The content of this document is draft and relates to material [or data] which is still in the course of completion in travel to Gate 2 and should not be relied upon at this early stage of development. We continue to develop our thinking and our approach to the issues raised in the document in preparation for Gate 2.

Gate 2 Carbon Calculator

Introduction

- This tool calculates the carbon emissions in the construction of an asset (embodied carbon emissions) and the emissions associated with annual operation.
- . The input data required is based on information available at Gate 2 such as capacity, e.g. 10Ml/d Activated Sludge plant.
- · Carbon emissions are calculated from carbon-curves, derived from a best fit line through an existing data set of emissions and capacity.
- The Net Present Costs (NPCs) are derived from emissions embodied in the construction of the asset and operational emissions over a 40 year period, with a 3.5% discount rate.
- The NPCs are calculated according to the latest Defra guidelines with the Shadow Price of Carbon based on 2009 prices (£27.60 rising by 2% each year).

User Guide

- The user should enter quantities in the light blue cells in columns D~J.
- . Compulsory input requirements are specific to individual Design Manual Categories (DMCs) and may include:
 - Capacity (m³ or p.e.);
 - Number of items;
 - Dosed flow (I/hr);
 - o Pumping station power (kW) or flow (MI/d);
 - Pipe diameter (mm), length (m), depth to invert (m) and location (field or highway); and
 - Tonnes of treated dry solids (TTDS).
- Annual Electricity Consumption is an optional input for some DMCs. When the major input has been entered, if a value for electricity appears in the Annual
 Electricity Consumption input cell, a default electricity usage has been calculated by the tool. This electricity usage is used in the calculation of operational
 emissions. If the user knows the electricity usage for the item, the default electricity can be overwritten and the tool will use this new electricity usage for
 operational emissions. Those items with no default electricity input require compulsory input of electricity usage for calculation of operational emissions.
- The 'Ancillary Works' category is a generic additional item to allow the user to make an allowance for construction of items that are not included in the principal DMC.
- Holding the mouse over column C will reveal a comment containing a description of the items included within each DMC. More detailed descriptions of the
 items included or excluded in a DMC are provided in the individual tabs for each DMC.
- · Carbon has been used throughout this tool to represent carbon dioxide equivalent.
- The carbon curves are presented for information only and do not allow user input. They will be updated by the administrator when additional data is
 available.
- If more than one instance of a DMC is required (e.g. for multiple diameters of water mains) the model should be run with the different capacities and the results recorded in the Record Sheet by clicking the "copy" button in the Design Manual Input Sheet.
- · A new copy of the Carbon Tool should be used for each project.

Process Emissions

- The operational emissions calculated by this tool are typically in addition to the operational emissions reported annually in the June returns.
- The operational emissions for a number of additional treatment processes are taken from the UKWIR 08/WW/20/3 report and include direct emissions from
 operation of the process, indirect emissions from electricity use and chemical dosing and emissions associated with sludge disposal. These additional
 processes are:
 - activated carbon;
 - biofilters;
 - o phosphorous removal;
 - activated sludge;
 - o sludge digestion; and
 - tertiary treatment
- In all other treatment processes, direct emissions, emissions embodied in the production of chemicals and emissions as a result of additional sludge are excluded.
- The reduction in NO₂ emissions downstream of an effluent discharge point that may result from improved levels of treatment are not included.

Related Documents:

Severn Trent Water Design Manual UKWIR report 08/WW/20/3 'Water Framework Directive: Sustainable Treatment Solutions for Achieving Good Ecological Status' Carbon Accounting PR09 Phase 1 report

Version Control

Revision	Purpose and Description	Originated	Checked	Reviewed	Date
0	Final for issue to client				29/05/2009
1	Inclusion of Record Sheet				23/06/2009

roject Ref.	Date	Author	Design Manual Category		User Input	Proposed Year of Construction	Design Life (yrs)	Embodied Carbon (CO₂eq)	Operational Carbon (CO₂eq/yr)	Net Present Cost of Carbon
Example	20/07/2009		Pumping Stations	Flow (MI/d)	Annual Electricity Consumption (kWh)	2009	40	139,492	238,349	£204,586
			Activated Carbon - Removal of							
			Pesticides (Full flow)	Flow (MI/d)	Annual Electricity Consumption (kWh)	2012		1,278,563	4,990,167	£3,829,199
			Sewage Pumping Stations	Pump Power (kW)	Pipe Length (m) Depth to inve			18,454,127	5,444,638	£4,628,626
			contd	Pipe Diameter (mm)	Pipe Location Annual Elect	tricity Consumption (k)				
			Flooring	Floor area (m2)		2012		679,482 -		£17,951
			Lifting Equipment	No. of plants	Annual Electricity Consumption (kWh)	2012		7,812	0	£361
			Access Road	Road Length (m)		2012		244,461 -		£15,815
			Outfall Structures	No. of structures		2012		1,223 -		£32
			Tunnelling & Low Dig Techniques	Tunnel length (m)		2012	2 40	1,683,094 -		£44,466
			Remote Asset Monitoring							
			(Telemetry) Systems	No. of works	Annual Electricity Consumption (kWh)	2012	20	1,751	611,558	£465,220
			Co-mag (Manual Input) UV (Manual Input)					261,023 17,820	329,301 451,612	
							Sum Total	22,629,356	11,827,276	£9,001,670
	_									
							tCO2e	22,629	11,827	
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							tCO2e	22,629	11,827	

