Coombefield Quarry

Environmental Permit Application

Environmental Setting and Site Design

Portland Stone Limited

September 2022

Prepared on Behalf of Tetra Tech Environment Planning Transport Limited.

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1.0 INTRODUCTION

1.1 REPORT CONTEXT

1.1.1 This document has been prepared by Tetra Tech on behalf of the Operator, Portland Stone Limited (PSL) to support an environmental permit application for Coombefield Quarry (the site) at Southwell Road, Isle of Portland, Dorset, DT5 2EG.

1.1.2 PSL are seeking to gain a bespoke environmental permit to allow the operation of an inert landfill and a waste management facility that will include the following:-

- Inert waste recycling facility (including crushing and screening); and
- Household, Commercial and Industrial (HCI) Waste Transfer Station (including waste electrical and electronic equipment (WEEE)) with treatment via manual sorting and separation (via a picking station), screening (with a vibrating screen separator), the shredding of specific non-hazardous waste streams to produce RDF and the baling of specific waste streams such as cardboard, plastics and RDF.

1.1.3 This document corresponds to Question 1, Appendix 4 of Part B4 of the Environmental Permit application forms, which requires the provision of an Environmental Setting and Site Design (ESSD) report. According to the Environment Agency's (EA) 'Landfill operators: environmental permits' guidance, an ESSD document is only required for an application that comprises a landfill for inert waste or a deposit for recovery operation. As such, this document solely relates to the inert landfill.

1.1.4 The aim of this report is to describe the regulated facility in relation to the environmental setting, identifying the source terms, pathways and receptors that will be used as the basis for the Environmental Risk Assessment (ERA) for this permit application.

1.1.5 This document has been prepared based on the ESSD report guide that's provided in the EA's 'Landfill operators: environmental permits' guidance (updated April 2021).

2.0 SITE DETAILS

2.1 SITE LOCATION AND CONTEXT

2.1.1 The site is situated within the wider Coombefield Quarry site, which is located approximately 500m north east of Southwell, on the Isle of Portland in Dorset. The site is centred at approximate National Grid Reference (NGR) SY 69107 70631. The site location and environmental permit boundary is shown on Drawing Number PSL/B034779/PER/01.

2.1.2 Access to the site is achieved via an unnamed access road off Southwell Road which is located to the south west of the site. The immediate surroundings of the site largely comprise disused quarry sites including Suckthumb Quarry to the north west, Duncecroft Quarry to the south east, Pennsylvania Quarry to the north east and Freshwater Quarry to the south. The nearest residential receptor to the site is located approximately 67m north on Weston Street.

2.1.3 A 'Nature and Heritage Conservation Screen' (EPR/LB3202GS/A001) was requested from the EA. The screen determines the presence of any site of nature and heritage conservation, or protected species or habitats that may be impacted by the proposal. A copy of the results is in the ERA (Appendix C of the Environmental Permit Application).

2.1.4 The results of the screen identified the following receptors:-

- Isle of Portland to Studland Cliffs (Special Area of Conservation) located approximately 45m east of the site;
- Studland to Portland (Special Area of Conservation) located approximately 215m east of the site;
- Isle of Portland (Site of Special Scientific Interest) located approximately 45m east of the site;
- Pennsylvania Quarry (Local Wildlife Site) located approximately 60m north east of the site;
- Deciduous Woodland located approximately 100m west of the site; and
- Maritime Cliffs and Slopes located approximately 45m east of the site.

2.2 SITE CLASSIFICATION

2.2.1 The regulated facility is an inert landfill.

2.3 APPLICATION BOUNDARY AND SITE SECURITY

2.3.1 The proposed application boundary is shown on Drawing Number PSL/B034779/PER/01.

2.3.2 The entrance to the site is gated, with security fences and trees/vegetation located around the perimeter of the site to prevent unauthorised access. Site gates and perimeter fencing will be inspected on a daily basis. Any identified damage to the fence or gates that could prejudice the site security is recorded and temporarily repaired as necessary before the end of that working day. Permanent repair or replacement will be undertaken as soon as practicable.

3.0 SOURCE TERM CHARACTERISATION

3.1 HISTORICAL ACTIVITY

Planning History

3.1.1 The wider Coombefield Quarry has been quarried intermittently since 1951 under Planning Permission reference 200411 granted by Dorset Council.

