NEW RESPONSES

ASSESSORS FEEDBACK EXAMPLES

SURVEYOR FRAMEWORK

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Assessors Feedback

Example Of Assessors Feedback

Your CER should describe the survey methods, calculations and decision-making processes you use in your workplace. The assessment requires you to justify your methods in the context of the framework.

The CERs described appropriate projects but additional explanations and supporting documentation has been requested in some areas. Generally the CERs could use additional explanation, especially in the context of the descriptors and elements being claimed. As a rule of thumb a paragraph should be written to address the requirements of each descriptor claimed and each descriptor should have a piece of supporting documentation referenced.

Any amendments and additional descriptors can be claimed by adding extra paragraphs (in red or bold) for each specific descriptor at the end of your CER or in the main text of your CER. These updates can be submitted with your next CER submission or sooner as Sub 2a

S 2.1(ii) EDME Baseline Comparison requires a full copy of the calibration report and your analysis of the baseline processing results. Demonstrate that chi squared test passes, outliers have been identified and results are consistent within double the stated instrument specifications. All inconsistencies should be analysed and either justified or corrected. See Baseline software guide for details (see page 3 "software Notes") (https://www.business.qld.gov.au/industries/building-property-development/titles-property-surveying/surveying/calibration-equipment).

S 2.3(i) – S 2.3(vi) have been demonstrated with respect to your projects, but some additional explanation in a broader context is required to satisfy the descriptors. A separate ½ page or so of notes should be sufficient. S **2.3(vi)** may also require an example or explanation of outputting results to a ground-based system. Refer to the descriptor requirements in the tables below.

S 5.4 (i) Certifying Data – this element is mainly about writing certificates that are accurate and clearly express what is being certified. Also include a brief discussion on the reliability of data, responsibilities of certification as well as identifying and managing risk. Refer to framework notes below:

When called upon will be able to:
  i.   *Understand and explain the accuracy and reliability of data to be certified.*
  ii.   *Understand and explain the responsibilities of data certification.*
  iii. *Apply effective validation procedures.*
  iv.   *Effectively identify and manage risk associated with certification*

Consider the questions:

- Exactly what is it that you are certifying?
- What is the accuracy of the data based on your survey method and what methods did you use to check that the data is correct?
- How did you check that the certificate is correct and wording is appropriate?
- How do you reduce the likelihood of making mistakes and what happens if you get it wrong?

Topographic Surveys

What was the required or expected accuracy for your survey and how did you know your proposed method would satisfy these requirements?

Although the horizontal and vertical control was sufficiently described no indication of the quality of this control was provided in the CER.

A brief description of quality checks undertaken through the scan registration process is required to validate the scans.

You used QQ strings to verify your model but did not quantify your expectations for these checks or provide a quantified summary of your analysis to demonstrate that the expectations were met. Summary results will be sufficient.

S 3.2(ii) although appropriate checks were undertaken a little more information, mainly to do with quantifying your checks is required to finalise this descriptor. Consider: for your RTK checks to the PMs, quantify the expected differences and what did you achieve; for the T/Stn traverse, quantify the expected misclose and what value did you achieve; for detail pickup, quantify the expected accuracy for pickup (RTK & T/Stn) and how did you demonstrate that these accuracies were achieved?

<u>**CER 3 Volume survey (S3.3)**</u>

Your CER should describe the survey methods, calculations and decision-making processes you use in your workplace. The assessment requires you to justify your methods in the context of the framework.

The surveyor framework specifically requires you to:

S 3.3(i) discuss the uncertainty of the topographic data collected and how the density of the data collected affects the calculated volume; and

S 3.3(ii) calculate and report volumes to an accuracy justified by the measurement methods.

Generally consider for volume surveys

- Quantify the survey requirements; if no specifications are provided quantify your expectations. What topographic survey uncertainty and volume uncertainty can you expect to achieve in the case you are describing?

- Select equipment and methods based on expectations. Demonstrate that the method you intend to use will be able to achieve this expectation; quantify your expectations based on the accuracy of your method (including reference surface), proposed density of survey points, and approximate area of stockpiles etc.

