



Appendix B1

Seedy Mill WTW – AMP 7 OPEX

Seedy Mill average flow: 76MI/d
Electricity cost: 11p per kWh

Inter-stage pumping station

@880l/s, D/D pumps, ≈150kW each, 24/7 operation

*$(150_{(kW)} * 2) * (24_{(h)} * 365_{(d)}) = 2,628\text{MWh/a @ 11p per kWh}$*

+£300,000 per annum effective at construction start date + 20 months

New RGFs

Assume 4 RGF backwashes per day @ 30mins each

D/D pumps, ≈150kW each

*$(150_{(kW)} * 2) * (2_{(h)} * 365_{(d)}) = 219\text{MWh/a @ 11p per kWh}$*

Allowance for blowers, valves and actuators = 40MWh/a @ 11p per kWh

+£30,000 per annum effective at construction start date + 20 months

TOTAL OPEX INCREASE

*£300,000 + £30,000 + 10% contingency for all other new plant = **+£363k per annum***



Appendix B2

Hampton Load WTW – AMP 7 OPEX

Hampton Load average flow: 150MI/d
Electricity cost: 11p per kWh

Inter-stage pumping station

@1740l/s, D/D/D pumps, ≈200kW each, 24/7 operation

*$(200_{(kW)} * 3) * (24_{(h)} * 365_{(d)}) = 5,256MWh/a @ 11p per kWh$*

+£580,000 per annum effective at construction start date + 22 months

New RGFs

Assume 4 RGF backwashes per day @ 30mins each

D/D pumps, ≈150kW each

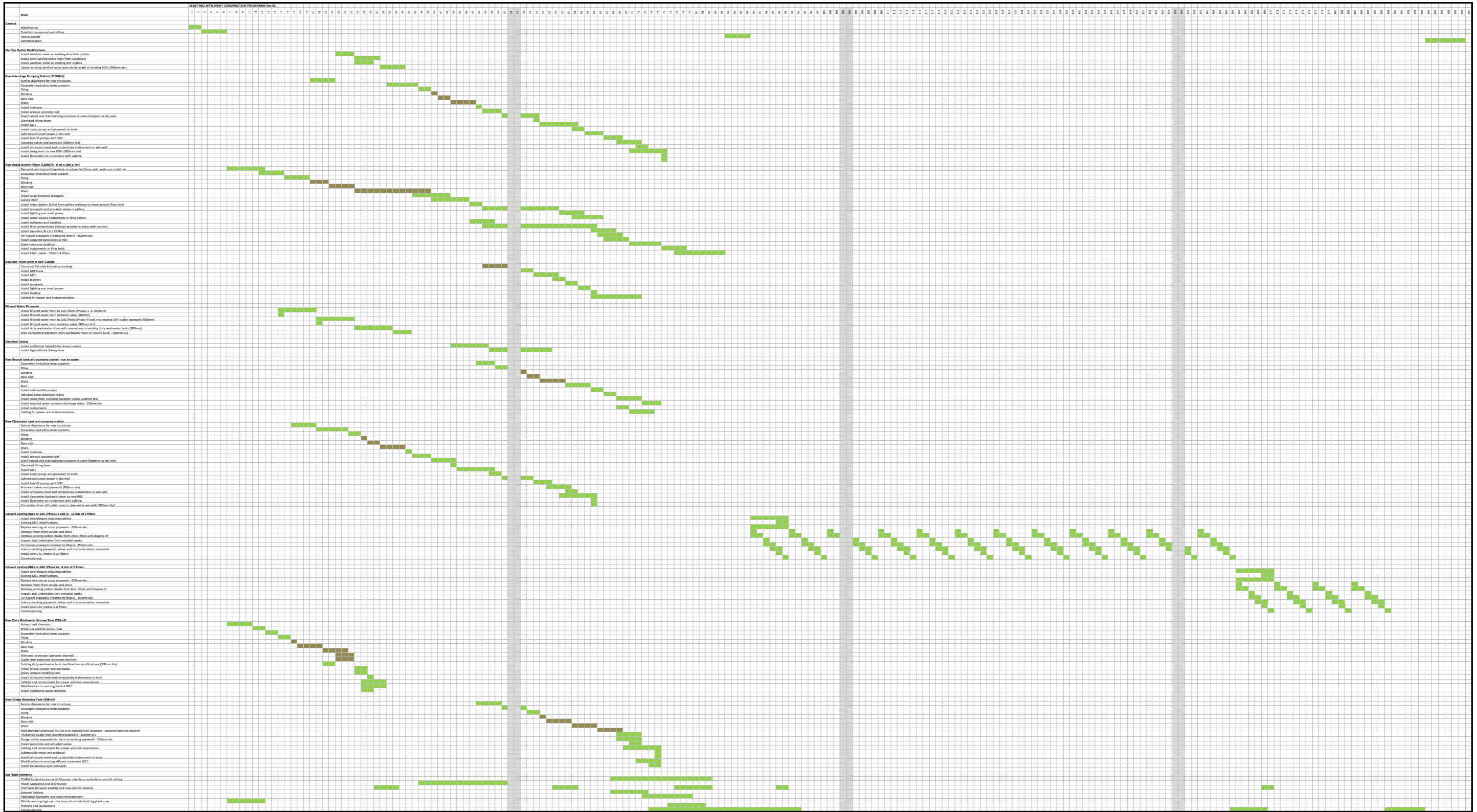
*$(150_{(kW)} * 2) * (2_{(h)} * 365_{(d)}) = 219MWh/a @ 11p per kWh$*

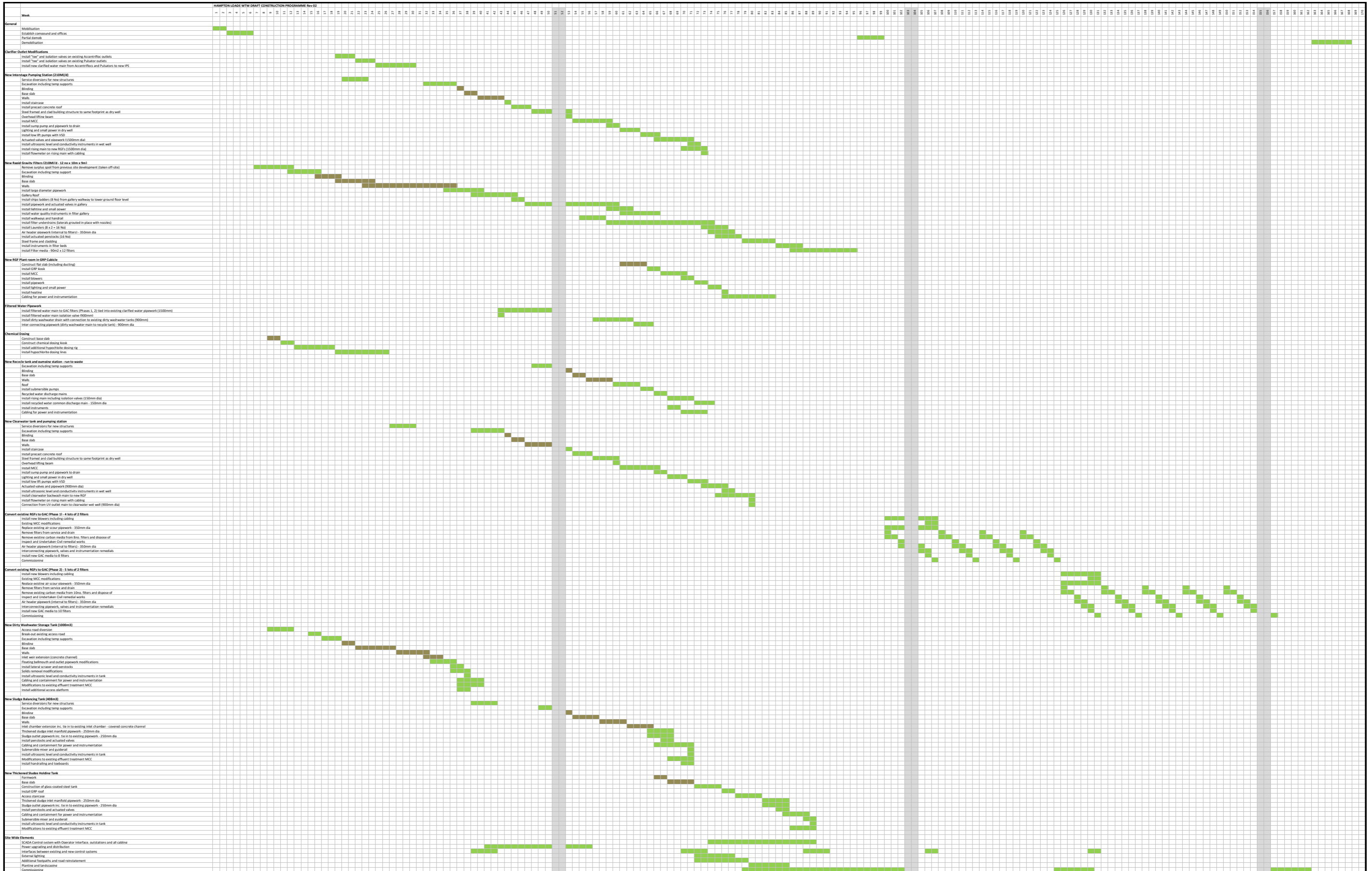
Allowance for blowers, valves and actuators = 50MWh/a @ 11p per kWh

+£30,000 per annum effective at construction start date + 22 months

TOTAL OPEX INCREASE

*£580,000 + £30,000 + 10% contingency for all other new plant = **+£671k per annum***





