ATTACHMENTS FOR THE EVIDENCE OF WALTER STARKE

ATTACHMENT A. LANDFILL OPERATIONS MANAGEMENT PLAN

(Separated out due to size)

ATTACHMENT B. UPDATED WASTE ACCEPTANCE PROJECTIONS

Waste acceptance since 2003, including the recently collated data for 2020, is shown in Figure B1. There has been an upward trend since 2016.

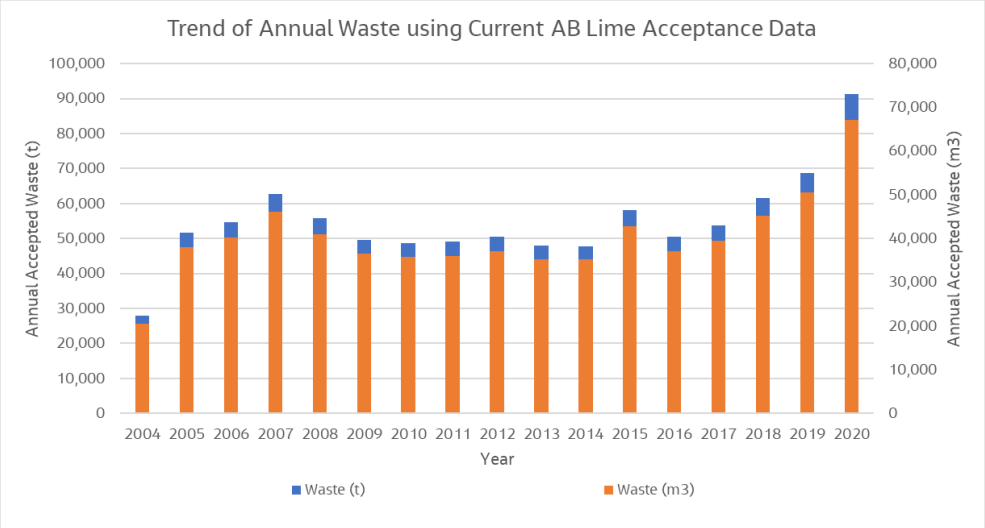


Figure B1. Waste acceptance from 2003 to 2020

The upward trend since 2016 has been used to predict future waste acceptance volumes. The equation of trend line for waste acceptance in tonnes provides the model for completing the projection. The equation is shown below and the trend line (blue) is shown in Figure B2.

$$y = 9662.6x + 36170$$

Where y is the waste volume in tonnes, and x is the number of years (with 2016 being year 1).

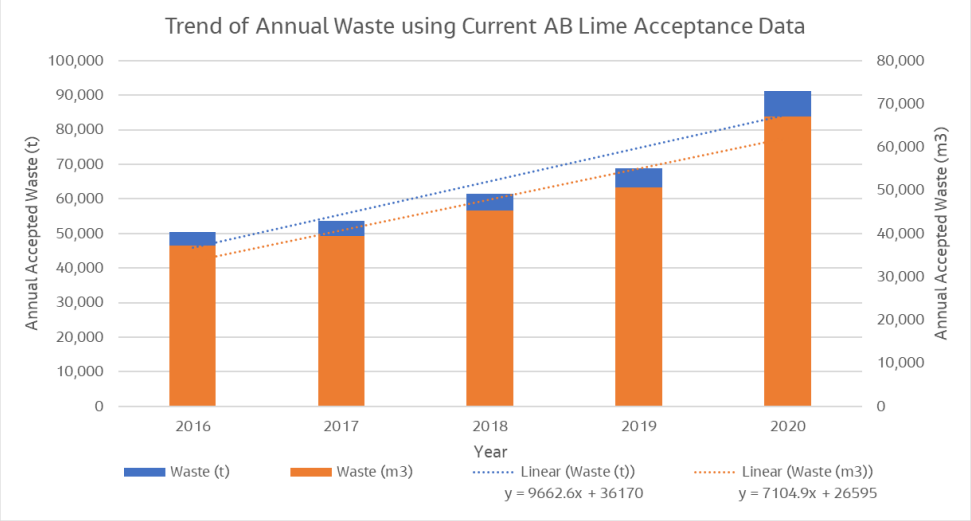


Figure B2. Upward trend since 2016

The trend line equation was applied from 2021 onwards, and the results for the 10 years after 2020 can be seen in Table B1.

Table B1. Waste acceptance to 2030

Year	Waste Volume (tonnes)
2021	95,946
2022	105,908
2023	115,871
2024	125,833
2025	135,796
2026	145,759
2027	155,721
2028	165,684
2029	175,646
2030	185,609

Under this prediction, waste acceptance increases by approximately 10,000 tonnes per year from 2021 onwards (seen in Figure B3). As a result, waste volumes surpass the current consented cap of 100,000 tonnes in 2022.