3.1.2 Permission 200411 is subject to a 'Review of Old Mineral Permission' (ROMP) application that was submitted around 2006. This process seeks to agree modern planning conditions and included proposals for the restoration details with an end date of 2042. The ROMP Application has not been determined and therefore there is not a fixed restoration end date or approved restoration details for Coombefield Quarry.

3.1.3 In June 2017, Planning Permission WP/16/00818/NOTS was granted by Dorset Council to allow the operation of a mine in the southern section of the wider quarry site known as Coombefield South. The operation comprises the extraction of approximately 25,000m3 of Portland dimension stone and would be worked by the 'Room and Pillar' method which is the same methodology that's used at other mines that are present on the Isle of Portland. Following extraction, the permission WP/16/00818/NOTS allows the void to be filled with waste rock that's generated from the mining process.

3.1.4 In May 2022, a Planning Permission was granted by Dorset Council (reference P/DCC/2021/04835) to allow the operation of an Inert Landfill and a Waste Management Facility in the northern section of the quarry site known as Coombefield North which is the application site.

3.2 PROPOSED ACTIVITY

3.2.1 The inert landfilling activities will comprise the importation of inert waste for infilling the quarry void that has been created from mineral extraction activities at the site.

3.2.2 The works would be undertaken in phases (as shown on Drawing Numbers 801-06 to 801-12) and the site would be restored in accordance with the restoration scheme (Drawing Numbers 801-13 and 801-14) that was approved by Dorset Council as part of the planning permission (reference P/DCC/2021/04835).

Proposed Operational Phasing

3.2.3 The proposed phasing plan for the bespoke permit is detailed on Drawing Numbers 801-06 to 801-12. The operations will comprise 6 phases (Phase 1a, 1b, 2a, 2b, 3a and 3b), where progressive infilling

and restoration will commence in Phase 1a located to the northeast of the site and will progress towards Phase 1b which is located to the north west of Phase 1a. There is an area of land to the north of Phase 1b that will be left as unrestored quarry face for geological and ecological interest.

3.2.4 Following the completion of Phases 1a and 1b, works will progress in a south-westerly direction.

Permitted Waste Types

3.2.5 In order to complete the proposed restoration works at the site, a volume of 660,200m^3 of material will be required. When using a bulk conversion factor of 1.5 tonnes/m^3 this equates to approximately 990,300 tonnes.

3.2.6 The site will only accept inert waste as classified under the Landfill Directive (1999/31/EC) and Council Decision (2003/33/EC) of 19 December 2002 'establishing criteria and procedures for the acceptance of waste landfills'.

3.2.7 Details regarding the proposed waste types including restrictions are provided in the Operating Techniques (Appendix B of the Environmental Permit Application).

Final Landform and After Use

3.2.8 Works would initially involve levelling operations within the eastern part of Coombefield North, in order to broadly infill holes and depressions and smooth out mounds and old stockpiles, prior to commencement of the main infilling operations. This is illustrated on Drawing Number 801-04. Cross sections are also provided on Drawing Number 801-15.

3.2.9 The main infilling works, material will be tipped, graded out and compacted in layers to form the restoration landform. This would be approximately 2m below the original ground levels. The existing northern slot area would not be infilled, with infilled material sloping down towards this part of the site, which would remain as existing.

3.2.10 Following creation of the final restoration landform, the land would be left to naturally regenerate, developing into calcareous grassland over a period of time. Stone walls would be built in the local vernacular style in accordance with the layout shown on Drawing Number 801-14. This layout has been influenced by the historical pattern of small fields divided by stone walls that was evident prior to mineral extraction. In addition, some areas of scrubby vegetation would be incorporated around the edge of the site, to help integrate the restored land with the existing scrubby vegetation around the site boundary. Groups of boulders would be randomly placed across the landscape to evoke the craggy character of the wider landscape, most notably older quarries that have not been previously restored but have been effectively abandoned many decades ago, and which have naturally regenerated over many decades.

Hydrogeological Risk Assessment

3.2.11 A Hydrogeological Risk Assessment (HRA) has been prepared to provide the geological and hydrogeological setting of the site allowing the development of a conceptual model to determine the risk that the facility will pose to underlying groundwater. A copy of the HRA is provided as Appendix F of the Environmental Permit Application.

