



BIM4Water case study template		
Section 1: Project Details		
Project name	Semer WTW Treatment and Resilience Commissioning	
Client	Anglian Water (AW)	
Project Scope and Outcomes	<p>The project included the construction of a new Water Treatment Works (WTW) fed from a newly drilled Borehole (BH) allowing an existing BH to be taken offline for rehabilitation. The existing works was not capable of treating the water quality from the BH therefore a new works was required.</p> <p>The project was developed with the use of 3D modelling which was progressed into developing a solution for running the project in 4D Synchro. The detailed commissioning plan and P6 programme formed the foundation to fully rehearse commissioning by making the commissioning requirements visible to all and to provide key focus areas with an emphasis on reliability.</p> <p>In order to maintain progress and reliability numerous rehearsals started during stage 3 and continued throughout stage 4 to address key construction and commissioning activities. Where stage 3 is the detailed design phase and stage 4 is assembly and commissioning as part of the delivery gateway process. During construction weekly production meetings were held in order to maintain progress and early identification of potential blockers. At times this led to a change in sequence of work to maintain reliability. The Tier 2 suppliers joined all production meetings prior to them starting and during their respective programme of works. The weekly meetings clearly identified expectations which benefitted the interfacing of numerous Tier 2 suppliers on site at the same time.</p> <p>The first new AMP6 WTW was successfully commissioned into supply in July 2016, removing a major business risk associated with a very old WTW an unreliable borehole source. Work now continues to refurbish the old borehole and complete final commissioning into supply to permit blending of the boreholes and finally rehabilitate BH3.</p> <p>The benefits of the white book efficiencies (@one Alliance guidance document for helping to achieve the KPI targets) and the drive to change the way projects have been delivered in the past is evident on this scheme. Through collaboration with the supply chain, and 4D modelling providing greater visibility to fully rehearse every aspect of the project has enabled the project to deliver against those (white book) efficiencies.</p> <p>The Appendix includes images illustrating the collaboration sessions held.</p>	
What are the project timescales?	Enabling	4 Months
	Optioning and Detailed Design	8 Months



	Construction	11 Months
	Commissioning and handover	3 Months
What is the total project budget (including fees)?	£6.2M	
Type of work (new build, refurbishment, Repair & Maintenance)	New WTW, BH and Mains Pipeline	
Asset type	Water Treatment Works	
Section 2: Stakeholders		
<p>Who's involved in the project team? (<i>where known</i>)</p> <p>Indicate (F) if they were appointed via a framework.</p>	Delivery partner(s)	<p><u>Stantec</u></p> <p>Mark Whitnell (Site Manager)</p> <p>Alan Thompson (M&E Supervisor)</p> <p>John Hoyles (Project Manager)</p> <p><u>Mott McDonald</u></p> <p>Srobona Ray (Planner)</p> <p><u>Skanska</u></p> <p>Clare Kovacs (4D/Assistant Planner)</p>
	Key supply chain partners	<p><u>Waveney (M&E)</u></p> <p>Mark Eastick</p> <p><u>Paktronics (MCC)</u></p> <p>Spencer Wright</p> <p><u>Bells (Civils)</u></p> <p>Jim Smith</p>
	Other key parties	<p><u>Anglian Water - Regional Supply Manager</u></p> <p>Paul Naylor</p> <p><u>Commissioning Engineers</u></p> <p>Andy Gilbert</p> <p>Richard Hearn</p> <p>Derry Last</p>
Lead contact details	Name and designation	Russell Marrows, Lead Commissioning Engineer
	Organisation	Anglian Water
	E-mail	NA.