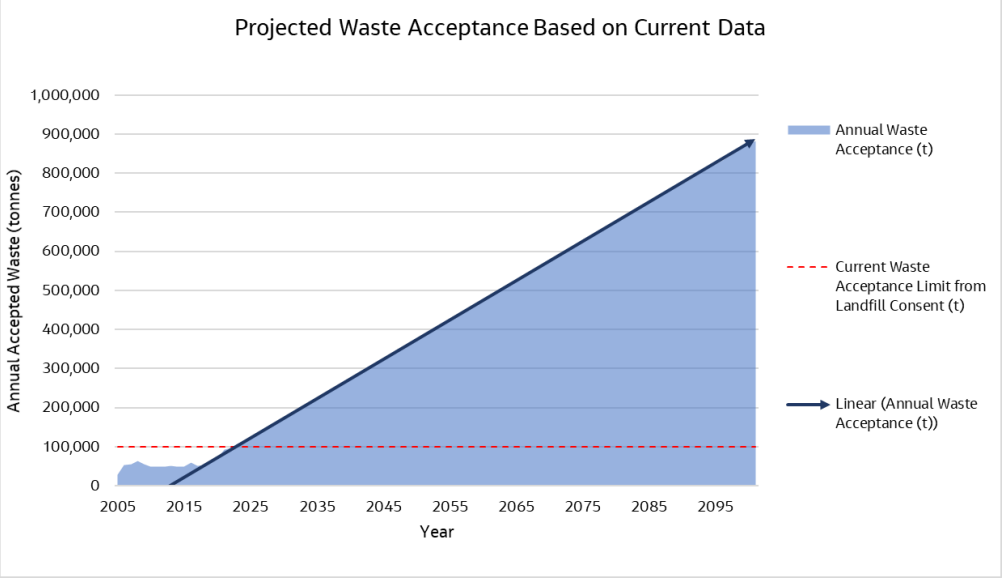


Figure B3. Predicted waste acceptance

ATTACHMENT C. WASTE FLOWS

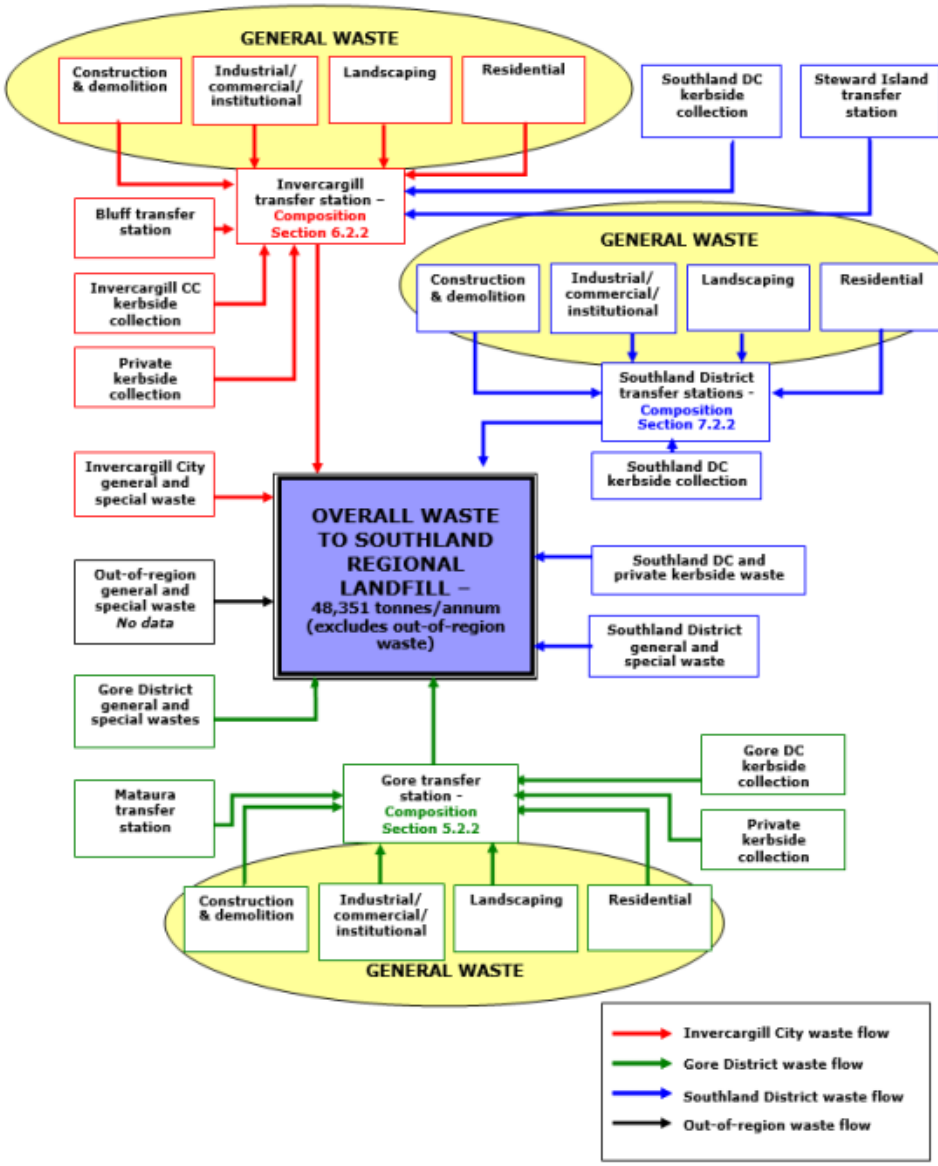


Figure C1. Waste flows in the Southland region.

