

ASSESSMENT GUIDE FOR ASSESSORS & FACILITATORS

Irrigation

Level 5

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Title:		Develop Suitable Irrigation Systems					
Applied Title:		Develop Suitable Irrigation Systems for Citrus Production					
Field:		Agriculture and Nature Conservation					
Sub-Field:		Primary Agriculture					
SETA (SGB):		AgriSETA					
Skills Area:		Irrigation					
Context:		Citrus Production					
US No:	116414	Level:	5	Credits:	10	Notional Hours:	100
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Based on the Production Guidelines of:



Supported by:



Unit standard alignment and assessment tool development:

Cabeton Training and Development

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Directions

Please Note: There is a separate assessment guide for the learner. The learner must use this guide to prepare himself / herself for the assessment.

This assessment guide contains all necessary activities and instructions that will enable the assessor and learner to gather evidence of the learner's competence as required by the unit standard. This guide was designed to be used by a trained and accredited assessor who is registered to assess this specific unit standard as per the requirements of the AgriSETA ETQA.

Prior to the delivery of the program the facilitator and assessor must familiarise themselves with content of this guide, as well as the content of the assessment guide for learners.

The assessor, facilitator and learner must plan the assessment process together, in order to offer the learner the maximum support, and the opportunity to reflect competence.

The policies and procedures that are applicable during the execution of this assessment are available on the website of the Citrus Academy, contained in a document named Policies and Procedures for Assessment, and must be strictly adhered to. The assessor must familiarise himself with this document before proceeding.

This guide provides step-by-step instructions for the assessment process of:

US No:	116414	Level:	5	Credits:	10
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The step-by-step instructions agree and are conducted in concert with the steps described in the learner assessment guide. The steps are as follows:

Step	Description	Timeframe
1	Learner assessment contract	Before delivery of program
2	Learner Declaration of Authenticity	Before delivery of program
3	Diagnostic Assessment of Learning Assumed to be in Place	Before delivery of program
4	Assessment Plan for Gathering of Evidence	Before delivery of program
5	Learner Formative Assessment Activities	During delivery of program, assessment after delivery of program
6	Summative Assessment	After delivery of program
7	Integrated Summative Assessment Tool	After delivery of program
8	Re-assessment Procedures	After completion of assessment
9	Documentation	After completion of assessment
10	Administration and Completion of Portfolio of Evidence	After completion of assessment

Step 1

Pre-Assessment Briefing and Checklist

A pre-assessment briefing for learners is held before the delivery of the program. Use the checklist below to ensure that all these points are addressed and discussed with the learners.

Pre-Assessment Briefing Checklist		
	√	X
Organise resources – people, equipment, venue, etc.		
Explain the purpose of the assessment		
Discuss the standards or criteria to be used		
Discuss assessment roles and accountabilities		
Decide on assessment venues		
Negotiate evidence required, and where or how this evidence may be gathered		
Explain the methods of assessment that will be used during the gathering and summing up of evidence		
Negotiate the date of submission for the activity workbook and the date for the summative assessment		
Discuss resources required for the assessment e.g. equipment, materials, etc.		
Explain the procedure if the learner is found to be not yet competent		
Explain the appeal and review procedures		
Identify any potential learning barriers and negotiate strategies to overcome these		
Complete and sign the assessment plan with the learner		

The learner and assessor must sign the **Learner Contract** in the learner assessment guide.

Step 2

Learner Declaration of Authenticity

The learner is requested to complete and sign the Declaration of Authenticity in the learner assessment guide. This should be checked and co-signed by the assessor.

The format is as reflected in the learner assessment guide.



Step 3

Diagnostic Assessment of Learning Assumed to be in Place

In the learner assessment guide, the learner is asked to indicate whether they have completed the learning assumed to be in place as prescribed by the unit standard.

The assessor must guide the learners through this step, explaining in detail the content of the mentioned learning areas, because names of learning programs do not always agree with the names of the unit standards, and learners might indicate the incorrect information.

If learners indicate that they have not yet completed the mentioned unit standards, the assessor should prescribe an action plan to allow the learner to obtain the skills required by recommending additional training, competence portfolios, or the relevant RPL assessment for the given unit standards.

The format is as reflected in the assessment guide for learners. Please read it and familiarise yourself with its content.