Severn Trent Water

GATE 2 CARBON CALCULATOR

USER INSTRUCTIONS:

USER INSTRUCTIONS:

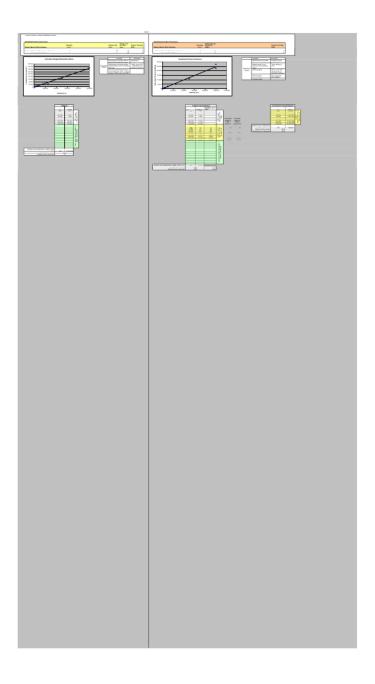
Enter quantities for required Design Manual Categories in the pale blue cells in this sheet in columns D to J. Some contain drop-down lists. Annual Electricity Consumption must be entered if a default (ITALICS) is not available. The default electricity consumption can be overwritten if there is more information. The Carbon Emissions and Net Present Cost are displayed in columns L to N. The Design Manual Category must be copied to the Record Sheet by clicking the button in column O to record the calculations.