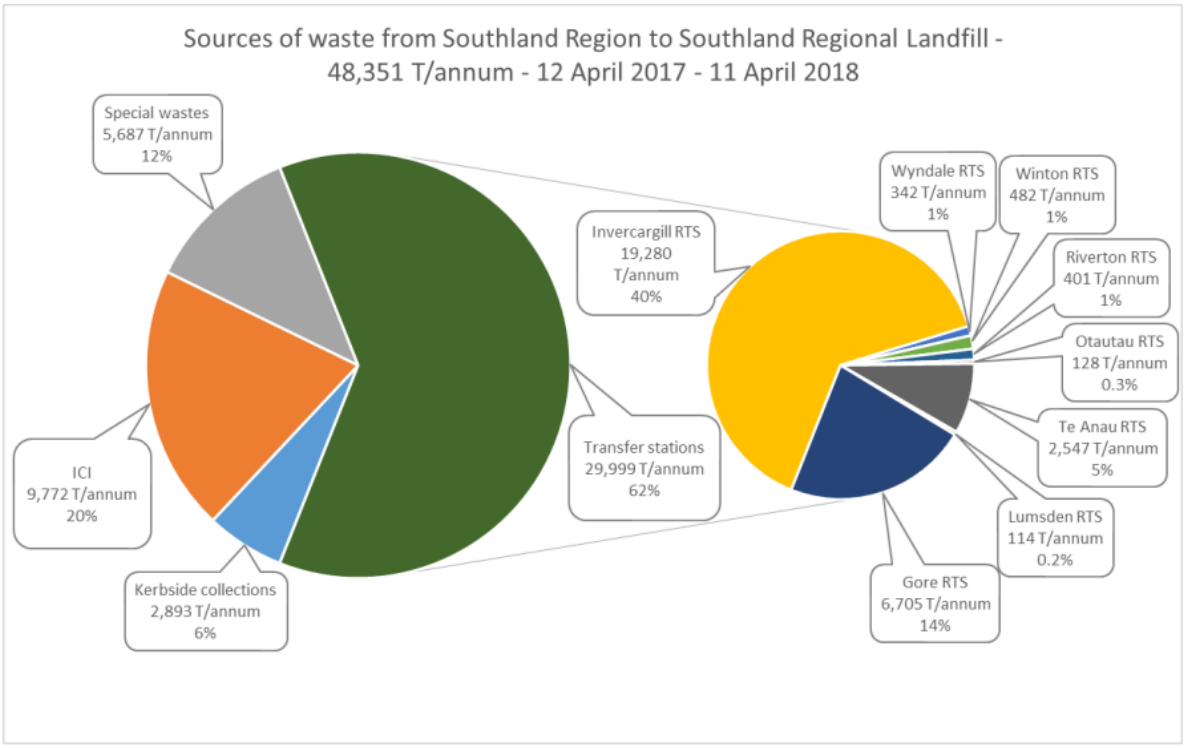


Figure C2. Sources of waste from Southland region to Southland Regional Landfill – 12 April 2017 – 11 April 2018

ATTACHMENT D. EXISTING AND PROPOSED WASTE ACCEPTANCE CRITERIA

Waste Acceptance Criteria (WAC): Proposed and Existing- AB Lime Landfill

By: Walter Starke (Jacobs, on behalf of AB Lime Ltd)

1) Proposed WAC: For Class 1 Landfills, Appendix D, WasteMINZ Landfill Guidelines (2018), see below.

2) Existing WAC: See Schedule 2 of existing resource consent, derived from Module 2 Hazardous Waste Guidelines- Class A, produced by Ministry for the Environment , (2004), see below.

Appendix D Class 1 Landfill Waste Acceptance Criteria

For Class 1 landfills, leachability testing should be completed to provide assurance that waste materials meet the following recommended waste acceptance criteria. The waste acceptance criteria leachability limits represent maximum values which should not be exceeded and should be viewed as a minimum treatment specification for a landfill.

If the following limits are exceeded by a leachate extract of the waste with respect to any of the listed constituents, then the material is not suitable for disposal to the facility.

Table D-1 Class 1 Waste Acceptance Criteria for Inorganic and Organic Elements[3]

Contaminant of concern	Unit	Maximum allowable TCLP concentration
Arsenic	mg/L	5
Barium	mg/L	100
Benzene	mg/L	0.5
Cadmium	mg/L	1
Carbon Tetrachloride	mg/L	0.5
Chlordane	mg/L	0.03
Chlorobenzene	mg/L	100
Chloroform	mg/L	6
Chromium	mg/L	5
Endrin	mg/L	0.02
m-Cresol	mg/L	200
o-Cresol	mg/L	200
p-Cresol	mg/L	200
Total cresol	mg/L	200
1,4-Dichlorobenzene	mg/L	7.5
1,2-Dichloroethane	mg/L	0.5
1,1-Dichloroethylene	mg/L	0.7
2,4-Dinitrotoluene	mg/L	0.13
2,4-Dichlorophenoxyacetic acid	mg/L	10
Heptachlor	mg/L	0.008
Hexachloro – 1,3-butadiene	mg/L	0.5
Hexachlorobenzene	mg/L	0.13
Hexachloroethane	mg/L	3
Lead	mg/L	5
Lindane	mg/L	0.4

[3] US EPA Chapter 40 CFR

Contaminant of concern	Unit	Maximum allowable TCLP concentration
Mercury	mg/L	0.2
Methoxychlor	mg/L	10
Methyl ethyl ketone	mg/L	200
Nitrobenzene	mg/L	2
Pentachlorophenol	mg/L	100
Pyridine	mg/L	5
Selenium	mg/L	1
Silver	mg/L	5
Tetrachloroethylene	mg/L	0.7
Toxaphene	mg/L	0.5
Trichloroethylene	mg/L	0.7
2,4,5-Trichlorophenol	mg/L	400
2,4,5-Trichlorophenoxypropionic acid	mg/L	1
2,4,6-Trichlorophenol	mg/L	2
Vinyl chloride	mg/L	0.2
Sulfides	ppm	50
Cyanides	ppm	50
Total halogenated compounds	ppm	1,000
Total synthetic non-halogenated compounds	ppm	10,000
Polychlorinated biphenyls	ppm	50