4.0 PATHWAY AND RECEPTOR TERM CHARACTERISATION

4.0.1 Specific background information that's used in Sections 4.1 – 4.4 are taken from the following documents:-

- Hydrological and Hydrogeological Assessment that was completed by BCL Consultant Hydrogeologists Limited (Version 2, October 2021) to support the planning application (P/DCC/2021/04835); and
- Hydrogeological Risk Assessment (September 2022) that was prepared to support the Environmental Permit Application. A copy is available as Appendix H of the main application.

4.1 GEOLOGY

4.1.1 The Isle of Portland lies on the southern limb of the Weymouth anticline. The strata in the locality record generally shallow dips to the south of between 1.5 and 2 degrees.

4.1.2 To characterise the geological setting for the site, BCL Consultant Hydrogeologists Limited used British Geological Survey (BGS) mapping and drilling data in combination with details obtained during a site-specific drilling exercise, to define the geological sequence in proximity to the Site.

4.1.3 A summary of the stratigraphic sequence for the area encompassing the Site, is provided below (order shown from youngest units to oldest):-

- Lulworth Formation – Limestones interbedded with marl and clay (>3 m thick);
- Portland Stone Formation – White-grey oolitic limestone separated by chert beds (35m thick);
- Portland Sand Formation – Marls, clays and sandstones with dolomitic seams (42 m thick); and
- Kimmeridge Clay – Clays, mudstones, shales and marls with some dolomitic seams (>100 m thick).

4.1.4 The Lulworth Formation covers much of the southern and central sections of the island in outcrop, including the area encompassing the Site. Within the Site itself the Lulworth Formation has been removed to facilitate quarrying of the underlying Portland Stone Formation.

4.1.5 The Portland Stone Formation (PSTF) constitutes the economic mineral at the Site, and records a pre-quarry thickness of some 35 m.

4.1.6 Drilling logs for groundwater monitoring points installed at the Site are included at Appendix A with a piezometer location plan at PSL/B034779/GW/01. The aforementioned logs record the presence of a laterally continuous 1.5 m to 5 m thick band of Portland Clay (uppermost unit within the Portland Sand

Formation) underlying the base of the Portland Stone Formation.

4.1.7 Elevations of the Portland Clay horizon range from 22 mAOD at the northern slot (P4/21) reducing to 13 mAOD towards the south-west of the Site (P1/21).

4.1.8 No water strikes were recorded during drilling; a delayed response of up to 24 hours was observed at each drilling location before water was recorded within the borehole.

4.1.9 The groundwater monitoring points extend between 8.5m – 22m into the underlying Portland Sand Formation. The BGS describe the remaining units of the Portland Sand Formation as approximately 30m thick medium grey dolomitic sandstone with thin shelly limestones.

4.2 HYDROLOGY

4.2.1 According to the Hydrological and Hydrogeological Assessment that was completed by BCL Consultant Hydrogeologists Limited (October 2021), a water features survey was undertaken in June 2021 which identified two areas of surface water within a 2km radius of the site. Details of these features are summarised in Table 1 below.

Table 1: Surface Water Features within 2km of the Site

Name	Type	Easting*	Northing*	Distance	Notes
Red Door Tunnel	Spring	369172	70211	0.2	Water emerges from the base of the cliff beneath Cheyne House.
Culvers Well	Spring	368405	69261	1.3	Dry at time of visit. Spring from Mesolithic site travels 300m through a gully and terminates as a waterfall on the cliff edge.

* - *Indicates Approximate Location*

4.2.2 The outfall observed at Red Door Tunnel has been proposed as a monitoring point in the Hydrometric Monitoring Scheme (the HMS), however data is unsubstantial due to unsafe access.

4.2.3 A spring is located at the Culverwell Mesolithic Site approximately 1.3 km southwest of the Site which is situated at 28 mAOD. As the highest groundwater elevation recorded within the Site was 11.4 maOD (P2/21), this is not considered to be in hydraulic conductivity to the Site.

4.2.4 The EA hold no data of surface water level or flow sites on the island.

4.2.5 In terms of flooding, the 'Flood Maps for Planning' Services indicates that the Site is not situated within a flood risk zone.

