

SGEL6000 Independent Project

DOUBLE MARKING SHEET AND COMBINED STUDENT FEEDBACK

Assessment 2 of 4

Presentation 1: Project Definition, Research and Quality Planning

2020-2021

Agreed mark

62

Student Name: Carl Jones

Student Number 1910607

<https://youtu.be/a04SqtB7amE>

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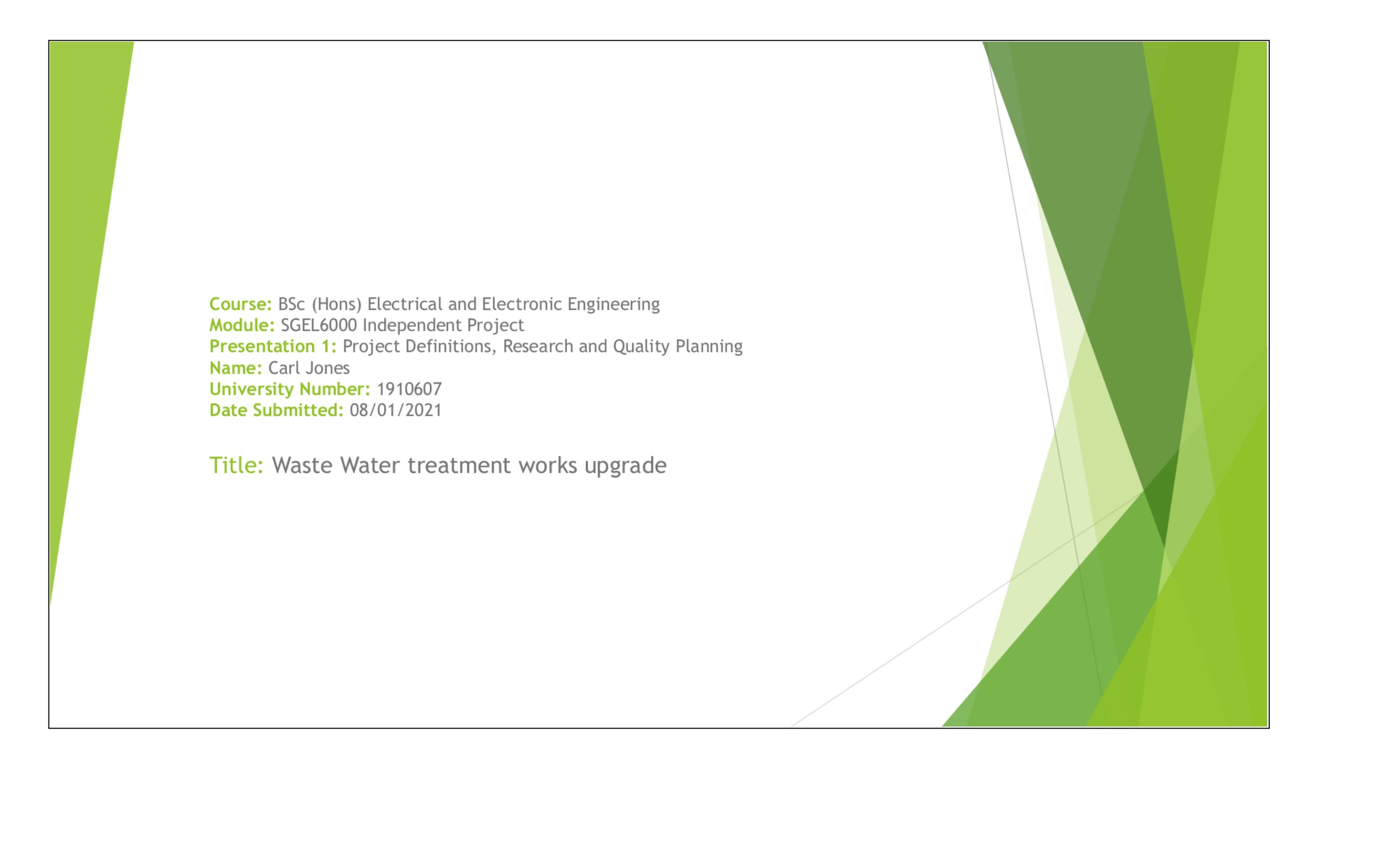
Generic Assessment Criteria	Marks available	1st Marker (RD)	2nd Marker (MH)	Agreed Mark
1. Engagement with Literature Skills.				
Section 1: Engagement in research, for project background (3/5) Some evidence present (RD) Evidence of research was demonstrated, however this was mainly limited to Welsh Water company policy document (MH)	5	3	3	3
Section 5: Engagement in research, for review of solutions (3/5) Evidence of one solution presented (RD) Additional research on wider issues using a diverse range of sources could have been employed (MH)	5	2	3	3
Total	10	5	6	6
2. Knowledge and Understanding Skills				
Section 1: Project background (4/5) Good explanation given (RD) Project explained as the requirement for a new pumping and treatment installation due to request from property developer (MH)	5	4	4	4
Section 3: Project risks, health and safety etc (4/5) Clearly presented (RD) Risk register identified constraints, but were limited to technical issues, no consideration of wider issues, limited assessment of risks to the project success. Collaboration between contractors was identified as a risk (MH)	5	5	3	4
Response to questions 1 and 4 (7/10) Good answers given (RD) Some good responses given, but limited answers to the ethical engineering questions (MH)	10	7	6	7
Total	20	16	13	15
3. Cognitive and Intellectual Skills				
Section 1: Problem Definition and constraints (8/10) Clearly defined (RD) The problem was only defined as a requirement due to 120 properties requiring sewage services (MH)	10	8	7	8

