In the Leicester Magistrates' Court

Drinking Water Inspectorate

V

Anglian Water Services Ltd

Exhibits Bundle

Index

		Page(s)
Section A: [redacted] **Exhibits**		
1	BP01 RE_ Witness Statement	9 - 10
2	BP02 fc 444758	11
3	BP03 JA21699	12
Section B: [redacted] **Exhibits**		
1	DF01 MIC 1984 Pitsford to Hannington_rev1	14 - 15
2	DF02 RE_ Pitsford - Inlet mains MIC Approval	16
3	DF03 WRAS 162PWX-factory 1109548	17 - 18
4	DF04 WRAS_1112500 Resicoat_R4	19 - 20
5	DF05 FW_ Pitsford - Coating	21 - 25
Section C: [redacted] **Exhibits**		
1	EN01 document 1	27
2	EN02 document 2	28 - 31
3	EN03 document 3	32
4	EN04 document 4	33
5	EN05 document 5	34 - 36
6	EN06 document 6	37 - 43
7	EN07 document 7	44 - 47
8	EN08 document 8	48 - 51
9	EN09 document 9	52
10	EN10 document 10	53
11	EN11 document 11	54
12	EN12 document 12	55
13	EN13 document 13	56 - 57
Section D: [redacted] **Exhibits**		
1	RB01 FW Grout used in Hannington Cell 1a not WRAS Approved - Livelink 7 KB	59 - 60
Section E: [redacted] **Exhibits**		
1	SEV001 Event Notification Anglian Water Services Ltd - EN_ANH_2021_00202 Kedington WTW - Created via portal	66 - 67

2	SEV002 Kedington 3 Day Event Report	68 - 79
3	SEV003 Kedington 20 Day Event Report	80 - 112
4	SEV003b Appendix 2. PSW-POS-3.0 - Policies and Standards for Materials and Chemicals in Contact with Water	113 - 124
5	SEV003c Appendix 3. PSW-POS-2.00 Policies and Standards for Asset Design and Creation	125 - 134
6	SEV003d Appendix 4. PSW-PRO-3.01 - Materials and Chemicals in Contact with Water	135 - 163
7	SEV003e Appendix 5. PSW-PRO-1.14 Water Quality Risk Assessment and Control	164 - 173
8	SEV003f Appendix 6 - Annotated MIC Form	174 - 183
9	SEV003g Appendix 7. Electrofresh Plus DWI Approval Confirmation - 56.4.537 - exp Aug 26	184 - 185
10	SEV003h Appendix 8 - Electrofresh Plus IFU	186 - 192
11	SEV003i Appendix 9. Anglian Water Pipework Design Specification	193 - 194
12	SEV003j Appendix 10. Kedington WTW Internal Inspection Reports Mar 2020	195 - 218
13	SEV003k Appendix 11. Designers Risk Assessment	219 - 226
14	SEV003l Appendix 12. Kedington WTW HAZOP Nodes 2 and 6	227 - 231
15	SEV003m Appendix 13. MIP E 310320 02 Rev 4 - Kedington WTW into supply 4 hours	232 - 248
16	SEV003n Appendix 14. MIP E 310320 02 Rev 5 - Kedington WTW into supply	249 - 265
17	SEV003o Appendix 15. Kedington WTW Internal Inspection Reports May 2021	266 - 289
18	SEV003p Appendix 16. ISF QD8 Enamel Promatch - Technical Data	290
19	SEV003q Appendix 17. QD8 Enamel Promatch - Material Safety Data Sheet	291 - 297
20	SEV003r Appendix 18. WRC Toxicity Datasheet - Xylene	298 - 330
21	SEV003s Appendix 19. Technical Drawing for Kedington WTW Contact and Balance Tanks	331
22	SEV003t Appendix 20. Kedington Performance Sampling	332
23	SEV004 Notification of the Diddington Event to DWI by ANH	333 - 334
24	SEV005 Diddington 3 Day Event Report	335 - 345
25	SEV006 Notification of the Hannington Event to DWI by ANH	346 - 347
26	SEV007 Hannington 3 Day Event Report	348 - 359
27	SEV008 Hannington 20 Day Event Report	360 - 384
28	SEV008a Appendix 1. WAT-05054-HANNWR-1H-DET-4580-140801-P1	385

29	SEV008b Appendix 2. Sample Summary	386 - 387
30	SEV008c Appendix 3. Acceptability Data	388
31	SEV009 Notification of the Pitsford Event to DWI by ANH	389 - 390
32	SEV010 Pitsford 3 Day Event Report	391 - 402
33	SEV011 Pitsford 20 Day Event Report	403 - 428
34	SEV011a Appendix 1. Sample Summary	429
35	SEV011b Appendix 2. Acceptability Data	430
36	SEV012 Safety Datasheet VandM Dacrylate enamel paint	431 - 451
37	SEV013 PSW-POS-3.0 - Policies and Standards for Materials and Chemicals in Contact with Water	452 - 463
38	SEV014 PSW-PRO-3.01 - Materials and Chemicals in Contact with Water	464 - 492
39	SEV015 Event Queries Response Letter	493 - 496
40	SEV016 Hannington MIC Form	497 - 499
41	SEV017 Electrosteel Invoice For Pipework	500
42	SEV018 Hannington soak test results and SNARLs protected	501
43	SEV019 Hannington Reservoir 1A data 2015 16 - present	502 - 506
44	SEV020 Hannington Reservoir 1B data 2015 16 - present formatting amended	507 - 512
45	SEV021 Sample Results Trace Organics Hannington 1B to September 2022	513 - 517
46	SEV022 Part 2 Trace organics results Hannington side 1B	518
47	SEV023 Drawing WAT-05054-HANNWR-1H-DET-4580-140801-P1	519
48	SEV024 Drawing WAT-06195-HANNWR-1H-DET-4581 Hannington typical tie in detail	520
49	SEV025 Hannington Reservoir 1A and 1B internal Inspection Reports	521 - 553
50	SEV026 MIC and Trace Organic Samples	554 - 556
51	SEV027. Diddington soak test results and SNARLs	557 - 559
52	SEV028 Diddington Operational Sample Data formatting amended	560 - 562
53	SEV029 Diddington MIC Forms	563 - 570
54	SEV030 Diddington Requisition and Purchase Order	571 - 572
55	SEV031 Diddington training matrix	573 - 575
56	SEV032 Training records Diddington	576 - 577
57	SEV033 Diddington Reservoir Internal Pictures 2019-2021	578 - 595
58	SEV034 Diddington East Reservoir Inspection Report - May 2020	596 - 604
59	SEV035 Diddington East Reservoir Inspection Report - Nov 2021	605 - 612
60	SEV036 Diddington West Reservoir Inspection Report - May 2020	613 - 621
61	SEV037 Diddington West Reservoir Inspection Report - Nov 2021	622 - 630

62	SEV038 Requested pictures DWI 10_11 August 2022 - Diddington PROTECTED	631 - 651
63	SEV039 Diddington Reservoir Update	652 - 653
64	SEV040 Anglian Water Alliance Jindall Sigma Pipeline Solutions Purchase Order	654 - 657
65	SEV041 MIC Forms Feb 22 Request	658 - 670
66	SEV042 Requested pictures DWI 10_11 August 2022 - Pitsford	671 - 690
67	SEV043 Collated MIC Forms for Pitsford WTW	691 - 919
68	SEV044 Queries Response	920 - 930
69	SEV045 AW Tank B annotated timeline	931 - 932
70	SEV046 Pitsford dip samples 2016 -2022	933
71	SEV047 Acothane DW IFU Issue 8 - Nov 2019	934 - 941
72	SEV048 Acothane DW Technical Data Sheets Base	942 - 944
73	SEV049 Acothane LV Sealer Technical Data Sheets	945 - 946
74	SEV050 Pitsford pipe	947
75	SEV051 Appendix Q11 Pitsford Final data 2015 16 - present	948 - 962
76	SEV052 Responses to questions raised in email of 16 September 2022 regarding Pitsford WTW 2nd tranche 20221107 2	963 - 964
77	SEV053 016. Appendix 19a - Pitsford Storage Tank B Internal Inspections 2015 to present	965 - 997
78	SEV054 Appendix Q6a Training matrix secured	998 - 1000
79	SEV055 Appendix Q6b Training records secured	1001 - 1004
80	SEV056 Reg 31 training [redacted]	1005 - 1009
81	SEV057 Notice ANH-2020-00001-Great Wratting WTW_V3	1010 - 1014
82	SEV058 QD8 Enamel Promatch - Material Safety Data Sheet	1015 - 1021
83	SEV059 Kedington Performance Sampling (1)	1022 - 1024
84	SEV060 MK13606 Kedington flake test	1025 - 1026
85	SEV061 Requested pictures DWI 10_11 August 2022 - Kedington PROTECTED	1027 - 1048
86	SEV062. - Kedington WTW Internal Inspection Reports Mar 2020	1049 - 1072
87	SEV063 - Kedington WTW Internal Inspection Reports May 2021	1073 - 1096
88	SEV064 Kedington Water Pipe Soak Test	1097 - 1103
89	SEV065 FLI Purchase Order with FT Ductile	1104 - 1107
90	SEV066 Kedington Annotated MIC Form	1108 - 1117
91	SEV067 Q26 MIC form 3659 with organics detections	1118

92	SEV068 Overview of training received by personnel associated with Kedington	1119
93	SEV069 Extract from Workday - training records	1120 - 1122
94.	**SEV070 Individual MIC Paperwork**	
94.1	[redacted] MIC paperwork	1124 - 1129
94.2	[redacted] MIC paperwork	1130 - 1134
94.3	[redacted] MIC paperwork	1135 - 1147
94.4	[redacted] MIC paperwork	1148 - 1152
94.5	[redacted] MIC paperwork	1153 - 1161
94.6	Kedington EL123 Workday courses completed	1162 - 1163
94.7	[redacted] MIC paperwork	1164 - 1169
94.8	[redacted] MIC paperwork	1170 - 1171
94.9	[redacted] MIC paperwork	1172 - 1177
94.10	[redacted] MIC paperwork	1178 - 1182
95	SEV071 Anglian Water Regulation 31 compliance for Noksel pipework 20220119	1183 - 1186
96	SEV072 MA7843R Report_FINAL	1187 - 1196
97	SEV073 [redacted] Head of WQ Email	1197 - 1199
98	SEV074 October 2023 Anglian Toxicology Report	1200 - 1233
99	SEV075 All Assets Trace Organics Samples v2	1234 - 1242
100	SEV076 Asset PWSZs Trace Organics samples v2	1243 - 1262
101	SEV077 UKHSA risk assessment Anglian water v2.0	1263 - 1276
102	SEV078 Pre-prepared Statement to DWI 21 February 2023 Mr [redacted] Anglian Water	1277 - 1319
103.	**SEV079 IUC Transcript**	
103.1	1. CD1 21 02 23 Drinking Water Inspectorate - Anglian Water DWI311 2021 - interview under caution	1321 - 1365
103.2	3. 28.02.23 CD1 Track01 Drinking Water Inspectorate - Anglian Water DW1311 2021 - interview under caution	1366 - 1411
103.3	4. CD 2 28 02 23 Drinking Water Inspectorate - Anglian Water DW1311 2021 - interview under caution	1412 - 1461
103.4	5. CD 3 28 02 23 Drinking Water Inspectorate - Anglian Water DWI311 2021 - interview under caution	1462 - 1495
104	SEV080 Letter to company R31 reservoir and tank inspections	1496 - 1497
105	SEV081 Letter to company reservoir and tank inspection request	1498 - 1499

106	SEV082 Response to Questions Relating to Hannington Reservoirs	1500 - 1506
107	SEV083 Responses to questions raised in email of 16 September 2022 regarding Hannington WTW Final – 3rd tranche	1507 - 1511
108	SEV084 RE Tank Inspection Request	1512 - 1513
109	SEV085 Hannington Reservoir 1A 2020 & 2021 Photos	1514 - 1518
110	SEV086 Photograph of remedial work in Hannington 1A	1519
111	SEV087 FW ANH Regulation 28 Risk Lines	1520 - 1521
112	SEV088 Appendix 5 - Lessons Learned Report	1522 - 1525
113	SEV089 ANH_LI_2019_00001 Hall WTW disinfection byproducts	1526 - 1530
114	SEV090 Regulation 31 review of governance	1531 - 1554
115	SEV091 Materials and Chemicals in Contact with Water	1555 - 1579

Section F: [redacted] Exhibits

1	WM01 RE_ 1796 Pitsford WTW Right Hand Storage Tank	1581 - 1585

Section A [redacted] Exhibits Index

		Page(s)
1	BP01 RE_ Witness Statement	9 - 10
2	BP02 fc 444758	11
3	BP03 JA21699	12

From: [redacted]
To: [redacted]
Cc: [redacted]
Subject: RE: Witness Statement
Date: 22 September 2022 11:22:36
Attachments: 0.jpg
1.jpg
2.jpg
3.jpg
4.jpg
5.jpg
6.jpg
JA21699.pdf
fc 444758.pdf
Statement of [redacted] Head of Technical and Quality_Electrosteel.pdf
Importance: High

Hi [redacted]

As promised; please find attached signed statement (I've made a couple of amendments to give the full factual info and dates), JN Bentley's original purchase order and our delivery documentation.

Regarding the Dacrylate info as discussed; the contact details are as below:

Dacrylate Paints Ltd
Lime St,
Kirkby in Ashfield,
Nottingham
NG17 8AL
Phone: 01623 753845

I trust all of the above is of assistance however, if you need anything further, please let me know.

Regards

[redacted]
Head of Technical and Quality

Direct Dial [redacted]
Mobile [redacted]

Electrosteel Castings (UK) Ltd
Ambrose House, Broombank Road Trading Estate,
Chesterfield, Derbyshire,England, S41 9QJ
Main Office +44 1246 264222 Fax + 44 1246 264224

Visit us at: www.electrosteel.co.uk
Follow us on

From: [redacted] <[redacted]defra.gov.uk>
Sent: 20 September 2022 14:53

To: [redacted]<[redacted]electrosteel.co.uk>
Cc: [redacted]<[redacted]defra.gov.uk>
Subject: Witness Statement

Hello [redacted]

Thank you for offering to give a statement today.
Please read through and check the statement. Once you are happy please sign each page, scan and send back to myself.

Thank you,

[redacted]

Dr [redacted] | Principal Inspector | Drinking Water Inspectorate
Mobile: +44 [redacted] | Email: [redacted]defra.gov.uk | www.dwi.gov.uk
1A Nobel House, 17 Smith Square, London, SW1P 3JR

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by	[illegible]
by	[illegible]
[illegible]pection	RMB
Date	8/12/15

ELECTROSTEEL
Ductile Iron Pipes and Fittings

Ambrose Yard, Broombank Trading Estate,Broombank Road, Chesterfield, Derbyshire S41 9QJ, UK
Tel: 01246 264 222 Fax: 01246 264 224 Website: www.electrosteel.co.uk

FILE COPY

11

Delivery Note No: ECL 2015/444758 **Customer Order No: JA21699** **Delivery Date:** 08/12/2015
Based on Sales Orders 319417.

Customer Name & Address	Customer Details	Delivery Address	Electrosteel Details
J N Bentley (Yorkshire) Keighley Road Skipton North Yorkshire BD23 2QR UNITED KINGDOM	**Account:** JNBL103S1C **Customer Ref:** JA21699 **Contact:** [redacted] **Phone:** **Fax:** **Email:**	GRAFHAM RESILIENCE CONSTRUCTION PROJECT WEST PERRY HUNTINGTON PE280BW UNITED KINGDOM **Contact:** **Tel No:** [redacted]	**Contact:** [redacted] **Email:** [redacted]@electrosteel.co.uk **Territory:** Yorkshire Water Services Ltd

SPECIAL INSTRUCTIONS:

Line	ECL Part Code	Description	Quantity	UoM	Unit Weight	Line Weight	Due Date
1	WSSS0900B1249AA	**900X1060MM SOCK SPIG PIPE EN545 BLUE PN16**	2.00	each	333.48	666.96 kg	08/12/2015
2	GTEP0900N0000AA	**900MM GASKET TYTON EPDM**	2.00	Each	1.00	2.00 kg	08/12/2015
3	WSFP0900B1749AA	**900X1410 MM FLG SOCK PIPE C/W PDL 500 FFE EN598 BLUE PN16**	2.00	Each	154.00	308.00 kg	08/12/2015
4	GTEP0900N0000AA	**900MM GASKET TYTON EPDM**	2.00	Each	1.00	2.00 kg	08/12/2015
5	WDFS0900B3499AA	**900X3195MM DBL FLG PIPE EN545 BLUE PN16**	2.00	Each	1,086.00	2,172.00 kg	08/12/2015

Packing Details:

Pallets ☐ Boxes ☐ Bundles

Loose

RECEIVED BY: **Print Name:** [redacted]

Signature: [redacted]

Date: 8/12/15

This transaction is subject to our standard Terms & Conditions of Sale. Copies available upon request. All discrepancies must be notified within three days of receipt.

ECLS03-01

Bentley

PURCHASE ORDER

J.N.BENTLEY LTD
Keighley Road
Skipton
North Yorkshire
BD23 2QR
Tel: 01756 707002
Fax:
EMail: [redacted]@jnbentley.co.uk

Contract Number	Order Number	Date
NA25-01	JA21699	24 November 2015

Delivery Address

GRAFHAM RESILIENCE CONSTRUCTION PROJECT
WEST PERRY

HUNTINGDON
CAMBRIDGESHIRE PE28 0BW

Site Contact

[redacted]
Tel: [redacted]

DELIVERY DATE: 07/12/2015

Delivery Notes: CARRIAGE INCLUDED

TO BE DELIVERED ON A FLAT BED VEHICLE C/W SIDE RAILS

TO: ELECTROSTEEL CASTINGS (UK) LIMITED **CONTACT:** [redacted]

CHESTERFIELD INDUSTRIAL ESTATE
CARRWOOD ROAD
CHESTERFIELD
DERBYSHIRE
S41 9QB

TELEPHONE: 01246 264222 **FAX: 01246 264224**

Item Description	Quantity	Units	Price	Total Price
AS PER ANGLIAN FRAMEWORK AGREEMENT				
PRICES AS PER YOUR QUOTATION REF: ECL 2015/206064 **DWI APPROVAL NUMBER FOR EPOXY COATING - 56.4.537** **WRAS APPROVAL FOR COATINGS PAINTS AND LINING - FACTORY APPLIED - 5028 - DUNPOINT POWDER COATING LTD - 1011504**				
OVERFLOW REF:01 900MM STANDARD SPIGOT SOCKET PIPE 1060MM LONG C/W GASKET BSEN545	2	No	[redacted]	[redacted]
OVERFLOW REF:02 900MM FLANGE SOCKET PIPE 1410MM LONG WITH PUDDLE FLANGE 500MM FROM FLANGE FACE	2	No	[redacted]	[redacted]
OVERFLOW REF:03 900MM DF PIPE 3195MM LONG PN16 BSEN545	2	No	[redacted]	[redacted]
			Total Order Price:	[redacted]

This order is placed on J N Bentley Limited Conditions for the Purchase of Goods (v3.4) . Copies available upon request.

J N Bentley Limited is Registered in England No. 1085646
Registered office: Keighley Road, Skipton, North Yorkshire, BD23 2QR

Signed: [redacted]

Bentley Involved in Health & Safety

All visitors to site must understand and comply with the J N Bentley Limited 10 Golden Rules

Section B
[redacted] Exhibits
Index

		Page(s)
1	DF01 MIC 1984 Pitsford to Hannington_rev1	14 - 15
2	DF02 RE_ Pitsford - Inlet mains MIC Approval	16
3	DF03 WRAS 162PWX-factory 1109548	17 - 18
4	DF04 WRAS_1112500 Resicoat_R4	19 - 20
5	DF05 FW_ Pitsford - Coating	21 - 25

ANGLIAN WATER SERVICES - MATERIALS APPROVAL FORM

FORM NO: 1984

PART B

PART B COMPLETED BY:

Please provide the following contact names:

OPERATIONAL SCIENTIST:

SUPPLY MANAGER:

PART A LINE NUMBERS WHICH SAMPLES REPRESENT		SAMPLE NUMBER	SAMPLE DATE	COLIFORMS	E. COLI	COLONY COUNTS 2 DAY 37°C 3 DAY 22°C	QUALITATIVE TASTE*	QUALITATIVE ODOUR	pH	COLOUR (HAZEN)	TURBIDITY (NTU)	CONDUCTIVITY (us/cm)	ALKALINITY(mg/l CaCO3)	ALUMINIUM (mg/l Al)	TRACE ORGANICS		1	2
															DCM & PURGE/ TRAP	MK FORM NO.	PROCESS ENGINEER /SCIENTIST CONFIRMATION	WQPT APPROVED FOR SUPPLY
																	SIGN/DATE	SIGN/DATE

Insert more lines as necessary

** taste testing only to be performed on samples of potable water and after confirmation of clear bacteriological results*

1	PROCESS ENGINEER/SCIENTIST TO SIGN AND DATE TO CONFIRM SAMPLES TAKEN ARE APPROPRIATE FOR THE MATERIALS LISTED IN PART A AND THAT EVERY PRODUCT HAS BEEN TESTED
2	WATER QUALITY PERFORMANCE TEAM TO SIGN AND DATE TO CONFIRM APPROVAL FOR USE IN SUPPLY
NOTE	OPERATIONAL SCIENTIST TO GIVE FINAL APPROVAL FOR THE MATERIAL OR EQUIPMENT TO ENTER SUPPLY

Component	Material	WRAS Listing Number
Outer Protective Tubing	Grilamid L25	906512
Internal protective sheath	Grilamid L25 Natural 6112	906512
Housing components	316 ST/STL BS6920	N/A
Connection section	316 ST/STL BS6920	N/A
Locking Pin	316 ST/STL BS6920	N/A
Drive system contact compo	Aluminium	N/A
Guide Head Arrangement	316 ST/STL BS6920	N/A
Launch Assembly	316 ST/STL BS6920	N/A
Roller mechanism	316 ST/STL BS6920	N/A
Guide Bearing race and ball	316 ST/STL BS6920	N/A
Lens (Camera sensor) Plast	Tarflon IR 2200	706510
Seal material EP62 'O' Ring	EP62 (Black)	611518
Seal material 'O' Rings	ME2020. Silicone rubber `O`	706509
Thermoplastic Compound	Estane 58197	708529
Silicone sealant compound	781 Acetoxy Silicone Sealan	804505
LED Lens	Makrolon WB 1239 (Clear)	710548
Internal Protective Sheath	Silicone rubber hose	702504
Adhesive Compound	Loctite 403	910507
	Thermolast K grade thermoplastic elastomers - TF5WKZ	
	Green	
	White	
Centralising legs	Yellow	904511
Centralising legs	316 ST/STL BS6920	N/A
Hydrophone external couple	BASF – Natural Colour – Ult	907501
Silicone grease	PHCB041	1201531
Silicone lubricant	Aqu-Sil	708520

From: [redacted]
To: [redacted]
Subject: RE: Pitsford - Inlet mains MIC Approval
Date: 12 May 2022 16:08:13
Attachments: image001.png
image002.jpg
WRAS_1112500 Resicoat_R4.pdf
WRAS_162PWX-factory_1109548.pdf

***EXTERNAL MAIL* - Please be aware this mail is from an external sender - THINK BEFORE YOU CLICK**

[redacted]– I was in a hurry for this meeting, but here's the WRAS certs for the Resicoat R4 and 3M Skotchkote which both have a statement for Instructions for Use in the opening statement.

Kind Regards,
[redacted]
Principal Engineer

Sweco UK Limited | Solihull
Mobile +44 [redacted]

From: [redacted]
Sent: 12 May 2022 15:07
To: [redacted]anglianwater.co.uk
Subject: Pitsford - Inlet mains MIC Approval

Hi [redacted]

The coatings were not DWI approval but WRAS approved for which I have given a brief description below as to why the different coatings were used.

Kind Regards,
[redacted]
Principal Engineer

Sweco UK Limited | Solihull
Mobile +44 [redacted]
[redacted]sweco.co.uk
www.sweco.co.uk

LinkedIn | Instagram
Reg. No.: 2888385 | Reg. Office: Leeds (Registered in England and Wales)
Reg. Office Address: Sweco UK Limited, Grove House, Mansion Gate Drive, Leeds, LS7 4DN

For more information on how Sweco processes your personal data, please read here.

Our Ref: NJ/M120435 & NJ/M120218
Test Report: MAT/LAB 341D & MAT/LAB 342D

WRAS®
Water Regulations Advisory Scheme

12th July 2012

3M United Kingdom Plc - Infrastructure Protection Division (IspD)
23 Standard Way
Northallerton
N Yorkshire
DL6 2XA

WATER REGULATIONS ADVISORY SCHEME (WRAS)
MATERIAL APPROVAL

The material referred to in this letter is suitable for contact with wholesome water for domestic purposes having met the requirements of BS 6920-1:2000 'Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water'.

The reference relates solely to its effect on the quality of the water with which it may come into contact and does not signify the approval of its mechanical or physical properties for any use.

COATINGS, PAINTS & LININGS - FACTORY APPLIED PIPE & FITTINGS COATINGS **5030**

3M Scotchkote Epoxy Coating 162PWX Grey. 2 part epoxy coating, consisting of base (white liquid) & activator (grey liquid). 3M Scotchkote Epoxy Coating 162PWX Blue. 2 part epoxy coating, consisting of base (blue liquid) & activator (blue liquid). Both for use with water up to 23°C.

APPROVAL NUMBER: 1109548
APPROVAL HOLDER: 3M UNITED KINGDOM PLC - INFRASTRUCTURE PROTECTION DIVISION (ISPD)

The Scheme reserves the right to review approval. This approval is valid between September 2011 and September 2016.

An entry, as above, will accordingly be included in the Water Fittings Directory on-line under the section headed, "Materials which have passed full tests of effect on water quality".

The Directory may be found at: www.wras.co.uk/directory

Yours faithfully

[redacted]

Approvals & Enquiries Manager
Water Regulations Advisory Scheme

WRAS MATERIAL APPROVAL - MATERIALS WHICH HAVE PASSED FULL TESTS OF EFFECT ON WATER QUALITY

The material referred to in this letter is suitable for contact with water for domestic purposes. **Approval of this material does not signify the approval of its mechanical or physical properties for any use.**

Manufacturers or applicants may only quote in their sales literature terms which are used in this letter, namely that; 'the material as listed, having passed the tests of effect on water quality, is suitable for use in contact with wholesome water'

This may be abbreviated to 'Water Regulations Advisory Scheme - Approved Material' or 'WRAS Approved Material'.

The scope of an Approval does not extend to rebranded materials unless otherwise agreed by the Scheme.

Use of the WRAS Approved Material Logo

The WRAS Approved Material logo is registered under the Trade Marks Acts 1994

Approval holders may use the WRAS Approved Material logo and make reference to any approval issued by WRAS Ltd. in respect of a particular material or range of materials provided the approval is, and remains valid.

Approval holders are entitled to use the logo on the packing, promotional literature and point of sale advertising Approved Materials.

Modifications to existing Approvals

It is a condition of WRAS Material Approval that **NO** changes or modifications to the Approved Material, be made without the Approval Holder first notifying WRAS Ltd. Full details of the proposed changes must be provided to the Scheme. Failure to comply with this condition will immediately invalidate a previously granted Approval.

Re-Approval

WRAS will write to you 1 year before the approval expires asking whether you would like to renew it. Please complete the relevant section of the MA3 application form which will be included with the letter and return to WRAS (via e-mail or post).

Please note it is the responsibility of the Approval Holder to ensure the Approval remains valid. WRAS Ltd. accepts no liability for the delay in granting approval where this is caused by circumstances outside of the Scheme's control.

Our Ref: HL/M110333
Test Report: M103927/A-D, M103991/A-D, M104740
M104818, M104953 & M105037/A-C

WRAS®
Water Regulations Advisory Scheme

1st December 2011
Akzo Nobel Coatings GmbH.
Markwiesenstrasse 50,
72770 Reutlingen,
Germany

WATER REGULATIONS ADVISORY SCHEME (WRAS)
MATERIAL APPROVAL

The material referred to in this letter is suitable for contact with wholesome water for domestic purposes having met the requirements of BS 6920-1:2000 'Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water'.

The reference relates solely to its effect on the quality of the water with which it may come into contact and does not signify the approval of its mechanical or physical properties for any use.

COATINGS, PAINTS & LININGS – FACTORY APPLIED – PIPE & FITTINGS COATINGS **5030**

Resicoat R4 factory applied, epoxy powder coatings. For use with water up to 85°C.

Resicoat R4 blue: R4-ES HJ601R, R4-ES HJ605R, R4-ES HJ606R, R4-FB HJC03R, R4-FB HJC04R, R4-FB HJC06R, R4-FB HJC08R, R4-FB HJC12R PAM blue, R4-ES HJF01R, R4-ES HJF10R, R4-ES HJF13R PAM blue, R4-ES HJF14R, R4-ES HJF21R, R4-ES HJF22R, R4-ES HJF23R, R4-ES HJF24R, R4-ES HJF26R, R4-ES HJF42R, R4-ES HJF47R, R4-ES HJG05R, R4-ES HJG07R, R4-ES HJG08R.
Resicoat R4 red/red-brown: R4-FB HGC07R, R4-FB HGC17R, R4-ES HGF03R, R4-ES HGF04R, R4-ES HGF10R, R4-ES HGF17R, R4-ES HGF20R, R4-ES HGF22R RAL 3011, R4-ES HGH02R.
Resicoat R4 black: R4-ES HNF04R.
Resicoat R4 green: R4-FB HKC71R.
Resicoat R4 grey.

APPROVAL NUMBER: 1112500
APPROVAL HOLDER: AKZO NOBEL POWDER COATING GMBH.

The Scheme reserves the right to review approval. This approval is valid between December 2011 and December 2016.

An entry, as above, will accordingly be included in the Water Fittings Directory on-line under the section headed, "Materials which have passed full tests of effect on water quality".
The Directory may be found at: www.wras.co.uk/directory

Yours faithfully

[redacted]

Approvals & Enquiries Manager
Water Regulations Advisory Scheme

WRAS MATERIAL APPROVAL - MATERIALS WHICH HAVE PASSED FULL TESTS OF EFFECT ON WATER QUALITY

The material referred to in this letter is suitable for contact with water for domestic purposes. **Approval of this material does not signify the approval of its mechanical or physical properties for any use.**

Manufacturers or applicants may only quote in their sales literature terms which are used in this letter, namely that; 'the material as listed, having passed the tests of effect on water quality, is suitable for use in contact with wholesome water'

This may be abbreviated to 'Water Regulations Advisory Scheme - Approved Material' or 'WRAS Approved Material'.

The scope of an Approval does not extend to rebranded materials unless otherwise agreed by the Scheme.

Use of the WRAS Approved Material Logo

The WRAS Approved Material logo is registered under the Trade Marks Acts 1994

Approval holders may use the WRAS Approved Material logo and make reference to any approval issued by WRAS Ltd. in respect of a particular material or range of materials provided the approval is, and remains valid.

Approval holders are entitled to use the logo on the packing, promotional literature and point of sale advertising Approved Materials.

Modifications to existing Approvals

It is a condition of WRAS Material Approval that **NO** changes or modifications to the Approved Material, be made without the Approval Holder first notifying WRAS Ltd. Full details of the proposed changes must be provided to the Scheme. Failure to comply with this condition will immediately invalidate a previously granted Approval.

Re-Approval

WRAS will write to you 1 year before the approval expires asking whether you would like to renew it. Please complete the relevant section of the MA3 application form which will be included with the letter and return to WRAS (via e-mail or post).

Please note it is the responsibility of the Approval Holder to ensure the Approval remains valid. WRAS Ltd. accepts no liability for the delay in granting approval where this is caused by circumstances outside of the Scheme's control.

From: [redacted]
To:
Cc:
Subject: FW: Pitsford - Coating
Date: 12 May 2022 13:00:24
Attachments: image003.jpg
image005.png
image006.png
image007.jpg
image004.png
WAT-07033-(WAT-05860)-PITSV1MA-SS-LOC-008_R - (Internal Pipework on MIC Highlighted)_PDF.pdf
1984 Pitsford to Hannington_rev1.xls

> You don't often get email from [redacted]anglianwater.co.uk. Learn why this is important

fyi

From: [redacted]<[redacted]sweco.co.uk>
Sent: 07 January 2022 14:51
To: [redacted]<[redacted]anglianwater.co.uk>; [redacted]<[redacted]anglianwater.co.uk>; [redacted]<[redacted]anglianwater.co.uk>
Cc: [redacted]<[redacted]anglianwater.co.uk>; [redacted]<[redacted]anglianwater.co.uk>
Subject: [SUSPICIOUS EXTERNAL MESSAGE] RE: Pitsford - Coating

***EXTERNAL MAIL* - Please be aware this mail is from an external sender - THINK BEFORE YOU CLICK**

Hi [redacted]

Lines 5-8 on MIC1984 relate to the storage tank internal pipework highlighted yellow on the attached design dwg.

Kind Regards,
[redacted]
Mobile +44 [redacted]

From: [redacted]<[redacted]anglianwater.co.uk>
Sent: 23 December 2021 13:09
To: [redacted]<[redacted]sweco.co.uk>; [redacted]<[redacted]anglianwater.co.uk>; [redacted]<[redacted]anglianwater.co.uk>
Cc: [redacted]<[redacted]anglianwater.co.uk>; [redacted]<[redacted]anglianwater.co.uk>
Subject: RE: Pitsford - Coating

Thanks for your prompt response [redacted]

From my review I'm unable to identify a description that would match pipe used on the outlet chamber on form 1984.

If you can advise the specific line on your return that would be great.

Thanks
[redacted]

From: [redacted]<[redacted]sweco.co.uk>

Sent: 23 December 2021 13:04
To: [redacted]<[redacted]anglianwater.co.uk>; [redacted]<[redacted]anglianwater.co.uk>; [redacted]<[redacted]anglianwater.co.uk>
Cc: [redacted]<[redacted]anglianwater.co.uk>; [redacted]<[redacted]anglianwater.co.uk>
Subject: [SUSPICIOUS EXTERNAL MESSAGE] Re: Pitsford - Coating

***EXTERNAL MAIL* - Please be aware this mail is from an external sender - THINK BEFORE YOU CLICK**

[redacted]- the pipework through the wall is on MIC 1984 with WRAS approved coatings.

Get Outlook for Android

From: [redacted]<[redacted]anglianwater.co.uk>
Sent: Thursday, December 23, 2021 11:57:19 AM
To: [redacted]<[redacted]anglianwater.co.uk>; [redacted]<[redacted]sweco.co.uk>; [redacted]<[redacted]anglianwater.co.uk>
Cc: [redacted]<[redacted]anglianwater.co.uk>; [redacted]<[redacted]anglianwater.co.uk>
Subject: RE: Pitsford - Coating

Firstly, thanks for everyone helps on this.

Following on the [redacted] email, I do have several questions in relation to this scheme to fully appreciate timeline and work involved.

Would you be able to help on the below points, or could someone within Alliance be assigned to locate documents relating to this scheme please? If available information can be provided by 1st week of January it would be greatly appreciated.

- Are you able to provide documents from this scheme (WAT codes identified listed below), such as delivery execution plan (DEP), DM3 stage, scheme start/end dates, highlight reports and/or similar please?
- MIC form 1796 (completed in Sept-16) and MIC form 2790 (completed in Aug-17), both have very similar products listed but nearly a year apart. Do you recall why two separate forms were completed and signed off?
- Do you've any documents or notes highlighted the construction period for the chamber please?
- Are you able provide any details in relation to the blue pipework passing through new outlet chamber, as I'm unable to locate this on either of MIC form? Also, is this the pipe that is mentioned within the email provided within this email chain as being coated with Acothane DW?

WAT number referenced on MIC forms:

- WAT 05860
- WAT 07033
- WAT 06560
- WAT 06142
- WAT 06526

Thanks for your help.

[redacted]
Water Quality Risk Scientist
Mobile: [redacted]

Anglian Water Services Limited
Isleham WTW, Fordham Road, Isleham, Cambs, CB7 5QX

From: [redacted] <[redacted]anglianwater.co.uk>
Sent: 23 December 2021 09:08
To: [redacted] <[redacted]sweco.co.uk>; [redacted] <[redacted]anglianwater.co.uk>; [redacted] <[redacted]anglianwater.co.uk>; [redacted] <[redacted]anglianwater.co.uk>; [redacted] <[redacted]anglianwater.co.uk>
Subject: RE: Pitsford - Coating

I'm sure if you ask [redacted] he should be able to send you guys a link to the works diary and photo's on the Stonbury system.

Many Thanks

[redacted]
Project Delivery Manager
Anglian Water @one Alliance

Anglian Water Services Limited
Thorpe Wood House, Thorpe Wood, Peterborough, Cambridgeshire, PE3 6WT

Mobile [redacted]
www.anglianwater.co.uk

From: [redacted] <[redacted]sweco.co.uk>
Sent: 23 December 2021 02:19
To: [redacted] <[redacted]anglianwater.co.uk>; [redacted] <[redacted]anglianwater.co.uk>; [redacted] <[redacted]anglianwater.co.uk>; [redacted] <[redacted]anglianwater.co.uk>; [redacted] <[redacted]anglianwater.co.uk>
Subject: RE: Pitsford - Coating

EXTERNAL MAIL **- Please be aware this mail is from an external sender - THINK BEFORE YOU CLICK**

[redacted]

After carrying out an in depth search I've found another MIC 1796 that I recall was produced by Stonburys submitted by myself and approved by WQ Team after the submission of the original project MIC 1984. For some reason it appears this form was originally initiated by Stonburys independently of the project MIC 1984.

MIC 1796 line 5 does show the Acothane DW (Blue) that you refer to in your earlier email and there is some correspondence regarding this product in one of the attached emails which was later resolved and approved in the other email attached.

[redacted] – regarding photos, at the time Stonburys had an intranet site where all the photos of the tank were stored, right now I can't find the link to this site and probably my password would have expired anyway.

I'm on leave now till the new year so hopefully this additional info helps.

This

Kind Regards,

[redacted]
Mobile +44 [redacted]

From: [redacted] <[redacted]anglianwater.co.uk>
Sent: 20 December 2021 18:02
To: [redacted] <[redacted]anglianwater.co.uk>; [redacted] <[redacted]anglianwater.co.uk>; [redacted] <[redacted]anglianwater.co.uk>
Subject: Re: Coating

[redacted]

As much as I know Stonburys installed the fittings at Pitsford, as [redacted] mentioned in an earlier email the Contruction Manager was [redacted] ([redacted]).

Kind Regards,

[redacted]

Discipline Engineer - Civil (WI)

Anglian Water @one Alliance

e-mail: [redacted]anglianwater.co.uk

mob: [redacted]

From: [redacted] <[redacted]anglianwater.co.uk>
Sent: 20 December 2021 17:56
To: [redacted] <[redacted]anglianwater.co.uk>; [redacted] <[redacted]anglianwater.co.uk>;

[redacted]<[redacted]anglianwater.co.uk>
Subject: Coating

[redacted]

I'm going to test your memory – Pitsford – your name is on the MIC form. We have some discrepancies on coatings.
It would seem that someone has overcoated some pipework (maybe with a touch up paint – could be Acothane repair kit)
Who installed this on site? Can you recall?
Please advise
Cheers
[redacted]

--*----*----*----*----*----*----*----*----*----*----*----*----*----*---*----*-----*----*----*----*----*----*----*----*----*----*----*----*----*

Section C
[redacted] Exhibits
Index

		Page(s)
1	EN01 document 1	27
2	EN02 document 2	28 - 31
3	EN03 document 3	32
4	EN04 document 4	33
5	EN05 document 5	34 - 36
6	EN06 document 6	37 - 43
7	EN07 document 7	44 - 47
8	EN08 document 8	48 - 51
9	EN09 document 9	52
10	EN10 document 10	53
11	EN11 document 11	54
12	EN12 document 12	55
13	EN13 document 13	56 - 57

ORIGINAL MATERIALS

Extract from @One Call- Off Order to Framework Number: 2015-0144C
Signed 18/9/2018

CONTACT TANK: Appendix A Works Information: (pages 16 and 19)

Original design FBE coated pipe changed by @One as an instruction to DI. Design, drawing & Spec by @One.

8. Contact Tank

Contact Tank Pipework, inclusive of valves, flanges, joints, etc, as necessary
- To be covered within process block 34 pipework & cable tray & rack

34. Pipework & Cable Tray & Rack

Backwash Pipework, inclusive of valves, flanges, joints, etc, as necessary
- Epoxy coated carbon steel
- 45.000Lm x 0.300m dia
- Un-lagged

Backwash Pipework Supports
- Quantity and size to *Contractor's* design

Backwash Pipework Instruments
- Flowmeter 0.300m x 1nr – offload, installation and connection

Main Process Pipework, inclusive of valves, flanges, joints, etc, as necessary
- Epoxy coated carbon steel
- 30.000Lm x 0.400m dia
- 8.000Lm x 0.300m dia (Contact Tank inlet)
- 8.000Lm x 0.450m dia (Contact Tank overflow)

WASHWATER SETTLEMENT TANK: Appendix A Works Information: (pages 17 and 18)

Free issue arms. Anchored with SS chem anchors and WRAS approved Resin.

14. Washwater Settlement Tanks

Washwater Settlement Tanks
- Washwater Settlement Tanks installed by others

Washwater Settlement Tanks Pipework, inclusive of valves, flanges, joints, etc, as necessary
- To be covered within process block 34 pipework & cable tray & rack

Washwater Settlement Tanks Pipework Supports
- To be covered within process block 34 pipework & cable tray & rack

Washwater Settlement Tanks Internal Piping
- Epoxy coated carbon steel
- 8.000Lm x 0.150m dia (4.000Lm per tank)
- Un-lagged

Washwater Settlement Tanks Floating Arms x 2nr
- Offload, installation and connection

Washwater Settlement Tanks Platform and Stairways
- Installed by *Tier 1 Contractor*

@ONE INSTRUCTION – ITEMS & DRAWING/SPEC (DUCTILE IRON)

[redacted]

From: [redacted]@anglianwater.co.uk>
Sent: 17 July 2019 09:50
To: [redacted]
Cc:
Subject: WAT-06742 Wratting - Above Ground DI Pipework
Attachments: WAT-06742-KEHRWW-1F-DET-5302 2C.PDF; WAT-06742 DI Above Grnd 2019.07.17.xlsx

Hi [redacted],

I have left avoicemail re this, can you call when free to discuss.

I have reviewed the above ground ductile iron MTO with [redacted], and discussed with [redacted], and we feel it is best for yourselves to procure the above ground elements.

This will enable you to manage the delivery requirements to suit your programme and also negates the risk of any items getting mixed up with our below ground DI on site.

I have attached the above ground DI MTO (excel doc), along with the contact tank internal pipework dwg WAT-06742-KEHRWW-1F-DET-5302-2C (the contact tank materials are not listed on the excel MTO), the areas summarised below: -

- Contact Tank (by FLI, see attached dwg for details)
- Pump Room (by FLI, see attached MTO for details)
- Sludge Collection (by FLI, see attached MTO for details)
- Supernatant Return (by FLI, see attached MTO for details)
- Cess Collection (by @one, partially below ground so we will procure)

The above ground pipework is in your existing contract, so there is no need for a PMI at this time, we can just capture the change in material as part of the on-going remeasure exercise.

Regards,

[redacted]
Cost Manager
Anglian Water @one Alliance

Anglian Water Services Limited
Thorpe Wood House, Thorpe Wood, Peterborough, Cambridgeshire, PE3 6WT
Mobile [redacted]

Ductile Iron - Not detailed on CSP drawings (Mech Install)

ID	QTY	SIZE	RATING	DESCRIPTION	LENGTH	MATERIAL	NOTES
Pump Room 80-PW-030-DIW Mech Install							
PIPE							
900	1	80	PN16	PIPE, DOUBLE FLANGED	700	BS EN 545 (BLUE)	TO BE ORDERED BY FLI
901	1	80	PN16	PIPE, DOUBLE FLANGED	350	BS EN 545 (BLUE)	TO BE ORDERED BY FLI
902	1	80	PN16	PIPE, DOUBLE FLANGED	150	BS EN 545 (BLUE)	TO BE ORDERED BY FLI
903	1	80	PN16	PIPE, FLANGED/SPIGOT	230	BS EN 545 (BLUE)	TO BE ORDERED BY FLI
904	1	80	PN16	PIPE, FLANGED/SPIGOT	158	BS EN 545 (BLUE)	TO BE ORDERED BY FLI
905	1	80	PN16	PIPE, DOUBLE FLANGED	150	BS EN 545 (BLUE)	TO BE ORDERED BY FLI
BENDS							
906	2	80	PN16	BEND 90, FLANGED, SHORT RADIUS		BS EN 545 (BLUE)	TO BE ORDERED BY FLI
TEES							
907	1	80	PN16	TEE, EQUAL, FLANGED, SERIES A		BS EN 545 (BLUE)	TO BE ORDERED BY FLI
FLANGES							
908	2	80	PN16	FLANGE ADAPTOR, VJ FLEXLOCK FOR DI		BS EN 545 (BLUE)	TO BE ORDERED BY FLI
909	1	80	PN16	FLANGE, BLIND		BS EN 545 (BLUE)	TO BE ORDERED BY FLI
GASKETS							
910	18	80	PN16	GASKET, FLAT		EPDM	TO BE ORDERED BY FLI
BOLTS							
911	14	80	PN16	STUD BOLT SET, M16 8-OFF	70		TO BE ORDERED BY FLI
912	2	80	PN16	STUD BOLT SET, M16 8-OFF, EXTRA LONG	140		TO BE ORDERED BY FLI
VALVES							
913	1	80	PN16	GATE VALVE, FLANGED, HANDWHEEL			ORDERED
914	1	80	PN16	GATE VALVE, FLANGED, HANDWHEEL			ORDERED
915	1	80	PN16	GATE VALVE, FLANGED, HANDWHEEL			ORDERED
916	1	80	PN16	FLOW METER			ORDERED
917	1	80	PN16	CHECK VALVE, WAFER			ORDERED
918	1	80	PN16	CHECK VALVE, WAFER			ORDERED
Sludge Collection 100-SL-021-DIW Mech Install							
PIPE							
920	1	100	PN16	PIPE, DOUBLE FLANGED	1000	BS EN 545 (BLACK)	TO BE ORDERED BY FLI
921	1	100	PN16	PIPE, DOUBLE FLANGED (SPINNING)	393	BS EN 545 (BLACK)	TO BE ORDERED BY FLI
922	1	100	PN16	PIPE, FLANGED/SPIGOT	3650	BS EN 545 (BLACK)	TO BE ORDERED BY FLI
923	1	100	PN16	PIPE, FLANGED/SPIGOT	391	BS EN 545 (BLACK)	TO BE ORDERED BY FLI
BENDS							
924	3	100	PN16	BEND 90, FLANGED, SHORT RADIUS		BS EN 545 (BLACK)	TO BE ORDERED BY FLI
TEES							
925	1	100	PN16	TEE, EQUAL, FLANGED, SERIES A		BS EN 545 (BLACK)	TO BE ORDERED BY FLI
COUPLINGS							
926	1	100	PN16	BAUER CONNECTOR, FLANGED, MALE		BS EN 545 (BLACK)	TO BE ORDERED BY FLI
GASKETS							
927	11	100	PN16	GASKET, FLAT		EPDM	TO BE ORDERED BY FLI
BOLTS							
928	11	100	PN16	STUD BOLT SET, M16 8-OFF	70		TO BE ORDERED BY FLI
VALVES							
929	1	100	PN16	GATE VALVE, FLANGED, HANDWHEEL			ORDERED
930	1	100	PN16	ECC PLUG VALVE, FLANGED, LEVER			ORDERED
931	1	100	PN16	FLOW METER			ORDERED
Supernatant Return 80-NP-068-DIW Mech Install							
PIPE							
940	1	80	PN16	PIPE, FLANGED/SPIGOT	560	BS EN 545 (BLACK)	TO BE ORDERED BY FLI
941	1	80	PN16	PIPE, DOUBLE SPIGOT	513	BS EN 545 (BLACK)	TO BE ORDERED BY FLI
TEES							
942	1	100	PN16	TEE, EQUAL, FLANGED, SERIES A		BS EN 545 (BLACK)	TO BE ORDERED BY FLI
FLANGES							
943	3	80	PN16	FLANGE ADAPTOR, VJ FLEXLOCK FOR DI		BS EN 545 (BLACK)	TO BE ORDERED BY FLI
944	1	80	PN16	FLANGE, BLIND c/w 2" BSPF THD BOSS		BS EN 545 (BLACK)	TO BE ORDERED BY FLI
GASKETS							
945	4	80	PN16	GASKET, FLAT		EPDM	TO BE ORDERED BY FLI
BOLTS							
946	4	80	PN16	STUD BOLT SET, M16 8-OFF	70		TO BE ORDERED BY FLI

ID	QTY	SIZE	RATING	DESCRIPTION	LENGTH	MATERIAL	NOTES
Cess Collection 100-SE-416-DIS Civil/Mech Install							
PIPE							
950	1	100	PN16	PIPE, DOUBLE FLANGED	650	BS EN 598 (RED)	TO BE ORDERED BY @ONE
951	1	100	PN16	PIPE, DOUBLE FLANGED	300	BS EN 598 (RED)	TO BE ORDERED BY @ONE
952	1	100	PN16	PIPE, DOUBLE FLANGED (SPINNING)	1257	BS EN 598 (RED)	TO BE ORDERED BY @ONE
953	1	100	PN16	PIPE, DOUBLE SPIGOT	557	BS EN 598 (RED)	TO BE ORDERED BY @ONE
954	1	80	PN16	PIPE, FLANGED/SPIGOT	1700	BS EN 598 (RED)	TO BE ORDERED BY @ONE
BENDS							
955	2	100	PN16	BEND 90, FLANGED, SHORT RADIUS		BS EN 598 (RED)	TO BE ORDERED BY @ONE
TEES							
956	1	100	PN16	TEE, EQUAL, FLANGED, SERIES A		BS EN 598 (RED)	TO BE ORDERED BY @ONE
REDUCERS							
957	1	100x80	PN16	REDUCER, CONCENTRIC, FLANGED		BS EN 598 (RED)	TO BE ORDERED BY @ONE
FLANGES							
958	2	100	PN16	FLANGE ADAPTOR, VJ MAXIDAPTOR FOR DI		BS EN 598 (RED)	TO BE ORDERED BY @ONE
COUPLINGS							
959	1	100	PN16	90DEG BAUER CONNECTOR, FLANGED, MALE		BS EN 598 (RED)	TO BE ORDERED BY @ONE
GASKETS							
960	10	100	PN16	GASKET, FLAT		EPDM	TO BE ORDERED BY @ONE
961	1	80	PN16	GASKET, FLAT		EPDM	TO BE ORDERED BY @ONE
BOLTS							
962	10	100	PN16	STUD BOLT SET, M16 8-OFF	70		TO BE ORDERED BY @ONE
963	1	80	PN16	STUD BOLT SET, M16 8-OFF	70		TO BE ORDERED BY @ONE
VALVES							
964	1	100	PN16	ECC PLUG VALVE, FLANGED, LEVER			ORDERED
HLP Bldg Under Slab Civil Install							
PIPE							
970	1	400	PN16	PIPE, DOUBLE FLANGED	2123	BS EN 545 (BLUE)	ON SITE AND INSTALLED
971	1	400	PN16	PIPE, DOUBLE FLANGED	1716	BS EN 545 (BLUE)	ON SITE AND INSTALLED
972	1	400	PN16	PIPE, DOUBLE FLANGED	497	BS EN 545 (BLUE)	ON SITE AND INSTALLED
973	2	400	PN16	PIPE, DOUBLE FLANGED	347	BS EN 545 (BLUE)	ON SITE AND INSTALLED
974	1	300	PN16	PIPE, DOUBLE FLANGED	1747	BS EN 545 (BLACK)	ON SITE AND INSTALLED
975	1	300	PN16	PIPE, DOUBLE FLANGED	547	BS EN 545 (BLACK)	ON SITE AND INSTALLED
976	2	300	PN16	PIPE, DOUBLE FLANGED	397	BS EN 545 (BLACK)	ON SITE AND INSTALLED
BENDS							
980	2	400	PN16	BEND 90, FLANGED, SHORT RADIUS		BS EN 545 (BLUE)	ON SITE AND INSTALLED
981	1	400	PN16	BEND 45, FLANGED, SHORT RADIUS		BS EN 545 (BLUE)	ON SITE AND INSTALLED
983	2	300	PN16	BEND 90, FLANGED, SHORT RADIUS		BS EN 545 (BLACK)	ON SITE AND INSTALLED
GASKETS							
985	6	400	PN16	GASKET, FLAT		EPDM	ON SITE AND INSTALLED
987	4	300	PN16	GASKET, FLAT		EPDM	ON SITE AND INSTALLED
BOLTS							
990	6	400	PN16	STUD BOLT SET, M27 16-OFF	100		ON SITE AND INSTALLED
992	4	300	PN16	STUD BOLT SET, M24 12-OFF	90		ON SITE AND INSTALLED

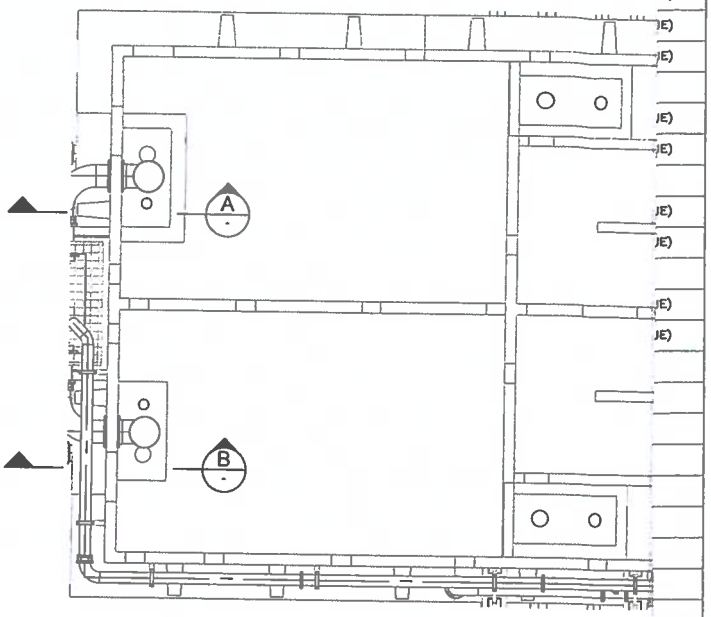
SAFETY HEALTH AND ENVIRONMENTAL INFORMATION
IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING:-
SIGNIFICANT RESIDUAL RISKS
THESE STATEMENTS RESULT FROM THE DESIGN RISK ASSESSMENTS CARRIED OUT BY THE DESIGNER. THE INTENT IS TO DEMONSTRATE COMPLIANCE WITH THE PROVISIONS OF THE CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATION 2015 PART 3, REGULATION 9 (2-4 INCLUSIVE). THESE STATEMENTS MUST BE REVIEWED AND UPDATED AS NEEDED ALONG WITH THE RISK ASSESSMENTS AS AND WHEN ANY SIGNIFICANT DESIGN CHANGE OCCURS.
CONSTRUCTION
WORK AT HEIGHT, MANUAL HANDLING
MAINTENANCE / CLEANING / OPERATION
ENTRY TO TANKS IS SUBJECT TO CONFINED SPACE ENTRY PROCEDURES
DECOMMISSIONING / DEMOLITION
NO SIGNIFICANT RESIDUAL RISKS IDENTIFIED

GENERAL NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS IN METRES RELATIVE TO ORDNANCE DATUM NEWLYN.
3. ALL DIMENSIONS AND LEVELS TO EXISTING WORK ARE TO BE CHECKED ON SITE AND VERIFIED PRIOR TO COMMENCEMENT OF WORK.
4. ALL EXISTING EQUIPMENT, SERVICES ETC. IN THE AREA ARE TO BE PROTECTED FROM DAMAGE DURING CONSTRUCTION.
5. IF ANY CHANGE IS REQUIRED TO THE DESIGN, USE TECHNICAL QUERY & DESIGN CHANGE REQUEST FORM (ALL-TEM-TD-010).
6. FIXINGS INTO CONCRETE (DUCKFOOT AND PIPE SUPPORTS) TO BE 316L STAINLESS STEEL WITH PROVENTURE PRO V200 RESIN.

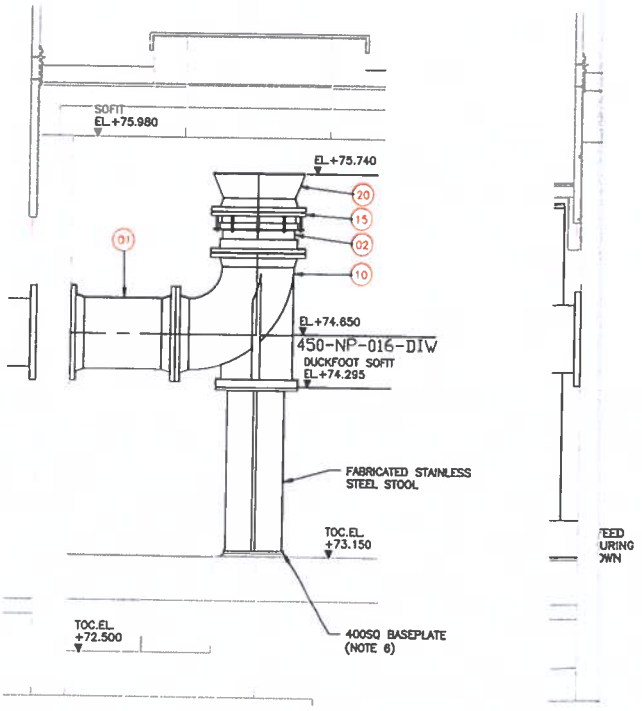
REFERENCE DRAWINGS

OVERALL SITE LAYOUT AND HAZARD AWARENESS	WAT-06742-KEHRWW-SS-LAY-2000
CONTACT TANK MECHANICAL GA	WAT-06742-KEHRWW-1F-DET-5300
PIPING MATERIAL NOTES	WAT-06742-KEHRWW-SS-DET-5990



PLAN

SCALE 1



SECTION A

SCALE 1:25

@one ALLIANCE
FOR CONSTRUCTION

DESIGN CONTACT INFORMATION - IF IN DOUBT, ASK!

	NAME	TELEPHONE	EMAIL
TACT			
NEER	[redacted]		@anglianwater.co.uk
TECHNICIAN			@anglianwater.co.uk

REV	DATE	DETAILS	STAT	BY	CHK	APP
2	23.05.19	APPROVED FOR CONSTRUCTION	C	TP	PG	AFM
1	27.04.19	ISSUED FOR REVIEW	P	TP		

This plan is provided by Anglian Water Services Limited pursuant to the Water Industry Act 1991 and other statutory and common law duties attached, amended but not limited by the position as owners and duties we are governed by in connection with our water and sewerage undertakings. The extent and position of Anglian Water plant shown on this plan is produced by Anglian Water Services Limited from its records and other sources and should be treated as indicative only. This plan is produced by Anglian Water Services Limited for the purpose of providing information about the location of certain Anglian Water plant and equipment. This notice is a personal injury resulting from the use of this plan. Copyright. All rights reserved. Ordnance Survey 100019452.

20.05.19	DRAWN: TP	DATE: 26.04.19	CHK'D:PG	DATE:21.05.19	APP'D:AFM	DATE: 22.05.19

REFERENCED DRAWINGS:

-06742-KEHRWW-1F-DET-5302 | REV. 2 | STAT. C

, **Water Ltd**
agent House, Wolseley Road
Kempston, Bedford, MK42 7JY, UK

Office +44 (0) 1234 852 900
Web www.fliwater.com

Your Sustainable Solutions Partner

From: [redacted]@anglianwater.co.uk>
Sent: 17 July 2019 09:50
To: [redacted]@fliwater.com>
Cc: [redacted]@anglianwater.co.uk>; [redacted]@anglianwater.co.uk>; [redacted]
<[redacted]@stantec.com>
Subject: WAT-06742 Wratting - Above Ground DI Pipework

Hi [redacted]

I have left a voicemail re this, can you call when free to discuss.

I have reviewed the above ground ductile iron MTO with [redacted] and discussed with [redacted] and we feel it is best for yourselves to procure the above ground elements.

This will enable you to manage the delivery requirements to suit your programme and also negates the risk of any items getting mixed up with our below ground DI on site.

I have attached the above ground DI MTO (excel doc), along with the contact tank internal pipework dwg WAT-06742-KEHRWW-1F-DET-5302-2C (the contact tank materials are not listed on the excel MTO), the areas summarised below: -

- Contact Tank (by FLI, see attached dwg for details)
- Pump Room (by FLI, see attached MTO for details)
- Sludge Collection (by FLI, see attached MTO for details)
- Supernatant Return (by FLI, see attached MTO for details)
- Cess Collection (by @one, partially below ground so we will procure)

The above ground pipework is in your existing contract, so there is no need for a PMI at this time, we can just capture the change in material as part of the on-going remeasure exercise.

Regards,

[redacted]
Cost Manager
Anglian Water @one Alliance

Anglian Water Services Limited
Thorpe Wood House, Thorpe Wood, Peterborough, Cambridgeshire, PE3 6WT
Mobile [redacted]

[redacted]

1@ ONE INSTRUCTION MATERIAL CHANGE

From: [redacted]@anglianwater.co.uk>
Sent: 12 August 2019 12:43
To: [redacted]
Cc: [redacted]
Subject: RE: 20190729 Kedington- CE - Above Ground & contact tank internal DI Pipework
Attachments: 16473 - CE - DI Pipework supply.pdf; WAT-06742 Wratting - Above Ground DI Pipework

Hi [redacted]

Please cover this element of work under you overall re-measure of the above ground pipework – much of this is in your scope – just change in material type. The final paragraph of my email 17th July 2019 refers

[redacted] please can you review [redacted]'s notes re colours and advise him of way to proceed.

Regards,

[redacted]
Cost Manager
Anglian Water @one Alliance
Anglian Water Services Limited
Mobile [redacted]

From: [redacted]@fliwater.com]
Sent: 29 July 2019 15:42
To: [redacted]
Cc: [redacted]
Subject: 20190729 Kedington- CE - Above Ground & contact tank internal DI Pipework

EXTERNAL MAIL **- Please be aware this mail is from an external sender - THINK BEFORE YOU CLICK**

Hi [redacted]
Please find attached CE for supply only of above ground and contact tank internal DI pipework as per drawing and excel sheet sent.
Please note comments in Scope tab regarding some of the coating colours.

Kind Regards,

[redacted]
Project Manager

Email [redacted]@fliwater.com
Mob +44[redacted]

ENQUIRY TO SUPPLIER
(WITH DRAWING/SPEC ATTACHED)
STATING FOR POTABLE WATER

[redacted]

From: [redacted]
Sent: 17 July 2019 15:35
To: [redacted]
Cc:
Subject: 20190717 Kedington - Ductile Iron Quote
Attachments: WAT-06742-KEHRWW-1F-DET-5302 2C.PDF

Tracking:	**Recipient**	**Delivery**
	[redacted]	Delivered: 17/07/2019 15:35
		Delivered: 17/07/2019 15:35

Hi [redacted]
Hope you are well.

Please can you quote the items below together with lead times.
Also the parts on the attached drawing. Please note parts are for Potable water. Approval numbers will be required.
Thanks

Pump Room 80-PW-030-DIW Mech Install

ID	QTY	SIZE	RATING	DESCRIPTION
PIPE				
900	1	80	PN16	PIPE, DOUBLE FLANGED
901	1	80	PN16	PIPE, DOUBLE FLANGED
902	1	80	PN16	PIPE, DOUBLE FLANGED
903	1	80	PN16	PIPE, FLANGED/SPIGOT
904	1	80	PN16	PIPE, FLANGED/SPIGOT
905	1	80	PN16	PIPE, DOUBLE FLANGED
BENDS				
906	2	80	PN16	BEND 90, FLANGED, SHORT RADIUS
TEES				
907	1	80	PN16	TEE, EQUAL, FLANGED, SERIES A
FLANGES				
908	2	80	PN16	FLANGE ADAPTOR, VJ FLEXLOCK FOR DI
909	1	80	PN16	FLANGE, BLIND
GASKETS				
910	18	80	PN16	GASKET, FLAT
BOLTS				
911	14	80	PN16	STUD BOLT SET, M16 8-OFF
912	2	80	PN16	STUD BOLT SET, M16 8-OFF, EXTRA LONG

Sludge Collection 100-SL-021-DIW Mech Install

PIPE				
920	1	100	PN16	PIPE, DOUBLE FLANGED
921	1	100	PN16	PIPE, DOUBLE FLANGED (SPINNING)
922	1	100	PN16	PIPE, FLANGED/SPIGOT
923	1	100	PN16	PIPE, FLANGED/SPIGOT
BENDS				
924	3	100	PN16	BEND 90, FLANGED, SHORT RADIUS
TEES				
925	1	100	PN16	TEE, EQUAL, FLANGED, SERIES A
COUPLINGS				
926	1	100	PN16	BAUER CONNECTOR, FLANGED, MALE
GASKETS				
927	11	100	PN16	GASKET, FLAT
BOLTS				
928	11	100	PN16	STUD BOLT SET, M16 8-OFF
VALVES				
929	1	100	PN16	GATE VALVE, FLANGED, HANDWHEEL
930	1	100	PN16	ECC PLUG VALVE, FLANGED, LEVER
931	1	100	PN16	FLOW METER

Supernatant Return 80-NP-068-DIW Mech Install

PIPE				
940	1	80	PN16	PIPE, FLANGED/SPIGOT
941	1	80	PN16	PIPE, DOUBLE SPIGOT
TEES				
942	1	100	PN16	TEE, EQUAL, FLANGED, SERIES A
FLANGES				
943	3	80	PN16	FLANGE ADAPTOR, VJ FLEXLOCK FOR DI
944	1	80	PN16	FLANGE, BLIND c/w 2" BSPF THD BOSS
GASKETS				
945	4	80	PN16	GASKET, FLAT
BOLTS				
946	4	80	PN16	STUD BOLT SET, M16 8-OFF

Kind Regards,

[redacted]
Project Manager

Email [redacted]@fliwater.com
Mob +44(0)[redacted]

FLI Water Ltd
Regent House, Wolseley Road
Kempston, Bedford, MK42 7JY, UK

Office +44 (0) 1234 852 900
Web www.fliwater.com

Your Sustainable Solutions Partner

SUPPLIER QUOTE

(WILL BE WRAS APPROVED)

[redacted]

From: [redacted]@ftductile.co.uk>
Sent: 22 July 2019 16:43
To: [redacted]
Subject: RE: 20190717 Kedington - Ductile Iron Quote

Follow Up Flag: Follow up
Flag Status: Flagged

Morning[redacted],

Thanks for you email, we would offer you the following additional prices.

Ductile Iron EN545:2010 NP16 flanges, Pipes Cement Lined, Epoxy seal coated, Zinc Alloy & Blue epoxy seal coated, Fittings Blue Epoxy coated inside & outside.

2 no 450mm x 720mm Double flanged pipe	£839.46 ea	
2 no 450mm x 250mm Flange spigot	£440.88 ea	
2 no 300mm x 1950mm Flange spigot	£301.59 ea	
2 no 300mm x 594mm Double flanged pipe	£307.37 ea	
2 no 450mm Double flanged 90 deg Duckfoot bends	£1488.76 ea	
2 no 300mm Double flanged 90 deg Duckfoot bends	£457.38 ea	
2 no 450mm VJ Maxidaptors (476 – 493mm)	£489.15 ea	
2 no 300mm VJ Maxidaptors (315 – 349mm)	£83.06 ea	
2 no 450mm Flanged Bellmouths	£392.49 ea	
2 no 300mm Flanged Bellmouths	£160.27 ea	
8 no 450mm NP16 Full face gaskets EPDM	£7.86 ea	
8 no 300mm NP16 Full face gaskets EPDM	£3.58 ea	
6 no 450mm Stud bolt set, 20 no M27 x 100 – Galv	£91 ea	
6 no 300mm Stud bolt set, 12 no M24 x 90 – Galv	£39 ea	
Alternative		
6 no 450mm Stud bolt set, 20 no M27 x 100 – Galv	£195 ea	
6 no 300mm Stud bolt set, 12 no M24 x 90 – Galv	£79 ea	
40 no M27 x 120 A2 Stud Bolt (cut to suit at site)	£7.86 ea	(approx. length – tbc)
24 no M24 x 120 A2 Stud bolt (cut to suit at site)	£5.20 ea	(approx. length – tbc)

In the event of an order we could supply the relevant WRAS certification for the Ductile pipes & fittings, Full face gaskets and VJ Maxidaptors.

Ready works complete 6- 8 working weeks

[redacted]
Sales & Technical Director

ft ductile ltd

Unit 6 B , Eastern Park, Eastern Avenue,
Lichfield
Staffs
WS13 7SY
☎ [redacted]
🖷 01543 411469
M [redacted]
www.ftductile.co.uk
www.facebook.com/ftductile

Part of the Frazer & Tabberer Group of Companies.

Ductile pipe cutting tool

We are now a distributor for exact pipe cutting tools, suitable for ductile upto 300mm
80mm-150mm machine (170E) will cut and bevel at the same time, average cut 60-90 seconds
https://www.youtube.com/watch?v=4b-_SGSwY0g

From: [redacted] <[redacted]@fliwater.com>
Sent: 22 July 2019 07:56
To: [redacted] <[redacted]@ftductile.co.uk>
Subject: RE: 20190717 Kedington - Ductile Iron Quote

Hi [redacted]
Thanks for the quote.
Please could you also quote for the parts shown on the drawing attached, apart from the SS support.
Thanks

Kind Regards,

[redacted]
Project Manager

Email [redacted]@fliwater.com
Mob +44(0)[redacted]
FLI Water Ltd
Regent House, Wolseley Road
Kempston, Bedford, MK42 7JY, UK

Office +44 (0) 1234 852 900
Web www.fliwater.com

Your Sustainable Solutions Partner

From: [redacted]@ftductile.co.uk>
Sent: 18 July 2019 16:34
To: [redacted]@fliwater.com>
Subject: RE: 20190717 Kedington - Ductile Iron Quote

Afternoon [redacted]

Thank you for your enquiry, I am well thank you.

Please find attached our spreadsheet detailing the prices you require, all prices are each, carriage to site in one consignment, consignee to unload would be £110.

We have offered Ductile Iron Flanged pipes & fittings to EN545:2010, the pipes would be cement lined and Epoxy seal coated, externally zinc alloy and Blue epoxy seal coated, the fittings would be Blue epoxy coated inside & outside, both the linings & Blue epoxy coatings would be fully WRAS approved.

Flanges EN1092: NP16 Raised face

Gate Valves Resilient Seated, WRAS approved seals & coating

Notes –
Item 908 VJ Flexlock adaptors have a Black Rilsan finish which is WRAS approved
Item 910, 927, 945 – Full face gaskets EPDM rubber, WRAS approved
Item 911 Stud bolts Galvanised
Item 912 Stud bolts Galvanised
Item 920, 922, 923, 924, 925 We have offered a Blue WRAS approved finish, there is not a Black finish that has WRAS approval.
Item 921 This item would have to be manufactured in Steel with a WRAS approved Blue coating.
Item 926 Standard Bauer's are Galvanised Steel, as an option you could have a Stainless Steel Bauer (for wetted areas only) price each £297
Delivery 10 working days, either option has WRAS approvals
Item 931 We would need to know what type of Flowmeter you require, each Water Utility has their own nominated supplier/type.
Item 940 – 942 As items 920 – 925
Item 943 As item 908

In the event of an order we could supply the relevant WRAS certification for the Ductile pipes & fittings, Valves, Full face gaskets and Flexlock adaptors,

Ready works complete 15 working days

[redacted]
Sales & Technical Director

ft ductile ltd

Unit 6 B , Eastern Park, Eastern Avenue,
Lichfield
Staffs
WS13 7SY
☎ [redacted]
🖷 01543 411469
M [redacted]
www.ftductile.co.uk
www.facebook.com/ftductile

Part of the Frazer & Tabberer Group of Companies.

Ductile pipe cutting tool

We are now a distributor for exact pipe cutting tools, suitable for ductile upto 300mm
80mm-150mm machine (170E) will cut and bevel at the same time, average cut 60-90 seconds
https://www.youtube.com/watch?v=4b-_SGSwY0g

From: [redacted]@fliwater.com>
Sent: 17 July 2019 15:35
To: [redacted]@ftductile.co.uk>
Cc: [redacted]@fliwater.com>; [redacted]@fliwater.com>
Subject: 20190717 Kedington - Ductile Iron Quote

Hi [redacted]
Hope you are well.

Please can you quote the items below together with lead times.
Also the parts on the attached drawing. Please note parts are for Potable water. Approval numbers will be required.
Thanks

Pump Room 80-PW-030-DIW Mech Install

ID	QTY	SIZE	RATING	DESCRIPTION
PIPE				
900	1	80	PN16	PIPE, DOUBLE FLANGED
901	1	80	PN16	PIPE, DOUBLE FLANGED
902	1	80	PN16	PIPE, DOUBLE FLANGED
903	1	80	PN16	PIPE, FLANGED/SPIGOT
904	1	80	PN16	PIPE, FLANGED/SPIGOT
905	1	80	PN16	PIPE, DOUBLE FLANGED
BENDS				
906	2	80	PN16	BEND 90, FLANGED, SHORT RADIUS
TEES				
907	1	80	PN16	TEE, EQUAL, FLANGED, SERIES A
FLANGES				
908	2	80	PN16	FLANGE ADAPTOR, VJ FLEXLOCK FOR DI
909	1	80	PN16	FLANGE, BLIND
GASKETS				
910	18	80	PN16	GASKET, FLAT
BOLTS				
911	14	80	PN16	STUD BOLT SET, M16 8-OFF
912	2	80	PN16	STUD BOLT SET, M16 8-OFF, EXTRA LONG

Sludge Collection 100-SL-021-DIW Mech Install

PIPE				
920	1	100	PN16	PIPE, DOUBLE FLANGED
921	1	100	PN16	PIPE, DOUBLE FLANGED (SPINNING)
922	1	100	PN16	PIPE, FLANGED/SPIGOT
923	1	100	PN16	PIPE, FLANGED/SPIGOT
BENDS				
924	3	100	PN16	BEND 90, FLANGED, SHORT RADIUS
TEES				
925	1	100	PN16	TEE, EQUAL, FLANGED, SERIES A
COUPLINGS				
926	1	100	PN16	BAUER CONNECTOR, FLANGED, MALE

GASKETS				
927	11	100	PN16	GASKET, FLAT
BOLTS				
928	11	100	PN16	STUD BOLT SET, M16 8-OFF
VALVES				
929	1	100	PN16	GATE VALVE, FLANGED, HANDWHEEL
930	1	100	PN16	ECC PLUG VALVE, FLANGED, LEVER
931	1	100	PN16	FLOW METER

Supernatant Return 80-NP-068-DIW Mech Install

PIPE				
940	1	80	PN16	PIPE, FLANGED/SPIGOT
941	1	80	PN16	PIPE, DOUBLE SPIGOT
TEES				
942	1	100	PN16	TEE, EQUAL, FLANGED, SERIES A
FLANGES				
943	3	80	PN16	FLANGE ADAPTOR, VJ FLEXLOCK FOR DI
944	1	80	PN16	FLANGE, BLIND c/w 2" BSPF THD BOSS
GASKETS				
945	4	80	PN16	GASKET, FLAT
BOLTS				
946	4	80	PN16	STUD BOLT SET, M16 8-OFF

Kind Regards,

[redacted]
Project Manager

Email [redacted]@fliwater.com
Mob +44(0)[redacted]
FLI Water Ltd
Regent House, Wolseley Road
Kempston, Bedford, MK42 7JY, UK

Office +44 (0) 1234 852 900
Web www.fliwater.com

Your Sustainable Solutions Partner

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2409694. Registered Office: FLI Water Ltd, Regent House, Wolseley Road, Kempston,
Bedford, MK42 7JY. Vat Number 856480594.

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Bedford, MK42 7JY. Vat Number 856480594.

OUR ORDER - HIGHLIGHTING NEED FOR REG 31 COMPLIANCE

FLI water

FLI USE
NOMINAL CODE
6085

PURCHASE ORDER

IMPORTANT

Please ensure that your Delivery Note contains our Purchase Order Number in a clear and prominent position. Thank you.

FLI Water Limited
Regent House
Wolseley Road
Kempston, Bedford
MK42 7JY

Tel: +44 (0)1234 852900
Fax: +44 (0)1234 304010
Web: www.fliwater.com
e-mail: accountsbedford@fliwater.com

Company Registration Number: 02409694
VAT Number: 212 1958 32

PURCHASE ORDER NO
40691 - 16473 - 00 - EN

SUPPLIER
FT Ductile
6b Eastern Park Eastern Ave
Lichfield
Staffs
WS13 7SY

DELIVER TO:
FLI WATER
C/O @One Alliance
Kedington WTW
Haverhill Road
Haverhill
CB9 7TD
(If you put Blunts Corner, Haverhill in google maps that will get you to within yards of site entrance)

ORDER DATE
1 August 2019

DATE REQUIRED
19 August 2019

ENQUIRIES TO:
[redacted]

Good supplied under this order must comply with Regulation 31 of The Water Supply (Water Quality) Regulations 2000 (as Amended)	Required	Yes
Material / Goods Certificates of conformity required with this order	Required	Yes

Please supply the following items, subject to our terms and conditions [Attached]

ITEM	PART NUMBER	DESCRIPTION	UNIT COST	QUANTITY	DISCOUNT	TOTAL COST
1		**Pump Room 80-PW-030-DIW Mech Install**				-
2		80mm PN16 pipe, double flanged x 700 long	98.81	1		98.81
3		80mm PN16 pipe, double flanged x 350 long	43.11	1		43.11
4		80mm PN16 pipe, double flanged x 150 long	30.59	1		30.59
5		80mm PN16 pipe, flanged/spigot x 230 long	54.34	1		54.34
6		80mm PN16 pipe, flanged/spigot x 158 long	54.34	1		54.34
7		80mm PN16 pipe, double flanged x 150 long	30.59	1		30.59
8		80mm PN16 90 bend, flanged short radius	33.06	2		66.12
9		80mm PN16 equal tee, flanged series A	50.84	1		50.84
10		80mm PN16 flange adapter, VJ flexlock for DI	69.41	2		138.82
					Sub-total this sheet	567.56
					Sub-total continuation sheets	12,989.78
					TOTAL ORDER VALUE	**13,557.34**
					CURRENCY	0

COMMENTS

One off Supplier?
0

Authorised Initials by: _____

Authorised Signature by: [redacted]

FLI USE
NOMINAL CODE
6085

PURCHASE ORDER

IMPORTANT

Please ensure that your Delivery Note contains our Purchase Order Number in a clear and prominent position. Thank you.

FLI Water Limited
Regent House
Wolseley Road
Kempston, Bedford
MK42 7JY

Tel: +44 (0)1234 852900
Fax: +44 (0)1234 304010
Web: www.fliwater.com
e-mail: accountsbedford@fliwater.com

Company Registration Number: 02409694
VAT Number: 212 1958 32

PURCHASE ORDER NO

40691 - 16473 - 00 - EN

ITEM	PART NUMBER	DESCRIPTION	UNIT COST	QUANTITY	DISCOUNT	TOTAL COST
11		80mm PN16 flange, blind	12.95	1		12.95
12		80mm EPDM gasket	1.06	18		19.08
13		80mm PN16 stud bolt set, M16 x 70 8 off	9.86	14		138.04
14		80mm PN16 stud bolt set, M16x 140 extra long 8 off	17.92	2		35.84
15		**Sludge Collection 100-SL-021-DIW Mech Install**				-
16		100mm PN16 Pipe double flanged x 1000 long	122.34	1		122.34
17		100mm PN16 Pipe double flanged (Spinning) STEEL x 393 long	257.64	1		257.64
18		100mm PN16 pipe flanged / spigot x 3650 long	171.72	1		171.72
19		100mm PN16 pipe flanged / spigot x 391 long	67.58	1		67.58
20		100mm PN16 90 bend, flanged, short radius	43.48	3		130.44
21		100mm PN16 equal tee, flanged, series A	62.92	1		62.92
22		100mm PN16 Bauer connector, flanged, stainless steel	79.56	1		79.56
23		100mm EPDM gasket	1.34	11		14.74
24		10mm PN16 stud bolt set, M16 8 off	9.86	11		108.46
25		Supernatant Return 80-NP-068-DIW Mech Install				-
26		80mm PN16 pipe flanged spigot x 560 long	67.54	1		67.54
27		80mm PN16 pipe doublespigot x 513 long	32.98	1		32.98
28		100mm PN16 equal tee, flanged series A	62.92	1		62.92
29		80mm PN16 equal tee, flanged series A	62.92	1		62.92
30		80mm PN16 flange adapter, VJ flexlock for DI	69.41	3		208.23
31		80mm EPDM gasket	15.46	4		61.84
32		80mm PN16 flange , blind c/w 2" bspf thread boss	1.06	1		1.06
33		80mm PN16 stud bolt set, M16 x 70 8 off	9.86	4		39.44
34		**Contact & Balance Tanks**				-
35		450mm pipe double flanged x 720 long - Blue	839.46	2		1,678.92
36		450mm pipe flanged spigot x 250 long - Blue	440.88	2		881.76
37		300mm pipe flanged spigot x 1950 long - Blue	301.59	2		603.18
38		300mm pipe double flanged x 594 long - Blue	307.37	2		614.74
39		450mm 90 bend, flanged short radius duckfoot	1,488.76	2		2,977.52

FLI water

FLI USE NOMINAL CODE
6085

PURCHASE ORDER

IMPORTANT

Please ensure that your Delivery Note contains our Purchase Order Number in a clear and prominent position. Thank you.

FLI Water Limited
Regent House
Wolseley Road
Kempston, Bedford
MK42 7JY

Tel: +44 (0)1234 852900
Fax: +44 (0)1234 304010
Web: www.fliwater.com
e-mail: accountsbedford@fliwater.com

Company Registration Number: 02409694
VAT Number: 212 1958 32

PURCHASE ORDER NO			
40691	- 16473	- 00	- EN

40		300mm 90 bend, flanged short radius duckfoot	457.38	2		914.76
41		450mm flange adapter, VJ Maxidapter for DI	489.15	2		978.30
42		300mm flange adapter, VJ Maxidapter for DI	83.06	2		166.12
43		450mm bellmouth, flanged	392.49	2		784.98
44		300mm bellmouth, flanged	160.27	2		320.54
45		450mm EPDM gasket	7.86	8		62.88
46		300mm EPDM gasket	3.58	8		28.64
47		450mm stud bolt sets. M27x100mm long. 20 off	91.00	6		546.00
48		300mm stud bolt sets. M24x90mm long. 12 off	39.00	6		234.00
49		450mm stud bolt set. M27 cut to suit wall coupling. 20 off	7.86	40		314.40
50		300mm stud bolt set. M24 cut to suit wall coupling. 12 off	5.20	24		124.80

SUB TOTAL SHEETS VALUE	12,989.78
CURRENCY	0

FLI USE
NOMINAL CODE
6085

PURCHASE ORDER

IMPORTANT

Please ensure that your Delivery Note contains our Purchase Order Number in a clear and prominent position. Thank you.

FLI Water Limited
Regent House
Wolseley Road
Kempston, Bedford
MK42 7JY

Tel: +44 (0)1234 852900
Fax: +44 (0)1234 304010
Web: www.fliwater.com
e-mail: accountsbedford@fliwater.com

Company Registration Number: 02409694
VAT Number: 212 1958 32

PURCHASE ORDER NO			
40691	- 16473	- 00	- EN

STANDARD CONDITIONS OF ORDER

1. These conditions are hereby incorporated into and form part of the contract between the Supplier (to whom this order is addressed) and the Company (FLI Water Limited) and shall prevail over any inconsistent terms and conditions contained in or referred to in the supplier's quotation, the supplier's acceptance of this order or contained in any other correspondence between the parties hereto; and insofar as these Standard Conditions are expressly amended on the face of this order and such amendment is initialed
2. The material or goods supplied shall be to the reasonable satisfaction of the Company and/or Architect, Engineer or Employer.

3. (a) The Supplier shall make good by replacement or otherwise at the Company's discretion any defective materials, goods or equipment supplied. The Supplier shall also pay to the company any loss or damage it may suffer as a result of the supply of any such defective materials, goods or equipment and the necessary replacement thereof.
(b) The Supplier shall be liable to the Company for and/or will indemnify it against all loss and damage whatsoever caused to or sustained by the Company (including loss of profit by the Company) and including any liability incurred under any contract between the Company and any other person by reason of any breach by the Supplier of any term, condition or warranty of this contract and whether express or implied.

(c) i Property in the Goods shall pass to the Company as soon as they are in a deliverable state and have been appropriated to the Contract with the assent of the Company. Such assent shall be deemed to have been given as soon as the goods have been appropriated to the Contract.
(c) ii Risk in the Goods shall pass to the Company only when they have been delivered to the destination stated in the order.

(d) Acceptance of delivery of the materials, goods or equipment by the Company will not absolve the Supplier from any liability which may arise if such materials, goods or equipment are subsequently found to be defective whether or not such defective
4. The delivery of the materials or goods supplied shall be commenced and completed at such times and on such dates as given on the attached order. The delivery times or dates may be altered or amended by the Company if it so desires, provided that such alterations and/or amendments are reasonable. Such delivery times and/or dates and any alterations or amendments thereto shall be adhered to be the Supplier. Time is of the essence.
5. The signature on behalf of the Company upon any delivery order or other equipment document shall only signify acceptance of delivery of the relevant goods, materials or equipment. Such signature shall not signify acceptance of any of the Supplier's terms set out on such delivery order or document.
6. The prices on this order are firm and fixed unless otherwise indicated on the front of this order.

7. Any costs incurred by strike action affecting the Supplier will be the responsibility of the Supplier.

8. In the event of any dispute arising as to the quantity of material supplied, then the quantity will be determined by the method of measurement stated within the contract.

9. Should the Supplier fail to supply materials, goods or equipment in accordance with the terms and conditions of this order either with regard to time of delivery or quality the Company (in addition to any of its other rights) reserves the right to cancel this order in whole or in part at its sole discretion. In the event of any such cancellation the Supplier shall have no right to reimbursement in respect of any damages it may suffer as a result thereof.
10. The Supplier must comply with all statutory regulations which are to be complied with on part of any Supplier in respect of the materials, goods or equipment supplied and he is to inform the Company in writing prior to the delivery of any said goods, materials or equipment of any statutory regulations with which the Company must comply either as the storer of or the installer of any such goods, materials or equipment. Where any such goods, materials or equipment could constitute any risk to the health
11. The Supplier shall ensure that all persons delivering goods, materials or equipment to the site are in possession at all times of safety boots, a helmet and any other relevant personal protection equipment and that all such persons utilize such equipment
12. Payment Terms are 45 days from the end of the month following the of receipt of invoice.
13. The supplier / contractor must ensure they adhere to the Modern Slavery Act of 2015. Failure to comply with this law could result in the purchase order being terminated

ADDITIONAL TERMS AND CONDITIONS OF OPERATED PLANT HIRE AND LABOUR SUPPLY

1. These terms override any CPA or customer terms of trade relating to charges for operated plant and labour supply.
2. Any signature on timesheets or otherwise, obtained from Site Manager will not bind the Company to any deviation from the terms contained in this document. Site signatures are purely for recording hours and agreeing work was undertaken in a satisfactory
3. Agreed hourly rates will be applied at a standard rate between 7:00 – 19:00 on normal working days, and between 7:00 - 13:00 on a Saturday. Any time worked outside these hours may be chargeable at overtime rates, if specifically agreed.
4. Any deviation from the original rates and terms must be agreed, in writing with the Head Office. This includes any agreement to site bonuses.
Please note the requirements on the front of this order. Failure to comply with these conditions will result in the plant / operative being declined work and payments to be withheld. Also any insurance claims for damage to plant will be invalidated by the lack of

Supplier Invoice

ft ductile ltd

RECEIVED 04 SEP 2019

6B Eastern Park
Eastern Ave
Lichfield, Staffordshire
WS13 7SY

Telephone: 01543 416894
Facsimile: 01543 416261
VAT Reg: GB 936 2673 04

Invoice Address

F.L.I. Water Ltd
Unit 4 , Lyon Close
Woburn Road Industrial Estate
Bedford

MK42 7SB

Delivery Address

FLI WATER
c/o @ Alliance One
Kedlington WTW
Haverhill Road
Haverhill
CB9 7TD

SALES INVOICE

Invoice No.	INV21039	**Invoice Date**	30/08/2019
Sales Order No.	ORD19695	**Payment Due Date**	29/09/2019
Delivery Note	DOC20498	**Account No.**	FLIWATER
Internal Track No.	DEL21400	**Customer Order No.**	40691-16473-00-EN

Description	Quantity	Unit Price	Total	V
pump room 80-pw-030 DIW mech ins				
80mm x 700mm d/flange pipe en545	1.00	98.81	98.81	1
80 d/flanged cast pipe x 350 en545	1.00	43.11	43.11	1
80 d/flanged cast pipe x150 en545	1.00	30.59	30.59	1
80mm x 230mm flange spigot x 230mm long en545	1.00	54.34	54.34	1
80mm flange spigot x 158mm long en545	1.00	54.34	54.34	1
80 d/flanged cast pipe x150 en545	1.00	30.59	30.59	1
80 x 90 double flanged sr bend en545	2.00	33.06	66.12	1
80 all flanged tee en545	1.00	50.84	50.84	1
98mm VJ flexlock flange adaptor NP16	2.00	69.41	138.82	1
80 blank flange en545	1.00	12.95	12.95	1
80mm EPDM full face gaskets np16	18.00	1.06	19.08	1
80/100 galvn bolt joint set 8xm16x70	14.00	9.86	138.04	1
m16 x 140 galvn bolt set 8 off M16 x 140 bolt/nut/2 washer per set	2.00	17.92	35.84	1
sludge collection 100-SL-021 DIW mech				

Bank Name: HSBC
Sort Code: 40-11-18
Account No: 64492803
BIC: HBUKGB4B

GBP

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Eastern Ave
Lichfield, Staffordshire
WS13 7SY

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Invoice Address

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Bedford

MK42 7SB

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SALES INVOICE

CONTINUATION PAGE 2

Invoice No.	INV21039	**Invoice Date**	30/08/2019
Sales Order No.	ORD19695	**Payment Due Date**	29/09/2019
Delivery Note	DOC20498	**Account No.**	FLIWATER
Internal Track No.	DEL21400	**Customer Order No.**	40691-16473-00-EN

Description	Quantity	Unit Price	Total	V
100mm x 1000mm double flange pipe en545	1.00	122.34	122.34	1
100mm double flange pipe x 393mm steel special with spining flanges	1.00	257.64	257.64	1
100mm x 3650mm d/flange pipe en545	1.00	171.72	171.72	1
100mm x 391mm d/flange pipe en545	1.00	67.58	67.58	1
100 x 90 double flanged sr bend en545	3.00	43.48	130.44	1
100 all flanged tee en545	1.00	62.92	62.92	1
100mm flanged male bauer coupling	1.00	79.56	79.56	1
100mm EPDM full face gaskets np16	11.00	1.34	14.74	1
80/100 galvn bolt joint set 8xm16x70	11.00	9.86	108.46	1
supernatant return 80-NP-068 DiW mech				
80mm flange spigot x 560mm en545	1.00	67.54	67.54	1
80mm x 513mm d/spigot en545	1.00	32.98	32.98	1
100 all flanged tee en545	1.00	62.92	62.92	1
80 all flanged tee en545	1.00	62.92	62.92	1
98mm VJ flexlock flange adaptor NP16	3.00	69.41	208.23	1
80mm EPDM full face gaskets np16	4.00	1.06	4.24	1

Bank Name: HSBC
Sort Code: 40-11-18
Account No: 64492803
BIC: HBUKGB4B

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RECEIVED 04 SEP 2019

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Invoice No.	INV21039	**Invoice Date**	30/08/2019
Sales Order No.	ORD19695	**Payment Due Date**	29/09/2019
Delivery Note	DOC20498	**Account No.**	FLIWATER
Internal Track No.	DEL21400	**Customer Order No.**	40691-16473-00-EN

Description	Quantity	Unit Price	Total	V
80 Blank flanged Tapped 2"BSP en545	1.00	15.46	15.46	1
80/100 galvn bolt joint set 8xm16x70	4.00	9.86	39.44	1
contact & Balance tanks				
450mm x 720mm d/flange pipe en545	2.00	839.46	1678.92	1
450mm x 250mm long flange spigot en545	2.00	440.88	881.76	1
300mm x 1950mm flange spigot en545	2.00	301.59	603.18	1
300mm x 594mm double flange pipe en545	2.00	307.37	614.74	1
450x90 d/ flanged duckfoot bend en545	2.00	1488.76	2977.52	1
300x90 d/ flanged duckfoot bend en545	2.00	457.38	914.76	1
450mm VJ Maxidaptor (455-472) NP16	2.00	489.15	978.30	1
300MM VJ MAXIDAPTORS NP16 315-349	2.00	83.06	166.12	1
450 flanged bellmouth en545	2.00	392.49	784.98	1
300 flanged bellmouth en598	2.00	160.27	320.54	1
450mm EPDM full face gaskets np16	8.00	7.86	62.88	1
300mm EPDM full face gaskets np16	8.00	3.58	28.64	1
450 galvn bolt set 20 No m27x100	6.00	91.00	546.00	1
300 galvn bolt set 12 No m24x90	6.00	39.00	234.00	1

Bank Name: HSBC
Sort Code: 40-11-18
Account No: 64492803
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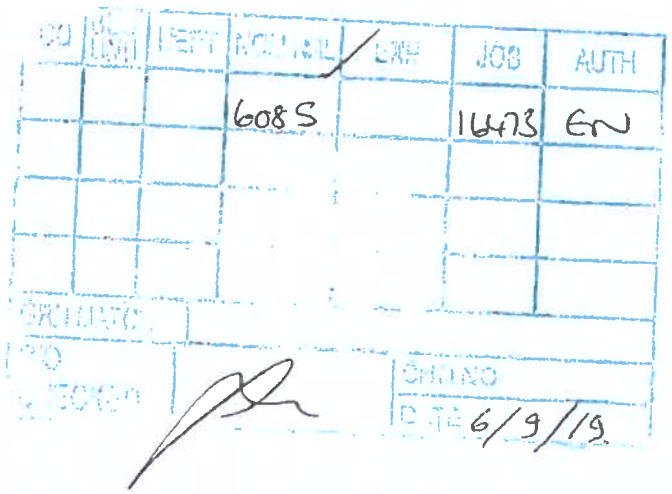
SALES INVOICE

CONTINUATION PAGE 4

Invoice No.	INV21039	**Invoice Date**	30/08/2019
Sales Order No.	ORD19695	**Payment Due Date**	29/09/2019
Delivery Note	DOC20498	**Account No.**	FLIWATER
Internal Track No.	DEL21400	**Customer Order No.**	40691-16473-00-EN

Description	Quantity	Unit Price	Total	V
m27 x 120 s/steel A2 stud bolt	40.00	7.86	314.40	1
M24 x 120 s/steel A2 stud bolt	24.00	5.20	124.80	1



VAT Analysis

Code	Goods	Rate	VAT
1	13514.14	20.00	2702.84

Bank Name: HSBC
Sort Code: 40-11-18
Account No: 64492803
BIC: HBUKGB4B

Total Goods	13514.14
Total VAT	2702.84
Total Due	16216.98

GBP

IN DRAWING (@ ONE)

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uPVC & ABS NOTES

1. ALL PIPING & FITTINGS FROM uPVC UNLESS STATED OTHERWISE.
2. PIPING TO BE SUPPORTED AT OR NEAR VALVES, ELBOWS AND TEES.
3. STRAIGHT LENGTHS TO BE SUPPORTED AT *SEE CHART* CENTRES. (MAX).
4. PIPING TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS USING APPROVED SOLVENT CEMENT.
5. EPDM FULL FACE CLOTH FINISH GASKETS TO BE USED AS STANDARD BETWEEN ALL FLANGES. 3mm TO BE ALLOWED FOR INSTALLED THICKNESS.
6. ALL NUTS & BOLTS TO BE IN ACCORDANCE WITH ISO 272; ISO 4759/1 OR EQUIVALENT, AND GALVANISED TO BS 7371 PART 6. WASHERS ARE TO BE IN ACCORDANCE WITH BS4320:1968 & GALVANISED TO BS 7371 PART 6.

SUPPORT CENTRES			
SIZE (in)	SIZE (mm)	uPVC@20°	ABS@20°
¼"	12	700	800
⅜"	16	700	800
½"	20	800	900
¾"	25	900	1000
1"	32	1000	1100
1 ¼"	40	1100	1100
1 ½"	50	1200	1200
2"	63	1400	1400
2 ½"	75	1500	1600
3"	90	1600	1700
4"	110	1800	1900
–	125	2000	1900
5"	140	2100	2000
6"	160	2200	2100
–	200	2500	2500
8"	225	2500	2500

DUCTILE IRON NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS STATED OTHERWISE.
2. ALL LEVELS IN METRES UNLESS STATED OTHERWISE.
3. LINEAR DIMENSIONAL TOLERANCES TO BE AS SHOWN BELOW. TOLERANCES MUST NOT BE ACCUMULATIVE.

LINEAR DIMENSION	TOLERANCE
0–500mm	± 1mm
500–2000mm	± 2mm
2000mm AND OVER	± 3mm

4. ANGULAR TOLERANCES TO BE ± 1°.
5. DUCTILE IRON PIPING & FITTINGS TO EN545 SERIES A.
6. FLANGES TO BE DIMENSIONED AND DRILLED TO BS4504 NP16.
7. UNLESS OTHERWISE STATED,THE COATINGS FOR PIPES WILL BE
   EXTERNAL: ZINC & FINISH COAT (BITUMIN OR EPOXY). INTERNAL: CEMENT MORTAR LINED (OPC). PIPE ENDS: EXTERNAL SURFACES OF SPIGOTS – ZINC & FINISH COAT (BITUMEN OR EPOXY), & INTERNAL SURFACES OF SOCKETS & FLANGE FACES – FINISH COAT (BITUMEN OR EPOXY)
8. UNLESS OTHERWISE STATED, THE COATINGS FOR FITTINGS WILL BE
   EXTERNAL: FINISH COAT (BITUMIN OR EPOXY). INTERNAL: FINISH COAT (BITUMIN OR EPOXY).
10. FLANGE ADAPTORS & COUPLINGS TO BE TIED, UNLESS STATED OTHERWISE, USING SCREWED ROD CUT FROM 1m LENGTHS.
11. EPDM FULL FACE CLOTH FINISHED GASKETS TO BE USED AS STANDARD BETWEEN ALL FLANGES. 3mm TO BE ALLOWED FOR INSTALLED THICKNESS.
12. ALL NUTS, BOLTS & THREADED BAR TO BE IN ACCORDANCE WITH ISO 272; ISO 4759/1 EQUIVALENT, & GALVANISED TO BS 7371–6–1998. WASHERS ARE TO BE IN ACCORDANCE WITH BS4320 1968 & GALVANISED TO BS 7371–6:1998. ALL CUT TIE BAR ENDS TO BE PROTECTED WITH GALVAFROID OR SIMILAR ZINC RICH PAINT, IMMEDIATELY AFTER CUTTING.
13. SPOOLS MUST BE TAGGED WITH THE DRAWING NUMBER & RELEVANT ITEM NUMBER WITH METAL TAGS WIRED TO FLANGES. SPOOLS WITHOUT FLANGES MUST HAVE THE NUMBERS PRINTED ON PIPE USING INDELIBLE PAINT.
14. PIPEWORK SHALL BE INSTALLED AS INDICATED. ANY DISCREPANCIES MUST BE REPORTED TO THE DRAWING OFFICE.
15. UNDERGROUND PIPES AND FITTINGS SHALL HAVE A BLACK EXTERNAL FINISH UNLESS OTHERWISE STATED.

STAINLESS STEEL NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS STATED OTHERWISE.
2. ALL LEVELS IN METRES UNLESS STATED OTHERWISE.
3. LINEAR DIMENSIONAL TOLERANCES TO BE AS SHOWN BELOW. TOLERANCES MUST NOT BE ACCUMULATIVE.

LINEAR DIMENSION	TOLERANCE
0–500mm	± 1mm
500–2000mm	± 2mm
2000mm AND OVER	± 3mm

4. ANGULAR TOLERANCES TO BE ± 1°.
5. SPIGOT END CONCENTRICITY TOLERANCES TO BE ± 1.6mm FOR A LENGTH OF 125mm TO SUIT COUPLINGS.
6. MATERIAL TO BE STAINLESS STEEL TRU–BORE TUBE, GRADE AISI 316, UNLESS STATED OTHERWISE.
7. FLANGES TO BE ACCORDING TO BS EN 1092 PART 1 2007, TABLE 13, TYPE 37, TYPE A FLAT FACE UNLESS STATED OTHERWISE & TYPE 5 FOR BLANK FLANGES.
8. BACKING FLANGES TO BE FINISHED WITH 100% SOLIDS THERMOSETTING FUSION BONDED EPOXY RESIN SCOTCHKOTE 206N APPLIED BY FLUIDISED BED METHOD. MINIMUM DRY THICKNESS 300 MICRONS.
9. WELDING OF FABRICATED PIPEWORK SHALL BE TO BS 4677 : 1984 WITH THE FOLLOWING INCLUSIONS.

WORKING PRESSURE	
UP TO 24 Bar	10% DYE PENETRANT (IN LIEU OF RADIOGRAPHY)
24 Bar AND OVER	10% RADIOGRAPHY AS BS4677:1984

10. FLANGE ADAPTORS & COUPLINGS TO BE TIED, UNLESS STATED OTHERWISE, USING SCREWED ROD CUT FROM 1m LENGTHS, FIXED THROUGH LUGS OR BACKING RINGS WELDED TO PIPE.
11. EPDM FULL FACE CLOTH FINISHED GASKETS TO BE USED AS STANDARD BETWEEN ALL FLANGES. 3mm TO BE ALLOWED FOR INSTALLED THICKNESS.
12. ALL NUTS, BOLTS & THREADED BAR TO BE IN ACCORDANCE WITH ISO 272; ISO 4759/1 EQUIVALENT, A& GALVANISED TO BS 7371–6 – 1998. WASHERS ARE TO BE IN ACCORDANCE WITH BS4320 1968 & GALVANISED TO BS 7371–6 : 1998. ALL CUT TIE BAR ENDS TO BE PROTECTED WITH GALVAFROID OR SIMILAR ZINC RICH PAINT, IMMEDIATELY AFTER CUTTING.
13. A WASHER MUST BE USED UNDER EACH COATED FLANGE BOLT HEAD AND NUT.
14. SPOOLS MUST BE TAGGED WITH THE DRAWING NUMBER & RELEVANT ITEM NUMBER WITH METAL TAGS WIRED TO FLANGES. SPOOLS WITHOUT FLANGES MUST HAVE THE NUMBERS PRINTED ON PIPE USING INDELIBLE PAINT.
15. PIPEWORK SHALL BE INSTALLED AS INDICATED.

@one ALLIANCE
FOR CONSTRUCTION

CARBON STEEL NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS STATED OTHERWISE.
2. ALL LEVELS IN METRES UNLESS STATED OTHERWISE.
3. LINEAR DIMENSIONAL TOLERANCES TO BE AS SHOWN BELOW. TOLERANCES MUST NOT BE ACCUMULATIVE.

LINEAR DIMENSION	TOLERANCE
0–500mm	± 1mm
500–2000mm	± 2mm
2000mm AND OVER	± 3mm

4. ANGULAR TOLERANCES TO BE ± 1°.
5. SPIGOT END CONCENTRICITY TOLERANCES TO BE ± 1.6mm FOR A LENGTH OF 125mm TO SUIT COUPLINGS.
6. MATERIAL TO BE CARBON STEEL PIPES TO API 5L GRADE B (OR EQUIVALENT). WALL THICKNESS TO BS534, HFS, ERW OR SAW
7. FLANGES TO BE ACCORDING TO BS EN 1092 PART 1 2007, TABLE 13, TYPE 1, TYPE B RAISED FACE UNLESS STATED OTHERWISE & TYPE 5 FOR BLANK FLANGES.
8. CARBON STEEL PIPEWORK TO BE FINISHED INTERNALLY & EXTERNALLY WITH 100% SOLIDS THERMOSETTING FUSION BONDED EPOXY RESIN SCOTCHKOTE 206N APPLIED BY FLUIDISED BED METHOD. MINIMUM DRY THICKNESS 300 MICRONS.
9. WELDING OF FABRICATED PIPEWORK SHALL BE AS FOLLOWS

WORKING PRESSURE	
UP TO 24 Bar	CLASS II TO BS2971 : 1991
24 Bar AND OVER	CLASS I TO BS2633 : 1987

10. FULL PENETRATION SEAM WELDS TO PIPEWORK SHALL HAVE EXTERNAL FACE GROUND FLUSH AT SPIGOT ENDS FOR INSTALLATION OF COUPLINGS AND FLANGE ADAPTORS FOR A LENGTH OF 150mm (<600ø) AND 200mm (>600ø).
11. BUTT WELD FITTINGS, WHERE USED, TO BS1640 PART 3 & 4 1966 OR EQUIVALENT
12. FLANGE ADAPTORS & COUPLINGS TO BE TIED, UNLESS STATED OTHERWISE, USING SCREWED ROD CUT FROM 1m LENGTHS, FIXED THROUGH LUGS OR BACKING RINGS WELDED TO PIPE.
13. EPDM FULL FACE CLOTH FINISHED GASKETS TO BE USED AS STANDARD BETWEEN ALL FLANGES. 3mm TO BE ALLOWED FOR INSTALLED THICKNESS.
14. ALL NUTS, BOLTS & THREADED BAR TO BE IN ACCORDANCE WITH ISO 272; ISO 4759/1 EQUIVALENT, & GALVANISED TO BS 7371–6 1998. WASHERS ARE TO BE IN ACCORDANCE WITH BS4320 1968 & GALVANISED TO BS 7371–6 : 1998. ANY CUT TIE BAR ENDS TO BE PROTECTED WITH GALVAFROID OR SIMILAR ZINC RICH PAINT, IMMEDIATELY AFTER CUTTING.
15. A WASHER MUST BE USED UNDER EACH COATED FLANGE BOLT HEAD AND NUT.
16. SPOOLS MUST BE TAGGED WITH THE DRAWING NUMBER & RELEVANT ITEM NUMBER WITH METAL TAGS WIRED TO FLANGES. SPOOLS WITHOUT FLANGES MUST HAVE THE NUMBERS PRINTED ON PIPE USING INDELIBLE PAINT.
17. PIPEWORK SHALL BE INSTALLED AS INDICATED.

ALL DISCREPANCIES MUST BE REPORTED TO THE DRAWING OFFICE

REV	DATE	DETAILS			
1	25.04.18	ISSUED FOR CONSTRUCTION	C STAT	ML CHK	ML APP

REFERENCED DRAWINGS:

"This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but the position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The exact position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or drain or disposal main or any item of apparatus. This information is valid for the date printed. The plan is produced by Anglian Water Services Limited, from Ordnance Survey Crown Copyright, WU 299462. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other use of the map data or further copies are not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

anglianwater @one
Thorpe Wood House, Thorpe Wood, Peterborough, Cambs. PE3 6WT
Tel: 01733 414100 Fax: 01733 414111

PROJECT TITLE: GREAT WRATTING WTW

DRAWING TITLE: MATERIAL NOTES

DES'D: STD	DATE: 03.02.11	DRAWN: STD	DATE: 03.02.11	CHK'D: STD	DATE: 03.02.11	APP'D: STD	DATE: 03.02.11	A3	SCALE: NTS

DRAWING No. WAT–06742–GWRAWW–SS–DET–5990 –

REV. 1 | STAT. C

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uPVC & ABS NOTES

1. ALL PIPING & FITTINGS FROM uPVC UNLESS STATED OTHERWISE.
2. PIPING TO BE SUPPORTED AT OR NEAR VALVES, ELBOWS AND TEES.
3. STRAIGHT LENGTHS TO BE SUPPORTED AT *SEE CHART* CENTRES. (MAX).
4. PIPING TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS USING APPROVED SOLVENT CEMENT.
5. EPDM FULL FACE CLOTH FINISH GASKETS TO BE USED AS STANDARD BETWEEN ALL FLANGES. 3mm TO BE ALLOWED FOR INSTALLED THICKNESS.
6. ALL NUTS & BOLTS TO BE IN ACCORDANCE WITH ISO 272; ISO 4759/1 OR EQUIVALENT, AND GALVANISED TO BS 7371 PART 6. WASHERS ARE TO BE IN ACCORDANCE WITH BS4320:1968 & GALVANISED TO BS 7371 PART 6.

SUPPORT CENTRES			
SIZE (in)	SIZE (mm)	uPVC@20°	ABS@20°
¼"	12	700	800
⅜"	16	700	800
½"	20	800	900
¾"	25	900	1000
1"	32	1000	1100
1 ¼"	40	1100	1100
1 ½"	50	1200	1200
2"	63	1400	1400
2 ½"	75	1500	1600
3"	90	1600	1700
4"	110	1800	1900
–	125	2000	1900
5"	140	2100	2000
6"	160	2200	2100
–	200	2500	2500
8"	225	2500	2500

DUCTILE IRON NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS STATED OTHERWISE.
2. ALL LEVELS IN METRES UNLESS STATED OTHERWISE.
3. LINEAR DIMENSIONAL TOLERANCES TO BE AS SHOWN BELOW. TOLERANCES MUST NOT BE ACCUMULATIVE.

LINEAR DIMENSION	TOLERANCE
0–500mm	± 1mm
500–2000mm	± 2mm
2000mm AND OVER	± 3mm

4. ANGULAR TOLERANCES TO BE ± 1°.
5. DUCTILE IRON PIPING & FITTINGS TO EN545 SERIES A.
6. FLANGES TO BE DIMENSIONED AND DRILLED TO BS4504 NP16.
7. UNLESS OTHERWISE STATED,THE COATINGS FOR PIPES WILL BE
   EXTERNAL: ZINC & FINISH COAT (BITUMIN OR EPOXY). INTERNAL: CEMENT MORTAR LINED (OPC). PIPE ENDS: EXTERNAL SURFACES OF SPIGOTS – ZINC & FINISH COAT (BITUMEN OR EPOXY), & INTERNAL SURFACES OF SOCKETS & FLANGE FACES – FINISH COAT (BITUMEN OR EPOXY)
8. UNLESS OTHERWISE STATED, THE COATINGS FOR FITTINGS WILL BE
   EXTERNAL: FINISH COAT (BITUMIN OR EPOXY). INTERNAL: FINISH COAT (BITUMIN OR EPOXY).
10. FLANGE ADAPTORS & COUPLINGS TO BE TIED, UNLESS STATED OTHERWISE, USING SCREWED ROD CUT FROM 1m LENGTHS.
11. EPDM FULL FACE CLOTH FINISHED GASKETS TO BE USED AS STANDARD BETWEEN ALL FLANGES. 3mm TO BE ALLOWED FOR INSTALLED THICKNESS.
12. ALL NUTS, BOLTS & THREADED BAR TO BE IN ACCORDANCE WITH ISO 272; ISO 4759/1 EQUIVALENT, & GALVANISED TO BS 7371–6–1998. WASHERS ARE TO BE IN ACCORDANCE WITH BS4320 1968 & GALVANISED TO BS 7371–6:1998. ALL CUT TIE BAR ENDS TO BE PROTECTED WITH GALVAFROID OR SIMILAR ZINC RICH PAINT, IMMEDIATELY AFTER CUTTING.
13. SPOOLS MUST BE TAGGED WITH THE DRAWING NUMBER & RELEVANT ITEM NUMBER WITH METAL TAGS WIRED TO FLANGES. SPOOLS WITHOUT FLANGES MUST HAVE THE NUMBERS PRINTED ON PIPE USING INDELIBLE PAINT.
14. PIPEWORK SHALL BE INSTALLED AS INDICATED. ANY DISCREPANCIES MUST BE REPORTED TO THE DRAWING OFFICE.
15. UNDERGROUND PIPES AND FITTINGS SHALL HAVE A BLACK EXTERNAL FINISH UNLESS OTHERWISE STATED.

STAINLESS STEEL NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS STATED OTHERWISE.
2. ALL LEVELS IN METRES UNLESS STATED OTHERWISE.
3. LINEAR DIMENSIONAL TOLERANCES TO BE AS SHOWN BELOW. TOLERANCES MUST NOT BE ACCUMULATIVE.

LINEAR DIMENSION	TOLERANCE
0–500mm	± 1mm
500–2000mm	± 2mm
2000mm AND OVER	± 3mm

4. ANGULAR TOLERANCES TO BE ± 1°.
5. SPIGOT END CONCENTRICITY TOLERANCES TO BE ± 1.6mm FOR A LENGTH OF 125mm TO SUIT COUPLINGS.
6. MATERIAL TO BE STAINLESS STEEL TRU–BORE TUBE, GRADE AISI 316, UNLESS STATED OTHERWISE.
7. FLANGES TO BE ACCORDING TO BS EN 1092 PART 1 2007, TABLE 13, TYPE 37, TYPE A FLAT FACE UNLESS STATED OTHERWISE & TYPE 5 FOR BLANK FLANGES.
8. BACKING FLANGES TO BE FINISHED WITH 100% SOLIDS THERMOSETTING FUSION BONDED EPOXY RESIN SCOTCHKOTE 206N APPLIED BY FLUIDISED BED METHOD. MINIMUM DRY THICKNESS 300 MICRONS.
9. WELDING OF FABRICATED PIPEWORK SHALL BE TO BS 4677 : 1984 WITH THE FOLLOWING INCLUSIONS.

WORKING PRESSURE	
UP TO 24 Bar	10% DYE PENETRANT (IN LIEU OF RADIOGRAPHY)
24 Bar AND OVER	10% RADIOGRAPHY AS BS4677:1984

10. FLANGE ADAPTORS & COUPLINGS TO BE TIED, UNLESS STATED OTHERWISE, USING SCREWED ROD CUT FROM 1m LENGTHS, FIXED THROUGH LUGS OR BACKING RINGS WELDED TO PIPE.
11. EPDM FULL FACE CLOTH FINISHED GASKETS TO BE USED AS STANDARD BETWEEN ALL FLANGES. 3mm TO BE ALLOWED FOR INSTALLED THICKNESS.
12. ALL NUTS, BOLTS & THREADED BAR TO BE IN ACCORDANCE WITH ISO 272; ISO 4759/1 EQUIVALENT, A& GALVANISED TO BS 7371–6 – 1998. WASHERS ARE TO BE IN ACCORDANCE WITH BS4320 1968 & GALVANISED TO BS 7371–6 : 1998. ALL CUT TIE BAR ENDS TO BE PROTECTED WITH GALVAFROID OR SIMILAR ZINC RICH PAINT, IMMEDIATELY AFTER CUTTING.
13. A WASHER MUST BE USED UNDER EACH COATED FLANGE BOLT HEAD AND NUT.
14. SPOOLS MUST BE TAGGED WITH THE DRAWING NUMBER & RELEVANT ITEM NUMBER WITH METAL TAGS WIRED TO FLANGES. SPOOLS WITHOUT FLANGES MUST HAVE THE NUMBERS PRINTED ON PIPE USING INDELIBLE PAINT.
15. PIPEWORK SHALL BE INSTALLED AS INDICATED.

@one ALLIANCE
FOR CONSTRUCTION

CARBON STEEL NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS STATED OTHERWISE.
2. ALL LEVELS IN METRES UNLESS STATED OTHERWISE.
3. LINEAR DIMENSIONAL TOLERANCES TO BE AS SHOWN BELOW. TOLERANCES MUST NOT BE ACCUMULATIVE.

LINEAR DIMENSION	TOLERANCE
0–500mm	± 1mm
500–2000mm	± 2mm
2000mm AND OVER	± 3mm

4. ANGULAR TOLERANCES TO BE ± 1°.
5. SPIGOT END CONCENTRICITY TOLERANCES TO BE ± 1.6mm FOR A LENGTH OF 125mm TO SUIT COUPLINGS.
6. MATERIAL TO BE CARBON STEEL PIPES TO API 5L GRADE B (OR EQUIVALENT). WALL THICKNESS TO BS534, HFS, ERW OR SAW
7. FLANGES TO BE ACCORDING TO BS EN 1092 PART 1 2007, TABLE 13, TYPE 1, TYPE B RAISED FACE UNLESS STATED OTHERWISE & TYPE 5 FOR BLANK FLANGES.
8. CARBON STEEL PIPEWORK TO BE FINISHED INTERNALLY & EXTERNALLY WITH 100% SOLIDS THERMOSETTING FUSION BONDED EPOXY RESIN SCOTCHKOTE 206N APPLIED BY FLUIDISED BED METHOD. MINIMUM DRY THICKNESS 300 MICRONS.
9. WELDING OF FABRICATED PIPEWORK SHALL BE AS FOLLOWS

WORKING PRESSURE	
UP TO 24 Bar	CLASS II TO BS2971 : 1991
24 Bar AND OVER	CLASS I TO BS2633 : 1987

10. FULL PENETRATION SEAM WELDS TO PIPEWORK SHALL HAVE EXTERNAL FACE GROUND FLUSH AT SPIGOT ENDS FOR INSTALLATION OF COUPLINGS AND FLANGE ADAPTORS FOR A LENGTH OF 150mm (<600ø) AND 200mm (>600ø).
11. BUTT WELD FITTINGS, WHERE USED, TO BS1640 PART 3 & 4 1966 OR EQUIVALENT
12. FLANGE ADAPTORS & COUPLINGS TO BE TIED, UNLESS STATED OTHERWISE, USING SCREWED ROD CUT FROM 1m LENGTHS, FIXED THROUGH LUGS OR BACKING RINGS WELDED TO PIPE.
13. EPDM FULL FACE CLOTH FINISHED GASKETS TO BE USED AS STANDARD BETWEEN ALL FLANGES. 3mm TO BE ALLOWED FOR INSTALLED THICKNESS.
14. ALL NUTS, BOLTS & THREADED BAR TO BE IN ACCORDANCE WITH ISO 272; ISO 4759/1 EQUIVALENT, & GALVANISED TO BS 7371–6 1998. WASHERS ARE TO BE IN ACCORDANCE WITH BS4320 1968 & GALVANISED TO BS 7371–6 : 1998. ANY CUT TIE BAR ENDS TO BE PROTECTED WITH GALVAFROID OR SIMILAR ZINC RICH PAINT, IMMEDIATELY AFTER CUTTING.
15. A WASHER MUST BE USED UNDER EACH COATED FLANGE BOLT HEAD AND NUT.
16. SPOOLS MUST BE TAGGED WITH THE DRAWING NUMBER & RELEVANT ITEM NUMBER WITH METAL TAGS WIRED TO FLANGES. SPOOLS WITHOUT FLANGES MUST HAVE THE NUMBERS PRINTED ON PIPE USING INDELIBLE PAINT.
17. PIPEWORK SHALL BE INSTALLED AS INDICATED.

ALL DISCREPANCIES MUST BE REPORTED TO THE DRAWING OFFICE

REV	DATE	DETAILS	C STAT	ML CHK	ML APP
1	25.04.18	ISSUED FOR CONSTRUCTION	C	ML	ML

REFERENCED DRAWINGS:

*This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but the position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water mains, discharge pipes, sewer or drain or disposal mains or any item of apparatus. This information is valid for the date printed. The plan is produced by Anglian Water Services Limited, from Ordnance Survey Crown Copyright, WU 298402. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other use of the map data or further copies are not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

anglianwater @one
Thorpe Wood House, Thorpe Wood, Peterborough, Cambs. PE3 6WT
Tel: 01733 414100 Fax: 01733 414111

PROJECT TITLE: GREAT WRATTING WTW

DRAWING TITLE: MATERIAL NOTES

DES'D: STD	DATE: 03.02.11	DRAWN: STD	DATE: 03.02.11	CHK'D: STD	DATE: 03.02.11	APP'D: STD	DATE: 03.02.11	A3	SCALE: NTS

DRAWING No. WAT–06742–GWRAWW–SS–DET–5990 –

REV. 1 | STAT. C

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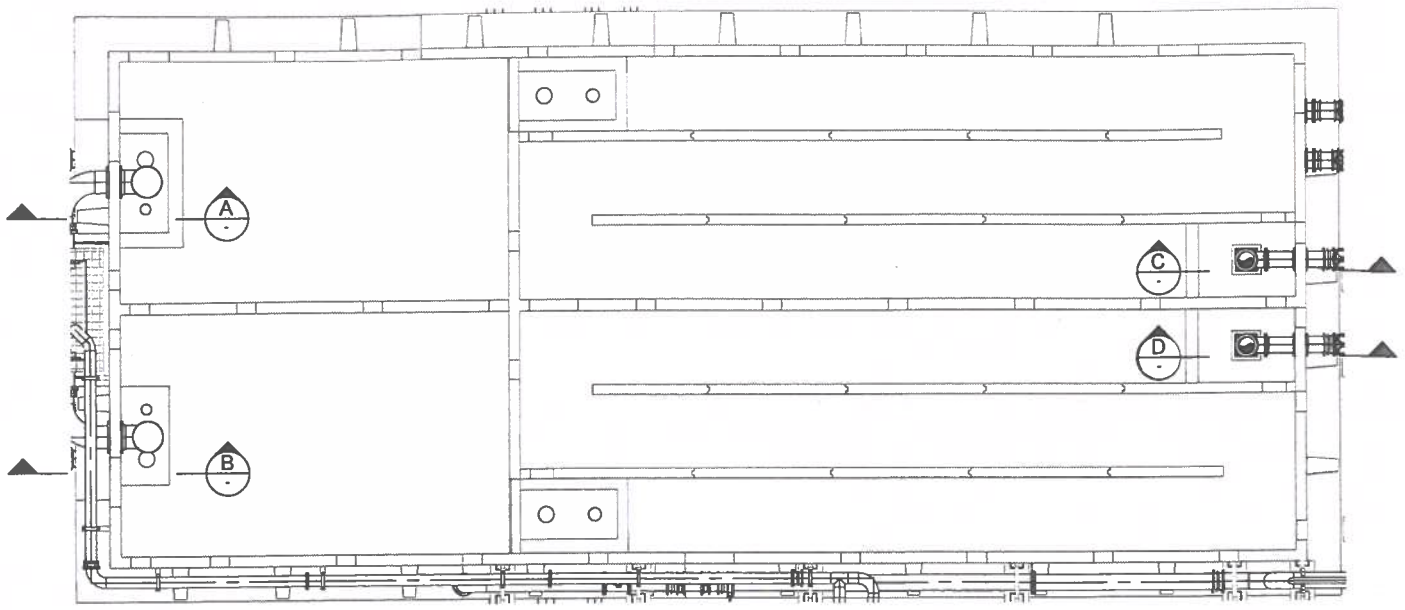

PLAN
SCALE 1:75

BILL OF MATERIALS - CONTACT & BALANCE TANKS INTERNAL PIPEWORK						
ID	QTY	SIZE	RATING	DESCRIPTION	WEIGHT (KG)	MATERIAL
1	2	450	PN16	PIPE, DOUBLE FLANGED 720 LONG	167	BE EN 545 (BLUE)
2	2	450	PN16	PIPE, FLANGED/SPIGOT 250 LONG	71	BS EN 545 (BLUE)
3	2	300	PN16	PIPE, FLANGED/SPIGOT 1950 LONG	147	BS EN 545 (BLUE)
4	2	300	PN16	PIPE, DOUBLE FLANGED 594 LONG	77	BS EN 545 (BLUE)
10	2	450	PN16	BEND 90 FLANGED, SHORT RADIUS, DUCKFOOT	246	BS EN 545 (BLUE)
11	2	300	PN16	BEND 90, FLANGED SHORT RADIUS, DUCKFOOT	116	BS EN 545 (BLUE)
15	2	450	PN16	FLANGE ADAPTOR, VJ MAXIDAPTOR FOR DI	42	BS EN 545 (BLUE)
18	2	300	PN16	FLANGE ADAPTOR, VJ MAXIDAPTOR FOR DI	15	BS EN 545 (BLUE)
20	2	450	PN16	BELLMOUTH, FLANGED	83	BS EN 545 (BLUE)
21	2	300	PN16	BELLMOUTH, FLANGED	29	BS EN 545 (BLUE)
25	8	450	PN16	GASKET, FLAT		EPDM
26	8	300	PN16	GASKET, FLAT		EPDM
30	6	450	PN16	STUD BOLT SET, M27x100LG, 20 OFF		
31	6	300	PN16	STUD BOLT SET, M24x90LG, 12 OFF		
35	2	450	PN16	STUD BOLT SET, M27 CUT TO SUIT WALL COUPLING, 20 OFF		
36	2	300	PN16	STUD BOLT SET, M24 CUT TO SUIT WALL COUPLING, 12 OFF		

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION
IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING:-
SIGNIFICANT RESIDUAL RISKS
THESE STATEMENTS RESULT FROM THE DESIGN RISK ASSESSMENTS CARRIED OUT BY THE DESIGNER. THE INTENT IS TO DEMONSTRATE COMPLIANCE WITH THE PROVISIONS OF THE CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATION 2015 PART 3, REGULATION 9 (2-4 INCLUSIVE). THESE STATEMENTS MUST BE REVIEWED AND UPDATED AS NEEDED ALONG WITH THE RISK ASSESSMENTS AS AND WHEN ANY SIGNIFICANT DESIGN CHANGE OCCURS.
CONSTRUCTION
WORK AT HEIGHT, MANUAL HANDLING
MAINTENANCE / CLEANING / OPERATION
ENTRY TO TANKS IS SUBJECT TO CONFINED SPACE ENTRY PROCEDURES
DECOMMISSIONING / DEMOLITION
NO SIGNIFICANT RESIDUAL RISKS IDENTIFIED

GENERAL NOTES

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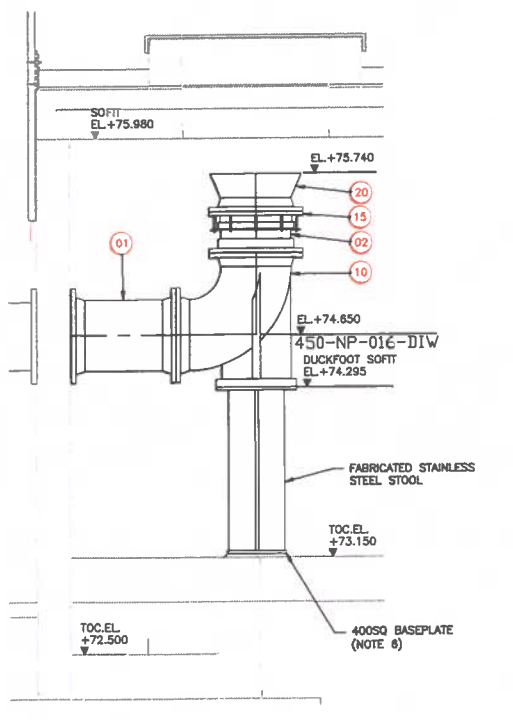
4. ALL EXISTING EQUIPMENT, SERVICES ETC. IN THE AREA ARE TO BE PROTECTED FROM DAMAGE DURING CONSTRUCTION.
5. IF ANY CHANGE IS REQUIRED TO THE DESIGN, USE TECHNICAL QUERY & DESIGN CHANGE REQUEST FORM (ALL-TEM-TD-010).
6. FIXINGS INTO CONCRETE (DUCKFOOT AND PIPE SUPPORTS) TO BE 316L STAINLESS STEEL WITH PROVENTURE PRO V200 RESIN.

REFERENCE DRAWINGS

OVERALL SITE LAYOUT AND HAZARD AWARENESS	WAT-06742-KEHRWW-SS-LAY-2000
CONTACT TANK MECHANICAL GA	WAT-06742-KEHRWW-1F-DET-5300
PIPING MATERIAL NOTES	WAT-06742-KEHRWW-SS-DET-5990



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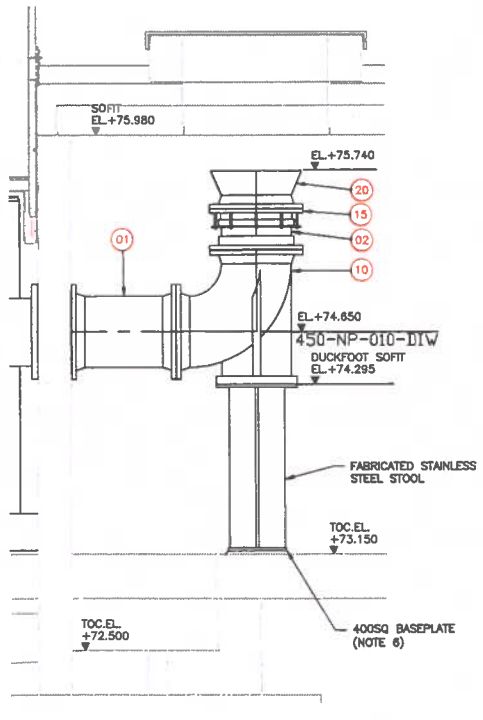

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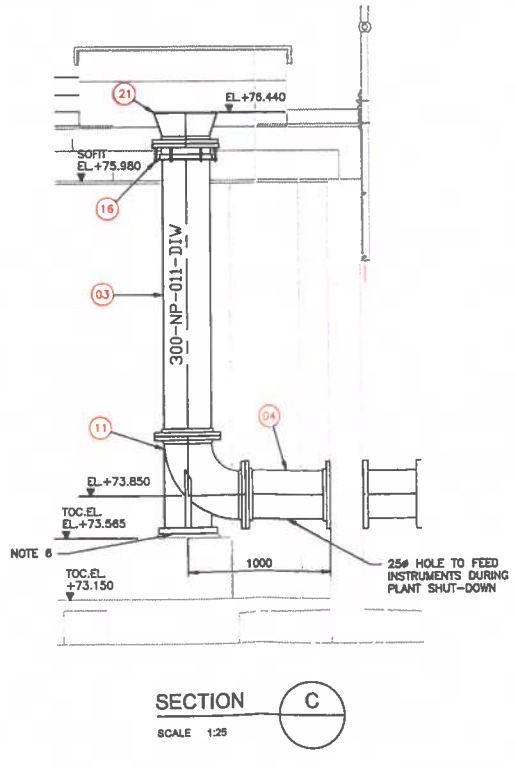

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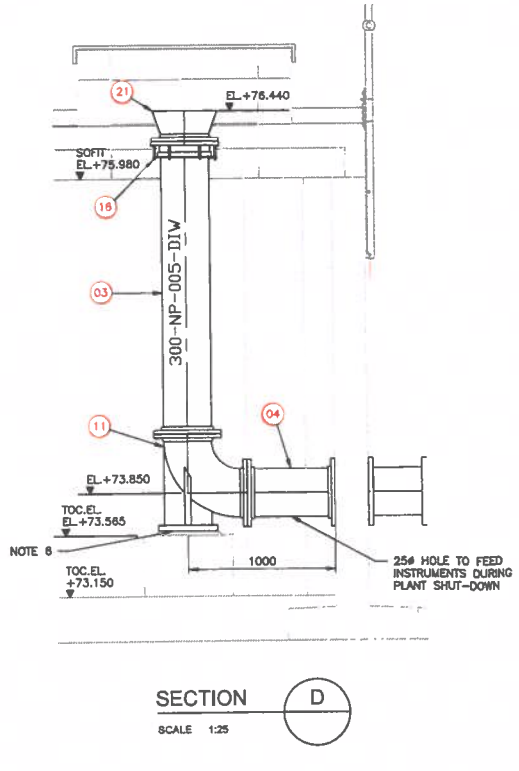

SECTION D
SCALE 1:25

@one ALLIANCE
FOR CONSTRUCTION

DESIGN CONTACT INFORMATION - IF IN DOUBT, ASK!			
CONTACT	NAME	TELEPHONE	EMAIL
ENGINEER	KAPILAN SUKUMARAN	01733 414100	ksukumaran@anglianwater.co.uk
CAD TECHNICIAN	TONY PALMER	01733 414630	tpalmer@anglianwater.co.uk

REV	DATE	DETAILS	STAT	BY	CHK	APP
2	23.05.19	APPROVED FOR CONSTRUCTION	C	TP	PG	AFM
1	27.04.19	ISSUED FOR REVIEW	P	TP		

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anglianwater
@one
Thorpe Wood House, Thorpe Wood, Peterborough, Cambridgeshire, PE3 6WT
Tel: 01733 414100 Fax: 01733 414111

PROJECT TITLE
KEDINGTON WTW

DRAWING TITLE
CONTACT AND BALANCE TANKS
GENERAL ARRANGEMENT
INTERNAL PIPEWORK

DES'D: KS	DATE: 20.05.19	DRAWN: TP	DATE: 26.04.19	CHK'D:PG	DATE:21.05.19	APP'D:AFM	DATE: 22.05.19
A1 SCALE:		REFERENCED DRAWINGS:					

DRAWING No. WAT-06742-KEHRWW-1F-DET-5302 REV. 2 STAT. C

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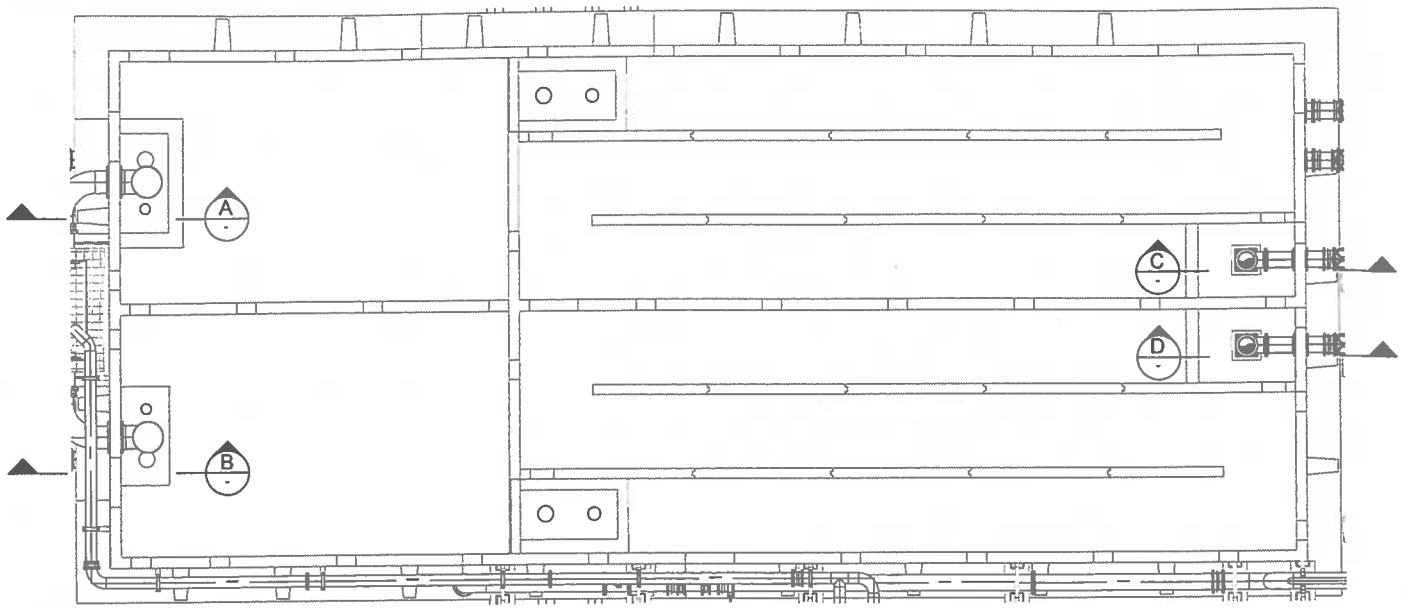

PLAN
SCALE 1:75

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3	2	300	PN16	PIPE, FLANGED/SPIGOT 1950 LONG	147	BS EN 545 (BLUE)
4	2	300	PN16	PIPE, DOUBLE FLANGED 594 LONG	77	BS EN 545 (BLUE)
10	2	450	PN16	BEND 90 FLANGED, SHORT RADIUS, DUCKFOOT	246	BS EN 545 (BLUE)
11	2	300	PN16	BEND 90, FLANGED SHORT RADIUS, DUCKFOOT	116	BS EN 545 (BLUE)
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21	2	300	PN16	BELLMOUTH, FLANGED	29	BS EN 545 (BLUE)
25	8	450	PN16	GASKET, FLAT		EPDM
26	8	300	PN16	GASKET, FLAT		EPDM
30	6	450	PN16	STUD BOLT SET, M27x100LG, 20 OFF		
31	6	300	PN16	STUD BOLT SET, M24x90LG, 12 OFF		
35	2	450	PN16	STUD BOLT SET, M27 CUT TO SUIT WALL COUPLING, 20 OFF		
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MAINTENANCE / CLEANING / OPERATION
ENTRY TO TANKS IS SUBJECT TO CONFINED SPACE ENTRY PROCEDURES
DECOMMISSIONING / DEMOLITION
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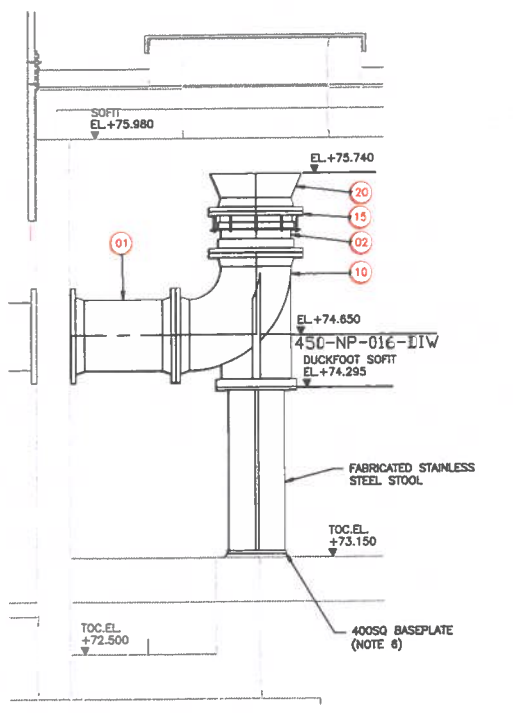
REFERENCE DRAWINGS

OVERALL SITE LAYOUT AND HAZARD AWARENESS	WAT-06742-KEHRWW-SS-LAY-2000
CONTACT TANK MECHANICAL GA	WAT-06742-KEHRWW-1F-DET-5300
PIPING MATERIAL NOTES	WAT-06742-KEHRWW-SS-DET-5990



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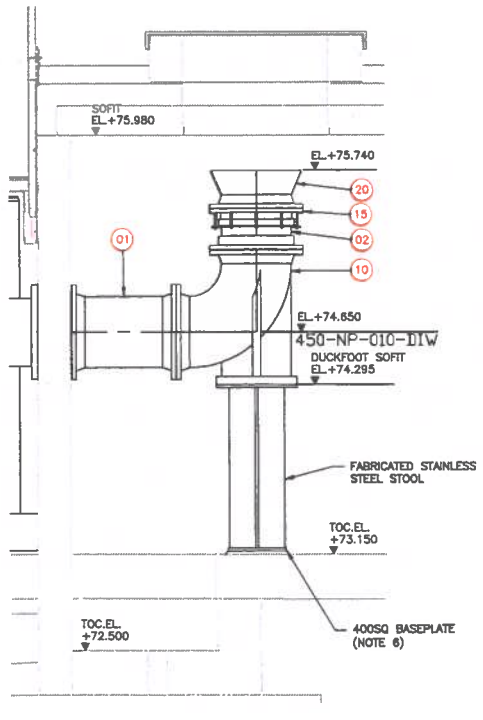

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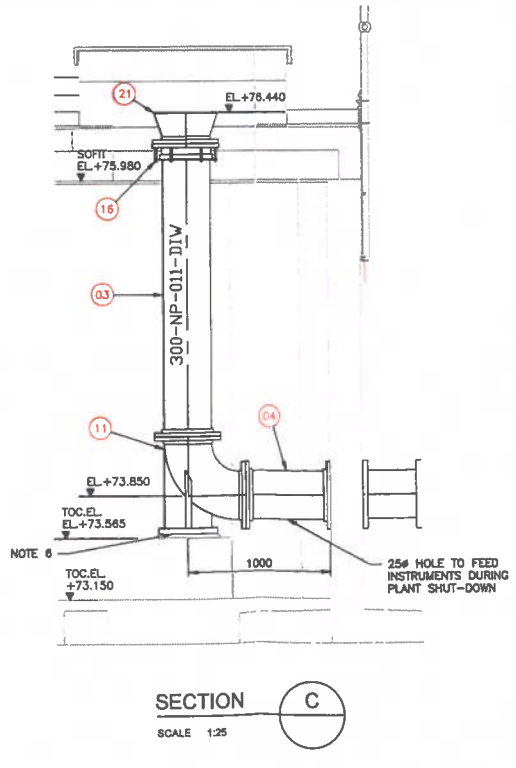

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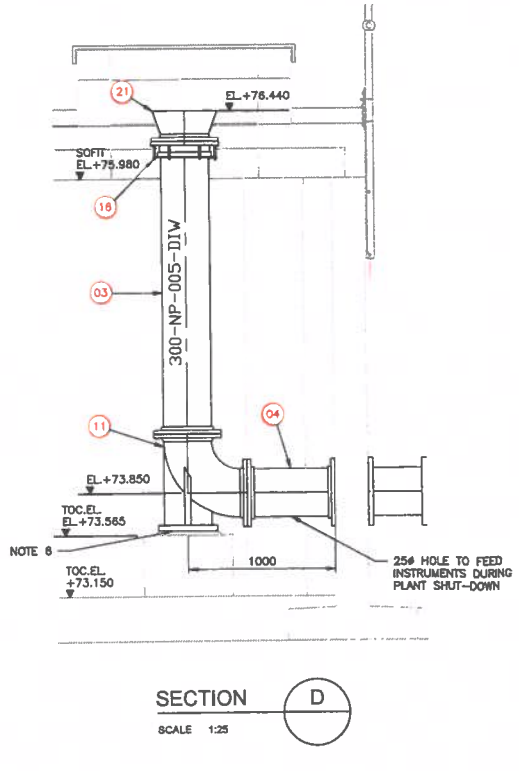

SECTION D
SCALE 1:25

@one ALLIANCE
FOR CONSTRUCTION

DESIGN CONTACT INFORMATION - IF IN DOUBT, ASK!			
CONTACT	NAME	TELEPHONE	EMAIL
ENGINEER	KAPILAN SUKUMARAN	01733 414100	ksukumaran@anglianwater.co.uk
CAD TECHNICIAN	TONY PALMER	01733 414630	tpalmer@anglianwater.co.uk

REV	DATE	DETAILS	STAT	BY	CHK	APP
2	23.05.19	APPROVED FOR CONSTRUCTION	C	TP	PG	AFM
1	27.04.19	ISSUED FOR REVIEW	P	TP		

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anglianwater
@one
Thorpe Wood House, Thorpe Wood, Peterborough, Cambridgeshire, PE3 6WT
Tel: 01733 414100 Fax: 01733 414111

PROJECT TITLE
KEDINGTON WTW

DRAWING TITLE
CONTACT AND BALANCE TANKS
GENERAL ARRANGEMENT
INTERNAL PIPEWORK

DES'D: KS	DATE: 20.05.19	DRAWN: TP	DATE: 26.04.19	CHK'D:PG	DATE:21.05.19	APP'D:AFM	DATE: 22.05.19
A1 SCALE:		REFERENCED DRAWINGS:					

DRAWING No. WAT-06742-KEHRWW-1F-DET-5302 REV. 2 STAT. C

From: [redacted]
To: [redacted]
Subject: FW: Privileged and confidential -Reg31 issues - Request from Anglian Water
Date: 18 August 2022 09:27:00
Attachments: image002.png
image004.png
Importance: High

Warning: The sender of this message could not be validated. Please use caution when opening any message content such as attachments or links

Hi [redacted],
Hope you are both well.
Please see request below from Anglian Water. Do I have to send him a copy of my statement or should they be requesting it from yourselves?
Take care.

Kind Regards,

[redacted]
Project Manager

Email [redacted]fliwater.com
Mob +44(0)[redacted]

Membership number - P0452406

FLI Water Ltd
Unit B, Regent House,
Wolseley Road
Kempston,
Bedford, MK42 7NY

Phone +44 (0) 1234 852900
Web www.fliwater.com

Your Sustainable Solutions Partner

From: [redacted]<[redacted]anglianwater.co.uk>
Sent: 18 August 2022 08:32

To: [redacted]<[redacted]fliwater.com>
Subject: Privileged and confidential -Reg31 issues

Good morning [redacted]
We understand that the DWI contacted you and took a statement from you a couple of weeks ago regarding issues around Reg31 compliance. If you are OK with it can you provide a copy of any statement you made to the DWI for our internal records?
Happy to discuss
Best regards
[redacted]

Dr [redacted]
Water Quality Regulation Manager

Mobile: [redacted]

Anglian Water Services Limited
Lancaster House, Lancaster Way
Ermine Business Park, Huntingdon
Cambridgeshire, PE29 6XU

--*----*----*----*----*----*----*----*----*----*----*----*----*----*---*----*-----*----*----*----*----*----*----*----*----*----*----*----*----*

Section D [redacted] Exhibits Index

		Page(s)
1	RB01 FW Grout used in Hannington Cell 1a not WRAS Approved - Livelink 7 KB	59 - 60

From: [redacted] <[redacted]anglianwater.co.uk>
Sent: 11 August 2022 13:51
To: [redacted]
Subject: FW: Grout used in Hannington Cell 1a not WRAS Approved - Livelink 7 KB

Importance: High

From: [redacted]
Sent: 04 May 2016 14:12
To: [redacted]anglianwater.co.uk>
Subject: FW: Grout used in Hannington Cell 1a not WRAS Approved - Livelink 7 KB
Importance: High

[redacted]

I assume this has by now been taken forward and reported as a breach of Reg 31 in my absence? I hadn't been involved in the res refurb side of the project, so not sure what went on.

Thanks
[redacted]

From: [redacted]T
Sent: 20 April 2016 09:17
To: [redacted]G
Cc: [redacted]@jnbentley.co.uk; [redacted]@jnbentley.co.uk; [redacted]@jnbentley.co.uk; [redacted]
Subject: Grout used in Hannington Cell 1a not WRAS Approved
Importance: High

Hello [redacted]

As requested by [redacted]on Monday, I have been trying to complete the MiC form for the materials used in Hannington Reservoir Cell 1a.

One of the materials used is Fosroc Conbextra HF High Flow grout, which we used to seal the gap between the core drill aperture and the puddle flange pipe. The grout was applied so that it was flush with the reservoir wall, so a thin annulus can be seen from inside the reservoir.

I have spoken to Fosroc this morning, and they have confirmed that no WRAS approval has been given for this material. He said that the way to overcome this would be to apply two coats of either Nitocote CM210 (water based) or Nitocote EP405 (epoxy based) coating. Neither need a primer and both are WRAS approved.

I have spoken to [redacted]this morning, and he is now making arrangements to get the reservoir taken out of service, so we can apply this coating. I will make sure that all the other materials and products used on site have been listed on the MiC form and approved before anything is put back in to supply.

I sincerely apologise for this breech in WQ standards. It had been assumed that the materials used had been checked beforehand, but this was clearly not the case.

Regards,

[redacted]

Section E [redacted] Exhibits Index

		Page(s)
1	SEV001 Event Notification Anglian Water Services Ltd - EN_ANH_2021_00202 Kedington WTW - Created via portal	66 - 67
2	SEV002 Kedington 3 Day Event Report	68 - 79
3	SEV003 Kedington 20 Day Event Report	80 - 112
4	SEV003b Appendix 2. PSW-POS-3.0 - Policies and Standards for Materials and Chemicals in Contact with Water	113 - 124
5	SEV003c Appendix 3. PSW-POS-2.00 Policies and Standards for Asset Design and Creation	125 - 134
6	SEV003d Appendix 4. PSW-PRO-3.01 - Materials and Chemicals in Contact with Water	135 - 163
7	SEV003e Appendix 5. PSW-PRO-1.14 Water Quality Risk Assessment and Control	164 - 173
8	SEV003f Appendix 6 - Annotated MIC Form	174 - 183
9	SEV003g Appendix 7. Electrofresh Plus DWI Approval Confirmation - 56.4.537 - exp Aug 26	184 - 185
10	SEV003h Appendix 8 - Electrofresh Plus IFU	186 - 192
11	SEV003i Appendix 9. Anglian Water Pipework Design Specification	193 - 194
12	SEV003j Appendix 10. Kedington WTW Internal Inspection Reports Mar 2020	195 - 218
13	SEV003k Appendix 11. Designers Risk Assessment	219 - 226
14	SEV003l Appendix 12. Kedington WTW HAZOP Nodes 2 and 6	227 - 231
15	SEV003m Appendix 13. MIP E 310320 02 Rev 4 - Kedington WTW into supply 4 hours	232 - 248
16	SEV003n Appendix 14. MIP E 310320 02 Rev 5 - Kedington WTW into supply	249 - 265
17	SEV003o Appendix 15. Kedington WTW Internal Inspection Reports May 2021	266 - 289
18	SEV003p Appendix 16. ISF QD8 Enamel Promatch - Technical Data	290
19	SEV003q Appendix 17. QD8 Enamel Promatch - Material Safety Data Sheet	291 - 297
20	SEV003r Appendix 18. WRC Toxicity Datasheet - Xylene	298 - 330
21	SEV003s Appendix 19. Technical Drawing for Kedington WTW Contact and Balance Tanks	331
22	SEV003t Appendix 20. Kedington Performance Sampling	332
23	SEV004 Notification of the Diddington Event to DWI by ANH	333 - 334

24	SEV005 Diddington 3 Day Event Report	335 - 345
25	SEV006 Notification of the Hannington Event to DWI by ANH	346 - 347
26	SEV007 Hannington 3 Day Event Report	348 - 359
27	SEV008 Hannington 20 Day Event Report	360 - 384
28	SEV008a Appendix 1. WAT-05054-HANNWR-1H-DET-4580-140801-P1	385
29	SEV008b Appendix 2. Sample Summary	386 - 387
30	SEV008c Appendix 3. Acceptability Data	388
31	SEV009 Notification of the Pitsford Event to DWI by ANH	389 - 390
32	SEV010 Pitsford 3 Day Event Report	391 - 402
33	SEV011 Pitsford 20 Day Event Report	403 - 428
34	SEV011a Appendix 1. Sample Summary	429
35	SEV011b Appendix 2. Acceptability Data	430
36	SEV012 Safety Datasheet VandM Dacrylate enamel paint	431 - 451
37	SEV013 PSW-POS-3.0 - Policies and Standards for Materials and Chemicals in Contact with Water	452 - 463
38	SEV014 PSW-PRO-3.01 - Materials and Chemicals in Contact with Water	464 - 492
39	SEV015 Event Queries Response Letter	493 - 496
40	SEV016 Hannington MIC Form	497 - 499
41	SEV017 Electrosteel Invoice For Pipework	500
42	SEV018 Hannington soak test results and SNARLs protected	501
43	SEV019 Hannington Reservoir 1A data 2015 16 - present	502 - 506
44	SEV020 Hannington Reservoir 1B data 2015 16 - present formatting amended	507 - 512
45	SEV021 Sample Results Trace Organics Hannington 1B to September 2022	513 - 517
46	SEV022 Part 2 Trace organics results Hannington side 1B	518
47	SEV023 Drawing WAT-05054-HANNWR-1H-DET-4580-140801-P1	519
48	SEV024 Drawing WAT-06195-HANNWR-1H-DET-4581 Hannington typical tie in detail	520
49	SEV025 Hannington Reservoir 1A and 1B internal Inspection Reports	521 - 553
50	SEV026 MIC and Trace Organic Samples	554 - 556
51	SEV027. Diddington soak test results and SNARLs	557 - 559
52	SEV028 Diddington Operational Sample Data formatting amended	560 - 562
53	SEV029 Diddington MIC Forms	563 - 570
54	SEV030 Diddington Requisition and Purchase Order	571 - 572
55	SEV031 Diddington training matrix	573 - 575
56	SEV032 Training records Diddington	576 - 577

57	SEV033 Diddington Reservoir Internal Pictures 2019-2021	578 - 595
58	SEV034 Diddington East Reservoir Inspection Report - May 2020	596 - 604
59	SEV035 Diddington East Reservoir Inspection Report - Nov 2021	605 - 612
60	SEV036 Diddington West Reservoir Inspection Report - May 2020	613 - 621
61	SEV037 Diddington West Reservoir Inspection Report - Nov 2021	622 - 630
62	SEV038 Requested pictures DWI 10_11 August 2022 - Diddington PROTECTED	631 - 651
63	SEV039 Diddington Reservoir Update	652 - 653
64	SEV040 Anglian Water Alliance Jindall Sigma Pipeline Solutions Purchase Order	654 - 657
65	SEV041 MIC Forms Feb 22 Request	658 - 670
66	SEV042 Requested pictures DWI 10_11 August 2022 - Pitsford	671 - 690
67	SEV043 Collated MIC Forms for Pitsford WTW	691 - 919
68	SEV044 Queries Response	920 - 930
69	SEV045 AW Tank B annotated timeline	931 - 932
70	SEV046 Pitsford dip samples 2016 -2022	933
71	SEV047 Acothane DW IFU Issue 8 - Nov 2019	934 - 941
72	SEV048 Acothane DW Technical Data Sheets Base	942 - 944
73	SEV049 Acothane LV Sealer Technical Data Sheets	945 - 946
74	SEV050 Pitsford pipe	947
75	SEV051 Appendix Q11 Pitsford Final data 2015 16 - present	948 - 962
76	SEV052 Responses to questions raised in email of 16 September 2022 regarding Pitsford WTW 2nd tranche 20221107 2	963 - 964
77	SEV053 016. Appendix 19a - Pitsford Storage Tank B Internal Inspections 2015 to present	965 - 997
78	SEV054 Appendix Q6a Training matrix secured	998 - 1000
79	SEV055 Appendix Q6b Training records secured	1001 - 1004
80	SEV056 Reg 31 training [redacted]	1005 - 1009
81	SEV057 Notice ANH-2020-00001-Great Wratting WTW_V3	1010 - 1014
82	SEV058 QD8 Enamel Promatch - Material Safety Data Sheet	1015 - 1021
83	SEV059 Kedington Performance Sampling (1)	1022 - 1024
84	SEV060 MK13606 Kedington flake test	1025 - 1026
85	SEV061 Requested pictures DWI 10_11 August 2022 - Kedington PROTECTED	1027 - 1048
86	SEV062. - Kedington WTW Internal Inspection Reports Mar 2020	1049 - 1072
87	SEV063 - Kedington WTW Internal Inspection Reports May 2021	1073 - 1096

88	SEV064 Kedington Water Pipe Soak Test	1097 - 1103
89	SEV065 FLI Purchase Order with FT Ductile	1104 - 1107
90	SEV066 Kedington Annotated MIC Form	1108 - 1117
91	SEV067 Q26 MIC form 3659 with organics detections	1118
92	SEV068 Overview of training received by personnel associated with Kedington	1119
93	SEV069 Extract from Workday - training records	1120 - 1122
94.	**SEV070 Individual MIC Paperwork**	
94.1	[redacted] MIC paperwork	1124 - 1129
94.2	[redacted] MIC paperwork	1130 - 1134
94.3	[redacted] MIC paperwork	1135 - 1147
94.4	[redacted] MIC paperwork	1148 - 1152
94.5	[redacted] MIC paperwork	1153 - 1161
94.6	Kedington EL123 Workday courses completed	1162 - 1163
94.7	[redacted] MIC paperwork	1164 - 1169
94.8	[redacted] MIC paperwork	1170 - 1171
94.9	[redacted] MIC paperwork	1172 - 1177
94.10	[redacted] MIC paperwork	1178 - 1182
95	SEV071 Anglian Water Regulation 31 compliance for Noksel pipework 20220119	1183 - 1186
96	SEV072 MA7843R Report_FINAL	1187 - 1196
97	SEV073 [redacted] Head of WQ Email	1197 - 1199
98	SEV074 October 2023 Anglian Toxicology Report	1200 - 1233
99	SEV075 All Assets Trace Organics Samples v2	1234 - 1242
100	SEV076 Asset PWSZs Trace Organics samples v2	1243 - 1262
101	SEV077 UKHSA risk assessment Anglian water v2.0	1263 - 1276
102	SEV078 Pre-prepared Statement to DWI 21 February 2023 Mr [redacted] Anglian Water	1277 - 1319
103.	**SEV079 IUC Transcript**	
103.1	1. CD1 21 02 23 Drinking Water Inspectorate - Anglian Water DWI311 2021 - interview under caution	1321 - 1365
103.2	3. 28.02.23 CD1 Track01 Drinking Water Inspectorate - Anglian Water DW1311 2021 - interview under caution	1366 - 1411
103.3	4. CD 2 28 02 23 Drinking Water Inspectorate - Anglian Water DW1311 2021 - interview under caution	1412 - 1461

103.4	5. CD 3 28 02 23 Drinking Water Inspectorate - Anglian Water DWI311 2021 - interview under caution	1462 - 1495
104	SEV080 Letter to company R31 reservoir and tank inspections	1496 - 1497
105	SEV081 Letter to company reservoir and tank inspection request	1498 - 1499
106	SEV082 Response to Questions Relating to Hannington Reservoirs	1500 - 1506
107	SEV083 Responses to questions raised in email of 16 September 2022 regarding Hannington WTW Final – 3rd tranche	1507 - 1511
108	SEV084 RE Tank Inspection Request	1512 - 1513
109	SEV085 Hannington Reservoir 1A 2020 & 2021 Photos	1514 - 1518
110	SEV086 Photograph of remedial work in Hannington 1A	1519
111	SEV087 FW ANH Regulation 28 Risk Lines	1520 - 1521
112	SEV088 Appendix 5 - Lessons Learned Report	1522 - 1525
113	SEV089 ANH_LI_2019_00001 Hall WTW disinfection byproducts	1526 - 1530
114	SEV090 Regulation 31 review of governance	1531 - 1554
115	SEV091 Materials and Chemicals in Contact with Water	1555 - 1579

From: sil_prodsql@defra.gov.uk
To: DL-DEFRA-DWI Internal Notifications
Cc: SM-Defra-Events, DWI
Subject: Event Notification Anglian Water Services Ltd - EN/ANH/2021/00202 Kedington WTW - Created via portal
Date: 22 June 2021 12:48:01

For information

Chief Inspector
Deputy Chief Inspector
Principal Inspectors
Inspectors

DWI
Area 1A, Nobel House
17 Smith Square
London
SW1P 3JR
Tel 030 0068 6435

Company	Anglian Water Services Ltd
Name of event	Kedington WTW
Notification Reference	EN/ANH/2021/00202
Person making the notification	[redacted]
Date of notification	22/06/2021
Time of notification	12:44
Date of event	22/06/2021
Location of event	Kedington WTW
Nature of event	LI for Kedington WTW blending with Gt Wratting WTW is ANG3337 Kedington WTW is a new works commissioned in March 2020. As part of the 1 year warranty internal inspection of the four contact and balance tanks constructed in 2019 at Kedington WTW we identified that sections of pipework installed within the tanks did not comply with Regulation 31 of the Water Supply (Water Quality) Regulation 2018. Kedington WTW has been out of supply since 14 May 2020 to enable further optimisation of the treatment process following odour detection related to the raw water quality. The pipework will be replaced before the WTW returns to supply. We have begun a full Lessons Learnt review to understand the circumstances that caused this event to occur. No water quality contacts were received from the PWSZ supplied that could be attributed to the pipework.
Population affected	78756
Likely cause(s)	Use of unapproved materials/products
Action taken to inform/protect consumers	Full commissioning sampling including Materials in Contact sampling, was undertaken along with regulatory monitoring whilst the WTW was in supply prior to 14 May 2020 and WTW has remained out of

and details of risk assessment	supply since this date. We are consulting WRc expertise regarding any potential impact of the unapproved materials we believe there has not been any impact on the water quality. No WQ complaints received
Action being taken to rectify the situation	The non compliant pipework within the tanks will be replaced with Regulation 31 approved pipework before the WTW is returned to supply. A full lessons learnt review has been initiated There is no evidence to suggest there has been any impact on the water quality. There is no effect on the sufficiency of water
LAs/HAs informed?	no
Level of publicity	None

Line to take

The Inspectorate has been informed of an event affecting supplies in the Kedington WTW area.

The Company is taking steps to return supplies to normal.

The Inspectorate is investigating the event.

No further notice will be given unless recipients request it or the situation changes.

3 DAY REPORT

AW Reference No:	AW/2021/1718
DWI Reference No:	DWI/2021/8118
Name of event:	Kedington WTW
Description of event:	Identification of lengths of pipework within the contact tanks and balance tanks that are not compliant with Regulation 31.
Date and time of event:	31 March 2020 18:00
Date and time of notification to DWI:	22 June 2021 at 12:44
Notified by:	[redacted]
Population/Property Count affected:	32,815 properties with a population of 78,187
Duration of event:	412 hours
Effect on water sufficiency or quality:	There has been no evidence to date of the water quality being affected. The sufficiency of the water supply has not been affected.
Risk to public health:	It is not believed there is a wider risk to public health.
Details of any regulatory breaches:	There have been no regulatory breaches associated with this event. Relevant sample results can be seen in attached appendices.
Other organisations notified:	CCWater
Publicity:	None known

Executive Summary

Kedington WTW is a new works utilising an existing raw water borehole source. The construction of Kedington WTW was an AMP6 engineering scheme designed to provide a low metaldehyde source of water to blend with Great Wratting WTW, the works entered supply on 31 March 2020.

Following a period out of supply to carry out additional commissioning of automatic control systems the works was returned to supply on 27 April 2020. The works was then taken out of supply on 14 May 2020 following quantitative odour detections in samples taken from the regulatory sample point. There is a hydrogen sulphide raw water challenge at this works and the site has remained out of supply since this date to carry out a full investigation and installation of additional treatment to address this issue.

In May 2021 as part of a planned inspection the balance and contact tanks were drained down for inspection. This revealed evidence of small blue flakes on the tanks' flooring. Investigations have subsequently highlighted that some of the pipework within the balance and contact tanks did not have the required Regulation 31 approval.

Investigations are ongoing but there is no evidence to date that this pipework has caused any water quality issues for the short period of time the works was in supply. Kedington WTW remains out of supply.