4.3 HYDROGEOLOGY

Aquifer Designation

4.3.1 According to the Multi-Agency Geographic Information for the Countryside's (MAGIC) website, the Portland Stone Formation is classified as a Principal Aquifer which reflects the unit's ability to store and transmit groundwater, where present in sufficient areal extent and suitable geological setting.

4.3.2 The limestone unit features negligible primary (intergranular) permeability, with groundwater storage and movement being dependant on the development of secondary permeability (weathering / fracturing) within the aquifer. On the Isle of Portland, the Portland Stone Formation aquifer is overlain by the Lulworth Formation, which comprise a series of sandy limestones and mudstones, with generally lower permeability than the underlying Portland Stone Formation aquifer.

4.3.3 The Portland Stone Formation is underlain by the Portland Sand Formation. The Portland Sand Formation comprises silty dolomitic sandstone, with thin shelly limestones. Field assessment suggests the primary porosity of this unit is also expected to be low (for sandstone), with permeability again expected to be dependent on the presence and interconnectivity of the secondary fracturing.

4.3.4 According to the MAGIC website and BCL Consultant Hydrogeologists Limited, both the Lulworth Formation and Portland Sand Formation are classified as "Secondary A Bedrock Aquifer" – being capable of supporting local water supplies and/or baseflow supplies to springs etc. This again being the case only if the units are present in suitable geological setting etc.

4.3.5 Due to the elevated and largely isolated position of the island landform, recharge to the Portland Stone Formation aquifer on the Isle of Portland can only occur from rainfall (as opposed to any lateral flow from other aquifers). Recharge is therefore expected to occur as diffuse and autogenic input, either through direct recharge to areas of Portland Stone Formation outcrop, or as leakage through the overlying Lulworth Formation, where present.

Groundwater Source Protection Zones

4.3.6 According to the MAGIC website, the site is not situated within a Groundwater Source Protection Zone (GSPZ) however, the groundwater vulnerability is identified as high.

Groundwater Levels

4.3.7 The available groundwater data submitted by PSL were plotted on the hydrograph of Appendix B (raw level data also in this appendix). The following comments apply to the plotted data:-

- The highest average water table levels are recorded in P2/21 and P3/21, whereas the lowest average levels were measured in borehole P1/21. Borehole P4/21 has reported dry conditions throughout the monitoring period.

- From these data the plotted groundwater contours indicate an inferred flow direction to be from north west to south east, mirroring the reported flow direction in the BCL report and topographic setting.

- A groundwater contour map has been prepared and is presented as Drawing Number PSL/B0134779/GW/01.

4.3.8 The current inferred groundwater flow direction has therefore allowed for the identification of the up- and down-gradient boreholes, namely:-

- Up-gradient: P2/21 and P4/21;

- Down-gradient:P1/21 and P3/21.

Groundwater Quality

4.3.9 With reference to Section 4.3 of the HRA (Appendix F of the main application), groundwater quality data were obtained from the boreholes forming the current monitoring network (Drawing Number PSL/B0134779/GW/01) between August 2021 and May 2022.

4.3.10 The groundwater quality results for the indicator substances ammoniacal nitrogen (Amm. N) and chloride are chosen to identify are potential contamination arising from the landfill due to their high mobility. Sulphate is also included as an additional substance since it is identified as being a primary potential leachable component of inert materials along with chloride.

4.3.11 Various metals have also been included in the interpretation of the chemical characteristic of the groundwater and these have been discussed in the sections that follow.

4.3.12 The raw and plotted data to derive the time series chemographs are shown in Appendix C. Plotting of “less than” reported values has been possible by the application of the substitution rule of 0.5 x L, where L is the “less than” value, as per guidance “Final Technical Report P1-471_Techniques for the interpretation of monitoring data”.

4.3.13 It should be noted that potential outliers have not been removed at this stage due to the currently limited amount of monitoring information. However for the purposes of the HRA (Appendix F of the main application), statistical analysis has been performed on the data set for the calculation of the Environmental Assessment Limits (EALs). A review of these monitoring data will be carried out once a reasonably robust set is available.

Up-gradient boreholes

- The Amm. N chemograph displays a peak in values on one occasion within P2/21 during October

2021 visit. The remaining data points are in a relatively linear pattern, with no discernible trends. Average concentrations of the plotted data are around 0.03mg/l.