Section 2: Functional Design Specification (8/10) Clearly presented (RD) A detailed description of the system was described in the FDS (MH)	10	8	7	8
Section 4: Test planning (7/10) Clearly presented (RD) A test plan with some performance metrics to gauge success was included, tolerances on results would have been good (MH)	10	8	6	7
Response to questions 2 and 6 (3/5) Good answers given (RD) Some good responses given, but lacked confidence in others (MH)	5	4	3	3
Total	35	28	23	26
4. Practical Application Skills				
Section 5: Critical choice and justification of final solution (3/10) No alternative solutions presented (RD) Final solution was discussed, but ran out of time to fully explain alternatives (MH)	10	3	4	3
Section 6: Project Planning and working breakdown structure (3/10) Not present (RD) Little evidence of planning through a WBS, Gantt chart was included (MH)	10	3	4	3
Response to questions 3 and 5 (4/5) Good answers (RD) Some good responses given, but lacked confidence in others (MH)	5	4	3	4
Total	25	10	11	10
5. Transferable Skills for Life and Professional Practice				
All sections: Quality of the presentation slides – (3/5) Good, but some slides contained too many words, block diagrams would have been better (RD) Most slides were generally readable and well presented (MH)	5	3	4	3
All sections: Quality of the delivery style – (2/5) Many pauses, overran time (RD) Slightly nervous, as to be expected, but confidently presented. Poor internet connection didn't help (MH)	5	2	3	2
Total	10	5	7	5
Grand Total	100	64	60	62

1910607 - project Presentation 1

by Carl Jones

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TIME SUBMITTED	08-JAN-2021 05:23PM (UTC+0000)	WORD COUNT	1188
SUBMISSION ID	141286786	CHARACTER COUNT	5835

The background of the slide features abstract, overlapping green geometric shapes, primarily triangles and polygons, in various shades of green, creating a modern and dynamic visual effect.

Course: BSc (Hons) Electrical and Electronic Engineering
Module: SGEL6000 Independent Project
Presentation 1: Project Definitions, Research and Quality Planning
Name: Carl Jones
University Number: 1910607
Date Submitted: 08/01/2021

Title: Waste Water treatment works upgrade

Introduction to Project

- ▶ A housing developer has requested to connect 120 new properties to an existing Wastewater treatment works.
- ▶ The Treatment works requires an upgrade to be able to connect these properties, so a new pumping station and treatment plant needs to be installed.
- ▶ The work will be split between three contractors, civil, mechanical and Electrical.
- ▶ The treatment works is old and has no provision for electrical power.

Scope of works

- ▶ Design, build and supply a pumping station control panel that will power and control two pumps. The pumps will be run off VSDs and the control must be intelligent. The control will also incorporate a ultrasonic level controller and sensor to measure levels in the well and a flow meter to measure pumped flow to the process.
- ▶ Supply and install a Mains power/Generator change over switch to allow backup power to the works.
- ▶ Design and supply power cables to all equipment in the works as part of the process.
- ▶ Design and supply control cables to all equipment in the works as part of the process for interconnecting control and fault signals.
- ▶ Carry out an Earthing protection study of the works as the new Mains supply from the Electrical company will be a TT system so an earth rod will be required
- ▶ Full Electrical Test Certifications
- ▶ Create site Operation & Maintenance manual for client.