We have detailed processes and procedures in place to ensure Regulation 31 compliance and it appears these were not followed on this occasion. We have also developed both on-line and classroom training on Regulation 31 compliance and rolled this out across our business including our partner organisations. A full Lessons Learned investigation is being carried out, working with our Alliance partners to understand the circumstances of how this event occurred and identify any actions required to ensure this does not happen again.

1. Geographical location of event

Figure 1 shows the location of Kedington WTW (TKED), Haverhill Road, Little Wratting, Haverhill CB9 7UQ. Kedington WTW receives groundwater from the adjacent Kedington borehole. Water from Kedington WTW blends, for compliance with the pesticide standards, with water from Great Wratting WTW (TGRW1) at the inlet to Boyton Hall Reservoir 1 and 2 (RBTN and RBTN2). These reservoirs supply water into the Haverhill Public Water Supply Zone (PWSZ) (ZSS23). Kedington WTW is in our Bury St Edmunds Supply System, see Figure 2 below.

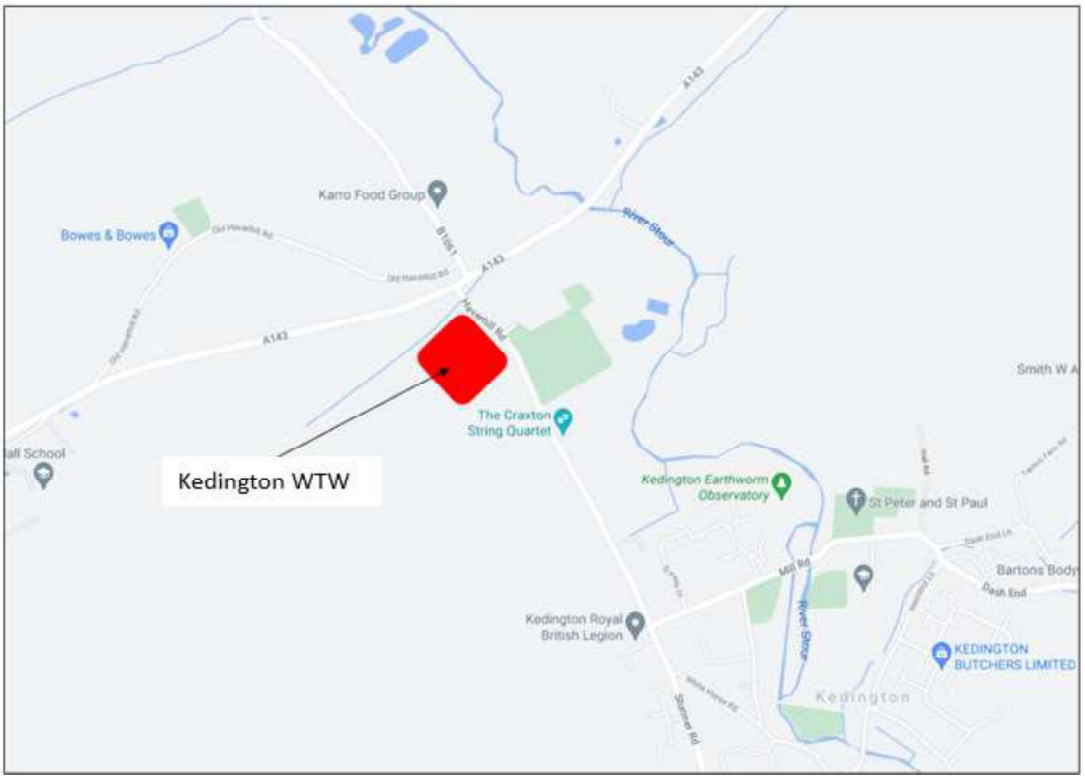


Figure 1: Kedington WTW location

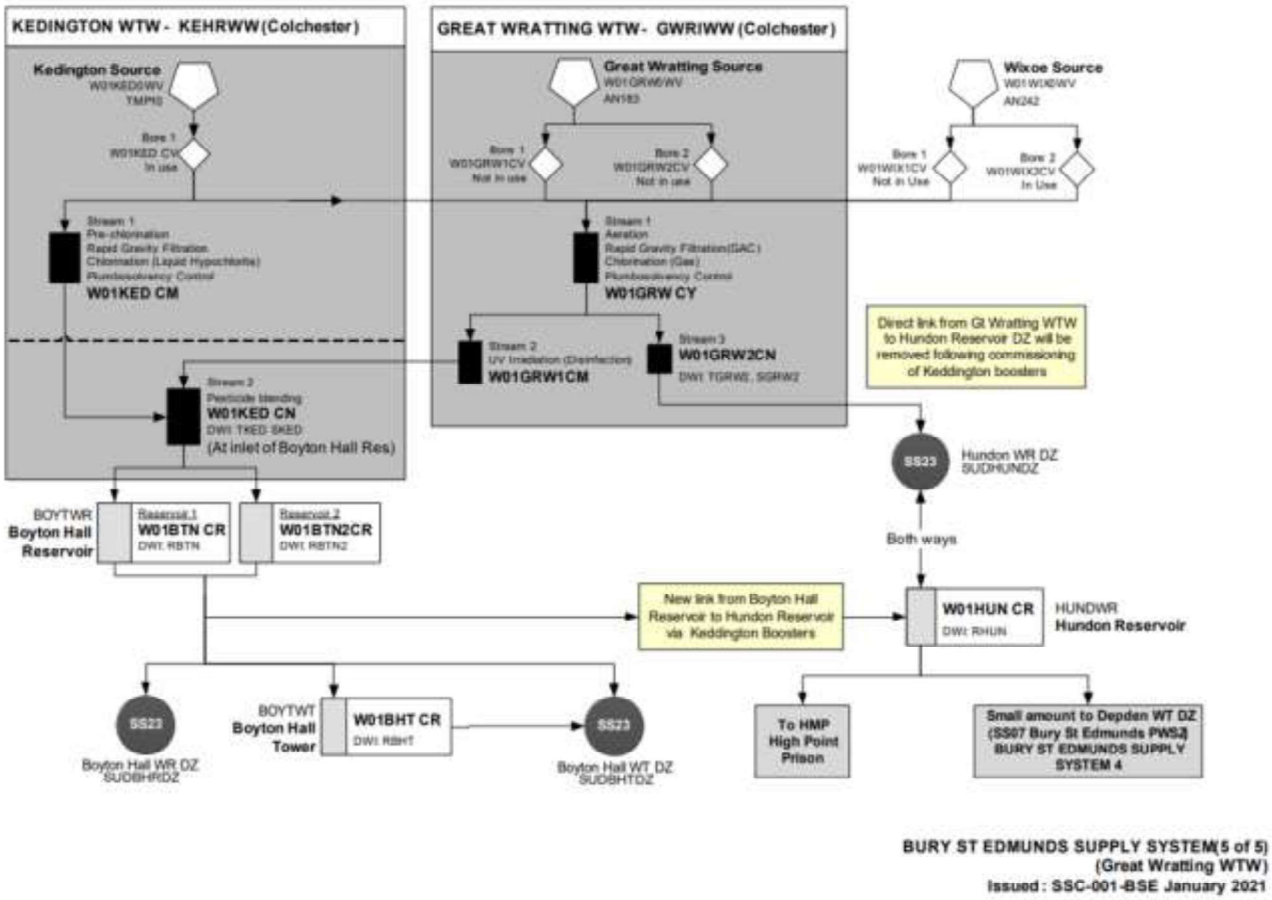


Figure 2: Supply System Schematic

2. Regulation 28 Risk Assessment

Kedington WTW is covered by the following Regulation 28 Risk Assessment: ANH-Risk-TKED.

We recognise the hazardous activity of 'Use of unapproved chemicals/materials' across the hazards of individual microbiological parameters, hydrocarbons, taste and odour. The Regulation 28 records for these hazardous activities for Kedington WTW are listed below. Our Water Quality Risk Team are currently reviewing this event and any associated updates will be triggered in our Water Quality Risk Portal and will be submitted to the DWI as part of our Regulation 28 submission.

Asset Reference	Asset Name	Hazard Reference	DWI risk Category	Unique Hazard ID
TKED	Kedington WTW	C004A	A	ANH-TKED-C004A-TR0278
TKED	Kedington WTW	C001	A	ANH-TKED-C001-TR0334
TKED	Kedington WTW	C007	A	ANH-TKED-C007-TR1326
TKED	Kedington WTW	C002	A	ANH-TKED-C002-TR0546
TKED	Kedington WTW	C003	A	ANH-TKED-C003-TR0600
TKED	Kedington WTW	H064	A	ANH-TKED-H064-TR1282
TKED	Kedington WTW	A003	C	ANH-TKED-A003-TR0942
TKED	Kedington WTW	A004	C	ANH-TKED-A004-TR1112

3. Summary of Event

The construction for Kedington WTW was an AMP6 engineering scheme designed to provide a low metaldehyde source of water to blend with Great Wratting WTW in accordance with the DWI Notice, Great Wratting WTW (Kedington WTW) ANH-2020-00001, at the inlet of Boyton Hall Reservoirs. Prior to the commissioning of Kedington WTW the water from Kedington borehole was pumped to Great Wratting WTW and treated along with water from the Wixoe boreholes.

The Kedington WTW was built and commissioned during 2019 and 2020. The process schematic below, figure 1, outlines the treatment processes at the site. Detailed engineering drawings of the contact and balance tanks and associated pipework can be found in Appendices 1a and 1b.

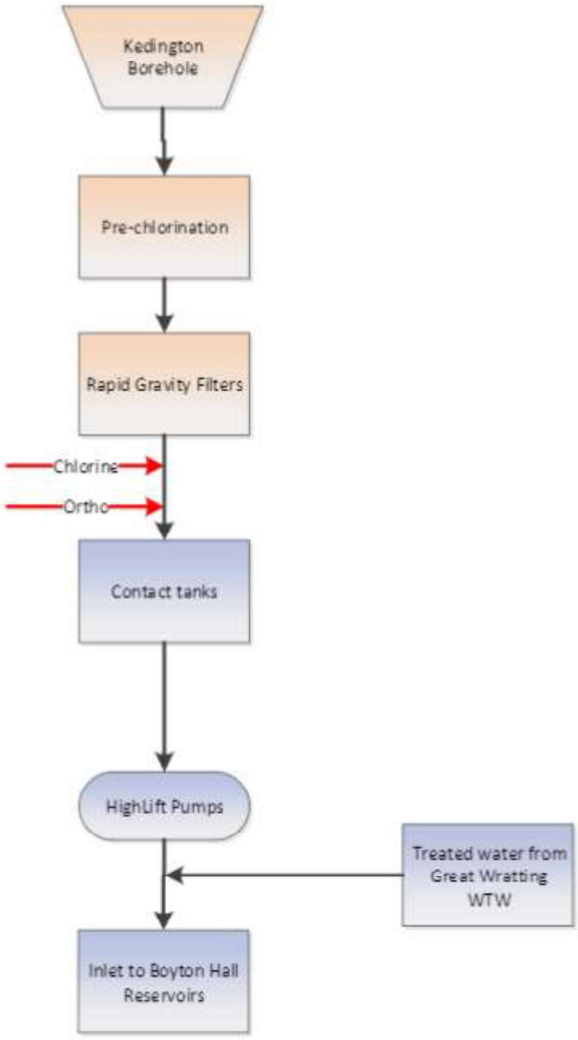


Figure 1 – Kedington WTW – Treatment Stages

Whilst this was a new WTW it did not involve the commissioning a new source water asset, as the borehole was supplying water to Great Wratting WTW.

As part of the wet commissioning of the new assets, a full program of commissioning sampling was undertaken, this included Materials In Contact (MIC) sampling to ensure materials used did not pose a water quality issue. The commissioning sampling consisted of 7 sets of analysis which were carried out over a 10 day period. MIC sampling was

carried out throughout each of the newly constructed assets. This sampling used the source raw water, due to the anaerobic conditions at depth, water from this borehole has a naturally occurring sulphurous odour. The results of the MIC sampling contained odours that was linked to that experienced from the raw water. They were assessed as having no change from the reference source water and having not been influenced as a result of the contact with the new materials. The commissioning and MIC sample information can be found in Appendix 2.

The four contact and balance tanks underwent internal inspections on 17 March 2020 prior to the works being run into supply. These inspections did not identify any issues with the structures or pipework. The inspection reports for Contact Tank No. 1 and Balance Tank No.1 are included in Appendix 3. Following the successful completion of the commissioning and MIC sampling, approval was granted by the Regional Supply Manager to run Kedington WTW into supply.

Kedington WTW first ran into supply on 31 March 2020 between 18:00 and 22:00 under manual control. The works was taken out of supply to enable the full commissioning of the automatic control system and remained out of supply until 27 April 2020. During this time the site was regularly run to waste. Kedington WTW was given approval by the Regional Supply Manager to be returned to supply on 27 April 2020. The high lift flow for this period can be seen in figure 2 below.

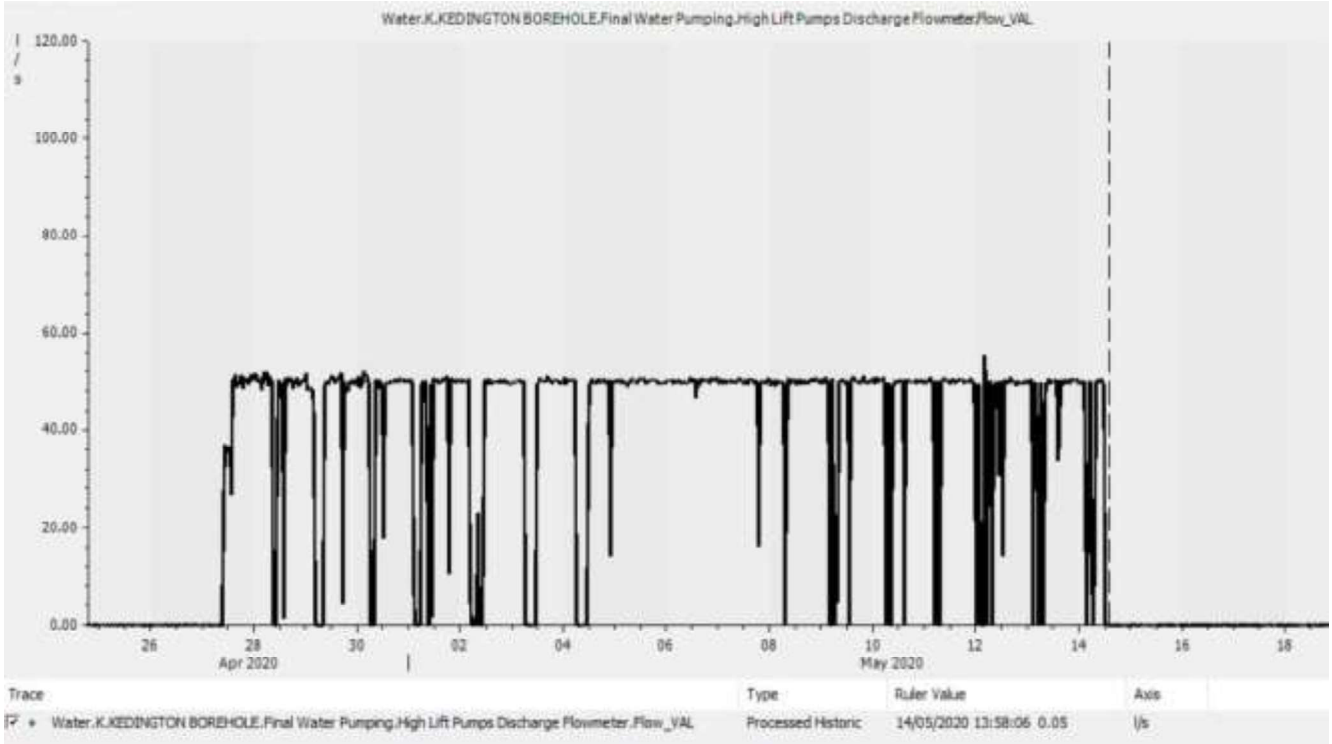


Figure 2 – Kedington WTW Flow 24 April to 18 May 2020

During the period where Kedington WTW was in supply between 27 April to 14 May 2020, enhanced sampling was undertaken from the treated, unblended, water leaving Kedington WTW (sample point W01KED CY and W01KED CM) and the compliance, final water monitoring point following blending with water from Great Wratting WTW at the inlet of Boyton Hall reservoir (sample point W01KED CN). A summary of the quantitative taste and odour results is shown below in figure 3. The full sample results taken during this period can be seen in Appendix 4 – Kedington WTW Performance Sampling.

	Kedington WTW Treated Water (Sampled at Kedington WTW)				Kedington WTW Final Water (Sampled post Gt Wratting WTW Blend at Boynton Hall Reservoir)			
	Undiluted Odour 25°C	Odour Descriptor	Undiluted Taste 25°C	Taste Descriptor	Undiluted Odour 25°C	Odour Descriptor	Undiluted Taste 25°C	Taste Descriptor
31 March 2020					1	Musty	0	
28 April 2020	0		0					
29 April 2020	0		0		1	Bad Egg	0	
30 April 2020	0		0					
01 May 2020	0		0					
02 May 2020	0		0		1	Bad Egg	0	
03 May 2020	0		0					
04 May 2020	0		0					
05 May 2020					1	Musty	0	
11 May 2020	0		1	Sweet	2	Bad Egg	Untasted	Untasted

Figure 3 – Kedington WTW Quantitative Taste and Odour Results

A quantitative odour was detected in 5 samples from the regulatory sample point. No taste was detected by the analysts in four of these samples. Due to the nature of the odour, the analysts declined to taste the sample collected on 11 May 2020. The investigations into these detections concluded they were related to the raw water challenge at the site and on 14 May 2020 the decision was taken to remove the Kedington WTW from supply to enable further work to enhance the treatment processes on site to take place.

Hydrogen sulphide is a known raw water challenge from the Kedington borehole due to the local geology. The original process design was to pre chlorinate the water to remove the sulphide odour. Following the odour detections whilst the site was in supply it was established there was a requirement to add additional treatment at the site to mitigate this raw water challenge. The work to install the additional treatment required is ongoing and is now due to be completed by the end of August 2020 however, the works will not enter supply until we are fully confident in the resolution of the identified odour issues. Full details of the investigation carried out can be seen in Appendix 5. We have been providing the Inspectorate with regular updates on the progress of this work as part of the requirements of the Undertaking (Ref ANG3337).

Whilst the WTW remained out of supply, the site became due for the 12 month warranty inspection, following the construction of the new assets. The contact and balance tanks were drained and the initial internal inspections took place on 28 May 2021, copies of the initial reports for Contact Tank No.1 and Balance Tank No.1 can be found in Appendix 6. During these inspections it was identified that minor amounts of expected deposits along with some blue paint flakes were noted on the floor of the tanks, as can be seen in the picture in figure 4 below.

Figure 4 – Small Blue Flakes Within the Contact Tank

On investigation into the source of the identified flakes a review was carried out of all pipework and fittings installed within the tanks. It was established that two sections of pipe in each of the two contact and balance tanks, did not have the correct Regulation 31 approval. The coating on parts of the pipework had blistered and there were areas of exposed metal underneath as can be seen in the picture below in figure 5.

Figure 5 – Exposed metal on a pipe

All the pipework was Electrofresh Plus ductile iron and manufactured by Electrosteel, see Appendix 7 for product specification of the pipes.

The details of the pipework within the contact and balance tanks at Kedington WTW can be seen in the table below (figure 6)

Pipe Location	Pipe Diameter	Pipe Length	Material	Manufacturer	Product
Contact Tank 1 Contact Tank 2	300mm	720mm	Ductile	Electrosteel	Electrofresh Plus
Contact Tank 1 Contact Tank 2	300mm	250mm	Ductile	Electrosteel	Electrofresh Plus
Balance Tank 1 Balance Tank 2	450mm	1950mm	Ductile	Electrosteel	Electrofresh Plus
Balance Tank 1 Balance Tank 2	450mm	594mm	Ductile	Electrosteel	Electrofresh Plus

Figure 6 – Pipe Details in the Contact and Balance Tanks

The Electrofresh Plus pipework has Regulation 31 approval for the conveyance of water, above and below ground but not for being permanently submerged in water. The external coating of this pipework has WRAS approval 1807507.

The pipework as supplied has a plain end and the other is a socket connection. To facilitate the connections within the tanks it was necessary to alter the pipework and weld a flange connection at either end. This flange connection was then coated by the manufacturer before being supplied to site. As part of the review of the pipework and fittings compliance with Regulation 31 following the inspection in May 2021, it was established that this coating did not have the required approval. The spray coating was ISF Coatings QD5 Promatch and the product safety data sheet can be seen in Appendix 8.

The SNARLs were checked for the compounds highlighted in the ISF Coatings QD5 Promatch and the product safety data sheet and the summary is shown below in figure 7.

All values in µg/litre	SNARL			Source
	24h	7 day	Operational	
2-butanone Oxime	390	195	Not Stated	WRC (NCET)
Xylenes	5400	2700	20	
Hydrocarbons (like Naphtha)	>900	>450	10	

Figure 7 – SNARL levels for compounds in ISF Coatings QD5 Promatch

All trace organic samples carried out during the commissioning and MIC process for the site were satisfactory. Any trace organic compounds present would have been detected down to the reporting level 0.1 µg/l.

During the period Kedington WTW was running into supply, we did not receive any customer contacts relating to taste and odour from within the Haverhill PWSZ. All water quality contacts from the Haverhill PWSZ for 2020 are shown below in figure 8.

SAP Ref	Contact Type	DMA	DZ	Date	Kedington WTW in supply?
57100060	Illness – Vomiting or diarrhoea	SUDHBTMA	SUDBHTDZ	January 2020	No
57163791	Illness – Mouth	SUDHCKMA	SUDBHTDZ	February 2020	No
58306973	Chlorine	SUDCACMA	SUNDUNDZ	December 2020	No

Figure 8 – Haverhill PWSZ 2020 Water Quality Customer Contacts

4. Next Steps

The non-compliant pipework within the tanks is being removed week commencing 28 June and will be replaced by a suitably approved alternative, fully complying with the requirements of Regulation 31.

Once the separate programme of work installing the new treatment for the raw water odour challenge has been completed the works will be recommissioned and returned to service. This is now due to be completed by the end of August 2020 however, the works will not enter supply until we are fully confident in the resolution of the identified odour issues.

We are continuing to work with the product suppliers to investigate any potential impact on water quality.

A full review is being carried out with our Alliance partners to ensure Regulation 31 compliance across all current and ongoing schemes. An alert is also being issued to all relevant areas across the business to raise awareness of this issue and ensure compliance with our Regulation 31 processes and procedures.

Working with our Alliance partners, a full Lessons Learned investigation is underway for this event. This will include a review of the processes followed and what actions need to be undertaken to ensure this event doesn't recur. If applicable, we will share any learning with the wider industry.

5. Summary and Likely Cause of the Event

Investigations are ongoing but it appears that the installation of two sections of pipe in each of the two contact and balance tanks did not have the correct Regulation 31 approvals. This is not believed to have had an impact on water quality.

We have detailed processes and procedures in place to ensure Regulation 31 compliance and it appears these were not followed on this occasion. We have also developed both on-line and classroom training on Regulation 31 compliance and rolled this out across our business including our partner organisations. A full Lessons Learned investigation is being carried out, working with our Alliance partners to understand the circumstances of how this event occurred and identify any actions required to ensure this does not happen again.

6. Notifications

Other organisations informed:
CCWater

ANGLIAN WATER SERVICES

FINAL REPORT OF AN EVENT UNDER THE WATER INDUSTRY (SUPPLIERS' INFORMATION) DIRECTION 2017

AW/2021/1717

DWI/2021/8118

KEDINGTON WTW

IDENTIFICATION OF PIPEWORK INSTALLED NOT IN ACCORDANCE WITH REQUIREMENTS OF REGULATION 31

Date of Event:	Friday, 28 May 2021
Notified by:	[redacted]
Date of Initial Notification:	Monday, 22 June 2021
Time of Initial Notification:	12:44
Population Affected:	78,187
Duration of Event:	412 hours

CONTENTS

1. **Executive Summary**

2. **Location and Supply Arrangements**

3. **Regulation 28 Risk Assessment**

4. **Site Details**

5. **Regulation 31 – Materials In Contact (MIC) Process**

   - Regulation 31 Governance
   - Policies, Standards and Procedures
   - Materials In Contact Sampling
   - Chemicals In Contact
   - Supplier Assurance
   - Compliance with Instructions For Use
   - Training and Competency
   - Industry Development

6. **Materials In Contact at Kedington WTW**

7. **Design of the Scheme**

8. **Construction and Commissioning of the Scheme**

9. **Warranty Inspection and Investigation of the Contact and Balance Tanks**

10. **Pipe Investigations**

11. **Impact on Water Quality**

12. **Investigation Into the Cause and Actions Being Taken to Prevent a Reoccurrence**

13. **Explanation of Event Notification Timescale**

14. **Liaison**
    - Drinking Water Inspectorate
    - Consumer Council for Water

15. **Publicity**

Appendices
With the exception of Appendix 1, all other appendices are attached as additional files

1) Bury St Edmunds Supply System Catalogue
2) PSW-POS-3.0 – Policies and Standards for Materials and Chemicals In Contact With Water
3) PSW-POS-2.0 – Policies and Standards for Asset Design and Creation
4) PSW-PRO-3.01 - Materials and Chemicals In Contact With Water
5) PSW-PRO-1.14 – Water Quality Risk Assessment and Control
6) Annotated MIC Form
7) Electrofresh Plus DWI Approval Confirmation
8) Electrofresh Plus – Instructions For Use
9) Anglian Water Pipework Design Specification
10) Kedington WTW HAZOP (Nodes 2 and 6)
11) Desginers Risk Assessment
12) Kedington WTW Internal Inspections Reports – March 2020
13) MIP E/310320/02 Rev 4
14) MIP E/310320/02 Rev 5
15) Kedington WTW Internal Inspection Reports – May 2021
16) ISF QD8 – Technical Data Sheet
17) ISF QD8 – Material Safety Data Sheet
18) WRC Toxicity Datasheet – Xylene
19) Technical Drawing for Kedington WTW Contact and Balance Tanks
20) Kedington WTW Performance Sampling

1. Executive Summary

Kedington WTW is a new works utilising an existing raw water borehole source. The construction of Kedington WTW was an AMP6 engineering scheme designed to provide a low metaldehyde source of water to blend with water from Great Wratting WTW, the works entered supply for a short period on 31 March 2020.

Following a period out of supply to carry out additional commissioning of automatic control systems the works was returned to supply on 27 April 2020 but then taken off-line on 14 May 2020 following quantitative odour detections in samples taken from the regulatory sample point, which were related to the source water. Kedington WTW pumped into supply for a total of 412 hours during this period.

Kedington borehole has a hydrogen sulphide raw water challenge, and the site has remained out of supply since this date to carry out a full investigation and installation of additional treatment to address this issue.

In May 2021 as part of a planned warranty inspection the contact and balance tanks were drained down for inspection. The inspections revealed evidence of small blue flakes on the tank flooring. Investigations have subsequently identified that sections of pipework located within the contact and balance tanks did not have the required Regulation 31 approval for the submerged environment they were installed in.

The MIC approval for the scheme was given on the basis of the installation of an approved pipework for this submerged environment however, a change was made which did not go through our procedures, resulting in a pipework installation not approved for this environment. Additionally, before delivery to site the pipework had been altered to add flanges to each end. To protect these flanges and the new welded joints the supplier had overcoated the ends and part of the pipework itself with an unapproved product. It is this overcoat that has partly flaked off and exposed some of the bare fitting underneath.

We have no evidence to suggest that water quality has been impacted by this Regulation 31 breach. Kedington WTW remains out of supply pending the installation and commissioning of sodium bisulphate dosing and the replacement of all sections of pipework within the contact and balance tanks with pipework with the correct approvals.

Our current detailed MIC governance and processes are in place to ensure compliance with Regulation 31 however these procedures were not followed on this occasion, in light of this event a full review has been carried out with our Alliance Partners to ensure a step change in Regulation 31 management and ensure this does not happened again. Our Chief Engineer and Head of Water Quality will be responsible for driving forward actions identified to ensure we can demonstrate a step change in this area.

The actions we have identified fall within the categories of combined assurance process improvement, the use of Digital Solutions to embed and track products and certification throughout the design and delivery phase and further enhancements on training and competency across our business including our alliance partners and integrated supply chain. We believe these advancements

will make a step change in our Regulation 31 management and compliance and we will identify ways to share this with the industry using existing and novel approaches such as on-line events, webinars and blogs.

Additionally, we are gaining assurance of Regulation 31 compliance on current schemes utilising Regulation 31 team stand down days and independently led audit.

2. Location and Supply Arrangements

Figure 1 shows the location of Kedington WTW (TKED), Haverhill Road, Little Wratting, Haverhill CB9 7UQ. Kedington WTW receives groundwater from the adjacent Kedington borehole. Water from Kedington WTW blends, for compliance with the pesticide standards, with water from Great Wratting WTW (TGRW1) at the inlet to Boyton Hall Reservoir 1 and 2 (RBTN and RBTN2). These reservoirs supply water into the Haverhill Public Water Supply Zone (PWSZ) (ZSS23). Kedington WTW is in our Bury St Edmunds Supply System, see Appendix 1.

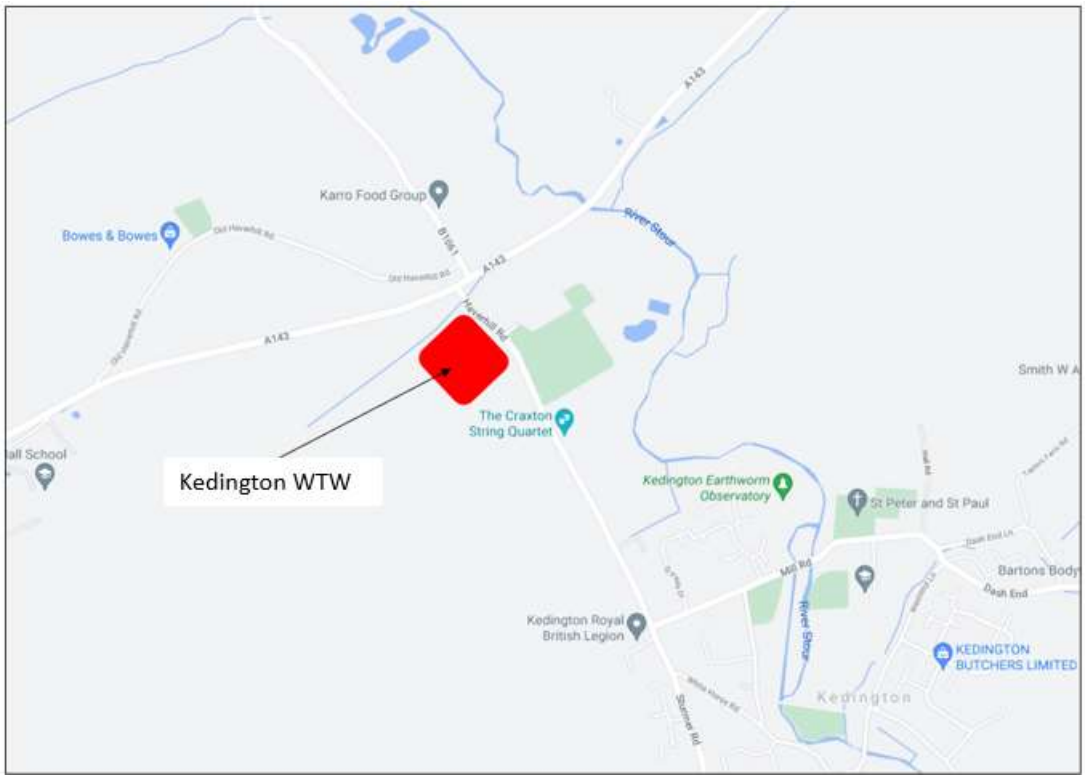


Figure 1: Kedington WTW location

3. Regulation 28 Risk Assessment

Kedington WTW is covered by the following Regulation 28 Risk Assessment: ANH-Risk-TKED.

We recognise the hazardous activity of 'Use of unapproved chemicals/materials' across the hazards of individual microbiological parameters, hydrocarbons, taste and odour. The Regulation 28 records for these hazardous activities for Kedington WTW are listed below in figure 2. Our Water Quality Risk Team have reviewed these risks and the associated updates will be triggered in our Water Quality Risk Portal. Only the hazard of odour currently has a risk score at Kedington WTW (71,000), all other hazards linked to this event are currently zero. All associated hazard risk scores will be increased as a result of this event. Risk changes will be submitted to the DWI as part of our Regulation 28 submission.

Asset Reference	Asset Name	Hazard Reference	DWI risk Category	Unique Hazard ID
TKED	Kedington WTW	C004A	A	ANH-TKED-C004A-TR0278
TKED	Kedington WTW	C001	A	ANH-TKED-C001-TR0334
TKED	Kedington WTW	C007	A	ANH-TKED-C007-TR1326
TKED	Kedington WTW	C002	A	ANH-TKED-C002-TR0546
TKED	Kedington WTW	C003	A	ANH-TKED-C003-TR0600
TKED	Kedington WTW	H064	A	ANH-TKED-H064-TR1282
TKED	Kedington WTW	A003	C	ANH-TKED-A003-TR0942
TKED	Kedington WTW	A004	C	ANH-TKED-A004-TR1112

Figure 2 – Regulation 28 Risk Assessment

4. Site Details

The construction of Kedington WTW was an AMP6 engineering scheme designed to provide a low metaldehyde source of water to blend with water from Great Wratting WTW in accordance with the DWI Notice, Great Wratting WTW (Kedington WTW) ANH-2020-00001, at the inlet of Boyton Hall Reservoirs. Prior to the commissioning of Kedington WTW the water from Kedington borehole was pumped to Great Wratting WTW and treated along with water from the Wixoe boreholes.

The Kedington WTW was built and commissioned during 2019 and 2020. The process schematic below in figure 3, outlines the treatment processes at the site.

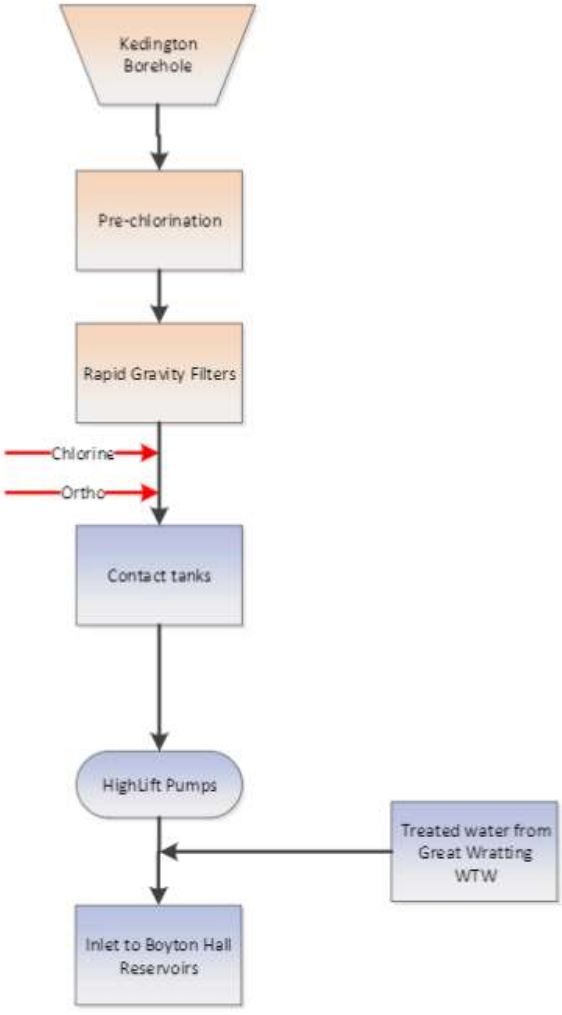


Figure 3 – Kedington WTW Processes

5. Regulation 31 – Materials in Contact (MIC) Process

The Regulation 31 governance at Anglian Water ranges from policy through training and auditing to application on site.

Regulation 31 Governance

An internal Regulation 31 Steering Group was created in 2019 to focus on continual improvement of procedure, training updates, communications and further raising awareness across the company. The group also review any near misses from Anglian Water and the wider industry, makes decisions, approves items submitted for review by scientists and engineers and review industry and regulatory updates. The core members include Water Quality Risk Managers, Water Quality Regulation Manager, Risk Scientist Portfolio Lead, Senior Strategy Scientist, and a Procurement Specialist.

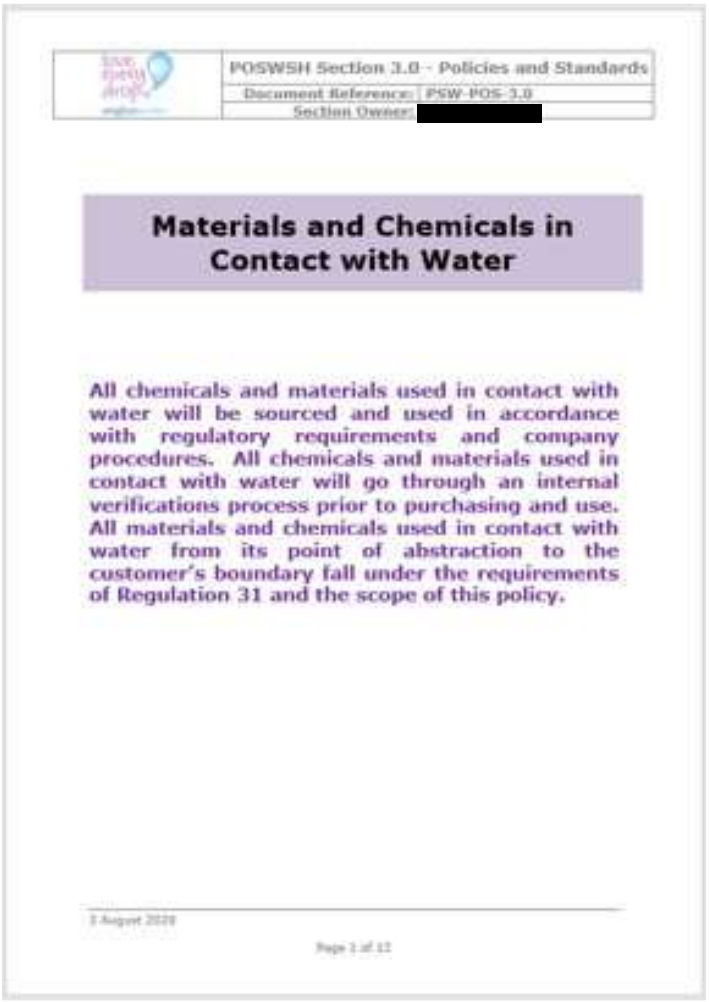
Water quality performance is tracked and reviewed at Water Services Compliance Monitoring Group (WS CMG), which is chaired by the Head of Water Quality with a core membership including the Director of Water and members of Water Senior Leadership team, Tactical Operations Manager, Analytical Services and Water Quality Senior Leadership team.

Policies, Standards and Procedures

Anglian Water has a POSWSH (Policies and Standards for Water Supply Hygiene) policy containing the standards on "Materials and Chemicals in Contact with Water," see Appendix 2. The policy statement can be seen in figure 4 below. This policy details how we maintain compliance with Regulation 31 of the Water Supply (Water Quality) Regulations. Our policy and standards for "Asset Design and Creation" mandates that all assets involved in the production and delivery of drinking water will be designed, commissioned, and decommissioned to ensure that they do not impact adversely on water quality, including meeting all

Regulation 31 requirements, see Appendix 3. Our asset design envelopes, Minimum Asset Standards, are developed according to these POSWSH policy and standard requirements, which must be adhered to by our Alliance Partners for any scheme delivery.

A POSWSH procedure PSW-PRO-3.01 Materials and Chemicals in Contact with Water documents the responsibilities of all employees working with any materials and chemicals which will be introduced into water intended for public supply to ensure they are fully compliant with Regulation 31, see Appendix 4.



POSWSH Section 3.0 - Policies and Standards

Document Reference: PSW-POS-3.0

Section Owner: [redacted]

Materials and Chemicals in Contact with Water

All chemicals and materials used in contact with water will be sourced and used in accordance with regulatory requirements and company procedures. All chemicals and materials used in contact with water will go through an internal verifications process prior to purchasing and use. All materials and chemicals used in contact with water from its point of abstraction to the customer's boundary fall under the requirements of Regulation 31 and the scope of this policy.

Figure 4 – POSWSH Policy Statement

The scheme owner requests a Materials in Contact (MIC) form, an example of the template can be seen is figure 5, from the Water Quality Risk Science team, who then raise a form with a unique reference number and return a link. The scheme owner completes Part A of the form with the relevant items and approval numbers, signs each line and then returns to the Risk Scientists. Part A of the MIC form also requires the completing engineers to confirm relevant instructions for use (IFUs) / conditions for use for each item have been checked and are met. The scientists review the listed items compliance and will counter sign Part A of the form and return to the scheme owner. Sampling is agreed at the point of Part A final sign off and forms Part B of the form. Once sampling has taken place, the Risk Scientists will review the sample results, save the data on Part C of the form, and sign off or advise further sampling required.

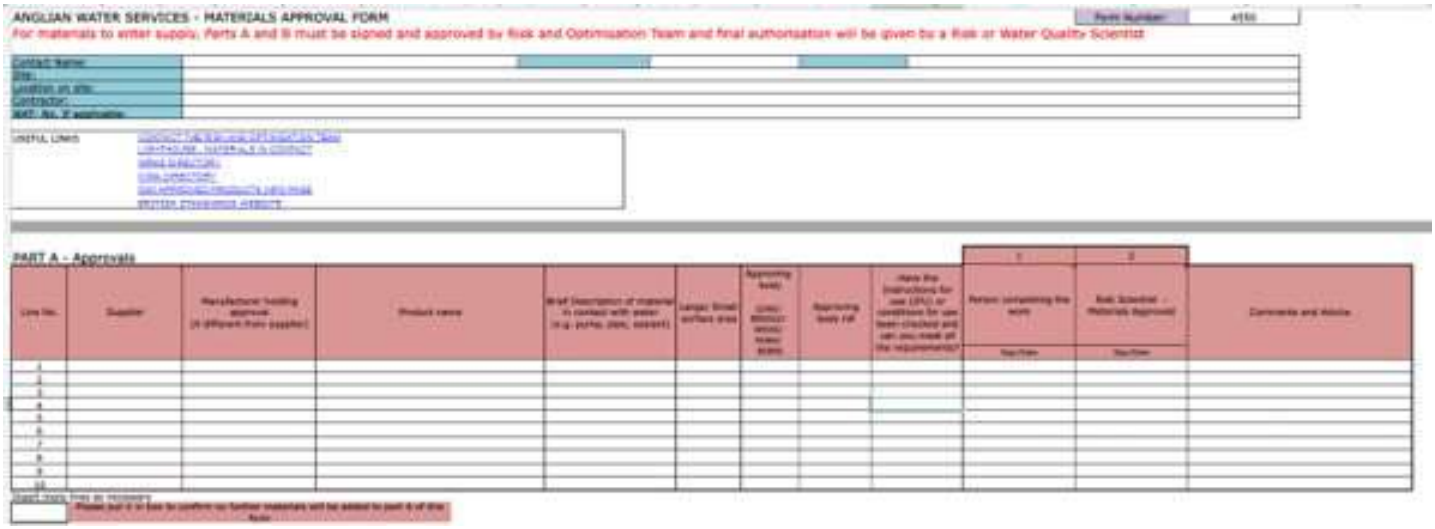


Figure 5 – MIC Form Template

Materials In Contact (MIC) Sampling

The asset will only go into supply once sample data is signed off. In the case of a large project e.g. a full works going into supply, the activity will also be covered by a Major Impact Plan following procedure PSW-PRO-1.14 Water Quality Risk Assessment and Control and checking the MIC form has been fully signed off will be documented as one of the preliminary activities, see Appendix 5.

As part of our process, we take a suite of samples to verify that the work undertaken including the items introduced and in contact with the water, have had no adverse impact on the water quality. See figure 6 for analysis list from the MIC training module. The results must be signed off by the Water Quality Risk team before the asset is allowed into supply. Prior to sampling we ensure the water has been in contact with the surfaces for a time of double the likely operational contact time, up to 16 hours or in line with IFU, whichever is greater. The sampling includes analysis for taste, odour, and microbiological parameters, as well as other parameters such as pH, colour, turbidity, conductivity, and trace organics.

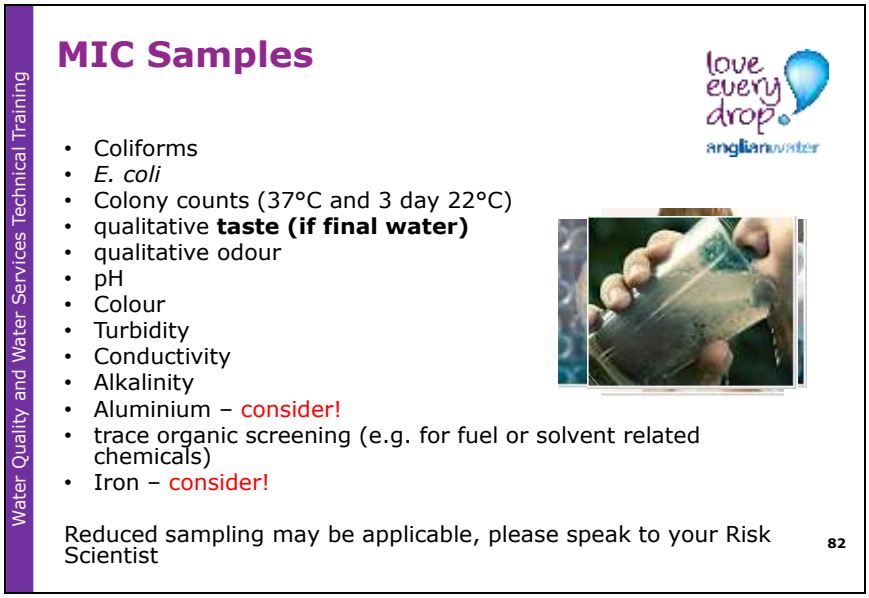


Figure 6 – MIC Analysis

Chemicals in Contact

For chemicals in use in water supply we also have a POSWSH policy, standards and related procedure in place. These ensure that fuel and chemicals of the correct specification are delivered to prevent the unintended use of incorrect chemicals. The procedure includes the requirement for the receiving works technician to verify product conformity to the correct BS:EN specification. A record of the delivery and the checks completed are recorded on the site-specific "Water Services Chemical and Fuel Delivery Log" form, see figure 7.

Chemical and Fuel Delivery Log Form 1 Part 2

Chemical and Fuel Delivery Record

(note all deliveries should be signed for by an Anglian Water Representative and the Chemical Delivery Driver).

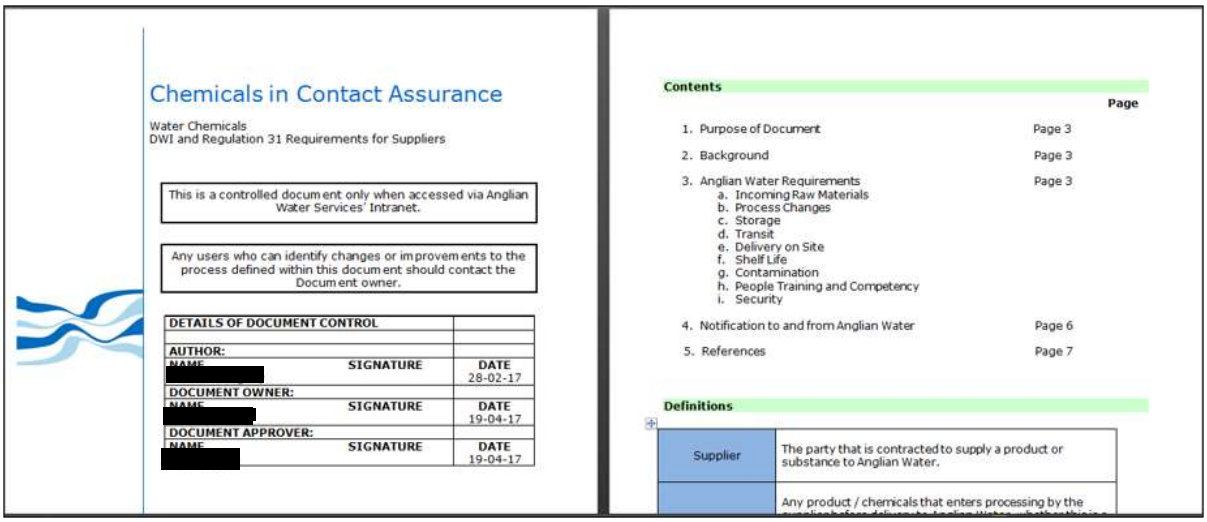
EXAMPLE

Figure 7 – Chemical and Fuel Delivery Record

Supplier Assurance

Framework contracts undergo a supplier tendering, evaluation, and selection processes to ensure selected suppliers are capable of meeting Anglian Water and Regulation 31 requirements and are committed to do so. Materials in Contact and product traceability requirements are built into the framework contracts. Assurance of key performance measures for chemical suppliers are proactively sought, via an electronic questionnaire which suppliers have to respond to. This includes confirming if there have been any changes to product manufacturing processes, raw material changes, continuity of supply etc.

The Water Services annual assurance programme includes Regulation 31 focussed chemical and material supplier audits. Audits are carried out by Water Quality and Procurement representatives. Audit reports are published, and actions are categorised and tracked. Our Director of Water held a supplier summit with all chemical suppliers to highlight key aspects of assurance we required from them (e.g. compliance to BS:EN) as a consequence of a GAC contamination issue in 2017. We launched the "Chemicals in Contact Assurance" document at this event (see figure 8), which re-enforced the standard, confirmed our intention to audit and included the requirement for them to highlight any changes to their products or processes. All suppliers of potable water treatment chemicals were audited across 2017 and 2018 utilising a multi-disciplinary team. Sixteen chemical suppliers are now audited on risk-based frequencies, annual to every seven years.



Chemicals in Contact Assurance

Water Chemicals
DWI and Regulation 31 Requirements for Suppliers

This is a controlled document only when accessed via Anglian Water Services' Intranet.

Any users who can identify changes or improvements to the process defined within this document should contact the Document owner.

DETAILS OF DOCUMENT CONTROL		
AUTHOR:		
NAME [redacted]	SIGNATURE	DATE 28-02-17
DOCUMENT OWNER:		
NAME [redacted]	SIGNATURE	DATE 19-04-17
DOCUMENT APPROVER:		
NAME [redacted]	SIGNATURE	DATE 19-04-17

Contents

	Page
1. Purpose of Document	Page 3
2. Background	Page 3
3. Anglian Water Requirements a. Incoming Raw Materials b. Process Changes c. Storage d. Transit e. Delivery on Site f. Shelf Life g. Contamination h. People Training and Competency i. Security	Page 3
4. Notification to and from Anglian Water	Page 6
5. References	Page 7

Definitions

Supplier	The party that is contracted to supply a product or substance to Anglian Water.
	Any product / chemicals that enters processing by the

Figure 8 – Chemicals in Contact Assurance document

Expanding on the success of the chemical suppliers' assurance programme a scanmarket assessment questionnaire is now being sent to framework materials suppliers. Answers are scored and suppliers ranked to form the annual assurance programme for materials. The first four audits were carried out virtually in 2020/21, and another seven are scheduled for this year. Wash up and launch sessions with the auditors for these programmes have allowed sharing of best practice, areas to focus and improvements to our audit templates.

We have seen a number of benefits above gaining internal insurance, including building relationships with suppliers and learning for our auditors and suppliers. Suppliers have reacted well to our material audits and we work with them to close down any actions identified.

Compliance with Instructions For Use (IFU)

In 2017, working collaboratively with our Integrated Operational Solutions, we developed a method to record and capture key data in relation to IFU compliance, which was briefed out to all relevant staff (see figure 9). These records are maintained for all schemes and include IFU information, records of temperature monitoring, coating records, surface preparation, data sheets etc. Engineers are required to check and sign-off the forms to provide further assurance of IFU compliance. This also led to the creation of an Integrated Operational Solutions QA role to carry out additional checks and audits in this area.

In 2018 AW Regulation 31 e-learning course was delivered to our contractors CRL and Stonburys who carry out storage point refurbishment work on behalf of Anglian Water.

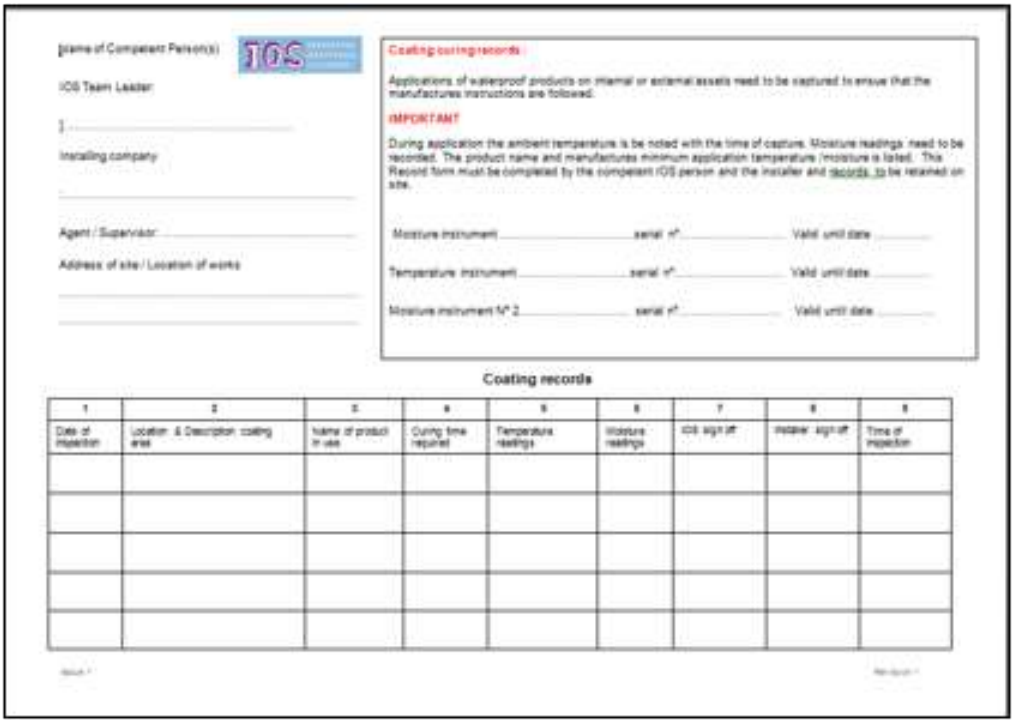


Figure 9 – IOS Coating Curing Record Form

Training and Competency

We have reviewed our current internal training material to introduce more practical elements on navigating and understanding routes of compliance to drive continuous improvement and ongoing communications are sent to the business in the form of Water Quality Updates, see figure 10 for example of updates.

Two forms of training are currently in place throughout Anglian Water. An e-learning module and a one-day classroom training course. The e-learning module was created in 2018 to raise the overall awareness of key aspects of Regulation 31, including a competency test as part of the module. To date over 550 members of staff have completed this e-learning module. We have recently introduced a new requirement for this to be retaken on a 3-yearly basis, see figure 11 for a screenshot of the e-learning. The one-day classroom training course which builds on knowledge of Regulation 31 requirements from the e-learning module. There are two versions of this course, one for engineers and the second for water quality teams (forms part of our Licence to Operate). The training course was fully reviewed and updated last year to include a much more practical element.

Only those individuals who have completed the e-learning and classroom training and signed off as competent are able to complete Part A of the MIC form.

Water Quality Update

Good Catch: Regulation 31 (Materials in Contact)

Whilst installing a booster pump, part of the factory-applied epoxy coating was found to be missing by @One Alliance. Rusting around the flange plate was also visible – see photo.

Following an investigation, it's believed the problems originated during both the application of the Regulation 31 approved coating and drying of the product at the manufacturers.
This voided the WRAS approval for the product.

Had this not been spotted and the pump entered into service, we would have breached Regulation 31 and it could have resulted in unwholesome water being supplied.

What you need to do?

It's a legal requirement that all materials and products used from source to tap are Regulation 31 approved.

- Check any product to be used for defects such as above - defects must be reported to the Water Quality team immediately.
- Ensure a MIC form is raised through the Water Quality Risk team - all products and materials must be signed off by the team before purchase (see POSWSH procedure 3.01).
- Ensure all products are installed as per their Instruction For Use (IFU).

Additional information

- Further training can be found in Workday in the online training 'Materials in Contact' (specific roles may also require completion of further virtual training).
- To raise a MIC form or for further guidance, contact the Water Quality Risk Team at WQRiskandOptimisation@anglianwater.co.uk.

love every drop
anglianwater

June 2020

Figure 10 – Examples of Water Quality Update relating to Regulation 31

Figure 11 - Front page of e-learning training for Materials in Contact

Industry Development

We have also set up a Water UK Regulation 31 Industry Group including Anglian Water, Thames, Northumbrian, Severn Trent, Southern and South Staffs. The group has focussed on the sharing of Regulation 31 best practice and have been working with EUSR to scope two industry training schemes

- Stage 1 - Basic awareness
- Stage 2 - For contractors applying specialist materials to align with a draft CoP for application of materials to drinking water structures

6. Materials In Contact at Kedington WTW

At Kedington WTW a full set of Materials In Contact (MIC) sampling was undertaken to ensure all of the materials used do not pose a water quality issue. MIC sampling was carried out systematically throughout each of the newly constructed assets. This sampling used the source raw water, due to the anaerobic conditions at depth, water from this borehole has a naturally occurring sulphurous odour. The results of the MIC sampling contained odours that was linked to that experienced from the raw water, therefore, they were assessed as having no change from the reference source water and having not been influenced as a result of the contact with the new materials. The MIC sample information can be found in Appendix 6.

The completed MIC form stated that the required pipework was to be Saint-Gobain System CL, which holds DWI Regulation 31 approval for total immersion in water and suitable to be installed within the contact and balance tanks. However, the pipework installed within the contact and balance tanks at Kedington WTW was Electrofresh Plus. This was not added to the MIC form and was therefore not subject to assessment by the Risk Scientist. A section of the original MIC form for Kedington WTW can be seen below in figure 12.

Line No.	Supplier	Manufacturer holding approval (If different from supplier)	Product name	Brief Description of material in contact with water (e.g. pump, pipe, sealant)	Large/ Small surface area	Approving body (DWI/ WRAS/ WIAA/ BSEN)	Approving body ref	Have the instructions for use (IFU) or conditions for use been checked and can you meet all the requirements?
Cross Site Pipework (potable)								
1	Saint-Gobain PAM UK		System CL – cement mortar lined pipes without seal coat	Ductile iron pipe , various diameters	Large	DWI	56/4/283	Yes
2	Saint-Gobain PAM UK	BG Coatings	Eurokote	Factory applied epoxy coating (inside surfaces of DI fittings, various diameters)	Small	WRAS	1503518	Yes
3	GPS		GPS Excel (Blue)	PE100 pipe	Large	DWI	56/4/600	Yes
4	Isolev / Viking John	VIP Polymers Ltd	Flange Adaptors (various diameters)	EPDM rubber sealing ring	Small	WRAS	1807507	Yes
		Arkema		COATING: Rilsan Nylon 11 polyamide powder coating used in conjunction with Pregreen LAT 12033 epoxy resin primer	Small	WRAS	1910523	Yes
5	Isolev / Viking John	VIP Polymers Ltd	Pipe Couplings (various diameters)	EPDM rubber sealing ring	Small	WRAS	1807507	Yes
		Arkema		COATING: Rilsan Nylon 11 polyamide powder coating used in conjunction with Pregreen LAT 12033 epoxy resin primer	Small	WRAS	1910523	Yes
6	Isolev / Viking John	VIP Polymers Ltd	Dismantling Joints (various diameters)	EPDM rubber sealing ring	Small	WRAS	1807507	Yes
		Arkema		COATING: Rilsan Nylon 11 polyamide powder coating used in conjunction with Pregreen LAT 12033 epoxy resin primer	Small	WRAS	1910523	Yes

Figure 12 - Original MIC form for Kedington WTW

The Electrofresh Plus pipe holds a DWI approval, DWI 56/4/537, see Appendix 7. The external epoxy coating of this pipework has WRAS approval 1807507. The Instructions For Use (IFU) do not state the pipe can be submerged in water, see Appendix 8.

7. Design of the Scheme

The design of the scheme was carried out in accordance with the Anglian Water POSWSH policy, PSW-POS-2.00 Policies and Standards for Asset Design and Creation, relevant sections can be found in Appendix 2. This policy details how we design new or refurbish assets to achieve compliance with company water quality target standards and the Water Supply (Water Quality) Regulations. Our policy and standards for "Asset Design and Creation" mandates that all assets involved in the production and delivery of drinking water will be designed, commissioned and decommissioned to ensure that they do not impact adversely on water quality. The policy and standards are shared with our supply chain partners to ensure a consistent approach.

The Asset Standards page on the company intranet, Lighthouse, contains links to all of the relevant standards for the design requirements for any construction or refurbishment of an asset, screenshots of the page can be seen below in figure 13. We would welcome the opportunity to share this information with you at a future liaison meeting.

The company Pipework Design Specification (PDS), see Appendix 9, is collated from a range of internal and external reference sources, including the Minimum Asset Standards (MAS) for the pipes and fittings for any specified job. The MAS defines the material of the pipework, and the Water Industry Mechanical and Electrical Specification (WIMES) section 4.01 defines the suitability of paints and polymer coatings for corrosion protection of the pipes.

This information forms part of the Project Works Information which forms Appendix A of the design, supply and installation of the mechanical works contract. These clauses include the description of the works, materials in contact with drinking water, design, documentation and technical standards which must be adhered to during the construction phase of the project.

A Hazard and Operability study (HAZOP) was completed as part of the Kedington scheme. A HAZOP is a formal, qualitative, systematic and rigorous examination of a plant, process or operation to identify credible deviations from the design intent in the context of the complete system that can contribute to hazards or operability problems, by applying the experience, judgement, perception and imagination, stimulated by key words, of a team. Specific focus on the contact and balance tank structures is covered by Nodes 2 and 6 within the HAZOP document, these specific nodes can be seen in Appendix 10 - Kedington WTW HAZOP Nodes 2 and 6. There were no specific references to, or actions raised against the contact and balance tank pipework and associated fittings.

In addition, a Design Risk Assessment (DRA) is completed for every scheme and the document for Kedington WTW can be seen in Appendix 11 – Kedington WTW Designers Risk Assessment. The DRA is a CDM requirement for the construction phase of the scheme and does not identify any Regulation 31 risks.

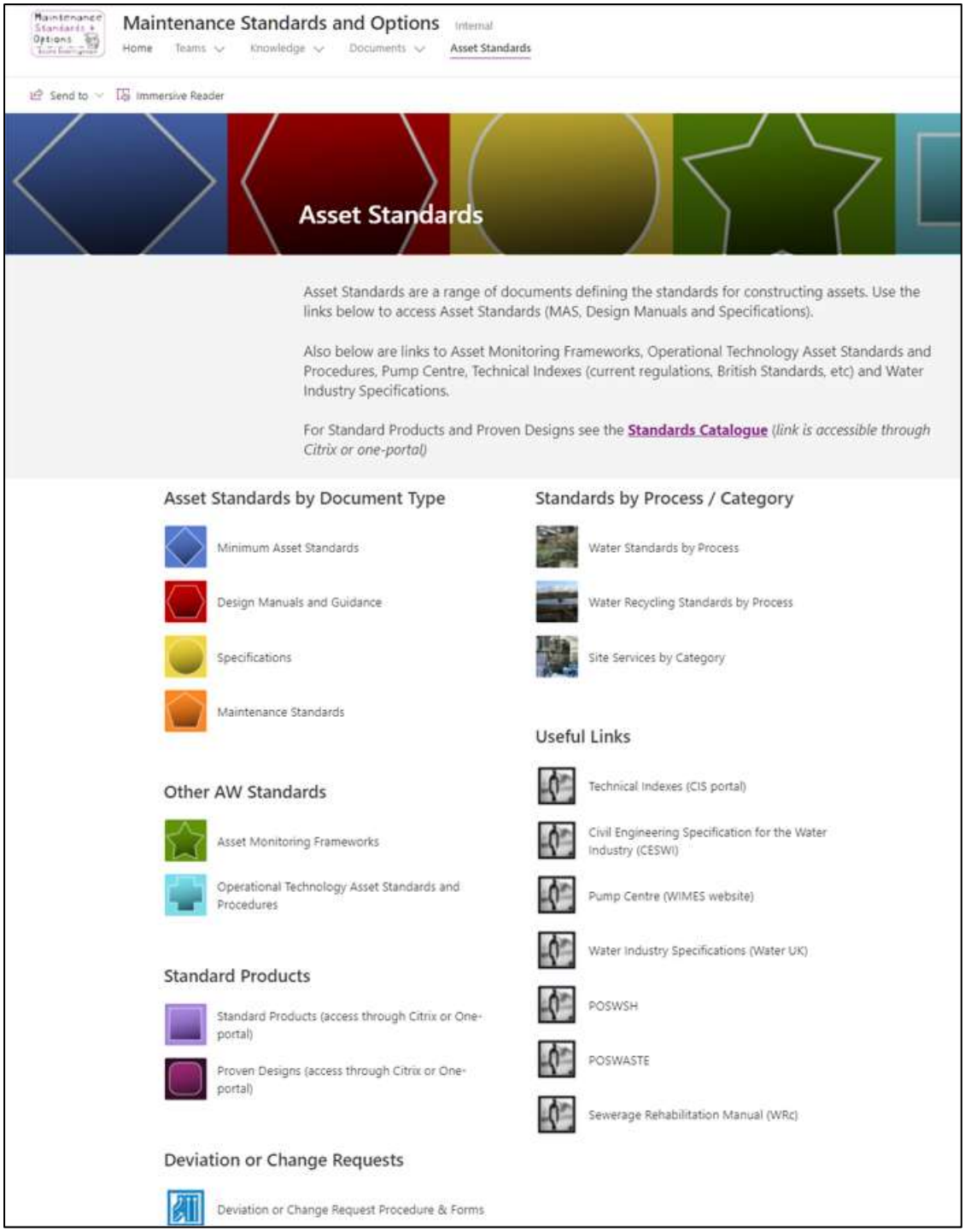


Figure 13 – Asset Standards Homepage on Lighthouse

8. Construction and Commissioning of the Scheme

In March 2018, site construction works of the new Kedington WTW commenced. The construction of contact and balance tanks started in May 2019, with the internal pipework and initial water testing occurring in the October. The final flood test of the structure was carried out on the 02 March 2020 once the installation of the roof membrane had been completed. Prior to final commissioning of the works, an internal inspection was carried out of the newly constructed contact and balance

tanks on 17 and 18 March 2020, no issues were identified during these inspections. See Appendix 12 for the inspection reports.

Throughout the construction of the site the contractors completed extensive quality control checks on all aspects of the construction, as per the contractor's project Quality Control Procedure.

Kedington WTW entered supply on 31 March 2020 at 18:15 for a short period to demonstrate it could run in hand as required as per the Major Impact Plan E/310320/02 Rev 4, see Appendix 13. Following the successful completion of the operational test, the WTW was shutdown at approximately 22:30 on 31 March 2020.

During April work was completed to commission the automatic control systems at the site. Work undertaken between 31 March and 27 April 2020 comprised of three main areas. This period was used to improve reliability, automation and optimise the works whilst it was run to waste.

Specific items worked on during this period were:

- Standby generator testing was required to ensure that the fully automatic changeover to and from mains power functioned correctly. This involved replicating various scenarios of site failure and power restoration, to ensure that all parts of the process performed correctly during switch over from mains to generated power and vice-versa.

- Telemetry improvements were identified during commissioning, specifically that part of the infrastructure was not performing optimally. Additional telemetry equipment was installed on the 07 April, as extra capacity was required, and on 20 April full telemetry commissioning was completed.

- Full plant automation tests, with further proving of the plants ability to run in auto were carried out during this period. Reliability tests were carried out on the plant during this period in run to waste mode discharging water to the environment under a permit from post contact/balance tank.

Following the completion of the work highlighted above, Kedington WTW was returned to supply following satisfactory on-site water quality checks (turbidity, clarity, chlorine, taste and odour) and confirmation the site was operating within the site specific operating limits, in automatic control, at 10:00 on 27 April 2020 in accordance with the Major Impact Plan E/310320/01 Rev 5, see Appendix 14. The regulatory sampling programme and the additional into supply performance sampling for the site was commenced.

The works was then taken out of supply at 12:00 on 14 May 2020 following quantitative odour detections and one untasted sample taken from the regulatory sample point. The flow from Kedington WTW during this period can be seen in figure 14. The total duration that Kedington WTW had pumped into supply was 412 hours.

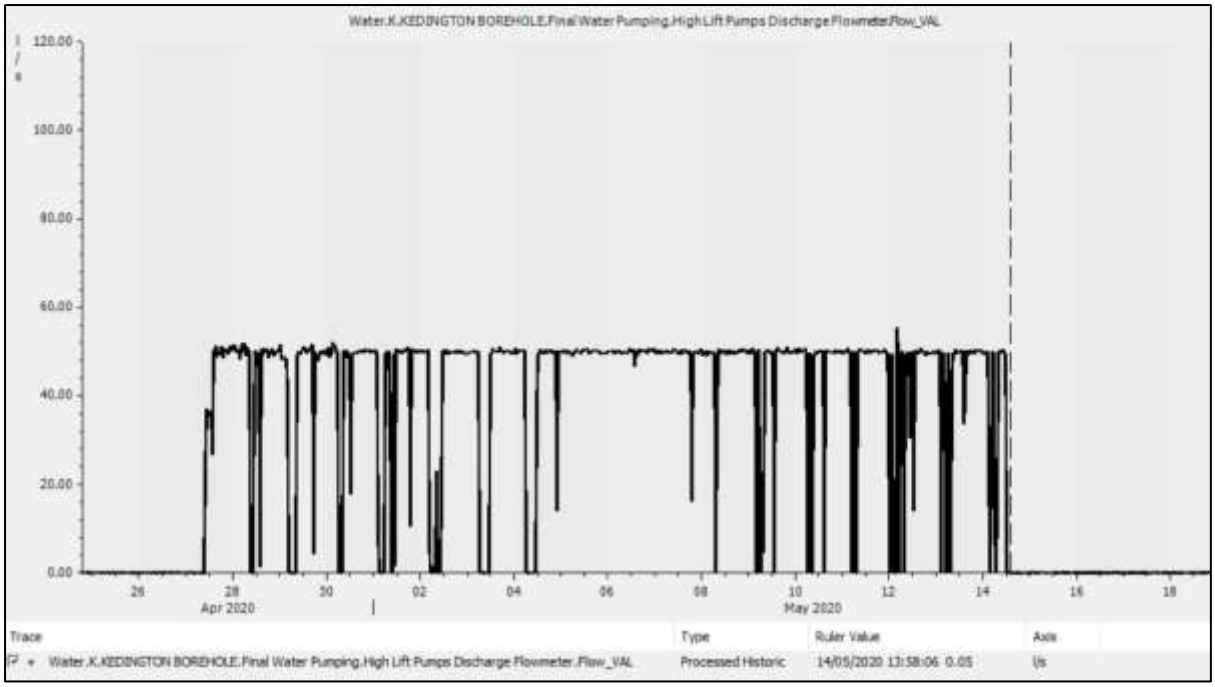


Figure 14 – Kedington WTW Flow 27 April to 14 May 2020

9. Warranty Inspection and Investigation of Contact and Balance Tanks

Whilst the site was offline, the four newly constructed contact and balance tanks became due for their 12-month warranty internal inspection. The tanks were drained, and the initial internal inspections took place on 27 and 28 May 2021, see Appendix 15 - Internal Inspection Reports. During these inspections by the Reservoir & Tower Inspection Engineer it was identified that minor amounts of expected deposits along with small amounts of blue paint flakes were observed on the floor of the tanks. The identification of these flakes was reported to the Reservoir & Tower Team Manager and the Water Quality Risk Scientist, on the 27 May 2021. A site visit by the Water Quality Risk Scientist was undertaken on the 28 May 2021 along with the Reservoir & Tower Inspection Engineer who was also completing the inspections on the remaining tanks. The source of the blue flakes was potentially identified as the pipework within the contact and balance tanks, this information was escalated through the Water Quality Team. Following identification of the source of the flakes a review was carried out of all pipework and fittings installed within the tanks.

A further site inspection on 26 June 2021 confirmed that the blue flake particles were not present in any other process stream onsite. This included checks of the filters, backwash system and all run to waste flushing points. No evidence of blue flake particles was found.

All the pipework within the contact and balance tanks was Electrofresh Plus ductile iron and manufactured by Electrosteel. As detailed the Electrofresh Plus pipe holds a Regulation 31 DWI approval and the external epoxy coating of this pipework has WRAS approval 1807507. As part of the pipe order for Kedington, a second manufacturer FT Ductile, used the pipes supplied by Electrosteel to fabricate the specific fittings ordered. FT Ductile cut the pipe to size and welded flange ends to either or both ends, depending on the requirements.

Following our investigation, it was discovered that after FT Ductile cut the pipe to specification, the bare welds were coated with an ISF QD8 promatch coating, see Appendix 16 - ISF QD8 Technical Data Sheet. This product does not have Regulation 31 approval and was not added to the MIC form for assessment by our Water Quality Risk team at which point this issue would have been identified. Our Regulation 31 procedures were therefore not followed on this occasion. The ISF promatch coating also overcoats some of the original pipe epoxy coating. This is a change in information since the 3-day report was submitted. We were initially informed that the ISF coating specification was QD5 promatch coating, subsequently FT Ductile have informed us that this is not the case and the ISF coating specifications have been confirmed as being QD8 promatch coating.

The ISF QD8 promatch safety data sheet, see Appendix 17 - ISF QD8 Material Safety Data Sheet, was used to identify any organic compounds of concern and toxicity datasheets were sourced, see Appendix 18. The SNARLs were checked for this compound see figure 15, below.

All values in µg/litre	SNARL			Source
	24 hour	7 day	Operational	WRC (NCET)
Xylenes	5400	2700	20	

Figure 15 – SNARL levels for compounds in ISF Coatings QD8 Promatch

All trace organic samples carried out during the commissioning and MIC process for these pipes and fittings were satisfactory, this can be seen in the MIC form in Appendix 6. Any trace organic compounds present would have been detected down to the reporting level 0.1 µg/l.

The details of the pipework within the contact and balance tanks at Kedington WTW can be seen in the table below, figure 16, and on the technical design CAD drawings, see Appendix 19.

Pipe Location	Pipe Diameter	Pipe Length	Material	Manufacturer	Product
Contact Tank 1 Contact Tank 2	300mm	720mm	Ductile	Electrosteel	Electrofresh Plus
Contact Tank 1 Contact Tank 2	300mm	250mm	Ductile	Electrosteel	Electrofresh Plus
Balance Tank 1 Balance Tank 2	450mm	1950mm	Ductile	Electrosteel	Electrofresh Plus
Balance Tank 1 Balance Tank 2	450mm	594mm	Ductile	Electrosteel	Electrofresh Plus

Figure 16 – Pipe Details in the Contact and Balance Tanks

For information, the total c-score for the items in each tank and the individual tank volumes are detailed in the table below in figure 17.

	Volume (m^3)	c-score
Contact Tank	202.64	12.34
Balance Tank	101.14	40.09

Figure 17 – Contact and Balance Tank volumes

10. Pipe Investigations

All the pipework in question was removed from the tanks on 01 July 2021 and held at Kedington WTW for inspection. A site visit was conducted on 07 July 2021 to inspect the pipe and fittings. The contact tank straight pipe with one flanged end, item 03 on CAD drawing, see Appendix 19, appeared to have a ISF QD8 promatch coating around the flange, welded joint and one metre up the pipe length over the original epoxy coating. The shorter pipe lengths (items 01, 02, 04) look to be fully coated with ISF QD8 promatch. On close examination the ISF QD8 promatch coating on parts of the pipework had blistered and there were areas of exposed metal which was rusting, or where present, epoxy coating intact underneath, as can be seen in pictures 18, 19 and 20.

Picture 18 - Contact tank inlet pipe (item 03 on CAD drawing) welded flange end with ISF QD8 promatch coating

Picture 19 - Contact tank inlet pipe (item 03 on CAD drawing) welded flange end with ISF QD8 promatch coating on bare metal and then at 6cm in picture the ISF promatch coating is on top of the epoxy coating

Picture 20 - Contact tank inlet pipe (item 03 on CAD drawing) blister rubbed off by hand showing epoxy coating exposed underneath the promatch QD8 coating

11. Impact on Water Quality

As part of the wet commissioning of the new assets, a full program of commissioning sampling was undertaken, this included Materials In Contact (MIC) sampling to ensure materials used did not pose a water quality issue. The commissioning sampling consisted of seven sets of analysis which were carried out over a 10-day period. MIC sampling was carried out throughout each of the newly constructed assets. This sampling used the source raw water, due to the anaerobic conditions at depth, water from this borehole has a naturally occurring sulphurous odour. The results of the MIC sampling contained odours that was linked to that experienced from the raw water. They were assessed as having no change from the reference source water and having not been influenced as a result of the contact with the new materials. The commissioning and MIC sample information can be found in Appendix 6.

During the period where Kedington WTW was in supply enhanced sampling was undertaken from the treated and unblended water leaving Kedington WTW (sample point W01KED CY and W01KED CM) and the compliance final water monitoring point following blending with water from Great Wratting WTW, at the inlet of Boyton Hall reservoir (sample point W01KED CN). The full results can be seen in Appendix 20 – Kedington WTW Performance Sampling. Other than the odour detections linked to the raw water there were no samples results to indicate any impact of the unapproved pipework to the water supply.

All trace organic samples carried out during the commissioning and MIC process for the site were satisfactory. Any trace organic compounds present would have been detected down to the reporting level 0.1 µg/l.

During the period Kedington WTW was running into supply, we did not receive any customer contacts relating to taste and odour from within the Haverhill PWSZ. All water quality contacts from the Haverhill PWSZ for 2020 are shown below in figure 21.

SAP Ref	Contact Type	DMA	DZ	Date	Kedington WTW in supply?
57100060	Illness – Vomiting or diarrhoea	SUDHBTMA	SUDBHTDZ	January 2020	No
57163791	Illness – Mouth	SUDHCKMA	SUDBHTDZ	February 2020	No
58306973	Chlorine	SUDCACMA	SUNDUNDZ	December 2020	No

Figure 21 – Water Quality Contacts from Haverhill PWSZ in 2020

12. Investigation Into the Cause and Actions Being Taken to Prevent a Reoccurrence

Our current detailed MIC governance and processes to ensure compliance with Regulation 31 are outlined in the previous sections however, in light of this event a full review has been carried out with our Alliance Partners to ensure a step change in Regulation 31 management and ensure this does not happened again.

Within Anglian Water we have recently appointed new roles, a Chief Engineer and a Materials Scientist, with the key purpose to drive improvements in quality and consistency of output across the business. Our Chief Engineer is leading this

process review working closely with the Head of Water Quality and will be responsible for driving forward actions identified to ensure we can demonstrate a step change in this area.

The detailed investigation carried out has focused on three key areas:

- Procurement and contractual relationship with suppliers
- Design/engineering standards and decision making
- Delivery assurance and compliance

The investigation has identified the following areas to be addressed:

- Change Management
  A critical record of how the design developed was not rigorous enough as to define the moment when the change from ductile iron pipe approved for full immersion in water to supplier provided ductile iron occurred or why.

- Delivery Assurance
  Reference to MIC requirements is present in existing documents however, the existing processes do not interconnect logically or in a way that is simple for team members to follow, creating vulnerability through over complex referencing.

- MIC/Regulation 31 Visibility to Delivery Teams
  Clarity in minimum asset standards, design guides and reference materials require improvement.

- Suitability and Capability of the Supplier
  Integrated framework suppliers are selected based on a range of requirements including technical competence and experience with an on-going annual review to assure continued adherence. However, a requirement for further assurance has been identified in this area.

- Reliance on Individual Competence
  Training and competency of individuals key to Regulation 31 compliance are currently not supported by robust assurance processes.

The actions we have identified to drive a step change in Regulation 31 compliance and understanding fall into the following 3 key areas:

1. Combined Assurance Process Improvement

Remove barriers that exist that prevent the easy passage of critical information between teams, review standard inspection and assurance templates to include clear and unambiguous reference to Regulation 31 and clearer links backs to standards and the design.

A full review of all water Minimum Asset Standards to ensure a consistent messaging about materials in contact currently this information is available however in a fragmented and difficult to follow format.

A full review of all Mechanical / Pipeline Design Guides and reference materials to be undertaken to ensure a full suite of standards directly connected to ensuring MIC compliance and awareness, including the creation of a dedicated pipework design guide which includes a full review of 'Standard' material notations.

This review will clearly improve the visibility of all Regulation 31 requirements such as compliance with Instructions for Use (IFU).

2. Use of Digital Solutions to embed and track products and certification throughout the design and delivery phase.

The element of real time data within the Building Information Modelling (BIM) model will align Scientific, Procurement and Design to enable a real-time database of Materials In Contact for use within the delivery team.

Within our @one Alliance, designs are created in 3D models, utilising the BIM 360 platform. Every component (such as a pipe, valve or item of equipment) is selected from the engineering catalogue, a database that provides comprehensive data to allow the correct selection of compliant components, this catalogue and the data are continuously reviewed and updated.

The 3D model can be interrogated, and properties such as Regulation 31 status can be reported in a schedule which can then be used for procurement. This MIC schedule could then be accepted by the Water Quality Scientist through a BIM360 document workflow. Using these tools, compliance with Regulation 31 can be clearly and unambiguously demonstrated in the design process.

To manage any alterations during construction the @one Alliance design change process requires the designer to approve any design changes, including a change of materials or suppliers. This can be specifically tailored to assess potential impacts on MIC compliance. This process is managed within the BIM software, see figure 22.

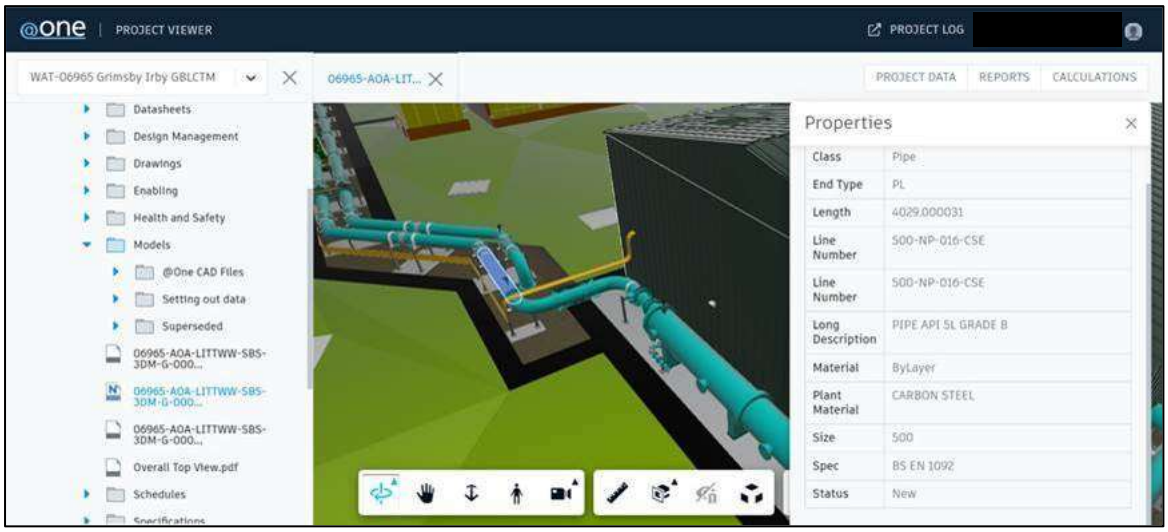


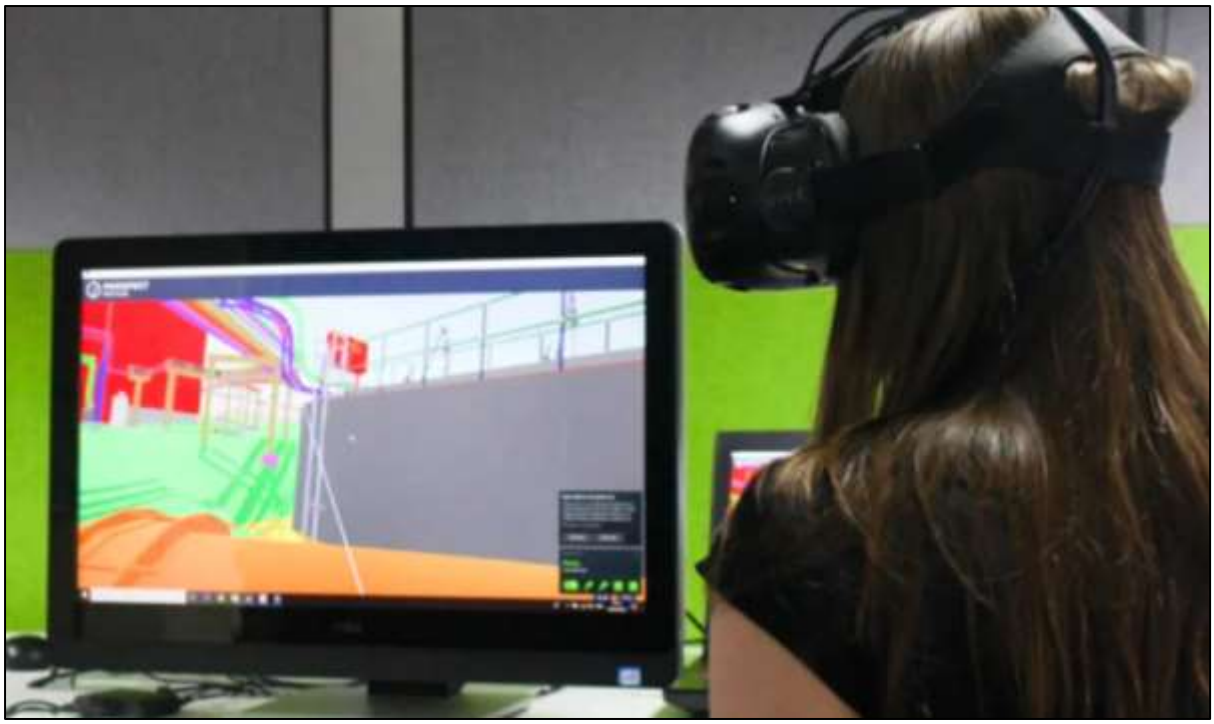
Figure 22 – BIM Software Screenshot

As part of our digital transformation our @one Alliance uses digital data and models to collaboratively design the new assets, but before moving towards Assembly, the project is scrutinised and tested to meet a specific criteria in a

process called 'Fit for Assembly'. This process includes the Design and Assembly teams, along with key supply chain suppliers.

However, before this stage there is another, equally important, phase, 'Project Rehearsal'. The rehearsal, as its name implies, is a collaborative digital exercise where the designers engage the wider delivery teams, including the integrated supply chain in the optioneering phase.

The digital rehearsals combine the output of the planning sessions into an intelligent digital model of the asset, aligning them with the planned program to produce both sequence and method. The tools use the BIM model in both the augmented and virtual immersive environment enabling the assembly teams and end users to ratify the design fully, see picture 23.



Picture 23 - Augmented and Virtual Immersive Environment

This process allows real time data within the model, delivery framework partners, assembly and operations team to validate the plan. This model remains 'live' throughout the delivery phase and is used to cover off any changes and their impacts before implementation. Ever increasing detailed BIM data is being added and linked to other dependent systems to improve the delivery and final asset process.

As outlined above it is our intention to increase the detail within BIM data to include Materials In Contact and Instructions For Use which will reference to a live database. The Project Rehearsal and the Fit for Assembly will then be used as additional checkpoints as part of our quality management system to confirm Regulation 31 compliance, see figure 24.

This approach will be applied throughout the Anglian Water frameworks to ensure consistency across our business.

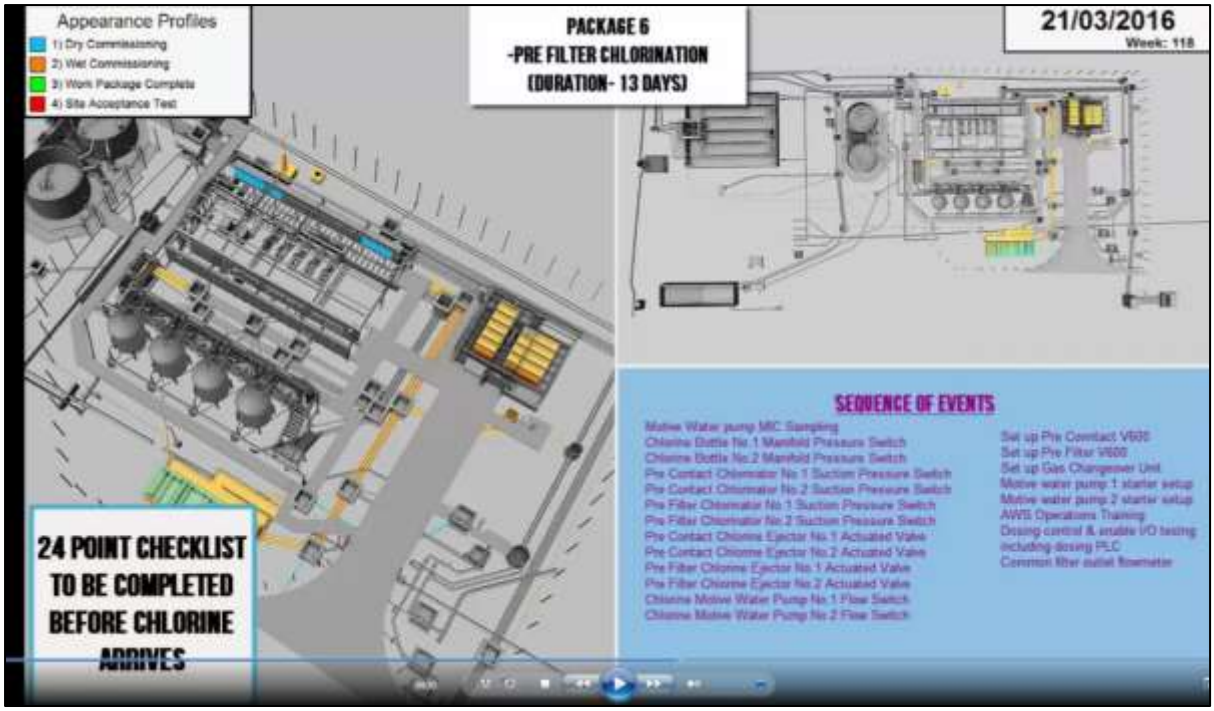


Figure 24 - Animated '4D' model build aligned with Program

The link below demonstrates the benefits that can be realised using this digital solution:
https://www.youtube.com/watch?v=t4HVRv97JKc

3. Training and Competency

Training and competence are key to the success of delivery; core to this is our staff but also our integrated supply chain. To this end we have a number of systems and processes to embed the core principles of the management of Materials In Contact and the wider water quality standards.

Each of our staff, who have a role in the design, procurement, installation and commissioning of assets all undertake a range of training exercises in both e-learning and face to face assessed training modules for the wider POSWSH standards but also focussed MIC training.

Our training runs from the basic awareness through to detailed training from our water quality scientists for designers and both include assessment of competency. To improve our knowledge base further, we have identified the need to match training to role and define this training as core competence and therefore compulsory. This training will be tracked and visible on our 'Workday' system, see figure 25 showing e-learning currently available on Workday.

In addition to clearly embedding Regulation 31 training with role we are looking to implement a Licence to Operate (LTO) process for key roles within our Alliance delivery partners. This will be expand on the successful LTO schemes currently in operation across our business including operational and scientific teams.

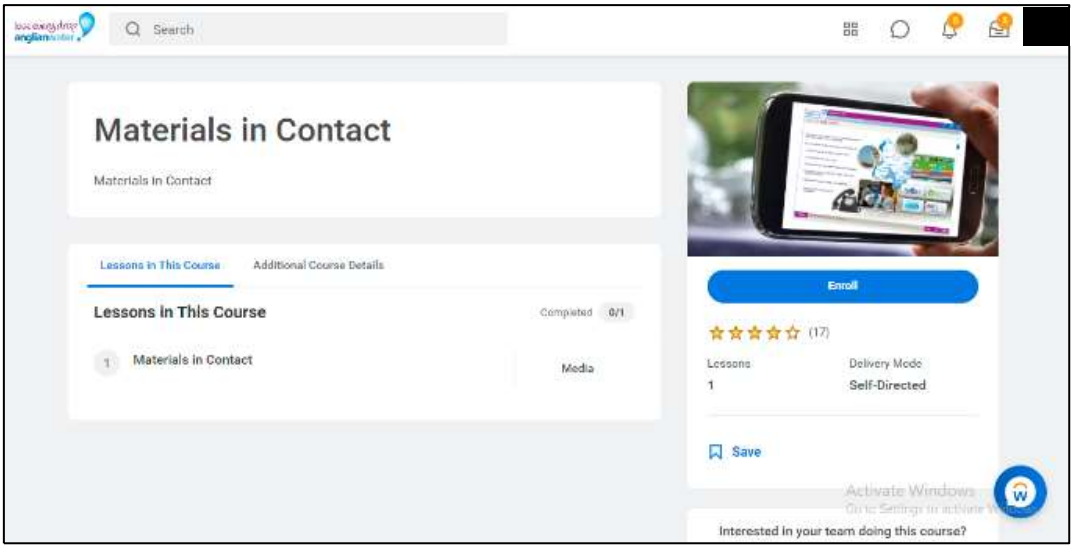
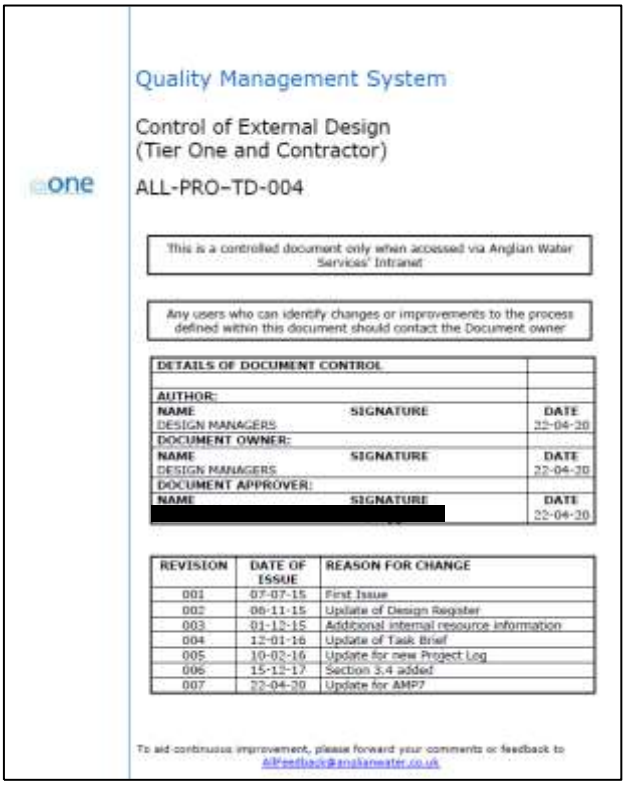


Figure 25 - E-Learning available on Workday

With respect to our Integrated Supply Chain, we assess their suitability and ability to deliver key assets and maintain a register of capability which is reviewed annually as per the procedure ALL-PRO-TD-004, see figure 26. The focus to date has been on CDM capabilities and awareness of items such as water quality needs. Going forward we will extend our training into our integrated supply chain who will receive Regulation 31 training, managed through the M2i Active application, assuring that they meet the clearly defined requirements of what our contracts and standards ask for. In addition, a process will be introduced, mirroring a system currently on place for our chemical suppliers, whereby changes within integrated suppliers are notified to us proactively for assessment of their potential impact on Regulation 31 compliance.



Quality Management System

Control of External Design
(Tier One and Contractor)

ALL-PRO-TD-004

This is a controlled document only when accessed via Anglian Water Services' Intranet

Any users who can identify changes or improvements to the process defined within this document should contact the Document owner

DETAILS OF DOCUMENT CONTROL		
AUTHOR:		
NAME DESIGN MANAGERS	SIGNATURE	DATE 22-04-20
DOCUMENT OWNER:		
NAME DESIGN MANAGERS	SIGNATURE	DATE 22-04-20
DOCUMENT APPROVER:		
NAME [redacted]	SIGNATURE	DATE 22-04-20

REVISION	DATE OF ISSUE	REASON FOR CHANGE
001	07-07-15	First Issue
002	06-11-15	Update of Design Register
003	01-12-15	Additional internal resource information
004	12-01-16	Update of Task Brief
005	10-02-16	Update for new Project Log
006	15-12-17	Section 3.4 added
007	22-04-20	Update for AMP7

To aid continuous improvement, please forward your comments or feedback to [redacted]

Figure 26 – Procedure ALL-PRO-TD-004

We understand the importance of ensuring competency while operating in a contractor environment and working closely with our Training and Development team we have recently made improvements in this area. One example is within our Integrated Metering and Developer Services Alliance (IMDS) where role specific minimum standards have now been set and agreed focusing specifically on the inclusion of Water Quality Training and awareness. Continued competency is formerly monitored via annual re-assessments on POSWSH modules. A dedicated IMDS and Integrated Maintenance and Repair (IMR) page has been created on our intranet Lighthouse where IMR and IMDS induction schedules are published along with the dates of the monthly induction sessions and detailed role requirements. In addition, stand-down events for IMDS teams, managers and Developer Services (DS) Engineers, associated with the delivery of new mains and services were rolled out November/December 2020 to reinforce the importance of water quality. These were collaborative events supported by Head of Water Quality and Head of IMDS, and topic leads included members from Regional Quality, Technical Training and IMDS, and focused on water quality from recent events, lessons learned, hygienic practices, WQ kit validation and WQ testing.

We continue to strive to improve in this area and the learning from the case study outlined above related to IMDS will be rolled out to our other delivery frameworks to drive continuous improvement.

Regulation 31 Compliance Assurance on Current Schemes

In addition to the wider lessons learned carried out and outlined above a Water Quality Alert has been sent out to our @one Alliance and has been shared across the business through other delivery routes, see Figure 27 below.

We are also currently carrying out a review of current schemes to ensure full compliance with Regulation 31. All project teams undertook a project stand down between the 23 June and 30 June where the incident was discussed and importance of Regulation 31 compliance reiterated. The stand downs were led by the Project Technical Manager and involved all team members, the stand down took the format of a lessons learnt and improvement discussion. The teams were asked to look at their part in the process of ensuring compliance and where they felt improvements could be made. As part of the stand down each team was requested to undertake a Stop, Check, Review of their projects compliance and adherence and identify any issues. The finding of the review did not identify any further Regulation 31 issues.

Quality alert

love every drop
anglian water

For all @one Alliance | Issue No: QA0021 | Date: 14/07/2021

Materials In Contact – Regulation 31 Compliance

What happened

A major scheme installing a new water treatment plant for Iron and Manganese removal was found to have non approved materials in contact contained within its treatment stream.

Validity checks of current DWI approvals, correct identification and inclusion within the MIC forms for approval was not completed in sufficient detail.

Designer checks, on supplier's equipment was not thorough enough where additional sub contractors were engaged, leading to material not being fully assessed for presentation to the Water Quality team for approval.

What the risks are

MIC forms and processes are in place to ensure we are compliant with Regulation 31. Breaches in Regulation 31 are a criminal offence.

Any such breach can seriously impact upon the company's reputation, possible prosecution, and above all, risk to the customer's drinking water quality.

It is also important to follow the Instructions For Use – which accompany Approved Materials as failure to abide by these conditions can render the approval void.

Best practice

Ensure that **ALL** Staff involved in the Design, Procurement, Delivery, Construction and Commissioning teams are fully trained in Materials In Contact Regulations and their Use before undertaking specification.
Ensure that the conditions of the approval – the Instructions For Use are fully adhered to are monitored and recorded.
Ensure that output of our supply Chain MEICA frameworks providers meets the provisions needed in the Materials In Contact Regulations and their Use.
Make your self fully aware of the relevant standards governing our processes.
Ensure MIC form A is correctly completed and submitted for approval following internal design review – Refer to process below.
Ensure that ALL materials in contact with Drinking Water are considered during design and procurement.
Ensure that ALL materials not only have Approval, but the approval will still be in date at the time of assembly.

If in Doubt Contact the Water Quality Team for Advice.

For details of MIC process and supporting documentations – Here

Quality Alerts are issued to raise awareness and to highlight the correct way of working. If you feel you have an issue that could be raised as a quality alert, please contact the Quality Team.
For more information on other alerts, please visit www.@one.portal.co.uk

@one

Figure 27 - Quality Alert

The @one Alliance will also conduct an independently led audit, facilitated by an external independent quality auditor, of five water schemes currently in delivery. The audit process will work back through the MIC and Regulation 31 requirements implemented by the project teams, to ensure the required assurance and quality processes have been adhered to, review compliance, confirm the competence of the teams, test the understanding of the processes within the teams, and it will stress test the processes for any potential vulnerabilities and improvements that could be made to continually improve the control of materials in contact. The audit is scheduled to be complete by end of August with lessons learnt available by mid-September.

Sharing Learning with the Wider Industry

Once we have introduced these changes to drive forward compliance with Regulation 31 it is our intention to share these advancements with the wider industry. We have a number of routes to do this successfully through our existing networks in the industry but we would also like to explore options using digital technology and hosting an industry webinar or on-line event.

13. Explanation of Event Notification Timescale

On the 27 May 2021, the warranty inspection of the contact and balance tanks identified the presence of some small blue flakes on the floor of the tanks. A Risk Scientist investigated the source of the blue flakes on the 28 May and identified that the likely source was the coating of the pipework within these tanks.

Upon initial investigation and review of the MIC forms for the project it was assumed that the flaking had come from suitably approved pipework as listed on the original forms. As investigations developed with the suppliers, manufacturers and installers of the pipework it became more evident that the MIC processes had not been followed. Further requests for information were sent to the company supplying the pipework so we could assess the full impact. As there were initially some conflicting pieces of information from the supplier, we delayed the initial notification to the DWI until we had as complete a picture as possible. And, also given the fact the site had been out of supply for more than 12 months and we believed there had been no impact to water quality or customers.

We would like to apologise for the delay in reporting this event and we will ensure such a delay is not repeated for any future event.

14. Liaison

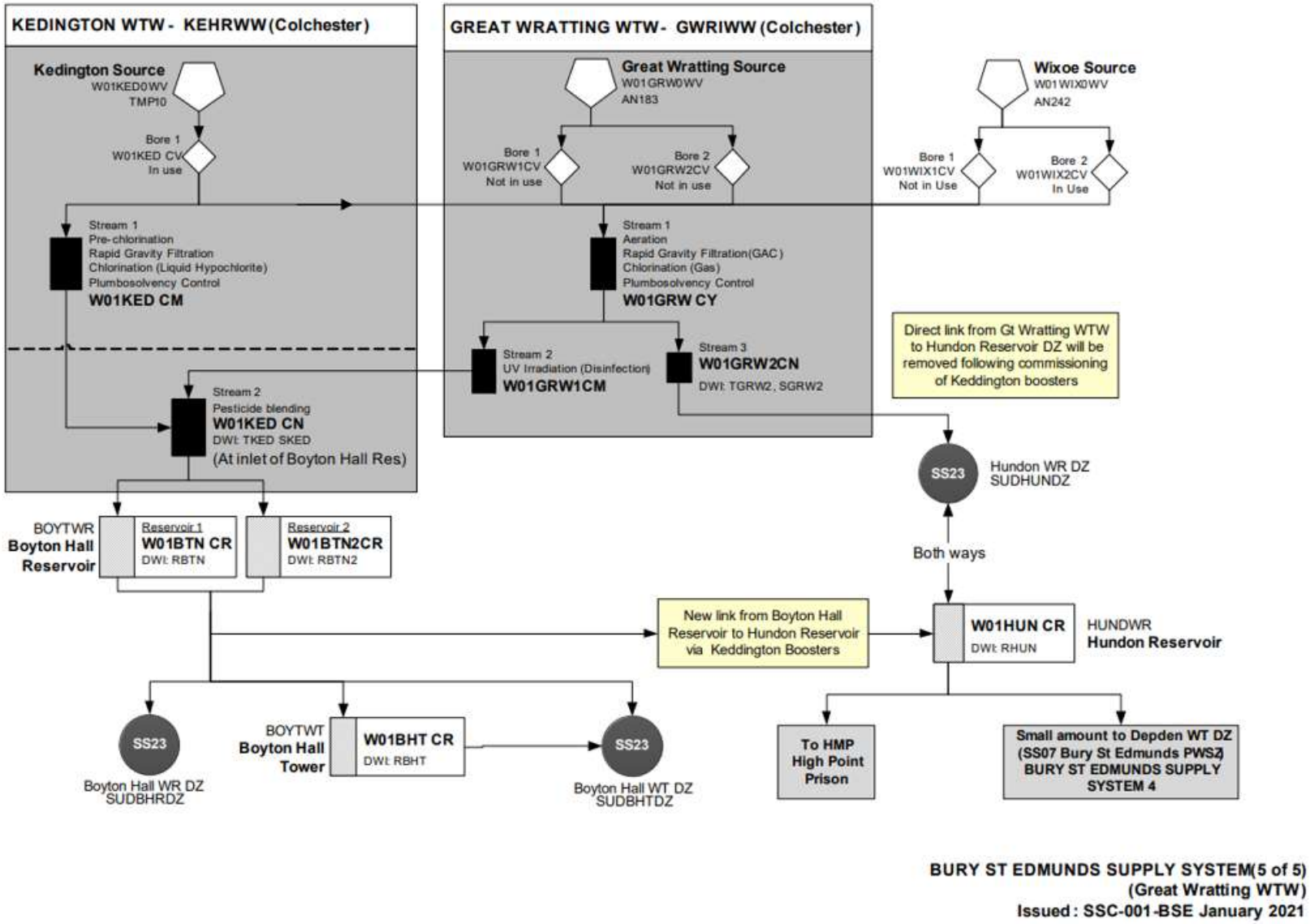
DWI
An initial notification was made to the DWI via the online notification system on Monday, 22 June at 12:44. The 3 Day Report was submitted on 25 June.

Consumer Council for Water
CCWater was notified with the Initial Report and the 3 Day Report. A copy of this 20 Day Report will also be sent to them.

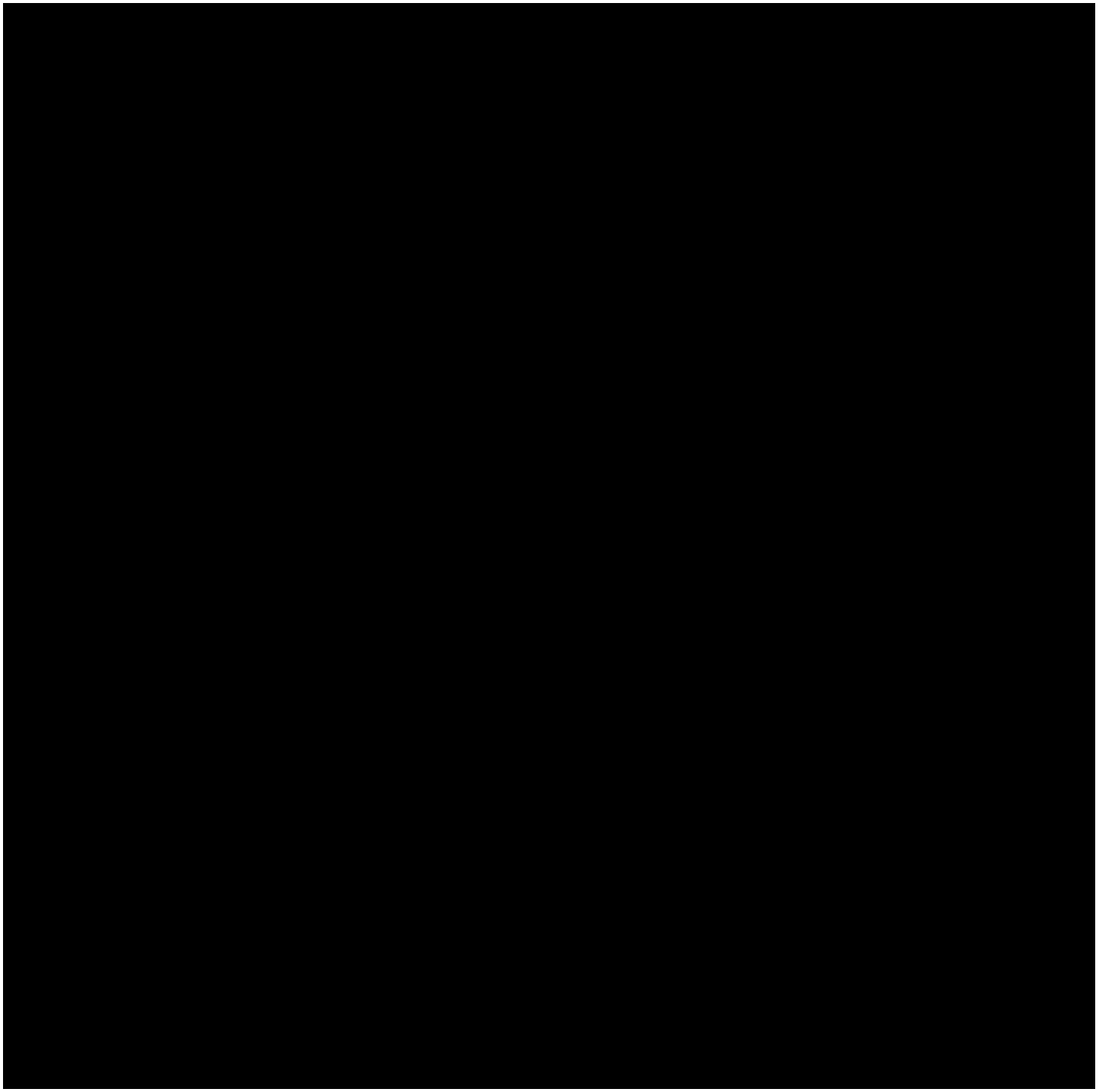
15. Publicity

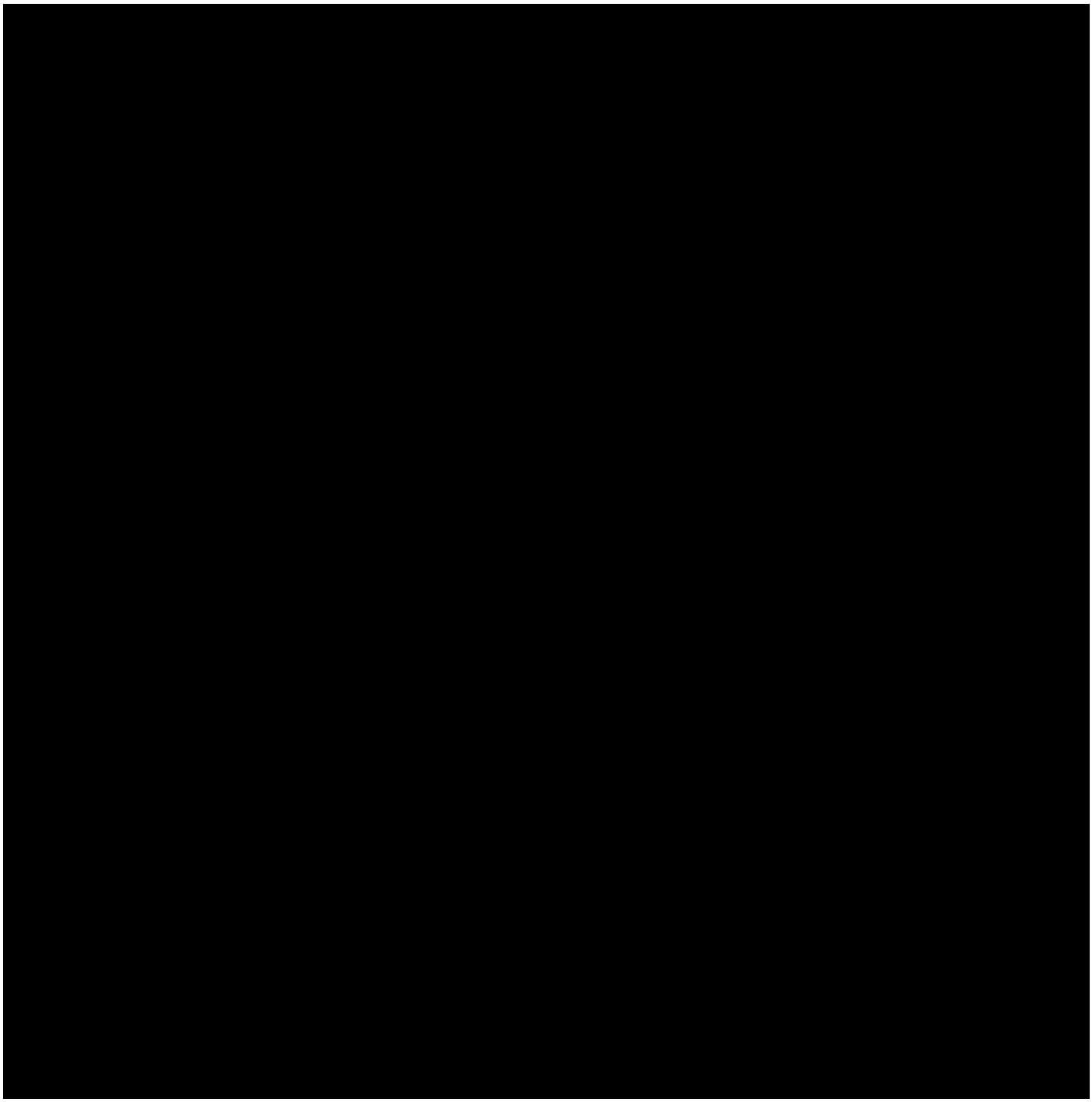
There are no known media articles or radio broadcasts relating to the event at Kedington WTW.

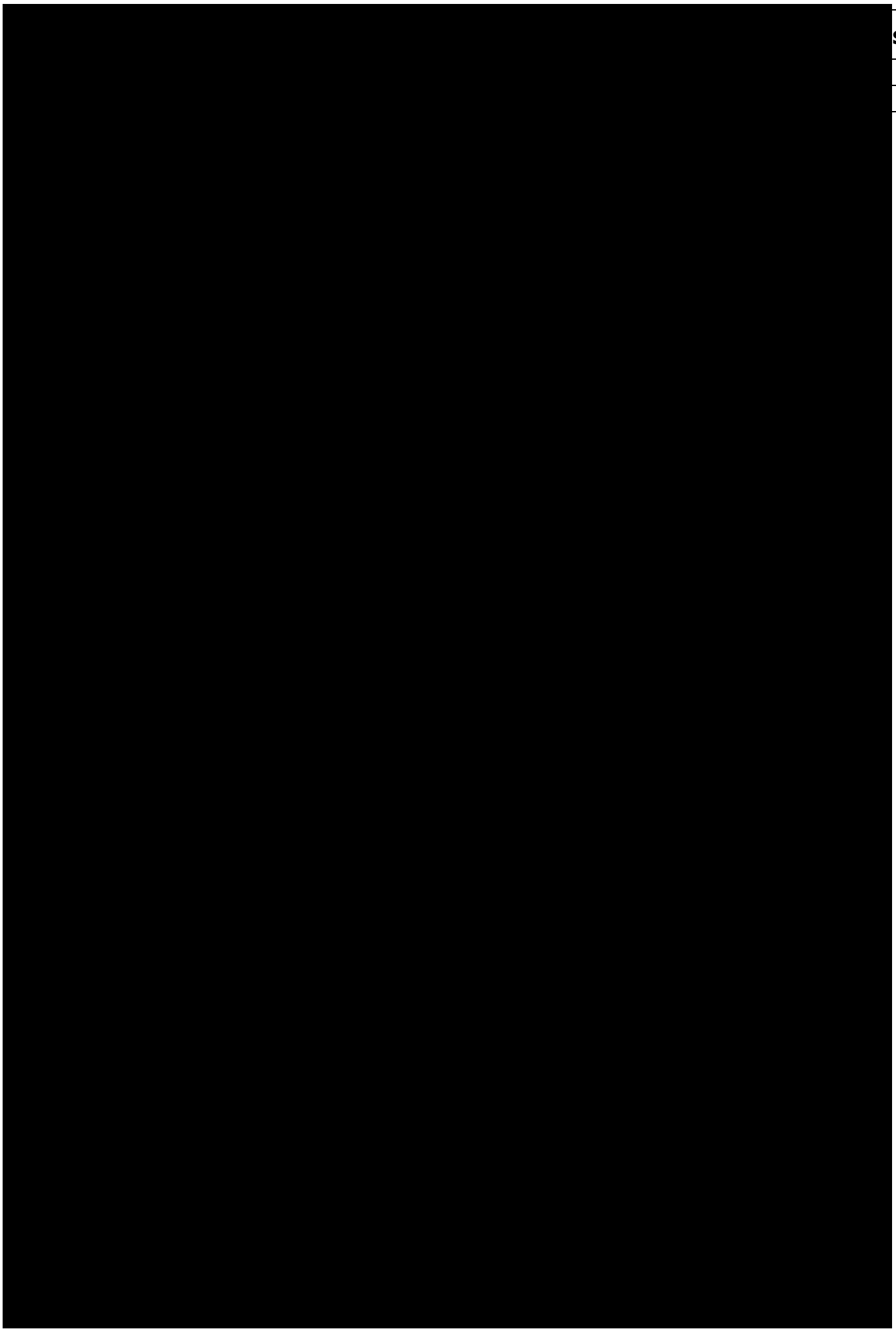
Appendix 1: Supply System Catalogue

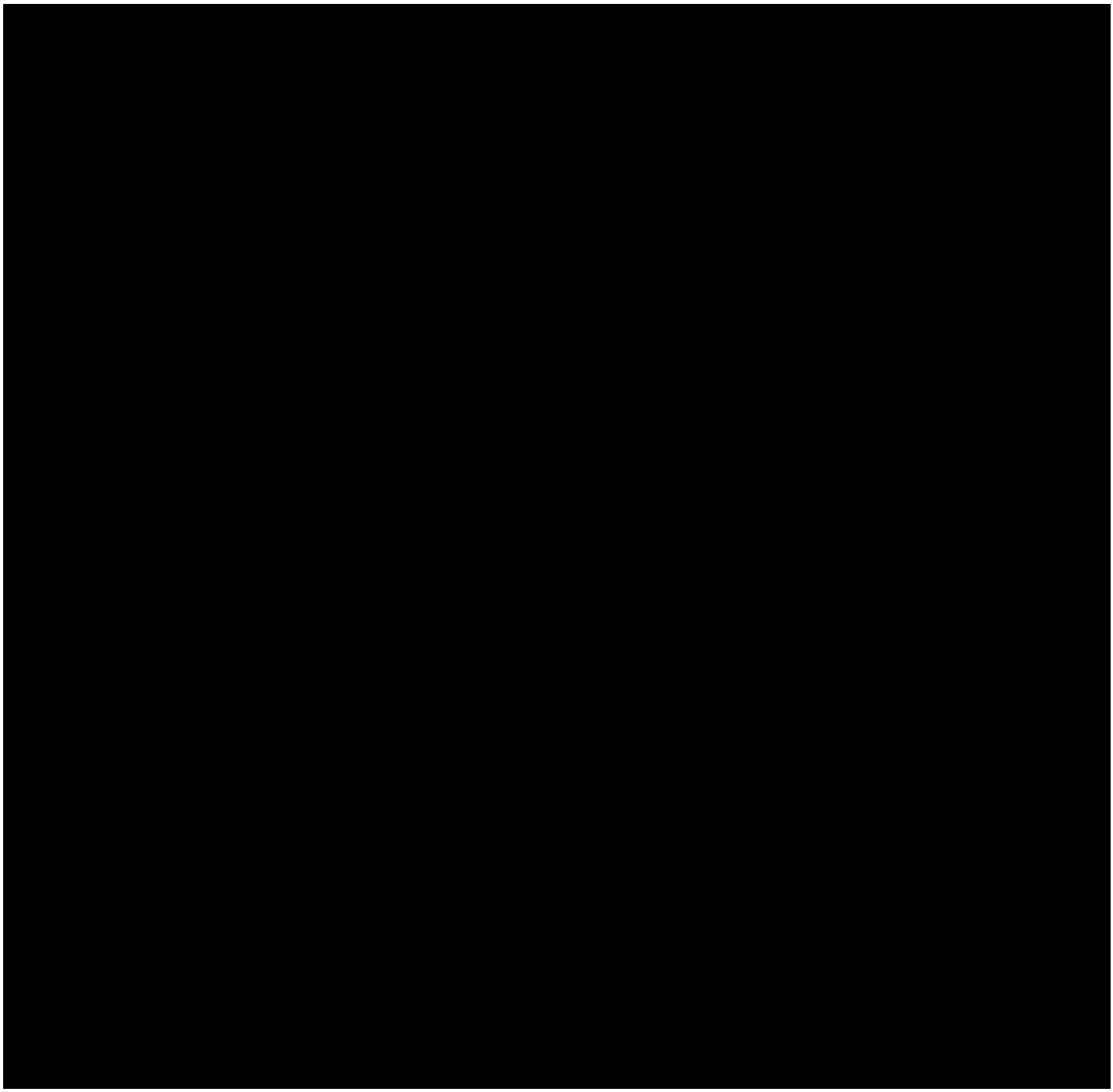


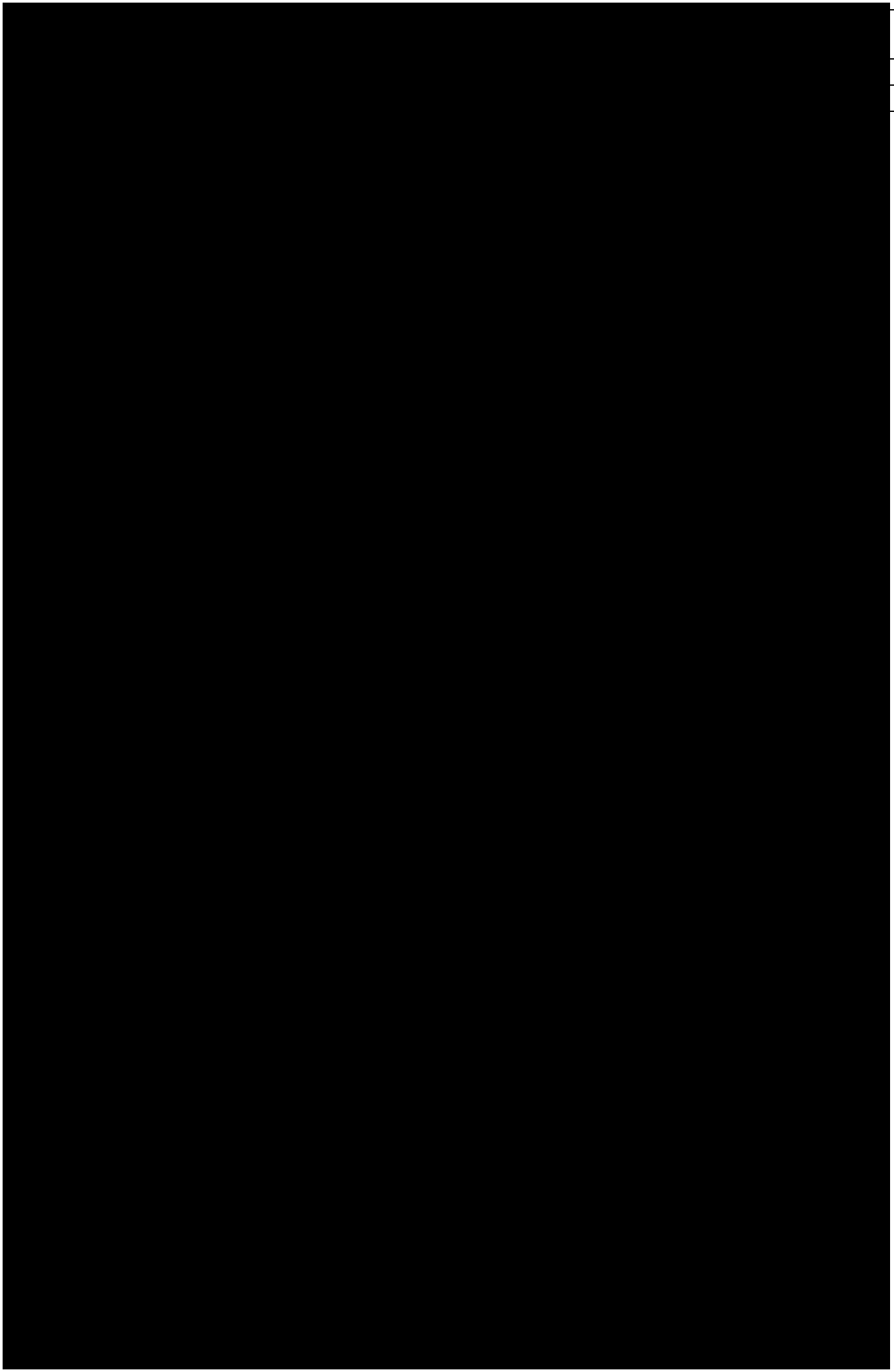
BURY ST EDMUNDS SUPPLY SYSTEM (5 of 5)
(Great Wratting WTW)
Issued : SSC-001-BSE January 2021

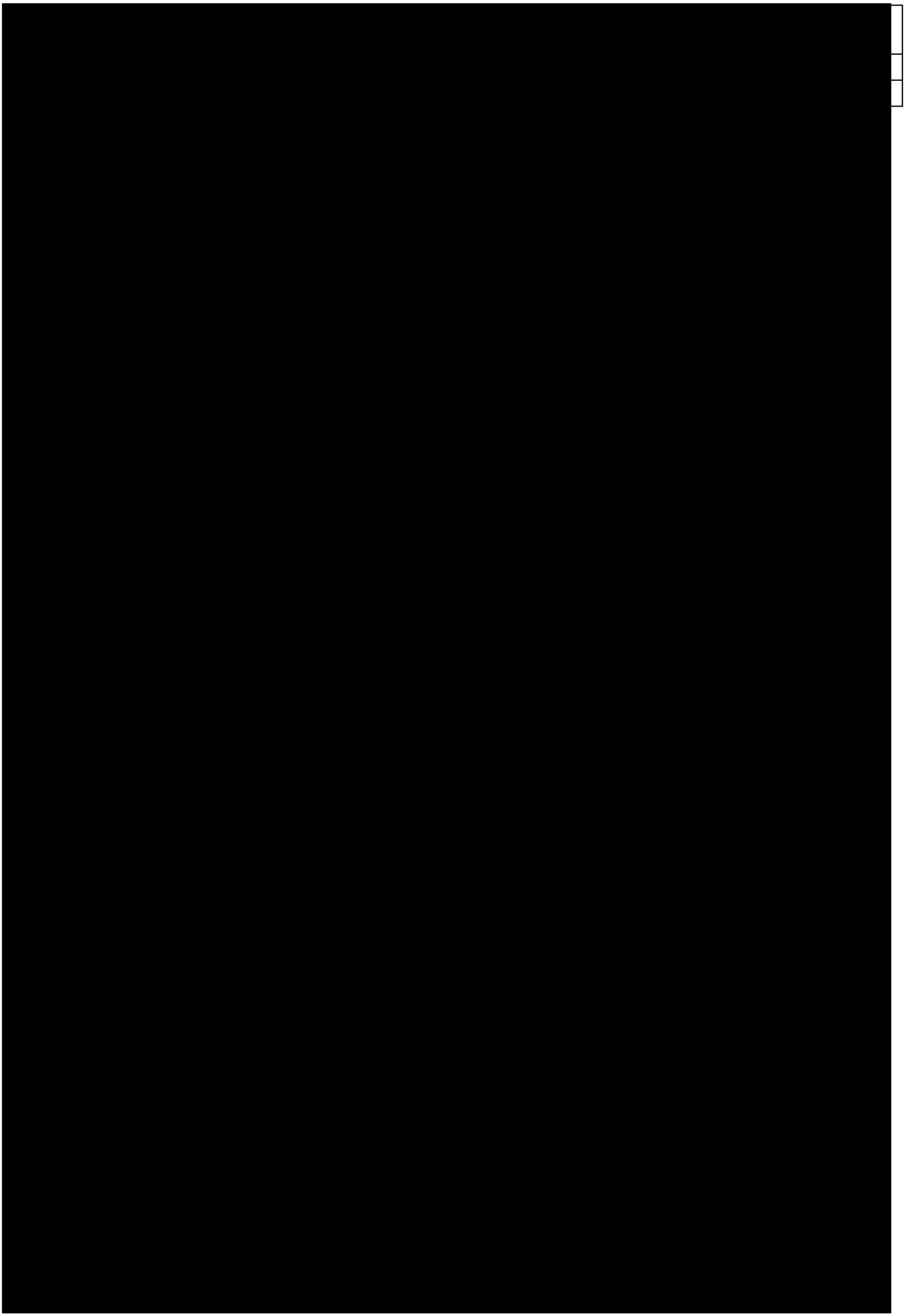


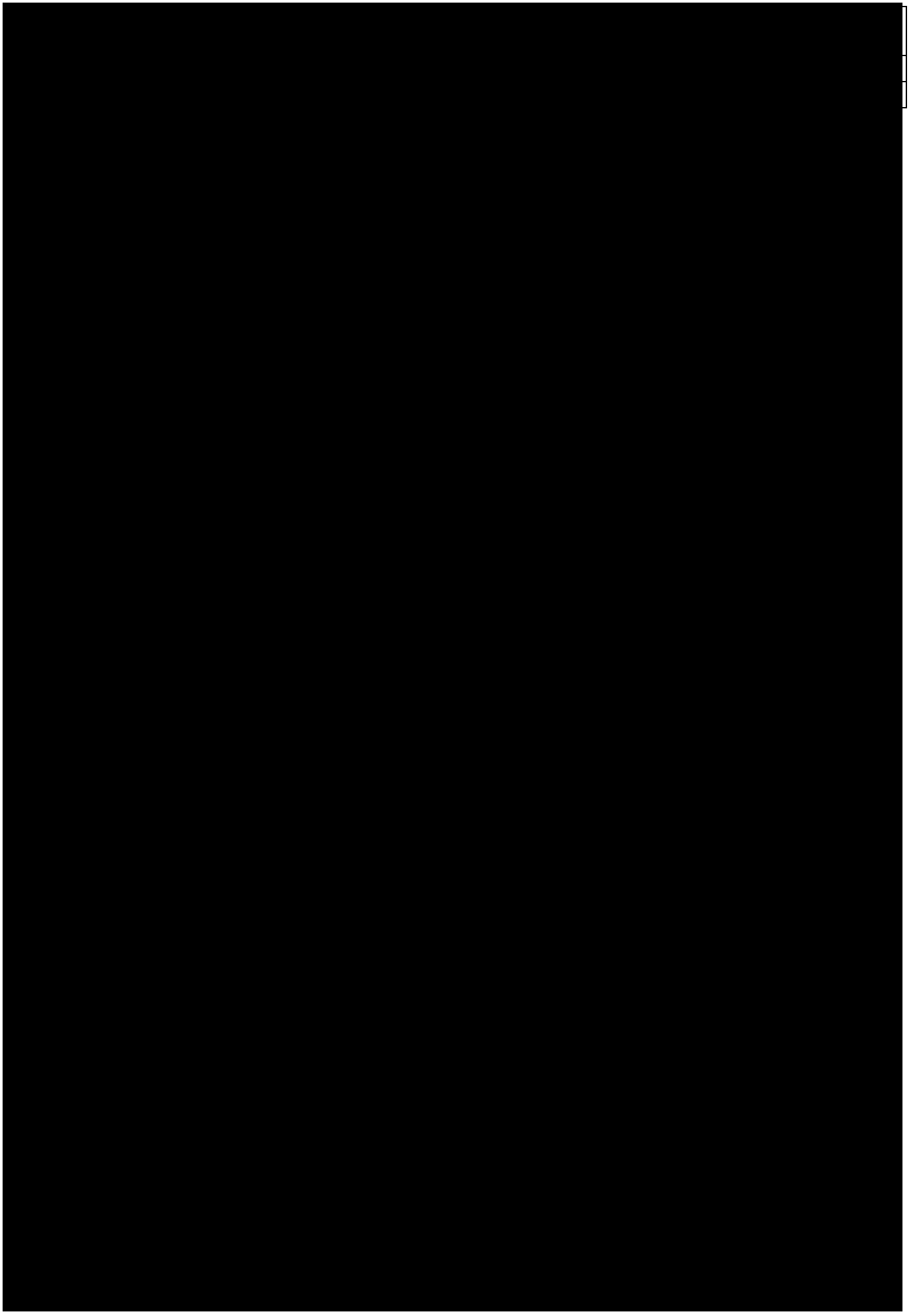


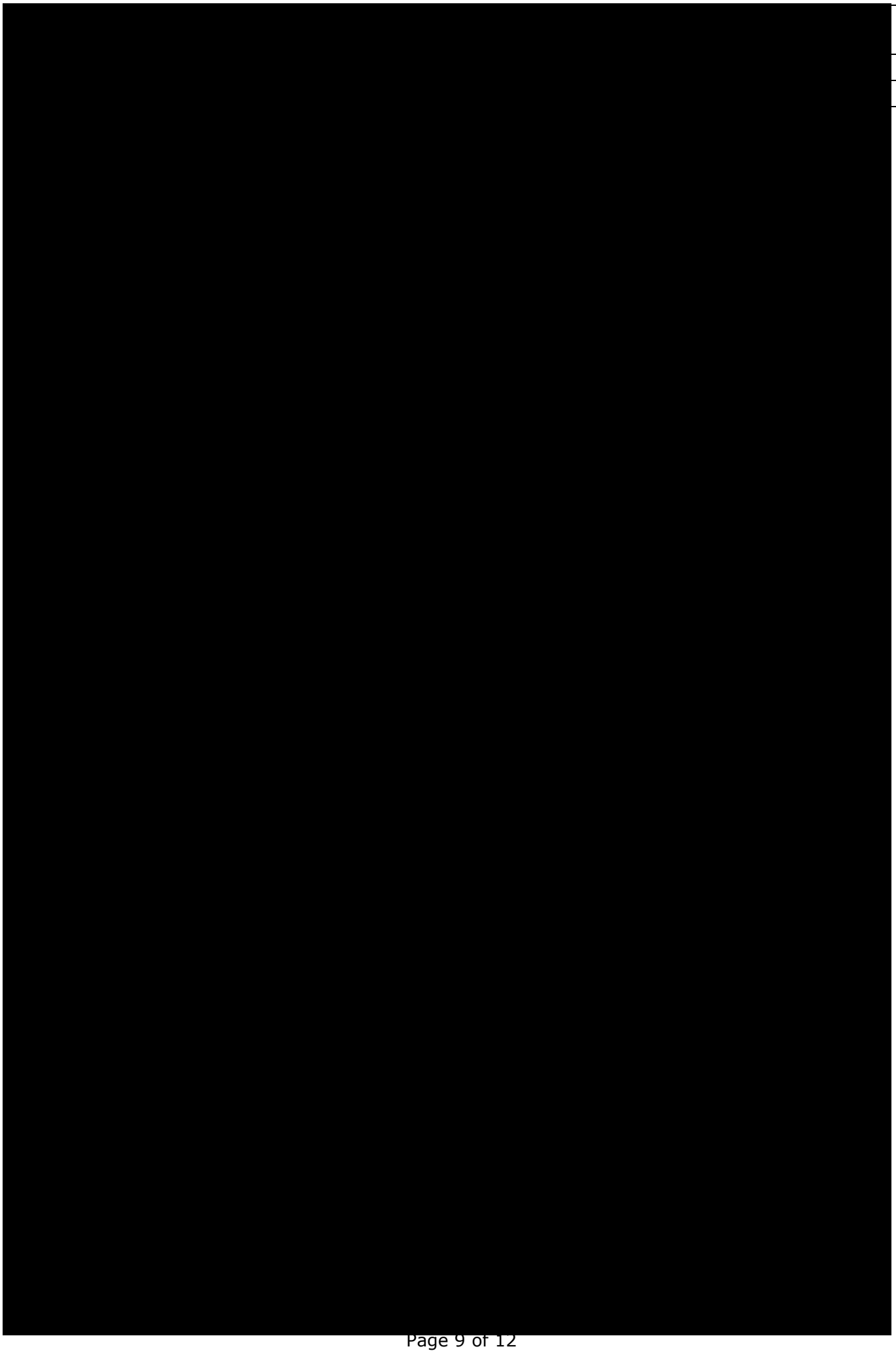


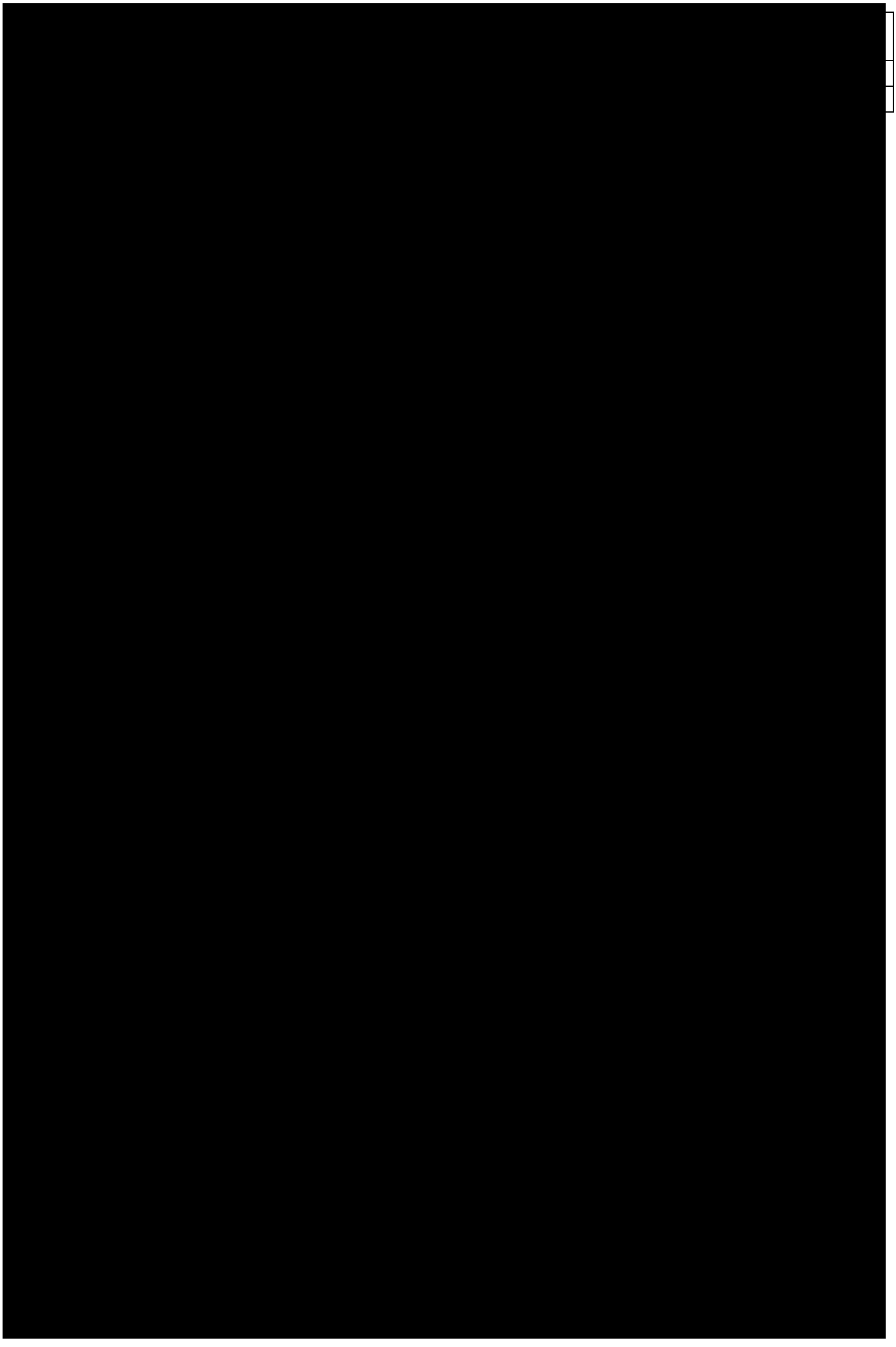


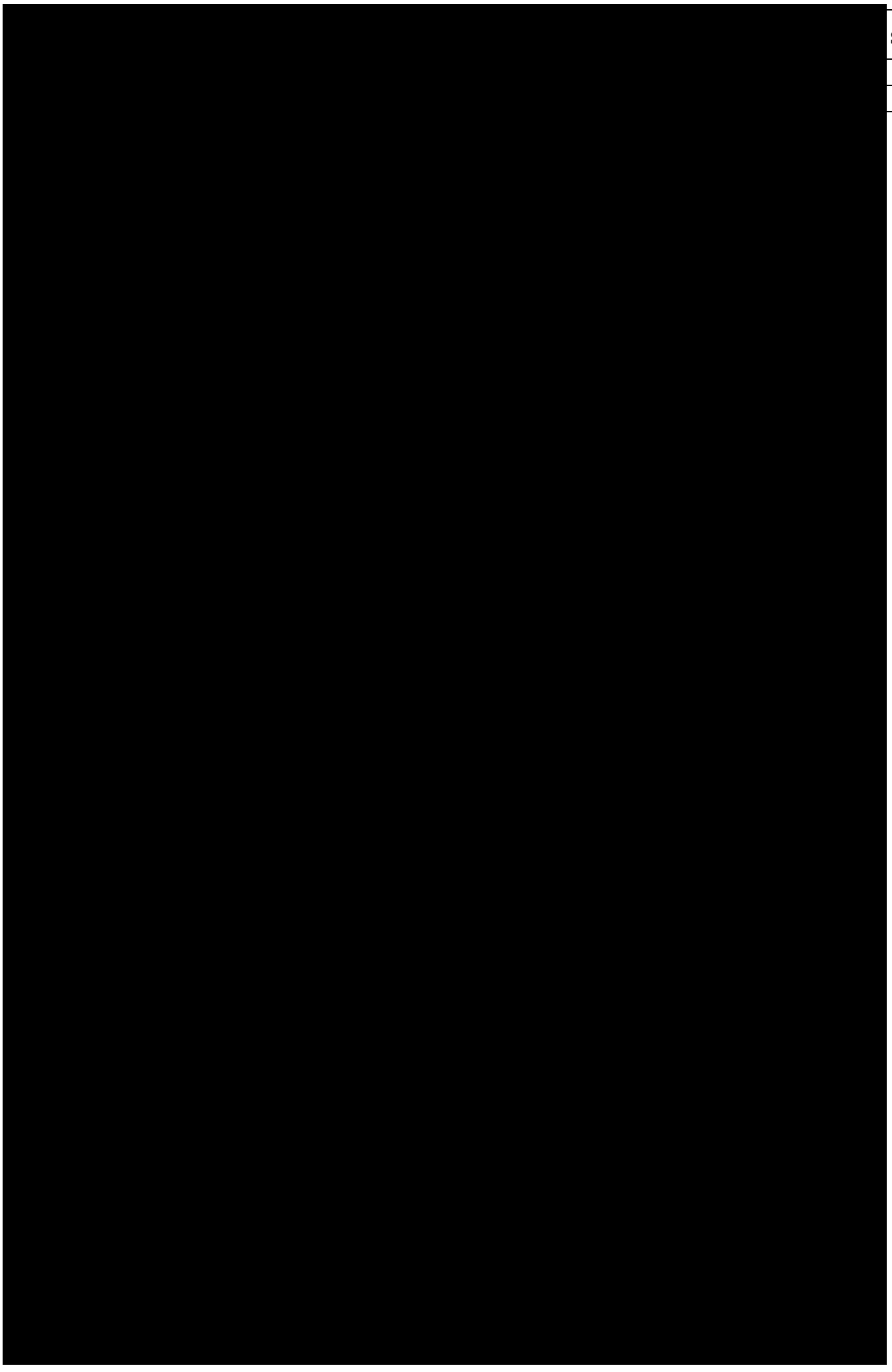












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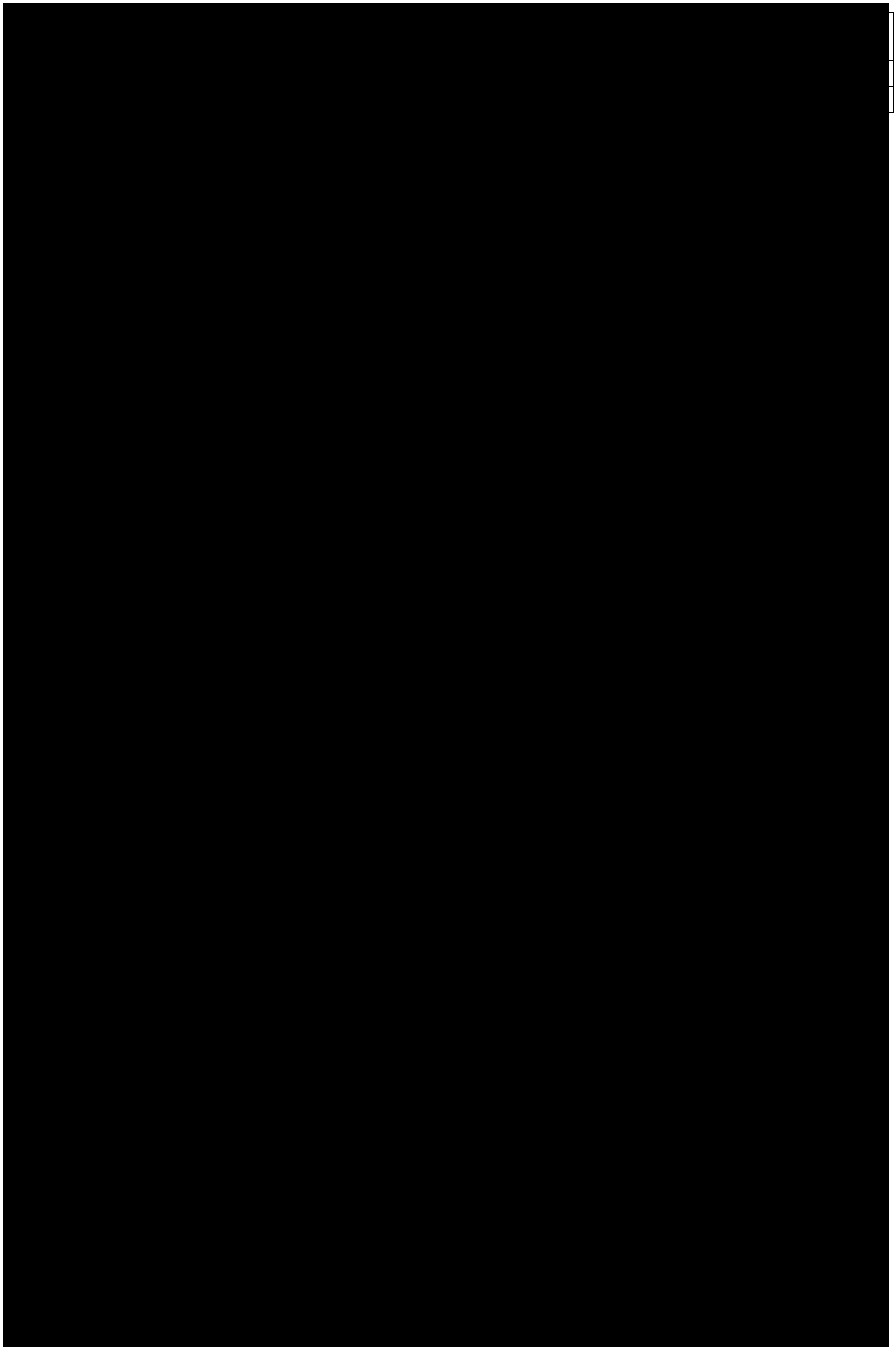