Seedy Mill WTW – AMP 7 Commissioning Constraints



Tie-in location	Details	Tie-in strategy	Forecast Date and Duration	Operational impact	Notes and Contingency
Accelerator 1 and 4 clarified water	Tie-in to existing 750mm diameter buried mains	Installation of "T" complete with isolation valves	Date: flexible around production Duration: 2 days each	Accelerator 1 then 4 offline for duration of tie-in works	Full treatment capacity retained
Common Accelerator clarified water	Tie-in to existing 750mm dia buried main	Installation of 2no. isolation valves	Date: flexible around production Duration: 2 days	Accelerator(s) 2 and 3 offline for duration of tie-in works	Over-pumping can be provided to bring online further Accelerators (if required). DAF remains operational
DAF clarified water	Tie-in to existing 1000mm dia buried main	Installation of "T" complete with isolation valves	Date: flexible around production Duration: 2 days	DAF offline for duration of tie-in works	Over-pumping can be provided to bring online DAF (if required). Accelerators remain operational
UV potable water outlet	New outlet from UV discharge chamber	Installation of plate during shut-down	Date: flexible around production Duration: 12 hours	1 UV "block" offline for duration of tie-in works	50% of UV remains operational
Conversion of existing RGFs to GAC	Replacement of media and air scour improvements	2 filters taken out of service at any one time	Date: flexible around production Duration: 6wks per bank of two	2 filters taken out of service at any one time	Full treatment capacity retained. Temporary blowers can be provided for air scour (if necessary)

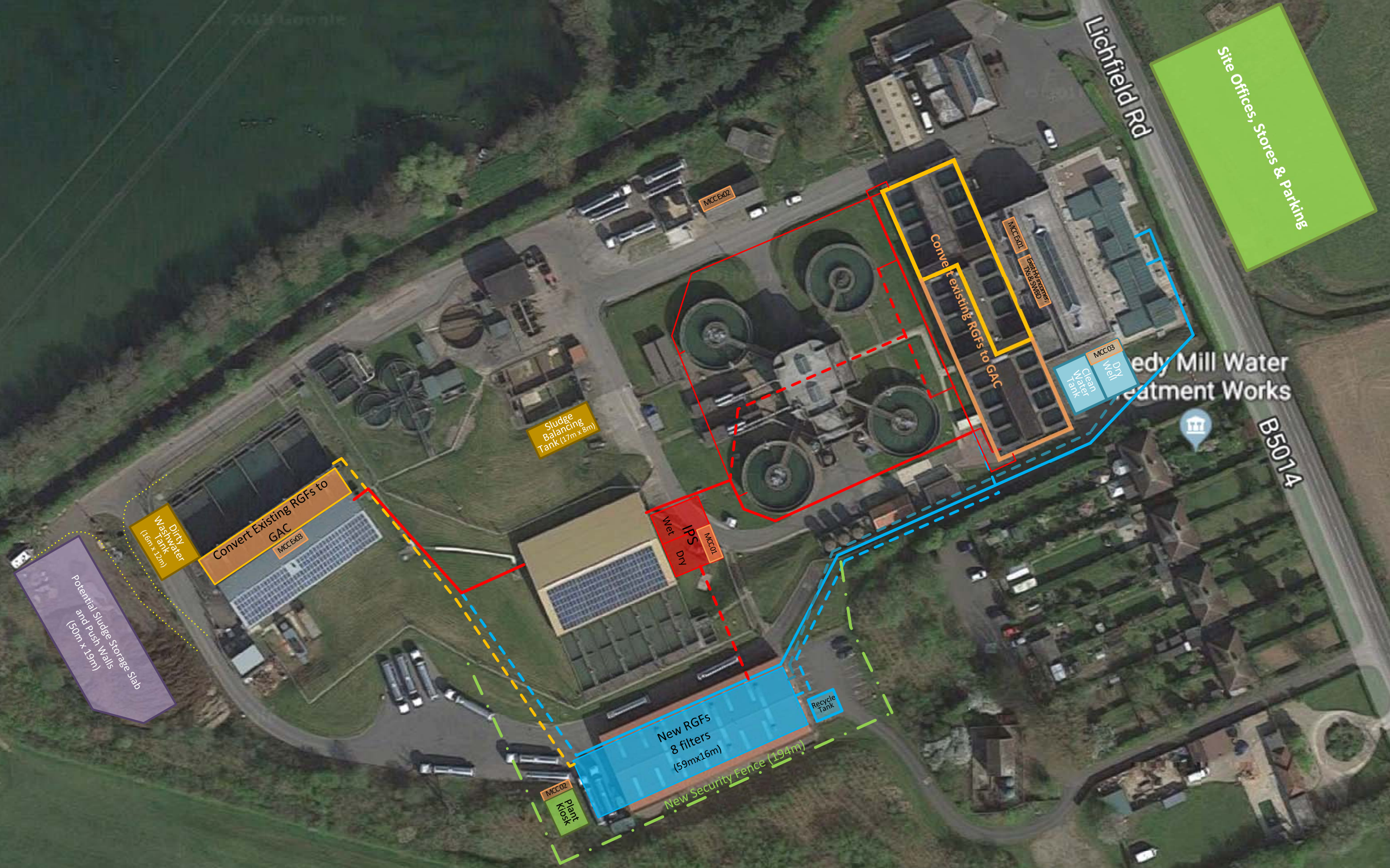
Hampton Loade WTW – AMP 7

Commissioning Constraints

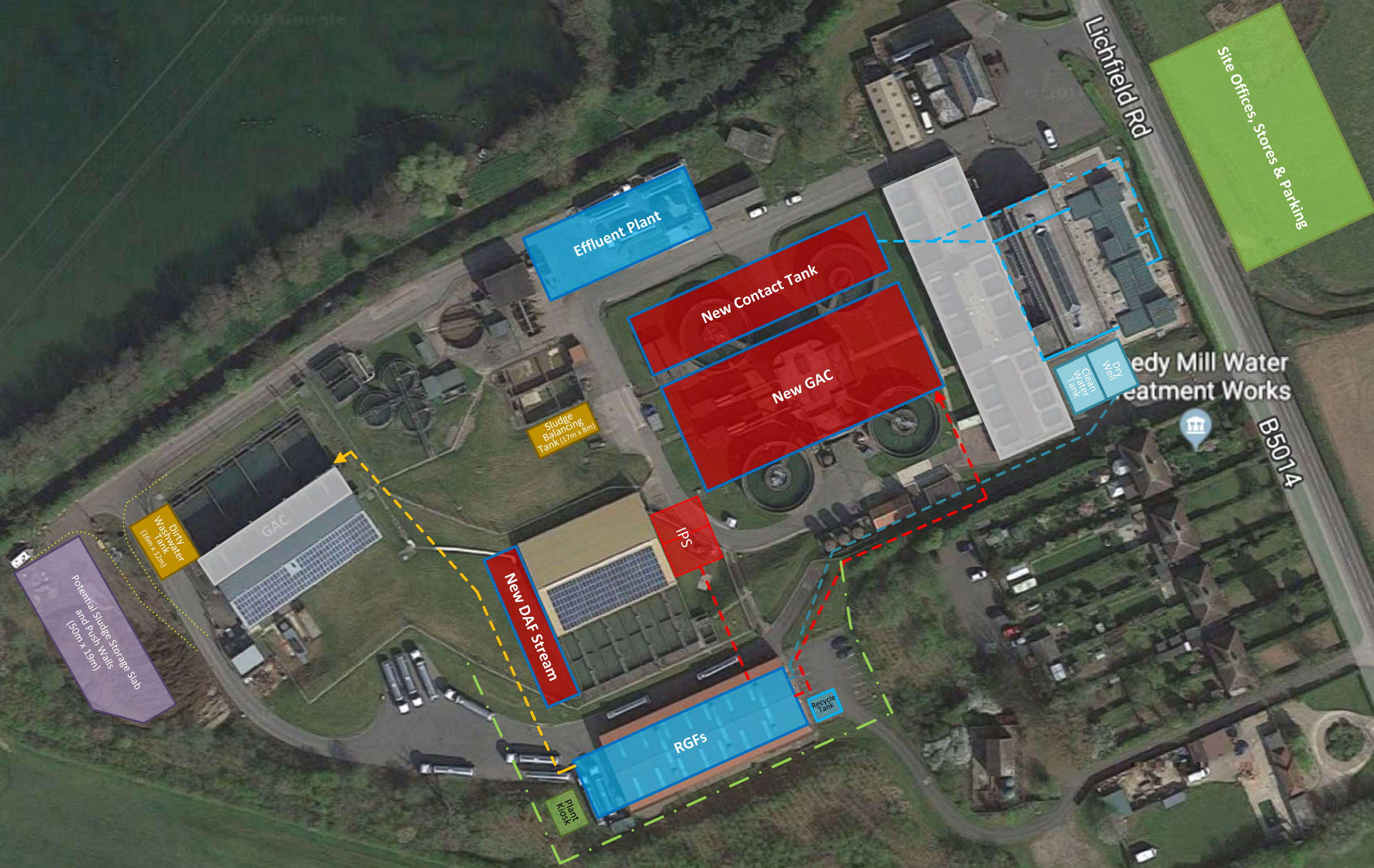


Tie-in location	Details	Tie-in strategy	Forecast Date and Duration	Operational impact	Notes and Contingency
Accentrifloc 1 and 2 clarified water	Tie-in to existing buried mains	Installation of “T” complete with isolation valves	Date: flexible around production Duration: 2 days each	Accentrifloc 1 then 2 offline for duration of tie-in works	Use of inflatable pipe stopper/bung for isolation. Over-pumping provided (if necessary)
Pulsator 1 and 2 clarified water	Tie-in to existing buried mains	Installation of “T” complete with isolation valves	Date: flexible around production Duration: 2 days each	Accentrifloc 1 then 2 offline for duration of tie-in works	Use of inflatable pipe stopper/bung for isolation. Over-pumping provided (if necessary)
RGFs 1 to 4 inlet water	Tie-in to existing buried inlet mains	Installation of “T” complete with isolation valves	Date: flexible around production Duration: 2 days each	RGFs blocks offline sequentially for duration of tie-ins	Use of inflatable pipe stopper/bung for isolation. Over-pumping provided (if necessary)
Existing RGF water outlet	New tie-in to existing RGF outlet main (clearwater tank supply)	Installation of “T” complete with isolation valves	Date: flexible around production Duration: 2 days	1 RGF “block” (4 filters) offline for duration of tie-in works	Over-pumping can be provided to bring online additional filters (if required).
Conversion of existing RGFs to GAC	Replacement of media and air scour improvements	2 filters taken out of service at any one time	Date: flexible around production Duration: 6wks per bank of two	2 filters taken out of service at any one time	Full treatment capacity retained. Temporary blowers can be provided for air scour (if necessary)