Project Constraints

- ▶ The Project is client driven as the Water board have they're own design speciation's that must be read and followed along with mandatory regulations and standards.
- ▶ As the project as a whole is a joint collaboration between contractors, meetings needed to be held to discuss any limitations within the design, i.e. size of the pump control panel to fit into a supply kiosk.
- ▶ The site is in a field and open to all elements so weather conditions will play a part in the installation time scale

Function Design Specification (FDS)

Key Elements of the pumping station Control panel.

- ▶ Pumping station shall operate as Duty/Standby between the two pumps
- ▶ The pump duty will Auto rotate
- ▶ Pumps will be variable speed driven
- ▶ Pump well levels will be measured by an ultrasonic controller and sensor
- ▶ Pump flows will be monitored by a inline flow meter
- ▶ Pumps must be able to run in Auto or manual
- ▶ Any Alarms of faults with the pumps must shut them down and be sent the telemetry outstation which monitors and reports to main operator control room for operations team to be called to site.
- ▶ Pumps must be able to be shut down in an emergency
- ▶ Pumps must only supply 2 litre/sec to the process plant for it to operate.
- ▶ Pump speeds will be controlled on a PID loop, controlled from level of liquid in pump well and the generated flow from the pumps.
- ▶ Inhibit signals to stop the pumps when the process plant has failed.
- ▶ Inhibit signal to stop process plant when sludge tanks are full and need tankers.
- ▶ All alarms from process plant must be connected to telemetry outstation
- ▶ Level and flow controllers will give an analogue output for control and this will also be monitored at telemetry outstation.

Project Design Risks

- A risk register was created to try and identify and mitigate any risk that were likely to effect a successful project being delivered. Below is a section of the register.

ID	Date	Description of design element that could create hazard of constraint	Potential risk and challenge	Initial risk rating			Mitigating action	Residual risk rating			Action required
				Likelihood	Severity	Risk		Likelihood	Severity	Risk	
1	12/10/2020	Covid 19 - site work	loose worker due to virus or self isolations, close site and relay project dates	Medium	High	Medium	Follow Government guidelines, limit the amount of men working in areas.	Low	High	medium	
2	12/10/2020	delays to materials due to Covid 19 lockdowns	Unable to get materials to site on time long lead times if manufactures close, delay project dates	Medium	Medium	Medium	contact suppliers and order materials early with long lead times, cost for alternative.	Low	Medium	Low	
3	12/10/2020	Environmental	Weather effecting site conditions	High	Medium	Medium	Monitor weather, arrange for temporary work shelters on site	Low	Medium	Low	
4	12/10/2020	mechanical and Civil contrators	Site installation delays due to uncomplete work by others	Medium	Medium	Medium	constant mointoring of site work and project meeting to discuss any delays	low	Medium	Low	

- As the site is classed a construction site a full site Risk assessment and Method Statement will need to be issued to the client for approval before work can be carried out.

Project Test Plan

On completion of the pump control panel a Factory acceptance test (FAT) will be carried out which will cover.

- ▶ Build quality
- ▶ Functional and control test
- ▶ Fully simulated design test

This FAT test will then be witnessed by the client before being allowed to install the panel on site.

On site a Site acceptance test will be carried out and witnessed before full commissioning and hand over can take place. All these tests will be fully documented and issued as part of the O&M manual at the end of the project.

Design Solutions

- ▶ The design is to implement a PID loop to control the pump speeds to produce a constant flow to the treatment plant.
- ▶ As the work is being completed for a client then only specified frame work components are allowed to be used. For this reason the following components must be used.
- ▶ The VSDs, pumps are 2.2kw, an ABB ACQ580 has been
- ▶ The flow meter selected must be a Siemens MAG5100W, this is an inline flanged mounded flow
- ▶ The flow meter requires a signal converter this is a MAG 6000 signal convertor, rated voltage 110 - 230 Vac and will require the wall mounting kit
- ▶ Level will be monitored in the sludge holding tank by two pressure transmitter, these will be Siemens Sitrans P300 Hydrostatic sensors. They will be loop powered 4- 20mA so will need to be supplied with 24vdc power. This sensor has been designed for sludge tank levels and must be used. The pressure sensor will read between to range 0 - 1 bar g