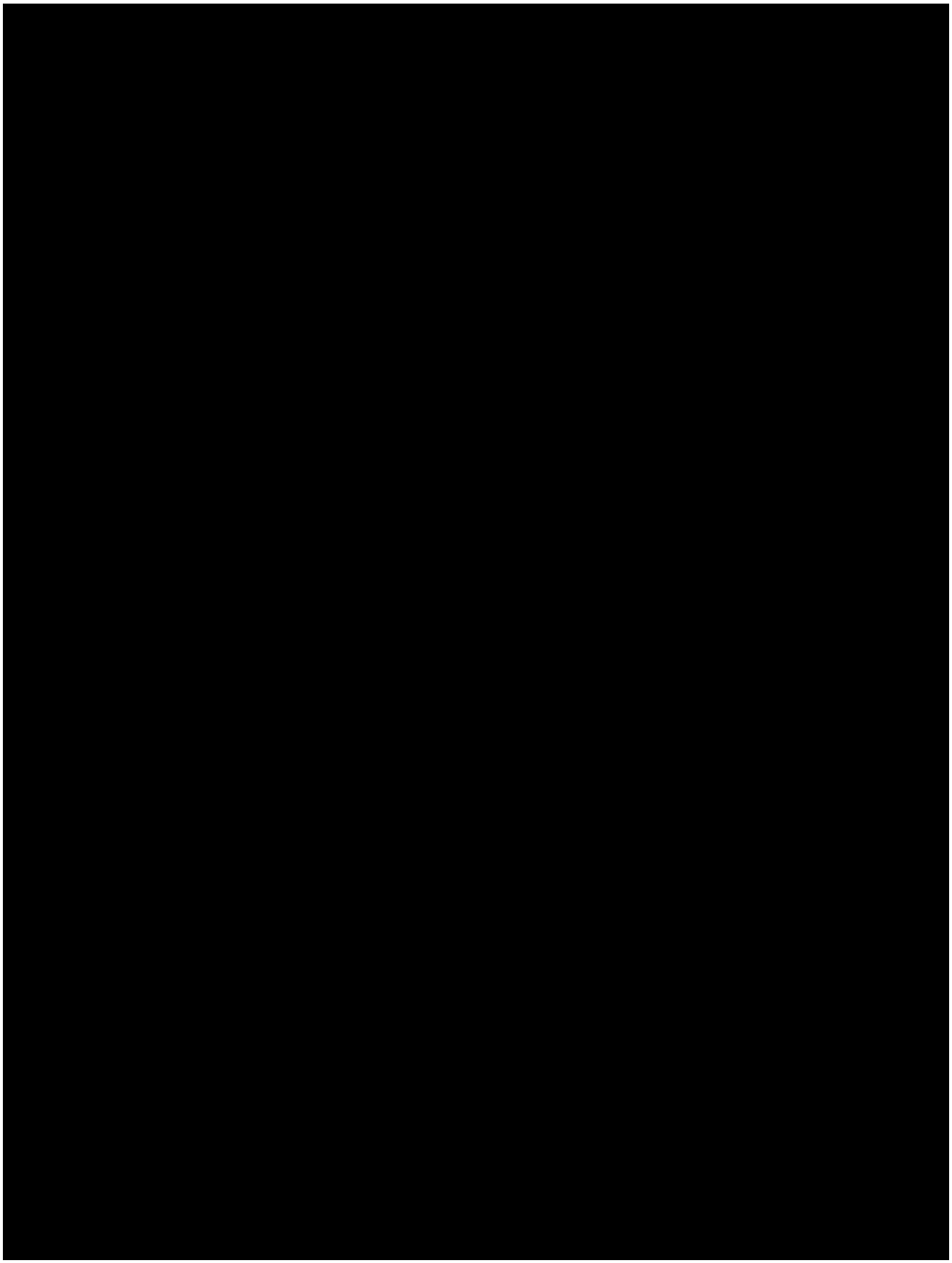

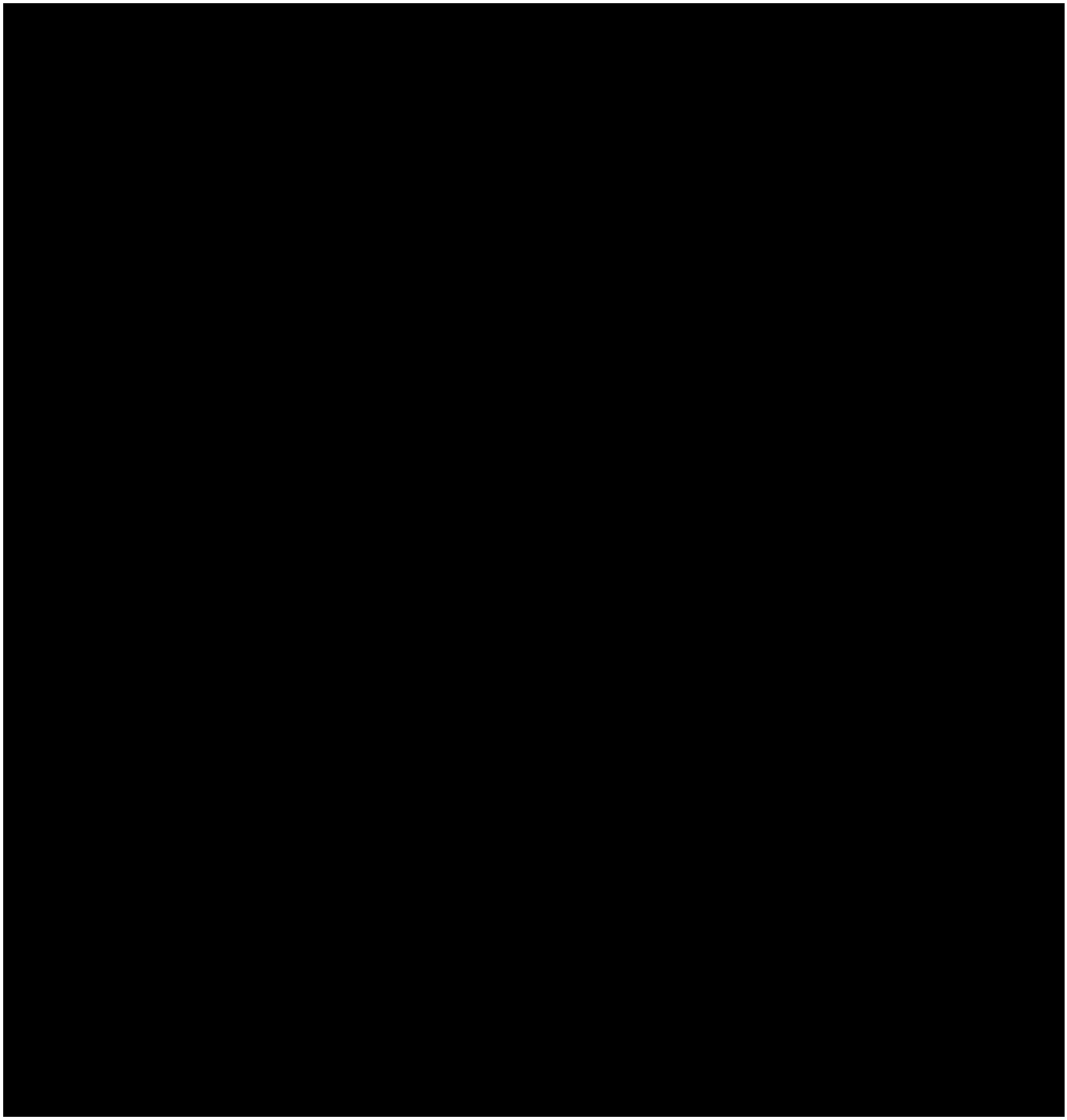

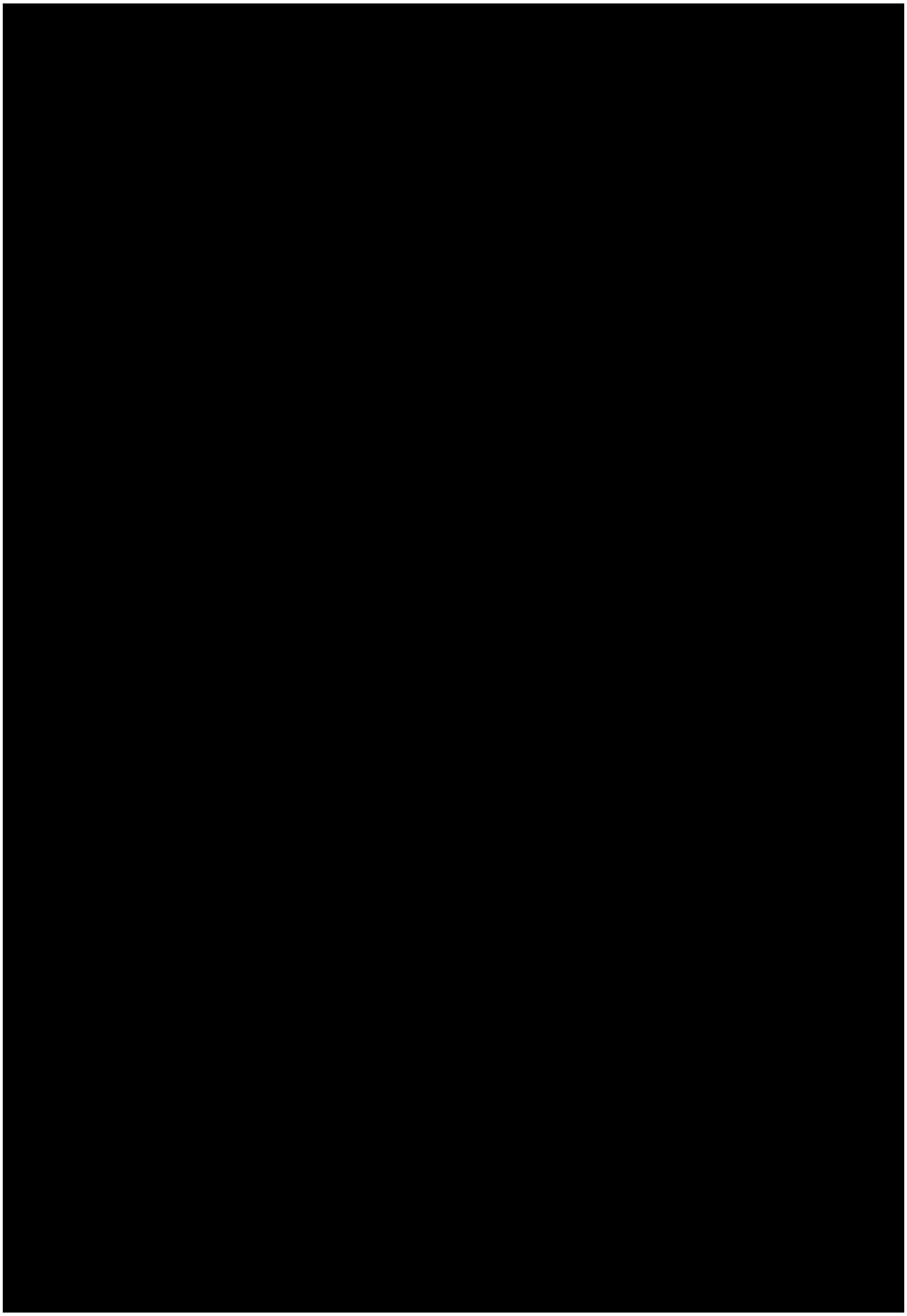

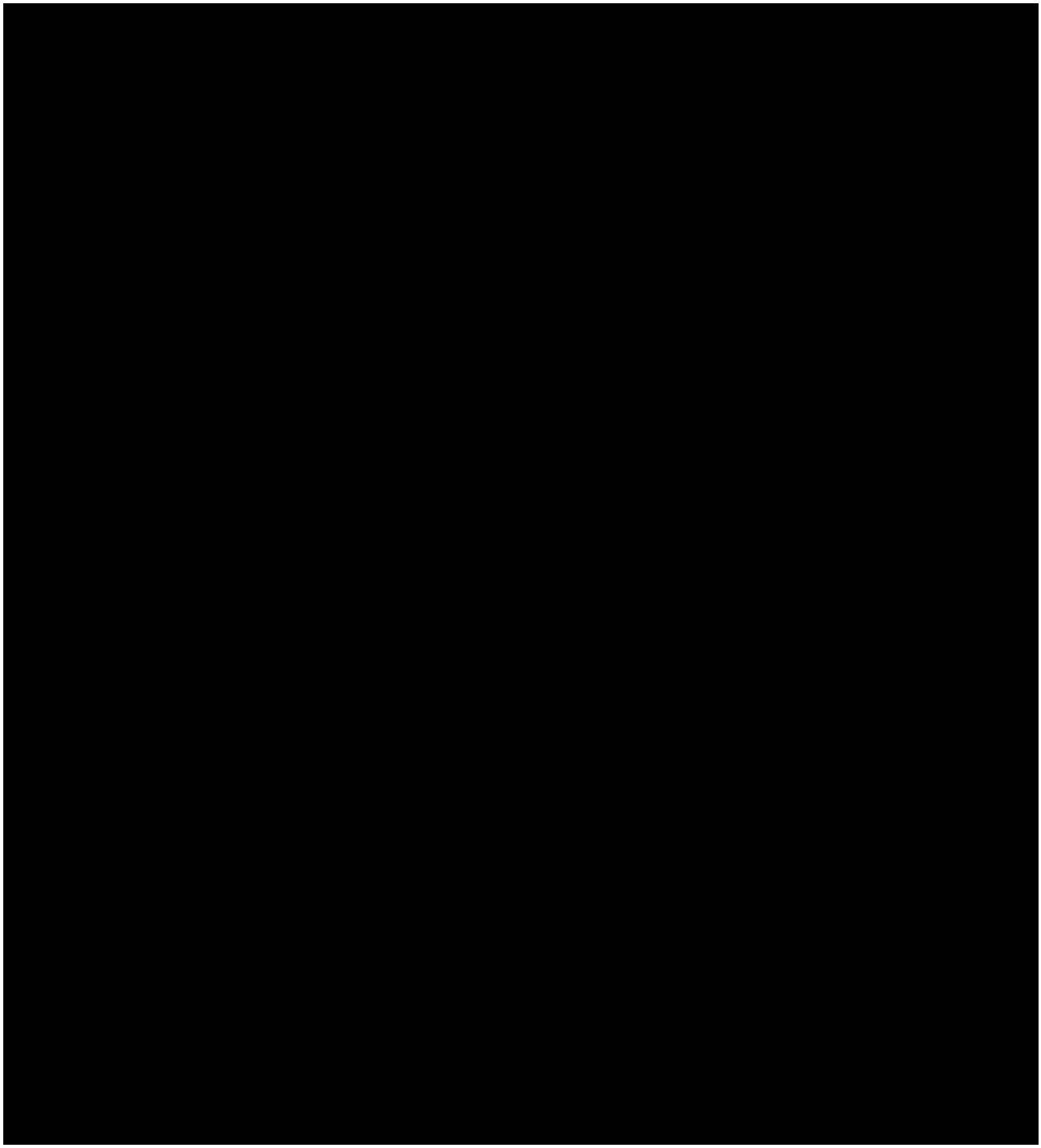

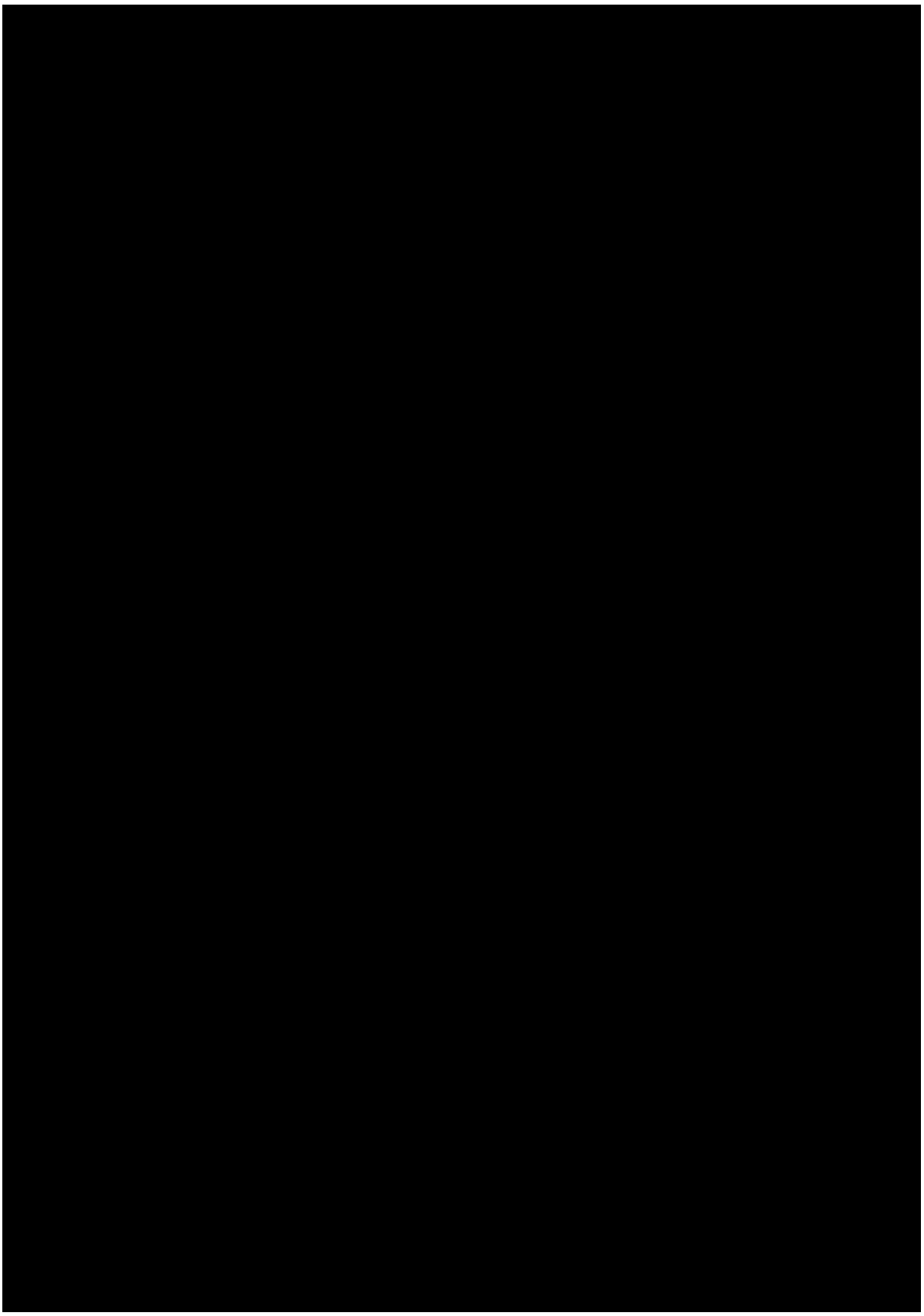

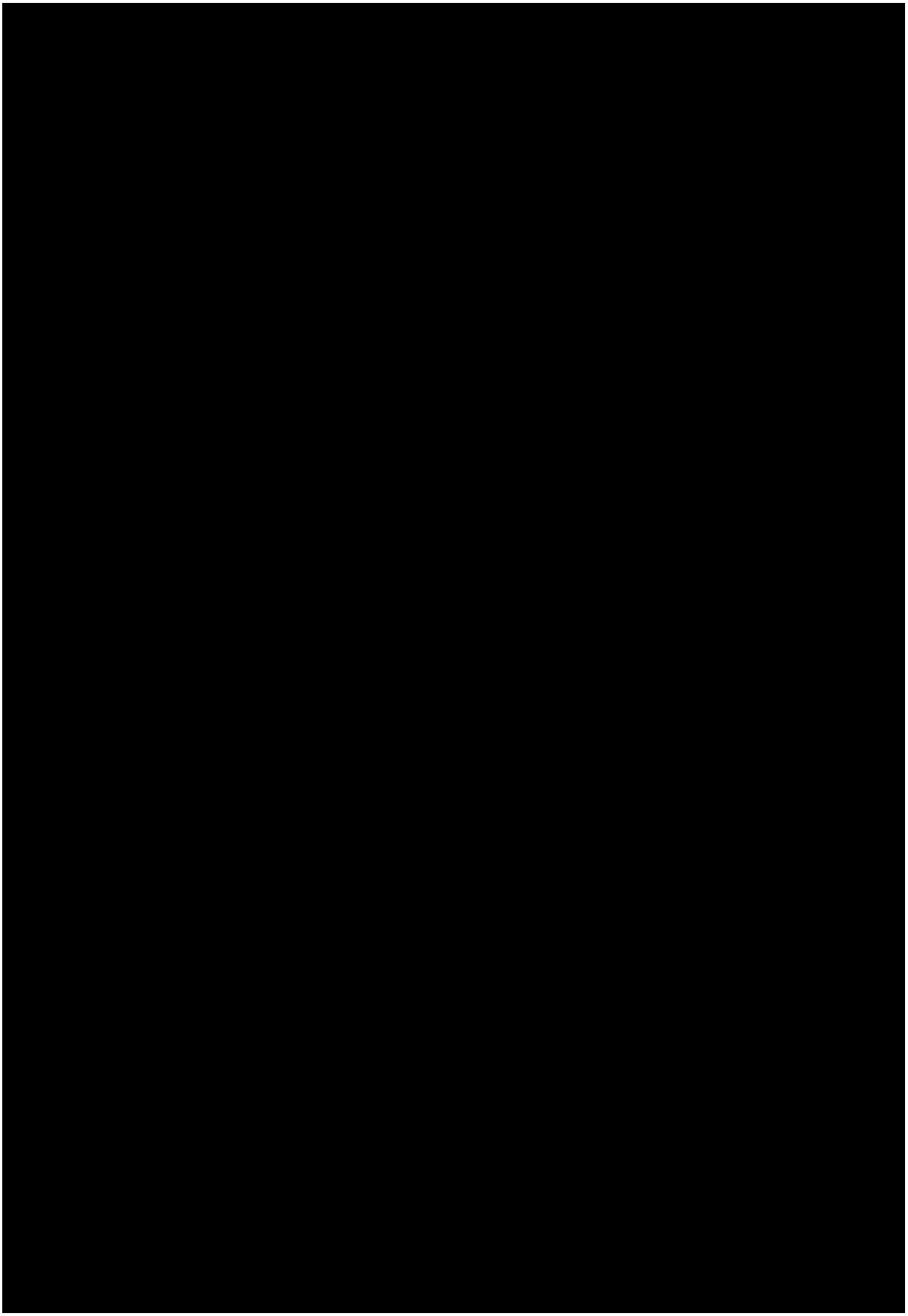

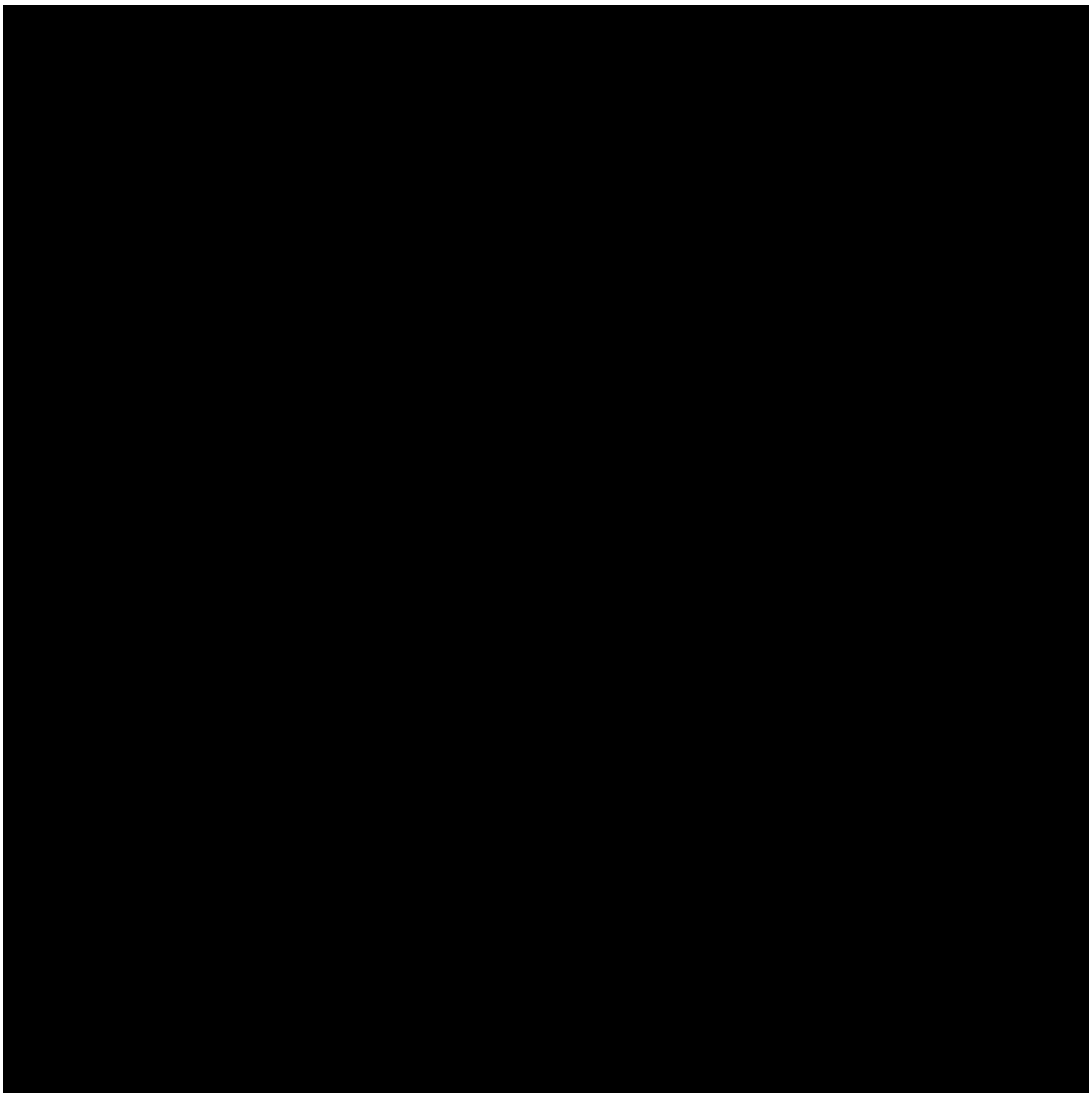

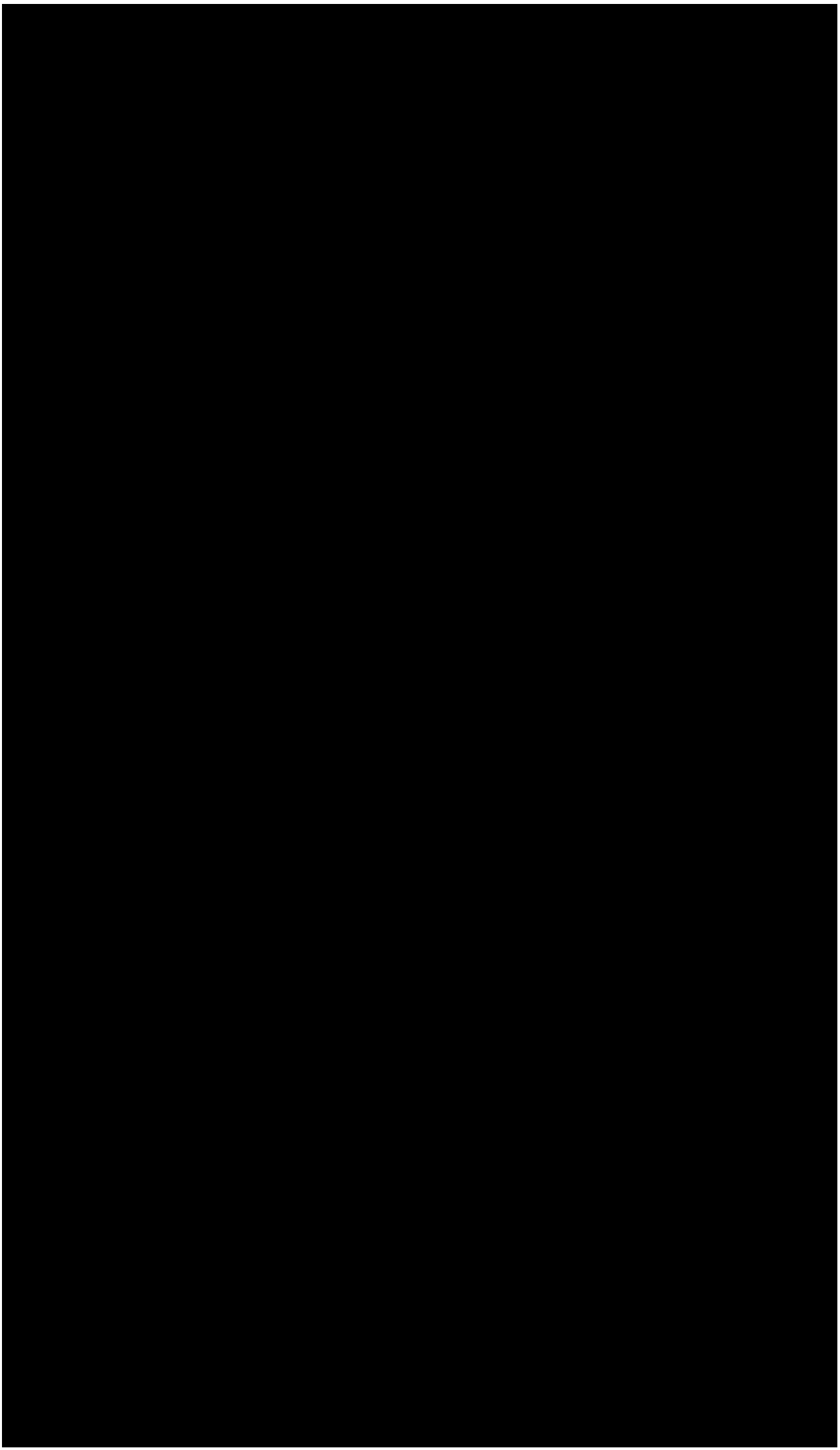

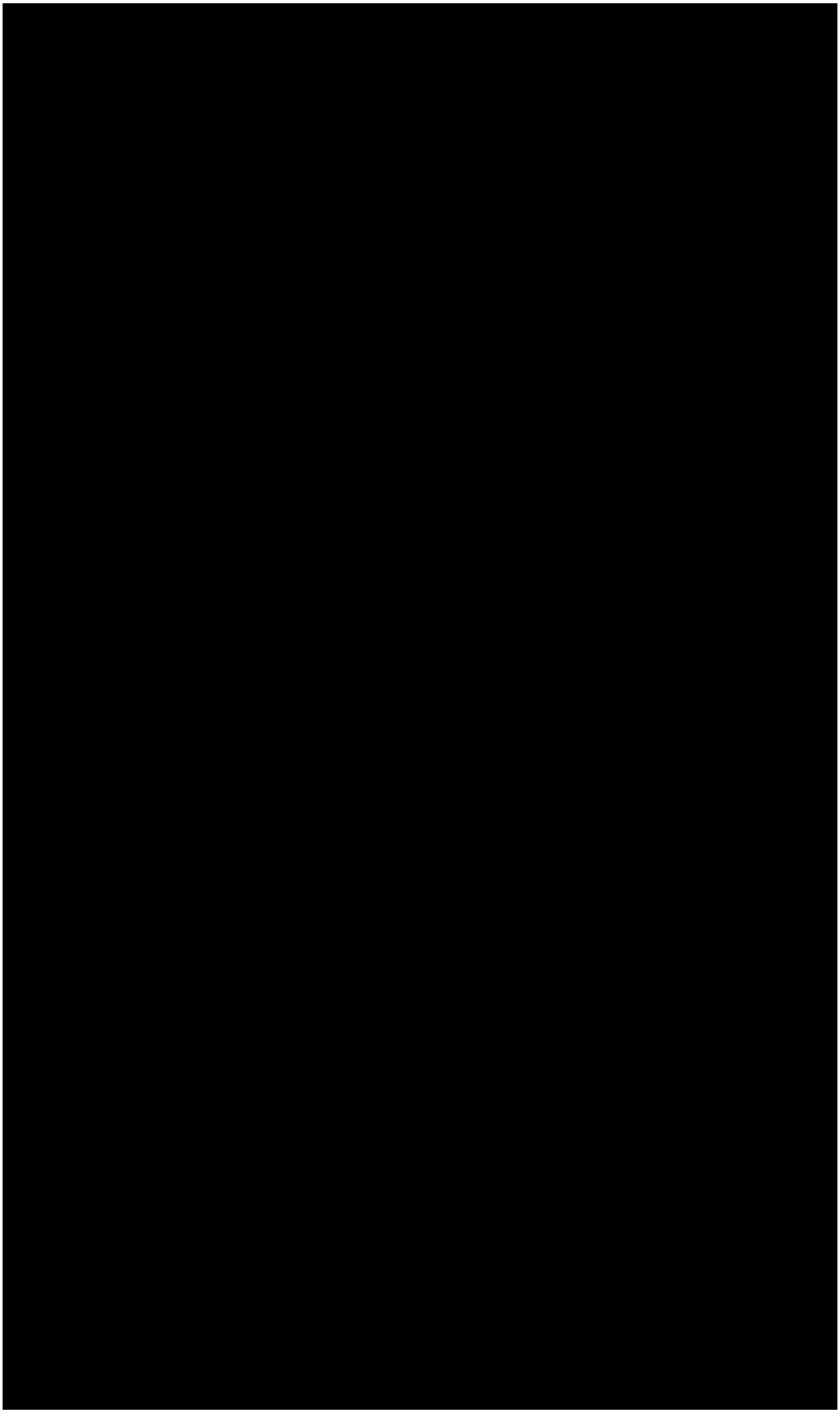

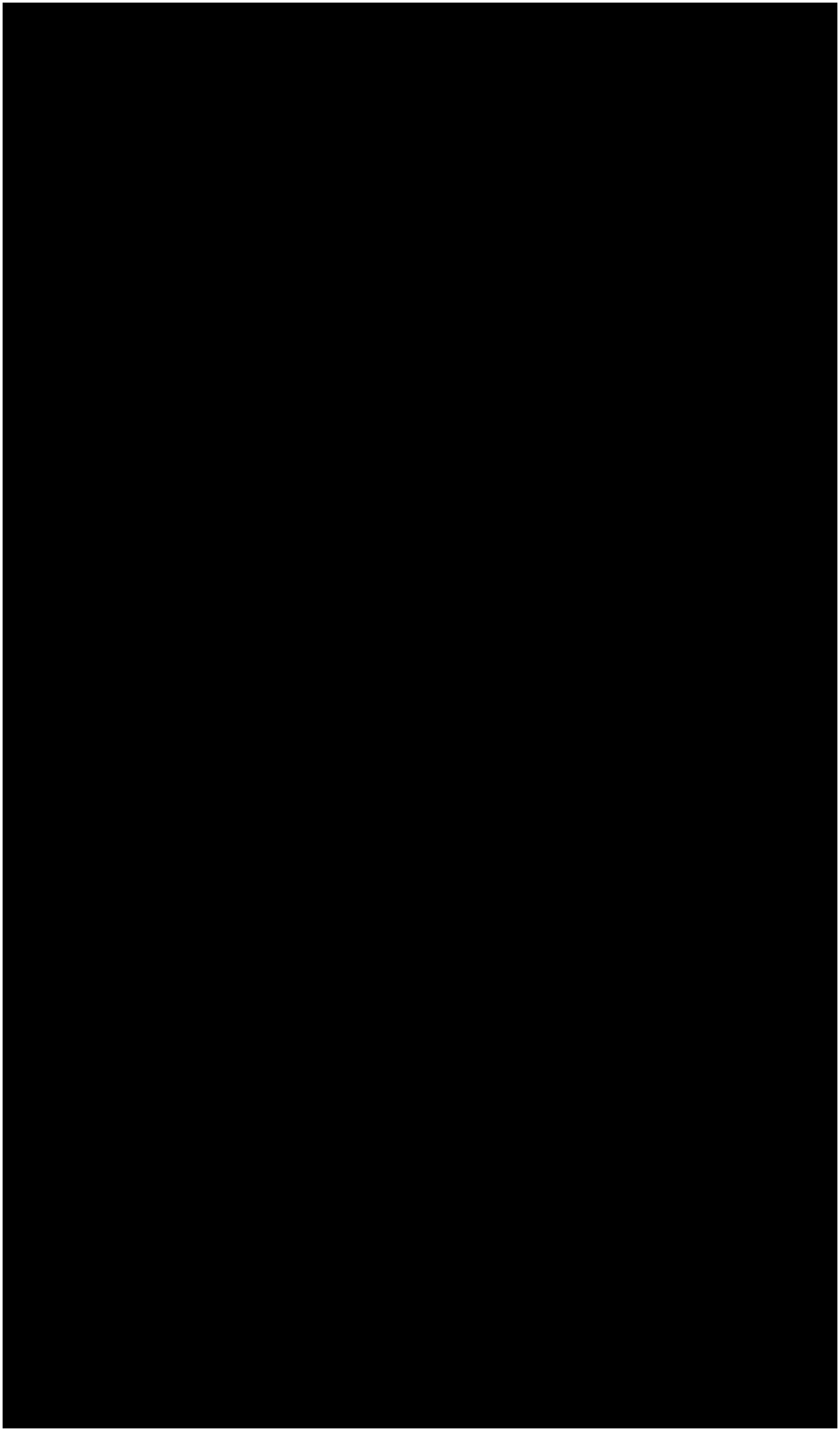

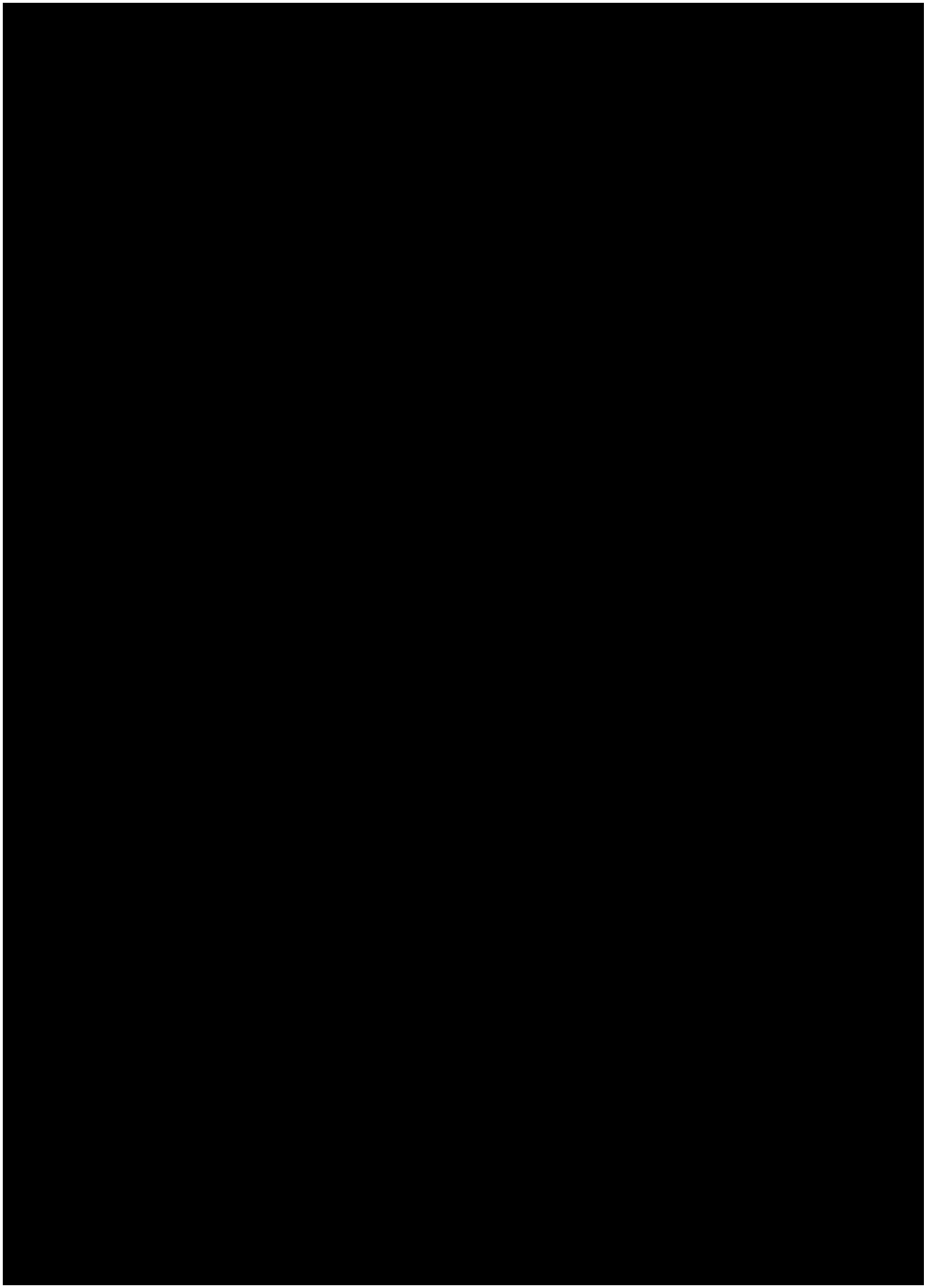

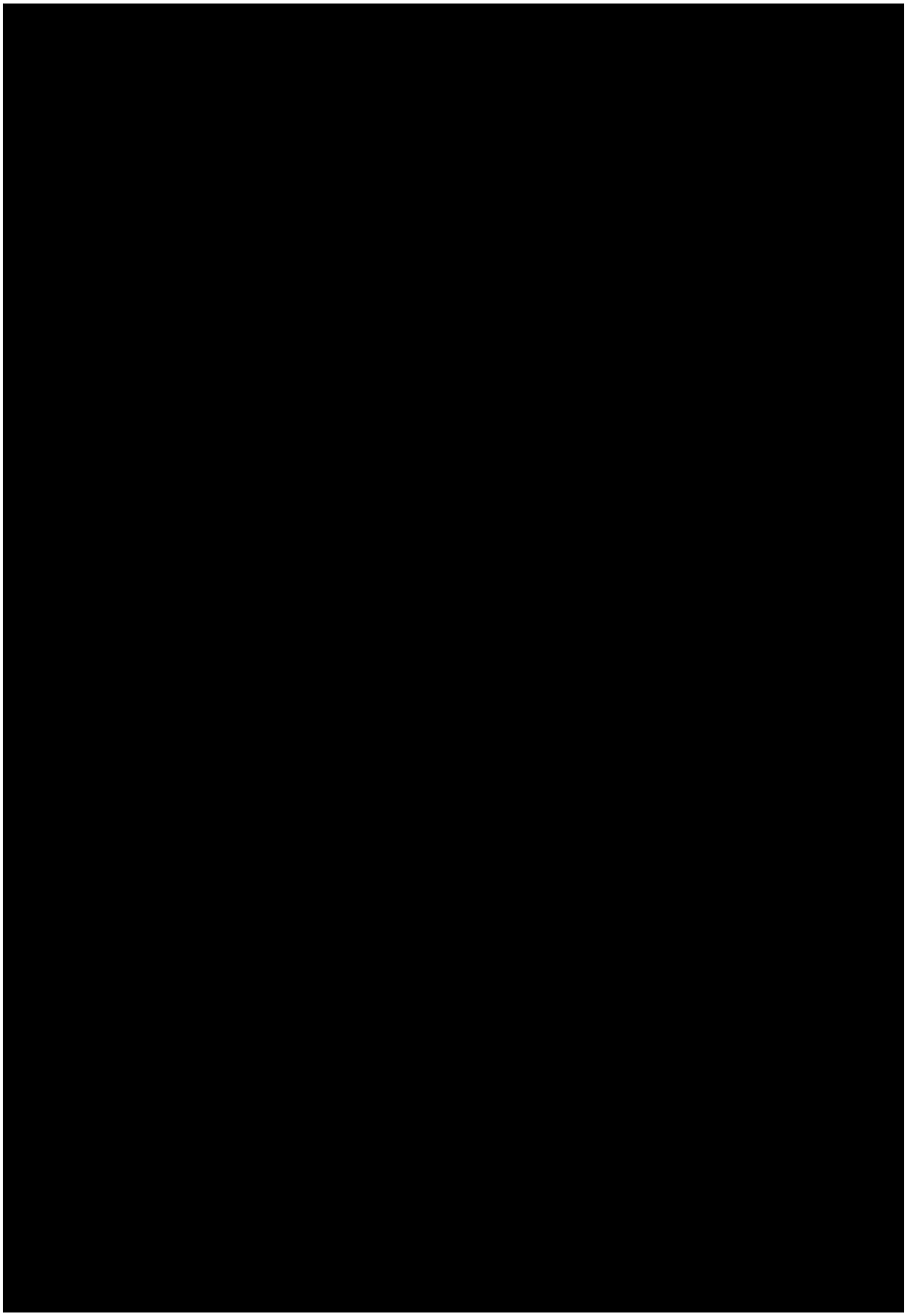

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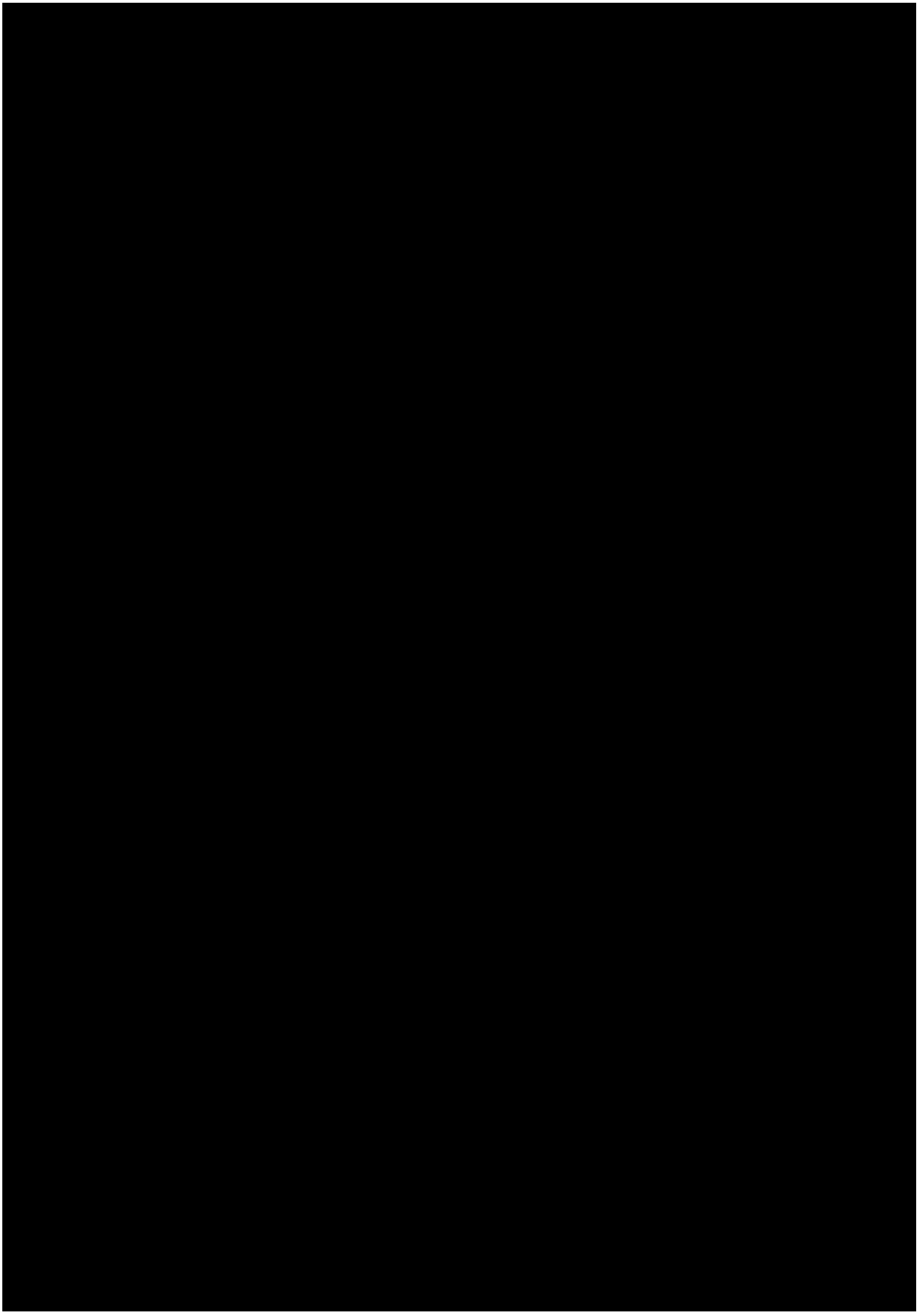

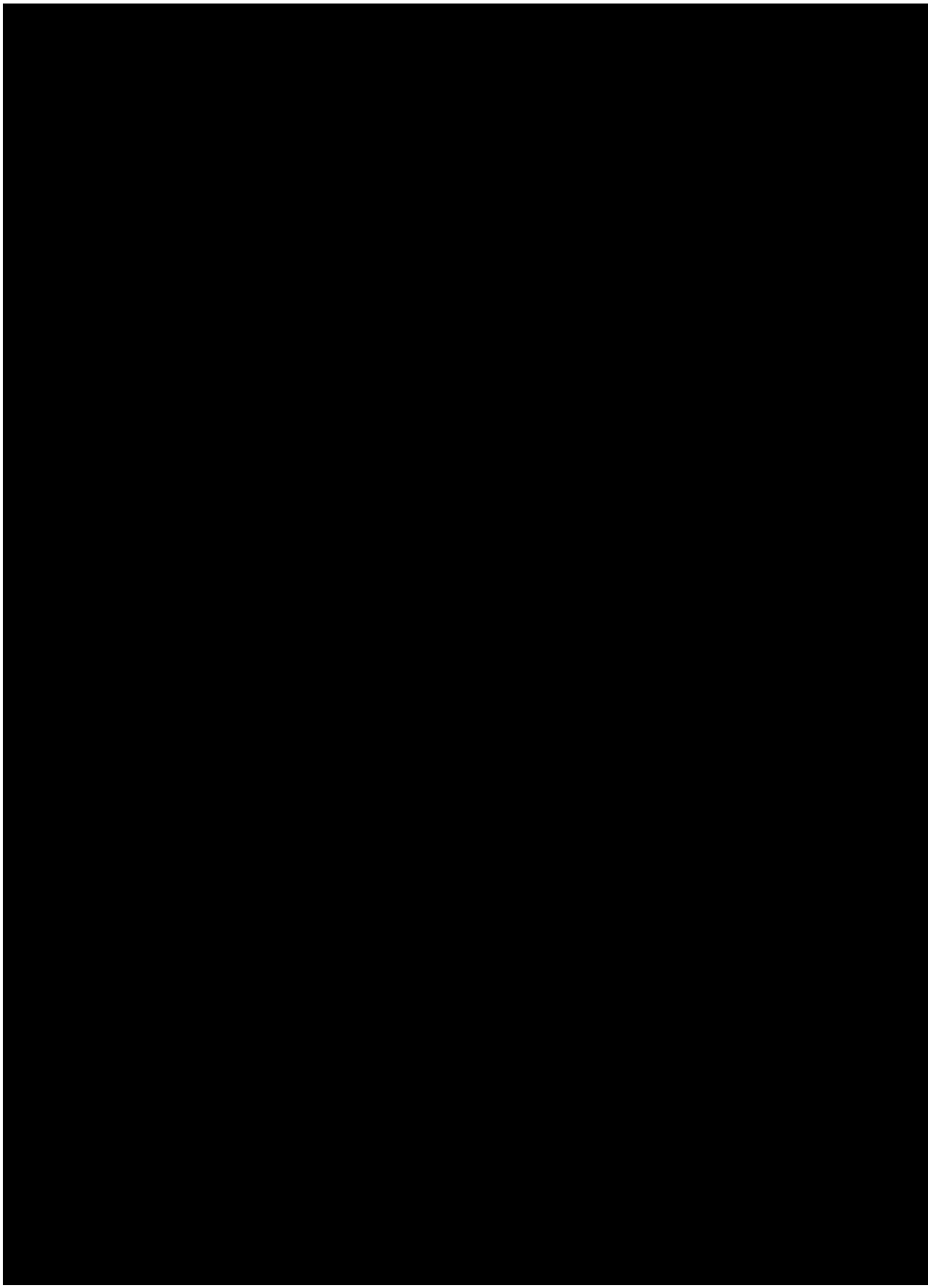

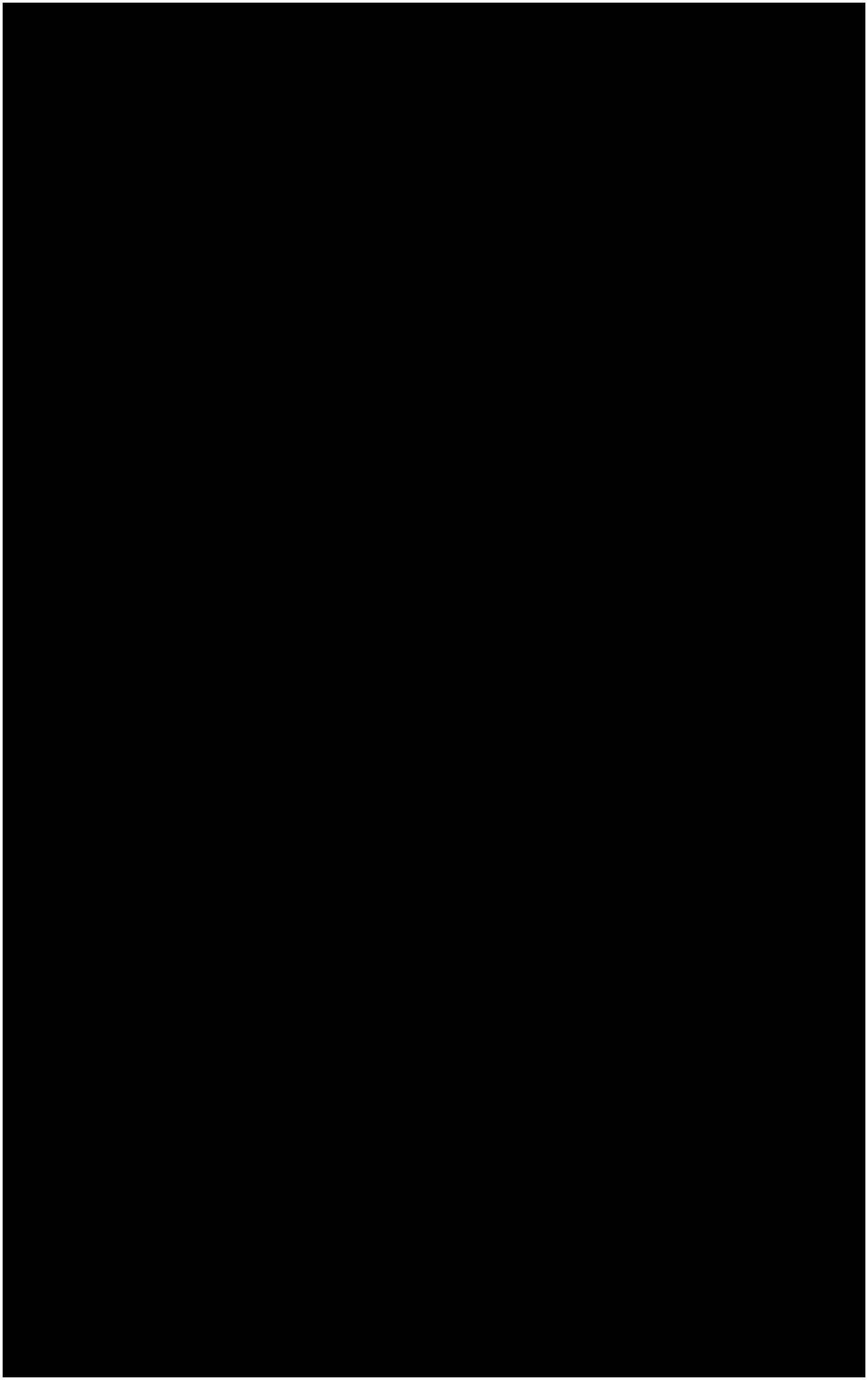

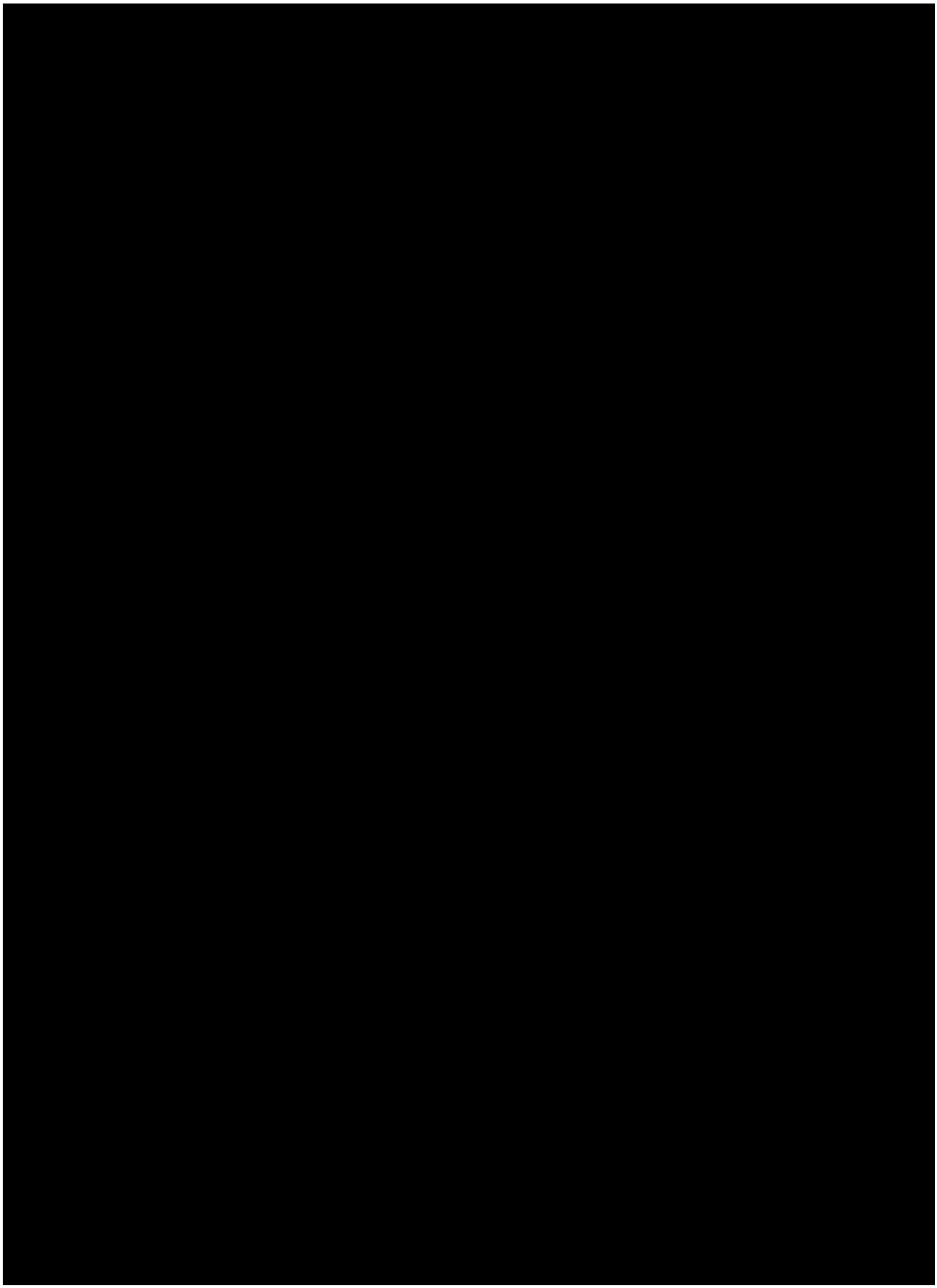

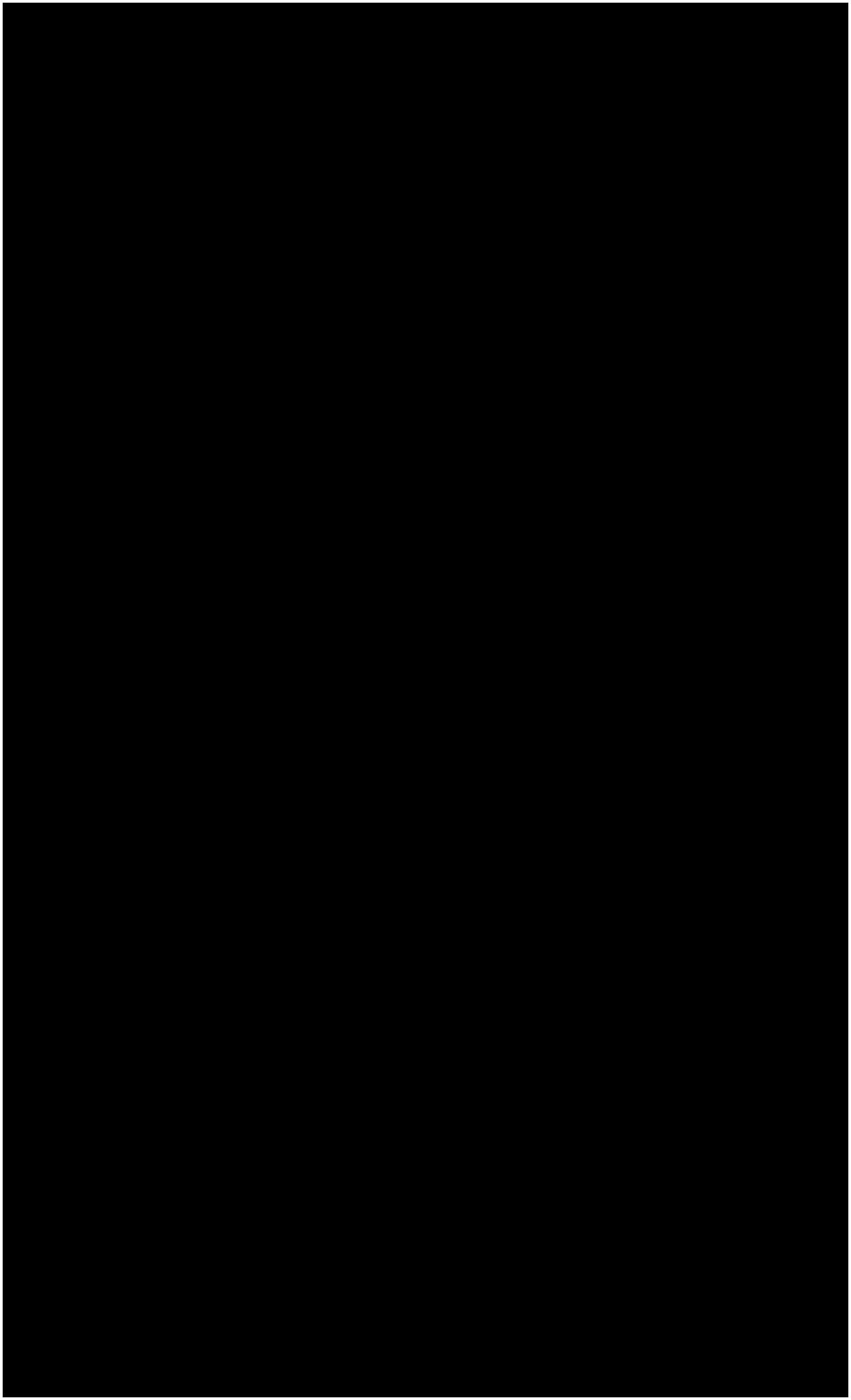

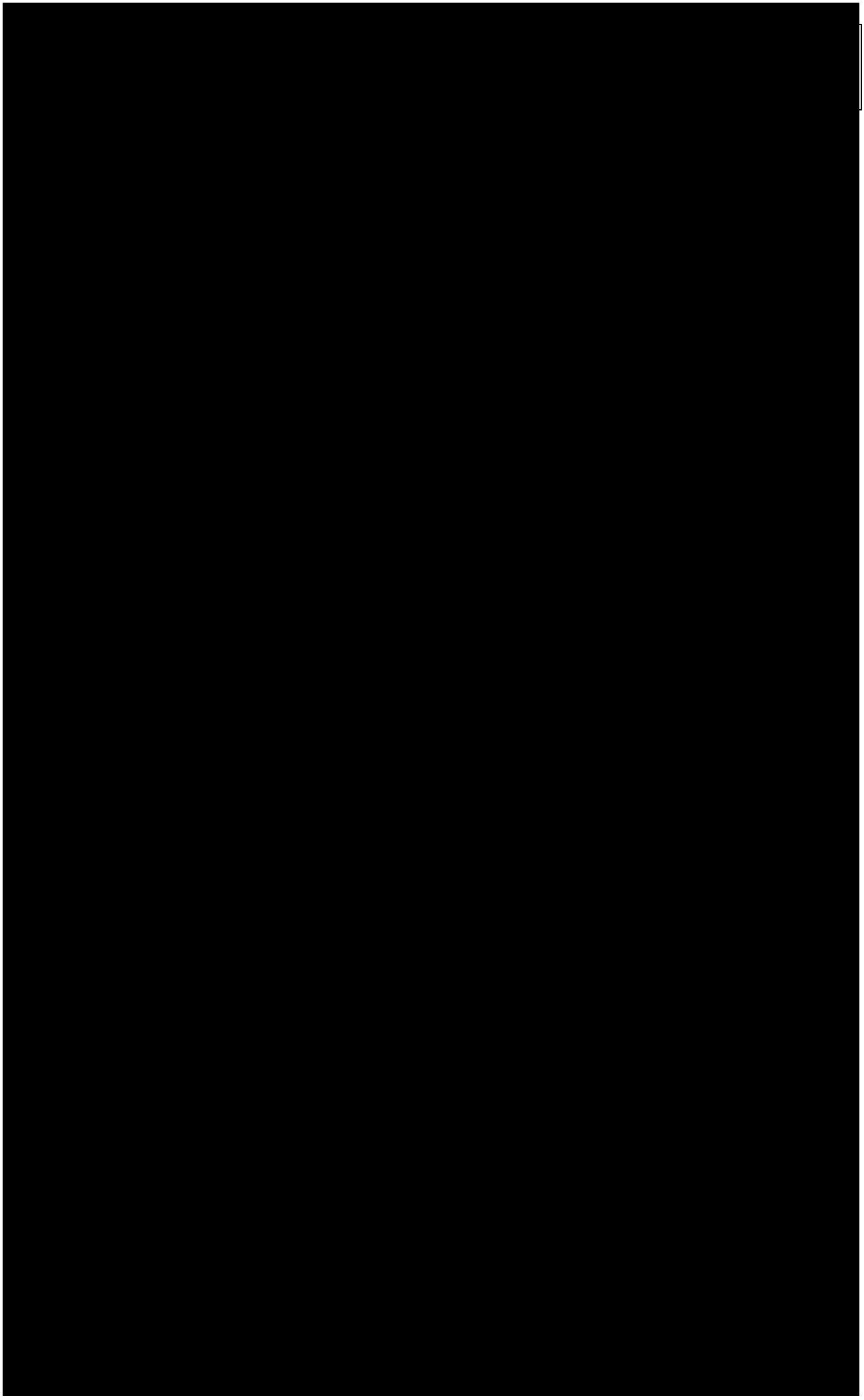

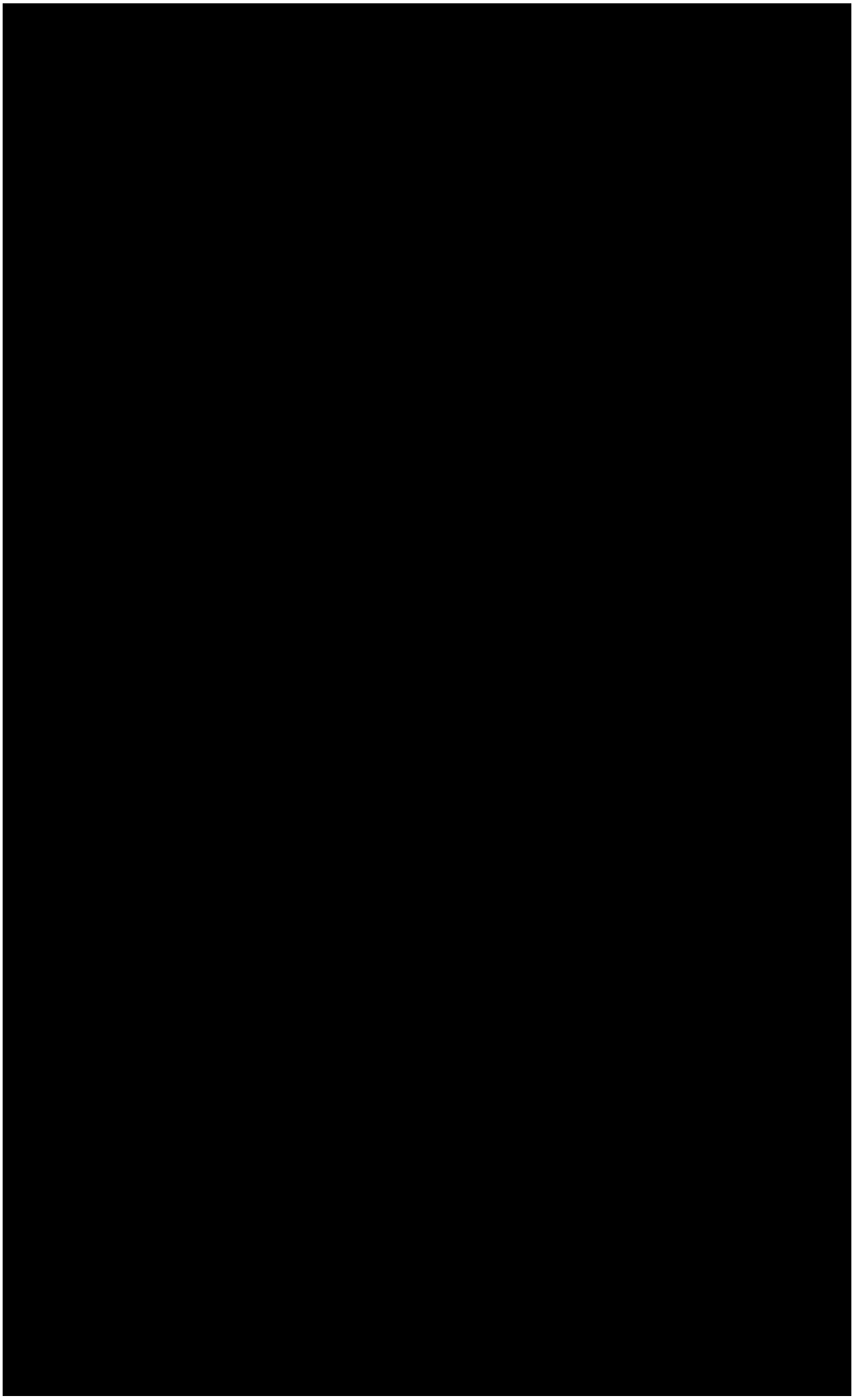

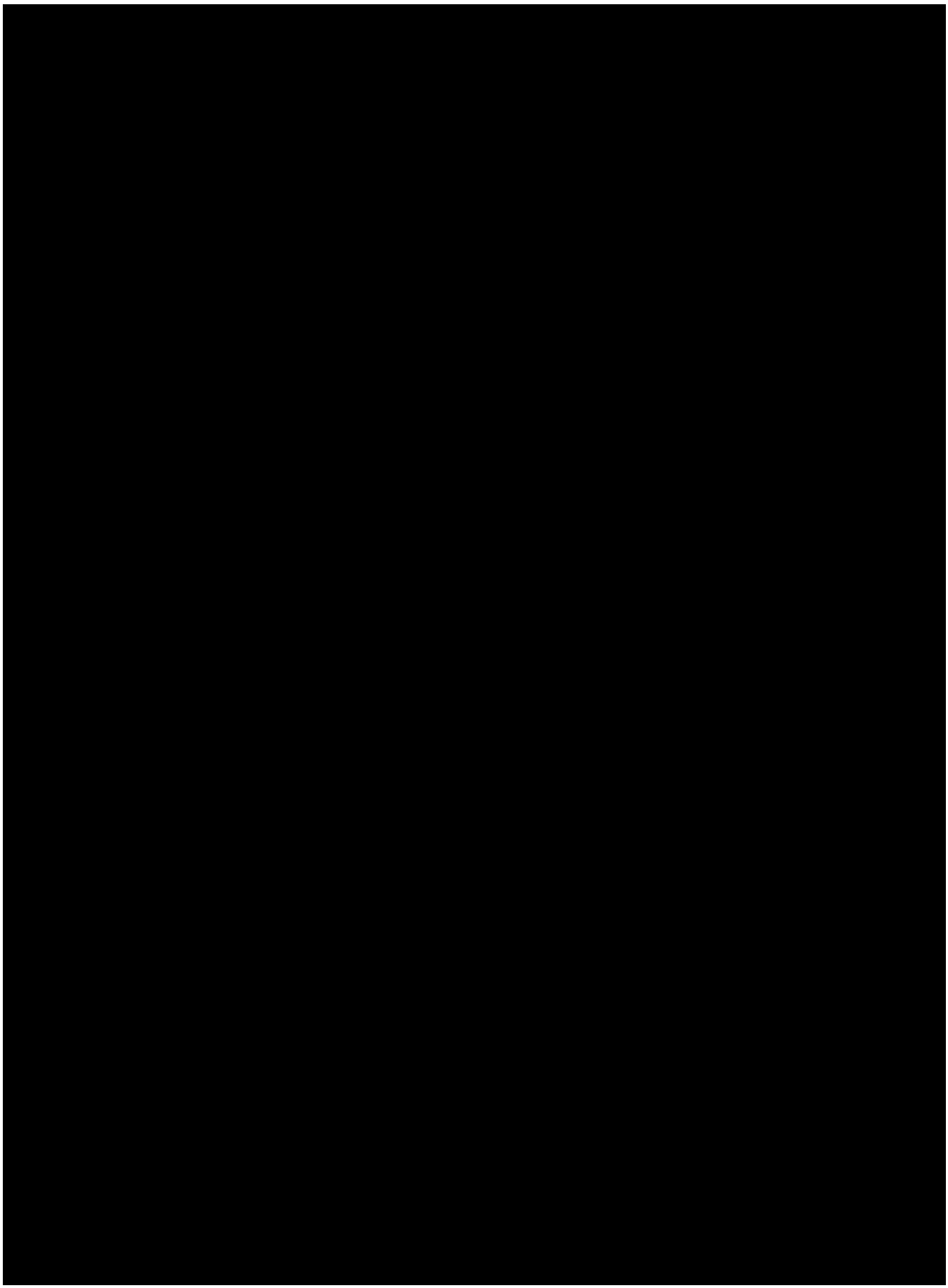

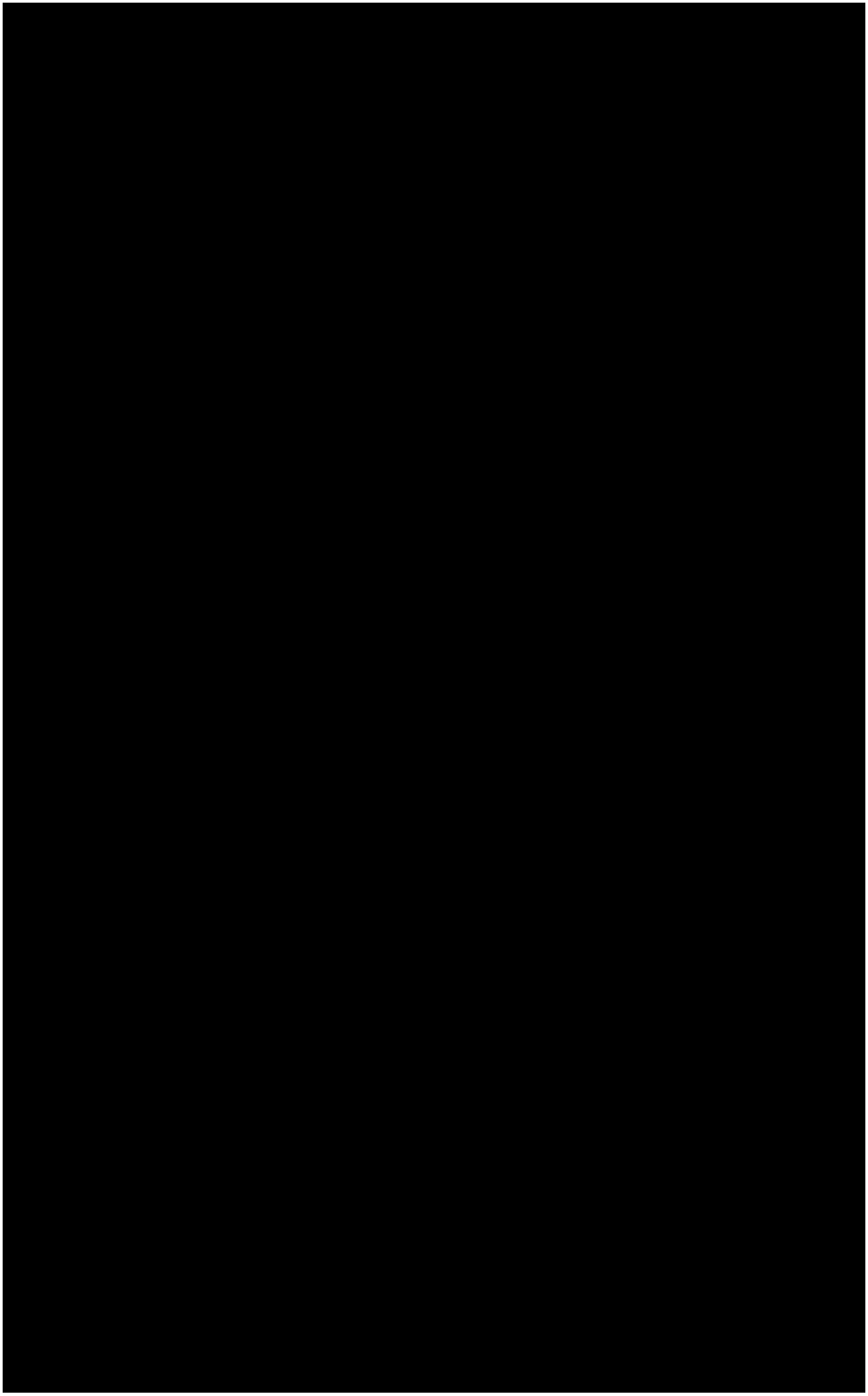

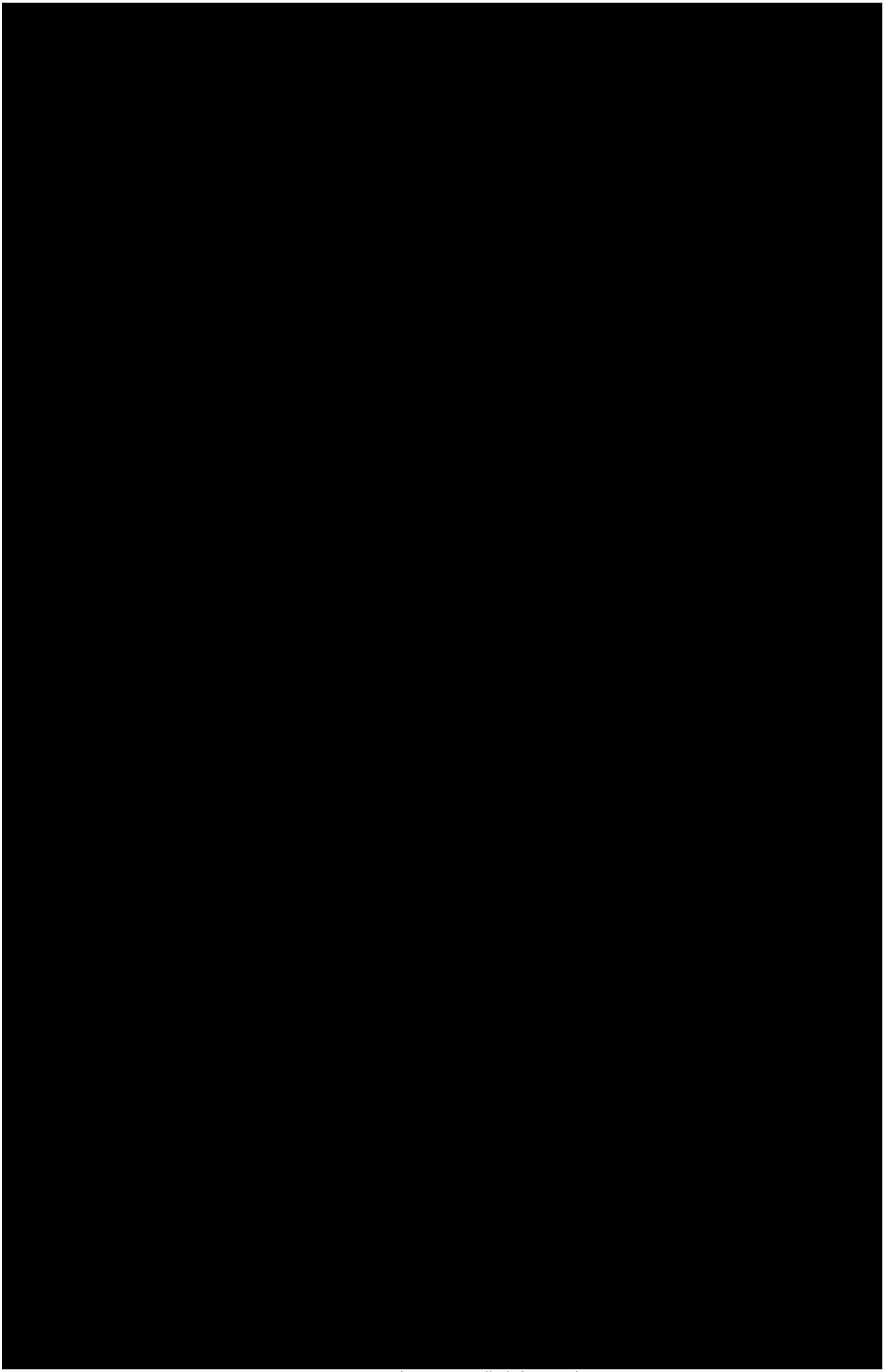

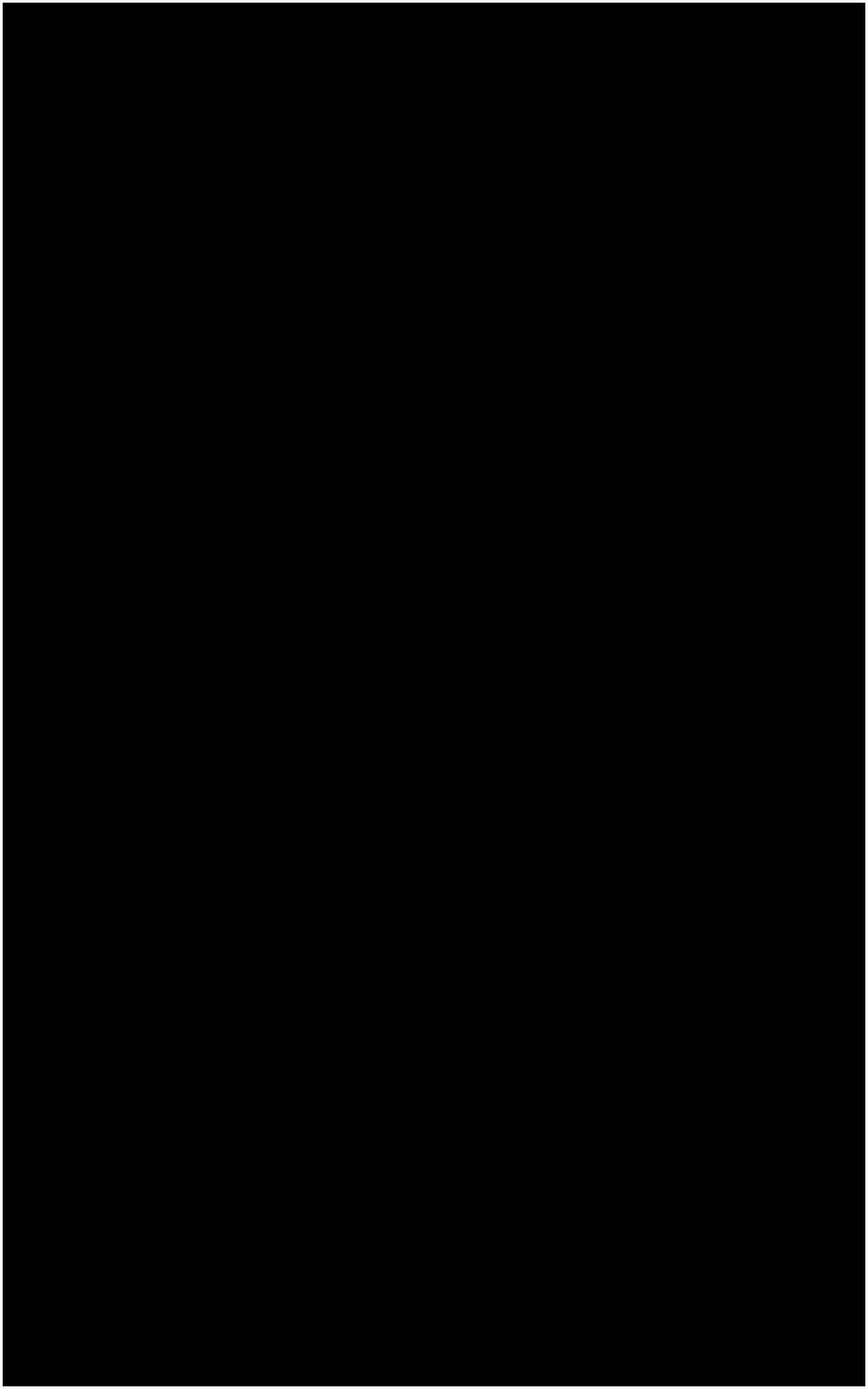

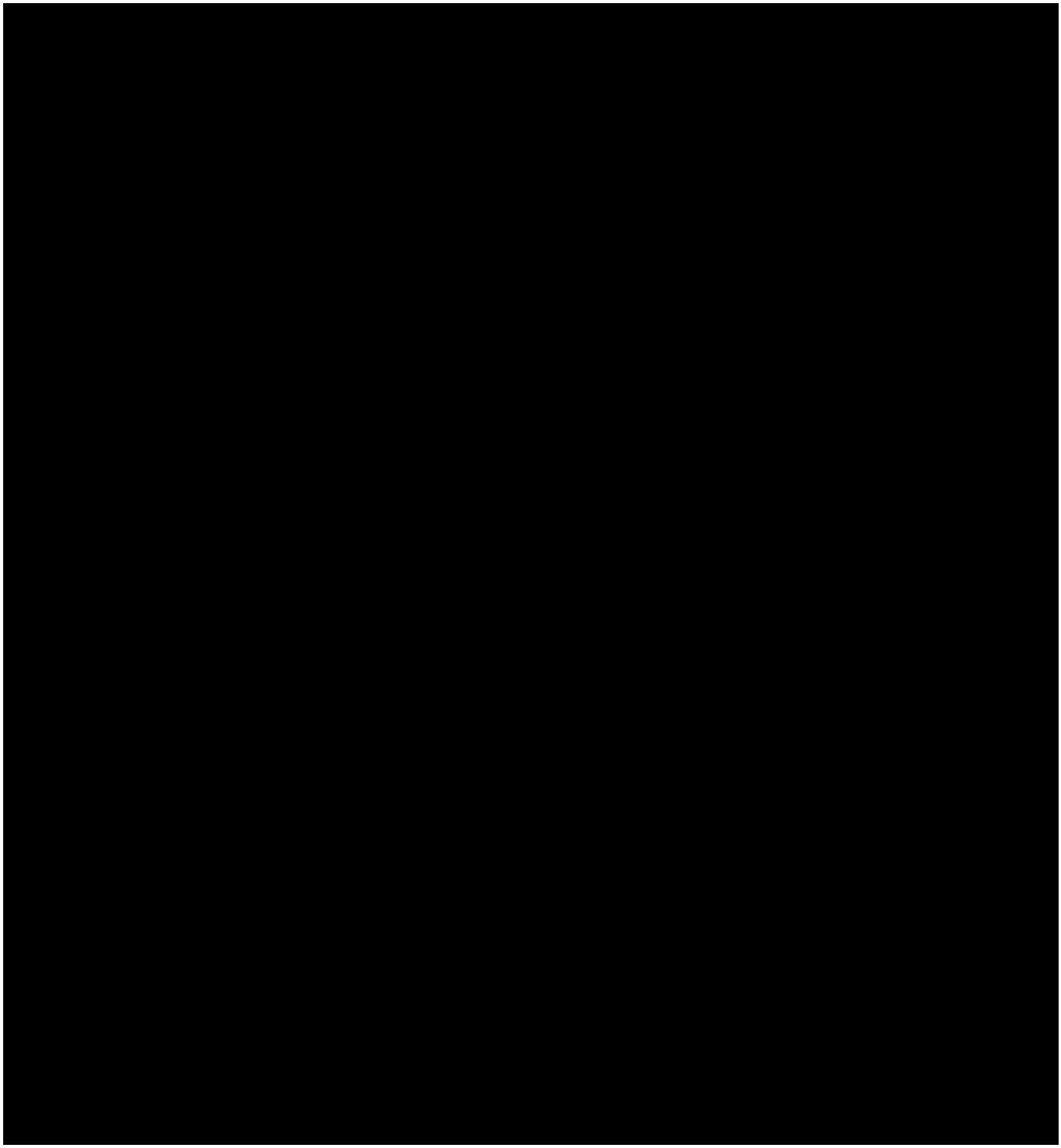

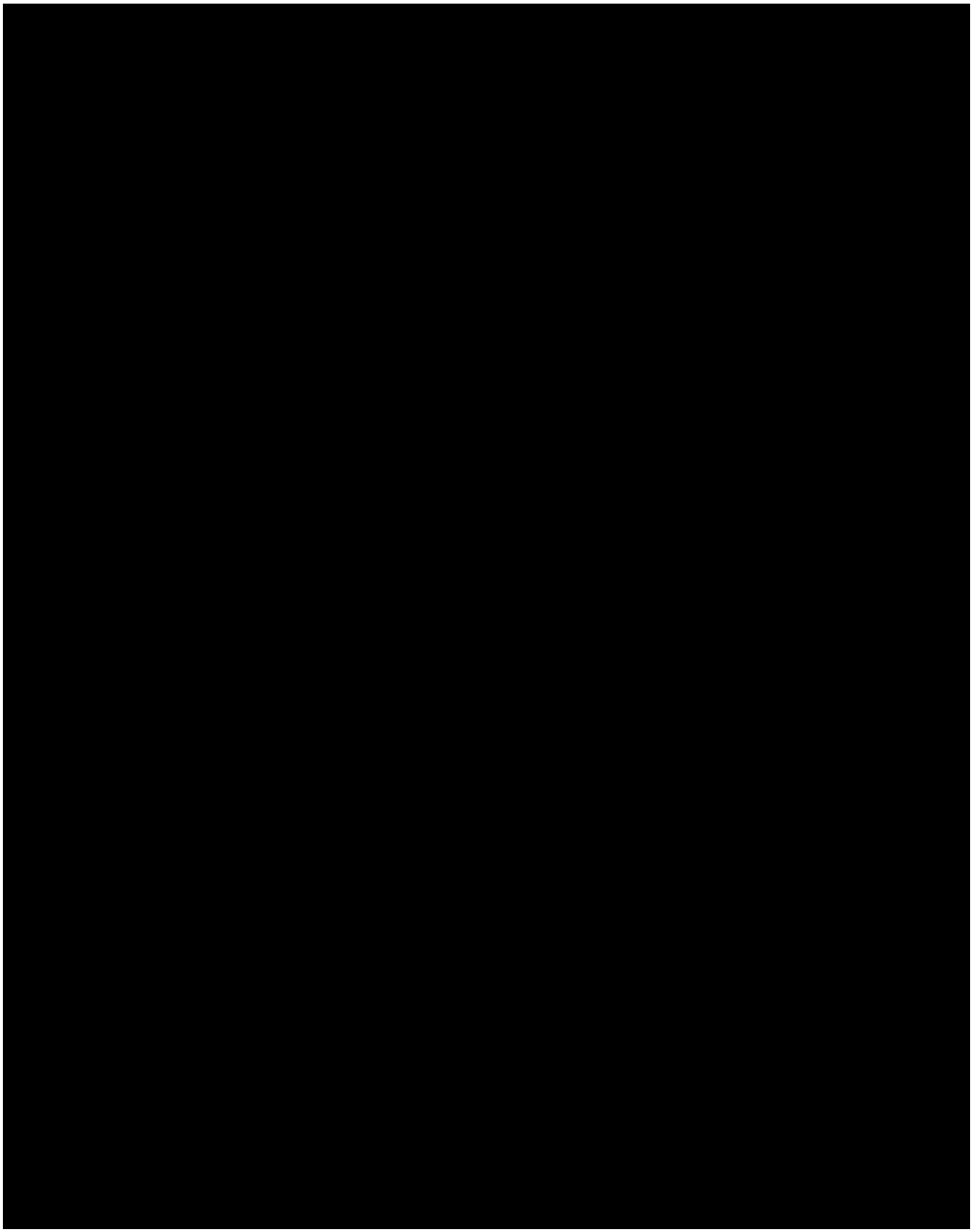

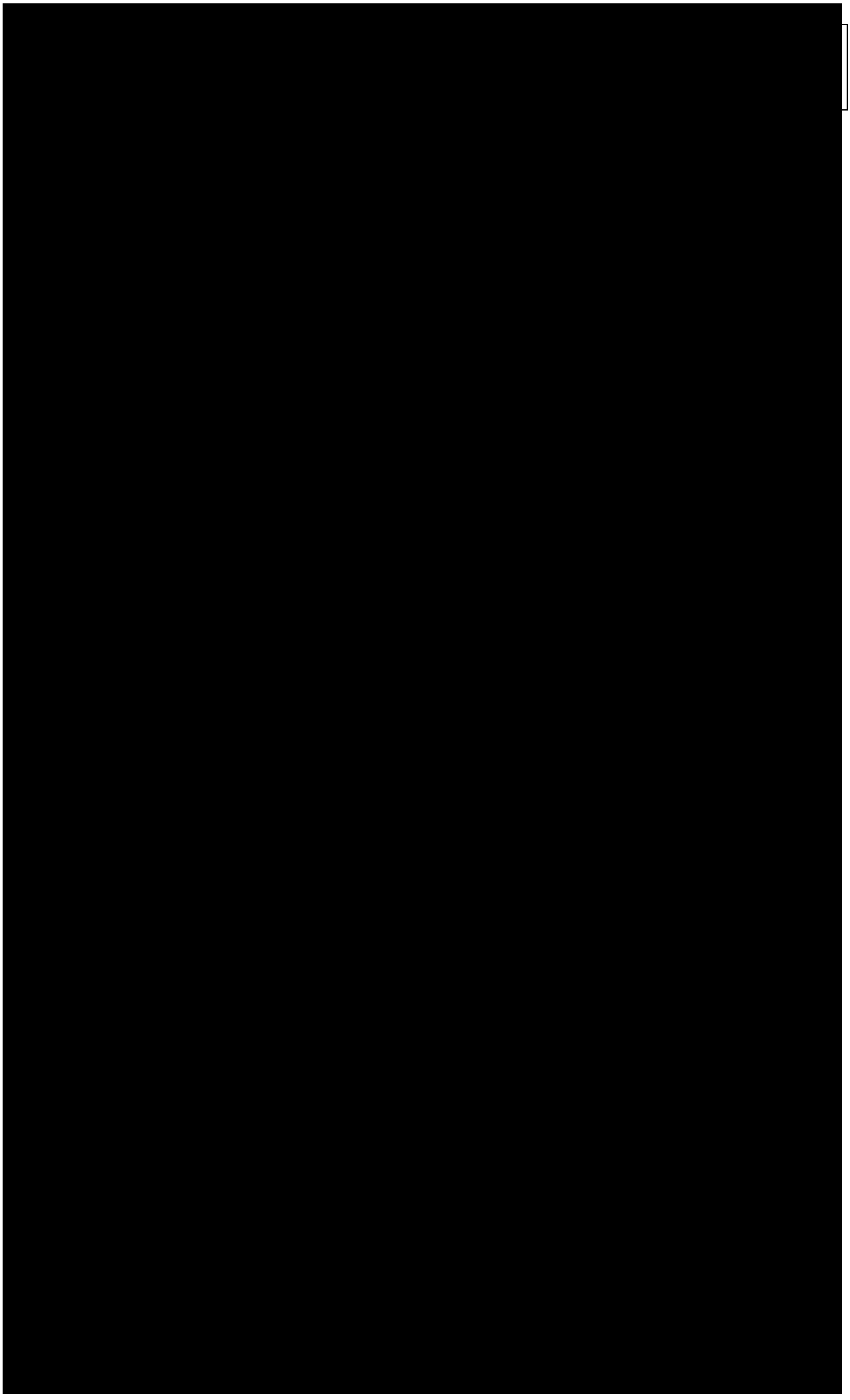

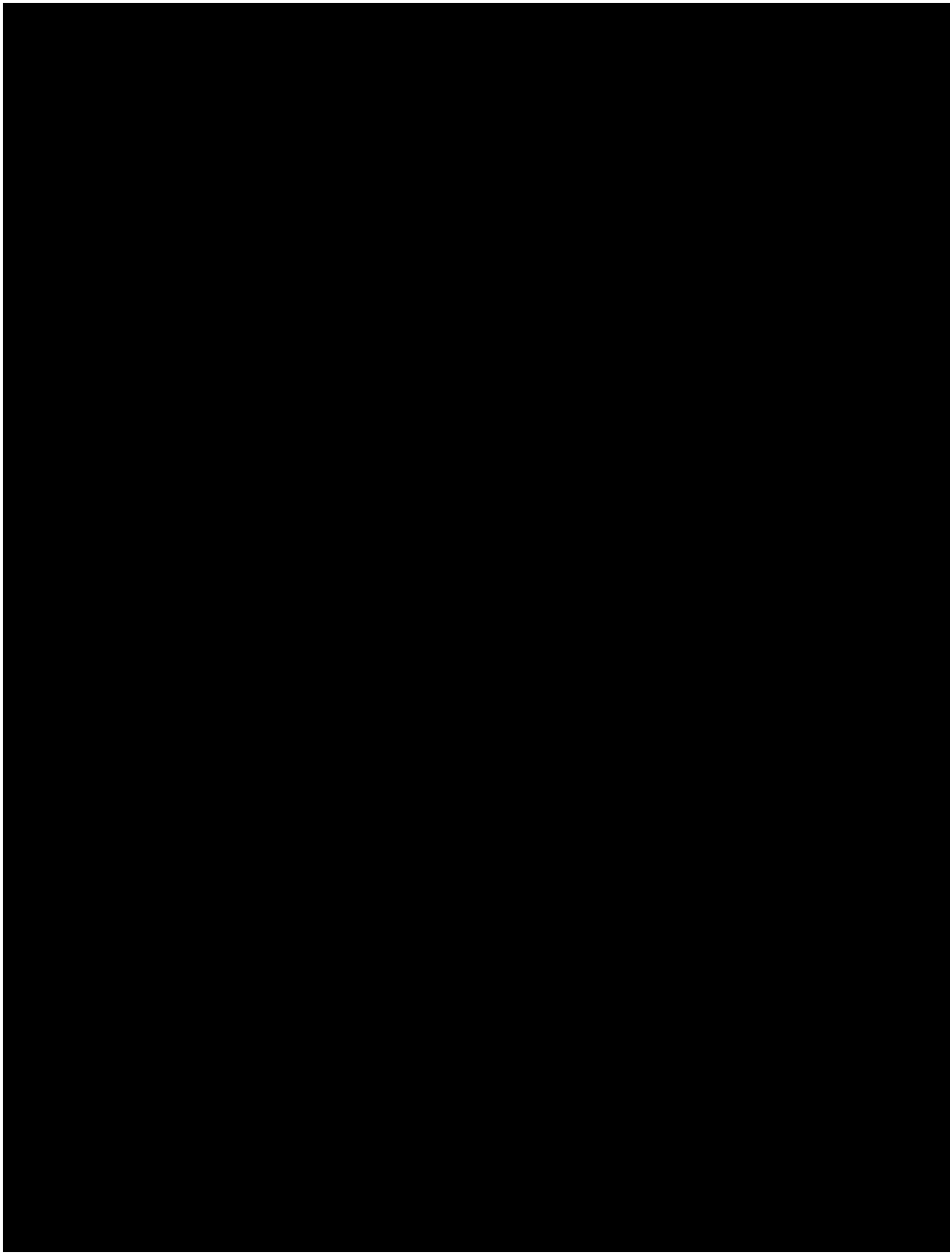

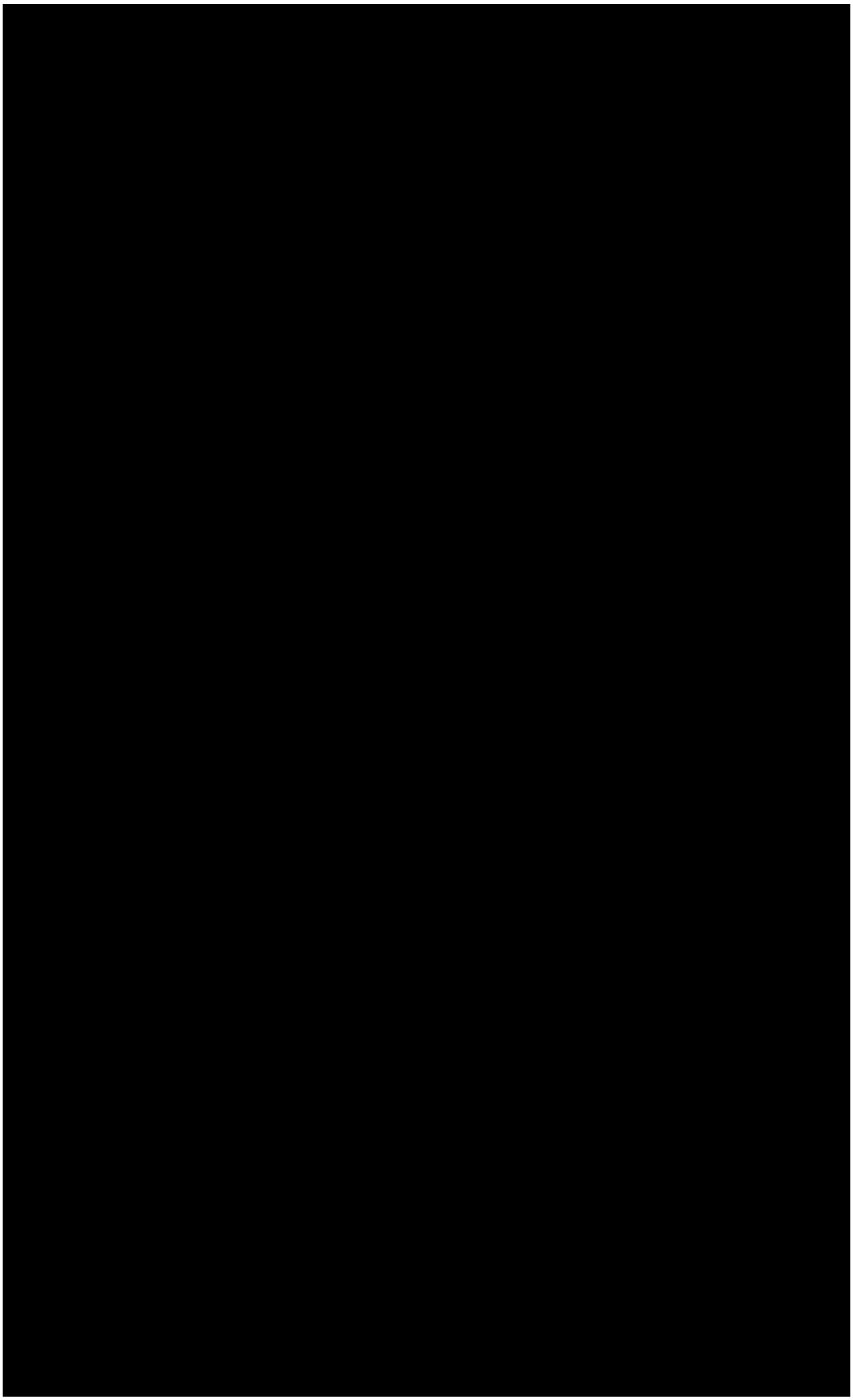

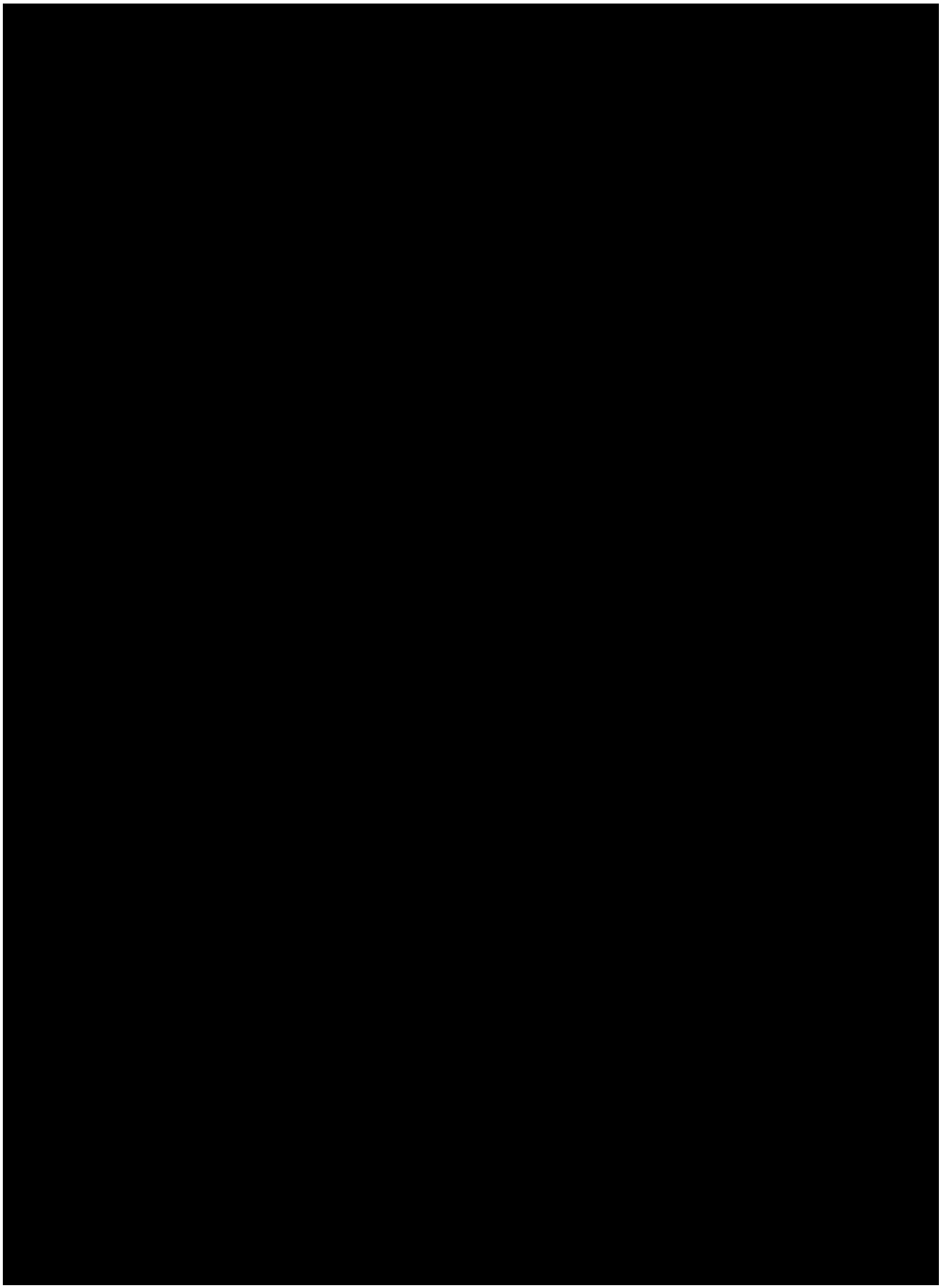

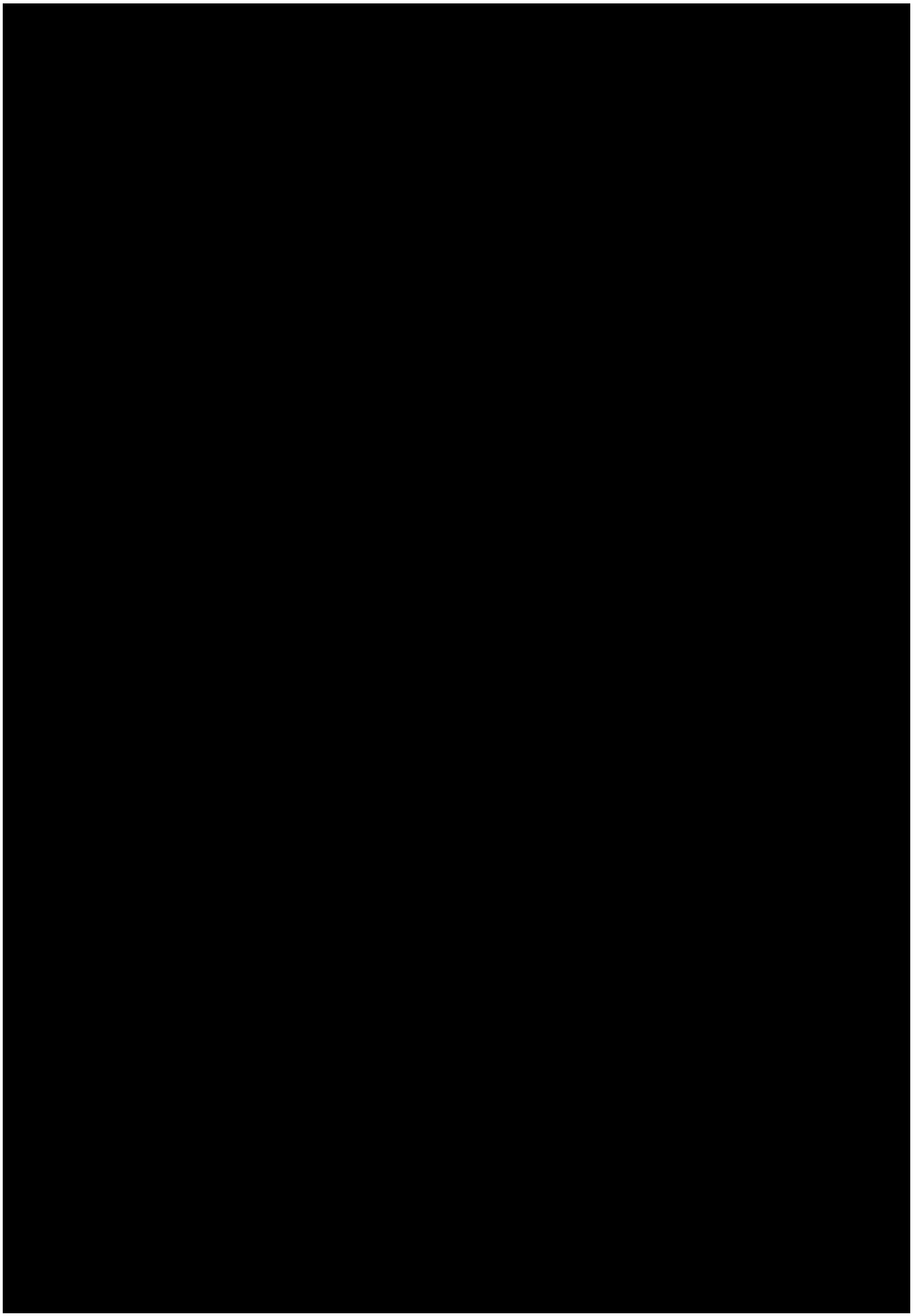

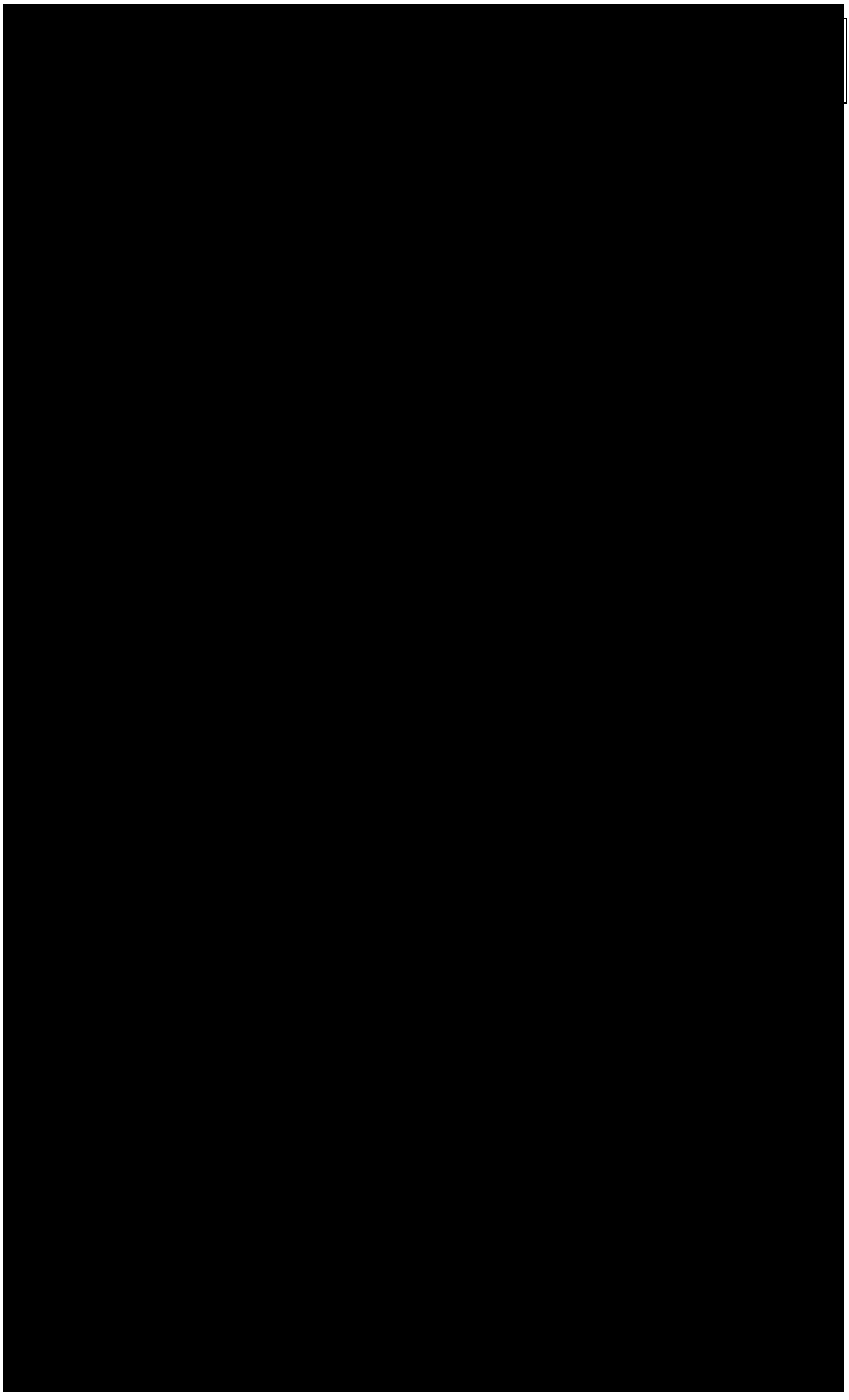

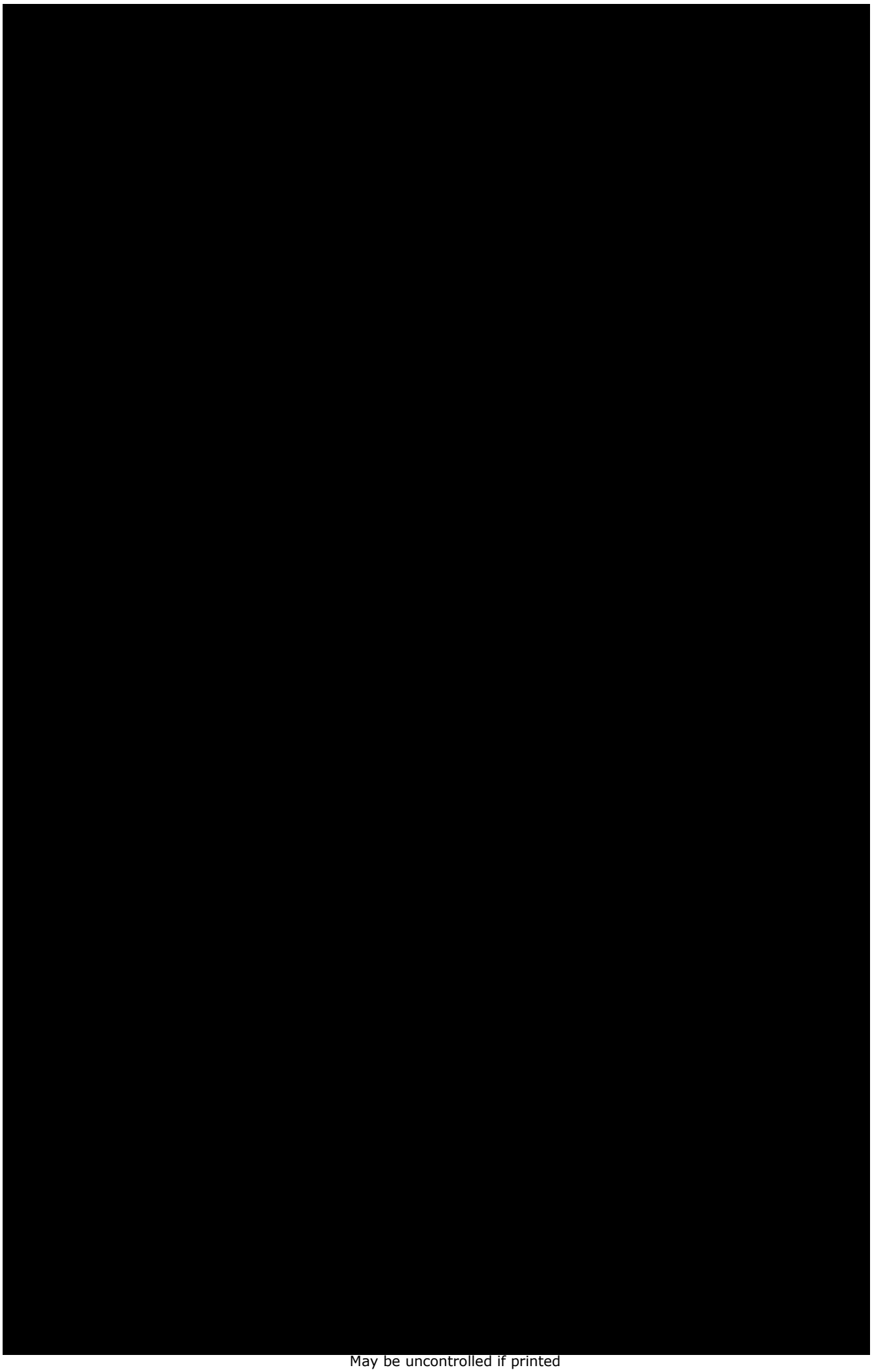

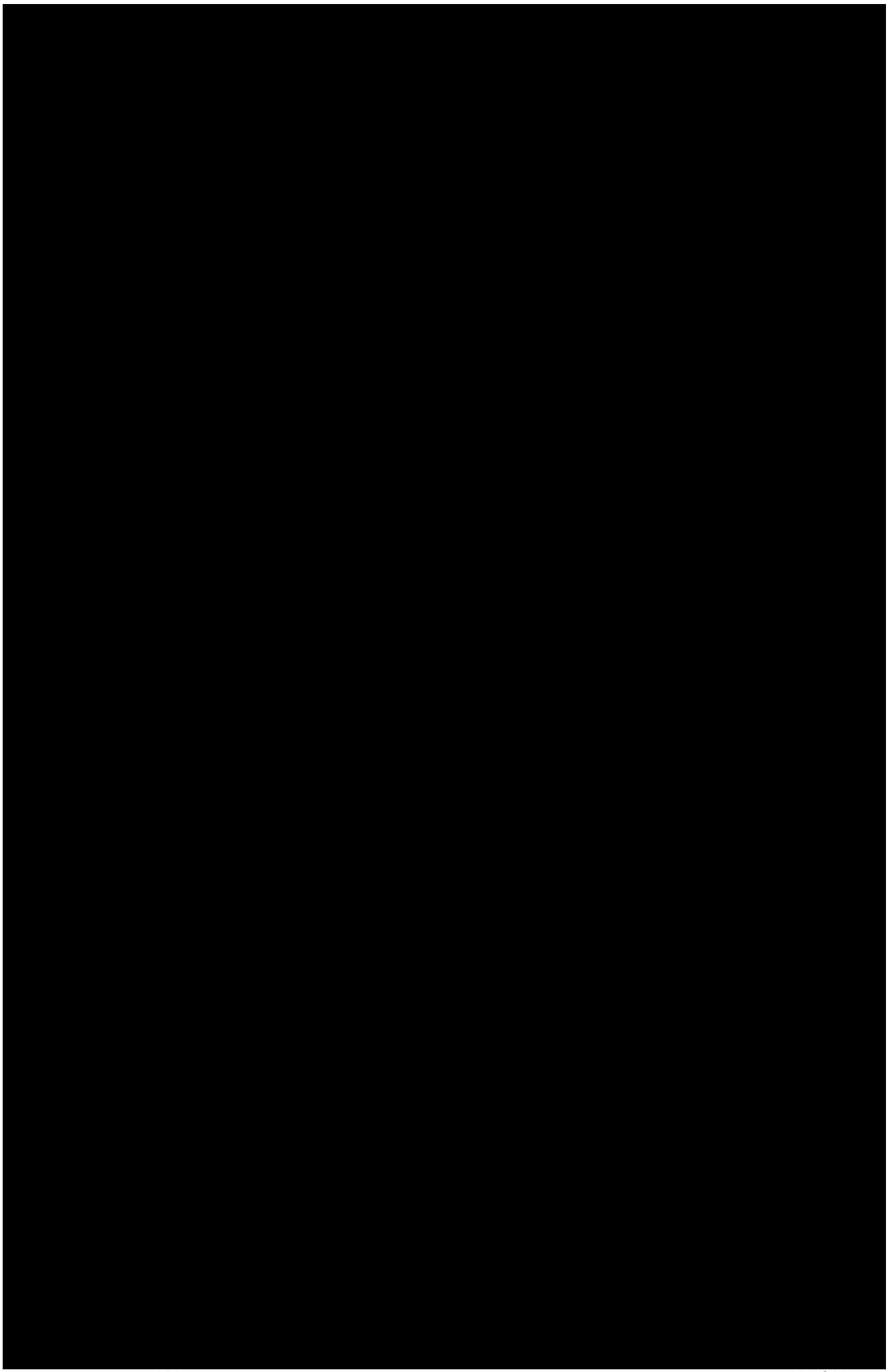

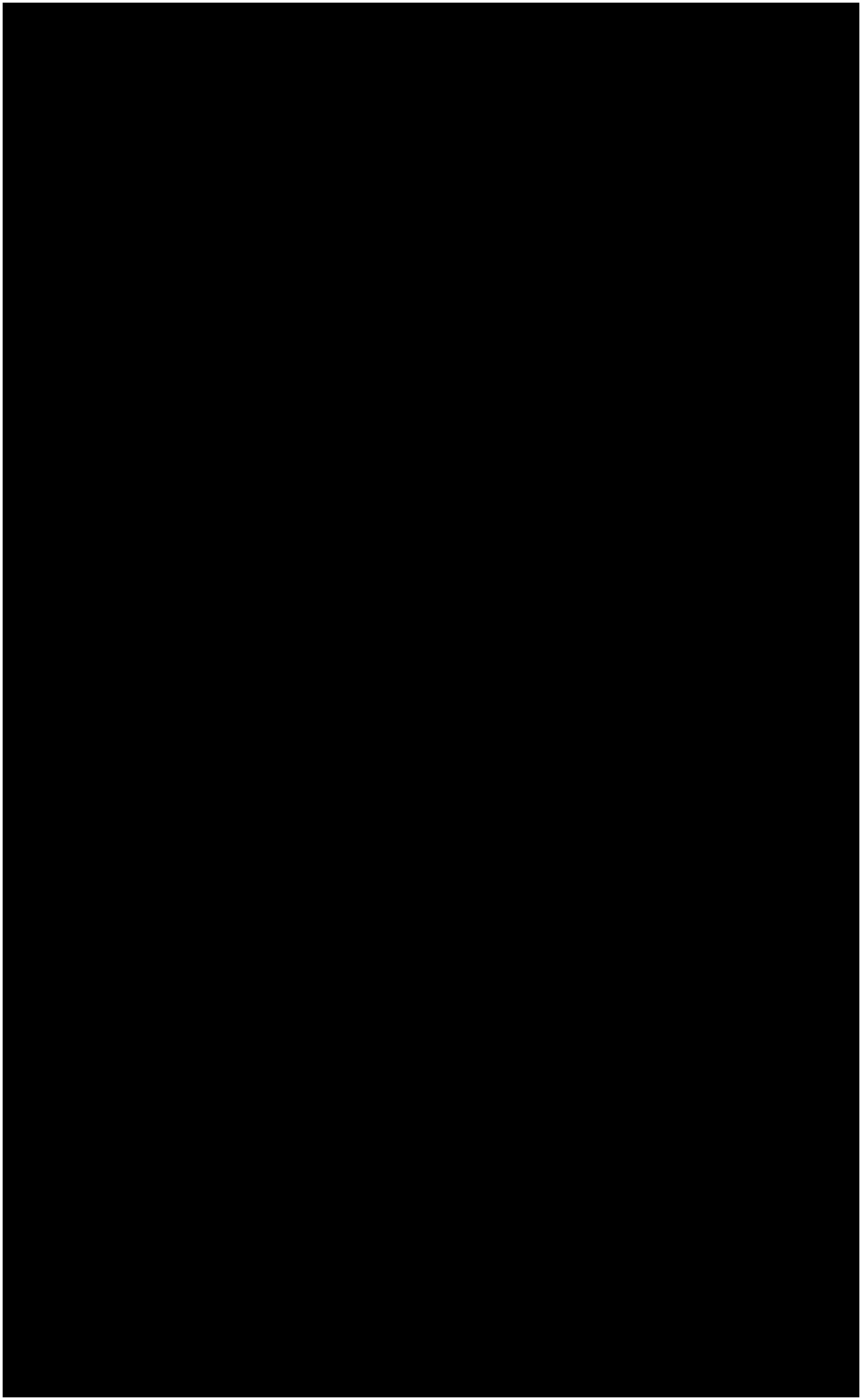

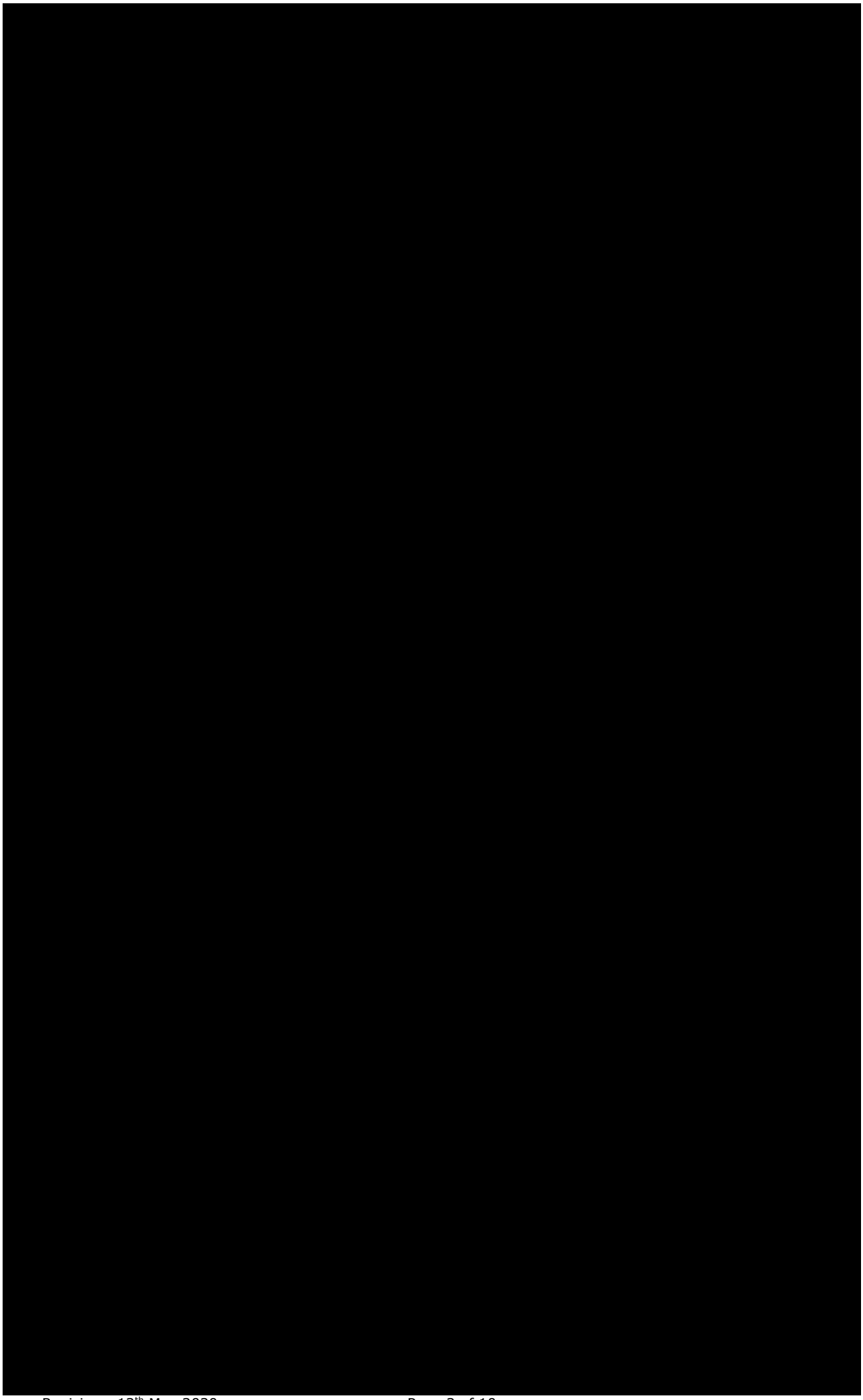

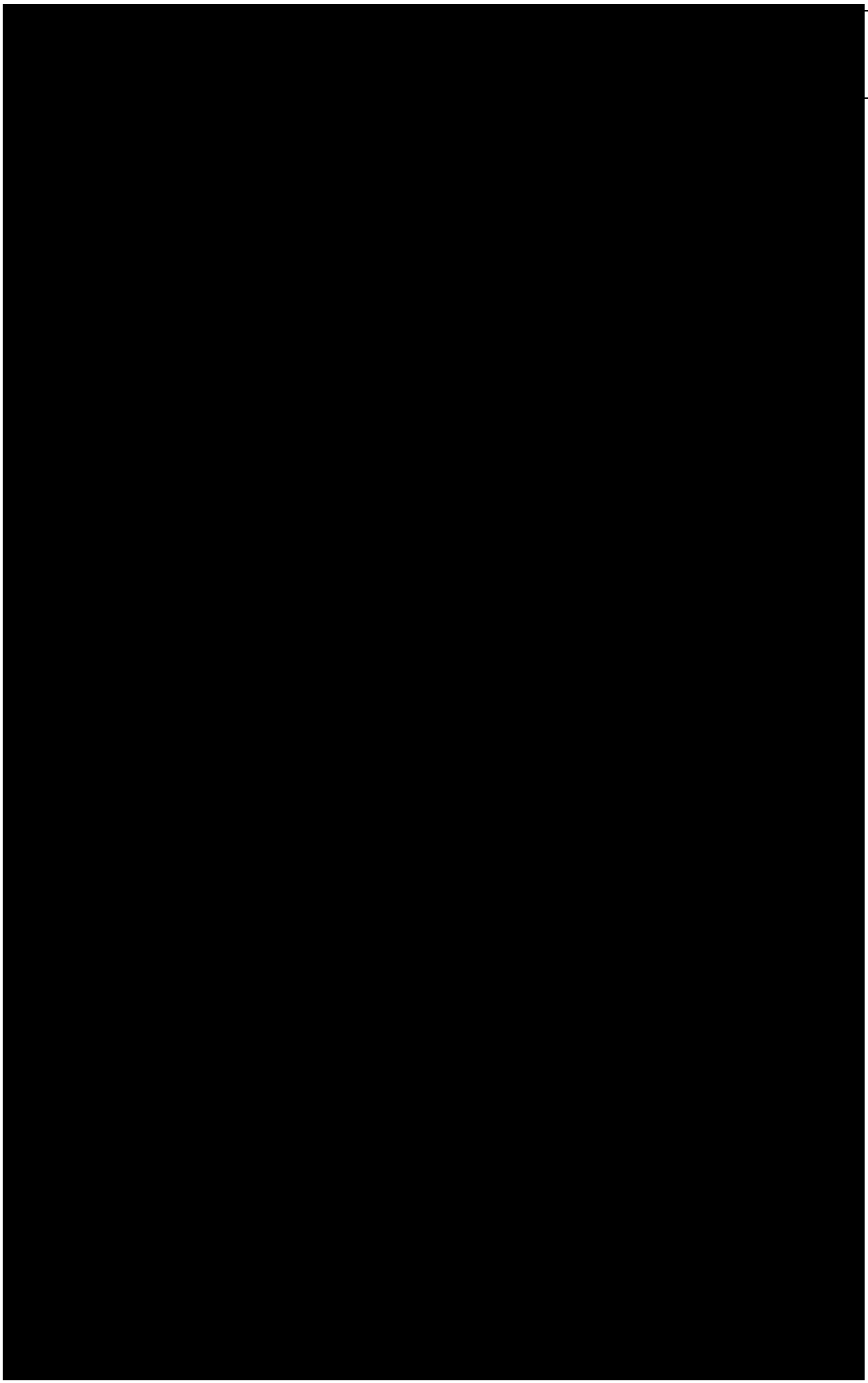

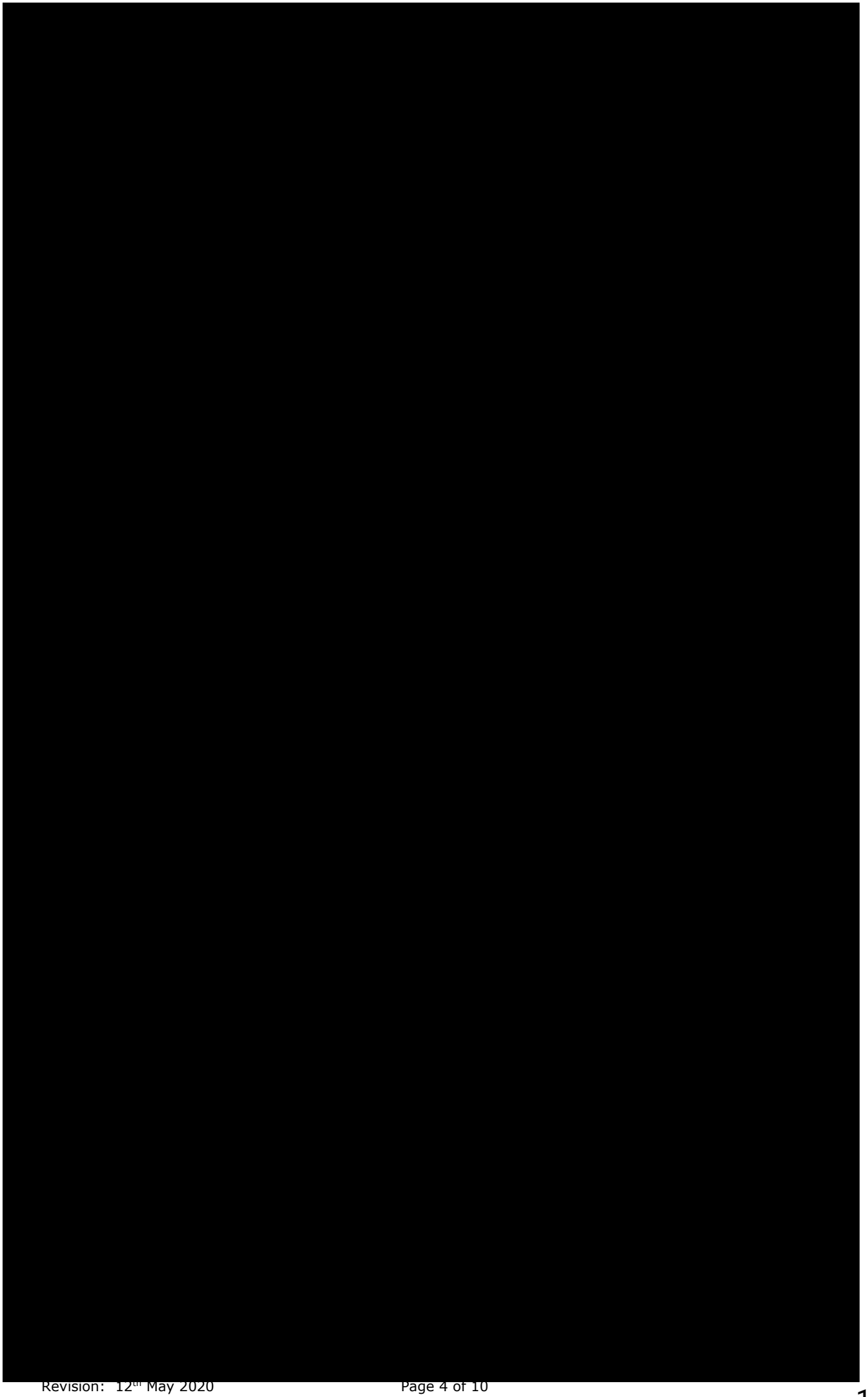

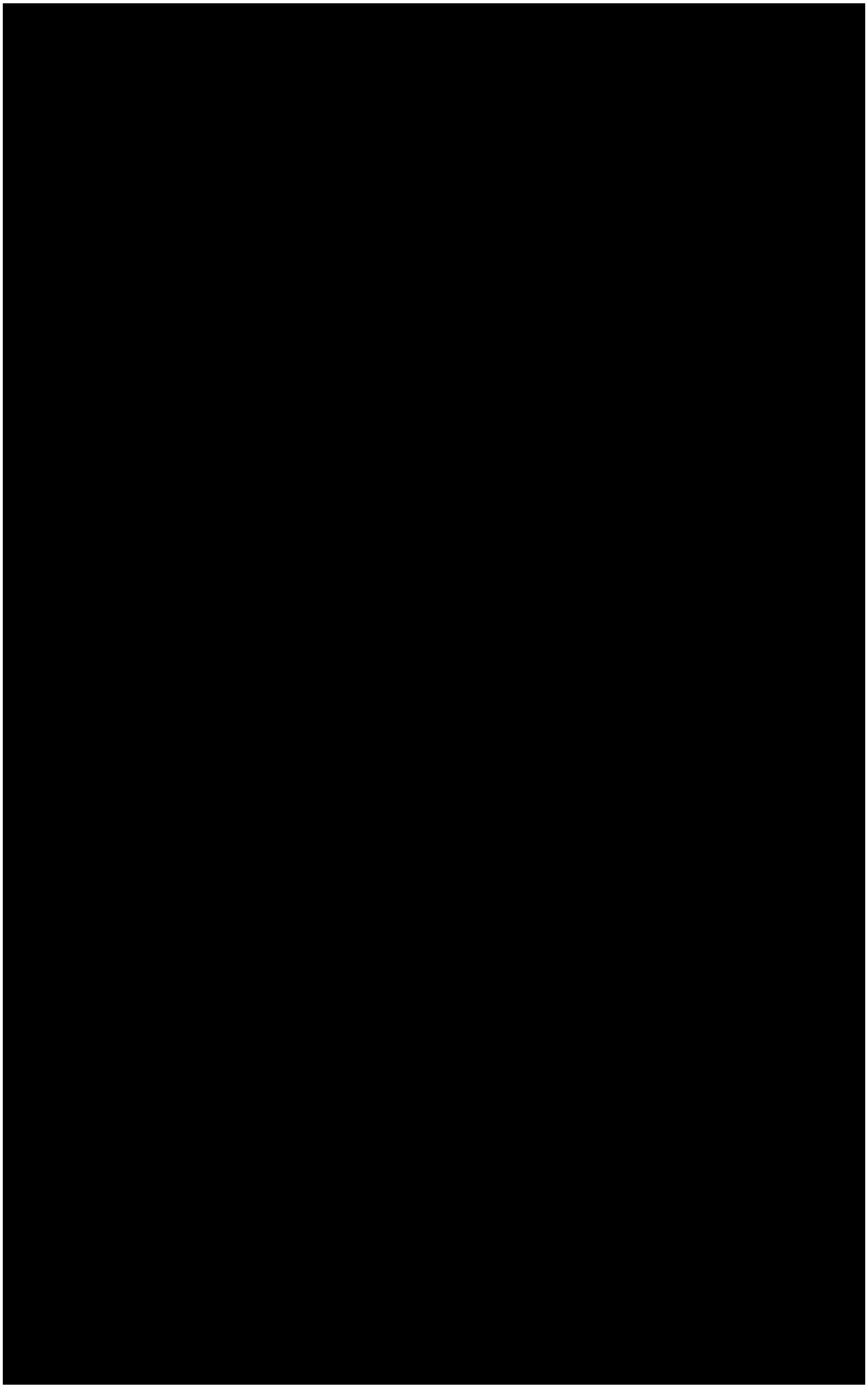

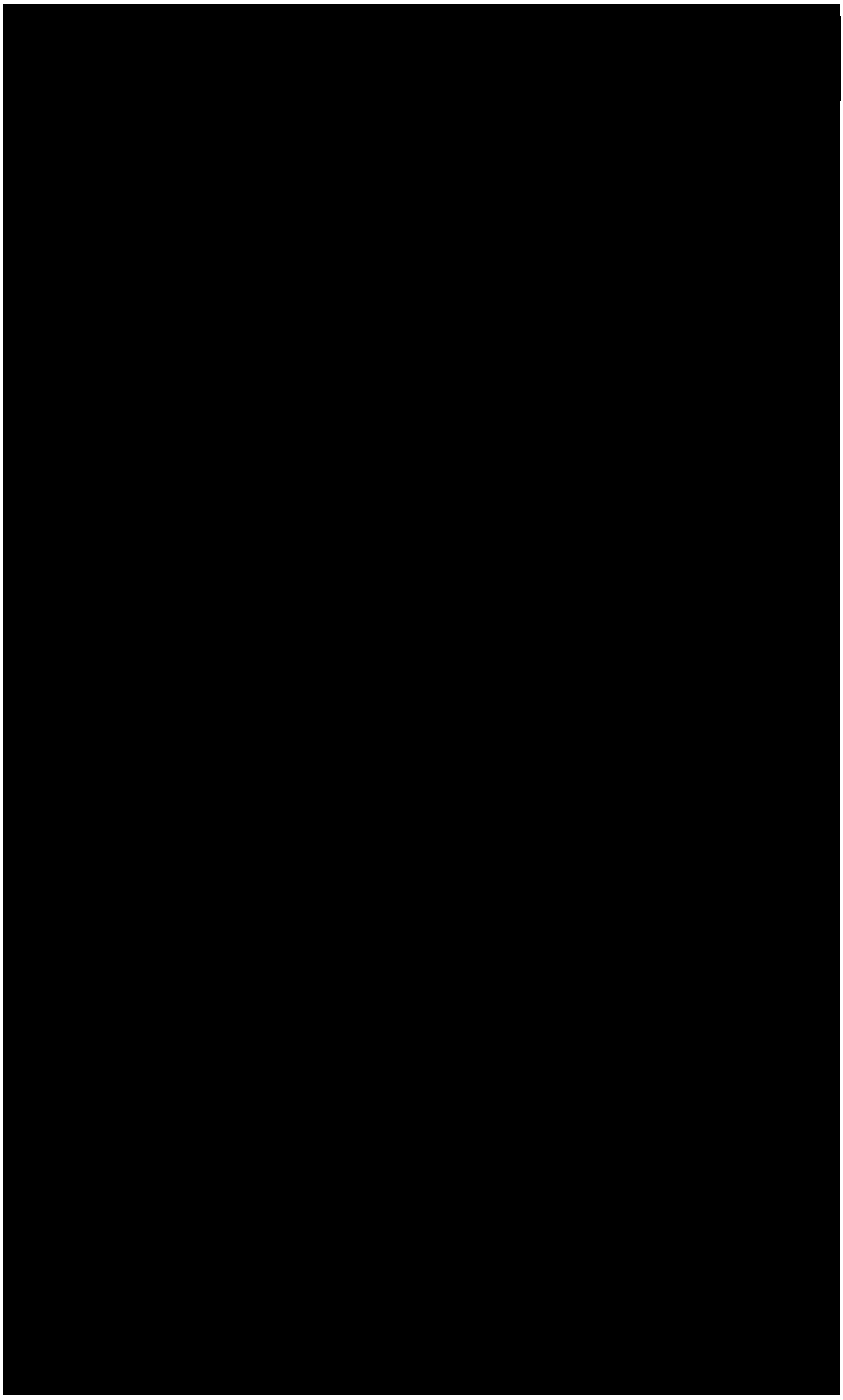

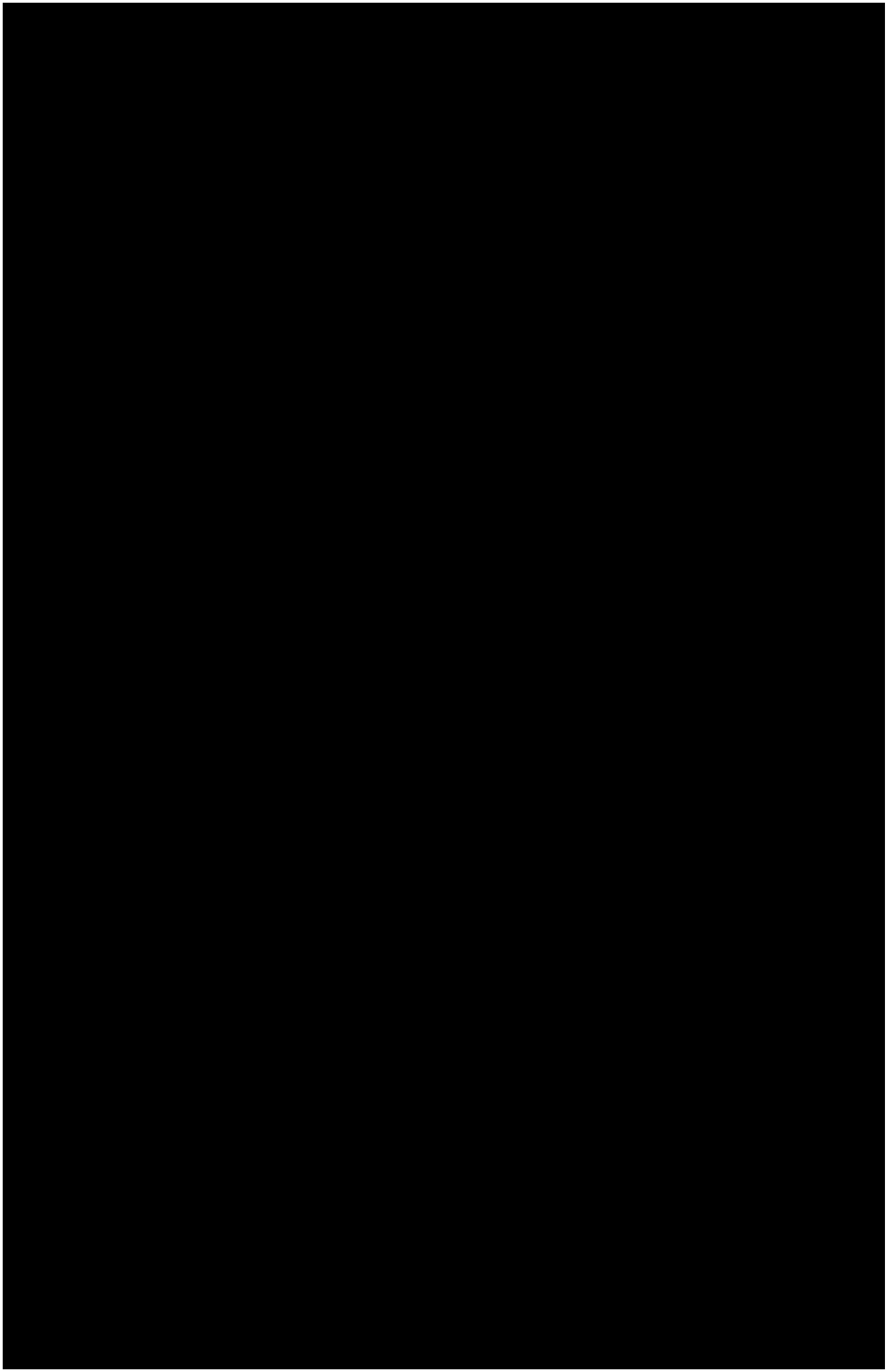

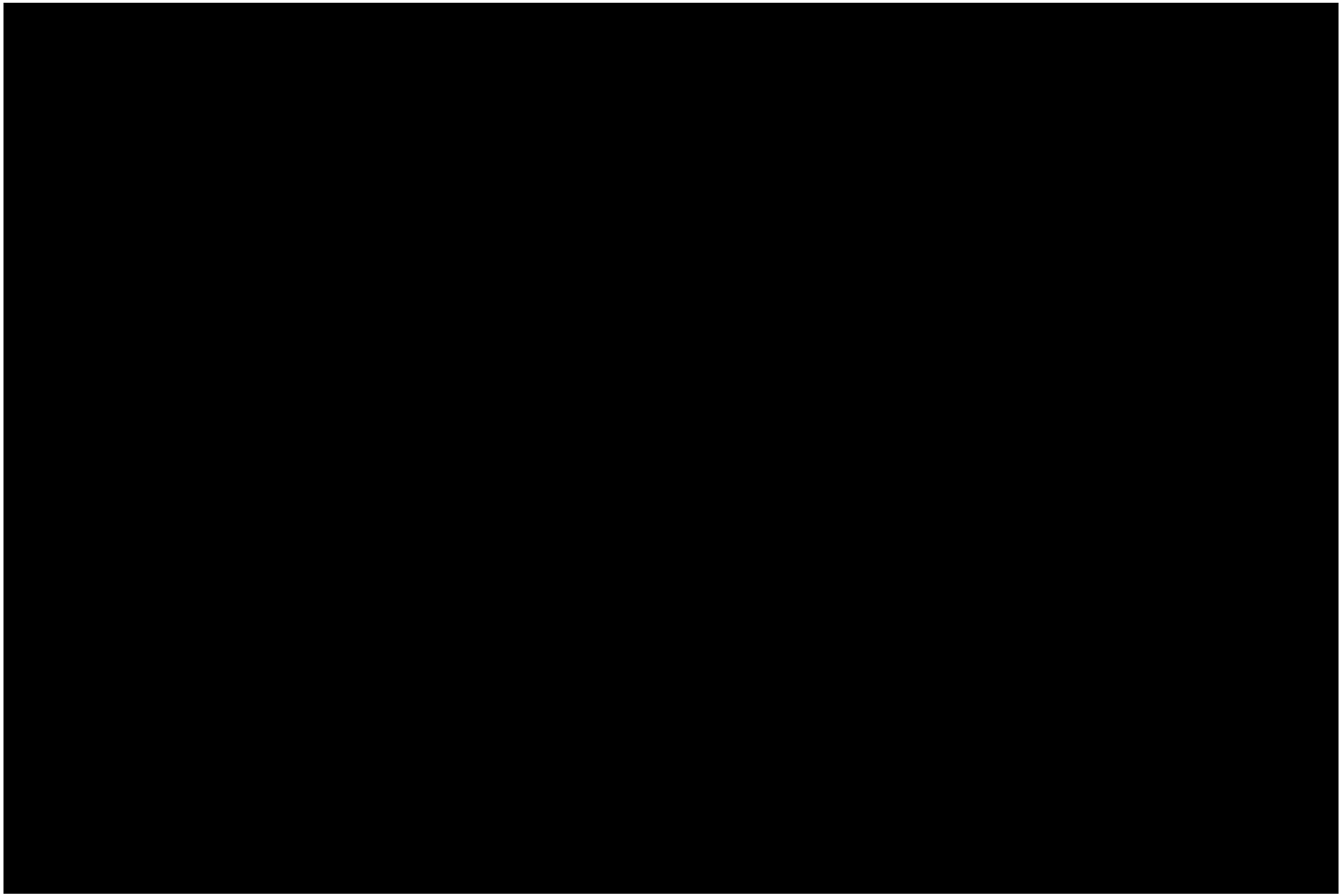

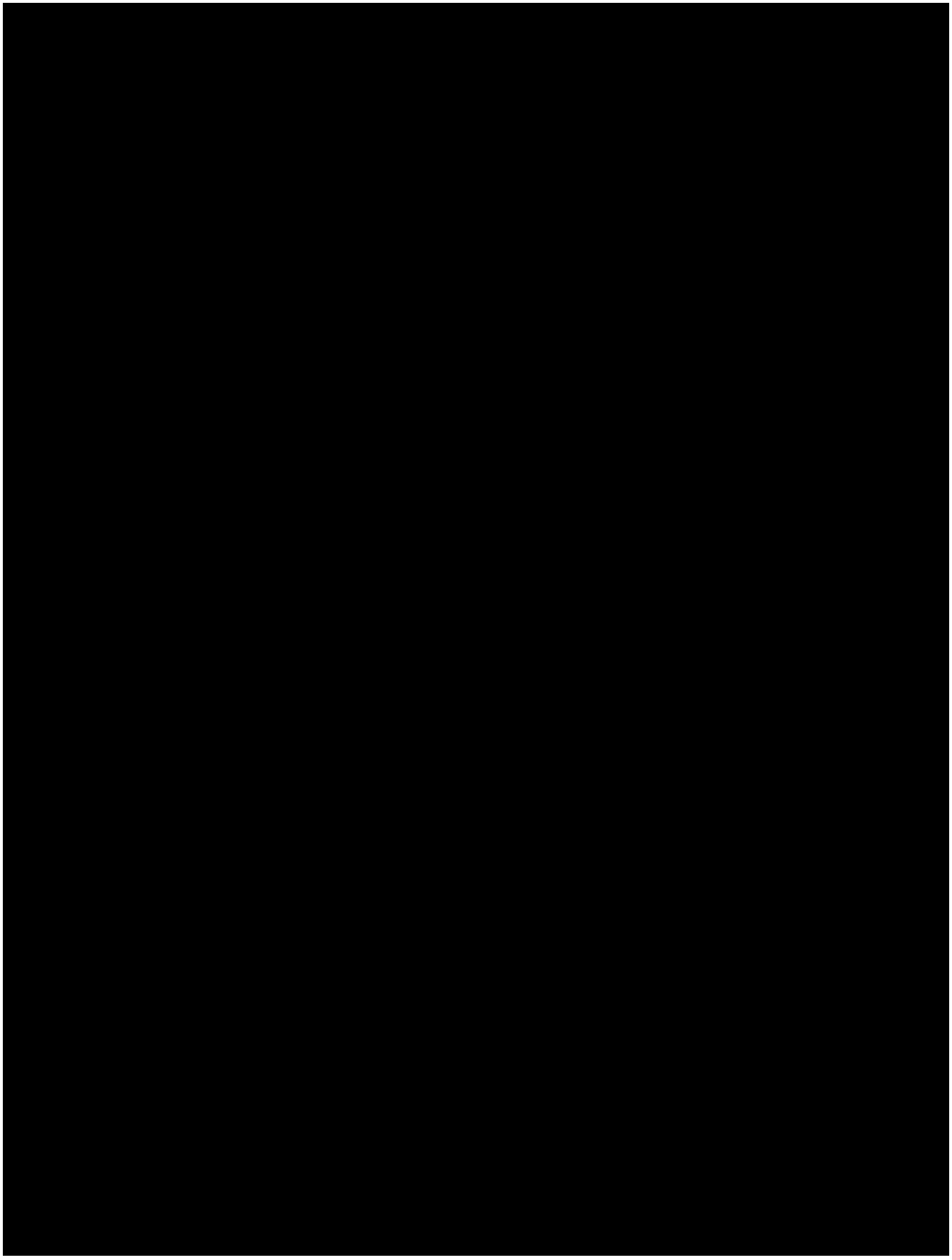

ANGLIAN WATER SERVICES - MATERIALS APPROVAL FORM | **Form Number:** | **3659**

For materials to enter supply, Parts A and B must be signed and approved by Risk and Optimisation Team and final authorisation will be given by a Risk or Water Quality Scientist

Contact Name:	[redacted](MIC) [redacted](Project Manage) [redacted](Lead commissioning engineer) [redacted](Assurance engineer)	**Contact Number:**		**Date:**	[redacted]
Site:	Kedington WTW				
Location on site:					
Contractor:					
WAT- No. If applicable:	WAT-06742-04-CM				

USEFUL LINKS

CONTACT THE RISK AND OPTIMISATION TEAM
HAWK - MATERIALS IN CONTACT
WRAS DIRECTORY
DWI APPROVED PRODUCTS LIST
BRITISH STANDARDS WEBSITE
REGULATION 31 WATER FITTINGS DATABASE

PART A - Approvals

Line No.	Supplier	Manufacturer holding approval (if different from supplier)	Product name	Brief Description of material in contact with water (e.g. pump, pipe, sealant)	Large/ Small surface area	Approving body (DWI/ BS6920/ WRAS/ KIWA/ BSEN)	Approving body ref	Have rhe Instructions for use (IFU) or conditions for use been checked and can you meet all the requirements?	1 Person completing the work Sign/Date	2 Risk Scientist - Materials Approved Sign/Date	Comments and Advice
Pressure Filter Vessels (Supplier - Allied Storage Tanks)											
1	Allied Storage Tanks	Sherwin-Williams Protective and Marine Coatings	**Macropoxy P300**	Coatings based on epoxy resins	Large	DWI	56/4/253	Yes	[redacted]9-1-20	27/02/2020 [redacted]	Is it only the coating that is in contact with the water? Not the tank itself? Thats correct, only coating.
2	Allied Storage Tanks	Guarniflon SpA	**PTFE**	Gasket for VISILUME Site Glass	Small	WRAS	1605507	Yes	[redacted]9-1-20	13/01/2020 [redacted]	
4	N/a	N/a	**VISILUME SIGHT GLASS**	Glass	Small	N/a	N/a	N/a	N/a	N/a	Discussed in the Reg31 steering group and as glass is inert no approval is required. (LO)
4	Allied Storage Tanks	JP Polymer Sheetings Ltd	**EPDM (E78S) rubber gaskets**	Manway/weir gasket	Small	WRAS	1711567	Yes	[redacted]9-1-20	13/01/2020 [redacted]	
Pre Filter											
1	IFM		**Flow Switch**	Stainless Steel 1.4404 / 316L	Small	DWI Advice sheet 5 Annex 3C	1.4404 / 316L	Yes	[redacted]26-02-20	10/03/2020 [redacted]	
2	IFM		**Flow Switch Progressive Ring Fitting**	Stainless Steel 1.4571 / 316Ti	Small	DWI Advice sheet 5 Annex 3C	1.4571 (320S31/AISI 316Ti) (SS 2350)	Yes	[redacted]26-02-20	10/03/2020 [redacted]	
3	ABB	AVK GUMMI A/S	**EIW-54'. Black coloured, injection moulded EPDM rubber material**	Ethylene Propylene Diene Monomer (EPDM)	Small	WRAS	1803514	Yes	[redacted]26-02-20	10/03/2020 [redacted]	
4	IFM		**Pressure Transducer**	Stainless Steel 1.4404 / 316L	Small	DWI Advice sheet 5 Annex 3C	1.4404 / 316L	Yes	[redacted]26-02-20	10/03/2020 [redacted]	
5	IFM		**Pressure Transducer Mounting Adapter**	Stainless Steel 1.4404 / 316L	Small	DWI Advice sheet 5 Annex 3C	1.4404 / 316L	Yes	[redacted]26-02-20	10/03/2020 [redacted]	
6	IFM		**Pressure Transducer**	Stainless Steel 1.4404 / 316L	Small	DWI Advice sheet 5 Annex 3C	1.4404 / 316L	Yes	[redacted]26-02-20	10/03/2020 [redacted]	
7	IFM		**Pressure Transducer Mounting Adapter**	Stainless Steel 1.4404 / 316L	Small	DWI Advice sheet 5 Annex 3C	1.4404 / 316L	Yes	[redacted]26-02-20	10/03/2020 [redacted]	
Pressure Filter Vessel Internal											
1	Durapipe UK	Durapipe UK	**Durapipe PVC-U Pipe NGS**	Pipe (filter internal and lateral system)	Large	56/4/937	DWI	Yes	[redacted]9-1-20	13/02/2020 [redacted]	
2	Durapipe UK	Durapipe UK	**Durapipe RERFIX ECO solvent cement**	Solvent cement for connecting pipes	Small	1703530	WRAS	Yes	[redacted]9-1-20	13/01/2020 [redacted]	
3	BSS Industrial	BSS Industrial	**Stainless Steel**	Stainless Steel fixings for securing pipe work	Small	56/4/1017	DWI	Yes	[redacted]9-1-20	13/01/2020 [redacted]	
4	Cadar Ltd	Cadar Ltd	Filter Nozzles + saddles **ABS Filter Component** **PP Filter Component (Green)** **PP Filter Component (Ivory)**	Filter nozzles for filters	Small	BS6920	MAT/LAB 397L, MAT/LAB 398L, MAT/LAB 399L	Yes	[redacted]7-2-20	27/02/2020 [redacted]	PP Filter Component (Ivory) MAT/LAB 399L has not been tested for Growth of aquatic microorganisms but refers to PP Filter Component (Green) which has been tested.
5	Western Carbons		**16/30 sand**	16/30 sand	Large	DWI Annex 2 - 2.2 BSEN	12904:2005	Yes	[redacted]9-1-20	13/02/2020 [redacted]	
6	Western Carbons		**Gravel**	Gravel support media	Large	DWI Annex 2 - 2.2 BSEN	12904:2005	Yes	[redacted]9-1-20	13/02/2020 [redacted]	
7	Western Carbons	Prince Minerals	**Manganese Dioxide**	Mn02 filter media	Large	DWI Annex 2 - 2.2 BSEN	13752:2012	Yes	[redacted]9-1-20	13/02/2020 [redacted]	
8	Eastern Concrete		**C28/35 concrete (CEM1 cement, aggregate, potable water, admixture detailed below)**	Concrete for securing laterals inside presure filters	Large	Advice Sheet 7 Annex 1	BSEN 197-1:2011 (cement) BSEN 12620:2002 (aggregate)	Yes	[redacted]30-10-19	01/11/2019 [redacted]	
9	Eastern Concrete	BASF	**MasterGlenium123**	Concrete admixture (water reducing super-plasticizer) for use inside pressure vessels	Large	Advice Sheet 7 Annex 1 DWI Advice sheet 7 Annex 2 Section 2.4	BS EN 934-2:2009 Provided Declaration of DWI Compliance	Yes	[redacted]30-10-19	12/03/2020 [redacted]	
10	IFM	VICTREX PLC	**Victrex PEEK grades 450GL30 (beige coloured), 450FC30 (black) & 450CA30 (black). Injection moulded PEEK thermoplastic material.**	Polyether Ether Ketone (PEEK)	Small	WRAS	1606514	Yes	[redacted]26-02-20	10/03/2020 [redacted]	

ANGLIAN WATER SERVICES - MATERIALS APPROVAL FORM										Form Number:	3659		
11	IFM		**Screw-in Adaptor**	Screw-in Adaptor Stainless Steel 1.4404 / 316L	Small	DWI Advice sheet 5 Annex 3C	1.4404 / 316L	Yes	[redacted]26-02-20	10/03/2020 [redacted]			
12	ABB		**Differential Pressure Transmitter Flanges**	Differential Pressure Transmitter Stainless Steel 1.4404 / 316L	Small	DWI Advice sheet 5 Annex 3C	1.4404 / 316L	Yes	[redacted]26-02-20	10/03/2020 [redacted]			
Filter Package Plant Large Bore Valves (Supplied by Alliance)													
1	AVK	Wouter Witzel	**150mm, 300mm EVBS Wouter Witzel butterfly calves**	Body, disks and seats	Small	WRAS	1612049	Yes	[redacted]9-1-20	13/01/2020 [redacted]			
2	AVK	Wouter Witzel	**400mm, 600mm EVS Wouter Witzel butterfly valves**	Body, disks and seats	Small	WRAS	1612049	Yes	[redacted]28-1-20	10/02/2020 [redacted]			
3	AVK	Wouter Witzel	**80mm EVFS Wouter Witzel butterfly valve**	Body, disks and seats	Small	WRAS	1612049	Yes	[redacted]9-1-20	13/01/2020 [redacted]			
4	AVK	Aqua Gas Manufacturing Ltd	**80, 100, 150, 200,mm S21/35 gate valves**	Body, disks and seats	Small	WRAS	1512320	Yes	[redacted]9-1-20	13/02/2020 [redacted]			
7	AVK	Mitsubishi Engineering Plastics Corp	**Acetal IUPITAL F20-EW White coloured, injection moulded acetal material**	Valve Components	Small	WRAS	1707510	Yes	[redacted]9-1-20	10/02/2020 [redacted]			
8	AVK	Polyram Ram-On Industries	**Plustek PB305G33BK37 PA material**	Injection moulded PA material	Small	WRAS	1503511	Yes	[redacted]9-1-20	10/02/2020 [redacted]			
9	AVK	Polyram Ram-On Industries	**Polypropylene (Ramofin PPH300G6BK11' & 'Ramofin PPH300G6NT')**	Injection moulded polypropylene material	Small	WRAS	1703534	Yes	[redacted]9-1-20	10/02/2020 [redacted]			
11	AVK	Xiamen Maifeng Seal Products Co Ltd	**EPDM Rubbers**	Valve Components	Small	WRAS	1508511	Yes	[redacted]9-1-20	13/02/2020 [redacted]			
12	AVK	Xiamen Maifeng Seal Products Co Ltd	**Nitrile Rubbers**	Valve Components	Small	WRAS	1805500	Yes	[redacted]9-1-20	13/02/2020 [redacted]			
13	AVK	AVK Gummi A/S	**EPDM**	Valve Components	Small	WRAS	1601506	Yes	[redacted]06-02-20	13/02/2020 [redacted]			
14	AVK	PPG Protective & Marine Coatings	**SigmaGuard CSF 585.**	Valve internal coating	Small	WRAS	1406524	Yes	[redacted]9-1-20	04/03/2020 [redacted]	Factory applied, light blue coloured, two component solvent free epoxy coating consisting of a base and hardener. For use with water up to 23°C. Expired. Items were ordered in March 2019		
Filter Package Plant Small Bore Valves (Supplied by FLI)													
1	Invicta Valves	RIV SPA Rubinetterie Italiane Velatta	**DERBY TYPE: RIV 4100, RIV4101, RIV4104 & RIV4107 SPHERICAL VALVES**	Valve internal (nickel plated brass bodies, chrome plated brass balls, PTFE seats, FKM and NBR 'O'-rings)	Small	WRAS	1711717	Yes	[redacted]9-1-20	24/02.2020 [redacted]	Are we using all modesl of this valve? **Yes**		
Filter Package Plant Pipework													
1	FLI Water	Freeflow Pipesystems	**Resicoat® R4-FB**	Factory applied epoxy resin coated Carbon Steel Pipework	Large	DWI	56/4/817	Yes	[redacted]9-1-20	10/02/2020 [redacted]			
2	FLI Water	Zenith Industrial Rubber Products PVT Ltd	**EPDM rubber - EP 701110 HW**	EPDM Gaskets	Small	WRAS	1701547	Yes	[redacted]9-1-20	10/02/2020 [redacted]			
3	FT Ductile	VIP Polymers Ltd	**EPDM rubber - CVE45**	EPDM Rubber seal	Small	WRAS	1610521	Yes	[redacted]9-1-20	04/03/2020 [redacted]			
4	FT Ductile	Arkema	**Rilsan polyamide powder coatings to be used in conjunction with Primgreen LAT 12035 epoxy resin primer**	Flange adapter coating	Small	WRAS	1411519	Yes	[redacted]9-1-20	10/03/2020 [redacted]	Expired. items were ordered and fabricated in early to mid 2019.		
5	FLI Water	Yorkshire Stainless Ltd	**SS304, SS316 pipe and fittings**	Sample Pipework, air pipework	Large	DWI	56/4/1368	Yes	[redacted]9-1-19	10/02/2020 [redacted]	Included air pipework in brief description column. [redacted]16-03-20		
Dirty Wash Water Tank													
1a	Hayes GFS LTD	Permastore Ltd	**TRIFUSION**	Tank walls & roofs	Large	DWI	DWI 56/4/1213	Yes	[redacted]06-02-20	10/03/2020 [redacted]			
1b	Hayes GFS LTD	Sika Ltd	**Sikaflex TS Plus**	Tank joint seal	Small (calculations done by Alliance)	BS 6920	**0906533 / BS6920 Test Report Ref M105605 and emails from Supplier and Manufacturer**	Yes	[redacted]05-03-20	18/03/2020 [redacted]	**Signed off after approval from [redacted] Risk Manager**		
2	Eastern Concrete		**GEN3 concrete (CEM1 cement, aggregate, potable water)**	Benching concrete inside DWW tanks	Large	Advice Sheet 7 Annex 1	BSEN 197-1:2011 (cement) BSEN 12620:2002 (aggregate)	Yes	[redacted]31/01/20	24/02/2020 [redacted]			
3	Eastern Concrete		**RC28/35 concrete consisting of cement C111A (CEM 1 cement with a mass fraction of 36% GGBS), aggregate, potable water**	Concrete plinths for pipework inside DWW tanks	Large	Advice Sheet 7 Annex 1	BSEN 197-1:2011 (cement) BSEN 12620:2002 (aggregate) BSEN 15167-1:2006 (GGBS)	Yes	[redacted]31/01/20	24/02/2020 [redacted]			
4	Hawker		**316 Stainless Steel Electrode**	316L Stainless Steel Electrode for level switching within Dirty Washwater Tank	Small	DWI Advice sheet 5 Annex 3C	1.4404 (316S11/AISI 316L) (SS 2348)	Yes	[redacted]26-02-20	10/03/2020 [redacted]			
Surge Vessel													
1	Quantum Engineering Developments Ltd	Quantum Engineering Developments Ltd	Quantum Pressure Vessels- 316L	316L stainless steel	Large	DWI	56/4/1133	Yes	[redacted]9-1-20	17/03/2020 [redacted]			
2	S M Gauge	S M Gauge	Pressure gauge stainless steel 1.4571 AISI	stainless steel 1/2" connection	Small	DWI	Advice sheet 5 Annex 3	Yes	[redacted]9-1-20	13/02/2020 [redacted]			
3	Mars Valve	Mars Valve	Isolation valves 1.4401 316L	Level gauge isolation	Small	DWI	Advice sheet 5 Annex 3	Yes	[redacted]9-1-20	13/02/2020 [redacted]			
4	Seagull stainless	Seagull stainless	ND25 PN16 flange	stainless steel 1.4401	Small	DWI	Advice sheet 5 Annex 4	Yes	[redacted]9-1-20	13/02/2020 [redacted]			
5	Seagull stainless	Seagull stainless	1/2" pipe fittings	stainless steel 1.4401	Small	DWI	Advice sheet 5 Annex 5	Yes	[redacted]9-1-20	13/02/2020 [redacted]			
6	QED Ltd	JP Polymer Sheetings Ltd	E78S EPDM Material	Rubber joints	Small	WRAS	1711567	Yes	[redacted]9-1-20	10/03/2020 [redacted]			
7	Seagull stainless	Seagull stainless	flow restictor	flow restrictor - 1.4404 stainless steel	Small	DWI Advice sheet 5 Annex 3C	1.4404 (316S11/AISI 316L) (SS 2348)	Yes	[redacted]9-1-20	10/03/2020 [redacted]			
8	BSS	BSS Industrial	Stainless steel pipework 316L tubings and fittings	316L stainless steel tubings and fittings	Small	DWI	56/4/1017	Yes	[redacted]9-1-20	04/03/2020 [redacted]			
Supernatant Tank													
1	Forbes Technology Ltd	Forbes Technology Ltd	**Cheetah range of tanks - Supernatant tank**	Tank internal	Large	DWI	56/4/1292	Yes	[redacted]9-1-20	13/02/2020 [redacted]			
2	Hawker		**316 Stainless Steel Electrode**	316L Stainless Steel Electrode for level switching within Supernatant Tank	Small	DWI Advice sheet 5 Annex 3C	1.4404 (316S11/AISI 316L) (SS 2348)	Yes	[redacted]26-02-20	10/03/2020 [redacted]			
5	Mercom	ABB Ltd	**Maxxam PP Flow Meter Insert. Off-White coloured, injection moulded polypropylene flow meter insert.**	Flowmeter Polypropylene	Small	WRAS	1512533	Yes	[redacted]26-02-20	10/03/2020 [redacted]			
Sampling Kiosk													
1	FLI	KSB	**Movitec Pump (Motive Water Pump)**	Pump	Small	WRAS	1807083	Yes	[redacted]9-1-20	13/02/2020 [redacted]			
2	FLI	Xylem Service Italia SRL (Lowara)	**Sample Pumps: model 5SV**	Pump	Small	WRAS	1601036	Yes	[redacted]20-2-20	24/02/2020 [redacted]			
3	FLI	Durapipe UK	**Durapipe PREMIUM PVC-U pipe**	PVCu Pipe	Large	DWI	56/4/1226	Yes	[redacted]16-3-20	17/03/2020 [redacted]			
4	FLI	International Plastic Systems Ltd	**Spears Grey PVC-U Fittings**	PVCu fittings	Small	WRAS	1710500	Yes	[redacted]16-3-20	17/03/2020 [redacted]			