Seedy Mill



Seedy Mill

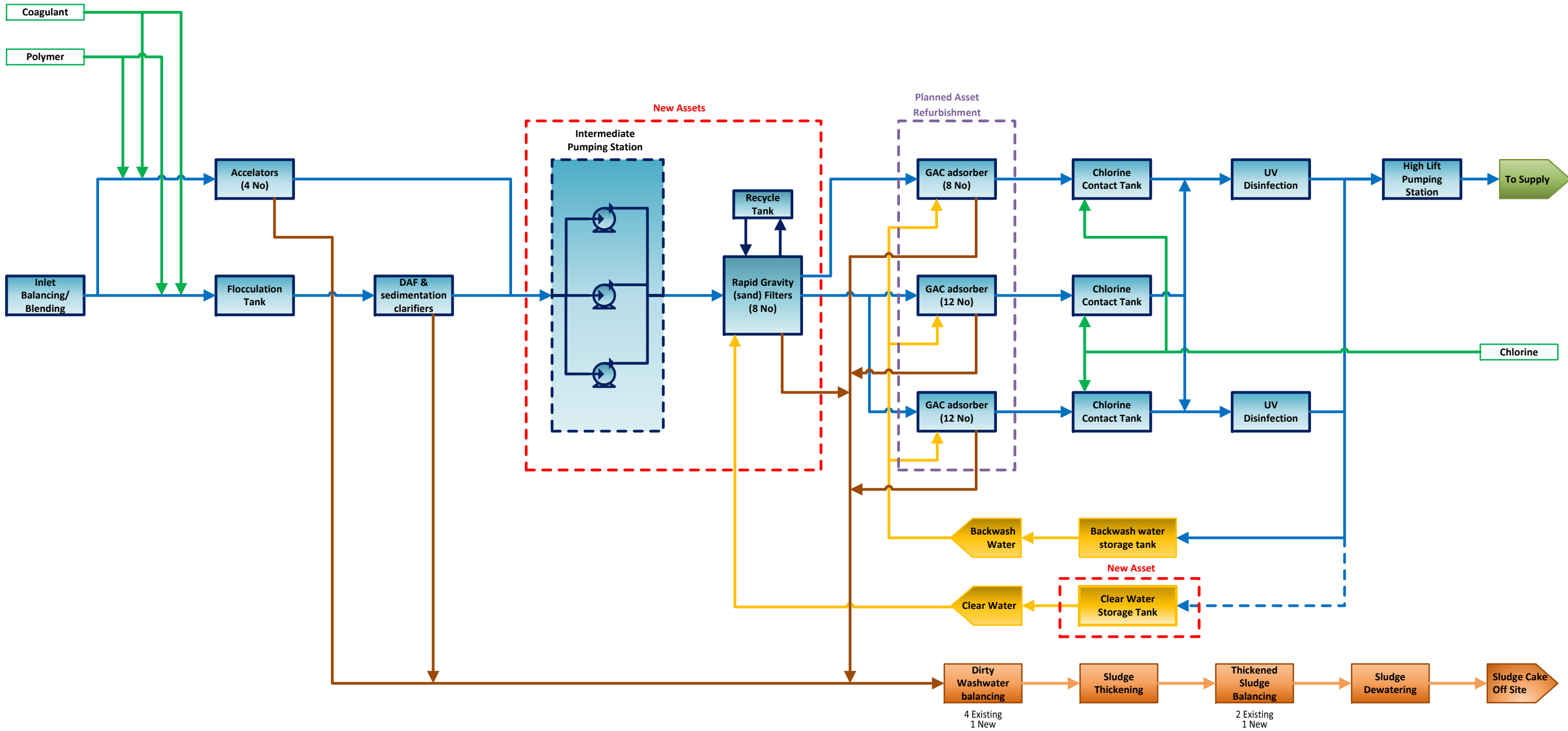


Approx. 1:1000 @ A3
All dimensions are approximate

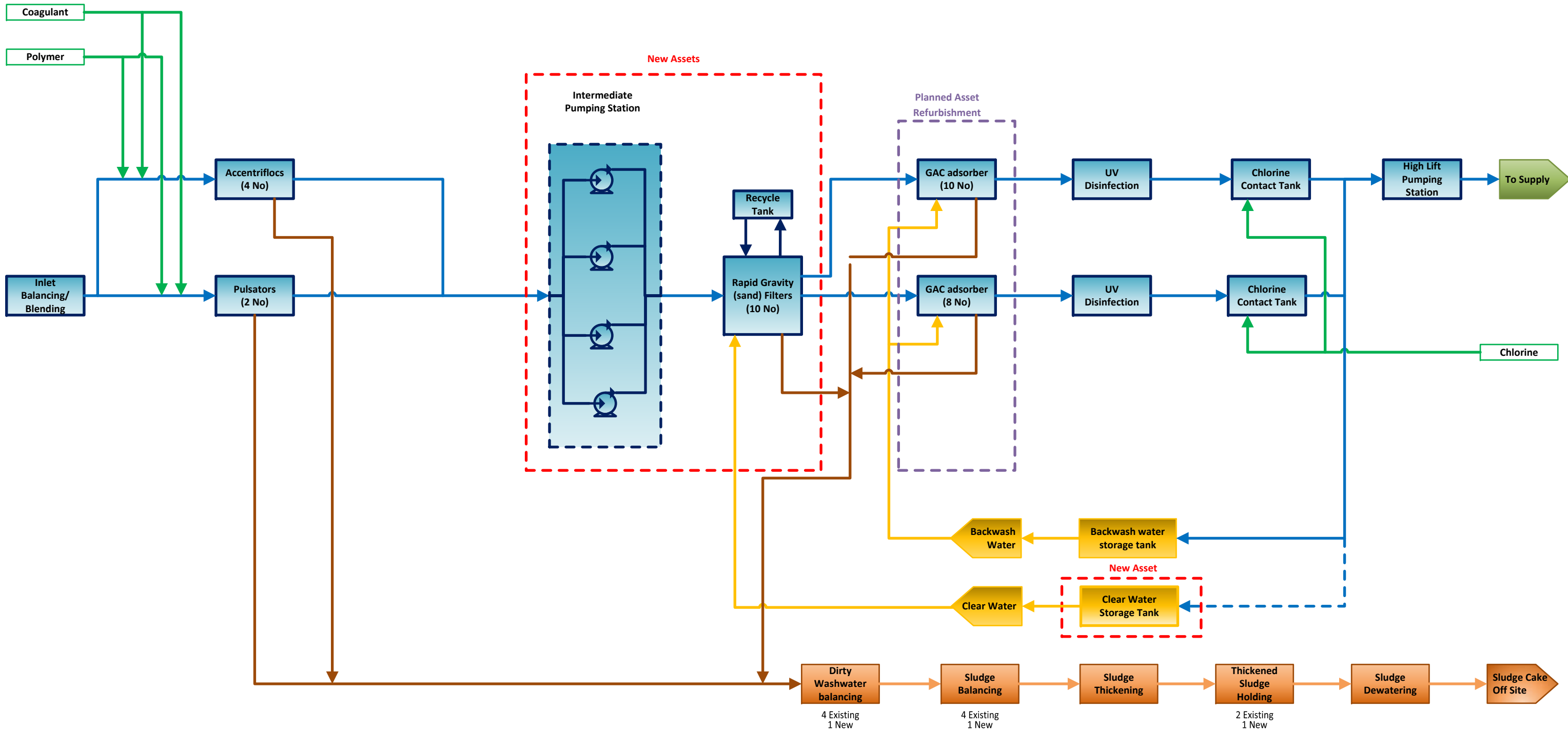




Appendix F1
Seedy Mill Process Block Diagram



Appendix F2
Hampton Load Process Block Diagram



South Staffordshire Water
 Seedy Mill WTW
 Scope of Work and Work Breakdown Structure