Step 4

Assessment Plan for Gathering of Evidence

A pro-forma assessment plan for this unit standard has been drafted in the learner assessment guide. Explain the plan to the learner and complete the dates and signatures as indicated.

The format for the assessment plan is as reflected in the assessment guide for learners. Please read it and familiarise yourself with its content. Make a note of the dates agreed upon in the table provided below.

Learner and Assessor Assessment Plan		
Unit Standard	Develop Suitable Irrigation Systems	
Registration Number	116414	
Step	Description	Completion / Submission Date
Step 5	Learner Formative Assessment Activities	
Step 6	Summative Assessment	
Step 7	Integrated Summative Assessment	
Step 8	Re-Assessment Procedures	
Step 9	Documentation	
Step 10	Administration and Completion of Portfolio of Evidence	

Step 5

Learner Formative Assessment Activities

The Learner Assessment Guide contains comprehensive activities and worksheets that the learner must complete during the delivery of the learning program. It is imperative that these activities be completed as part of the learning process in order to give the learner the opportunity to develop the skills, knowledge and attitudes that are required for competence.

Learners must complete all the activities in the workbook.

Learners must be encouraged to take control of their learning by indicating areas in the workbook where they experience difficulty.

Learners hand in the Learner Assessment Guide to the assessor or the facilitator, only if the facilitator is a subject matter expert, for the assessment of the formative assessment activities. The assessment of these activities must be done according to the prescribed benchmarks and according to the marking matrix that follows.

The learner must not move on to the next step before this step has been completed and learners show sufficient capacity and readiness for summative assessment. If problems areas are identified, the learner should be guided with a developmental action plan, which is documented separately and signed by the learner, the facilitator and the assessor.

Model answers are provided below. Where there is variation between learner circumstances, marking matrixes are provided to gather evidence against the activity.

Activity 1 – Research and Discover
Research the irrigation system used on the farm where you work and answer the questions below.
No model answers provided due to variation in irrigation systems. Please use the marking matrix below to gather evidence against this activity.
Describe the system.
Why was this system chosen?
How effective is the system in terms of the available water?
How effective is the system in terms of the soil type?
How effective is the irrigation system in terms of the climatic conditions?
How economic is the installation of such an irrigation system?
How economically does the irrigation system operate?
Is the system compatible with fertigation? Motivate your answer.
Is the system compatible with the water quality? Motivate your answer.
Describe how the irrigation system suits the rooting depth of the crop.
Describe how the irrigation volume is managed and varied with the aid of the irrigation system.
How will the irrigation system assist the plants during times of water stress?
If you had to install a new irrigation system, which system would you recommend and why would you recommend this system?

Criteria	Evidence Assessment				Commentary
	0 No evidence found	1 Evidence found but lacking / incorrect	2 Evidence found, but can improve	3 Evidence complete and accurate	
Irrigation system accurately described in terms of type and operation					
Reasons for choice of system identified					
System evaluated against water availability					
System evaluated against soil type					
System evaluated against climate					
Economy of installation of system evaluated					
Economy of running of system evaluated					
Compatibility for fertigation of system evaluated					
System compatibility with water quality evaluated					
System's suitability with crop root depth evaluated					
Irrigation volume management explained					
Method of system assisting plants during times of stress explained					
Own recommendation in terms of new irrigation system made					
Choice of new irrigation system motivated					
Total:	/42				

Activity 2 – Worksheet

Complete the worksheet below.

Give a brief description on the following:

Flood irrigation	In flood irrigation water is channeled to the crop by furrows in the ground. This means that the area that is irrigated must have a constant slope that is not too steep. In some instances basins that can be filled with water are made around the crop plants.
Mobile irrigation systems	Mobile, or moving, irrigation systems irrigate while the system is moving and includes systems such as centre pivots, linear systems and motored cannon sprays. The centre pivot consists of sections that are supported by wheels and rotates around a fixed point called a tower. The linear system is similar to the centre pivot in the sense that it is also steel sections supported on wheels. The linear system however moves in linear motion across a field. Motored cannon sprays are water cannons, or large sprinklers, mounted on trailers. A mechanism is provided, usually a water powered winch, which propels the trailer trough the field.
Static irrigation systems	Static systems are systems that stand still, or are static, while it irrigates. It includes systems such as permanent and non-permanent sprinkler systems and micro-jet and drip systems.
Name three possible water sources on a farm.	
• The enlisted water allocation from an irrigation scheme • Storage and holding dams • Free streams and fountains • Boreholes	
A farm is enlisted for 60ha and has an allocation of 9,500m ³ /ha/annum. Calculate the total annual allocation.	
Enlisted ha x Allocation per ha = 60ha x 9,500m³/annum = 570,000 m³/annum	
Name three factors that influence irrigation efficiency negatively.	
• Evaporation of the water as it is applied from the emitter to the ground. • Mist drift, when the wind carries mist that is formed during irrigation outside the root-zone area. • The wetted area is larger than the root-zone area, which is usually because of system design. • The wetted depth is greater than the root depth.	
Name and discuss three types of impurities found in irrigation water.	
• Physical (e.g. suspended solids, e.g. sand, plastic pieces) • Chemical (e.g. salts) • Biological (e.g. algae)	
Name four possible water treatments to improve water quality.	
• Filtration • Sedimentation • Oxidation • pH Adjustment • Chlorination • Acid Treatment	
Describe the following chemical water quality factors:	
EC	Refers to the ability of water to conduct electricity, and is an indication of the total dissolved salts in water.
pH	Is a measurement of the acidity or alkalinity of water.

Sodium absorption ratio	Is a measurement of the relation between sodium and calcium plus magnesium in the water. The higher this value, the more sodium is present, and the greater the hazard of degradation of the physical properties of the soil.
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TDS	Refers to the total amount of dissolved salts in the water. The higher the salt content of the water, the more energy plants need to expend to absorb the water.
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How are different types of irrigation systems affected by water quality?

<i>System</i>	<i>Sensitivity to Water Quality</i>
Flood	Not sensitive
Pivot	Not very sensitive, water may require screening, saline water can burn leaves
Cannon	Not sensitive, saline water can burn leaves
Sprinkler system	Not very sensitive, water may require screening, saline water can burn leaves
Micro-jet	Sensitive to blockage but to a lesser degree than drippers, requires filtration
Drippers	Sensitive to blockage, needs good physical water quality or good filtration

In citrus production, why is it important to be able to irrigate the trees at any given time?

Citrus yield and quality are extremely sensitive to water stress. Water availability is critical especially during flowering and fruit set, which is the time with the highest peak water demand for all citrus. Generally speaking, citrus requires regular irrigation at least two or three times a week, because citrus trees have shallow root systems with an average depth of only about 300mm. This limits the plant available water. The physiological processes of citrus trees, and therefore their production, are very quickly influenced by water stress. Water requirements change depending on the prevailing weather conditions and the growth stage of the tree.

Explain why sandy soils have a lower water holding capacity than clay soils.

Sandy soils have a low water holding capacity, because water does not adhere well to sand particles. When irrigating sandy soils, the soil fills quickly to field capacity and all free water immediately starts to drain away. Sandy soils also have a lower water content at field capacity and because of this the volume of available water is quickly depleted. Sandy soils must be irrigated with short stand-times at regular intervals. Clayey soils have a high water holding capacity because the water adheres well to the clay particles. This translates to a high water content at field capacity but also a higher water content at wilting point, and sometimes more plant available water. The higher plant available water means that stand-times can be longer and irrigation intervals spaced further apart.

Activity 3 – Workplace Report

Obtain a copy of an irrigation schedule for an irrigation block for 6 weeks from the farm where you are completing your practical duties. Explain how the irrigation schedule has been designed and why the irrigation volume changes.

No model answers provided due to variation in circumstances. Please use the marking matrix below to gather evidence against this activity.

Criteria	Evidence Assessment				Commentary
	0 No evidence found	1 Evidence found but lacking / incorrect	2 Evidence found, but can improve	3 Evidence complete and accurate	
Example of irrigation schedule from own workplace attached					
Irrigation schedule design explained					
Irrigation volume changes identified and explained					
Total:	/9				

Activity 4 – Calculation Worksheet

Assumptions:

System Application Rate: 6mm/h

Block Area: 5ha

Using the assumptions above, complete the calculations below. Show the formulas and every step in the calculation.

Calculate the flow rate per hour.