ANGLIAN WATER SERVICES - MATERIALS APPROVAL FORM										Form Number:	3659		
5	FLI	IPS Corporation	**Weld-On 725 Wet 'R' Dry Clear Solvent Cement'**	Solvent Cement	Small	WRAS	1711500	Yes	[redacted]16-3-20	17/03/2020 [redacted]			
6	FLI	Praher Kunststoffechnik	**Quarter turn PVC-U double union spherical valves with EPDM seals and PTFE Seats, 12.8809 (16mm), 12.8810 (20mm), 12.8811 (25mm), 12.8812 (32mm), 12.8813 (40mm), 12.8814 (50mm) & 12.8815 (63mm)**	spherical valves	Small	WRAS	1611069	Yes	[redacted]16-3-20	17/03/2020 [redacted]			
7	FLI	Zenith Industrial Rubber Products PVT Ltd	**EP 701110 HW EPDM Rubber**	Flange Gasket	Small	WRAS	1701547	Yes	[redacted]16-3-20	17/03/2020 [redacted]			
8	FLI	Durapipe UK	**VKR & VKD range of PVC-U isolation valves with PTFE ball seats - 25mm (25 H0 MBE 307)**	Metering ball valves	Small	WRAS	1505035	Yes	[redacted]16-3-20	17/03/2020 [redacted]			
Static Mixers													
1	Statiflo	Multiple Suppliers	**Mixer elements/injection boss/injection branches/lance support**	Stainless steel 316L (DIN 1.4404)	Small	DWI Advice sheet 5 Annex 3C	316L (DIN 1.4404)	Yes	[redacted]9-1-20	27/02/2020 [redacted]			
2	Statiflo	La.re.ter s.p.a	**Injection Lances**	PVC-U	Small	WRAS	1509516	Yes	[redacted]9-1-20	24/02/2020 [redacted]			
3	Statiflo	Northpoint Ltd	**MIXER HOUSING / FLANGE / LIFTING LUG / NAMEPLATE SUPPORT BRACKET**	Epoxy coating - RESICOAT R4-FB	Small	DWI	56/4/659	Yes	[redacted]9-1-20	24/02/2020 [redacted]			
Pre Contact Tank													
1	ABB	AVK GUMMI A/S	**EIW-54'. Black coloured, injection moulded EPDM rubber material**	Ethylene Propylene Diene Monomer (EPDM)	Small	WRAS	1803514	Yes	[redacted]26-02-20	10/03/2020 [redacted]			
2	IFM		**TD2507**	Temperature Transmitter Stainless Steel 1.4404 / 316L	Small	DWI Advice sheet 5 Annex 3C	1.4404 (316S11/AISI 316L) (SS 2348)	Yes	[redacted]26-02-20	10/03/2020 [redacted]			
3	IFM		**E43303**	Screw-in Adaptor Stainless Steel 1.4404 / 316L	Small	DWI Advice sheet 5 Annex 3C	1.4404 (316S11/AISI 316L) (SS 2348)	Yes	[redacted]26-02-20	10/03/2020 [redacted]			
Contact Tank/ Balance Tanks													
1	FLI Carlow UK Ltd	Irish Cement Limited	**Cement**	CEM I Cement	Large	DWI Advice Sheet 7 Annex 1	BSEN 197-1:2011	Yes	[redacted]23/12/19	24/02/2020 [redacted]			
2	FLI Carlow UK Ltd	Flexcrete Technologies Ltd	**Intercrete 4807 (formerly known as Tiefill)**	Tie-hole/bolt-hole filler. Grey coloured, single component, polymer modified, fibre reinforced, Portland cement based repair compound. Mix (with water) and apply as per manufacturer`s instructions. Cure for 21 days at 7°C. For use with water up to 23°C	Small	DWI	56/4/1287	Yes	[redacted]25/02/2020	04/03/2020 [redacted]	Is brief description still correct? **Yes; material cured at same time as the panels were manufactured (summer/autumn 2019)**		
3	FLI Carlow UK Ltd	Flexcrete Technologies Ltd	**Intercrete 4820 (formerly MONOLEVEL 844S)**	Class R4 waterproof screed & pore filler (for rubbing-up to produce a fair-worked finish and for minor repairs - in layers not greater than 6mm thick).	Large	DWI	56/4/1161	Yes	[redacted]23/12/19	27/02/2020 [redacted]			
4	FLI Carlow UK Ltd	Flexcrete Technologies Ltd	**Intercrete 4802 (formerly Fastfill) Repair Mortar Grey**	Class R4 rapid setting structural repair mortar for more extensive repairs - in layers up to 300mm thick.	Large	DWI	56/4/1162	Yes	[redacted]23/12/19	27/02/2020 [redacted]	This product must be cured for a minimum of 21 days at a minimum temperature of 7°C or in accordance with the cure curve provided in the manufacturers IFU. Can this be met? ***The units were cast and supplied in summer and autumn so I would expect that they never dropped below 7°C***		
5	FLI Carlow UK Ltd	OMYA UK Ltd	**Betocarb**	A finely ground calcium carbonate (limestone) powder of high purity. Aids compaction by excluding air.	Large	DWI Advice Sheet 7 Annex 1 DWI Advice sheet 7 Annex 2 Section 2.4	BS EN 934-2:2009 Declaration of DWI Compliance	Yes	[redacted]16/03/20	17/03/2020 [redacted]	DWI Advice sheet 7 Annex 2 Section 2.4 Provide Declaration of DWI Compliance **Declaration of DWI Compliance supplied by email**		
6	FLI Carlow UK Ltd	Ecocem	**GGBS**	Granulated Blastfurnace Slag (GGBS) cement replacement	Large	DWI	Advice sheet 7: Annex 1 Meets the requirements of EN15167-1:2006	Yes	[redacted]23/12/19	13/02/2020 [redacted]			
7	FLI Carlow UK Ltd	BASF	**MasterGlenium ACE 474**	An innovative super-plasticiser admixture based on newly developed polycarboxylate ether polymers (particularly for the precast industry). Used in conjunction with BASF RheoMATRIX 110 as an alternative to Sika Stabiliser 4.	Large	Advice Sheet 7 Annex 1 DWI Advice sheet 7 Annex 2 Section 2.4	BS EN 934-2:2009 Declaration of DWI Compliance	Yes	[redacted]23/12/19	28/02/2020 [redacted]	DWI Advice sheet 7 Annex 2 Section 2.4 Provide Declaration of DWI Compliance **Declaration of DWI Compliance supplied by email**		
8	FLI Carlow UK Ltd	BASF	**RheoMATRIX® 110 Now Mastermatrix SDC 100**	A viscosity modifying self-compacting admixture for fluid concretes. Used in conjunction with BASF GLENIUM ACE 474 as an alternative to Sika Stabiliser 4.	Large	Advice Sheet 7 Annex 1 DWI Advice sheet 7 Annex 2 Section 2.4	BS EN 934-2:2009 Declaration of DWI Compliance	Yes	[redacted]23/12/19	28/02/2020 [redacted]	DWI Advice sheet 7 Annex 2 Section 2.4 Provide Declaration of DWI Compliance **Declaration of DWI Compliance supplied by email**		
9	Hanson		**Cement-C111A+SR (CEM 1 cement with a mass fraction of 36% GGBS)**	In-situ poured concrete floor and sections of wall between adjacent precast units	Large	Advice Sheet 7 Annex 1	BSEN 197-1:2011 (cement) BSEN 15167-1:2006 (GGBS)	Yes	[redacted]7/08/19	24/02/2020 [redacted]			
10	Hanson		**Aggregate-Gravel Flint 20**	In-situ poured concrete floor and sections of wall between adjacent precast units	Large	Advice Sheet 7 Annex 1	BSEN 12620:2002	Yes	[redacted]7/08/19	24/02/2020 [redacted]			

ANGLIAN WATER SERVICES - MATERIALS APPROVAL FORM										Form Number:	3659
11	Hanson		**Aggregate-Sand**	In-situ poured concrete floor and sections of wall between adjacent precast units	Large	Advice Sheet 7 Annex 1	BSEN 12620:2002	Yes	[redacted]7/08/19	24/02/2020 [redacted]	
12	Hanson	Sika Ltd	**Admixture-Sika Viscoflow 1000**	Admixture (superplasticizer) for in-situ poured concrete floor and sections of wall between adjacent precast units	Large	Advice Sheet 7 Annex 1 DWI Advice sheet 7 Annex 2 Section 2.4	BS EN 934-2:2009 Declaration of DWI Compliance	Yes	[redacted]7/08/19	28/02/2020 [redacted]	DWI Advice sheet 7 Annex 2 Section 2.4 Provide Declaration of DWI Compliance **Declaration of DWI Compliance supplied**
13	Technocover		**Zinc galvanizing**	Hot dip galvanized steel access hatch security covers on roof	Small	BSEN	ISO 1461:2009	Yes	[redacted]2/01/20	13/02/2020 [redacted]	Covers are not in direct contact but condensate will form on the underside and drip back down into the potable water
14	Hawker		**316 Stainless Steel Electrode**	316L Stainless Steel Electrode for level switching within contact and balance tanks 1 and 2.	Small	DWI Advice sheet 5 Annex 3C	1.4404 (316S11/AISI 316L) (SS 2348)	Yes	[redacted]26-02-20	10/03/2020 [redacted]	
Post CT Instruments											
1	ABB	AVK GUMMI A/S	**EIW-54'. Black coloured, injection moulded EPDM rubber material**	Ethylene Propylene Diene Monomer (EPDM)	Small	WRAS	1803514	Yes	[redacted]26-02-20	11/03/2020 [redacted]	
2	Elster Water Metering Ltd		**H4000 range of helical rotor bulk water meters, with cast iron bodies (blue epoxy coated) and NBR rubber 'O'- rings.**	Mechnical Flowmeter	Small	WRAS	1510032	Yes	[redacted]26-02-20	11/03/2020 [redacted]	
Cross Site Pipework (potable)											
1	Saint-Gobain PAM UK		**System CL - cement mortar lined pipes without seal coat**	Ductile iron pipe , various diameters	Large	DWI	56/4/283	Yes	[redacted]23/12/19	04/03/2020 [redacted]	Review - Approval for pipes only **I've added a separate line below for DI fittings (tees, bends, etc,) which aren't cement lined**
2	Saint-Gobain PAM UK	BS Coatings	**Eurokote**	Factory applied epoxy coating (inside surfaces of DI fittings, various diameters)	Small	WRAS	1503518	Yes	[redacted]28/02/20	04/03/2020 [redacted]	
3	GPS		**GPS Excel (Blue)**	PE100 pipe	Large	DWI	56/4/850	Yes	[redacted]03/02/20	13/02/2020 [redacted]	
4	Wolseley / Viking Johnson	VIP Polymers Ltd	**Flange Adaptors (various diameters)**	EPDM rubber sealing ring	Small	WRAS	1607507	Yes	[redacted]04/02/20	13/02/2020 [redacted]	
		Arkema		COATING: Rilsan Nylon 11 polyamide powder coating used in conjunction with Primgreen LAT 12035 epoxy resin primer	Small	WRAS	1910523	Yes	[redacted]04/02/20	13/02/2020 [redacted]	
5	Wolseley / Viking Johnson	VIP Polymers Ltd	**Pipe Couplings (various diameters)**	EPDM rubber sealing ring	Small	WRAS	1607507	Yes	[redacted]04/02/20	13/02/2020 [redacted]	
		Arkema		COATING: Rilsan Nylon 11 polyamide powder coating used in conjunction with Primgreen LAT 12035 epoxy resin primer	Small	WRAS	1910523	Yes	[redacted]04/02/20	13/02/2020 [redacted]	
6	Wolseley / Viking Johnson	VIP Polymers Ltd	**Dismantling Joints (various diameters)**	EPDM rubber sealing ring	Small	WRAS	1607507	Yes	[redacted]04/02/20	13/02/2020 [redacted]	
		Arkema		COATING: Rilsan Nylon 11 polyamide powder coating used in conjunction with Primgreen LAT 12035 epoxy resin primer	Small	WRAS	1910523	Yes	[redacted]04/02/20	13/02/2020 [redacted]	
Grundfos Pump Skids											
Section 1	**High Lift Pump Skid**										
1	Grundfos	Grundfos	TP Series 300 150-660/4 (With BQQE Seal)	In-line Pump	Small	WRAS	1812901	Yes	[redacted]9-1-20	02/03/2020 [redacted]	
2	Grundfos	Powerrun Pipe-Mech Ltd	Powerrun fabricated stainless steel pipework	Pipe	Large	DWI	DWI 56/4/769	Yes	[redacted]9-1-20	04/03/2020 [redacted]	
3	Grundfos	Powerrun Pipe-Mech Ltd	Powerrun fabricated stainless steel pipework	Pipe	Large	DWI	DWI 56/4/769	Yes	[redacted]9-1-20	04/03/2020 [redacted]	
4	Grundfos	Chronimo	DN400 Blind Flange - 1.4571	Blind flange	Small	DWI Advice sheet 5 Annex 3C	1.4571 (320S31/AISI 316Ti) (SS 2350)	Yes	[redacted]9-1-20	02/03/2020 [redacted]	
5	Grundfos	Weflo Valve Co Ltd	NRV	Valve	Small	WRAS	1407909	Yes	[redacted]9-1-20	04/03/2020 [redacted]	Expired. **Ordered in 2018**
6	Grundfos	Albion Valves	Butterfly valve with ductile iron bodies, stainless steel discs and EPDM seats. DN250	Valve	Small	WRAS	1803800	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
7	Grundfos	Powerrun Pipe-Mech	DN 250mm double flange -Powerrun fabricated stainless steel pipework	Pipe	Large	DWI	56/4/769	Yes	[redacted]9-1-20	11/03/2020 [redacted]	[redacted]confirmed that pipe with flanges was bought from Powerrun Pipe-Mech as a whole product.
8	Grundfos	GIACOMINI S.P.A.	Ball valve type R250WX 1" I/I DVGW PN16	Valve	Small	WRAS	1907332	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
9	Grundfos	GIACOMINI S.P.A.	Ball valve type R250WX 2" I/I DVGW	Valve	Small	WRAS	1907332	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
10	Grundfos	N/A	GBST0330 - 2" STAINLESS STEEL HEX NIPPLE 1.4401	Fitting	Small	DWI Advice sheet 5 Annex 3C	1.4401 (316S31/AISI 316) (SS 2347)	Yes	[redacted]9-1-20	02/03/2020 [redacted]	
11	Grundfos	N/A	99599152 - Flow sensor - SA4100 1.4404	Sensor	Small	DWI Advice sheet 5 Annex 3C	1.4404 (316S11/AISI 316L) (SS 2348)	Yes	[redacted]9-1-20	02/03/2020 [redacted]	
12	Grundfos	N/A	99468547 - IFM Flow Meter threaded Adaptor - E40258 1.4404	Fitting	Small	DWI Advice sheet 5 Annex 3C	1.4404 (316S11/AISI 316L) (SS 2348)	Yes	[redacted]9-1-20	02/03/2020 [redacted]	
13	Grundfos	N/A	98297432 - Pressure sensor IFM PG2793 G1" Ceramic Al2O3, PTFE , 1.4435	Sensor	Small	DWI Advice sheet 5 Annex 3C	1.4435 (SS 2353)	Yes	[redacted]9-1-20	02/03/2020 [redacted]	
14	Grundfos	Powerrun Pipe-Mech	DN250 to DN150 Discharge reducer - Powerrun fabricated stainless steel pipework	Pipe	Large	DWI	56/4/769	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
15	Grundfos	Powerrun Pipe-Mech	DN250 to DN150 Suction reducer - Powerrun fabricated stainless steel pipework	Pipe	Large	DWI	56/4/769	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
16	Grundfos	Arkema	Rilsan polyamide powder coatings to be used in conjunction with Primgreen LAT 12035 epoxy resin primer	DN150 Dismantling Flange Adapter Coating	Small	WRAS	1411519	Yes	[redacted]9-1-20	11/03/2020 [redacted]	**Expired. Ordered in 2018**
17	Grundfos	VIP Polymer	CVE45 EPDM seal	DN150 Dismantling Flange adapter seal	Small	WRAS	1612514	Yes	[redacted]9-1-20	11/03/2020 [redacted]	

ANGLIAN WATER SERVICES - MATERIALS APPROVAL FORM										Form Number:	3659
18	Grundfos	Frenzelit	Novapress Universal Gasket Material.	Gasket	Small	WRAS	1503526	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
19	Grundfos	Rich. Klinger Dichtungstechnik GmbH & Co. KG	KLINGERSIL C-4324	Gasket	Small	WRAS	1706523	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
Section 2	**Backwash Pump Skid**										
1	Grundfos	Grundfos	99697693-TP Series 300 200/130/4 (With BQQE Seal)	In-line Pump	Small	WRAS	1812901	Yes	[redacted]9-1-20	02/03/2020 [redacted]	
2	Grundfos	Powerrun Pipe-Mech	DN300 suction manifold-Powerrun fabricated stainless steel pipework	Pipe	Large	DWI	56/4/769	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
3	Grundfos	Powerrun Pipe-Mech	DN300 discharge manifold-Powerrun fabricated stainless steel pipework	Pipe	Large	DWI	56/4/769	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
4	Grundfos	Chronimo	DN300 Blind Flange - 1.4571	Blind flange	Small	DWI Advice sheet 5 Annex 3C	1..4571	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
5	Grundfos	Weflo Valve	DN 250 NRV	Valve internal	Small	WRAS	1407909	Yes	[redacted]9-1-20	11/03/2020 [redacted]	**Expired. Ordered in 2018**
6	Grundfos	Albion Valves (UK) Limited	DN250 butterfly valve	Valve internal	Small	WRAS	1803800	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
7	Grundfos	Powerrun Pipe-Mech	DN 250mm double flange-Powerrun fabricated stainless steel pipework	Pipe	Large	DWI	56/4/769	Yes	[redacted]9-1-20	11/03/2020 [redacted]	[redacted]confirmed that pipe with flanges was bought from Powerrun Pipe-Mech as a whole product.
8	Grundfos	GIACOMINI S.P.A.	Ball valve type R250WX 1" I/I DVGW PN16	Valve	Small	WRAS	1407329	Yes	[redacted]9-1-20	11/03/2020 [redacted]	**Expired. Ordered in 2018**
9	Grundfos	GIACOMINI S.P.A.	Ball valve type R250WX 2" I/I DVGW	Valve	Small	WRAS	1407329	Yes	[redacted]9-1-20	11/03/2020 [redacted]	**Expired. Ordered in 2018**
10	Grundfos	N/A	GBST0330 - 2" STAINLESS STEEL HEX NIPPLE 1.4401	Fitting	Small	DWI Advice sheet 5 Annex 3C	1.4401 (316S31/AISI 316) (SS 2347)	Yes	[redacted]9-1-20	02/03/2020 [redacted]	
11	Grundfos	N/A	Flow sensor - SA4100 1.4404	Sensor	Small	DWI Advice sheet 5 Annex 3C	1.4404 (316S11/AISI 316L) (SS 2348)	Yes	[redacted]9-1-20	02/03/2020 [redacted]	
12	Grundfos	N/A	IFM Flow Meter threaded Adaptor - E40258 1.4404	Fitting	Small	DWI Advice sheet 5 Annex 3C	1.4404 (316S11/AISI 316L) (SS 2348)	Yes	[redacted]9-1-20	02/03/2020 [redacted]	
13	Grundfos	N/A	Pressure sensor IFM PG2793 G1" Ceramic Al2O3, PTFE , 1.4435	Sensor	Small	DWI Advice sheet 5 Annex 3C	1.4435 (SS 2353)	Yes	[redacted]9-1-20	02/03/2020 [redacted]	
14	Grundfos	Powerrun Pipe-Mech	DN250 to DN200 Discharge reducer-Powerrun fabricated stainless steel pipework	Pipe	Large	DWI	56/4/769	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
15	Grundfos	Powerrun Pipe-Mech	DN250 to DN200 Suction reducer-Powerrun fabricated stainless steel pipework	Pipe	Large	DWI	56/4/769	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
16	Grundfos	Arkema	Rilsan polyamide powder coatings to be used in conjunction with Primgreen LAT 12035 epoxy resin primer	DN150 Dismantling Flange Adapter Coating	Small	WRAS	1411519	Yes	[redacted]9-1-20	11/03/2020 [redacted]	**Expired. Ordered in 2018**
17	Grundfos	VIP Polymer	CVE45 EPDM seal	DN150 Dismantling Flange adapter seal	Small	WRAS	1612514	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
18	Grundfos	Frenzelit GmbH	Novapress Universal Gasket Material.	Gasket	Small	WRAS	1503526	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
Section 3	**Supernatant Pump Skid**										
1	Grundfos	Grundfos	WU-PS-0-X-2-CRI 15-1 Supernatant	Pump	Small	WRAS	1709018	Yes	[redacted]9-1-20	10/02/2020 [redacted]	
2	Grundfos	Powerrun Pipe-Mech	DN80 suction manifold--Powerrun fabricated stainless steel pipework	Pipe	Large	DWI	56/4/769	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
3	Grundfos	Powerrun Pipe-Mech	DN80 discharge manifold--Powerrun fabricated stainless steel pipework	Pipe	Large	DWI	56/4/769	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
4	Grundfos	Chronimo	DN80 Blind Flange - 1.4571	Blind flange	Small	DWI Advice sheet 5 Annex 3C	1.4571 (320S31/AISI 316Ti) (SS 2350)	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
5	Grundfos	Grundfos Pumpenfabrik GmbH	Non-return valve GNVP DN50	Valve internal	Small	WRAS	1710375	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
6	Grundfos	Powerrun Pipe-Mech	DN50 Suction pipe---Powerrun fabricated stainless steel pipework	Pipe	Large	DWI	56/4/769	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
7	Grundfos	Powerrun Pipe-Mech	DN50 Discharge pipe---Powerrun fabricated stainless steel pipework	Pipe	Large	DWI	56/4/769	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
8	Grundfos	GIACOMINI S.P.A.	Ball valve type R250WX 1" I/I DVGW PN16	Valve	Small	WRAS	1407329	Yes	[redacted]9-1-20	11/03/2020 [redacted]	**Expired. Ordered in 2018**
9	Grundfos	GIACOMINI S.P.A.	Ball valve type R250WX 2" I/I DVGW	Valve	Small	WRAS	1407329	Yes	[redacted]9-1-20	11/03/2020 [redacted]	**Expired. Ordered in 2018**
10	Grundfos	N/A	1" STAINLESS STEEL HEX NIPPLE - 1.4401	Fitting	Small	DWI Advice sheet 5 Annex 3C	1.4401 (316S31/AISI 316) (SS 2347)	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
11	Grundfos	N/A	Flow sensor - SA4100 1.4404	Sensor	Small	DWI Advice sheet 5 Annex 3C	1.4404 (316S11/AISI 316L) (SS 2348)	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
12	Grundfos	N/A	IFM Flow Meter threaded Adaptor - E40258 1.4404	Fitting	Small	DWI Advice sheet 5 Annex 3C	1.4404 (316S11/AISI 316L) (SS 2348)	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
13	Grundfos	N/A	Pressure sensor IFM PG2793 G1" Ceramic Al2O3, PTFE , 1.4435	Sensor	Small	DWI Advice sheet 5 Annex 3C	1.4435 (SS 2353)	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
14	Grundfos	Powerrun Pipe-Mech	DN50 Doubleflange-Powerrun fabricated stainless steel pipework	Pipe	Large	DWI	56/4/769	Yes	[redacted]9-1-20	11/03/2020 [redacted]	[redacted]confirmed that pipe with flanges was bought from Powerrun Pipe-Mech as a whole product.
15	Grundfos	Arkema	Rilsan polyamide powder coatings to be used in conjunction with Primgreen LAT 12035 epoxy resin primer	DN50 dismantling flange adapter coating	Small	WRAS	1411519	Yes	[redacted]9-1-20	17/03/2020 [redacted]	**Expired. Ordered in 2018**
16	Grundfos	VIP Polymers Ltd	CVE45 EPDM	DN50 dismantling flange seal	Small	WRAS	1612514	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
17	Grundfos	Donit Tesnit	Tesnit BA-U. Blue coloured fibre/NBR	Pipe Gasket	Small	WRAS	1509513	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
18	Grundfos	Donit Tesnit	Tesnit BA-U. Blue coloured fibre/NBR	Pipe Gasket	Small	WRAS	1509513	Yes	[redacted]9-1-20	11/03/2020 [redacted]	
Site Pipework - Raw water main IPs (mains tapping and up to 2x NRV valves on the raw water main)											
1	AVK GUMMI A/S	Aqua-Gas Manufacturing Ltd	**400mm S21/50 gate valves**	Body, disks and seats	Small	WRAS	1806705	Yes	[redacted]27-1-20	31/01/2020 [redacted]	
2	AVK GUMMI A/S	AVK GUMMI A/S	**EPDM rubber**	EPDM in S29/91 Hydrant	Small	WRAS	1807505	Yes	[redacted]28-1-20	30/01/2020 [redacted]	
3	AVK GUMMI A/S	AKZO Nobel Powder Coatings GMBH	**Resicoat R4-ES HJF14R**	Coating on S29/91 Hydrant	Small	WRAS	1701509	Yes	[redacted]03.2.20	03/01/2020 [redacted]	
4	AVK GUMMI A/S	AVK GUMMI A/S	**Black coloured, injection moulded TPU material.**	Disc in S29/91 Hydrant	Small	WRAS	1603529	Yes	[redacted]31-1-20	03/01/2020 [redacted]	

ANGLIAN WATER SERVICES - MATERIALS APPROVAL FORM										Form Number:	3659		
5	Wolseley	AKZO Nobel Powder Coatings GMBH	**Resicoat R4-FB HGC07R red/brown**	WAGA Flange adapter internal coatings, paintings & linings	Small	WRAS	1701509	Yes	[redacted]30-1-20	03/01/2020 [redacted]			
6	Wolseley	Compounds AG	**EPDM Rubber**	WAGA FA EPDM Seals	Small	WRAS	1611530	Yes	[redacted]28-1-20	30/01/2020 [redacted]			
7	Wolseley	Zenith Industrial Rubber Products Pvt Ltd	**EPDM rubber**	WAGA FA EPDM Gaskets	Small	WRAS	1701547	Yes	[redacted]28-1-20	30/01/2020 [redacted]			
8	George Green	Northpoint Ltd	**Resicoat® R4-FB**	FBE coated Carbon Steel Pipework	Large	DWI	56/4/659	Yes	[redacted]28-1-20	30/01/2020 [redacted]			
9	Vulcan Fasteners	Zenith Industrial Rubber Products PVT Ltd	**EPDM rubber**	EPDM Gaskets	Small	WRAS	1701547	Yes	[redacted]28-1-20	30/01/2020 [redacted]			
10	FT Ductile	Viking Johnson - VIP Polymers Ltd	**VIP Polymer**	EPDM rubber	Small	WRAS	1610521	Yes	[redacted]28-1-20	30/01/2020 [redacted]			
11	Wolseley / Viking Johnson	Arkema	**Rilsan polyamide powder coatings to be used in conjunction with Primgreen LAT 12035 epoxy resin primer.**	Wall Couplings	Small	WRAS	1910523	Yes	[redacted]31-1-20	03/02/2020 [redacted]			
12	AVK	Wouter Witzel	**400mm, 600mm EVS Wouter Witzel Valves**	Body, disks and seats	Small	WRAS	1612049	Yes	[redacted]30-1-20	30/01/2020 [redacted]			
13	FLI	Weflo Valve Co Ltd	**DN400 Non Return Valve**	Body, disks and seats	Small	WRAS	1908809	Yes	[redacted]30-1-20	30/01/2020 [redacted]			
14	FLI	Eastland Compounding	**EPDM rubber**	400/80 dia Flange Pipe EPDM Gaskets	Small	WRAS	1511505	Yes	[redacted]30-1-20	03/02/2020 [redacted]			
15	Saint-Gobain		**System CL - cement mortar lined pipes without seal coat**	Ductile iron pipe and fittings, various diameters - 400 diameter pipe spools, Equal Tee, Reducing T 400/80/400, 90/45/22.5deg flanged elbows	Large	DWI	56/4/283	Yes	[redacted]23/12/19	03/02/2020 [redacted]			
16	Wolseley / Viking Johnson	VIP Polymers Ltd	**Flange Adaptors (400mm)**	EPDM rubber sealing ring	Small	WRAS	1607507	Yes	[redacted]03/02/20	04/02/2020 [redacted]			
		Arkema		400 dia item: COATING: Rilsan Nylon 11 polyamide powder coating used in conjunction with Primgreen LAT 12035 epoxy resin primer	Small	WRAS	1910523	Yes	[redacted]03/02/20	04/02/2020 [redacted]			
17	Wolseley / Viking Johnson	VIP Polymers Ltd	**Pipe Couplings (400mm)**	EPDM rubber sealing ring	Small	WRAS	1607507	Yes	[redacted]03/02/20	04/02/2020 [redacted]			
		Arkema		400 dia item: COATING: Rilsan Nylon 11 polyamide powder coating used in conjunction with Primgreen LAT 12035 epoxy resin primer	Small	WRAS	1910523	Yes	[redacted]03/02/20	04/02/2020 [redacted]			
18	Wolseley / Viking Johnson	VIP Polymers Ltd	**Dismantling Joints (400mm)**	EPDM rubber sealing ring	Small	WRAS	1607507	Yes	[redacted]03/02/20	04/02/2020 [redacted]			
		Arkema		400 dia item: COATING: Rilsan Nylon 11 polyamide powder coating used in conjunction with Primgreen LAT 12035 epoxy resin primer	Small	WRAS	1910523	Yes	[redacted]03/02/20	04/02/2020 [redacted]			
Site Pipework - Other Mechanical Items													
1	George Green	Valspar Powder Coating	**Epoxy Powder Coatings**	Coating for flange adapters/couplings	Small	WRAS	1707572	Yes	[redacted]12-02-20	13/02/2020 [redacted]			
2	Dobsons Gaskets	Dexine Rubber Technology Ltd	**EPDM gaskets**	EPDM rubber	Small	WRAS	1911536	Yes	[redacted]12-02-20	13/02/2020 [redacted]			
3	AVK	AVK GUMMI A/S	**flange adapter seal**	EPDM rubber	Small	WRAS	1607500	Yes	[redacted]12-02-20	13/02/2020 [redacted]	received further info and updated the product description (on 20.2.20, from valve internal components to flange adapter seal) after your sign off. [redacted]20.2.20		
4	FLI	Superior Seals Ltd	**Bibtap o-ring**	Nitrile rubber	Small	WRAS	1908508	Yes	[redacted]20-2-20	28/02/2020 [redacted]			
5	FLI	Elastotech SRL	**Bibtap washer**	Nitrile rubber	Small	WRAS	1805551	Yes	[redacted]20-2-20	28/02/2020 [redacted]			
6	FLI		**Bibtap body**	Copper alloy body	Small	BSEN	BS EN 12164:2016 grade CW614W	Yes	[redacted]20-2-20	28/02/2020 [redacted]			
7	FLI		**Bibtap spindle**	Gun metal spindle	Small	BSEN	BS EN 1982:2017 grade CC491K	Yes	[redacted]20-2-20	28/02/2020 [redacted]			
8	FLI	International Plastic Systems Ltd	**Grey coloured, injection moulded PVC-U fittings**	U-PVC fittings	Small	WRAS	1710500	Yes	[redacted]20-2-20	28/02/2020 [redacted]			
9	FLI	Durapipe UK	**Durapipe premium U-PVC pipes**	U-PVC	Large	DWI	56/4/1226	Yes	[redacted]20-2-20	24/02/2020 [redacted]			
10	FLI	ARI Flow Control Accessaries	**D-040 range (AVK series 701/40 double orifice air release valves)**	Valve internal components	Small	WRAS	1909095	Yes	[redacted]20-2-20	24/02/2020 [redacted]			
Hypochlorite Dosing Kiosk (WES Package Plant)													
1	B&D Plastics (Midlands) Ltd	Georg Fischer Sales	**GF PVC-U Pipe**	Polyvinylchloride (PVC-U) pipe	Large	DWI	56/4/1235	Yes	[redacted]04-02-20	10/02/2020 [redacted]			
2	B&D Plastics (Midlands) Ltd	Georg Fischer Sales	**GF PVC-U fitting**	Polyvinylchloride (PVC-U)	Small	DWI	56/4/1235	Yes	[redacted]04-02-20	10/02/2020 [redacted]			
3	B&D Plastics (Midlands) Ltd	Georg Fischer Piping Systems (Switzerland) Ltd Tecnogomma International SpA	**Type 546 valve**	PVC-U body, EPDM seals & O rings	Small	WRAS	Valve:1810060, EPDM Seals: 1711538	Yes	[redacted]04-02-20	24/02/2020 [redacted]			
4	B&D Plastics (Midlands) Ltd	Georg Fischer Sales	**GF PVC-U Pipe**	Polyvinylchloride (PVC-U) pipe	Large	DWI	56/4/1235	Yes	[redacted]04-02-20	10/02/2020 [redacted]			
5	B&D Plastics (Midlands) Ltd	Tecnogomma International SpA	**TIMO-70 EPDM 'O'-rings & gaskets**	GF PRV type 582 EPDM seals/0 rings & gaskets	Small	WRAS	1711538	Yes	[redacted]04-02-20	17/03/2020 [redacted]			
6	B&D Plastics (Midlands) Ltd	Georg Fischer Sales	**GF PVC-U Pipe**	Polyvinylchloride (PVC-U) pipe	Large	DWI	56/4/1235	Yes	[redacted]04-02-20	10/02/2020 [redacted]			
7a	IFM	VICTREX PLC	**Victrex PEEK grade 450GL30 Injection moulded PEEK thermoplastic materials**	Flow transmitter SM9100 component	Small	WRAS	1606514	Yes	[redacted]04-02-20	11/03/2020 [redacted]			
7b	IFM	Superior Seals Ltd	**EP10/7/7 BLK 'O' rings and gaskets. Injection moulded, EPDM 'O' rings and gaskets.**	Flow transmitter SM9100 O rings and Gaskets	Small	WRAS	1606503	Yes	[redacted]10-03-20	11/03/2020 [redacted]			
7c	IFM	Freudenberg Sealing Technologies GmbH & Co. KG	**60 EPDM 334 black 60 ShA (shore hardness 60) EPDM**	Flow transmitter SM9100 component	Small	WRAS	1504504	yes	[redacted]10-03-20	11/03/2020 [redacted]			
7d	IFM	HECKER WERKE GMBH & CO	**Centellen WS 3820'. Green coloured fibre/NBR gasket materia**	Flow transmitter SM9100 component	Small	WRAS	1705538	Yes	[redacted]10-03-20	11/03/2020 [redacted]			
7e	IFM	Carl Bechem GmbH	**Berusoft 30'. White coloured lubricant.**	Flow transmitter SM9100 component	Small	WRAS	1707508	Yes	[redacted]10-03-20	11/03/2020 [redacted]			
8	Advanced Water Company Ltd	Reliance Worldwide Corp.	**Floguard double check valve**	DZR brass, EPDM seals, acetyl copolymer check cartridge, SS spring	Small	WRAS	1502301	Yes	[redacted]04-02-20	13/02/2020 [redacted]	Please confirm seal is inlcuded.. Yes, seals are part of the valve		
9	B&D Plastics (Midlands) Ltd	Georg Fischer Sales	**GF PVC-U fitting**	Polyvinylchloride (PVC-U)	Small	DWI	56/4/1235	Yes	[redacted]04-02-20	10/02/2020 [redacted]			
10	B&D Plastics (Midlands) Ltd	Georg Fischer Sales	**GF PVC-U Pipe**	Polyvinylchloride (PVC-U) pipe	Large	DWI	56/4/1235	Yes	[redacted]04-02-20	10/02/2020 [redacted]			

ANGLIAN WATER SERVICES - MATERIALS APPROVAL FORM									Form Number:	3659
11	Advanced Water Company Ltd	Reliance Worldwide Corp.	**Flowguard double check valve**	DZR brass, EPDM seals, acetyl copolymer check cartridge, SS spring	Small	WRAS	1502301	Yes	[redacted]04-02-20	13/02/2020 [redacted]	Please confirm seal is inlcuded. Yes, seals are part of the valve
12	B&D Plastics (Midlands) Ltd	Georg Fischer Sales	**GF PVC-U fitting**	Polyvinylchloride (PVC-U)	Small	DWI	56/4/1235	Yes	[redacted]04-02-20	10/02/2020 [redacted]	
13	B&D Plastics (Midlands) Ltd	Georg Fischer Sales	**GF PVC-U Pipe**	Polyvinylchloride (PVC-U) pipe	Large	DWI	56/4/1235	Yes	[redacted]04-02-20	10/02/2020 [redacted]	
14	Advanced Water Company Ltd	Reliance Worldwide Corp.	**Flowguard double check valve**	DZR brass, EPDM seals, acetyl copolymer check cartridge, SS spring	Small	WRAS	1502301	Yes	[redacted]04-02-20	13/02/2020 [redacted]	Please confirm seal is inlcuded. Yes, seals are part of the valve
15	B&D Plastics (Midlands) Ltd	Georg Fischer Sales	**GF PVC-U Pipe**	Polyvinylchloride (PVC-U) pipe	Large	DWI	56/4/1235	Yes	[redacted]04-02-20	10/02/2020 [redacted]	
16	B&D Plastics (Midlands) Ltd	Georg Fischer Sales	**GF PVC-U fitting**	Polyvinylchloride (PVC-U)	Small	DWI	56/4/1235	Yes	[redacted]04-02-20	10/02/2020 [redacted]	
17	Advanced Water Company Ltd	Reliance Worldwide Corp.	**Flowguard double check valve**	DZR brass, EPDM seals, acetyl copolymer check cartridge, SS spring	Small	WRAS	1502301	Yes	[redacted]04-02-20	13/02/2020 [redacted]	Please confirm seal is inlcuded. Yes, seals are part of the valve
18	B&D Plastics (Midlands) Ltd	Georg Fischer Sales	**GF PVC-U fitting**	Polyvinylchloride (PVC-U)	Small	DWI	56/4/1235	Yes	[redacted]04-02-20	10/02/2020 [redacted]	
Hundon PS (NPS Package Plant) - MOVED TO MIC FORM 4167											
1	Grundfos Ltd	N/A	CR155-3-2-A-F-A-V-HQQV	Ductile cast iron pump with stainless steel wetted parts	Small	WRAS	1704067	Yes	[redacted]09/03/2020	11/03/2020 [redacted]	
2	Viking Johnson	Arkema	Rilsan polyamide powder coating to be used in conjunction with Primgreen LAT 12035 epoxy resin primer	Dismantling Joint coated with Rilsan polyamide powder coating	Small	WRAS	1910523	Yes	[redacted]09/03/2020	11/03/2020 [redacted]	
3	Viking Johnson	VIP Polymers Ltd.	EPDM Gasket on the Viking Johnson dismantling joint	Dismantling Joint - EPDM Gasket	Small	WRAS	1607507	Yes	[redacted]09/03/2020	11/03/2020 [redacted]	
4	Leengate	RIV Rubinetterie Italiane Velatta SPA	Ball Valves - 1"	Brass (nickel plated) valve body with PTFE seats	Small	WRAS	1610065	Yes	[redacted]09/03/2020	11/03/2020 [redacted]	
5	Leengate	Valtec Ind.co.Ltd	Ball Valves - 1"	Stainless Steel Body, PTFE Seat	Small	WRAS	1712043	Yes	[redacted]09/03/2020	11/03/2020 [redacted]	
6	Leengate	Valtec Ind.co.Ltd	Ball Valves - 1 1/4"	Stainless Steel Body, PTFE Seat	Small	WRAS	1712043	Yes	[redacted]09/03/2020	11/03/2020 [redacted]	
7	Pacific Valves	Tiajin City Binhaixinqu Tangu Yuzhuang Rubber Factory	Gate Valve - 6"	EPDM Valve Seat	Small	WRAS	1503528	Yes	[redacted]09/03/2020	11/03/2020 [redacted]	
8	Pacific Valves	Qingdao Jindapeng Powder Technology Co. Ltd		Epoxy coating - factory applied	Small	WRAS	1603543	Yes	[redacted]09/03/2020	11/03/2020 [redacted]	
9	Leengate	Leengate Valves Ltd & Brandoni Qian'an Valves Co. Ltd.	Butterfly Valve - 8"	Ductile Iron body, Stainless Steel	Small	WRAS	1712083	Yes	[redacted]09/03/2020	11/03/2020 [redacted]	
10	Leengate	Weflo Valve Co. Ltd	Non-return valve - 8"	Epoxy coated cast iron body, St St plates and springs, EPDM seat	Small	WRAS	1908809	Yes	[redacted]09/03/2020	11/03/2020 [redacted]	
11	NPS Ltd.	Amari Metals ltd.	Pump station fabricated stainless steel pipework	Pipework	Large	DWI	56/4/738	Yes	[redacted]18/03/2020	19/03/2020 [redacted]	
12	Whitby and Chandler	Nova Siria Srl.	EPDM Gaskets	Black coloured extruded EPDM gasket	Small	WRAS	1811574	Yes	[redacted]09/03/2020	11/03/2020 [redacted]	
13	IFM	IFM	Flow Transmitter	stainless steel (1.4404 / 316L)	Small	DWI Advice sheet 5 Annex 3C	1.4404 (316S11/AISI 316L) (SS 2348)	Yes	[redacted]11-03-20	12/03/2020 [redacted]	
14	IFM	IFM	Pressure Transducer	stainless steel (1.4404 / 316L)	Small	DWI Advice sheet 5 Annex 3C	1.4404 (316S11/AISI 316L) (SS 2348)	Yes	[redacted]11-03-20	12/03/2020 [redacted]	
15	IFM	IFM	Pressure Sensor	stainless steel (1.4404 / 316L)	Small	DWI Advice sheet 5 Annex 3C	1.4404 (316S11/AISI 316L) (SS 2348)	Yes	[redacted]11-03-20	12/03/2020 [redacted]	
16	NPS Ltd.	Bruce Douglas Marketing Ltd.	Thread Seal	PTFE Tape	Small	WRAS	1804504	Yes	[redacted]09/03/2020	11/03/2020 [redacted]	
17	AVK	A.R.I Flow Control Accessories	Air release valve	Reinforced PA body and PP float with EPDM seals	Small	WRAS	1909095	Yes	[redacted]09/03/2020	11/03/2020 [redacted]	
18	Charlatte Reservoirs	N/A	Hydrochoc Butyl Bladder Surge Vessel	Steel vessel with internal epoxy paint with butyl rubber bladder	Large	DWI	56/4/1016	Yes	[redacted]09/03/2020	11/03/2020 [redacted]	
19	Mercom	ABB Ltd	Maxxam PP Flow Meter Insert. Off-White coloured, injection moulded polypropylene flow meter insert.	Flowmeter Polypropylene	Small	WRAS	1512533	Yes	[redacted]11-03-20	12/03/2020 [redacted]	
20	Krohne	N/A	OPTIBAR DP 7060	Differential Pressure Transmitter Stainless Steel (1.4404/316L)	Small	DWI Advice sheet 5 Annex 3C	1.4404 (316S11/AISI 316L) (SS 2348)	Yes	[redacted]12/03/2020	17/03/2020 [redacted]	
21	Charlatte S.A. France	N/A	Vessel Level Assembly Isolation Valve	Stainless Steel (1.4404/316L)	Small	DWI Advice sheet 5 Annex 3C	1.4404 (316S11/AISI 316L) (SS 2348)	Yes	[redacted]18/03/2020	19/03/2020 [redacted]	
22	Charlatte S.A. France	Donit Tesnit d.o.o	Vessel Level Assembly Gasket	Tesnit Ba-U blue fibre/NBR material	Small	WRAS	1509513	Yes	[redacted]18/03/2020	19/03/2020 [redacted]	
Connection into the res outlet main at Boyton Hall IP (Under Pressure Tee)											
1	Underpressure Pipeline Solutions	Eastland Compounding	**Ethylene Propylene Diene Monomer (EPDM) - material only**	Rubber: cellular elastomeric mat	Small	WRAS	1511505 expiry 30/11/2020	Yes	[redacted] 12/03/20	12/03/2020 [redacted]	
2	Underpressure Pipeline Solutions	Jotun Powder Coatings UAE LLC	**Jotaguard VA 5001**	Factory applied coating for saddle used to clamp around pipework	Small	WRAS	1601528 expiry 31/01/2021	Yes factory applied: Cure for 5 minutes@245°C.	[redacted] 12/03/20	12/03/2020 [redacted]	
Boyton Sampling Kiosk at Boyton Reservoir											
1	Swan Pipelines	Compounds AG	Sunaflex T 9635 black coloured, compression moulded EPDM material	Universal pipe saddlle strap rubber	Small	WRAS	1801520	Yes	[redacted]11-05-2020	15/05/2020 [redacted]	
2	Swan Pipelines	AKZO Nobel Powder Coatings GMBH	"Resicoat" R4 Blue, R4-ES HJF10R factory applied epoxy powder coating	Universal pipe saddlle strap epoxy coating	Small	WRAS	1701509	Yes	[redacted]11-05-2020	15/05/2020 [redacted]	
3	FLI	Talis UK	Water Meter Manifolds with plastic body - MB201-0303A	Water Meter Manifold	Small	WRAS	1512056	Yes	[redacted]11-05-2020	15/05/2020 [redacted]	
4	FLI	GPS	GPS N Blue PE80 Pipe	Polyethelene Pipe	Large	DWI	56/4/651	Yes	[redacted]11-05-2020	15/05/2020 [redacted]	
5	FLI	Talis UK	25mm Stop Cock BS-5433, E2993	Brass Stop Valve	Small	WRAS	1708706	Yes	[redacted]11-05-2020	15/05/2020 [redacted]	

NOTE: Some products and materials may not require a full set of MIC samples, depending on what they are and where they are being installed.
Please contact the Risk and Optimisation Team (WQRiskandOptimisatio@anglianwater.co.uk) if you wish to discuss reduced sampling. Part A must be complete before the Risk Team can reduce sampling requirements.

PART B - Sampling requirements

ANGLIAN WATER SERVICES - MATERIALS APPROVAL FORM

Form Number: 3659

PART A LINE NUMBERS WHICH SAMPLES REPRESENT	Source being used to sample	Analysis	Bottles required	Comparison required?	Likely contact time whilst in operation?	Agreed standing time for samples	Scientist / Engineer agreement (sign and date)	Risk Scientist Approval (sign and date)
LINES	Raw Water (Borehole)	Full MIC without taste	1*Bacti, 2*500ml Chem, 2*Purge and trap vials, 1*Winchester	YES		16 HOURS		

PART C - Sample results

Part C completed by:
Please provide the following contact names:
Risk Scientist:
Supply Manager:
Senior Technician or deputy:

To Self Assess Sample results
Ensure Parts A and B above are completed fully
Click this button and locate the QDW / PACE 711 report with the MIC
Samples on it. Open that report and then identify which samples
are associated with this form.

Assess Samples

DETERMINAND CODES		next row	339	09111	09121	9194	9195	09340	09320	00220	00230			00612	00721	00681	00621	01621, 01624	02875	04215	75161	75171						
Part A line numbers which samples represent	Sample Number	Sample Date and Time	Sample Type	Location	Free Chlorine	Total Chlorine	Coliforms	E Coli	COLONY COUNTS 2 day	COLONY COUNTS 3 day	Qualitative Taste*	Qualitative Odour	Quantative Taste*	Quantative Odour	pH	Colour (Hazen)	Turbidity (NTU)	Conductivity (us/cm)	Alkalinity (mg/l CaCO3)	Aluminium (mg/l Al)	Iron (mg/l Fe)	TRACE ORGANICS Water Profile	TRACE ORGANICS Purge & Trap	TRACE ORGANICS MK FORM NO.	Sample Completed?	Verdict	Comment	1 Person completing the work Sign/Date	2 Risk or WQ Scientist or authorised delegate signature and date Sign/Date
Site Pipework - Raw water main IP (mains tapping and up to 2x NRV valves on raw water main)																												
RAW WATER main section - Main tappings	20054444 (bacti) 20054470 (chem)	04/02/2020	Full MIC without taste	0674204CM KEDINGTON BH NO.1 **Comparison sample US**	N/a	N/a	0	0	0	0	N/a	5U	**1?**	3	7.16	0.7	1.29	925	324	Sampled on 7/2/2020	N/a	Sampled on 7/2/2020	Sampled on 7/2/2020	N/a	**YES**	**N/a**	Clarity N		
	20054445 (bacti) 20054471 (chem)	04/02/2020	Full MIC without taste	0674204CM KEDINGTON W.O NO.5 **DS**	N/a	N/a	0	0	0	0	N/a	3U	**1?**	4	7.15	0.5	**5.07**	927	329	Sampled on 7/2/2020	N/a	Sampled on 7/2/2020	Sampled on 7/2/2020	N/a	**YES**	**PASS**	Clarity AV		Passed bacti and chem 21/02/2020 [redacted]
	20060441 (Aluminium) 20062123 (organics)	07/02/2020	Aluminium Organics	WAT-06742-04-CM KED BH NO.1 4/5 D/S	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	< 0.0140	N/a	**1**	0	12285	**YES**	**N/a**			
	20060440 (Aluminium) 20062124 (organics)	07/02/2020	Aluminium Organics	WAT-06742-04-CM KED WO NO.5 **D/S**	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	< 0.0140	N/a	**1**	0	12285	**YES**	**PASS**			Al &and P&T passed 21/02/2020 [redacted]
	20076960 (Organics)	18/02/2020	DCM	KEDINGTON WO NO.5 D/S MK12285 WAT 0674204CM	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	0	N/a	12285	**YES**	**PASS**	Upstream DCM sample collected from BH which contained Total cyclo octasulphur 1.20ug/l		Passed DCM 21/02/2020 [redacted]
RAW WATER main section - Up to 2x NRVs FILTER INLET	20060254 (bacti) 20060438 (chem) 20062122 (organics)	07/02/2020	Full MIC without taste	WAT-063742-04-CM HUNDON MAINS HYDRANT **US**	Not done	Not done	0	0	0	0	1	2T	1	1	7.51	N/a	0.17	937	301	< 0.0140	0.015	0	0	12285	**YES**	**N/a**	Clarity N **Raw water main was blanked off so flushed with Hundon water.** Due to an analytical quality control issue the quantitative 60oC odour results were originally accepted in error. Our Quality Manager has deemed these results as acceptable, but please be aware they are for indicative purposes only.		
	20060253 (bacti) 20060439 (chem) 20062124 (organics)	07/02/2020	Full MIC without taste	WAT-063742-04-CM KEDINGTON FILTER INLET COMMON **DS**	Not done	Not done	0	0	0	0	N/a	2T	N/a	1 - 60C 2 - 25C	7.55	N/a	0.14	936	296	< 0.0140	0.012	**1**	0	12285	**YES**	**FAIL**	Clarity N All 3 in the panel - BADEGG odour after de-chlorinated Main has also been flushed with raw water. Due to an analytical quality control issue the quantitative 60oC odour results were originally accepted in error. Our Quality Manager has deemed these results as acceptable, but please be aware they are for		Signed off chem and P&T 6/3/2020 [redacted]
	20076962 (Organics)	18/02/2020	DCM	KEDINGTON FILTER INLET PIPEWORK D/S MK12285 WAT0674204CM	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	**1**	N/a	12285	**YES**	**FAIL**	Resample DCM., bacti and qual & quant odour		
	20091217 (Chem) 20091010 (Bacti)	27/02/2020	Resample DCM., bacti and qual & quant odour	WAT-06742 KEDINGTON WTW INLET TO FILTER	Not done	Not done	0	0	0	0	N/a	3U	N/a	60C - 2	N/a	N/a	N/a	N/a	N/a	N/a	N/a	0	N/a	12285	**YES**	**PASS**	Clarity N Mild bad egg odour **But upstream water is this time Kedington** [illegible]		Signed off bacti, odour and CDM 6/3/2020 [redacted]
LINES 191, 122	20113636	10/03/2020	FULL MIC WITHOUT TASTE	BOREHOLE HEADWORKS COMPARISON	N/A	N/A	0	0	0	21	N/A	5U	N/a	60C - 2 25C - 2 Badegg	7.17	0.4	5.03	934	295	<0.0140	N/a	0	0	12369	**YES**	**N/a**	**Upstream comparison sample**	[redacted] 18/03/2020	19/03/2020 [redacted] But the quant 25C odour needs to be looked at and resolved seperately (LO)

ANGLIAN WATER SERVICES - MATERIALS APPROVAL FORM																												Form Number:	3659			
LINES 27, 48, 191	20113634	10/03/2020	FULL MIC WITHOUT TASTE	FILTER INLET PIPEWORK VO2007	0.61	0.82	0	0	0	0	N/A	2T	N/a	60C - 1 25C - 4 Farmy	7.2	<0.34	0.43	937	299	<0.0140	N/a	0	0	12369	**YES**	**PASS**		[redacted] 18/03/2020	19/03/2020 [redacted] But the quant 25C odour needs to be looked at and resolved seperately (LO)		
LINESS 35, 22, 122	20113632	10/03/2020	FULL MIC WITHOUT TASTE	FILTER NO 1 OUTLET V03114	0.42	0.68	0	0	0	0	N/A	2T	N/a	60C - 1 25C - 4 Farmy	7.19	<0.34	<0.090	939	307	<0.0140	N/a	0	0	12369	**YES**	**PASS**		[redacted] 18/03/2020	19/03/2020 [redacted] But the quant 25C odour needs to be looked at and resolved seperately (LO)		
LINESS 35, 22, 122	20113635	10/03/2020	FULL MIC WITHOUT TASTE	FILTER NO 2 OUTLET V03214	0.47	0.66	0	0	0	0	N/A	2T	N/a	60C - 1 25C - 3 Farmy	7.18	<0.34	<0.090	939	310	<0.0140	N/a	0	0	12369	**YES**	**PASS**		[redacted] 18/03/2020	19/03/2020 [redacted] But the quant 25C odour needs to be looked at and resolved seperately (LO)		
LINESS 35, 22, 122	20113633	10/03/2020	FULL MIC WITHOUT TASTE	FILTER NO 3 OUTLET V03314	40	0.64	0	0	0	0	N/A	2T	N/a	60C - 1 25C - 3 Farmy	7.11	<0.34	<0.090	939	309	<0.0140	N/a	0	0	12369	**YES**	**PASS**		[redacted] 18/03/2020	19/03/2020 [redacted] But the quant 25C odour needs to be looked at and resolved seperately (LO)		
LINESS 35, 22, 122	20113631	10/03/2020	FULL MIC WITHOUT TASTE	FILTER NO 4 OUTLET V03414	0.46	0.62	0	0	0	0	N/A	2T	N/a	60C - 1 25C - 3 Farmy	7.16	<0.34	<0.090	941	312	<0.0140	N/a	0	0	12369	**YES**	**PASS**		[redacted] 18/03/2020	19/03/2020 [redacted] But the quant 25C odour needs to be looked at and resolved seperately (LO)		
LINESS 35, 22, 122	20125591	18/03/2020	FULL MIC WITHOUT TASTE	COMBINED FILTER OUTLET PIPEWORK - V05001	**?**	**?**	0	0	0	0	N/a	2T	N/a	60C -1 25C - 2 Badegg	7.08	0.4	0.09	943	404	<0.0140	N/a	0	0	12369	**YES**	**PASS**			25/03/2020 [redacted] But the quant 25C odour needs to be looked at and resolved seperately (LO)		
line 104 Contact / balance tank item 1-14	20125592	18/03/2020	FULL MIC WITHOUT TASTE	CONTACT TANK/ BALANCE TANK NO 1 - V05104	**?**	**?**	0	0	0	0	N/a	2T	N/a	60C -1 25C - 2 Badegg	7.32	< 0.34	0.18	944	392	<0.0140	N/a	0	0	12369	**YES**	**PASS**			25/03/2020 [redacted] But the quant 25C odour needs to be looked at and resolved seperately (LO)		
LINESS 100, 104	20127179	19/03/2020	FULL MIC WITHOUT TASTE	CONTACT TANK/ BALANCE TANK NO.2 V05204	**?**	**?**	0	0	0	0	N/a	2T	N/a	60C -1 25C - 2 Badegg	7.38	< 0.34	0.14	939	397	<0.0140	N/a	0	0	12369	**YES**	**PASS**			25/03/2020 [redacted] But the quant 25C odour needs to be looked at and resolved seperately (LO)		
LINES 133, 122	20115768	11/03/2020	FULL MIC WITHOUT TASTE	HIGHLIFT SUCTION PIPEWORK	0.55	0.67	0	0	0	0	N/A	2T	N/a	60C - 1 25C - 2	7.34	0.6	0.09	944	326	<0.0140	N/a	0	0	12369	**YES**	**PASS**		[redacted] 18/03/2020 Red text added by [redacted] on 19/03/2020			
LINES 133, 122 Resamples	20127361	20/03/2020	Resample odour	WAT-06742-04-CM MK12369 FEED WATER TO HLPS COMPARISON	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	60C -1 25C - 1 But 1 person in panel picked up badegg	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	12369	**YES**	**PASS**			25/03/2020 [redacted] But the quant 25C odour needs to be looked at and resolved seperately (LO)		
LINES 133, 122	20113684, 20113689, 20114002	10/03/2020	FULL MIC WITHOUT TASTE	HIGHLIFT PUMP NO 1	0.61	0.79	0	0	0	0	N/A	3T	N/a	60C - 1 No 25C result	7.12	<0.34	<0.090	938	317	<0.0140	<0.007	0	0	12369	**YES**	**PASS**		[redacted] 18/03/2020 Red text added by [redacted] on 19/03/2020			
LINES 133, 122 Resamples	20127359	20/03/2020	Resample odour	WAT-06742-04-CM MK12410 HIGHLIFT PUMP NO 1	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	60C -1 25C - 2 Badegg	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	12369	**YES**	**PASS**			25/03/2020 [redacted] But the quant 25C odour needs to be looked at and resolved seperately (LO)		
LINES 133, 122	20116061, 20115923, 20115749	10/03/2020	FULL MIC WITHOUT TASTE	HIGHLIFT PUMP NO 2	0.59	0.78	0	0	0	0	N/A	2T	N/a	60C - 1 No 25C result	7.21	<0.34	<0.090	941	366	<0.0140	<0.007	0	0	12369	**YES**	**PASS**		[redacted] 18/03/2020 Red text added by [redacted] on 19/03/2020			
LINES 133, 122 Resamples	20127360	20/03/2020	Resample odour	WAT-06742-04-CM MK12410 HIGHLIFT PUMP NO 2	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	60C -1 25C - 1 But 1 person in panel picked up badegg	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	12369	**YES**	**PASS**			25/03/2020 [redacted] But the quant 25C odour needs to be looked at and resolved seperately (LO)		
LINES 153	20114003, 20113688, 20113685	10/03/2020	FULL MIC WITHOUT TASTE	BACKWASH PUMP NO. 1	0.52	0.71	0	0	0	0	N/A	2T	N/a	60C - 1 No 25C result	7.15	0.8	0.13	941	317	<0.0140	**0.054**	**1**	0	12369	**YES**	**FAIL**	Clarity=N **RESAMPLE DCM & IRON (LO)**	[redacted] 18/03/2020 Red text added by [redacted] on 19/03/2020			
Line 153 Section 2 backwash skid item 1-18 RESAMPLES	20126060 20127638 20127358	18/03/2020 20/03/2020	Resample DCM & iron Odour	BACKWASH PUMP NO. 1	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	60C -1 25C - 2 Badegg	N/a	N/a	N/a	N/a	N/a	N/a	**0.053**	**1**	N/a	12369	**YES**	**FAIL**	RESAMPLE DCM & IRON (LO)				
Line 153 Section 2 backwash skid item 1-18 RESAMPLES	20133655 20133786	25/03/2020	Resample DCM & iron	KEDDINGTON WTW BACKWASH PUMP1 MK12369 WAT06742-04-CM	0.55	0.79	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	0.008	0	N/a	12369	**YES**	**PASS**			30/03/2020 [redacted] But the quant 25C odour needs to be looked at and resolved seperately (LO)		
LINES 153	20116017, 20115924, 20115754	10/03/2020	FULL MIC WITHOUT TASTE	BACKWASH PUMP NO. 2	0.58	0.77	0	0	0	0	N/A	2T	N/a	60C - 1 No 25C result	7.22	<0.34	0.12	943	342	<0.0140	<0.007	0	0	12369	**YES**	**PASS**		[redacted] 18/03/2020 Red text added by [redacted] on 19/03/2020			
LINES 153 RESAMPLES	20127357	20/03/2020	Resample odour	WAT-06742-04-CM MK12410 BACKWASH PUMP NO 2	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	60C -1 25C - 2 Badegg	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	**YES**	**PASS**			25/03/2020 [redacted] But the quant 25C odour needs to be looked at and resolved seperately (LO)		
LINES 68	20115771	11/03/2020	FULL MIC WITHOUT TASTE	COLLECTION TANK	0.21	0.32	0	0	0	0	N/A	2T	N/a	60C -1 25C - 4	7.53	0.7	2.88	942	Not done	0.0198	N/a	0	**1**	12369	**YES**	**PASS**	P&T - very low levels and I agreement with Risk Manager [redacted] these levels were acceptable (LO).	[redacted] 18/03/2020 Red text added by [redacted] on 19/03/2020		
LINES 172	20115773	11/03/2020	FULL MIC WITHOUT TASTE	SUPERNATANT PUMP NO. 1	0.18	0.3	0	0	0	0	N/A	2T	N/a	60C -1 25C - 4	7.52	0.4	2.84	944	323	0.0162	N/a	0	**1**	12369	**YES**	**PASS**	P&T - very low levels and I agreement with Risk Manager [redacted] these levels were acceptable (LO).	[redacted] 18/03/2020 Red text added by [redacted] on 19/03/2020		
LINES 172	20115776	11/03/2020	FULL MIC WITHOUT TASTE	SUPERNATANT PUMP NO. 2	0.2	0.33	0	0	0	0	N/A	2T	N/a	60C -1 25C - 4	7.54	<0.34	2.58	940	323	0.0178	N/a	0	**1**	12369	**YES**	**PASS**	P&T - very low levels and I agreement with Risk Manager [redacted] these levels were acceptable (LO).	[redacted] 18/03/2020 Red text added by [redacted] on 19/03/2020		
LINES 83	20115775	10/03/2020	FULL MIC WITHOUT TASTE	SUPERNATANT RETURN LINE	0.18	0.31	0	0	0	0	N/A	2T	N/a	60C -1 25C - 4	7.53	<0.34	2.91	940	345	0.018	N/a	0	**1**	12369	**YES**	**PASS**	P&T - very low levels and I agreement with Risk Manager [redacted] these levels were acceptable (LO).	[redacted] 18/03/2020 Red text added by [redacted] on 19/03/2020		
LINE 74	20115777	11/03/2020	FULL MIC WITHOUT TASTE	SURGE VESSEL	0.5	0.66	0	0	0	0	N/A	2T	N/a	60C - 1 25C - 1	7.18	<0.34	0.24	946	336	<0.0140	N/a	0	**1**	12369	**YES**	**PASS**	P&T - very low levels and I agreement with Risk Manager [redacted] these levels were acceptable (LO).	[redacted] 18/03/2020 Red text added by [redacted] on 19/03/2020	25/03/2020 [redacted]		

ANGLIAN WATER SERVICES - MATERIALS APPROVAL FORM

| | | |

REGULATION 31(4)(A) OF THE WATER SUPPLY (WATER QUALITY) REGULATIONS 2016 SI No 614 & THE WATER SUPPLY (WATER QUALITY) REGULATIONS 2010 SI No 994 (W.99)(AMENDMENT REGULATIONS 2016 No 410(W.128))

APPROVAL CONFIRMATION

Product name/designation	Electrofresh Plus Pipes
Approval Holder (Name & Address)	Electrosteel Castings Ltd 30 B.T. Road, P.O. Sukchar, Kolkata – 700115, India
Instructions for Use	IFU (INSTRUCTION FOR USE) FOR ELECTROFRESH PLUS PIPES AT SITE , Issue: No: 04, Rev. 0, Issue Date: 01.04.2017
DWI Ref Number	DWI 56.4.537

The Secretary of State for Environment, Food and Rural Affairs in respect of relevant water suppliers[1] whose area of supply is wholly or mainly in England, and the Welsh Ministers in respect of relevant water suppliers whose area of supply is wholly or mainly in Wales, in exercise of their powers under Regulation 31(4)(a) of the Water Supply (Water Quality) Regulations 2016 and Regulation 31(4)(a) of the Water Supply (Water Quality) Regulations 2010 (Wales) respectively hereby approve the introduction of the product detailed above, in accordance with the following Conditions of Use & Approval.

CONDITIONS OF USE & APPROVAL

The above named product is approved for application in England and Wales[2] by a water supply company for public water supply purposes subject to the following conditions:

1. Water undertakers and water supply licensees shall be provided with a copy of the Instructions for Use (IFU) detailed above and use of the approved product must be in accordance with the IFU.

2. The Drinking Water Inspectorate (DWI) must be notified, in advance and in writing, by the approval holder detailed above, in respect of any **further** change(s) in –
   a) The Instructions for Use
   b) The formulation of the approved product, including change in source or identity of raw materials
   c) The manufacturing process, including location of manufacture
   d) The designation of the approved product
   e) The name, address or ownership of the organisation holding the approval

   Failure to notify such further changes will result in approval being withdrawn.

3. The producer shall ensure that the product is tested for conformity with its formulation, and the source or identity of its raw materials, at such intervals and by such persons, as may be determined by the Authorities. The results of such testing shall be sent to DWI.

4. The use of either the Drinking Water Inspectorate or DEFRA logos, in respect of any approved product (including on the product or in editorial or advertising/trade copy) is not permitted.

5. The following product specific condition(s) apply – **None**

Signed by authority of the Secretary of State
and the National Assembly for Wales

Date of Issue: 10 March 2021
Date of Expiry: 02 August 2026

Marcus Rink
Chief Inspector of Drinking Water
England and Wales

[1] Relevant water suppliers shall include water undertakers, water supply licensees and inset appointees.
[2] Separate approval arrangements apply in Scotland and Northern Ireland

ACKNOWLEDGEMENT OF RECEIPT OF APPROVED PRODUCT CONFIRMATION & CONDITIONS OF APPROVAL

Product name/designation	Electrofresh Plus Pipes
Approval Holder (Name & Address)	Electrosteel Castings Ltd 30 B.T. Road, P.O. Sukchar, Kolkata – 700115, India
Section in the "List of Approved Products"	B.1.7.2 Cement Mortar Lined Pipes with seal coat
Application Contact Name	[redacted]
Application Contact email	[redacted]@electrosteel.com
Consultant	No
DWI Ref Number	DWI 56.4.537

Please carefully read the accompanying Product Approval document, together with the accompanying letter. If there is any error please notify us as soon as possible.
Please confirm, by ticking the boxes below and then signing and returning this form, the safe receipt of this documentation and your agreement to the conditions of use and approval set out in it.

On behalf of the approval holder I confirm -	Tick here
The safe receipt of the approval documentation and ***EITHER*** – • All details are correct and no changes are required ***OR*** • Corrections concerning the approval product are needed and I am returning to you, a corrected copy of the "Product Approval" for amendment and reissue	☐ ***OR*** ☐
Our agreement to comply with the conditions of use and approval set out in the "Product Approval", including – • Ensuring that a copy of the appropriate Instructions for use is always provided with the approved product as sold • Ensuring that the Drinking Water Inspectorate is informed of **any further proposed** change(s) to the approved product • Not using either the Drinking Water Inspectorate or the DEFRA logos in association with the approved product.	☐ ☐ ☐
We understand that the approval of this product under Regulation 31 relates only to potential effects on drinking water quality. It does NOT imply fitness-for-purpose or an endorsement of the product, and no general claim of "Drinking Water Inspectorate (DWI) approval" should be made.	☐
Signed	
Title & Name	Date

IMPORTANT NOTES

1. Upon receipt of this completed acknowledgement we will notify the Scottish Government and the Department of Agriculture, Environment and Rural Affairs, Northern Ireland of the approval; these bodies are responsible for issuing their own approvals for use of the product in Scotland and Northern Ireland, under Regulation 33 of the Public Water Supply (Scotland) Regulations 2014 and Regulation 33 of The Water Supply (Water Quality) Regulations (Northern Ireland) 2017, respectively.

2. If we do not receive this signed acknowledgement with acceptance by you of all conditions of approval within 6 months, the acceptance of the change(s) to this approved product will lapse automatically.

3.Please return the signed form by email:– reg31.enquiries@defra.gov.uk or by post:-Regulation 31 Enquiries, Area 1A, Nobel House, 17 Smith Square, London SW1P 3JR, U.K.

ELECTROSTEEL

TITLE: IFU (INSTRUCTION FOR USE) FOR ELECTROFRESH PLUS PIPES AT SITE	**WORK INST NO**: WC-04-01	PAGE 1 OF 1
	ISSUE NO. 04 **Rev**.- 0	DATE: 01.04.2017

PURPOSE:
TO PROVIDE ALL DETAILS FOR USE OF ELECTROFRESH PLUS PIPES AT SITE.

SCOPE:
DUCTILE IRON PIPES AS PER EN 545, ISO 2531 AND OTHER EQUIVALENT NATIONAL & INTERNATIONAL STANDARDS.

REFERENCE: CLAUSE NO. 8.5.5 OF ISO 9001 : 2015

SL NO.	ACTIVITY	RESPONSIBILITY
1.	To illustrate Description of Product, Product use, Approval condition of Product, Physical and Chemical Properties, Field of use and requirement, Water characteristic, Instruction for Storage and Transportation, Handling, Packaging , Installation including jointing ,Testing , Flushing and commissioning, Safe handling procedure, Fire hazards etc. For details, please see Annexure reference WC-04-01/1 Information given here is based on Laboratory/Site experience. Customers are requested to contact the Pipe Manufacturer for any clarification/information. **Annexure Ref. WC-04-01/1**	Head QA and Technical

NO REPRODUCTION IS ALLOWED WITHOUT SPECIFIC PERMISSION OF MANAGEMENT REPRESENTATIVE.	PREPARED BY	APPROVED BY	ISSUED BY	SPACE FOR CONTROLLED/ UNCONTROLLED STAMP
	[redacted]	[redacted]	[redacted]	UNCONTROLLED COPY

1. 1. DESCRIPTION OF THE PRODUCT:

'ELECTROFRESH PLUS' Pipe is basically a casting of Silver Grey metal of Spheroidal Graphite Iron. The pipe is cast by Centrifugal Casting process in a water cooled mould. Subsequently the cast pipe, after heat treatment and finishing, is internally lined with Cement Morter (with Sulphate Resisting Portland Cement or Portland Blast Furnace Slag Cement) by spinning process followed by epoxy seal coating on top of Cement Lining by spraying with epoxy paint. The internal socket profile is coated with Epoxy paint.

The internal socket design is suitable for Push-on Joint and/or Mechanical Joint where EPDM/SBR gaskets, used for jointing, meet the requirements of Regulation 31 (4)(b).

The external coating consists of 99.99% pure metallic Zinc of 130 Grams/M^2 minimum deposit followed by Bitumen/Epoxy Paint Coating of minimum thickness of 70 micron or 85% Zinc- 15% Aluminum Alloy deposit of 200 to 400 Grams/M^2 followed by Epoxy paint on top of it.

2. DESCRIPTION OF THE PRODUCT USE:

These Pipes with internal lining of Cement Mortar And Epoxy Seal Coating are mainly used for transporting potable water in both pumping and distribution mains by Water Supply Authorities/ Industries. The end use of the Product and the environment for laying the Pipelines over ground or underground decides the type of external coating to be applied, maintaining, however, the same quality of internal lining.

3. THE APPROVAL CONDITION WHICH APPLIES TO ELECTROFRESH PLUS

The 'ELECTROFRESH PLUS' Pipe when approved by Secretary of State under regulation 31(4)(a) uses a recognized coating on the inner (water contact) surface of the product.

The outer coating also shall be WRC approved Bitumen Paint as per BS: 3416 type 2 or Epoxy Coating on Zinc/Zinc-Aluminum deposit on outer surface of Pipe. The type of outer coating shall depend on the requirement at site and as specified by the customer.
The socket inside and spigot outside in both the cases will be coated with recognized paint.

4. PHYSICAL SPECIFICATIONS/TYPICAL CHEMICAL FORMULA (e) OF METALLIC PIPE FOR THE PRODUCT :

Total Carbon	3.6 0– 3.90%
Silicon	1.70 – 2.20%
Magnesium	0.02- 0.05%
Sulphur	0.01 - 0.02%
Phosphorous	0.02 - 0.10%
Manganese	0.10 - 0.60%
Nickel	0.01 - 0.05%
Molybdenum	0.01 - 0.05%
Copper	0.01 - 0.05%
Titanium	0.03 - 0.1%
Iron	Balance

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GENERAL PROPERTIES OF THE METALLIC PIPE :

Microstructure consists of graphite in nodular/spheroid shape in a ferrite matrix (> 85%).

Tensile strength	- 420 Mpa minimum
Proof strength	- 270 Mpa minimum
Hardness	- 230 HB maximum
Elongation	- 10% minimum
Melting Point	- 1150°C minimum
Thermal conductivity (At - 100°C)	- 36.5 - 33.5 W/mK
Coefficient of Thermal Expansion (20- 200°C)	- 10.5 - 14.0 x 10^{-6} / °C

Cement Lining thickness and properties are as per EN 545, ISO 2531 and other equivalent national and international standards.
Epoxy Seal Coating on CML is a two pack epoxy resin with minimum thickness of around 50 micron.

5. FIELD OF USE, WATER CHARACTERISTIC:

All types of potable water as specified in Annex E of EN 545: 2006 can be conveyed. However, with WRAS/DWI approved Epoxy Seal coating, aggressive waters with low alkalinity and low buffering capacity together with low flow rates/long residence times will not result in any change in pH and water quality should remain undisturbed. Epoxy Seal Coat acts as a partial barrier to leaching of CML

6. INSTRUCTION FOR STORAGE AND TRANSPORTATION :

6.1 STORAGE CONDITION:

6.1.1 Minimum time of Storage at Manufacturing Plant: 2 Weeks

6.1.2 Storage temperature at Manufacturing Plant: - 15°C Minimum and 45°C Maximum.

6.1.3 Sea transportation time: 4/5 Weeks (Tentative).

6.1.4 Storage time before burial in ground: There is no limit, if kept inside shed. If kept in open area, exposed to Sun, colour of coating may fade. Further, Quality of coating may deteriorate, if exposed to dusty storm and/or atmosphere affected by chemical fumes.

6.1.5 Storage temperature before burial: – 15°C Minimum and 45°C Maximum
(For other extreme conditions, consult Manufacturer).

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6.2 **STORAGE SYSTEM**:

Pipes can be stored in bundles or loose condition in warehouses. However, these are to be on a firm ground with suitable approach road, space and handling facilities.

Stacking of Pipes is to be done in such a way by putting wooden pallets at the bottom so that the Socket, Spigot and central portion do not touch the ground. The size of woods would be at least 100 mm x 225 mm wide.

6. 2.1 **STACKING OF LOOSE PIPES**:

These are to be stacked in the following fashion:

a) Square stacking (suitable for all sizes).

b) Parallel stacking using timber (suitable for all sizes :

c) Pyramid stacking (suitable for all sizes).

Size (DN)	Stacking Height (Maximum No. of Layers)
80	18
100	16
150	14
200	12
250	10
300	8
400	7
500	6
600	4
700	3
800-1000	2

6.2.2 **STACKING OF BUNDLED PIPES** :

The stacking area should provide a firm foundation with a suitable approach road for vehicle, forklift etc. Bundles are provided with base wood and can be laid directly on the ground. The bundles are to be stacked on top of another with axis of Pipes kept parallel.

Recommended height of Bundled Pipes:

Size	Maximum No. of layers	Size	Maximum No. of layers
80,100,150	18	450	4
200	12	500,600	6
250,300	10	700	3
350,400	8	800,900,1000	2

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7. **LIFTING & UNLOADING:**

Lifting of bundles is normally done with the help of forklift or mobile /overhead crane. Nylon ropes or nylon belts are used as sling. Layers from bundles are removed with the help of forklifts after cutting the straps.

In case of loose pipes, lined hooks may be used taking care that there is no metal contact with the internal lining causing damage to it.

In case of unloading of bundles from containers, two forklifts or a combination of a mobile crane and forklift is used with nylon belt as sling.

For loose pipes, padded booms may be used with sufficient care so that internal lining is not damaged.

For safe offloading, angle of sling should not be more than 20 degrees.

The nylon ropes or belts must be of sufficient capacity considering the load it carries.

8. **PACKAGING:**

Pipes are dispatched in loose or bundled condition in trucks/trailers, containers or ships depending on the customer's recommendations.

8.1 Normally loose pipes are loaded in layers providing polyester or rubber cloth in between the layers and separator woods and fabrics wherever required to avoid contact in between layers.

8.2 The bundles are normally made upto DN 300 with base wood at bottom and separator woods in between each layer. However, bundles of larger sizes are made if asked by customer.

8.3 **END CAPS**:

On specific demand from customer, End Caps made of Plastic are provided at spigot and socket ends to stop entry of dust or foreign particles inside the pipes.

9. INSTALLATION INSTRUCTION:

9.1. The pipe installation is to be carried out mainly as per guidelines given in EN 805:2000 /BS 8010 and/or Manufacturer's guidelines provided separately, keeping in mind the following conditions:

a) Prevention of back flow.
b) Prevention of stagnation.
c) Prevention of cross connection with other systems.

9.2 In case of underground installation, soil test data to the required depth of installation including soil resistivity, stray current, cathodic protection to other installations, water retention of soil etc. must be studied and additional suitable protection, against corrosion, may be provided.

9.3 External forces and internal forces must be considered before installation.

9.4 For additional guidance customers may consult the Pipe Manufacturer.

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9.5 **Jointing:**

Non-metallic components used for jointing like Rubber Gaskets, Lubricants must be WRAS approved. Instructions for Jointing are available and if required, customers may ask for it.
Care is taken so that any damages observed on coating or body of pipe must be rectified before lying and gasket sitting area inside the socket must be thoroughly cleaned before jointing.

10. **TESTING & COMMISSIONING**:

Testing & Commissioning shall be carried out as per EN 805-2000. The following steps are to be followed:

a) Back filling and anchorage. Back filling must be done properly so that changes in ground condition during testing are avoided. However, the joint portion may be kept open (optional).

b) The pipe section must be tested segment-wise. Section and length should be selected such a way that test pressure can be achieved at the lowest point of each section. Maximum design pressure can be achieved at the highest point.

Necessary water for testing can be provided and removed without difficulty.

c) Any debris & foreign material must be removed from pipeline before testing.

d) The water used for testing shall be clean water.

e) Air release valves shall be provided for reasonable release of air. Filling of pipeline is to be done slowly, if possible, from the lowest point of the pipeline in such a way so as to prevent back siphonage so that air can escape easily through air vents provided on the pipe line.

f) During filling and seeing the pressure built up, occasionally open the wash out valves at steep alignment change points and close them subsequently.

g) Hold at desired test pressure for the duration as specified in the specification.

11. **FLUSHING**:

After the tested line with proper rectification and retest (if any) is handed over, back filling of the pipe trench is to be completed to assume stability.

After the construction of pipeline is over, the pipeline and service point are disinfected by flushing and/or use of disinfectants.

All water to be used for this purpose shall be potable water. The flushing water after dis-infection must be disposed off.

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12. **GENERAL SAFE HANDLING PROCEDURE**:

a) Personal safety and also that of handling equipments must be ensured during loading/unloading/shifting of pipes. This is possible only when proper ceilings and handling facilities are used.

b) Precaution to be taken that water used during dis-infection/flushing must not get connected to running/operating pipelines. Following the disinfection contact period, flush the section, as many times as necessary to ensure that the residual disinfectant concentration of water does not exceed the requirements of EU directives or EFTA regulations where applicable. Dispose the disinfection solution without harm to the environment, if necessary after using neutralizing agents.

When the section is filled with potable water from the system, take samples at positions and time interval as specified by the designer, in accordance with hygiene regulations. Test samples must satisfy all requirements for drinking water. If the results are satisfactory, then only the line is to be connected with operating lime. If results are not satisfactory, repeat disinfection as before.

c) Ductile Iron in its solid form is stable and non-hazardous.

d) Dust from grinding and cutting will be predominately iron and some quartz. Approved protection and safety gadgets should be used by grinding/cutting operators.

e) Welding of Ductile Iron is permitted. Generated fumes are harmless; extraction of the fume improves working condition. Eyes must be protected from stray metal particles, when grinding, cutting or machining.

f) Trained persons must be employed.

FIRE HAZARD:

Ductile Iron Castings do not constitute a fire or explosive hazard.

MATERIAL HANDLING:

No special precautions are necessary except the use of personal protective like helmets, gloves, safety shoes etc. However, tools and tackles used should be such that they should not cause damage to the internal and external coating.

End of Document

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Pipework Design Specification Methodology

AW General Procedures, Specifications and Standards relating to the design of pipework

Document Title	Document Description / Purpose	Abstract extracts relating to Materials in Contact
1M-INF-WAT-MAS	Potable Water Mains and Fittings Minimum Asset Standard (MAS) – Infrastructure Standard, not generally referenced for Non-Infra Projects	**Asset Standard** 1. General: 1.1 Materials shall meet the requirements of regulation 31 1.2 Assets shall be designed and constructed to maintain AW obligations for flow, pressure and water quality.
SS-SSE-MEC-DSG	Mechanical Design Manual; Design Manuals contain design standards and supporting guidance, their use is mandatory. Design Manuals must be used by designers when designing or modifying an Anglian Water asset. They are intended to support and clarify the design process, reduce rework and prevent mistakes.	Section 4 – Process Pipework, includes; **Materials and corrosion protection need to be specified to be compatible with the environment and the medium being handled. Where the application is for potable water then all materials must be on the DWI Approved List.**
WAT-06742-KEHRWW-SS-DET-5990	Material notes for Pipework. Part of a suite of drawings under 'Standard Details'. For each project the suite is reviewed and those drawings appropriate to the project are issued with a project drawing number.	
M&E Specification, 4.21 Pipeline Identification	AW Mechanical and Electrical Specification for the identification of pipework by colour coding	
WIMES 8.03 – Mechanical Installation (Section 6.0 Installation of Pipework), with AW amendments	Water Industry Mechanical and Electrical Specification (WIMES) incorporating AW amendments. This Specification defines the requirements for the mechanical installation of equipment in the Water Industry in the form of text and DATA SHEETS.	
WIMES 4.01 – Paints and Polymeric Coatings for Corrosion Protection	Water Industry Mechanical and Electrical Specification (WIMES) referenced within WIMES 8.03. This Specification defines the requirements for the corrosion protection of mild steel structures and assemblies, items of machinery and ductile and cast iron pipework (incorporating piping, valves and fittings) for use in the Water Industry by paints and polymeric coatings (hereafter termed 'coatings').	**5.2 Coatings in Contact with Water Intended for Human Consumption** 1. Coatings that will come into contact with water intended for human consumption shall comply with the following regulations, as appropriate: a) England - Regulation 31 of the Water Supply (Water Quality) Regulations 2000; b) Wales - Regulation 31 of the Water Supply (Water Quality) Regulations 2001; c) Scotland - Regulation 27 of the Water Supply (Water Quality) (Scotland) Regulations 2001; or d) Northern Ireland - Regulation 30 of the Water Supply (Water Quality) Regulations (Northern Ireland) 2007. 2. Coatings that will have a large surface area in contact with water intended for human consumption shall, as a minimum, comply with Regulation 31(4)(a) of the Water Supply (Water Quality) Regulations 2000 (or equivalent regulations in Wales, Scotland or N Ireland) **and** be on the current 'Approved List' published by the Drinking Water Inspectorate (or equivalent body in Wales, Scotland or N Ireland) ***(refer to Table 3A in Appendix A).*** 3. Coatings that will have a small surface area in contact with water intended for human consumption shall, as a minimum, comply with Regulation 31(4)(b) of the Water Supply (Water Quality) Regulations 2000 (or equivalent regulations in Wales, Scotland or N Ireland) and have conformed to the test requirements for odour and flavour, and growth of aquatic microorganisms, specified in parts 2.2.1 and 2.4 respectively of BS 6920, within the previous 5 years ***(refer to Table 3B in Appendix A and Guidance Notes).***

AW Project Specific Information relating to the design of Pipework

Project Works Information (Relating to the Design, Supply and Installation of the Mechanical Works – Contract Appendix A) • Relevant Clauses; ○ WI 105 – Description of the works ○ WI 208 – Materials in Contact with Drinking Water ○ WI 306 – Design and Standardisation ○ WI 307 – Documentation Standards ○ WI 310 – Design Submission Procedures ○ Annex A – Technical Standards	ECC Contract Document including the Work Information (WI). The Works Information details General Requirements, Scope and Particulars for the contract for the Design, Supply and Installation of the Mechanical Works for the Kedington New Works.	**WI 208 Materials in Contact with Drinking Water** All materials and chemicals that will be in contact with drinking water supply (both treated and untreated water) shall comply with the requirements of POSWH (Section 3) and with the requirements of Regulation 31 issued by the Drawing Water Inspectorate (DWI). All such materials and chemicals shall be listed on the Water Regulations Advisory Scheme (WRAS) database and have a current, in-date, WRAS approval number. This requirement shall apply to all materials and chemicals that will be in contact with drinking water 27 supply including Materials and temporary works materials (e.g. chemical curing compounds, shutter release agents and retarders) notwithstanding that they may not be in contact with drinking water at the time of use. The *Contractor* shall ensure all materials and chemicals supplied by him comply with the above requirements. Prior to using any materials or chemicals that will, or may, be in contact with drinking water supply, the *Contractor* shall submit an MIC Approval Form to the *Project Manager*, for acceptance within 4 weeks of the *starting date*. The *Contractor* shall not use any such material or chemical, and shall not bring any such material or chemical onto the Site, without the *Project Manager's* prior acceptance of the relevant MIC Approval Form.
WAT-06742-07-05-01-0007	Site Pipework Mechanical Specification; This specification covers plant and services forming part of and complying with the Alliance scheme WAT-06742, Gt Wratting – Kedington WTW. All plant and services covered by this particular specification shall be in accordance with the minimum standards and requirements set down by the current Anglian Water Framework and/or engineering standards.	Section 4.4.1 WIMES Section 8.03 Section 6.1; *Addition, Clause 26* *All materials and equipment supplied, or any work undertaken that introduces any product, substance, or material in contact with, treated or untreated water that is intended for potable use shall comply with the current relevant regulations and in particular Regulation 31.*
3D Model	Collaborative and Integrated 3D of the works including civil, mechanical and electrical components with embedded information	
WAT-06742-KEHRWW-1F-PID-1005	Drawing; Contact Tank and Balance Tank Piping and Instrumentation diagram produced for the project	
WAT-06742-KEHRWW-1F-DET-5300	Drawing; Contact and Balance Tanks General Arrangement Plan	
WAT-06742-KEHRWW-1F-DET-5301	Drawing; Contact and Balance Tanks General Arrangement Sections and Details	
WAT-06742-KEHRWW-1F-DET-5302, including Bill of Materials – Contact & Balance Tank Internal Pipework (tabulated on drawing)	Drawing; Contact and Balance Tanks General Arrangement Internal Pipework	

Water Retaining Structure Internal Inspection Form

Regional Supply Area:	**East**
Supply Manager Area:	**Colchester**
Site Name:	**KEDINGTON HAVERHILL ROAD WW**
Site Short Name:	**KEHRWW**
MTL Information:	**SAP No: 2328641. SAP Func: KEHRWW-1F-HYP-TS11-CHT001.**
Tank Name:	**CT ST1 Tnk1. (WTW side)**
Inspection Date (dd/mm/yyyy):	**17.03.2020**
Date of next inspection (dd/mm/yyyy) - if early check than normal frequency required:	
Inspection Reason:	**Final Inspection.**
Clean Reason:	**New construction 2019 to 2020.**
Impact Plan Number:	**N/A - New Build.**
Inspected By:	[redacted]
Additional Information:	**Above ground pre-cast concrete panel construction with in-situ infills. Precast concrete roof panels with concrete roof screed. External liquid roof coating applied by CRL. Finished with Gravel. Structure is made up of 2 Contact tanks and 2 Balance tanks making 2 Streams. Tank constructed by @one alliance 2019 to 2020 as part of the new Kedington WTW scheme. Access to top of tanks is via metal stairway. Handrailing is in place around tank. This CT weirs in to BT St1 Tnk1. Ct St1 Tnk1 and BT St1 Tnk1 can be inspected together while the works runs on the other CT/BT. (Please also refer to BT St1 Tnk1 inspection report)**

To upload data onto the log press Ctrl U once form complete.

Question	Answer	Comments	Remedial Work / Action	Priority 1-3*	Action Management System Number
Tank Attributes					
What is the tanks jack head category?	N/A				
Is the tank hydraulically isolatable - can it be easily taken out of supply?	Yes	All 4 tanks are OOS for this inspection as this is a new build.			
Is there adjoining untreated water storage - above, to the side, passing through the tank?	No				
Is this an Ozone tank - if so which stage?	No				
Is the structure covered by the reservoir act (1975) - large raised reservoirs >25,000m3?	No				
Compartment Dimensions					
Storage volume - floor to overflow (m3)	202.64	Calculated from LengthXWidthXOverflow Height (Not excluding baffle walls)			
Operational volume - useable volume (m3)		Please refer to Site Operating Guide.			
Height of compartment (m)	2.82	Taken at centre of floor in lane 2.			
Width of compartment (m)	4.89				
Depth of compartment (m)	16	Length (Rear CT wall to BT dividing wall)			
Inlet height (m)	3.29	Inlet stack pipe.			
Outlet height (m)	1: WEIR to BT 2: Wash water	1:- Weir to BT St1 Tnk1 Weir is 2.36 AFL in lane 3 of CT. 2:- Filter wash water outlet in sump of lane 3.			
Overflow height (m)	IN BT.	No overflow in CT tank, Overflow located in BT. Overflow stack is 2.59 AFL.			
Overflow diameter (mm)		Please refer to BT St1 Tnk1 Report.			
Top water level - normal operation (m)		Please refer to Site Operating Guide.			
Bottom water level (m)		Please refer to Site Operating Guide.			

Tank Structure					
What material is the tank?	Other	Pre cast concrete panels with in-situ infills (FLI-Carlow)			
What's the type of membrane?	Liquid	Full liquid Aqualine membrane completed by CRL.			
If an earth embankment what type is it?	None				
What type of roof covering is there?	Gravel	Geo-textile covered with gravel.			
What's the type of support structure?	Other	Buried.			
Tank Roof					
Are there signs of leakage / ingress through roof?	No	No ingress noted on final construction inundation test.			
Is there evidence of cracks in roof?	No	None noted at time of inspection.			
Is there evidence of discolouration / slime on internal roof?	No				
Are the roof joints / seals in satisfactory condition?	Yes	Visible day joints as roof is constructed from pre cast concrete panels.			
Is there evidence of standing or pooling water?	n/a	Full inundation test in progress.			
Is the roof drainage insufficient to clear all standing water?	n/a	Full inundation test in progress.			
Tank walls					
Are there signs of leakage / ingress through walls?	No	No ingress noted on final construction inundation test.			
Is there evidence of cracks in walls?	No	None noted at time of inspection.			
Is there evidence of discolouration / slime on walls?	No				
Are the wall joints / seals in satisfactory condition?	n/a	Construction day joints between pre-cast and in-situ infills. No noted expansion type joints.			

Tank floor					
Are there signs of leakage / ingress through floor?	No	No ingress noted on final construction inundation test.			
Is there evidence of cracks in floor?	No	None noted at time of inspection.			
Is there evidence of discolouration / slime on floor?	No				
Was any material found in the tank / on the floor?	No	New construction.			
Tank Support structure					
Are the roof supports in satisfactory condition?	Yes	Roof supported via outer walls and internal dividing/baffle walls.			
Tank Fittings / Pipework					
Are the internal fittings in satisfactory condition?	Yes				
Is the inlet pipework in satisfactory condition?	Yes	Low level pipe entry with internal stack pipe and bell mouth. 90 degree ducks foot bend support on concrete plinth.			
Is the outlet pipework in satisfactory condition?	Yes	Outlet to BT is letterbox type high level weir. Filter wash water outlet pipe is located within floor sump of lane 3 (Before the outlet weir)			
Is the overflow in satisfactory condition?	n/a	Located in BT, Please refer to BT St1 Tnk1 Report.			
Are the valves in satisfactory condition?	n/a	All valve are external to the tank.			
Are the ladders in satisfactory condition?	n/a	No fixed ladder. Mobile ladder must be used for internal inspection.			
Is the metalwork in satisfactory condition?	Yes				
Are the baffled walls / curtains in satisfactory condition?	Yes	X2 full height baffle walls to make 3 lanes. High level baffle wall in lane 1 next to inlet stack - forcing water under baffle into lane 1.			
Are the level probes in satisfactory condition?	Yes	Probes and ultrasonic level equipment in dedicated hatch located in lane 1.			
Are cable entry points sealed, in satisfactory condition and without evidence of ingress?	Yes	No ingress noted on final construction inundation test.			

Are there any other fittings / mountings with inadequate seals / sealant?	n/a				
Are any mixers in satisfactory working order / condition?	n/a				
Are any sample pumps in satisfactory working order / condition?	n/a				
Is there any redundant pipework or equipment connected to the tank?	No	Not aware of any - new construction.			
Access points					
Are all the hatch, covers or doors in satisfactory condition and working order?	Yes	X4 techno covers techno-covers installed.			
Are the seals in place and in satisfactory condition?	Yes				
Are the insect meshes in place and in satisfactory condition?	Yes				
Is the mesh an adequate size? (approx. 1mm or less)	Yes				
Is the membrane lapping around up stands in satisfactory condition?	Yes	Waterproof coating installed and no ingress noted on final construction inundation test.			
Dedicated Air Vents					
Are the vents securely fixed undamaged and in good condition?	n/a	Vented through techno cover hatches.			
Are the insect meshes in place and in satisfactory condition?	n/a				
Is the mesh an adequate size? (approx. 1mm or less)	n/a				

Roof Saturation Test					
Was the roof saturation test satisfactory?	Yes	Final inundation completed and no ingress noted. Full clean completed and tank disinfected. AWS locks fitted - tank due to be filled for full MIC samples.			
Other					
Are there any other issues to note? (add detail in comments box)	n/a				
Have actions been added to the Action Management System (AMS)?	n/a				

To upload data onto the tracker press Ctrl U. Also the form must be saved to the correct HAWK folder (see instruction tab)

[redacted]

Priority	Brief Rationale for Categorisation	Examples
Priority 1	Major Defect. Remedial work to be implemented before return to service or within 12 months if return to service is approved pending remedial work.	Ingress issue Significant Leak
Priority 2	Remedial work to be implemented before the next inspection.	Roof Drainage Minor Leak
Priority 3	Continue to monitor condition at next inspection.	Slippage Corrosion

Water Retaining Structure Internal Inspection Form

Regional Supply Area:	**East**
Supply Manager Area:	**Colchester**
Site Name:	**KEDINGTON HAVERHILL ROAD WW.**
Site Short Name:	**KEHRWW**
MTL Information:	**SAP No: 2328653. SAP Func: KEHRWW-1F-HYP-TS13-BNT001**
Tank Name:	**BT St1 Tnk1 (WTW Side)**
Inspection Date (dd/mm/yyyy):	**17.03.2020**
Date of next inspection (dd/mm/yyyy) - if early check than normal frequency required:	
Inspection Reason:	**Final Inspection**
Clean Reason:	**New Construction 2019/2020.**
Impact Plan Number:	**N/A - New Build.**
Inspected By:	[redacted]
Additional Information:	**Above ground pre-cast concrete panel construction with in-situ infills. Precast concrete roof panels with concrete roof screed. External liquid roof coating applied by CRL. Finished with Gravel. Structure is made up of 2 Contact tanks and 2 Balance tanks making 2 Streams. Tank constructed by @one alliance 2019 to 2020 as part of the new Kedington WTW scheme. Access to top of tanks is via metal stairway. Handrailing is in place around tank. CT St1 Tnk1 and BT St1 Tnk1 can be inspected together while the works runs on the other CT/BT. (Please also refer to CT St1 Tnk1 inspection report)**

To upload data onto the log press Ctrl U once form complete.

Question	Answer	Comments	Remedial Work / Action	Priority 1-3*	Action Management System Number
Tank Attributes					
What is the tanks jack head category?	N/A				
Is the tank hydraulically isolatable - can it be easily taken out of supply?	Yes	All 4 tanks are OOS for this inspection as this is a new build.			
Is there adjoining untreated water storage - above, to the side, passing through the tank?	No				
Is this an Ozone tank - if so which stage?	No				
Is the structure covered by the reservoir act (1975) - large raised reservoirs >25,000m3?	No				
Compartment Dimensions					
Storage volume - floor to overflow (m3)	101.14	Calculated from LengthXWidthXOverflow Height			
Operational volume - useable volume (m3)		Please refer to site operating guide.			
Height of compartment (m)	2.81	Taken at centre of tank.			
Width of compartment (m)	4.9				
Depth of compartment (m)	7.97	Length (End BT wall to Ct dividing wall)			
Inlet height (m)	Weir From CT.	High level weir inlet arrangement from CT St1 Tnk1.			
Outlet height (m)	In Sump In Floor	Outlet is located in sump constructed into the floor of the BT.			
Overflow height (m)	2.59	Overflow stack, Bell mouth 2.59 AFL			
Overflow diameter (mm)	450				
Top water level - normal operation (m)		Please refer to site operating guide.			
Bottom water level (m)		Please refer to site operating guide.			

Tank Structure					
What material is the tank?	Other	Pre cast concrete panels with in-situ infills (FLI-Carlow)			
What's the type of membrane?	Liquid	Full liquid Aqualine membrane completed by CRL.			
If an earth embankment what type is it?	None				
What type of roof covering is there?	Gravel	Geo-textile covered with gravel.			
What's the type of support structure?	Other	Buried.			
Tank Roof					
Are there signs of leakage / ingress through roof?	No	No ingress noted on final construction inundation test.			
Is there evidence of cracks in roof?	No	None noted at time of inspection.			
Is there evidence of discolouration / slime on internal roof?	No				
Are the roof joints / seals in satisfactory condition?	Yes	Visible day joints as roof is constructed from pre cast concrete panels.			
Is there evidence of standing or pooling water?	n/a	Full inundation test in progress.			
Is the roof drainage insufficient to clear all standing water?	n/a	Full inundation test in progress.			
Tank walls					
Are there signs of leakage / ingress through walls?	No	No ingress noted on final construction inundation test.			
Is there evidence of cracks in walls?	No	None noted at time of inspection.			
Is there evidence of discolouration / slime on walls?	No				
Are the wall joints / seals in satisfactory condition?	n/a	Construction day joints between pre-cast and in-situ infills. No noted expansion type joints.			

Tank floor					
Are there signs of leakage / ingress through floor?	No	No ingress noted on final construction inundation test.			
Is there evidence of cracks in floor?	No	None noted at time of inspection.			
Is there evidence of discolouration / slime on floor?	No				
Was any material found in the tank / on the floor?	No	New construction.			
Tank Support structure					
Are the roof supports in satisfactory condition?	No	Roof supported via outer walls and internal dividing/baffle walls.			
Tank Fittings / Pipework					
Are the internal fittings in satisfactory condition?	Yes				
Is the inlet pipework in satisfactory condition?	n/a	Concrete Weir from CT St1 Tnk1.			
Is the outlet pipework in satisfactory condition?	Yes	Outlet is located in sump constructed into the floor of the BT.			
Is the overflow in satisfactory condition?	Yes	Internal overflow stack pipe. 90 Degree ducks foot bend supported on concrete plinth.			
Are the valves in satisfactory condition?	n/a	All valves are external to the tank.			
Are the ladders in satisfactory condition?	n/a	No fixed ladder. Mobile ladder must be used for internal inspection.			
Is the metalwork in satisfactory condition?	Yes				
Are the baffled walls / curtains in satisfactory condition?	n/a				
Are the level probes in satisfactory condition?	Yes	Probes and ultrasonic level equipment in dedicated hatch.			
Are cable entry points sealed, in satisfactory condition and without evidence of ingress?	Yes	No ingress noted on final construction inundation test.			
Are there any other fittings / mountings with inadequate seals / sealant?	n/a				
Are any mixers in satisfactory working order / condition?	n/a				

Are any sample pumps in satisfactory working order / condition?	n/a				
Is there any redundant pipework or equipment connected to the tank?	No	Not aware of any - new construction.			
Access points					
Are all the hatch, covers or doors in satisfactory condition and working order?	Yes	X3 techno covers techno-covers installed.			
Are the seals in place and in satisfactory condition?	Yes				
Are the insect meshes in place and in satisfactory condition?	Yes				
Is the mesh an adequate size? (approx. 1mm or less)	Yes				
Is the membrane lapping around up stands in satisfactory condition?	Yes	Waterproof coating installed and no ingress noted on final construction inundation test.			
Dedicated Air Vents					
Are the vents securely fixed undamaged and in good condition?	n/a	Vented through techno cover hatches.			
Are the insect meshes in place and in satisfactory condition?	n/a				
Is the mesh an adequate size? (approx. 1mm or less)	n/a				

Roof Saturation Test					
Was the roof saturation test satisfactory?	Yes	Final inundation completed and no ingress noted. Full clean completed and tank disinfected. AWS locks fitted - tank due to be filled for full MIC samples.			
Other					
Are there any other issues to note? (add detail in comments box)	n/a				
Have actions been added to the Action Management System (AMS)?	n/a				

To upload data onto the tracker press Ctrl U. Also the form must be saved to the correct HAWK folder (see instruction tab)

[redacted]

Priority	Brief Rationale for Categorisation	Examples
Priority 1	Major Defect. Remedial work to be implemented before return to service or within 12 months if return to service is approved pending remedial work.	Ingress issue Significant Leak
Priority 2	Remedial work to be implemented before the next inspection.	Roof Drainage Minor Leak
Priority 3	Continue to monitor condition at next inspection.	Slippage Corrosion

Water Retaining Structure Internal Inspection Form

Regional Supply Area:	**East**
Supply Manager Area:	**Colchester**
Site Name:	**KEDINGTON HAVERHILL ROAD WW.**
Site Short Name:	**KEHRWW.**
MTL Information:	**SAP No: 2328647. Sap Func: KEHRWW-1F-HYP-TS12-CHT001.**
Tank Name:	**CT St1 Tnk2. (Field side)**
Inspection Date (dd/mm/yyyy):	**18.03.2020**
Date of next inspection (dd/mm/yyyy) - if early check than normal frequency required:	
Inspection Reason:	**Final Inspection.**
Clean Reason:	**New Construction 2019/2020.**
Impact Plan Number:	**N/A - New Build.**
Inspected By:	[redacted]
Additional Information:	**Above ground pre-cast concrete panel construction with in-situ infills. Precast concrete roof panels with concrete roof screed. External liquid roof coating applied by CRL. Finished with Gravel. Structure is made up of 2 Contact tanks and 2 Balance tanks making 2 Streams. Tank constructed by @one alliance 2019 to 2020 as part of the new Kedington WTW scheme. Access to top of tanks is via metal stairway. Handrailing is in place around tank. This CT weirs in to BT St1 Tnk2. Ct St1 Tnk2 and BT St1 Tnk2 can be inspected together while the works runs on the other CT/BT. (Please also refer to BT St1 Tnk2 inspection report)**

To upload data onto the log press Ctrl U once form complete.

Question	Answer	Comments	Remedial Work / Action	Priority 1-3*	Action Management System Number
Tank Attributes					
What is the tanks jack head category?	N/A				
Is the tank hydraulically isolatable - can it be easily taken out of supply?	Yes	All 4 tanks are OOS for this inspection as this is a new build.			
Is there adjoining untreated water storage - above, to the side, passing through the tank?	No				
Is this an Ozone tank - if so which stage?	No				
Is the structure covered by the reservoir act (1975) - large raised reservoirs >25,000m3?	No				
Compartment Dimensions					
Storage volume - floor to overflow (m3)	201.81	Calculated from LengthXWidthXOverflow Height (Not excluding baffle walls)			
Operational volume - useable volume (m3)		Please refer to Site Operating Guide.			
Height of compartment (m)	2.82	Taken at centre of floor in lane 2.			
Width of compartment (m)	4.87				
Depth of compartment (m)	16	Length (Rear CT wall to BT dividing wall)			
Inlet height (m)	3.29	Inlet stack pipe.			
Outlet height (m)	1: WEIR to BT 2: Wash water	1:- Weir to BT St1 Tnk2 Weir is 2.36 AFL in lane 3 of CT. 2:- Filter wash water outlet in sump of lane 3.			
Overflow height (m)	IN BT.	No overflow in CT tank, Overflow located in BT. Overflow stack is 2.59 AFL.			
Overflow diameter (mm)		Please refer to BT St1 Tnk1 Report.			
Top water level - normal operation (m)		Please refer to Site Operating Guide.			
Bottom water level (m)		Please refer to Site Operating Guide.			

Tank Structure					
What material is the tank?	Other	Pre cast concrete panels with in-situ infills (FLI-Carlow)			
What's the type of membrane?	Liquid	Full liquid Aqualine membrane completed by CRL.			
If an earth embankment what type is it?	None				
What type of roof covering is there?	Gravel	Geo-textile covered with gravel.			
What's the type of support structure?	Other	Buried.			
Tank Roof					
Are there signs of leakage / ingress through roof?	No	No ingress noted on final construction inundation test.			
Is there evidence of cracks in roof?	No	None noted at time of inspection.			
Is there evidence of discolouration / slime on internal roof?	No				
Are the roof joints / seals in satisfactory condition?	Yes	Visible day joints as roof is constructed from pre cast concrete panels.			
Is there evidence of standing or pooling water?	n/a	Full inundation test in progress.			
Is the roof drainage insufficient to clear all standing water?	n/a	Full inundation test in progress.			
Tank walls					
Are there signs of leakage / ingress through walls?	No	No ingress noted on final construction inundation test.			
Is there evidence of cracks in walls?	No	None noted at time of inspection.			
Is there evidence of discolouration / slime on walls?	No				
Are the wall joints / seals in satisfactory condition?	n/a	Construction day joints between pre-cast and in-situ infills. No noted expansion type joints.			

Tank floor					
Are there signs of leakage / ingress through floor?	No	No ingress noted on final construction inundation test.			
Is there evidence of cracks in floor?	No	None noted at time of inspection.			
Is there evidence of discolouration / slime on floor?	No				
Was any material found in the tank / on the floor?	No	New construction.			
Tank Support structure					
Are the roof supports in satisfactory condition?	Yes	Roof supported via outer walls and internal dividing/baffle walls.			
Tank Fittings / Pipework					
Are the internal fittings in satisfactory condition?	Yes				
Is the inlet pipework in satisfactory condition?	Yes	Low level pipe entry with internal stack pipe and bell mouth. 90 degree ducks foot bend supported on concrete plinth.			
Is the outlet pipework in satisfactory condition?	Yes	Outlet to BT is letterbox type high level weir. Filter wash water outlet pipe is located within floor sump of lane 3 (Before the outlet weir)			
Is the overflow in satisfactory condition?	n/a	Located in BT, Please refer to BT St1 Tnk2 Report.			
Are the valves in satisfactory condition?	n/a	All valve are external to the tank.			
Are the ladders in satisfactory condition?	n/a	No fixed ladder. Mobile ladder must be used for internal inspection.			
Is the metalwork in satisfactory condition?	Yes				
Are the baffled walls / curtains in satisfactory condition?	Yes	X2 full height baffle walls to make 3 lanes. High level baffle wall in lane 1 next to inlet stack - forcing water under baffle into lane 1.			
Are the level probes in satisfactory condition?	Yes	Probes and ultrasonic level equipment in dedicated hatch located in lane 1.			
Are cable entry points sealed, in satisfactory condition and without evidence of ingress?	Yes	No ingress noted on final construction inundation test.			
Are there any other fittings / mountings with inadequate seals / sealant?	n/a				

Are any mixers in satisfactory working order / condition?	n/a				
Are any sample pumps in satisfactory working order / condition?	n/a				
Is there any redundent pipework or equipment connected to the tank?	No	Not aware of any - new construction.			
Access points					
Are all the hatch, covers or doors in satisfactory condition and working order?	Yes	X4 techno covers techno-covers installed.			
Are the seals in place and in satisfactory condition?	Yes				
Are the insect meshes in place and in satisfactory condition?	Yes				
Is the mesh an adequate size? (approx. 1mm or less)	Yes				
Is the membrane lapping around up stands in satisfactory condition?	Yes	Waterproof coating installed and no ingress noted on final construction inundation test.			
Dedicated Air Vents					
Are the vents securely fixed undamaged and in good condition?	n/a	Vented through techno cover hatches.			
Are the insect meshes in place and in satisfactory condition?	n/a				
Is the mesh an adequate size? (approx. 1mm or less)	n/a				

Roof Saturation Test					
Was the roof saturation test satisfactory?	Yes	Final inundation completed and no ingress noted. Full clean completed and tank disinfected. AWS locks fitted - tank due to be filled for full MIC samples.			
Other					
Are there any other issues to note? (add detail in comments box)	n/a				
Have actions been added to the Action Management System (AMS)?	n/a				

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[redacted]

Priority	Brief Rationale for Categorisation	Examples
Priority 1	Major Defect. Remedial work to be implemented before return to service or within 12 months if return to service is approved pending remedial work.	Ingress issue Significant Leak
Priority 2	Remedial work to be implemented before the next inspection.	Roof Drainage Minor Leak
Priority 3	Continue to monitor condition at next inspection.	Slippage Corrosion

Water Retaining Structure Internal Inspection Form

Regional Supply Area:	**East**
Supply Manager Area:	**Colchester**
Site Name:	**KEDINGTON HAVERHILL ROAD WW.**
Site Short Name:	**KEHRWW.**
MTL Information:	**SAP No: 2328660. SAP Func: KEHRWW-1F-HYP-TS14-BNT001.**
Tank Name:	**BT St1 Tnk2. (Field side)**
Inspection Date (dd/mm/yyyy):	**18.03.2020**
Date of next inspection (dd/mm/yyyy) - if early check than normal frequency required:	
Inspection Reason:	**Final Inspection.**
Clean Reason:	**New Construction 2019/2020.**
Impact Plan Number:	**N/A - New Build.**
Inspected By:	[redacted]
Additional Information:	**Above ground pre-cast concrete panel construction with in-situ infills. Precast concrete roof panels with concrete roof screed. External liquid roof coating applied by CRL. Finished with Gravel. Structure is made up of 2 Contact tanks and 2 Balance tanks making 2 Streams. Tank constructed by @one alliance 2019 to 2020 as part of the new Kedington WTW scheme. Access to top of tanks is via metal stairway. Handrailing is in place around tank. CT St1 Tnk2 and BT St1 Tnk2 can be inspected together while the works runs on the other CT/BT. (Please also refer to CT St1 Tnk2 inspection report)**

To upload data onto the log press Ctrl U once form complete.

Question	Answer	Comments	Remedial Work / Action	Priority 1-3*	Action Management System Number
Tank Attributes					
What is the tanks jack head category?	N/A				
Is the tank hydraulically isolatable - can it be easily taken out of supply?	Yes	All 4 tanks are OOS for this inspection as this is a new build.			
Is there adjoining untreated water storage - above, to the side, passing through the tank?	No				
Is this an Ozone tank - if so which stage?	No				
Is the structure covered by the reservoir act (1975) - large raised reservoirs >25,000m3?	No				
Compartment Dimensions					
Storage volume - floor to overflow (m3)	101.32	Calculated from LengthXWidthXOverflow Height			
Operational volume - useable volume (m3)		Please refer to site operating guide.			
Height of compartment (m)	2.82	Taken at centre of tank.			
Width of compartment (m)	4.89				
Depth of compartment (m)	8	Length (End BT wall to CT dividing wall)			
Inlet height (m)	Weir from CT	High level weir inlet arrangement from CT St1 Tnk2.			
Outlet height (m)	In Sump In Floor	Outlet is located in sump constructed into the floor of the BT.			
Overflow height (m)	2.59	Overflow stack, Bell mouth 2.59 AFL			
Overflow diameter (mm)	450				
Top water level - normal operation (m)		Please refer to site operating guide.			
Bottom water level (m)		Please refer to site operating guide.			

Tank Structure					
What material is the tank?	Other	Pre cast concrete panels with in-situ infills (FLI-Carlow)			
What's the type of membrane?	Liquid	Full liquid Aqualine membrane completed by CRL.			
If an earth embankment what type is it?	None				
What type of roof covering is there?	Gravel	Geo-textile covered with gravel.			
What's the type of support structure?	Other	Buried.			
Tank Roof					
Are there signs of leakage / ingress through roof?	No	No ingress noted on final construction inundation test.			
Is there evidence of cracks in roof?	No	None noted at time of inspection.			
Is there evidence of discolouration / slime on internal roof?	No				
Are the roof joints / seals in satisfactory condition?	Yes	Visible day joints as roof is constructed from pre cast concrete panels.			
Is there evidence of standing or pooling water?	n/a	Full inundation test in progress.			
Is the roof drainage insufficient to clear all standing water?	n/a	Full inundation test in progress.			
Tank walls					
Are there signs of leakage / ingress through walls?	No	No ingress noted on final construction inundation test.			
Is there evidence of cracks in walls?	No	None noted at time of inspection.			
Is there evidence of discolouration / slime on walls?	No				
Are the wall joints / seals in satisfactory condition?	n/a	Construction day joints between pre-cast and in-situ infills. No noted expansion type joints.			

Tank floor					
Are there signs of leakage / ingress through floor?	No	No ingress noted on final construction inundation test.			
Is there evidence of cracks in floor?	No	None noted at time of inspection.			
Is there evidence of discolouration / slime on floor?	No				
Was any material found in the tank / on the floor?	No	New construction.			
Tank Support structure					
Are the roof supports in satisfactory condition?	No	Roof supported via outer walls and internal dividing/baffle walls.			
Tank Fittings / Pipework					
Are the internal fittings in satisfactory condition?	Yes				
Is the inlet pipework in satisfactory condition?	n/a	Concrete Weir from CT St1 Tnk2.			
Is the outlet pipework in satisfactory condition?	Yes	Outlet is located in sump constructed into the floor of the BT.			
Is the overflow in satisfactory condition?	Yes	Internal overflow stack pipe. 90 Degree ducks foot bend supported on concrete plinth.			
Are the valves in satisfactory condition?	n/a	All valves are external to the tank.			
Are the ladders in satisfactory condition?	n/a	No fixed ladder. Mobile ladder must be used for internal inspection.			
Is the metalwork in satisfactory condition?	Yes				
Are the baffled walls / curtains in satisfactory condition?	n/a				
Are the level probes in satisfactory condition?	Yes	Probes and ultrasonic level equipment in dedicated hatch.			
Are cable entry points sealed, in satisfactory condition and without evidence of ingress?	Yes	No ingress noted on final construction inundation test.			
Are there any other fittings / mountings with inadequate seals / sealant?	n/a				
Are any mixers in satisfactory working order / condition?	n/a				

Are any sample pumps in satisfactory working order / condition?	n/a				
Is there any redundent pipework or equipment connected to the tank?	No	Not aware of any - new construction.			
Access points					
Are all the hatch, covers or doors in satisfactory condition and working order?	Yes	X3 techno covers techno-covers installed.			
Are the seals in place and in satisfactory condition?	Yes				
Are the insect meshes in place and in satisfactory condition?	Yes				
Is the mesh an adequate size? (approx. 1mm or less)	Yes				
Is the membrane lapping around up stands in satisfactory condition?	Yes	Waterproof coating installed and no ingress noted on final construction inundation test.			
Dedicated Air Vents					
Are the vents securely fixed undamaged and in good condition?	n/a	Vented through techno cover hatches.			
Are the insect meshes in place and in satisfactory condition?	n/a				
Is the mesh an adequate size? (approx. 1mm or less)	n/a				

Roof Saturation Test					
Was the roof saturation test satisfactory?	Yes	Final inundation completed and no ingress noted. Full clean completed and tank disinfected. AWS locks fitted - tank due to be filled for full MIC samples.			
Other					
Are there any other issues to note? (add detail in comments box)	n/a				
Have actions been added to the Action Management System (AMS)?	n/a				

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[redacted]

Priority	Brief Rationale for Categorisation	Examples
Priority 1	Major Defect. Remedial work to be implemented before return to service or within 12 months if return to service is approved pending remedial work.	Ingress issue Significant Leak
Priority 2	Remedial work to be implemented before the next inspection.	Roof Drainage Minor Leak
Priority 3	Continue to monitor condition at next inspection.	Slippage Corrosion

Appendix D – Design Risk Assessment

Project No:	WAT-06742	Last Review:	6/02/2019	Assessor's Name:	[redacted](Technical Manager)

RISK MATRIX

Severity							
	Catastrophic	5	5	10	15	20	25
	Major	4	4	8	12	16	20
	Serious	3	3	6	9	12	15
	Minor	2	2	4	6	8	10
	Negligible	1	1	2	3	4	5
	Likelihood (Probability)		1 Extremely Unlikely	2 Very Unlikely	3 Unlikely	4 Likely	5 Very Likely

1 – 4: **Low risk** – No additional controls required

5 – 18: **Medium risk** – Risk controls required corrective actions. Preventative measures. (Apply Risk Hierarchy when considering and developing risk controls). Residual medium risks to be qualified by providing information on residual hazards to be conveyed to others.

20 – 25: **High risk** – Stop activity. Apply elimination of reduction strategies. Management involvement in decisions and risk control implementation.

Definitions of Probability of (Likelihood)		Definitions of Severity		
Likelihood (Probability)		**Consequences (Severity)**		**Definition**
Very Likely	5	Catastrophic	5	Fatality, severe environmental damage, severe property/machine damage.
Likely	4	Major	4	Major injury or illness, significant environmental damage, significant property/machine damage.
Unlikely	3	Serious	3	2-day injury or illness, multiple minor injuries, notable property/machine damage, serious environmental damage.
Very Unlikely	2	Minor	2	First aid injury or illness, minor property/machine damage, minor environmental damage.
Extremely Unlikely	1	Negligible	1	Injury may need first aid, slight property//machine damage

Hazard Identification		Without Control Measures			Design Measures taken to Eliminate or Reduce the Hazards	With Control Measures			Information of residual hazards to be conveyed to others
		L	S	R		L	S	R	
A	**Hazards in Construction**								
Process Design									
1.1	Taking an operational asset offline for a period of time (Kedington – Gt Wratting blend water) – loss of customer supply	4	4	16	Period of time required for Kedington borehole to be unavailable.	3	4	12	Risk of loss of Supply - PC to consult to Assurance Manager. Likely major impact plan required
1.2	Failure of filter vessel and pipework leading to injury cause by closed valve head of borehole pump	2	4	8	Pressure filter/pipework designed for 5 Barg closed valve head (minimum) of borehole pump. Hardwired pressure switch on borehole pump	0	4	0	-
M&E Design									
2.1	Installation of pipework, steelwork and plant packages including cutting and welding	4	3	12	Use of off-site assembly & standard product PS's to be specified as far as practicable	2	3	6	Need for onsite cutting and welding cannot be eliminated.
2.2	Aeration tower (working at height, piled foundations)	4	5	20	Filterability trials confirmed that aerator is not required	0	5	0	-
2.3	Open excavations for ducting and cable installation (falls)	3	3	9	Maximise routing of cabling above ground, using plant packages, and tray works. Utilise of MCC above ground arrangement.	2	3	6	Temporary works likely for duct installation due to the need for 3 vertical rows
2.4	Lifting of heavy plant and equipment (modular offsite built vessels)	1	4	4	Designers/fabricators to provide weights for safe means of lifting	1	4	4	-
2.5	Plant / pipework installation relative to the filter area – open excavation (falls)	3	3	9	Filter plant M&E equipment is designed to be installed above ground where possible to minimise time on site and reduce amount of excavation. Buried pipework lengths minimised where possible and trial holes undertaken to confirm depth of installation in design process.	1	3	3	-
2.6	Plant / pipework / trace heating and lagging/ Electrical installation – working at height (Pressure Filter Plant)	3	4	12	To mitigate working at height risk, the plant and pipework will be constructed offsite as modules for assembly on site reducing the duration for working at height. The modules are designed to be of consistent design where possible to make management of deliveries and assembly simpler on site. Layout provides sufficient space during installation for craneage, scaffolding, MEWP access as deemed appropriate by the contractor.	1	4	4	-
2.7	DWT installation – working at height	3	4	12	GRP coated steel tanks selected in place of above ground concrete tanks to reduce site construction time and to allow assembly of the tanks from ground level. Access is required inside the tank to construct concrete benching and install decant arm following tank assembly.	2	4	8	Working at required for tank roof installation, fitted after internal concreting and M&E fit out.

2.9	Working at height when installing new cables above ground.	4	3	12	Where practically possible, cable management systems to be installed at a height accessible from ground level without the need for access platforms.	4	3	12	Working at height - Contractor to be advised that they are required to use temporary access platforms when installing the new cables at height.
2.10	Above ground large bore pipework packages; Work at height; manual handling injuries.	4	4	16	Pipework to be pre-fabricated in sections to allow fitting onto pre-installed pipe support arrangements. Temporary/mobile access platforms are to be provided in conjunction with pipework lifted by crane to facilitate safe working at height for both pipework & valves.	2	4	8	Working at Height / manual handling of above ground large diameter pipework.
2.11	Sampling/Dosing Equipment - Low hazard ; assembly of small bore plastic pipework	2	2	4	Turbidity sampling equipment to be housed in GRP cabinets and pre-built off site ready for placement into position.	1	2	2	-
2.12	New Air Scour Blowers; Manual handling injuries.	3	3	9	Fully built-off-site standard package for off-loading & placement onto a low level concrete plinth.	1	3	3	-
2.13	Borehole pump replacement: non identified	-	-	-		-	-	-	-
2.14	Borehole electrical modifications: shutdown required for MCC changes. Risk of electrocution	2	5	10	Isolate Borehole MCC Panel whilst work is being carried out on the panel	0	5	0	-
2.15	Borehole pump – pipework tie-in: falls into excavation	4	4	16	No design mitigation	4	4	16	Deep excavations present
2.16	Borehole pump – pipework tie-in: manual handling	4	3	12	Fitting weights to be added to the drawings	3	3	9	Manual handling
2.17	Borehole pump – pipework tie-in: constrained working area due to fence				TBC on final location				
2.18	Borehole pump – pipework tie-in / ducts installation: laying across ditch. Rats / weils disease / deeper excavation – risk of falls / water ingress leading to reduced slope stability	4	4	16	No permanent works design mitigation	4	4	16	Deep excavation risk of collapse *Note – temporary works design to address*
2.19	High level electrical cable and pipework installations – Working at height, ground conditions during construction unknown.	2	4	8	Adequate space for MEWP.	1	4	4	-
2.20	Contact tank – installation of waterproofing membrane over roof/wall joint (working at height)	4	4	16	Sufficient space around perimeter during construction to allow work from MEWP and temporary handrailing systems on roof *SEQUENCE REQUIRED*	2	4	8	Hazard – Working at height during installation of waterproofing membrane Risk – Risk of falling and Injury or death to personnel
2.21	Contact tank – installation of roof level perimeter handrailing (working at height)	3	4	12	Sufficient space around perimeter during construction to allow work from MEWP	2	4	8	Hazard – Working at height during installation of handrailing Risk – Risk of falling and Injury or death to personnel
2.22	Contact tank – installation of heavy items with constrained headspace. Manual handling injuries	3	3	9	No design mitigation	3	3	9	Manual handling
2.24	Run-to-waste PS – installation of flap valves. Working in confined space, at height. Risk of falls, injury, death	2	5	10	Flap valves to be installed in package during manufacture off-site	0	5	0	-

Civil Design									
3.1	BURIED SERVICES - Unknown services buried on site	4	4	16	Utility companies contacted to collate service information on site. Randalls survey commissioned to confirm locations. Trial pits to determine service locations.	2	4	8	Hazard – Buried services Risk – Injury or death to personnel or damage to services if struck Available service information to be communicated, some risk of unknown / uncharted services remains to be managed by construction team.
3.2	BOREHOLE - Heavy construction adjacent to existing operational borehole could alter quality of raw water (turbidity / solids)	2	2	4	Discuss working arrangements with groundwater team and agree suitable mitigation	1	2	2	-
3.3	SITE ENTRANCE - Excavating for installation of fencing and tree planting for screening at a depth >0.5m where the existing Gas main is located. Gas mains runs 1.3-1.7m parallel to the road of proposed site location indicated in as-laid plan of Kedington borehole run-to-waste.	4	5	20	Security fencing and screening set back in the site layout, Randall's survey to verify accurate location of Gas mains and trial holes to be (hand) dug to find exact location of gas pipes.	2	5	10	Hazard – Buried services Risk – Injury or death to personnel or damage to services if struck
3.4	SITE ENTRANCE - Movement of heavy plant and machinery/materials stacked or stored above gas pipelines.	5	4	20	Temporary access routes and material storage to be planned allowing clearance from existing pipework location.	3	4	12	Hazard – Buried services Risk – Injury or death to personnel or damage to services if struck
3.5	BURIED SERVICES - Buried services under main construction area	3	4	8	Site layout developed to minimise impact on Wixoe RW main and gas main. Existing borehole run-to-waste to be rerouted around the main construction activities. Gas main protection slab to be installed.	2	4	8	Hazard – Buried services Risk – Injury or death to personnel or damage to services if struck
3.6	GENERAL - Overhead power lines	4	5	20	Overhead lines between the compound and site area. Cable heights have been communicated to contractor. Cables will be flagged on relevant drawings for all works in close proximity to them.	3	5	15	Cables will be flagged on relevant drawings for all works in close proximity to them. Hazard – Overhead power lines. Risk – Damage to services, electrocution
3.7	SITE ENTRANCE - Highways risk – site access	3	4	12	Compound location selected to use existing borehole site access due to insufficient visibility. Permanent site access selected to maximise sight lines / visibility to the highway. Access taken from B1061 rather than A143. Traffic speed survey undertaken to demonstrate traffic passing site is not travelling at 60mph. Vehicle tracking undertaken to confirm that construction and operational traffic can turn within the site boundary. Highways to be consulted. Temporary speed limit to be put in place during construction to manage risks for access into and out of site.	2	4	8	Hazard – Adjacent highway Risk – Death from vehicle impact
3.8	HAVS	4	3	12	Off-site assembly maximised to reduce on-site fixing. Slabs are required to have anchors drilled on site to allow for flexibility in installation of manifolds and to	1	3	3	-

					allow for construction vehicle tracking and plant storage (as per 3.1)				
3.9	BURIED SERVICES - Working near underground services – existing raw water borehole mains – risk of internal deposits breaking off and causing water quality issue	3	4	12	Trial holes undertaken to locate existing Wixoe borehole main. Temporary works details working in proximity of the mains to be agreed with Operations in advance of works.	3	4	12	Hazard Awareness and services survey drawings to be issued to all relevant contractors. Hazard – Buried services Risk – Injury or death to personnel or damage to services if struck
3.10	GENERAL - Plant / Vehicular movements around site – vehicular accident / pedestrian accident	4	4	16	Site has single access road through site. Site roads developed and autotracked to ensure suitable turning areas are provided so vehicles do not need to reverse long distances.	3	4	12	Hazard Awareness to be issued to all relevant contractors. Hazard – Large plant/vehicular movement Risk – Vehicular accident / Pedestrian accident
3.11	BOREHOLE – Pressurised water mains – diversion of existing borehole mains / connections to existing mains	4	4	16	Mains trial holed to gather best available information in advance of design. Cut and caps to be to existing flange connections with thrust restraint specified appropriately.	2	4	8	Hazard to be highlighted on design drawings detailing sequence required prior to bringing pipelines back into supply.
3.12	RC SLABS – Manual handling – reinforcement design	3	2	6	Slabs designed using mesh reinforcement where possible.	2	2	4	-
3.13	DITCH - Working near ditch – water in ditch may be contaminated e.g. Leptospirosis, sewage, hydrocarbons, etc.	4	4	16	Not possible as works involve digging out ditch to re-align it. Temporary site access required. Temporary site access ditch embankment to be demolished at the end of construction.	4	4	16	Hazard – Working near ditch Risk - water in ditch may be contaminated e.g. Leptospirosis, sewage, hydrocarbons, etc.
3.14	PUMP ROOM – Deep excavation for Pump Room basement - slab	4	4	16	Basement structure required for most efficient use of the balance tank volume and to prevent cavitation in pumps.	4	4	16	Hazard – Deep excavation Risk – Risk of falling and injury to personnel
3.15	WASHWATER TANKS –release of silica dust during concrete planning to provide smooth surface under perimeter of Hayes GFS tanks	4	4	16	Concrete surface at the circumference of steel tanks must be planed smooth by installer. Not designed out but mandatory PPE to be used.	4	4	16	Hazard – Concrete planing Risk – Release of silica dust (respiratory disease)
3.16	EMBANKMENTS – Overturning of plant on earth bank	4	4	16	Minimum slope MAS requirements adhered to when designing embankments.	2	4	8	Hazard – Sloped embankments Risk – Overturning of plant on earth bank
3.17	Installing filter laterals and concrete backfill. Working in a restricted environment.	3	3	9	Design requires for concreted in system. No further design mitigation.	3	3	9	Concrete works in restricted environment
3.18	Dust generation duration media installation into pressure filter	4	3	12	Media to be pre-washed. However, mechanical handling will generate fine particles. Risk cannot be fully mitigated. Appropriate PPE to be worn.	3	3	9	Risk – Release of dust (respiratory disease)
B	**Hazards in Operation and Maintenance**								
Process Design									
4.1	Contact tank inspections / maintenance will be a confined space activity - asphyxiation	4	5	20	UV disinfection considered and ruled out on WLC grounds.	3	5	15	Confined space for inspections

					Access arrangements considered for contact tank with suitable lane width (min 1.5m) for access.				
4.2	Working at height to maintain aeration tank	4	5	20	Filterability trials confirmed that aerator is not required	0	5	0	-
4.3	Chlorine gas on site – Accidental release to environment – toxic gas	2	5	10	Sodium hypochlorite used as an alternative to reduce risk on site.	0	5	0	-
4.4	Chemical storage on site – risk of orthophosphoric and sodium hypochlorite chemicals being mixed (releases chlorine gas)	4	5	20	Standard operational procedures including different keys for each chemical. The delivery point is common but the fill point for each chemical is separated.	2	5		Risk of mixing incompatible chemicals – toxic gas release. AW procedures to be followed.
4.5	Chemical or fuel spill on site (pollution)	3	4	12	Common bunded delivery area with interlocked drain to capture any spills within the bund.	1	4	4	-
4.6	Restricted working inside pressure vessels – e.g. for nozzle replacement / media replacement	3	4	12	Access manway with davit socket for personnel recovery. Two hatches provided for ventilation to the vessel.	2	4	8	Restricted working inside pressure vessels – Transfer to H&S file
4.7	Operation/Maintenance access to pressure filters	3	4	12	Quick release view ports on filters for inspection. Manway has local davit to provide fall arrest	1	4	4	-
4.8	Operation/Maintenance access to DWT	3	4	12	Permanent stair access provided to top of DWT to allow operational access to decant arm. Wall of tank used as edge protection at the top.	1	4	4	-
4.9	Operation/Maintenance access to hypochlorite	3	4	12	HAZOP undertaken on sodium hypochlorite to ensure suitable safety precautions are in place. Screening provided between dosing points due to direct dosing and risk of lance failure on adjacent live dose lines. For pre-filter, dosing cabinet has central screening point; for post-UV, two dosing cabinets are provided. Emergency showers provided adjacent to fill point and package (2no.).	1	4	4	-
M&E Design									
5.1	Maintenance of Instrumentation. Working on Height, Installation at open tanks - Slips, Trips and Falls	3	4	12	Instruments installed at low level where possible if not provided with suitable means of access. Where possible instrument to be hinged bracket, rotating bracket	1	4	4	-
5.2	New Pipework - Operation of Valves; Working at Height & Lifting operations.	4	3	12	Arrange for all valves/actuators to be positioned at low level wherever possible. Heavy valves to be removed using contract lift (from adjacent roadway).	2	3	6	Heavy Plant – contract lift required.
5.3	Filter Package (instrumentation & valves); Mechanical Lifting, Access & Ergonomics, Work at Height **Confined Space**	4	3	12	Refer to Alliance completed Designers Checklists (to be completed by KS).	1	3	3	-
5.4	Blowers (outside); Temperature (pipework)	3	2	6	Consideration to be given to provision of thermal protection (lagging) to low level pipework where this could present a hazard to personnel. Blower outlet air temperature is approx 60°C (TBC).	1	2	2	Confirm on placement of blower order.

5.5	Drain & sample points (valved) on pipework; Accidentally knocking ball valves open and exposing operators to liquid discharges	2	2	4	All ball valves located at operator level (or where inadvertent discharge could be hazardous) are to be provided with plugs	1	2	2	-
5.6	Maintenance and Inspection of instrumentation – Pressure filter vessel level switch. Falling from height	2	3	6	2 potential positions provided, one on top with ladder runs and hand holds provided. Second position is on dished end accessible by MEWP.	1	3	3	-
5.7	Risk of electrocution from filter local control panels, contact tank control panel, wash water settlement tanks and distribution boards if worked on in wet conditions.	2	5	10	Filters can be operated with the filters offline to enable an electrical engineer to work on outdoor panels when conditions are safe. Filter Distribution Boards, Contact Tank LCP and Washwater Settlement Tanks LCP to be isolated in LV Switchboard Kiosk.	1	5	5	-
5.8	Pump hall – gates in platform handrail open to allow equipment carried on overhead crane through. Potential fall from height (1m)	4	3	12	Gate is lockable and opens inwards – provide suitable signage	2	3	6	Risk of fall from height
5.9	Run-to-waste PS valve chamber – falls from height	2	3	6	Valve chamber designed out	0	3	0	-
5.10	Operation/ maintenance access to MCC's	3	3	6	Pumps MCC & LV Switchboard to be on raised steelwork flooring within the building/ kiosk. Cables are installed within flooring above ground level to reduce flood risk (Sump pump in Pump Building). Sampling MCC at ground level with top entry cabling.	1	3	3	-
Civil Design									
6.1	GENERAL - Accidents occurring from access to process units: slips & trips/lifting.	4	3	12	Site layout includes road/footpath access to provide paved access to all process units and pipework. No need to cross over ground level pipework.	1	3	3	-
6.2	GENERAL – Buried power lines adjacent to ditch.	3	5	15	Overhead lines between the compound and site area are to be buried during construction. Location to be documented in As-Built drawings and communicated to contractor before removal of ditch culvert.	2	5	10	Cables will be flagged on relevant drawings for all works in close proximity to them. Efforts to arrange burying of cable ongoing. Hazard – Buried services Risk – Injury or death to personnel or damage to services if struck
6.3	DITCH - water in ditch may be contaminated e.g. Leptospirosis, sewage, hydrocarbons, etc.	4	4	16	Not designed out. Temporary site access required. Temporary site access ditch embankment to be demolished at the end of construction.	4	4	16	Hazard – Working near ditch Risk - water in ditch may be contaminated e.g. Leptospirosis, sewage, hydrocarbons, etc.
6.4	GENERAL – Overturning of plant on earth bank	4	4	16	Minimum slope MAS requirements adhered to when designing embankments.	2	4	8	Hazard – Sloped embankments Risk – Overturning of plant on earth bank
C	**Hazards affecting the Public**								
Process Design									
7.1	-								
M&E Design									

8.1	Blowers; Operational Noise	4	2	8	Specify blowers to have acoustic enclosures	1	2	2	Confirm noise levels of equipment with suppliers on order placement for compliance with stated limits.
Civil Design									
8.1	DITCH - water in ditch may be contaminated e.g. Leptospirosis, sewage, hydrocarbons, etc.	4	4	16		4	4	16	Hazard – Working near ditch Risk - water in ditch may be contaminated e.g. Leptospirosis, sewage, hydrocarbons, etc.

HAZOP STUDY REPORT FORM

DATE :	27/06/2018
SITE :	WAT-06742 -Great Wratting -Kedington WTW
NODE:	Node 2 -Filter Outlet to Contact Tank
	Node 2Description / Summary
DRAWING No.	PIDs 1003, 1004, 1005

Deviation		Cause		Consequence		Safeguards	Action		
Parameter	Guideword	No.	Description	No.	Description	How do we know the deviation occurred ?	No.	Description	By
Flow	**NONE**		Compared to previous designs, pipework from filter manifold to contact tank inlet is all above ground. Pipe burst due to impact		Loss of flow through the WTW. Lose flow out of WTW in ~30mins. Loss of supply to customers in 8-12hrs (capacity of Boyton WR)	All pipework is within the site SEMD area with pedestrian access only.			
FLOW	**NONE**		Pipe burst due to freezing		Loss of flow through the WTW. Lose flow out of WTW in ~30mins. Loss of supply to customers in 8-12hrs (capacity of Boyton WR)	Main pipework run is DN400mm. Smaller pipework (bypass around shutdown valve and sample return line)	20	Confirm trace heating and lagging requirements for smaller pipework lines on this section.	[redacted]
FLOW	**NONE**		Other than the above, no significant additional causes have been identified when considered against previous designs highlighted above						
FLOW	**MORE OF**		Other than the above, no significant additional causes have been identified when considered against previous designs highlighted above						
Flow	**LESS OF**		Backwash of filter when one filter out for maintenance.		2no. Filters cannot take peak hydraulic works flow.	When 1no. filters are taken out of service, the works flow is limited during the backwash cycle to 33l/s per available filter	21	Confirm that works output can be achieved across a 24hr period.	[redacted]
FLOW	**LESS OF**		Other than the above, no significant additional causes have been identified when considered against previous designs highlighted above						
LEVEL			In the event of borehole flow stopping and a filter outlet valve failing open, the filter may partially drain into the contact tank		Filter taken off-line on low level requiring operator intervention to reset.	Low level switch to take filter off-line in the event of partially draining.	22	Justify not having a high level break point on the filter outlet manifold to prevent the filter draining following an outlet valve failing open	[redacted]
							23	Ensure the constant flow to individual filter turbidity monitors does not significantly affect the filter level/pressure conditions during no forward flow	[redacted]
LEVEL			Other than the above, no significant additional causes have been identified when considered against previous designs highlighted above						
TEMPERATURE			Covered under FLOW NONE						
PRESSURE			No significant additional causes have been identified when considered against previous designs highlighted above						
COMPOSITION	**LESS OF**		Chlorine measured coming from filters due to high ammonia in raw water.		Low chlorine alarm on post-filter monitors. Pre-contact dosing would attempt to maintain setpoint. Intermediate works shutdown on low/low chlorine level at pre-contact monitors. In this case, alternative risk of iron/manganese not sufficiently oxidised. Iron monitor post-filter would alarm in high iron. Could potentially lead to loss of works output.		24	Justify not providing residual control of pre-filter chlorine dose from post-filter chlorine instruments. Consideration over utilising V600's for control of chlorine dosing retaining previous dose point on start-up which could cause low chlorine dose for ~45mins before being measured post-filter	[redacted]
							25	Ensure the pre-contact chlorine dose capability is sufficient for achieving break point and disinfection whilst still having sufficient turn-down for normal operational conditions.	[redacted]
COMPOSITION	**MORE OF**		Phosphate dosed pre-filter as well as pre-contact - ~70% pre-filter. This is different to historic designs.		With supernatant return, the actual P concentration leaving the works will be marginally higher than the set point dose		26	Ensure the mass balance for phosphate on the recirculation system (including carrier water and supernatant recycle) does not result in an unacceptable increase in residual P level through the works over time.	[redacted]
MAINTENANCE	**OTHER**		An alternative filter floor arrangement is being considered with a metal floor instead of a concrete base. This carries a maintenance risk to access the area under the filter floor				27	Review access for maintenance during the confirmation of the filter floor design.	[redacted]
MAINTENANCE	**OTHER**		Location of filter level switches are on top of the filters.				28	Ensure filter level switches are accessible for maintenance.	[redacted]
MAINTENANCE	**OTHER**		Change out of mixer for maintenance.				29	Justify installing the mixer within a kiosk.	[redacted]

MAINTENANCE	**OTHER**		Removal/replacement of the shut down valve				30	Ensure the valve is at a suitable level/location for maintenance access	
Reg 31	**MIC**						31	Ensure sufficient sample points provided on sample return lines PID-1004 and on the contact tank inlet.	
COMPOSITION	**LESS OF**		Insufficient ventilation of the high level contact tank inlet due to requirement for insect mesh.		Insufficient raising of DO levels within the contact tank.		32	Ensure the ventilation design for the contact tank considers all operational conditions, whilst also ensuring the insect mesh requirements are considered within the calculation.	
MAINTENANCE	**OTHER**		Contact tank inlet valves shown as gate valves.				33	Justify specification of gate valves for this point instead of butterfly valves. Ensure selected valve is operable.	

HAZOP STUDY REPORT FORM

DATE :	27/06/2018
SITE :	WAT-06742 -Great Wratting -Kedington WTW
NODE:	Node 6 - High Lift Pumps to service
	Node 6 Description / Summary 2no. contact tank streams, each weiring into a balance tank. Each of the four compartments has a low level drain. High level overflow from balance tank. Low level floor outlet from balance tank into high lift pump suction. Suction line to high lift pumps and lifted offsite towards Boyton. Downstream of high lift pumps are SWORPS flowmeter and takes offs for final water monitors and safety shower/welfare supply.
DRAWING No.	PIDs 1005,1006

Deviation		Cause		Consequence		Safeguards	Action		
Parameter	Guideword	No.	Description	No.	Description	How do we know the deviation occurred ?	No.	Description	By
LEVEL	**NONE**		Drain valve open on contact tank (V05109, V05209)		High lift pumping stopped when balance tank drops to preset min level. Great Wratting pumping stopped automatically. Filter backwash is inhibited based on low balance tank level. Loss of supply to customers in 8-12hrs (capacity of Boyton	Below ground valves within SEMD area. A trained and competent operator would be running the valve. The ability to provide Boyton WR with water from Gt Wratting only, subject to WQ approval.	36	Justify not providing ultrasonic level probe within contact tank sections	[redacted]
LEVEL	**NONE**		Drain valve open on balance tank (V05107, V05207)		High lift pumping stopped. Great Wratting pumping stopped automatically. Filter backwash is inhibited based on low balance tank level. Loss of supply to customers in 8-12hrs (capacity of Boyton WR) With both balance tanks drained simultaneously, it is possible that the high lift pumps may lose prime	Low level lock out of high lift pumps (hardwired - manual reset). The ability to provide Boyton WR with water from Gt Wratting only, subject to WQ approval. Below ground valves within SEMD area. A trained and competent operator would be running the valve. High level alarm in the run-to-waste pumping station. Sufficient flushing points provided downstream of pumps to prime.			
LEVEL	**PART OF**		One number inlet valves closed (either V05101 or V05201) for a period		All flow goes through one contact stream. Some goes straight over weir, some will balance flows with other contact stream. Risk of effect on Ct time, and risk of WQ dead spots (and chlorine loss) within contact stream with closed inlet.	Valves within SEMD area. A trained and competent operator would be running the valve following operational procedures for return to supply. Tank out of service switch available within PLC which limits forward flow. High level inlet means there will be noticeable sound on forward flow			
LEVEL	**NONE**		Both inlet valves closed (V05101, V05201) for a period with tanks emptying following backwashing		High lift pumping stopped when balance tank drops to preset min level. Great Wratting pumping stopped automatically. Filter backwash is inhibited based on low balance tank level. Loss of supply to customers in 8-12hrs (capacity of Boyton	Valves within SEMD area. A trained and competent operator would be running the valve following operational procedures for return to supply. The ability to provide Boyton WR with water from Gt Wratting only, subject to WQ approval.			
LEVEL	**NONE**		Excessive backwash pumping (contact tank) - greater than two consecutive washes from one contact stream. Pumps run in hand, or continuous manual washing of filters.		Potential damage to backwash pumps due to insufficient contact tank level causing pumps to dry run. Potential media loss in filters.	Hardwired interlock on DWWT level to inhibit backwash pumping (4no. consecutive washes) Inhibit level within the balance tank, although this doesn't apply if works is not delivering forward flow Low level switch within the contact tank	37	Ensure the contact tank includes an inhibit level for backwashing and a hardwired interlock to the backwash pumps at low level in contact tank.	[redacted]
LEVEL	**NONE**		Excessive high lift pumping (balance tank). Pumps run in hand or incorrect setpoint put in.		Balance tank level would fall to a point where the high lift pumps stop in auto. Filter backwash is inhibited based on low balance tank level. Loss of supply to customers in 8-12hrs (capacity of Boyton WR)	Low level lock out of high lift pumps (hardwired - manual reset). The ability to provide Boyton WR with water from Gt Wratting only, subject to WQ approval.	38	Justify not including facility to manually run backwash cycle (to enable backwashing in the event of a low balance tank level).	[redacted]

LEVEL	**NONE**						39	Ensure range limits are suitably defined in Control Philosophy to cover the required high lift pump operating range to limit output on start-up and below backwash permit level.	[redacted]
LEVEL	**NONE**		Pipe burst / tank leak		High lift pumping stopped when balance tank drops to preset min level. Great Wratting pumping stopped automatically. Filter backwash is inhibited based on low balance tank level. Loss of supply to customers in 8-12hrs (capacity of Boyton	Pre-cast concrete tank. Pipework is buried ductile iron, within the SEMD fenced area.			
LEVEL	**NONE**		Control system failure - inhibit levels unavailable		Run out of water within the tank and pump damage accordingly. Loss of supply to customers in 8-12hrs (capacity of Boyton WR)	Alarm on failure of ultrasonic probes. Low flow switches hardwired interlocks on the backwash and high lift pumps. Low level interlock in the balance tank.			
LEVEL	**NONE**		Excessive time with no forward flow. Contact tank draining back to pre-contact sampling (contact tank)		Would take ~1month to have a significant effect. Not a plausible cause.				
LEVEL	**LESS OF**		Sample tap V05105 or V05205 left open (balance tanks)		Localised flooding. To drain the balance tank from 85% to 65% would take ~10hrs at 1l/s. Filter backwash is inhibited based on low balance tank level lower than 65%	Low level lock out of high lift pumps (hardwired - manual reset).			
LEVEL	**MORE THAN**		Running site in hand. Treatment running at higher level than high lift pumping.		Overfill of contact/balance tank through overflow. Environmental impact of chlorinated water to the environment	Physical overflow pipework from each tank gravitated to river sized at max works flow Filters prevented from draining down by valve V04024 automatically closing borehole unavailable. High level switch alarms at high level in balance tank.	40	Ensure high level switch in balance tank provides hardwired interlock to stop borehole pump (P&ID update - already in control philosophy).	[redacted]
							41	Ensure the panel specification for the borehole modifications includes interlock mentioned above.	[redacted]
LEVEL	**MORE THAN**		Running high lift pumps in hand at a lower flow than the works is producing.		Front end treatment process control will naturally ramp down accordingly to balance tank level.	Physical overflow pipework from each tank gravitated to river sized at max works flow High level switch alarms at high level in balance tank.			
LEVEL	**MORE THAN**		High lift pump failure (both pumps)		Front end treatment process control will naturally ramp down accordingly to balance tank level.	Physical overflow pipework from each tank gravitated to river sized at max works flow High level switch alarms at high level in balance tank.			
LEVEL	**MORE THAN**		Balance tank outlet valves closed (V05107, V05207).		Front end treatment process control will naturally ramp down accordingly to balance tank level.	Physical overflow pipework from each tank gravitated to river sized at max works flow High level switch alarms at high level in balance tank.			
LEVEL	**MORE THAN**		High lift pump isolation valves closed (V06101, V06201, V06106, V06206)		Front end treatment process control will naturally ramp down accordingly to balance tank level.	Physical overflow pipework from each tank gravitated to river sized at max works flow High level switch alarms at high level in balance tank.			
LEVEL	**MORE THAN**		Common high lift discharge line valve V06004 closed.		Front end treatment process control will naturally ramp down accordingly to balance tank level.	Physical overflow pipework from each tank gravitated to river sized at max works flow High level switch alarms at high level in balance tank.			

LEVEL	**MORE THAN**		Control system failure - main WTW treatment continuing after call to stop has been received from balance tank.		Overfill of contact/balance tank through overflow. Environmental impact of chlorinated water to the environment	Physical overflow pipework from each tank gravitated to river sized at max works flow. Facility to add dechlorination tablets to overflow chamber. Filters prevented from draining down by valve V04024 automatically closing borehole unavailable. High level switch alarms at high level in balance tank.	42	Ensure high level switch in balance tank provides hardwired interlock to stop borehole pump (P&ID update - already in control philosophy).	[redacted]
LEVEL	**MORE THAN**		Reverse flow from Boyton main (failure open of either NRV V06104 or V06204)		Rapidly fill contact tank on major failure open of NRV. Turbining of the pumps. Overfill of contact/balance tank through overflow, although size of overflow may not be enough. Environmental impact of chlorinated water to the environment - potential	Specification of wafer check valve ensures spring failure would still fail closed on reverse flow. High level switch alarms at high level in balance tank.	43	Justify not providing means of automated outlet isolation in the event of reversed flow to site and overflow operation.	[redacted]
LEVEL	**BEFORE**		Contact tank empty on plant start up (quality event during which filters were washed during a works shutdown)		High lifts will draw down balance tank before works is feeding through contact tank into balance tank.		44	Justify the proposed pumping arrangement (start up sequence) is acceptable.	
FLOW	**NONE**		No additional causes identified which have not already been identified in						
FLOW	**LESS OF**		Flushing valves left open (V06102, V06103, V06105)			Flushing valves flanged and blanked. Within SEMD fence line (within pump building)			
FLOW	**LESS OF**		Leak or pipe burst on safety shower / site water supply (refer to						
FLOW	**LESS OF**		V06009 valve open (possible surge vessel connection - if required)			Flushing valves flanged and blanked. Within SEMD fence line	45	Ensure the final detail from V06009 is reviewed and HAZOPed if necessary.	[redacted]
FLOW	**MORE THAN**		Pipe burst leading to increase in flow from existing pumps.				46	Ensure new pipework rated to above deadhead rating of the high lift pump.	[redacted]
COMPOSITION									
MAINTENANCE	**OTHER**		Pumps are located within a small basement, within a building, with no direct road access.				47	Ensure suitable access is provided for removal/replacement of pumps and equipment from the pump building.	[redacted]
LEVEL	**MORE OF**		Pipe burst within pump building hall leading to high water level within the pump hall (~1m below ground level). Note: this also affects backwash pumps and				48	Ensure the pump hall is adequately protected against flood, both from inside and outside.	[redacted]
OTHER	**OTHER**		The location of the safety shower supply is downstream of the SWORPS meter.				49	Justify not providing a separate flowmeter on the safety shower / site water supply.	[redacted]
OTHER	**MIC**						50	Ensure sufficient large bore connection provided d/s of high lift pumps for use in commissioning activities	[redacted]
ENVIRONMENTAL	**OTHER**		Noise from the contact tank aerator				51	Ensure noise of aerator considered within noise assessment for the site.	[redacted]
OTHER	**E-STOP**		Requirement and specification of E-stop discussed - currently not expected to be required				52	Ensure review of any identified E-stop undertaken post completion of machinery design checklist	[redacted]

THIS PLAN MUST BE AVAILABLE ON SITE AT THE TIME OF WORK

OPERATIONS IMPACT PLAN - WATER

All white boxes on this document must be completed fully – If 'not applicable' enter 'N/A'

GENERAL DETAILS

Job Summary / Title	**Kedington WTW into supply (4hrs)**		
	Work Order Number or Capital Code	WAT-06742 04 OP	
Site Address	Kedington WTW Haverhill Road / A143 Little Wratting Suffolk		
	Postcode		
	CB9 7TD		
Key Asset(s) Affected	Site Code	Asset Number	
	KEHRWW	New Assets	
Always include National Grid Reference, Postcode and site / asset references wherever applicable			

ASSESSMENT OF RISK *	**Minor**	**MAJOR**
		✓
	Local Approval (owner minimum)	All local approvals plus OMC TOM Approval

Refer to Risk Assessments used to determine the level of risk for this work

Impact Plan Author		
Post Title:	Name:	Date:
Assurance Engineer	[redacted]	30/03/20

APPROVAL RECORDS *(to be completed by OMC)*

OMC Registration / Approval	**DO NOT Proceed with this work without an Approval Number**		
E/310320/02 Rev 4			
Operational Owner Approval (must be an Operational Manager – Supply or Networks)			
Post Title	Name	Approval details	Date
Supply Manager	[redacted]	Email	31/03/20
Additional Stakeholder Approval Details			
Post Title	Name	Approval details	Date
Network Service support Manager	[redacted]	Email	For info
Risk Scientist	[redacted]	Email	31/03/20
Regional Supply Manager	[redacted]	for info	31/03/20
For Major Impact Plans – OMC Tactical Ops Approval			
Post Title	Name	Approval details	Date
Proactive Risk Manager	[redacted]	Email	31/03/20

Dates and Timing						
Proposed Date of Work	Timing and duration of work					
31st March 2020	Start	0800	Finish	1600	8	Hrs
If work is being completed out of hours confirm reason	N/A					
If the proposed date is TBA it must be confirmed to the OMC TOM Team at least 48hrs in advance of work commencing						

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Revision Details			
Date	Rev. No	Details	By Who
30/03/20	001	Original draft	[redacted]
31/03/20	002	Amended with stakeholder comment	[redacted]
31/03/20	003	Amendments follow RSM comments	[redacted]
31/03/20	004	Review by PRM for OMC Approval	[redacted]

1. BACKGROUND AND RISKS

a) Summary Description of work to be carried out, together with the aims and drivers?

Great Wratting Treatment works is ageing with a number of assets showing various signs of defect. It is also likely to exceed the 0.05µg/l individual pesticide target standard in the raw water and final treated water.

A new treatment works has been constructed in order to treat the water from the low metaldehyde Kedington borehole source.
The existing Great Wratting treatment works will continue to treat flows from the Wixoe borehole source only, which continues to have high Metaldehyde concentrations.

The outputs from the new and existing works will be blended upstream of the first reservoir inlet at Boyton Hall reservoir. Hundon reservoir is currently fed directly from Great Wratting.
The works will go into supply on a capped flow, **for a duration of 4hours,** running in manual control with Great Wratting. Prelims for into supply will still require signing off but due to issues that still need to be resolved to allow the WTW to run in auto, the works will be turned off and returned to its commissioning state to ensure they are fixed. Into supply will then be carried out under a separate plan.

b) Explain how this work will affect normal operations	
Normal operations statement	Currently two raw water sources supply Gt Wratting WTW with water: Wixoe Raw Water Pumping Station and from Kedington. The borehole pump at Kedington has been replaced with one of a higher output and used to commission the new WTW. This pump is currently valved out from Great Wratting WTW .
Effect on normal operations	The plan is to run the new Kedington WTW into supply with Great Wratting under manual control, to prove forward flow from the new WTW, with stable Water Quality. Once completed then the new WTW will be returned to its commissioning state running to waste to allow for the finalisation of key items to ensure that when running in auto the WTW will remain compliant, reliable and function to prevent Water Quality exceedance in event of power failure.

c) Has operational modelling been used to support this plan?	**No**	If Yes confirm OMC Ref:	N/A
		Insert Hyperlink to report:	N/A

d) Network Risks - DZ or DMA Risk Data			(link to data: All DMAs & DZs by NM)	
Area Name / Code:	Discoloration Risk:	Air Risk:	PAH Risk:	Property Count:
Boyton Hall WR DZ	Low	Low	Low	2,132
Boyton Hall WT DZ	Low	Low	Low	12,274
Hundon WR DZ	Low	Low	Low	2,499
Total Property Count				**16,906**

THIS PLAN MUST BE AVAILABLE ON SITE AT THE TIME OF WORK

e) Are customer supplies going to be affected by this work before any restoration options are used?			**No**	If Yes please complete all boxes below		
Type of affect	X) Reduced Pressure	No	Y) Supply Interruption	No	Z) Change in WQ	No

RESTORATION OPTIONS (These options should be used to used to maintain the customers supplies)				
Is there a Rezone Option?	Yes/No		No. properties restored?	
Capture the details of the rezone (assets to be operated, locations, area affected). If no rezone option is available, explain why?				
Is there an overland option?	Yes/No		No. properties restored?	
Capture the details of the overland (assets to be operated, locations, area affected). If no overland option is available, explain why?				
Is there a tankering into supply Option?	Yes/No		No. properties restored?	
Capture the details of the tankers (assets to be operated, locations, area affected). If no tanker option is available, explain why?				
Can extra fittings/ line stops be installed to restore/maintain supplies?	Yes/No		No. properties restored?	
Capture the details of additional fittings (fittings required, locations, area affected). If no overland option is available, explain why?				

Capture the restoration option that is most suitable for this job in section 1f. This may be a combination of techniques. Include commentary in section 1f and actions in section 2a and 2c and follow relevant POSWSH procedures. Also capture any restoration option that may be required for contingency in section 3a.

Are customer supplies going to be affected by this work once restoration options have been implemented?			**No**	If Yes please complete all boxes below		
Type of affect	X) Reduced Pressure	No	Y) Supply Interruption	No	Z) Change in WQ	No

Number and type of properties affected by the activity following restoration implementation (X, Y or Z)			
Total Properties (a)	Domestic:		NON HOUSEHOLD **(see below)*****:
	Key Accounts:		Special Needs / Water Care:
	Inset Agreements / Exports:		

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Times customers warned:	Start		Finish			Total hours

*****IF THERE ARE NON HOUSEHOLD AFFECTED AFTER RESTORATION OPTIONS THEN WE MUST ENSURE THAT A DM/DMTS IS INFORMED TO FOLLOW THEIR PROCESS (ie DRAW POLYGON ON GALLERY AND ENSURE SPIDs ARE AWARE)**

If customer supplies are being interrupted you must include actions in section 2a to provide adequate warning and also to submit an 'Interruption Form' to the OMC. Potential interruption score calculated below. Any plans with a I2S event time in seconds > 1 second must be signed off by a band 4 manager.

Total Properties (a)		Expected Duration (hours) (b)		I2S Event Score (a x b)		I2S Event Seconds	

To calculate the ODI score and time open the 'Interruption to Supply ODI Calculator' held on HAWK

Customer Comms – Do we need to manage the customer experience and provide proactive communication?

OMS Phone System	No
Anglian Water Website	No
Pro-active Comms (auto messaging service)	No

If any of the above are Yes include fully detailed actions in sections 2a and / or 2c

f) Summarise the operational risks and how they are being controlled or mitigated?
(Refer to sections 1b, c, d, e, and 5b)

1. **Shutdown and water quality parameter checks and commissioning** - The new filter plant will be commissioned which include shutdown checks through to the local HMI. The shutdowns will be witnessed before going into supply

2. **Borehole faults and failures** –Great Wratting will be able to support storage points

3. **Sampling** – All new mains and components will have been subject to MIC sampling prior. These will be confirmed as 'passed' as per the preliminary actions below. In the event of a performance sample failure – Resamples will be required ASAP.
4. **Plant Faults/Failures** – Operations techs will have been briefed/trained on how to deal with the resetting of faults. This may require out of hours call outs
5. **Customers might experience change in WQ –** WQ testing carried out before going into supply.
6. **Disinfection failure risk** – The chlorine shutdowns will be witnessed for both pre contact tank and final water before going into supply. Post filter instruments are just monitoring only,
7. **Supernatant return failure** – The Turbidity alarm limits will be witnessed before going into supply, turbidity monitor (<20ntu) and flow restriction in place (max 10% return of flow). Currently set for 8hours settle period. If high turbidity is realised then the supernatant will not return and try again after another timer has expired, (currently set at 30 mins)

IRIS Mimics:

KEHRWW

Refer to any Risk Assessments used to determine the level of risk for this work

g) Are customers likely to be directly affected by the work in any other way?	If Yes please provide detail to mitigate this risk below and include any actions in sections 2a and 2c	
Increased traffic in the surrounding area	**No**	
Access issues to their property	**No**	
Excessive noise or out of hours work	**No**	
Anything else (please state)	**No**	

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Always aim to ensure customers affected by our work are very satisfied with our service

h) Are security risks increased by this work?	**No**	If Yes please provide detail to mitigate this risk below and include any actions in sections 2a and 2c
N/A		

2. METHODOLOGY OF WORK

DEVIATION FROM THIS PLAN CAN ONLY BE AUTHORISED BY THE OPERATIONAL OWNER OR OMC DUTY MANAGER

a) Preliminary work items (to be completed chronologically)

ALL PRELIM. ITEMS REQUIRED TO ENSURE SUCCESFULL DELIVERY OF THE TASK MUST BE DETAILED BELOW
'Site Check' column to be initialled, dated and timed on the site working copy as a record of actions

Item	Description	Day / Time	Action by	Site Check
1.	Book Technicians (NT / WT) required to support the job	5 Days prior	Assurance Engineer	
2.	Confirm all approvals have been received and that the plan has been allocated an approval number by the OMC TOM Team	3 Days prior	Assurance Engineer	
3.	Confirm planned date(s) to the OMC OSM Team to update the relevant planned work calendar and register at least three days in advance	3 Days prior	Alliance Commissioning Engineer	
4.	FDS and Control Philosophy to be confirmed as current so that a Site Operating Guide can be created	prior into supply	PDM/ Supply Manager	
5.	Draft O&M Files available on site including: Draft 'As Built' drawings (paper copies) for comment Electrical certificates Instrument calibration & test certificates Pipework test certificates CCTV / swab records Lifting equipment test certificate Pressure vessel test certificates	prior into supply	PDM	
6.	Ensure **MIC form 3659** Part A and Part C is signed-off. Materials in contact sample test results for all new plant and onsite pipework, approvals where appropriate and handover performance samples (7 days) confirmed as approved by Risk Scientist **Performance sampling only tested and reviewed on capped flow (50l/s).** Water Quality Risk & Optimisation team to be informed of Into Supply date.	prior to into supply date	PDM Risk Scientist	
7.	Request approval from Network Manager for all new mains installed in the network as not covered in above. Confirm that samples have passed and that the main has been turned over.	Prior to into supply	Commissioning Engineer	

	Complete onsite WQ checks for the new main (taste, odour, clarity, turbidity <1ntu and chlorine) from WO3 and flush the main if required.			
8.	Please ensure that the Lab sampling team are contacted as soon as the intended start date is known to ensure regulatory samples are taken. Contact should be made by email to the [redacted] mailbox and by phone to the **Standby Sampling Manager** on **07808 884798.** If there is any change to the intended start date, please notify the Standby Sampling Manager by email and phone to this effect."	Prior to into supply	Commissioning Engineer	
9.	Sample plant outlet <7 days before into supply in accordance with procedure Installation, refurbishment, repair and commissioning of Water Compliance Sample Points. **Sample points:** W01KED CY (at Kedington WTW) W01KED CN (at inlet to Boyton WR) Sample points to be added to AUD2 dataset	5 Days prior to into supply	Lab sampler	
10.	The WTW including telemetry commissioned on water to waste. All Test / Commissioning sheets completed for Assets, available for reference with this MIP, and any software backups held by AWS Systems. Reliability test will be completed after into supply as agreed with Supply Manager,	prior to into supply date	Alliance Commissioning Engineer	
11.	Demonstrate plant operation Tests required to be agreed with Supply Manager prior to into supply date. • Confirm minimum and capped flow that the plant will be running at for the into supply requirements and make sure it has been WQ tested in this flow range. • Test supernatant (high turbidity) to ensure pumps don't discharge and waits further setpoint timer (30mins) • Test pre-contact CL2 shut down • Test final water CL2 (disinfection) shut down • Make sure sites are interlocked	prior to into supply date	Alliance Commissioning Engineer / Supply Manager	
12.	Confirm all water quality instrumentation and telemetry alarms are set in accordance with the WOLFs.	Prior to into supply date	Alliance Commissioning Engineer / Supply	

	WOLFs to be uploaded on HAWK prior to into supply.		Manager/ Risk scientist	
13.	The WTW HMI is available for monitoring during manual control	prior to into supply date	Alliance Commissioning Engineer / Supply Manager	
14.	Operator training completed, Telemetry invited to attend training, including filter wash	Prior to into supply date	Alliance Commissioning Engineer	
15.	Site meeting to be held before going into supply between AWS Water Operations and Alliance Project Team to confirm completion of preliminary actions as detailed above. Handover testing including handover performance sample results and plant operation agreed as satisfactory. Decision to be taken to progress to running into supply.	Prior to into supply	AWS Water Operations and Alliance Project Team	
16.	RSM to be informed of likely into supply date	X2 days prior to Into supply date	[redacted]	
17.	Consult with the Strategic Planner (Water Supply) to ensure the relevant sample point certificates and sample point codes are generated and available on site. **Sample points:** W01KED CY (at Kedington WTW) W01KED CN (at inlet to Boyton WR)	Prior to into supply date	Commissioning Engineer	
18.	Arrange with the Strategic Planner (Water Supply) for the appropriate water quality commissioning samples to be collected.	Prior to into supply date	Commissioning Engineer	
19.	Establish flush time by measuring the time taken to obtain a constant temperature after the start of flushing	Prior to into supply date	Commissioning Engineer	
20.	Arrange with the Lab daily sampling for 1 day from Kedington final water, borehole and the Kedington/Wratting blend. Required sampling listed in 5e.	Prior to into supply date	Commissioning Engineer	
21.	Sample the supernatant tank at min standing for turbidity and iron.	Prior to into supply date	Commissioning Engineer	
22.	Inform the Water Quality Reactive team regarding the affected downstream areas and Into Supply date as a precaution against any customer complaints. (Taste and Odour)	Prior to into supply date	Assurance Engineer	

b) Telemetry Interaction:	
1. Annotations/Time bound notes – Do you require any annotations to be created for this work?	**No**
2. Monitoring – Do you require any points to be checked / monitored for this work?	**No**
3. Do you require any temporary alarm status changes for this work?	**No**

THIS PLAN MUST BE AVAILABLE ON SITE AT THE TIME OF WORK

If any of the above are Yes include fully detailed actions in sections 2a and / or 2c

c) Methodology of work(s) to be carried out (to be completed chronologically)

'Site Check' column to be initialled, dated and timed on the site working copy as a record of actions

All valve operations must be undertaken in accordance with guidance in PSW-PRO-1.15 Appendix 1

Item	Description	Day / Time	Action by	Site Check
1.	Confirm that all preliminary actions have been completed in section 2a above	Prior to start	[redacted] /@ONE	
2.	Approval to proceed putting the work into supply via manual control from the Regional Supply Manager and Director shall be sought prior to commencement of any work, having sent RSM a photograph / copy of prelim actions all signed off.	Prior to start	Supply Manager	
3.	Contact OMC OCM to confirm that there are no on-going issues that could affect the implementation of this plan Boyton Hall WR >50 % WT confirm with OCM all preliminary work has been completed and samples have passed.	Prior to start	[redacted]	
4.	WT to confirm with Alarm Handler that they are on site.	Prior to start	[redacted]	
5.	Ensure confirmation of clear sample results from the performance samples are available (as per 2a).	Prior to start	@one alliance Commissioning/ supply manager	
6.	Supply Manager & Commissioning Engineer to confirm that telemetry is active, and all alarm inhibits have been removed on KRHWW		@one alliance Commissioning/ supply manager	
7.	Supply Manager to confirm all other process set points.		@one alliance Commissioning/ supply manager	
8.	At Kedington: Undertake final check of the WTW (turbidity, clarity, chlorine and taste and odour) and confirm all water quality is within limits of WOLFs - record routine water quality instrument readings and record any manual test kit readings in ops log for reference. (i.e. Cl2 and turbidity)	On the day	[redacted]	
9.	At Great Wratting: Undertake final check of the WTW (turbidity, clarity, chlorine and taste and odour) and record routine water quality instrument readings and record any manual test kit readings in ops log for reference. (i.e. Cl2 and turbidity)	On the day	[redacted]	
10.	At Kedington: shutdown Boyton Hall highlift pumps,	On the day	[redacted]	
11.	Close WO4	On the day	@one alliance Commissioning	
12.	Open SV 4 to allow Kedington highlift flow to Boyton Hall WR	On the day	@one alliance Commissioning	

13.	Adjust HMI settings: Reservoir level start / stop	On the day	@one alliance Commissioning	
14.	Return highlift pumps to manual control, ensuring they start as expected. Confirm after electrical mods that Gt Wratting starts up	On the day	@one alliance Commissioning	
15.	Monitor Kedington WTW for next four hours	On the day	@one alliance Commissioning/ Operations	
16.	At the Kedington/Wratting blend: Undertake WQ checks (turbidity, clarity, chlorine and taste and odour) and report anything unusual.	On the day	[redacted]	
17.	Sample as per 5e Kedington BH Kedington WTW Blend water at Boyton WR Before the WTW is stopped: Take AUD2 sample, Inform OMC OCM that the WTW is out and the Final sample tap (W01KED CY) requires an AUD2 to be logged with time taken, ref 5e	On the day	Lab sampler	
18.	**Once 4hours running has been completed** Review and agreement by all parties that the proving of the works operation into supply via manual control can stop. Thus verifying that blend control could be achieved in manual operation should this be required whilst finalisation of the full automation commissioning is completed.	On the day	@one alliance Commissioning/ Operations	
19.	Stop the Kedington Highlift pumps in manual control.	On the day	@one alliance Commissioning/ Operations	
20.	Once transient flows have stopped then close SV4 , and open WO4 to allow the WTW to be returned to its commissioning state, running to waste	On the day	@one alliance Commissioning/ Operations	
21.	Review the running of Great Wratting WTW and ensure it is operating as expected	On the day	[redacted]	
22.	Check with OMC Alarm handlers that no alarms are present for site and that any telemetry alarms are to be directed to AW operations as per coding. Advise OMC OCM that work is over, and plant is now on line.	End of work	[redacted]	
Feedback	On completion of the work the plan author must confirm whether the plan was successful or provide details of any issues that occurred. Please reply with details to the 'Approval email' issued for the plan.			

d) Technician Resource requirements for the job (include prelim actions in 2a to book)		
Type	Detail skills required, and no. of Techs required	When Required
Networks Techs.	None,	
Supply Techs.	Works technician- any skill type	Pre and post work
All Technicians must be booked in advance via. the OMC Tactical Planning Team Note: The impact plan approval number will be required before a booking can be confirmed		

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e) Plant and Material requirements for the job (include prelim actions in 2a to check)			
Item no	Description	Day / Time	Action by whom
1	Turbidity & Cl2 residual portable monitoring equipment	On day	WT

f) Contingency Plant and Material requirements (include prelim actions in 2a to check)			
Item no	Description	Day / Time	Action by whom
1	No plant and material needed although Contingency will be to isolate new plant and revert to running just on Gt Wratting WW.		@one alliance commissioning/ Operations

g) Details of plans and drawings attached to support this plan	
Ref	Description / Title
	See section 8

h) Keys required or access arrangement details?
None.