Table D-2 Class 1 Waste Acceptance Criteria for Inorganic and Organic Elements[4]

Contaminant of concern	Unit	Maximum allowable TCLP concentration
Aluminium	ppm	40
Aniline	ppm	0.2
Antimony	ppm	0.6
Beryllium	ppm	10
Boron	ppm	20
Bromodichloromethane	ppm	1
Bromoform	ppm	10
Carbon disulphide	ppm	3
2 Chlorophenol	ppm	0.05
Copper	ppm	5.0
1,2 Dibromo-3-chloropropane	ppm	0.2
Dibromochloromethane	ppm	10

[4] Module 2: Hazardous Waste Guidelines MfE 2004

Contaminant of concern	Unit	Maximum allowable TCLP concentration
1,2 Dichlorobenzene	ppm	0.2
1,2 Dichloroethene	ppm	10
Dichloromethane	ppm	2
2,4 Dichlorophenol	ppm	0.05
1,2 Dichloropropane	ppm	1
1,3 Dichloropropene	ppm	2
Diethylphthalate	ppm	100
Dimethylphthalate	ppm	400
Ethyl benzene	ppm	50
Fluoride	ppm	200
Lithium	ppm	20
Molybdenum	ppm	10
Naphthalene	ppm	10
Nickel	ppm	10
Phenol	ppm	40
1,1,2,2 Tetrachloroethane	ppm	50
Tin	ppm	1000
Toluene	ppm	100
Tributyltin oxide (TBTO)	ppm	3
1,1,1 Trichloroethane	ppm	200
1,1,2 Trichloroethane	ppm	500
Vanadium	ppm	2.0
Xylene (m,o,p)	ppm	100
Zinc	ppm	10.0

Schedule 2
Waste Acceptance Criteria
Leachable and Total Concentration Limits

Contaminant threshold is the maximum allowable concentration if a TCLP test is not carried out.

Contaminant	Contaminant Threshold (mg per litre)	Leachable Concentration (mg per litre)	Total Concentration (mg per litre)
Arsenic	100	5.0	
Benzene	10	0.5	
Benzo(a)pyrene	0.8	0.04	
Beryllium	20	1.0	
Cadmium	20	1.0	
Carbon Tetrachloride	10	0.5	
Chlorobenzene	2000	100	
Chloroform	120	6	
Chromium (VI)	100	5	
Chlorpyrifos	4	0.2	
m-Cresol	4000	200	
o-Cresol	4000	200	
p-Cresol	4000	200	
Cresol (total)	4000	200	
Cyanide (amenable)	70	3.5	
Cyanide (total)	320	16	
2,4-D	200	10	
1,2-Dichlorobenzene	86	4.3	
1,4-Dichlorobenzene	150	7.5	
1,2-Dichloroethane	10	0.5	
1,1-Dichloroethylene	14	0.7	
Dichloromethane	172	8.6	
2,4-Dinitrotoluene	2.6	0.13	
Ethylbenzene	600	30	
Fluoride	3000	150	
Fluroxypyr	40	2	
Halogenated compounds			1000
Lead	100	5	
Mercury	4	0.2	
Methyl ethyl ketone	4000	200	
Molybdenum	100	5	
Nickel	40	2	
Nitrobenzene	40	2	
C6-C9 petroleum hydrocarbons	N/A	N/A	650
C10-C36 petroleum hydrocarbons	N/A	N/A	10000
Phenol (non-halogenated)	288	14.4	

Contaminant	Contaminant Threshold (mg per litre)	Leachable Concentration (mg per litre)	Total Concentration (mg per litre)
Picloram	60	3	
Plasticiser compounds*	20	1	
Polychlorinated biphenyls	N/A	N/A	<50
Polycyclic aromatic hydrocarbons (total)	N/A	N/A	200
Scheduled chemicals *	N/A	N/A	<50
Selenium	20	1	
Silver	100	5.0	
Styrene (vinyl benzene)	60	3	
Synthetic non-halogenated compounds			10000
Tebuconazole	128	6.4	
1,1,1,2 – Tetrachloroethane	200	10	
1,1,2,2 – Tetrachloroethane	26	1.3	
Tetrachloroehylene	14	0.7	
Toluene	288	14.4	
1,1,1 – Trichloroethane	600	30	
1,1,2 – Trichloroethane	24	1.2	
Triclopyr	40	2	
Trichloroethylene	10	0.5	
2,4,5-Trichlorophenol	8000	400	
2,4,6-Trichlorophenol	40	2	
Vinyl chloride	4	0.2	
Xylenes	1000	50	

* Plasticiser compounds means the total of di-2-ethyl hexyl phthalate and di-2 ethyl hexyl adipate

*Scheduled Chemicals
Aldrin
Benzene, hexachloro
Benzene, pentachloronitro
Alpha-BHC
Beta-BHC
Gamma-BHC Lindane
Delta-BHC
Chlordane
DDD
DDE
DDT
Dieldrin
Endrin
Endrin aldehyde
Heptachlor
Heptachlor epoxide
Hexachlorophene
Isodrin
Pentachlorobenzene
Pentachlorophenol
1,2,4,5-tetrachlorobenzene
2,3,4,6- trichlorobenzene
2,4,5-trichlorophenoxyacetic acid, salts and esters

Source: NSWEPA (1999) Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes, and subsequent update.