- Describe the processes used; checks undertaken and how the methods used achieve the required results (are your topographic surveys correct?). Demonstrate an understanding of the topographic survey methods used, the appropriate checks and the resultant uncertainties. Consider instrument precisions, software analysis of results (e.g. UAV and scanning) and other contributing factors.

- Review your QA checks and statistical data used to test your models. Are the uncertainties achieved with these tests consistent with your initial expectations and stockpile surface conditions? If not is there a problem with your surveyed data or your initial expectations?

- Provide a quantified estimate of your volume accuracy based on uncertainties in your models.

- Describe what calculation method was used to calculate the volume e.g. surface to surface and state if the uncertainty of the calculation contributes significantly to the volume uncertainty.

- Report the volumes to an appropriate accuracy, including justifying or explaining the "rounding" of the reported result.

These calculations are inherently about disputed amounts and one day you may have to stand up in court and validate your results.

Did you record any check shots within the model areas as checks on the heights within the model, if not how did you validate the heights in your model? Quantify these checks to confirm your assumed accuracies.

When considering the volume uncertainties you assumed an uncertainty of Xmm over the area of your stockpile for an estimate of your volume uncertainty. This calculation does not take into consideration the fact that your volume was calculated from two surfaces (even though both surfaces were derived from the same data) or the nature of random errors in each surface.

This CER is more about how you do the survey, calculations and decision making in your work situation than a one off exercise. It is important that you discuss this process with other people in your organisation to ensure you can explain it clearly and that the method used makes sense to them.

S 6.3(i) GNSS control network; S 6.3(iv) and S 6.3(v)

There are a number of issues that come up regularly in the GNSS

Network design

- Minimum of 2 preferably 3 Datum control marks
- Fast static baselines less than 10km;
- Baselines preferable 750+, can justify less, but less than about 400-500 can be difficult to justify.

Baseline Processing

- Brief statement regarding baseline processing results

Evidence

- Sketch of network
- Sketch or session plan sufficient to justify independent baselines
- Copies of control form 6 or reg 13 certificates
- Some baseline processing evidence
- Adjustment printouts
- Final control co-ordinates and estimates of uncertainty

CER 6 – Vertical Control

The vertical control component is more about establishing new control based on SP1 requirements than closed loop control used for project control. Refer to SP1 – Differential Levelling for details of vertical control levelling.

S 6.4(i) – You are required to demonstrate the testing of miscloses and providing adjustments to the selected standard. Consider using a table similar to the example 5 in SP1 to demonstrate this.

You are required to demonstrate that the minimum requirements in SP1 have been achieved. Consider differential levelling (12 root k), 2 Datum AHD control stations, establish one or two new control heights, two way level run (not closed loop); test misclose between bays and overall; and adjust as set out in example section 5 SP1 (holding datum control fixed).

S 6.4(ii) – the effects of curvature and refraction should be sufficiently described, consider relating to adjustments applied in your total station as well as referenced to levelling.

An example of trigonometric levelling (total station levelling) as described in SP1 is also required to finalise this descriptor. Refer to the process for T/Stn levelling described in SP1 (swapping the level with the T/Stn in a normal differential levelling process). A simple traverse between 2 or 3 random marks satisfying $12\sqrt{k}$ as described in SP1 tables will be sufficient to demonstrate this process.

__Recommendation__

Further explanation or supporting documentation is required for descriptors that have not yet met the minimum standard of a score of 3. Refer to the comments in the assessor's comments column of the following feedback sheets.

It is common practice to resubmit some of your existing CERs with additional requested information inserted in red or bold. This option keeps the context of the original document and provides any additional information or supporting documentation that is required. Most of the requirements can be addressed in this manner or you may prefer to address some of the requests in your new CERs. These updates can be submitted with your next CER submission.