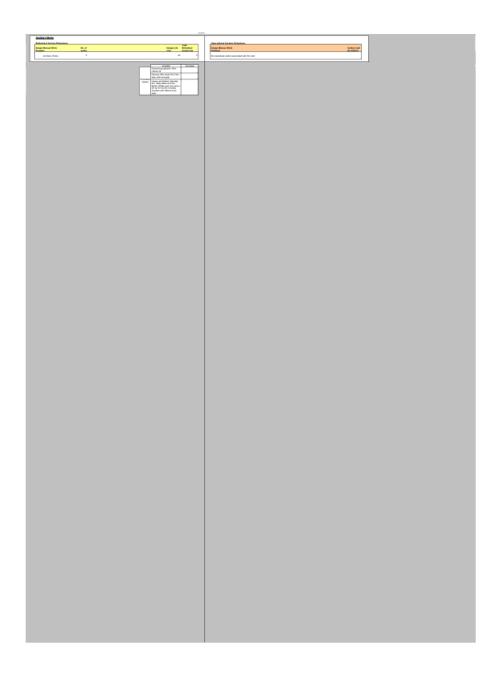
	N. The Design Manual Category n	nust be copi	ed to the Record Sheet by o	licking the but	tton in column O to rec	ord the calcu	ilations.				
								Proposed Year		Operational	Net Present
	Design Manual Category			Use	er Input			of Construction	CO _{2eq} (kgCO _{2eq})	CO _{2eq}	Cost of Carbon
	Boreholes		No. of boreholes		Annual Electricity Co	nsumption /k	(Wh)	2012	(kgCO _{2ea})	(kgCO _{2ea} /yr)	£0
	Service Reservoirs & Water Retaining		TVO. OF DOTATIONS		Printed Encountry Co	and inputer (r	,		, i	, i	
	Structures		Capacity (m ³)					2009	0		£0
	Arsenic Removal		Dosed Flow (l/hr)		Annual Electricity Co	onsumption (k	:Wh)	2012	0	0	£0
	Fluoridation		Dosed Flow (l/hr)		Annual Electricity Co	onsumption (k	:Wh)	2012	0	0	£0
	pH Correction		Dosed Flow (l/hr)		Annual Electricity Co	onsumption (F	:Wh)	2012	0	0	£0
	Clarification		Capacity (MI/d)		Annual Electricity Co	nsumption (k	:Wh)	2012	0	0	£0
Water	Filtration		Flow (Ml/d)		Annual Electricity Co	onsumption (k	:Wh)	2009	0	0	£0
Resources and Treatment	Activated Carbon - Removal of Endocrine Disruptors (Full flow)		Flow (Ml/d)		Annual Electricity Co	onsumption (F	:Wh)	2012	0	0	£0
Treatment	Activated Carbon - Removal of Pesticides (Full flow)		Flow (Ml/d)		Annual Electricity Co	onsumption (F	:Wh)	2012	1,278,563	4,990,167	£3,829,199
	Activated Carbon - Removal of Zinc (Full flow)		Flow (Ml/d)		Annual Electricity Co	onsumption (F	:Wh)	2012	0	0	£0
	Iron & Manganese Treatment		Dosed Flow (l/hr)		Annual Electricity Co	onsumption (k	(Wh)	2012	0	0	£0
	Nitrate Treatment		Flow to Treatment (m ³ /hr)		Annual Electricity Co			2012	0	0	£0
	Disinfection		Dosed Flow (l/hr)		Annual Electricity Co			2012	0	0	£0
	Stabilisation & Conditioning		Dosed Flow (l/hr)		Annual Electricity Co	onsumption (F	(Wh)	2012	0	0	£0
	Distribution Mains & Service Pipes		Length (m)		Diameter (mm)			2012	0		£0
Water	contd		Pipe Location		Depth to invert (m)						
Transfer and	Pumping Stations		Flow (Ml/d)		Annual Electricity Co	onsumption (k	(Wh)	2014	0	0	£0
Distribution	Trunk Mains		Length (m)		Diameter (mm)			2009	0		£0
	contd		Pipe Location		Depth to invert (m)						
	Sewage Pumping Stations		Pump Power (kW)		Pipe Length (m)	3.5	Depth to invert (m)	2012	18,454,127	5,444,638	£4,628,626
I	contd		Pipe Diameter (mm)		Pipe Location	******	Annual Electricity C	onsumption (kWh)			
Sewerage	Sewer Rehabilitation		Sewer Length (m)	_	Diameter (mm)			2012	0		£0
	contd		Pipe Location		Depth to invert (m)						
	Manholes		No.					2012	0		£0
	Inlet Works		m ³ /d		Annual Electricity Co	nsumption (k	:Wh)	2012	0	0	£0
	Primary Sedimentation		Capacity (m ³)		Annual Electricity Co	onsumption (k	:Wh)	2012	0	0	£0
	Bio Filters (Trickling Filters)		Capacity (p.e.)		Annual Electricity Co	onsumption (k	(Wh)	2012	0	0	£0
	Chemical Phosphorous Removal		Dosed Flow (l/hr)		Annual Electricity Co	onsumption (k	:Wh)	2012	176,323	282,258	£222,817
	Activated Sludge Process		Capacity (p e.)		Annual Electricity Co	onsumption (k	(Wh)	2012	0	0	£0
Sewage	Enhanced Biological Phosphorous Removal		Capacity (p.e.)		Annual Electricity Co			2012	0	0	£0
Treatment	Sludge Digestion (new plant)		TTDS per annum		Annual Electricity Co	onsumption (k	:Wh)	2012	0	0	£0
	Sludge Thickening - Centrifuge Dewatering		TTDS per annum		Annual Electricity Co	onsumption (k	:Wh)	2012	0	0	£0
	Sludge Thickening - Sludge Press		No. of works		Annual Electricity Co			2012	0	0	£0
	Sludge Drying		TTDS per annum		Annual Natural Gas			2012	0	0	£0
	Sludge Mixing		Dosed Flow (l/hr)		Annual Electricity Co			2012	0	0	£0
	Tertiary Treatment		Capacity (MI/d)		Annual Electricity Co			2012	261,023	329,301	£257,355
	Small Sewage Treatment Works		Capacity (p.e.)		Annual Electricity Co	onsumption (k	:Wh)	2012	0	0	£0
Access to	Flooring		Floor area (m ²)					2012	679,482		£17,951
Access to Assets	Guarding of Equipment		No of works					2012	0		£0
	Lifting Equipment		No. of plants		Annual Electricity Co	ensumption (k	:Wh)	2012	7,812	0	£361
	Access Road		Road Length (m)					2012	244,461		£15,815
Civil Engineering	Outfall Structures		No. of structures					2012	1,223		£32
Lingineering	Tunnelling & Low Dig Techniques		Tunnel length (m)					2012	1,683,094		£44,466
	Environmental and Landscape		No. of sites					2012	0		£0
	Remote Asset Monitoring (Telemetry) Systems		No. of works		Annual Electricity Co	onsumption (F	:Wh)	2012	1,751	611,558	£465,220
Other	Security and Fencing		No. of installations		Annual Electricity Co	onsumption (k	:Wh)	2012	0	0	£0
1	Site Investigation		No. of sites			,		2012	0		£0
	Ancillary Works		No. of works					2012	0		£0
Renewable Energy	СНР		TTDS per annum		Power generated per	annum (kWi	h)	2012	0	0	£0