- Chloride average concentrations are all below 100mg/l for up-gradient borehole P2/21. The trend displayed by the plotted values is generally stable and linear around an average of 60mg/l.

- Average sulphate values are around 300mg/l for this up-gradient borehole. The plot of these concentrations displays a relatively stable but slightly increasing trend as displayed by the data since April 2022. This trend will be monitored for any future changes.

- Common metal values up-gradient, most importantly with cadmium, lead and mercury have concentrations below the detection limits of the laboratory in most of the visits and iron being consistently found in the dissolved state. The remaining metals have varying concentrations between being below the limits of detection or a narrow range of values. The few organic compounds sampled also all show values below the limit of detection of the laboratory.

Down gradient boreholes

- The Amm. N plot is affected by spurious behaviour in the values found in P1/21 until October 2021, after which concentrations rapidly declined to around 1.5mg/l displaying a trend mostly linear and stable. Average concentrations and plotting trend for P3/21 is very similar to that of up-gradient P2/21 with an average value of 0.047mg/l.

- Average chloride concentrations in down-gradient boreholes P1/21 and P3/21 are also all below 100mg/l and fall within a very narrow average range of 50mg/l and 75mg/l respectively. The linear trends displayed in the chemograph by both monitoring points are a reflection of the narrow plotting range of these boreholes.

- Average sulphate values for P1/21 are around 700mg/l whereas for P3/21 these are below 100mg/l. The trend for P1/21 is initially more haphazard that that displayed by P3/21, which in turn is linear and stable. Interesting to note the harmonised low and high towards the end of the monitoring period between P1/21 and up-gradient P2/21.

- Metal values down-gradient display similar patterns to those up-gradient. Again, cadmium, lead and mercury have not been detected above the limit of detection of the laboratory in all visits and iron is being consistently found in the dissolved state. The remaining metals have varying concentrations between being below the limits of detection or a narrow range of values. The organic suite tested during the monitoring period in question has returned concentration for all substances below the laboratory's limit of detection.

4.3.14 As an overall comment, the groundwater quality between the up-gradient and down-gradient monitoring

points is nearly identical, with P2/21 in all cases plotting between the graphs of the two down-gradient boreholes – a situation somewhat varied as expected to be found within a hydrogeological environment that has been anthropogenically influenced over many years of development.

4.3.15 Due to the limited amount of statistical data currently available, the development of groundwater quality patterns will become clearer as more information is gathered.

4.4 MAN MADE DEPOSITS

4.4.1 There are no Made Ground deposits shown on site.

4.5 AMENITY

4.5.1 All receptors that may be affected by this proposal are identified in the ERA that has been prepared as part of this Environmental Permit Application. A copy of the ERA is provided as Appendix C of the Environmental Permit Application.

4.6 COMPLIANCE PONTS

4.6.1 The risk of impact on groundwater and surface water and the selection of relevant compliance points is detailed in the HRA (Appendix F of the Environmental Permit Application).

5.0 POLLUTION CONTROL MEASURES

5.1 SITE ENGINEERING

Basal Engineering

5.1.1 A geological barrier is a fundamental requirement for all landfills according to the Landfill Directive (1999/31/EC) and must provide sufficient attenuation to prevent a risk to soil and groundwater. The geological barrier shall have a minimum thickness of 1m and a permeability of no greater than $1x10^{-7}$ m/s or equivalent.

5.1.2 Prior to the commencement of landfilling, a geological barrier will be engineered using imported materials. The geological barrier will be constructed in compliance with the Landfill Directive and will have a hydraulic conductivity of less than 1m at 1×10^{-7} m/s or its direct equivalent of 0.5m at 5×10^{-8} m/s.

Side Slope Engineering

5.1.3 A side slope liner will be constructed from suitable waste materials against a suitable subgrade slope. The engineered clay liner will be constructed in compliance with the Landfill Directive and will have a hydraulic conductivity of less than 1m at 1×10^{-7} m/s or its direct equivalent of 0.5m at 5×10^{-8} m/s.

5.1.4 The proposed construction of the clay liner would be to the specification detailed in the Construction Quality Assurance (CQA) Plan that will be submitted to the Agency for approval prior to engineering taking place. See the Hydrogeological Risk Assessment for further details (Appendix F of the Environmental Permit Application).