	Telephone - Landline	NA.
	Mobile No	NA.
Section 3: BIM details		
<p>Background - how long has the Client been using BIM and what is the overall progress to date?</p> <p>Can you provide an overview of the Technology arrangements to support BIM?</p>	<p>BIM has been used in AW for approximately 6 years. Currently there is a mixture of maturity across programme areas with some areas more developed than others, but areas are moving towards BIM Level 2 competence.</p> <p>The @one Alliance has invested in the creation of Project Rehearsal Suites (BIM rooms), which reflects the Alliance vision to be working in a different and more efficient and integrated way throughout AMP6 and beyond, providing truly industry-leading facilities.</p> <p>The Project Rehearsal Suites provides technology supporting three principal processes:</p> <ul style="list-style-type: none"> - Digital Rehearsals; week by week breakdown of the construction and commissioning programme utilising 4D to obtain the most efficient and safe programme, developed with the right people in the room - Immersive Reviews; using VR technology to immerse the design and operations team and identify clashes prior to being on site - Interactive Reviews; using smart boards to review 3D models, track comments, share information remotely <p>The project team were utilising BIM Field but 4D BIM was utilised for rehearsal of flushing and sampling plan and commissioning work packages.</p>	
<p>What is the BIM scope for this project and is it planned to use key documents, e.g. EIR/BEP plan/AIR etc.</p>	<p>There was no formal digital delivery strategy set out by the delivery team; the use of BIM was adopted to meet the needs of site.</p> <p>However, a formal digital delivery strategy document has now been developed and adopted by the @one Alliance for schemes going forward.</p>	
<p>At what stage was the decision taken to use BIM on this project and has BIM been used throughout the project lifecycle?</p>	<p>The decision to utilise BIM on the project was decided part way through outline design stage, as this scheme started construction prior to completion of the detailed design stage, as it was partly emergency works. This was utilised primarily to share and interrogate the 3D model, Synchro 4D animations, snap shots and TQs.</p>	
<p>How was the project team “brought on board” to use BIM?</p>	<p>The main BIM element of the project was the utilisation of 4D for the M&E installation and commissioning sections of work. This was achieved by detailing the P6 programme with the commissioning and flushing and sampling plans, which broke down the sections of work in to packages. Synchro was then used to highlight those components in the 3D model highlighting it according to its appearance profile whether it was being flushed, sampled etc.</p>	



	<p>4D BIM was then used for M&E and commissioning rehearsals which were held on site. The 4D animation were shared on BIM Field and we projected and ran through sequences in detail on site. We also captured screenshots with key dates and tasks and printed these and put them up around site in the work areas, this focused on site resources on what needed to be installed and prioritised in order to achieve the commissioning of that package.</p>
<p>How did BIM impact on the design stage of the project? What were the benefits and to whom?</p>	<p>The programme moved from being the project manager’s responsibility and a reporting tool, to a live, accurate and project team owned programme. The constant reviewing and amendments ensured that the DM4 forecast date was reliable and the Client could see that the supplier was doing everything feasible to bring the project in on time</p>
<p>How did BIM impact on the construction stage of the project? What were the benefits and to whom?</p>	<p>BIM was an enabler for focusing M&E resources in the right areas on site and it provided clarity for the site manager. The approach created a culture of “calm” and planned works rather than reactive, sometimes stressful environment.</p> <p>The commissioning engineers got the opportunity to own their programme and ensure it was realistic in timescales, up to date as they tracked their progress throughout.</p> <p>The Client was engaged in all rehearsal and production meetings and could see the project team delivering what they said they would, this provided confidence in the programme and the delivery team.</p> <p>4D also facilitated the right conversations with the right people in the room to develop the most efficient and reliable programme, it highlighted blockers, clashes and opportunities. This 4D rehearsal process ensured all the right enabling works were completed prior to it being needed on site, thus preventing delays and smoothing out the commissioning process.</p> <p>Digital rehearsal is a collaborative centric process whereby, with the right people in the room, the team validated the commissioning programme. The process involves breaking down the programme week by week to ensure continuity of works. By running through the programme in a 4D capacity we can visually identify any blockers, opportunities or risks to the scheme. The overall aim of the digital rehearsal process was to mitigate the unforeseen risks, to develop the most efficient programme and to produce a culture of programme ownership by all key stakeholders.</p>
<p>How did BIM impact on the operational stage of the project? What were the benefits and to whom?</p>	<p>Created collaboration with the AW Operations as they attended the commissioning rehearsals which utilised 4D BIM and got to fully understand how the new plant would work from an earlier stage. They had full access to BIM Field and could review and comment on the programme at any time.</p> <p>Operations input at the construction phase was invaluable and by them</p>



