Decision Making*. Department of Environment Regulation, Perth.	DER 2017b	accessed at www.dwer.wa.gov.au
10	DER, July 2015. *Land Use Planning.* Department of Environment Regulation, Perth.	DER 2017c	accessed at www.dwer.wa.gov.au
11	DOW, 2011. *West Mirrabooka Drinking Water Source Protection Assessment*. Department of Water, Perth.	DOW 2011	accessed at www.water.wa.gov.au
12	DOW, 2016. *Water quality protection note no. 25.* Department of Water, Perth.	DOW 2016	accessed at www.water.wa.gov.au
13	ERM, 2014. *Atlas Landfill Alexander Drive, Mirrabooka, Western Australia Mandatory*	ERM 2014	DWER records (A718425)

	Document title	In text ref	Availability
	Auditor's Report. Ref 01066448.		
14	GHD, 2013. *Atlas Landfill Groundwater Monitoring Report, December 2013*. Ref 61/27855.	GHD 2013	DWER records (A1735700)
15	NHMRC, 2011. *Australian Drinking Water Quality Guidelines*	NHMRC 2011	accessed at www.nhmrc.gov.au
16	Salama, R. B., Davis, G. B. and Barber, C., 1989. *Characterizing the hydrogeological variability of a sand aquifer in the region of a domestic waste disposal site,* IAHS Publ. no. 188.	Salama *et al.* 1989	

Appendix 2: Summary of Licence Holder comments

The Licence Holder was provided with the draft Amendment Notice on 11 June 2019 for review and comment. The Licence Holder responded on 25 June 2019 waiving the remaining comment period (until 3 July 2019). The following comments were received on the draft Amendment Notice.

Condition	Summary of Licence Holder comment	DWER response
2.3.1, Table 2.3.1	**BH2S and MW1-2** The Licence Holder considers the retention of both BH2S and MW1-2 as duplication of shallow groundwater monitoring in the vicinity of the current landfill cell. The two wells are located in close proximity to one another and monitor along the same longitudinal hydraulic gradient to the source of historical contamination and current landfilling. The Licence Holder considers that monitoring both wells will provide minimal additional information to assess the current landfill and plume characteristics and requests that consideration be given to removing either BH2S or MW1-2 from the monitoring network.	MW1-2 is approximately 75 m down hydraulic gradient from BH2S. Both monitoring bores are screened at similar depths, BH2S is screened from 41.5-44 m BGL and MW1-2 is screened from 38.4-44.4 m BGL. Based on their proximity, the Delegated Officer considers that monitoring of one of these bores will provide sufficient assessment of groundwater contamination directly down hydraulic gradient from the current landfill. The Delegated Officer has selected BH2S for inclusion in the monitoring network. BH2S is closer to current and historical landfilling areas than MW1-2 and should provide early indication of groundwater impacts from these sources. Further advice was sought from the Contaminated Sites Branch in relation to this matter. The Contaminated Sites Branch indicated that they do not object to substitution of BH2S in place of MW1-2.
2.3.1, Table 2.3.1	**BH12** The Licence Holder requested that DWER consider removing BH12 from the groundwater monitoring network. The Licence Holder considers that potential impacts to groundwater from the Waste Transfer Facility and general site operations are adequately managed by other regulatory controls in the Licence.	The Delegated Officer considers that groundwater monitoring of BH12 is necessary to provide a precautionary approach and enable monitoring of potential impacts from the Waste Transfer Facility and general site operations.
2.3.1, Table 2.3.1	**MW1-1 and MW1-11** The Licence Holder requested that DWER reconsider retention of MW1-1 and MW1-11 in the groundwater	The draft Amendment Notice proposed to remove MW1-11 from the monitoring network. Based on the content of these comments, the Delegated Officer has assumed that the

Condition	Summary of Licence Holder comment	DWER response
	monitoring network. Based on the hydrogeological regime, current plume movements and risk profile, the Licence Holder does not agree that it should be responsible for providing early warning should groundwater flow paths change due to operation of drinking water supply bores.	Licence Holder intended to refer to MW1-1 and MW1-7 in this request. A licence contains conditions that aim to prevent, control, abate or mitigate pollution or environmental harm as a result of the operation of prescribed premises, this includes historically related prescribed activities carried-out at the premises (i.e. the former putrescible landfill). The Delegated Officer considers monitoring of groundwater quality between the Premises and existing IWSS bores to be an appropriate regulatory control. Groundwater monitoring in this area will help to mitigate the potential public health risk from impacts to existing IWSS bores and is consistent with the risk management objective of a P3 PDWSA.
N/A	Atlas requested DWER consider including a statement in the Amendment Notice indicating that monitoring continue as per the current licence for an additional two to three years, after which time another assessment of monitoring requirements be undertaken based on monitoring results.	The Licence Holder may apply for a licence amendment at any stage if they consider that there are grounds to support a change in groundwater monitoring requirements. Notwithstanding, Atlas should consider at least a further three years of additional monitoring to support any further changes.