These updates can be submitted with your next CER submission or sooner as Sub 1a

Scores   **Note: A score of 3 or 4 indicates competency has been demonstrated.**
0 - No relation at all to the element or not authenticated
1 - Evidence is insufficient or lacks depth to illustrate adequately competence
2 - Either the evidence is appropriate but further explanation may be required
    or the explanation is appropriate but further documentary evidence may be required
3 - Satisfactory level of competence has been illustrated
4 - Competence clearly identified and documented to a high standard

UNIT 1: PERSONAL QUALITIES

Elements / Descriptors	Score	Assessors Comments
S 1.1 Possess a tertiary qualification in surveying Applicants will need to demonstrate that they: i. Have completed a course of study of at least three years fulltime duration acceptable to the Surveyors Board of Queensland or have been previously registered as a Surveyor by the Surveyors Board of Queensland *Refer to the notes column of the Competency Framework*	3	Copy of degree or letter of overseas assessment.
S 1.2 Are professional in their dealings with the public Applicants will need to demonstrate that they: i. Have not conducted themselves in a manner that erodes the public confidence in the profession *An absence of contrary evidence will be sufficient*		Statement required
ii. Have not been unfair or unethical in their dealings with the public *An absence of contrary evidence will be sufficient*		Statement required
S 1.3 Know and comply with published ethical codes Applicants will need to demonstrate that they: i. Understand and can explain the Surveyors Board of Queensland's *Code of Practice for Surveyor*		At least one section of the code needs to be quoted with an example from your work situation.
S 1.4 Keep their knowledge and skills current Applicants will need to demonstrate that they have made themselves aware of changes in surveying practice through activities such as: i. Attending continuing professional development events		Requires Evidence – log of events, with evidence of participation in at least one event.
ii. Reading literature relevant to surveying practice		Requires evidence – log of literature including links to on-line material.

S 1.5 Know what limitations apply to their work Applicants will need to demonstrate that they: i. Can describe the regulation of surveying in Queensland See *Surveyors Act 2003*		Consider the surveyors act, purpose and how it applies to you. At least one section of the act needs to be quoted with an example from your work situation. Also consider regulations relevant to your mining operation, particularly supervision if applicable. Also consider S6.2(i) and discuss SMI here – include at least one example from your workplace.
ii. Have not undertaken work beyond limits of personal skills and expertise *An absence of contrary evidence will be sufficient*		Statement required

UNIT 2: COLLECTION OF DATA AND MEASUREMENT

Elements / Descriptors	Score	Assessors Comments
S 2.1 Collect data by measurement Applicants will need to demonstrate that they: i. Use adequate redundant measurements to validate data		
ii.Ensure measurements are legally traceable – Note: EDME baseline adequate *Successful completion of EDME baseline comparison is required.*		Requires the applicant to personally carry out a range calibration and reduce the results preferably in the DNRM software. Include a copy of calibration report, particularly pages showing chi square test and outlier test results.
iii.Evaluate the various measurements methods and procedures available *Evidence of a variety of measurement methods in a variety of circumstances will be sufficient evidence*		
iv.Assess the effectiveness of the measurement method adopted *Evidence of a variety of measurement methods in a variety of circumstances will be sufficient evidence*		

S 2.2 Search and acquire existing data Applicants will need to demonstrate that they are able to: i. Extract required information from relevant geographic and land information records, survey data bases, and general information depositories		Consider cadastral search, PSM, DBYD. For miners consider Mining searches, PSM and role as custodians of data on mine site. Also consider lease boundary and DNRM – MinesOnline. Requires some evidence search (not full searches).
S 2.3 Can use and maintain GNSS surveying instruments Applicants will need to demonstrate that they are able to: i. Define coordinates systems likely to be encountered by GNSS users and calculate GNSS coordinates		Define MGA coordinate system in more detail and identify some others. Reference GA website and/or Auspos report.
ii. Discuss the principles of GNSS observations		
iii. Make observations using a GNSS receiver		
iv. Explain GNSS observations techniques, and calculate and evaluate levels of accuracy associated with GNSS observations		Identify a list of techniques and achievable accuracies for other GNSS techniques. https://www.icsm.gov.au/sites/default/files/2018-02/Guideline-for-Control-Surveys-by-GNSS_v2.1.pdf -Fig 2
v. Identify error sources in GNSS observations, and explain the uses and critical factors of differential GNSS techniques		Reference text following figure 2 https://www.icsm.gov.au/sites/default/files/2018-02/Guideline-for-Control-Surveys-by-GNSS_v2.1.pdf
vi. Output GNSS observations in existing local co-ordinate systems including ground based systems		