Design solution

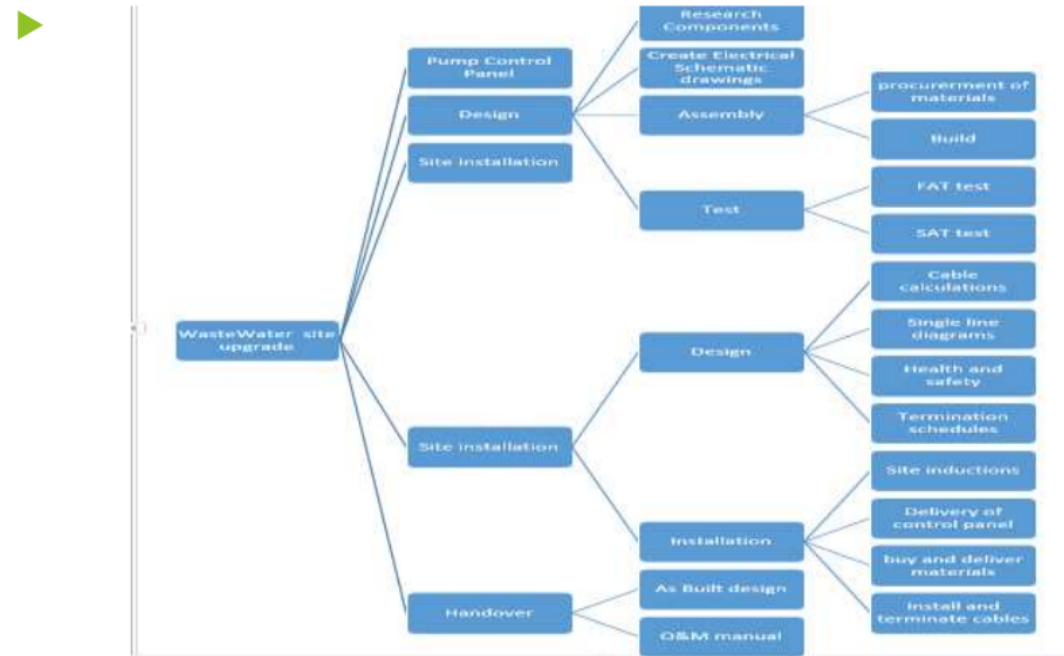
- ▶ Welsh water specification, specify that their pumping station must be intelligent control and require a PLC with HMI interface. The framework PLC is a Mitsubishi Q series with GT27 HMI. Using a PLC makes PID control easy as all Digital input/ output and analogue cards can be bought and fitted. This makes future development and expansion easier.
- ▶ Level instrument can be selected from a list of manufactures 3 instruments were compared
 - Siemens LUT420
 - Siemens HydroRanger 200 HMI
 - Pulsar Ultra 5
- ▶ It came down to two Instruments the Siemens HydroRanger and Pulsar Ultra 5

Chosen Design Solution

- ▶ Pulsar Ultimate controller combines ultrasonic level, flow measurement. RTU and advanced pump control all into one easily programmed module unit. It has dedicated web server remote control and a touch screen HMI
- ▶ The ultimate controller also can be expanded with extra modules, it has built in pre- selected
- ▶ features for pump blockage detection, automatic resets and can select the most efficient pump.
- ▶ For cost saving this unit combines HMI, PLC and level controller all into one unit.
- ▶ The analogue input allows for the Siemens Flowmeter inverter output to be connected to it and two
- ▶ analogue outputs, one of which will be connected to the telemetry unit for remote monitoring of the
- ▶ wet well levels and the other for speed control of the VSDs.
- ▶ Cost of controller and sensor £1280.00 with 2 weeks delivery time.
- ▶ The proposal was put forward to Welsh Water and the client as a technical query and was accepted as a preferred design. This is the first time this unit has been trialed to run a pumping station as a PID loop.