Flow rate per hour = Application rate per hour x Area
= 6mm/h x 5ha
= 0.006m/h x 50,000m²
= 300m³/h

Calculate the water usage for the block per week if the block is irrigated 5.5hours per week.

Application rate: 6mm/h
i.e. Total water usage: 60m³/ha/h
Flow rate: 300m³/h
Irrigation time: 5.5 h/week
Total water usage: 1,650m³/week

Activity 5 – Report

Draw up a water usage data table for an irrigation block on the farm where you are completing your practical duties according to the example.

Date	Pump Meter Reading (m ³)	Water Use at Pump (m ³)	Meter Reading Section 1 (m ³)	Water Use Section 1 (m ³)	Hours Irrigated Section 1			Meter Reading Section 2 (m ³)	Water Use Section 2 (m ³)	Hours Irrigated Section 2		
					1.1	1.2	1.3			2.1	2.2	2.3
03/05	3,500	160	1,500	100	2		2	2,000	60	2		
04/05	3,360	170	1,600	50		2		2,060	120		2	2
05/05	3,830	160	1,650	100	2		2	2,180	60	2		

06/05	3,990		1,750					2,240				

Assumptions:

- Meter readings are taken before start up.
- Blocks in section 1 use 25 m³/h and blocks in section 2 uses 30 m³/h.

No model answers provided due to variation in circumstances. Please use the marking matrix below to gather evidence against this activity.

Criteria	Evidence Assessment				Commentary
	0 No evidence found	1 Evidence found but lacking / incorrect	2 Evidence found, but can improve	3 Evidence complete and accurate	
Water usage data table for own workplace designed					
Verifiable that the table is an original design					
All fields in table filled out					
Sequential dates of data provided					

Activity 6 – Program Development

Draw up a water loss detection programme for the farm where you are completing your practical duties. Be very specific with your allocation of inspection points, assigning duties and allocating specific inspection times.

No model answers provided due to variation in circumstances. Please use the marking matrix below to gather evidence against this activity.

Criteria	Evidence Assessment				Commentary
	0 No evidence found	1 Evidence found but lacking / incorrect	2 Evidence found, but can improve	3 Evidence complete and accurate	
Water loss detection program designed for own workplace					
Verifiable that the detection program is an original design					
Inspection points indicated					

Inspection points relevant to detecting water loss					
Specific duties in terms of inspection indicated					
Specific inspection times provided					
Total:	/12				

Activity 7 – Interview an Expert

Interview the irrigation manager or farm manager on the farm where you are completing your practical duties and answer the questions below.

No model answers provided due to variation in circumstances. Please use the marking matrix below to gather evidence against this activity.

What are the common problems that are encountered with the irrigation system?					
How can these problems be prevented or illuminated?					
How are these problems dealt with when they occur?					
Criteria	Evidence Assessment				Commentary
	0 No evidence found	1 Evidence found but lacking / incorrect	2 Evidence found, but can improve	3 Evidence complete and accurate	
Contact details of interviewee verifiable					
Answers gathered as per own workplace:					
What are the common problems that are encountered with the irrigation system?					
How can these problems be prevented or illuminated?					
How are these problems dealt with when they occur?					
Total:	/18				

Activity 8 – Report

Collect the following data for the farm where you are completing your practical duties.

No model answers provided due to variation in circumstances. Please use the marking matrix below to gather evidence against this activity.

The water use of an irrigation block for a month.

The water quality data of the water delivered to the irrigation block.

The fertigation records for the irrigation block for the last year.

Explain the meaning of this data and what the decisions are that will be made based on this data.

Criteria	Evidence Assessment				Commentary
	0 No evidence found	1 Evidence found but lacking / incorrect	2 Evidence found, but can improve	3 Evidence complete and accurate	
Water use data for specific block provided					
Water quality data of the water delivered to the irrigation block provided					
Fertigation records for the irrigation block for the last year provided					
Each set of data analysed in terms of reasons for gathering data					
Each set of data analysed in terms of decisions that can be made from data evaluation					
Total:	/15				

Activity 9 – Report

Obtain or design a water use data sheet for an irrigation block on the farm where you are completing your practical duties. Discuss how effectively the water is being used with suggestions of how to improve the water usage of the irrigation system.

No model answers provided due to variation in circumstances. Please use the marking matrix below to gather evidence against this activity.