Elements / Descriptors	Score	Assessors Comments
S 2.4 Apply quality assurance principles Applicants will need to demonstrate that they are able to: i. Comply with an accepted quality assurance program		Direct reference to your QS manual required. Requires that you comply with a documented QS (quality system) or a significant component of a QS (e.g. considers client instructions, checking of supplied information, production control, output checks and communicating results). If a documented system does not exist, you may have to first develop a document that describes the undocumented QS or component of a QS that is being used.
ii. Rectify non-compliance with quality standards		Requires an appropriate corrective action or improvement to Quality System e.g. reviewing, correcting or creating a checklist, form or process. This descriptor does not refer to identifying a mistake using a checklist or process check and correcting the mistake

UNIT 3: DEVELOPMENT SURVEYS

Elements / Descriptors	Score	Assessors Comments
S 3.1 Setout minor works Applicants will need to demonstrate that they are able to : i. Read, interpret and understand design and construction plans		Requires example of design plans/models, checks on the supplied information and/or evidence of your model or upload information extracted from these and other plans (set-out sketch or screen print of model of calculated set-out points)
ii. Set out works		
iii. Communicate results to client, construction staff and other consultants		Discuss the communication process and provide instructions and confirmation e-mails or notes of verbal instructions etc. as evidence of supplied results.

iv. Use adequate redundant measurements to validate data		Identify the redundancies used in control and set-out; quantify expected accuracy and the results of suitable tests. Provide evidence of checks undertaken (e.g. field records, comparison tables) and discuss/quantify the results of checks.
S 3.2 Perform topographic surveys Applicants will need to demonstrate that they have: i. Completed a variety of topographic surveys that were fit for purpose using terrestrial and GNSS instruments. *Descriptor (i) requires evidence that the applicant has completed detail surveys that:* *Have an adjusted network of stations connected to a reference framework (e.g. co-ordinated control or cadastral marks);* *Involve surveys of irregular surface levels and breaklines; and locating a range of artificial and natural features;* *Require creation of a digital terrain model and contours;* *Require compilation of supplementary data from other sources (e.g. plotting underground services from records);* *Generate output formats (e.g. digital files, PDF) to suit the project brief and demonstrates understanding of design requirements.*		A terrestrial and GNSS (RTK) survey or a survey combining both methods is required. One of these surveys can be of less complexity than the main survey. Also refer to the notes in blue in the column to the left.
ii. Use adequate redundant measurements to validate data		
iii. Accurately described the origin of datums and other explanatory notes		Requires the datum (horizontal & vertical) notes and explanatory notes in the title block to be explained and justified.
S 3.3 Survey and calculate volumes and quantities Applicants will need to demonstrate that they: i. Collect topographic data at appropriate accuracy and density for volume purpose		Requires you to discuss the uncertainty of the topographic data collected and how the density of the data collected affects the calculated volume; Discuss the method of checking, quantified accuracy and density of the topographic survey data and the models used for volume calculations.

ii. Calculate and report volumes to an accuracy justified by the measurement method		Requires discussion on the quantified accuracy of volume related to measurement method and the reported volume (including justifying or explaining the rounding of reported result).

S 3.4 Know and apply occupational health and safety requirements
 	
Applicants will need to demonstrate that they:
i. Can describe the requirements of occupational health and safety legislation in Queensland that is pertinent to their work environment
See *Coal Mining Safety and Health Act 1999*
    Mining and Quarrying Safety and Health Act 1999
    Work Health and Safety Act 2011, Transport & Operation Act (Road Use Management) 1995 (as a way of explanation, it refers to the Manual for Uniform Traffic Control Devices which is required when placing any traffic sign on a public road)
		Requires at least one direct reference from WHS and MUTCD legislation relevant to your workplace.
		
		Demonstrate an understanding of MUTCD and traffic safety; particularly what road conditions and work methods (e.g. gaps in traffic) require different levels of control and signage.
		
		Consider for MUTCD new TMR online courses WIPTT 1 & 2
		https://www.tmr.qld.gov.au/business-industry/Business-with-us/Traffic-Management/Traffic-management-training
		
		Requires at least one direct reference from WHS and mining legislation relevant to your workplace.

ii. Use occupational health and safety procedures that comply with the relevant legislation
See *Coal Mining Safety and Health Act 1999*
    Mining and Quarrying Safety and Health Act 1999
    Work Health and Safety Act 2011, Transport & Operation Act (Road Use Management) 1995 (as a way of explanation, it refers to the Manual for Uniform Traffic Control Devices which is required
		Requires evidence of control procedure or risk assessment used by you in workplace.