ATTACHMENT E. AREA 15 FILLING PLAN

Figure 1: Incoming Waste and Access Track Temporary Locations

Phase 1 Filling

Volume Airspace = 25,000 m^3

Phase 1 consists of 19 cells

Filling sequence: 1, 2, 3 and 4 as follows (see concept cross sections):

1: Cell 15-1A to 15-1E

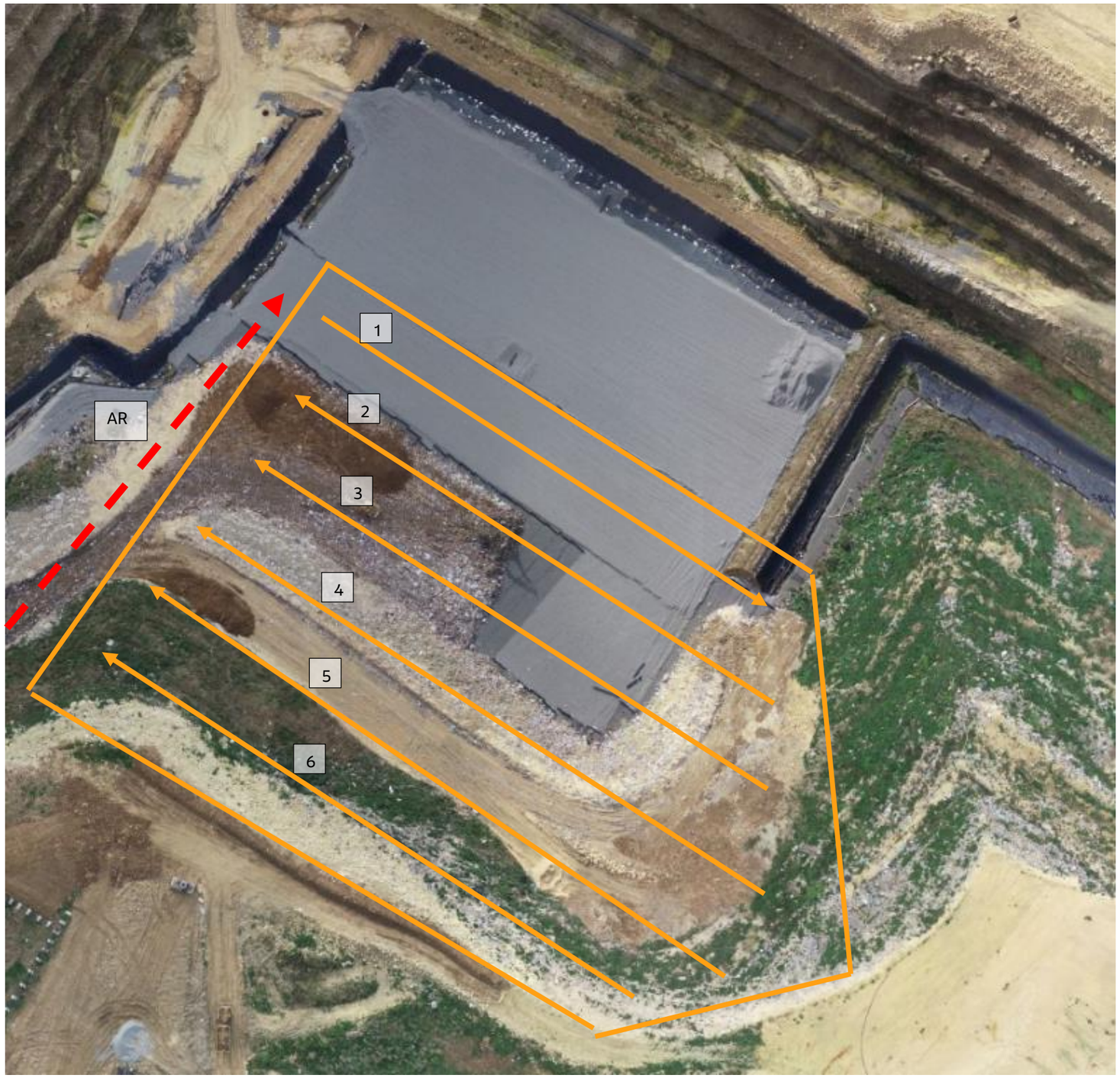
2: Cell 15-1F to 15-1J

3: Cell 15-1K to 15-1O

4: Cell 15-1P to 15-1S

AR= Temporary access road to Working Faces of Phase 1

Figure 2: <u>Phase 1</u> – Concept Filling Plan for Area 15



Phase 2 Filling

Volume Airspace = 70,000 m^3

Phase 2 consists of 27 cells

Filling sequence: 1, 2, 3, 4, 5, 6 as follows (see concept cross sections):