	discipline responsibility					dimensions	comments / further information	unit cost	assumptions
	Civil	Mech	Elec	ICA	Process				
Modify Existing Accelerator Clarifiers									
Divert Accelerator 1 outlet pipe (750mm dia)	Y					20m	buried ductile iron		
Divert Accelerator 4 outlet pipe (750mm dia)	Y					20m	buried ductile iron		
Install common outlet from Accelerators 1 & 4 (say 900mm dia)	Y					62m	buried ductile iron		
Connection to clarified water main near Accelerator 2	Y						buried ductile iron tee piece		
Manual isolation valves 750 dia (existing accelerator discharge lines to existing RGFs) - 4no.		Y					4no. - 750NB wedge gate valve PN10, manually actuated, in compliance with UU S03	£6,325.60	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Modify Existing DAF									
Manual isolation valve (existing DAF discharge to existing RGFs) - 900 dia		Y					1no. - 900NB wedge gate valve PN10, manually actuated, in compliance with UU S03	£12,651.19	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Manhole chamber for isolation valve	Y						1500mm diameter, 1m deep		
New Interstage Pumping Station (110Ml/d)									
Excavation including temp supports	Y								
Blinding	Y								
Formwork	Y								
Reinforcement	Y								
Concrete chamber (dry well) complete with concrete roof slab (50% floor area)	Y					9m x 13m x 10m deep			ref: "Inter-stage PS plan" and "Inter-stage PS section"
Concrete chamber (wet well) complete with concrete roof slab	Y					8m x 13m x 10m deep	416m3 working volume (0.5m freeboard)		ref: "Inter-stage PS plan" and "Inter-stage PS section"
Ultrasonic level instrument				Y			PPM 180 Ultra 5 (Profibus enabled) and dB10 ultrasonic transducer	£767.00	ref: Pulsar quotation 24620 for Liverpool WwTW dated 05/11/2013
Conductivity level probes				Y			E&H conductivity level probes, HH probe length 2000mm, LL probe length 8000mm	£652.00	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Pump plinths	Y					2m x 2m x 0.5m height	3no.		
Low lift pumps with VSD (3 No x 640 l/s x 15m head) - D/D/S		Y				circa 2m x 2m x 3m height	3no. - Hidrostral L12K series (240kW), 650l/s @ 25m	£51,794.41	ref: Hidrostral budget quotation 30/01/2018 (Estimate 83780 Rev B)
Actuated valves (upstream and downstream of pumps) - 900mm dia		Y					6no. - 900NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£16,388.69	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Miscellaneous interconnecting pipework - 900mm dia		Y				30m	scotchkoted steel		
Lighting in dry well			Y				1no. - Flygt N 3085 SH series (2.4kW)	£2,301.00	ref: https://www.pumpsukitd.com/flygt-ns-3085-sh-160-24-sewage-pump.html
Sump pump in dry well with integrated level control		Y							
Sump pump pipework to drain including non-return valve (80mm dia)		Y				assume 50m length	plastic pipework		
Access staircase from ground floor landing to dry well base		Y				10m vertical rise			
Manhole cover to wet well	Y								
Steel framed and clad building structure to same footprint as dry well (3m height to eaves)	Y					9m x 13m x 3m height	single-skin cladding to walls and roof		
MCC			Y	Y					ref: "MCCs" workbook sheet
Cabling for power and instrumentation			Y	Y					ref: "MCCs" workbook sheet
Overhead lifting beam		Y				12m length	capacity 5t		
Small power			Y				2no. 110v sockets		
Incoming pipework from clarified water main including tie-in connection (1500 dia)	Y					5m	buried ductile iron		
Isolation valve (route from DAF) - 900 dia		Y					1no. - 900NB wedge gate valve PN10, manually actuated, in compliance with UU S03	£12,651.19	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Isolation valve (route from Accelerators) - 900 dia		Y					1no. - 900NB wedge gate valve PN10, manually actuated, in compliance with UU S03	£12,651.19	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Rising main to new RGFs - 900mm dia	Y					32m	buried ductile iron		
Flowmeter on rising main with cabling - 900mm dia				Y			siemens/ABB magflow		
New Rapid Gravity Filters (110Ml/d - 8 no x 10m x 7m)									
Demolish existing bottling plant structure (incl floor slab, walls and cladding)	Y								
Excavation including temp support	Y								
Blinding	Y								
Formwork	Y								
Reinforcement	Y								
Concrete filters (single bank) and filter gallery	Y					10m x 7m x 3m deep per filter	8no. filters		
Sump pump		Y					1no. - Flygt N 3085 SH series (2.4kW), 80mm NB pipework	£2,301.00	ref: https://www.pumpsukitd.com/flygt-ns-3085-sh-160-24-sewage-pump.html
Ships ladders (8 No) from gallery walkway to lower ground floor level		Y							
Access handrail within gallery and externally including toe-boards		Y							
Actuated penstocks (16 No say 900mm x 900mm)		Y					16no. - Fig SG3100 900W x 1000D electrically actuated penstock (compliant with UU S03)	£4,945.63	ref: Ham Baker Adams quotation for Blackburn and Darwen dated 10/05/2016
Pipework and actuated valves in gallery		Y							
- Clarified water inlet 1200mm dia manifold pipework		Y				1no. @ 65m length	scotchkoted steel		
- Clarified water inlet valve (450mm dia)		Y					8no. - 450NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£3,541.81	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
- Clarified water inlet pipework (450mm dia)		Y				8no. @ 5m length	scotchkoted steel		
- Filtered water outlet valve (450mm dia)		Y					8no. - 450NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£3,541.81	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
- Filtered water outlet pipework (450mm dia)		Y				8no. @ 5m length	scotchkoted steel		
- Filtered water outlet 1200mm dia manifold pipework		Y				1no. @ 65m length	scotchkoted steel		
- Dirty washwater outlet valve (900mm dia)		Y					8no. - 900NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£16,388.69	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
- Dirty washwater outlet pipework (900mm dia)		Y				8no. @ 5m length	scotchkoted steel		
- Dirty washwater outlet 900mm dia manifold pipework		Y				1no. @ 65m length	scotchkoted steel		
- Washwater main inlet 900mm dia manifold pipework		Y				1no. @ 65m length	scotchkoted steel		
- Washwater main inlet valve (900mm dia)		Y					8no. - 900NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£16,388.69	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
- Washwater main inlet pipework (900mm dia)		Y				8no. @ 5m length	scotchkoted steel		
- Air scour main inlet 350mm dia manifold pipework		Y				1no. @ 65m length	scotchkoted steel		
- Air scour main inlet valve (350mm dia)		Y					8no. - 350NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£3,110.38	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
- Air scour main inlet pipework (350mm dia)		Y				8no. @ 5m length	scotchkoted steel		
- Run to waste actuated penstock		Y					8no. - Fig SG3100 900W x 1000D electrically actuated penstock (compliant with UU S03)	£4,945.63	ref: Ham Baker Adams quotation for Blackburn and Darwen dated 10/05/2016
Transfer pipework (external to gallery)	Y								
- Single filtered water main to GAC filters (Phases 1, 2) - 900mm dia	Y					101m	buried ductile iron		
- Filtered water main isolation valve (900mm dia)		Y					1no. - 900NB wedge gate valve PN10, manually actuated, in compliance with UU S03	£12,651.19	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
- Single filtered water main to GAC filters (Phase 4) tied into existing DAF outlet pipework - 900mm dia	Y					52m	buried ductile iron		
- Filtered water main isolation valve (900mm dia)		Y					1no. - 900NB wedge gate valve PN10, manually actuated, in compliance with UU S03	£12,651.19	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
- Dirty washwater drain with connection to existing dirty washwater tanks - 900mm dia	Y					103m	buried ductile iron		
- Dirty washwater drain isolation valve (900mm dia)		Y					1no. - 900NB wedge gate valve PN10, manually actuated, in compliance with UU S03	£12,651.19	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Inter-connecting pipework (dirty washwater main to recycle tank) - 900mm dia		Y				10m	buried ductile iron		
Dirty washwater main isolation valve (900mm dia)		Y					1no. - 900NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£16,388.69	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Recycle water main isolation valve (900mm dia)		Y					1no. - 900NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£16,388.69	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Underdrains (laterals grouted in place with nozzles)		Y							
- Filter internal pipework, central manifold/header - 450mm dia		Y				8no. @ 10m length	PVC - floor mounted with concrete surround		
- Filter internal pipework, laterals - 150mm dia @ 300mm centres		Y				8no. @ 231m length	PVC - 33 laterals per filter, 33 x 7m = 231m of pipework per filter		
- Filter floor nozzles - grouted in place		Y				8no. @ 429 heads	500mm centres on each lateral (13 per lateral), 13no. X 33 laterals = 429 heads per filter		
Filter media - 70m2 x 8 filters					Y		gravel support layer (50mm), sand (1100mm), anthracite (400mm)		
- Gravel support layer (50mm depth)	Y					0.05*70*8 (+10%) = 30.8m3	4 to 6.3mm equivalent size, bulk density 1600kg/m3		ref: D. Brydon email dated 26/01/2018 "New RGF and GAC media"
- Sand media (1100mm depth)	Y					1.1*70*8 (+10%) = 677.6m3	0.56 or 0.65mm equivalent size, uniformity coefficient <1.3		ref: D. Brydon email dated 26/01/2018 "New RGF and GAC media"
- Anthracite layer (400mm depth)	Y					0.4*70*8 (+10%) = 246.4m3	1.18 to 2.5mm equivalent size (grade 2), bulk density 1600kg/m3		ref: D. Brydon email dated 26/01/2018 "New RGF and GAC media"
Launders (8 x 2 = 16 No)		Y				8m long (2 per filter)	stainless steel		ref: D. Brydon email dated 26/01/2018 "New RGF and GAC media"
Air header pipework (internal to filters) - 350mm dia		Y				8no. @ 5m length	stainless steel, fixed to concrete filter walls		
Install roof over new filters	Y						steel structure with single-skin cladding to roof and walls		
Lighting			Y						
Small power			Y				8no. 110v sockets		
Install increased diameter pipe to replace existing clarified water pipe along length of existing RGFs - 900mm dia	Y					88m	buried ductile iron		
Ultrasonic level instruments (8no.)				Y			PPM 180 Ultra 5 (Profibus enabled) and dB10 ultrasonic transducer	£767.00	ref: Pulsar quotation 24620 for Liverpool WwTW dated 05/11/2013
Conductivity level probes (8no.)				Y			E&H conductivity level probes, HH probe length 2000mm, LL probe length 8000mm	£652.00	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Turbidity analyser (9no.) - individual filter outlets and common filtered water outlet				Y					
Manganese analyser (2 No) - common RGF inlet and outlet				Y					
Temperature transmitter - common RGF clarified water inlet				Y			E&H TMT162	£762.40	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Outlet flowmeter filtered water 450mm dia - 8no.				Y			ABB watermaster FEF121 magflow meter (full bore) - DN500	£2,025.00	ref: ABB quotation 13Q1929371-1 for Liverpool WwTW dated 2013
Sample water drain		Y							
Additional hypochlorite dosing pumps		Y			Y		2no. PROMINENT SIGMA2 dosing pumps (max 0.2kW)	£2,709.00	ref: https://www.anchorpumps.com/prominent-sigma2-motor-driven-pump-148l-hr
Dosing pipework for chlorination at new RGFs		Y				100m	dual contained plastic pipework		
Provisional sum for improvements to existing chemical storage and dosing systems		Y						£100,000.00	