UNIT 4: PROCESS FIELD MEASUREMENTS

Elements / Descriptors	Score	Assessors Comments
S 4.1 Can detect errors in existing data and field observations.		

Applicants will need to demonstrate that they are able to: i. Identify errors in data that is supplied by other parties		
ii. Use quality assurance processes to ensure that errors are detected and eliminated		Required to supply evidence e.g. an example of a prompt list or checklist (filled in).
S 4.2 Understands the accuracy of existing data and creates new data with appropriate accuracy. Applicants will need to demonstrate that they are able to: i. Determine the accuracy and reliability of data *Descriptor i requires an assessment of data that may be influenced by the knowledge of its age, what equipment was or may have been used, what was the purpose of collecting it, datums and control used etc.*		Requires an assessment of existing data based on age, equipment and purpose.
ii. Define the limitations of collected data *Descriptor ii requires an understanding of the limitations of equipment and methods used and accuracies required for the task at hand.*		
S 4.3 Can combine existing data with new survey data Applicants will need to demonstrate that they: i. Are able to deduce or estimate the accuracy limitations of existing data sets		
ii. Do not use data sources of insufficient accuracy in survey products		
S 4.4 Can produce plans that are accurate, legible and useful Applicants will need to demonstrate that they are able to: i. Use a computer aided drafting package to produce paper plans		
ii. Produce sketches that are fit for purpose *Descriptor (ii) requires evidence that the applicant produces plans for set out operations that accurately and unambiguously identify the marks placed and their relation to works to be constructed.*		Requires a set-out sketch that accurately and unambiguously identify the marks placed and their relation to works to be constructed.
S 4.5 Can produce electronic models and plans Applicants will need to demonstrate that they are able to: i. Use a computer aided drafting package to produce electronic plans		

Descriptor (i) requires evidence that the applicant produces plans where the plan information is accurately and unambiguously ordered to prevent misinterpretation by other parties.		
ii. Create digital models of physical surfaces		
iii. Attach attribute information to a digital model		
iv. Transfer files between various formats		

UNIT 5: COMMUNICATION

Elements / Descriptors	Score	Assessors Comments
S 5.1 Communicate effectively Applicants will need to demonstrate that they are able to: i. Communicate effectively, orally and in writing		Requires evidence e.g. e-mails confirming oral communications, notes from handovers.
ii. Issue clear, accurate instructions to subordinates		Requires evidence e.g. drafter instructions, e-mails confirming oral instructions or notes from handovers.
iii. Successfully use electronic communications technologies		Requires evidence e.g. e-mails.
S 5.2 Can speak effectively at meetings Applicants will need to demonstrate that they are able to: i. Explain surveying matters in comprehensible and unambiguous language at small meetings of allied professions		Requires evidence e.g. e-mails confirming meeting outcomes, minutes or agendas.
S 5.3 Prepare reports Applicants will need to demonstrate that they are able to: i. Prepare logical and coherent reports for the benefit of surveyors, other professions and clients		Requires brief written report demonstrating logical and coherent wording. Software output reports are insufficient.
S 5.4 Certify data Applicants will need to demonstrate that they are able to: i. Write certificates that are accurate and limited to areas of their professional competence *When called upon will be able to:*		Evidence required demonstrating that you can write certificates that are accurate and clearly express what is being certified.

Elements / Descriptors	Score	Assessors Comments
v. *Understand and explain the accuracy and reliability of data to be certified.* vi. *Understand and explain the responsibilities of data certification.* vii. *Apply effective validation procedures.* viii. *Effectively identify and manage risk associated with certification*		This can be an internal or external report, and can be signed by another person if that is the policy. Also include a brief discussion on the reliability of data, responsibilities of certification as well as identifying and managing risk. Consider an appropriately worded certificate consistent with the survey process or other non-standard format certification.
S 5.5 Provide advisory services Applicants will need to demonstrate that they are able to: i. Provide sound advice to clients and fellow professionals on surveying and land management matters at an appropriate level of detail.		Advice requires recommending a course of action based on the facts presented.