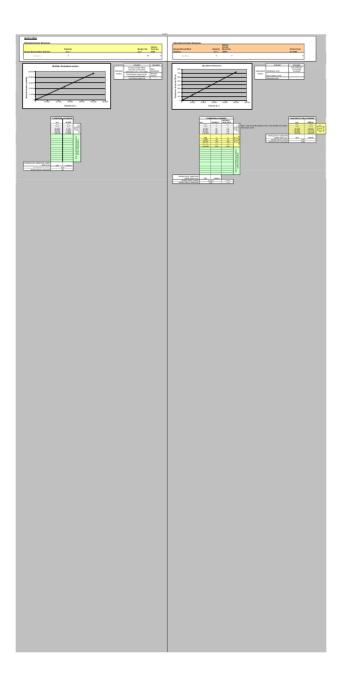
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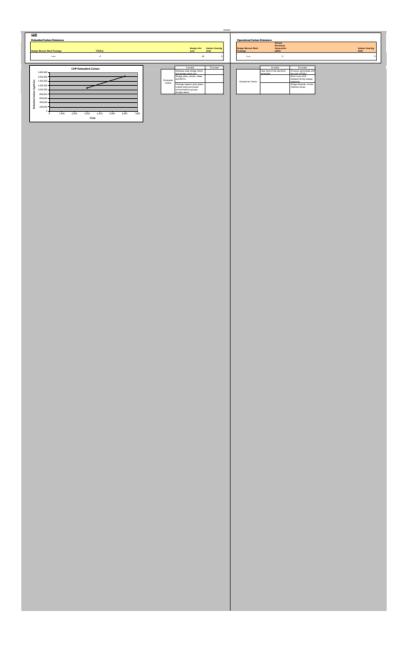


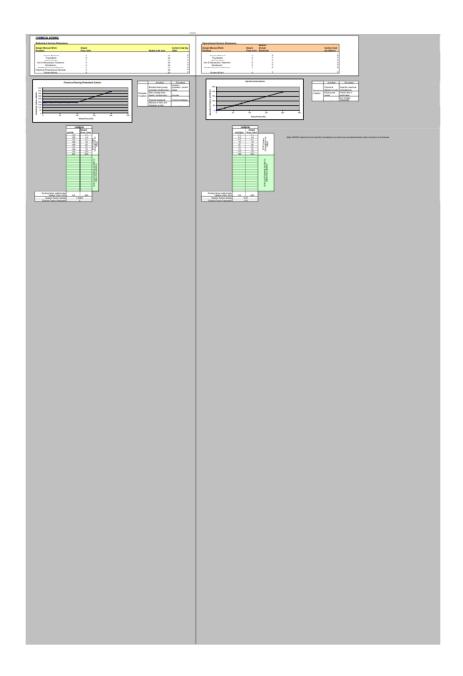


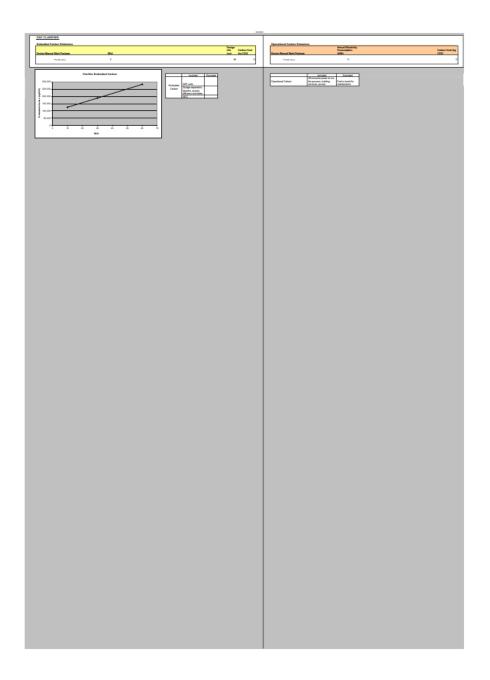


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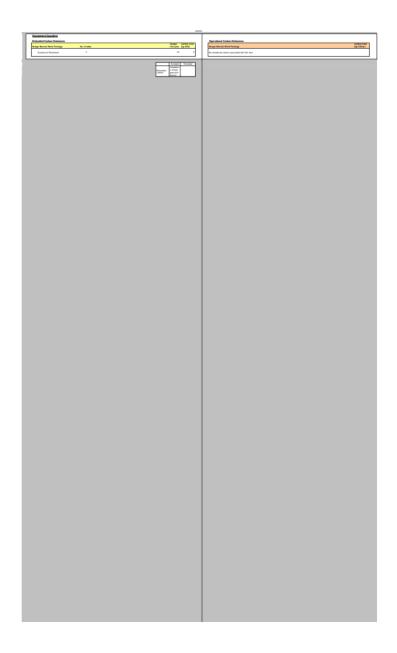