	discipline responsibility				dimensions	comments / further information	unit cost	assumptions
New Recycle tank and pumping station - run to waste								
Recycle tank (wet well) - 250m3	Y				7m x 6m x 6m depth	buried concrete tank. Include for benching to tank corners		
Ultrasonic level instrument				Y		PPM 180 Ultra 5 (Profibus enabled) and dB10 ultrasonic transducer	£767.00	ref: Pulsar quotation 24620 for Liverpool WwTW dated 05/11/2013
Conductivity level probes				Y		E&H conductivity level probes, HH probe length 2000mm, LL probe length 8000mm	£652.00	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Submersible pumps with VSD (2no. X 75l/s x 20m head) - D/S configuration		Y				2no. - Flygt NP3202.090 (30kW), 75l/s @ 22m head	£10,850.20	ref: Xylem quotation 13-SALSHQ-06770 Alt. 1 Ver. 7 for Liverpool WwTW dated 04/02/2014
Non-return valves - 150mm dia		Y				2no.		
Recycled water discharge mains - 150mm dia		Y			10m	2no. - one per submersible pump. Scotchkoted steel		
Rising main isolation valves - 150mm dia		Y				2no. - 150NB wedge gate valve PN10, manually actuated, in compliance with UU S03	£107.24	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Flowmeter on rising main with cabling - 150mm dia				Y		ABB watermaster FEF121 magflow meter (full bore) - DN200	£859.00	ref: ABB quotation 13Q1929371-1 for Liverpool WwTW dated 2013
Recycled water common discharge main - 150mm dia	Y				50m	buried ductile iron		
New RGF Plant room in GRP Cubicle								
GRP kiosk	Y				8m x 12m x 3m height			
Flat concrete floor slab	Y				8.5m x 12.5m			
Blowers (D/S)		Y				2no. - 1890m3/hour @350mbar. 2no. Sulzer HST2500-2-L, 90kW	£58,612.50	ref: "blower sizing" and Sulzer quotation for Blackburn and Darwen dated 27/10/2016
Actuated valves (downstream of blowers) - 350mm dia		Y				2no. - 350NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£3,110.38	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Air scour main flowmeter (350mm dia)				Y				
Air scour main pressure switch				Y		Guardian series pressure switch model P1201	£245.00	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Air scour main (350mm dia)		Y			15m	scotchkoted steel		
Heating / air conditioning			Y			4no. ceiling mounted cassette units and external condensers		
Lighting			Y					
Small power			Y			2no. 110v sockets		
MCC			Y	Y				ref: "MCCs" workbook sheet
Cabling for power and instrumentation			Y	Y				ref: "MCCs" workbook sheet
New Clearwater tank and pumping station								
Excavation including temp supports	Y							
Blinding	Y							
Formwork	Y							
Reinforcement	Y							
Concrete chamber (dry well) complete with concrete roof slab (50% floor area)	Y				9m x 13m x 10m deep			
Concrete chamber (wet well) complete with concrete roof slab	Y				8m x 13m x 10m deep			
Ultrasonic level instrument				Y		PPM 180 Ultra 5 (Profibus enabled) and dB10 ultrasonic transducer	£767.00	ref: Pulsar quotation 24620 for Liverpool WwTW dated 05/11/2013
Conductivity level probes				Y		E&H conductivity level probes, HH probe length 2000mm, LL probe length 8000mm	£652.00	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Pump plinths	Y				2m x 2m x 0.5m height	3no.		
Low lift backwash pumps with VSD (3 No x 560 l/s x 25m head) - D/D/S		Y			circa 2m x 2m x 3m height	3no. - Hidrostral L12K series (240kW), 650l/s @ 25m	£51,794.41	ref: Hidrostral budget quotation 30/01/2018 (Estimate 83780 Rev B)
Actuated valves (upstream and downstream of pumps) - 900mm dia		Y				6no. - 900NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£16,388.69	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Miscellaneous interconnecting pipework - 900mm dia		Y			30m	scotchkoted steel		
Backwash main flowmeter (1 No) - 900mm dia				Y				
Backwash main pressure transmitter						E&H Cerabar M PMC51	£830.30	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Clearwater backwash main to new RGF (900mm dia)	Y				115m	buried ductile iron		
Lighting in dry well			Y					
Sump pump in dry well with integrated level control			Y			1no. - Flygt N 3085 SH series (2.4kW)	£2,301.00	ref: https://www.pumpsukitd.com/flygt-ns-3085-sh-160-24-sewage-pump.html
Sump pump rising main to drain including non-return valve (80mm dia)			Y		assume 50m length	plastic pipework		
Access staircase from ground floor landing to dry well base			Y		10m vertical rise			
Steel framed and clad building structure to same footprint as dry well (3m height to eaves)	Y				9m x 13m x 3m height	single-skin cladding to walls and roof		
MCC			Y	Y				ref: "MCCs" workbook sheet
Cabling for power and instrumentation			Y	Y				ref: "MCCs" workbook sheet
Overhead lifting beam		Y			12m length	capacity 5t		
Small power			Y			2no. 110v sockets		
Connection from UV outlet main to clearwater wet well (900mm dia)	Y				15m length of pipework	buried ductile iron		
Manual isolation valve (UV outlet connection) - 900 dia		Y				1no. - 900NB wedge gate valve PN10, manually actuated, in compliance with UU S03	£12,651.19	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Convert existing RGFs to GAC Phases 1 and 2) - individual filter footprint 6m x 4.5m								
Remove existing carbon media from 24no. filters and dispose of	Y				972m3 of media	media quantity - 24 filters x 27m2 surface area x 1.5m depth = 972m3		
Replace existing air scour pipework		Y						
- Air scour main inlet 350mm dia manifold pipework		Y			1no. @ 65m length	scotchkoted steel		
- Air scour main inlet valve (350mm dia)		Y				24no. - 350NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£3,110.38	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
- Air scour main inlet pipework (350mm dia)		Y			24no. @ 5m length	scotchkoted steel		
Air header pipework (internal to filters) - 350mm dia		Y			8no. @ 5m length	stainless steel, fixed to concrete filter walls		
Replace existing blowers		Y				2no. - 2117m3/hour @350mbar. 2no. Sulzer HST2500-2-L, 90kW	£58,612.50	ref: "blower sizing" and Sulzer quotation for Blackburn and Darwen dated 27/10/2016
MCC Feeder and cabling upgrade			Y					ref: "MCCs" workbook sheet
Install new GAC media to 24 filters	Y				1296m3 of media	6m x 4.5m x 2m depth (assumed depth - to be confirmed) x 24 filters		Evoqua AquaCarb® 830 and 1240 Carbons
Convert existing RGFs to GAC (Phase 4) - individual filter footprint 7m x 5m								
Remove existing carbon media from 8no. filters and dispose of	Y				420m3 of media	media quantity - 8 filters x 35m2 surface area x 1.5m depth = 420m3		
Replace existing air scour pipework		Y						
- Air scour main inlet 350mm dia manifold pipework		Y			1no. @ 65m length	scotchkoted steel		
- Air scour main inlet valve (350mm dia)		Y				8no. - 350NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£3,110.38	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
- Air scour main inlet pipework (350mm dia)		Y			8no. @ 5m length	scotchkoted steel		
Air header pipework (internal to filters) - 350mm dia		Y			8no. @ 5m length	stainless steel, fixed to concrete filter walls		
Replace existing blowers		Y				2no. - 2117m3/hour @350mbar. 2no. Sulzer HST2500-2-L, 90kW	£58,612.50	ref: "blower sizing" and Sulzer quotation for Blackburn and Darwen dated 27/10/2016
MCC Feeder and cabling upgrade			Y					ref: "MCCs" workbook sheet
Install new GAC media to 8 filters	Y				560m3 of media	7m x 5m x 2m depth (assumed depth - to be confirmed) x 8 filters		Evoqua AquaCarb® 830 and 1240 Carbons
New Dirty Washwater Storage Tank (576m3)								
Access road diversion	Y				50m length @ 7m wide	Note: existing dirty washwater storage (4no. @ 16m x 10m x 3m TWL)		
Break-out existing access road	Y					tarmac surface and white-lining		
Excavation including temp supports	Y							
Blinding	Y							
Formwork	Y							
Reinforcement	Y							
Concrete chamber (tank) buried to level of existing backwash tanks	Y				16m x 12m x 3.5m deep	top water level @3m depth. Tie-in to existing dirty washwater tank(s)		
Ultrasonic level instrument				Y		PPM 180 Ultra 5 (Profibus enabled) and dB10 ultrasonic transducer	£767.00	ref: Pulsar quotation 24620 for Liverpool WwTW dated 05/11/2013
Conductivity level probes				Y		E&H conductivity level probes, HH probe length 2000mm, LL probe length 8000mm	£652.00	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Inlet weir extension (concrete channel)	Y				1m wide, 12m long, 3.5m deep	tied into existing inlet channel - assume 300mm thick walls		
Floating bellmouth outlet inc. outlet pipework		Y						
Connection to existing outlet manifold - 200 dia			Y		assume 20m length	scotchkoted steel		
Existing dirty washwater tank overflow line modifications (500mm dia)	Y				assume 20m length	buried DI - requires removal of existing pipework and tie-in for overflow from new tank		
Settled solids lateral scraper inc. support fixings and drive			Y					
Solids removal channel extension	Y				1m wide, 12m long, 3.5m deep	tied into existing solids channel		
Solids removal actuated penstocks (3 No say 900mm x 900mm)		Y				3no. - Fig SG3100 900W x 1000D electrically actuated penstock (compliant with UU S03)	£4,945.63	ref: Ham Baker Adams quotation for Blackburn and Darwen dated 10/05/2016
Connection to existing solids removal manifold - 200 dia		Y			assume 20m length	scotchkoted steel		
Cabling for power and instrumentation			Y	Y				ref: "MCCs" workbook sheet
Modifications to existing block 4 MCC			Y	Y		new starters and additional I/O for instrumentation		ref: "MCCs" workbook sheet
Additional access platform including handrailing, toeboards and 1no. 3.5m vertical ladder		Y			12m length			