	<p>understanding how the site would operate through the commissioning it flushed out a lot of issues that may have been brought up at the Safe to Operate/Project Handover.</p>
<p>What were the estimated costs of utilising BIM on this project?</p>	<p>An investment of £20k was spent on consultation services from Synchro, training and development of the 4D animations. Purchasing of IT for site and delivery teams and hosting various project rehearsals and programme reviews.</p>
<p>What were the estimated savings from the use of BIM?</p>	<p>The @one Alliance are unable to quantify the commercial benefits on site from the use of 4D BIM as it mitigates the unforeseen risks and delays however the benefits are captured above.</p> <p>The @one Alliance believe that the risk of not investing in 4D BIM is continuing to put site and commissioning teams under pressure to deliver in a reactive and often uncontrolled environment. Delivery on time will not improve unless focus is given to the construction and commissioning sequences. There will also be insufficient collaboration between the project team, Tier 2 suppliers and Operations resulting in clashes, delayed programmes and commercial pain.</p>
<p>Any other information</p>	<p>N/A</p>
<p>Section 4: Overall Assessment</p>	
<p>Was the use of BIM appropriate?</p>	<p>The scheme could have benefited from using 4D BIM from the start of the scheme to help develop the initial construction programme, however the application of 4D for commissioning was appropriate at the time and was very beneficial to the scheme.</p> <p>This scheme has become the baseline going forward in the @one Alliance for rehearsing our commissioning sequences and highlighting the true benefits of programming the testing of assets prior to handover.</p>
<p>Are there clear benefits (both quantitative and qualitative) by applying BIM to this project?</p>	<p>There are some clear qualitative benefits as follows:</p> <p>a) The understanding of the criticality of everyone’s input to a project gets highlighted through the use of 4D BIM, from the Delivery Assurance Managers impact plans, to the Clients 24-point checklist for bringing Chlorine gas to site to Civils subcontractors completing access roads.</p> <p>b) Mitigation of unforeseen risks and delays to programme through focusing resources on completion of key M&E critical path tasks to enable commissioning to commence at the earliest opportunity without any blockers.</p>



	<p>c) Another enabler for this project was the breaking down of the handover of the Motor Control Centre (MCC) into panels rather than waiting for the full panel to be glanded and tested. If this approach had not been taken, then it would not have been identified as an opportunity to save time without the visualisation of the programme.</p> <p>d) Provides a clearer understanding of how the plant operates and therefore if a sample failure should occur a mitigation plan can easily be put in place and the situation controlled. In this instance the mitigation plan was developed from reviewing the programme of works within Synchro, modifying the programme with the enabling tasks to resolve the issue, and then reassessing the programme completion date. If need be this plan can be issued to the Client as part of an early warning notice. This ensure everyone is on board with the changes and it is communicated to the right people at the right time.</p> <p>e) 4D BIM is the best tool @One alliance have utilised to help meet the white book efficiencies, which strives to achieve a 50% reduction of time on site. This has only been achievable through the change in which projects are delivered, through collaboration with key stakeholders and a greater visibility to fully rehearse every aspect of projects.</p> <p>f) 4D BIM creates a cultural behaviour change where the programme moves from being the project manager's responsibility and a reporting tool, to a live, accurate and project team owned programme. The constant reviewing and amendments ensure the forecast completion date is reliable and the programme is fully transparent to the Client; whereby they can visually see that the suppliers are doing everything feasible to bring the project in on time</p>
<p>What are the key challenges in using BIM on this project and how were they overcome?</p>	<p>Accessibility of the 4D model and understanding how to use it fully. At the time no one could use Synchro and therefore it was heavily reliant on consultancy services from Synchro, in order to reduce cost and turn around it would be advised to have a 4D planner on the job who can utilise the software, have full understanding of the scope, work closely with the site and commissioning engineers to understand what they want to visualise and be proactive in driving digital rehearsals.</p> <p>Although the 4D animations were on BIM Field it would have been more beneficial in hindsight to have used Synchro Open Viewer to enable all parties to review and comment on the programme in more detail. We overcame this at the time by having a lot of meetings and capturing snap shots.</p>
<p>What could be learnt from using BIM on this project and applied elsewhere?</p>	<p>The utilisation of 4D BIM for visualisation of commissioning activities and bridging the digital gap between office and site.</p>
<p>Has all appropriate changes or new asset data been transfer to Asset Management been completed?</p>	<p>Asset handover for the scheme has been completed and approved by the Client.</p>
<p>Client testimony (where possible)</p>	<p>Paul Naylor, Regional Supply Manager said: "Integrated Main Works Capital and our Colchester Water Supply team have successfully completed the commissioning and entering 'into Supply' of our new Semer WTW' – this is a great news for the business.</p>