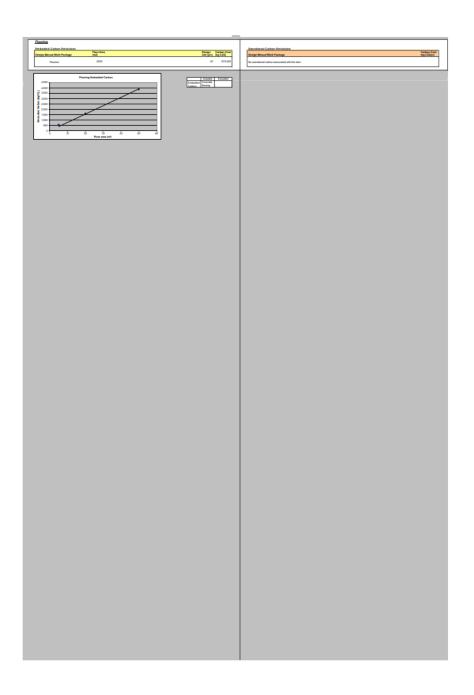




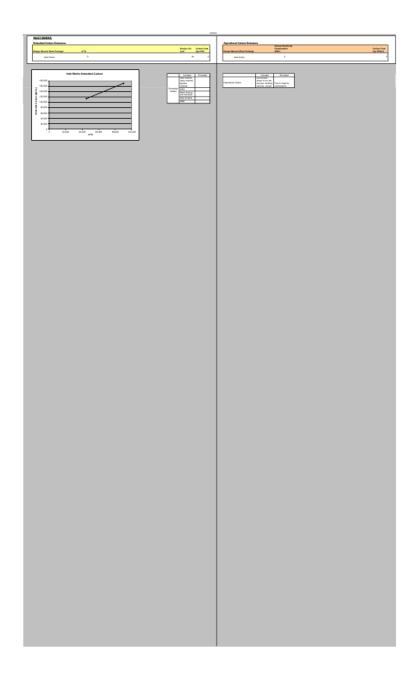
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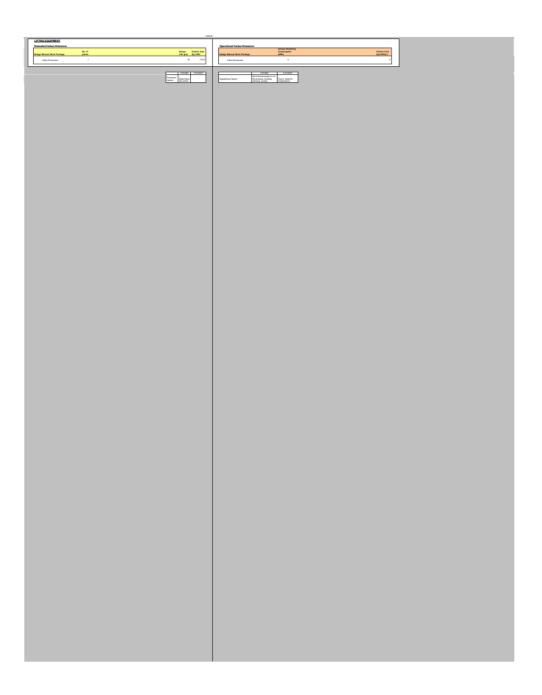
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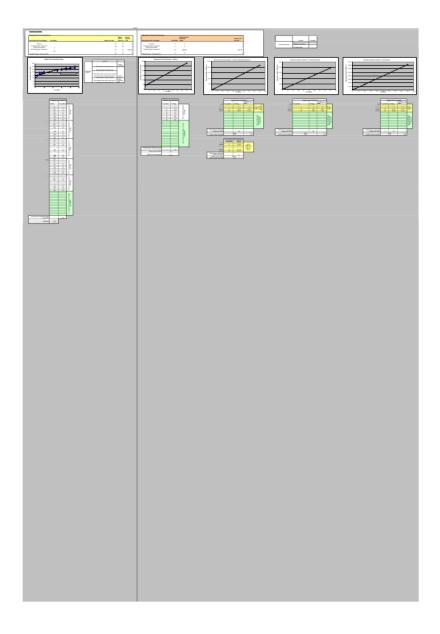


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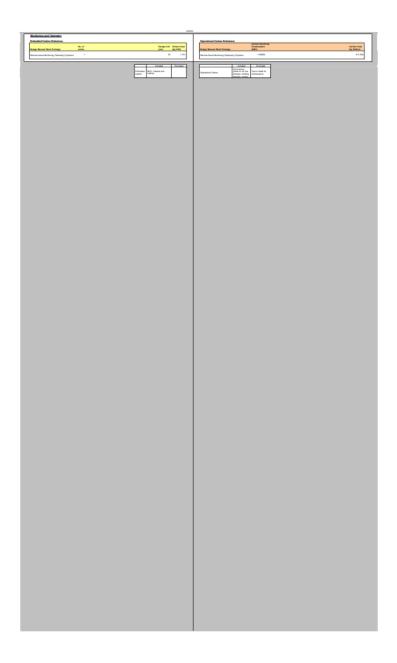