1: Cell 15-2A to 15-2E

2: Cell 15-2F to 15-2J

3: Cell 15-2K to 15-2O

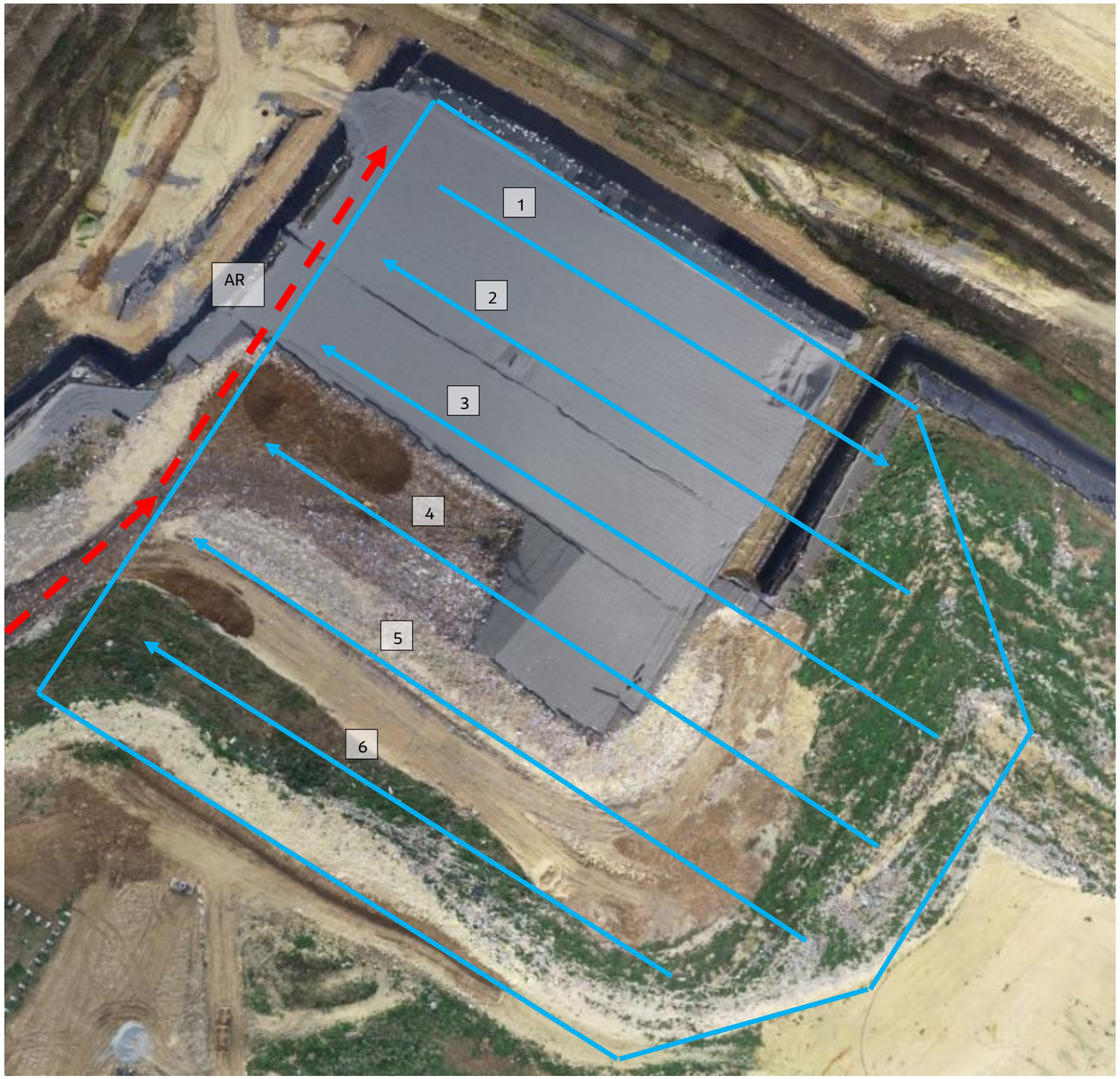
4: Cell 15-2P to 15-2S

5: Cell 15-2T to 15-2W

6: Cell 15-2X to 15-2AA

AR= Temporary access road to Working Faces of Phase 2

Figure 3: <u>Phase 2</u> – Concept Filling Plan for Area 15



Phase 3 Filling

Volume Airspace = 88,000 m^3

Phase 3 consists of 27 cells

Filling sequence: 1, 2, 3, 4, 5, 6 as follows (see concept cross sections):