	discipline responsibility				dimensions	comments / further information	unit cost	assumptions
New Sludge Balancing Tank (420m3)								
Excavation including temp supports	Y							
Blinding	Y							
Formwork	Y							
Reinforcement	Y							
Concrete chamber (tank) buried to level of existing backwash tanks	Y				14m x 10m x 3.5m deep	top water level @3m depth.		
Ultrasonic level instrument				Y		PPM 180 Ultra 5 (Profibus enabled) and dB10 ultrasonic transducer	£767.00	ref: Pulsar quotation 24620 for Liverpool WwTW dated 05/11/2013
Conductivity level probes				Y		E&H conductivity level probes, HH probe length 2000mm, LL probe length 8000mm	£652.00	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Inlet chamber extension inc. tie in to existing inlet chamber - covered concrete channel	Y				2m wide x 8m long x 3.5m deep	concrete channel with lid		
Inlet penstock (1 No say 900mm x 900mm)		Y				1no. - Fig SG3100 900W x 1000D electrically actuated penstock (compliant with UU S03)	£4,945.63	ref: Ham Baker Adams quotation for Blackburn and Darwen dated 10/05/2016
Thickened sludge inlet manifold pipework - 250mm dia	Y				assume 20m length	scotch-koted steel		
Thickened sludge inlet valves - 250mm dia		Y				3no. - 250NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£2,139.56	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Sludge outlet valve - 250mm diameter		Y				1no. - 250NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£2,139.56	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Sludge outlet pipework inc. tie in to existing pipework - 250mm dia	Y					buried ductile iron		
Submersible mixer and guiderail		Y				Flygt S4650 5.5kW mixer	£8,283.00	ref: Flygt quotation for Bredbury MBT dated 01/04/2014
Lifting davit and socket		Y						
Sludge tank 2 to 3 balancing penstock (1 No say 900mm x 900mm)		Y				1no. - Fig SG3100 900W x 1000D electrically actuated penstock (compliant with UU S03)	£4,945.63	ref: Ham Baker Adams quotation for Blackburn and Darwen dated 10/05/2016
Cabling for power and instrumentation			Y	Y				ref: "MCCs" workbook sheet
Modifications to existing effluent treatment MCC			Y	Y		new starters and additional I/O for instrumentation		ref: "MCCs" workbook sheet
Handrailing, toeboards and 1no. 3.5m vertical ladder		Y			35m length			
Site Wide Elements								
SCADA Control system with Operator Interface, outstations and all cabling				Y				
Power upgrading and distribution			Y					ref: "MCCs" workbook sheet
Interfaces between existing and new control systems				Y				
External lighting			Y	Y		12no. lighting columns		
Additional footpaths and road reinstatement	Y							
Modify existing high security fence to include bottling plant area	Y				200m total length			
Planting and landscaping	Y							
Lightning protection to new RGFs??			Y					
Pipework fittings, joints, couplers etc.	Y	Y					20% of pipework mats	
Service diversions for new structures	Y					applies to inter-stage pumping station and clearwater storage tank		
Modifications to existing drainage system	Y				100m length allowance	assume 4no. new manholes and additional 200NB pipework		
Valve chambers for buried valves	Y					12no. 1500mm diameter manhole rings to a depth of 1m		
Preliminaries								
Preparation and reinstatement of site compound for offices and car parking	Y							
Site offices and stores	Y							
Mess and welfare facilities	Y							
Design	Y							
Staff	Y							
Insurances	Y							
Risk	Y							
Plant	Y							
Site security, signage and demarcation	Y							
Utility services to site offices	Y							
Site topo and condition surveys	Y							
Temporary over-pumping	Y							
Temporary lighting	Y							
Optional Elements								
Cover existing RGFs when converted to GAC	Y					steelwork frame, single-skin cladding to walls and roof		
Construct hard standing / push walls for sludge storage area	Y				50m x 30m, 3m high push walls	flat concrete slab incorporating drainage. Push walls to two sides		

Notes

- 1 Buried pipework is ductile iron spigot and socket unless otherwise indicated
- 2 Pipework in gallery, Interstage PS or above ground is coated steel unless otherwise indicated
- 3 Products in contact with water must be approved for this application
- 4 Actuated valves will provide process control and isolation. No additional manual isolation valves provided

South Staffordshire Water
Hampton Loade WTW
Scope of Work and Work Breakdown Structure

	discipline responsibility					dimensions	comments / further information	unit cost	assumptions
	Civil	Mech	Elec	ICA	Process				
Connection to Existing Clarifier Outlets									
Connection to Accentrifloc 1 outlet pipe (750mm dia - install 2nr tees)	Y					5m	buried ductile iron including a vertical 45 degree bend		
Connection to Accentrifloc 2 outlet pipe (750mm dia - install 2nr tees)	Y					5m	buried ductile iron including a vertical 45 degree bend		
Connection to Pulsator 3 outlet pipe (1100mm dia - install 2nr tees)	Y					5m	buried ductile iron including a vertical 45 degree bend		
Connection to Pulsator 4 outlet pipe (1100mm dia - install 2nr tees)	Y					5m	buried ductile iron including a vertical 45 degree bend		
Install common Clarified Water pipe (say 1500mm dia) inc. connection to IPS	Y					60m	buried ductile iron with 4 tee connections (2 x 750dia and 2 x 1100dia)		
Manual isolation valves 1100 dia (existing Pulsator discharge lines to existing RGFs) - 4no.		Y				4.000	4no. - 750NB wedge gate valve PN10, manually actuated, in compliance with UU S03		
Manual isolation valves 750 dia (existing Accentrifloc discharge lines to existing RGFs) - 4no.		Y				4.000	4no. - 750NB wedge gate valve PN10, manually actuated, in compliance with UU S03	£6,325.60	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
New Interstage Pumping Station (210M/d)									
Excavation including temp supports	Y								
Blinding	Y								
Formwork	Y								
Reinforcement	Y								
Concrete chamber (dry well) complete with concrete roof slab (50% floor area)	Y					9m x 13m x 10m deep			
Concrete chamber (wet well) complete with concrete roof slab	Y					8m x 13m x 10m deep	416m3 working volume (0.5m freeboard)		
Ultrasonic level instrument				Y			PPM 180 Ultra 5 (Profibus enabled) and dB10 ultrasonic transducer	£767.00	ref: Pulsar quotation 24620 for Liverpool WwTW dated 05/11/2013
Conductivity level probes				Y			E&H conductivity level probes, HH probe length 2000mm, LL probe length 8000mm	£652.00	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Pump plinths	Y					2m x 2m x 0.5m height	4no.		
Low lift pumps with VSD (4 No x 820 l/s x 20m head) - D/D/D/5		Y				circa 2m x 2m x 3m height	4no. - Hidrostral L12K series (240kW), 650l/s @ 25m	£70,000.00	Plug rate based on: Hidrostral budget quotation 30/01/2018 (Estimate 83780 Rev B). Increased by £18k to cover rise in flow rate
Actuated valves (upstream and downstream of pumps) - 1500mm dia		Y					8no. - 1500NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£53,456.25	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016 (Knife Gate Valve rate used 2 Bar rating)
Miscellaneous interconnecting pipework - 1500mm dia		Y				40m	scotchkoted steel		
Lighting in dry well			Y						
Sump pump in dry well with integrated level control		Y					1no. - Flygt N 3085 SH series (2.4kW)	£2,301.00	ref: https://www.pumpsukitd.com/flygt-ns-3085-sh-160-24-sewage-pump.html
Sump pump pipework to drain including non-return valve (80mm dia)		Y				assume 50m length	plastic pipework		
Access staircase from ground floor landing to dry well base		Y				10m vertical rise			
Manhole cover to wet well	Y								
Steel framed and clad building structure to same footprint as dry well (3m height to eaves)	Y					9m x 13m x 3m height	single-skin cladding to walls and roof		
MCC			Y	Y					ref: "MCCs" workbook sheet
Cabling for power and instrumentation			Y	Y					ref: "MCCs" workbook sheet
Overhead lifting beam		Y				12m length	capacity 5t		
Small power			Y				2no. 110v sockets		
Rising main to new RGFs - 1500mm dia	Y					20m	buried ductile iron		
Flowmeter on rising main with cabling - 1500mm dia				Y			siemens/ABB magflow		
New Rapid Gravity Filters (210M/d - 12 no x 10m x 9m)									
Remove surplus spoil from previous site development	Y					40m x 60m x 1m deep	Assume inert material disposed off site		
Excavation including temp support	Y								
Blinding	Y								
Formwork	Y								
Reinforcement	Y								
Concrete filters double bank) and filter gallery - see separate worksheet	Y					10m x 9m x 3m deep per filter	12no. filters		
Sump pump		Y					1no. - Flygt N 3085 SH series (2.4kW). 80mm NB pipework	£2,301.00	ref: https://www.pumpsukitd.com/flygt-ns-3085-sh-160-24-sewage-pump.html
Ships ladders (12 No) from gallery walkway to lower ground floor level		Y							
Access handrail within gallery and externally including toe-boards		Y							
Penstocks (24 No say 900mm x 900mm)		Y					24no. - Fig SG3100 900W x 1000D electrically actuated penstock (compliant with UU S03)	£4,945.63	ref: Ham Baker Adams quotation for Blackburn and Darwen dated 10/05/2016
Pipework and actuated valves in gallery		Y							
- Clarified water inlet 1500mm dia manifold pipework		Y				1no. @ 60m length	scotchkoted steel		
- Clarified water inlet valve (450mm dia)		Y					12no. - 450NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£3,541.81	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
- Clarified water inlet pipework (450mm dia)		Y				12no. @ 5m length	scotchkoted steel		
- Filtered water outlet valve (450mm dia)		Y					12no. - 450NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£3,541.81	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
- Filtered water outlet pipework (450mm dia)		Y				12no. @ 5m length	scotchkoted steel		
- Filtered water outlet 1500mm dia manifold pipework		Y				1no. @ 60m length	scotchkoted steel		
- Dirty washwater outlet valve (900mm dia)		Y					12no. - 900NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£16,388.69	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
- Dirty washwater outlet pipework (900mm dia)		Y				12no. @ 5m length	scotchkoted steel		
- Dirty washwater outlet 900mm dia manifold pipework		Y				1no. @ 60m length	scotchkoted steel		
- Washwater main inlet 900mm dia manifold pipework		Y				1no. @ 60m length	scotchkoted steel		
- Washwater main inlet valve (900mm dia)		Y					12no. - 900NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£16,388.69	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
- Washwater main inlet pipework (900mm dia)		Y				12no. @5m length	scotchkoted steel		
- Air scour main inlet 350mm dia manifold pipework		Y				1no. @ 60m length	scotchkoted steel		
- Air scour main inlet valve (350mm dia)		Y					12no. - 350NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£3,110.38	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
- Air scour main inlet pipework (350mm dia)		Y				12no. @5m length	scotchkoted steel		
Transfer pipework (external to gallery)	Y						buried ductile iron		
- Single filtered water main to GAC filters (Phases 1, 2) - 1500mm dia	Y					110m	buried ductile iron		
- Filtered water main isolation valve (1500mm dia)		Y					1no. - 1500NB wedge gate valve PN10, manually actuated, in compliance with UU S03	£45,000.00	Plug rate based on : Industrial valves quotation for Blackburn and Darwen dated 09/05/2016 (Knife Gate Valve rate used 2 Bar rating). Reduced by £8k as manually actuated.
- Dirty washwater drain with connection to existing dirty washwater tanks - 900mm dia	Y					60m	buried ductile iron		
- Dirty washwater drain isolation valve (900mm dia)		Y					1no. - 900NB wedge gate valve PN10, manually actuated, in compliance with UU S03	£12,651.19	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Underdrains (laterals grouted in place with nozzles)		Y							
- Filter internal pipework, central manifold/header - 450mm dia		Y				12no. @ 10m length	PVC - floor mounted with concrete surround		
- Filter internal pipework, laterals - 150mm dia @ 300mm centres		Y				12no. @ 297m length	PVC - 33 laterals per filter, 33 x 9m = 297m of pipework per filter		
- Filter floor nozzles - grouted in place		Y				8no. @ 561 heads	500mm centres on each lateral (17 per lateral). 17no. X 33 laterals = 561 heads per filter		
Filter media - 90m2 x 12 filters				Y			gravel support layer (50mm), sand (1100mm), anthracite (400mm)		ref: D. Brydon email dated 26/01/2018 "New RGF and GAC media"
- Gravel support layer (50mm depth)	Y					0.05*90*12 (+10%) = 59.4m3	4 to 6.3mm equivalent size, bulk density 1600kg/m3		ref: D. Brydon email dated 26/01/2018 "New RGF and GAC media"
- Sand media (1100mm depth)	Y					1.1*90*12 (+10%) = 1306m3	0.56 or 0.65mm equivalent size, uniformity coefficient <1.3		ref: D. Brydon email dated 26/01/2018 "New RGF and GAC media"
- Anthracite layer (400mm depth)	Y					0.4*90*12 (+10%) = 475m3	1.18 to 2.5mm equivalent size (grade 2), bulk density 1600kg/m3		ref: D. Brydon email dated 26/01/2018 "New RGF and GAC media"
Launders (12 x 2 = 24 No)		Y				10m long (2 per filter)	stainless steel		
Air header pipework (internal to filters) - 350mm dia		Y				12no. @ 5m length	stainless steel, fixed to concrete filter walls		
Install roof over new filters	Y						steel structure with single-skin cladding to roof and walls		
Lighting			Y						
Small power			Y				12no. 110v sockets		
Ultrasonic level instruments (12no.)				Y			PPM 180 Ultra 5 (Profibus enabled) and dB10 ultrasonic transducer	£767.00	ref: Pulsar quotation 24620 for Liverpool WwTW dated 05/11/2013
Conductivity level probes (12no.)				Y			E&H conductivity level probes, HH probe length 2000mm, LL probe length 8000mm	£652.00	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Turbidity analyser (13no.) - individual filter outlets and common filtered water outlet				Y					
Manganese analyser (2 No) - common RGF inlet and outlet				Y					
Temperature transmitter - common RGF clarified water inlet				Y			E&H TMT162	£762.40	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Outlet flowmeter filtered water 450mm dia - 12no.				Y			ABB watermaster FEF121 magflow meter (full bore) - DN500	£2,025.00	ref: ABB quotation 13Q1929371-1 for Liverpool WwTW dated 2013
Sample water drain		Y							
Additional hypochlorite dosing rig, including pumps, containment, valves, instrumentation etc.		Y			Y		2no. PROMINENT SIGMA2 dosing pumps (max 0.2kW)	£2,709.00	ref: https://www.anchorpumps.com/prominent-sigma2-motor-driven-pump-148l-hr
Dosing pipework for chlorination at new RGFs		Y					dual contained plastic pipework		
Flat concrete slab for dosing kiosk	Y					4.5m x 3.5m	include provision for ducting (4no. @ 150mm)		
New chemical dosing kiosk (to house new dosing rig)	Y					4m x 3m x 2m height (to eaves)	GRP kiosk with double door access		