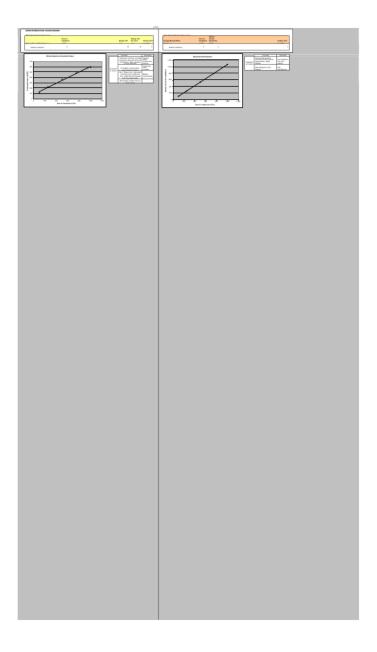


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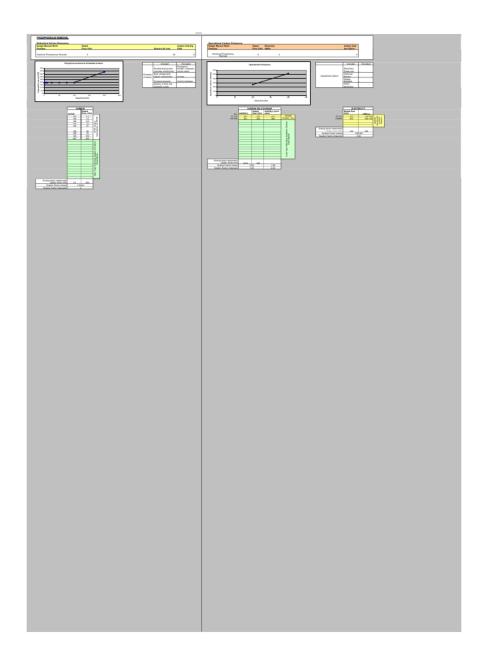
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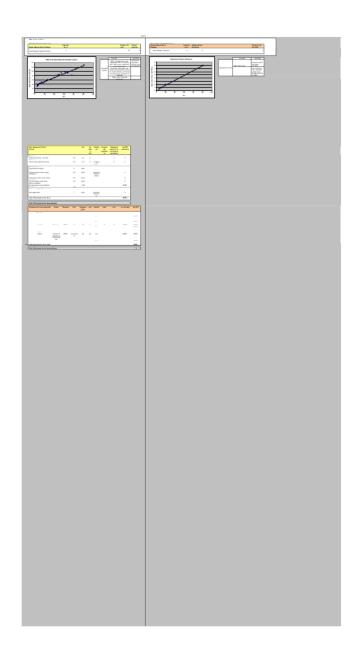


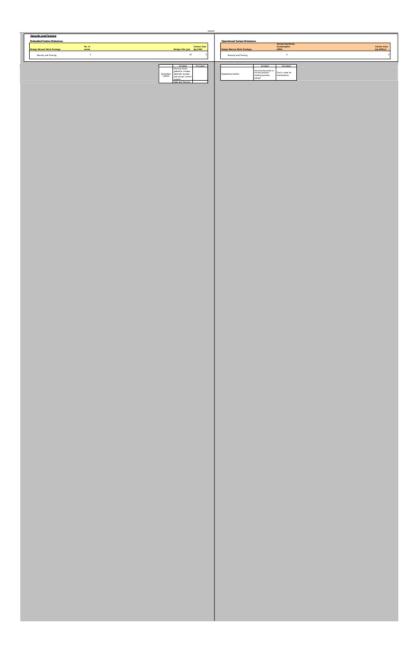
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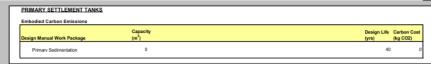


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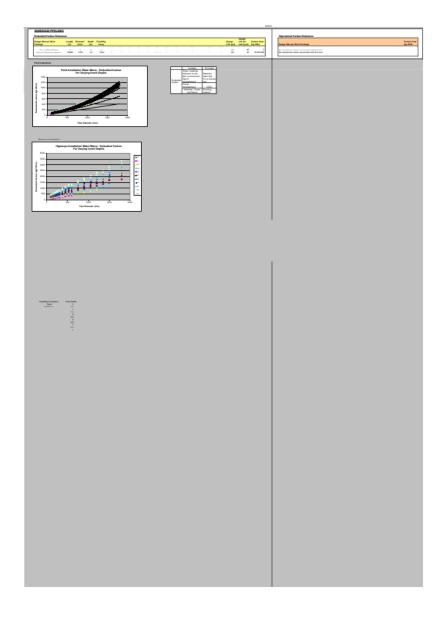
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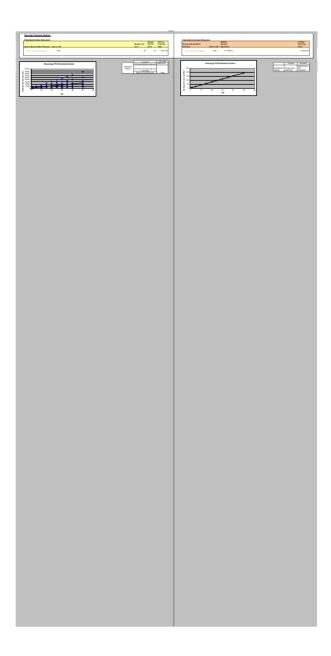