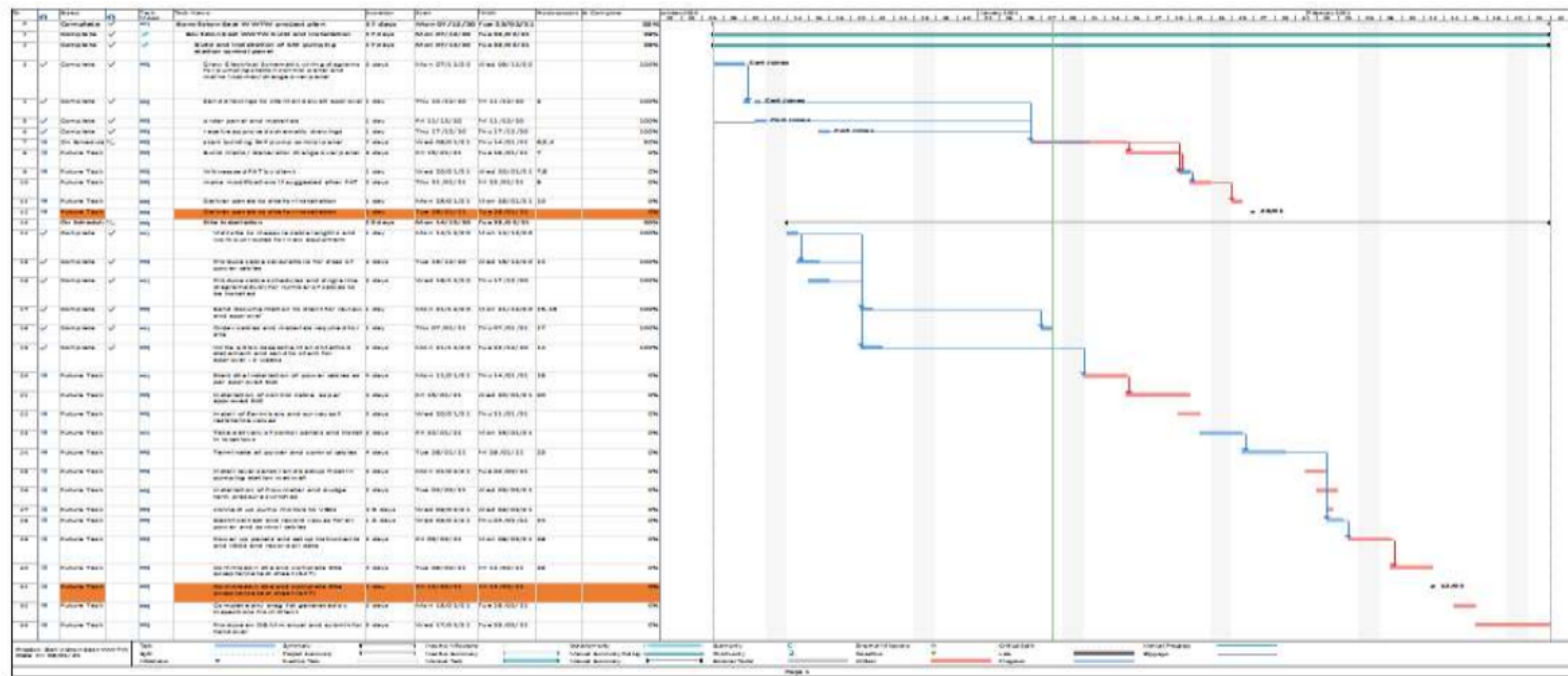
Project Planning and programme of works

- By creating a list of Key deliverables a work breakdown structure (WBS) was created



Project Programme

- Microsoft Project was used to create a working programme.



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GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

62/100

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CARL JONES

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1. ENGAGEMENT WITH LITERATURE

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6

2. KNOWLEDGE AND UNDERSTANDING

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15

3. COGNITIVE AND INTELLECTUAL



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26

4. PRACTICAL APPLICATION



Section 5: Critical choice and justification of final solution (3/10) No alternative solutions presented (RD) Final solution was discussed, but ran out of time to fully explain alternatives (MH) Section 6: Project Planning and working breakdown structure (3/10) Not present (RD) Little evidence of planning through a WBS, Gantt chart was included (MH) Response to questions 3 and 5 (4/5) Good answers (RD) Some good responses given, but lacked confidence in others (MH)

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5. TRANSFERABLE SKILLS



All sections: Quality of the presentation slides – (3/5) Good, but some slides contained too many words, block diagrams would have been better (RD) Most slides were generally readable and well presented (MH) All sections: Quality of the delivery style – (2/5) Many pauses, overran time (RD)

5

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