	discipline responsibility				dimensions	comments / further information	unit cost	assumptions
New RGF Plant room in GRP Cubicle								
GRP kiosk	Y				8m x 15m x 3m height			
Flat concrete floor slab	Y				8.5m x 15.5m			
Blowers (D/S)		Y				2no. - 2430m ³ /hour @350mbar, 2no. Sulzer HST20-4500-1-150, 150kW	£76,387.50	ref: "blower sizing" and Sulzer quotation for Blackburn and Darwen dated 27/10/2016
Actuated valves (downstream of blowers) - 350mm dia		Y				2no. - 350NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£3,110.38	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Air scour main flowmeter (350mm dia)			Y					
Air scour main pressure switch			Y			Guardian series pressure switch model P1201	£245.00	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Air scour main (350mm dia)		Y			15m	scotchkoted steel		
Heating / air conditioning			Y			4no. ceiling mounted cassette units and external condensers		
Lighting			Y					
Small power			Y			2no. 110v sockets		
MCC			Y	Y				ref: "MCCs" workbook sheet
Cabling for power and instrumentation			Y	Y				ref: "MCCs" workbook sheet
New Recycle tank and pumping station - run to waste								
Recycle tank (wet well) - 288m ³	Y				8m x 6m x 6m depth	buried concrete tank. Include for benching to tank corners		
Ultrasonic level instrument				Y		PPM 180 Ultra 5 (Profibus enabled) and dB10 ultrasonic transducer	£767.00	ref: Pulsar quotation 24620 for Liverpool WwTW dated 05/11/2013
Conductivity level probes				Y		E&H conductivity level probes, HH probe length 2000mm, LL probe length 8000mm	£652.00	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Submersible pumps with VSD (2no. X 75l/s x 20m head) - D/S configuration		Y				2no. - Flygt NP3202.090 (30kW), 75l/s @ 22m head	£10,850.20	ref: Xylem quotation 13-SALSHQ-06770 Alt. 1 Ver. 7 for Liverpool WwTW dated 04/02/2014
Non-return valves - 150mm dia		Y				2no.		
Recycled water discharge main - 150mm dia		Y			10m	2no. - one per submersible pump. Scotchkoted steel		
Rising mains isolation valves - 150mm dia		Y				2no. - 150NB wedge gate valve PN10, manually actuated, in compliance with UU S03	£107.24	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Flowmeter on rising main with cabling - 150mm dia				Y		ABB watermaster FEF121 magflow meter (full bore) - DN200	£859.00	ref: ABB quotation 13Q1929371-1 for Liverpool WwTW dated 2013
Recycled water common discharge main - 150mm dia	Y				100m	buried ductile iron		
New Clearwater tank and pumping station								
Excavation including temp supports	Y							
Blinding	Y							
Formwork	Y							
Reinforcement	Y							
Concrete chamber (dry well) complete with concrete roof slab (50% floor area)	Y				9m x 13m x 10m deep			
Concrete chamber (wet well) complete with concrete roof slab	Y				8m x 13m x 10m deep			
Ultrasonic level instrument				Y		PPM 180 Ultra 5 (Profibus enabled) and dB10 ultrasonic transducer	£767.00	ref: Pulsar quotation 24620 for Liverpool WwTW dated 05/11/2013
Conductivity level probes				Y		E&H conductivity level probes, HH probe length 2000mm, LL probe length 8000mm	£652.00	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Pump plinths	Y				2m x 2m x 0.5m height	3no.		
Low lift backwash pumps with VSD (3 No x 560 l/s x 25m head) - D/D/S		Y			circa 2m x 2m x 3m height	3no. - Hidrostral L12K series (240kW), 650l/s @ 25m	£51,794.41	ref: Hidrostral budget quotation 30/01/2018 (Estimate 83780 Rev B)
Actuated valves (upstream and downstream of pumps) - 900mm dia		Y				6no. - 900NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£16,388.69	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Miscellaneous interconnecting pipework - 900mm dia		Y			30m	scotchkoted steel		
Backwash main flowmeter (1 No) - 900mm dia				Y				
Backwash main pressure transmitter				Y		E&H Cerabar M PMC51	£830.30	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Clearwater backwash main to new RGF (900mm dia)	Y				150m	buried ductile iron		
Lighting in dry well			Y					
Sump pump in dry well with integrated level control		Y				1no. - Flygt N 3085 SH series (2.4kW)	£2,301.00	ref: https://www.pumpsukitd.com/flygt-ns-3085-sh-160-24-sewage-pump.html
Sump pump rising main to drain including non-return valve (80mm dia)		Y			assume 50m length	plastic pipework		
Access staircase from ground floor landing to dry well base		Y			10m vertical rise			
Steel framed and clad building structure to same footprint as dry well (3m height to eaves)	Y				9m x 13m x 3m height	single-skin cladding to walls and roof		
MCC			Y	Y				ref: "MCCs" workbook sheet
Cabling for power and instrumentation			Y	Y				ref: "MCCs" workbook sheet
Overhead lifting beam		Y			12m length	capacity 5t		
Small power			Y			2no. 110v sockets		
Connection from UV outlet main to clearwater wet well (900mm dia)	Y				15m length of pipework	buried ductile iron		
Manual isolation valve (UV outlet connection) - 900 dia		Y				1no. - 900NB wedge gate valve PN10, manually actuated, in compliance with UU S03	£12,651.19	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Convert existing Phase 1 RGFs to GAC - 8nr individual filter footprint 10m x 10m								
Remove existing carbon media from 8no. filters and dispose of	Y				1200m ³ of media	media quantity - 8 filters x 100m ² surface area x 1.5m depth = 1200m ³		
Replace existing air scour pipework		Y						
- Air scour main inlet 350mm dia manifold pipework		Y			1no. @ 75m length	scotchkoted steel		
- Air scour main inlet valve (350mm dia)		Y				24no. - 350NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£3,110.38	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
- Air scour main inlet pipework (350mm dia)		Y			8no. @5m length	scotchkoted steel		
Air header pipework (internal to filters) - 350mm dia		Y			8no. @ 5m length	stainless steel, fixed to concrete filter walls		
Replace existing blowers		Y				2no. - 5040m ³ /hour @350mbar, 2no. Sulzer HST20-4500-1-150, 150kW	£76,387.50	ref: "blower sizing" and Sulzer quotation for Blackburn and Darwen dated 27/10/2016
Feeder and cabling upgrade			Y					ref: "MCCs" workbook sheet
Install new GAC media to 8 filters	Y				1600m ³ of media	10m x 10m x 2m depth (assumed depth) x 8 filters	675/m ³	Carbsorb30 Chemviron quote February 2018
Convert existing Phase 2 RGFs to GAC - 10nr individual filter footprint 10m x 10m								
Remove existing carbon media from 10no. filters and dispose of	Y				1500m ³ of media	media quantity - 10 filters x 100m ² surface area x 1.5m depth = 1500m ³		
Replace existing air scour pipework		Y						
- Air scour main inlet 350mm dia manifold pipework		Y			1no. @ 75m length	scotchkoted steel		
- Air scour main inlet valve (350mm dia)		Y				10no. - 350NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£3,110.38	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
- Air scour main inlet pipework (350mm dia)		Y			10no. @5m length	scotchkoted steel		
Air header pipework (internal to filters) - 350mm dia		Y			10no. @ 5m length	stainless steel, fixed to concrete filter walls		
Replace existing blowers			Y			2no. - 5040m ³ /hour @350mbar, 2no. Sulzer HST20-4500-1-150, 150kW	£76,387.50	ref: "blower sizing" and Sulzer quotation for Blackburn and Darwen dated 27/10/2016
Feeder and cabling upgrade			Y					ref: "MCCs" workbook sheet
Install new GAC media to 10 filters	Y				2000m ³ of media	10m x 10m x 2m depth (assumed depth) x 10 filters	675/m ³	Carbsorb30 Chemviron quote February 2018
New Dirty Washwater Storage Tank (1000m³)								
Access road diversion	Y				50m length @ 7m wide	Note: existing dirty washwater storage (4no. @ 22m x 11m x 3m TWL)		
Break-out existing access road	Y					tarmac surface and white-lining		
Excavation including temp supports	Y							
Blinding	Y							
Formwork	Y							
Reinforcement	Y							
Concrete chamber (tank) buried to level of existing backwash tanks	Y				22m x 15m x 3.5m deep	top water level @3m depth. Tie-in to existing dirty washwater tank(s)		
Ultrasonic level instrument				Y		PPM 180 Ultra 5 (Profibus enabled) and dB10 ultrasonic transducer	£767.00	ref: Pulsar quotation 24620 for Liverpool WwTW dated 05/11/2013
Conductivity level probes				Y		E&H conductivity level probes, HH probe length 2000mm, LL probe length 8000mm	£652.00	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Inlet weir extension (concrete channel)	Y				1m wide, 15m long, 3.5m deep	tied into existing inlet channel - assume 300mm thick walls		
Floating bellmouth outlet inc. outlet pipework	Y							
Connection to existing outlet manifold - 200 dia	Y				assume 20m length	scotchkoted steel		
Settled solids lateral scraper inc. support fixings and drive		Y						
Solids removal channel extension	Y				1m wide, 15m long, 3.5m deep	tied into existing solids channel		
Solids removal actuated penstocks (3 No say 900mm x 900mm)		Y				3no. - Fig SG3100 900W x 1000D electrically actuated penstock (compliant with UU S03)	£4,945.63	ref: Ham Baker Adams quotation for Blackburn and Darwen dated 10/05/2016
Connection to existing solids removal manifold - 200 dia		Y			assume 20m length	scotchkoted steel		
Cabling for power and instrumentation			Y	Y				ref: "MCCs" workbook sheet
Modifications to existing MCC			Y	Y		new starters and additional I/O for instrumentation		ref: "MCCs" workbook sheet
Additional access platform including handrailing, toeboards and 1no. 3.5m vertical ladder	Y				15m length			