3. CONTINGENCIES

	a) Contingency Actions			
Item no	Action	No. Properties affected	Trigger Point	Action by
1	Failure of the Kedington BH would potentially impact PCV for metaldehyde if Great Wratting was able to run by itself without checking current samples. The levels are low enough at present to allow Great Wratting to run by itself to maintain storage at Boyton Hall and Hundon. The interlock between Kedington and Great Wratting could be inhibited upon agreement with the OCM-W. If there was a failure of the Great Wratting WTW then again the interlock with agreement could be inhibited to allow Kedington WTW on it's own, Iron is the only water quality concern when running on the Kedington BH. There is sand filtration on site to reduce this below the PCV.	16,906 potential for impact (Only if Gt. Wratting storage lost)	Pump Failure to Wixoe BH, WQ change, Burst mains	OMC/ @one alliance/ Operations
	Contingency Plant and Materials must be detailed in section 2f			

Name	Post Title	Mobile	Landline
OMC OCM	OMC Operational Control Manager - Water	[redacted]	
[redacted]	SM		
[redacted]	SSM		
[redacted]	NSM		
[redacted]	NSSM		
Duty Scientist			

[redacted]	Risk Scientist	[redacted]	

4. PERMITS

Are the following permits required?				
Permit or Card			Person Issuing Permit	2a / 2c Item
a	National Water Hygiene Card	No		
b	Site / Asset Access Authorisation (SAAA)	No		
c	Confined space Permit	No		
d	Electrical Permit	No		
e	Work at Height Permit	No		
f	Hot Works Permit	No		
g	Plant / Machinery Isolation Permit	No		
h	Mains Pressure Isolation Permit	No		
I	Highways Permits	No		
j	Other - Please state:			
If any of the above are Yes link to action items in sections 2a and / or 2c				

5. WATER QUALITY / ENVIRONMENTAL QUALITY CONSIDERATIONS

a) All work must be undertaken in accordance with AWS policies and procedures. List which particular business standards and procedures are relevant to this work

[redacted]

b) Drinking Water Safety Plan Risks – Consult Risk Portal and if further guidance required consult Operational Science			
Are there any relevant Treatment Works or Supply Zone Risks highlighted by the risk portal?	Yes	If Yes detail risks below	Date checked March 2020

Kedington BH1 – iron red risk and turbidity amber risk – treatment downstream
Wixoe BH 1 – amber metaldehyde risk – levels will be reviewed before work commence
Great Wratting WTW – metaldehyde and coliforms amber risk

c) Regulatory Sampling and Supply Assets removed from service			Refer to PSW-PRO-12.09
POSWSH sampling procedures must be complied with at all times without deviation. Any impact on regulatory or compliance sampling must be clearly identified and detailed in the risks in this plan			
Is an AUD2 required?	No	If Yes confirm sample point	N/A
If Yes include relevant sampling in section 5e below and all associated actions in sections 2a and 2c			

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(include pre and post sampling, AUD2 completion and closure plus temporary labelling of sample taps)

d) Materials in Contact (MIC) Sampling			Refer to PSW-PRO-3.01
Is MIC sampling required as part of this work?	no	If Yes confirm MK ref	
If Yes include relevant sampling in section 5e below and all associated actions in sections 2a and 2c (for PARTs A and B)			

e) Is sampling required for this work?	Yes	If Yes please provide full details below
The sampling requirements must fully comply with POSWSH without deviation and must be fully detailed below to provide a clearly defined sampling plan linked using item numbers to the preliminary and methodology sections (2a and 2c). Ensure sampling requirements for any restoration options are included as per sections 1e and 1f.		
Is an ARP (Analytical Request) required	No	If yes include an action in section 2a

Item No:	Location / description:	Loc - Type: (U/S or D/S)	Analysis: (eg. Bacti / *9)	Label: (eg. MF)	Who is sampling:
2c17	Kedington Borehole W01KED CV	US	Iron Turbidity	IM	Lab sampler
2c17	Kedington WTW final sample W01KED CY	DS	Turbidity Conductivity Colour Iron Manganese Bacti – EC, TC and 2&3 day Clarity Qualitative odour Qualitative taste Quant taste Quantitative odour both 25C and 60C PO4 Temperature Calcium Alkalinity pH Conductivity Sodium Chloride Sulphate Nitrate Phosphate Dissolved Oxygen	IM	Lab sampler
2c17	Great Wratting / Kedington WTW blend W01KEN CN	DS	Qualitative odour Qualitative taste Quant taste Quantitative odour both 25C and 60C Bacti – EC, TC and 2&3 day Metaldehyde	IM	Lab sampler

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			Temperature Calcium Alkalinity pH Conductivity Sodium Chloride Sulphate Nitrate Phosphate Dissolved Oxygen turbidity, iron manganese		
2c17	AUD2 sample Point Code: W01KED CY Name: Kedington WTW final sample		Bacti: Coliforms & E.coli 2 day and 3 day plate counts	IM	lab sampler
Link item no's above to actions in methodology sections 2a and 2c					

f) Laboratory Liaison			
Are there any non-routine arrangements that need to be agreed with the laboratory (e.g. fast tracking / quantities)?:		No	If Yes provide details below
Item:	Details of arrangements / liaison:	Action by whom:	When:
If fast track analysis is required confirm reason:			

g) Pollution Risks, Controls and Discharge Consents	
For any activity that includes draining down or flushing water to waste a pollution risk assessment must be carried out (for each discharge point) and the discharge managed in accordance with PSW-POS-4.04 and 4.05. If in doubt consult the Environmental Permit Team about legal requirements.	
If drain or flush water is being run to waste for this task where will it discharge to	Via WO NGR TL 70[redacted] 47[redacted] & TL 70[redacted]47[redacted]
Is there a discharge consent or permit in place to support this work	Yes [redacted] & [redacted]
If Yes confirm details and controls	Discharge will be monitored periodically for odour, clarity, turbidity, Chlorine and iron The consent shall consist of de-chlorinated potable water. A sample point shall be provided and maintained so that a representative sample of the discharge may be obtained. The total volume of the discharge shall not exceed 680,000 cubic meters with max daily volume <8,500cm at a rate of no more than 102l/s
If no include actions in section 2a to confirm requirements with Environmental Permit Team	
If specific risks have been highlighted please detail them below including all controls that will be put in place	

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Item	Description of issue and controls	Action by
1	Flooding to downstream catchment – ensure free flow of water from washout and as free as may be reasonably practicable from: a) mud and silt b) solid, polluting, offensive or injurious substances c) any substances prejudicial to fish or spawn, or to spawning beds or food of fish the rate of discharge shall be controlled to prevent any significant scouring of the bed or bankside of the receiving water. The Discharge shall not contain more than 50 milligrams per litre of suspended solids (measured after drying at 105 degrees Celsius). ii) The Discharge shall have a pH value of not less than 6 nor greater than 9. iii) The Discharge shall not contain more than 5000 micrograms per litre of Total Iron as Fe. iv) Chlorine <0.05 ppm The Consent shall cease to have effect on 25/4/2020	@one alliance
Any actions must be included and referenced in section 2a and 2c		

h) External Liaison	Detail below any actions relating to liaison with external parties (e.g. EA)		
External Contact	Details of liaison required or completed	Action by whom	Section 2a item
None	-	-	-

6. HEALTH AND SAFETY

'NOTHING IS SO IMPORTANT THAT WE CANNOT TAKE THE TIME TO DO IT SAFELY'

a) Supervision and Contractors		
Who is supervising the work on site	@One Site Manager/Supervisor	
Are Contractors being used to complete any part of this work?	yes	If Yes you must follow the 'Management of Contractors' procedures
Include an item in section 2a to receive and approve the Contractor Risk Assessments and Method Statements (RAMS)		

b) Safety Risk Assessments	All work must be carried out in accordance with AWS Safe and Well policies, procedures and model task risk assessments	
For any specific H&S risks that have been highlighted in planning this task please detail them below including all additional controls and site specific risk assessments that will put in place		
Item	Description of issue and controls	Action by
1	No health and safety risks have been identified that are not covered by AWS Safe and Well policies, procedures and model task risk assessments	[redacted]
If applicable any items above must be referenced in sections 2a and 2c		

c) Specialist Safety Equipment required?	No	If Yes please complete boxes below
Appropriate PPE Equipment to be used	Who is supplying the equipment	By When
None	-	-

7. ASSET STATUS CHANGES

Are you making any permanent status changes to existing assets or creating new ones?	yes	If Yes ensure corporate data sets are updated
Data Type to be Updated	No	
GIS Mapping Data	Yes	
SAP Data	Yes	
Telemetry Picture modifications	Yes	
Operational Manual / Guide updates	Yes	
Network Model / MISER updates	No	
DWSP – Changes to Works or Supply Zones	Yes	
Regulatory Sample Points (consult Ops Scientist)	yes	
Other (please state)	No	
Inform Water Configuration Team of any new assets or asset status changes		

8. APPENDICES

Please attach all other relevant documentation to support this Impact Plan and list them below

Item	**Reference**	**Title**

Layout (double click to open a separate PDF)

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OPERATIONS IMPACT PLAN - WATER

All white boxes on this document must be completed fully – If 'not applicable' enter 'N/A'

GENERAL DETAILS

Job Summary / Title	**Kedington WTW into supply**	
	Work Order Number or Capital Code	WAT-06742 04 OP
Site Address	Kedington WTW Haverhill Road / A143 Little Wratting Suffolk	
	Postcode	
	CB9 7TD	
Key Asset(s) Affected	Site Code	Asset Number
	KEHRWW	New Assets
Always include National Grid Reference, Postcode and site / asset references wherever applicable		

ASSESSMENT OF RISK *	**Minor**	**MAJOR**
		✓
	Local Approval (owner minimum)	All local approvals plus OMC TOM Approval

Refer to Risk Assessments used to determine the level of risk for this work

Impact Plan Author		
Post Title:	Name:	Date:
Assurance Engineer	[redacted]	10/03/20

APPROVAL RECORDS *(to be completed by OMC)*

OMC Registration / Approval	**DO NOT Proceed with this work without an Approval Number**		
E/310320/01 Rev 5			
Operational Owner Approval (must be an Operational Manager – Supply or Networks)			
Post Title	Name	Approval details	Date
Supply Manager	[redacted]	Email	20/03/2020
Additional Stakeholder Approval Details			
Post Title	Name	Approval details	Date
Network Service support Manager	[redacted]	Email	26/03/2020
Risk Scientist	[redacted]	Email	30/03/2020
Regional Supply Manager	[redacted]	for info	
For Major Impact Plans – OMC Tactical Ops Approval			
Post Title	Name	Approval details	Date
Tactical Operations Manager	[redacted]	Email	30/03/2020

Dates and Timing						
Proposed Date of Work	Timing and duration of work					
31st March 2020	Start	0800	Finish	1600	8	Hrs
If work is being completed out of hours confirm reason	N/A					
If the proposed date is TBA it must be confirmed to the OMC TOM Team at least 48hrs in advance of work commencing						

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Revision Details			
Date	Rev. No	Details	By Who
10/03/20	001	Original draft	[redacted]
20/03/20	002	[redacted]Review	[redacted]
26/03/20	003	[redacted]Review	[redacted]
28/03/20	004	[redacted]Review	[redacted]
30/03/20	005	[redacted]review	[redacted]

1. BACKGROUND AND RISKS

a) Summary Description of work to be carried out, together with the aims and drivers?

Great Wratting Treatment works is ageing with a number of assets showing various signs of defect. It is also likely to exceed the 0.05µg/l individual pesticide target standard in the raw water and final treated water.

A new treatment works has been constructed in order to treat the water from the low metaldehyde Kedington borehole source.
The existing Great Wratting treatment works will continue to treat flows from the Wixoe borehole source only, which continues to have high Metaldehyde concentrations.

The outputs from the new and existing works will be blended upstream of the first reservoir inlet at Boyton Hall reservoir. Hundon reservoir is currently fed directly from Great Wratting.
The works will go into supply on a capped flow, where water quality performance will be signed off, further flow increases will be required, but under separate impact plan to manage the water quality blend.

b) Explain how this work will affect normal operations	
Normal operations statement	Currently two raw water sources supply Gt Wratting WTW with water: Wixoe Raw Water Pumping Station and from Kedington. The borehole pump at Kedington has been replaced with one of a higher output and used to commission the new WTW. This pump is currently valved out from Great Wratting WTW .
Effect on normal operations	The introduction of the new plant will give resilience and reduce the risk of potential Metaldehyde exceedance at Great Wratting, as both Great Wratting and Kedington will control as a blend to feed into Boyton Hall storage points. Both site are interlocked if there is a shutdown on one of them. Currently Metaldehyde levels in the Wixoe BH are under PCV limits, and if there was a major issue at Kedington then this interlock could be bypassed to allow Great Wratting to maintain supplies to Boyton and Hundon storage points.

c) Has operational modelling been used to support this plan?	**No**	If Yes confirm OMC Ref:	N/A
		Insert Hyperlink to report:	N/A

d) Network Risks - DZ or DMA Risk Data (link to data: All DMAs & DZs by NM)				
Area Name / Code:	Discoloration Risk:	Air Risk:	PAH Risk:	Property Count:
Boyton Hall WR DZ	Low	Low	Low	2,132
Boyton Hall WT DZ	Low	Low	Low	12,274
Hundon WR DZ	Low	Low	Low	2,499
Total Property Count				**16,906**

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e) Are customer supplies going to be affected by this work before any restoration options are used?			**No**	If Yes please complete all boxes below		
Type of affect	X) Reduced Pressure	No	Y) Supply Interruption	No	Z) Change in WQ	No

RESTORATION OPTIONS (These options should be used to used to maintain the customers supplies)				
Is there a Rezone Option?	Yes/No		No. properties restored?	
Capture the details of the rezone (assets to be operated, locations, area affected). If no rezone option is available, explain why?				
Is there an overland option?	Yes/No		No. properties restored?	
Capture the details of the overland (assets to be operated, locations, area affected). If no overland option is available, explain why?				
Is there a tankering into supply Option?	Yes/No		No. properties restored?	
Capture the details of the tankers (assets to be operated, locations, area affected). If no tanker option is available, explain why?				
Can extra fittings/ line stops be installed to restore/maintain supplies?	Yes/No		No. properties restored?	
Capture the details of additional fittings (fittings required, locations, area affected). If no overland option is available, explain why?				

Capture the restoration option that is most suitable for this job in section 1f. This may be a combination of techniques. Include commentary in section 1f and actions in section 2a and 2c and follow relevant POSWSH procedures. Also capture any restoration option that may be required for contingency in section 3a.

Are customer supplies going to be affected by this work once restoration options have been implemented?			**No**	If Yes please complete all boxes below		
Type of affect	X) Reduced Pressure	No	Y) Supply Interruption	No	Z) Change in WQ	No

Number and type of properties affected by the activity following restoration implementation (X, Y or Z)				
Total Properties (a)	Domestic:		NON HOUSEHOLD **(see below)*****:	
	Key Accounts:		Special Needs / Water Care:	
	Inset Agreements / Exports:			

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Times customers warned:	Start		Finish			Total hours

*****IF THERE ARE NON HOUSEHOLD AFFECTED AFTER RESTORATION OPTIONS THEN WE MUST ENSURE THAT A DM/DMTS IS INFORMED TO FOLLOW THEIR PROCESS (ie DRAW POLYGON ON GALLERY AND ENSURE SPIDs ARE AWARE)**

If customer supplies are being interrupted you must include actions in section 2a to provide adequate warning and also to submit an 'Interruption Form' to the OMC. Potential interruption score calculated below. Any plans with a I2S event time in seconds > 1 second must be signed off by a band 4 manager.

Total Properties (a)		Expected Duration (hours) (b)		I2S Event Score (a x b)		I2S Event Seconds	

To calculate the ODI score and time open the 'Interruption to Supply ODI Calculator' held on HAWK

Customer Comms – Do we need to manage the customer experience and provide proactive communication?

OMS Phone System	No
Anglian Water Website	No
Pro-active Comms (auto messaging service)	No

If any of the above are Yes include fully detailed actions in sections 2a and / or 2c

f) Summarise the operational risks and how they are being controlled or mitigated?
(Refer to sections 1b, c, d, e, and 5b)

1. **Shutdown and water quality parameter checks and commissioning** - The new filter plant will be commissioned which include shutdown checks through to telemetry. (Confirmed by TF27 and 'sensor to screen' documentation provided by commissioning engineer). The checking of all digital signals and analogues will be completed by CE prior. The shutdowns will be witnessed before going into supply.
2. **Borehole faults and failures** –Great Wratting will be able to support storage points
3. **Sampling** – All new mains and components will have been subject to MIC sampling prior. These will be confirmed as 'passed' as per the preliminary actions below. In the event of a performance sample failure – Resamples will be required ASAP.
4. **Plant Faults/Failures** – Operations techs will have been briefed/trained on how to deal with the resetting of faults. This may require out of hours call outs
5. **Customers might experience change in WQ –** WQ testing carried out before going into supply.
6. **Disinfection failure risk** – The chlorine shutdowns will be witnessed for both pre contact tank and final water before going into supply. Post filter instruments are just monitoring only,
7. **Supernatant return failure** – The Turbidity alarm limits will be witnessed before going into supply, turbidity monitor (<20ntu) and flow restriction in place (max 10% return of flow). Currently set for 8hours settle period. If high turbidity is realised then the supernatant will not return and try again after another timer has expired, (currently set at 30 mins)

IRIS Mimics:

KEHRWW

Refer to any Risk Assessments used to determine the level of risk for this work

g) Are customers likely to be directly affected by the work in any other way?	If Yes please provide detail to mitigate this risk below and include any actions in sections 2a and 2c	
Increased traffic in the surrounding area	**No**	
Access issues to their property	**No**	
Excessive noise or out of hours work	**No**	
Anything else (please state)	**No**	

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Always aim to ensure customers affected by our work are very satisfied with our service

h) Are security risks increased by this work?	**No**	If Yes please provide detail to mitigate this risk below and include any actions in sections 2a and 2c
N/A		

2. METHODOLOGY OF WORK

DEVIATION FROM THIS PLAN CAN ONLY BE AUTHORISED BY THE OPERATIONAL OWNER OR OMC DUTY MANAGER

a) Preliminary work items (to be completed chronologically)

ALL PRELIM. ITEMS REQUIRED TO ENSURE SUCCESFULL DELIVERY OF THE TASK MUST BE DETAILED BELOW
'Site Check' column to be initialled, dated and timed on the site working copy as a record of actions

Item	Description	Day / Time	Action by	Site Check
1.	Book Technicians (NT / WT) required to support the job	5 Days prior	Assurance Engineer	
2.	Confirm all approvals have been received and that the plan has been allocated an approval number by the OMC TOM Team	3 Days prior	Assurance Engineer	
3.	Confirm planned date(s) to the OMC OSM Team to update the relevant planned work calendar and register at least three days in advance	3 Days prior	Alliance Commissioning Engineer	
4.	Site Schematic drawing is up to date with the new plant and valve numbers attached to chambers for easy identification	prior to into supply date	PDM	
5.	Sites cleaned and all equipment labelling in place. (Minimum temporary labels if P&I Tags not available)	prior to into supply date	Alliance Site team	
6.	Site access control handed over to Water Services and all door locks set to AW suite of keys.	prior into supply	Alliance Site team	
7.	Supply Manager to confirm, "Works is safe to operate".	prior to into supply date	Assurance Engineer / Supply Manager	
8.	Non-Conformance list - with agreed completion dates	prior to into supply date	Assurance Engineer / Supply Manager	
9.	SAP Database including maintenance scheduled plans completed. Confirmed that the WTW has been captured on routine activity database and asset tick sheets.	prior into supply	Assurance Manager Supply Manager	
10.	FDS and Control Philosophy to be confirmed as current so that a Site Operating Guide can be created	prior into supply	PDM/ Supply Manager	
11.	Blue box and documentation to be provided H&S file Sample point Routine activities	prior into supply	PDM/ Supply Manager	

	Coshh WOLFS Chemical delivery log, especially for the hypo delivery, to ensure the right grade etc is received Site Plan			
12.	Draft O&M Files available on site including: Draft 'As Built' drawings (paper copies) for comment Electrical certificates Instrument calibration & test certificates Pipework test certificates CCTV / swab records Lifting equipment test certificate Pressure vessel test certificates	prior into supply	PDM	
13.	Ensure **MIC form 3659** Part A and Part C is signed-off. Materials in contact sample test results for all new plant and onsite pipework, approvals where appropriate and handover performance samples (7 days) confirmed as approved by Risk Scientist **Performance sampling only tested and reviewed on capped flow (50l/s).** Water Quality Risk & Optimisation team to be informed of Into Supply date.	prior to into supply date	PDM Risk Scientist	
14.	Request approval from Network Manager for all new mains installed in the network as not covered in above. Confirm that samples have passed and that the main has been turned over.	Prior to into supply	Commissioning Engineer	
15.	Please ensure that the Lab sampling team are contacted as soon as the intended start date is known to ensure regulatory samples are taken. Contact should be made by email to the SSM@anglianwater.co.uk mailbox and by phone to the **Standby Sampling Manager** on **07808 884798.** If there is any change to the intended start date, please notify the Standby Sampling Manager by email and phone to this effect."	Prior to into supply	Commissioning Engineer	
16.	Sample plant outlet <7 days before into supply in accordance with procedure Installation, refurbishment, repair and commissioning of Water Compliance Sample Points. **Sample points:** W01KED CY (at Kedington WTW) W01KED CN (at inlet to Boyton WR) Sample points to be added to AUD2 dataset	5 Days prior to into supply	Lab sampler	
17.	The WTW including telemetry commissioned on water to waste. All Test / Commissioning sheets completed for Assets, available for reference with this MIP, and any software backups held by AWS Systems.	prior to into supply date	Alliance Commissioning Engineer	

	Reliability test will be completed after into supply as agreed with Supply Manager,			
18.	"Hands off" test satisfactorily completed as per agreed schedule, records available on site for reference with MIP.	prior to into supply date	Alliance Commissioning Engineer	
19.	Demonstrate plant operation including water quality shutdowns and power failure / restoration in accordance with FDS. Tests required to be agreed with Supply Manager prior to into supply date. • Confirm minimum and capped flow that the plant will be running at for the into supply requirements and make sure it has been WQ tested in this flow range. • Test supernatant (high turbidity) to ensure pumps don't discharge and waits further setpoint timer (30mins) • Test pre-contact CL2 shut down • Test final water CL2 (disinfection) shut down • Make sure sites are interlocked	prior to into supply date	Alliance Commissioning Engineer / Supply Manager	
20.	Confirm all water quality instrumentation and telemetry alarms are set in accordance with the WOLFs. WOLFs to be uploaded on HAWK prior to into supply.	Prior to into supply date	Alliance Commissioning Engineer / Supply Manager/ Risk scientist	
21.	Telemetry completion certificate TF27 and IRIS pictures on line and sensor to screen testing complete, to include historical logging. Operations to review IRIS and Alarm action codes set, to confirm agreement by email of any minor errors that can be completed in an agreed time frame	prior to into supply date	Alliance Commissioning Engineer / Supply Manager	
22.	Ensure Telemetry Applications are available on "Into Supply" date to make necessary alarms active/live and mimic change-overs.	Prior to into supply date	Alliance Commissioning Engineer	
23.	Operator training completed, Telemetry invited to attend training, including filter wash	Prior to into supply date	Alliance Commissioning Engineer	
24.	The PLC and HMI software changes made will have a current copy available on site once all mods are captured	prior to into supply date	Alliance Commissioning Engineer	

25.	Site meeting to be held before going into supply between AWS Water Operations and Alliance Project Team to confirm completion of preliminary actions as detailed above. Handover testing including handover performance sample results and plant operation agreed as satisfactory. Decision to be taken to progress to running into supply.	Prior to into supply	AWS Water Operations and Alliance Project Team	
26.	**Email Alarm Team Leader to be briefed as appropriate on the operating setup.** **Time Bound Notes created to state status of new WTW and communicated to the Alarm handler as required.**	prior to into supply date	Alliance Commissioning Engineer	
27.	Provide list of names and contact numbers of Alliance personnel covering 7-day reliability period and out of hours call-out.	Prior to into supply date	Alliance Commissioning Engineer	
28.	Supply and Network Managers to brief own team on the changes to normal operation, impact and contingency,.	Prior to into supply date	Operations	
29.	RSM to be informed of likely into supply date	X2 days prior to Into supply date	SM / SSM	
30.	Consult with the Strategic Planner (Water Supply) to ensure the relevant sample point certificates and sample point codes are generated and available on site. **Sample points:** W01KED CY (at Kedington WTW) W01KED CN (at inlet to Boyton WR)	Prior to into supply date	Commissioning Engineer	
31.	Arrange with the Strategic Planner (Water Supply) for the appropriate water quality commissioning samples to be collected.	Prior to into supply date	Commissioning Engineer	
32.	Establish flush time by measuring the time taken to obtain a constant temperature after the start of flushing	Prior to into supply date	Commissioning Engineer	
33.	Arrange with the Lab daily sampling for 7 days (performance testing into supply) from Kedington final water, borehole and the Kedington/Wratting blend. Starting on the day we go into supply. Required sampling listed in 5e.	Prior to into supply date	Commissioning Engineer	
34.	Sample the supernatant tank at min standing for turbidity and iron.	Prior to into supply date	Commissioning Engineer	
35.	Inform the Water Quality Reactive team regarding the affected downstream areas and Into Supply date as a precaution against any customer complaints. (Taste and Odour)	Prior to into supply date	Assurance Engineer	

THIS PLAN MUST BE AVAILABLE ON SITE AT THE TIME OF WORK

b) Telemetry Interaction:	
1. Annotations/Time bound notes – Do you require any annotations to be created for this work?	**No**
2. Monitoring – Do you require any points to be checked / monitored for this work?	**No**
3. Do you require any temporary alarm status changes for this work?	**No**
If any of the above are Yes include fully detailed actions in sections 2a and / or 2c	

c) Methodology of work(s) to be carried out (to be completed chronologically)

'Site Check' column to be initialled, dated and timed on the site working copy as a record of actions

All valve operations must be undertaken in accordance with guidance in PSW-PRO-1.15 Appendix 1

Item	Description	Day / Time	Action by	Site Check
1.	Confirm that all preliminary actions have been completed in section 2a above	Prior to start	WT /@ONE	
2.	Approval to proceed from the Regional Supply Manager and Director shall be sought prior to commencement of any work, having sent RSM a photograph / copy of prelim actions all signed off.	Prior to start	Supply Manager	
3.	Contact OMC OCM to confirm that there are no on-going issues that could affect the implementation of this plan Boyton Hall WT >60 % WT confirm with OCM all preliminary work has been completed and samples have passed.	Prior to start	WT	
4.	WT to confirm with Alarm Handler that they are on site.	Prior to start	WT	
5.	Ensure confirmation of clear sample results from the performance samples are available (as per 2a).	Prior to start	@one alliance Commissioning/ supply manager	
6.	Demonstrate new plant operation power failure / restoration in accordance with FDS to Supply manager	Prior to start	@one alliance Commissioning/ supply manager	
7.	Supply Manager & Commissioning Engineer to confirm that telemetry is active, and all alarm inhibits have been removed on KRHWW		@one alliance Commissioning/ supply manager	
8.	Supply Manager to confirm all other process set points.		@one alliance Commissioning/ supply manager	
9.	At Kedington: Undertake final check of the WTW (turbidity, clarity, chlorine and taste and odour) and confirm all water quality is within limits of WOLFs - record routine water quality instrument readings and record any manual test kit readings in ops log for reference. (i.e. Cl2 and turbidity)	On the day	WT	
10.	At Great Wratting: Undertake final check of the WTW (turbidity, clarity, chlorine and taste and odour) and record routine water quality instrument readings and record any manual test kit readings in ops log for reference. (i.e. Cl2 and turbidity)	On the day	WT	

11.	At Kedington: shutdown Boyton Hall highlift pumps,	On the day	WT	
12.	Close WO4	On the day	@one alliance Commissioning	
13.	Open SV 4 to allow Kedington highlift flow to Boyton Hall WR	On the day	@one alliance Commissioning	
14.	Adjust HMI settings: Reservoir level start / stop	On the day	@one alliance Commissioning	
15.	Return highlift pumps to auto control, ensuring they start as expected. Confirm after electrical mods that Gt Wratting starts up	On the day	@one alliance Commissioning	
16.	Monitor Kedington WTW for next two hours and confirm both works shutdown on WQ shutdown	On the day	@one alliance Commissioning/ Operations	
17.	At the Kedington/Wratting blend: Undertake WQ checks (turbidity, clarity, chlorine and taste and odour) and report anything unusual.	On the day	WT	
18.	Re start and Sample as per 5e Kedington BH Kedington WTW Blend water at Boyton WR **Repeat daily for 7 days.**	On the day	Lab sampler	
19.	Check with OMC Alarm handlers that no alarms are present for site and that any telemetry alarms are to be directed to AW operations as per coding. Advise OMC OCM that work is over, and plant is now on line.	End of work	WT	
Feedback	On completion of the work the plan author must confirm whether the plan was successful or provide details of any issues that occurred. Please reply with details to the 'Approval email' issued for the plan.			

d) Technician Resource requirements for the job (include prelim actions in 2a to book)		
Type	Detail skills required, and no. of Techs required	When Required
Networks Techs.	None,	
Supply Techs.	Works technician- any skill type	Pre and post work
All Technicians must be booked in advance via. the OMC Tactical Planning Team Note: The impact plan approval number will be required before a booking can be confirmed		

e) Plant and Material requirements for the job (include prelim actions in 2a to check)			
Item no	Description	Day / Time	Action by whom
1	Turbidity & Cl2 residual portable monitoring equipment	On day	WT

f) Contingency Plant and Material requirements (include prelim actions in 2a to check)			
Item no	Description	Day / Time	Action by whom
1	No plant and material needed although Contingency will be to isolate new plant and revert to running just on Gt Wratting WW.		@one alliance commissioning/ Operations

g) Details of plans and drawings attached to support this plan	
Ref	Description / Title
	See section 8

h) Keys required or access arrangement details?
None.

3. CONTINGENCIES

	a) Contingency Actions			
Item no	Action	No. Properties affected	Trigger Point	Action by
1	Failure of the Kedington BH would potentially impact PCV for metaldehyde if Great Wratting was able to run by itself without checking current samples. The levels are low enough at present to allow Great Wratting to run by itself to maintain storage at Boyton Hall and Hundon. The interlock between Kedington and Great Wratting could be inhibited upon agreement with the OCM-W. If there was a failure of the Great Wratting WTW then again the interlock with agreement could be inhibited to allow Kedington WTW on it's own, Iron is the only water quality concern when running on the Kedington BH. There is sand filtration on site to reduce this below the PCV.	16,906 potential for impact (Only if Gt. Wratting storage lost)	Pump Failure to Wixoe BH, WQ change, Burst mains	OMC/ @one alliance/ Operations
	Contingency Plant and Materials must be detailed in section 2f			

Name	Post Title	Mobile	Landline
OMC OCM	OMC Operational Control Manager - Water	[redacted]	
[redacted]	SM		
[redacted]	SSM		
[redacted]	NSM		
[redacted]	NSSM		
Duty Scientist			
[redacted]	Risk Scientist		

4. PERMITS

Are the following permits required?				
Permit or Card			Person Issuing Permit	2a / 2c Item
a	National Water Hygiene Card	No		
b	Site / Asset Access Authorisation (SAAA)	No		
c	Confined space Permit	No		
d	Electrical Permit	No		
e	Work at Height Permit	No		
f	Hot Works Permit	No		
g	Plant / Machinery Isolation Permit	No		
h	Mains Pressure Isolation Permit	No		
I	Highways Permits	No		
j	Other - Please state:			
If any of the above are Yes link to action items in sections 2a and / or 2c				

5. WATER QUALITY / ENVIRONMENTAL QUALITY CONSIDERATIONS

THIS PLAN MUST BE AVAILABLE ON SITE AT THE TIME OF WORK

a) All work must be undertaken in accordance with AWS policies and procedures. List which particular business standards and procedures are relevant to this work
e.g. PSW-POS-11.0 Policies and Standards for Personnel Hygiene and Training

[redacted]

b) Drinking Water Safety Plan Risks – Consult Risk Portal and if further guidance required consult Operational Science			
Are there any relevant Treatment Works or Supply Zone Risks highlighted by the risk portal?	Yes	If Yes detail risks below	Date checked March 2020
Kedington BH1 – iron red risk and turbidity amber risk – treatment downstream Wixoe BH 1 – amber metaldehyde risk – levels will be reviewed before work commence Great Wratting WTW – metaldehyde and coliforms amber risk			

c) Regulatory Sampling and Supply Assets removed from service			Refer to PSW-PRO-12.09
POSWSH sampling procedures must be complied with at all times without deviation. Any impact on regulatory or compliance sampling must be clearly identified and detailed in the risks in this plan			
Is an AUD2 required?	No	If Yes confirm sample point	N/A
If Yes include relevant sampling in section 5e below and all associated actions in sections 2a and 2c (include pre and post sampling, AUD2 completion and closure plus temporary labelling of sample taps)			

d) Materials in Contact (MIC) Sampling			Refer to PSW-PRO-3.01
Is MIC sampling required as part of this work?	no	If Yes confirm MK ref	
If Yes include relevant sampling in section 5e below and all associated actions in sections 2a and 2c (for PARTs A and B)			

e) Is sampling required for this work?		Yes	If Yes please provide full details below
The sampling requirements must fully comply with POSWSH without deviation and must be fully detailed below to provide a clearly defined sampling plan linked using item numbers to the preliminary and methodology sections (2a and 2c). Ensure sampling requirements for any restoration options are included as per sections 1e and 1f.			
Is an ARP (Analytical Request) required		No	If yes include an action in section 2a

Item No:	Location / description:	Loc - Type: (U/S or D/S)	Analysis: (eg. Bacti / *9)	Label: (eg. MF)	Who is sampling:
2c16	Kedington Borehole W01KED CV	US	Iron Turbidity	IM	Lab sampler

	Daily for 7 days				
2c16	Kedington WTW final sample W01KED CY Daily for 7 days	DS	Turbidity Conductivity Colour Iron Manganese Bacti – EC, TC and 2&3 day Clarity Qualitative odour Qualitative taste Quant taste Quantitative odour both 25C and 60C PO4 Temperature Calcium Alkalinity pH Conductivity Sodium Chloride Sulphate Nitrate Phosphate Dissolved Oxygen	IM	Lab sampler
2c16	Great Wratting / Kedington WTW blend W01KEN CN	DS	Qualitative odour Qualitative taste Quant taste Quantitative odour both 25C and 60C Daily sampling for 7 days Bacti – EC, TC and 2&3 day Metaldehyde Temperature Calcium Alkalinity pH Conductivity Sodium Chloride Sulphate Nitrate Phosphate Dissolved Oxygen Three times spread out over the 7 days	IM	Lab sampler
Link item no's above to actions in methodology sections 2a and 2c					

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f) Laboratory Liaison			
Are there any non-routine arrangements that need to be agreed with the laboratory (e.g. fast tracking / quantities)?:		No	If Yes provide details below
Item:	Details of arrangements / liaison:	Action by whom:	When:
If fast track analysis is required confirm reason:			

g) Pollution Risks, Controls and Discharge Consents	
For any activity that includes draining down or flushing water to waste a pollution risk assessment must be carried out (for each discharge point) and the discharge managed in accordance with PSW-POS-4.04 and 4.05. If in doubt consult the Environmental Permit Team about legal requirements.	
If drain or flush water is being run to waste for this task where will it discharge to	Via WO NGR TL 70033 47170 & TL 70014726
Is there a discharge consent or permit in place to support this work	Yes NPSWIA001746-01 & NPSWIA003710-01
If Yes confirm details and controls	Discharge will be monitored periodically for odour, clarity, turbidity, Chlorine and iron The consent shall consist of de-chlorinated potable water. A sample point shall be provided and maintained so that a representative sample of the discharge may be obtained. The total volume of the discharge shall not exceed 680,000 cubic meters with max daily volume <8,500cm at a rate of no more than 102l/s
If no include actions in section 2a to confirm requirements with Environmental Permit Team	

If specific risks have been highlighted please detail them below including all controls that will be put in place

Item	Description of issue and controls	Action by
1	Flooding to downstream catchment – ensure free flow of water from washout and as free as may be reasonably practicable from: a) mud and silt b) solid, polluting, offensive or injurious substances c) any substances prejudicial to fish or spawn, or to spawning beds or food of fish the rate of discharge shall be controlled to prevent any significant scouring of the bed or bankside of the receiving water. The Discharge shall not contain more than 50 milligrams per litre of suspended solids (measured after drying at 105 degrees Celsius). ii) The Discharge shall have a pH value of not less than 6 nor greater than 9. iii) The Discharge shall not contain more than 5000 micrograms per litre of Total Iron as Fe. iv) Chlorine <0.05 ppm The Consent shall cease to have effect on 25/4/2020	@one alliance

Any actions must be included and referenced in section 2a and 2c

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h) External Liaison	Detail below any actions relating to liaison with external parties (e.g. EA)		
External Contact	Details of liaison required or completed	Action by whom	Section 2a item
None	-	-	-

6. HEALTH AND SAFETY

'NOTHING IS SO IMPORTANT THAT WE CANNOT TAKE THE TIME TO DO IT SAFELY'

a) Supervision and Contractors		
Who is supervising the work on site	@One Site Manager/Supervisor	
Are Contractors being used to complete any part of this work?	yes	If Yes you must follow the 'Management of Contractors' procedures
Include an item in section 2a to receive and approve the Contractor Risk Assessments and Method Statements (RAMS)		

b) Safety Risk Assessments	All work must be carried out in accordance with AWS Safe and Well policies, procedures and model task risk assessments	
For any specific H&S risks that have been highlighted in planning this task please detail them below including all additional controls and site specific risk assessments that will put in place		
Item	Description of issue and controls	Action by
1	No health and safety risks have been identified that are not covered by AWS Safe and Well policies, procedures and model task risk assessments	WT
If applicable any items above must be referenced in sections 2a and 2c		

c) Specialist Safety Equipment required?	No	If Yes please complete boxes below
Appropriate PPE Equipment to be used	Who is supplying the equipment	By When
None	-	-

7. ASSET STATUS CHANGES

Are you making any permanent status changes to existing assets or creating new ones?	yes	If Yes ensure corporate data sets are updated
Data Type to be Updated	No	
GIS Mapping Data	Yes	
SAP Data	Yes	
Telemetry Picture modifications	Yes	
Operational Manual / Guide updates	Yes	
Network Model / MISER updates	No	
DWSP – Changes to Works or Supply Zones	Yes	
Regulatory Sample Points (consult Ops Scientist)	yes	
Other (please state)	No	
Inform Water Configuration Team of any new assets or asset status changes		

8. APPENDICES

Please attach all other relevant documentation to support this Impact Plan and list them below

Item	**Reference**	**Title**

THIS PLAN MUST BE AVAILABLE ON SITE AT THE TIME OF WORK

Layout (double click to open a separate PDF)

THIS PLAN MUST BE AVAILABLE ON SITE AT THE TIME OF WORK

[redacted]

Water Retaining Structure Internal Inspection Form

Regional Supply Area:	East
Supply Manager Area:	Colchester
Site Name:	KEDINGTON HAVERHILL ROAD WW
Site Short Name:	KEHRWW
MTL Information:	SAP No: 2328641. SAP Func: KEHRWW-1F-HYP-TS11-CHT001.
Tank Name:	CT ST1 Tnk1. (WTW side)
Inspection Date (dd/mm/yyyy)**:**	28.05.2021
Date of next inspection (dd/mm/yyyy) - if early check than normal frequency required:	
Inspection Reason:	Initial Inspection.
Clean Reason:	1 Year check after construction.
Impact Plan Number:	N/A - Tank not in supply
Inspected By:	[redacted]
Additional Information:	Above ground pre-cast concrete panel construction with in-situ infills. Precast concrete roof panels with concrete roof screed. External liquid roof coating applied by CRL. Finished with Gravel. Structure is made up of 2 Contact tanks and 2 Balance tanks making 2 Streams. Tank constructed by @one alliance 2019 to 2020 as part of the new Kedington WTW scheme. Access to top of tanks is via metal stairway. Handrailing is in place around tank. This CT weirs in to BT St1 Tnk1. Ct St1 Tnk1 and BT St1 Tnk1 can be inspected together while the works runs on the other CT/BT. (Please also refer to BT St1 Tnk1 inspection report)

To upload data onto the log press Ctrl U once form complete.

Question	Answer	Comments	Remedial Work / Action	Priority 1-3*	Action Management System Number
Tank Attributes					
What is the tanks jack head category?	N/A				
Is the tank hydraulically isolatable - can it be easily taken out of supply?	Yes	All 4 tanks are currently OOS for @one commissioning scheme of new dosing plant.			
Is there adjoining untreated water storage - above, to the side, passing through the tank?	No				
Is this an Ozone tank - if so which stage?	No				
Is the structure covered by the reservoir act (1975) - large raised reservoirs >25,000m3?	No				
Compartment Dimensions					
Storage volume - floor to overflow (m3)	202.64	Calculated from LengthXWidthXOverflow Height (Not excluding baffle walls)			
Operational volume - useable volume (m3)		Please refer to Site Operating Guide.			
Height of compartment (m)	2.82	Taken at centre of floor in lane 2.			
Width of compartment (m)	4.89				
Depth of compartment (m)	16	Length (End CT wall to BT dividing wall)			
Inlet height (m)	3.29	Inlet stack pipe.			
Outlet height (m)	1: WEIR to BT 2: Wash water	1:- Weir to BT St1 Tnk1 Weir is 2.36 AFL in lane 3 of CT. 2:- Filter wash water outlet in sump of lane 3.			
Overflow height (m)	IN BT.	No overflow in CT tank, Overflow located in BT. Overflow stack is 2.59 AFL.			
Overflow diameter (mm)		Please refer to BT St1 Tnk1 Report.			
Top water level - normal operation (m)		Please refer to Site Operating Guide.			
Bottom water level (m)		Please refer to Site Operating Guide.			

Tank Structure					
What material is the tank?	Other	Pre cast concrete panels with in-situ infills (FLI- Carlow)			
What's the type of membrane?	Liquid	Full liquid Aqualine membrane completed by CRL.			
If an earth embankment what type is it?	None				
What type of roof covering is there?	Gravel	Geo-textile covered with gravel.			
What's the type of support structure?	Other	Buried.			
Tank Roof					
Are there signs of leakage / ingress through roof?	No	No ingress noted on initial inundation test.			
Is there evidence of cracks in roof?	No	None noted at time of inspection.			
Is there evidence of discolouration / slime on internal roof?	No				
Are the roof joints / seals in satisfactory condition?	Yes	Visible day joints as roof is constructed from pre cast concrete panels.			
Is there evidence of standing or pooling water?	n/a	Full inundation test in progress.			
Is the roof drainage insufficient to clear all standing water?	n/a	Full inundation test in progress.			
Tank walls					
Are there signs of leakage / ingress through walls?	No	No ingress noted on initial inundation test.			
Is there evidence of cracks in walls?	No	None noted at time of inspection on internal walls. Some minor evidence of salting on external walls.			
Is there evidence of discolouration / slime on walls?	No				
Are the wall joints / seals in satisfactory condition?	No	External roof to wall joint has blown in some areas which has damaged the aqua-line coating and exposed the water-bar. However no ingress was noted at the roof/wall joint during the initial inundation test.	Recommend further investigation and complete all external repairs before final inspection.	2	Site team informed. (@one)

Tank floor					
Are there signs of leakage / ingress through floor?	No	No ingress noted on initial inundation test.			
Is there evidence of cracks in floor?	Yes	Minor crack on floor, crack can be followed across floor in all 3 lanes however no ingress was noted from crack.	Monitor on next inspection.	3	NOTE.
Is there evidence of discolouration / slime on floor?	No				
Was any material found in the tank / on the floor?	Yes	Minor amounts of expected deposits along with blue paint flakes.	To be removed ahead of final inspection/clean.		
Tank Support structure					
Are the roof supports in satisfactory condition?	Yes	Roof supported via outer walls and internal dividing/baffle walls.			
Tank Fittings / Pipework					
Are the internal fittings in satisfactory condition?	Yes				
Is the inlet pipework in satisfactory condition?	No	Low level pipe entry with internal stack pipe and bell mouth. 90 degree ducks foot bend supported on concrete plinth. Coating on inlet pipework showing signs of deterioration and blisters. Some small areas showing build up of rust around pipe flange.	Recommend completing further investigation to inlet pipework and complete any remedial work before final inspection.	1	Site team informed. (@one)
Is the outlet pipework in satisfactory condition?	Yes	Outlet to BT is letterbox type high level weir. Filter wash water outlet pipe is located within floor sump of lane 3 (Before the outlet weir)			
Is the overflow in satisfactory condition?	n/a	Located in BT, Please refer to BT St1 Tnk1 Report.			
Are the valves in satisfactory condition?	n/a	All valve are external to the tank.			
Are the ladders in satisfactory condition?	n/a	No fixed ladder. Mobile ladder must be used for internal inspection.			
Is the metalwork in satisfactory condition?	Yes				
Are the baffled walls / curtains in satisfactory condition?	Yes	X2 full height baffle walls to make 3 lanes. High level baffle wall in lane 1 next to inlet stack - forcing water under baffle into lane 1.			
Are the level probes in satisfactory condition?	Yes	Probes and ultrasonic level equipment in dedicated hatch located in lane 1.			

Are cable entry points sealed, in satisfactory condition and without evidence of ingress?	Yes	No ingress noted on initial inspection.			
Are there any other fittings / mountings with inadequate seals / sealant?	n/a				
Are any mixers in satisfactory working order / condition?	n/a				
Are any sample pumps in satisfactory working order / condition?	n/a				
Is there any redundant pipework or equipment connected to the tank?	No	Not aware of any.			
Access points					
Are all the hatch, covers or doors in satisfactory condition and working order?	Yes	X4 techno covers techno-covers installed.			
Are the seals in place and in satisfactory condition?	Yes				
Are the insect meshes in place and in satisfactory condition?	No	Some mesh has build up of rust causing larger holes to appear in mesh size.	Recommend replacing all insect mesh on all techno-covers before final inspection.	1	Site team informed. (@one)
Is the mesh an adequate size? (approx. 1mm or less)	No	As Above (line No 80)			
Is the membrane lapping around up stands in satisfactory condition?	Yes	Waterproof coating installed and no ingress noted on initial inundation test.			
Dedicated Air Vents					
Are the vents securely fixed undamaged and in good condition?	n/a	Vented through techno cover hatches.			
Are the insect meshes in place and in satisfactory condition?	n/a				
Is the mesh an adequate size? (approx. 1mm or less)	n/a				

Roof Saturation Test					
Was the roof saturation test satisfactory?	Yes	No ingress noted on roof or hatches during initial inundation test, However Tank is to remain OOS as per line No 54,57,64 and 80.	Carry out repairs as required to current AWS standards as per line 54,57,64, and 80. Complete inspection when repairs are completed.		
Other					
Are there any other issues to note? (add detail in comments box)	n/a				
Have actions been added to the Action Management System (AMS)?	n/a				

To upload data onto the tracker press Ctrl U. Also the form must be saved to the correct HAWK folder (see instruction tab)

[redacted]

Priority	Brief Rationale for Categorisation	Examples
Priority 1	Major Defect. Remedial work to be implemented before return to service or within 12 months if return to service is approved pending remedial work.	Ingress issue Significant Leak
Priority 2	Remedial work to be implemented before the next inspection.	Roof Drainage Minor Leak
Priority 3	Continue to monitor condition at next inspection.	Slippage Corrosion

Water Retaining Structure Internal Inspection Form

Regional Supply Area:	**East**
Supply Manager Area:	**Colchester**
Site Name:	**KEDINGTON HAVERHILL ROAD WW.**
Site Short Name:	**KEHRWW**
MTL Information:	**SAP No: 2328653. SAP Func: KEHRWW-1F-HYP-TS13-BNT001**
Tank Name:	**BT St1 Tnk1 (WTW Side)**
Inspection Date (dd/mm/yyyy):	**28.05.2021**
Date of next inspection (dd/mm/yyyy) - if early check than normal frequency required:	
Inspection Reason:	**Initial Inspection**
Clean Reason:	**1 year check after construction.**
Impact Plan Number:	**N/A - Tank not in supply.**
Inspected By:	[redacted]
Additional Information:	**Above ground pre-cast concrete panel construction with in-situ infills. Precast concrete roof panels with concrete roof screed. External liquid roof coating applied by CRL. Finished with Gravel. Structure is made up of 2 Contact tanks and 2 Balance tanks making 2 Streams. Tank constructed by @one alliance 2019 to 2020 as part of the new Kedington WTW scheme. Access to top of tanks is via metal stairway. Handrailing is in place around tank. CT St1 Tnk1 and BT St1 Tnk1 can be inspected together while the works runs on the other CT/BT. (Please also refer to CT St1 Tnk1 inspection report)**

To upload data onto the log press Ctrl U once form complete.

Question	Answer	Comments	Remedial Work / Action	Priority 1-3*	Action Management System Number
Tank Attributes					
What is the tanks jack head category?	N/A				
Is the tank hydraulically isolatable - can it be easily taken out of supply?	Yes	All 4 tanks are currently OOS for @one commissioning scheme of new dosing plant.			
Is there adjoining untreated water storage - above, to the side, passing through the tank?	No				
Is this an Ozone tank - if so which stage?	No				
Is the structure covered by the reservoir act (1975) - large raised reservoirs >25,000m3?	No				
Compartment Dimensions					
Storage volume - floor to overflow (m3)	101.14	Calculated from LengthXWidthXOverflow Height			
Operational volume - useable volume (m3)		Please refer to site operating guide.			
Height of compartment (m)	2.81	Taken at centre of tank.			
Width of compartment (m)	4.9				
Depth of compartment (m)	7.97	Length (End BT wall to Ct dividing wall)			
Inlet height (m)	Weir From CT.	High level weir inlet arrangement from CT St1 Tnk1.			
Outlet height (m)	In Sump In Floor	Outlet is located in sump constructed into the floor of the BT.			
Overflow height (m)	2.59	Overflow stack, Bell mouth 2.59 AFL			
Overflow diameter (mm)	450				
Top water level - normal operation (m)		Please refer to site operating guide.			
Bottom water level (m)		Please refer to site operating guide.			

Tank Structure					
What material is the tank?	Other	Pre cast concrete panels with in-situ infills (FLI- Carlow)			
What's the type of membrane?	Liquid	Full liquid Aqualine membrane completed by CRL.			
If an earth embankment what type is it?	None				
What type of roof covering is there?	Gravel	Geo-textile covered with gravel.			
What's the type of support structure?	Other	Buried.			
Tank Roof					
Are there signs of leakage / ingress through roof?	No	No ingress noted on initial inundation test.			
Is there evidence of cracks in roof?	No	None noted at time of inspection.			
Is there evidence of discolouration / slime on internal roof?	No				
Are the roof joints / seals in satisfactory condition?	Yes	Visible day joints as roof is constructed from pre cast concrete panels.			
Is there evidence of standing or pooling water?	n/a	Full inundation test in progress.			
Is the roof drainage insufficient to clear all standing water?	n/a	Full inundation test in progress.			
Tank walls					
Are there signs of leakage / ingress through walls?	No	No ingress noted on initial inundation test.			
Is there evidence of cracks in walls?	No	None noted at time of inspection on internal walls. Some minor evidence of salting on external walls.			
Is there evidence of discolouration / slime on walls?	No				
Are the wall joints / seals in satisfactory condition?	No	External roof to wall joint has blown in some areas which has damaged the aqua-line coating and exposed the water-bar. However no ingress was noted at the roof/wall joint during the initial inundation test. (As per CT St1 Tnk1)	Recommend further investigation and complete all external repairs before final inspection.	2	Site team informed. (@one)

Tank floor					
Are there signs of leakage / ingress through floor?	No	No ingress noted on initial inundation test.			
Is there evidence of cracks in floor?	No	None noted at time of inspection.			
Is there evidence of discolouration / slime on floor?	No				
Was any material found in the tank / on the floor?	Yes	Minor amounts of expected deposits along with small amount blue paint flakes.	To be removed ahead of final inspection/clean.		
Tank Support structure					
Are the roof supports in satisfactory condition?	No	Roof supported via outer walls and internal dividing/baffle walls.			
Tank Fittings / Pipework					
Are the internal fittings in satisfactory condition?	Yes				
Is the inlet pipework in satisfactory condition?	n/a	Concrete Weir from CT St1 Tnk1.			
Is the outlet pipework in satisfactory condition?	Yes	Outlet is located in sump constructed into the floor of the BT.			
Is the overflow in satisfactory condition?	No	Internal overflow stack pipe. 90 Degree ducks foot bend supported on concrete plinth. Overflow pipework is starting to deteriorate, similar to CT inlet pipework. (Please refer to CT St1 Tnk1 report)	Recommend completing further investigation to overflow pipework and complete any remedial work before final inspection.	1	Site team informed. (@one)
Are the valves in satisfactory condition?	n/a	All valves are external to the tank.			
Are the ladders in satisfactory condition?	n/a	No fixed ladder. Mobile ladder must be used for internal inspection.			
Is the metalwork in satisfactory condition?	Yes				
Are the baffled walls / curtains in satisfactory condition?	n/a				
Are the level probes in satisfactory condition?	Yes	Probes and ultrasonic level equipment in dedicated hatch.			
Are cable entry points sealed, in satisfactory condition and without evidence of ingress?	Yes	No ingress noted on initial inundation test.			

Are there any other fittings / mountings with inadequate seals / sealant?	n/a				
Are any mixers in satisfactory working order / condition?	n/a				
Are any sample pumps in satisfactory working order / condition?	n/a				
Is there any redundant pipework or equipment connected to the tank?	No	Not aware of any.			
Access points					
Are all the hatch, covers or doors in satisfactory condition and working order?	Yes	X3 techno covers techno-covers installed.			
Are the seals in place and in satisfactory condition?	Yes				
Are the insect meshes in place and in satisfactory condition?	No	Mesh has build up of rust causing larger holes to appear in mesh size.	Recommend replacing all insect mesh on all techno-covers before final inspection.	1	Site team informed. (@one)
Is the mesh an adequate size? (approx. 1mm or less)	No	As Above (line No 80)			
Is the membrane lapping around up stands in satisfactory condition?	Yes	Waterproof coating installed and no ingress noted on final construction inundation test.			
Dedicated Air Vents					
Are the vents securely fixed undamaged and in good condition?	n/a	Vented through techno cover hatches.			
Are the insect meshes in place and in satisfactory condition?	n/a				
Is the mesh an adequate size? (approx. 1mm or less)	n/a				

Roof Saturation Test					
Was the roof saturation test satisfactory?	Yes	No ingress noted on roof or hatches during initial inundation test, However Tank is to remain OOS as per line No 54,66 and 80.	Carry out repairs as required to current AWS standards as per line 54,66 and 80. Complete inspection when repairs are completed.		
Other					
Are there any other issues to note? (add detail in comments box)	n/a				
Have actions been added to the Action Management System (AMS)?	n/a				

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[redacted]

Priority	Brief Rationale for Categorisation	Examples
Priority 1	Major Defect. Remedial work to be implemented before return to service or within 12 months if return to service is approved pending remedial work.	Ingress issue Significant Leak
Priority 2	Remedial work to be implemented before the next inspection.	Roof Drainage Minor Leak
Priority 3	Continue to monitor condition at next inspection.	Slippage Corrosion

Water Retaining Structure Internal Inspection Form

Regional Supply Area:	East
Supply Manager Area:	Colchester
Site Name:	KEDINGTON HAVERHILL ROAD WW.
Site Short Name:	KEHRWW.
MTL Information:	SAP No: 2328647. Sap Func: KEHRWW-1F-HYP-TS12-CHT001.
Tank Name:	CT St1 Tnk2. (Field side)
Inspection Date (dd/mm/yyyy)**:**	28.05.2021
Date of next inspection (dd/mm/yyyy) - if early check than normal frequency required:	
Inspection Reason:	Initial Inspection.
Clean Reason:	1 Year check after construction.
Impact Plan Number:	N/A - Tank not in supply
Inspected By:	[redacted]
Additional Information:	Above ground pre-cast concrete panel construction with in-situ infills. Precast concrete roof panels with concrete roof screed. External liquid roof coating applied by CRL. Finished with Gravel. Structure is made up of 2 Contact tanks and 2 Balance tanks making 2 Streams. Tank constructed by @one alliance 2019 to 2020 as part of the new Kedington WTW scheme. Access to top of tanks is via metal stairway. Handrailing is in place around tank. This CT weirs in to BT St1 Tnk2. Ct St1 Tnk2 and BT St1 Tnk2 can be inspected together while the works runs on the other CT/BT. (Please also refer to BT St1 Tnk2 inspection report)

To upload data onto the log press Ctrl U once form complete.

Question	Answer	Comments	Remedial Work / Action	Priority 1-3*	Action Management System Number
Tank Attributes					
What is the tanks jack head category?	N/A				
Is the tank hydraulically isolatable - can it be easily taken out of supply?	Yes	All 4 tanks are currently OOS for @one commissioning scheme of new dosing plant.			
Is there adjoining untreated water storage - above, to the side, passing through the tank?	No				
Is this an Ozone tank - if so which stage?	No				
Is the structure covered by the reservoir act (1975) - large raised reservoirs >25,000m3?	No				
Compartment Dimensions					
Storage volume - floor to overflow (m3)	201.81	Calculated from LengthXWidthXOverflow Height (Not excluding baffle walls)			
Operational volume - useable volume (m3)		Please refer to Site Operating Guide.			
Height of compartment (m)	2.82	Taken at centre of floor in lane 2.			
Width of compartment (m)	4.87				
Depth of compartment (m)	16	Length (Rear CT wall to BT dividing wall)			
Inlet height (m)	3.29	Inlet stack pipe.			
Outlet height (m)	1: WEIR to BT 2: Wash water	1:- Weir to BT St1 Tnk2 Weir is 2.36 AFL in lane 3 of CT. 2:- Filter wash water outlet in sump of lane 3.			
Overflow height (m)	IN BT.	No overflow in CT tank, Overflow located in BT. Overflow stack is 2.59 AFL.			
Overflow diameter (mm)		Please refer to BT St1 Tnk2 Report.			
Top water level - normal operation (m)		Please refer to Site Operating Guide.			
Bottom water level (m)		Please refer to Site Operating Guide.			

Tank Structure					
What material is the tank?	Other	Pre cast concrete panels with in-situ infills (FLI- Carlow)			
What's the type of membrane?	Liquid	Full liquid Aqualine membrane completed by CRL.			
If an earth embankment what type is it?	None				
What type of roof covering is there?	Gravel	Geo-textile covered with gravel.			
What's the type of support structure?	Other	Buried.			
Tank Roof					
Are there signs of leakage / ingress through roof?	No	No ingress noted on initial inundation test.			
Is there evidence of cracks in roof?	No	None noted at time of inspection.			
Is there evidence of discolouration / slime on internal roof?	No				
Are the roof joints / seals in satisfactory condition?	Yes	Visible day joints as roof is constructed from pre cast concrete panels.			
Is there evidence of standing or pooling water?	n/a	Full inundation test in progress.			
Is the roof drainage insufficient to clear all standing water?	n/a	Full inundation test in progress.			
Tank walls					
Are there signs of leakage / ingress through walls?	No	No ingress noted on initial inundation test.			
Is there evidence of cracks in walls?	No	None noted at time of inspection on internal walls. Some minor evidence of salting on external walls.			
Is there evidence of discolouration / slime on walls?	No				
Are the wall joints / seals in satisfactory condition?	No	External roof to wall joint has blown in some areas which has damaged the aqua-line coating and exposed the water-bar. However no ingress was noted at the roof/wall joint during the initial inundation test.	Recommend further investigation and complete all external repairs before final inspection.	2	Site team informed. (@one)

Tank floor					
Are there signs of leakage / ingress through floor?	No	No ingress noted on initial inundation test.			
Is there evidence of cracks in floor?	Yes	Minor crack on floor, crack can be followed across floor in all 3 lanes however no ingress was noted from crack.	Monitor on next inspection.	3	NOTE.
Is there evidence of discolouration / slime on floor?	No				
Was any material found in the tank / on the floor?	Yes	Minor amounts of expected deposits along with blue paint flakes.	To be removed ahead of final inspection/clean.		
Tank Support structure					
Are the roof supports in satisfactory condition?	Yes	Roof supported via outer walls and internal dividing/baffle walls.			
Tank Fittings / Pipework					
Are the internal fittings in satisfactory condition?	Yes				
Is the inlet pipework in satisfactory condition?	No	Low level pipe entry with internal stack pipe and bell mouth. 90 degree ducks foot bend supported on concrete plinth. Coating on inlet pipework showing signs of deterioration and blisters. Some small areas showing build up of rust around pipe flange.	Recommend completing further investigation to inlet pipework and complete any remedial work before final inspection.	1	Site team informed. (@one)
Is the outlet pipework in satisfactory condition?	Yes	Outlet to BT is letterbox type high level weir. Filter wash water outlet pipe is located within floor sump of lane 3 (Before the outlet weir)			
Is the overflow in satisfactory condition?	n/a	Located in BT, Please refer to BT St1 Tnk2 Report.			
Are the valves in satisfactory condition?	n/a	All valve are external to the tank.			
Are the ladders in satisfactory condition?	n/a	No fixed ladder. Mobile ladder must be used for internal inspection.			
Is the metalwork in satisfactory condition?	Yes				
Are the baffled walls / curtains in satisfactory condition?	Yes	X2 full height baffle walls to make 3 lanes. High level baffle wall in lane 1 next to inlet stack - forcing water under baffle into lane 1.			

Are the level probes in satisfactory condition?	Yes	Probes and ultrasonic level equipment in dedicated hatch located in lane 1.			
Are cable entry points sealed, in satisfactory condition and without evidence of ingress?	Yes	No ingress noted on initial inspection.			
Are there any other fittings / mountings with inadequate seals / sealant?	n/a				
Are any mixers in satisfactory working order / condition?	n/a				
Are any sample pumps in satisfactory working order / condition?	n/a				
Is there any redundent pipework or equipment connected to the tank?	No	Not aware of any.			
Access points					
Are all the hatch, covers or doors in satisfactory condition and working order?	Yes	X4 techno covers techno-covers installed.			
Are the seals in place and in satisfactory condition?	Yes				
Are the insect meshes in place and in satisfactory condition?	No	Some mesh has build up of rust causing larger holes to appear in mesh size.	Recommend replacing all insect mesh on all techno-covers before final inspection.	1	Site team informed. (@one)
Is the mesh an adequate size? (approx. 1mm or less)	No	As Above (line No 80)			
Is the membrane lapping around up stands in satisfactory condition?	Yes	Waterproof coating installed and no ingress noted on initial inundation test.			
Dedicated Air Vents					
Are the vents securely fixed undamaged and in good condition?	n/a	Vented through techno cover hatches.			
Are the insect meshes in place and in satisfactory condition?	n/a				
Is the mesh an adequate size? (approx. 1mm or less)	n/a				

Roof Saturation Test					
Was the roof saturation test satisfactory?	Yes	No ingress noted on roof or hatches during initial inundation test, However Tank is to remain OOS as per line No 54,57,64 and 80.	Carry out repairs as required to current AWS standards as per line 54,57,64, and 80. Complete inspection when repairs are completed.		
Other					
Are there any other issues to note? (add detail in comments box)	n/a				
Have actions been added to the Action Management System (AMS)?	n/a				

To upload data onto the tracker press Ctrl U. Also the form must be saved to the correct HAWK folder (see instruction tab)

[redacted]

Priority	Brief Rationale for Categorisation	Examples
Priority 1	Major Defect. Remedial work to be implemented before return to service or within 12 months if return to service is approved pending remedial work.	Ingress issue Significant Leak
Priority 2	Remedial work to be implemented before the next inspection.	Roof Drainage Minor Leak
Priority 3	Continue to monitor condition at next inspection.	Slippage Corrosion

Water Retaining Structure Internal Inspection Form

Regional Supply Area:	**East**
Supply Manager Area:	**Colchester**
Site Name:	**KEDINGTON HAVERHILL ROAD WW.**
Site Short Name:	**KEHRWW.**
MTL Information:	**SAP No: 2328660. SAP Func: KEHRWW-1F-HYP-TS14-BNT001.**
Tank Name:	**BT St1 Tnk2. (Field side)**
Inspection Date (dd/mm/yyyy):	**28.05.2021**
Date of next inspection (dd/mm/yyyy) - if early check than normal frequency required:	
Inspection Reason:	**Initial Inspection.**
Clean Reason:	**1 year check after construction.**
Impact Plan Number:	**N/A - Tank not in supply.**
Inspected By:	[redacted]
Additional Information:	**Above ground pre-cast concrete panel construction with in-situ infills. Precast concrete roof panels with concrete roof screed. External liquid roof coating applied by CRL. Finished with Gravel. Structure is made up of 2 Contact tanks and 2 Balance tanks making 2 Streams. Tank constructed by @one alliance 2019 to 2020 as part of the new Kedington WTW scheme. Access to top of tanks is via metal stairway. Handrailing is in place around tank. CT St1 Tnk2 and BT St1 Tnk2 can be inspected together while the works runs on the other CT/BT. (Please also refer to CT St1 Tnk2 inspection report)**

To upload data onto the log press Ctrl U once form complete.

Question	Answer	Comments	Remedial Work / Action	Priority 1-3*	Action Management System Number
Tank Attributes					
What is the tanks jack head category?	N/A				
Is the tank hydraulically isolatable - can it be easily taken out of supply?	Yes	All 4 tanks are currently OOS for @one commissioning scheme of new dosing plant.			
Is there adjoining untreated water storage - above, to the side, passing through the tank?	No				
Is this an Ozone tank - if so which stage?	No				
Is the structure covered by the reservoir act (1975) - large raised reservoirs >25,000m3?	No				
Compartment Dimensions					
Storage volume - floor to overflow (m3)	101.32	Calculated from LengthXWidthXOverflow Height			
Operational volume - useable volume (m3)		Please refer to site operating guide.			
Height of compartment (m)	2.82	Taken at centre of tank.			
Width of compartment (m)	4.89				
Depth of compartment (m)	8	Length (End BT wall to CT dividing wall)			
Inlet height (m)	Weir from CT	High level weir inlet arrangement from CT St1 Tnk2.			
Outlet height (m)	In Sump In Floor	Outlet is located in sump constructed into the floor of the BT.			
Overflow height (m)	2.59	Overflow stack, Bell mouth 2.59 AFL			
Overflow diameter (mm)	450				
Top water level - normal operation (m)		Please refer to site operating guide.			
Bottom water level (m)		Please refer to site operating guide.			

Tank Structure					
What material is the tank?	Other	Pre cast concrete panels with in-situ infills (FLI- Carlow)			
What's the type of membrane?	Liquid	Full liquid Aqualine membrane completed by CRL.			
If an earth embankment what type is it?	None				
What type of roof covering is there?	Gravel	Geo-textile covered with gravel.			
What's the type of support structure?	Other	Buried.			
Tank Roof					
Are there signs of leakage / ingress through roof?	No	No ingress noted on initial inundation test.			
Is there evidence of cracks in roof?	No	None noted at time of inspection.			
Is there evidence of discolouration / slime on internal roof?	No				
Are the roof joints / seals in satisfactory condition?	Yes	Visible day joints as roof is constructed from pre cast concrete panels.			
Is there evidence of standing or pooling water?	n/a	Full inundation test in progress.			
Is the roof drainage insufficient to clear all standing water?	n/a	Full inundation test in progress.			
Tank walls					
Are there signs of leakage / ingress through walls?	No	No ingress noted on initial inundation test.			
Is there evidence of cracks in walls?	No	None noted at time of inspection on internal walls. Some minor evidence of salting on external walls.			
Is there evidence of discolouration / slime on walls?	No				
Are the wall joints / seals in satisfactory condition?	No	External roof to wall joint has blown in some areas which has damaged the aqua-line coating and exposed the water-bar. However no ingress was noted at the roof/wall joint during the initial inundation test. (As per CT St1 Tnk2)	Recommend further investigation and complete all external repairs before final inspection.	2	Site team informed. (@one)

Tank floor					
Are there signs of leakage / ingress through floor?	No	No ingress noted on initial inundation test.			
Is there evidence of cracks in floor?	No	None noted at time of inspection.			
Is there evidence of discolouration / slime on floor?	No				
Was any material found in the tank / on the floor?	Yes	Minor amounts of expected deposits along with small amount blue paint flakes.	To be removed ahead of final inspection/clean.		
Tank Support structure					
Are the roof supports in satisfactory condition?	No	Roof supported via outer walls and internal dividing/baffle walls.			
Tank Fittings / Pipework					
Are the internal fittings in satisfactory condition?	Yes				
Is the inlet pipework in satisfactory condition?	n/a	Concrete Weir from CT St1 Tnk2.			
Is the outlet pipework in satisfactory condition?	Yes	Outlet is located in sump constructed into the floor of the BT.			
Is the overflow in satisfactory condition?	No	Internal overflow stack pipe. 90 Degree ducks foot bend supported on concrete plinth. Overflow pipework is starting to deteriorate, similar to CT inlet pipework. (Please refer to CT St1 Tnk2 report)	Recommend completing further investigation to overflow pipework and complete any remedial work before final inspection.	1	Site team informed. (@one)
Are the valves in satisfactory condition?	n/a	All valves are external to the tank.			
Are the ladders in satisfactory condition?	n/a	No fixed ladder. Mobile ladder must be used for internal inspection.			
Is the metalwork in satisfactory condition?	Yes				
Are the baffled walls / curtains in satisfactory condition?	n/a				
Are the level probes in satisfactory condition?	Yes	Probes and ultrasonic level equipment in dedicated hatch.			
Are cable entry points sealed, in satisfactory condition and without evidence of ingress?	Yes	No ingress noted on initial inundation test.			

Are there any other fittings / mountings with inadequate seals / sealant?	n/a				
Are any mixers in satisfactory working order / condition?	n/a				
Are any sample pumps in satisfactory working order / condition?	n/a				
Is there any redundent pipework or equipment connected to the tank?	No	Not aware of any.			
Access points					
Are all the hatch, covers or doors in satisfactory condition and working order?	Yes	X3 techno covers techno-covers installed.			
Are the seals in place and in satisfactory condition?	Yes				
Are the insect meshes in place and in satisfactory condition?	No	Mesh has build up of rust causing larger holes to appear in mesh size.	Recommend replacing all insect mesh on all techno-covers before final inspection.	1	Site team informed. (@one)
Is the mesh an adequate size? (approx. 1mm or less)	No	As Above (line No 80)			
Is the membrane lapping around up stands in satisfactory condition?	Yes	Waterproof coating installed and no ingress noted on initial inundation test.			
Dedicated Air Vents					
Are the vents securely fixed undamaged and in good condition?	n/a	Vented through techno cover hatches.			
Are the insect meshes in place and in satisfactory condition?	n/a				
Is the mesh an adequate size? (approx. 1mm or less)	n/a				

Roof Saturation Test					
Was the roof saturation test satisfactory?	Yes	No ingress noted on roof or hatches during initial inundation test, However Tank is to remain OOS as per line No 54,66 and 80.	Carry out repairs as required to current AWS standards as per line 54,66 and 80. Complete inspection when repairs are completed.		
Other					
Are there any other issues to note? (add detail in comments box)	n/a				
Have actions been added to the Action Management System (AMS)?	n/a				

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[redacted]

Priority	Brief Rationale for Categorisation	Examples
Priority 1	Major Defect. Remedial work to be implemented before return to service or within 12 months if return to service is approved pending remedial work.	Ingress issue Significant Leak
Priority 2	Remedial work to be implemented before the next inspection.	Roof Drainage Minor Leak
Priority 3	Continue to monitor condition at next inspection.	Slippage Corrosion

Thurmaston Boulevard, Leicester, LE4 9HS
Tel 0116 2742222 Fax 0116 2743333 email technical@isf.co.uk

QD8 (Fast Cure Compliant) Enamel

FEATURES

- Fast drying due to its unique 'short oil alkyd' technology
- Good opacity with excellent adhesion and Anti corrosion properties
- Conforms to **ISO 12944-6** and is **Certified Class C3: (Low)**
- Developed to be used Direct or as a 'Coat on Coat' system

USES

Interior and exterior metal work

TOPCOAT

QD8-6-AA000-005	QD8 (Fast Dry Comp) Enamel Promatch
QD8-6-AA0ME-005	QD8 (Fast Dry Comp) Enamel Promatch Metallic
QD8-6-AS000-005	QD8 (Fast Dry Comp) Enamel Promatch SPECIAL

THINNER FOR SYSTEM

QDT-9-TH0xx-005 No 99 QAD Thinners or No 31 Retarder Thinners

CLEANER FOR SUBSTRATE

CL2-9-TH040-005 No 40 Solvent Degreaser

CLEANER FOR EQUIPMENT

CL2-9-TH020-005 ISF Spray Gun & Brush Cleaner

APPLICATION EQUIPMENT

Conventional airless / airmix spray equipment or Brushing.

APPLICATION

Please ensure substrate is clean using a suitable degreaser: Recommended No 40 Degreaser. If thinners required, add No 99 QDT Thinners up to 10% by volume. In normal ambient air temperatures, QD8 Enamel will be hard dry to handle after 4 hours but this process may be accelerated by heating with good airflow - temperatures between 50c-70c are advised for 20 minutes, after an initial 15-minute flash off period. No 31 Retarder Thinners may be used by up to 10% volume to reduce the drying times if necessary but not normally required.

FURTHER INFORMATION

Environmental Considerations: Please ensure the product is applied in temperatures above 10c. Applications below this temperature would mean the solvents will not be able to evaporate correctly, this could then lead to the product "blocking out" (not drying). If applying the product in high salt environments it is recommended that a DFT of 300 microns' minimum (top coat & primer combined) is applied. Do not apply to wet or damp surfaces, all damp areas must be fully dried before being painted. May be used as a O.C.F (one coat finish) via AIRLESS application - recommended tip size 1.7. Ideal product for AIRLESS application where a minimum 150 DFT is required for exterior use, can be applied up to 1mm thick without sagging or running.

This coating system complies with international VOC guidelines.

Coverage 575	Touch Dry	Recoat Time	Max Resistance	Pot Life	Mix Ratio	Shelf Life	Pack Size
8-10 Sq.m/lt	15-20 mins	60 mins	7 Days	N/A	N/A	12 months	1, 5 & 25lt

95/17

SAFETY DATA SHEET

QD8 (FAST CURE COMPLIANT) ENAMEL PROMATCH

Compilation date: 05/04/2017

Revision date: 29/03/2021

Revision No: 2

Section 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name: QD8 (FAST CURE COMPLIANT) ENAMEL PROMATCH

Product code: QD8-6-20477

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of substance / mixture: PC9a: Coatings and paints, thinners, paint removers.

1.3. Details of the supplier of the safety data sheet

Company name: ISF Group Limited
350 Thurmaston Boulevard
Leicester
LE4 9HS
United Kingdom

Tel: +44 (0)116 274 2222

Fax: +44 (0)116 274 3333

Email: healthandsafety@isf.co.uk

1.4. Emergency telephone number

Emergency tel: +44 (0)116 274 2222
Poison centre contact:
England & Wales : NHS 111 - dial 111
Scotland : NHS 24 - dial 111
Republic of Ireland : Beaumont Hospital, Beaumont Road, Dublin 9, ROI.
dial +353 (0) 1 809 2566

Section 2: Hazards identification

2.1. Classification of the substance or mixture

Classification under CLP: Flam. Liq. 3: H226; Skin Irrit. 2: H315

Most important adverse effects: Flammable liquid and vapour. Causes skin irritation.

2.2. Label elements

Label elements:

Hazard statements: H226: Flammable liquid and vapour.
H315: Causes skin irritation.

Hazard pictograms: GHS02: Flame
GHS07: Exclamation mark

[cont...]

Signal words: Warning

Precautionary statements: P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

P241: Use explosion-proof electrical/ventilating/lighting/... equipment.

P280: Wear protective gloves/protective clothing/eye protection/face protection.

P302+P352: IF ON SKIN: Wash with plenty of water.

P303+P361+P353: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water .

P321: Specific treatment (see instructions on this label)

2.3. Other hazards

Other hazards: In use, may form flammable / explosive vapour-air mixture.

PBT: This product is not identified as a PBT/vPvB substance.

Section 3: Composition/information on ingredients

3.2. Mixtures

Hazardous ingredients:

XYLENE

EINECS	CAS	PBT / WEL	CLP Classification	Percent
215-535-7	1330-20-7	-	Flam. Liq. 3: H226; Acute Tox. 4: H332; Acute Tox. 4: H312; Skin Irrit. 2: H315	30-50%

Section 4: First aid measures

4.1. Description of first aid measures

Skin contact: Remove all contaminated clothes and footwear immediately unless stuck to skin. Wash immediately with plenty of soap and water.

Eye contact: Bathe the eye with running water for 15 minutes. Consult a doctor.

Ingestion: Wash out mouth with water. Consult a doctor.

Inhalation: Remove casualty from exposure ensuring one's own safety whilst doing so. Consult a doctor.

4.2. Most important symptoms and effects, both acute and delayed

Skin contact: There may be irritation and redness at the site of contact.

Eye contact: There may be irritation and redness. The eyes may water profusely.

Ingestion: There may be soreness and redness of the mouth and throat.

Inhalation: There may be irritation of the throat with a feeling of tightness in the chest. Exposure may cause coughing or wheezing.

Delayed / immediate effects: Immediate effects can be expected after short-term exposure.

4.3. Indication of any immediate medical attention and special treatment needed

Immediate / special treatment: Eye bathing equipment should be available on the premises.

Section 5: Fire-fighting measures

5.1. Extinguishing media

Extinguishing media: Alcohol resistant foam. Water spray. Carbon dioxide. Dry chemical powder. Use water spray to cool containers.

5.2. Special hazards arising from the substance or mixture

Exposure hazards: Flammable. In combustion emits toxic fumes. Forms explosive air-vapour mixture.

5.3. Advice for fire-fighters

Advice for fire-fighters: Wear self-contained breathing apparatus. Wear protective clothing to prevent contact with skin and eyes.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions: Refer to section 8 of SDS for personal protection details. If outside do not approach from downwind. If outside keep bystanders upwind and away from danger point. Mark out the contaminated area with signs and prevent access to unauthorised personnel. Turn leaking containers leak-side up to prevent the escape of liquid. Eliminate all sources of ignition.

6.2. Environmental precautions

Environmental precautions: Do not discharge into drains or rivers. Contain the spillage using bunding.

6.3. Methods and material for containment and cleaning up

Clean-up procedures: Absorb into dry earth or sand. Transfer to a closable, labelled salvage container for disposal by an appropriate method. Do not use equipment in clean-up procedure which may produce sparks.

6.4. Reference to other sections

Reference to other sections: Refer to section 8 of SDS.

Section 7: Handling and storage

7.1. Precautions for safe handling

Handling requirements: Avoid direct contact with the substance. Ensure there is sufficient ventilation of the area. Do not handle in a confined space. Avoid the formation or spread of mists in the air. Smoking is forbidden. Use non-sparking tools.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions: Store in a cool, well ventilated area. Keep container tightly closed. Keep away from sources of ignition. Prevent the build up of electrostatic charge in the immediate area. Ensure lighting and electrical equipment are not a source of ignition.

7.3. Specific end use(s)

Specific end use(s): No data available.

Section 8: Exposure controls/personal protection

8.1. Control parameters

Hazardous ingredients:

XYLENE

Workplace exposure limits: **Respirable dust:**

State	8 hour TWA	15 min. STEL	8 hour TWA	15 min. STEL
UK	220 mg/m3	441 mg/m3	-	-

DNEL/PNEC Values

DNEL / PNEC No data available.

8.2. Exposure controls

Engineering measures: Ensure there is sufficient ventilation of the area. Ensure lighting and electrical equipment are not a source of ignition.

Respiratory protection: Self-contained breathing apparatus must be available in case of emergency.

Hand protection: Protective gloves.

Eye protection: Safety glasses. Ensure eye bath is to hand.

Skin protection: Protective clothing.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

State: Liquid

Colour: Various

Odour: Characteristic odour

Evaporation rate: No data available.

Oxidising: No data available.

Solubility in water: No data available.

Viscosity: Viscous

Boiling point/range°C: No data available.

Melting point/range°C: No data available.

Flammability limits %: lower: No data available.

upper: No data available.

Flash point°C: 23 - 60

Part.coeff. n-octanol/water: No data available.

Autoflammability°C: No data available.

Vapour pressure: No data available.

Relative density: 1.03

pH: No data available.

VOC g/l: 390

9.2. Other information

Other information: Solid Weight : 62% +/- 2% Dependant of Colour

Section 10: Stability and reactivity

10.1. Reactivity

Reactivity: Stable under recommended transport or storage conditions.

10.2. Chemical stability

Chemical stability: Stable under normal conditions. Stable at room temperature.

10.3. Possibility of hazardous reactions

Hazardous reactions: Hazardous reactions will not occur under normal transport or storage conditions.

Decomposition may occur on exposure to conditions or materials listed below.

10.4. Conditions to avoid

Conditions to avoid: Heat. Hot surfaces. Sources of ignition. Flames.

10.5. Incompatible materials

Materials to avoid: Strong oxidising agents. Strong acids.

10.6. Hazardous decomposition products

Haz. decomp. products: In combustion emits toxic fumes.

Section 11: Toxicological information

11.1. Information on toxicological effects

Hazardous ingredients:

XYLENE

ORL	MUS	LD50	2119	mg/kg
ORL	RAT	LD50	4300	mg/kg
SCU	RAT	LD50	1700	mg/kg

Relevant hazards for product:

Hazard	Route	Basis
Skin corrosion/irritation	DRM	Hazardous: calculated

Symptoms / routes of exposure

Skin contact: There may be irritation and redness at the site of contact.

Eye contact: There may be irritation and redness. The eyes may water profusely.

Ingestion: There may be soreness and redness of the mouth and throat.

Inhalation: There may be irritation of the throat with a feeling of tightness in the chest. Exposure may cause coughing or wheezing.

Delayed / immediate effects: Immediate effects can be expected after short-term exposure.

Section 12: Ecological information

12.1. Toxicity

Ecotoxicity values: No data available.

12.2. Persistence and degradability

Persistence and degradability: Biodegradable.

12.3. Bioaccumulative potential

Bioaccumulative potential: No bioaccumulation potential.

12.4. Mobility in soil

Mobility: Readily absorbed into soil.

12.5. Results of PBT and vPvB assessment

PBT identification: This product is not identified as a PBT/vPvB substance.

12.6. Other adverse effects

Other adverse effects: Negligible ecotoxicity.

Section 13: Disposal considerations

13.1. Waste treatment methods

Disposal operations: Transfer to a suitable container and arrange for collection by specialised disposal company.

NB: The user's attention is drawn to the possible existence of regional or national regulations regarding disposal.

Section 14: Transport information

14.1. UN number

UN number: UN1263

14.2. UN proper shipping name

Shipping name: PAINT

14.3. Transport hazard class(es)

Transport class: 3

14.4. Packing group

Packing group: II

14.5. Environmental hazards

Environmentally hazardous: No **Marine pollutant:** No

14.6. Special precautions for user

Special precautions: No special precautions.

Tunnel code: D/E

Transport category: 2

Section 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

Specific regulations: Not applicable.

15.2. Chemical Safety Assessment

Chemical safety assessment: A chemical safety assessment has not been carried out for the substance or the mixture by the supplier.

Section 16: Other information

Other information

Other information: This safety data sheet is prepared in accordance with Commission Regulation (EU) No 2015/830.

* indicates text in the SDS which has changed since the last revision.

Phrases used in s.2 and s.3: H226: Flammable liquid and vapour.

H312: Harmful in contact with skin.

H315: Causes skin irritation.

H332: Harmful if inhaled.

Legal disclaimer: The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. This company shall not be held liable for any damage resulting from handling or from contact with the above product.

UKWIR/WRc Toxicity Datasheet

Xylene

IUPAC chemical name:	Dimethylbenzene
CAS Reg Number:	1330-20-7 (Xylene mixture), 95-47-6 (o-Xylene), 108-38-3 (m-Xylene), 106-42-3 (p-Xylene)
Substance ID Number:	1307 (both: xylenes, flash point <23°C; and xylenes, flash point 23°C or above)
Emergency Action Code:	3[Y]E (xylenes, flash point <23°C); 3[Y] (xylenes, flash point 23°C or above)
Alternative Chemical Names:	DIMETHYLBENZENE, METHYLTOLUENE, XYLENE, XYLOL,
Date Last Reviewed:	20/08/2019

Synopsis

Xylene is a hydrocarbon that exists as three isomers: *ortho-, meta-* and *para-xylene (o-, m- and p-xylene*; also referred to as 1,2-, 1,3- and 1,4-dimethylbenzene, respectively). Mixed isomers of xylene may also contain other contaminants, including ethylbenzene (A Toxicity Datasheet is available on Ethylbenzene).

The data presented in this Toxicity Datasheet are summarised in the table below.

Occurrences & Uses	
Xylenes are found naturally in coal tar and petroleum, and are blended into gasoline. They are also used in chemical manufacture and have a number of solvent applications.	
Taste and odour properties	
Xylene has been described as having a 'sweet' or 'aromatic' odour. The odour threshold in water ranges from 0.02-1.8 mg/l.	
Emergencies and SNARLs	
24-hour health-based SNARL	5.4 mg/l (5400 µg/l)
7-day health-based SNARL	2.7 mg/l (2700 µg/l)
Operational SNARL	0.02 mg/l (20 µg/l)
Additional SNARL considerations (e.g. consideration of bathing and showering)	

Xylenes are volatile. Exposure to pollutants in drinking water may include inhalation of droplets containing volatile substances or dermal absorption during bathing and showering. In most cases, there is insufficient information to permit the reliable assessment of exposure by inhalation and dermal absorption. However, the conservatism and default allocation used in the derivation of SNARLs should be sufficient to allow for these additional routes of exposure.

Removal during (drinking water) treatment

Some removal of xylene is expected by sorption to activated carbon. In a study using activated carbon followed by UV, removals of 20-36 % o-xylene and 1-29 % m-xylene were obtained. However, using pilot-scale fluidised bed reactors, >90 % removal was obtained for p-xylene. Xylenes may be amenable to removal by air stripping. However, they are not expected to react with chlorine or ozone.

Effects to Sewage Treatment Processes

All isomers of xylene are readily biodegradable. The available data indicate that xylenes are of low to moderate toxicity to protozoa.

Human toxicity

Xylenes are irritating to the skin. In 1999, the International Agency for Research on Cancer (IARC) evaluated xylenes and classified them as Group 3, i.e. not classifiable as to their carcinogenicity to humans.

Toxicity to Experimental Animals

Mixed xylenes are of low acute oral and dermal toxicity and the individual xylene isomers are of low acute oral toxicity to experimental animals. Mixed xylenes are moderately irritating to skin and eyes, but are not skin sensitisers. The predominant effect observed following repeat dose exposure to xylenes is decreased body weight and increased mortality. Mixed xylenes and the individual isomers of xylene are not genotoxic. No evidence for carcinogenicity has been observed in chronic studies using mixed xylenes in rats and mice. In 1999, IARC evaluated xylenes and classified them as Group 3, i.e. are not classifiable as to their carcinogenicity to humans. No data were located on the reproductive toxicity of mixed xylenes or individual xylene isomers following oral administration. Increased incidence of foetal malformations (cleft palate) has been reported following oral exposure to xylenes. In one study, this occurred at maternally toxic doses, and is likely to be secondary to treatment. However, in another study, this effect occurred in the absence of maternal toxicity. Effects were noted on visually-evoked brain potentials in an acute neurological study. However, the possibility that these effects were secondary to arousal or excitability cannot be discounted.

Freshwater Ecotoxicity

Protozoa	Low to moderate toxicity
Algae	Low to moderate acute and moderate chronic toxicity
Annelids	No data
Molluscs	Moderate acute toxicity
Crustaceans	Low to moderate acute and moderate chronic toxicity
Insects	Low to moderate acute toxicity
Fish	Low to moderate acute and low chronic toxicity
Amphibians	Low to moderate acute toxicity

Environmental Fate & Behaviour

In the atmosphere, vapour phase xylenes will be degraded by reaction with photochemically-produced hydroxyl radicals.

Xylenes are moderately soluble in water. It is expected that they will moderately sorb to sediment and suspended solids, but volatilisation is considered to be the main removal process in water.

Xylene isomers are expected to be of low to moderate mobility in soil. Biodegradation can occur in soil under aerobic conditions, but denitrifying conditions appear to be required when oxygen is lacking. Volatilisation from dry and moist soil surfaces is expected to be an important fate process.

Assessments, SNARLs, Taste and Odour, Standards and Legislation

Evaluation by Authoritative Bodies

The evaluations in the table below are for xylenes. No evaluations were located for the individual xylene isomers (o-, m- and p-xylene) at the time of the update.

Evaluations highlighted in bold were used as the basis of the SNARL derivation.

Evaluating organisation and year	Study	PoD	UF	Authoritative Evaluation/HBGV	Ref.
WHO, 2003 (current for 2017)	2-year gavage study in F344/N rats (50/sex/dose) administered mixed xylenes 5 days/week	NOAEL: 179 mg/kg bw/day (adjusted for 7 day/week exposure), based on decreased body weight	1000, a	TDI: 0.179 mg/kg bw/day GDWQ: 0.5 mg/l, b	NTP, 1986 cited in WHO, 2003; WHO, 2017
US EPA, 2009	90-day gavage study in Sprague Dawley rats (20/sex/dose) administered m-xylene	$BMDL_{10}$: 440 mg/kg bw/;day, based on decreased body weight in males	1000, c	Subchronic p-RfD: 0.4 mg/kg bw/day	Wolfe, 1988 cited in US EPA, 2009
US EPA, 2003	**2-year gavage study in F344/N rats (50/sex/dose) administered mixed xylenes 5 days/week**	**NOAEL: 179 mg/kg bw/day (adjusted for 7 day/week exposure), based on decreased body weight and increased mortality**	**1000, d**	**RfD: 0.2 mg/kg bw/day**	**NTP, 1986 cited in US EPA, 2003a**
ATSDR, 2007	Acute neurological study in male Long-Evans rats (10-11/dose and 14-16/dose in two	NOAEL: 125 mg/kg bw/day, based on suppression of visually-evoked brain potentials	100, e	Acute (<14 days) MRL: 1 mg/kg bw/day	Dyer *et al*., 1988 cited in

	experiments) administered p-xylene				ATSDR, 2007
ATSDR, 2007	2-year gavage study in B6C3F1 mice (50/sex/dose) administered mixed xylenes 5 days/week	NOAEL: 360 mg/kg bw/day (adjusted for 7 day/week exposure), based on neurotoxicity (hyperactivity)	1000, f	Intermediate (14-365 days) MRL: 0.4 mg/kg bw/day	NTP, 1986 cited in ATSDR, 2007
ATSDR, 2007	**2-year gavage study in F344/N rats (50/sex/dose) administered mixed xylenes 5 days/week**	**NOAEL: 179 mg/kg bw/day (adjusted for 7 day/week exposure), based on decreased body weight and increased mortality**	**1000, f**	**Chronic (>365 days) MRL: 0.2 mg/kg bw/day**	**NTP, 1986 cited in ATSDR, 2007**
Health Canada, 1993	90-day study in Sprague Dawley rats (10/sex/dose) administered mixed xylenes	NOEL: 150 mg/kg bw/day, based on liver and kidney effects (no further details)	100, e	TDI: 1.5 mg/kg bw/day	Condie *et al*., 1988 cited in Health Canada, 1993; ITER, 2019
RIVM, 1999	90-day study in Sprague Dawley rats (10/sex/dose) administered mixed xylenes	LOAEL: 150 mg/kg bw/day, based on kidney effects (no further details)	1000, g	TDI: 0.15 mg/kg bw/day	Condie *et al*., 1988 cited in ITER, 2019
IARC, 1999	N/A	N/A	N/A	Group 3, i.e. not classifiable as to their carcinogenicity to humans	IARC, 1999

a: 100 to account for inter- and intra-species variation and 10 to account for the limited database.
b: Assuming a 60 kg adult drinks 2 litres of water per day, and using an allocation of 10 % of the TDI to water.
c: 100 to account for inter- and intra-species variation and 10 to account for database uncertainties. The US EPA noted a lack of adequate neurotoxicity studies and a lack of reproductive and developmental neurotoxicity studies.
d: 100 to account for inter- and intra-species variation and 10 to account for database uncertainties. The US EPA noted a lack of adequate neurotoxicity studies, a lack of reproductive and developmental neurotoxicity studies, and uncertainties related to the presence of ethylbenzene in mixed xylenes.
e: To account for inter- and intra-species variation.
f: 100 to account for inter- and intra-species variation and 10 to account for the lack of neurological and reproductive data.
g: 100 to account for inter- and intra-species variation and 10 to account for the use of a subchronic study.

ATSDR: Agency for Toxic Substances and Disease Registry
$BMDL_{10}$: lower 95 % confidence limit of the benchmark dose causing a 10 % response
US EPA: Environmental Protection Agency
GDWQ: Guideline for Drinking-water Quality
HBGV: Health-based guidance value
IARC: International Agency for Research on Cancer
LOAEL: Lowest Observed Adverse Effect Level
MRL: Minimal Risk Level
NOAEL: No Observed Adverse Effect Level
PoD: Point of Departure
p-RfD: Provisional Reference Dose
RfD: Reference Dose
RIVM: The Dutch National Institute for Public Health and the Environment
TDI: Tolerable Daily Intake
UF: Uncertainty Factor
WHO: World Health Organization

Emergencies & SNARLs

In a 2-year study in F344/N rats (50/sex/dose) administered mixed xylenes, a No Observed Adverse Effect Level (NOAEL) of 179 mg/kg bw/day was determined based on decreased body weight (5-8 %) and increased mortality (NTP, 1986 cited in US EPA, 2003a; US EPA, 2009; ATSDR, 2007). Although the decreased body weight is of marginal biological significance, the US EPA stated that this effect could not be discounted in light of the effects on mortality, indicating treatment-related toxicity (US EPA, 2003a). Following application of an uncertainty factor (UF) of 1000 (100 to account for inter- and intra-species variation and 10 to account for uncertainty in the database (concerns about potential neurotoxicity and developmental toxicity (cleft palate), and uncertainties due to the presence of ethylbenzene in mixed xylenes) to the NOAEL, a Tolerable Daily Intake (TDI) of 0.179 mg/kg bw/day can be derived. Assuming a 60 kg adult drinks 2 litres of water per day, health-based SNARLs are as follows:

24-hour health-based SNARL allocating 100 % of the TDI to water = 5.4 mg/l (5400 µg/l)

7-day health-based SNARL allocating 50 % of the TDI to water = 2.7 mg/l (2700 µg/l)

Xylenes are volatile. Exposure to pollutants in drinking water may include inhalation of droplets containing volatile substances or dermal absorption during bathing and showering. In most cases, there is insufficient information to permit the reliable assessment of exposure by inhalation and dermal absorption. However, the conservatism and default allocation used in the derivation of SNARLs should be sufficient to allow for these additional routes of exposure.

Taste and odour effects may occur at concentrations below the health-based SNARLs. The lowest reported odour threshold in water of xylenes is 0.02 mg/l (WHO, 2003). Therefore, an operational SNARL of 0.02 mg/l (20 µg/l) is recommended".

	SNARL (µg/l)			Date derived	Change and reason
	24-hour health-based	7-day health-based	Operational		
Present SNARLs	**5400**	**2700**	**20**	**22/08/19**	**No change**

Previous SNARLs	5400	2700	20	16/07/13	No change
Previous SNARLs	5400	2700	20	13/01/10	No change; toxicity data still valid
Previous SNARLs	5400	2700	20	25/06/07	-

Taste and odour properties

Xylenes
Xylenes have been described as having a 'sweet' or 'aromatic' odour (ATSDR, 2019). The odour threshold in water ranges from 0.02-1.8 mg/l (WHO, 2003). A detectable taste and odour is reported at concentrations of 0.3-1 mg/l (WHO, 2003).

o-Xylene
o-Xylene has been reported to have a 'geranium' odour (The Good Scents Company, 2019). An odour threshold of 1.8 mg/l in water has been reported (HSDB, 2019).

m-Xylene
m-Xylene has been reported to have a 'plastic' odour (The Good Scents Company, 2019).
Odour thresholds in water of 0.05 and 1 mg/l have been reported (Lillard and Powers, 1975).

p-Xylene
Threshold odour concentrations of 0.53 and 1 mg/l have been reported for p-Xylene (Lillard and Powers, 1975).

Drinking Water Standards

Xylenes
Drinking water standards for total xylenes are presented below. No standards for individual isomers were located from the countries/organisations listed below.

Country / Region	Regulatory body	Standard	Year set / Year of amendment	Drinking water (mg/l)		Comments
				Duration	Value	
UK - England & Wales	-	-	-	-	-	-
UK - Scotland	-	-	-	-	-	-
UK - Northern Ireland	-	-	-	-	-	-
EU	-	-	-	-	-	-
WHO	-	GDWQ	2017	Lifetime	0.5	a
USA	EPA	MCLG	2018	Maximum	10	-
		MCL		Maximum	10	-
		HA		1-day	40	Based on a

						10 kg child
				10-day	40	Based on a 10 kg child
		DWEL		Maximum	7	-
Australia	NHMRC	ADWG	2019	Lifetime	0.6	Health guideline
				Maximum	0.02	Aesthetic guideline, b
Canada	HC	GCDWQ	2019	Maximum	0.09	MAC
				Maximum	0.02	AO

a: Concentrations of the substance at or below the health based guideline value may affect the appearance, taste or odour of the water, leading to consumer complaints.
b: Could occur in drinking water as a pollutant, or from solvent used for bonding plastic fittings.

AO: Aesthetic Objective
ADWG: Australian Drinking Water Guidelines
DWEL: Drinking Water Equivalent Level. A lifetime exposure concentration protective of adverse, non-cancer health effects, that assumes all of the exposure to a contaminant is from drinking water.
US EPA: Environmental Protection Agency
GCDWQ: Guidelines for Canadian Drinking Water Quality
GDWQ: Guidelines for Drinking-water Quality
HA: Health Advisory. An estimate of acceptable drinking water levels for a chemical substance based on health effects information; a Health Advisory is not a legally enforceable Federal standard, but serves as technical guidance to assist Federal, State, and local officials. One-Day HA: The concentration of a chemical in drinking water that is not expected to cause any adverse non-carcinogenic effects for up to one day of exposure. The One-Day HA is normally designed to protect a 10 kg child consuming 1 litre of water per day. Ten-Day HA: The concentration of a chemical in drinking water that is not expected to cause any adverse non-carcinogenic effects for up to ten days of exposure. The Ten-Day HA is also normally designed to protect a 10 kg child consuming 1 litre of water per day.
HC: Health Canada
MAC: Maximum Acceptable Concentration
MCL: Maximum Contaminant Level. The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLG as feasible using the best available analytical and treatment technologies and taking cost into consideration. MCLs are enforceable standards.
MCLG: Maximum Contaminant Level Goal. A non-enforceable health goal which is set at a level at which no known or anticipated adverse effect on the health of persons occurs and which allows an adequate margin of safety.
NHMRC: National Health & Medical Research Centre
WHO: World Health Organization
WS(WQ)(S)R: Water Supply (Water Quality) (Scottish) Regulations
WS(WQ)R(NI): Water Supply (Water Quality) Regulations (Northern Ireland)
WS(WQ)R: Water Supply (Water Quality) Regulations

Environmental Standards

Country / Region	Regulatory body	Standard	Year set / Year of	Environmental waters (µg/l)		Comments

			amendment	Short-term / max		Long-term / average		
				F/W	S/W	F/W	S/W	
UK - England & Wales	EA	EQS	2015	-	-	30	30	-
	EA	Groundwater thresholds	2015	15.5-63.6	-	-	-	Minimum – maximum threshold value
UK - Scotland	SEPA	EQS	2014	-	-	30	30	-
UK - Northern Ireland	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-
USA	-	-	-	-	-	-	-	-
Australia & New Zealand	GFMWQ	NWQMS	2000	200	a	-	-	o-Xylene; trigger value for 99 % protection of species
				350	a	-	-	o-Xylene; trigger value for 95 % protection of species
				470	a	-	-	o-Xylene; trigger value for 90 % protection of species
				640	a	-	-	o-Xylene; trigger value for 80 % protection of species
				a	a	-	-	m-Xylene; trigger value for 99 % protection of species
				a	a	-	-	m-Xylene; trigger value for 95 % protection of species
				a	a	-	-	m-Xylene; trigger value for 90 % protection of species

				a	a	-	-	m-Xylene; trigger value for 80 % protection of species
				140	a	-	-	p-Xylene; trigger value for 99 % protection of species
				200	a	-	-	p-Xylene; trigger value for 95 % protection of species
				250	a	-	-	p-Xylene; trigger value for 90 % protection of species
				340	a	-	-	p-Xylene; trigger value for 80 % protection of species
Canada	CCME	CEQG	2015	b	-	-	-	Soil: agricultural land uses
				b	-	-	-	Soil: residential/parkland uses
				b	-	-	-	Soil: commercial land uses
				b	-	-	-	Soil: industrial land uses

a: Insufficient data to derive a reliable trigger value.
b: Surface: 11 mg/kg (course), 2.4 mg/kg (fine). Subsoil: 11 mg/kg (course), 2.4 mg/kg (fine).

CCME: Canadian Council of Ministers of the Environment
CEQG: Canadian Environmental Quality Guidelines
EA: Environment Agency
EQS: Environmental Quality Standard
GFMWQ: Guidelines for Fresh & Marine Water Quality
NWQMS: National Water Quality Management Strategy
SEPA: Scottish Environmental Protection Agency

Occupational Standards

Country / Region	Regulatory body	Standard	Year set / Year of amendment	Occupational standards (mg/m3 (ppm))		Comments
				Short-	TWA (long-	

				term	term)	
UK	HSE	WEL	2018	441 (100)	220 (50)	a, b, c
USA	ACGIH	TLV	2019	651 (150)	434 (100)	a, d
	OSHA	PEL		-	435 (100)	a
	NIOSH	REL		655 (150)	435 (100)	a
Australia	NOHSC	NES	2019	655 (150)	350 (80)	a
Canada	-	-	-	-	-	-

a: o-, m-, p- or mixed xylenes.
b: Biological Monitoring Guidance Value of 650 mmol methyl hippuric acid/mol creatinine in urine.
c: Can be absorbed through the skin.
d: ACGIH has recommended a Biological Exposure Index or Indices (BEI) for this substance.

ACGIH: American Conference of Governmental Industrial Hygienists
HSE: Health & Safety Executive
NES: National Exposure Standards
NIOSH: National Institute for Occupational Safety & Health
NOHSC: National Occupational Health & Safety
OSHA: Occupational Safety & Health Administration
PEL: Permissible Exposure Limit
REL: Recommended Exposure Limits
TLV: Threshold Limit Value
TWA: Time Weighted Average (8 hours)
WEL: Workplace Exposure Limit

Occurrence & Use

Use

There are three isomers of xylene:

- ortho-Xylene (o-xylene, also known as 1,2-dimethylbenzene)
- meta-Xylene (m-xylene; 1,3-dimethylbenzene); and
- para-Xylene (p-xylene; 1,4-dimethylbenzene).

Commercial xylene (often referred to as mixed xylenes or xylenes) is a mixture of these three isomers, with m-xylene the largest component, and <20 % ethylbenzene (ATSDR, 2007; US EPA, 2003a).

Xylenes
Mixed xylenes are hydrocarbons that are blended into gasoline and also have a number of solvent applications. The individual isomers of xylene are extracted from mixed xylenes (WHO, 1997; HSDB, 2019). Solvent uses include in in the printing, rubber and leather industries, as a cleaning agent, as paint thinner, in varnishes, and in paints and coatings (HSDB, 2019; ATSDR, 2007).

Xylene (reported to usually be 60 % m-xylene, 14 % p-xylene, 9 % o-xylene with 17 % ethylbenzene) is classified as a class 2 solvent, where its use should be limited in pharmaceutical products because of its inherent toxicity. The permitted daily exposure (PDE) is 21.7 mg/day (0.36 mg/kg bw/day, assuming a 60 kg adult) (FDA, 2017).

In Europe, xylene is registered as an industrial chemical in the 1000-10 000 tonnes per annum tonnage band under the Registration, Evaluation, Authorisation and restriction of CHemicals (REACH) Regulation (ECHA, 2019a).

o-Xylene
o-Xylene is predominantly used in the manufacture of phthalic anhydride, used in phthalate plasticisers (WHO, 1997; HSDB, 2019). It is also used in the manufacture of vitamins, pharmaceuticals, dyes, insecticides, and other chemicals, and as a solvent for resins, lacquers, enamels and rubber cements (HSDB, 2019; Verschueren, 1996). It is found in aviation gasoline, asphalt and naphtha (Verschueren, 1996).

In Europe, o-xylene is registered as an industrial chemical in the 100 000-1 000 000 tonnes per annum tonnage band under the REACH Regulation (ECHA, 2019a).

m-Xylene
m-Xylene is used in the production of isophthalic acid, an intermediate in the manufacture of polyester resins (HSDB, 2019; WHO, 1997). It is also used as an intermediate in the synthesis of organics and dyes, and as an additive in aviation fuel (HSDB, 2019).

In Europe, m-xylene is registered as an industrial chemical in the 100 000-1 000 000 tonnes per annum tonnage band under the REACH Regulation (ECHA, 2019a).

p-Xylene (1,4-Dimethylbenzene)
p-Xylene is used in the manufacture of terephthalic acid for use in polyester resins and fibres, as well as in the manufacture of vitamins, pharmaceuticals, and insecticides (HSDB, 2019).

In Europe, p-xylene is registered as an industrial chemical in the 1 000 000-10 000 000 tonnes per annum tonnage band under the REACH Regulation (ECHA, 2019a).

Occurrence

o-Xylene is reported to be present in coal tar and petroleum (no further details available) (Verschueren, 1996). m-Xylene and p-xylene are both found in gasoline (high octane number) at concentrations of 12 and 5 % by weight, respectively (Verschueren, 1996).

Data on the occurrence of xylenes are presented in the table below.

Isomer	Date	Location	Sample Details	Concentration (µg/l)	Ref.
Wastewater					
Xylenes	Reported in 1984	Puerto Rico	Detected in the effluent from a wastewater treatment facility	1.82	Kennicut *et al.*, 1984 cited in WHO, 1997
p-Xylene	Reported in 1991	USA	Detected in the influent of a wastewater treatment works in the Great Lakes Basin (p-xylene)	4.4	Michael *et al.*, 1991 cited in

					WHO, 1997
p-Xylene	Reported in 1991	USA	Detected in the effluent of a wastewater treatment works in the Great Lakes Basin (p-xylene)	<1	Michael *et al.*, 1991 cited in WHO, 1997
Surface Water					
Xylenes	Reported in 1991	UK	Detected in the River Humber	<0.001-29.0	MAFF, 1991 cited in WHO, 1997
Xylenes	Reported in 1990	UK	Detected in the North Sea, off the coast of the UK	<0.01-0.25	Hurford *et al.*, 1990 cited in WHO, 1997
Xylenes	Reported in 1985	USA	Detected in the inner harbour of the navigation canal of Lake Ponchartrain	0.04-0.2	Mcfall *et al.*, 1985 cited in WHO, 1997
o-Xylene	Reported in 1991	Spain	Reported in the polluted River Llobregat	0.83	Gomez-Belinchon *et al.*, 1981 cited in WHO, 1997
o-Xylene	Reported in 1991	Spain	Reported in the polluted River Besos	8.1	Gomez-Belinchon *et al.*, 1981 cited in WHO, 1997
o-Xylene	Reported in 1985	UK	Detected in the River Tees estuary	<0.05-1.1	Harland *et al.*, 1985 cited in WHO, 1997

m- and p- Xylene	1991	Spain	Reported in the polluted River Llobregat	4.7	Gomez-Belinchon *et al*., 1981 cited in WHO, 1997
m- and p- Xylene	Reported in 1991	Spain	Reported in the polluted River Besos	24	Gomez-Belinchon *et al*., 1981 cited in WHO, 1997
m- and p- Xylene	Reported in 1985	UK	Detected in the River Tees estuary	<0.05-1.1	Harland *et al*., 1985 cited in WHO, 1997
Groundwater					
Xylenes	Reported in 1990	Edwards, Texas, USA	Reported in groundwater aquifer	0.08 (maximum)	Buszka *et al*., 1990 cited in WHO, 1997
Xylenes	Reported in 1985	USA	Detected in groundwater in New Jersey and New York	59-300	Rao *et al*., 1985 cited in WHO, 1997
o- Xylene	Reported in 1990	Ontario, Canada	Concentration in groundwater near a sanitary landfill site	<2-21	Buszka *et al*., 1990 cited in WHO, 1997
o- Xylene	Reported in 1988	Ontario, Canada	Detected in groundwater near a landfill site	0.03-0.5	Barker *et al*., 1988 cited in WHO, 1997
o- Xylene	Reported in 1985	UK	Detected in 19 out of 32 groundwater samples. These sites were uncontaminated and therefore, these concentrations were believed to represent normal background levels	0.02 (maximum), 0.011 (mean)	Kenrick *et al*., 1985 cited in

					WHO, 1997
o-Xylene	Reported in 1982	USA	Detected in groundwater near an underground coal gasification site	260-590	Stuermer *et al*., 1982 cited in WHO, 1997
m- and p-Xylene	Reported in 2005	Dusseldorf, Germany	Concentration measured in contaminated groundwater samples	0.03 (median) and 1.59 (maximum)	Rosell *et al*., 2005 cited in HSDB, 2019
m- and p-Xylene	Reported in 1992	Denmark	Groundwater from locations downstream from Vejen landfill	2-224	Lyngkilde *et al*., 1992 cited in HSDB, 2019
Drinking Water					
m- and p-Xylene	Reported in 1983	The Netherlands	Maximum concentration in bank filtered River Rhine water	0.1	Piet *et al*., 1983 cited in HSDB, 2019
m-Xylene	Reported in 1981	Great Britain	Detected in all 14 drinking water supplies studied, 10 surface and 4 ground, in the lowlands of Great Britain	Not reported	Fielding *et al*., 1981 cited in HSDB, 2019

dw: Dry weight.
LOD: Limit of detection.

Drinking Water Treatment

Removal during (drinking water) treatment

Based on log Kows of 2.77-3.15 (EC, 2000a), 3.12; 2.77 (US EPA, 2003b), 3.2 (US EPA, 2003b) and 3.15 (US EPA, 2003b) for mixed isomers of xylenes, o-, m- and p-xylene, respectively, some adsorption to activated carbon would be anticipated.

Tap water spiked with o-xylene (~60 ng/l) and m-xylene (~120 ng/l) was treated by activated carbon (Acticarbone NC35J) followed by UV irradiation. Removals of 20-36 % o-xylene and 1-29 % m-xylene were obtained (Serperi *et al*., 2000).

A comparison was made of biological versus non-biological activated carbon (F400) for removal of p-xylene in pilot-scale fluidised bed reactors. Non-biological Granular Activated Carbon (GAC) removed 92 % from a 996 mg/l influent and biological GAC removed 90.7 % from an influent of 732 mg/l. However, during step-loading experiments, the biological system gave better removal of p-xylene and more stable operation (Voice *et al*., 1992).

Mixed isomers of xylenes, o-, m- and p-xylene have vapour pressures of 7.99, 6.61, 8.29 and 8.84 mmHg, respectively (SRC, 2019). Therefore, xylenes may be amenable to removal by air stripping.

Reactivity with chlorine and information on by-products

No reaction with chlorine is expected under normal treatment conditions, i.e. no consumption of xylenes (o-, m- and p-xylene) (10 µg/l in aqueous solution buffered at pH 7) was detected using 1 and 10 mg/l chlorine, with 4 hours contact time at 20 °C (Fielding *et al*., 1989).

Reaction with other disinfectants

All three isomers of xylene have been shown to be unreactive with ozone (Fielding *et al*., 1989). No reaction with ozone has been reported under normal treatment conditions, i.e. no consumption of xylenes (o-, m- and p-xylene) (10 µg/l in purified water) was detected using 5 mg/l ozone, with 30 minute contact time at 10 °C (Fielding *et al*., 1989).

Sewage Treatment

Effects on Sewage Treatment Processes

Removal/Biodegradation During Sewage Treatment Processes
Standard tests indicate that all isomers of xylene are readily biodegradable. Biodegradation data are summarised in the table below:

Isomer	Method/type of study	Inoculum	Concentration (mg/l)	Results	Ref.
Aerobic					
o-Xylene	OECD Guideline 301 F (Ready Biodegradability: Manometric Respirometry Test)	Mixture of sewage, soil and “natural water”	16	94 % degradation in 28 days	ECHA, 2019b
m-Xylene	OECD Guideline 301 F (Ready Biodegradability: Manometric Respirometry Test)	Mixture of sewage, soil and “natural water”	16	98 % degradation in 28 days	ECHA, 2019b
p-Xylene	OECD Guideline 301 F (Ready Biodegradability: Manometric Respirometry Test)	Mixture of sewage, soil and “natural water”	16.2	90 % degradation in 28 days	ECHA, 2019b

Toxicity To Sewage Treatment Organisms
The available data indicate that xylenes are of low to moderate toxicity to microorganisms.

Isomer	Species	Endpoint	Duration (hrs)	Conc. (mg/l)	Ref.

o-Xylene	Protozoa (*Uronema parduczi*)	EC0 (cell multiplication inhibition)	Not reported	>160	Verschueren, 1996
o-Xylene	Soil microorganisms	IC50 (respiration inhibition)	10	220 mg/kg soil	ECHA, 2019c
p-Xylene	Ciliate (*Tetrahymena pyriformis*)	IC50 (population growth rate)	48	88	US EPA, 2019

Physico-Chemical Properties

Chemical formula: C_8H_{10}. (SRC, 2019).

Molecular Mass: 106.17 (SRC, 2019).

Melting Point: See table.

Boiling Point: See table.

Flash Point: See table.

Water Solubility: See table.

Octanol: Water partition coefficient: See table.

Dissociation Constant: No data.

Density: See table.

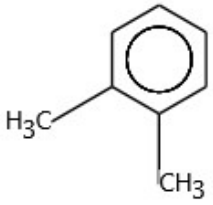
Volatility: See table.

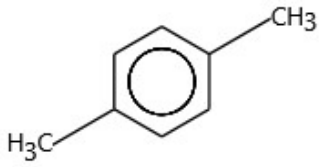
Physical Appearance:

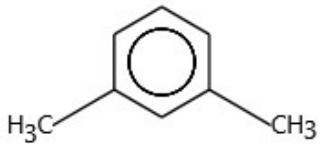
Chemical Name	Melting point (°C)	Boiling point (°C)	Flash point (°C)	Physical appearance	Solubility (mg/l at 25 °C)	Vapour pressure (mmHg at 25 °C)	Henry's Law constant (atm.m³/mole at 25 °C)	Log Kow	Density (g/cm³ at 25 °C)
Xylenes (mixed isomers)	-47.9 to -13.3 (EC, 2000a)	137-144 (EC, 2000a)	25; 29 (closed cup) (EC, 2000a)	Colourless liquid (WHO, 1997)	146-175 (EC, 2000a)	7.99 (SRC, 2019)	0.00663 (SRC, 2019)	2.77-3.15 (EC, 2000a)	0.86-0.88 (EC, 2000a)
o-Xylene	-25 (US EPA, 2003b)	144.4 (US EPA, 2003b)	30 (closed cup) (WHO, 1997)	Colourless liquid (WHO, 1997)	178-213 (US EPA, 2003b)	6.61 (SRC, 2019)	0.00518 (SRC, 2019)	3.12; 2.77 (US EPA, 2003b)	0.88 (US EPA, 2003b)
m-Xylene	-47.4 (US EPA, 2003b)	139 (US EPA, 2003b)	25 (closed cup) (WHO, 1997)	Colourless liquid (WHO, 1997)	134-146 (US EPA, 2003b)	8.29 (SRC, 2019)	0.00718 (SRC, 2019)	3.2 (US EPA, 2003b)	0.86 (US EPA, 2003b)

p-Xylene	13-14 (US EPA, 2003b)	138.37 (US EPA, 2003b)	25 (closed cup) (WHO, 1997)	Colourless liquid (WHO, 1997)	185-198 (US EPA, 2003b)	8.84 (SRC, 2019)	0.0069 (SRC, 2019)	3.15 (US EPA, 2003b)	0.86 (US EPA, 2003b)

Chemical Structure:







Analytical Chemistry

Reference/Principle of the method

REFERENCE: Determination of Very Low Concentrations of Hydrocarbons and Halogenated Hydrocarbons in Water 1984-1985, Methods for the Examination of Waters and Associated Materials, HMSO.

PRINCIPLE: Double extraction using pentane and clean-up using a florisil column. The eluate is concentrated and analysed by capillary gas chromatography using a flame ionisation detector (GC-FID).

Methodology

Gas chromatograph equipped with a flame ionisation detector. 60 m, 0.32 mm, 0.25 µm film, DB1 fused silica capillary column, oven temperature 20 °C (2 minutes), 250 °C at 8 °C/minute, 2.5 µl injection. 1 litre sample extracted twice with 10 ml aliquots of purified pentane, with mixing and settling times of 3 and 5 minutes, respectively. Evaporate the solution to 1 ml using a Kuderna-Danish evaporator, and elute this concentrate through a florisil column with 50 ml of 10% v/v dichloromethane in pentane. Concentrate the eluate to 2.5 ml in a second Kuderna-Danish evaporator, and then to 0.5 ml using a micro-Snyder column. Inject 2.5 µl for the GC-FID determination.

Limit of Detection

Not determined; experience with homologues suggest it will be just under 1 µg/l.

Availability of Analytical Standards

No data.

Environmental Fate and Behaviour

Air
In the atmosphere, xylenes are expected to exist solely in the vapour phase. Vapour-phase xylenes are degraded by reaction with photochemically-produced hydroxyl radicals, with estimated half-lives of 16-28 hours. It is not expected that xylenes will be susceptible to direct photolysis by sunlight (HSDB, 2019).

Water
Xylenes are moderately soluble in water; solubilities of 178-213, 134-146 and 185-198 mg/l have been reported for o-, m- and p-xylene, respectively (US EPA, 2003b). Xylenes are expected to moderately sorb to sediment and suspended solids, based on log Kows of 3.12, 3.2 and 3.15 for o-, m- and p-xylene, respectively (US EPA, 2003b). However, volatilisation is considered to be the main removal process in water, with reported half-lives of 1-5.5 days (Howard, 1990). Xylenes are also considered to be readily biodegradable (ECHA, 2019b).

Soil
Xylene isomers are expected to be of low to moderate mobility in soil. Biodegradation can occur in soil under aerobic conditions, but denitrifying conditions appear to be required when oxygen is lacking (Howard, 1990). Volatilisation from dry and moist soil surfaces is expected to be an important fate process, based on vapour pressures ranging from 6.61-8.84 mmHg and Henry's Law constants ranging from 0.00518 to 0.00718 atm.m^3/mole, respectively, for the individual isomers (HSDB, 2019; SRC, 2019).

Mammalian Toxicity

Toxicokinetics

Xylenes are well absorbed via the oral route, with 87-92 % absorption reported in rats following gavage administration of 1.8 g m-xylene or 1.74 g o- or p-xylene (ATSDR, 2007). Following absorption, xylene is rapidly distributed around the body and accumulates mainly in adipose tissue (ATSDR, 2007).

In humans, metabolism of all three isomers is primarily by oxidation of the methyl group and conjugation with glycine to form methylhippuric acid (ATSDR, 2007). A small proportion of xylene may also be metabolised to xylenol (ATSDR, 2007). It has been reported that consumption of ethanol affects the rate of metabolism of xylene. Co-administration of ethanol and xylene inhibits the metabolism of xylene. However, exposure to ethanol prior to xylene exposure increases the metabolism of xylene, due to the induction of enzymes in the liver (ATSDR, 2007).Metabolism is generally similar in experimental animals, but methylbenzaldehyde can also be formed, where this metabolite has not been detected in humans (ATSDR, 2007).

Xylene is primarily excreted in urine (95 %), with excretion in exhaled air (5 %) a more minor route (ATSDR, 2007). In humans, greater than 90 % of an administered dose of xylene was reported to be excreted in the urine as methylhippuric acid and less than 2 % of an administered dose of xylene was excreted in the urine as xylenol (ATSDR, 2007).

Human Toxicity

Irritation, dryness and scaling of skin, as well as vasodilation (dilatation of blood vessels), have been reported following dermal exposure to xylene (ATSDR, 2007).

In one study, m-xylene was reported to be irritating to the skin (no study details available). In another

study, m-xylene was considered to be corrosive to the skin, with erythema, a burning sensation and delayed slight scaling observed following a single immersion of hands into xylene liquid (no further details reported). m-Xylene is also reported to be irritating to eyes (EC, 2000b).

In 1999, the International Agency for Research on Cancer (IARC) evaluated xylenes and classified them as Group 3, i.e. not classifiable as to their carcinogenicity to humans, on the basis that there was inadequate evidence for carcinogenicity in humans (IARC, 1999).

Toxicity to Experimental Animals

Mixed xylenes and the individual isomers, m-, o- and p-xylene, have been given the following classifications under the European Classification, Labelling and Packaging (CLP) Regulation (EC No 1272/2008) (ECHA, 2019d).

Endpoint	Harmonised classification	Interpretation
Acute toxicity	Acute Tox. 4 (H312)	Harmful in contact with skin
Skin irritation	Skin Irrit. 2 (H315)	Causes skin irritation
Acute toxicity	Acute Tox. 4 (H332)	Harmful if inhaled

Acute Toxicity

The available data indicate that mixed xylenes are of low acute oral and dermal toxicity and the individual xylene isomers are of low acute oral toxicity to experimental animals.

Isomer	Species	Route	LD50 (mg/kg bw)	Ref.
Mixed xylenes	Rat	Oral	4300	EC, 2000a
	Mouse	Oral	2119	NIOSH, 2019
	Rat	Dermal	>4350	EC, 2000a
	Rabbit	Dermal	>1700	NIOSH, 2019
o-Xylene	Rat	Oral	3609; 4400	EC, 2000c
m-Xylene	Rat	Oral	5000	EC, 2000b
p-Xylene	Rat	Oral	>3392-4779	EC, 2000d

Irritation and sensitisation

Xylenes
C8 aromatics (mixed isomers of xylene and ethylbenzene; no further details on composition) were moderately irritating to the intact and abraded skin of six male New Zealand White rabbits (ECHA, 2019b).

The same test substance was moderately irritating to the eyes of six male New Zealand White rabbits, with unspecified effects observed on the conjunctiva of all animals, which were not reversible within the 72-hour observation period (ECHA, 2019b). In a local lymph node assay in mice, mixed xylenes were not a skin sensitiser (ECHA, 2019b).

o-Xylene

o-Xylene is reported to be non-irritating to the skin in three studies in rabbits (strain not reported, 5-6 animals in one study but number not reported in the other two studies).

o-Xylene was non-irritating to the eyes in two studies in rabbits (strain and number not reported) and moderately irritating to the eyes in one study in 4-6 New Zealand White rabbits (EC, 2000c).

m-Xylene

m-Xylene was reported to be slightly irritating to hairless (CB HrBi) rats (number not reported; treatment schedule: 230 µl for 1 hour under occlusive conditions, followed by 15 µl every 2 hours, for 8 hours a day, for 4 days under non-occlusive conditions) and irritating to male Fisher 344 rats (number not reported) following 1-hour exposure under occlusive conditions. However, m-xylene was not irritating to five New Zealand White rabbits (sex not reported) following a 24-hour exposure (no further details reported) (ECHA, 2019e).

m-Xylene was not irritating to the eyes of New Zealand White rabbits (no further details reported) (ECHA, 2019e).

p-Xylene

p-Xylene (99 %) was moderately irritating to the skin of six New Zealand White rabbits (sex not reported) following a 4-hour exposure under semi-occlusive conditions (ECHA, 2019f). In another study, undiluted p-xylene was irritating to the skin of New Zealand White rabbits (5-6/group) following 4-hour exposure under occlusive conditions, but lower concentrations (5, 10, 25 and 50 %) were non-irritating (ECHA, 2019f).

p-Xylene was slightly irritating to the eyes of rabbits (no further details reported) (EC, 2000d).

Repeat Dose Toxicity

Overall summary of section			
The predominant effect observed following repeat dose exposure to xylenes is decreased body weight and increased mortality			
Key study (basis of health-based SNARL derivation)			
Study design	**Summary of study including NOAEL**	**Authoritative Evaluations**	**Ref.**
2-year gavage study in F344/N rats (50/sex/dose) administered mixed xylenes 5 days/week	NOAEL: 179 mg/kg bw/day (adjusted for 7 day/week exposure), based on decreased body weight and increased mortality	RfD: 0.2 mg/kg bw/day Chronic (>365 days) MRL: 0.2 mg/kg bw/day	NTP, 1986 cited in US EPA, 2003a; ATSDR, 2007

Xylenes

In a 13-week study, Sprague Dawley rats (10/sex/dose) were administered 0, 150, 750 or 1500 mg/kg bw/day mixed xylenes (17.6 % o-xylene, 62.3 % m- and p-xylene, and 20 % ethylbenzene) in corn oil via gavage (Condie *et al*., 1988 cited in US EPA, 2003a; Health Canada, 1993; ITER, 2019; ATSDR, 2007). The US Environmental Protection Agency (US EPA) determined a NOAEL of 150 mg/kg bw/day, based on increased absolute kidney weight (18 %) and mild nephropathy in females at 750 mg/kg bw/day (US

EPA, 2003a). Health Canada (1993) also determined a NOEL of 150 mg/kg bw/day, based on liver and kidney effects at 750 mg/kg bw/day (no further details reported). In 1993, Health Canada used this study to derive a TDI of 1.5 mg/kg bw/day (Health Canada, 1993; ITER, 2019). The Dutch National Institute for Public Health and the Environment (RIVM) determined a Lowest Observed Adverse Effect Level (LOAEL) of 150 mg/kg bw/day from this study, based on kidney effects. In 1999, RIVM used this study to derive a TDI of 0.15 mg/kg bw/day (ITER, 2019). The Agency for Toxic Substances and Disease Registry (ATSDR) determined a NOAEL of 150 mg/kg bw/day based on hepatic effects (14% increase in serum alanine aminotransferase in females, and 14-17% increase in relative liver weight in both sexes) and renal effects (minimal chronic nephropathy in females) (ATSDR, 2007). In a 2-year study, F344/N rats (50/sex/dose) were administered 0, 250 or 500 mg/kg bw/day mixed xylenes (9.1, 60, 13.6 and 17.0 % o-, m-, p-xylene and ethylbenzene, respectively) in corn oil via gavage for 5 days/week (reported to be 0, 179 and 357 mg/kg bw/day, respectively, adjusting for 7 day/week exposure) (NTP, 1986 cited in WHO, 2003; US EPA, 2003a; US EPA, 2009; ATSDR, 2007). The US EPA and ATSDR determined NOAELs of 179 mg/kg bw/day, based on decreased body weight (5-8 %) and increased mortality in males at the top dose (US EPA, 2003a; ATSDR, 2007). WHO also determined a NOAEL of 179 mg/kg bw/day, based on the decreased body weight only (WHO, 2003). In 2003, this study was used by the World Health Organization (WHO) to derive a TDI of 0.179 mg/kg bw/day (WHO, 2003; WHO, 2017) and by the US EPA to derive an oral Reference Dose (RfD) of 0.2 mg/kg bw/day in 2003 (US EPA, 2003a). In 2007, ATSDR used this study to derive a chronic (>365 days) Minimal Risk Level (MRL) of 0.2 mg/kg bw/day (ATSDR, 2007).

In a 2-year study, B6C3F1 mice (50/sex/dose) were administered 0, 500 or 1000 mg/kg bw/day mixed xylenes (9.1, 60, 13.6 and 17.0 % o-, m-, p-xylene and ethylbenzene, respectively) in corn oil via gavage for 5 days/week (reported to be 0, 360 and 714 mg/kg bw/day, respectively, adjusting for 7 day/week exposure) (NTP, 1986 cited in US EPA, 2003a; US EPA, 2009; ATSDR, 2007). ATSDR and US EPA determined a NOAEL of 360 mg/kg bw/day, based on neurotoxicity (hyperactivity) at the top dose (ATSDR, 2007; US EPA, 2003a). In 2007, ATSDR used this study to derive an intermediate (14-365 days) MRL of 0.4 mg/kg bw/day (ATSDR, 2007).

o-Xylene
In a 10-day study, Sprague-Dawley rats (10/sex/dose) were administered 0, 250, 1000 or 2000 mg/kg bw/day o-xylene via gavage. A LOAEL of 250 mg/kg bw/day was determined by EC (2000c), based on decreased relative brain weight in females at the low dose; it is not clear whether this effect was also observed at higher doses (Condie *et al*, 1988 cited in EC, 2000c). Using this study, ATSDR (2007) determined a NOAEL of 1000 based decrease of body weights (14% in males).

m-Xylene
In a 90-day study, Sprague-Dawley rats (20/sex/dose) were administered 0, 100, 200 or 800 mg/kg bw/day m-xylene in corn oil via gavage (Wolfe, 1988 cited in US EPA, 2003a; .US EPA, 2009). The US EPA determined a NOAEL of 200 mg/kg bw/day, based on decreased body weight gains (75% of controls in males and 85% of controls in females) at 800 mg/kg bw/day (US EPA, 2003a; US EPA, 2009). Decreased body weight gains in males at 200 mg/kg bw/day were reported as 89% of controls, but this appears not considered adverse given the US EPA (2003a) choice of NOAEL. Decreased food consumption (90% of control levels for males in weeks 1 to 5 at the high dose and 92% of control levels at mid dose for males and females at mid and high doses) was also observed (US EPA, 2003a). The US EPA also determined a BMDL10 (lower 95 % confidence limit of the benchmark dose causing a 10 % response) of 440 mg/kg bw/day based on decreased body weight in males (US EPA, 2009). In 2009, this $BMDL_{10}$ was used to derive a subchronic provisional Reference Dose (p-RfD) of 0.4 mg/kg bw/day (US EPA, 2009).

p-Xylene
In a 90-day study, Sprague-Dawley rats (20/sex/dose) were administered 0, 100, 200 or 800 mg/kg bw/day p-xylene in corn oil via gavage (Wolfe, 1988 cited in US EPA, 2003a; .US EPA, 2009). The US

EPA determined a NOAEL of 200 mg/kg bw/day, based on increased mortality in males at 800 mg/kg bw/day. Most of the deaths were attributed to aspiration of the test material, as histopathology revealed intra-alveolar foreign material in the lungs (US EPA, 2003a; US EPA, 2009).

Genotoxicity

Overall, the data indicate that mixed xylenes and the individual isomers of xylene are not genotoxic.

In vitro

Isomer	Test	Metabolic Activation	Result	Ref.
Xylenes, a	Ames assay conducted in *Salmonella typhimurium* strains TA98, TA100, TA1535, TA1537 and TA1538	With and without	Negative	EC, 2000a
Xylenes, b	Ames assay conducted in *Salmonella typhimurium* strains TA98, TA100, TA1535, TA1537 and TA1538	With and without	Negative	EC, 2000a
Xylenes, b	DNA repair assay conducted in repair-proficient and repair-deficient *Bacillus subtilis*	With and without	Negative	EC, 2000a
Xylenes, b	DNA repair assay conducted in repair-proficient and repair-deficient *Escherichia coli*	With and without	Negative	EC, 2000a
Xylenes, b	Gene mutation assay conducted in mouse lymphoma cells	With and without	Negative	EC, 2000a
Xylenes, b	Chromosome aberration assay conducted in Chinese Hamster Ovary (CHO) cells	With and without	Negative	ECHA, 2019b
Xylenes, b	Sister chromatid exchange assay conducted in CHO cells	With and without	Negative	ECHA, 2019b
Xylenes, b	Sister chromatid exchange assay conducted in human lymphocytes	Not reported	Negative	Genetox, 2019
o-Xylene	Ames assay conducted in *Salmonella typhimurium* strains TA98, TA100, TA1535, TA1537 and TA1538	With and without	Negative	EC, 2000c
o-Xylene	Two Ames assays conducted in *Salmonella typhimurium* strains TA98, TA100, TA1535 and TA1537	With and without	Negative	EC, 2000c
o-Xylene	DNA damage in human peripheral blood lymphocytes	Not applicable	Positive	ECHA, 2019c
m-Xylene	Reverse mutation assay conducted in *Salmonella typhimurium* strains TA98, TA100, TA1535 and TA1537	With and without	Negative	EC, 2000b
p-Xylene	Ames assays conducted in *Salmonella typhimurium* strains TA98, TA100, TA1535, TA1537 and TA1538	With and without	Negative	EC, 2000d
p-Xylene	Reverse mutation assay conducted in *Escherichia coli* strains WP2 and UVRA	With and without	Negative	EC, 2000d

a: 11.4, 52.1, 0.3 and 36.1% o-, m-, p-xylene and ethylbenzene, respectively.
b: Undefined composition.

In vivo

Isomer	Test	Result	Ref.
Xylenes, b	Dominant lethal assay conducted in Long-Evans rats (intraperitoneal administration)	Negative	EC, 2000a
Xylenes, b	Dominant lethal assay conducted in Swiss Webster mice (subcutaneous administration)	Negative	EC, 2000a
Xylenes, b	Bone marrow micronucleus assay conducted in ICR mice (gavage administration)	Negative	EC, 2000a
Xylenes, a	Chromosome aberration assays conducted in rat bone marrow (single and repeated intraperitoneal administration)	Negative	EC, 2000a
Xylenes, b	Chromosome aberration assays conducted in rat bone marrow (repeated inhalation administration)	Negative	EC, 2000a
o-Xylene	Micronucleus assay conducted in NMRI mice (intraperitoneal administration)	Negative	EC, 2000c
o-Xylene	Sperm head abnormality assay conducted in Sprague Dawley rats at 20-24 °C	Negative	EC, 2000c
o-Xylene	Sperm head abnormality assay conducted in Sprague Dawley rats at 24-30 °C	Positive	EC, 2000c
m-Xylene	Chromosomal aberration assay conducted in rats (inhalation exposure)	Negative	EC, 2000b
m-Xylene	Micronucleus assay conducted in bone marrow of male NMRI mice (intraperitoneal administration)	Negative	ECHA, 2019e
p-Xylene	Micronucleus assay conducted in NMRI mice (intraperitoneal administration)	Negative	EC, 2000d

a: 11.4, 52.1, 0.3 and 36.1 % o-, m-, p-xylene and ethylbenzene, respectively.
b: Undefined composition.

Carcinogenicity

Overall summary of section
No evidence for carcinogenicity has been observed in chronic studies using mixed xylenes in rats and mice. In 1999, IARC evaluated xylenes and classified them as Group 3, i.e. are not classifiable as to their carcinogenicity to humans.

Xylenes
In a 2-year study, F344/N rats (50/sex/dose) were administered 0, 250 or 500 mg/kg bw/day mixed xylenes (9.1, 60, 13.6 and 17.0 % o-, m-, p-xylene and ethylbenzene, respectively) in corn oil via gavage for 5 days/week (reported to be 0, 179 and 357 mg/kg bw/day, respectively, adjusting for 7 day/week exposure) (NTP, 1986 cited in WHO, 2003; US EPA, 2003b; US EPA, 2009; ATSDR, 2007). No statistically significant increases were noted in the incidence of neoplastic or non-neoplastic lesions at any dose (US EPA, 2003b).

In a 2-year study, B6C3F1 mice (50/sex/dose) were administered 0, 500 or 1000 mg/kg bw/day mixed xylenes (9.1, 60, 13.6 and 17.0 % o-, m-, p-xylene and ethylbenzene, respectively) in corn oil via gavage for 5 days/week (0, 360 and 714 mg/kg bw/day, respectively, adjusting for 7 day/week exposure) (NTP, 1986 cited in US EPA, 2003b; US EPA, 2009; ATSDR, 2007). No statistically significant increases were noted in the incidence of neoplastic or non-neoplastic lesions at any dose (US EPA, 2003b).

In 1999, IARC evaluated xylenes and classified them as Group 3, i.e. not classifiable as to their carcinogenicity to humans, on the basis that there was inadequate evidence for carcinogenicity in experimental animals (IARC, 1999).

Individual Isomers (o- m- and p-Xylene)
No data were located at the time of the update.

Reproductive and Developmental Toxicity

Overall summary of section
No data were located at the time of the update on the reproductive toxicity of mixed xylenes or individual xylene isomers following oral administration. Increased incidence of foetal malformations (cleft palate) has been reported following oral exposure to xylenes. In one study, this occurred at maternally toxic doses, and is likely to be secondary to treatment. However, in another study, this effect occurred in the absence of maternal toxicity.

No data were located at the time of the update on the reproductive toxicity of mixed xylenes or individual xylene isomers following oral administration.

Xylenes
In a developmental study, female CD-1 mice (number not reported) were administered 0, 520, 1030, 2060, 2580, 3100 or 4130 mg/kg bw/day mixed xylenes (9.1, 60.2, 13.6 and 17.0 % o-, m-, p-xylene and ethylbenzene, respectively) in cottonseed oil via gavage 3 times/day on gestation days 6-15 (Marks *et al.*, 1982 cited in US EPA, 2003b). The US EPA determined maternal and developmental NOAELs of 1030 mg/kg bw/day, based on decreased gravid uterine weight, decreased foetal body weight (88 % of the control) and increased incidence of foetal malformations (mainly cleft palate) at 2060 mg/kg bw/day (US EPA, 2003b).

m-Xylene
In a developmental study, female mice (strain and number not reported) were administered 0, 1935 or 2580 mg/kg bw/day m-xylene via gavage at on gestation days 12-15 or 6-15. No overt toxicity or increased incidence of malformations was observed with exposure on gestation days 12-15. However, with exposure on gestation days 6-15, a low but statistically significant increase in cleft palate was observed at the top dose (4.4 % compared to 0 % in the controls), in the absence of overt maternal toxicity. Neither the study authors nor the US EPA determined NOAELs from this study (Nawrot and Staples, 1980 cited in US EPA, 2003b). However, from these effects, a maternal NOAEL of 2580 mg/kg bw/day (the highest dose tested) and a developmental NOAEL of 1935 mg/kg bw/day can be determined.

o- and p-Xylene
No data were located at the time of the update.

Other Toxicity

Overall summary of section

Effects were noted on brain potentials in response to visual testing, in an acute neurological study.

In an acute neurological study, male Long-Evans rats were implanted with electrodes in their skulls and were allowed to recover for 1 week prior to exposure to a single gavage dose of p-xylene and testing for visual processing. Initially, rats (10-11/dose) were administered 0, 500, 1000, 2000 or 5000 mg/kg bw, 75 minutes prior to testing. Based on the results from this test, additional groups of rats (14-16/dose) were administered 0, 125 or 250 mg/kg bw, 45 minutes prior to visual testing(response to a single strobe-generated flash) (Dyer *et al*., 1988 cited in ATSDR, 2007). ATSDR determined a NOAEL of 125 mg/kg bw/day, based on suppression of visually-evoked brain potentials at 250 mg/kg bw/day. It was noted by the study authors that these effects may be secondary to changes in arousal or excitability. In 2007, ATSDR used this study to derive an acute (<14 days) MRL of 1 mg/kg bw/day (ATSDR, 2007).

Ecotoxicity

Freshwater Ecotoxicity

The data indicate that xylenes are of low to moderate toxicity to protozoa, of low to moderate acute and moderate chronic toxicity to algae, of moderate acute toxicity to molluscs, of low to moderate acute and moderate chronic toxicity to crustaceans, of low to moderate acute toxicity to insects, of low to moderate acute and low chronic toxicity to fish, and of low to moderate acute toxicity to amphibians.

Isomer	Species	Endpoint	Duration (hrs)	Conc. (mg/l)	Ref.
Protozoa					
o-Xylene	Protozoa (*Uronema parduczi*)	EC0 (cell multiplication inhibition)	Not reported	>160	Verschueren, 1996
p-Xylene	Ciliate (*Tetrahymena pyriformis*)	IC50 (population growth rate)	48	88	US EPA, 2019
Algae					
Xylenes	Green algae (*Pseudokirchneriella subcapitata*)	EC50 (growth)	14 days	72	US EPA, 2019
Xylenes	Green algae (*Chlorococcales*)	EC50 (physiology)	24	100	US EPA, 2019
o-Xylene	Green algae (*Chlorella vulgaris*)	EC50 (growth)	24	55	US EPA, 2019
o-Xylene	Green algae (*Pseudokirchneriella subcapitata*)	EC50 (growth)	8 days	4.2	US EPA, 2019
o-Xylene	Green algae (*Pseudokirchneriella subcapitata*)	EC50 (growth)	72	4.7	US EPA, 2019
m-Xylene	Green algae (*Chlamydmonas reinhardtii*)	EC20 (fluorescence)	2	12	US EPA, 2019

m-Xylene	Green algae (*Psudokirchneriella subcapitata*)	EC50 (growth)	72	4.9	US EPA, 2019
m-Xylene	Green algae (*Psudokirchneriella subcapitata*)	EC50 (growth)	8 days	3.9	US EPA, 2019
p-Xylene	Green algae (*Pseudokirchneriella subcapitata*)	EC50 (growth)	72	3.2	US EPA, 2019
p-Xylene	Green algae (*Pseudokirchneriella subcapitata*)	EC50 (growth)	8 days	4.4	US EPA, 2019
Molluscs					
o-Xylene	Snail (*Aplexa hypnorum*)	LC50	96	>22.4	US EPA, 2019
Crustaceans					
Xylenes	Waterflea (*Daphnia magna*)	EC50 (immobilisation)	24	75.5	US EPA, 2019
Xylenes	Waterflea (*Daphnia magna*)	LC50	24	150	US EPA, 2019
o-Xylene	Waterflea (*Daphnia magna*)	EC50 (equilibrium)	24	165	US EPA, 2019
o-Xylene	Waterflea (*Daphnia magna*)	EC50 (immobilisation)	24	1	US EPA, 2019
o-Xylene	Waterflea (*Daphnia magna*)	EC50 (immobilisation)	48	<1.39, 1.39, 1.87, 3.19, 3.82	US EPA, 2019
m-Xylene	Waterflea (*Ceriodaphnia dubia*)	IC50 (reproduction)	7 days	2.76	US EPA, 2019
m-Xylene	Waterflea (*Daphnia magna*)	EC50 (immobilisation)	24	4.7	US EPA, 2019
m-Xylene	Waterflea (*Daphnia magna*)	EC50 (immobilisation)	48	2.44, 3.53, 5, 9.56	US EPA, 2019
p-Xylene	Waterflea (*Daphnia magna*)	EC50 (immobilisation)	24	3.6	US EPA, 2019
p-Xylene	Waterflea (*Daphnia magna*)	EC50 (immobilisation)	48	4.73, 5.03, 8.49	US EPA, 2019
p-Xylene	Waterflea (*Daphnia magna*)	LC50	48	28, 31.5, 33.1, 37	US EPA, 2019, 40
Insects					

Xylenes	Yellow fever mosquito (*Aedes aegypti*)	EC50 (immobilisation)	24	13.9	US EPA, 2019
Xylenes	Midge (*Chironmus plumosus*)	LC50	24	109	US EPA, 2019
Xylenes	Midge (*Chironmus plumosus*)	LC50	48	42	US EPA, 2019
o-Xylene	Mayfly (*Ephemerella walkeri*)	LOEC (avoidance)	Not reported	>10	Verschueren, 1996
Fish					
Xylenes	Rainbow trout (*Oncorhynchus mykiss*)	LC50	96	3.3, 8.2, 13.5, 17.3	US EPA, 2019
Xylenes	Bluegill sunfish (*Lepomis macrochirus*)	LC50	24	10.4, 15.6, 16.3, 36	US EPA, 2019
Xylenes	Bluegill sunfish (*Lepomis macrochirus*)	LC50	96	8.6, 15, 15.7, 24.5	US EPA, 2019
Xylenes	Fathead minnow (*Pimephales promelas*)	LC50	24	28.77, 42	US EPA, 2019
Xylenes	Fathead minnow (*Pimephales promelas*)	LC50	96	13.4, 26.7, 28.77, 42	US EPA, 2019
Xylenes	Goldfish (*Carassius auratus*)	LC50	24	30.55, 36.81, 75	US EPA, 2019
Xylenes	Goldfish (*Carassius auratus*)	LC50	96	16.94, 36.81	US EPA, 2019
Xylenes	Common carp (*Cyprinus carpio*)	LC50	24	1080	US EPA, 2019
Xylenes	Common carp (*Cyprinus carpio*)	LC50	96	780	US EPA, 2019
Xylenes	Zebrafish (*Danio rerio*)	LC50	48	20	US EPA, 2019
o-Xylene	Goldfish (*Carassius auratus*)	LC50	24	13	US EPA, 2019
o-Xylene	Goldfish (*Carassius auratus*)	LC50	96	16.1	US EPA, 2019
o-Xylene	Bluegill sunfish (*Lepomis macrochirus*)	LC50	96	16.1	US EPA, 2019
o-Xylene	Guppy (*Poecilia reticulata*)	LC50	96	12	US EPA, 2019
o-Xylene	Carp (*Leuciscus idus melanotus*)	LC50	48	86, 308	US EPA, 2019
o-	Rainbow trout	LC50	96	7.6, 8.05	US EPA,

Xylene	(*Oncorhynchus mykiss*)				2019
m-Xylene	Rainbow trout (*Oncorhynchus mykiss*)	LC50	96	8.4	US EPA, 2019
m-Xylene	Guppy (*Poecilia reticulata*)	LC50	96	12.9	US EPA, 2019
m-Xylene	Guppy (*Poecilia reticulata*)	LC50	14 days	38	Verschueren, 1996
m-Xylene	Goldfish (*Carassius auratus*)	LC50	24	16	US EPA, 2019
p-Xylene	Fathead minnow (*Pimephales promelas*)	LC50	96	8.4, 8.87	US EPA, 2019
p-Xylene	Goldfish (*Carassius auratus*)	LC50	24	18	US EPA, 2019
p-Xylene	Guppy (*Poecilia reticulata*)	LC50	96	8.8	US EPA, 2019
p-Xylene	Guppy (*Poecilia reticulata*)	LC50	7 days	35	Verschueren, 1996
p-Xylene	Rainbow trout (*Oncorhynchus mykiss*)	LC50	96	2.6	US EPA, 2019
Amphibians					
Xylenes	Clawed frog (*Xenopus sp.*)	EC50 (abnormal growth)	<96	58, 102, 299	US EPA, 2019
Xylenes	Clawed frog (*Xenopus sp.*)	LC50	<96	54, 78, 135	US EPA, 2019
o-Xylene	African clawed frog (*Xenopus laevis*)	LC50	48	73	US EPA, 2019

Marine Ecotoxicity

The data indicate that xylenes are of low acute toxicity to molluscs and of low to moderate acute toxicity to crustaceans and fish.

Isomer	Species	Endpoint	Duration (hrs)	Conc. (mg/l)	Ref.
Molluscs					
Xylenes	Pacific oyster (*Crassostrea gigas*)	ED50 (multiple effects)	48	693 µl/l (approximately 603 mg/l)	US EPA, 2019
Xylenes	Pacific oyster (*Crassostrea gigas*)	ED50 (abnormal development)	48	1239 µl/l (approximately 1078 mg/l)	US EPA, 2019
Xylenes	Marine bivalve (*Katelysia*	LC50	24	240	US

	opima)				EPA, 2019
Xylenes	Marine bivalve (*Katelysia opima*)	LC50	48	220	US EPA, 2019
Xylenes	Marine bivalve (*Katelysia opima*)	LC50	72	205	US EPA, 2019
Xylenes	Marine bivalve (*Katelysia opima*)	LC50	96	190	US EPA, 2019
o-Xylene	Pacific oyster (*Crassostrea gigas*)	ED50 (multiple effects)	48	192 µl/l (approximately 169 mg/l)	US EPA, 2019
m-Xylene	Pacific oyster (*Crassostrea gigas*)	ED50 (development)	48	626 µl/l (approximately 538 mg/l)	US EPA, 2019
p-Xylene	Pacific oyster (*Crassostrea gigas*)	ED50 (multiple effects)	48	678 µl/l (approximately 583 mg/l)	US EPA, 2019
Crustaceans					
Xylenes	Brine shrimp (*Artemia salina*)	LC50	24	194	US EPA, 2019
Xylenes	Daggerblade grass shrimp (*Palaemonetes pugio*)	LC50	24	14	US EPA, 2019
Xylenes	Daggerblade grass shrimp (*Palaemonetes pugio*)	LC50	48	8.5	US EPA, 2019
Xylenes	Daggerblade grass shrimp (*Palaemonetes pugio*)	LC50	96	7.4	US EPA, 2019
o-Xylene	Brine shrimp (*Artemia sp.)*	EC50 (immobilisation)	48	10.7, 12.7	US EPA, 2019
o-Xylene	Brine shrimp (*Artemia sp.*)	LC50	48	22.4, 27.1	US EPA, 2019
o-Xylene	Dungeness crab (*Cancer magister*)	LC50	96	6	US EPA, 2019

m-Xylene	Brine shrimp (*Artemia sp.*)	EC50 (immobilisation)	48	5.77, 7.09, 8.54, 10.9	US EPA, 2019
m-Xylene	Brine shrimp (*Artemia sp.*)	LC50	48	8.52, 8.84, 12.2, 14.8	US EPA, 2019
m-Xylene	Bay shrimp (*Crangon franciscorum*)	LC50	24	4.8 µl/l (approximately 4.1 mg/l)	US EPA, 2019
m-Xylene	Bay shrimp (*Crangon franciscorum*)	LC50	96	3.7 µl/l (approximately 3.2 mg/l)	US EPA, 2019
m-Xylene	Dungeness or edible crab (*Cancer magister*)	LC50	48	33	US EPA, 2019
m-Xylene	Dungeness or edible crab (*Cancer magister*)	LC50	96	12	US EPA, 2019
p-Xylene	Brine shrimp (*Artemia sp.*)	EC50 (immobilisation)	24	16.5, 20.6	US EPA, 2019
p-Xylene	Bay shrimp (*Crangon franciscorum*)	LC50	24, 96	2 µl/l (approximately 1.72 mg/l)	US EPA, 2019
Fish					
Xylenes	Atlantic cod (*Gadus morhua*)	EC50 (hatching, mortality)	Not reported (until hatching)	4	US EPA, 2019
Xylenes	Tigerfish (*Terapon jarbua*)	LC50	24	102	US EPA, 2019
Xylenes	Tigerfish (*Terapon jarbua*)	LC50	48	95	US EPA, 2019
Xylenes	Tigerfish (*Terapon jarbua*)	LC50	72	92	US EPA, 2019
Xylenes	Tigerfish (*Terapon jarbua*)	LC50	96	89	US EPA, 2019
o-Xylene	Striped bass (*Morone saxatilis*)	LC50	24, 96	11 µl/l (approximately 9.68 mg/l)	US EPA, 2019

m-Xylene	Striped bass (*Morone saxatilis*)	LC50	24, 96	9.2 µl/l (approximately 7.9 mg/l)	US EPA, 2019
p-Xylene	Striped bass (*Morone saxatilis*)	LC50	24, 96	2 µl/l (approximately 1.72 mg/l)	US EPA, 2019

Terrestrial Ecotoxicity

Isomer	Species	Endpoint	Duration (hrs)	Conc.	Ref.
Bacteria					
o-Xylene	Soil microorganisms	IC50 (respiration inhibition)	10	220 mg/kg soil	ECHA, 2019c
Plants					
o-Xylene	Lettuce (*Lactuca sativa*)	EC50 (biomass)	21 days	>1<3.2 mg/l	US EPA, 2019
o-Xylene	Lettuce (*Lactuca sativa*)	EC50 (biomass)	7 days, 14 days	>1 mg/kg soil	US EPA, 2019
o-Xylene	Lettuce (*Lactuca sativa*)	EC50 (germination)	7 days, 14 days	>1 mg/kg soil	US EPA, 2019
Insects					
Xylenes	Bluebottle fly (*Calliphora vomitoria*)	LC50	5 days	4539 mg/m3	US EPA, 2019

Bio-Accumulation and Bio-Concentration

Xylenes are not expected to bioconcentrate in aquatic organisms based on Bioconcentration Factors (BCF) ranging from 1 to 15 in freshwater fish and 1 to 24 in saltwater fish and invertebrates (no further details available) (Hedgecott and Lewis, 1997).

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[redacted]

Sample number			20127178, 20127200, 20127462	20128659, 20129006, 20129565	20129132, 20129401, 20129566	20129567, 20129532, 20129609	20130518, 20130784, 20131147	20132462, 20132362, 20132367	20133628, 20133656, 20133784	No sampling done	20136089, 20136308	No sampling done	20136759, 20136615	20138212, 20138421
Date			19/03/2020	20/03/2020	21/03/2020	22/03/2020	23/03/2020	24/03/2020	25/03/2020	26/03/2020	27/03/2020	28/03/2020	29/03/2020	30/03/2020
Time			15:40:00	15:00:00	12:30:00	11:30:00	14:00:00	14:00:00	15:45:00	N/a	15:00:00	N/a	15:30:00	15:00:00
Flow (L/s)			40	40	45	50	50	50	50	N/a	50	N/a	70	
Sample point			W01NORMCP	W01NORMCP	W01NORMCP	W01NORMCP	W01NORMCP	W01NORMCP	W01NORMCP	N/a	W01NORMCP	N/a	W01NORMCP	W01NORMCP
			DAY 1	**DAY 2**	**DAY 3**	**DAY 4**	**DAY 5**	**DAY 6**	**DAY 7**	N/a	**DAY 8**	N/a	**DAY 9**	**DAY 10**
Code	**Name**	**Units**							SUPERNATENT RETURN WAS STARTED UP		Reduced sampling		Reduced sampling	Reduced sampling
210	Clarity Qualitative	---	N	N	N	N	N	N	N	N/a	N	N/a	N	N
220	Taste Qualitative	---	1			1	1	1	1	N/a	1	N/a	1	1
230	Odour Qualitative	---	2T			2T	2T	2T	3T	N/a	2T	N/a	2T	2T
612	pH Clean Water	pH _	7.28	7.22	7.23	7.29	7.42	7.26	7.42	N/a	N/a	N/a	N/a	N/a
621	Conductivity at 20C	µS/cm _	941	928	934	938	938	958	931	N/a	N/a	N/a	N/a	N/a
681	Turbidity	NTU _	0.12	0.09	< 0.090	< 0.090	0.11	< 0.090	0.1	N/a	< 0.090	N/a	< 0.090	0.1
721	Colour Filtered	Hazen _	< 0.34	< 0.34	< 0.34	< 0.34			< 0.34	N/a	0.6	N/a	0.4	< 0.34
822	Dissolved Oxygen	mg/l O	7.36	8.39	7.36	8.08	7.65	8.03	8.15	N/a	N/a	N/a	N/a	N/a
Not requested	Hardness Total CLEANWATER	N/a	N/a	N/a	N/a	538	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a
1621	Alkalinity Total	mg/l CACO3	381	316	330	322		356	420	N/a	324	N/a	289	347
1806	Orthophosphate Total	mg/l P	1.922	2.157	1.999	2.022		2.014	2.177	N/a	N/a	N/a	N/a	N/a
1835	Sulphate Total	mg/l SO4	181	178	182	180	185	177	178	N/a	N/a	N/a	N/a	N/a
4035	Manganese Total	mg/l MN	**0.0067**	0.0017	0.0014	0.0024	0.0017	0.0026	0.0029	N/a	< 0.0010	N/a	0.0015	< 0.0010
4215	Iron Total	mg/l FE	< 0.007	**0.018**	< 0.007	**0.028**	< 0.007	**0.03**	< 0.007	N/a	< 0.007	N/a	< 0.007	**0.015**
9111	Chlorine Free	mg/l CL2	0.4	0.55	0.47	0.35	0.5		0.48	N/a	0.48	N/a		0.48
9121	Chlorine Total	mg/l CL2	0.85	0.81	0.68	0.52	0.81		0.8	N/a	0.69	N/a		0.68
9320	3-day Colony Count at 22C	No/ml _	0	0	1	0	0	0	0	N/a	0	N/a	0	0
9340	2-day Colony Count at 37C	No/ml _	0	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a
60131	Undiluted odour count 25C dechlorinated		0		0	0		0	0	N/a	0	N/a	0	**1** intensity 2 CHLOR
60141	Undiluted taste count 25C dechlorinated		0			0		0	0	N/a	0	N/a	0	0
73601	Phosphorus Total	mg/l P	N/a	2.28	2.05	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a
75161	Water Profile	bar AC 1242	0	0	0	0	0	0	0	N/a	N/a	N/a	N/a	N/a
75171	Purge &Trap			0	0	0	0	0	0	N/a	N/a	N/a	N/a	N/a
91371	Odour Quantitative at 60C	TON _	1		1	1		1	1	N/a	1	N/a	1	1
91943	Coliforms Confirmed MPN IDEXX	No/100ml _	0	0	0	0	0	0	0	N/a	0	N/a	0	0
91953	E.Coli Confirmed MPN IDEXX	No/100ml _	0	0	0	0	0	0	0	N/a	0	N/a	0	0
92212	ODOUR QUANTITATIVE 25C DE-CHLORINATED	TON _	1		1	1		1	1	N/a	1	N/a	1	1
97822	TASTE QUANTITATIVE 25C DE-CHLORINATED	TON _	1		1	1		1	1	N/a	1	N/a	1	1
Not requested	Nickel Total	N/a	N/a	N/a	N/a	N/a	0.52	N/a	N/a	N/a	N/a	N/a	N/a	N/a
	Chlorate	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	

From: sil_prodsql@defra.gov.uk
To: DL-DEFRA-DWI Internal Notifications
Cc: SM-Defra-Events, DWI
Subject: Event Notification Anglian Water Services Ltd - EN/ANH/2021/00422 Diddington Reservoir - Created via portal
Date: 15 November 2021 16:38:08

For information

Chief Inspector
Deputy Chief Inspector
Principal Inspectors
Inspectors

DWI
Area 1A, Nobel House
17 Smith Square
London
SW1P 3JR
Tel 030 0068 6435

Company	Anglian Water Services Ltd
Name of event	Diddington Reservoir
Notification Reference	EN/ANH/2021/00422
Person making the notification	[redacted]
Date of notification	15/11/2021
Time of notification	16:27
Date of event	02/11/2021
Location of event	Areas supplied by Diddington Reservoir
Nature of event	Diddington Reservoir was commissioned on 27 Feb 2018 & was removed from supply on 21 Sept 2021 as part of the Grafham Resilience Trial. Prior to the reservoir being returned to service and internal inspections were undertaken on 02 & 08 Nov & being mindful of the situation at Keddington WTW particular attention was paid to the internal pipework. This inspection & further investigation identified sections of pipework installed within the tank does not comply with Reg 31 of the Water Supply (Water Quality) Reg 2018. The pipework identified in the tank will be replaced, with appropriately approved pipes, before the reservoir is returned to supply. Prior to the reservoir being commissioned, we undertook extensive sampling, which included Materials in Contact (MIC) with water & there has been no evidence to suggest there has been any impact on the water quality received by customers. A full review of all new build tanks is underway & inspections will be carried out on all of these tanks.
Population affected	89449
Likely cause(s)	Use of unapproved materials/products
	Full commissioning sampling including Materials in Contact sampling, was

Action taken to inform/protect consumers and details of risk assessment	undertaken along with regulatory monitoring whilst the reservoir was in supply prior to 21 September 2021, the reservoir has been out of supply since this date. We are reviewing the Water Quality contacts and sample results but we currently believe there has not been any impact on the water quality.
Action being taken to rectify the situation	The non compliant pipework within the tanks will be replaced with Regulation 31 approved pipework before the reservoir is returned to supply. There is no evidence to suggest there has been any impact on the water quality or effect on the sufficiency of water.
LAs/HAs informed?	no
Level of publicity	None

Line to take

The Inspectorate has been informed of an event affecting supplies in the Areas supplied by Diddington Reservoir area.