Capping

5.1.5 In accordance with the requirements of the Landfill Directive, an engineered cap (clay or plastic) is not required.

Restoration

5.1.6 Following the establishment of the basal and side slope engineering, infilling will commence where waste will be tipped, graded and compacted in layers to form the restoration layer that will be approximately 2m below the original ground levels.

5.1.7 Once the final restoration landform has been created, the land would be left to naturally regenerate, developing into calcareous grassland over a period of time. Stone walls would be built in the local vernacular style in accordance with the layout shown on Drawing Number 801-14. In addition, some

areas of scrubby vegetation would be incorporated around the edge of the site, to help integrate the restored land with the existing scrubby vegetation around the site boundary. Groups of boulders would be randomly placed across the landscape to evoke the craggy character of the wider landscape, most notably older quarries that have not been previously restored but have been effectively abandoned many decades ago.

5.2 LEACHATE MANAGEMENT AND MONITORING

Leachate Generation

5.2.1 Leachate would be generated by rainfall infiltrating through areas of open inert restoration materials and through capped and restored areas. Due to the inert nature of the proposed waste types, there will be no polluting leachate generated at the site and therefore no leachate management or monitoring is needed.

5.3 GAS MANAGEMENT AND MONITORING INFRASTRUCTURE

Gas Generation and Management & Monitoring Infrastructure

5.3.1 A Gas Risk Assessment (GRA) has not been prepared for the site, as the Landfill Technical Guidance Note LFTGN03 indicates that new inert landfills do not pose a landfill gas hazard.

5.3.2 A Landfill Gas Screening Report has been prepared which has been submitted with the Environmental Permit application as Appendix G. This report concludes that active gas management is not required for the site but recommends that monitoring is undertaken.

5.3.3 Further details regarding the monitoring of landfill gas are provided in the Environmental Management and Monitoring Plan (Appendix I of the Environmental Permit Application).

5.4 SURFACE WATER MANAGEMENT AND MONITORING

5.4.1 The HRA that was prepared for the Environmental Permit Application concludes that active surface water management is not required for the site but recommends that monitoring is undertaken.

5.4.2 The HRA recommends that surface water is sampled from surface water monitoring point SW1 as shown on Drawing Number PSL/B0134779/GW/01. Further details regarding the monitoring of surface water are provided in the Environmental Management and Monitoring Plan (Appendix H of the Environmental Permit Application).

5.5 GROUNDWATER MANAGEMENT AND MONITORING

5.5.1 The HRA that was prepared for the Environmental Permit Application concludes that active groundwater management is not required for the site but recommends that monitoring is undertaken.

5.5.2 The HRA recommends that groundwater is monitored from the existing groundwater monitoring points (references P1/21, P2/21, P3/21 and P4/21) as shown on Drawing Number PSL/B0134779/GW/01.

5.5.3 Further details regarding the monitoring of groundwater are provided in the Environmental Management and Monitoring Plan (Appendix H of the Environmental Permit Application).

5.6 AMENITY

5.6.1 An ERA (Appendix C of the Environmental Permit Application) has been prepared to consider the potential impact of the proposal. The ERA indicates that the proposal will have no significant impacts in terms of odour, noise and vibration, and fugitive emissions. This is based on the control measures that are detailed in the ERA.

5.7 POST CLOSURE CONTROLS

5.7.1 The post closure controls will ensure long-term management and monitoring of the regulated facility.

5.7.2 The Environmental Management and Monitoring Plan (Appendix H of the Environmental Permit Application) provides details regarding the monitoring schedule of the aftercare phase.

5.7.3 The Closure and Aftercare Plan (Appendix I of the Environmental Permit Application) provides details of the measures to be taken upon and after the closure of the landfill to avoid pollution risk.

6.0 MONITORING

6.0.1 The Environmental Management and Monitoring Plan (Appendix H of the Environmental Permit Application) provides details regarding the proposed monitoring schedule for the site.

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PSL/B0134779/GW/01 – Average groundwater contours

APPENDICES

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APPENDIX B – GROUNDWATER LEVEL DATA AND PLOT

APPENDIX C – GROUNDWATER QUALITY DATA AND PLOTS