	discipline responsibility				dimensions	comments / further information	unit cost	assumptions
New Sludge Balancing Tank (408m3)								
Excavation including temp supports	Y					Note: existing sludge balancing tanks (2no. @ 17m x 7m x 3m TWL)		
Blinding	Y							
Formwork	Y							
Reinforcement	Y							
Concrete chamber (tank) buried to level of existing backwash tanks	Y				17m x 8m x 3.5m deep	top water level @3m depth. Tie-in to existing dirty washwater tank(s)		
Ultrasonic level instrument				Y		PPM 180 Ultra 5 (Profibus enabled) and dB10 ultrasonic transducer	£767.00	ref: Pulsar quotation 24620 for Liverpool WwTW dated 05/11/2013
Conductivity level probes				Y		E&H conductivity level probes, HH probe length 2000mm, LL probe length 8000mmm	£652.00	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Inlet chamber extension inc. tie in to existing inlet chamber - covered concrete channel	Y				2m wide x 20m long x 3.5m deep	concrete channel with lid		
Inlet penstock (1 No say 900mm x 900mm)		Y				1no. - Fig SG3100 900W x 1000D electrically actuated penstock (compliant with UU S03)	£4,945.63	ref: Ham Baker Adams quotation for Blackburn and Darwen dated 10/05/2016
Thickened sludge inlet manifold pipework - 250mm dia	Y				assume 20m length	scotchkoted steel		
Thickened sludge inlet valves - 250mm dia		Y				3no. - 250NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£2,139.56	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Sludge outlet valve - 250mm diameter		Y				1no. - 250NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£2,139.56	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Sludge outlet pipework inc. tie in to existing pipework - 250mm dia	Y				assume 20m length	buried ductile iron		
Submersible mixer and guiderail		Y				Flygt S4650 5.5kW mixer	£8,283.00	ref: Flygt quotation for Bredbury MBT dated 01/04/2014
Lifting davit and socket		Y						
Cabling for power and instrumentation			Y	Y				ref: "MCCs" workbook sheet
Modifications to existing effluent treatment MCC			Y	Y		new starters and additional I/O for instrumentation		ref: "MCCs" workbook sheet
Handrailing, toeboards and 1no. 3.5m vertical ladder		Y			50m length			
New Thickened Sludge Holding Tank (250m3) - above ground								
Flat concrete slab	Y				8.5m diameter			
Glass-coated steel storage tank (circular)	Y				8m diameter x 5m height	"permastore" tank		
GRP tank roof with access hatch	Y							
Lifting davit and socket		Y						
Access staircase from ground floor to tank roof landing		Y						
Submersible mixer and guiderail		Y						
Ultrasonic level instrument				Y		PPM 180 Ultra 5 (Profibus enabled) and dB10 ultrasonic transducer	£767.00	ref: Pulsar quotation 24620 for Liverpool WwTW dated 05/11/2013
Conductivity level probes				Y		E&H conductivity level probes, HH probe length 2000mm, LL probe length 8000mmm	£652.00	ref: E&H quotation 2300200500 for Liverpool WwTW dated 05/11/2013
Thickened sludge inlet manifold pipework - 250mm dia	Y				assume 30m length	scotchkoted steel		
Thickened sludge inlet valves - 250mm dia		Y				2no. - 250NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£2,139.56	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Sludge outlet valve - 250mm diameter		Y			assume 50m length	1no. - 250NB wedge gate valve PN10, electrically actuated, in compliance with UU S03	£2,139.56	ref: Industrial valves quotation for Blackburn and Darwen dated 09/05/2016
Sludge outlet pipework inc. tie in to existing pipework - 250mm dia	Y					buried ductile iron		
Cabling for power and instrumentation			Y	Y				ref: "MCCs" workbook sheet
Modifications to existing effluent treatment MCC			Y	Y		new starters and additional I/O for instrumentation		ref: "MCCs" workbook sheet
Site Wide Elements								
SCADA Control system with Operator Interface, outstations and all cabling				Y				
Power upgrading and distribution				Y				ref: "MCCs" workbook sheet
Interfaces between existing and new control systems				Y				
External lighting				Y				
Additional footpaths and road reinstatement	Y							
Planting and landscaping	Y							
Lightning protection to new RGFs??				Y				
Pipework fittings, joints, couplers etc.	Y	Y					20% of pipework mats	
Service diversions for new structures and pipework	Y							
Modifications to existing drainage system	Y				100m length allowance	assume 4no. new manholes and additional 200NB pipework		
Valve chambers for buried valves	Y					12no. 1500mm diameter manhole rings to a depth of 1m		
Preliminaries								
Preparation and reinstatement of site compound for offices and car parking	Y							
Site offices and stores	Y							
Mess and welfare facilities	Y							
Design	Y							
Staff	Y							
Insurances	Y							
Risk	Y							
Plant	Y							
Site security, signage and demarcation	Y							
Utility services to site offices	Y							
Site topo and condition surveys	Y							
Temporary over-pumping	Y							
Temporary lighting	Y							
Optional Elements								
Cover existing RGFs when converted to GAC	Y					steelwork frame, single-skin cladding to walls and roof		
Construct hard standing / push walls for sludge storage area	Y				50m x 30m, 3m high push walls	flat concrete slab incorporating drainage. Push walls to two sides		

Notes

- 1 Buried pipework is ductile iron spigot and socket unless otherwise indicated
- 2 Pipework in gallery, Interstage PS or above ground is coated steel unless otherwise indicated
- 3 Products in contact with water must be approved for this application
- 4 Actuated valves will provide process control and isolation. No additional manual isolation valves provided