The Company is taking steps to return supplies to normal.

The Inspectorate is investigating the event.

No further notice will be given unless recipients request it or the situation changes.

3 DAY REPORT

AW Reference No:	AW/2021/1750
DWI Reference No:	DWI/2021/8338
Name of event:	Diddington Reservoir
Description of event:	Identification of lengths of pipework within the tank that is not compliant with Regulation 31.
Date and time of event:	02 November 2021
Date and time of notification to DWI:	15 November 2021 at 16:27
Notified by:	[redacted]
Population/Property Count affected:	Under normal operation the reservoir supplies a population of 89,450.
Duration of event:	25,560 hours
Effect on water sufficiency or quality:	There has been no evidence to date of the water quality being affected. The sufficiency of the water supply has not been affected.
Risk to public health:	It is not believed there is a wider risk to public health.
Details of any regulatory breaches:	There have been no regulatory exceedances associated with this event. Relevant sample results can be seen in attached appendices.
Other organisations notified:	CCWater
Publicity:	None known

Executive Summary

Whilst undertaking an internal inspection at Diddington Reservoir, nr Huntingdon, it was noted that sections of blue pipework on both overflows had areas of blistering and in some areas the coating was peeling away from the pipe.

Diddington Reservoir is a newly constructed reservoir which entered supply following a full commissioning process in 2018, and following the recent identification of pipework at our new Keddington WTW which did not fully comply with Regulation 31, the issue was immediately escalated.

Investigations are ongoing but it has been confirmed that two sections of the overflow pipework at Diddington Reservoir did not have the correct Regulation 31 approval.

There has been no evidence to suggest that there has been any impact on the quality of water being supplied to customers whilst the reservoir was in supply and it will remain out of supply until remedial work has been completed.

We are also undertaking a review of all treated water tanks commissioned in AMP5, AMP6 and AMP7 to give assurance that this issue identified at Diddington Reservoir and Kedington WTW has not occurred elsewhere. Initial risk assessment has identified this to be low risk however, all sites identified will undergo an internal inspection focussing specifically on internal pipework.

A full Lessons Learned investigation has been initiated to identify the actions that need to be undertaken to ensure this event does not recur.

1. Geographical location of event

Diddington Reservoir (RDIDD) is located just outside the village of Perry nr Huntingdon. Figure 1 below shows the location of Diddington Reservoir.

The reservoir is supplied directly from our surface water Grafham Water Treatment Works (TGTW1) and in normal operation supplies water to our Huntingdon North (ZFW40) and Huntingdon South (ZFW41) Public Water Supply Zones (PWSZs). All these assets are located in our Ruthamford Supply System, see Figure 2 below.

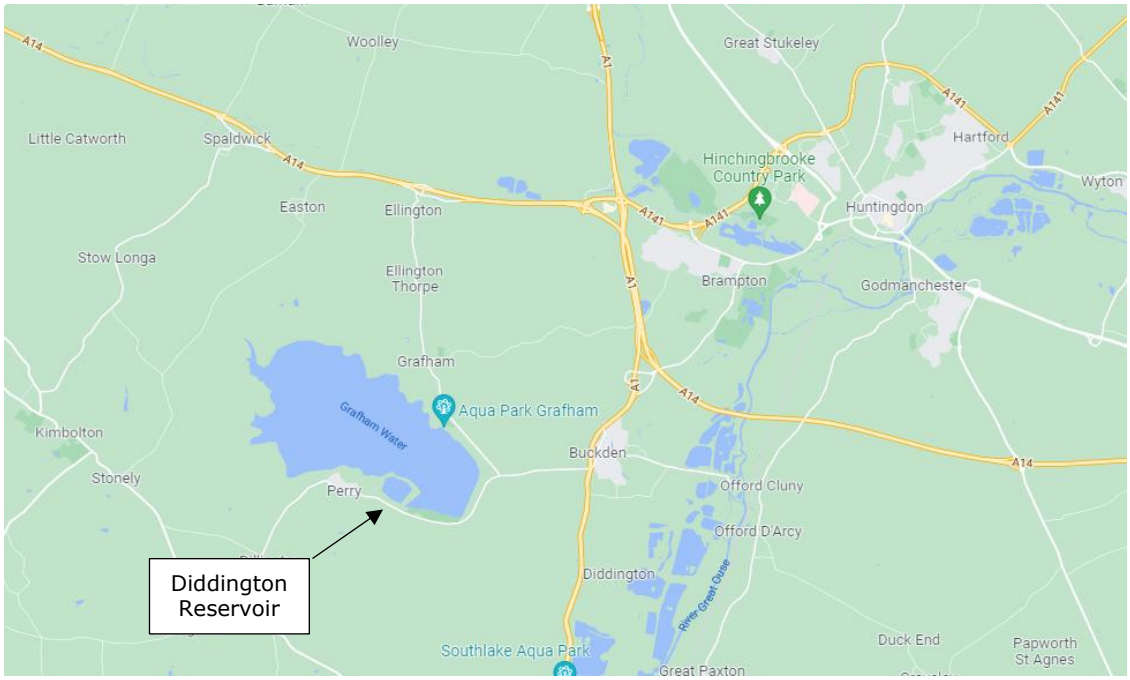


Figure 1: Diddington Reservoir location

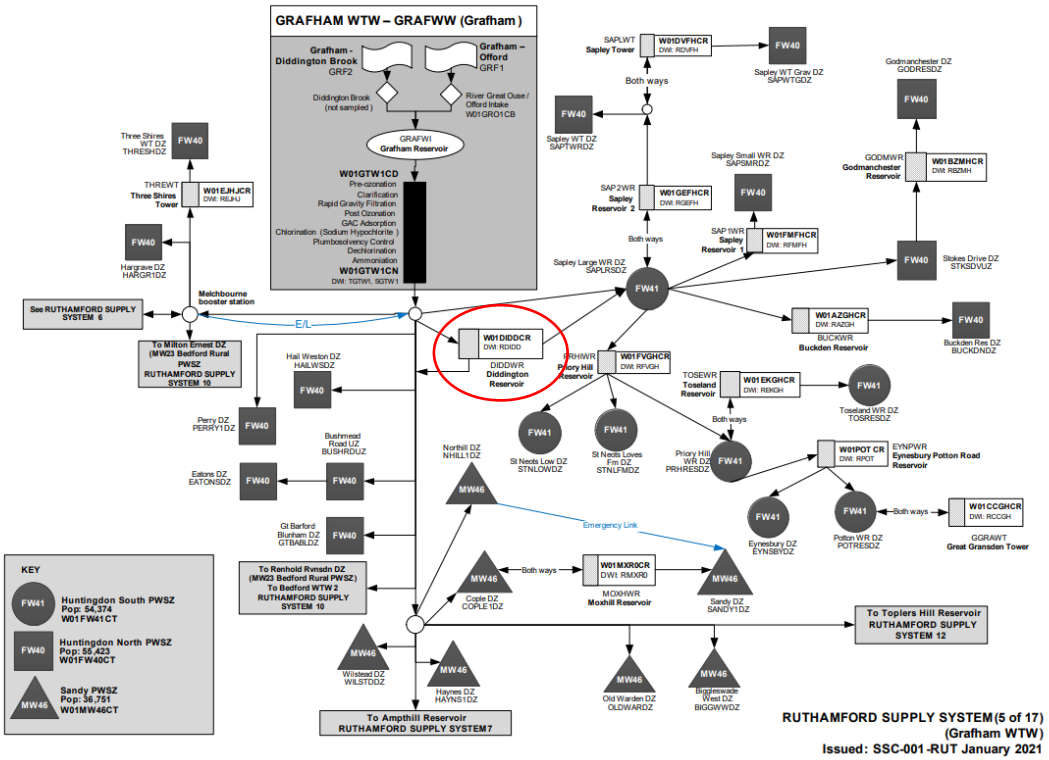


Figure 2: Supply System Schematic

2. Regulation 28 Risk Assessment

Diddington Reservoir is covered by the following Regulation 28 Risk Assessment: ANH-Risk-RDIDD.

We recognise the hazardous activity of 'Use of unapproved chemicals/materials' across the hazards of individual microbiological parameters, hydrocarbons, taste and odour, solvents and aluminium. The Regulation 28 records for these hazardous activities for Diddington Reservoir are listed below. A DWI Category E has been applied against these hazards on our Water Quality Risk Portal to reflect the ongoing investigations. Our Water Quality Risk Team are currently reviewing this event and any associated risk score updates will be triggered in our Water Quality Risk Portal and will be submitted to the DWI as part of our Regulation 28 submission.

Asset Reference	Asset Name	Hazard Reference	DWI risk Category	Unique Hazard ID
RDIDD	Diddington Reservoir	C004A	E	ANH-RDIDD-C004A-ST0107
RDIDD	Diddington Reservoir	C001	E	ANH-RDIDD-C001-ST0125
RDIDD	Diddington Reservoir	C007	E	ANH-RDIDD-C007-ST0499
RDIDD	Diddington Reservoir	C007	E	ANH-RDIDD-C007-ST0598
RDIDD	Diddington Reservoir	C002	E	ANH-RDIDD-C002-ST0196
RDIDD	Diddington Reservoir	C003	E	ANH-RDIDD-C003-ST0214
RDIDD	Diddington Reservoir	A004	E	ANH-RDIDD-A004-ST0417
RDIDD	Diddington Reservoir	A003	E	ANH-RDIDD-A003-ST0337
RDIDD	Diddington Reservoir	H006	E	ANH-RDIDD-H006-ST0487
RDIDD	Diddington Reservoir	A021	E	ANH-RDIDD-A021-ST0525
RDIDD	Diddington Reservoir	A021	E	ANH-RDIDD-A021-ST0526

Figure 3: Regulation 28 records for Diddington Reservoir with hazardous activities related to the use of unapproved materials

3. Details and Chronology of Event

The construction for Diddington Reservoir was an AMP6 engineering scheme designed to provide resilience to Grafham WTW in the event of a major issue at the works. The Reservoir was constructed by our AMP6 Special Project delivery vehicle with construction starting in 2015. The reservoir entered supply on 27 February 2018. The design was completed by Mott Macdonald and the construction by JN Bentley. Diddington Reservoir consists of two tank cells (East and West) with full height dividing walls, and individual operational tank capacities of 20,000m^3.

Diddington Reservoir is designed to remain between 70 and 90% full so that storage is always available in a resilience situation. During normal operations Diddington is fed from Grafham WTW via Grafhams high lift pumping station. In an emergency situation Diddington Reservoir is designed to receive a transfer of 82.7mld from Wing/Morcott via Beanfield WR and Hannington WR which is boosted to Diddington Reservoir via our Wilby and Melchbourne pumping stations.

MIC (Materials in Contact) sampling was carried out on both cells, and the combined sample point, prior to commissioning in February 2018. Two low level organic compounds were detected in the first sets of MIC samples from the West cell, and one from the first set in the East cell. These were significantly below the health based SNARLs listed below:

Compounds	Level detected (µg/l)	24hour Health Based SNARL (µg/l)	7-day Health Based SNARL (µg/l)	Data Source
Undecanol	0.12	60000	30000	UKWIR
Ethyl hexanol	0.14/ 0/19	5400	2100	UKWIR

Fig 4: Low level trace organics detected and their associated SNARLs

A subsequent sample from the West and East Cell with a longer standing time, along with the MIC sample from the combined sample point had no trace organic compounds detected. All taste and odour samples were satisfactory. A summary of the MIC and commissioning sample results from each cell and the combined outlet sample tap are included in Appendix 1.

During normal operations of Diddington Reservoir, water from the common outlet main is pumped via Diddington WR Booster Pumping Station to our Brampton Main, supplying Huntingdon South PWSZ (FW41) and 6 DZs within our Huntingdon North PWSZ (ZFW40) - Buckden Res DZ, Godmanchester DZ, Sapley Small WR DZ, Sapley WT DZ, Sapley WT Grav DZ, Stokes Drive DZ. These have a combined population of 89,450. Within Didddington WR Booster Pumping Station there is a second set of resilience pumps that can supply water to our Ampthill main which has connections with our wider Ruthamford supply system, including a further 18 PWSZs. The population of all the areas that could receive water from Diddington Reservoir across all modes of operation is 749,219. However, since commissioning in February 2018 the Ampthill pumps have only been in use for a combined time period of 41 and a half hours. These are from both monthly conditioning flushes for 10 minute durations, and thirteen occasions where the resilience mode was implemented with durations from 9 minutes to a maximum of 7 and a half hours. The list of dates these were operated can be found in Appendix 2.

Diddington Reservoir was out of supply from October 2019 to June 2020 for a warranty inspection; this time (5,712 hours) has been excluded the event duration calculation. Internal inspections of both cells were completed on 21 November 2019. Three areas were recorded requiring remedial work with identified areas of wall weeping, roof ingress and hatch ingress. Remedial work was completed to replace the hatches, repair roof ingress and overband the wall areas around the overflow pipework. Further internal inspections were carried out on 22 May 2020 for the West cell and 29 May for the East cell, both of which were satisfactory with items from the prior internal inspection having been rectified. Our internal inspection reports contain a section on Tank Fittings and Pipework. On both the initial and final inspections, the overflow pipework had been recorded to be in a satisfactory condition at that time. The internal and final internal inspection reports can be found in Appendices 3 and 4.

MIC sampling was also completed on the individual cells after the remedial work described above in 2020, before the reservoir was returned to supply in June 2020 and no trace organic compounds were detected.

Diddington Reservoir was removed from supply on 21 September 2021 to enable further validation testing of our Grafham resilience scheme. An internal inspection was carried out at Diddington Reservoir on 02 November 2021 prior to returning the reservoir to supply. Following the event at Kedington WTW (DWI 2021 8118) particular attention was paid to the pipework within the tank and it was identified at this inspection sections of blue pipework on both overflows were noted to have areas of blistering and in some areas peeling of the coating. This was escalated, and a representative from the team involved in building Diddington Reservoir was contacted. A joint investigation was initiated to further understand the details of this pipework.

On 8 November the formal internal inspections of Diddington Reservoir were completed by our Reservoir and Tower Team. Ingress was identified at roof points of both cells, and on two of the hatches on the east cell. The condition of the overflow pipework was additionally recorded to be in unsatisfactory condition. The inspection reports for both cells are included in Appendices 5 and 6.

A further group visit was also undertaken to Diddington Reservoir, on 08 November, by an investigating team comprised of a representative from JN Bentley, a Water Quality Risk Scientist, a Materials Scientist, the Reservoir and Tower Team Manager, a Supply Support Manager. During this visit both the paddle flange and connecting section of pipework were confirmed to have an Electrosteel marking.

The overflows in both cells of Diddington reservoir are comprised of a paddle flange socket, a section of coated ductile iron pipework and a duckfoot bellmouth. The paddle flange sockets and connecting sections of pipework were supplied from Electrosteel Casings Ltd.

Figure 5: Electrofresh pipe length on the west cell overflow

Figure 6: External surface of Electrofresh pipe length on the east cell overflow

The Electrosteel pipework is Electrofresh Plus Pipe lined with 3M Scotchkote Epoxy coating 162. This held and still holds a DWI approval of DWI 56/4/537. The pipe is approved as a product for use for the conveyance of water. The DWI approval certificate and Instruction for Use for Electrofresh Plus at the time of purchase are included in Appendices 7 and 8. The sections of Electrosteel manufactured pipework in Diddington Reservoir are listed in the table below.

Pipe type	Pipe location	Pipe Diameter	Pipe Length	Material	Product
Paddle flange socket	East cell overflow	900mm	275mm	Ductile iron lined with epoxy coating	Electrofresh Plus
Double flanged pipe length	East cell overflow	900mm	3195mm	Ductile iron lined with epoxy coating	Electrofresh Plus
Paddle flange socket	West cell overflow	900mm	275mm	Ductile iron lined with epoxy coating	Electrofresh Plus
Double flanged pipe length	West cell overflow	900mm	3195mm	Ductile iron lined with epoxy coating	Electrofresh Plus

Figure 7: Table of Electorsteel pipes found in Diddington Reservoir

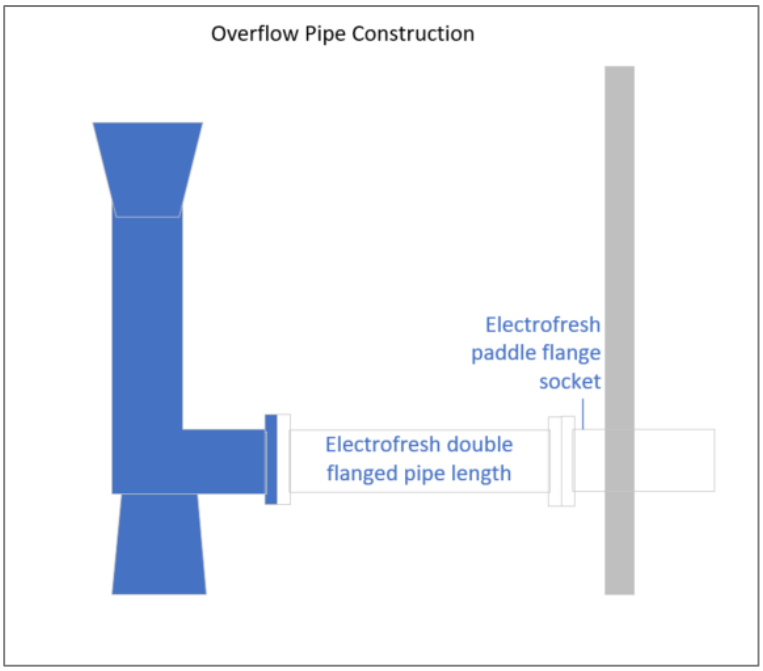


Fig 8: Simplified overflow design showing location of Electrosteel pipework on the overflow

Our subsequent investigation has identified the following process is carried out on the Electrofresh pipework. Standard 5.5m lengths of Electrofresh pipes are manufactured at Electrosteel's facility in in India. An external blue epoxy coating is applied as part of the manufacturing process. The coating applied was Electrocoat EP812 which was WRAS approved (1305512) at time of purchase and still holds an active approval (1807507).

Electrosteel produce required lengths of pipe from these full 5.5m lengths at their UK facility. The pipe is cut to length requirement. The ends of the pipe are linished to remove the external coating to give a clean substrate for attaching the flange. The flanges are cut, heated and hydraulically pressed onto the receiving pipe barrel, before cooling and welding. Any bare metal areas, on the external surface, have a zinc paint application before being finished with 3M Scotchkote Epoxy 162PWX coating. 3M Scotchkote Epoxy 162PWX held both DWI and WRAS approvals (DWI approval 56/4/300) at the time of purchase and installation. The external barrel of the pipe is finally coated with a synthetic coating for aesthetic purposes. The paint used is Dacrylate V&M enamel 97-line, and this holds no approval for contact with drinking water. The safety data sheet for this coating

is included in Appendix 9. The safety data sheet is for the wet paint and not the final dried coating.

A sample of flaking blue external coating taken from the Electrosteel overflow pipework in Diddington Reservoir West cell on 8th November was soaked in 500ml deionised water for 24 hours. The water sample was extracted with dichloromethane and analysed by gas-chromatography/ mass spectrometry (GC/MS) to produce a qualitative result. This test gave clear results with no trace organic compounds detected.

An initial review of regulatory and internal monitoring sample results has not highlighted any concerns. The review looked at the mean results for samples collected in the two downstream PWSZs in the twelve months prior and post Diddington Reservoir entering supply (see Appendix 10).

During the period that Diddington Reservoir was in supply from February 2018 to September 2021, all samples from the reservoir were satisfactory meeting the requirements of the Water Supply (Water Quality) Regulations (as amended), however there were four customer tap coliform detections and one iron exceedance in the area supplied by Diddington Reservoir. Details of the investigations into all of these were reported to the Inspectorate as part of our monthly data returns, however a summary of the findings for the investigations into these can be found in the table below:

Date	Asset	Parameter	Findings
25/07/2019	Huntingdon North PWSZ	Coliform Bacteria (Indicator) (ANH-C001A-25-07-19)	It was not been possible to categorically confirm the cause of the exceedence. However the most likely cause was the hygiene of the kitchen tap. On resampling, all results were satisfactory, as were the results of samples collected from customer's taps at neighbouring properties and the supplying Grafham WTW and upstream storage points; Sapley Tower, Sapley Reservoir No. 2 and Diddington Reservoir.
04/09/2019	Huntingdon South PWSZ	Coliform Bacteria (Indicator) (ANH-C001A-04-09-19)	The most likely cause of the coliform exceedance was the hygiene of the kitchen tap when the initial sample was collected. On resampling, the pre-disinfection sample contained one confirmed coliform. All other samples collected were satisfactory, as were the results of samples collected from customer's taps at neighbouring properties, the supplying Grafham WTW and storage points; Sapley Reservoirs Nos. 1 and 2, Diddington Reservoir, Godmanchester Reservoir, Priory Hill Reservoir and Buckden Reservoir.
26/05/2020	Huntingdon North PWSZ	Iron (ANH-A022-26-05-20)	The likely cause of the exceedence was a disturbance of iron sediment within the distribution system supplying the property following operation of a hydrant within the area by the local fire service. All resamples were satisfactory.
28/07/2020	Huntingdon North PWSZ	Coliform Bacteria (Indicator) (ANH-C001A-28-07-20)	The most likely cause of the exceedance was the condition of the kitchen tap when the initial sample was collected. The tap had already been re-disinfected between collection of the failing sample and resamples being collected, as another regulatory monitoring sample had been collected. All investigatory samples collected were satisfactory, as were the results of samples collected from customer's taps at neighbouring properties and the supplying WTWs and storage points; Grafham WTW, Diddington Reservoir, Sapley Reservoir No. 2 and Sapley Tower.
06/08/2020	Huntingdon North PWSZ	Coliform Bacteria (Indicator) (ANH-C001A-06-08-20)	The most likely cause of the exceedance was the condition of the kitchen tap when the initial sample was collected. The tap had already been re-disinfected between collection of the failing sample and resampling, as another regulatory monitoring sample had been collected. All investigatory samples collected were satisfactory, as were the results of samples collected from customer's taps at neighbouring properties, properties in the wider area and the supplying WTWs and storage points; Grafham WTW, Diddington Reservoir, Sapley Reservoir No. 2 and Sapley Tower.

Figure 9 – Regulatory Monitoring Exceedance Summary

There were two quantitative odour detections in the Huntingdon North PWSZ which were also reported to the Inspectorate, however both of these properties are located in our Eatons DZ, which is not fed from Diddington Reservoir under normal operation. Prior to these detections the Ampthill Pumps at Diddington Reservoir had not been feeding into the wider area (see Appendix 2) and therefore the detections are not considered to be related to Diddington Reservoir.

Our target standard process for raw and treated waters highlights any regulatory and operational samples that are above our internal set triggers on a twice weekly basis. These are each investigated by a Water Quality Risk Scientist where trends will be reviewed as part of the investigation. There have been no associated trends or unusual numbers of target standard investigations for Huntington North PWSZ and Huntingdon South PWSZ since Diddington Reservoir was commissioned and entered supply in February 2018.

We have also carried out a review of the customer contacts received from the Huntingdon North (FW40) and Huntingdon South (FW41) PWSZs before and after the introduction into supply of Diddington Reservoir, for all tastes and odours categories.

The table below gives a breakdown of the Acceptability Rates for the two PWSZs downstream of Diddington Reservoir this shows that there has been no associated impact on acceptability since Diddington Reservoir entered supply.

Year	Acceptability rate (per 1000 pop.)	
	FW40	FW41
2015	1.14	0.75
2016	1.36	0.65
2017	0.52	0.80
2018	0.45	0.72
2019	1.27	0.61
2020	0.95	0.76

Figure 10 – PWSZ Acceptability Rates for FW40 and FW41

The table below gives a breakdown, by year, of the contacts from each of the DZs downstream of Diddington Reservoir in these PWSZs under normal operation.

Year	FW40 BUCKDNDZ	FW40 GODRESDZ	FW40 SAPSMRDZ	FW40 SAPTWRDZ	FW40 SAPWTGDZ	FW40 STKSDVUZ	FW40 Total	FW41 POTRESDZ	FW41 PRHRESDZ	FW41 EYNSBYDZ	FW41 SAPLRSDZ	FW41 STNLOWDZ	FW41 STNLFMDZ	FW41 TOSRESDZ	FW41 Total
2015	1	0	1	2	3	0	7	1	0	1	1	1	0	0	4
2016	1	1	0	3	1	0	6	1	0	0	5	1	1	1	9
2017	0	0	0	0	0	0	0	0	0	0	4	0	1	0	5
Jan to 26 Feb 2018	0	0	0	1	0	0	1	0	2	0	0	0	1	0	3
Diddington Reservoir into supply															
27 Feb 2018 onwards	1	1	2	1	0	0	5	0	0	0	4	2	0	0	6
2019	2	1	1	2	0	0	6	0	2	0	6	2	0	0	10
2020	2	2	0	2	2	0	8	0	0	1	8	1	0	0	10

Figure 11 – Customer Contacts per year for DZs downstream of Diddington Reservoir

A detailed review of these contacts has not established an increase in calls following the introduction of Diddington Reservoir or a link back to Diddington Reservoir as the cause of any of these contacts.

Appendix 11, gives a brief summary of the root causes of the taste or odour detected following our conversations with customers and investigations or sampling. All water quality contacts into Anglian Water are firstly triaged by our Call Centre Agents, who are trained to provide advice to customer on aspects of water quality such as chlorine and TCP. Calls may be escalated to a Water Quality Scientist, in line with our procedures, if the Call Agent feels the customer requires more in depth advice or the if the contact has been received following work on the network, the customers own plumbing or for certain types of complaints such as a taste or odour described as petrol/diesel in nature. All calls are visible to the Water Quality Team and if clusters of calls are received from hydraulically linked areas these are also escalated for investigation.

Our review of the calls shows that the majority of calls are due to internal issues in the customers property, such as earthy/musty smells originating from sink traps, long service pipes or a lack of NRVs on washing machines or dishwashers. Where a visit was carried out by a Network Technician and sampling undertaken, all samples results returned as satisfactory for water quality parameters.

4. Next Steps

The non-compliant pipework within the reservoir will be removed and will be replaced with a suitably approved alternative, fully complying with the requirements of Regulation 31. The reservoir will not be returned to supply until this work has been completed and appropriate sampling has been undertaken.

We are continuing to work with the product suppliers to investigate any potential impact on water quality.

A full Lessons Learned investigation is underway for this event which is being led by our Chief Engineer. This will include a review of the processes followed and what actions need to be undertaken to ensure this event does not recur. The learning from this will feed directly into our action plan developed following the Kedington WTW event and if applicable, we will share any learning with the wider industry.

As a result of this event we are also carrying out a full investigation of all treated water tanks commissioned in AMP5, AMP6 and AMP7 to give assurance that this issue identified at Diddington Reservoir and Kedington WTW has not occurred elsewhere. This investigative review covers 9 tanks listed below:

AMP7:
Keddington WTW – Rectified (currently out of supply)
Boughton Reservoir – (currently out of supply)
Ludham (Horstead Reservoir)

AMP6:
Diddington Reservoir – (currently out of supply)
Pulloxhill WTW
Postwick WTW

AMP5:
Hall WTW
Mattishall WTW - (currently one lane out of supply)
Raithby WTW – (currently one lane out of supply)

The review consists of a desktop exercise using paper records, inspection records and photographs where available to give an initial assessment of risk at each site. We will also remove each asset from supply and carry out an internal inspection focussing specifically on the pipework within the tank. Each inspection will be carried out by a Reservoir Engineer, accompanied by representatives from the Supply team, the Water Quality team and an Engineer from our @one Alliance. Details of the initial assessment of risk at each site is given below:

Boughton Reservoir:
Stainless steel construction – all internal pipework and structural steel including bolting is stainless steel.
Very Low Risk
Date of internal inspection: 24/11/21

Ludham (Horstead Reservoir):
Inlet pipe, overflow and bolting – stainless steel, epoxy coated carbon steel flanges and wall couplings. Drainage pipe encased in concrete structure to sump is ductile iron – no external face and so not in contact externally.

Very Low Risk
Date of internal inspection: 1/12/21

Pulloxhill WTW:
All internal pipework epoxy coated carbon steel, wall couplers – Viking Johnson approved coating system, bolting – stainless steel. Drainage pipe encased in concrete structure to sump is ductile iron – no external face and so not in contact externally.
Very Low Risk
Date of internal inspection: 9/12/21

Postwick WTW:
All internal pipework epoxy coated carbon steel, wall couplers – Viking Johnson approved coating system, bolting – stainless steel. Drainage pipe encased in concrete structure to sump is ductile iron – no external face and so not in contact externally.
Very Low Risk
Date of internal inspection: 2/12/21

Hall WTW:
Internal pipework - large scale stainless steel pipework.
Low Risk
Date of internal inspection: 1/12/21

Mattishall WTW:
All internal pipework epoxy coated carbon steel, wall couplers – Viking Johnson approved coating system, bolting – stainless steel. Drainage pipe encased in concrete structure to sump is ductile iron – no external face and so not in contact externally.
Very Low Risk
Date of internal inspection: 24/11/21

Raithby WTW:
Inlet, outlet and overflow pipework – HDPE Weholite provision pipework jointed by stainless steel couplings, bolting – stainless steel.
Very Low Risk
Date of internal inspection:24/11/21

5. Likely Cause of the Event

Investigations are on-going however, sections of pipe have been identified within the reservoir which do not hold the correct approvals under Regulation 31. At this stage there is no evidence to suggest this has had an impact on water quality.

The cause appears to be the same as the Kedington WTW event (DWI 2021 8118).

6. Notifications

Other organisations informed:
CCWater

From: sil_prodsql@defra.gov.uk
To: DL-DEFRA-DWI Internal Notifications
Cc: SM-Defra-Events, DWI
Subject: Event Notification Anglian Water Services Ltd - EN/ANH/2021/00463 Hannington Reservoirs 1A & 1B - Created via portal
Date: 21 December 2021 18:03:02

For information

Chief Inspector
Deputy Chief Inspector
Principal Inspectors
Inspectors

DWI
Area 1A, Nobel House
17 Smith Square
London
SW1P 3JR
Tel 030 0068 6435

Company	Anglian Water Services Ltd
Name of event	Hannington Reservoirs 1A & 1B
Notification Reference	EN/ANH/2021/00463
Person making the notification	[redacted]
Date of notification	21/12/2021
Time of notification	17:53
Date of event	20/12/2021
Location of event	Area supplied by Hannington Reservoirs
Nature of event	Additional inlet mains were installed into Hannington Reservoirs 1A and 1B in AMP6 as part of the Grafham Resilience scheme and the reservoir returned to service 16 April 2016. An internal inspection was carried out on 20 December 2021 in Compartment 1A being mindful of the situation at Kedington WTW particular attention was paid to the internal pipework. This inspection identified sections of pipework installed within the tank does not comply with Reg 31 of the Water Supply (Water Quality) Reg 2018. The pipework identified in the tank will be replaced, with appropriately approved pipes, before the reservoir is returned to supply. There has been no evidence to suggest there has been any impact on the water quality received by customers. A full review of all new build tanks is underway & inspections will be carried out on all of these tanks.
Population affected	834041
Likely cause(s)	Use of unapproved materials/products
Action taken to inform/protect consumers and details of risk assessment	Full commissioning sampling, was undertaken along with regulatory monitoring whilst the Hannington Reservoir Compartments 1A & 1B were in supply prior 1A being removed from supply for inspection which was undertaken on 20

	December 2021. We are reviewing the Water Quality contacts and sample results but we currently believe there has not been any impact on the water quality.
Action being taken to rectify the situation	The non compliant pipework within the tanks will be replaced with Regulation 31 approved pipework before the reservoir is returned to supply. There is no evidence to suggest there has been any impact on the water quality or effect on the sufficiency of water.
LAs/HAs informed?	no
Level of publicity	None

Line to take

The Inspectorate has been informed of an event affecting supplies in the Area supplied by Hannington Reservoirs area.

The Company is taking steps to return supplies to normal.

The Inspectorate is investigating the event.

No further notice will be given unless recipients request it or the situation changes.

3 DAY REPORT

AW Reference No:	AW/2021/1753
DWI Reference No:	DWI/2021/8379
Name of event:	Hannington Reservoirs 1A and 1B
Description of event:	Discovery of lengths of pipework within the tanks that is not compliant with Regulation 31.
Date and time of event:	20 December 2021
Date and time of notification to DWI:	21 December 2021 at 17:53
Notified by:	[redacted]
Population/Property Count affected:	Under normal operation the reservoir supplies a population of 834,041
Duration of event:	50,040 hours
Effect on water sufficiency or quality:	There has been no evidence to date of the water quality being affected. The sufficiency of the water supply has not been affected.
Risk to public health:	It is not believed there is a wider risk to public health.
Details of any regulatory breaches:	There have been no regulatory exceedances associated with this event.
Other organisations notified:	CCWater
Publicity:	None known

Executive Summary

Whilst undertaking an internal inspection at Hannington Reservoir 1A, it was noted that two of the outlet mains had areas of blistering of the coating on sections of blue pipework that had been installed in 2016 as part of our AMP6 Grafham WTW Resilience Scheme.

The inspection had been undertaken in response to the identification of pipework at our new Kedington WTW and Diddington Reservoirs, which did not fully comply with Regulation 31 as previously reported (DWI 2021 8118 and DWI 2021 8338, respectively).

Investigations are on-going however sections of pipe have been identified within Hannington Reservoir 1A which do not hold the correct approvals under Regulation 31.

There has been no evidence to suggest that there has been any impact on the quality of water being supplied to customers whilst the reservoir was in supply. The reservoir will remain out of supply until remedial works have been completed.

A full Lessons Learned investigation has been initiated to identify the actions that need to be undertaken to ensure this event does not recur.

1. Geographical location of event

Hannington Reservoir 1A (RCGJL) and 1B (RAGJL) are located on the A43 between Northampton and Kettering. Figure 1 below identifies the location of Hannington Reservoirs.

The Hannington Reservoir complex is supplied with water from Anglian Water's Wing and Morcott WTWs via Beanfield Reservoir No. 2 (RAHUA) and Beanfield Hannington DZ (BHTRNKDZ) and supplies water to the Public Water Supply Zones (PWSZs) listed in Table 1. All these assets are located within our Ruthamford Supply System (Figure 2).

The Hannington Reservoirs complex consists of three storage points. Reservoirs 1A and 1B are separated by a full height dividing wall. The operational tank capacity of Reservoirs 1A and 1B are each 11,365m^3. Figure 3 provides additional detail for Reservoirs 1A and 1B pipework. Reservoir 2 is a separate structure.

PWSZ Reference	PWSZ Name
ZMW21	Newport Pagnall PWSZ
ZMW27	Winslow PWSZ
ZMW28	Milton Keynes City North West PWSZ
ZMW29	Milton Keynes City North East PWSZ
ZMW31	Milton Keynes City South East PWSZ
ZMW58	Milton Keynes City West PWSZ
ZRW07	Wellingborough PWSZ
ZRW08	Desborough PWSZ
ZRW10	Ravensthorpe PWSZ
ZRW11	Brixworth PWSZ
ZRW14	Daventry PWSZ
ZRW15	Northampton West PWSZ
ZRW16	Northampton Central PWSZ
ZRW18	Northampton East PWSZ
ZRW19	Northampton North PWSZ
ZRW20	Buckingham PWSZ
ZRW45	Kettering Town West PWSZ

PWSZ Reference	Grafham WTW Resilience Support
ZFW40	Huntingdon North PWSZ
ZMW23	Bedford Rural PWSZ
ZMW52	Sandhouse PWSZ

PWSZ Reference	Ravensthorpe WTW Resilience Support
ZRW10	Ravensthorpe PWSZ

Table 1 – PWSZ fed from Hannington Reservoirs

There are a number of bulk exports within the area supplied from Hannington Reservoirs to Thames Water and to Independent Water Networks Limited (IWNL). Following discussions with the DWI, it has been agreed that these suppliers will be contacted in due course.

Figure 1: Hannington Reservoirs location

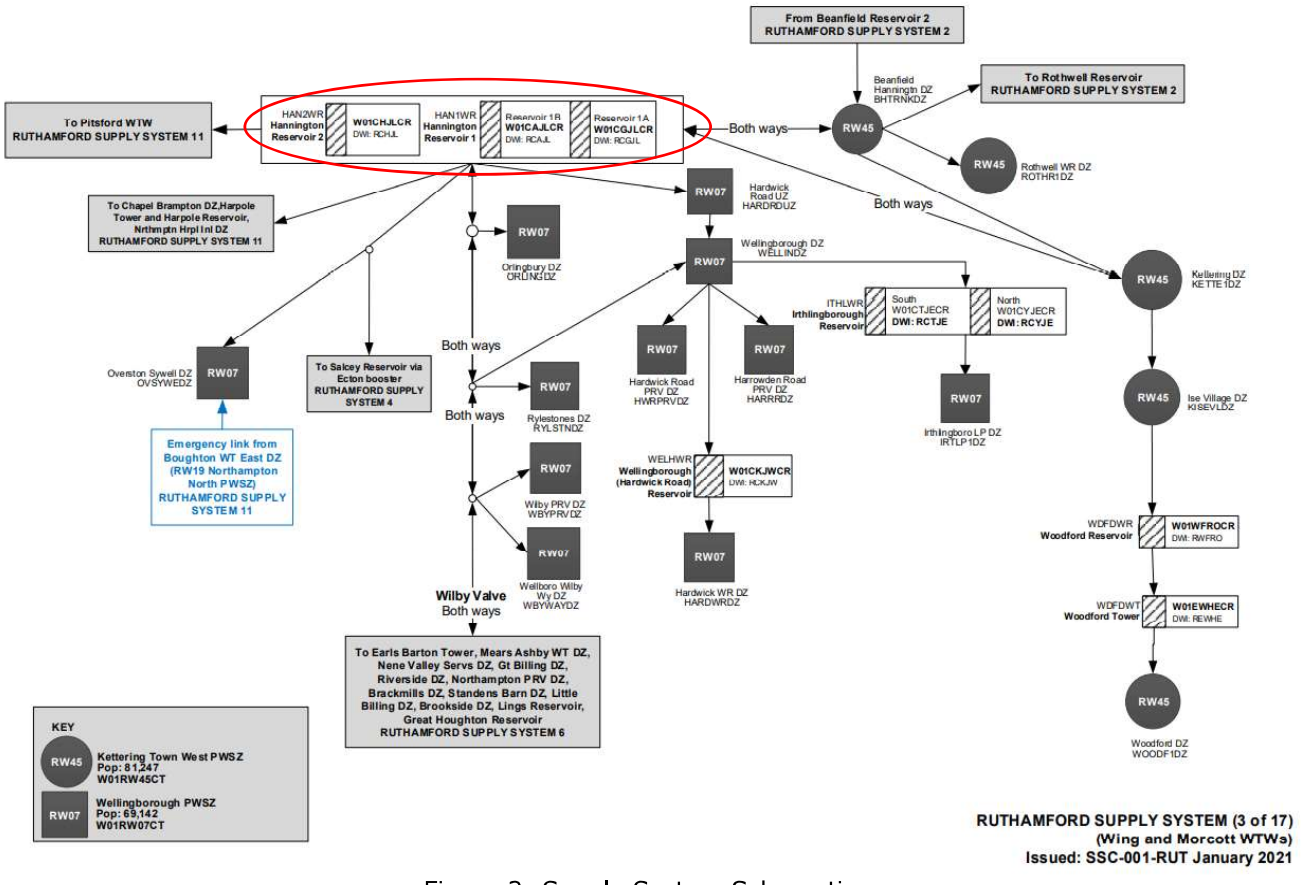


Figure 2: Supply System Schematic

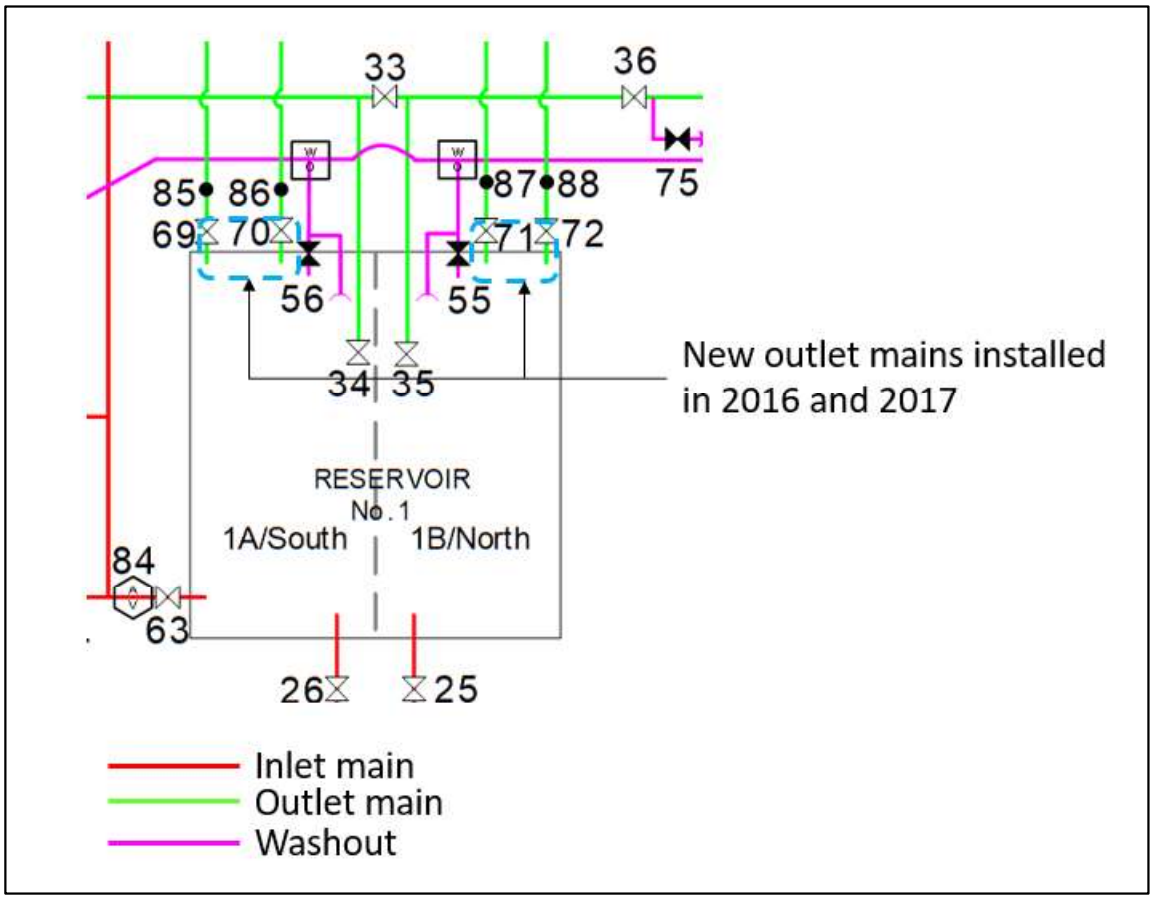


Figure 3 – Pipework Schematic of Hannington Reservoirs 1A and 1B

Under the normal operation of Hannington Reservoirs, water feeds under gravity from the reservoir outlets into six mains. These mains feed to Kettering, Wellingborough, Wilby, Ecton and two mains supply Pitsford WTW. Via these mains water from Hannington Reservoirs is supplied to 16 PWSZ, as listed in Table 1, within the Ruthamford Supply System, which have a combined population of 834,041. The additional outlets installed into Reservoirs 1A and 1B were part of the Grafham Resilience engineering scheme. This enables water from Hannington Reservoirs to support three PWSZ, listed in Table 1, in the event of a reduction in output from Grafham WTW. This resilience scheme was tested in 2019 and 2021. When in operation, the resilience scheme supplies an additional three PWSZs with a population of 143,094.

Ravensthorpe WTW Resilience Scheme enables water from Pitsford WTW and Hannington Reservoirs to either support or bypass Ravensthorpe WTW. During the operation of this resilience scheme the Ravensthorpe PWSZ, which has a population of 18,654, would receive water from the Hannington Reservoirs.

2. Regulation 28 Risk Assessment

Hannington Reservoir 1 (A) and 1 (B) are covered by the following Regulation 28 Risk Assessment: ANH-Risk-RCGJL and ANH-Risk-RCAJL (details provided in Table 2).

We recognise the hazardous activity of 'Use of unapproved chemicals/materials' across the hazards of individual microbiological parameters, hydrocarbons, taste and odour, solvents

and aluminium. The Regulation 28 records for these hazardous activities for Hannington Reservoir 1 (A) and 1 (B) are listed below. A DWI Category E has been applied against these hazards on our Water Quality Risk Portal to reflect the ongoing investigations. Our Water Quality Risk Team are currently reviewing this event and any associated risk score updates will be triggered in our Water Quality Risk Portal and will be submitted to the DWI as part of our Regulation 28 submission.

Asset Reference	Asset Name	Hazard Reference	DWI risk Category	Unique Hazard ID
RCGJL	Hannington Reservoir 1 (A)	C004A	E	ANH- RCGJL -C004A-ST0107
RCGJL	Hannington Reservoir 1 (A)	C004A	E	ANH- RCGJL -C004A-ST0984
RCGJL	Hannington Reservoir 1 (A)	C001	E	ANH- RCGJL -C001-ST0125
RCGJL	Hannington Reservoir 1 (A)	C001	E	ANH- RCGJL -C001-ST0985
RCGJL	Hannington Reservoir 1 (A)	C007	E	ANH- RCGJL -C007-ST0499
RCGJL	Hannington Reservoir 1 (A)	C007	E	ANH- RCGJL -C007-ST0598
RCGJL	Hannington Reservoir 1 (A)	C007	E	ANH- RCGJL -C007-ST0986
RCGJL	Hannington Reservoir 1 (A)	C002	E	ANH- RCGJL -C002-ST0196
RCGJL	Hannington Reservoir 1 (A)	C002	E	ANH- RCGJL -C002-ST0987
RCGJL	Hannington Reservoir 1 (A)	C003	E	ANH- RCGJL -C003-ST0214
RCGJL	Hannington Reservoir 1 (A)	C003	E	ANH- RCGJL -C003-ST0988
RCGJL	Hannington Reservoir 1 (A)	H064	E	ANH- RCGJL -H064-ST0485
RCGJL	Hannington Reservoir 1 (A)	A004	E	ANH- RCGJL -A004-ST0417
RCGJL	Hannington Reservoir 1 (A)	A003	E	ANH- RCGJL -A003-ST0337
RCGJL	Hannington Reservoir 1 (A)	H006	E	ANH- RCGJL -H006-ST0487
RCGJL	Hannington Reservoir 1 (A)	A021	E	ANH- RCGJL -A021-ST0525
RCGJL	Hannington Reservoir 1 (A)	A021	E	ANH- RCGJL -A021-ST0526
RCAJL	Hannington Reservoir 1 (B)	C004A	E	ANH- RCAJL -C004A-ST0107
RCAJL	Hannington Reservoir 1 (B)	C004A	E	ANH- RCAJL -C004A-ST0984
RCAJL	Hannington Reservoir 1 (B)	C001	E	ANH- RCAJL -C001-ST0125
RCAJL	Hannington Reservoir 1 (B)	C001	E	ANH- RCAJL -C001-ST0985
RCAJL	Hannington Reservoir 1 (B)	C007	E	ANH- RCAJL -C007-ST0499
RCAJL	Hannington Reservoir 1 (B)	C007	E	ANH- RCAJL -C007-ST0598
RCAJL	Hannington Reservoir 1 (B)	C007	E	ANH- RCAJL -C007-ST0986
RCAJL	Hannington Reservoir 1 (B)	C002	E	ANH- RCAJL -C002-ST0196
RCAJL	Hannington Reservoir 1 (B)	C002	E	ANH- RCAJL -C002-ST0987
RCAJL	Hannington Reservoir 1 (B)	C003	E	ANH- RCAJL -C003-ST0214
RCAJL	Hannington Reservoir 1 (B)	C003	E	ANH- RCAJL -C003-ST0988
RCAJL	Hannington Reservoir 1 (B)	H064	E	ANH- RCAJL -H064-ST0485
RCAJL	Hannington Reservoir 1 (B)	A004	E	ANH- RCAJL -A004-ST0417
RCAJL	Hannington Reservoir 1 (B)	A003	E	ANH- RCAJL -A003-ST0337
RCAJL	Hannington Reservoir 1 (B)	H006	E	ANH- RCAJL -H006-ST0487
RCAJL	Hannington Reservoir 1 (B)	A021	E	ANH- RCAJL -A021-ST0525
RCAJL	Hannington Reservoir 1 (B)	A021	E	ANH- RCAJL -A021-ST0526

Table 2: Regulation 28 records for Hannington Reservoir 1 (A) and 1 (B) with hazardous activities related to the use of unapproved materials

3. Details and Chronology of Event

Following recent events reported to the Inspectorate at Kedington WTW (DWI 2021 8118) and Diddington Reservoir (DWI 2021 8338) we are undertaking a program of asset inspections to investigate the potential for there to be similar non-compliant pipework *in situ*. Initially this programme comprised of all new build treated water tanks from 2010 onwards (as both Kedington WTW and Diddington Reservoir were new build tanks) and was later expanded to include resilience schemes where modifications to pipework were made within a treated water tank (as Diddington Reservoir was part of the Grafham resilience scheme).

As part of this expanded program Hannington Reservoirs 1A and 1B were identified for inspection. Hannington Reservoir 1A was isolated from supply on 15 December 2021 and an internal inspection was carried out on 20 December 2021 with particular attention being paid to the new pipework installed in 2016. During this inspection sections of blue pipework on the new outlets were identified as having areas of blistering of the coating (Figure 4).

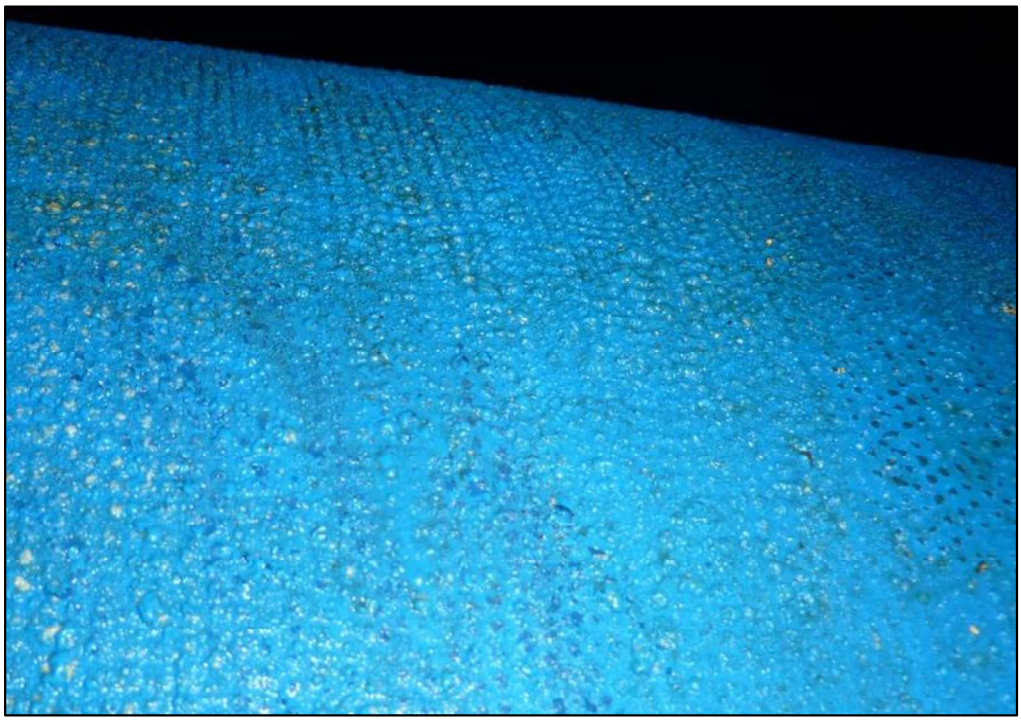


Figure 4: External surface of Electrofresh pipe length Reservoir 1A new outlet pipe1

The installation of the new outlet pipework into Hannington Reservoirs 1A and 1B was an AMP6 engineering scheme designed to provide support and resilience to Grafham WTW and engineering work was undertaken in 2016 and 2017. Two new outlet mains were installed into each reservoir i.e. four new outlet mains in total, two in 1A and two in 1B. Each of the four new outlet mains were all designed for 500mm diameter to protrude into the structure approximately 500mm.

The design was completed by Mott Macdonald and the construction by JN Bentley. The new outlet mains were installed by drilling through the wall of the reservoir and installing pipework into the reservoirs. The work to install the new outlet mains into Reservoir 1A was completed in early 2016 and the work on Reservoir 1B was completed in early 2017.

Following completion of the engineering work on each reservoir, commissioning sampling, including Materials In Contact (MIC) samples, was undertaken and Reservoir 1A was returned to supply on 16 April 2016 and Reservoir 1B was returned to supply on 07 February 2017.

The new outlets in Hannington Reservoir 1A are sections of coated ductile iron pipework. The pipework was supplied from Electrosteel Castings Ltd.

The Electrosteel pipework is Electrofresh Plus which comprises a cement mortar lined, ductile iron pipe with a seal coat, Copon Hycote 162 PWX, that conforms to EN 545. This product held and still holds a DWI approval of DWI 56/4/537. The pipe is approved as a product for use for the conveyance of water.

Our subsequent investigation has identified the following process is carried out on the Electrofresh pipework. Standard 5.5m lengths of Electrofresh pipes are manufactured at Electrosteel's facility in India. An external blue epoxy coating is applied as part of the manufacturing process. The coating applied was Electrocoat EP812 which was WRAS approved (1305512) at time of purchase and still holds an active approval (1807507).

Electrosteel produce required lengths of pipe from these full 5.5m lengths at their UK facility. We understand that the following processes occurred:
(a) The pipe was cut to length requirement.
(b) The end of the pipe was finished to remove the external coating to give a clean substrate for attaching the flange.
(c) The flange was cut, heated, and hydraulically pressed on to the receiving pipe barrel, before cooling and welding.
(d) Any bare metal areas on the external surface, had a zinc paint application before being finished with 3M Scotchkote Epoxy 162PWX coating. 3M Scotchkote Epoxy 162PWX held both DWI and WRAS approvals (DWI approval 56/4/300) at the time of purchase and installation.
(e) The external barrel of the pipe was then coated with a synthetic coating for aesthetic purposes. The paint used was V&M enamel, and this holds no approval for contact with drinking water. The safety data sheet for this coating is included in Appendix 1. Please note that the safety data sheet is for the wet paint and not the final dried coating.

Following the installation of the new pipework each reservoir underwent commissioning sampling which includes Materials In Contact parameters. All sample results including for trace organics, taste and odour analysis were satisfactory. The MIC and into supply sample results for both reservoirs are identified in Figure 5. At the time this sampling occurred (August 2016) Quantitative Taste and Odour analysis was not undertaken as part of our MIC analysis suite. Subsequently, following a recommendation from the DWI (received on 4 January 2017 (ANG/RN/2016/0066), Quantitative Taste and Odour analysis was added to this suite and is now undertaken on all Materials in Contact samples.

			Hannington Reservoir 1A		Hannington Reservoir 1B	
Sample Type			MIC	Routine Sample	MIC	Into Supply
Sample number			16171232, 16171249 & 16206458	16172597	17052348, 17053273 & 17056642	17060048
Date			16/04/2016	18/04/2016	01/02/2017	07/02/2017
Sample point			W01CGJLCR	W01CGJLCR	W01DIPSCP	W01CAJLCR
Stand Time			16 hours	n/a	16 hours	n/a
Det Code	Parameter	Units				
Bacteriological						
91941	Coliforms Confirmed	No/100ml	0	0	0	0
91951	E.coli Confirmed	No/100ml	0	0	0	0
09340	2-day colony count at 37°C	No/ml	2	0	0	1
09320	3-day colony count at 22°C	No/ml	12	5	1	0
Chemistry						
09111	Chlorine Free	mg/l Cl_2	0.09	0.06	<0.05	0.05
09121	Chlorine Total	mg/l Cl_2	0.83	0.82	0.31	0.51
00220	Taste Qualitative	---	1[1]	n/a	1[1]	n/a
00230	Odour Qualitative	---	2T[3]	n/a	1Z[2]	n/a
92212	Odour Quantitative 25°C De-Chlorinated	---	n/a	n/a	n/a	n/a
97822	Taste Quantitative 25°C De-Chlorinated	---	n/a	n/a	Satisfactory	n/a
91371	Odour Quantitative 60°C De-Chlorinated	---	Satisfactory	n/a	Satisfactory	n/a
00612	pH Clean Water	pH	7.57	n/a	7.66	n/a
01621	Alkalinity Total	mg/l $CaCO_3$	135	n/a	138	n/a
00621	Conductivity at 20C	µS/cm[2]	623	n/a	699	n/a
00681	Turbidity	NTU	0.12	n/a	0.13	n/a
00721	Colour Filtered	Hazen	0.5	n/a	0.8	n/a
02875	Aluminium Total	mg/l Al	<0.014	n/a	<0.014	n/a
Organics						
75161	Water Profile	µg/l	0	n/a	0	n/a
75171	Purge and Trap	µg/l	0	n/a	0	n/a

[1] No taste/satisfactory
[2] No smell
[3] Very mild chlorine

Figure 5 – MIC and In Supply samples from Hannington Reservoir 1A and 1B

Following the installation of the new outlet mains, Hannington Reservoir 1A was returned to supply on 16 April 2016, and Reservoir 1B was returned to supply on 7 February 2017, respectively.

All monitoring samples from both reservoir outlet sample points were satisfactory i.e. they met the requirements of the Water Supply (Water Quality) Regulations (as amended).

An initial review of regulatory monitoring sample results from 01 January 2016 has not highlighted any concerns. The review looked at the mean results for samples collected in the sixteen downstream PWSZs since the pipework was installed and Hannington Reservoir 1A returned to supply on the 16 April 2016. A summary of the total number of coliform, *E. coli*, quantitative taste and quantitative odour samples collected at each location since 01 April 2016 can be seen in Table 3 below. An annual summary can be seen in Appendix 2.

From the sixteen PWSZ supplied by Hannington Reservoirs under normal operational conditions, over 14,000 bacteriological sample have been collected since 01 April 2016 (to 22 December 2021). Of these in 37 customer tap samples coliforms were detected, one of which was an *E. coli*. Approximately 4,400 quantitative odour and taste samples were collected with 30 detecting an odour and two a taste. Details of the investigations into all of these were reported to the Inspectorate as part of our monthly data returns.

2016 - 2021	No. Coliform Samples	No. of Coliform detections	No. E.coli Samples	No. of E. coli detections	No. Quantitative taste Samples	No. of Quantitative taste detections	No. Quantitative Odour Samples	No. of Quantitative Odour detections
Hannington Res 1A	290	0	290	0	0	0	0	0
Hannington Res 1B	290	0	290	0	0	0	0	0
Huntingdon North PWSZ	796	4	796	0	274	0	274	3
Newport Pagnell PWSZ	531	1	531	0	198	0	216	2
Bedford Rural PWSZ	1099	3	1099	0	295	0	295	2
Winslow PWSZ	633	1	633	0	172	0	172	0
Milton Keynes City North West PWSZ	748	2	748	0	287	0	276	5
Milton Keynes City North East PWSZ	647	2	647	0	204	0	204	5
Milton Keynes City South East PWSZ	1233	3	1233	0	397	1	397	1
Sandhouse PWSZ	137	0	137	0	58	0	58	0
Milton Keynes City West	378	0	378	0	137	0	137	2
Wellingborough PWSZ	1003	7	1003	1	284	0	285	1
Ravensthorpe PWSZ	273	0	273	0	129	0	128	2
Brixworth PWSZ	138	0	138	0	67	0	67	0
Daventry PWSZ	704	4	704	0	223	0	223	1
Northampton West PWSZ	531	0	531	0	165	0	165	0
Northampton Central PWSZ	1023	1	1023	0	267	0	267	2
Northampton South PWSZ	470	1	470	0	172	1	172	1
Northampton East PWSZ	838	2	838	0	240	0	240	1
Northampton North PWSZ	580	2	580	0	172	0	172	0
Buckingham PWSZ	1168	2	1168	0	346	0	346	1
Kettering Town West PWSZ	1116	2	1116	0	309	0	308	1
Grand Total	**14,626**	**37**	**14,626**	**1**	**4,396**	**2**	**4,402**	**30**

Table 3 – Summary of Hannington Reservoirs 1A & 1B and Supplied PWSZs Sample Data

An initial review of water quality events within the area supplied by Hannington Reservoirs, which were reported to the Inspectorate since the installation of the outlet pipework in Reservoir 1A identified two instances, which are outlined below.

- On 25 April 2019 a routine monitoring sample was collected from the Wellingborough PWSZ. On analysis this sample was found to contain 48 coliforms, 46 *E. coli*. All investigatory samples were satisfactory and a Water Fittings inspection identified that the kitchen tap was fitted with an aerator, which was the most likely cause of the detections. This sample result was notified to the Inspectorate as an event, reference DWI/2019/7088 and as compliance breaches under references ANH-C001A-25-04-19 and ANH-C002-25-04-19.

- A routine monitoring sample from Newport Pagnall PWSZ was collected on 06 July 2020, was declined for quantitative taste analysis due to the presence of some small particles. All other analysis of the samples including bacteriological, turbidity and quantitative odour analysis was satisfactory. Due to the sample not being tasted, the customer was issued with a precautionary Do Not Drink notice whilst investigations were carried out, this was lifted following satisfactory resamples. This event was reported to the Inspectorate under reference DWI/2020/7702.

Our target standard process for raw, final, stored and customer tap samples highlights any regulatory and operational samples that are above our internal set triggers on a twice weekly basis. These are each investigated by a Water Quality Risk Scientist where trends will be reviewed as part of the investigation. At this point of the investigation we have not identified any water quality trends or unusual numbers of target standards investigations which could be associated to the pipework installed within Hannington Reservoirs 1A and 1B.

In addition, Risk Scientists review monthly changes in RAG risk categories that are identified through our water quality risk portal when changes occur from green to red/amber or amber to red. These risk changes are all investigated thoroughly and

presented at our monthly Compliance Monitoring Group. At this stage we have not identified any unusual risk changes related to Hannington Reservoir.

We have carried out a review of the customer contacts received from the sixteen PWSZs before and after the installation of the new pipework at Hannington Reservoirs for all tastes and odours categories.

Figure 6 presents the Average Acceptability Rate across the sixteen PWSZs downstream of Hannington Reservoirs indicating that there has been no impact associated with acceptability since the work has been carried out to install the new outlet mains.

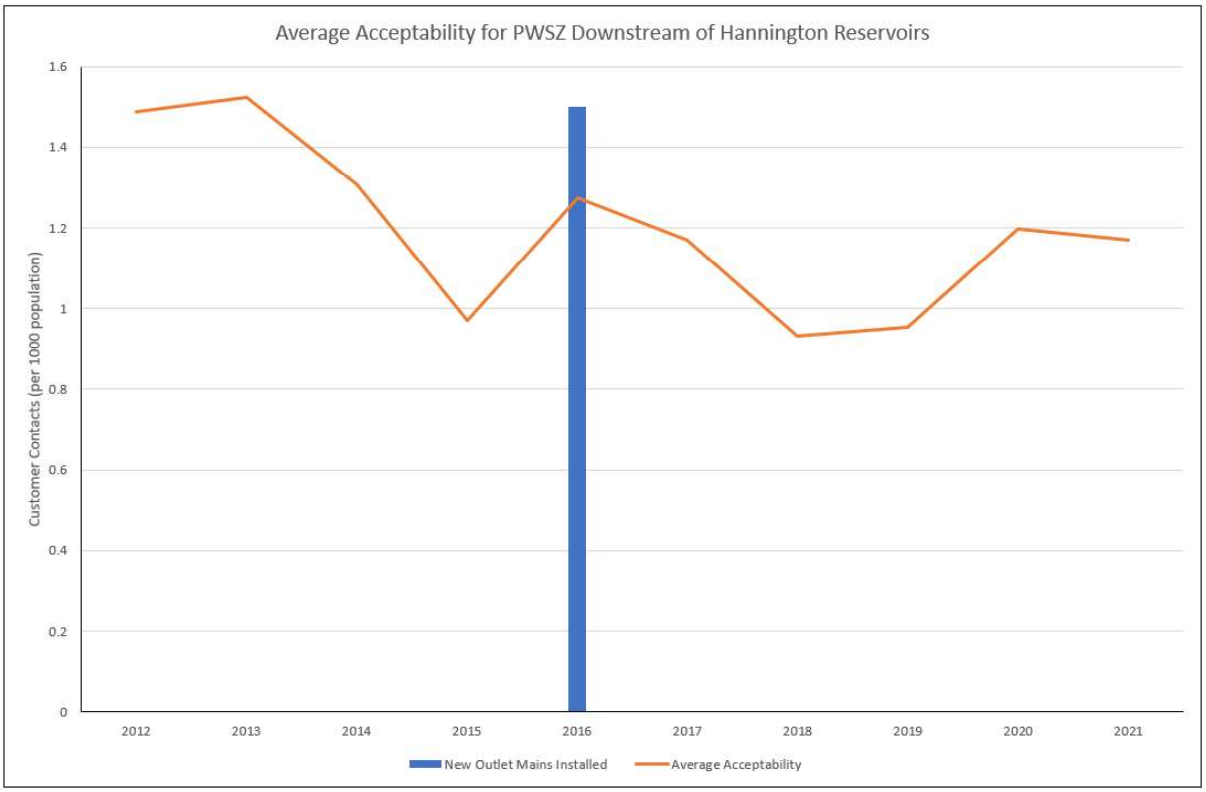


Figure 6 – Average Acceptability Rates for the Sixteen PWSZ supplied by Hannington Reservoirs

The breakdown of each individual PWSZ Acceptability Rate is included in Appendix 3.

All water quality contacts into Anglian Water are initially triaged by our Call Centre Agents (CCA) who are trained to provide advice to customer on aspects of water quality such as chlorine and TCP. TCP complaints are those where the customer typically describes the water tasting or smelling metallic/medicinal/chemical in nature and occurs either only in boiled drinks (often caused by a reaction between phenolic compounds from plastic or rubber parts of kettles with chlorine in the water), or sometimes occurs in the cold water, but will most typically persist after boiling as well. The presence of a TCP type taste/odour after a period of standing or boiling, is the key differentiator to separate a TCP complaint from a chlorine complaint. Advice is provided regarding leaving water to stand overnight, checking if the issue affects single taps or more than one tap, checking if appliances have non-return valves if it is suspected the cause might be appliance hoses.

Calls may be escalated to a Water Quality Scientist, in line with our procedures, if the CCA feels the customer requires more in-depth advice or the if the contact has been received following work on the network, the customers own plumbing or for certain types of complaints such as a taste or odour described as petrol/diesel in nature. All calls are

visible to the Water Quality Team and if clusters of calls are received from hydraulically linked areas these are also escalated for investigation. Please note that a cluster is considered to be two or more complaints of similar job descriptions (taste/odour for example, or discolouration, or white water) received from the same DMA within a 24-hour period.

Our review of the calls for the period in question identifies that the majority of calls were due to internal issues in the customer's property, such as earthy/musty smells originating from sink traps; long service pipes; or a lack of Non-Return Valves (NRVs) on washing machines or dishwashers. Where a visit was carried out and sampling undertaken, our present review identified that all sample results were returned as satisfactory for water quality parameters.

4. Next Steps

We are continuing our investigations into the circumstances of how this has occurred and identifying any lessons which can be learned. The learning from this will feed directly into our Materials In Contact Improvement Plan developed following the Kedington WTW event and if applicable, we will share any learning with the wider industry.

We are currently working on a plan to safely remove Hannington 1B from supply to allow inspection and subsequent remedial work without introducing a loss of supply risk to our customers.

The non-compliant pipework within the reservoir will be remediated with a suitably approved alternative, fully complying with the requirements of Regulation 31. The reservoir will not be returned to supply until this work has been completed and appropriate sampling has been undertaken.

5. Likely Cause of the Event

Investigations are on-going however sections of pipe have been identified within Hannington Reservoir which do not hold the correct approvals under Regulation 31. Investigations completed thus far provide no evidence to suggest this non-compliance with Regulation 31 has had any adverse impact on water quality.

The cause appears to be the same as the Kedington WTW event (DWI 2021 8118).

6. Notifications

Other organisations informed:
CCWater

20 DAY REPORT

AW Reference No:	AW/2021/1753
DWI Reference No:	DWI/2021/8379
Name of event:	Hannington Reservoirs 1A and 1B
Description of event:	Discovery of lengths of pipework within the tanks that is not compliant with Regulation 31.
Date and time of event:	20 December 2021
Date and time of notification to DWI:	21 December 2021 at 17:53
Notified by:	[redacted]
Population/Property Count affected:	Under normal operation the reservoir supplies a population of 852,695
Duration of event:	50,040 hours
Effect on water sufficiency or quality:	There has been no evidence to date of the water quality being affected. The sufficiency of the water supply has not been affected.
Risk to public health:	It is not believed there is a wider risk to public health.
Details of any regulatory breaches:	There have been no regulatory exceedances associated with this event.
Other organisations notified:	CCWater Thames Water Independent Water Networks Limited
Publicity:	None known

Executive Summary

Whilst undertaking an internal inspection at Hannington Reservoir 1A, it was noted that two of the outlet mains had areas of blistering of the coating on sections of blue pipework that had been installed in 2016 as part of our AMP6 Grafham WTW Resilience Scheme.

The inspection had been undertaken in response to the identification of pipework at our new Kedington WTW and Diddington Reservoirs, which did not fully comply with Regulation 31 as previously reported (DWI 2021 8118 and DWI 2021 8338, respectively).

Our investigations have found sections of pipe within Hannington Reservoir 1A which do not hold the correct approvals under Regulation 31.

There has been no evidence to suggest that there has been any impact on the quality of water being supplied to customers whilst the reservoir was in supply. The reservoir will remain out of supply until remedial works have been completed.

Learning from this event will be captured and incorporated into our Materials in Contact Improvement Programme to ensure similar events do not recur.

1. Geographical location of event

Hannington Reservoir 1A (RCGJL) and 1B (RAGJL) are located on the A43 between Northampton and Kettering. Figure 1 below identifies the location of Hannington Reservoirs.

The Hannington Reservoir complex is supplied with water from Anglian Water's Wing and Morcott WTWs via Beanfield Reservoir No. 2 (RAHUA) and Beanfield Hannington DZ (BHTRNKDZ) and supplies water to the Public Water Supply Zones (PWSZs) listed in Table 1. All these assets are located within our Ruthamford Supply System (Figure 2).

The Hannington Reservoirs complex consists of three storage points. Reservoirs 1A and 1B are separated by a full height dividing wall. The operational tank capacity of Reservoirs 1A and 1B are each 11,365m^3. Figure 3 provides additional detail for Reservoirs 1A and 1B pipework. Reservoir 2 is a separate structure.

PWSZ Reference	PWSZ Name
ZMW21	Newport Pagnall PWSZ
ZMW27	Winslow PWSZ
ZMW28	Milton Keynes City North West PWSZ
ZMW29	Milton Keynes City North East PWSZ
ZMW31	Milton Keynes City South East PWSZ
ZMW58	Milton Keynes City West PWSZ
ZRW07	Wellingborough PWSZ
ZRW08	Desborough PWSZ
ZRW10	Ravensthorpe PWSZ
ZRW11	Brixworth PWSZ
ZRW14	Daventry PWSZ
ZRW15	Northampton West PWSZ
ZRW16	Northampton Central PWSZ
ZRW18	Northampton East PWSZ
ZRW19	Northampton North PWSZ
ZRW20	Buckingham PWSZ
ZRW45	Kettering Town West PWSZ

PWSZ Reference	Grafham WTW Resilience Support
ZFW40	Huntingdon North PWSZ
ZMW23	Bedford Rural PWSZ
ZMW52	Sandhouse PWSZ

Table 1 – PWSZ fed from Hannington Reservoirs

There are a number of bulk exports within the area supplied from Hannington Reservoirs to Thames Water and to Independent Water Networks Limited (IWNL). We have discussed the circumstances of this event and the risk assessment we have undertaken with a representative from Thames Water and IWNL.

Figure 1: Hannington Reservoirs location

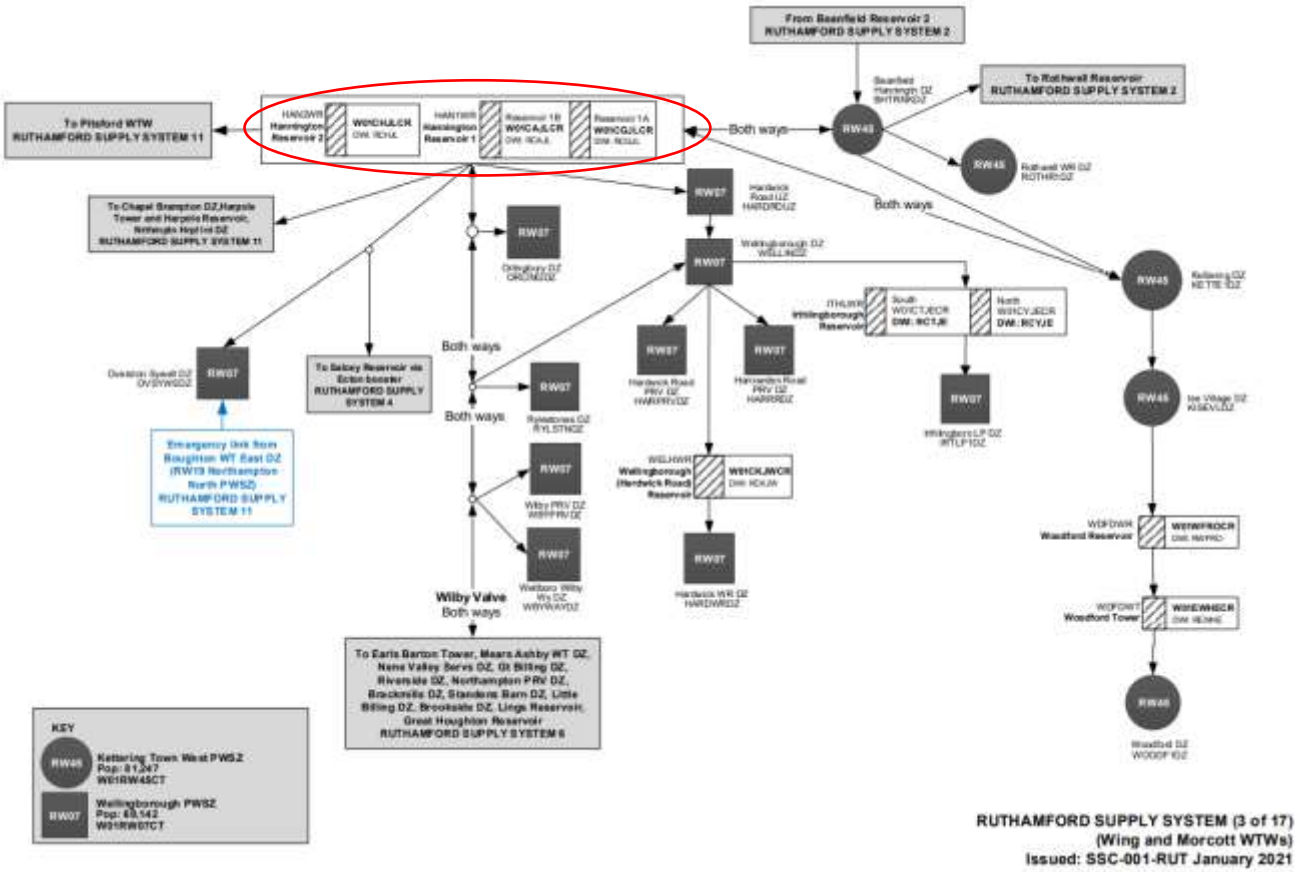


Figure 2: Supply System Schematic

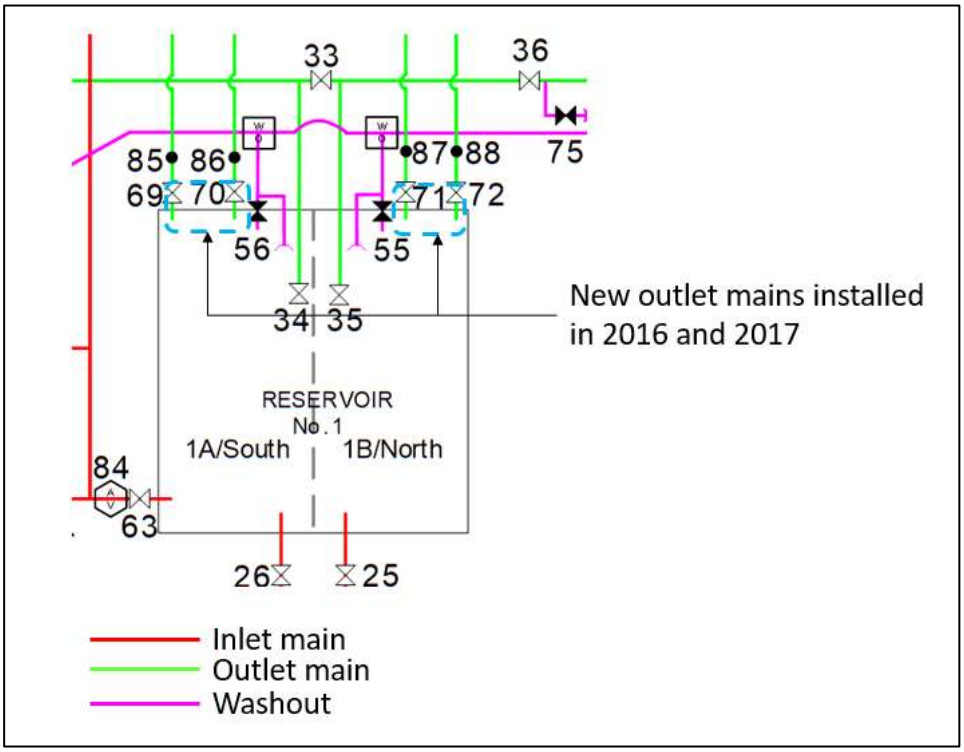


Figure 3 – Pipework Schematic of Hannington Reservoirs 1A and 1B

Under the normal operation of Hannington Reservoirs, water feeds under gravity from the reservoir outlets into six mains. These mains feed to Kettering, Wellingborough, Wilby, Ecton and two mains supply Pitsford WTW. Via these mains water from Hannington Reservoirs is supplied to 17 PWSZ, as listed in Table 1, within the Ruthamford Supply System, which have a combined population of 834,041. The additional outlets installed into Reservoirs 1A and 1B were part of the Grafham Resilience engineering scheme. This enables water from Hannington Reservoirs to support three PWSZ, listed in Table 1, in the event of a reduction in output from Grafham WTW. This resilience scheme was tested in 2019 and 2021 and in operation for 41 days during this period. When in operation, the resilience scheme supplies an additional three PWSZs with a population of 143,094.

Water from Hannington Reservoirs, directly and via Pitsford WTW, also supplies water into the storage tank at Ravensthorpe WTW as a business as usual operation. Ravensthorpe WTW supplies water into Ravensthorpe PWSZ (ZRW10) with a further population of 18,654. Therefore, the total population supplied by Hannington Reservoirs is 852,695.

A further resilience booster enables water from Hannington Reservoirs directly or via Pitsford WTW to bypass Ravensthorpe WTW and supply water to the Ravensthorpe PWSZ directly. The boosters are operated for 1 hour every two weeks.

The additional outlets installed into Reservoirs 1A and 1B were part of the Grafham Resilience engineering scheme. This enables water from Hannington Reservoirs to support three PWSZ, listed in Table 1, in the event of a reduction in output from Grafham WTW. This resilience scheme was tested in 2019 and 2021 and in operation for 41 days during this period. When in operation, the resilience scheme supplies an additional three PWSZs with a population of 143,094.

2. Regulation 28 Risk Assessment

Hannington Reservoir 1 (A) and 1 (B) are covered by the following Regulation 28 Risk Assessment: ANH-Risk-RCGJL and ANH-Risk-RCAJL.

We recognise the hazardous activity of 'Use of unapproved chemicals/materials' across the hazards of individual microbiological parameters, hydrocarbons, taste and odour, solvents and aluminium. The Regulation 28 records for these hazardous activities for Hannington Reservoir 1 (A) and 1 (B) are listed below (Table 2). A DWI Category E has been applied against these hazards on our Water Quality Risk Portal to reflect the ongoing investigations. A controlled risk has also been triggered for each of these Regulation 28 lines at Hannington Reservoir 1 (A) and 1 (B) in our Water Quality Risk Portal. These scores will be submitted to the DWI as part of our Regulation 28 submission in February 2022.

Asset Reference	Asset Name	Hazard Reference	DWI risk Category	Unique Hazard ID
RCGJL	Hannington Reservoir 1 (A)	C004A	E	ANH- RCGJL -C004A-ST0107
RCGJL	Hannington Reservoir 1 (A)	C004A	E	ANH- RCGJL -C004A-ST0984
RCGJL	Hannington Reservoir 1 (A)	C001	E	ANH- RCGJL -C001-ST0125
RCGJL	Hannington Reservoir 1 (A)	C001	E	ANH- RCGJL -C001-ST0985
RCGJL	Hannington Reservoir 1 (A)	C007	E	ANH- RCGJL -C007-ST0499
RCGJL	Hannington Reservoir 1 (A)	C007	E	ANH- RCGJL -C007-ST0598
RCGJL	Hannington Reservoir 1 (A)	C007	E	ANH- RCGJL -C007-ST0986
RCGJL	Hannington Reservoir 1 (A)	C002	E	ANH- RCGJL -C002-ST0196
RCGJL	Hannington Reservoir 1 (A)	C002	E	ANH- RCGJL -C002-ST0987
RCGJL	Hannington Reservoir 1 (A)	C003	E	ANH- RCGJL -C003-ST0214
RCGJL	Hannington Reservoir 1 (A)	C003	E	ANH- RCGJL -C003-ST0988
RCGJL	Hannington Reservoir 1 (A)	H064	E	ANH- RCGJL -H064-ST0485
RCGJL	Hannington Reservoir 1 (A)	A004	E	ANH- RCGJL -A004-ST0417
RCGJL	Hannington Reservoir 1 (A)	A003	E	ANH- RCGJL -A003-ST0337
RCGJL	Hannington Reservoir 1 (A)	H006	E	ANH- RCGJL -H006-ST0487
RCGJL	Hannington Reservoir 1 (A)	A021	E	ANH- RCGJL -A021-ST0525
RCGJL	Hannington Reservoir 1 (A)	A021	E	ANH- RCGJL -A021-ST0526
RCAJL	Hannington Reservoir 1 (B)	C004A	E	ANH- RCAJL -C004A-ST0107
RCAJL	Hannington Reservoir 1 (B)	C004A	E	ANH- RCAJL -C004A-ST0984
RCAJL	Hannington Reservoir 1 (B)	C001	E	ANH- RCAJL -C001-ST0125
RCAJL	Hannington Reservoir 1 (B)	C001	E	ANH- RCAJL -C001-ST0985
RCAJL	Hannington Reservoir 1 (B)	C007	E	ANH- RCAJL -C007-ST0499
RCAJL	Hannington Reservoir 1 (B)	C007	E	ANH- RCAJL -C007-ST0598
RCAJL	Hannington Reservoir 1 (B)	C007	E	ANH- RCAJL -C007-ST0986
RCAJL	Hannington Reservoir 1 (B)	C002	E	ANH- RCAJL -C002-ST0196
RCAJL	Hannington Reservoir 1 (B)	C002	E	ANH- RCAJL -C002-ST0987
RCAJL	Hannington Reservoir 1 (B)	C003	E	ANH- RCAJL -C003-ST0214
RCAJL	Hannington Reservoir 1 (B)	C003	E	ANH- RCAJL -C003-ST0988
RCAJL	Hannington Reservoir 1 (B)	H064	E	ANH- RCAJL -H064-ST0485
RCAJL	Hannington Reservoir 1 (B)	A004	E	ANH- RCAJL -A004-ST0417
RCAJL	Hannington Reservoir 1 (B)	A003	E	ANH- RCAJL -A003-ST0337
RCAJL	Hannington Reservoir 1 (B)	H006	E	ANH- RCAJL -H006-ST0487
RCAJL	Hannington Reservoir 1 (B)	A021	E	ANH- RCAJL -A021-ST0525
RCAJL	Hannington Reservoir 1 (B)	A021	E	ANH- RCAJL -A021-ST0526

Table 2: Regulation 28 records for Hannington Reservoir 1 (A) and 1 (B) with hazardous activities related to the use of unapproved materials

3. Details and Chronology of Event

Following recent events reported to the Inspectorate at Kedington WTW (DWI 2021 8118) and Diddington Reservoir (DWI 2021 8338) we are undertaking a program of asset inspections to investigate the potential for there to be similar non-compliant pipework *in situ*. Initially this programme comprised of all new build treated water tanks from 2010 onwards (as both Kedington WTW and Diddington Reservoir were new build tanks) and was later expanded to include resilience schemes where modifications to pipework were made within a treated water tank (as Diddington Reservoir was part of the Grafham resilience scheme).

As part of this expanded program Hannington Reservoirs 1A and 1B were identified for inspection. Hannington Reservoir 1A was isolated from supply on 15 December 2021 and an internal inspection was carried out on 20 December 2021 with particular attention being paid to the new pipework installed in 2016. During this inspection sections of blue pipework on the new outlets were identified as having areas of blistering of the coating (Figure 4).

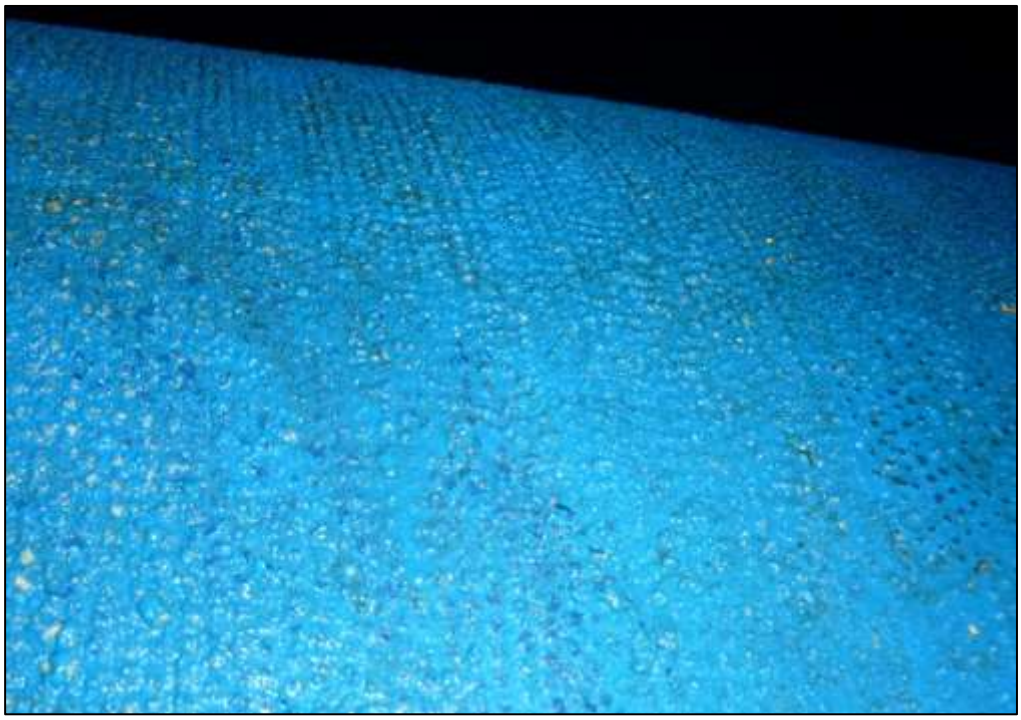


Figure 4: External surface of Electrofresh pipe length Reservoir 1A new outlet pipe1

The installation of the new outlet pipework into Hannington Reservoirs 1A and 1B was an AMP6 engineering scheme designed to provide support and resilience to Grafham WTW and engineering work was undertaken in 2016 and 2017. Two new outlet mains were installed into each reservoir i.e. four new outlet mains in total, two in 1A and two in 1B.

Each of the four new outlet mains were all designed for 500mm diameter to protrude into the structure approximately 500mm length. The original design document is included in Appendix 1, WAT-05054-HANNWR-1H-DET-4580-140801-P1. It is specified under the notes section (Appendix 1: note 11) that materials in contact with water should comply with Regulation 31, and the design at this time included surface

preparation and coating of the exterior of the protruding pipework (Appendix 1: note 8).

The design was completed by Mott Macdonald and the construction by JN Bentley. The new outlet mains were installed by drilling through the wall of the reservoir and installing pipework into the reservoirs. The work to install the new outlet mains into Reservoir 1A was completed in early 2016 and the work on Reservoir 1B was completed in early 2017.

The new outlets in Hannington Reservoir 1A are sections of coated ductile iron pipework. The pipework was supplied from Electrosteel Castings Ltd.

The Electrosteel pipework is Electrofresh Plus which comprises a cement mortar lined, ductile iron pipe with a seal coat, Copon Hycote 162 PWX, that conforms to EN 545. This product held and still holds a DWI approval of DWI 56/4/537. The pipe is approved as a product for use for the conveyance of water.

Our subsequent investigation has identified the following process is carried out on the Electrofresh pipework. Standard 5.5m lengths of Electrofresh pipes are manufactured at Electrosteel's facility in India. An external blue epoxy coating is applied as part of the manufacturing process. The coating applied was Electrocoat EP812 which was WRAS approved (1305512) at time of purchase and still holds an active approval (1807507).

Electrosteel produce required lengths of pipe from these full 5.5m lengths at their UK facility. We understand that the following processes occurred:

(a) The pipe was cut to length requirement.
(b) The end of the pipe was finished to remove the external coating to give a clean substrate for attaching the flange.
(c) The flange was cut, heated, and hydraulically pressed on to the receiving pipe barrel, before cooling and welding.
(d) Any bare metal areas on the external surface, had a zinc paint application before being finished with 3M Scotchkote Epoxy 162PWX coating. 3M Scotchkote Epoxy 162PWX held both DWI and WRAS approvals (DWI approval 56/4/300) at the time of purchase and installation.
(e) The external barrel of the pipe was then coated with a synthetic coating for aesthetic purposes. The paint used was V&M enamel, and this holds no approval for contact with drinking water. The safety data sheet for this coating was provided as Appendix 1 with the 3-day report. Please note that the safety data sheet is for the wet paint and not the final dried coating.

Following the installation of the new pipework each reservoir underwent commissioning sampling which includes Materials in Contact parameters. All sample results including for trace organics, taste and odour analysis were satisfactory. The MIC and into supply sample results for both reservoirs are identified in Figure 5. At the time this sampling occurred (August 2016) Quantitative Taste and Odour analysis was not undertaken as part of our MIC analysis suite. Subsequently, following a recommendation from the DWI (received on 4 January 2017 (ANG/RN/2016/0066), Quantitative Taste and Odour analysis was added to this suite and is now undertaken on all Materials in Contact samples.

			Hannington Reservoir 1A		Hannington Reservoir 1B	
Sample Type			MIC	Routine Sample	MIC	Into Supply
Sample number			16171232, 16171249 & 16206458	16172597	17052348, 17053273 & 17056642	17060048
Date			16/04/2016	18/04/2016	01/02/2017	07/02/2017
Sample point			W01CGJLCR	W01CGJLCR	W01DIPSCP	W01CAJLCR
Stand Time			16 hours	n/a	16 hours	n/a
Det Code	Parameter	Units				
Bacteriological						
91941	Coliforms Confirmed	No/100ml	0	0	0	0
91951	E.coli Confirmed	No/100ml	0	0	0	0
09340	2-day colony count at 37°C	No/ml	2	0	0	1
09320	3-day colony count at 22°C	No/ml	12	5	1	0
Chemistry						
09111	Chlorine Free	mg/l Cl_2	0.09	0.06	<0.05	0.05
09121	Chlorine Total	mg/l Cl_2	0.83	0.82	0.31	0.51
00220	Taste Qualitative	---	1[1]	n/a	1[1]	n/a
00230	Odour Qualitative	---	2T[3]	n/a	1Z[2]	n/a
92212	Odour Quantitative 25°C De-Chlorinated	---	n/a	n/a	n/a	n/a
97822	Taste Quantitative 25°C De-Chlorinated	---	n/a	n/a	Satisfactory	n/a
91371	Odour Quantitative 60°C De-Chlorinated	---	Satisfactory	n/a	Satisfactory	n/a
00612	pH Clean Water	pH	7.57	n/a	7.66	n/a
01621	Alkalinity Total	mg/l $CaCO_3$	135	n/a	138	n/a
00621	Conductivity at 20C	µS/cm[2]	623	n/a	699	n/a
00681	Turbidity	NTU	0.12	n/a	0.13	n/a
00721	Colour Filtered	Hazen	0.5	n/a	0.8	n/a
02875	Aluminium Total	mg/l Al	<0.014	n/a	<0.014	n/a
Organics						
75161	Water Profile	µg/l	0	n/a	0	n/a
75171	Purge and Trap	µg/l	0	n/a	0	n/a

[1] No taste/satisfactory
[2] No smell
[3] Very mild chlorine

Figure 5 – MIC and In Supply samples from Hannington Reservoir 1A and 1B

Following the installation of the new outlet mains, Hannington Reservoir 1A was returned to supply on 16 April 2016, and Reservoir 1B was returned to supply on 07 February 2017, respectively.

4. Impact on Water Quality

All regulatory monitoring samples from both reservoir outlet sample points were satisfactory i.e. they met the requirements of the Water Supply (Water Quality) Regulations (as amended).

A full review of regulatory monitoring sample results from 01 January 2016 has not highlighted any areas of concern. The review looked at the mean results for samples collected in the seventeen downstream PWSZs since the pipework was installed and Hannington Reservoir 1A returned to supply on the 16 April 2016. A summary of the total number of coliform, *E. coli*, quantitative taste and quantitative odour samples collected at each location since 01 April 2016 can be seen in Table 3 below. An annual summary is provided as Appendix 2.

From the seventeen PWSZ supplied by Hannington Reservoirs, over 12,000 bacteriological sample have been collected since 01 April 2016 (to 22 December 2021). Of these, in 30 customer tap samples coliforms were detected, one of which was an *E. coli*. Over 3,750 quantitative odour and taste samples were collected with 25 detecting an odour and two a taste. A summary of the sample collected in this

period can be found in Table 3, below. All of these compliance sample breaches were investigated and reported to the Inspectorate as part of our monthly data returns.

2016 - 2021	No. Coliform Samples	No. of Coliform Detections	No. E.coli Samples	No. of E. coli Detections	No. Quantitative Taste Samples	No. of Quantitative Taste Detections	No. Quantitative Odour Samples	No. of Quantitative Odour Detections
Hannington Res 1A	290	0	290	0	0	0	0	0
Hannington Res 1B	290	0	290	0	0	0	0	0
Newport Pagnell PWSZ	531	1	531	0	198	0	216	2
Winslow PWSZ	633	1	633	0	172	0	172	0
Milton Keynes City North West PWSZ	748	2	748	0	287	0	276	5
Milton Keynes City North East PWSZ	647	2	647	0	204	0	204	5
Milton Keynes City South East PWSZ	1233	3	1233	0	397	1	397	1
Milton Keynes City West	378	0	378	0	137	0	137	2
Wellingborough PWSZ	1003	7	1003	1	284	0	285	1
Ravensthorpe PWSZ	273	0	273	0	129	0	128	2
Brixworth PWSZ	138	0	138	0	67	0	67	0
Daventry PWSZ	704	4	704	0	223	0	223	1
Northampton West PWSZ	531	0	531	0	165	0	165	0
Northampton Central PWSZ	1023	1	1023	0	267	0	267	2
Northampton South PWSZ	470	1	470	0	172	1	172	1
Northampton East PWSZ	838	2	838	0	240	0	240	1
Northampton North PWSZ	580	2	580	0	172	0	172	0
Buckingham PWSZ	1168	2	1168	0	346	0	346	1
Kettering Town West PWSZ	1116	2	1116	0	309	0	308	1
Grand Total	**12,594**	**30**	**12594**	**1**	**3769**	**2**	**3775**	**25**

Table 3 – Summary of Hannington Reservoirs 1A & 1B and Supplied PWSZs Sample Data

As part of this investigation, we have revisited each of these reports and reviewed the root cause identified to establish whether there is a link to the Hannington Reservoirs. The table below shows the root causes identified during the investigations into bacteriological, taste and odour detections, were not linked to Hannington Reservoirs 1A and 1B. There were four instances of a coliform detection and four of a quantitative odour detection where there was not a root cause identified.

		Detection			
		Coliform	*E. coli*	Quantitative Taste	Quantitative Odour
Root Cause	Condition of Customer Tap	25	1	0	1
	Other Customer Internal Plumbing Issue	0	0	2	1
	Service Pipe Material	0	0	0	19
	Supply Pipe Location[1]	1	0	0	0
	No Cause Identified	4	0	0	4

[1] The supply pipe was identified to be installed at an insufficient depth

Table 4 – Summary of Water Quality Investigation Root Causes

An initial review of water quality events within the area supplied by Hannington Reservoirs, which were reported to the Inspectorate since the installation of the outlet pipework in Reservoir 1A identified two instances, which are outlined below.

- On 25 April 2019 a routine monitoring sample was collected from the Wellingborough PWSZ. On analysis this sample was found to contain 48 coliforms, 46 *E. coli*. All investigatory samples were satisfactory and a Water Fittings inspection identified that the kitchen tap was fitted with an aerator, which was the most likely cause of the detections. This sample result was notified to the Inspectorate as an event, reference DWI/2019/7088 and as compliance breaches under references ANH-C001A-25-04-19 and ANH-C002-25-04-19.

- A routine monitoring sample from Newport Pagnell PWSZ was collected on 06 July 2020, was declined for quantitative taste analysis due to the presence of some small particles. All other analysis of the samples including bacteriological, turbidity and quantitative odour analysis was satisfactory. Due to the sample not being tasted, the customer was issued with a precautionary Do Not Drink notice whilst investigations were carried out, this was lifted following satisfactory resamples. This event was reported to the Inspectorate under reference DWI/2020/7702.

Our target standard process for raw, final, stored and customer tap samples highlights any regulatory and operational samples that are above our internal set triggers on a twice weekly basis. These are each investigated by a Water Quality Risk Scientist where trends will be reviewed as part of the investigation. At this point of the investigation we have not identified any water quality trends or unusual numbers of target standards investigations which could be associated to the pipework installed within Hannington Reservoirs 1A and 1B.

In addition, Risk Scientists review monthly changes in RAG risk categories that are identified through our water quality risk portal when changes occur from green to red/amber or amber to red. These risk changes are all investigated thoroughly and presented at our monthly Compliance Monitoring Group. At this stage we have not identified any unusual risk changes related to Hannington Reservoir.

We have carried out a review of the customer contacts received from the seventeen PWSZs before and after the installation of the new pipework at Hannington Reservoirs for all tastes and odours categories.

Figure 6 presents the Average Acceptability Rate across the seventeen PWSZs downstream of Hannington Reservoirs indicating that there has been no impact associated with acceptability since the work has been carried out to install the new outlet mains.

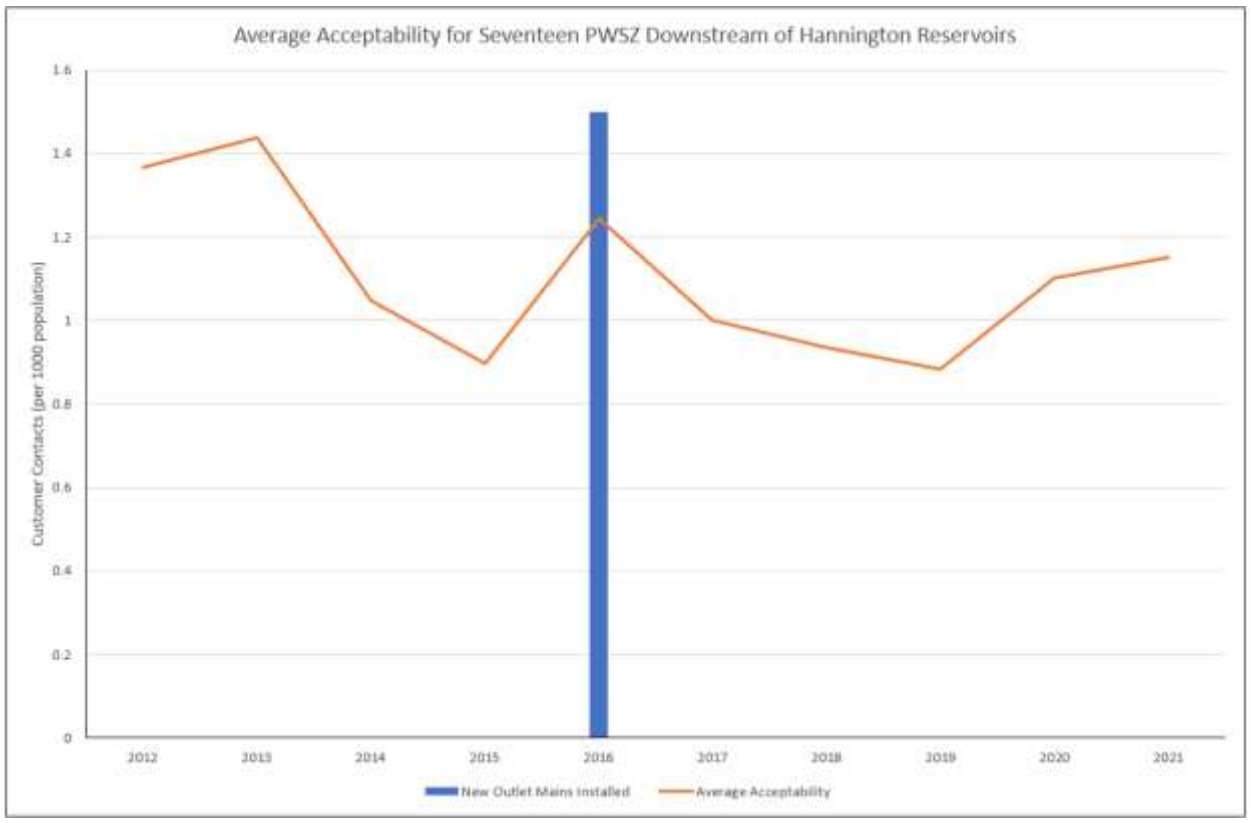


Figure 6 – Average Acceptability Rates for the Seventeen PWSZ supplied by Hannington Reservoirs

The breakdown of each individual PWSZ Acceptability Rate is provided as Appendix 3.

All water quality contacts into Anglian Water are initially triaged by our Call Centre Agents (CCA) who are trained to provide advice to customer on aspects of water quality such as chlorine and TCP. TCP complaints are those where the customer typically describes the water tasting or smelling metallic/medicinal/chemical in nature and occurs either only in boiled drinks (often caused by a reaction between phenolic compounds from plastic or rubber parts of kettles with chlorine in the water), or sometimes occurs in the cold water, but will most typically persist after boiling as well. The presence of a TCP type taste/odour after a period of standing or boiling, is the key differentiator to separate a TCP complaint from a chlorine complaint. Advice is provided regarding leaving water to stand overnight, checking if the issue affects single taps or more than one tap, checking if appliances have non-return valves if it is suspected the cause might be appliance hoses.

Calls may be escalated to a Water Quality Scientist, in line with our procedures, if the CCA feels the customer requires more in-depth advice or the if the contact has been received following work on the network, the customers own plumbing or for certain types of complaints such as a taste or odour described as petrol/diesel in nature. All calls are visible to the Water Quality Team and if clusters of calls are received from hydraulically linked areas these are also escalated for investigation. Please note that a cluster is considered to be two or more complaints of similar job descriptions (taste/odour for example, or discolouration, or white water) received from the same DMA within a 24-hour period.

Our review of the calls for the period in question identifies that the majority of calls were due to internal issues in the customer's property, such as earthy/musty smells originating from sink traps; long service pipes; or a lack of Non-Return Valves (NRVs)

on washing machines or dishwashers. Where a visit was carried out and sampling undertaken, our present review identified that all sample results were returned as satisfactory for water quality parameters.

Samples of the external paint on the barrel of each pipe were collected from Hannington 1A, these were labelled 1A-1 and 1A-2. These samples were soaked in 500ml de-ionised (DI) water for 24 hours. The water sample was extracted with dichloromethane and analysed by gas-chromatography/ mass spectrometry (GC/MS) to produce semi-quantitative results. The semi-quantitative results are estimated against a 1 µg/L standard of 1-chloroundecane. In total, three compounds were detected between the two samples (Table 5). All three compounds were below the operational, 24 hour and 7 day SNARLs.

Sample ID	**Compound detected**	**Estimated concentration (µg/L)**	**24 hour SNARL (µg/L)**	**7 day SNARL (µg/L)**	**Operational SNARL (ug/L)**
Hannington 1A-1	Nonanal	0.12	1,500	600	1
Hannington 1A-1	Oleic acid	0.70	210,000	84,000	None given
Hannington 1A-2	Tridecene	0.11	7,500	15,000	10

Table 5 – pipework coating soak test organic compounds detected

Further to the above, a trace organics sample was collected from the in supply Hannington 1B on Monday 10 January 2021, this sample was clear of any trace compounds. Whilst Hannington 1B remains in supply we have arranged routine weekly monitoring for trace organics sampling at this asset.

From the evidence reviewed we do not believe there has been an impact on water quality.

5. Regulation 31 - Materials in Contact (MIC) Process

The Regulation 31 governance at Anglian Water ranges from policy through training and auditing to application on site (see Figure 7).

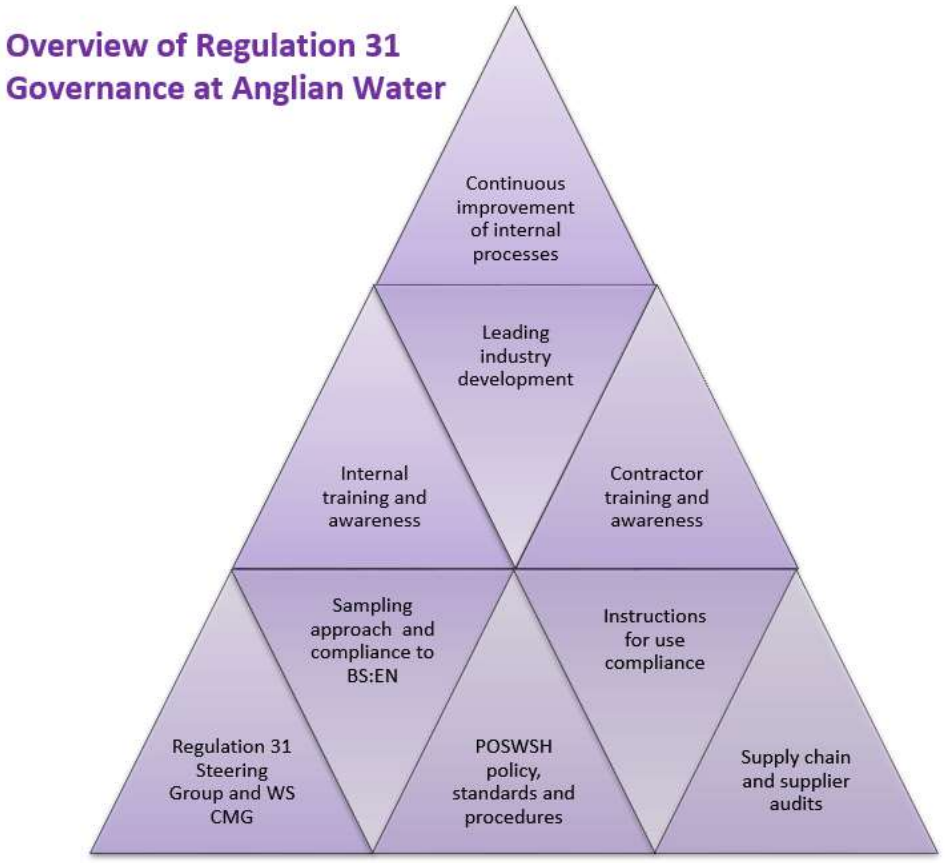


Figure 7 – Overview of Regulation 31 Governance at Anglian Water

Regulation 31 Governance

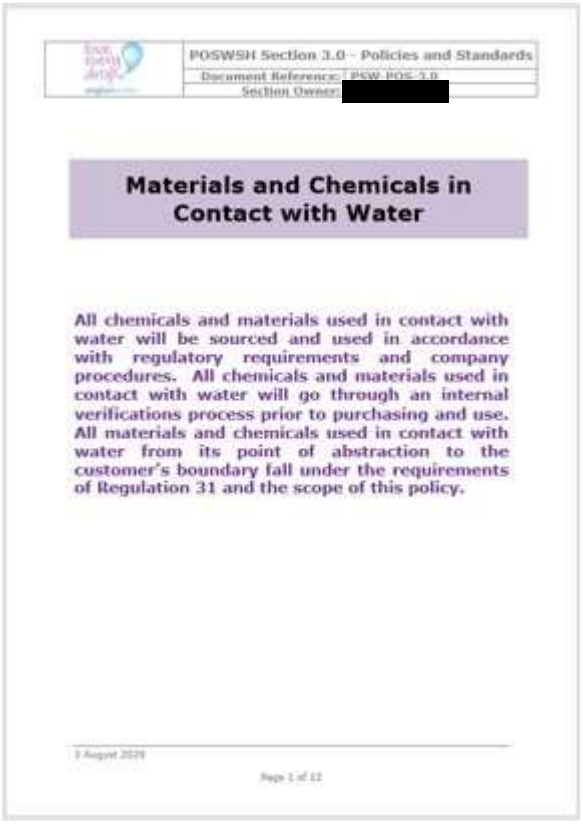
An internal Regulation 31 Steering Group was created in 2019 to focus on continual improvement of procedure, training updates, communications and further raising awareness across the company. The group also review any near misses from Anglian Water and the wider industry, make decisions, approve items submitted for review by scientists and engineers, and review industry and regulatory updates. The core members include Water Quality Risk and Optimisation Manager, Water Quality Risk Managers, Water Quality Regulation Manager, Risk Scientist Portfolio Leads, Policy and Strategy Scientist, Materials Scientist and a Procurement Specialist.

Water quality performance is tracked and reviewed at Water Services Compliance Monitoring Group (WSCMG), which is chaired by the Head of Water Quality with a core membership including the Director of Water, members of Water Senior Leadership team, Tactical Operations Manager, Analytical Services and Water Quality Senior Leadership team.

Policies, Standards and Procedures

Anglian Water has a POSWSH (Policies and Standards for Water Supply Hygiene) policy containing the standards on 'Materials and Chemicals in Contact with Water'. The policy statement can be seen in figure 8 below. This policy details how we maintain compliance with Regulation 31 of the Water Supply (Water Quality) Regulations. Our policy and standards for 'Asset Design and Creation' mandates that all assets involved in the production and delivery of drinking water will be designed, commissioned, and decommissioned to ensure that they do not impact adversely on water quality, including meeting all Regulation 31 requirements. Our asset design envelopes, Minimum Asset Standards, are developed according to these POSWSH policy and standard requirements, which must be adhered to by our Alliance Partners for any scheme delivery.

A POSWSH procedure PSW-PRO-3.01 Materials and Chemicals in Contact with Water documents the responsibilities of all employees working with any materials and chemicals which will be introduced into water intended for public supply to ensure they are fully compliant with Regulation 31.


POSWSH Section 3.0 - Policies and Standards

Document Reference: PSW-POS-3.0

Section Owner: [redacted]

Materials and Chemicals in Contact with Water

All chemicals and materials used in contact with water will be sourced and used in accordance with regulatory requirements and company procedures. All chemicals and materials used in contact with water will go through an internal verifications process prior to purchasing and use. All materials and chemicals used in contact with water from its point of abstraction to the customer's boundary fall under the requirements of Regulation 31 and the scope of this policy.

Figure 8 – POSWSH Policy Statement

The scheme owner requests a Materials in Contact (MIC) form from the Water Quality Risk Science team, who then raise a form with a unique reference number and return a link to the form (see Figure 9). The scheme owner completes Part A of the form with the relevant items and approval numbers, signs each line and then returns to the Risk Scientists. Part A of the MIC form also requires the completing engineers to confirm relevant instructions for use (IFUs) / conditions for use for each item have been checked and can be met. Risk Scientists review the listed items compliance and will counter sign Part A of the form and return to the scheme owner. Sampling is agreed at the point of Part A final sign off and forms Part B of the form. Once sampling

has taken place, the Risk Scientists will review the sample results, save the data on Part C of the form, and sign off or advise if further sampling required.

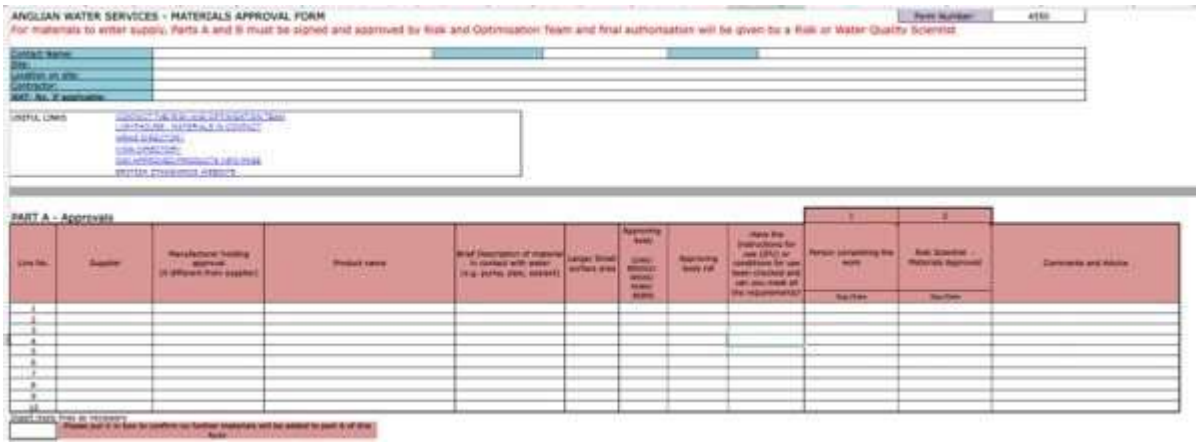


Figure 9 – MIC Form Template

Materials In Contact (MIC) Sampling

The asset will only go into supply once sample data is signed off. In the case of a large project e.g. a full works going into supply, the activity will also be covered by a Major Impact Plan following procedure PSW-PRO-1.14 Water Quality Risk Assessment and Control. Checking the MIC form has been fully signed off will be documented as one of the preliminary activities.

As part of our process we take a suite of samples to verify that the work undertaken, including the items introduced and in contact with the water, have had no adverse impact on water quality. See Figure 10 for analysis list from the MIC training module. The results must be signed off by the Water Quality Risk team before the asset is allowed into supply. Prior to sampling we ensure the water has been in contact with the surfaces for a time of double the likely operational contact time, up to 16 hours, or in line with IFU, whichever is greater. The sampling includes analysis for taste, odour and microbiological parameters, as well as other parameters such as pH, colour, turbidity, conductivity and trace organics.

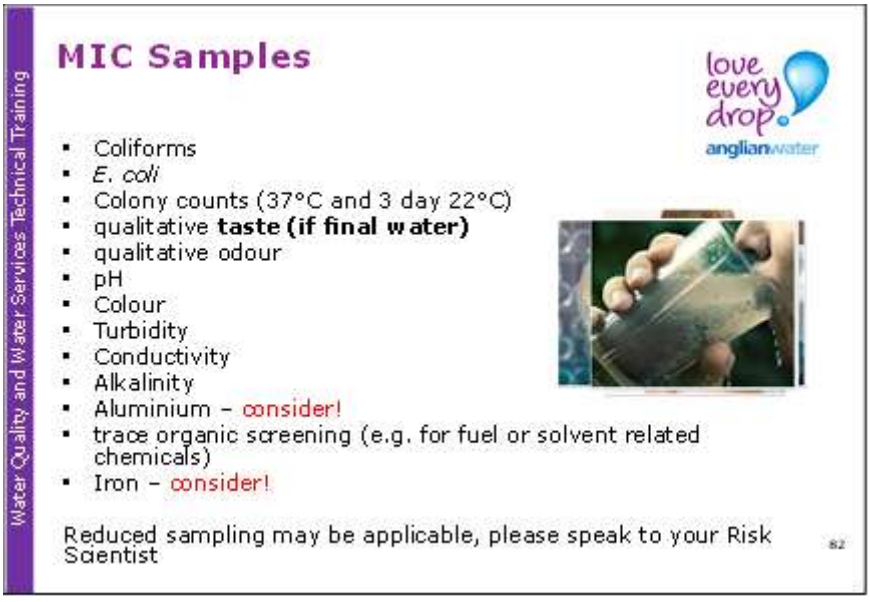
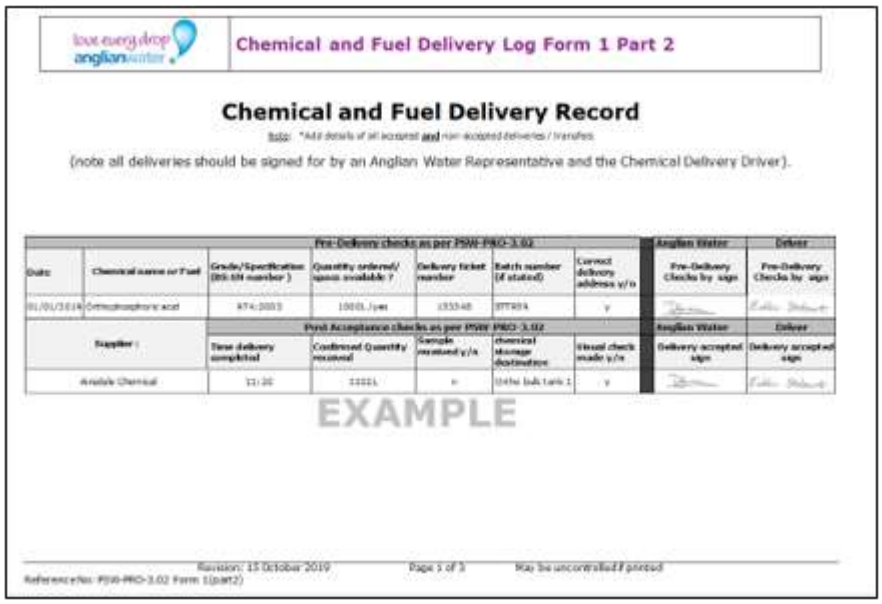


Figure 10 – MIC Analysis

Chemicals in Contact

For chemicals in use in water supply we also have a POSWSH policy, standards and related procedure in place. These ensure that fuel and chemicals of the correct specification are delivered to prevent the unintended use of incorrect chemicals. The procedure includes the requirement for the receiving works technician to verify product conformity to the correct BS:EN specification. A record of the delivery and the checks completed are recorded on the site-specific "Water Services Chemical and Fuel Delivery Log" form (see figure 11).


Chemical and Fuel Delivery Log Form 1 Part 2

Chemical and Fuel Delivery Record

(note all deliveries should be signed for by an Anglian Water Representative and the Chemical Delivery Driver).

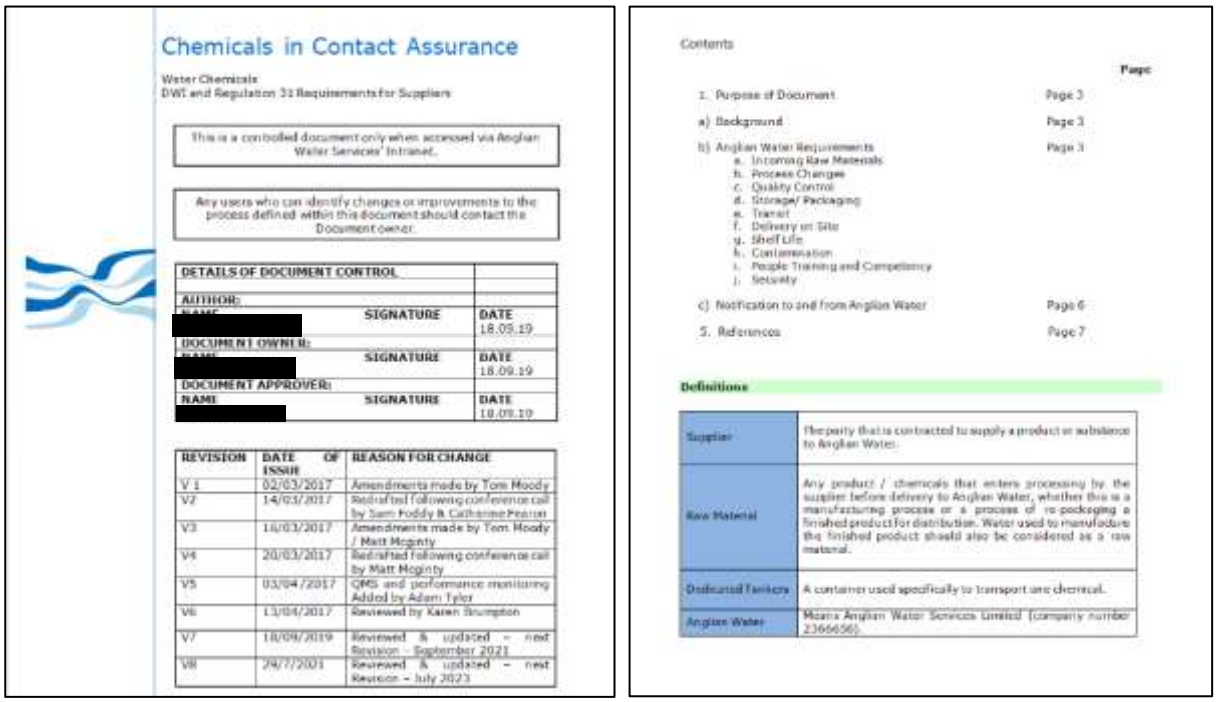
EXAMPLE

Figure 11 – Chemical and Fuel Delivery Record

Supplier Assurance

Framework contracts undergo a supplier tendering, evaluation, and selection process to ensure selected suppliers are capable of meeting Anglian Water and Regulation 31 requirements and are committed to do so. Materials in Contact and product traceability requirements are built into the framework contracts. Assurance of key performance measures for chemical suppliers are proactively sought, via an electronic questionnaire which suppliers have to respond to. This includes confirming if there have been any changes to product manufacturing processes, raw material changes, or continuity of supply etc.

The Water Services annual assurance programme includes Regulation 31 focussed chemical and material supplier audits. Audits are carried out by Water Quality and Procurement representatives. Audit reports are published to key stakeholders, and actions are categorised and tracked. Our Director of Water held a supplier summit with all chemical suppliers to highlight key aspects of assurance we required from them (e.g. compliance to BS:EN) as a consequence of a GAC contamination issue in 2017. We launched the 'Chemicals in Contact Assurance' document at this event (see figure 12), which re-enforced the standard, confirmed our intention to audit and included the requirement for them to highlight any changes to their products or processes. All suppliers of potable water treatment chemicals were audited across 2017 and 2018 utilising a multi-disciplinary team. Sixteen chemical suppliers are now audited on risk-based frequencies, from annually to every seven years.



Chemicals in Contact Assurance

Water Chemicals
DWI and Regulation 31 Requirements for Suppliers

This is a controlled document only when accessed via Anglian Water Services' Intranet.

Any users who can identify changes or improvements to the process defined within this document should contact the Document owner.

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NAME [redacted]	SIGNATURE	DATE 18.09.19

REVISION	DATE OF ISSUE	REASON FOR CHANGE
V 1	02/03/2017	Amendments made by Tom Moody
V2	14/03/2017	Redrafted following conference call by Sam Foddy & Catherine Pearce
V3	16/03/2017	Amendments made by Tom Moody / Matt Mcginty
V4	20/03/2017	Redrafted following conference call by Matt Mcginty
V5	03/04/2017	QMS and performance monitoring Added by Adam Tyler
V6	13/04/2017	Reviewed by Karen Brumpton
V7	18/09/2019	Reviewed & updated – next Revision – September 2021
V8	29/7/2021	Reviewed & updated – next Revision – July 2023

Contents

Page:

1. Purpose of Document — Page 3
a) Background — Page 3
b) Anglian Water Requirements — Page 3
   a. Incoming Raw Materials
   b. Process Changes
   c. Quality Control
   d. Storage/ Packaging
   e. Transit
   f. Delivery on Site
   g. Shelf Life
   h. Contamination
   i. People Training and Competency
   j. Security
c) Notification to and from Anglian Water — Page 6
5. References — Page 7

Definitions

Supplier	The party that is contracted to supply a product or substance to Anglian Water.
Raw Material	Any product / chemicals that enters processing by the supplier before delivery to Anglian Water, whether this is a manufacturing process or a process of re-packaging a finished product for distribution. Water used to manufacture the finished product should also be considered as a raw material.
Dedicated Tankers	A container used specifically to transport one chemical.
Anglian Water	Means Anglian Water Services Limited (company number 2366656).

Figure 12 – Chemicals in Contact Assurance document

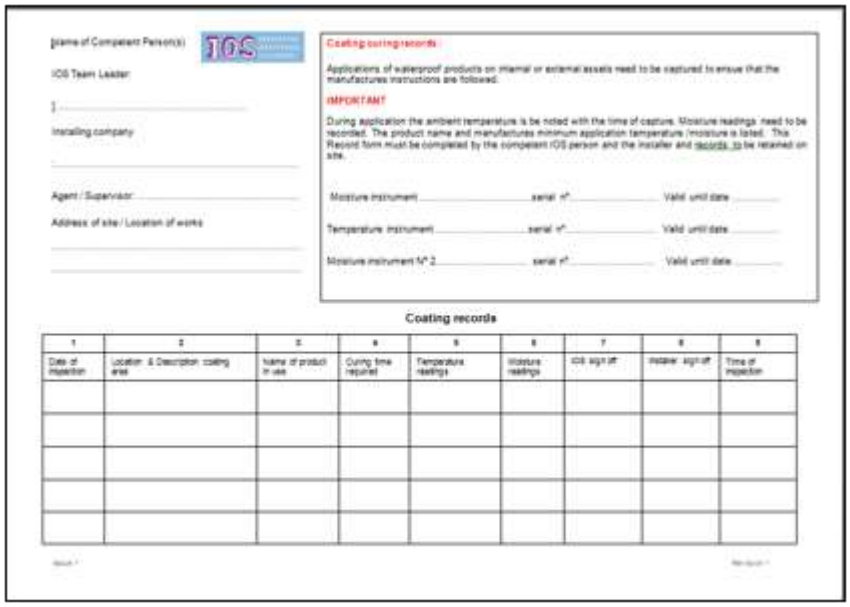
Expanding on the success of the chemical suppliers' assurance programme, a scanmarket assessment questionnaire was sent to framework material suppliers. Answers were scored and forty-nine material suppliers were ranked on a risk-based approach to form our material supplier audit programme.

We completed ten framework chemical and material supplier audits in 2021. The first two material audits were carried out virtually in 2020/21, and another seven feature in the 2021/22 audit programme. Wash up and launch sessions with the auditors for these programmes have allowed sharing of best practice, areas to focus on for future audits, and improvements to our audit templates.

We have seen a number of benefits above gaining internal insurance, including building relationships with suppliers and learning for our auditors and suppliers. Suppliers have reacted well to our material audits and we work with them to close down any actions identified.

Compliance with Instructions For Use (IFU)

In 2017, working collaboratively with our Integrated Operational Solutions, we developed a method to record and capture key data in relation to IFU compliance, which was briefed out to all relevant staff (see figure 13). These records are maintained for all schemes and include IFU information, records of temperature monitoring, coating records, surface preparation, data sheets etc. Engineers are required to check and sign-off the forms to provide further assurance of IFU compliance. This also led to the creation of an Integrated Operational Solutions QA role to carry out additional checks and audits in this area.



Coating curing records :

Applications of waterproof products on internal or external assets need to be captured to ensure that the manufactures instructions are followed.

IMPORTANT

During application the ambient temperature is be noted with the time of capture. Moisture readings need to be recorded. The product name and manufactures minimum application temperature /moisture is listed. This Record form must be completed by the competent IOS person and the installer and records to be retained on site.

Moisture instrument ..... serial n°..... Valid until date .....

Temperature instrument ..... serial n°..... Valid until date .....

Moisture instrument N° 2 ..... serial n°..... Valid until date .....

[name of Competent Person(s)]

IOS Team Leader

Installing company

Agent / Supervisor

Address of site / Location of works

Coating records

1	2	3	4	5	6	7	8	9
Date of inspection	Location & Description coating area	Name of product in use	Curing time required	Temperature readings	Moisture readings	IOS sign off	Installer sign off	Time of inspection

Figure 13 – IOS Coating Curing Record Form

Training and Competency

We have reviewed our current internal training material to introduce more practical elements on navigating and understanding routes of compliance to drive continuous improvement.

Two forms of training are currently in place throughout Anglian Water. An e-learning module and a one-day classroom training course. The e-learning module was created in 2018 to raise the overall awareness of key aspects of Regulation 31, including a competency test as part of the module. To date over 550 members of staff have completed this e-learning module. In August 2021 we introduced a new requirement for this to be retaken on a 3-yearly basis. See Figure 14 for a screenshot of the e-learning. The one-day classroom training course which builds on knowledge of Regulation 31 requirements from the e-learning module. There are two versions of this course, one for engineers and the second for water quality teams (forming part of our Licence to Operate programmes). The training course was fully reviewed and updated last year to include a much more practical element.

Only those individuals who have completed the e-learning and classroom training and are signed off as competent are able to complete Part A of the MIC form. A list of those trained is kept up to date and can be cross referenced by the Water Quality Risk Team upon receiving Part A of the MIC form for review.

Figure 14 - Front page of e-learning training for Materials in Contact

Our Water Quality Training team produce Water Quality Alerts to the business to share topical best practice and learning from near misses. A number of Regulation 31 themed Water Quality alerts have been produced and distributed over the last year. An example of a recent alert is shown in Figure 15.

Water Quality Update

Materials in Contact – Stainless Steel

What happened?
We have seen a number of MIC forms incorrectly filled in whereby **Large surface area stainless steel items** have been listed with **a stainless steel grade rather than the required DWI approval number.**

Large surface area items must be listed on the Full DWI Approved Product List against the relevant manufacturer, and a recognised grade of stainless steel is not sufficient as a route of compliance for such items.

Breaches in Regulation 31 are a criminal offence.

STOP

What do you need to do?

- Compliance for **Small Surface Area** items made of stainless steel.
  - Check the item is listed on advice sheet 8 exemplar list or calculate a contact risk C score to ensure it can be demonstrated it is a small surface area item (<100).
  - If confirmed as small surface area, approval can be found by checking that the item is made of a recognised grade of stainless steel as listed on Annex 3C .
- Compliance for **Large Surface Area** items made of stainless steel.
  - Ensure the stainless steel product has a listing by it's manufacturer on the Full DWI Approved Product List and has a current DWI number.
  - If the item does not have a DWI listing then it **cannot** be used in a large surface area application.
- If unsure contact the WQ Risk Team – WQRiskandOptimisatio@anglianwater.co.uk

Love every drop
Come rain or shine
Find out more at

love every drop
anglianwater

Figure 15 – Example of Water Quality Update relating to Regulation 31 from 2021

Industry Development

We have also set up a Water UK Regulation 31 Industry Group including Anglian Water, Thames, Northumbrian, Severn Trent, Southern and South Staffs. The group has focussed on the sharing of Regulation 31 best practice and have been working with EUSR to scope two industry training schemes

- Stage 1 - Basic awareness
- Stage 2 - For contractors applying specialist materials to align with a draft CoP for application of materials to drinking water structures

The first stage 1 Regulation 31 Awareness Scheme workshop was held on 22 November, attended by our Water Quality Training and Development Scientist.

Continuous Improvement of MIC Process

As part of our continuous review and improvement of the Materials in Contact Process in Anglian Water we have recently implemented the following improvements:

- **Additional Assurance Checks as part of our Scheme Delivery Process**

We have introduced two additional assurance stages as part of schemes requiring completion of Materials in Contact (MIC) forms. At our delivery milestones 3 and 4 (DM3 – confirm solution deliver plan and DM4 – confirm solution completion) we have introduced the requirement of a Materials in Contact deliverable. A Water Quality Risk Manager is now included as an MIC reviewer for the scheme, managed through our Totex Delivery Workflow system. The MIC form is submitted as supporting evidence for review at each of these stages. Completeness of the form is assessed by the reviewer and the scheme is then supported or not supported as appropriate at this stage. This ensures that the scheme will not progress any further without our MIC form process being at an appropriate level of completion at each stage.

- **Communications Awareness Campaign**

During August and September 2021 we delivered a communication plan for refreshing Regulation 31 awareness specifically to our Supply, IOS and @one Alliance teams. This consisted of:

- Three text messages being sent to over 250 individuals' mobiles from our Supply, IOS and @one Alliance teams. The messages reinforced timely completion of MIC forms, adherence to IFUs and refreshing training.
- Creation of a Regulation 31 Tool Box Talk refresher, with five key takeaways (see figure 16).

Figure 16 – Key takeaways extract from MIC Tool Box Talk

- Revamping our internal Regulation 31 Materials in Contact Lighthouse intranet page with useful information and links for those involved in our MIC process.
- Updating our hygiene charter to include a new commitment specific to Regulation 31 (see figure 17).

Figure 17 – Hygiene charter new commitment

- News articles in Anglian Water and @one Alliance weekly digital newsletters. These included links to the MIC Tool Box Talk and refreshed MIC intranet page.

- **MIC Form Improvements**
  We have recently trialled an updated version of our MIC form. The current changes in the trialled version include:
  - Introduction of drop down options guiding the form completer.
  - Warning and information notes based on the route of compliance being used.
  - Automated highlighting of upcoming end date of approvals.
  - An additional @one Alliance quality assurance check for @one Alliance schemes.
  - A new requirement to state the intended use for each line item.
  - The requirement to centrally save any supporting documents (such as BS6920 certification).

  We are making some final amendments based upon feedback and are considering if there are any further adaptions we can make as a result of the findings from recent events. The form will be signed off at our Regulation 31 steering group prior to publication.

- **Minimum Asset Standard Updates**
  In response to identification of non-compliant pipework at our new Kedington WTW as previously reported (DWI 2021 8118), we have reviewed and updated our Minimum Asset Standards (MAS) for treated water tanks. We have introduced a standard for new assets that specifies submerged pipework must be constructed from stainless steel, ensuring the pipework will be of a suitable material both internally and externally (standard 7.3 on figure 18 below). These revisions were made to our MASs for 'Treated Water Storage Reservoir (1K-TWS-RES-MAS)' and 'Contact and Balance Tank (1F-FND-CON-MAS)' published in December 2021.

7. Regulation 31 Compliance	7.1 All materials in contact with water intended for the public supply shall comply with Regulation 31 of the current Water Supply (Water Quality) Regulations. 7.2 All manufacturers' Instructions for Use (IFU) documents relating to Regulation 31 compliance shall be included in the operating and maintenance manual. 7.3 Submerged pipework (including the submerged sections of pipework originating outside the tank) shall be of a DWI recognised stainless steel grade and fabricated by a manufacturer listed in the DWI Full List of Approved Products. 7.4 Submerged fittings shall be made from A2 (304) stainless steel. 7.5 Mechanical joint fittings shall be suitable for immersion and all their internal and external materials compliant with Regulation 31. 7.6 Submerged small bore pipework and fittings feeding mid-point sample points shall be of a DWI recognised stainless steel grade. 7.7 Consult a Risk Scientist regarding equipment inside the tank but above top water level (including hatch covers and instrumentation).

Figure 18: extract from the minimum asset standard for Contact and Balance Tank

6. **Actions Being Taken to Prevent a Recurrence**

As part of our strategy to make a step change in compliance with Regulation 31 we have created a Materials in Contact Improvement Programme which aims to implement significant changes across Anglian Water, our Alliance Partners and Suppliers. This programme of work is being sponsored by our Director of Water Business Stream, [redacted] and Head of Water Quality, [redacted] We have a dedicated Project Manager driving this work forward, bringing together learning from recent Regulation 31 events and conducting an end-to-end review of our internal Materials in Contact processes. The improvement plan covers all stages of our MIC process from procurement, through design, change control, sign-off into supply, and auditing and assurance with the key aim to develop a fully traceable process for Regulation 31 compliance.

The improvement plan has a series of workstreams around:

- **Procurement and Contractual Relationships with Suppliers** – working with our suppliers to ensure they meet the clearly defined requirements of Regulation 31. Includes introduction of a system, mirroring a system currently on place for our chemical suppliers, whereby changes within integrated suppliers are notified to us proactively for assessment of their potential impact on Regulation 31 compliance.
- **Logistics and Traceability –** working together with our Logistics teams on shared goals of a fully traceable system for materials and fittings from entry to the company to final installation.
- **Design and Engineering Standards –** a full review of all water Minimum Asset Standards to ensure a consistent messaging about materials in

contact. A full review of all Mechanical / Pipeline Design Guides and reference materials to be undertaken to ensure a full suite of standards directly connected to ensuring MIC compliance and awareness, including the creation of a dedicated pipework design guide which includes a full review of 'Standard' material notations.

- **Materials in Contact Process Review** – removing barriers that exist that prevent the easy passage of critical information between teams, review standard inspection and assurance templates to include clear and unambiguous reference to Regulation 31 and clearer links backs to standards and the design.
- **Digital Solutions** – use of digital solutions to embed and track products and certification throughout the design and delivery phase. The element of real time data within the Building Information Modelling (BIM) model will align Scientific, Procurement and Design to enable a real-time database of Materials In Contact for use within the delivery team.
- **Training, Competency and Assurance** – training and competence are key to the success of delivery; core to this is our staff, our partner organisations but also our integrated supply chain. Ensuring Regulation 31 is a key part of our Licence to Operate and expand this programme to other key areas in the business.
- **Communications** – ensure we have clear communication processes in place to embed the core principles of the management of Materials in Contact and the wider water quality standards.

Sharing Learning with the Wider Industry

Once we have introduced these changes to drive forward compliance with Regulation 31, it is our intention to share these advancements with the wider industry. We have a number of routes to do this successfully through our existing networks in the industry but we would also like to explore options using digital technology and hosting an industry webinar or on-line event.

7. **Rectification of the Issue**

Hannington 1A remains out of supply until rectification of the pipework issues identified within this asset. It is not possible to remove Hannington 1A and 1B at the same time without introducing a high risk of loss of supply to our customers. The plan currently being progressed will include removal of some of the protruding pipework back to the wall of the tank with appropriate preparation and coating of any remaining surfaces in contact with water in full compliance with relevant Instructions for Use (IFU) documents. This work is being progressed as quickly as possible ensuring all health and safety aspects of working within a confined space are considered and addressed.

When this work is complete in Hannington 1A this reservoir will be returned to supply following appropriate sampling and approval. Hannington 1B will then be removed from supply immediately to enable the appropriate remedial work on this reservoir. We currently anticipate Hannington 1B will be removed from supply by the end of February 2022.

Whilst Hannington 1B remains in supply we have arranged enhanced weekly monitoring for trace organics at this asset.

8. Notifications

Other organisations informed:
CCWater
Thames Water
Independent Water Networks Limited

Notes

[redacted]

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As Shown	PRE	P1

Drawing Number
WAT-05054-HANNWR-1H-DET-4580

2016 - 2021	No. Coliform Samples	No. of Coliform detections	No. E.coli Samples	No. of E. coli detections	No. Quantitative taste Samples	No. of Quantitative taste detections	No. Quantitative Odour Samples	No. of Quantitative Odour detections
Hannington Res 1A	290	0	290	0	0	0	0	0
Hannington Res 1B	290	0	290	0	0	0	0	0
Newport Pagnell PWSZ	531	1	531	0	198	0	216	2
Winslow PWSZ	633	1	633	0	172	0	172	0
Milton Keynes City North West PWSZ	748	2	748	0	287	0	276	5
Milton Keynes City North East PWSZ	647	2	647	0	204	0	204	5
Milton Keynes City South East PWSZ	1233	3	1233	0	397	1	397	1
Milton Keynes City West	378	0	378	0	137	0	137	2
Wellingborough PWSZ	1003	7	1003	1	284	0	285	1
Ravensthorpe PWSZ	273	0	273	0	129	0	128	2
Brixworth PWSZ	138	0	138	0	67	0	67	0
Daventry PWSZ	704	4	704	0	223	0	223	1
Northampton West PWSZ	531	0	531	0	165	0	165	0
Northampton Central PWSZ	1023	1	1023	0	267	0	267	2
Northampton South PWSZ	470	1	470	0	172	1	172	1
Northampton East PWSZ	838	2	838	0	240	0	240	1
Northampton North PWSZ	580	2	580	0	172	0	172	0
Buckingham PWSZ	1168	2	1168	0	346	0	346	1
Kettering Town West PWSZ	1116	2	1116	0	309	0	308	1
Grand Total	**12,594**	**30**	**12,594**	**1**	**3,769**	**2**	**3,775**	**25**

2016	No. Coliform Samples	No. of Coliform detections	No. E.coli Samples	No. of E. coli detections	No. Quantitative taste Samples	No. of Quantitative taste detections	No. Quantitative Odour Samples	No. of Quantitative Odour detections
Hannington Res 1A	35		35		0		0	
Hannington Res 1B	32		32		0		0	
Newport Pagnell PWSZ	65	1	65		28		28	
Winslow PWSZ	84		84		15		15	
Milton Keynes City North West PWSZ	105		105		38		28	1
Milton Keynes City North East PWSZ	86		86		29		29	1
Milton Keynes City South East PWSZ	169	1	169		35		35	1
Milton Keynes City West	47		47		19		19	
Wellingborough PWSZ	132	1	132		20		21	
Ravensthorpe PWSZ	39		39		10		10	
Brixworth PWSZ	20		20		5		5	
Daventry PWSZ	95		95		15		15	
Northampton West PWSZ	77		77		15		15	
Northampton Central PWSZ	151		151		19		19	
Northampton South PWSZ	66		66		15		15	
Northampton East PWSZ	113		113		19		19	
Northampton North PWSZ	76		76		15		15	
Buckingham PWSZ	160		160		31		31	
Kettering Town West PWSZ	150		150		19		19	
Sub Total for Year	**1,702**	**3**	**1,702**	**-**	**347**	**-**	**338**	**3**

2017	No. Coliform Samples	No. of Coliform detections	No. E.coli Samples	No. of E. coli detections	No. Quantitative taste Samples	No. of Quantitative taste detections	No. Quantitative Odour Samples	No. of Quantitative Odour detections
Hannington Res 1A	47		47		0		0	
Hannington Res 1B	52		52		0		0	
Newport Pagnell PWSZ	91		91		20		39	
Winslow PWSZ	115		115		19		19	
Milton Keynes City North West PWSZ	142		142		53		52	2
Milton Keynes City North East PWSZ	127	1	127		37		37	1
Milton Keynes City South East PWSZ	204	1	204		55		55	
Milton Keynes City West	64		64		25		25	
Wellingborough PWSZ	177	2	177		52		52	1
Ravensthorpe PWSZ	51		51		25		25	
Brixworth PWSZ	25		25		12		12	
Daventry PWSZ	128		128		38		38	
Northampton West PWSZ	89		89		18		18	
Northampton Central PWSZ	204		204		52		52	
Northampton South PWSZ	89		89		20		20	
Northampton East PWSZ	153		153		26		26	
Northampton North PWSZ	103		103		19		19	
Buckingham PWSZ	217	1	217		40		40	
Kettering Town West PWSZ	205		205		53		52	1
Sub Total for Year	**2,283**	**5**	**2,283**	**-**	**564**	**-**	**581**	**5**

2018	No. Coliform Samples	No. of Coliform detections	No. E.coli Samples	No. of E. coli detections	No. Quantitative taste Samples	No. of Quantitative taste detections	No. Quantitative Odour Samples	No. of Quantitative Odour detections
Hannington Res 1A	52		52		0		0	
Hannington Res 1B	52		52		0		0	
Newport Pagnell PWSZ	91		91		40		40	
Winslow PWSZ	118		118		34		34	
Milton Keynes City North West PWSZ	137		137		52		52	
Milton Keynes City North East PWSZ	115		115		39		39	1
Milton Keynes City South East PWSZ	215		215		76		76	
Milton Keynes City West	65		65		25		25	1
Wellingborough PWSZ	180	2	180		52		52	
Ravensthorpe PWSZ	51		51		27		26	2
Brixworth PWSZ	27		27		15		15	
Daventry PWSZ	127	1	127		40		40	1
Northampton West PWSZ	102		102		33		33	
Northampton Central PWSZ	193	1	193		54		54	1
Northampton South PWSZ	85		85		37		37	
Northampton East PWSZ	154	2	154		52		52	
Northampton North PWSZ	99		99		37		37	
Buckingham PWSZ	209		209		66		66	
Kettering Town West PWSZ	205		205		52		52	
Sub Total for Year	**2,277**	**6**	**2,277**	**-**	**731**	**-**	**730**	**6**

2019	No. Coliform Samples	No. of Coliform detections	No. E.coli Samples	No. of E. coli detections	No. Quantitative taste Samples	No. of Quantitative taste detections	No. Quantitative Odour Samples	No. of Quantitative Odour detections
Hannington Res 1A	52		52		0		0	
Hannington Res 1B	52		52		0		0	
Newport Pagnell PWSZ	85		85		36		36	1
Winslow PWSZ	111		111		38		38	
Milton Keynes City North West PWSZ	134	1	134		53		53	
Milton Keynes City North East PWSZ	110		110		37		37	
Milton Keynes City South East PWSZ	204		204		77		77	
Milton Keynes City West	74		74		25		25	
Wellingborough PWSZ	168	2	168	1	53		53	
Ravensthorpe PWSZ	49		49		24		24	
Brixworth PWSZ	25		25		13		13	
Daventry PWSZ	123		123		37		37	
Northampton West PWSZ	96		96		36		36	
Northampton Central PWSZ	169		169		52		52	
Northampton South PWSZ	84		84		36		36	
Northampton East PWSZ	145		145		52		52	1
Northampton North PWSZ	108	1	108		36		36	
Buckingham PWSZ	206	1	206		76		76	
Kettering Town West PWSZ	196	1	196		53		53	
Sub Total for Year	**2,191**	**6**	**2,191**	**1**	**734**	**-**	**734**	**2**

2020	No. Coliform Samples	No. of Coliform detections	No. E.coli Samples	No. of E. coli detections	No. Quantitative taste Samples	No. of Quantitative taste detections	No. Quantitative Odour Samples	No. of Quantitative Odour detections
Hannington Res 1A	53		53		0		0	
Hannington Res 1B	53		53		0		0	
Newport Pagnell PWSZ	98		98		37		36	
Winslow PWSZ	79		79		28		28	
Milton Keynes City North West PWSZ	90		90		40		40	1
Milton Keynes City North East PWSZ	85	1	85		25		25	1
Milton Keynes City South East PWSZ	217	1	217		78		78	
Milton Keynes City West	53		53		18		18	
Wellingborough PWSZ	168		168		55		55	
Ravensthorpe PWSZ	33		33		18		18	
Brixworth PWSZ	16		16		9		9	
Daventry PWSZ	91		91		41		41	
Northampton West PWSZ	66		66		25		25	
Northampton Central PWSZ	129		129		38		38	1
Northampton South PWSZ	58	1	58		27	1	27	1
Northampton East PWSZ	108		108		38		38	
Northampton North PWSZ	81		81		27		27	
Buckingham PWSZ	149		149		56		56	1
Kettering Town West PWSZ	147		147		56		56	
Sub Total for Year	**1,774**	**3**	**1,774**	**-**	**616**	**1**	**615**	**5**

2021	No. Coliform Samples	No. of Coliform detections	No. E.coli Samples	No. of E. coli detections	No. Quantitative taste Samples	No. of Quantitative taste detections	No. Quantitative Odour Samples	No. of Quantitative Odour detections
Hannington Res 1A	51		51		0		0	
Hannington Res 1B	49		49		0		0	
Newport Pagnell PWSZ	101		101		37		37	1
Winslow PWSZ	126	1	126		38		38	
Milton Keynes City North West PWSZ	140	1	140		51		51	1
Milton Keynes City North East PWSZ	124		124		37		37	1
Milton Keynes City South East PWSZ	224		224		76	1	76	
Milton Keynes City West	75		75		25		25	1
Wellingborough PWSZ	178		178		52		52	
Ravensthorpe PWSZ	50		50		25		25	
Brixworth PWSZ	25		25		13		13	
Daventry PWSZ	140	3	140		52		52	
Northampton West PWSZ	101		101		38		38	
Northampton Central PWSZ	177		177		52		52	
Northampton South PWSZ	88		88		37		37	
Northampton East PWSZ	165		165		53		53	
Northampton North PWSZ	113	1	113		38		38	
Buckingham PWSZ	227		227		77		77	
Kettering Town West PWSZ	213	1	213		76		76	
Sub Total for Year	**2,367**	**7**	**2,367**	**-**	**777**	**1**	**777**	**4**

Grand Total	**12,594**	**30**	**12,594**	**1**	**3,769**	**2**	**3,775**	**25**	**20,196**

Year / PWSZ	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
ZMW21	1.26	1.69	0.53	0.78	1.66	0.92	0.89	0.68	1.14	0.99
ZMW27	1.08	2.65	1.55	1.70	1.08	0.94	2.12	1.64	1.16	1.39
ZMW28	0.60	0.43	0.49	0.51	0.99	0.59	0.50	0.57	0.56	0.47
ZMW29	0.83	0.58	0.90	0.62	0.64	0.51	0.48	0.56	0.57	0.72
ZMW31	1.04	0.65	0.98	0.73	0.94	0.65	0.57	0.44	0.65	0.47
ZMW58	N/A	N/A	N/A	N/A	0.41	0.42	1.32	0.94	0.99	1.89
ZRW07	3.15	1.09	1.14	1.00	1.13	0.66	1.34	0.83	1.14	1.16
ZRW08	0.96	1.74	0.82	0.64	0.78	1.09	0.80	1.04	1.59	1.53
ZRW10	1.83	1.64	2.45	1.94	3.72	2.66	1.01	1.11	1.50	1.70
ZRW11	0.98	1.96	1.68	0.42	0.45	2.13	0.56	0.82	1.87	0.64
ZRW14	1.69	1.16	1.03	1.16	1.09	1.69	0.86	0.97	0.80	1.42
ZRW15	1.77	1.15	0.65	0.70	2.33	1.09	0.64	0.90	0.84	0.88
ZRW16	1.25	1.19	0.87	0.53	0.52	0.35	0.42	0.38	0.82	1.10
ZRW17	1.68	1.17	0.67	0.88	1.08	0.78	0.63	0.53	0.85	1.02
ZRW18	1.35	1.52	1.18	0.65	1.35	0.81	0.90	0.94	0.95	1.23
ZRW19	N/A	3.13	0.65	0.49	1.59	0.68	0.79	0.28	0.46	0.83
ZRW20	1.14	1.04	1.41	1.22	1.39	1.22	1.67	1.31	1.69	1.43
ZRW45	1.28	1.64	0.81	1.29	1.26	0.83	1.31	1.92	2.26	1.83

From: sil_prodsql@defra.gov.uk
To: DL-DEFRA-DWI Internal Notifications
Cc: SM-Defra-Events, DWI
Subject: Event Notification Anglian Water Services Ltd - EN/ANH/2021/00464 Pitsford WTW Storage Tank B - Created via portal
Date: 21 December 2021 18:15:15

For information

Chief Inspector
Deputy Chief Inspector
Principal Inspectors
Inspectors

DWI
Area 1A, Nobel House
17 Smith Square
London
SW1P 3JR
Tel 030 0068 6435

Company	Anglian Water Services Ltd
Name of event	Pitsford WTW Storage Tank B
Notification Reference	EN/ANH/2021/00464
Person making the notification	[redacted]
Date of notification	21/12/2021
Time of notification	18:02
Date of event	17/12/2021
Location of event	Area supplied by Pitsford WTW
Nature of event	An additional inlet main was installed into Pitsford WTW Storage Tank B in 2016 as part of the Pitsford WTW Resilience scheme to bring water from Hannington Reservoirs into Pitsford WTW. Storage Tank B was returned to service 08 August 2017, following commissioning sampling, including Materials in Contact. An internal inspection was carried out on 17 December 2021 in Storage Tank B being mindful of the situation at Kedington WTW particular attention was paid to the internal pipework. This inspection identified sections of pipework installed within the tank does not comply with Reg 31 of the Water Supply (Water Quality) Reg 2018. The pipework identified in the tank will be replaced, with appropriately approved pipes, before the storage tank is returned to supply. There has been no evidence to suggest there has been any impact on the water quality received by customers. A full review of all new build tanks is underway & inspections will be carried out on all of these tanks.
Population affected	273210
Likely cause(s)	Use of unapproved materials/products
	Full commissioning sampling was undertaken in August 2017, along with

Action taken to inform/protect consumers and details of risk assessment	regulatory monitoring final water monitoring whilst the storage tank was in supply prior to 13 December 2021, the reservoir has been out of supply since this date. We are reviewing the Water Quality contacts and sample results but we currently believe there has not been any impact on the water quality.
Action being taken to rectify the situation	The non compliant pipework within the tanks will be replaced with Regulation 31 approved pipework before the reservoir is returned to supply. There is no evidence to suggest there has been any impact on the water quality or effect on the sufficiency of water.
LAs/HAs informed?	no
Level of publicity	None

Line to take

The Inspectorate has been informed of an event affecting supplies in the Area supplied by Pitsford WTW area.

The Company is taking steps to return supplies to normal.

The Inspectorate is investigating the event.

No further notice will be given unless recipients request it or the situation changes.

3 DAY REPORT

AW Reference No:	AW/2021/1754
DWI Reference No:	DWI/2021/8380
Name of event:	Pitsford WTW – Regulation 31
Description of event:	Discovery of fittings within Storage Tank B that is not compliant with Regulation 31.
Date and time of event:	17 December 2021
Date and time of notification to DWI:	21 December 2021 at 18:02
Notified by:	[redacted]
Population/Property Count affected:	Under normal operation the Pitsford WTW supplies a population of 273,210
Duration of event:	38,136 hours
Effect on water sufficiency or quality:	There has been no evidence to date of the water quality being affected. The sufficiency of the water supply has not been affected.
Risk to public health:	It is not believed there is a wider risk to public health.
Details of any regulatory breaches:	There have been no regulatory exceedances associated with this event.
Other organisations notified:	CCWater
Publicity:	None known

Executive Summary

Whilst undertaking an internal inspection of Pitsford WTW, Storage Tank B, it was noted that fittings in the tank had areas of flaking. The fittings had been installed in 2015 as part of our AMP6 Pitsford WTW Resilience Scheme.

The inspection had been undertaken in response to the identification of pipework at our new Kedington WTW and Diddington Reservoirs, which did not fully comply with Regulation 31 as previously reported (DWI 2021 8118 and DWI 2021 8338, respectively).

Investigations are on-going however fittings have been identified within Storage Tank B which do not hold the correct approvals under Regulation 31.

There has been no evidence to suggest that there has been any impact on the quality of water being supplied to customers whilst the reservoir was in supply and it will remain out of supply until remedial work has been completed.

A full Lessons Learned investigation has been initiated to identify the actions that need to be undertaken to ensure this event does not recur.

1. Geographical location of event and Process Summary

Pitsford Water Treatment Works (WTW) (PTW1) is located in the village of Pitsford, near Brixworth in Northamptonshire. Figure 1 identifies the location of Pitsford WTW which is in the Ruthamford Supply System (Figure 2).

Pitsford WTW receives surface water from the River Nene, Holcot feeder stream, Scaldwell Brook and Walgrave Brook via the Pitsford reservoir which is located adjacent to Pitsford WTW. From the draw-off tower within the reservoir, water gravitates to three raw water pumps which boost water to the inlet of the primary ozone tank. The treatment processes at Pitsford WTW comprise of primary ozone; clarification; rapid gravity filtration; secondary ozone; Sodium Bisulphate dosing prior to GAC adsorption; disinfection (via chlorination and ammoniation); and orthophosphoric acid dosing for plumbosolvency control. The water achieves contact time (Ct) in the contact tank before going into the treated water storage tanks by gravity.

The Pitsford WTW Storage Tanks are separated by a full height dividing wall. The operational tank capacities of Storage Tank A and B are each 2,182m^3.

The storage tanks receive water from the outlet of the contact tank. Final water is supplied from the storage tank to distribution via high-lift pumps operating as duty/assist/standby to Boughton Reservoir (3 pumps), Harpole Reservoir (2 pumps) and Brixworth Tower (2 pumps).

To provide resilience to the area supplied from Pitsford WTW, a new inlet was drilled into each of the storage tanks to provide an additional supply from Hannington Reservoirs. The work to install the inlet main into Storage Tank B was carried out in 2015 and the work to install the inlet main into Storage Tank A was carried out in 2020.

Under normal operation Pitsford WTW supplies water to six Public Water Supply Zones (PWSZ) with a total population of 273,210. Pitsford WTW can also supply water to Ravensthorpe PWSZ (ZRW10) either direct into Ravensthorpe WTW or bypassing the works and supplying the zone directly, the operation of the resilience scheme would supply water from Pitsford WTW to a further 18,654 people. The PWSZ fed from Pitsford are listed in Table 1.

PWSZ Reference	PWSZ Name
ZRW10	Ravensthorpe PWSZ
ZRW11	Brixworth PWSZ
ZRW14	Daventry PWSZ
ZRW15	Northampton West PWSZ
ZRW16	Northampton Central PWSZ
ZRW18	Northampton East PWSZ
ZRW19	Northampton North PWSZ

PWSZ Reference	Ravensthorpe WTW Resilience Support
ZRW10	Ravensthorpe PWSZ

Table 1 – PWSZ fed from Pitsford WTW in Business as Usual and Resilience Support

There are a number of bulk exports within the area supplied from Pitsford WTW to Independent Water Networks Limited (IWNL). Following discussions with the DWI, it has been agreed that this supplier will be contacted in due course.