	<p>The teams, IMWC capital delivery and Operational have shown the success that collaboration can bring in ensuring a smooth and effective transition from design, through to construction and commissioning. Creation of a new asset and the operational interface with the existing water supply system can introduce business risks and need to be carefully and effectively managed by the teams worked closely to understand each other's needs thus making sure delays were minimised through effective planning and delivery.</p> <p>This is our first new Water Treatment Works of AMP6 and one we can all be proud of. The new Works going into supply on 18th July, one of hottest days of the year so far is a credit to all involved and dramatically reduces our operating risk in this part of the Water Supply system. The existing borehole has been in urgent need of refurbishment for 18 months (following a deterioration in quality and subsequent reduction in yield) and this can now go ahead but most importantly the supply system can now produce enough water and treat it without having to rely on significant contingencies, Temporary treatment facilities and imports from its neighbouring supply system which was already stretched.</p> <p>All involved can be delighted with the end product, as a result of this scheme we now have a new generation of 'off site fabricated filter manifolds' used for the very first time that will now enable multiply role of the design, less time spent on site and thus enabling greater capital efficiency a 'win win' for all involved."</p>
<p>What is the potential for rolling out any of the above benefits/lesson learnt etc across the water industry wide?</p>	<p>There is potential to run digital rehearsals of commissioning on other projects, these rehearsals should be built in as a mandatory review process on all schemes, as part of a wider H&S and wellbeing process.</p>
<p>Section 5: Case Study Administration section</p>	
<p>Author and date completed</p>	<p>Clare Kovacs 25/1/19</p>
<p>Has a case study template been completed by this project before?</p>	<p>No.</p>
<p>Version Control</p>	<p>Version 2.0, 23/10/17</p>



Appendices.

Appendix A. Images of site and Collaboration Session



Image 1. Clockwise from L-R, Main building internals showing High-lift pumps, Backwash pumps, Air Scour blowers, Pressure filters, Dirty Washwater Tanks, Chlorination Kiosk, Main Building and Pressure Filters.



Image 2. Project team reviewing the M&E installation programme with snap shots of key dates of the commissioning 4D animation printed for integration.

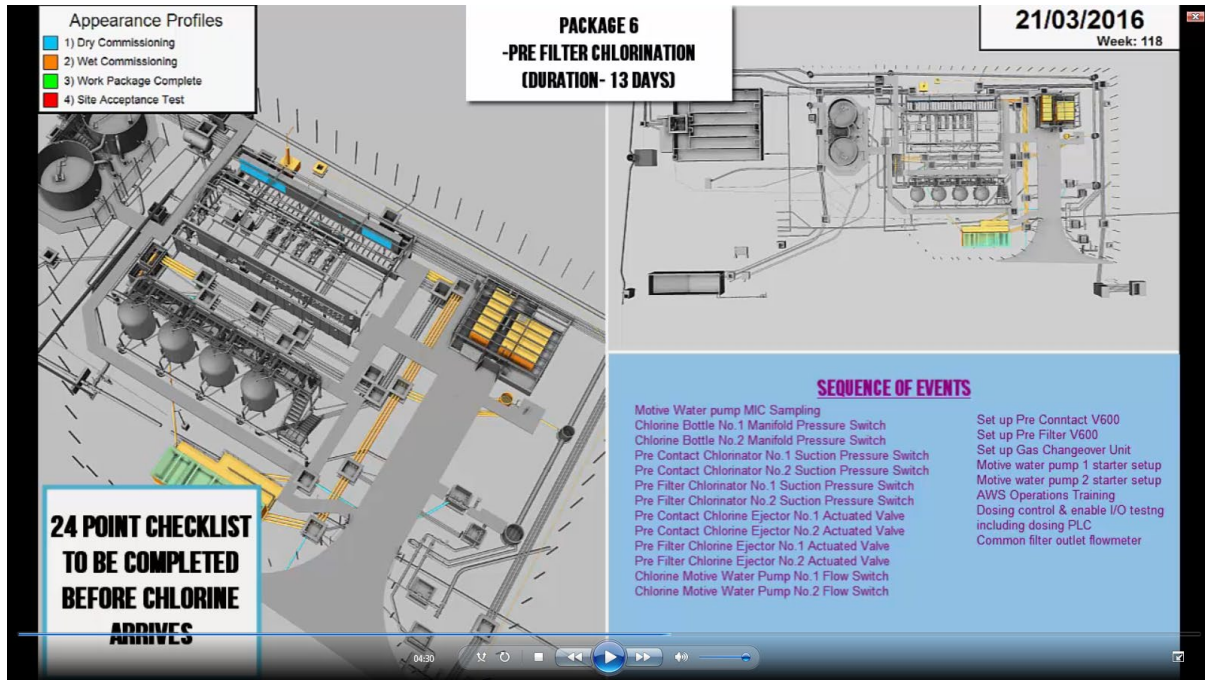


Image 3. A capture of the 4D BIM commissioning animation for, each work package is broken down in terms of instrumentation and M&E required to permit the commissioning of that package, this focused people's minds on ensuring no item was missed out in the field. We also identified which packages would be in dry commissioning, wet commissioning, site acceptance test (SAT) and completed, this allowed clash protection.