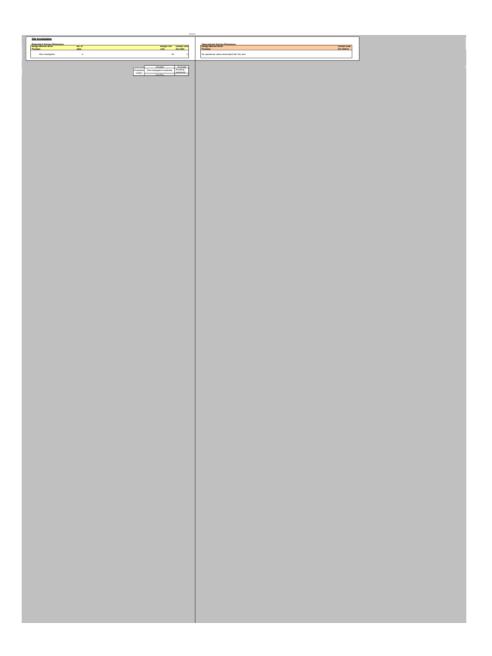
perational Carbon Emissions	Annual Electricity	
esign Manual Work Package	Consumption (kWh)	Carbon Cost (kg CO2/yr)
Primary Sedimentation	0	0

	Included	Excluded
Operational Carbon	All-inclusive power to run the process: building services, pumps.	Fuel in travel for maintenance

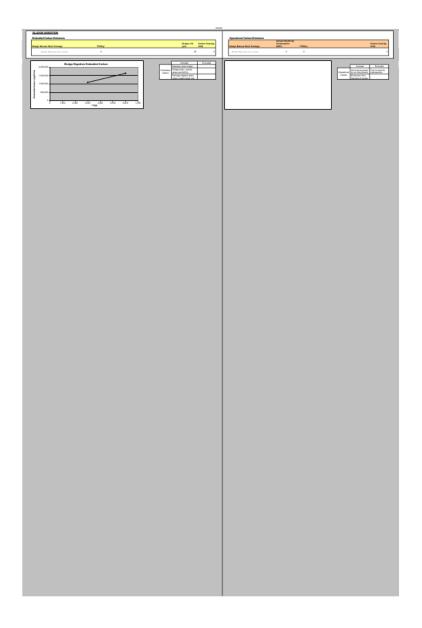
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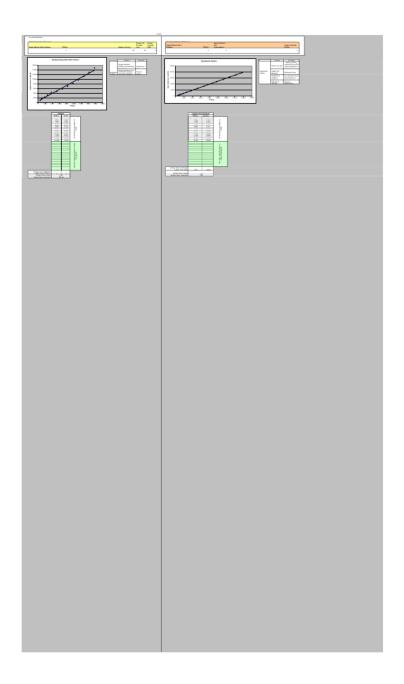