1: Cell 15-3A to 15-3E

2: Cell 15-3F to 15-3J

3: Cell 15-3K to 15-3O

4: Cell 15-23 to 15-3S

5: Cell 15-3T to 15-3W

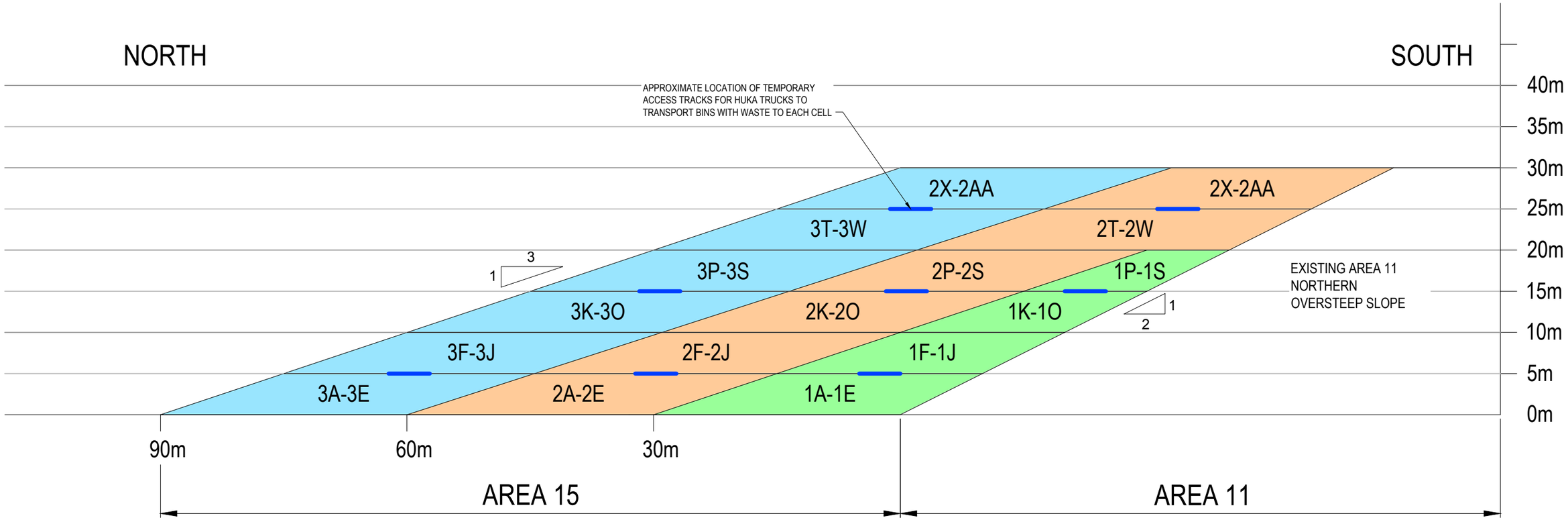
6: Cell 15-3X to 15-3AA

AR= Temporary access road to Working Faces of Phase 3

Figure 4: <u>Phase 3</u> – Concept Filling Plan for Area 15

NOTE

1. NOTE: 1A-1E = CELLS 15-1A +15-1B + 15-1C + 15-1D + 15-1E, SEE ALSO CROSS SECTIONS EAST-WEST FOR PHASES 1-3



PRELIMINARY ISSUE

REV	DATE	APP'D	REVISION
0	02/09/2020	VP	PRELIMINARY ISSUE

SCALES AT A1

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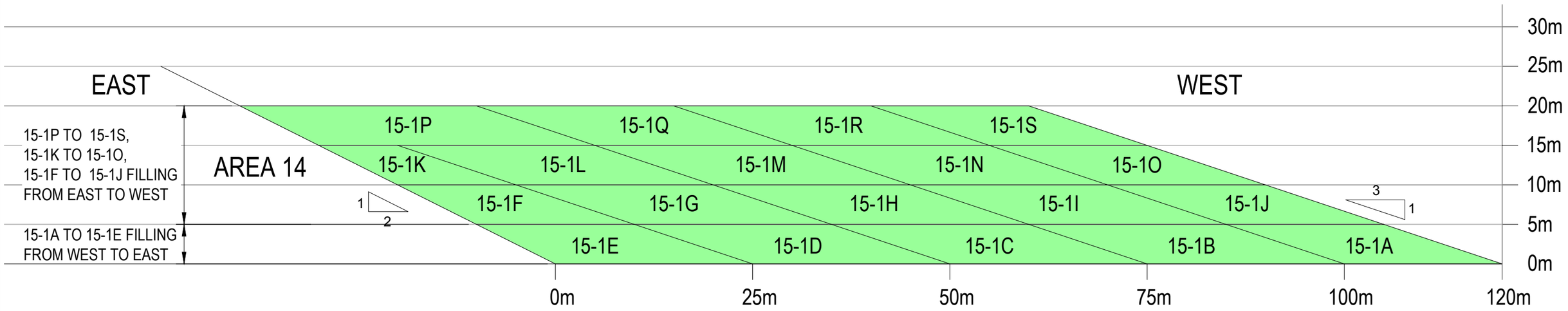
PROJECT: LANDFILL INVESTIGATION

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
MH	KJ	WS	VP
DESIGNED	DESIGN REVIEW	DATE 02/09/2020	DATE 01/09/2020
KJ	CW		

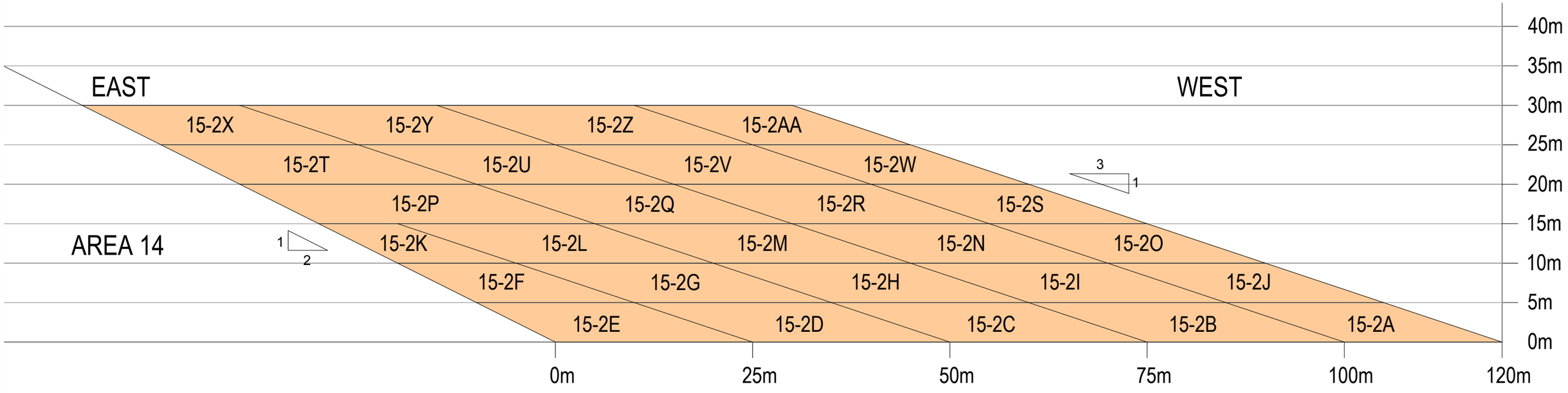
TITLE: AREA 15 FILLING PLAN ADJACENT TO AREA 11