UNIT 6: SURVEY CONTROL

Elements / Descriptors	Score	Assessors Comments
S 6.1 Use geodetic reference systems Applicants will need to demonstrate that they are able to: i. Use appropriate geodetic datums and map projections		
ii. Perform geodetic calculations of traverses and intersections using geographic coordinates		At least one calculation using geographic coordinates will need to be referenced. Refer to your calculation software and explain how the software deals with these calculations. A brief explanation of the transformations used in the software will help.
iii. Perform geodetic calculations of traverses and intersections using UTM grid coordinates		At least one calculation using grid coordinates will need to be referenced. Refer to your calculation software and explain how

		the software deals with these calculations. A brief explanation of the transformations used in the software will help.
iv. Transform three dimensional coordinates between systems and between datums, with the aid of suitable software, to the required level of accuracy		
S 6.2 Integrate survey control Applicants will need to demonstrate that they are able to: i. Describe and comply with the regulation of surveying and mapping infrastructure in Queensland See *Survey and Mapping Infrastructure Act 2003*		Requires at least one direct reference from SMI related to your work.
ii. Find and recognise evidence of previous surveys *Descriptor (ii) refers to evidence of previous cadastral, engineering and mining surveys.*		
S 6.3 Establish, measure and adjust horizontal survey control Applicants will need to demonstrate that they are able to: i. Establish project control networks using GNSS and terrestrial measurements *Descriptor (i) requires a static / fast static GNSS network establishing multiple new stations separated by a substantial distance. If there is no significant terrestrial measurements involved in the first survey a second survey (of lesser complexity) using terrestrial methods is required. The second control survey can refer to control provided for Cadastral, Engineering or Mining Surveys and can be braced networks, closed loops, longitudinal or underground control. The applicant should demonstrate an understanding of the survey methods applied and their limitations*		Terrestrial survey with Bowditch adjustment suitable for terrestrial component. A typical fast static GNSS network may consist of 3 existing control stations and 3 new control stations more than 750m apart containing multiple closed loops adjusted by least squares with appropriate analysis and evaluation. Refer to SP1 guidelines for details - "Guideline for Control Surveys by GNSS – SP1"and "Guideline for the Adjustment and Evaluation of Survey Control – SP1".
ii. Evaluate and adjust measurements by appropriate adjustment methods *Descriptor (ii) refers to knowledge of the assumptions inherent in the adjustment methods available.*		Relate to Terrestrial Control Survey
iii. Use adequate redundant measurements to validate data		Relate to Terrestrial Control Survey

iv.	Mathematically adjust survey networks by the method of least squares using computer software packages	Adjustment of fast static network required.
v.	Analyse and critically evaluate the adjustment	Analysis of fast static network required
S 6.4 Establish, measure and adjust vertical survey control Applicants will need to demonstrate that they are able to: i. Perform precise level measurements *Descriptor (i) precise levelling can refer to any levelling operation where techniques that comply with the lowest level quality detailed in SP1 are used and the requisite quality demonstrated.*		Establish new control from existing datum control marks. Levelling to 12√k OK Explain how the tests and adjustment used met SP1 guidelines. Consider the example in SP1 (Section 5), particularly required specifications (e.g. 12√k) testing in individual bays and overall misclose and adjustments applied. Requires 2-way levelling with a minimum of 2 known AHD heights.
ii.	Identify the effects of curvature and refraction on levelling and apply this knowledge to trigonometrical levelling	Quantify curvature and refraction effects and relate to a total station levelling example. Identify curvature and refraction (e.g. how is this applied in your instrument – quantity and direction?), statement on how it effects levelling. Apply the minimum SP1 recommendations (12√k) to a total station levelling example, even if it is only between 2 points – note conducted in same manner as conventional levelling, 2-way levelling, multiple rounds FL/FR, maximum sight length etc. Comment on any equipment or observation criteria that were not met.

iii.	Identify the equipment and methods used in precise levelling and the sources of error and the techniques to minimise their effects		Requires some information on other methods, sources of errors and accuracy achievable (refer to tables in SP1 "Guideline-for-Control-Surveys-by-Differential-Levelling"