Figure 1: Pitsford WTW location

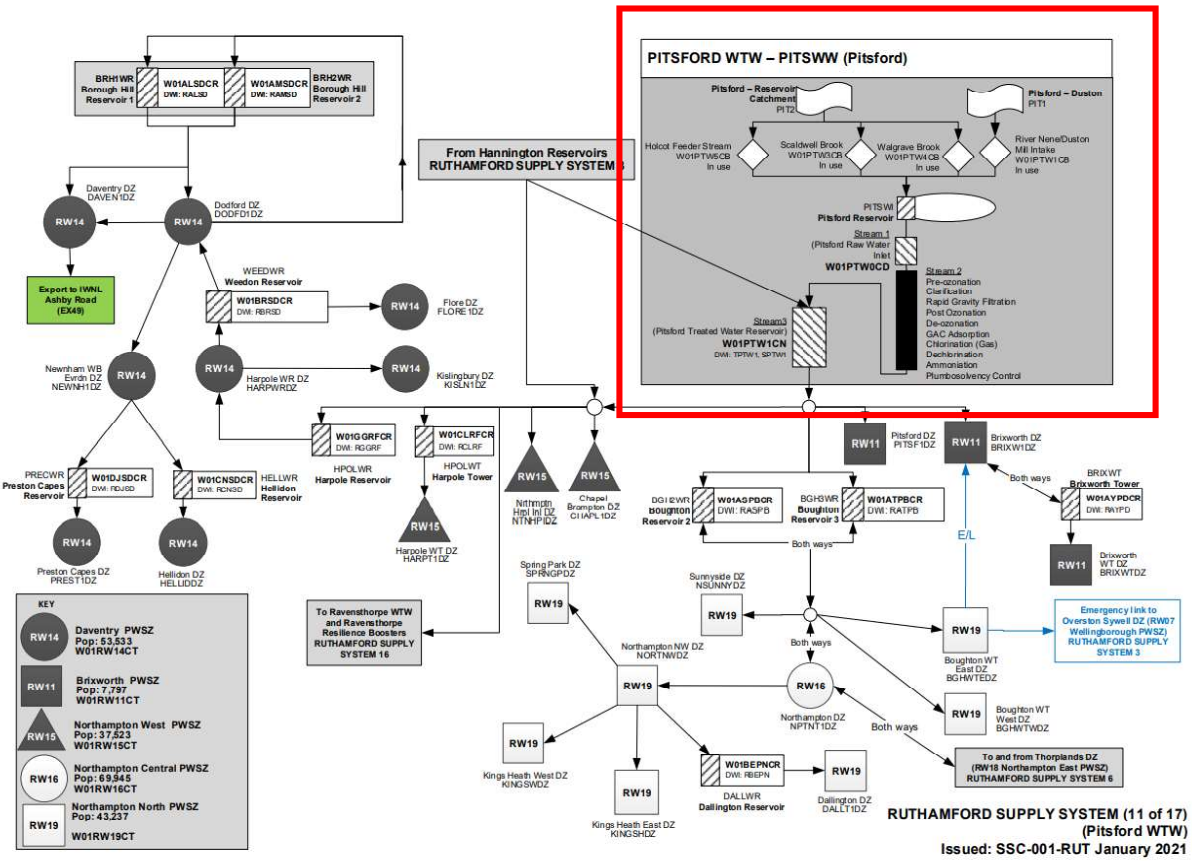


Figure 2: Supply System Schematic

2. Regulation 28 Risk Assessment

Pitsford WTW is covered by our Regulation 28 Risk Assessment; ANH-Risk-TPTW1.

We recognise the hazardous activity of 'Use of unapproved chemicals/materials' across the hazards of individual microbiological parameters, hydrocarbons, taste and odour. The Regulation 28 records for these hazardous activities for Pitsford Water Treatment Works are listed below (Table 2). A DWI Category E has been applied against these hazards on our Water Quality Risk Portal to reflect the ongoing investigations. Our Water Quality Risk Team are currently reviewing this event and any associated risk score updates will be triggered in our Water Quality Risk Portal and will be submitted to the DWI as part of our Regulation 28 submission.

Asset Reference	Asset Name	Hazard Reference	DWI risk Category	Unique Hazard ID
TPTW1	Pitsford WTW	C004A	E	ANH-TPTW1-C004A-TR0278
TPTW1	Pitsford WTW	C001	E	ANH-TPTW1-C001-TR0334
TPTW1	Pitsford WTW	C007	E	ANH-TPTW1-C007-TR1326
TPTW1	Pitsford WTW	C002	E	ANH-TPTW1-C002-TR0546
TPTW1	Pitsford WTW	C003	E	ANH-TPTW1-C003-TR0599
TPTW1	Pitsford WTW	A003	E	ANH-TPTW1-A003-TR0942
TPTW1	Pitsford WTW	A004	E	ANH-TPTW1-A004-TR1112
TPTW1	Pitsford WTW	H064	E	ANH-TPTW1-H064-TR1282

Table 2: Regulation 28 records for Pitsford WTW with hazardous activities related to the use of unapproved materials

3. Details and Chronology of Event

Following recent events reported to the Inspectorate at Kedington WTW (DWI 2021 8118) and Diddington Reservoir (DWI 2021 8338) we are undertaking a program of asset inspections to investigate the potential for there to be similar non-compliant pipework *in situ*. Initially this programme comprised of all new build treated water tanks from 2010 onwards (as both Kedington WTW and Diddington Reservoir were new build tanks) and was later expanded to include resilience schemes where modifications to pipework were made within a treated water tank (as Diddington Reservoir was part of the Grafham resilience scheme).

As part of this expanded program Pitsford WTW Storage Tank B was identified for inspection. Storage Tank A underwent an internal inspection on 19 August 2021, whilst reviewing the inspection report and associated photographs, the new inlet main installed in 2020 was identified as constructed from stainless steel and therefore did not require further inspection.

Pitsford WTW Storage Tank B was isolated from supply on 13 December 2021 and an internal inspection was carried out on 17 December 2021. Particular attention was paid to the inlet fittings installed in 2015; it was identified that sections of fittings on the new inlet had areas of flaking of the coating.

The installation of the new inlet fittings into Pitsford WTW Storage Tank B was an AMP6 engineering scheme designed to provide a support and resilience supply to the area supplied by Pitsford WTW from Hannington Reservoirs. The new inlet fittings were installed by drilling through the wall of the reservoir.

The design was completed by @One Alliance and the construction works were carried out by Stonbury. The work to install the additional inlet main into Storage Tank B was completed in early 2015. Figure 3 illustrates the new inlet fittings at the time of the construction work; we understand this image to show the fittings at the time of installation.

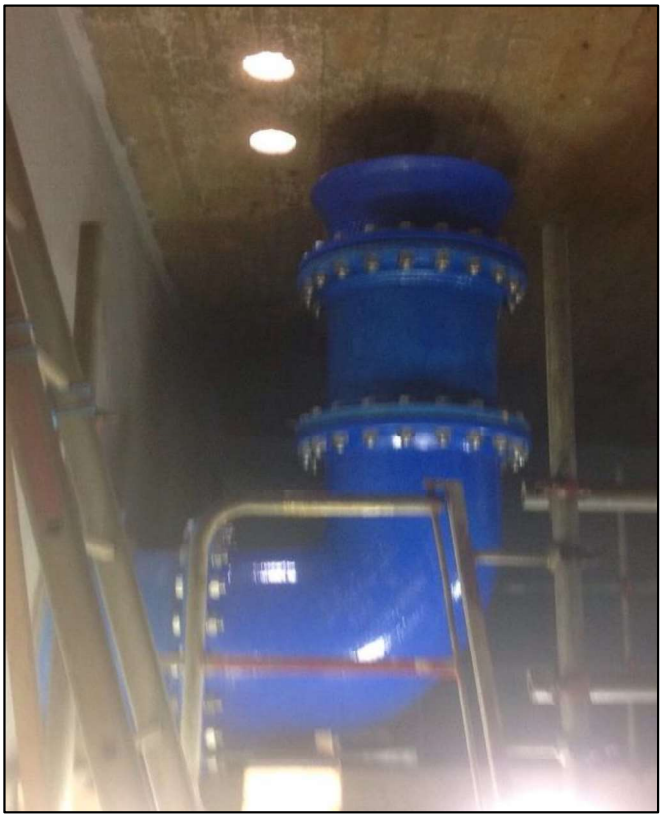


Figure 3 – The inlet fittings during construction in Pitsford WTW Storage Tank B

During an internal inspection carried out in March 2017, remedial work was required as ingress through the walls and floor into the tank was identified. Remedial works were undertaken and successful final inspection was carried out on 01 August 2017.

Commissioning sampling including Materials In Contact (MIC) were undertaken and Part A of the MIC form records that there had been the use of Acothane DW Blue, which holds DWI approval (DWI/56/4/1059), on fittings within the tank.

The commissioning and MIC sampling was undertaken on the 03 August 2017 and all sample results were reported as satisfactory including trace organic, taste and odour analysis. Storage Tank B was passed and valved back into supply at 11:20 on 11 August 2017 and an into supply sample was collected with the results of that sample being satisfactory (Figure 4).

Tank B (No2)				
Sample Type			**MIC**	**Into Supply**
Sample number			17354725, 17355277 & 17355987	17365234
Date			03/08/2017	11/08/2017
Sample point			W01DIPSCP	W01PTW1CN
Det Code	**Parameter**	**Units**		
Bacteriological				
91941/91943	Coliforms Confirmed	No/100ml	0	0
91951/91953	E.coli Confirmed	No/100ml	0	0
9340	2-day colony count at 37°C	No/ml	0	0
9320	3-day colony count at 22°C	No/ml	0	21
Chemistry				
09111	Chlorine Free	mg/l CL_2	<0.05	0.06
09121	Chlorine Total	mg/l CL_2	0.49	0.98
00220	Taste Qualitative	---	1[1]	n/a
00230	Odour Qualitative	---	1Z[3]	n/a
92212	Odour Quantitative 25°C De-Chlorinated	---	1	n/a
97822	Taste Quantitative 25°C De-Chlorinated	---	1	n/a
91371	Odour Quantitative 60°C De-Chlorinated	---	1	n/a
00612	pH Clean Water	pH	7.46	n/a
01621	Alkalinity Total	mg/l $CaCO_3$	115	n/a
00621	Conductivity at 20C	µS/cm	627	n/a
00681	Turbidity	NTU	0.16	n/a
00721	Colour Filtered	Hazen	0.7	n/a
02875	Aluminium Total	mg/l Al	<0.014	n/a
Organics				
75161	Water Profile	µg/l	0	n/a
75171	Purge and Trap	µg/l	0	n/a

[1] No taste/satisfactory
[2] Very mild chlorine
[3] No odour

Figure 4 – Record of results for 'into supply' sample from 11 August 2017

On inspection of the fittings in the storage tank (17 December 2021) it was suspected that two fitting sections had been coated with a material subsequently believed to be Acothane DW Blue, as referenced in the MIC document from 2017 (Figure 5). The coating of the fitting adjacent to the tank wall, which is submerged when the tank is operational, has been subject to "flaking" (Figure 6). We are continuing to investigate the likely cause of this flaking. It would appear that the coating material may not have been applied in accordance with the Instructions For Use (IFU).

Figure 5: New inlet fittings within Pitsford WTW Storage Tank B

Figure 6: External surface of fitting in Pitsford WTW Storage Tank B with flaking coating

Construction records identify the inlet from Hannington reservoir arrangement is comprised of four separate components: a fabricated flanged spigot; 90 degree flanged bend; a double flanged spacer; and a flanged bell-mouth. The fittings detailed were supplied from Jindal Sigma Ltd.

The 90° flanged bend and flanged bell-mouth were coated with Resicoat R4 which is a factory applied powder coating. This coating held WRAS approval under 1112500 at time of installation.

The flanged spigot and flanged spacer are coated with 3M Scotchkote Epoxy coating 162PWX, which held WRAS approval under 1109548 at time of installation. At this stage of our investigation, it is suspected that a further coating was applied using Acothane DW, this held and still holds a DWI approval under 56/4/1059.

The components part of this investigation located inside Pitsford WTW treated water tank B are listed in Table 3.

Fitting Type	Fitting location	Fitting Diameter	Fitting Length
Flanged spigot	Structure B Inlet	DN500	1000mm
90 degree flanged bend	Structure B Inlet	DN500	n/a
Double flanged spacer	Structure B Inlet	DN500	500mm
Flanged bell-mouth	Structure B Inlet	DN500	n/a

Table 3: Fittings in Pitsford WTW treated water tank B

Pitsford WTW Final water is sampled at a daily frequency. Since Storage Tank B returned to supply on 11 August 2017, Pitsford WTW Final Water sample point has been sampled on 1,821 occasions. A sample detected one confirmed coliform (zero *E. coli*) which was collected on 18 March 2021. This was reported to the Inspectorate as a compliance exceedance with reference ANH-C001-18-03-21. The investigation concluded that the likely cause of the coliform detection was as a result of ingress noted around the hatches on Storage Tank B, during the moat tests. All other samples from Pitsford WTW Final sample point were satisfactory meeting the requirements of the Water Supply (Water Quality) Regulations (as amended).

An initial review of regulatory monitoring sample results from 01 January 2017 has not highlighted any concerns. This review examined the mean results for samples collected in the six downstream PWSZs since the fittings were installed and Pitsford WTW Storage Tank B was returned to supply on the 11 August 2017. A summary of the total number of coliform, *E.* coli, quantitative taste and quantitative odour samples collected at each location since 01 January 2017 can be seen in Table 4 below. The annual summary data can be found in Appendix 1.

From the six PWSZ supplied by Pitsford WTW under normal operational conditions, over 3,200 bacteriological sample have been collected since 01 Jan 2017. Of these in 9 customer tap samples coliforms were detected, none of which was an *E. coli*. Approximately 1,050 quantitative odour and taste samples were collected with four detecting an odour and none a taste. Details of the investigations into all of these were reported to the Inspectorate as part of our monthly data returns.

2017 - 2021	No. Coliform Samples	No. of Coliform detections	No. E.coli Samples	No. of E. coli detections	No. Quantitative taste Samples	No. of Quantitative taste detections	No. Quantitative Odour Samples	No. of Quantitative Odour detections
Pitsford Final	1821	1	1821	0	4	0	0	0
Brixworth PWSZ	118	0	118	0	62	0	62	0
Daventry PWSZ	609	4	609	0	208	0	208	1
Northampton West PWSZ	454	0	454	0	150	0	150	0
Northampton Central PWSZ	872	1	872	0	248	0	248	2
Northampton East PWSZ	725	2	725	0	221	0	221	1
Northampton North PWSZ	504	2	504	0	157	0	157	0
Grand Total	**5,103**	**10**	**5,103**	**-**	**1,050**	**-**	**1,046**	**4**

Table 4 – Summary of Pitsford WTW and Supplied PWSZs Sample Data

An initial review of water quality events, within the area supplied by Pitsford WTW, which were reported to the Inspectorate since the installation of the fittings in Storage Tank B, did not identify any instances that were related to that tank.

Our target standard process for raw, final, stored and customer tap samples highlights any regulatory and operational samples that are above our internal set triggers on a twice weekly basis. These are each investigated by a Water Quality Risk Scientist where trends will be reviewed as part of the investigation. At this point of the investigation we have not identified any water quality trends or unusual numbers of target standards investigations that could be associated with the fittings installed within Pitsford WTW Storage Tank B.

In addition, Risk Scientists review monthly changes in RAG risk categories that are identified through our water quality risk portal when changes occur from green to red/amber or amber to red. These risk changes are all investigated thoroughly and presented at our monthly Compliance Monitoring Group. At this stage we have not identified any unusual risk changes related to Pitsford WTW.

A review of the customer contacts received from the six PWSZs before and after the installation of the new fittings at Pitsford WTW, for all taste and odour categories, has been undertaken.

Figure 7 presents the Average Acceptability Rates across the six PWSZs downstream of Pitsford WTW; there has been no associated impact on acceptability since the work has been carried out to install the new fittings in Storage Tank B.

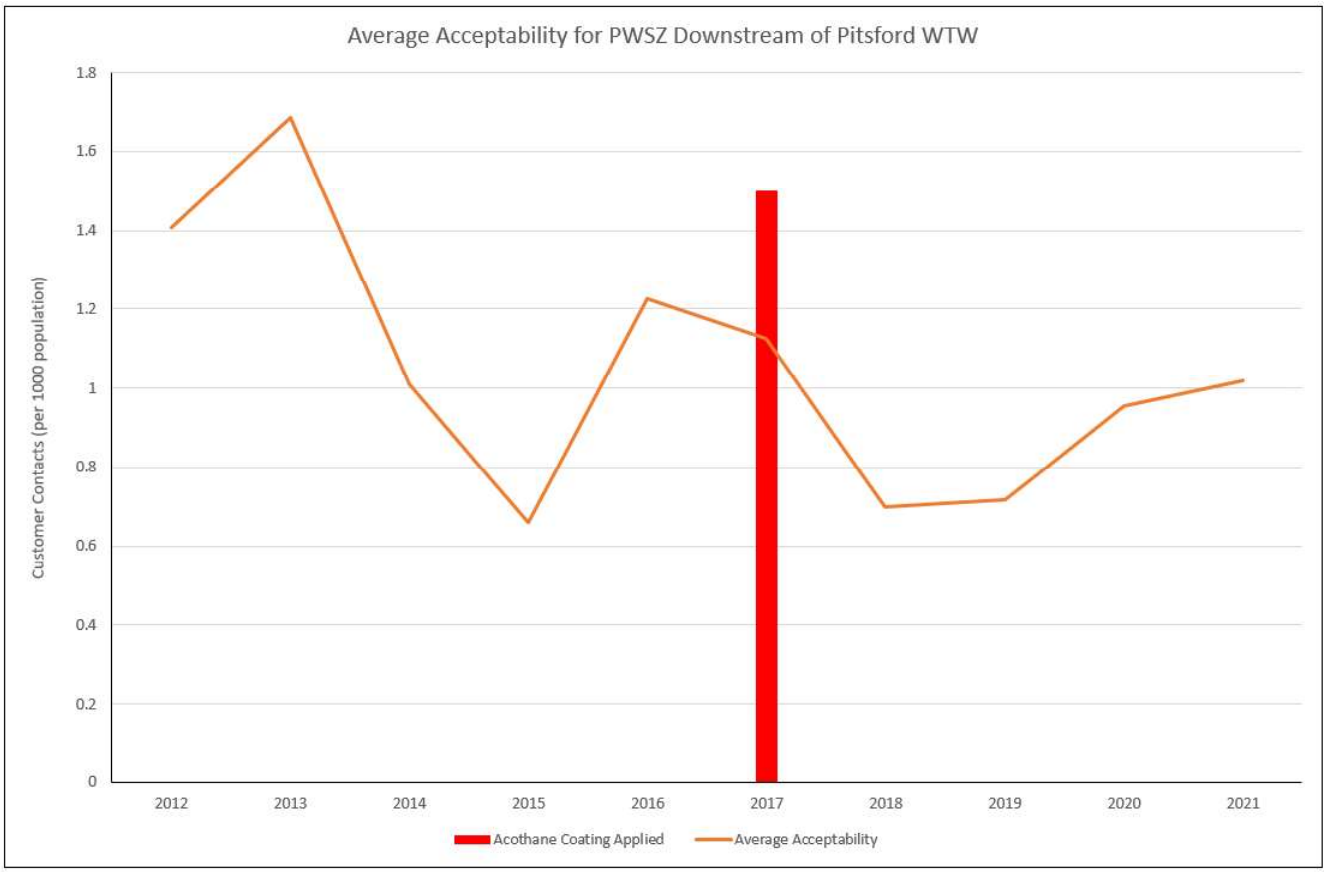


Figure 7 – Average Acceptability Rates for PWSZ supplied by Pitsford WTW

The breakdown of each individual PWSZ Acceptability Rate is included in Appendix 2.

All water quality contacts into Anglian Water are initially triaged by our Call Centre Agents (CCA) who are trained to provide advice to customer on aspects of water quality such as chlorine and TCP. TCP complaints are those where the customer typically describes the water tasting or smelling metallic/medicinal/chemical in nature and occurs either only in boiled drinks (often caused by a reaction between phenolic compounds from plastic or rubber parts of kettles with chlorine in the water), or sometimes occurs in the cold water, but will most typically persist after boiling as well. The presence of a TCP type taste/odour after a period of standing or boiling, is the key differentiator to separate a TCP complaint from a chlorine complaint. Advice is provided regarding leaving water to stand overnight, checking if the issue affects single taps or more than one tap, checking if appliances have non-return valves if it is suspected the cause might be appliance hoses.

Calls may be escalated to a Water Quality Scientist, in line with our procedures, if the CCA feels the customer requires more in-depth advice or the if the contact has been received following work on the network, the customers own plumbing or for certain types of complaints such as a taste or odour described as petrol/diesel in nature. All calls are visible to the Water Quality Team and if clusters of calls are received from hydraulically linked areas these are also escalated for investigation. To note, our cluster is two or more complaints of similar job descriptions (taste/odour for example, or discolouration, or white water) received from the same DMA within a 24-hour period.

Our review of the calls for the period in question identifies that the majority of calls were due to internal issues in the customer's property, such as earthy/musty smells originating from sink traps; long service pipes; or a lack of Non-Return Valves (NRVs) on washing machines or dishwashers. Where a visit was carried out and sampling undertaken, our

present review identified that all sample results were returned as satisfactory for water quality parameters.

4. Next Steps

We continue our investigations into the circumstances of how this has occurred and identifying any lessons which can be learned. The learning from this will feed directly into our Materials in Contact Improvement Plan developed following the Kedington WTW event and if applicable, we will share any learning with the wider industry.

The non-compliant fittings within the storage tank will be remediated with a suitably approved alternative, fully complying with the requirements of Regulation 31. The storage tank will not be returned to supply until this work has been completed and appropriate sampling has been undertaken.

5. Likely Cause of the Event

While investigations are on-going, we believe that two sections of coated fittings identified within Pitsford WTW Storage Tank B do not comply with Regulation 31. Investigations completed thus far provide no evidence to suggest this non-compliance with Regulation 31 has had any adverse impact on water quality.

6. Notifications

Other organisations informed:
CCWater

20 DAY REPORT

AW Reference No:	AW/2021/1754
DWI Reference No:	DWI/2021/8380
Name of event:	Pitsford WTW – Regulation 31
Description of event:	Discovery of coating applied to two sections of pipework within Storage Tank B where product Instructions for Use have not been followed.
Date and time of event:	17 December 2021
Date and time of notification to DWI:	21 December 2021 at 18:02
Notified by:	[redacted]
Population/Property Count affected:	Under normal operation Pitsford WTW supplies a population of 291,864
Duration of event:	38,136 hours
Effect on water sufficiency or quality:	There has been no evidence to date of the water quality being affected. The sufficiency of the water supply has not been affected.
Risk to public health:	It is not believed there is a wider risk to public health.
Details of any regulatory breaches:	There have been no regulatory exceedances associated with this event.
Other organisations notified:	CCWater Independent Water Networks Limited
Publicity:	None known

Executive Summary

Whilst undertaking a proactive internal inspection of Pitsford WTW Storage Tank B, it was noted that two sections of pipework within the tank had areas of flaking. The pipework had been installed as part of our AMP5 Pitsford WTW Resilience Scheme.

The inspection had been undertaken in response to the identification of pipework at our new Kedington WTW and Diddington Reservoirs, which did not fully comply with Regulation 31 as previously reported (DWI 2021 8118 and DWI 2021 8338, respectively).

Our investigations have found coating applied to two sections of pipework within Storage Tank B where product Instructions for Use have not been followed.

There has been no evidence to suggest that there has been any impact on the quality of water being supplied to customers whilst the reservoir was in supply, and it will remain out of supply until remedial work has been completed.

Learning from this event will be captured and incorporated into our Materials in Contact Improvement Programme to ensure similar events do not recur.

1. Geographical Location of Event and Process Summary

Pitsford Water Treatment Works (WTW) (PTW1) is located in the village of Pitsford, near Brixworth in Northamptonshire. Figure 1 identifies the location of Pitsford WTW which is in the Ruthamford Supply System (Figure 2).

Pitsford WTW receives surface water from the River Nene, Holcot feeder stream, Scaldwell Brook and Walgrave Brook via the Pitsford reservoir which is located adjacent to Pitsford WTW. From the draw-off tower within the reservoir, water gravitates to three raw water pumps which boost water to the inlet of the primary ozone tank. The treatment processes at Pitsford WTW comprise of primary ozone, clarification, rapid gravity filtration, secondary ozone, sodium bisulphate dosing prior to GAC adsorption, disinfection (via chlorination and ammoniation), and orthophosphoric acid dosing for plumbosolvency control. The water achieves contact time (Ct) in the contact tank before entering the treated water storage tanks by gravity.

The Pitsford WTW treated water storage tanks are separated by a full height dividing wall. The operational tank capacities of Storage Tank A and B are each 2,182m^3.

The storage tanks receive water from the outlet of the contact tank. Final water is supplied from the storage tank to distribution via high-lift pumps operating as duty/assist/standby to Boughton Reservoir (3 pumps), Harpole Reservoir (2 pumps) and Brixworth Tower (2 pumps).

To provide resilience to the area supplied from Pitsford WTW, a new inlet was core drilled into each of the storage tanks to provide an additional supply from Hannington Reservoirs. The work to install the inlet main into Storage Tank B was carried out in 2015 and the work to install the inlet main into Storage Tank A was carried out in 2020. A schematic of Pitsford WTW contact tank and treated water storage tanks is shown in Figure 3.

Under normal operation Pitsford WTW supplies water directly to six Public Water Supply Zones (PWSZ) with a total population of 273,210. Since submission of the 3-day report, it has been clarified that water from Pitsford WTW and Hannington Reservoirs also supplies water into the storage tank at Ravensthorpe WTW as a business-as-usual operation. Ravensthorpe WTW supplies water into Ravensthorpe PWSZ (ZRW10) with a further population of 18,654. Therefore, the total population supplied by Pitsford WTW is 291,864.

A further resilience booster enables water from Pitsford WTW to bypass Ravensthorpe WTW and supply water to the Ravensthorpe PWSZ directly. The boosters are operated for one hour every two weeks. The PWSZs fed from Pitsford WTW are listed in Table 1.

PWSZ Reference	PWSZ Name
ZRW10	Ravensthorpe PWSZ
ZRW11	Brixworth PWSZ
ZRW14	Daventry PWSZ
ZRW15	Northampton West PWSZ
ZRW16	Northampton Central PWSZ
ZRW18	Northampton East PWSZ
ZRW19	Northampton North PWSZ

Table 1 – PWSZs fed from Pitsford WTW

There are two bulk exports within the area supplied from Pitsford WTW to Independent Water Networks Limited (IWNL). We have discussed the circumstances of this event and the risk assessment we have undertaken with a representative from IWNL.

Figure 1: Pitsford WTW location

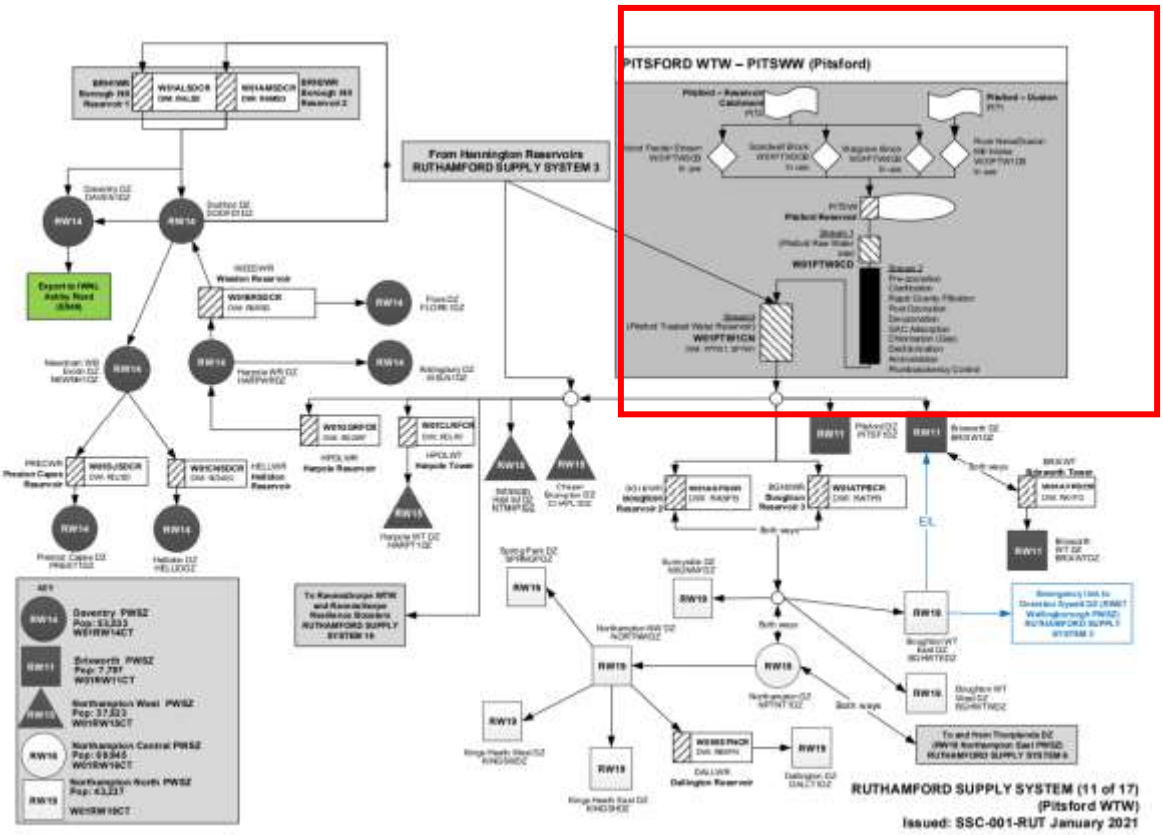


Figure 2: Ruthamford Supply System schematic

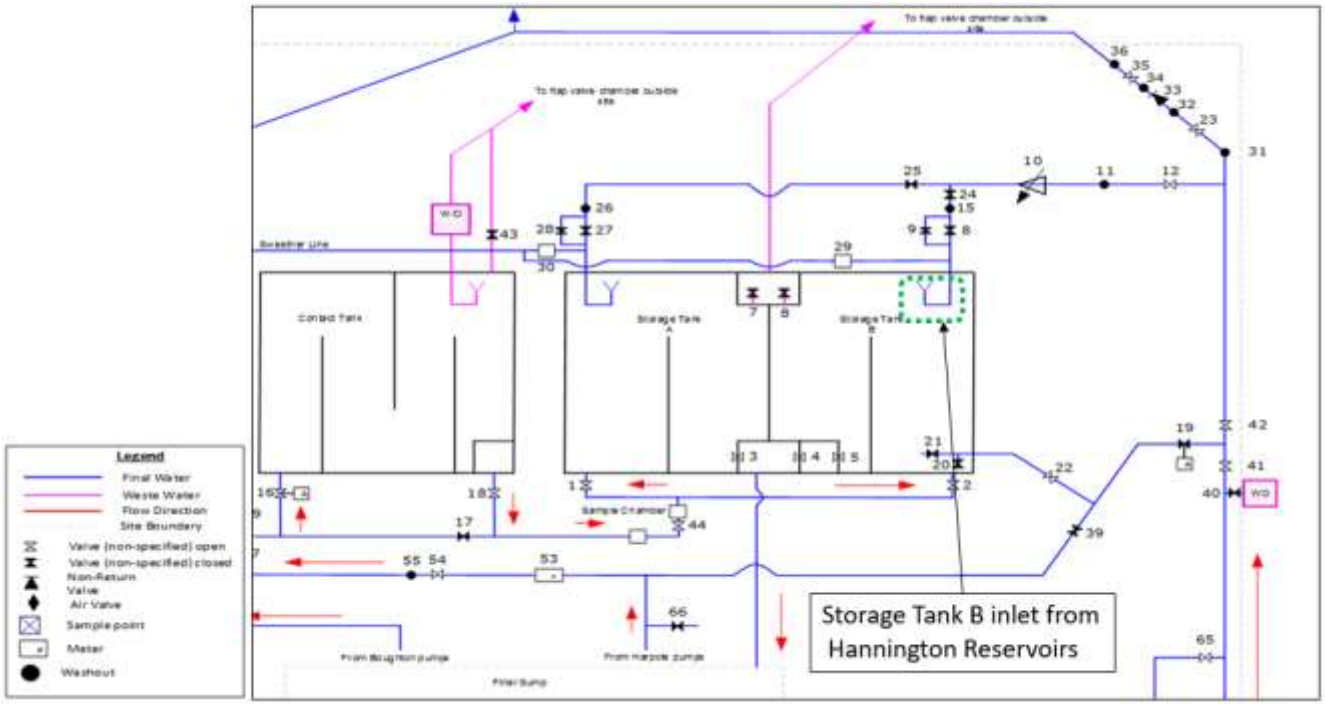


Figure 3 – Pipework Schematic of Pitsford WTW Contact Tank and Storage Tanks

2. Regulation 28 Risk Assessment

Pitsford WTW is covered by our Regulation 28 Risk Assessment; ANH-Risk-TPTW1.

We recognise the hazardous activity of 'Use of unapproved chemicals/materials' across the hazards of individual microbiological parameters, hydrocarbons, taste and odour, solvents and aluminium. The Regulation 28 records for these hazardous activities for Pitsford Water Treatment Works are listed below (Table 2). We have further added the hazardous activity to the hazards of solvents and aluminium to align with those at our storage stage. A DWI Category E has been applied against these hazards on our Water Quality Risk Portal to reflect the ongoing investigations. A controlled risk has also been triggered for each of these Regulation 28 lines at Pitsford WTW in our Water Quality Risk Portal. These scores will be submitted to the DWI as part of our Regulation 28 submission by March 2022.

Asset Reference	Asset Name	Hazard Reference	DWI risk Category	Unique Hazard ID
TPTW1	Pitsford WTW	C004A	E	ANH-TPTW1-C004A-TR0278
TPTW1	Pitsford WTW	C001	E	ANH-TPTW1-C001-TR0334
TPTW1	Pitsford WTW	C007	E	ANH-TPTW1-C007-TR1326
TPTW1	Pitsford WTW	C002	E	ANH-TPTW1-C002-TR0546
TPTW1	Pitsford WTW	C003	E	ANH-TPTW1-C003-TR0599
TPTW1	Pitsford WTW	A003	E	ANH-TPTW1-A003-TR0942
TPTW1	Pitsford WTW	A004	E	ANH-TPTW1-A004-TR1112
TPTW1	Pitsford WTW	H064	E	ANH-TPTW1-H064-TR1282
TPTW1	Pitsford WTW	H006	E	ANH-TPTW1-H006-TR3488
TPTW1	Pitsford WTW	A021	E	ANH-TPTW1-A021-TR3489

Table 2: Regulation 28 records for Pitsford WTW with hazardous activities related to the use of unapproved materials

3. Details and Chronology of Event

Following recent events reported to the Inspectorate at Kedington WTW (DWI 2021 8118) and Diddington Reservoir (DWI 2021 8338), we are undertaking a program of asset inspections to investigate the potential for there to be similar non-compliant pipework *in situ*. Initially this programme comprised of all new build treated water tanks from 2010 onwards (as both Kedington WTW and Diddington Reservoir were new build tanks). This was later expanded to include resilience schemes where modifications to pipework were made within a treated water tank (as Diddington Reservoir was part of the Grafham resilience scheme).

As part of this expanded programme Pitsford WTW Storage Tank B was identified for inspection. Storage Tank A underwent an internal inspection on 19 August 2021. Whilst reviewing the inspection report and associated photographs, the new inlet main installed in 2020 was identified as constructed from stainless steel and therefore did not require further inspection.

Pitsford WTW Storage Tank B was isolated from supply on 13 December 2021 and an internal inspection was carried out on 17 December 2021. Particular attention was paid to the inlet fittings and pipework installed in 2015; it was identified that sections of pipework on the new inlet had areas of flaking of the coating.

The installation of the new inlet fittings and pipework into Pitsford WTW Storage Tank B was an AMP5 engineering scheme with aspects continuing into AMP6. The scheme is designed to provide a support and resilience supply to the area supplied by Pitsford WTW from Hannington Reservoirs. The new inlet pipework was installed by core drilling through the wall of the reservoir.

The design was completed by @One Alliance and the construction works were carried out by Stonbury. The work to install the additional inlet main into Storage Tank B was completed in early 2015. We understand figure 4 illustrates the new inlet at the time of the construction work. Storage Tank B was returned to service on 07 October 2016; samples collected ahead of this time were satisfactory (Figure 5).

Figure 4 – The inlet pipework and fittings during construction in Pitsford WTW Storage Tank B

Tank B (No2)			
Sample number			16458105, 16458108 & 16458246
MK Number			MK 10703
Date			06/10/2016
Sample point			W01RUMWCP
Det Code	Parameter	Units	
Bacteriological			
91941/91943	Coliforms Confirmed	No/100ml	0
91951/91953	E.coli Confirmed	No/100ml	0
9340	2-day colony count at 37°C	No/ml	0
9320	3-day colony count at 22°C	No/ml	0
Chemistry			
09111	Chlorine Free	mg/l Cl_2	<0.05
09121	Chlorine Total	mg/l Cl_2	0.48
00220	Taste Qualitative	---	1[1]
00230	Odour Qualitative	---	2T[2]
92212	Odour Quantitative 25°C De-Chlorinated	---	n/a
97822	Taste Quantitative 25°C De-Chlorinated	---	Satisfactory
91371	Odour Quantitative 60°C De-Chlorinated	---	Satisfactory
00612	pH Clean Water	pH	7.66
01621	Alkalinity Total	mg/l $CaCO_3$	125
00621	Conductivity at 20C	µS/cm	622
00681	Turbidity	NTU	0.16
00721	Colour Filtered	Hazen	0.6
02875	Aluminium Total	mg/l Al	<0.014
Organics			
75161	Water Profile	µg/l	0
75171	Purge and Trap	µg/l	0

[1] No taste/satisfactory
[2] Very mild chlorine

Figure 5 – Record of results for sample from 06 October 2016

During an internal inspection carried out in March 2017, remedial work was required as ingress through the walls and floor into the tank was identified. Remedial works were undertaken, and successful final inspection was carried out on 01 August 2017. Part A of the MIC form records that there had been the use of Acothane DW Blue, which holds DWI approval (DWI 56/4/1059), on pipework within the tank.

The commissioning and Materials in Contact (MIC) sampling was undertaken on the 03 August 2017; all sample results were reported as satisfactory including trace organic, and taste and odour analysis. Storage Tank B was passed and valved back into supply at 11:20 on 11 August 2017 and an into supply sample was collected with the results of that sample being satisfactory (Figure 6).

Tank B (No2)				
Sample Type			MIC	Into Supply
Sample number			17354725, 17355277 & 17355987	17365234
MK Number				
Date			03/08/2017	11/08/2017
Sample point			W01DIPSCP	W01PTW1CN
Det Code	Parameter	Units		
Bacteriological				
91941/91943	Coliforms Confirmed	No/100ml	0	0
91951/91953	E.coli Confirmed	No/100ml	0	0
9340	2-day colony count at 37°C	No/ml	0	0
9320	3-day colony count at 22°C	No/ml	0	21
Chemistry				
09111	Chlorine Free	mg/l Cl_2	<0.05	0.06
09121	Chlorine Total	mg/l Cl_2	0.49	0.98
00220	Taste Qualitative	---	1[1]	n/a
00230	Odour Qualitative	---	1Z[2]	n/a
92212	Odour Quantitative 25°C De-Chlorinated	---	1	n/a
97822	Taste Quantitative 25°C De-Chlorinated	---	1	n/a
91371	Odour Quantitative 60°C De-Chlorinated	---	1	n/a
00612	pH Clean Water	pH	7.46	n/a
01621	Alkalinity Total	mg/l $CaCO_3$	115	n/a
00621	Conductivity at 20C	µS/cm	627	n/a
00681	Turbidity	NTU	0.16	n/a
00721	Colour Filtered	Hazen	0.7	n/a
02875	Aluminium Total	mg/l Al	<0.014	n/a
Organics				
75161	Water Profile	µg/l	0	n/a
75171	Purge and Trap	µg/l	0	n/a

[1] No taste/satisfactory
[2] Very mild chlorine
[3] No odour

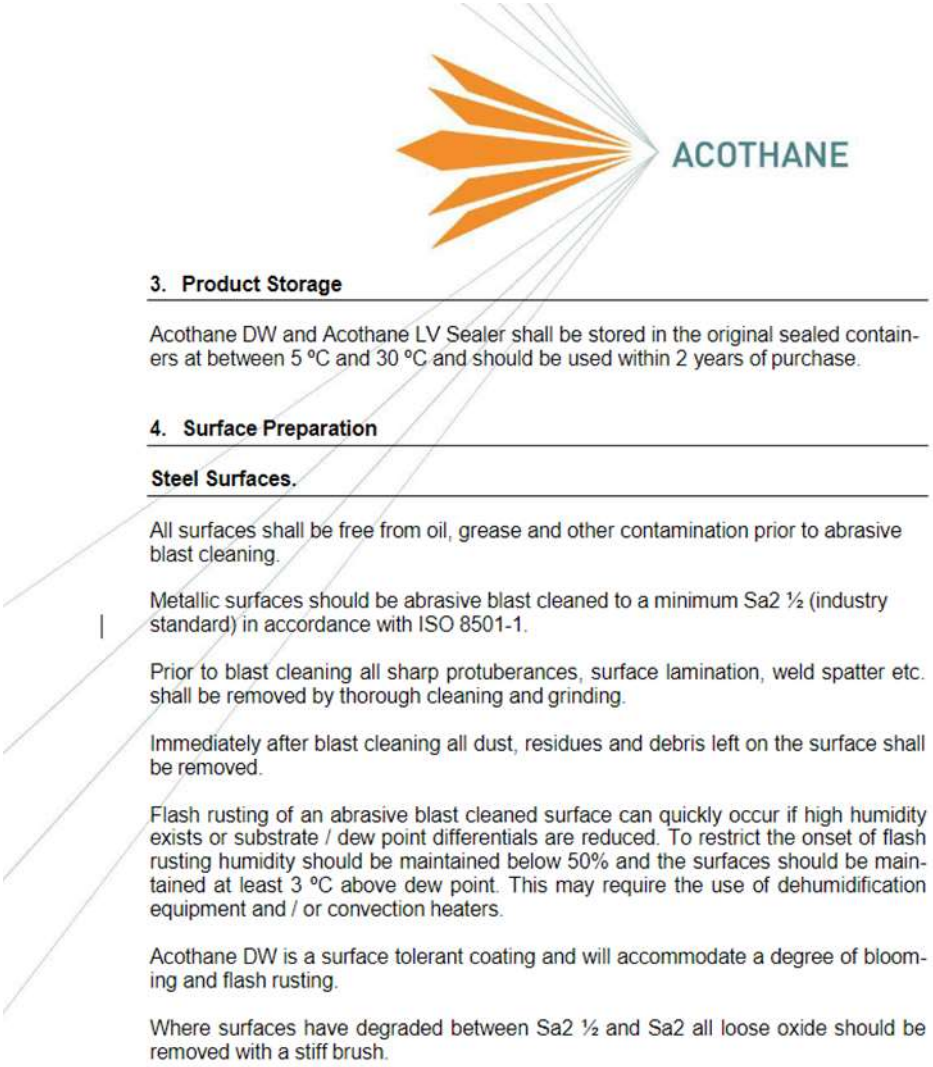
Figure 6 – Record of results for 'into supply' sample from 11 August 2017

On recent inspection of the components in Storage Tank B (17 December 2021), it was suspected that two sections had been coated with a material subsequently believed to be Acothane DW Blue, as referenced in the MIC document from 2017 (Figure 7). The coating of the pipework adjacent to the tank wall, which is submerged when the tank is operational, has been subject to "flaking" (Figure 8), with an original darker blue coating visible below.

Our investigation findings suggest the likely cause of this flaking is a result of incorrect surface preparation ahead of coating application, in accordance with manufacturer's Instructions for Use (IFU). Please see extract on surface preparation requirements for Acothane DW in Figure 9 below.

Figure 7: New inlet pipework and fittings within Pitsford WTW Storage Tank B

Figure 8: External surface of pipework in Pitsford WTW Storage Tank B with flaking coating



ACOTHANE

3. Product Storage

Acothane DW and Acothane LV Sealer shall be stored in the original sealed containers at between 5 °C and 30 °C and should be used within 2 years of purchase.

4. Surface Preparation

Steel Surfaces.

All surfaces shall be free from oil, grease and other contamination prior to abrasive blast cleaning.

Metallic surfaces should be abrasive blast cleaned to a minimum Sa2 ½ (industry standard) in accordance with ISO 8501-1.

Prior to blast cleaning all sharp protuberances, surface lamination, weld spatter etc. shall be removed by thorough cleaning and grinding.

Immediately after blast cleaning all dust, residues and debris left on the surface shall be removed.

Flash rusting of an abrasive blast cleaned surface can quickly occur if high humidity exists or substrate / dew point differentials are reduced. To restrict the onset of flash rusting humidity should be maintained below 50% and the surfaces should be maintained at least 3 °C above dew point. This may require the use of dehumidification equipment and / or convection heaters.

Acothane DW is a surface tolerant coating and will accommodate a degree of blooming and flash rusting.

Where surfaces have degraded between Sa2 ½ and Sa2 all loose oxide should be removed with a stiff brush.

Figure 9: Acothane DW IFU surface preparation (metallic)

Construction records identify the inlet from Hannington reservoir arrangement is comprised of four separate components: a fabricated flanged spigot pipe, 90-degree flanged bend, a double flanged spacer, and a flanged bell-mouth. The components detailed were supplied from Jindal Sigma Pipeline Solutions Ltd.

Jindal Sigma Pipeline Solutions Ltd were previously named Jindal Sigma Ltd until a name change in 2013. They were a UK arm of Jindal Saw Ltd, before being dissolved in 2018, according to Company House. Jindal Saw Ltd are a leading global manufacturer and supplier of iron and steel pipe products, fittings and accessories, with a ductile iron pipes division. They held and continue to hold multiple DWI Regulation 31 approvals for cement mortar lined pipes for conveyance of water.

The 90° flanged bend and flanged bell-mouth are coated with Resicoat R4 which is a factory applied powder coating. This coating held WRAS approval under 1112500 at time of installation. The flanged spigot pipe and flanged spacer fabrications are coated with 3M Scotchkote Epoxy coating 162PWX, which held WRAS approval under 1109548 at time of installation.

We understand that a further coating was applied externally to the flanged spigot pipe and double flanged spacer using Acothane DW; this held and still holds a DWI approval under 56/4/1059. We do not believe this coating was applied in accordance with the Instructions for Use (IFU) for this product and hence it has not adhered

effectively to the pipe, resulting in the flaking witnessed during the inspection on 17 December 21.

The components of the inlet under investigation located inside Pitsford WTW Storage Tank B are listed in Table 3.

Component Type	Component location	Component Diameter	Component Length
Flanged spigot	Pitsford Tank B Hannington Inlet	DN500	1000mm
90-degree flanged bend	Pitsford Tank B Hannington Inlet	DN500	n/a
Double flanged spacer	Pitsford Tank B Hannington Inlet	DN500	500mm
Flanged bell-mouth	Pitsford Tank B Hannington Inlet	DN500	n/a

Table 3: Components of inlet in Pitsford WTW Storage Tank B

4. Impact on Water Quality

Pitsford WTW final water is sampled at a daily frequency. Since Storage Tank B returned to supply on 11 August 2017, Pitsford WTW final water sample point has been sampled on 1,821 occasions. A sample collected on 18 March 2021 contained one confirmed coliform (zero *E. coli*). This was reported to the Inspectorate as a compliance exceedance with reference ANH-C001-18-03-21. The investigation concluded that the likely cause of the coliform detection was as a result of ingress noted around the hatches on Storage Tank B during the moat tests. All other samples from Pitsford WTW final water sample point were satisfactory meeting the requirements of the Water Supply (Water Quality) Regulations (as amended).

A full review of regulatory monitoring sample results obtained since 01 January 2017 has not highlighted any areas of concern. This review examined the results for samples collected in the seven downstream PWSZs since the installation of the new inlet was installed and Pitsford WTW Storage Tank B was returned to supply on the 11 August 2017. A summary of the total number of coliform, *E.* coli, quantitative taste and quantitative odour samples collected at each location since 01 January 2017 can be seen in Table 4 below. See Appendix 1 for the annual summary data.

From the seven PWSZ supplied by Pitsford WTW, over 3,500 bacteriological samples have been collected since 01 Jan 2017. Of these, in 9 customer tap samples coliforms were detected, none of which was an *E. coli*. Approximately 1,160 samples were analysed for quantitative odour and taste, with six samples detecting an odour and none a taste. All these compliance sample breaches were investigated and reported to the Inspectorate as part of our monthly data returns.

2017 - 2021	No. Coliform Samples	No. of Coliform detections	No. E.coli Samples	No. of E. coli detections	No. Quantitative taste Samples	No. of Quantitative taste detections	No. Quantitative Odour Samples	No. of Quantitative Odour detections
Pitsford Final	1821	1	1821	0	4	0	0	0
Ravensthorpe PWSZ	234	0	234	0	119	0	118	2
Brixworth PWSZ	118	0	118	0	62	0	62	0
Daventry PWSZ	609	4	609	0	208	0	208	1
Northampton West PWSZ	454	0	454	0	150	0	150	0
Northampton Central PWSZ	872	1	872	0	248	0	248	2
Northampton East PWSZ	725	2	725	0	221	0	221	1
Northampton North PWSZ	504	2	504	0	157	0	157	0
Grand Total	**5337**	**10**	**5337**	**0**	**1169**	**0**	**1164**	**6**

Table 4 – Summary of Pitsford WTW and supplied PWSZs sample data

As part of this investigation, we have revisited each of these reports and reviewed the root cause identified to establish whether there is a link to Pitsford Storage Tank B pipework. Table 5, below, shows the root causes identified during the investigations into bacteriological and odour detections highlighted above; none of these were linked to the pipework within Pitsford WTW Storage Tank B. There were two instances of a coliform detection where there was not a root cause identified.

		Detection	
		Coliform	Quantitative Odour
Root Cause	Condition of Customer Tap	7	0
	Service Pipe Material	0	6
	Ingress at Hatch Moat Test[1]	1	0
	No Cause Identified	2	0

[1]Pitsford WTW Final Coliform identified ingress during Access Hatch moat test.

Table 5 – Root Cause Summary for Coliform and Quantitative Odour detections downstream of Pitsford WTW Storage Tank B

We have further reviewed the total chlorine residual and 3-day colony count detections from Pitsford WTW since January 2017 shown below in figure 10. We have not identified an abnormal change in the profile, with no colony count result triggering the warning limit of 20 colonies per ml.

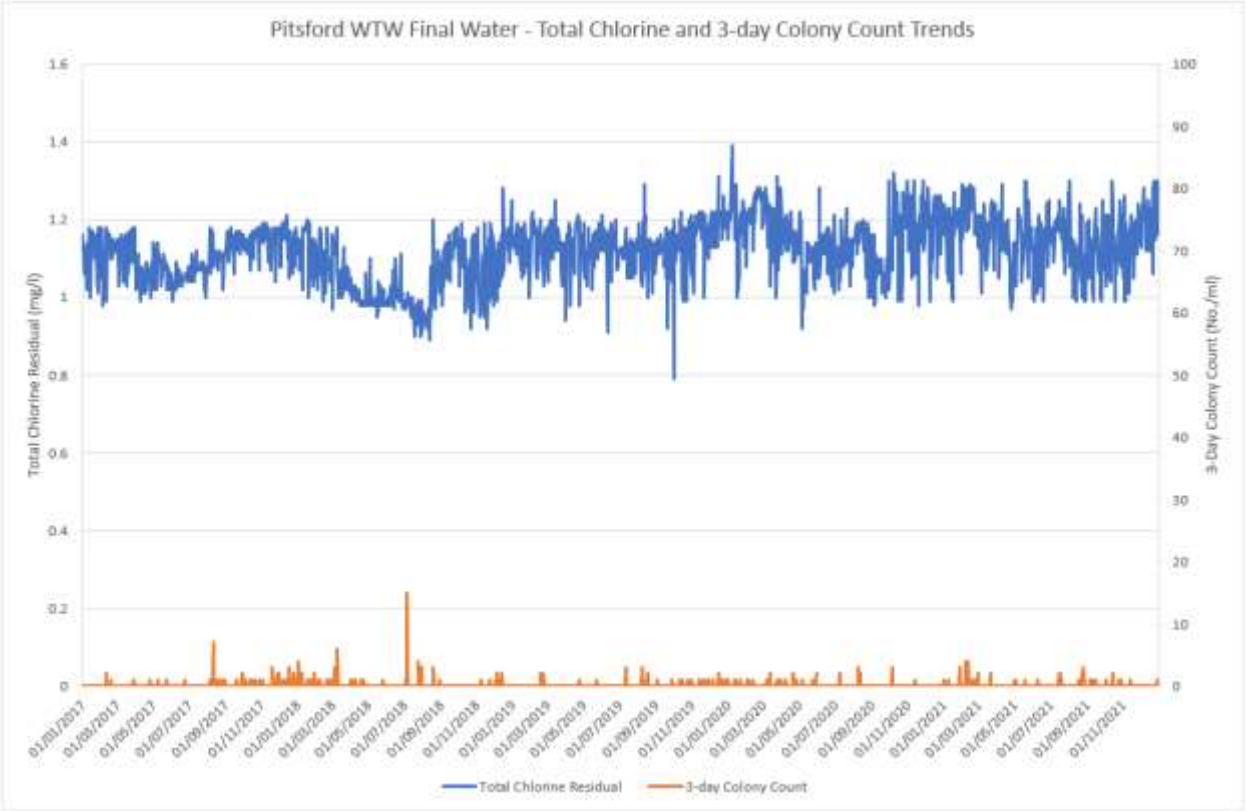


Figure 10: Total chlorine and 3-day colony count trends

Our target standard process for raw, final, stored and customer tap samples highlights any regulatory and operational samples that are above our internally set triggers on a twice weekly basis. These are each investigated by a Water Quality Risk Scientist, where trends will be reviewed as part of the investigation. At this time, we have not identified any water quality trends or unusual numbers of target standard investigations that could be associated with the pipework, fittings or coating installed within Pitsford WTW Storage Tank B.

In addition, Risk Scientists review monthly changes in RAG risk categories that are identified through our water quality risk portal when changes occur from green to red/amber or amber to red. These risk changes are all investigated thoroughly and presented at our monthly Compliance Monitoring Group. At this stage we have not identified any unusual risk changes related to Pitsford WTW.

A review of customer contacts received from the seven PWSZs before and after the installation of the new inlet at Pitsford WTW, for all taste and odour categories, has been undertaken. Figure 11 presents the Average Acceptability Rates across the seven PWSZs downstream of Pitsford WTW; there has been no associated impact on acceptability since the work has been carried out to install the new pipework and fittings in Storage Tank B.

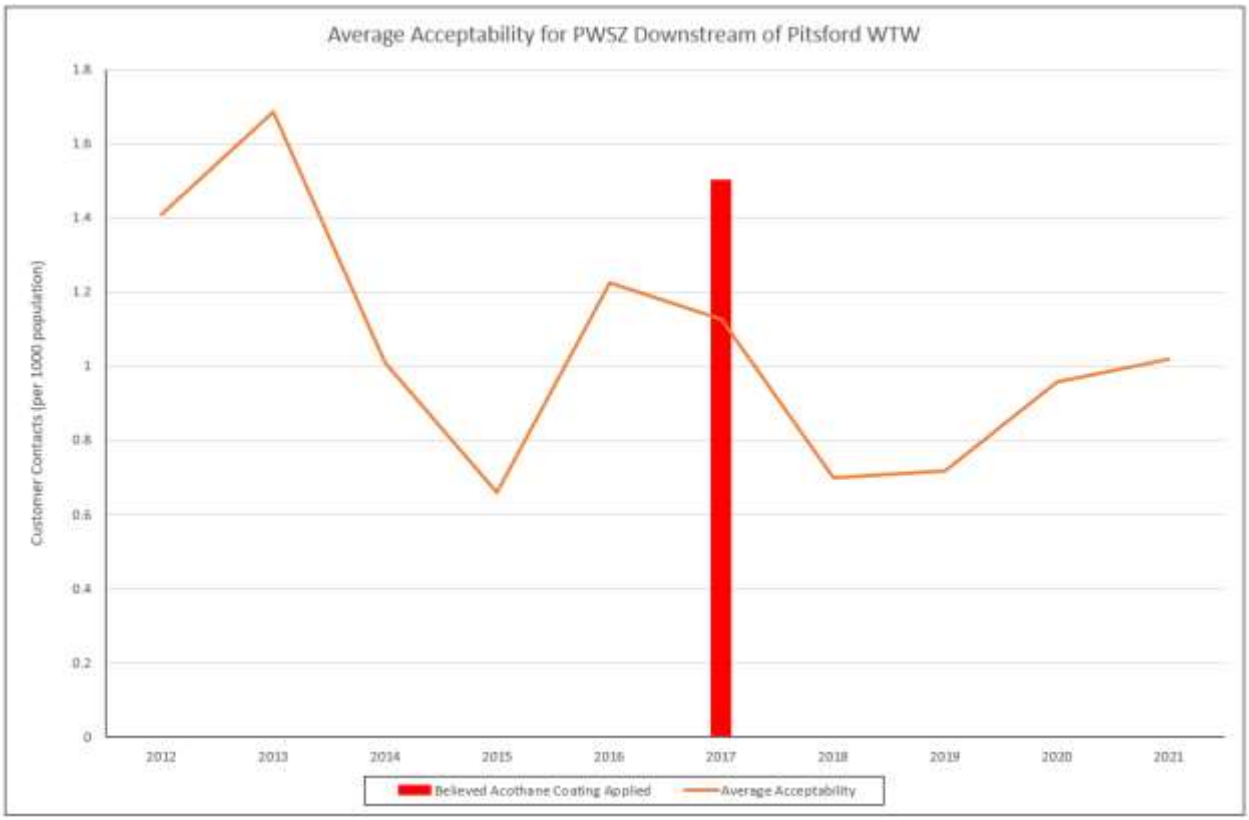


Figure 11 – Average Acceptability Rates for PWSZs supplied by Pitsford WTW

See Appendix 2 for the breakdown of each individual PWSZ Acceptability Rate.

All water quality contacts into Anglian Water are initially triaged by our Call Centre Agents (CCA) who are trained to provide advice to customer on aspects of water quality such as chlorine and TCP. TCP complaints are those where the customer typically describes the water tasting or smelling metallic/medicinal/chemical in nature and occurs either only in boiled drinks (often caused by a reaction between phenolic compounds from plastic or rubber parts of kettles with chlorine in the water), or sometimes occurs in the cold water, but will most typically persist after boiling as well. The presence of a TCP type taste/odour after a period of standing or boiling, is the key differentiator to separate a TCP complaint from a chlorine complaint. Advice is provided regarding leaving water to stand overnight, checking if the issue affects single taps or more than one tap, checking if appliances have non-return valves if it is suspected the cause might be appliance hoses.

Calls may be escalated to a Water Quality Scientist, in line with our procedures, if the CCA feels the customer requires more in-depth advice or the if the contact has been received following work on the network, the customers own plumbing or for certain types of complaints such as a taste or odour described as petrol/diesel in nature. All calls are visible to the Water Quality Team and if clusters of calls are received from hydraulically linked areas these are also escalated for investigation. To note, our cluster is two or more complaints of similar job descriptions (taste/odour for example, or discolouration, or white water) received from the same DMA within a 24-hour period.

Our review of the calls for the period in question identifies that the majority of calls were due to internal issues in the customer's property, such as earthy/musty smells originating from sink traps; long service pipes; or a lack of Non-Return Valves (NRVs) on washing machines or dishwashers. Where a visit was carried out and sampling

undertaken, our present review identified that all sample results were returned as satisfactory for water quality parameters.

As part of our investigation a sample of light blue flaking external coating was taken from the inlet flanged spigot in Pitsford WTW Storage Tank B on 17 December 2021. This was soaked in 500ml de-ionised (DI) water for 24 hours. The water sample was extracted with dichloromethane and analysed by gas-chromatography / mass spectrometry (GC/MS) to produce semi-quantitative results. This test gave clear results with no trace organic compounds detected.

From the evidence reviewed we do not believe there has been an impact on water quality.

5. Regulation 31 - Materials in Contact (MIC) Process

The Regulation 31 governance at Anglian Water ranges from policy through training and auditing to application on site (Figure 12).

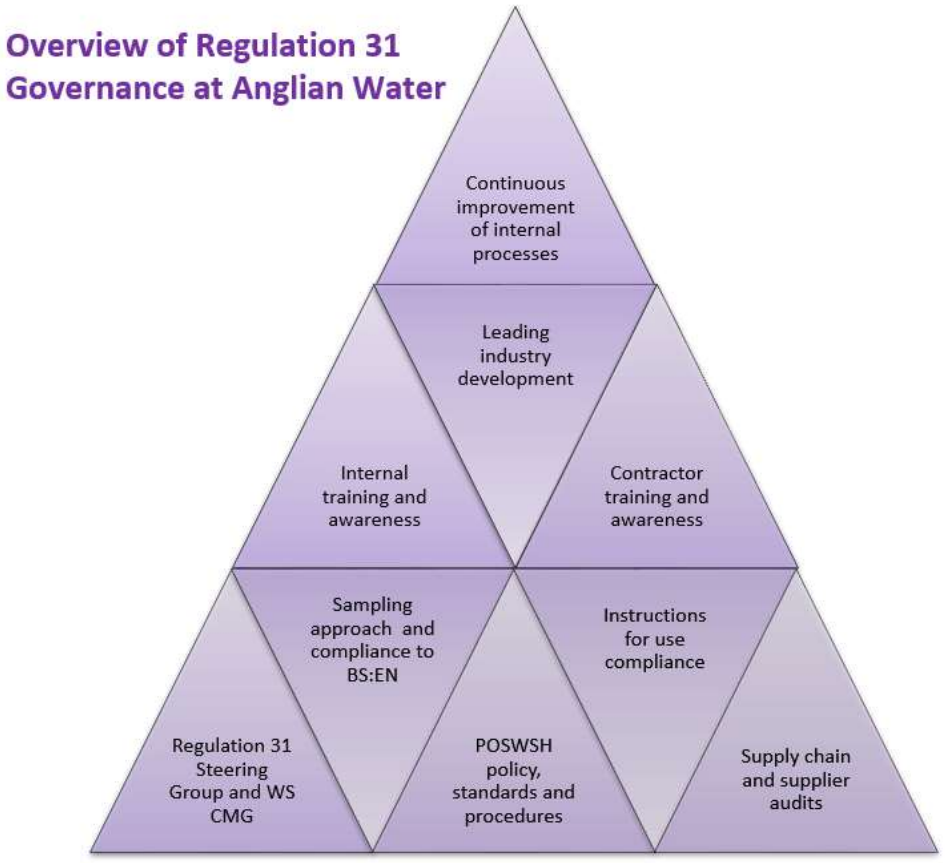


Figure 12 – Overview of Regulation 31 Governance at Anglian Water

Regulation 31 Governance

An internal Regulation 31 Steering Group was created in 2019 to focus on continual improvement of procedure, training updates, communications and further raising awareness across the company. The group also review any near misses from Anglian Water and the wider industry, make decisions, approve items submitted for review by scientists and engineers, and review industry and regulatory updates. The core members include Water Quality Risk and Optimisation Manager, Water Quality Risk

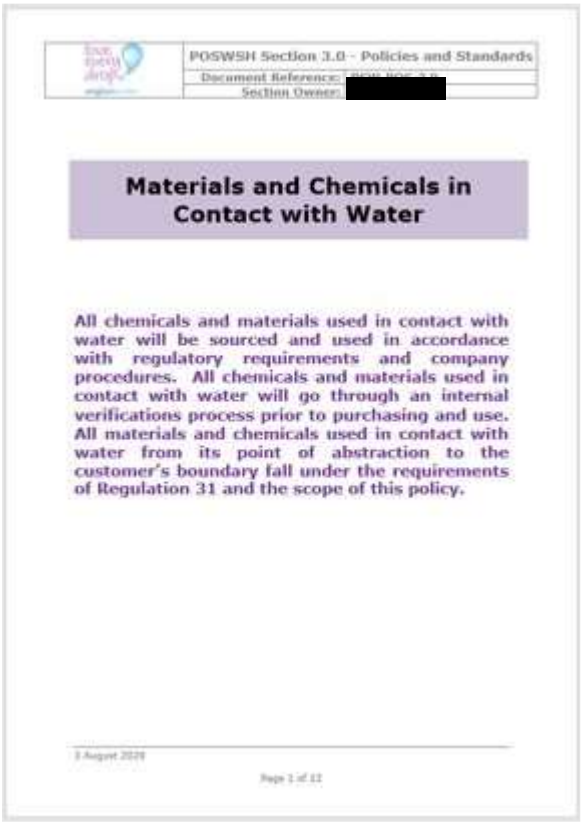
Managers, Water Quality Regulation Manager, Risk Scientist Portfolio Leads, Policy and Strategy Scientist, Materials Scientist, and a Procurement Specialist.

Water quality performance is tracked and reviewed at Water Services Compliance Monitoring Group (WSCMG), which is chaired by the Head of Water Quality with a core membership including the Director of Water, members of Water Senior Leadership team, Tactical Operations Manager, Analytical Services and Water Quality Senior Leadership team.

Policies, Standards and Procedures

Anglian Water has a POSWSH (Policies and Standards for Water Supply Hygiene) policy containing the standards on 'Materials and Chemicals in Contact with Water'. The policy statement can be seen in figure 13 below. This policy details how we maintain compliance with Regulation 31 of the Water Supply (Water Quality) Regulations. Our policy and standards for 'Asset Design and Creation' mandates that all assets involved in the production and delivery of drinking water will be designed, commissioned, and decommissioned to ensure that they do not impact adversely on water quality, including meeting all Regulation 31 requirements. Our asset design envelopes, Minimum Asset Standards, are developed according to these POSWSH policy and standard requirements, which must be adhered to by our Alliance Partners for any scheme delivery.

A POSWSH procedure PSW-PRO-3.01 Materials and Chemicals in Contact with Water documents the responsibilities of all employees working with any materials and chemicals which will be introduced into water intended for public supply to ensure they are fully compliant with Regulation 31.


POSWSH Section 3.0 - Policies and Standards

Document Reference: [redacted]

Section Owner: [redacted]

Materials and Chemicals in Contact with Water

All chemicals and materials used in contact with water will be sourced and used in accordance with regulatory requirements and company procedures. All chemicals and materials used in contact with water will go through an internal verifications process prior to purchasing and use. All materials and chemicals used in contact with water from its point of abstraction to the customer's boundary fall under the requirements of Regulation 31 and the scope of this policy.

Figure 13 – POSWSH Policy Statement

The scheme owner requests a Materials in Contact (MIC) form from the Water Quality Risk Science team, who then raise a form with a unique reference number and return a link to the form (Figure 14). The scheme owner completes Part A of the form with the relevant items and approval numbers, signs each line and then returns to the Risk Scientists. Part A of the MIC form also requires the completing engineers to confirm relevant instructions for use (IFUs) / conditions for use for each item have been checked and can be met. Risk Scientists review the listed items compliance and will counter sign Part A of the form and return to the scheme owner. Sampling is agreed at the point of Part A final sign off and forms Part B of the form. Once sampling has taken place, the Risk Scientists will review the sample results, save the data on Part C of the form, and sign off or advise if further sampling required.

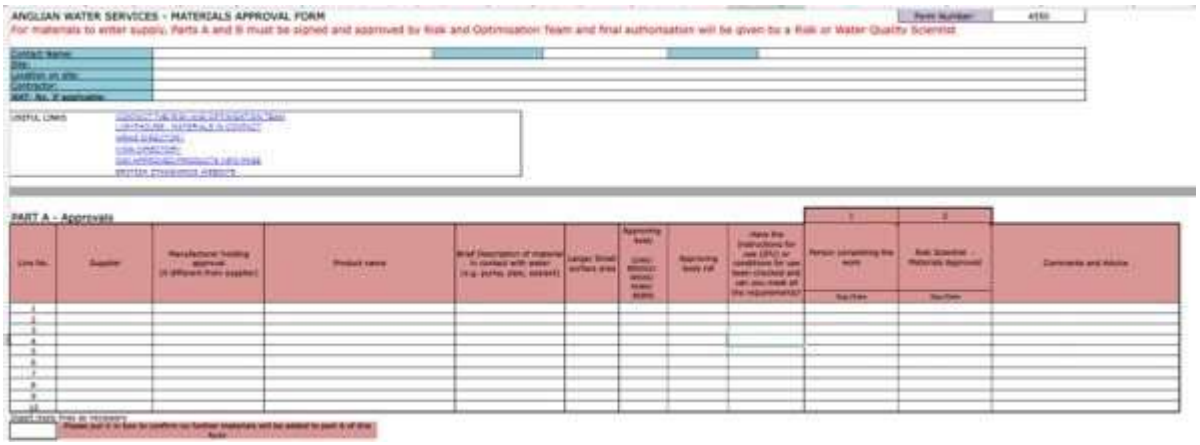


Figure 14 – MIC Form Template

Materials In Contact (MIC) Sampling

The asset will only go into supply once sample data is signed off. In the case of a large project e.g. a full works going into supply, the activity will also be covered by a Major Impact Plan following procedure PSW-PRO-1.14 Water Quality Risk Assessment and Control. Checking the MIC form has been fully signed off will be documented as one of the preliminary activities.

As part of our process, we take a suite of samples to verify that the work undertaken, including the items introduced and in contact with the water, have had no adverse impact on water quality. See figure 15 for analysis list from the MIC training module. The results must be signed off by the Water Quality Risk team before the asset is allowed into supply. Prior to sampling we ensure the water has been in contact with the surfaces for a time of double the likely operational contact time, up to 16 hours, or in line with IFU, whichever is greater. The sampling includes analysis for taste, odour and microbiological parameters, as well as other parameters such as pH, colour, turbidity, conductivity and trace organics.

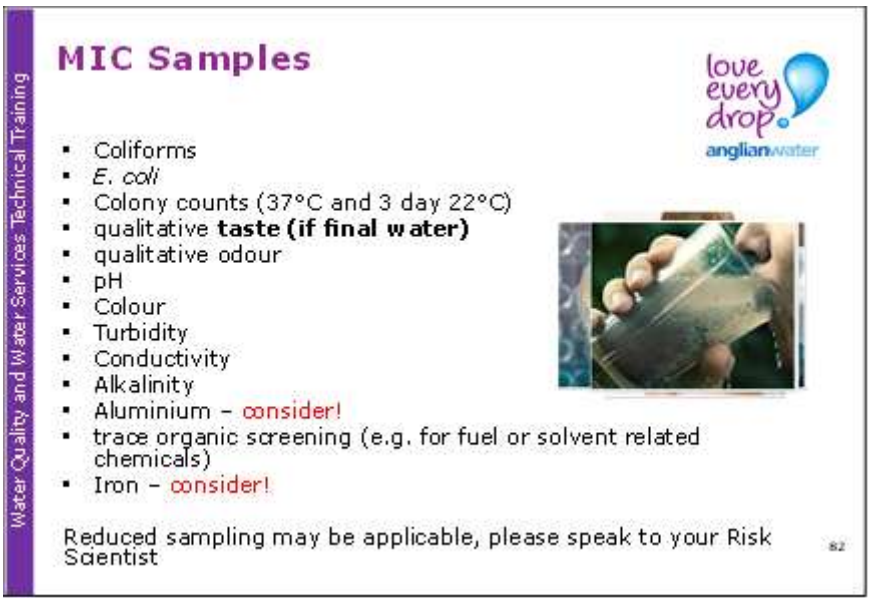


Figure 15 – MIC Analysis

Chemicals in Contact

For chemicals in use in water supply we also have a POSWSH policy, standards and related procedure in place. These ensure that fuel and chemicals of the correct specification are delivered to prevent the unintended use of incorrect chemicals. The procedure includes the requirement for the receiving works technician to verify product conformity to the correct BS:EN specification. A record of the delivery and the checks completed are recorded on the site-specific "Water Services Chemical and Fuel Delivery Log" form (figure 16).

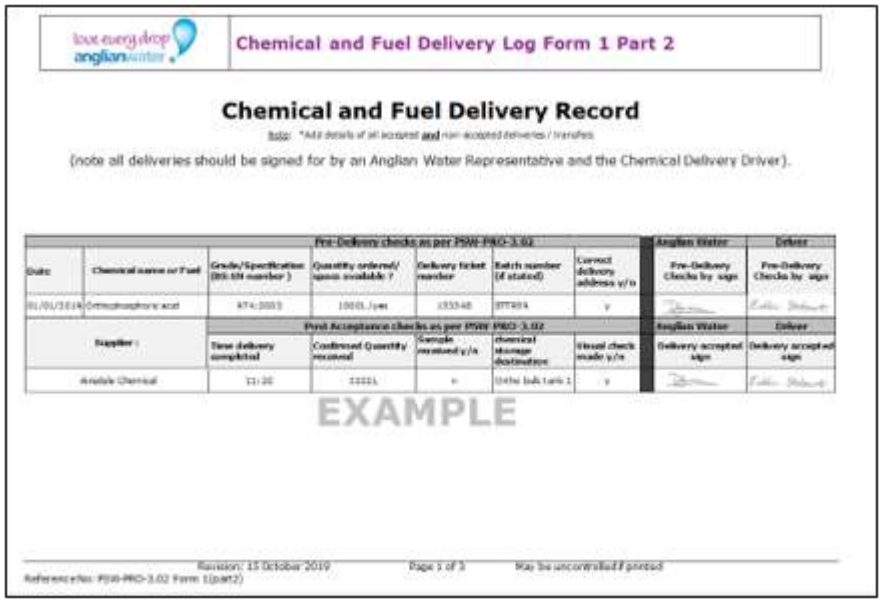


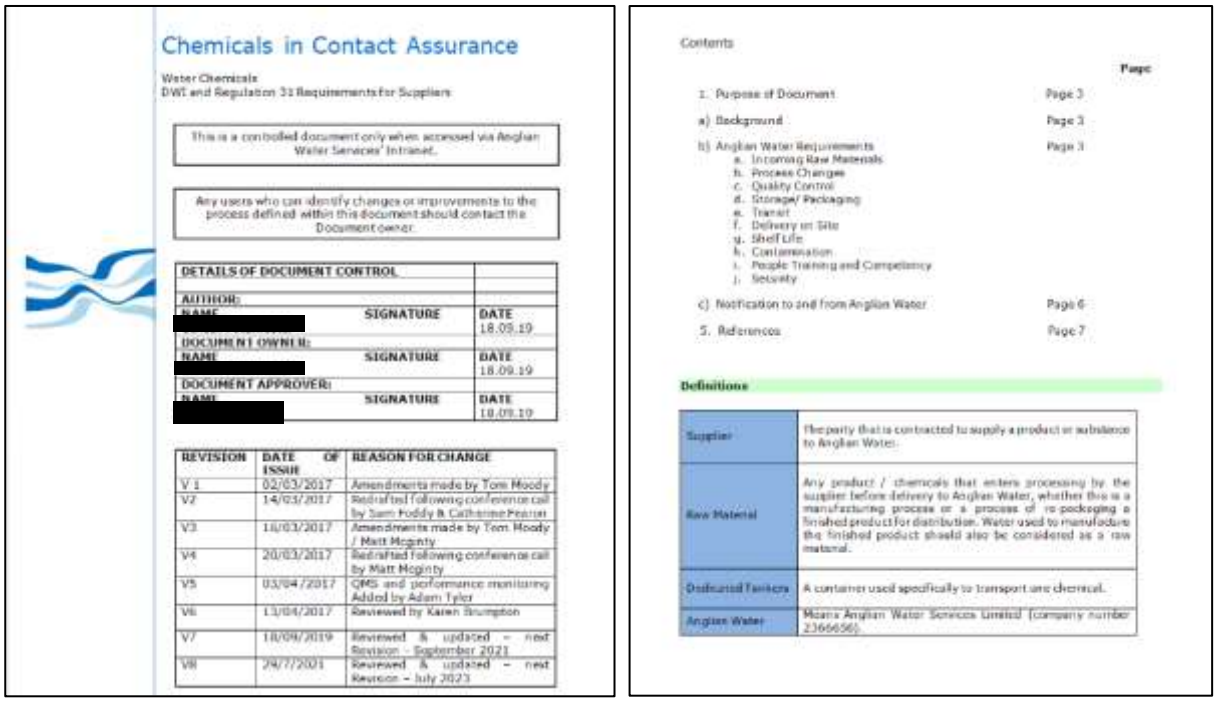
Figure 16 – Chemical and Fuel Delivery Record

Supplier Assurance

Framework contracts undergo a supplier tendering, evaluation, and selection process to ensure selected suppliers are capable of meeting Anglian Water and Regulation 31 requirements and are committed to do so. Materials in Contact and product

traceability requirements are built into the framework contracts. Assurance of key performance measures for chemical suppliers are proactively sought, via an electronic questionnaire which suppliers have to respond to. This includes confirming if there have been any changes to product manufacturing processes, raw material changes, or continuity of supply etc.

The Water Services annual assurance programme includes Regulation 31 focussed chemical and material supplier audits. Audits are carried out by Water Quality and Procurement representatives. Audit reports are published to key stakeholders, and actions are categorised and tracked. Our Director of Water held a supplier summit with all chemical suppliers to highlight key aspects of assurance we required from them (e.g. compliance to BS:EN) as a consequence of a GAC contamination issue in 2017. We launched the 'Chemicals in Contact Assurance' document at this event (figure 17), which re-enforced the standard, confirmed our intention to audit and included the requirement for them to highlight any changes to their products or processes. All suppliers of potable water treatment chemicals were audited across 2017 and 2018 utilising a multi-disciplinary team. Sixteen chemical suppliers are now audited on risk-based frequencies, from annually to every seven years.



Chemicals in Contact Assurance

Water Chemicals
DWI and Regulation 31 Requirements for Suppliers

This is a controlled document only when accessed via Anglian Water Services' Intranet.

Any users who can identify changes or improvements to the process defined within this document should contact the Document owner.

DETAILS OF DOCUMENT CONTROL		
AUTHOR:		
NAME [redacted]	SIGNATURE	DATE 18.09.19
DOCUMENT OWNER:		
NAME [redacted]	SIGNATURE	DATE 18.09.19
DOCUMENT APPROVER:		
NAME [redacted]	SIGNATURE	DATE 18.09.19

REVISION	DATE OF ISSUE	REASON FOR CHANGE
V 1	02/03/2017	Amendments made by Tom Moody
V2	14/03/2017	Redrafted following conference call by Sam Foddy & Catherine Pearce
V3	16/03/2017	Amendments made by Tom Moody / Matt Mcginty
V4	20/03/2017	Redrafted following conference call by Matt Mcginty
V5	03/04/2017	QMS and performance monitoring Added by Adam Tyler
V6	13/04/2017	Reviewed by Karen Brumpton
V7	18/09/2019	Reviewed & updated – next Revision - September 2021
V8	29/7/2021	Reviewed & updated – next Revision – July 2023

Contents

Page

1. Purpose of Document — Page 3
a) Background — Page 3
b) Anglian Water Requirements — Page 3
   a. Incoming Raw Materials
   b. Process Changes
   c. Quality Control
   d. Storage/ Packaging
   e. Transit
   f. Delivery on Site
   g. Shelf Life
   h. Contamination
   i. People Training and Competency
   j. Security
c) Notification to and from Anglian Water — Page 6
5. References — Page 7

Definitions

Supplier	The party that is contracted to supply a product or substance to Anglian Water.
Raw Material	Any product / chemicals that enters processing by the supplier before delivery to Anglian Water, whether this is a manufacturing process or a process of re-packaging a finished product for distribution. Water used to manufacture the finished product should also be considered as a raw material.
Dedicated Tankers	A container used specifically to transport one chemical.
Anglian Water	Means Anglian Water Services Limited (company number 2366656).

Figure 17 – Chemicals in Contact Assurance document

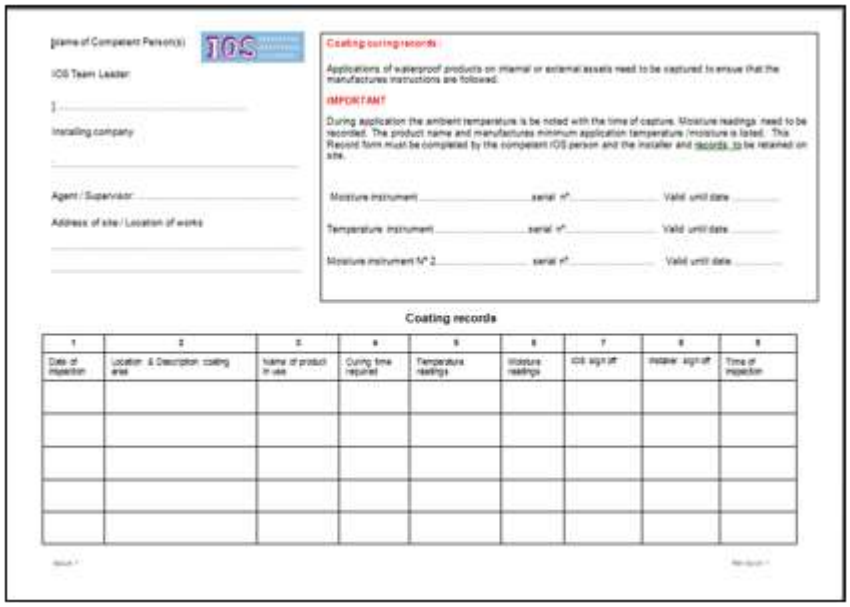
Expanding on the success of the chemical suppliers' assurance programme, a scanmarket assessment questionnaire was sent to framework material suppliers. Answers were scored and forty-nine material suppliers were ranked on a risk-based approach to form our material supplier audit programme.

We completed ten framework chemical and material supplier audits in 2021. The first two material audits were carried out virtually in 2020/21, and another seven feature in the 2021/22 audit programme. Wash up and launch sessions with the auditors for these programmes have allowed sharing of best practice, areas to focus on for future audits, and improvements to our audit templates.

We have seen a number of benefits above gaining internal insurance, including building relationships with suppliers and learning for our auditors and suppliers. Suppliers have reacted well to our material audits and we work with them to close down any actions identified.

Compliance with Instructions For Use (IFU)

In 2017, working collaboratively with our Integrated Operational Solutions, we developed a method to record and capture key data in relation to IFU compliance, which was briefed out to all relevant staff (see figure 18). These records are maintained for all schemes and include IFU information, records of temperature monitoring, coating records, surface preparation, data sheets etc. Engineers are required to check and sign-off the forms to provide further assurance of IFU compliance. This also led to the creation of an Integrated Operational Solutions QA role to carry out additional checks and audits in this area.


[Name of Competent Person(s)]

IOS Team Leader

Installing company

Agent / Supervisor

Address of site / Location of works

IOS

Coating curing records

Applications of waterproof products on internal or external assets need to be captured to ensure that the manufactures instructions are followed.

IMPORTANT

During application the ambient temperature is be noted with the time of capture. Moisture readings need to be recorded. The product name and manufactures minimum application temperature / moisture is listed. This Record form must be completed by the competent IOS person and the installer and records to be retained on site.

Moisture instrument ..... serial n° ..... Valid until date .....

Temperature instrument ..... serial n° ..... Valid until date .....

Moisture instrument N° 2 ..... serial n° ..... Valid until date .....

Coating records

1	2	3	4	5	6	7	8	9
Date of inspection	Location & Description coating area	Name of product in use	Curing time required	Temperature readings	Moisture readings	IOS sign off	Installer sign off	Time of inspection

Figure 18 – IOS Coating Curing Record Form

Training and Competency

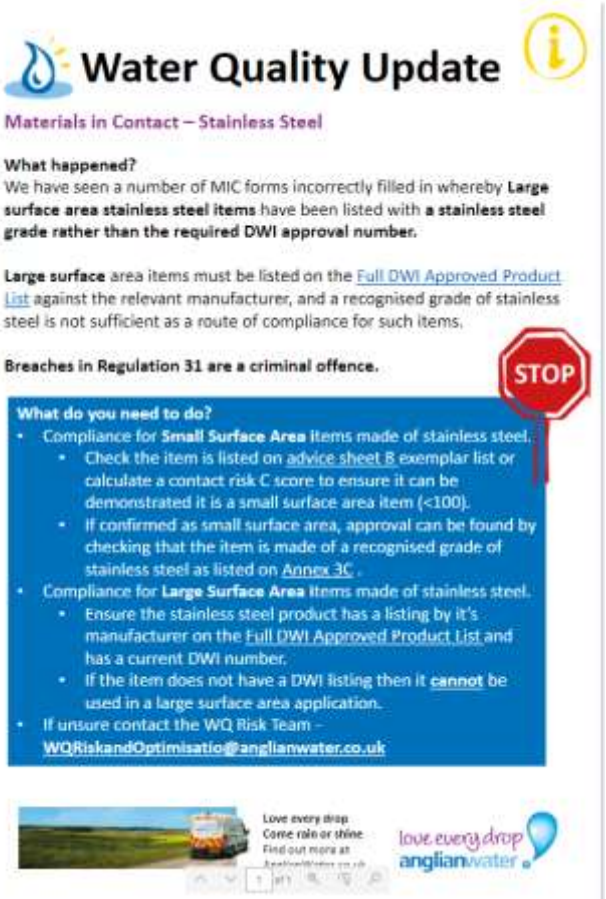
We have reviewed our current internal training material to introduce more practical elements on navigating and understanding routes of compliance to drive continuous improvement.

Two forms of training are currently in place throughout Anglian Water. An e-learning module and a one-day classroom training course. The e-learning module was created in 2018 to raise the overall awareness of key aspects of Regulation 31, including a competency test as part of the module. To date over 550 members of staff have completed this e-learning module. In August 2021 we introduced a new requirement for this to be retaken on a 3-yearly basis. See figure 19 for a screenshot of the e-learning. The one-day classroom training course which builds on knowledge of Regulation 31 requirements from the e-learning module. There are two versions of this course, one for engineers and the second for water quality teams (forming part of our Licence to Operate programmes). The training course was fully reviewed and updated last year to include a much more practical element.

Only those individuals who have completed the e-learning and classroom training and are signed off as competent are able to complete Part A of the MIC form. A list of those trained is kept up to date and can be cross referenced by the Water Quality Risk Team upon receiving Part A of the MIC form for review.

Figure 19 - Front page of e-learning training for Materials in Contact

Our Water Quality Training team produce Water Quality Alerts to the business to share topical best practice and learning from near misses. A number of Regulation 31 themed Water Quality alerts have been produced and distributed over the last year. An example of a recent alert is shown in figure 20.



Water Quality Update

Materials in Contact – Stainless Steel

What happened?
We have seen a number of MIC forms incorrectly filled in whereby **Large surface area stainless steel items** have been listed with **a stainless steel grade rather than the required DWI approval number.**

Large surface area items must be listed on the Full DWI Approved Product List against the relevant manufacturer, and a recognised grade of stainless steel is not sufficient as a route of compliance for such items.

Breaches in Regulation 31 are a criminal offence.

STOP

What do you need to do?

- Compliance for **Small Surface Area** items made of stainless steel.
  - Check the item is listed on advice sheet 8 exemplar list or calculate a contact risk C score to ensure it can be demonstrated it is a small surface area item (<100).
  - If confirmed as small surface area, approval can be found by checking that the item is made of a recognised grade of stainless steel as listed on Annex 3C .
- Compliance for **Large Surface Area** items made of stainless steel.
  - Ensure the stainless steel product has a listing by it's manufacturer on the Full DWI Approved Product List and has a current DWI number.
  - If the item does not have a DWI listing then it **cannot** be used in a large surface area application.
- If unsure contact the WQ Risk Team – WQRiskandOptimisatio@anglianwater.co.uk

Love every drop
Come rain or shine
Find out more at

love every drop
anglianwater

Figure 20 – Example of Water Quality Update relating to Regulation 31 from 2021

Industry Development

We have also set up a Water UK Regulation 31 Industry Group including Anglian Water, Thames, Northumbrian, Severn Trent, Southern and South Staffs. The group has focussed on the sharing of Regulation 31 best practice and have been working with EUSR to scope two industry training schemes

- Stage 1 - Basic awareness
- Stage 2 - For contractors applying specialist materials to align with a draft CoP for application of materials to drinking water structures

The first stage 1 Regulation 31 Awareness Scheme workshop was held on 22 November, attended by our Water Quality Training and Development Scientist.

Continuous Improvement of MIC Process

As part of our continuous review and improvement of the Materials in Contact Process in Anglian Water we have recently implemented the following improvements:

- **Additional Assurance Checks as part of our Scheme Delivery Process**
  We have introduced two additional assurance stages as part of schemes requiring completion of Materials in Contact (MIC) forms. At our delivery milestones 3 and 4 (DM3 – confirm solution deliver plan and DM4 – confirm solution completion) we have introduced the requirement of a Materials in Contact deliverable. A Water Quality Risk Manager is now included as an MIC reviewer for the scheme, managed through our Totex Delivery Workflow system. The MIC form is submitted as supporting evidence for review at each of these stages. Completeness of the

form is assessed by the reviewer and the scheme is then supported or not supported as appropriate at this stage. This ensures that the scheme will not progress any further without our MIC form process being at an appropriate level of completion at each stage.

- **Communications Awareness Campaign**
  During August and September 2021 we delivered a communication plan for refreshing Regulation 31 awareness specifically to our Supply, IOS and @one Alliance teams. This consisted of:
  - Three text messages being sent to over 250 individuals' mobiles from our Supply, IOS and @one Alliance teams. The messages reinforced timely completion of MIC forms, adherence to IFUs and refreshing training.
  - Creation of a Regulation 31 Tool Box Talk refresher, with five key takeaways (Figure 21).

Figure 21 – Key takeaways extract from MIC Tool Box Talk

  - Revamping our internal Regulation 31 Materials in Contact Lighthouse intranet page with useful information and links for those involved in our MIC process.
  - Updating our hygiene charter to include a new commitment specific to Regulation 31 (Figure 22).

Figure 22 – Hygiene charter new commitment

  - News articles in Anglian Water and @one Alliance weekly digital newsletters. These included links to the MIC Tool Box Talk and refreshed MIC intranet page.

- **MIC Form Improvements**
  We have recently trialled an updated version of our MIC form. The current changes in the trialled version include:

- Introduction of drop down options guiding the form completer.
- Warning and information notes based on the route of compliance being used.
- Automated highlighting of upcoming end date of approvals.
- An additional @one Alliance quality assurance check for @one Alliance schemes.
- A new requirement to state the intended use for each line item.
- The requirement to centrally save any supporting documents (such as BS6920 certification).

We are making some final amendments based upon feedback and are considering if there are any further adaptions we can make as a result of the findings from recent events. The form will be signed off at our Regulation 31 steering group prior to publication.

- **Minimum Asset Standard Updates**
  In response to identification of non-compliant pipework at our new Kedington WTW as previously reported (DWI 2021 8118), we have reviewed and updated our Minimum Asset Standards (MAS) for treated water tanks. We have introduced a standard for new assets that specifies submerged pipework must be constructed from stainless steel, ensuring the pipework will be of a suitable material both internally and externally (standard 7.3 on figure 23 below). These revisions were made to our MASs for 'Treated Water Storage Reservoir (1K-TWS-RES-MAS)' and 'Contact and Balance Tank (1F-FND-CON-MAS)' published in December 2021.

7. Regulation 31 Compliance	7.1 All materials in contact with water intended for the public supply shall comply with Regulation 31 of the current Water Supply (Water Quality) Regulations. 7.2 All manufacturers' Instructions for Use (IFU) documents relating to Regulation 31 compliance shall be included in the operating and maintenance manual. 7.3 Submerged pipework (including the submerged sections of pipework originating outside the tank) shall be of a DWI recognised stainless steel grade and fabricated by a manufacturer listed in the DWI Full List of Approved Products. 7.4 Submerged fittings shall be made from A2 (304) stainless steel. 7.5 Mechanical joint fittings shall be suitable for immersion and all their internal and external materials compliant with Regulation 31. 7.6 Submerged small bore pipework and fittings feeding mid-point sample points shall be of a DWI recognised stainless steel grade. 7.7 Consult a Risk Scientist regarding equipment inside the tank but above top water level (including hatch covers and instrumentation).

Figure 23: Extract from the Minimum Asset Standard for Contact and Balance Tank

6. Actions Being Taken to Prevent a Recurrence

As part of our strategy to make a step change in compliance with Regulation 31 we have created a Materials in Contact Improvement Programme which aims to implement significant changes across Anglian Water, our Alliance Partners and Suppliers. This programme of work is being sponsored by our Director of Water Business Stream, [redacted] and Head of Water Quality, [redacted] We have a dedicated Project Manager driving this work forward, bringing together learning from recent Regulation 31 events and conducting an end-to-end review of our internal Materials in Contact processes. The improvement plan covers all stages of our Materials in Contact process from procurement, through design, change control, sign-off into supply, training and assurance with the key aim to develop a fully traceable process for Regulation 31 compliance.

The improvement plan has a series of workstreams around:

- **Procurement and Contractual Relationships with Suppliers** – working with our suppliers to ensure they meet the clearly defined requirements of Regulation 31. Includes introduction of a system, mirroring a system currently on place for our chemical suppliers, whereby changes within integrated suppliers are notified to us proactively for assessment of their potential impact on Regulation 31 compliance.
- **Logistics and Traceability –** working together with our Logistics teams on shared goals of a fully traceable system for materials and fittings from entry to the company to final installation.
- **Design and Engineering Standards –** a full review of all water Minimum Asset Standards to ensure a consistent messaging about materials in contact. A full review of all Mechanical / Pipeline Design Guides and reference materials to ensure a full suite of standards directly connected to ensuring Regulation 31 compliance, including the creation of a dedicated pipework design guide which includes a full review of 'Standard' material notations.
- **Materials in Contact Process Review** – removing barriers that exist that prevent the easy passage of critical information between teams, review standard inspection and assurance templates to include clear and unambiguous reference to Regulation 31 and clearer links back to standards and the design.
- **Digital Solutions** – use of digital solutions to embed and track products and certification throughout the design and delivery phase. The element of real time data within the Building Information Modelling (BIM) model will align Scientific, Procurement and Design to enable a real-time database of Materials in Contact for use within the delivery team.
- **Training, Competency and Assurance** – training and competence are key to the success of delivery; core to this is our staff, our partner organisations but also our integrated supply chain. We will ensure Regulation 31 is a key part of our existing Licence to Operate programmes and expand this programme to other key areas in the business.
- **Communications** – ensure we have clear communication processes in place to embed the core principles of the management of Materials in Contact and the wider water quality standards into the business.

Sharing Learning with the Wider Industry

Once we have introduced these changes to drive forward compliance with Regulation 31, it is our intention to share these advancements with the wider industry. We have a number of routes to do this successfully through our existing networks in the industry, but we would also like to explore options using digital technology and hosting an industry webinar or on-line event.

7. Rectification of the Issue

The non-compliant components within Pitsford WTW Storage Tank B will be remediated with a suitably approved alternative, fully complying with the requirements of Regulation 31. The storage tank will not be returned to supply until this work has been completed and appropriate sampling has been undertaken.

8. Notifications

Other organisations informed:
CCWater

Independent Water Networks Limited

2017 - 2021	No. Coliform Samples	No. of Coliform detections	No. E.coli Samples	No. of E. coli detections	No. Quantitative taste Samples	No. of Quantitative taste detections	No. Quantitative Odour Samples	No. of Quantitative Odour detections
Pitsford Final	1821	1	1821	0	4	0	0	0
Ravensthorpe PWSZ	234	0	234	0	119	0	118	2
Brixworth PWSZ	118	0	118	0	62	0	62	0
Daventry PWSZ	609	4	609	0	208	0	208	1
Northampton West PWSZ	454	0	454	0	150	0	150	0
Northampton Central PWSZ	872	1	872	0	248	0	248	2
Northampton East PWSZ	725	2	725	0	221	0	221	1
Northampton North PWSZ	504	2	504	0	157	0	157	0
Grand Total	**5,337**	**10**	**5,337**	**-**	**1,169**	**-**	**1,164**	**6**

2017	No. Coliform Samples	No. of Coliform detections	No. E.coli Samples	No. of E. coli detections	No. Quantitative taste Samples	No. of Quantitative taste detections	No. Quantitative Odour Samples	No. of Quantitative Odour detections
Pitsford Final	367		367		0		0	
Ravensthorpe PWSZ	51		51		25		25	
Brixworth PWSZ	25		25		12		12	
Daventry PWSZ	128		128		38		38	
Northampton West PWSZ	89		89		18		18	
Northampton Central PWSZ	204		204		52		52	
Northampton East PWSZ	153		153		26		26	
Northampton North PWSZ	103		103		19		19	
Sub Total for Year	**1,120**	**-**	**1,120**	**-**	**190**	**-**	**190**	**-**

2018	No. Coliform Samples	No. of Coliform detections	No. E.coli Samples	No. of E. coli detections	No. Quantitative taste Samples	No. of Quantitative taste detections	No. Quantitative Odour Samples	No. of Quantitative Odour detections
Pitsford Final	368		368		4		0	
Ravensthorpe PWSZ	51		51		27		26	2
Brixworth PWSZ	27		27		15		15	
Daventry PWSZ	127	1	127		40		40	1
Northampton West PWSZ	102		102		33		33	
Northampton Central PWSZ	193	1	193		54		54	1
Northampton East PWSZ	154	2	154		52		52	
Northampton North PWSZ	99		99		37		37	
Sub Total for Year	**1,121**	**4**	**1,121**	**-**	**262**	**-**	**257**	**4**

2019	No. Coliform Samples	No. of Coliform detections	No. E.coli Samples	No. of E. coli detections	No. Quantitative taste Samples	No. of Quantitative taste detections	No. Quantitative Odour Samples	No. of Quantitative Odour detections
Pitsford Final	365		365		0		0	
Ravensthorpe PWSZ	49		49		24		24	
Brixworth PWSZ	25		25		13		13	
Daventry PWSZ	123		123		37		37	
Northampton West PWSZ	96		96		36		36	
Northampton Central PWSZ	169		169		52		52	
Northampton East PWSZ	145		145		52		52	1
Northampton North PWSZ	108	1	108		36		36	
Sub Total for Year	**1,080**	**1**	**1,080**	**-**	**250**	**-**	**250**	**1**

2020	No. Coliform Samples	No. of Coliform detections	No. E.coli Samples	No. of E. coli detections	No. Quantitative taste Samples	No. of Quantitative taste detections	No. Quantitative Odour Samples	No. of Quantitative Odour detections
Pitsford Final	366		366		0		0	
Ravensthorpe PWSZ	33		33		18		18	
Brixworth PWSZ	16		16		9		9	
Daventry PWSZ	91		91		41		41	
Northampton West PWSZ	66		66		25		25	
Northampton Central PWSZ	129		129		38		38	1
Northampton East PWSZ	108		108		38		38	
Northampton North PWSZ	81		81		27		27	
Sub Total for Year	**890**	**-**	**890**	**-**	**196**	**-**	**196**	**1**

2021	No. Coliform Samples	No. of Coliform detections	No. E.coli Samples	No. of E. coli detections	No. Quantitative taste Samples	No. of Quantitative taste detections	No. Quantitative Odour Samples	No. of Quantitative Odour detections
Pitsford Final	355	1	355		0		0	
Ravensthorpe PWSZ	50		50		25		25	
Brixworth PWSZ	25		25		13		13	
Daventry PWSZ	140	3	140		52		52	
Northampton West PWSZ	101		101		38		38	
Northampton Central PWSZ	177		177		52		52	
Northampton East PWSZ	165		165		53		53	
Northampton North PWSZ	113	1	113		38		38	
Sub Total for Year	**1,126**	**5**	**1,126**	**-**	**271**	**-**	**271**	**-**

Year / PWSZ	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
ZRW10	1.83	1.64	2.45	1.94	3.72	2.66	1.01	1.11	1.50	1.70
ZRW11	0.98	1.96	1.68	0.42	0.45	2.13	0.56	0.82	1.87	0.64
ZRW14	1.69	1.16	1.03	1.16	1.09	1.69	0.86	0.97	0.80	1.42
ZRW15	1.77	1.15	0.65	0.70	2.33	1.09	0.64	0.90	0.84	0.88
ZRW16	1.25	1.19	0.87	0.53	0.52	0.35	0.42	0.38	0.82	1.10
ZRW18	1.35	1.52	1.18	0.65	1.35	0.81	0.90	0.94	0.95	1.23
ZRW19	N/A	3.13	0.65	0.49	1.59	0.68	0.79	0.28	0.46	0.83

BY APPOINTMENT TO
HER MAJESTY THE QUEEN
MANUFACTURERS OF PAINT, VARNISHES & EMULSIONS
DACRYLATE PAINTS LTD.,
NOTTINGHAM

SAFETY DATA SHEET
V&M ENAMEL

According to Regulation (EC) No 1907/2006, Annex II, as amended by Regulation (EU) No 453/2010, According to Regulation (EC) No 1907/2006, Annex II

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name V&M ENAMEL

Product number 0097- Non Lead (incl. 597 Line Dacmix)

Internal identification Also including 6597 (L/F) and 8597 Line Dacmix Reduced Gloss Levels.

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses Paint.

1.3. Details of the supplier of the safety data sheet

Supplier Dacrylate Paints Ltd,
Lime Street,
[redacted]in-Ashfield
Nottingham NG17 8AL
Tel: +44 (0) 1623-753845
Fax: +44 (0) 1623-757151

Contact person sales@dacrylate.co.uk

1.4. Emergency telephone number

National emergency telephone number +44 (0) 1623 753845 08:30-17:00 MON-FRI

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification

Physical hazards Flam. Liq. 3 - H226

Health hazards Skin Sens. 1 - H317 STOT SE 3 - H336 STOT RE 1 - H372

Environmental hazards Aquatic Chronic 2 - H411

Classification (67/548/EEC or 1999/45/EC) N;R51/53. R10.

Human health Persons with a history of skin sensitization problems should not be employed in any process in which this product is used.

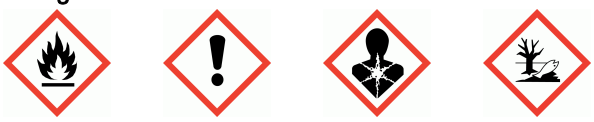
Environmental This product may cause harm to the environment. See Section 12 Ecological Information.

Physicochemical See Section 7.2 Storage Class. See Section 5.2 Hazardous combustion products. See Section 10: Stability and reactivity

2.2. Label elements

V&M ENAMEL

Pictogram



Signal word	Danger
Hazard statements	H372 Causes damage to organs through prolonged or repeated exposure. H317 May cause an allergic skin reaction. H226 Flammable liquid and vapour. H411 Toxic to aquatic life with long lasting effects. H336 May cause drowsiness or dizziness.
Precautionary statements	P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. P280 Wear protective gloves/protective clothing/eye protection/face protection. P303+P361+P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing. P333+P313 If skin irritation or rash occurs: Get medical advice/attention. P370+P378 In case of fire: Use foam, carbon dioxide, dry powder or water fog to extinguish. P403+P235 Store in a well-ventilated place. Keep cool. P501 Dispose of contents/container in accordance with national regulations.
Contains	WHITE SPIRIT, ALIPHATIC H/C (154/169), DIPENTENE, ETHYL METHYL KETOXIME
Supplementary precautionary statements	P240 Ground/bond container and receiving equipment. P241 Use explosion-proof electrical equipment. P242 Use only non-sparking tools. P243 Take precautionary measures against static discharge. P260 Do not breathe vapour/spray. P261 Avoid breathing vapour/spray. P264 Wash contaminated skin thoroughly after handling. P270 Do not eat, drink or smoke when using this product. P271 Use only outdoors or in a well-ventilated area. P272 Contaminated work clothing should not be allowed out of the workplace. P273 Avoid release to the environment. P302+P352 IF ON SKIN: Wash with plenty of water. P312 Call a POISON CENTER/doctor if you feel unwell. P314 Get medical advice/attention if you feel unwell. P321 Specific treatment (see medical advice on this label). P362+P364 Take off contaminated clothing and wash it before reuse. P391 Collect spillage. P403+P233 Store in a well-ventilated place. Keep container tightly closed. P405 Store locked up.

2.3. Other hazards

This product does not contain any substances classified as PBT or vPvB.

SECTION 3: Composition/information on ingredients

3.2. Mixtures

V&M ENAMEL

WHITE SPIRIT **30-60%**

CAS number: 64742-88-7 EC number: 265-191-7

Classification
Flam. Liq. 3 - H226
STOT RE 1 - H372
Asp. Tox. 1 - H304
Aquatic Chronic 2 - H411

Classification (67/548/EEC or 1999/45/EC)
Xn;R65. N;R51/53. R10.

ALIPHATIC H/C (154/169) **10-30%**

CAS number: 64742-88-7

Classification
Flam. Liq. 3 - H226
STOT RE 1 - H372
Asp. Tox. 1 - H304
Aquatic Chronic 2 - H411

Classification (67/548/EEC or 1999/45/EC)
Xn;R65. N;R51/53. R10.

XYLENE **1-5%**

CAS number: 1330-20-7 EC number: 215-535-7

Classification
Flam. Liq. 3 - H226
Acute Tox. 4 - H312
Acute Tox. 4 - H332
Skin Irrit. 2 - H315

Classification (67/548/EEC or 1999/45/EC)
R10 Xn;R20/21 Xi;R38

DIPENTENE **1-5%**

CAS number: 68956-56-9

Classification
Flam. Liq. 3 - H226
Skin Irrit. 2 - H315
Skin Sens. 1B - H317
Aquatic Chronic 3 - H412

Classification (67/548/EEC or 1999/45/EC)
Xi;R36/38. R10.

DE-AROMATISED KEROSENE **<1%**

CAS number: 64742-48-9 EC number: 265-150-3

Classification
Flam. Liq. 3 - H226
Muta. 1A - H340
Carc. 1A - H350
Asp. Tox. 1 - H304

Classification (67/548/EEC or 1999/45/EC)
Xn;R65.

V&M ENAMEL

ETHYL METHYL KETOXIME **<1%**

CAS number: 96-29-7 EC number: 202-496-6

Classification	Classification (67/548/EEC or 1999/45/EC)
Flam. Liq. 3 - H226 Acute Tox. 4 - H312 Eye Dam. 1 - H318 Skin Sens. 1 - H317 Carc. 2 - H351	Carc. Cat. 3;R40 Xn;R21 R43 Xi;R41

STRONTIUM CARBOXYLATE **<1%**

CAS number: 2457-02-5

Classification	Classification (67/548/EEC or 1999/45/EC)
Flam. Liq. 3 - H226 Skin Irrit. 2 - H315	Xi;R38.

ZIRCONIUM CARBOXYLATE **<1%**

CAS number: 22464-99-9

Classification	Classification (67/548/EEC or 1999/45/EC)
Flam. Liq. 3 - H226 Skin Irrit. 2 - H315 Skin Sens. 1B - H317 Repr. 2 - H361 Aquatic Chronic 2 - H411	Xi;R38.

COBALT CARBOXYLATE **<1%**

CAS number: 13586-82-8

Classification	Classification (67/548/EEC or 1999/45/EC)
Flam. Liq. 3 - H226 Skin Irrit. 2 - H315 Skin Sens. 1B - H317 Aquatic Chronic 2 - H411	Xi;R38. R43.

2-METHOXY-1-METHYLETHYL ACETATE **<1%**

CAS number: 108-65-6 EC number: 203-603-9

Classification	Classification (67/548/EEC or 1999/45/EC)
Flam. Liq. 3 - H226	R10

2-METHYLPENTANE-2,4-DIOL **<1%**

CAS number: 107-41-5 EC number: 203-489-0

Classification	Classification (67/548/EEC or 1999/45/EC)
Skin Irrit. 2 - H315 Eye Irrit. 2 - H319	Xi;R36/38

V&M ENAMEL

The Full Text for all R-Phrases and Hazard Statements are Displayed in Section 16.

SECTION 4: First aid measures

4.1. Description of first aid measures

General information The severity of the symptoms described will vary depending on the concentration and the length of exposure. Move affected person to fresh air and keep warm and at rest in a position comfortable for breathing.

Inhalation Get medical attention. Place unconscious person on their side in the recovery position and ensure breathing can take place. Move affected person to fresh air and keep warm and at rest in a position comfortable for breathing. Get medical attention. Symptoms of lung oedema (shortness of breath) may develop up to 24 hours after exposure. Show this Safety Data Sheet to the medical personnel.

Ingestion Remove affected person from source of contamination. Rinse mouth thoroughly with water. Give plenty of water to drink. DO NOT induce vomiting. Get medical attention immediately.

Skin contact Wash skin thoroughly with soap and water. Get medical attention promptly if symptoms occur after washing. Use barrier creams to prevent skin contact. Remove contaminated clothing and rinse skin thoroughly with water.

Eye contact Rinse immediately with plenty of water. Remove any contact lenses and open eyelids wide apart. Continue to rinse for at least 15 minutes. Get medical attention if irritation persists after washing. Show this Safety Data Sheet to the medical personnel.

Protection of first aiders First aid personnel should wear appropriate protective equipment during any rescue. In case of insufficient ventilation, wear suitable respiratory equipment.

4.2. Most important symptoms and effects, both acute and delayed

General information The severity of the symptoms described will vary dependent on the concentration and the length of exposure.

Inhalation Harmful if inhaled Vapours may cause headache, fatigue, dizziness and nausea.

Ingestion Harmful if swallowed. May cause nausea, stomach paint and vomiting.

Skin contact Skin irritation. May cause sensitisation or allergic reactions in sensitive individuals.

Eye contact May cause severe eye irritation.

4.3. Indication of any immediate medical attention and special treatment needed

Notes for the doctor No specific recommendation given, but first aid may still be required in case of accidental exposure, inhalation or ingestion of this chemical. If in doubt, GET MEDICAL ATTENTION PROMPTLY! In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media Use fire-extinguishing media suitable for the surrounding fire. Extinguish with foam, carbon dioxide or dry powder.

Unsuitable extinguishing media Do not use water jet as an extinguisher, as this will spread the fire.

5.2. Special hazards arising from the substance or mixture

Specific hazards	Vapours are heavier than air and may travel along the floor and accumulate in the bottom of containers. Vapours may be ignited by a spark, a hot surface or an ember. Vapours may form explosive mixtures with air. If a fire or if heated, a pressure increase will occur and the container may burst with the risk of subsequent explosion. The product is flammable.
Hazardous combustion products	In case of fire, toxic gases (CO, CO2, NOx) may be formed. Acrid smoke or fumes. Other pyrolysis products typical of burning an organic material. Protection against nuisance dust must be used when the airborne concentration exceeds 10 mg/m3. In the event of a fire and/or explosion, do not breathe fumes.

5.3. Advice for firefighters

Protective actions during firefighting	Containers close to fire should be removed or cooled with water. Do not allow water to contact any leaked material. Keep up-wind to avoid fumes. Control run-off water by containing and keeping it out of sewers and watercourses. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken without appropriate training or involving any personal risk.
Special protective equipment for firefighters	Wear positive-pressure self-contained breathing apparatus (SCBA) and appropriate protective clothing.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions	Do not handle broken packages without protective equipment. If ventilation is inadequate, suitable respiratory protection must be worn. Take care as floors and other surfaces may become slippery. Wash thoroughly after dealing with a spillage. Where anti slip aggregates, powders or similar are added/post added to a paint, the potential for the generation of respirable dust during handling and use can occur. In such cases, occupational exposures to respirable dust should be monitored and controlled. In the case of exposure to prolonged or high levels of air borne dust, wear a personal respirator in compliance with national legislation. No smoking, sparks, flames or other sources of ignition near spillage.
For non-emergency personnel	Do not touch or walk through spilt material. Avoid breathing vapour or mist. Provide adequate ventilation. Wear suitable respirator when ventilation is inadequate. Put on appropriate personal protective equipment. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering.
For emergency responders	If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable materials. See also the information in "For non-emergency personnel".

6.2. Environmental precautions

Environmental precautions	Do not discharge into drains or watercourses or onto the ground.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up	No smoking, sparks, flames or other sources of ignition near spillage. Collect and place in suitable waste disposal containers and seal securely. If involved in a fire, shut off flow if it can be done without risk. Eliminate all sources of ignition. No smoking, sparks, flames or other sources of ignition near spillage. Provide adequate ventilation. Small Spillages: Absorb small quantities with paper towels and evaporate in a safe place. Large Spillages: Absorb in vermiculite, dry sand or earth and place into containers. Ensure that waste and contaminated materials are collected and removed from the work area as soon as possible in a suitably labelled container. The accumulation of contaminated rags and application cloths may result in spontaneous combustion. This is particularly important in the case of products containing a high level of drying oils such as teak oil, linseed oil etc. Good housekeeping standards and regular safe removal of waste materials will minimise the risks of spontaneous combustion and other fire hazards.

6.4. Reference to other sections

Reference to other sections Wear protective clothing as described in Section 8 of this safety data sheet. See Section 11 for additional information on health hazards. See Section 12 for additional information on ecological hazards. For waste disposal, see section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Usage precautions Avoid contact with skin and eyes. Eliminate all sources of ignition. Keep away from heat, sparks and open flame. All handling should only take place in well-ventilated areas. Static electricity and formation of sparks must be prevented. Dust may form explosive mixture with air. Take precautionary measures against static discharges. Storage tanks and other containers must be earthed. Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Paints based on pitch, coal tar, high temp (CAS 65996-93-2) may cause sensitivity to sunlight. To reduce sun sensitivity, a sun blocking lotion (SPE 15+) can also be applied prior to application of a protective cream.

Advice on general occupational hygiene Do not eat, drink or smoke when using this product. Wash promptly with soap and water if skin becomes contaminated. Promptly remove any clothing that becomes contaminated. Use appropriate hand lotion to prevent defatting and cracking of skin.

7.2. Conditions for safe storage, including any incompatibilities

Storage precautions Keep away from food, drink and animal feeding stuffs. Keep away from oxidising materials, heat and flames. Paints containing aluminium must not get in contact with water during storage. Exercise caution when opening to allow pressure release. Keep container tightly closed and in a well-ventilated place. Avoid/separate from strong acids, alkalis, oxidising and reducing agents. Observe the label precautions. Store at temperatures between 5°C and 35°C (32 to 95°F).

Storage class Flammable liquid storage.

7.3. Specific end use(s)

Specific end use(s) The identified uses for this product are detailed in Section 1.2. Restricted to professional users.

SECTION 8: Exposure Controls/personal protection

8.1. Control parameters

Occupational exposure limits

WHITE SPIRIT

Long-term exposure limit (8-hour TWA): WEL 350 mg/m3(Sk)

XYLENE

Long-term exposure limit (8-hour TWA): WEL 50 ppm(Sk) 220 mg/m3(Sk)
Short-term exposure limit (15-minute): WEL 100 ppm(Sk) 441 mg/m3(Sk)

2-METHOXY-1-METHYLETHYL ACETATE

Long-term exposure limit (8-hour TWA): WEL 50 ppm(Sk) 274 mg/m3(Sk)
Short-term exposure limit (15-minute): WEL 100 ppm(Sk) 548 mg/m3(Sk)

2-METHYLPENTANE-2,4-DIOL

Long-term exposure limit (8-hour TWA): WEL 25 ppm 123 mg/m³
Short-term exposure limit (15-minute): WEL 25 ppm 123 mg/m³

WEL = Workplace Exposure Limit

Ingredient comments WEL = Workplace Exposure Limits

V&M ENAMEL

XYLENE (CAS: 1330-20-7)

DNEL - Inhalation; Short term : 442 mg/m³

8.2. Exposure controls

Protective equipment

Note: When spraying, the use of a suitable/approved respirator is advised.

Appropriate engineering controls No specific ventilation requirements noted, but forced ventilation may still be required if air contamination exceeds acceptable level.

Personal protection Advice on personal protection is applicable for high exposure levels. Select proper personal protection based on a risk assessment of the actual exposure scenario.

Eye/face protection The following protection should be worn: Chemical splash goggles. Eyewear complying with an approved standard should be worn if a risk assessment indicates eye contact is possible.

Hand protection Chemical-resistant, impervious gloves complying with an approved standard should be worn if a risk assessment indicates skin contact is possible. The most suitable glove should be chosen in consultation with the glove supplier/manufacturer, who can provide information about the breakthrough time of the glove material. To protect hands from chemicals, gloves should comply with European Standard EN374.

Other skin and body protection Wear appropriate clothing to prevent skin contamination. Use barrier creams to prevent skin contact.

Hygiene measures Use engineering controls to reduce air contamination to permissible exposure level. Provide eyewash station. Provide eyewash station and safety shower. Wash hands at the end of each work shift and before eating, smoking and using the toilet. Wash promptly if skin becomes contaminated.

Respiratory protection If ventilation is inadequate, suitable respiratory protection must be worn. Respiratory protection complying with an approved standard should be worn if a risk assessment indicates inhalation of contaminants is possible. Ensure all respiratory protective equipment is suitable for its intended use and is 'CE'-marked.

Environmental exposure controls Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels. Keep container tightly sealed when not in use.

SECTION 9: Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Appearance Liquid.

Colour Various colours.

Odour Characteristic/of solvents

Odour threshold Not determined.

pH Not relevant.

Melting point Not determined.

Initial boiling point and range Not determined.

Flash point	35°C CC (Closed cup).
Evaporation rate	Not determined.
Evaporation factor	Not determined.
Flammability (solid, gas)	No specific test data are available.
Upper/lower flammability or explosive limits	Lower flammable/explosive limit: 0.6% Upper flammable/explosive limit: 7%
Other flammability	Not known.
Vapour pressure	Not determined.
Vapour density	Not determined.
Relative density	@ 20°C 0.90 - 1.05°C
Bulk density	Not determined.
Solubility(ies)	Soluble in the following materials: Organic solvents.
Partition coefficient	Not available.
Auto-ignition temperature	Not determined.
Decomposition Temperature	Not determined.
Viscosity	Not determined.
Explosive properties	May form explosive mixtures with air.
Explosive under the influence of a flame	Not considered to be explosive.
Oxidising properties	Not determined.
Comments	Information given is applicable to the product as supplied.

9.2. Other information

Other information	Soluble in most organic solvents.

SECTION 10: Stability and reactivity

10.1. Reactivity

Reactivity	The following materials may react with the product: Acids. Alkalis. Oxidising materials.

10.2. Chemical stability

Stability	Stable at normal ambient temperatures and when used as recommended. Further information on correct storage: refer to Section 7.

10.3. Possibility of hazardous reactions

Possibility of hazardous reactions	None under normal processing Vapours may form explosive mixtures with air.

10.4. Conditions to avoid

Conditions to avoid	Avoid heat, flames and other sources of ignition. Avoid contact with strong oxidising agents. Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to conditions to heat or sources of ignition. Protection against nuisance dust must be used when the airborne concentration exceeds 10 mg/m3. Avoid extremes of temperature and direct sunlight.

10.5. Incompatible materials

Materials to avoid	Strong oxidising agents.

10.6. Hazardous decomposition products

Hazardous decomposition products	Thermal decomposition or combustion products may include the following substances: Carbon monoxide (CO). Carbon dioxide (CO_2). Oxides of nitrogen. Acrid smoke or fumes. In case of fire and/or explosion, do not breaths fumes.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

General information	This product is unlikely to harm health, given normal and proper handling and hygienic precautions. Prolonged and repeated contact with solvents over a long period may lead to permanent health problems.
Inhalation	Harmful by inhalation. Irritating to respiratory system.
Ingestion	Irritating. May cause nausea, stomach pain and vomiting.
Skin contact	Harmful in contact with skin. Irritating to skin.
Eye contact	Harmful in contact with eyes. Irritating to eyes.
Route of entry	Inhalation Ingestion. Skin and/or eye contact Oral
Additional Information:	For further information, please refer to Sections 4 and 8 respectively..

Toxicological information on ingredients.

WHITE SPIRIT

Toxicological effects	Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis. High vapour concentrations can cause headaches, dizziness and nausea.
Acute toxicity - oral	
Acute toxicity oral (LD_{50} mg/kg)	15,001.0
Species	Rat
ATE oral (mg/kg)	15,001.0
Acute toxicity - dermal	
Acute toxicity dermal (LD_{50} mg/kg)	3,401.0
Species	Rat
ATE dermal (mg/kg)	3,401.0
Acute toxicity - inhalation	
Acute toxicity inhalation (LC_{50} vapours mg/l)	13,101.0
Species	Rat
ATE inhalation (vapours mg/l)	13,101.0

V&M ENAMEL

Serious eye damage/irritation

Serious eye damage/irritation	Not Irritating

Respiratory sensitisation

Respiratory sensitisation	Not determined.

Skin sensitisation

Skin sensitisation	Not sensitising.

Germ cell mutagenicity

Genotoxicity - in vitro	Negative.
Genotoxicity - in vivo	Negative.

Carcinogenicity

Carcinogenicity	Not classified carcinogenic

Reproductive toxicity

Reproductive toxicity - fertility	No information available.
Reproductive toxicity - development	No evidence of development toxicity

Specific target organ toxicity - single exposure

STOT - single exposure	No specific test data are available.
Target organs	Central nervous system Vapours can cause drowsiness & dizziness.

Specific target organ toxicity - repeated exposure

STOT - repeated exposure	No specific test data are available.

Aspiration hazard

Aspiration hazard	No information available.

General information	Prolonged and repeated contact with solvents over a long period may lead to permanent health problems.
Inhalation	Vapours may irritate throat and respiratory system and cause headache, dizziness and dullness.
Ingestion	This product is moderately irritating. Irritating. May cause nausea, stomach pain and vomiting.
Skin contact	May cause irritation.
Eye contact	May cause severe eye irritation.
Route of entry	Skin and/or eye contact
Target organs	Central nervous system
Medical symptoms	No specific information available.

V&M ENAMEL

ALIPHATIC H/C (154/169)

Toxicological effects	Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis. High vapour concentrations can cause headaches, dizziness and nausea.

Acute toxicity - oral

Acute toxicity oral (LD_{50} mg/kg)	5,051.0
Species	Rat
ATE oral (mg/kg)	5,051.0

Acute toxicity - dermal

Acute toxicity dermal (LD_{50} mg/kg)	4,001.0
Species	Rabbit
ATE dermal (mg/kg)	4,001.0

Serious eye damage/irritation

Serious eye damage/irritation	Not Irritating

Respiratory sensitisation

Respiratory sensitisation	There is no evidence that the product can cause respiratory hypersensitivity.

Skin sensitisation

Skin sensitisation	Not expected to be a skin sensitizer

Germ cell mutagenicity

Genotoxicity - in vitro	Negative.
Genotoxicity - in vivo	Negative.

Carcinogenicity

Carcinogenicity	No evidence of carcinogenicity Not classified carcinogenic

Reproductive toxicity

Reproductive toxicity - fertility	No information available.
Reproductive toxicity - development	No evidence of development toxicity

Specific target organ toxicity - single exposure

STOT - single exposure	No information available.

Specific target organ toxicity - repeated exposure

STOT - repeated exposure	No information available.

Aspiration hazard

V&M ENAMEL

Aspiration hazard	No information available.
General information	Prolonged and repeated contact with solvents over a long period may lead to permanent health problems.
Inhalation	Vapours may irritate throat and respiratory system and cause headache, dizziness and dullness.
Ingestion	Irritating. May cause nausea, stomach pain and vomiting.
Skin contact	Acts as a defatting agent on skin. May cause cracking of skin, and eczema.
Eye contact	May cause eye and respiratory system irritation.
Route of entry	Skin and/or eye contact Inhalation
Target organs	Central nervous system
Medical symptoms	No specific information available.

XYLENE

Toxicological effects	Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis. High vapour concentrations can cause headaches, dizziness and nausea.

Acute toxicity - oral

Acute toxicity oral (LD_{50} mg/kg)	4,300.0
Species	Rat

Acute toxicity - dermal

Acute toxicity dermal (LD_{50} mg/kg)	2,000.0
Species	Rabbit
ATE dermal (mg/kg)	2,000.0

Acute toxicity - inhalation

Acute toxicity inhalation (LC_{50} vapours mg/l)	11.0
Species	Rat
ATE inhalation (vapours mg/l)	11.0

Skin corrosion/irritation

Animal data	No information available.
Human skin model test	Irritating.

Serious eye damage/irritation

Serious eye damage/irritation	Causes eye irritation

V&M ENAMEL

Respiratory sensitisation

Respiratory sensitisation	There is no evidence that the product can cause respiratory hypersensitivity.

Skin sensitisation

Skin sensitisation	No information available.

Germ cell mutagenicity

Genotoxicity - in vitro	Negative.
Genotoxicity - in vivo	Negative.

Carcinogenicity

Carcinogenicity	No evidence of carcinogenicity

Reproductive toxicity

Reproductive toxicity - fertility	This substance has no evidence of toxicity to reproduction.
Reproductive toxicity - development	No information available.

Specific target organ toxicity - single exposure

STOT - single exposure	Central and/or peripheral nervous system damage.
Target organs	Central nervous system Liver Kidneys

Specific target organ toxicity - repeated exposure

STOT - repeated exposure	No information available.

Aspiration hazard

Aspiration hazard	Aspiration hazard if swallowed.

General information	Prolonged and repeated contact with solvents over a long period may lead to permanent health problems.
Inhalation	Harmful by inhalation.
Ingestion	Irritating. May cause nausea, stomach pain and vomiting.
Skin contact	Harmful in contact with skin. Irritating to skin.
Eye contact	The product is irritating to eyes and skin.
Route of entry	Oral Skin and/or eye contact Inhalation Ingestion
Target organs	Central nervous system
Medical symptoms	Allergies. Irritation of eyes and mucous membranes. Headache. Fatigue. Dizziness.

DE-AROMATISED KEROSENE

Acute toxicity - oral

Acute toxicity oral (LD_{50} mg/kg)	5,051.0

V&M ENAMEL

Species	Rat
ATE oral (mg/kg)	5,051.0

Acute toxicity - dermal

Acute toxicity dermal (LD_{50} mg/kg)	4,001.0
Species	Rabbit
ATE dermal (mg/kg)	4,001.0

Acute toxicity - inhalation

Acute toxicity inhalation (LC_{50} vapours mg/l)	4,001.0
Species	Rat
ATE inhalation (vapours mg/l)	4,001.0

Serious eye damage/irritation

Serious eye damage/irritation	Not Irritating

Respiratory sensitisation

Respiratory sensitisation	There is no evidence that the product can cause respiratory hypersensitivity.

Skin sensitisation

Skin sensitisation	Not expected to be a skin sensitizer

Germ cell mutagenicity

Genotoxicity - in vitro	Negative.
Genotoxicity - in vivo	Negative.

Carcinogenicity

Carcinogenicity	No evidence of carcinogenicity Not classified carcinogenic

Reproductive toxicity

Reproductive toxicity - fertility	No information available.
Reproductive toxicity - development	No evidence of development toxicity

Specific target organ toxicity - single exposure

STOT - single exposure	No specific test data are available.

Specific target organ toxicity - repeated exposure

STOT - repeated exposure	No specific test data are available.

Aspiration hazard

Aspiration hazard	No information available.

General information	Prolonged and repeated contact with solvents over a long period may lead to permanent health problems.
Inhalation	Vapours may irritate throat and respiratory system and cause headache, dizziness and dullness.
Ingestion	Irritating. May cause nausea, stomach pain and vomiting.
Skin contact	Acts as a defatting agent on skin. May cause cracking of skin, and eczema.
Eye contact	May cause eye and respiratory system irritation.
Route of entry	Skin and/or eye contact Inhalation
Target organs	Central nervous system

SECTION 12: Ecological Information

12.1. Toxicity

Toxicity This product contains substances which are harmful to aquatic organisms. Do not discharge into drains, water courses or onto the ground.

Ecological information on ingredients.

WHITE SPIRIT

Toxicity	This product contains substances which are harmful to aquatic organisms. Do not discharge into drains, water courses or onto the ground.
Acute toxicity - fish	, LC50 96 hours < 30mg/lt (Rainbow trout) : ,
Acute toxicity - aquatic invertebrates	, EC50 48 hours <22 mg/lt (Daphnia magna) : ,
Acute toxicity - aquatic plants	, EC50 72 hours < 10 mg/lt : ,
Acute toxicity - microorganisms	, EC50 48 hours 43.98 mg/lt : ,
Acute toxicity - terrestrial	Not applicable.

ALIPHATIC H/C (154/169)

Toxicity	This product contains substances which are harmful to aquatic organisms. Do not discharge into drains, water courses or onto the ground.
Acute toxicity - fish	, LC50 96 hours < 30 mg/lt : ,
Acute toxicity - aquatic invertebrates	, NOEC 21 Days 0.097 mg/lt (Daphnia magna) : ,
Acute toxicity - aquatic plants	No information available.
Acute toxicity - microorganisms	, EC50 48 hours 43.98 mg/lt : ,

V&M ENAMEL

Acute toxicity - terrestrial	No information available.

Chronic aquatic toxicity

NOEC	0.01 < NOEC ≤ 0.1

DIPENTENE

Toxicity	This product contains substances which are harmful to aquatic organisms. Do not discharge into drains, water courses or onto the ground.

Acute aquatic toxicity

$LE(C)_{50}$	0.1 < L(E)C50 ≤ 1
Acute toxicity - fish	No information available
Acute toxicity - aquatic invertebrates	No information available.
Acute toxicity - aquatic plants	No information available.
Acute toxicity - microorganisms	No information available.
Acute toxicity - terrestrial	No information available.

Chronic aquatic toxicity

NOEC	0.01 < NOEC ≤ 0.1

12.2. Persistence and degradability

Persistence and degradability	Solvent will evaporate, residue will not readily biodegrade. There are no data on the degradability of this product.

Ecological information on ingredients.

WHITE SPIRIT

Persistence and degradability	Readily degradeable.
Biodegradation	75% (28 days)

ALIPHATIC H/C (154/169)

Persistence and degradability	No data available.
Biodegradation	Degradation (%) 75% (28 days)

DIPENTENE

Persistence and degradability	Readily degradeable.
Biodegradation	The substance is readily biodegradable.

12.3. Bioaccumulative potential

Bioaccumulative potential The product contains potentially bioaccumulating substances.

Partition coefficient Not available.

Ecological information on ingredients.

WHITE SPIRIT

Bioaccumulative potential Not known.

ALIPHATIC H/C (154/169)

Bioaccumulative potential No data available on bioaccumulation.

DIPENTENE

Bioaccumulative potential The product is not bioaccumulating.

12.4. Mobility in soil

Mobility The product is insoluble in water. Mobile liquid, solvent will evaporate leaving a semi-solid mass.

Ecological information on ingredients.

WHITE SPIRIT

Mobility The product contains volatile organic compounds (VOCs) which will evaporate easily from all surfaces. No information available.

ALIPHATIC H/C (154/169)

Mobility The product contains volatile organic compounds (VOCs) which will evaporate easily from all surfaces.

DIPENTENE

Mobility Readily absorbed into soil. The product contains volatile organic compounds (VOCs) which will evaporate easily from all surfaces.

12.5. Results of PBT and vPvB assessment

Results of PBT and vPvB assessment This product does not contain any substances classified as PBT or vPvB.

Ecological information on ingredients.

WHITE SPIRIT

Results of PBT and vPvB assessment This substance is not classified as PBT or vPvB according to current EU criteria.

ALIPHATIC H/C (154/169)

Results of PBT and vPvB assessment This product does not contain any substances classified as PBT or vPvB.

Results of PBT and vPvB assessment	No data available.

12.6. Other adverse effects

Other adverse effects	Not known.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

General information	Dispose of waste to licensed waste disposal site in accordance with the requirements of the local Waste Disposal Authority. This material and its container must be disposed of in a safe way. The generation of waste should be minimised or avoided wherever possible. The company encourages the recycle, recovery and reuse of materials, wherever possible.
Disposal methods	Dispose of waste to licensed waste disposal site in accordance with the requirements of the local Waste Disposal Authority. Avoid the spillage or runoff entering drains, sewers or watercourses. Residues and empty containers should be taken care of as hazardous waste according to local and national provisions. Dispose of waste via a licensed waste disposal contractor. Dispose of contents/container in accordance with national regulations.

SECTION 14: Transport information

General	To avoid the risk of spillage, always store and transport in a secure, upright position. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

14.1. UN number

UN No. (ADR/RID)	1263
UN No. (IMDG)	1263
UN No. (ICAO)	1263
UN No. (ADN)	1263

14.2. UN proper shipping name

Proper shipping name (ADR/RID)	PAINT
Proper shipping name (IMDG)	PAINT
Proper shipping name (ICAO)	PAINT
Proper shipping name (ADN)	PAINT

14.3. Transport hazard class(es)

ADR/RID class	3
ADR/RID classification code	F1
ADR/RID label	3
IMDG class	3
ICAO class/division	3
ADN class	3

Transport labels

14.4. Packing group

ADR/RID packing group	III
IMDG packing group	III
ADN packing group	III
ICAO packing group	III

14.5. Environmental hazards

Environmentally hazardous substance/marine pollutant

No.

14.6. Special precautions for user

EmS	F-E, S-E
ADR transport category	3
Emergency Action Code	•3YE
Hazard Identification Number (ADR/RID)	33
Tunnel restriction code	(D/E)

14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not applicable.

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations	Petroleum (Consolidation) Act, as amended 1984 SI 1244. Highly Flammable Liquid Regulations 1972. Rivers (Prevention of Pollution) Act 1961. Control of Pollution (Special Waste) Regulations 1980 (as amended). Control of Substances Hazardous to Health Regulations 2002 (as amended).
EU legislation	Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) (as amended). Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures (as amended). Commission Directive 2000/39/EC of 8 June 2000 establishing a first list of indicative occupational exposure limit values in implementation of Council Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work (as amended). Commission Regulation (EU) No 453/2010 of 20 May 2010.

Guidance	Workplace Exposure Limits EH40. Introduction to Local Exhaust Ventilation HS(G)37. CHIP for everyone HSG228. Approved Classification and Labelling Guide (Sixth edition) L131. Safety Data Sheets for Substances and Preparations.

15.2. Chemical safety assessment

No chemical safety assessment has been carried out.

SECTION 16: Other information

General information	Product to be used in industrial and/or professional applications.
Issued by	BOD
Revision date	13/03/2015
Revision	0
SDS number	10223
Risk phrases in full	R10 Flammable. R20/21 Harmful by inhalation and in contact with skin. R21 Harmful in contact with skin. R36/38 Irritating to eyes and skin. R38 Irritating to skin. R40 Limited evidence of a carcinogenic effect. R41 Risk of serious damage to eyes. R43 May cause sensitisation by skin contact. R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. R65 Harmful: may cause lung damage if swallowed.
Hazard statements in full	H226 Flammable liquid and vapour. H304 May be fatal if swallowed and enters airways. H312 Harmful in contact with skin. H315 Causes skin irritation. H317 May cause an allergic skin reaction. H318 Causes serious eye damage. H319 Causes serious eye irritation. H332 Harmful if inhaled. H336 May cause drowsiness or dizziness. H340 May cause genetic defects. H350 May cause cancer. H351 Suspected of causing cancer. H361 Suspected of damaging fertility or the unborn child. H372 Causes damage to organs through prolonged or repeated exposure. H411 Toxic to aquatic life with long lasting effects. H412 Harmful to aquatic life with long lasting effects.

The product should not be used for the purposes other than those shown in Section 1 without first referring to the supplier and obtaining written handling instructions. As the specific conditions of use of the product are outside the supplier's control, the user is responsible for ensuring that the requirements of relevant legislation are complied with.This information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Such information is, to the best of the company's knowledge and belief, accurate and reliable as of the date indicated. However, no warranty, guarantee or representation is made to its accuracy, reliability or completeness. It is the user's responsibility to satisfy himself as to the suitability of such information for his own particular use.

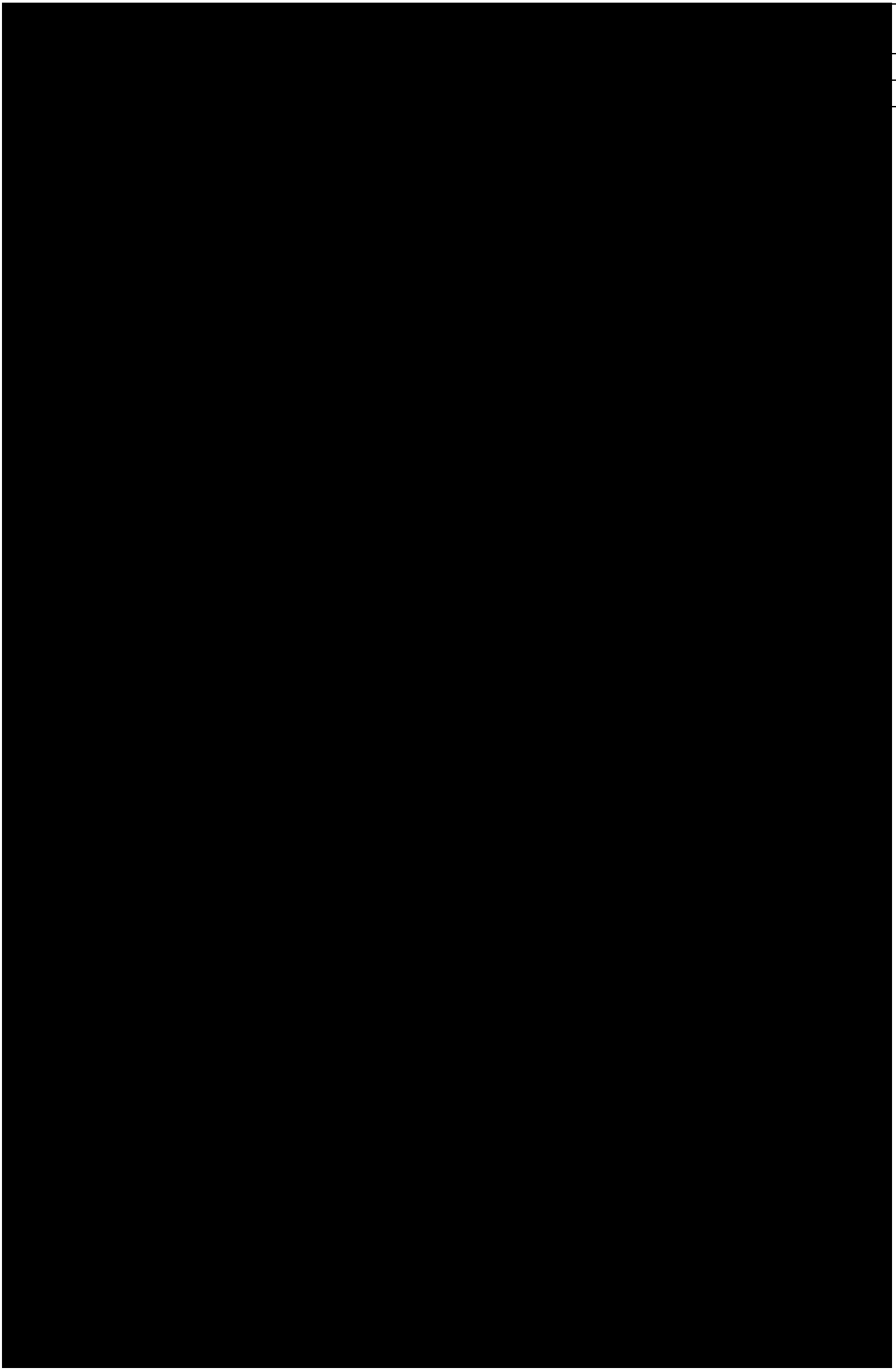
Materials and Chemicals in Contact with Water

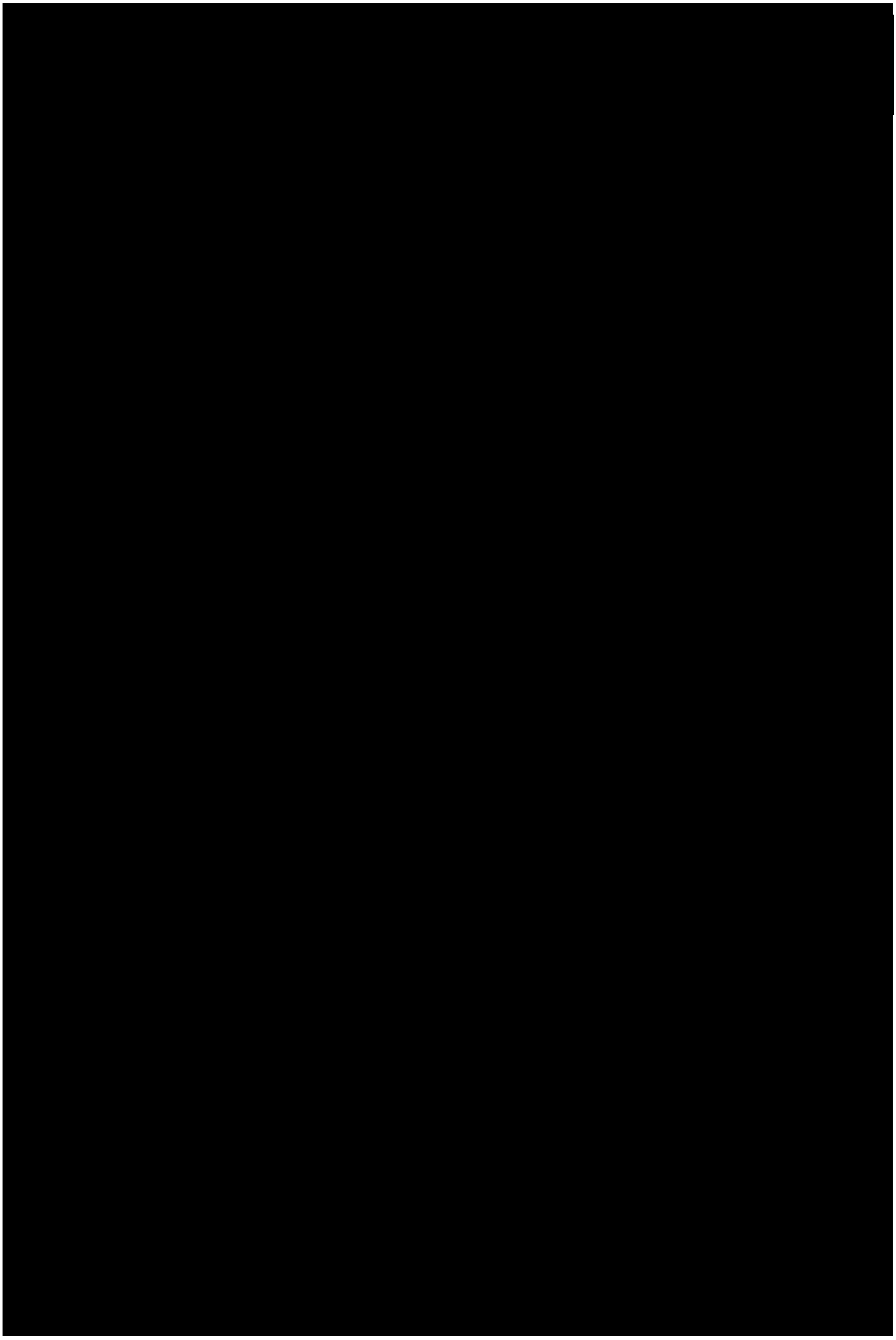
All chemicals and materials used in contact with water will be sourced and used in accordance with regulatory requirements and company procedures. All chemicals and materials used in contact with water will go through an internal verifications process prior to purchasing and use. All materials and chemicals used in contact with water from its point of abstraction to the customer's boundary fall under the requirements of Regulation 31 and the scope of this policy.