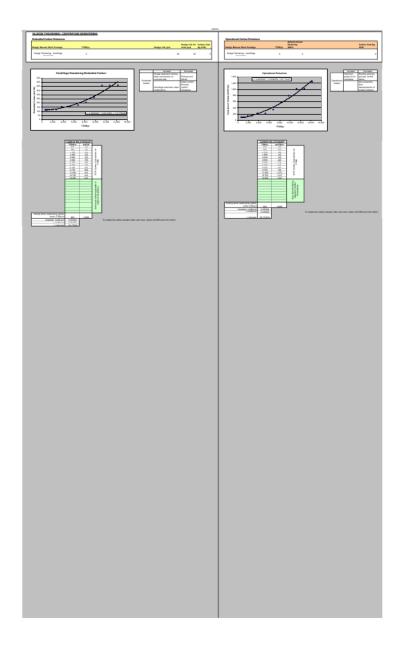
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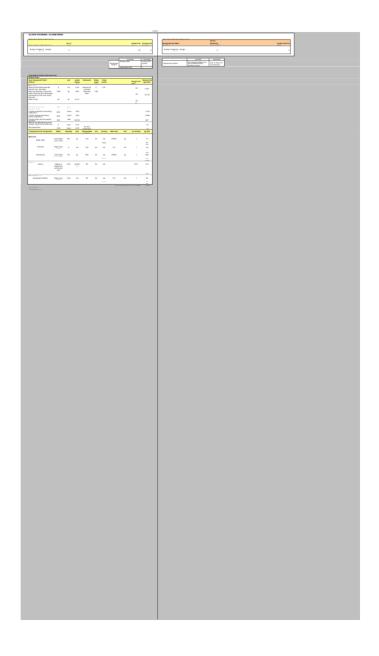
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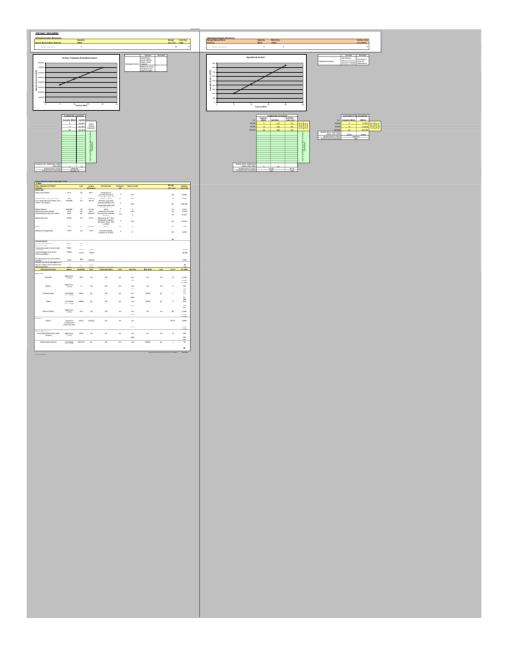
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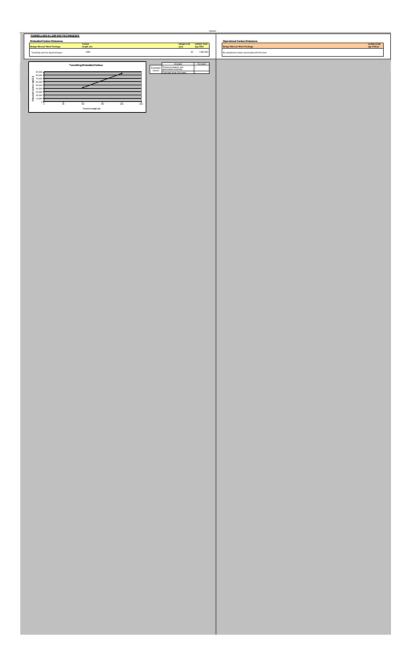
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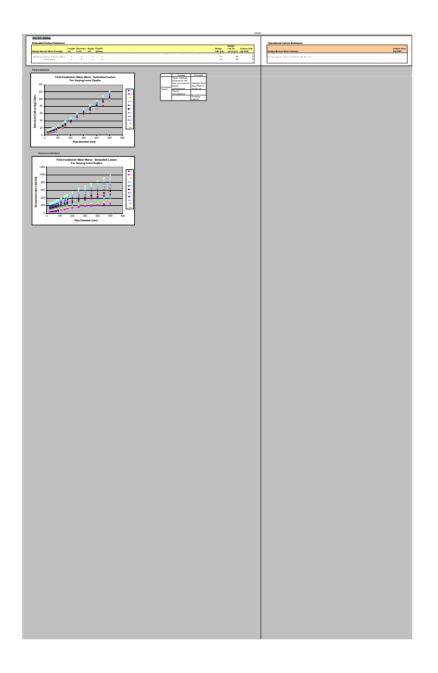
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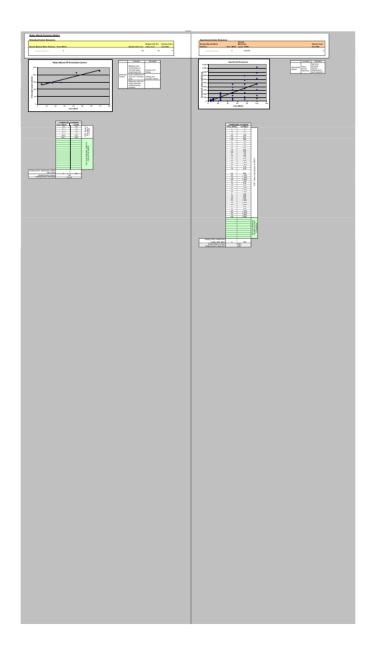
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