SCALE: 1:5 (A1) | DRAWING No: IZ000400-OA-NG-DRG-0003 | REV: 0

A1



PHASE 1 FILLING - AREA15



PHASE 2 FILLING - AREA15

PRELIMINARY ISSUE

REV	DATE	APPD	REVISION
A	02/09/2020	VP	PRELIMINARY ISSUE

SCALES AT A1

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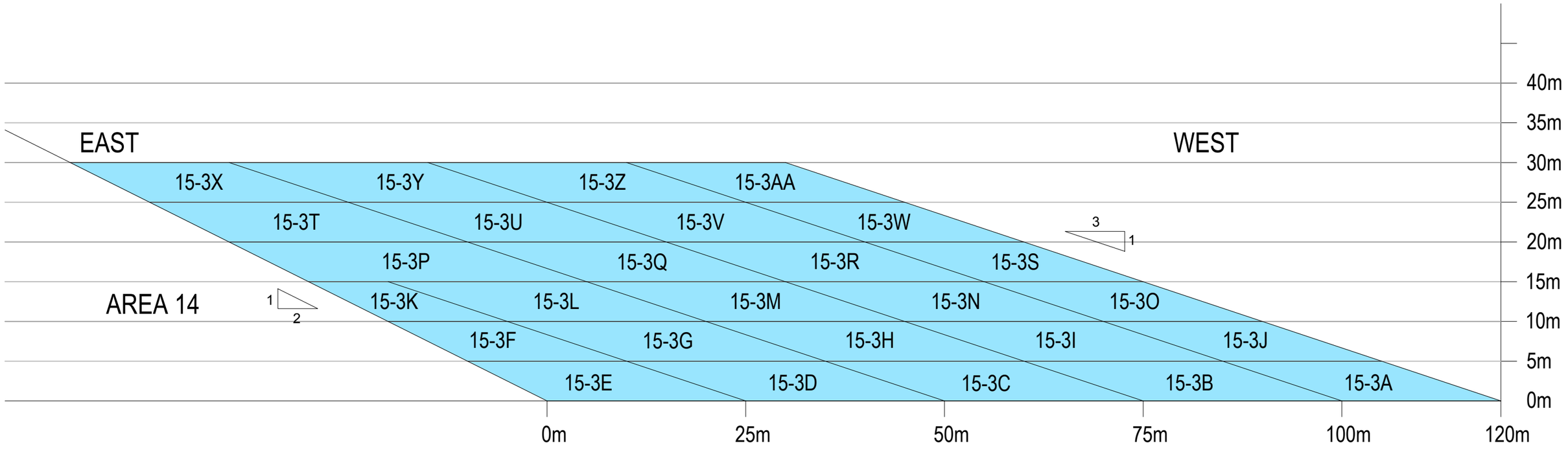
PROJECT: LANDFILL INVESTIGATION			
DRAWN: MH	DRAWING CHECK: KJ	REVIEWED: WS DATE 02/09/2020	APPROVED: VP DATE 02/09/2020
DESIGNED: KJ	DESIGN REVIEW: CW		

TITLE: AREA 15 FILLING PLAN
PHASE 1 & 2

SCALE	DRAWING No	REV
1:5 (A1)	IZ000400-OA-NG-DRG-0004	0

A1



PHASE 3 FILLING - AREA15

PRELIMINARY ISSUE

REV	DATE	APPD	REVISION
A	02/09/2020	VP	PRELIMINARY ISSUE

SCALES AT A1

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CLIENT: AB LIME LTD.
PROJECT: LANDFILL INVESTIGATION

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
MH	KJ	WS	VP
DESIGNED	DESIGN REVIEW	DATE 02/09/2020	DATE 02/09/2020
KJ	CW		

TITLE: AREA 15 FILLING PLAN ADJACENT TO AREA 14

SCALE: 1:5 (A1)
DRAWING No: IZ000400-OA-NG-DRG-0005
REV: 0

A1

ATTACHMENT F. LANDFILL COVER SUMMARY

Table F1. Existing LMP Cover Requirements

Cover/Capping Type	When used	Material type (typical) and thickness
Daily cover	Each day up to 4 weeks	150 mm minimum thick soil (or approved alternative daily cover)
Intermediate cover	>4 weeks	300 mm minimum thick quarry overburden or cleanfill
Permanent capping	As required	(from top to bottom): 150 mm topsoil, 300 mm knap-rock, 600 mm compacted clay liner ($k<1x10^{-7}$ m/s), 300 mm knap-rock

Table F2. Proposed LOMP Cover Requirements

Cover/Capping Type	When used	Material type (typical) and thickness
Daily cover	Each day	150 mm minimum thick soil (or approved alternative daily cover)
Intermediate cover	>7 days	300 mm minimum thick low permeability soil
Temporary capping	>3 months	600 mm minimum thick low permeability soil
Permanent capping	As required	(from top to bottom): 150 mm topsoil, 300 mm screened miner rock, GCL, 300 mm screened miner rock, 700 mm miner rock.

ATTACHMENT G. PERMANENT CAPPING STAGES

AB LIME

ATTACHMENT H. SURFACE WALKOVER MONITORING DATA

Legend

AB Lime Gastec Walkover March 2021 - Gastec Walkover March 30 2021 - Compliance

MethanePPM

- >5000
- 3000-5000
- 1000-3000
- <1000

ABLime Orthomosaic March 2021

ABLime210322_Orthomosaic_export_MonMa

- Red: Band_1
- Green: Band_2
- Blue: Band_3

ATTACHMENT I. LANDFILL GAS MANAGEMENT PLAN

(Separated out due to size)