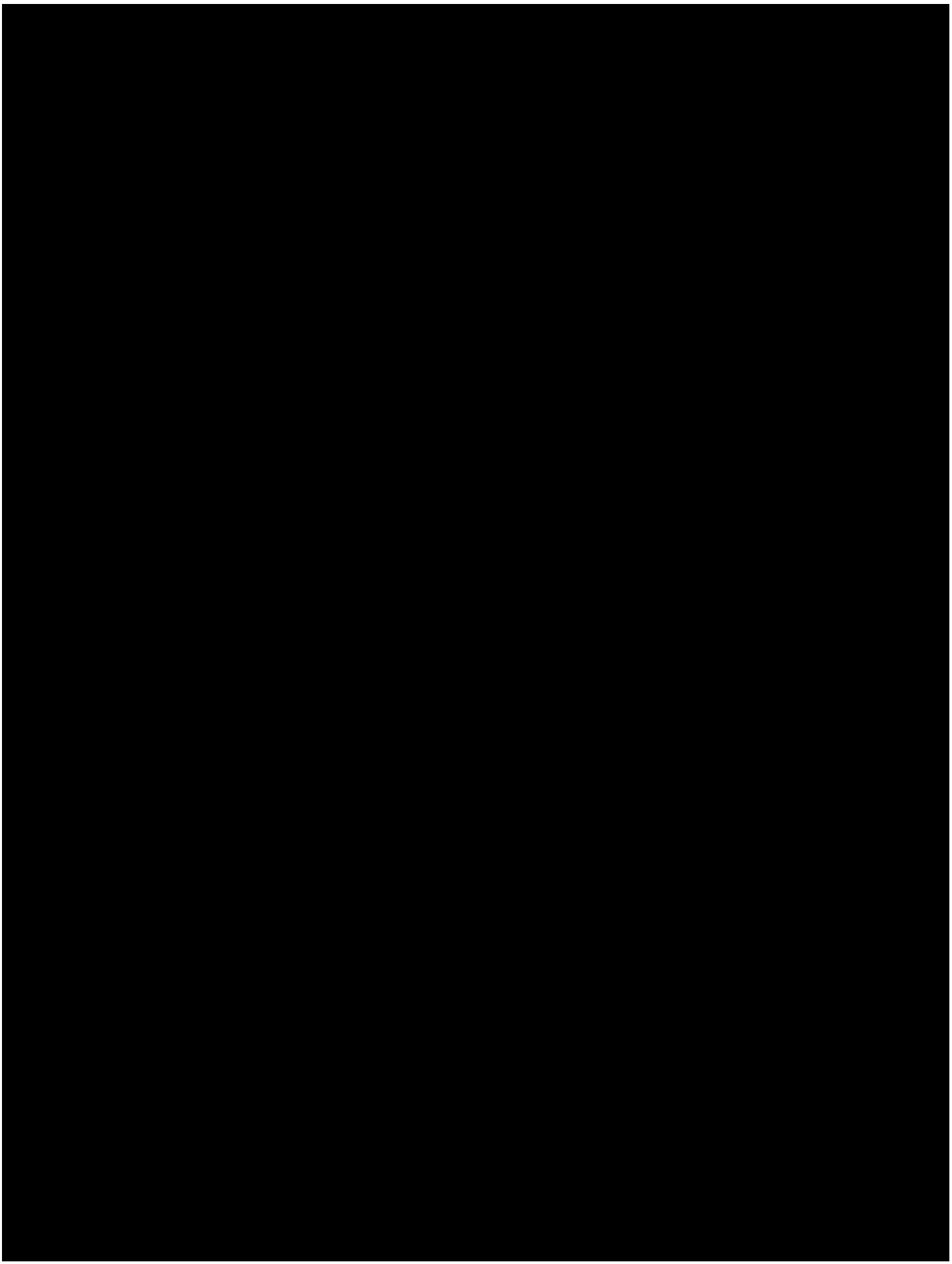
Policy and standard sub-sections:

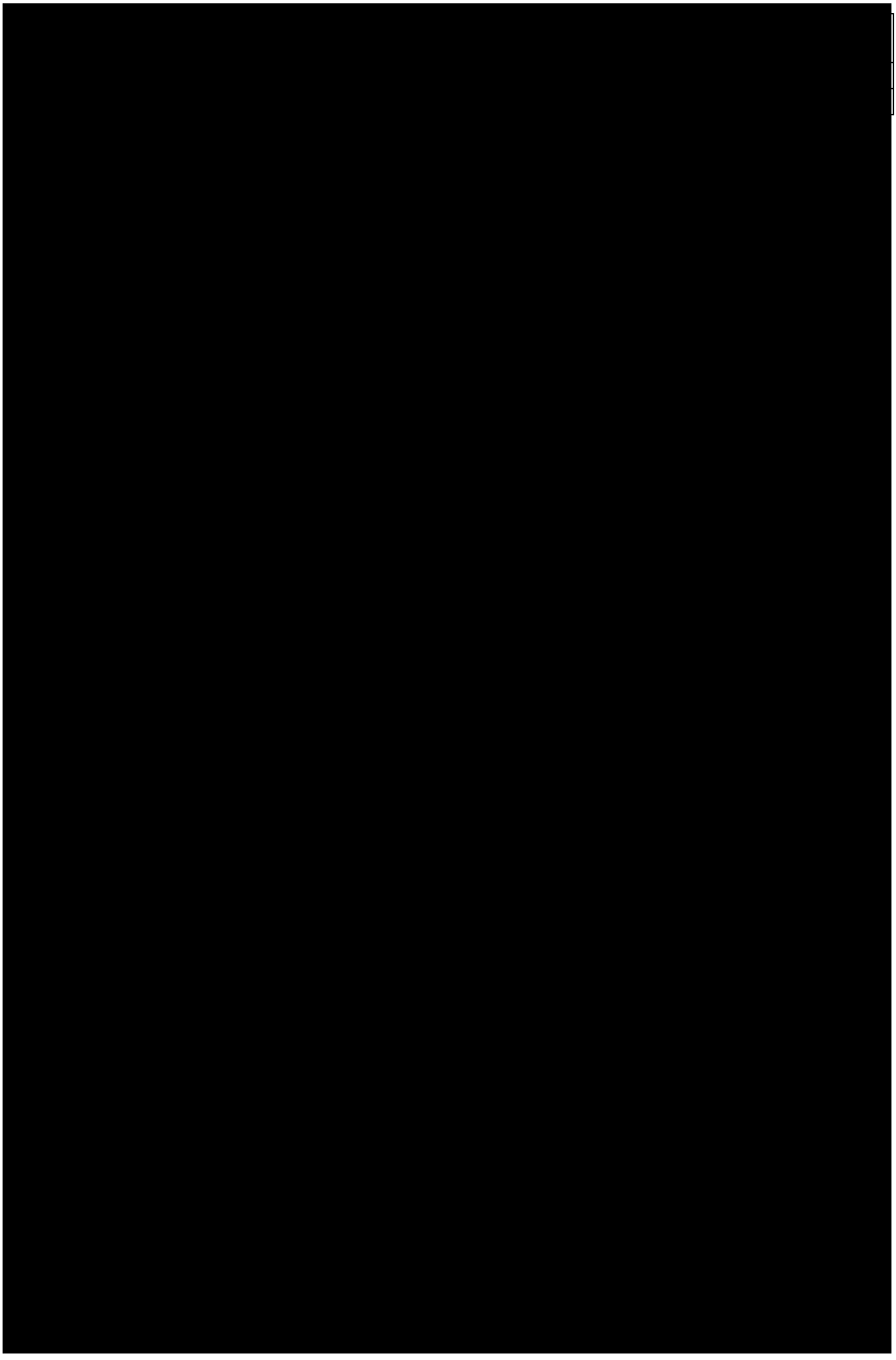
Materials and chemical approval **Page 3**

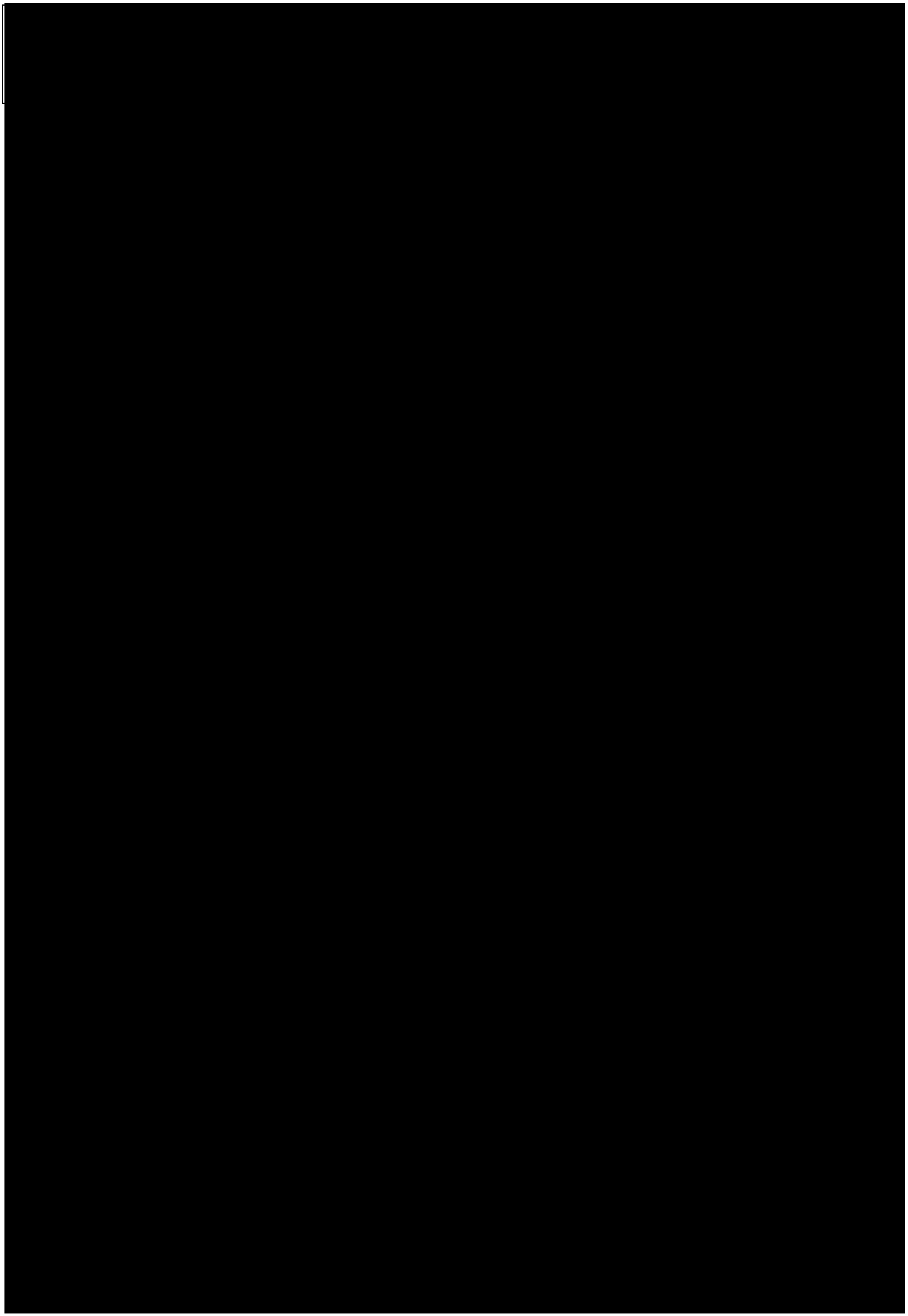
Delivery and storage of chemicals & Fuels **Page 8**

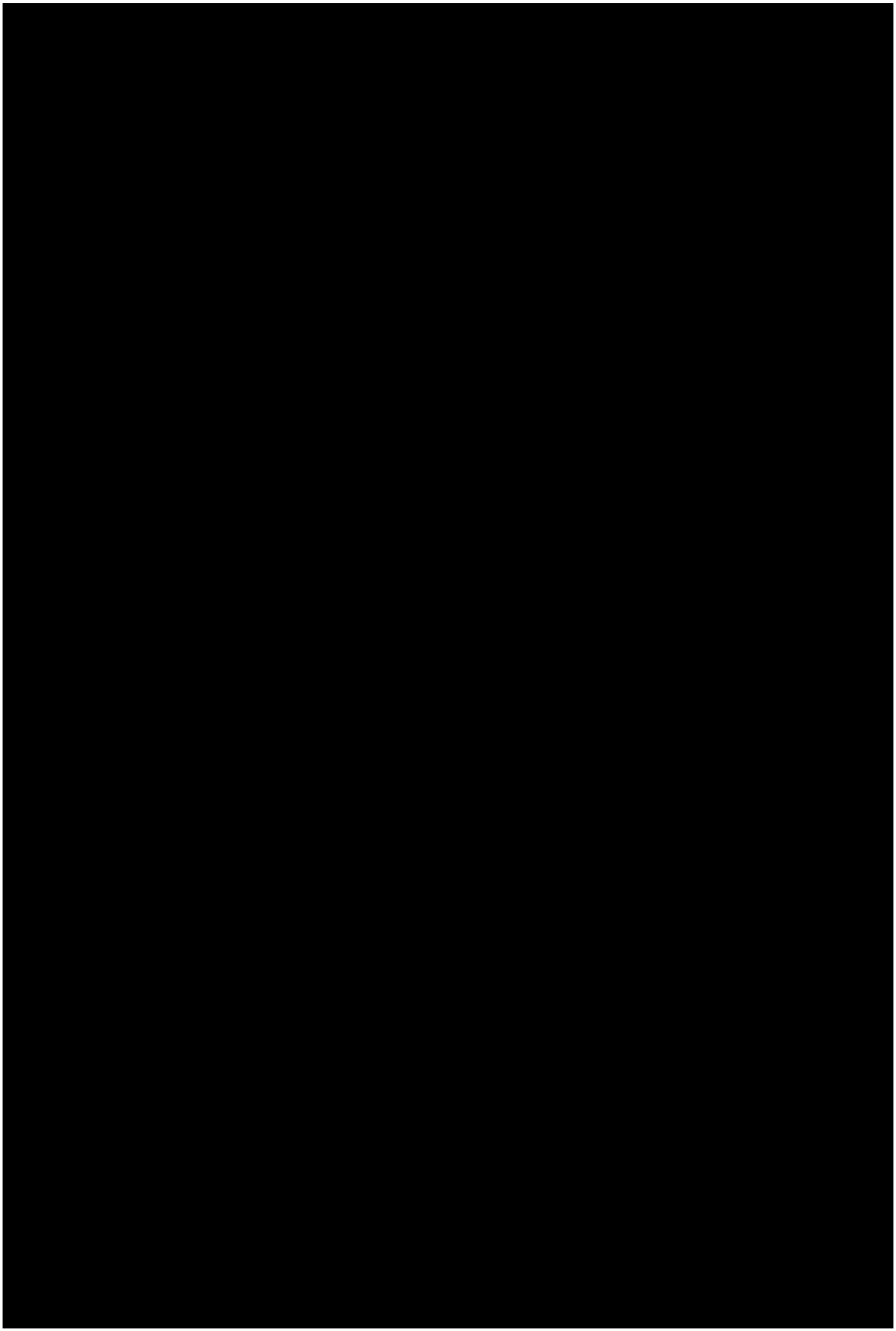


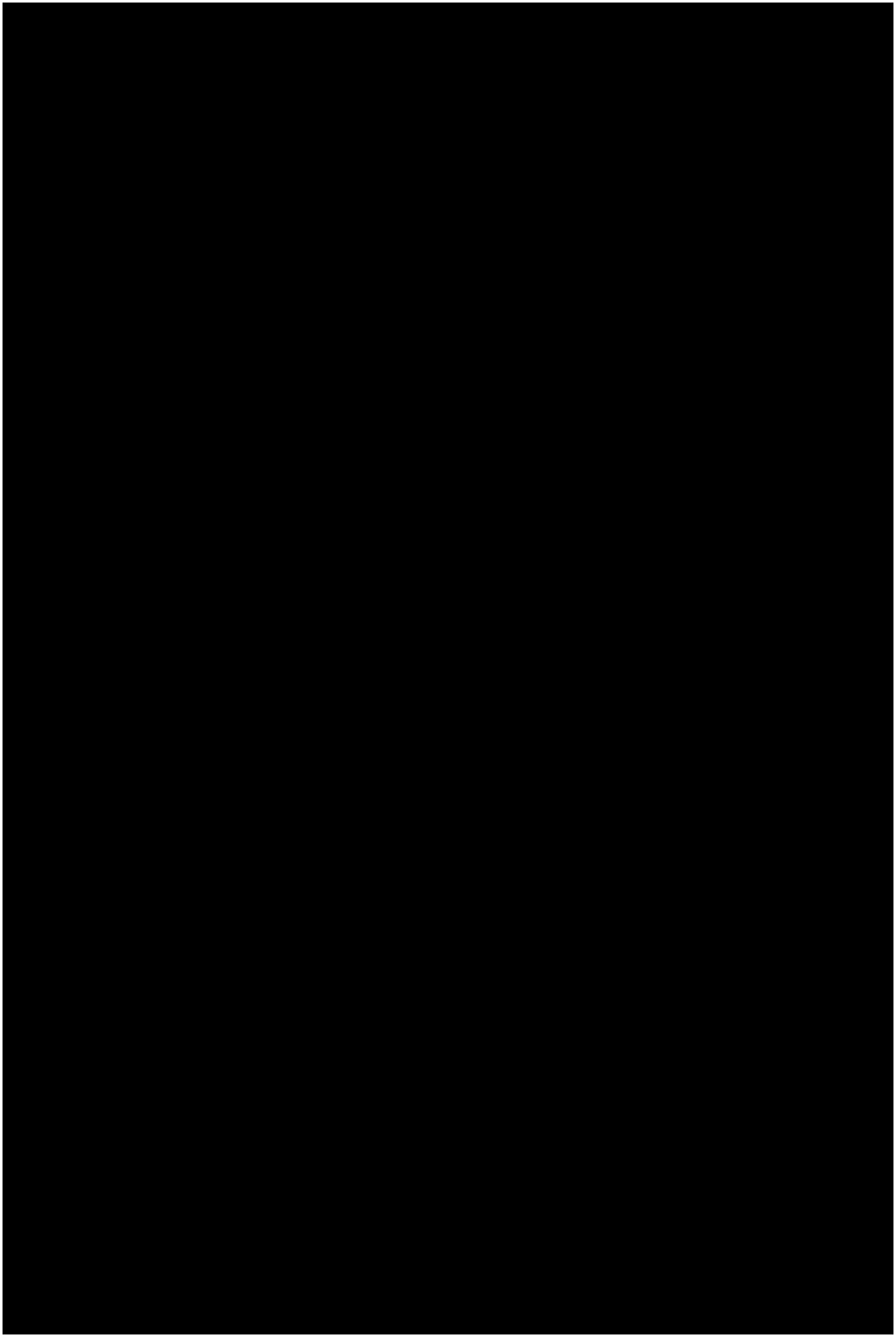


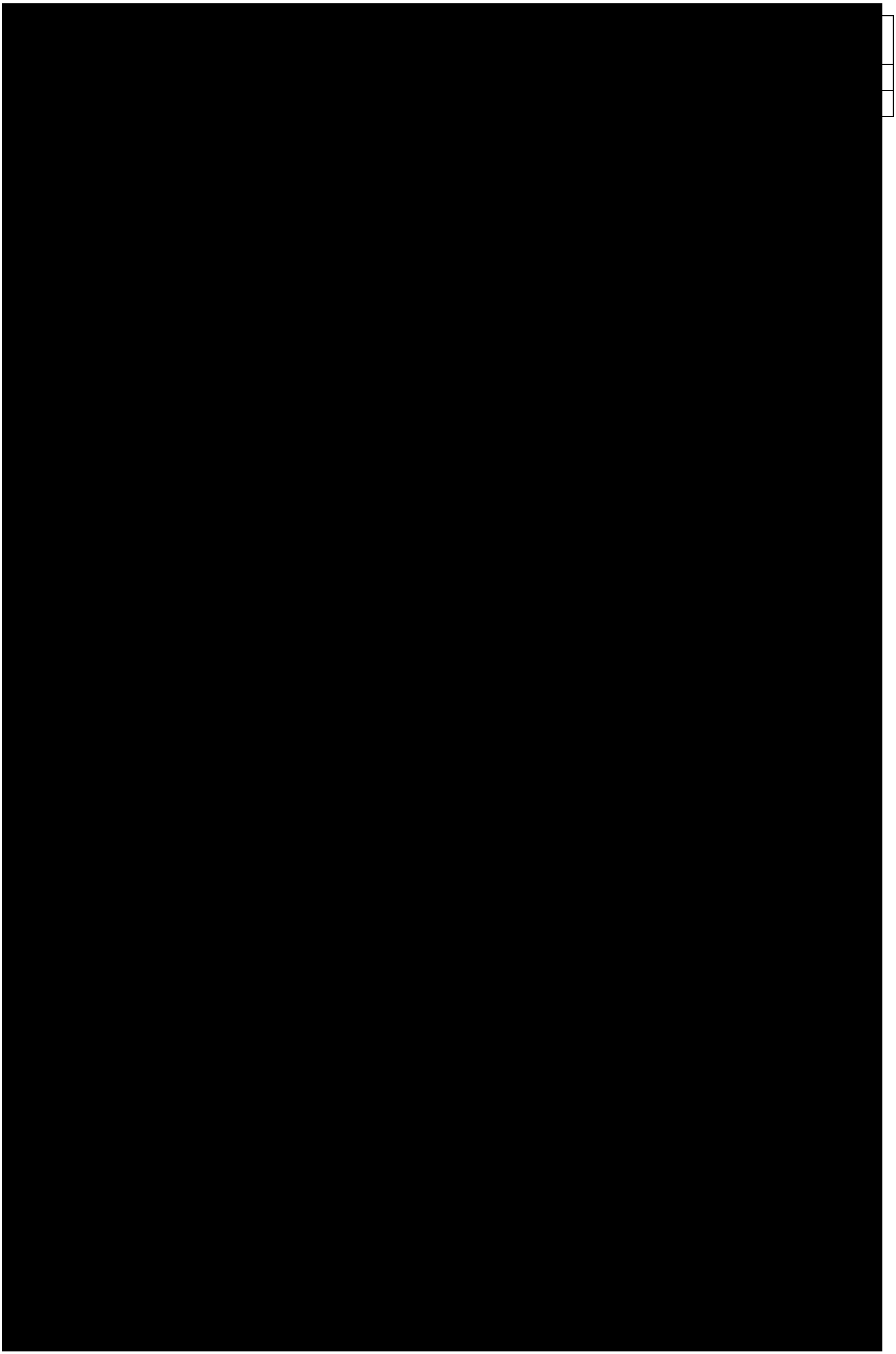


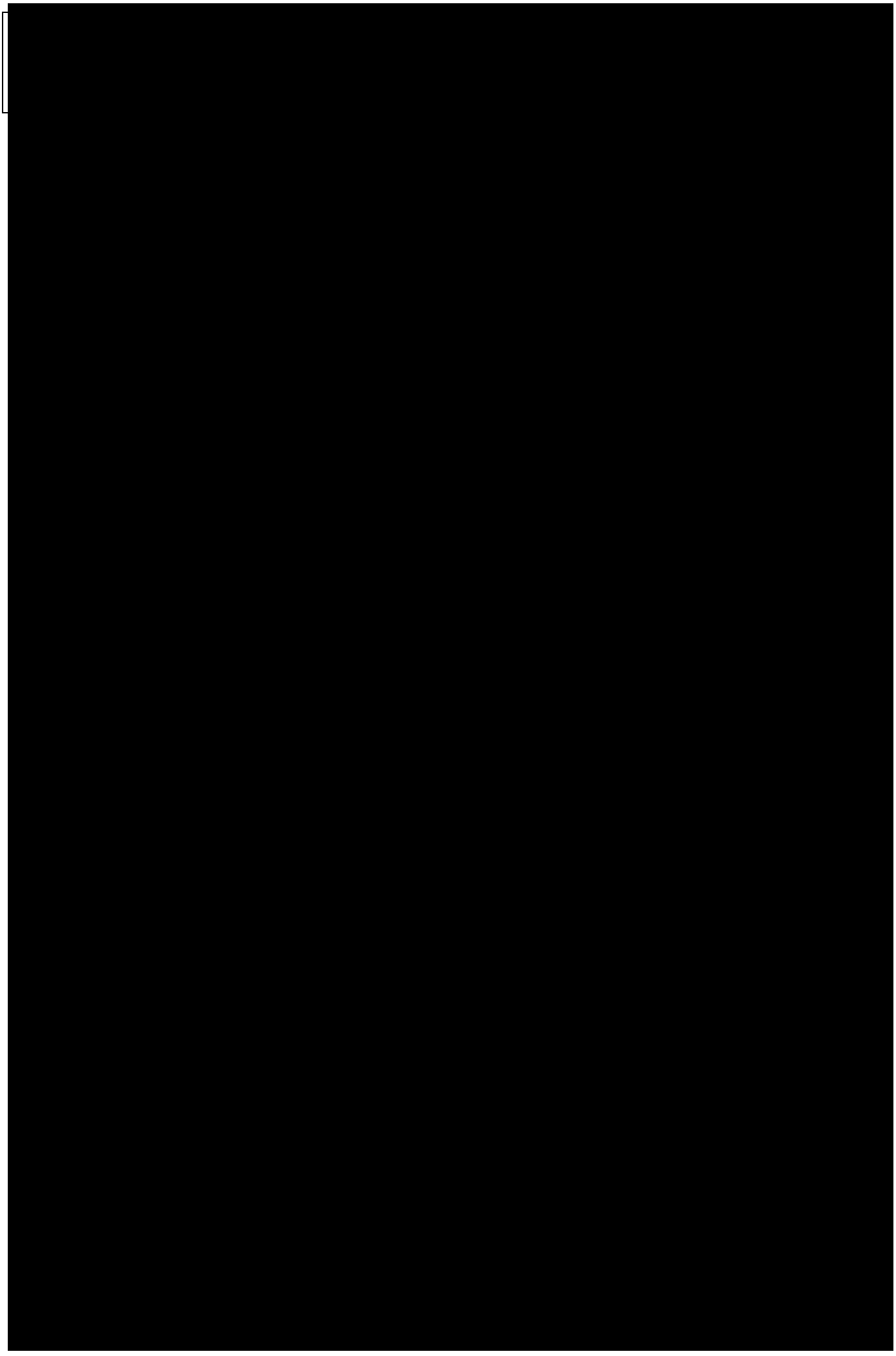


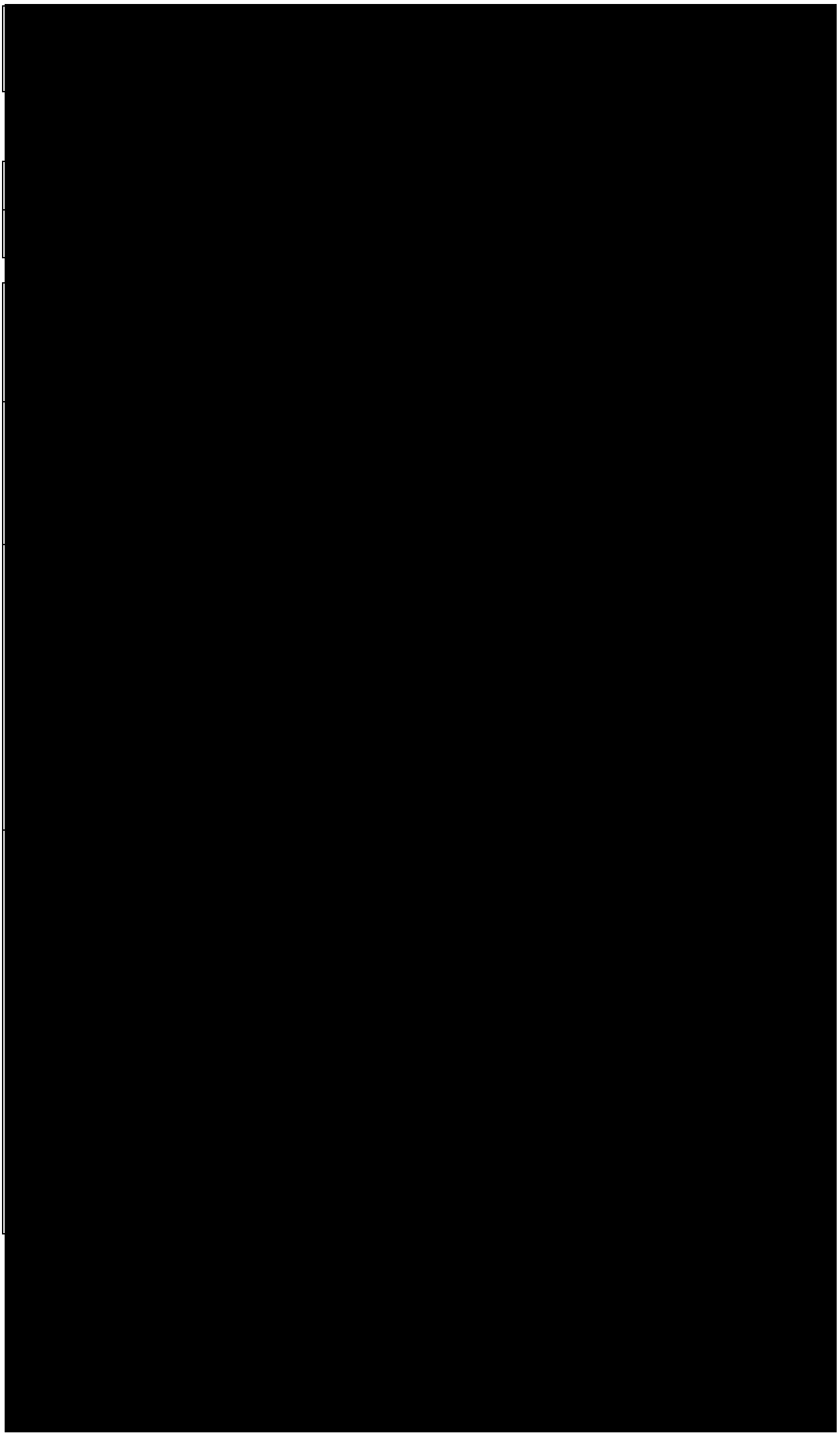


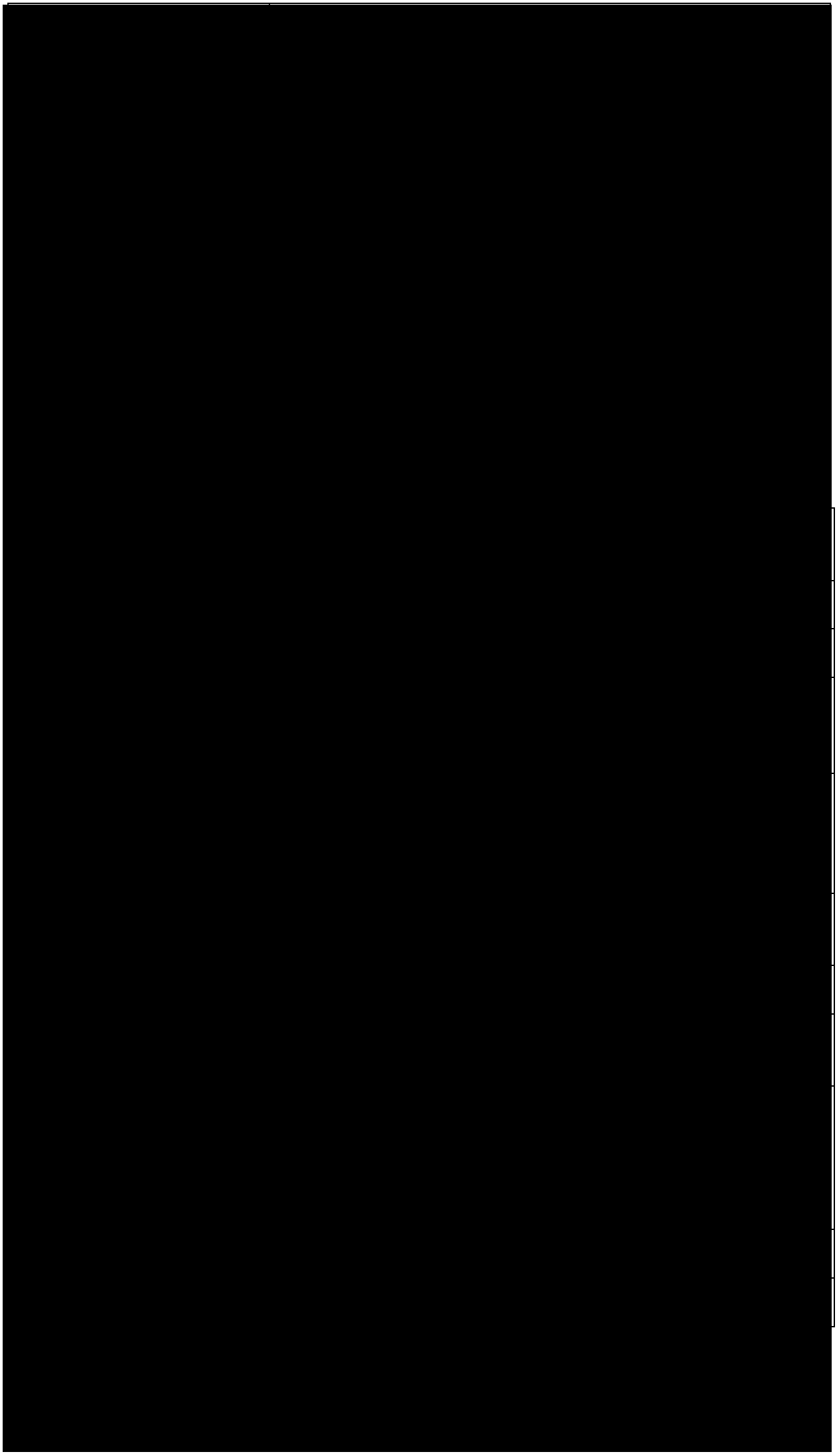


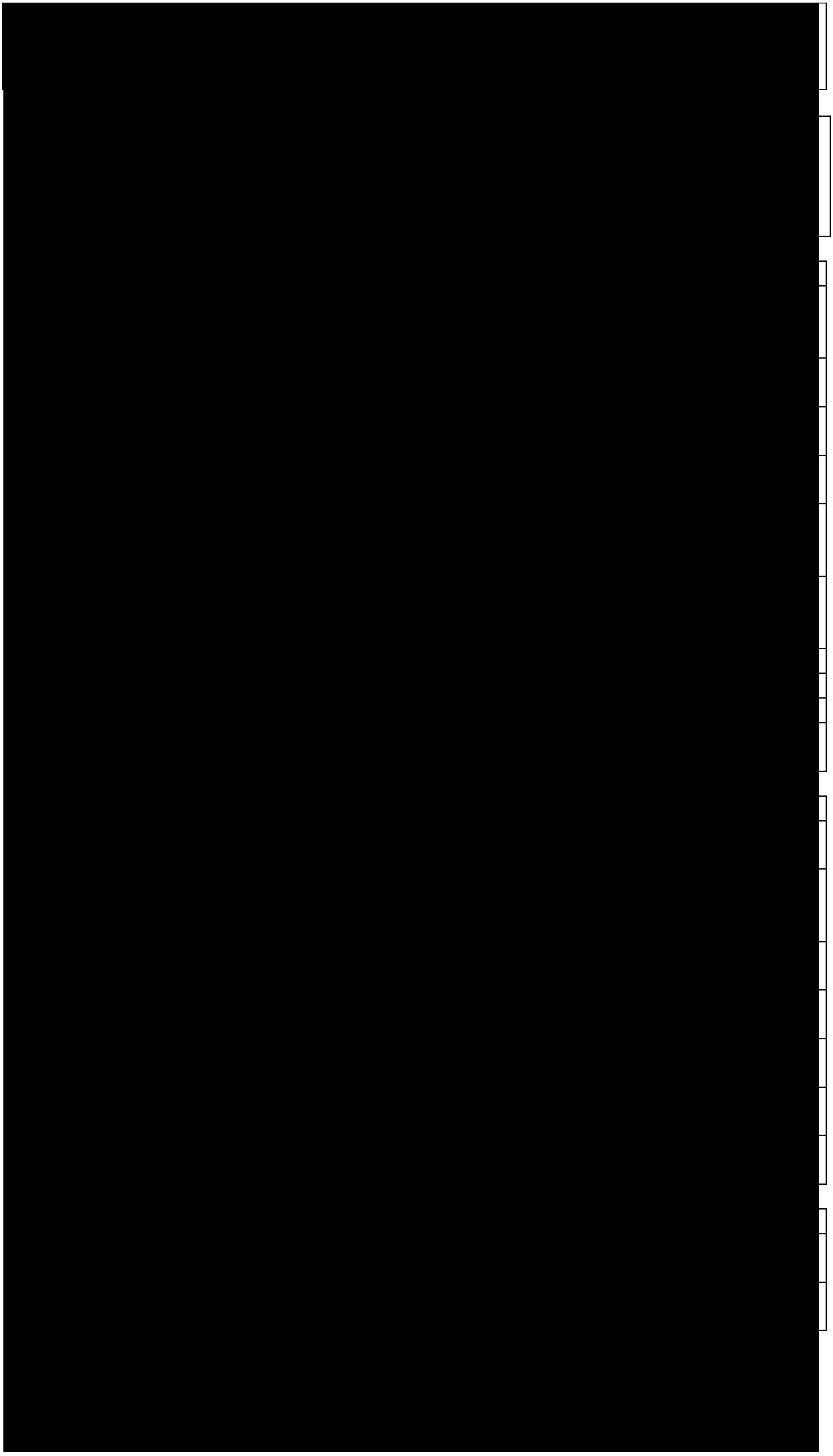


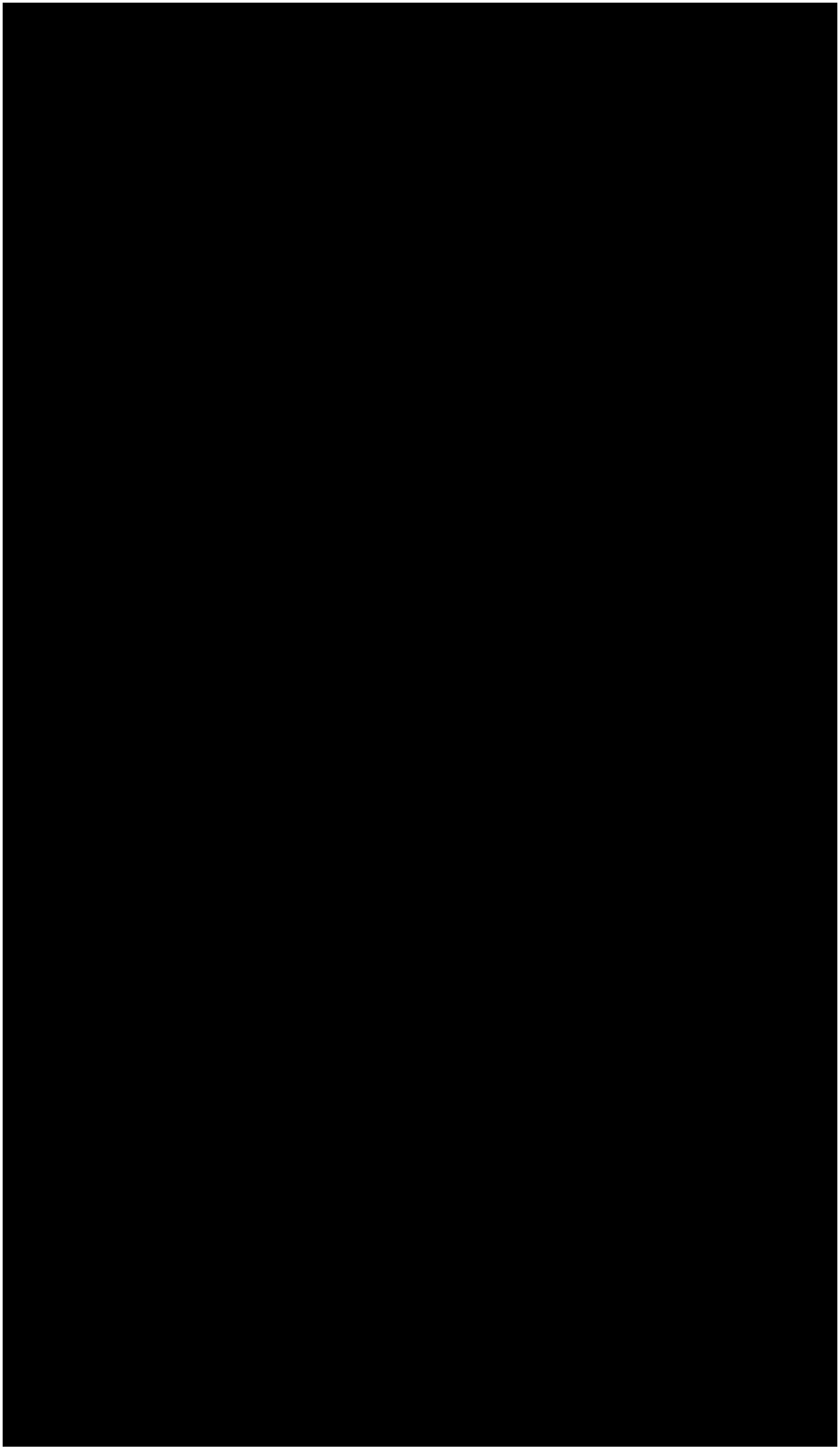


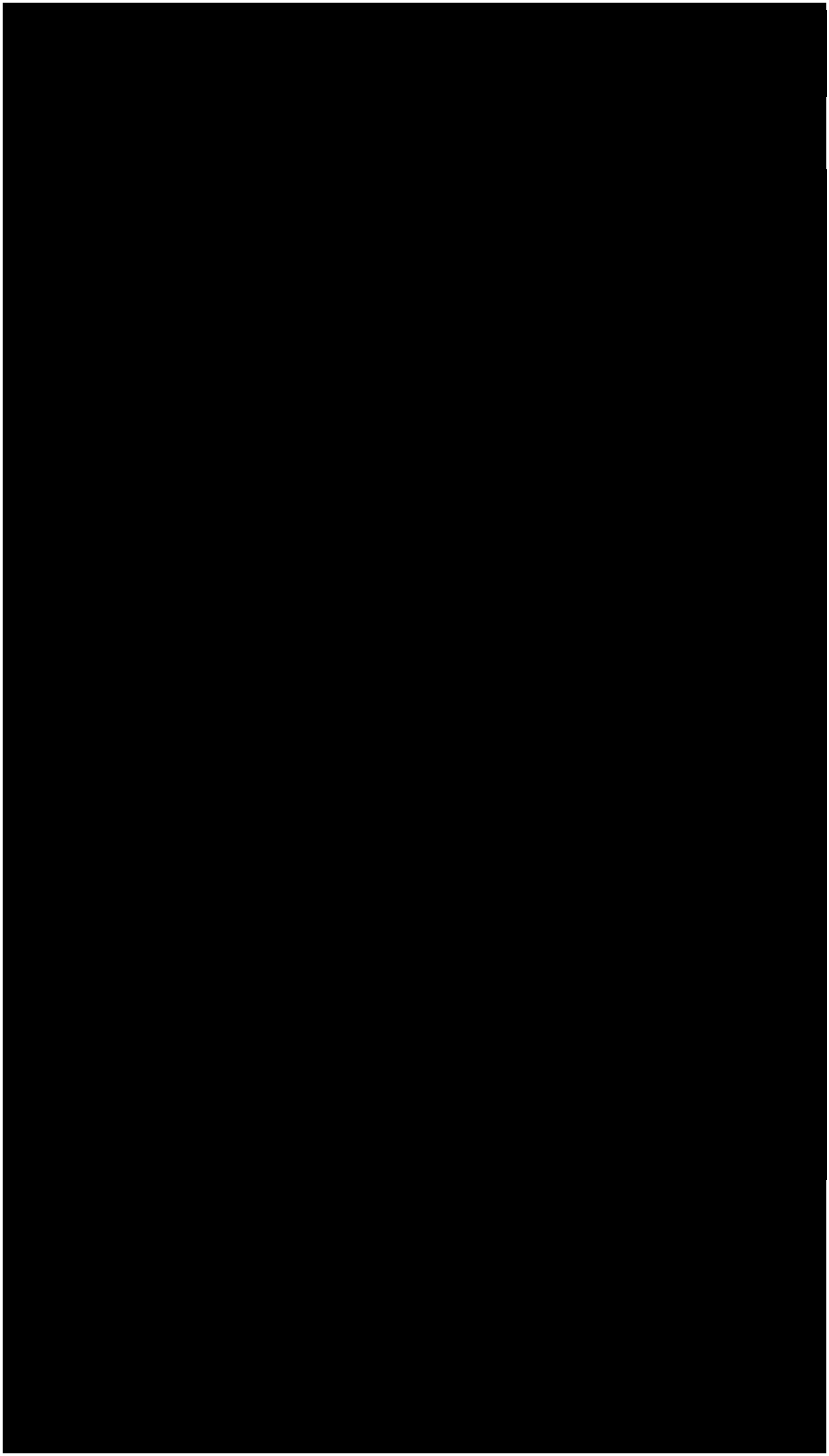


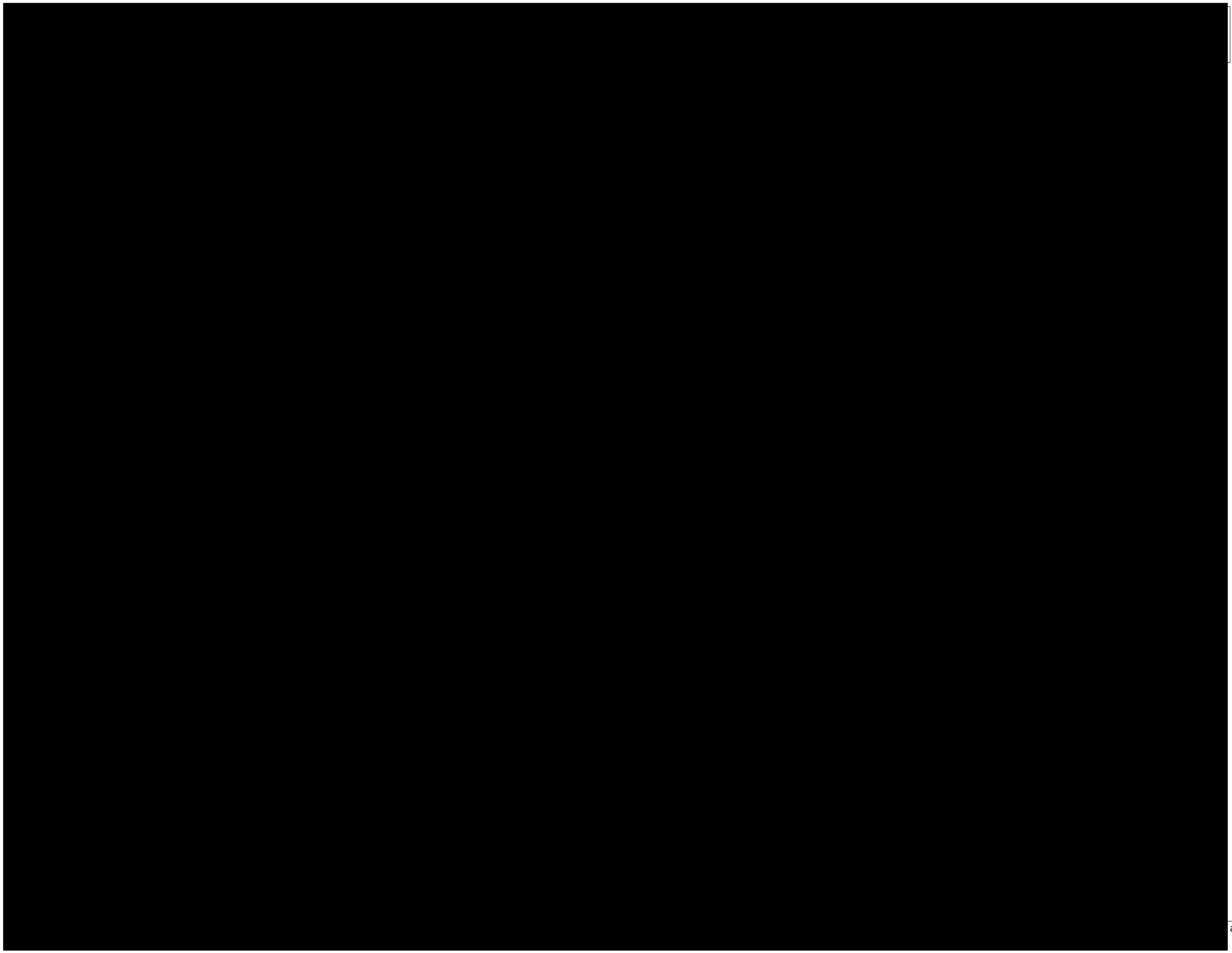


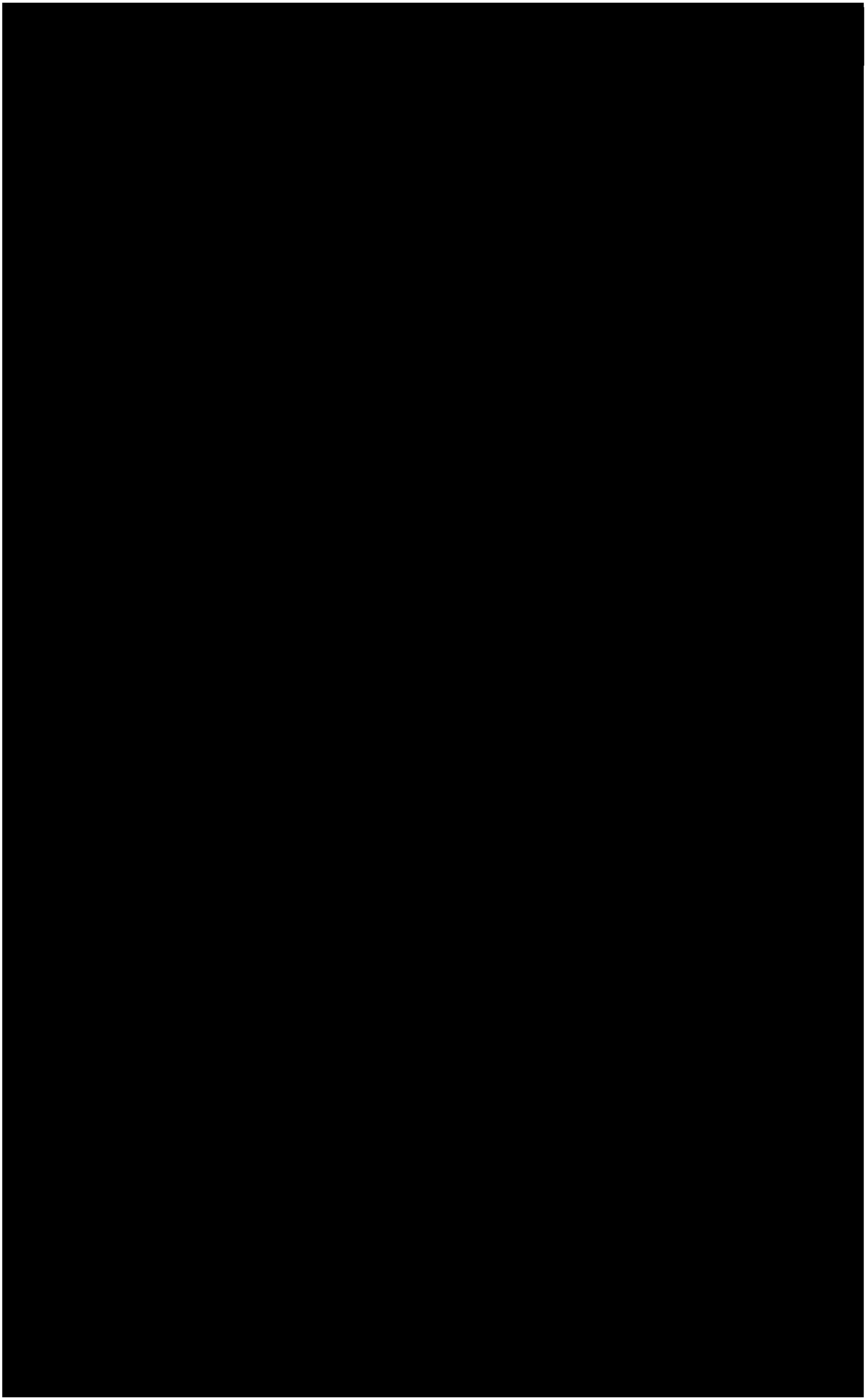


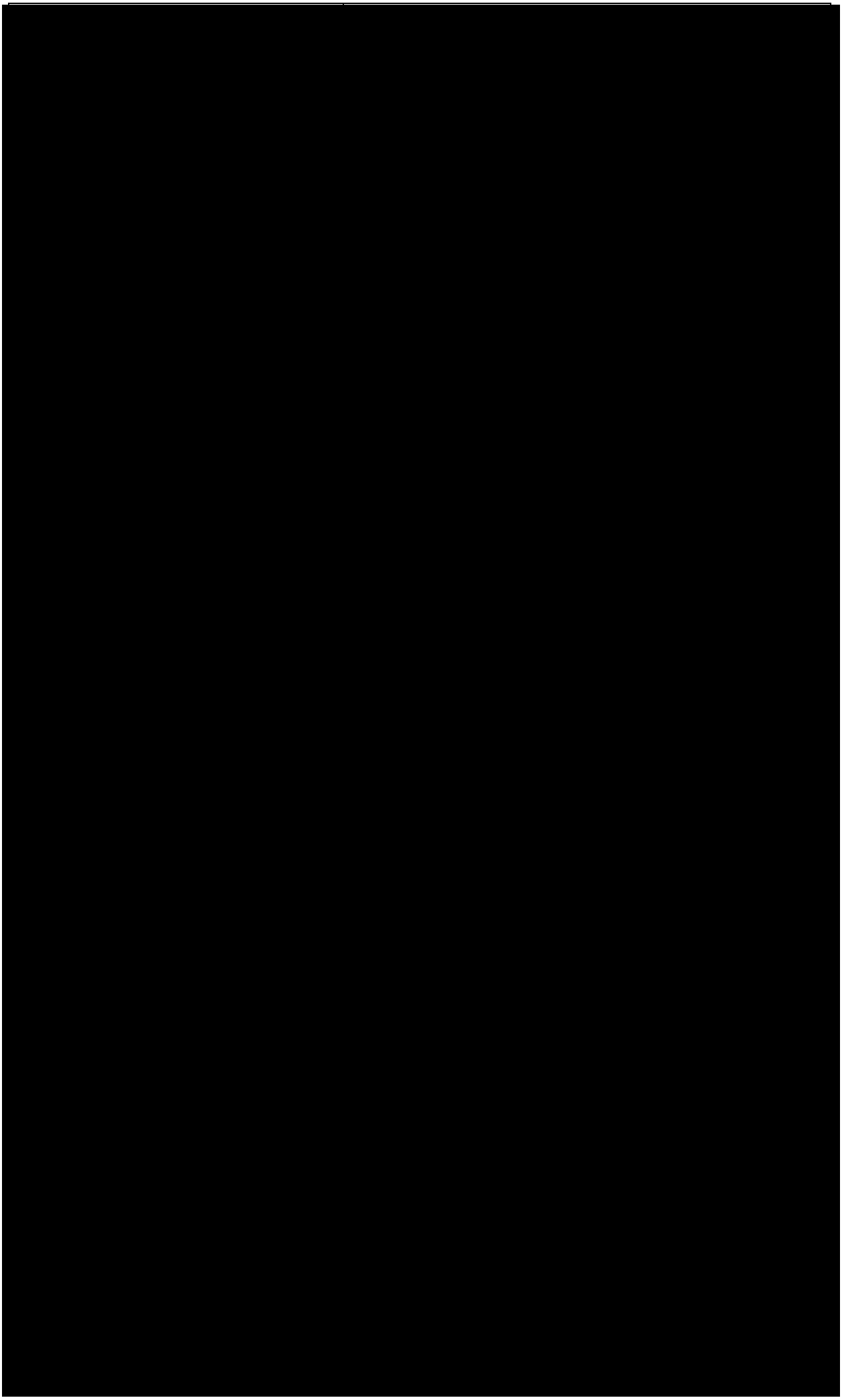


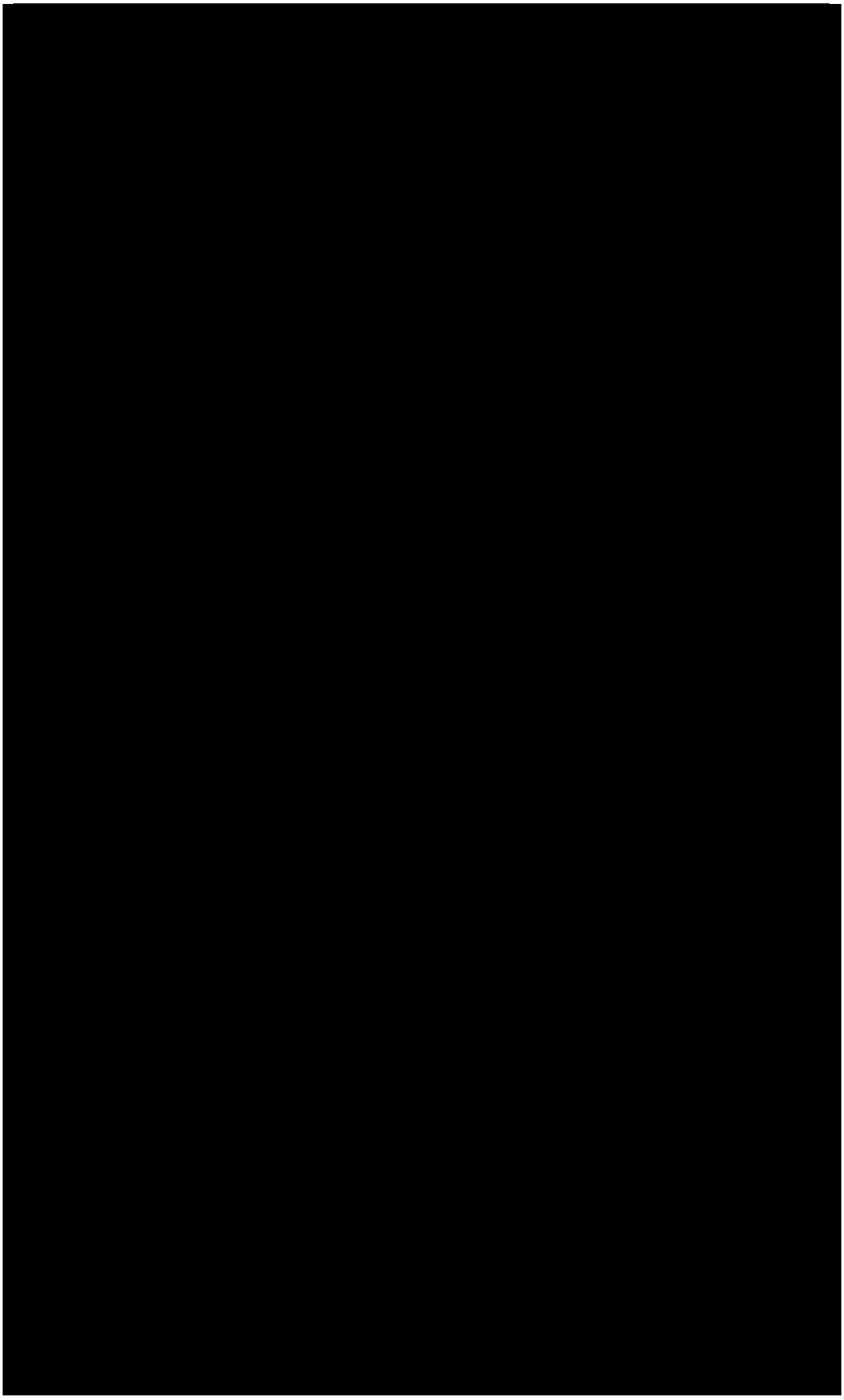


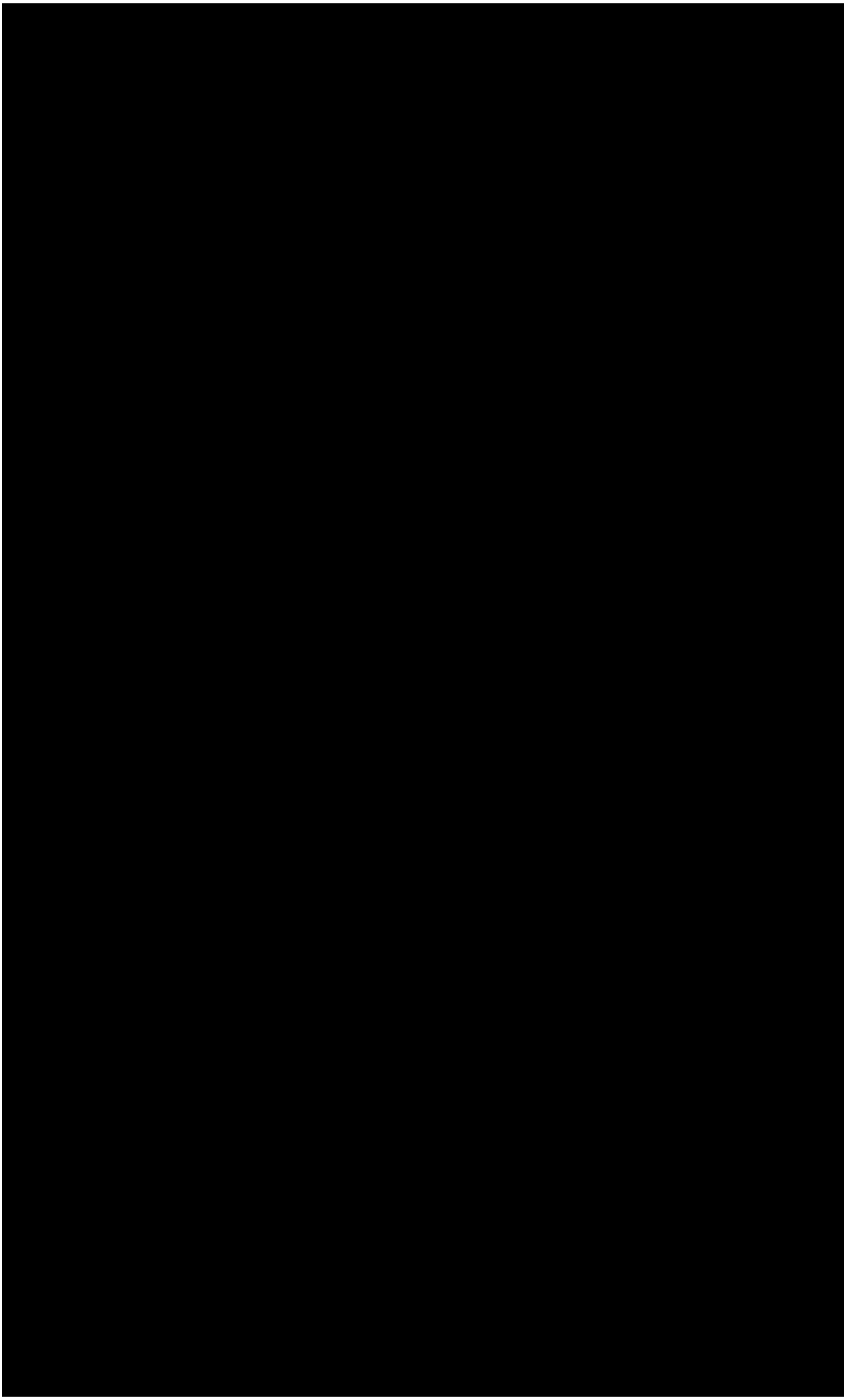


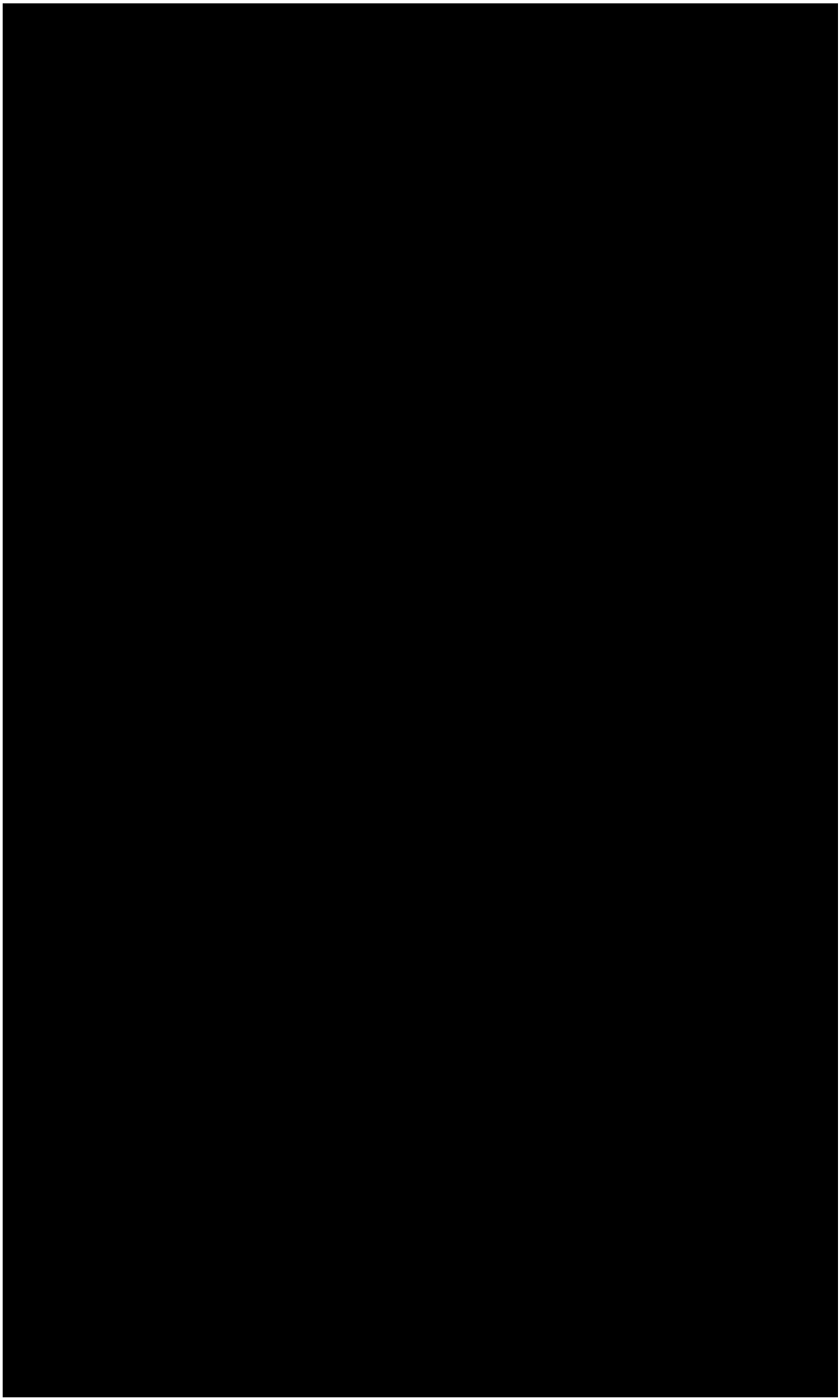


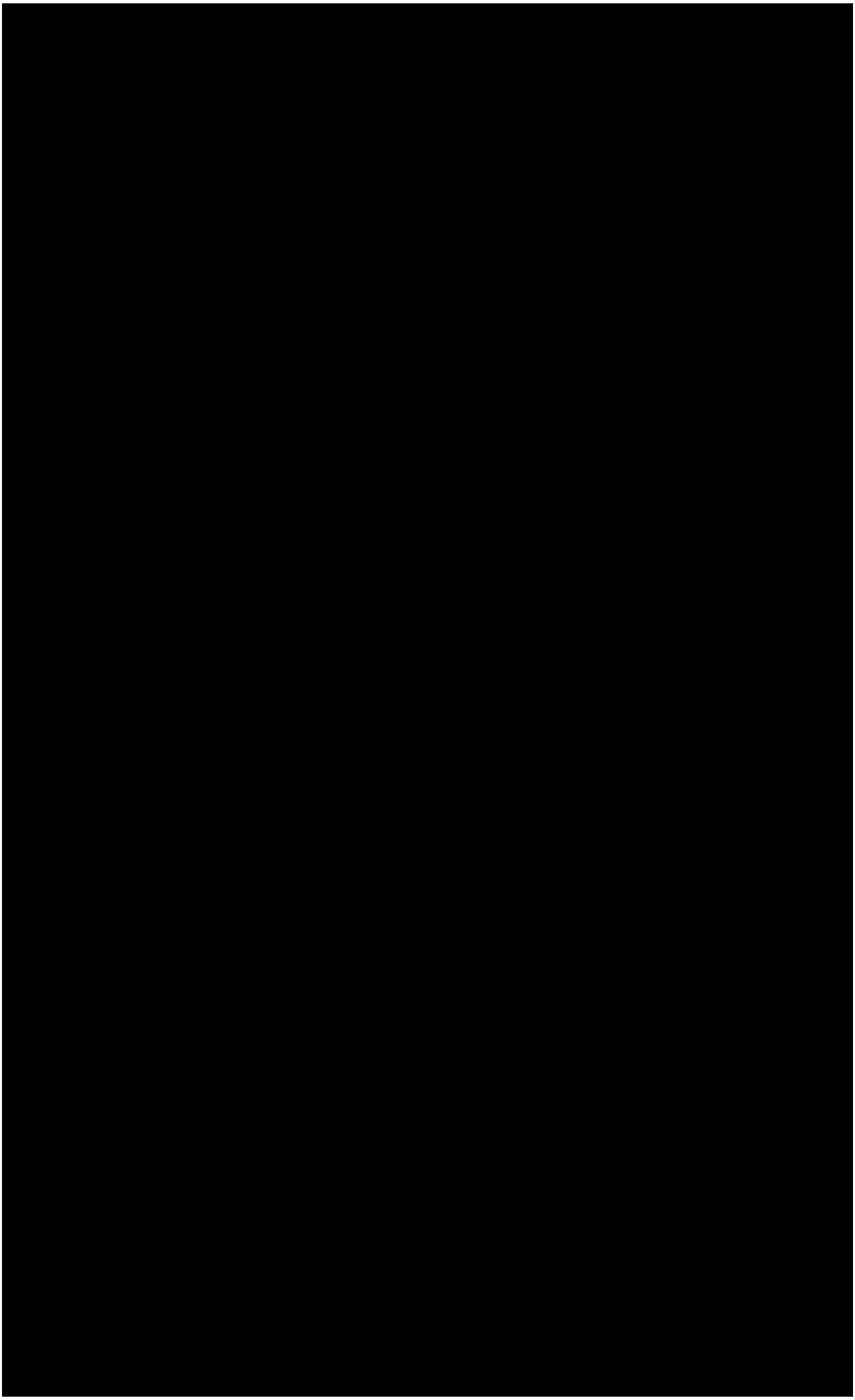


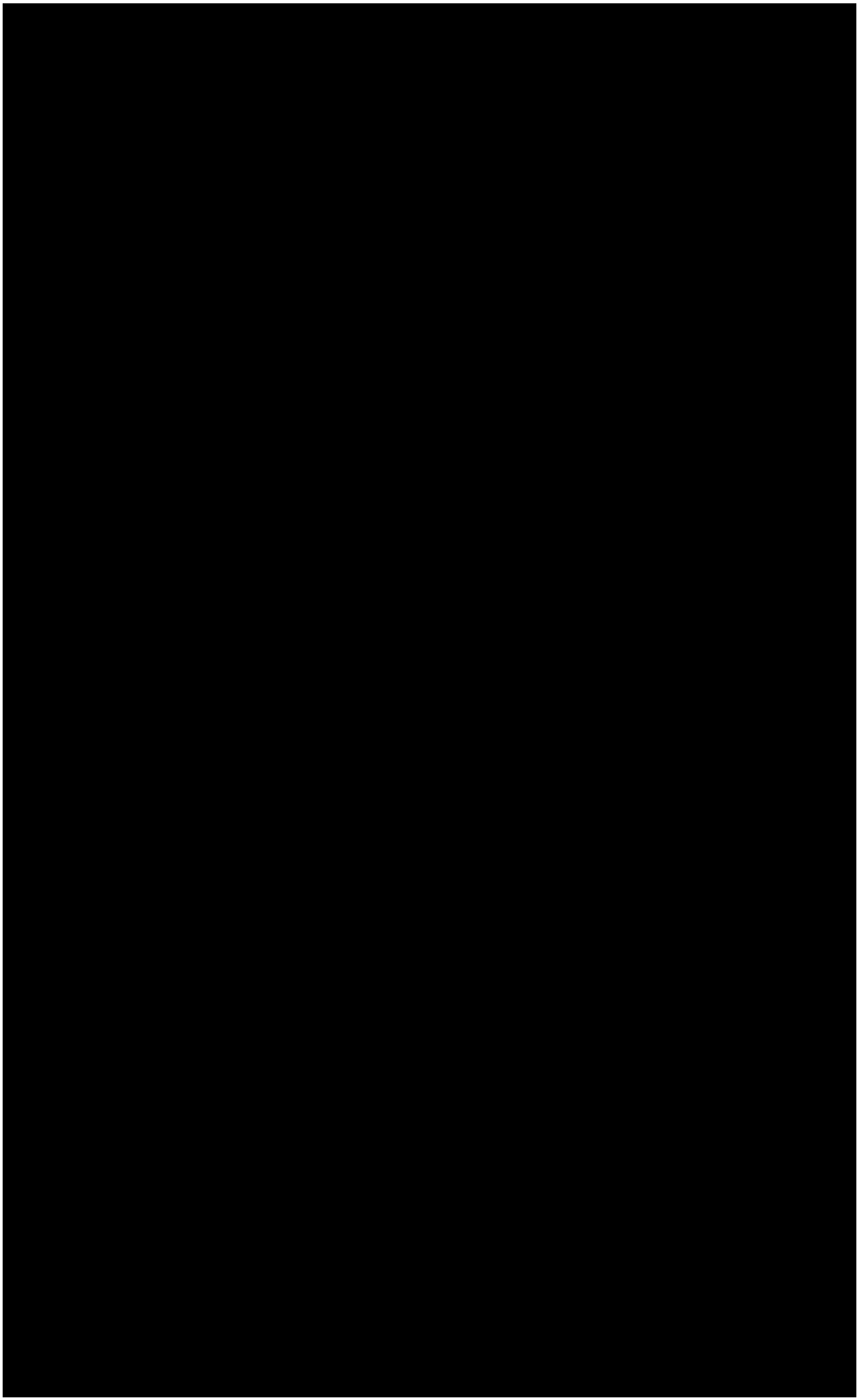


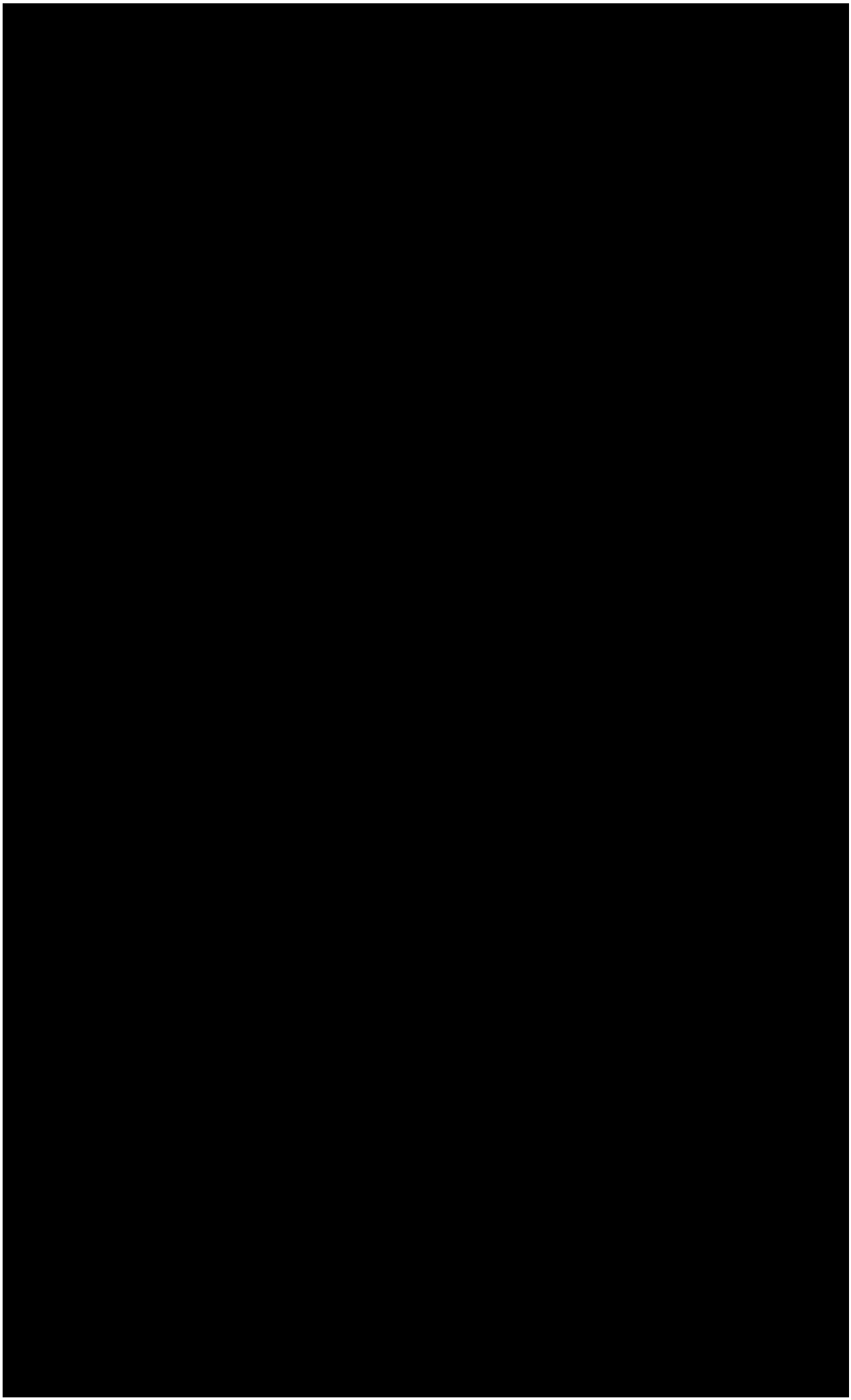


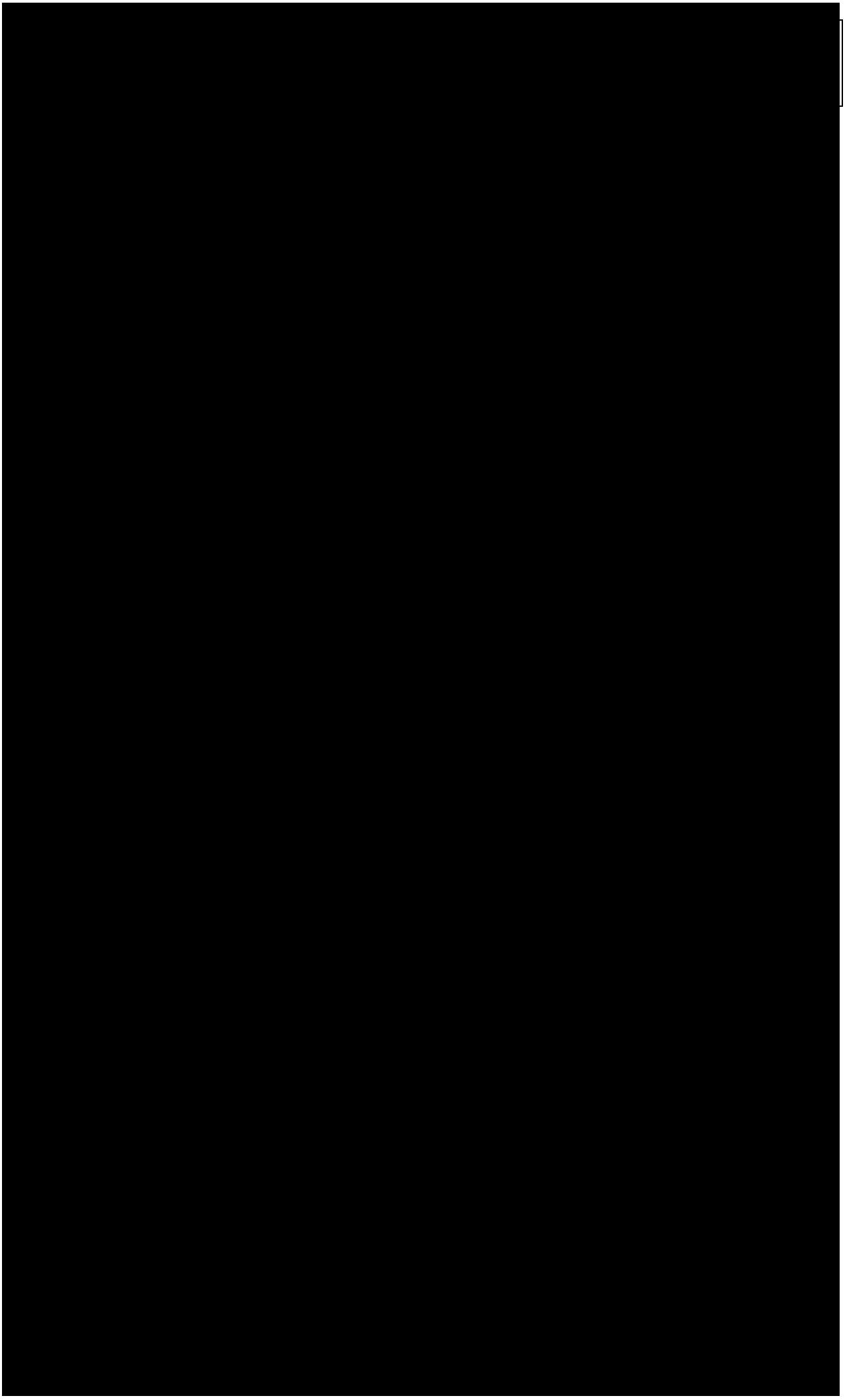


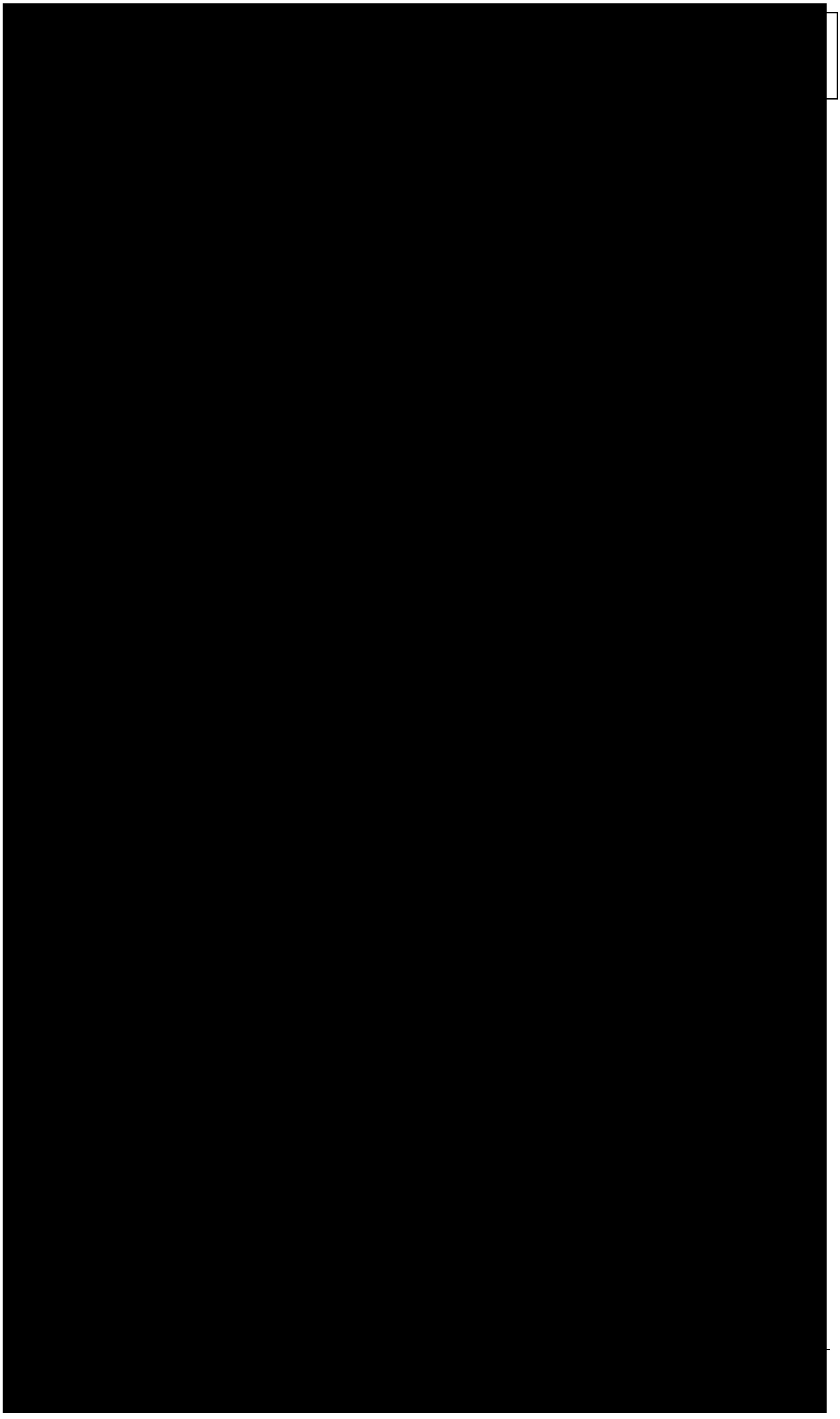


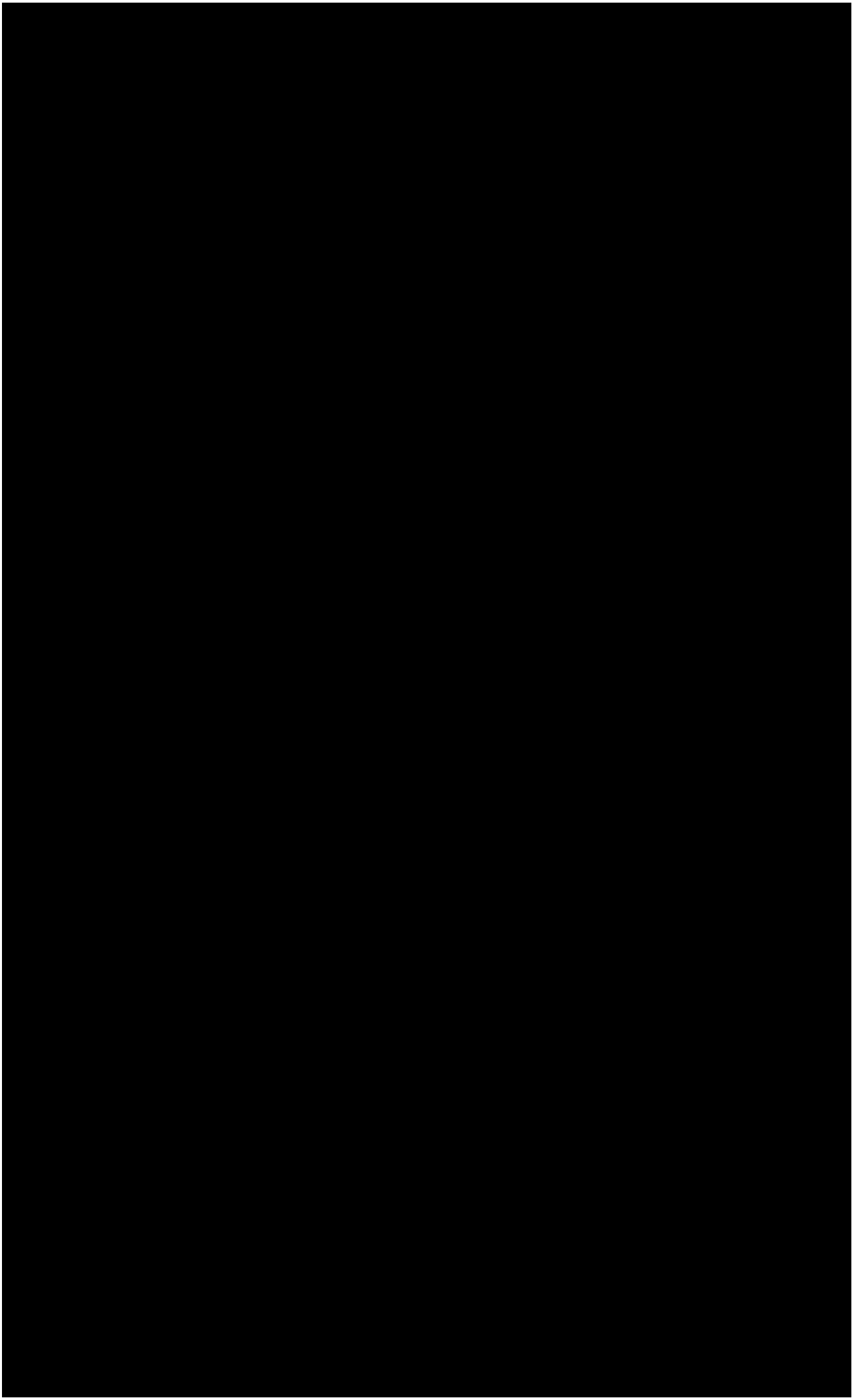


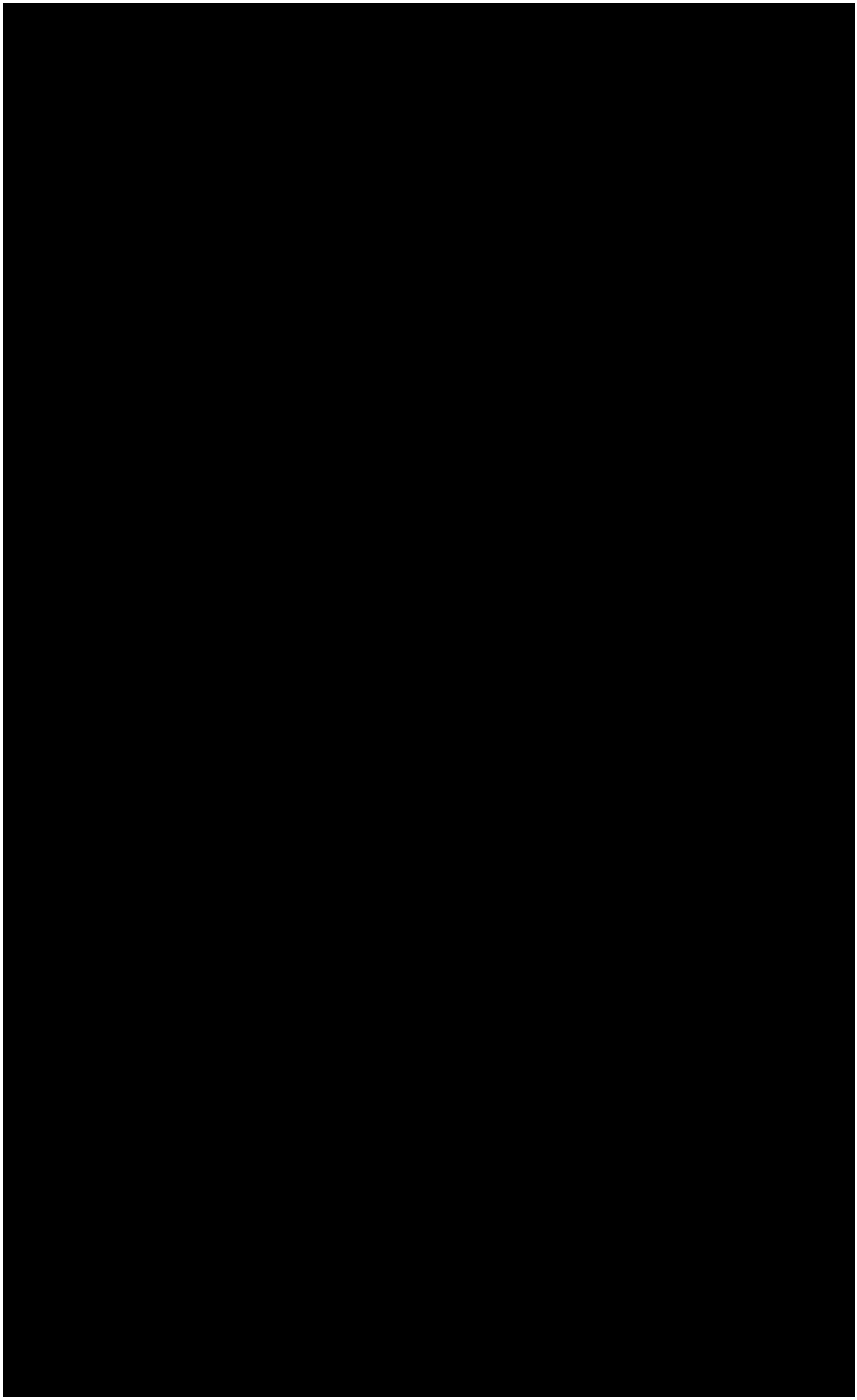


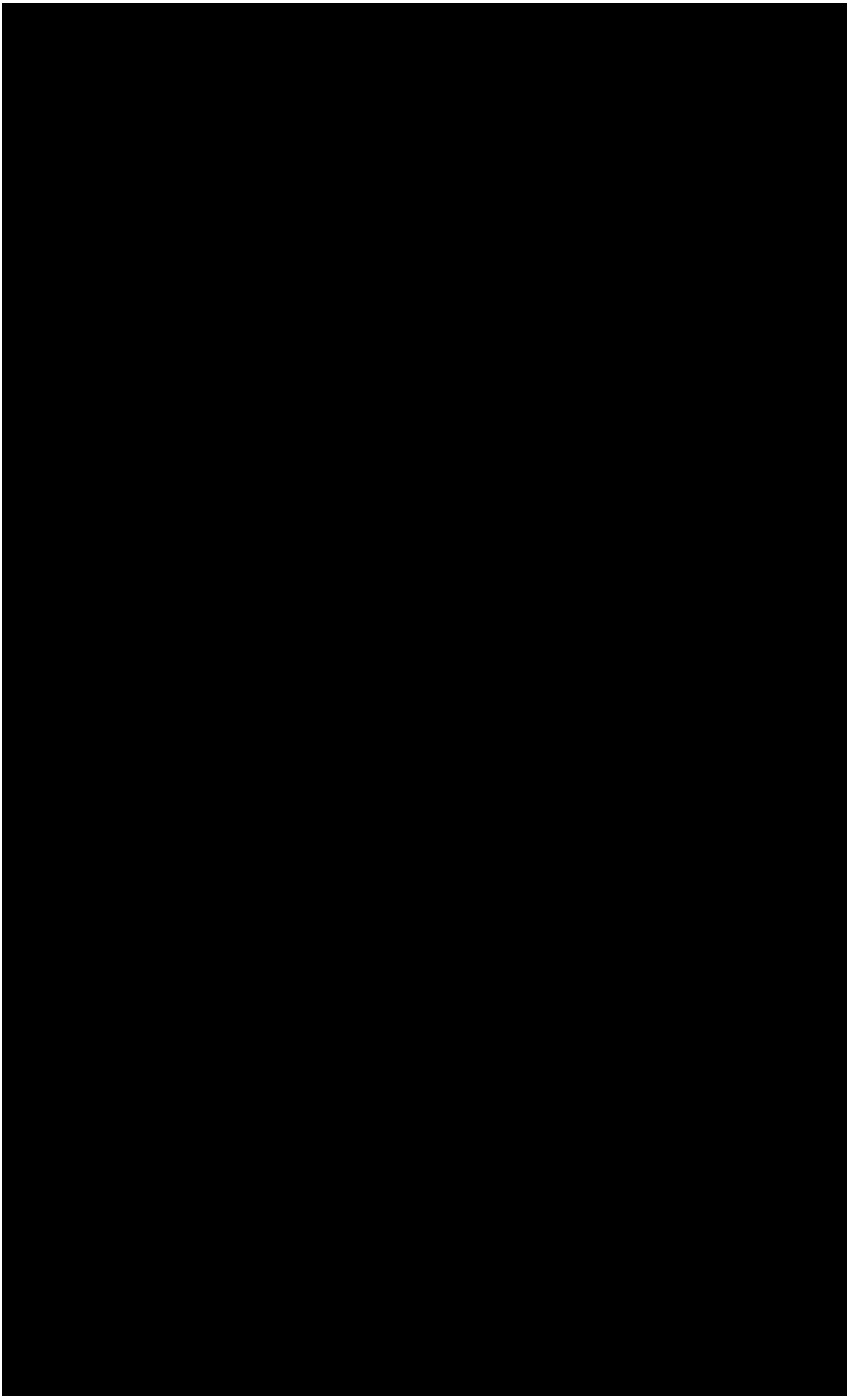


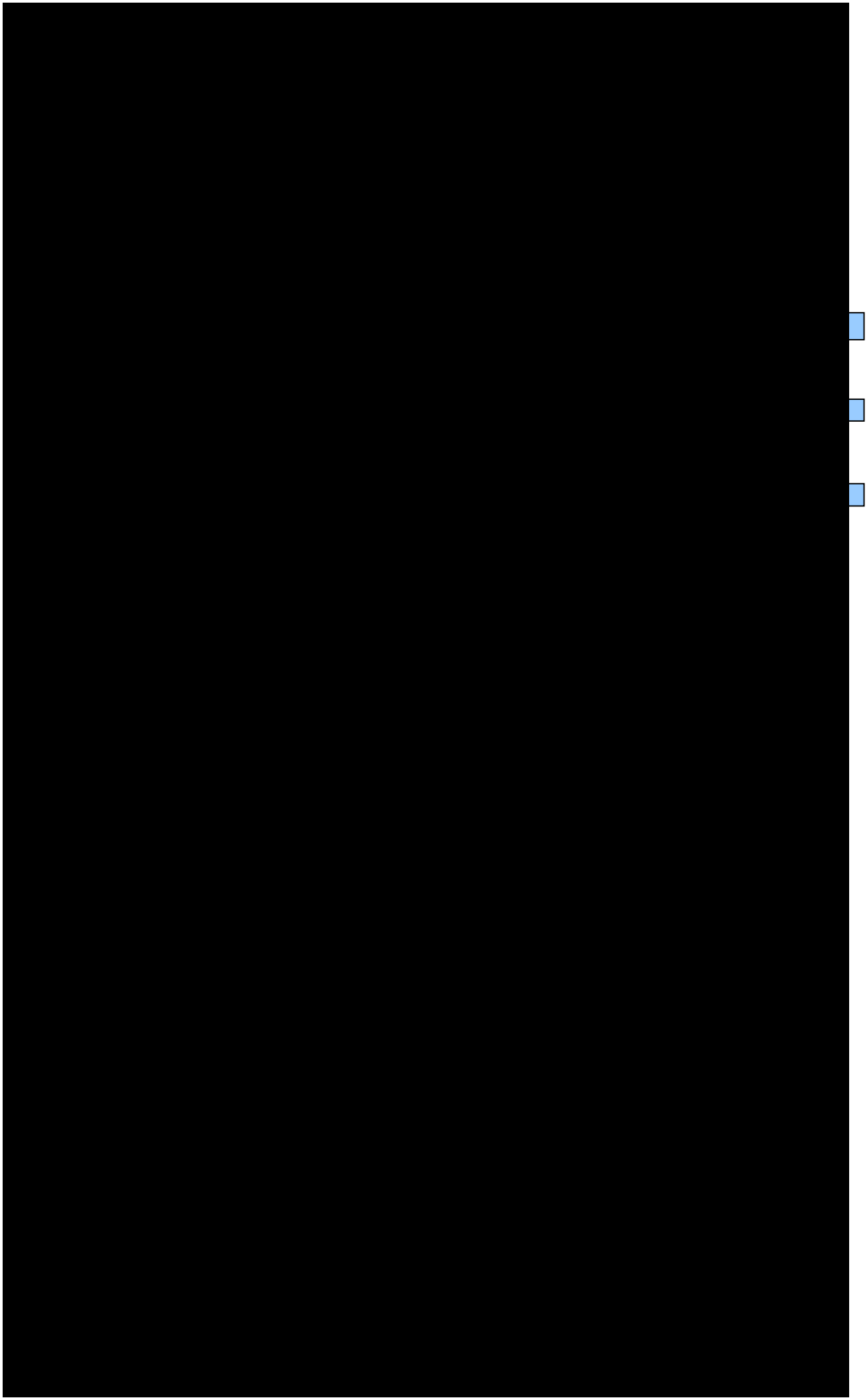


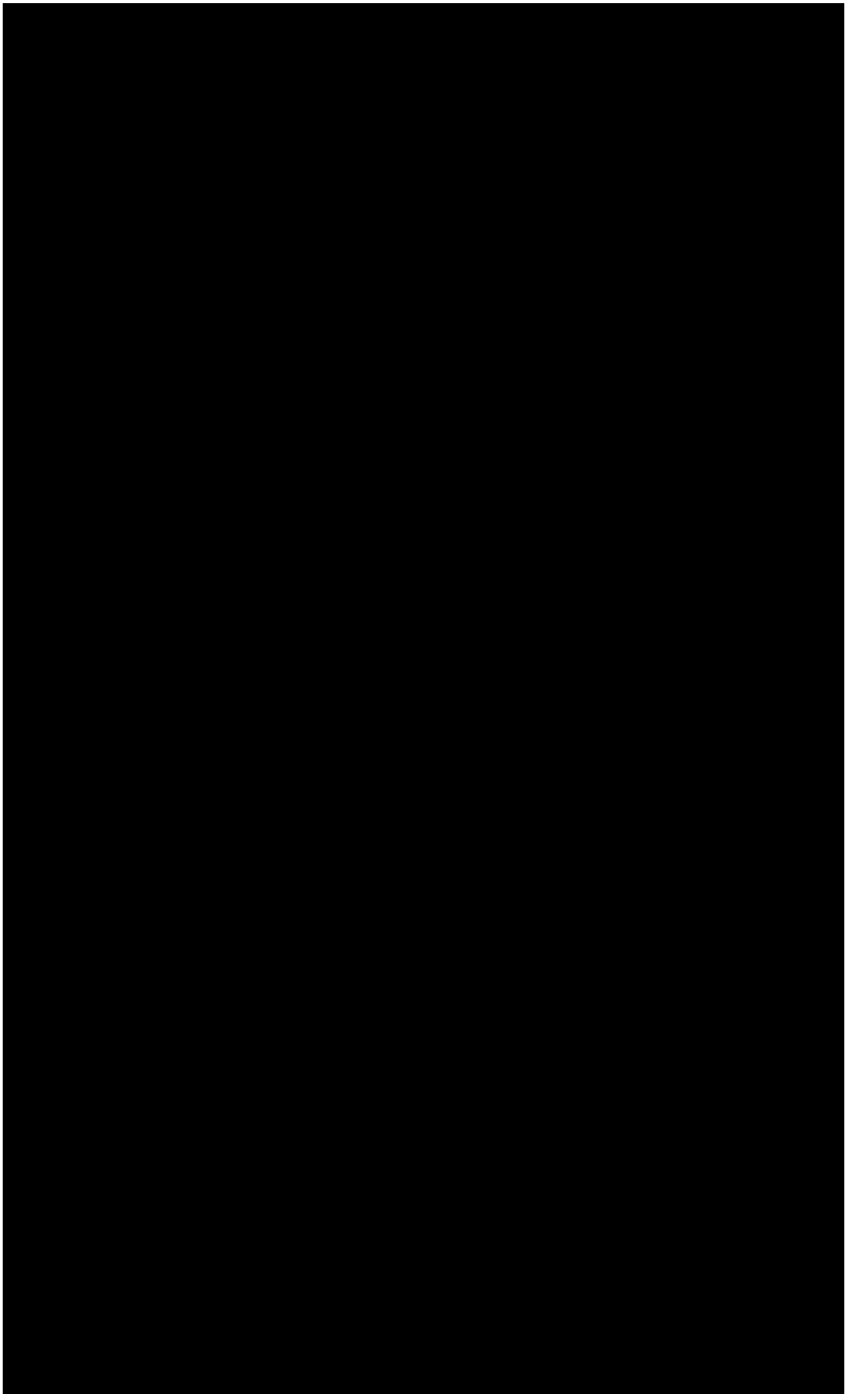


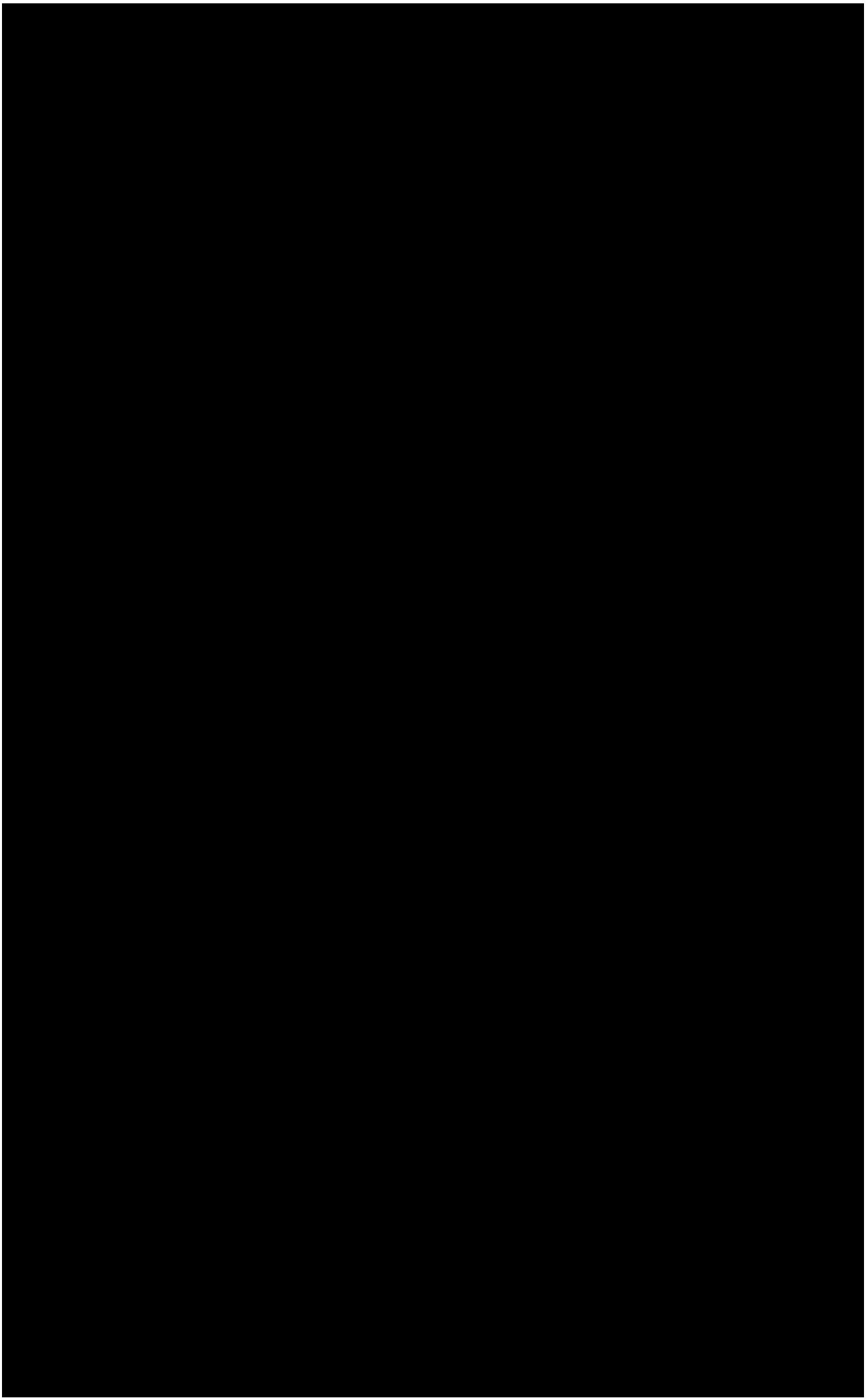


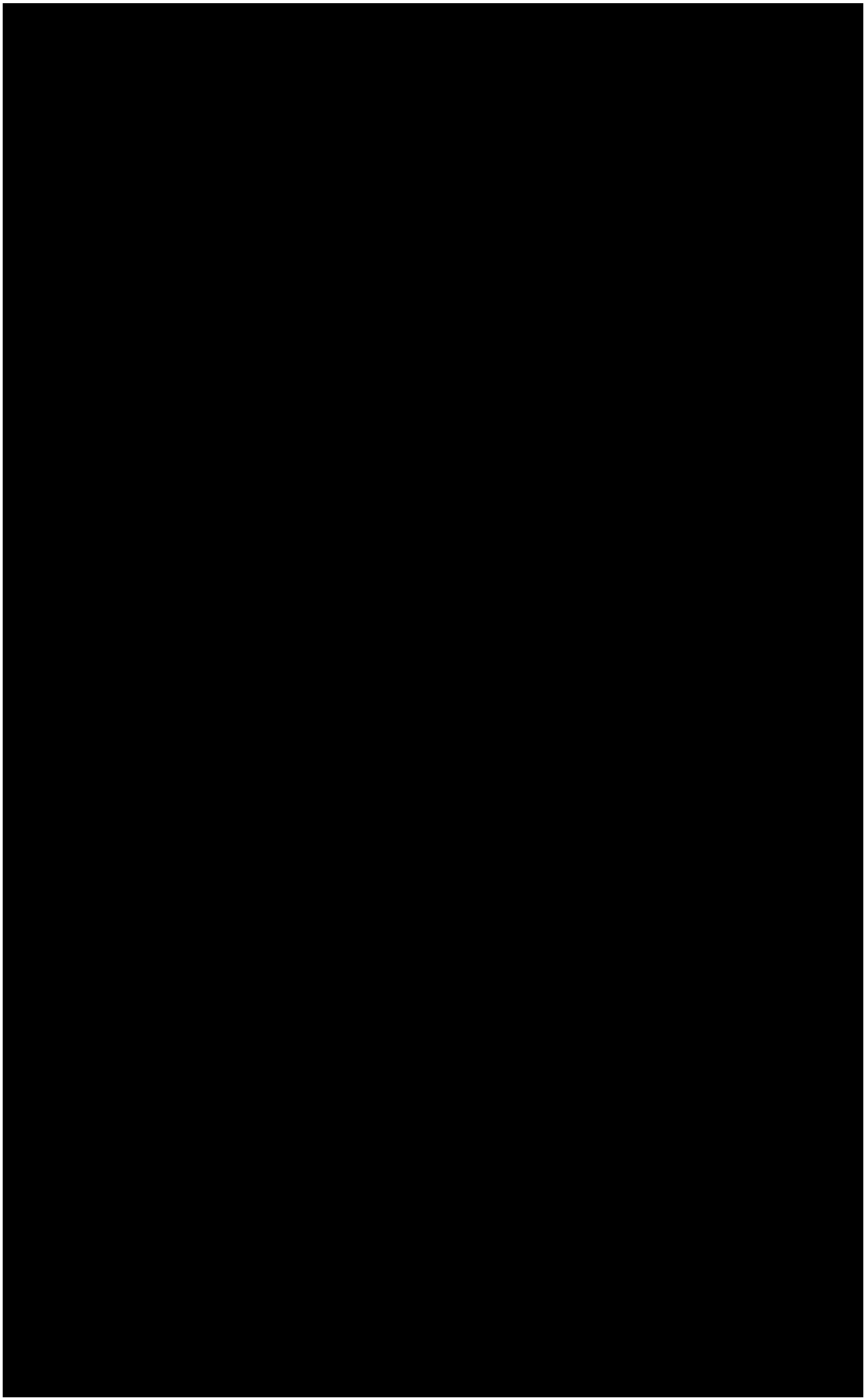


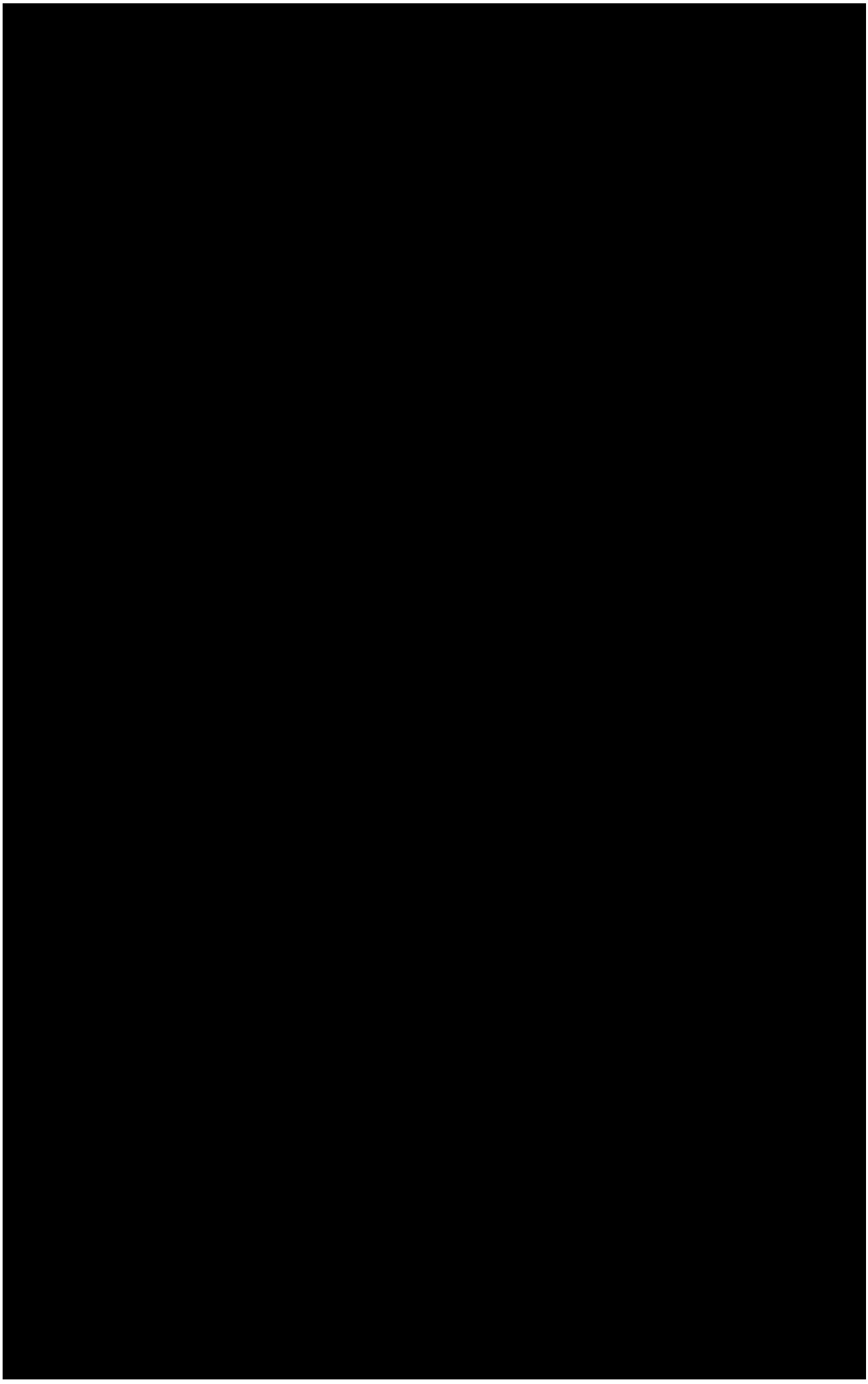


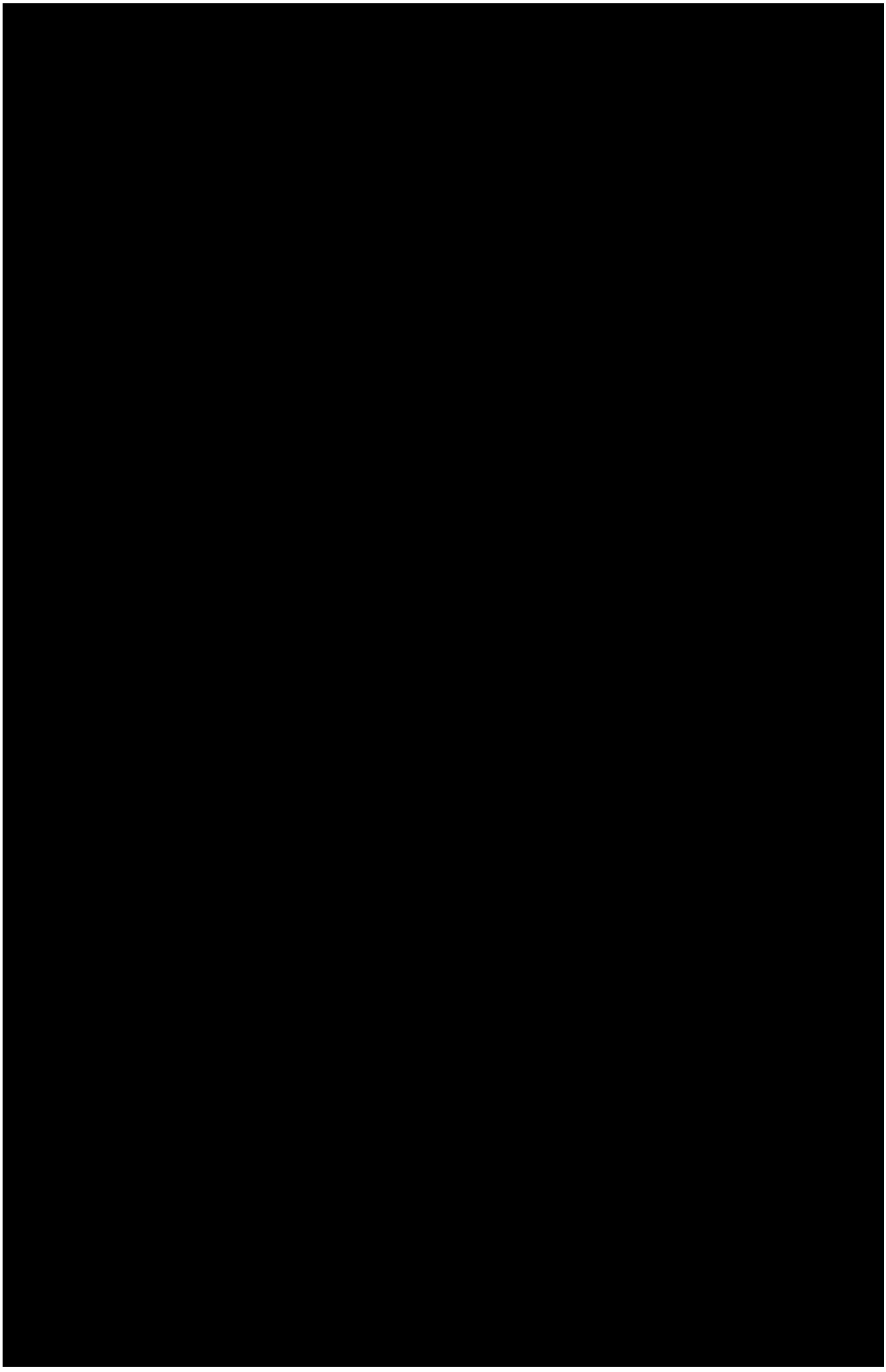


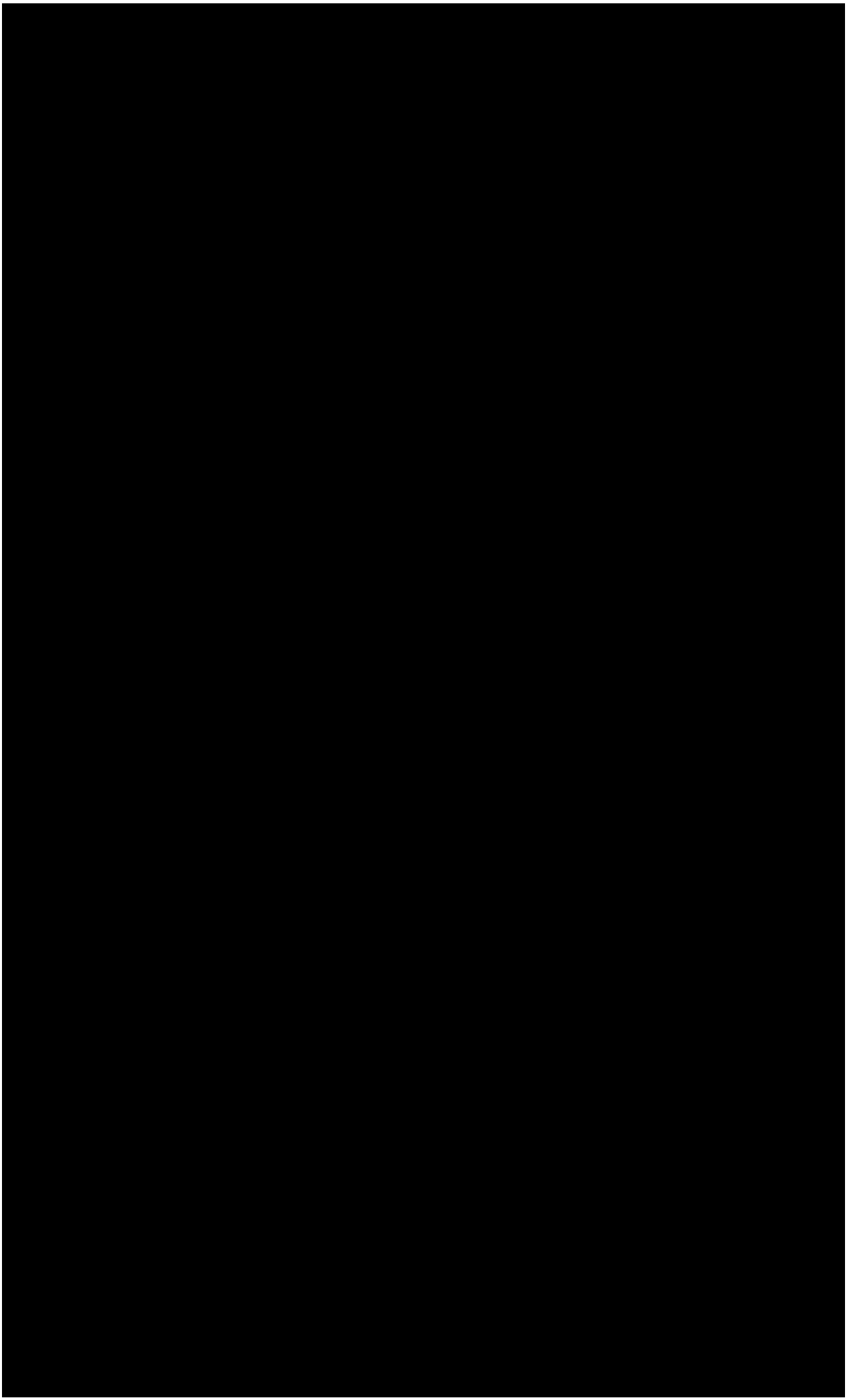


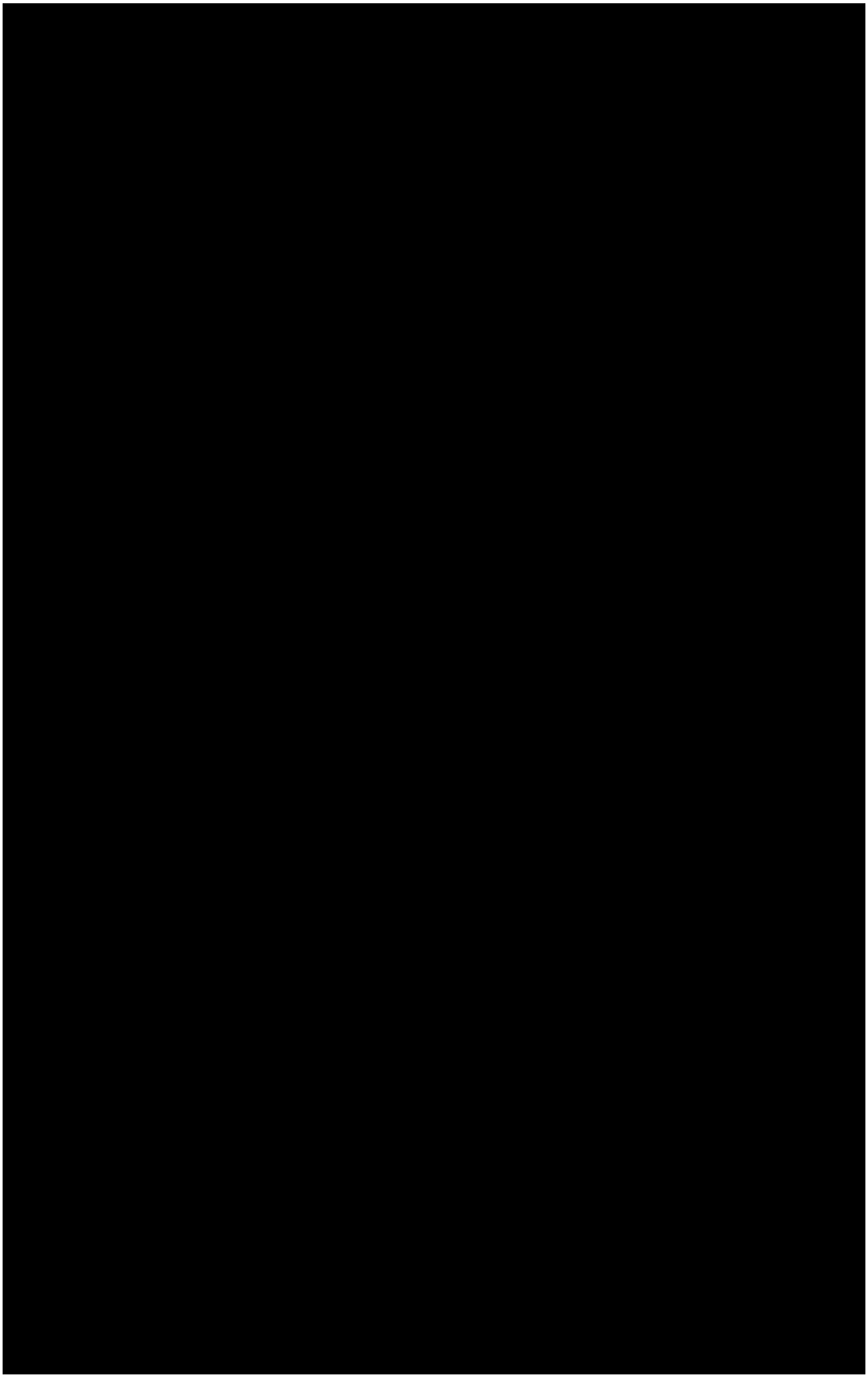


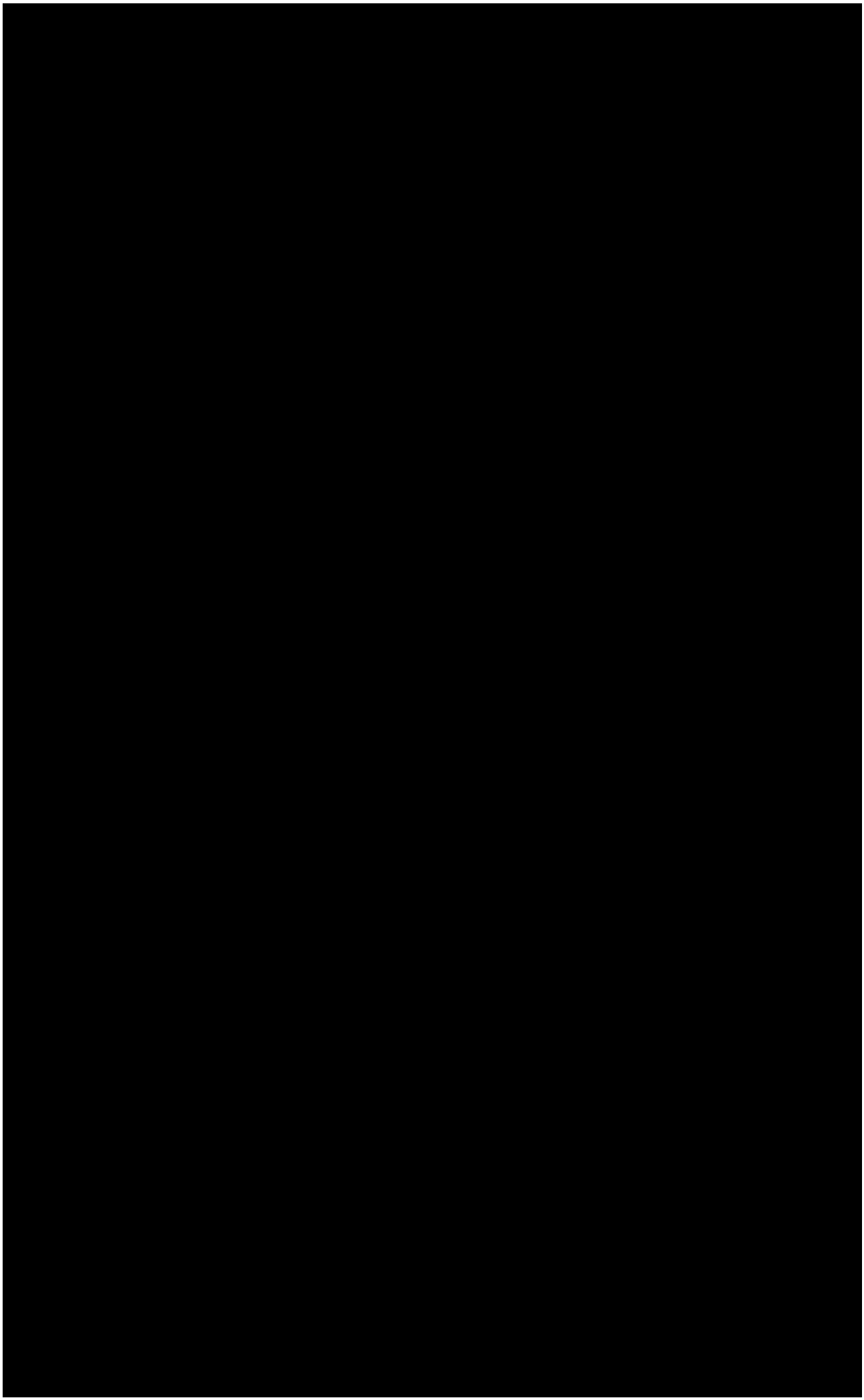


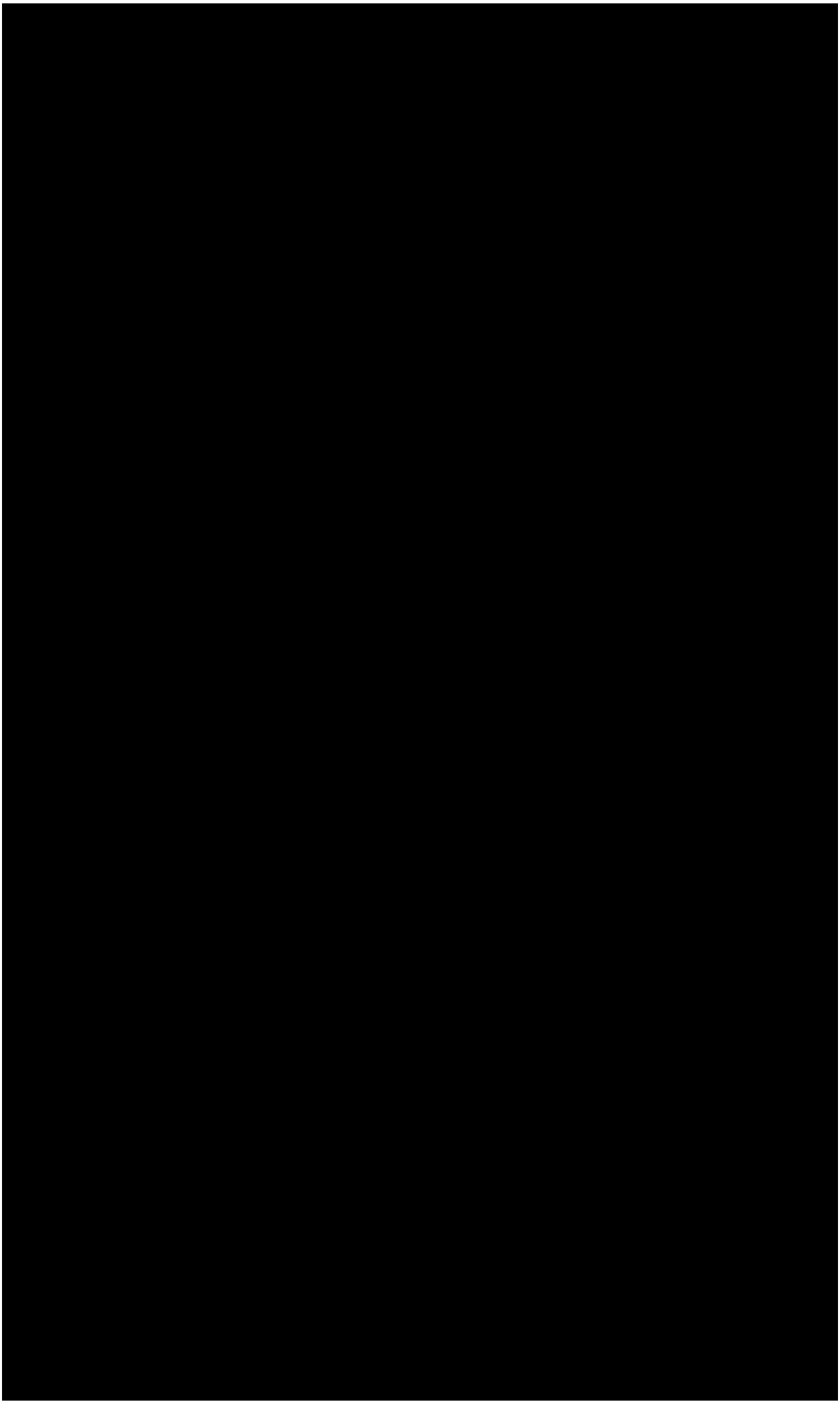












Anglian Water Services Ltd
Lancaster House
Lancaster Way
Ermine Business Park
Huntingdon
Cambs.
PE29 6XU

Tel: [redacted]

Our ref. n/a

Your ref.

[redacted]
Area 1A
Nobel House
17 Smith Square
London
SW1P 3JR

09 March 2022

Dear [redacted]

Regulation 31 Events – Information Request.

Further to your request, dated 23 February 2022, please find our responses below and attached appendices. I have copied the relevant sections from your letter in black below with our responses in blue.

1. For Diddington, Hannington, and Pitsford events please can a copy of the original Materials in Contact form please be provided?

Attached in Appendix 1 are the requested copies of the Materials in Contact (MIC) forms which relate to the events reported to the Inspectorate at Diddington, Hannington and Pitsford.

The form for Hannington Reservoir includes details of the fittings, pipes and materials utilised during the works within both Reservoir 1A and 1B and the wider engineering work at the site in relation to the mains being laid as part of the scheme.

During our investigation we have identified that whilst Hannington Reservoir 1A was been filled on 15 and 16 April 2016, to enable MIC sampling to be undertaken. When the reservoir had filled we were unable to close the inlet valve resulting in between 50-100l/s passing through the overflow. To prevent the washout water, flooding the area around the site, the Operational Management Centre (OMC) were contacted requesting the permission to put the reservoir into supply. The Operation Control Manager (OCM) discussed this issue with the standby Water Quality Scientist and the Regional Water Quality Scientist. It was agreed to return Hannington Res 1A into supply once satisfactory onsite quality checks and MIC Samples had been taken. Once the reservoir was returned into supply a routine monitoring sample was collected. Reservoir 1A was returned to supply at 23:00 on Saturday 16 April 2016.

We have identified that at this point the MIC form had not been completed, this was carried out on the 18 April 2016. On Wednesday the 20 April further attempts were made to close the inlet valve which were successful and the reservoir was isolated from supply. Additional MIC sampling was undertaken before the MIC form was signed off and Reservoir 1A was returned to supply on 10 June 2016.

This MIC form also applies to the works undertaken within Reservoir 1B, where the required MIC samples were undertaken on the 01 February 2017, prior to being returned to supply on

07 February. These samples should have been recorded and the results signed off by a water quality scientist on the MIC form but on this occasion this was not completed.

2. For all four schemes, please can you provide the name and job title and company of the engineer responsible for the inventory of materials used

Listed below are the Project Managers for the respective engineering schemed as requested.

Diddington Reservoir :- [redacted]Project Manager, Anglian Water
Hannington Reservoir :- [redacted]Project Manager, Anglian Water
Kedington WTW :- [redacted]Project Manager, Skanska
Pitsford WTW :- [redacted]Project Manager, Sweco

3. For all four schemes, please can you provide the name and job title of the water quality scientist responsible for approving the materials used, checking sample results, and signing off the MIC forms

Listed below are the water quality scientists for the respective engineering schemed as requested.

Diddington Reservoir :- [redacted]Risk Scientist, Anglian Water
Hannington Reservoir :- [redacted]Risk Scientist, Anglian Water
Kedington WTW :- [redacted]Risk Scientist, Anglian Water
Pitsford WTW :- Linda Featley, Risk Scientist (retired)

4. Please provide any on-site taste and odour records and details of any unusual taste/odour detections (from operational visits) at all the affected assets

Provided in Appendix 2 are the onsite taste and odour records for Pitsford WTW covering the period 01 August 2017 to 12 December 2021.

Provided in Appendix 3 are the onsite taste and odour records from Boyton Hall Reservoir. Kedington WTW Final Water sample point is a blend of water from Kedington WTW and Great Wratting WTW. The sample point is located at the inlet to Boyton Hall Reservoirs, and the onsite taste and odour records are from the reservoir. The onsite assessment of the water at this location includes the supply from Kedington WTW, when in supply.

5. Please provide any operational sample results from the affected assets while they were in supply (all assets)

The details of the operational water quality sampling undertaken at each asset whilst they were in supply can be found in the attached spreadsheet Appendix 4.

Within the operational sample data from Pitsford WTW there are 20 samples for trace organics. Two trace organic samples detected compounds at very low levels as shown in the table below. None of these compounds have been detected in more than one sample over the 5 years.

					Water Profile (µg/l)	Purge & Trap Profile (µg/l)	
Samp.No.	Date	Time	Point Code	Point Name	Nonanal	Isopropyl alcohol	Formamide
18074647	19/02/2018	09:20	W01PTW1CN	PITSFORD WTW FINAL	No Compounds Detected	0.24	Not Detected
21117577	12/03/2021	07:43	W01PTW1CN	PITSFORD WTW FINAL	0.18	Not Detected	0.18

These compounds were reviewed in the UKWIR Toxicity database. Nonanal is a naturally occurring essential oil, Isopropyl alcohol is used in inks and cosmetics and Formamide is a chloramine which can occur as Pitsford WTW undertakes chloramination of the water. Where SNARLs or taste and odour threshold values have been assessed for these compounds, the levels detected are significantly lower.

6. Provide the results from the trace organics sampling programs implemented whilst the assets remained in supply (Hannington)

The table below contains the details of the trace organics sampling undertaken from Hannington Reservoir 1B as outlined in our 20-day report. The Water Profile analysis is a broad spectrum analysis with lower a degree of accuracy than the Purge and Trap analysis, which provides greater quantification accuracy of any compounds detected.

The samples to date from Hannington Reservoir 1B have identified two compounds, Nonanal, a naturally occurring essential oil not listed on UKWIR Toxicity database and Tridecanol, identified as a best fit in one sample and not listed on UKWIR Toxicity database.

We do not believe that these compounds are related to the small sections of outlet main within the reservoir

					Water Profile (µg/l)		Purge & Trap Profile
Samp.No.	Date	Time	Point Code	Point Name	Nonanal	Tridecanol* best fit	
22024812	20/01/2022	09:20	W01CAJLCR	HANNINGTON NO 1 RES SIDE B	0.14	0.19	No Compounds Detected
22037518	28/01/2022	07:43	W01CAJLCR	HANNINGTON NO 1 RES SIDE B	No Compounds Detected		No Compounds Detected
22055463	03/02/2022	12:38	W01CAJLCR	HANNINGTON NO 1 RES SIDE B	0.10		No Compounds Detected
22063992	09/02/2022	14:23	W01CAJLCR	HANNINGTON NO 1 RES SIDE B	0.12		No Compounds Detected
22072390	15/02/2022	11:36	W01CAJLCR	HANNINGTON NO 1 RES SIDE B	No Compounds Detected		No Compounds Detected
22080244	21/02/2022	08:37	W01CAJLCR	HANNINGTON NO 1 RES SIDE B	No Compounds Detected		No Compounds Detected

7. Please provide a summary of the conclusions from the remaining list of assets that were identified as being at risk from non-compliance with Reg31 (as listed at the end of the Diddington 3 day report)

As detailed in the 3 Day Report for Diddington Reservoir, a program of asset inspections to investigate the potential for there to be similar non-compliant pipework *in situ* has been undertaken. Initially this programme comprised of all new build treated water tanks from 2010 onwards (as both Kedington WTW and Diddington Reservoir were new build tanks) and was later expanded to include resilience schemes where modifications to pipework were made within a treated water tank (as Diddington Reservoir was part of the Grafham resilience scheme). This investigative review covered tanks on seven sites.

Details of the findings from the initial desktop review that was conducted were included in the 3 Day Report and below is a summary of the findings of the internal inspections that have been carried out, with a specific focus on the pipework within the tanks.

Each inspection was carried out by a Reservoir Engineer, accompanied by representatives from the Supply team, the Water Quality team and an Engineer from our @one Alliance.

Boughton Reservoir
Date of internal inspection: 23 November 2021
- All internal pipework was found to be stainless steel.

Ludham (Horstead Reservoir)
Date of internal inspection: 1 December 2021
- All internal pipework was found to be stainless steel.

Pulloxhill WTW
Date of internal inspection: 9 December 2021
- Pipework identified as carbon steel with fusion bonded epoxy coating.

Postwick WTW
Date of internal inspection: 11, 12 and 20 December 2021
- Pipework was found to be carbon steel with fusion bonded epoxy coating.

Hall WTW
Date of internal inspection: 2 December 2021
- Pipework was found to be carbon steel with fusion bonded epoxy coating.

Mattishall WTW
Date of internal inspection: 24 November 2021
- Pipework was found to be carbon steel with fusion bonded epoxy coating.

Raithby WTW
Date of internal inspection:24 November 2021
- Weholite HDPE tank and pipework.

8. Provide a copy of the Lessons Learned report(s) for the events.

Attached in Appendix 5 is the requested Lessons Learned report for these events.

I trust this letter provides you with the information you need, however, please do not hesitate to contact me if you require any further information.

Yours sincerely,

Dr [redacted]
Water Quality Regulation Manager

ANGLIAN WATER SERVICES - MATERIALS APPROVAL FORM

FORM NO: 2361

For materials to enter supply, Parts A and B must be signed and approved by Water Quality Performance Team

CONTACT NAME:	[redacted]	**CONTACT NUMBER:**	[redacted]	**DATE:**	18/04/2016
SITE:	Hannington Reservoir Site				
LOCATION ON SITE:	Reservoir 1A and 1B and new pipework/fittings as part of Grafham Resilience Scheme				
CONTRACTOR:	Stonbury Limited & JN Bentley				
WAT- NO. IF APPLICABLE:	WAT-06195				

USEFUL LINKS

- CONTACT THE WATER QUALITY PERFORMANCE TEAM
- HAWK - MATERIALS IN CONTACT
- WRAS DIRECTORY
- DWI APPROVED PRODUCTS LIST
- BRITISH STANDARDS WEBSITE

PART A

								1	2	3							
LINE NO.	**SUPPLIER**	**MANUFACTURER HOLDING APPROVAL (IF DIFFERENT FROM SUPPLIER)**	**PRODUCT NAME**	**BRIEF DESCRIPTION OF MATERIAL IN CONTACT WITH WATER**	**APPROVING BODY DWI / WRAS/ BSEN**	**APPROVING BODY REF**	**LARGE/ SMALL SURFACE AREA**	**PROJECT ENGINEER CONFIRMATION**	**WQPT MATERIALS APPROVED**	**COMMENTS / ADVICE**	Res 1a	Res 1b	Cross Connection	Cut IN	600MM Cross Connection	End of pipework
								SIGN/DATE	**SIGN/DATE**	**SIGN/DATE**							
1	Stonbury Limited	BASF Construction Chemicals (UK) Ltd	MasterSeal 933**	Proprietary construction joint over-banding strip adhesive. (8 Meter length)	DWI	56/4/144	SMALL	[redacted] 18/04/2016	[redacted] 26/05/2016	This product must be cured in accordance with the cure curve provided in the IFU document otherwise this product must be cured for a minimum of 10 days at a minimum temperature of 70C.						
2	Stonbury Limited	BASF Construction Chemicals (UK) Ltd	MasterSeal 930**	Proprietary construction joint over-banding strip. (8 Meter length)	DWI	56/4/144	SMALL	[redacted] 18/04/2016	[redacted] 26/05/2016	This product must be cured in accordance with the cure curve provided in the IFU document otherwise this product must be cured for a minimum of 10 days at a minimum temperature of 70C.						
3	Electrosteel Castings Ltd	Electrosteel Castings Ltd	'Electrofresh Plus' Cement Mortar Lined Ductile Iron Pipe **with** seal coat (Copon Hycote 162 PWX), conforming to EN 545. Pipes include 500mm/1000mm pipework (flange spigot pipe, standard/double	New pipework laid from the reservoir to the existing outlet Hannington.pipework on the other side of the A43. Internal surface in	DWI	56/4/537	LARGE	JL [redacted] 10/05/2016	R. [redacted] 27/05/2016	This approval is for the pipe only. The tapers, tees and bends have been provided by Powerrun (item 10)						
4	Electrosteel Castings LtdB20:C26B20:C31B20:C34G19B	Electrosteel Castings Ltd	'Electrofresh' Cement Mortar Lined Ductile Iron Pipe **without** seal coat, conforming to EN 545. Pipes include 500mm/1000mm pipework (flange spigot pipe, standard/double spigot socket pipe).	New pipework laid from the reservoir to the existing outlet Hannington.pipework on the other side of the A43. Internal surface in	DWI	56/4/992	LARGE	JL [redacted] 10/05/2016	R. [redacted] 27/05/2016	This approval is for the pipe only. The tapers, tees and bends have been provided by Powerrun (item 10)						
5	Electrosteel Castings Ltd	Electrosteel Castings Ltd	Factory applied (India) epoxy 'Eco coat' coating on 500mm/1000mm Specials (socketed 45degree bend, 1000x200mm tee, 200x80mm taper).	Coating applied to internal and external surface of the carbon steel fittings, which is in direct contact with the water.	WRAS	1209502	SMALL	JL [redacted] 10/05/2016	R. [redacted] 09/06/2016	Cure for 6 minutes at 210°C and then cool in air. Is the coating applied on the fittings or the carbon steel pipe? **The coating is applied to the pipe at the factory in India.** Is this a Large surface area product as on the pipe? **The fittings are classed as a small surface area.**						
6	Electrosteel Castings Ltd	Akzo Nobel Powder Coatings GmbH	Factory applied (UK) epoxy 'Resicoat R4' coating on 500mm/1000mm Specials (socketed 45degree bend, 1000x200mm tee, 200x80mm taper).	Coating applied to internal and external surface of the carbon steel fittings, which is in direct contact with the water.	WRAS	1112500	SMALL	JL [redacted] 10/05/2016	R. [redacted] 09/06/2016	Is the coating applied on the fittings or the carbon steel pipe? **The coating is applied to the pipe at the factory in the UK.** Is this a Large surface area product as on the pipe? **The fittings are classed as a small surface area.**						
7	Electrosteel Castings Ltd	Thomas Grozier and Son Pty. Ltd.	BK Standard Lubricant	Pipe Lubricant used to assist in pushing the two pipes together, with gasket.	WRAS	1109550	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016	The material has been ordered and used. The work at Hannington will be completed before September (when approval expires), so even if additional material is required, it would be ordered before the expiry date.						
8	Electrosteel Castings Ltd	VIP Polymers Ltd	500mm EPDM Tyton Sit Plus Anchor Gasket with martensitic chromium nickel steel teeth with a chemical composition of: X 22Cr Ni17 with a steel grade of 1.4057 according to EN 10027	Rubber insert that fits inside the spigot socket connection between the 500mm pipes, to provide a seal. The teeth prevent the pipes coming apart.	WRAS	1112532	SMALL	JL [redacted] 10/05/2016	R. [redacted] 27/05/2016	The teeth are stainless steel, which has chromium and nickel in its composition. Martensitic steel is a variant of stainless steel. In either case, the teeth are installed within the rubber gasket, so will not be in direct contact with the water anyway. Approval given on the basis the teeth are not in contact with the water.						
9	Electrosteel Castings Ltd	Andhra Polymers Pvt. Ltd	1000mm EPDM Rubber Push Fit Gasket	Rubber insert that fits inside the spigot socket connection between the 1000mm pipes, to provide a good seal.	WRAS	1301552	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016							
10	Powerrun Project Management Ltd	Northpoint Ltd	Carbon Steel special fittings lined with Scotchkote 206N. Specials include spigoted tees, 1000x600mm concentric tapers, 500mm 45 degree bends, 1000mm 90 degree bends, 1000mm spigot pipe	Coating applied to internal and external surface of the carbon steel fittings, which is in direct contact with the water.	DWI	DWI 56/4/602	SMALL	JL [redacted] 10/05/2016	R. [redacted] 09/06/2016	This DWI number is for a pipe not fittings or a coating. **Powerrun manufacture pipework systems, which include specials, in both carbon steel and stainless steel. The DWI approval includes the skotchkote coating. See extract.** Is this a Large surface area product as on the pipe? **The fittings are classed as a small surface area.**						
11	Wolseley Utilities Ltd trading as Burdens	Semperit Technische Produkte GmbH	Gasket for 500mm pipework	Gasket between valve and pipe flanges	WRAS	1208502	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016							
12	Saint Gobain	BS Coatings	Factory applied epoxy powder coating to 500mm blank flanges.	Blank flange either in direct contact with the water, or separated by a valve. Generally used during commissioning.	WRAS	1503518	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016							
13	SIG PLC	Fosroc	Conbextra HF	High Flow Grout - To fill annulus between core drill and puddle pipe	N/A	N/A	N/A	N/A	N/A	**Note: None of this coating will be in contact with the water, as has been totally covered by the Flexcrete 851. Included for completeness only.**						
14	Flexcrete Technologies Ltd	Flexcrete Technologies Ltd	Flexcrete Cementitious Coating 851 White	Coating covering annulus of Conbextra HF - Surface ratio 89	DWI	DWI 56/4/95	SMALL	JL [redacted] 10/05/2016	R. [redacted] 27/05/2016							
15	Bentley	Adomast Manufacturing Ltd	Adoplug	Cementitious Repair Mortar used to plug construction bolt holes.	WRAS	1412517	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016	Must be used as per Mix and apply as per `Adomast Technical Specification 344', dated 3rd July 2014. Cure for 21 days@7°C.						
16	Hawker Electronics Ltd	Hawker Electronics Ltd	Light Duty Electrode Holder HPE7, consisting of polypropylene body cap and backnut, approved to BS6920:2000. The neoprene rubber 'o' ring fitted in the cap is detailed in item 35. Internally, SS collar	Light Duty Electrode Holder HPE7 suspended above the reservoir water level.	-	None - Risk assessment	SMALL	JL [redacted] 10/05/2016	R. [redacted] 31/10/2016	[redacted]						
17	Hawker Electronics Ltd	Hawker Electronics Ltd	Hawker Electrode Rod - Stainless Steel 316L Electrodes.	Electrode probes that are suspended from the electrode holder and hang vertically in the water.	-	SS Grade 316L	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016	The electrodes are stainless steel and not plastic coated, as first thought. The insulator between the probes and the bracket is now in the form of a PVCu insulator block mounted on the bracket. See comments in items 16 and 36.						
18	Hawker Electronics Ltd	Hawker Electronics Ltd	Threaded Rod Type 211 to join electrodes together for longer lengths. Stainless Steel 316L.	Threaded Rod between electrodes. In direct contact with the water when level is above joint length.	-	SS Grade 316L	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016							
19	Hawker Electronics Ltd	Hawker Electronics Ltd	Hawker Type 189/X Threaded Coupler for Rod Electrodes Stainless Steel 316L	Coupler to connect two shorter electrode lengths. In direct contact with water when level is above joint length.	-	SS Grade 316L	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016							
20	Hawker Electronics Ltd	Hawker Electronics Ltd	Single Electrode Holder Mounting Bracket Type 71/SS Stainless Steel 316	2No. Electrode holders to sit in 2No. Single mounting brackets within cell 1A.	-	SS Grade 316	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016							
21	Hawker Electronics Ltd	Hawker Electronics Ltd	Double Electrode Holder Mounting Bracket Type 72/SS Stainless Steel 304	2No. Electrode holders to sit in 1No. Double mounting brackets within cell 1A.	-	SS Grade 304	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016							
22	Hawker Electronics Ltd	Hawker Electronics Ltd	Electrode Steady Bracket Type 75/SS Stainless Steel 316 with UPVC Insulator	Electrode Steady Bracket Type 75/SS Stainless Steel 316 with UPVC Insulator. Electrodes hang inside the bracket, to keep them captive and	-	SS Grade 316	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016							
23	Electrix Ltd	Electrix Ltd	Stainless Steel 316 Flexible Conduit	Flexible Conduit. Used to contain electrical cabling.	-	SS Grade 316	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016							
24	Vulcan Industrial Fasteners Ltd	Flexitallic Ltd	1000mm full faced Novus Gaskets, used between the 1000mm pipework and other fittings (non return valve, valve).	Inner annulus (thickness of gasket) will be in contact with the potable water. nitrile rubber/aramid fibre gasket	WRAS	1510515	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016							
25	Vulcan Industrial Fasteners Ltd	Dexine Rubber Company Ltd	80mm EPDM Gaskets, used between the tee and the 80mm air valve/hydrant.	Inner annulus (thickness of gasket) will be in contact with the potable water.	WRAS	1401510	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016							
26	AVK UK Ltd	AVK Valves (Anhui) Co. Ltd	500mm and 600 mm Metal Faced Gate Valve Series 54 DN16 Buried Service Spec. Product Code 54-0500-31-1101100 and 54-0600-31-1101100 respectively.	Internal surfaces of the valve will be in direct contact with the potable water.	WRAS	1311067	SMALL	JL [redacted] 10/05/2016	R. [redacted] 27/05/2016	All series 54 valves are covered by WRAS number						
27	AVK UK Ltd	Henkel Ltd.	1000mm Metal Faced Gate Valve 5410003X1302000 PN16 F16 Loctite 5400 Adhesive	Internal surfaces of the valve will be in direct contact with the potable water.	WRAS	1112509	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016							
28	AVK UK Ltd		PN16 Dismantling Joints (500, 600, 1000mm), PN16 Flange Adaptors (500 and 1000mm) and Couplers (935mm and 1048mm OD) - All are epoxy coated fittings with an EPDM seal.	Internal surfaces of the valve will be in direct contact with the potable water.	WRAS	1407505	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016							
29	AVK UK Ltd	ARI Flow Control Accessories	Air release valve with an epoxy coating, EPDM and NBR seals. 80mm Air Valves - Model No 701/40 DN50 ball valve DN80 flange	Internal surfaces of the valve will be in direct contact with the potable water.	WRAS	1404099	SMALL	JL [redacted] 10/05/2016	R. [redacted] 27/05/2016	The model is a 'D' (double) acting air valve, so is the 'D Series' referred to on the WRAS certificate.						
30	AVK UK Ltd	Aqua-Gas Manufacturing Ltd	80mm Fire hydrant with epoxy powder coated ductile iron body. MK2 Clearway Fire Hydrant series 29/90.	Internal powder coated body will be in direct contact with the potable water.	WRAS	1301080	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016							
31	Industrial Valves Ltd	Akzo Nobel Powder Coatings GmbH	1000mm Non Return Valve wafer dual plate check valve c/w low pressure springs Cast iron Epoxy Powder Coated valve body	Internal powder coated body, plates, springs and seal will be in direct contact with the potable water.	WRAS	1112500	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016							
32	Keyline Builders Merchants Ltd	Arkema	1048mm Viking Johnson Coupler with epoxy coating and gasket Rilsan polyamide powder coatings	Internal surfaces of the valve will be in direct contact with the potable water.	WRAS	1411519	SMALL	JL [redacted] 10/05/2016	[redacted] 26/05/2016							
33	Hope Construction Materials Ltd	Grace Construction Products Ltd	Cement Grout for Annulus in Cell 1b - Concrete with Admixture - See separate tab for e-mail chain on Reg 31 Compliance for WRDA 17 and ADVA 650.	To fill annulus between core drill and puddle pipe. In direct contact with the water in the reservoir. Surface Area 89.	Reg 31	-	SMALL	JL [redacted] 13/06/2016	R. [redacted] 28/07/2016	See separate tab for e-mail chain on Reg 31 Compliance for Admixture						
34	Powerrun Project Management Ltd	Spencer Coatings Ltd	Acothane DW Blue	Coating applied to the weld seam, inside the 900mm pipe, so in direct contact with the potable water.	DWI	56/4/1059	SMALL	JL [redacted] 07/07/2016	R. [redacted] 28/07/2016	The product must be cured for a minimum period of 7 days at a minimum temperature of 3°C.						
35	Hawker Electronics Ltd	Elastotech srl	Neoprene o-ring	O-rings for Hawker HPE7 Electrode Holder, to replace standard non-WRAS approved o-rings. O-rings housed within electrode holder screw cap, so minimal contact with any condensation that may form.	WRAS	1301500	SMALL	JL [redacted] 07/07/2016	R. [redacted] 28/07/2016	Approved on the assumption the O-rings are within the range of in-radii sizes between 0.2mm and 5mm - the scope of the WRAS approval **The wall thickness of the o-ring, which I am assuming is the 'in-radii size', is less than 5mm.**						
36	Hawker Electronics Ltd	n/a	UPVC Insulator for Electrode Steady Bracket	Pvc–u disk supplied in rod form by Oadby Plastics, machined into insulators. Material manufactured by Manifattura Cattaneo Spa.	-	None - Risk assessment	SMALL	JL [redacted] 11/10/2016	R. [redacted] 31/10/2016	[redacted]						
37	Electrosteel Castings Ltd	3M United Kingdom Plc. - Infrastructure Protection Division (IsPD)	3M skotchkote Epoxy Coating 162PWX (Part A) Base for Blue and 3M skotchkote Epoxy Coating 162PWX (part B) Activator (for Blue),	Used on the cut ends of pipes. In theory, it will not be in direct contact with water, as the gaskets will seal the pipe.	WRAS	1109548	SMALL	JL [redacted] 07/07/2016	R. [redacted] 28/07/2016	Approved on the assumption the material is already purchased, as approval lapses at the end of Sept 2016 **This product has already been purchased**						
38	Franklyn Yates Engineering	Azko Nobel Powder Coatings GmbH	1.9M Scotchkoted Steel Special 935MM Spigoted offset Tee with 600MM Flanged Branch	New pipework laid for cross-connection	WRAS	1112500	SMALL	[redacted] 08/11/2016	R. [redacted] 05/05/2017	can you either confirm the item was purchased before December 2016. This Item was ordered 01/12/16 (BB)						
39	AQUA-GAS AVK LTD	Valspar Powder Coatings Ltd	Factory applied epoxy powder coated fabricated coupling 935MM (with EPDM Rubber Seal - see item below)	Internal surfaces of the coupling will be in direct contact with the potable water.	WRAS	1407505	SMALL	[redacted] 08/11/2016	R. [redacted] 28/12/2016	Apply as per manufacturer's instructions. Post-cure for 10 minutes at 180°C						
40	AQUA-GAS AVK LTD	Eastland Compounding	Coupling EPDM Rubber Seal	Internal surfaces of the seal will be in direct contact with the potable water.	WRAS	1511505	SMALL	[redacted] 08/11/2016	R. [redacted] 28/12/2016							
41	SIG PLC	Sika Corporation	Sika Hydrotite Hydrophilic Waterstop CJ0725 25X7MM 0M Roll	THIS PRODUCT WILL NOT BE IN CONTACT WITH THE POTABLE WATER, AS IT WILL BE COMPLETELY ENCASED IN CONCRETE. Please see the 'comments' cell and the separate worksheet 'Sika Hydrotite' for more information.	-B57:T68	-	-	JL [redacted] 09/12/2016	R. [redacted] 28/12/2016	This product is used to provide a water stop seal between the new outlet pipes and the core drilled reservoir wall of cell 1a and cell 1b. One band of the product will be between the outlet pipe and the cement infill annulus (see item 33) and one band of the product will be between the internal core drilled face of the reservoir wall and the concrete infill annulus. THIS PRODUCT WILL NOT BE IN CONTACT WITH THE POTABLE WATER, AS IT WILL BE COMPLETELY ENCASED IN CONCRETE. Please see the separate worksheet 'Sika Hydrotite' for more information. RB 28/12/16 - Agreed this product does not come under the scope of Regulation 31, but included on the MIC form completeness and for information on construction materials.						

ANGLIAN WATER SERVICES - MATERIALS APPROVAL FORM

FORM NO: 2361

42	SIG PLC	Flexcrete Technologies Ltd	Flexcrete Fast Fill R4 Rapid Repair Mortar	Mortar used to fill bolt holes. Surface area of grout holes will be in contact with the potable water	WRAS	1408533	SMALL	[redacted] 19/12/2016	R. [redacted] 28/12/2016	Mix mortar (in powder form) with water in a 1000:140 mass ratio. Cure for 21 days@7°C. For use with water up to 23°C. This material is only approved for the mixing & curing conditions that appear on the approval. If the mix & cure conditions are varied from those specified on the approval then the material is not covered by the scope of the approval.
43	George Green	Northpoint Ltd	1000mm Steel Specials. Pipeline coated with scotchkote 206N.	Internal surfaces of the pipework will be in contact with Potable Water.	DWI	56/4/602	LARGE	[redacted] 04/02/17	R. [redacted] 05/05/2017	Use of the product must be in accordance with the Instructions for Use: Instructions for Use of Pipes lined with Scotchkote 206NTM. Issue 04 dated 06 May 2013
44	UTS ENGINEERING LTD		1018MM OD PN16 FLANGE ADAPTOR	Internal surfaces of the Flange adaptor will be in contact with Potable Water.	WRC	PT/394/0915	Small	[redacted] 02/05/17	R. [redacted] 19/05/2017	WRc approved products confirmed with WRc to comply with Reg 31 for the life of the approval certificate (approved until 15/09/2017) and certification will be removed if any approvals lapse in this period.
			DN600 DISMANTLING JOINT EPDM PN16	Internal surfaces of the Dismantling joint will be in contact with Potable Water.	WRC	PT/394/0915	Small	[redacted] 11/04/17	R. [redacted] 05/05/2017	WRc approved products confirmed with WRc to comply with Reg 31 for the life of the approval certificate (approved until 15/09/2017) and certification will be removed if any approvals lapse in this period.
45	Saint Gobain	BS Coatings	80mm double flange pipework joiners (168-750mm lengths), 80mm all flanged tee. 600mm double flange bend 22.5 degree	Eurokote factory applied blue epoxy powder coating. Coated internal surfaces of the fittings will be in contact with Potable Water.	WRAS	1503518	Small	[redacted] 11/04/17	R. [redacted] 06/06/2017	Factory applied epoxy powder coatings. Apply as per manufacturer's instructions. Cure for 5 minutes@200°C. For use with water up to 85°C. This material is only approved for the curing conditions that appear on the approval. If the cure conditions are varied from those specified on the approval then the material is not covered by the scope of the approval.
46	RCF BOLT & NUT	Dexine Rubber Company Ltd	1000mm full faced gasket 6mm EPDM. 1000mm full faced gasket 3mm EPDM, 600mm full faced gasket EPDM	THICKNESS OF GASKET WILL BE IN CONTACT WITH WATER	WRAS	1401510	Small	[redacted] 11/04/17	R. [redacted] 05/05/2017	
47	Electrosteel Castings Ltd	Electrosteel Castings Ltd	Powder coated Double flanged 1000MM 22.5 degree Bend (Eco Coat FBE Powder E/105/7010 powder coated)	Factory applied blue coloured (Eco Coat FBE Powder E/105/7010)	WRAS	1209502	Small	[redacted] 11/04/17	R. [redacted] 17/05/2017	Factory applied, blue coloured, fusion bonded epoxy coating. Apply as per manufacturer`s instructions. Cure for 6 minutes at 210°C and then cool in air. For use with water up to 85°C
48	Electrosteel Castings Ltd	Electrosteel Castings Ltd	Electro fresh 600mm x5500MM spigot socket pipe	'Electrofresh' Cement Mortar Lined Ductile Iron Pipe without seal coat, conforming to EN 545.	DWI	56/4/992	Large	[redacted] 11/04/17	R. [redacted] 17/05/2017	Use of the product must be in accordance with the Instructions for Use: Instructions for Use for Electrofresh Pipes at Site Work Instruction: WC-04-02 Issue No: 03 Rev. C Issue Date: 25.02.2016 Before connection to supply, the water undertaker or their approved agent, must carry out tests to establish that migration from the cement mortar lining will not cause a contravention of the upper prescribed concentration for hydrogen ion in the relevant regulations.
49	Electrosteel Castings Ltd	Electrosteel Castings Ltd	Powder Coated 600mm flange socket piece	Factory applied blue coloured (Eco Coat FBE Powder E/105/7010)	WRAS	1209502	Small	[redacted] 11/04/17	R. [redacted] 17/05/2017	
50	Electrosteel Castings Ltd	Electrosteel Castings Ltd	Powder Coated 600MM DF 45 Degree bend	Factory applied blue coloured (Eco Coat FBE Powder E/105/7010)	WRAS	1209502	Small	[redacted] 11/04/17	R. [redacted] 17/05/2017	
51	Electrosteel Castings Ltd	Electrosteel Castings Ltd	Powder Coated 600MM Socketed 22.5 Degree bend	Factory applied blue coloured (Eco Coat FBE Powder E/105/7010)	WRAS	1209502	Small	[redacted] 11/04/17	R. [redacted] 17/05/2017	
52	Electrosteel Castings Ltd	Electrosteel Castings Ltd	Powder Coated 600 x 80MM all flanged tee	Factory applied blue coloured (Eco Coat FBE Powder E/105/7010)	WRAS	1209502	Small	[redacted] 11/04/17	R. [redacted] 17/05/2017	
53	Electrosteel Castings Ltd	Electrosteel Castings Ltd	Powder coated 600MM TYTON SIT + Anchor gasket	Factory applied blue coloured (Eco Coat FBE Powder E/105/7010)	WRAS	1209502	Small	[redacted] 11/04/17	R. [redacted] 17/05/2017	
54	Electrosteel Castings Ltd	Electrosteel Castings Ltd	Powder coated 600MM Blank Flange	Factory applied blue coloured (Eco Coat FBE Powder E/105/7010)	WRAS	1209502	Small	[redacted] 11/04/17	R. [redacted] 17/05/2017	
55	Electrosteel Castings Ltd	Electrosteel Castings Ltd	Powder Coated 1000MM 22.5 Degree Bend	Factory applied blue coloured (Eco Coat FBE Powder E/105/7010)	WRAS	1209502	Small	[redacted] 11/04/17	R. [redacted] 17/05/2017	
56	Electrosteel Castings Ltd	Electrosteel Castings Ltd	Powder Coated 1000MM 11.25 degree Bend	Factory applied blue coloured (Eco Coat FBE Powder E/105/7010)	WRAS	1209502	Small	[redacted] 11/04/17	R. [redacted] 17/05/2017	
57	FWB Products	Zenith Industrial Rubber Products PVT Ltd	500MM EPDM Gasket	EPDM Gasket	WRAS	1311533	Small	[redacted] 11/04/17	R. [redacted] 05/05/2017	
58	Saint Gobain	Saint Gobain	80mm double flange 90 degree bend	Eurokote factory applied blue coloured powder coating	WRAS	1503518	Small	[redacted] 11/04/17	R. [redacted] 06/06/2017	
59	Vulcan Industrial Fasteners Ltd	Dexine Rubber Company Ltd	600MM Full faced gasket	Thickness of gasket will be in contact with water	WRAS	1401510	Small	[redacted] 11/04/17	R. [redacted] 05/05/2017	
60	Vulcan Industrial Fasteners Ltd	Dexine Rubber Company Ltd	200MM EPDM Gasket	Thickness of gasket will be in contact with water	WRAS	1401510	Small	[redacted] 11/04/17	R. [redacted] 05/05/2017	
61	Wolseley Utilities Ltd trading as Bur	GPS	Stub flange asembly 90MM OD SDR17	PE Fitting	WRAS	1403507	Small	[redacted] 27/06/17	R. [redacted] 27/06/2017	
62	Wolseley Utilities Ltd trading as Bur	GPS	Excel NB 90mm OD PE pipe SDR17	PE internals of pipe	DWI	56/4/1026	Large	[redacted] 27/06/17	R. [redacted] 27/06/2017	Use of the product must be in accordance with the Instructions for Use: Issue: Excel NB. Issue No: 1. Issue Date: 1/7/2011
63	Saint Gobain	Saint gobain	System CL 800mm x 2500mm long DF pipe	Cement mortar lined pipework	DWI	56/4/283	Large	[redacted] 27/06/17	R. [redacted] 27/06/2017	Use of the product must be in accordance with the Instructions for Use: SAINT GOBAIN PAM UK. Instructions for Use Document for System CL Pipes. Issue Number 9. Date: 25th May 2009
64	olseley Utilities Ltd trading as Burde	Aqua Gas Manufacturing	Type 2 Hydrant 80MM	Epoxy powder coating on ductile iron body	WRAS	1301080	Small	[redacted] 27/06/17	R. [redacted] 27/06/2017	

Insert more lines as necessary

1 **PROJECT ENGINEER TO SIGN AND DATE TO CONFIRM MATERIALS HAVE BEEN CHECKED AGAINST CURRENT APPROVAL LISTS**

2 **WATER QUALITY PERFORMANCE TEAM TO SIGN AND DATE TO CONFIRM MATERIALS ARE APPROVED IN ACCORDANCE WITH REGULATION 31(4)(a) and 31(4)(b)**

3 **COMMENTS OR ADVICE FROM WATER QUALITY PERFORMANCE TEAM, EG INSTRUCTIONS FOR USE**

x **PLEASE TICK BOX TO CONFIRM NO FURTHER MATERIALS WILL BE ADDED TO PART A OF THIS FORM**

NOTE: FOR SMALL SURFACE AREA MATERIALS THEY MAY NOT REQUIRE A FULL SET OF MIC SAMPLES. PLEASE CONTACT THE WATER QUALITY PERFORMANCE TEAM FOR FURTHER ADVICE

REQUEST FOR REDUCED SAMPLING	WQPT APPROVED FOR REDUCED SAMPLING	COMMENTS
SIGN/DATE	SIGN/DATE	SIGN/DATE
No	n/a	n/a

PART B

PART B COMPLETED BY: [redacted]

Please provide the following contact names:

OPERATIONAL SCIENTIST: [redacted]

SUPPLY MANAGER: [redacted]

PART A LINE NUMBERS WHICH SAMPLES REPRESENT	SAMPLE NUMBER	SAMPLE DATE	COLIFORMS	E. COLI	COLONY COUNTS 2 DAY 37°C 3 DAY 22°C	QUALITATIVE TASTE *	QUALITATIVE ODOUR	pH	COLOUR (HAZEN)	TURBIDITY (NTU)	CONDUCTIVITY (us/cm)	ALKALINITY(mg/l CaCO3)	ALUMINIUM (mg/l Al)	TRACE ORGANICS		1	2	
														DCM & PURGE/ TRAP	MK FORM NO.	PROCESS ENGINEER / CHEMIST CONFIRMATION	WQPT APPROVED FOR SUPPLY	
																SIGN/DATE	SIGN/DATE	
1,2,3, 4, 11, 12, 14-23, 26	16256074 16256090 16257518	04/06/2016	0	0	0, 1	1	3T	7.41	0.4	0.32	611	129	< 0.014	0, 0	10545	R. [redacted] 09/06/2016	R. [redacted] 09/06/2016	* Approval to return to supply given subject to line 16 of Part A being approved, or this material being removed from the interior of the reservoir prior to return to supply.
Hannington new main and cross connection																		
Cell 2 North connection (Existing supply) - 16 hour	17278877	22/06/2017	n/d	n/d	n/d	1	1Z	n/d	n/a	0.1	n/a	n/a	n/d	n/d	n/d	~	~	No chlorine residuals Not all parameters sampled Enterococci/Clostridia satisfactory
Cell 2 North connection (Existing supply) - additional 12	17280513	22/06/2017	0	0	n/d, 0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	~	~	No chlorine residuals Enterococci/Clostridia satisfactory
Cell 2 North connection (Existing supply) - 16 hour stand	17304001	04/07/2017	0	0	0, n/a	1	1Z	7.41	n/a	0.13	n/a	n/a	< 0.014	1, 1	11084	R. [redacted] 12/07/2016	R. [redacted] 12/07/2016	Enterococci/Clostridia clear Chlorine <0.01, 0.45 Organics levels satisfactory (handcream, toluene operational SNARL 24 ug/L)
Cell 2 North connection (Existing supply) - additional 12 hour stand	17305386	05/07/2017	0	0	0, 0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	R. [redacted] 12/07/2016	R. [redacted] 12/07/2016	Enterococci and Clostridia clear Chlorine <0.1/0.54
Cell 2 North connection (Existing supply) - Marked as "Hannington res A" on	17312425	10/07/2017	n/a	n/a	n/a	1	2T	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	R. [redacted] 12/07/2016	R. [redacted] 12/07/2016	Clarity N Resample following nettle odour on end air valve. Main had been standing for an undetermined time (>16 hours)
Cell 2 North connection (Existing supply) - Marked as "Hannington res A" on	17312439	11/07/2017	n/a	n/a	n/a	1	2T	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	R. [redacted] 12/07/2016	R. [redacted] 12/07/2016	Clarity N Resample following nettle odour on end air valve. Main had been standing for 16 hours after flushing
600mm cross connection																		
Outlet main test plate (new main) - 16 hour stand	17278878	22/06/2017	n/d	n/d	n/d	n/d	1Z	n/d	n/a	0.6	n/a	n/a	n/d	n/d	n/d	~	~	No chlorine residuals Not all parameters sampled Enterococci/Clostridia satisfactory
Outlet main test plate (new main) - additional 12 hour	17280512	22/06/2017	0	0	n/d, 51	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	~	~	No chlorine residuals Enterococci/Clostridia satisfactory

ANGLIAN WATER SERVICES - MATERIALS APPROVAL FORM

FORM NO: 2361

Outlet main test plate (new main set) - 16 hour stand	17304000	04/07/2017	0	0	0, n/a	1	1Z	7.57	n/a	0.2	n/a	n/a	< 0.014	1, 0	11084	R. [redacted] 12/07/2016	R. [redacted] 12/07/2016	Enterococci/Clostridia clear Chlorine <0.01, 0.49 Organics levels satisfactory (handcream)					
Outlet main test plate (new main set) - additional 12 hour stand	17305388	05/07/2017	0	0	0, 34	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	R. [redacted] 12/07/2016	R. [redacted] 12/07/2016	Enterococci and Clostridia clear Chlorine <0.1/0.50					
Outlet main test plate (new main set) - Marked as "Hannington res B" on	17312426	10/07/2017	n/a	n/a	n/a	1	3T	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	R. [redacted] 12/07/2016	R. [redacted] 12/07/2016	Clarity N Resample following nettle odour on end air valve. Main had been standing for an undetermined time (>16 hours)					
Outlet main test plate (new main set) - Marked as "Hannington res B" on	17312440	11/07/2017	n/a	n/a	n/a	1	3T	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	R. [redacted] 12/07/2016	R. [redacted] 12/07/2016	Clarity N Resample following nettle odour on end air valve. Main had been standing for 16 hours after flushing					
New main																							
Outlet end main air valve (new main) - 16 hour stand	17278879	22/06/2017	n/d	n/d	n/d	n/d	2T	n/d	n/a	0.6	n/a	n/a	n/d	n/d	n/d	~	~	No chlorine residuals Not all parameters sampled Enterococci/Closrtidia satisfactory					
Outlet end main air valve (new main) - additional 12 hour	n/d	n/d	n/d	n/d	n/d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	~	~	No sample got to the lab					
Outlet end main air valve (new main set) - 16 hour stand	17304003	04/07/2017	0	0	0, n/a	n/d	3NET	7.46	n/a	0.12	n/a	n/a	< 0.014	1, 0	11084	R. [redacted] 12/07/2016	R. [redacted] 12/07/2016	Enterococci/Clostridia clear Chlorine 0.02, 0.50 Organics levels very low (all well below 1 ug/L). Not in Tox database, and mild nettle odour detected. Will need a further sample for clarity, taste and odour to confirm these very low levels detected will not cause an issue. Resamples are ok for taste and odour, given the very low levels of these compounds and no t&o issues on resample, the organics levels are					
Outlet end main air valve (new main set) - additional 12 hour stand	17305387	05/07/2017	0	0	0, 37	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	R. [redacted] 12/07/2016	R. [redacted] 12/07/2016	Enterococci and Clostridia clear Chlorine <0.1/0.50					
Outlet end main air valve (new main set) - Marked as "Hannington res C" on	17312427	10/07/2017	n/a	n/a	n/a	1	3T	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	R. [redacted] 12/07/2016	R. [redacted] 12/07/2016	Clarity N Resample following nettle odour on end air valve. Main had been standing for an undetermined time (>16 hours)					
Outlet end main air valve (new main set) - Marked as "Hannington res C" on	17312441	11/07/2017	n/a	n/a	n/a	1	2T	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	R. [redacted] 12/07/2016	R. [redacted] 12/07/2016	Clarity N Resample following nettle odour on end air valve. Main had been standing for 16 hours after flushing					
Bacti samples following connection of 'golden joints' at either end of mains. Not MIC samples, included here for completeness																							
Hannington res 2 source supply (cell 1)	17318436	14/07/2017	0	0	0, n/d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	R. [redacted] 17/07/2016	Chlorine <0.05/0.60 Samples not registered for 3-day plates but happy to pass on the basis of clear TC/EC/2-day plates and good chlorine residuals					
Hannington res 2 source supply (cell 2)	17318437	14/07/2017	0	0	0, n/d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	R. [redacted] 17/07/2016	Chlorine 0.06/0.55 Samples not registered for 3-day plates but happy to pass on the basis of clear TC/EC/2-day plates and good chlorine residuals					
Hannington new main cross connection (between d/s of u/s golden joints)	17318434	14/07/2017	0	0	0, n/d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	R. [redacted] 17/07/2016	Chlorine <0.05/0.54 Samples not registered for 3-day plates but happy to pass on the basis of clear TC/EC/2-day plates and good chlorine residuals					
Hannington new main air valve (u/s of d/s golden joint)	17318435	14/07/2017	0	0	0, n/d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	R. [redacted] 17/07/2016	Chlorine <0.05/0.55 Samples not registered for 3-day plates but happy to pass on the basis of clear TC/EC/2-day plates and good chlorine residuals					
Hannington new main d/s (d/s of d/s golden joint)	17318433	14/07/2017	0	0	0, n/d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	R. [redacted] 17/07/2016	Chlorine <0.05/0.52 Samples not registered for 3-day plates but happy to pass on the basis of clear TC/EC/2-day plates and good chlorine residuals					

Insert more lines as necessary

** taste testing only to be performed on samples of potable water and after confirmation of clear bacteriological results*

1	**PROCESS ENGINEER/SCIENTIST TO SIGN AND DATE TO CONFIRM SAMPLES TAKEN ARE APPROPRIATE FOR THE MATERIALS LISTED IN PART A AND THAT EVERY PRODUCT HAS BEEN TESTED**
2	**WATER QUALITY PERFORMANCE TEAM TO SIGN AND DATE TO CONFIRM APPROVAL FOR USE IN SUPPLY**
NOTE	**OPERATIONAL SCIENTIST TO GIVE FINAL APPROVAL FOR THE MATERIAL OR EQUIPMENT TO ENTER SUPPLY**

ELECTROSTEEL
Ductile Iron Pipes and Fittings

Ambrose Yard, Broombank Trading Estate,Broombank Road, Chesterfield, Derbyshire S41 9QJ, UK
Tel: 01246 264 222 Fax: 01246 264 224 Website: www.electrosteel.co.uk

Invoice No: ECL 2015/553786 **Customer Order No: JA21712** **Date:** 08/01/2016

Customer Name & Address	Customer Details	Delivery Address	Electrosteel Details
J N Bentley (Yorkshire) Keighley Road Skipton North Yorkshire BD23 2QR UNITED KINGDOM	**Account:** JNBL103S1C **Customer Ref:** JA21712 **Contact:** [redacted] **Phone:** **Fax:** **Email:** **Vat No:**	HANNINGTON RESEVOIR KETTERING ROAD HANNINGTON NN69TD UNITED KINGDOM **Contact:** 07583102762 **Tel No:** [redacted]	**Contact:** [redacted] **Email:** [redacted]@electrosteel.co.uk **Territory:** Yorkshire Water Services Ltc

Line	ECL Part Code	Description	Quantity	Unit Price	UoM	Total	Unit Weight	Line Weight	Due Date
1	WFSP0500B2499AA	**500X2332MM FLG SPIG PIPE C/W PDL EN545 BLUE PN16 PDL 1190MM FROM FLANGE END**	**4.00**	**489.24**	**Each**	**1,956.96**	407.37 kg	1,629.48 kg	06/01/2016

Despatch Ref:445066
Payment Due Date: 01/03/2016
Bank Details: Sort Code: [redacted]8

Currency	Vat %	Goods	VAT	Total
£	20.00	**1,956.96**	**391.39**	**2,348.35**

This transaction is subject to our standard Terms & Conditions of Sale
Due to the risk of fraud do not take instructions to change our bank details by phone or electronic notifications.

VAT No: GB902609053 Co Reg: 4057880