Criteria	Evidence Assessment				Commentary
	0 No evidence found	1 Evidence found but lacking / incorrect	2 Evidence found, but can improve	3 Evidence complete and accurate	
Water use data for specific block provided					
Efficiency of water use evaluated					
Suggestions made to					

improve water usage more effectively					
Total:	/9				

Activity 10 – Evaluation

Evaluate the efficiency and accuracy of the irrigation scheduling equipment found on the farm where you are completing your practical duties.

No model answers provided due to variation in circumstances. Please use the marking matrix below to gather evidence against this activity.

Equipment	Findings
Make suggestions for improvement where you find that the equipment is inefficient or inaccurate.	
Make suggestions of typical irrigation schedules for an irrigation block (a) when the rainy season is at its peak; (b) when the dry season is at its peak.	

Criteria	Evidence Assessment				Commentary
	0 No evidence found	1 Evidence found but lacking / incorrect	2 Evidence found, but can improve	3 Evidence complete and accurate	
List of equipment provided					
Irrigation system evaluated in terms of efficiency					
Irrigation system evaluated in terms of accuracy					
Suggestions for improvement made where it is found that the equipment is inefficient or inaccurate					
Suggestions made of typical irrigation schedules for an irrigation block (a) when the rainy season is at its peak;					
(b) when the dry season is at its peak.					
Total:	/18				

Activity 11 – Worksheet

Answer the questions below for the farm where you are completing your practical duties.

No model answers provided due to variation in circumstances. Please use the marking matrix below to gather evidence against this activity.

What is the peak water requirement of the crop on the farm and how is it determined?
How and why is the irrigation program adjusted to ensure optimal yield, size, colour and quality of the fruit?
How, why and when is the crop fertigated?
Describe the process of fertigation and differentiate between continuous injection and where injections are made from time to time.
What are prerequisites for an irrigation system to be suitable for fertigation?
Name three fertilisers suitable for fertigation.
Name and discuss two ways in which fertiliser can be injected or introduced to the irrigation water.
Shortly describe what maintenance must be carried out on a fertigation system.
Name three causes of blockages in drippers and micro-jets and the possible remedies.
Shortly describe the process of chlorination.
Shortly describe how you would do an acid treatment.
Name and discuss three aspects to keep in mind when maintenance programs are adapted for filters when water quality change.

Criteria	Evidence Assessment				Commentary
	0 No evidence found	1 Evidence found but lacking / incorrect	2 Evidence found, but can improve	3 Evidence complete and accurate	
Peak water requirement of the crop identified					
Method/s for determining peak water requirement identified					
Worksheet answers provided based on own workplace and own interpretation as follows:					
How and why is the irrigation program adjusted to ensure optimal yield, size, colour and quality of the fruit?					
How, why and when is the crop fertigated?					
Describe the process of fertigation and differentiate between continuous injection and where injections are made from time to time.					

What are prerequisites for an irrigation system to be suitable for fertigation?					
Name three fertilisers suitable for fertigation.					
Name and discuss two ways in which fertiliser can be injected or introduced to the irrigation water.					
Shortly describe what maintenance must be carried out on a fertigation system.					
Name three causes of blockages in drippers and micro-jets and the possible remedies.					
Shortly describe the process of chlorination.					
Shortly describe how you would do an acid treatment.					
Name and discuss three aspects to keep in mind when maintenance programs are adapted for filters when water quality change.					
Total:	/39				

Activity 12 – Research and Discover

How and when is the irrigation system on the farm where you are completing your practical duties sanitised?

No model answers provided due to variation in circumstances. Please use the marking matrix below to gather evidence against this activity.

Criteria	Evidence Assessment				Commentary
	0 No evidence found	1 Evidence found but lacking / incorrect	2 Evidence found, but can improve	3 Evidence complete and accurate	
Answers applicable to own workplace and irrigation system					
Method/s of irrigation system sanitation identified					

Time of irrigation system sanitation identified					
Total:	/9				

Activity 13 – Program Development

Design an annual maintenance program for the irrigation system on the farm where you are completing your practical duties.

No model answers provided due to variation in circumstances. Please use the marking matrix below to gather evidence against this activity.

Criteria	Evidence Assessment				Commentary
	0 No evidence found	1 Evidence found but lacking / incorrect	2 Evidence found, but can improve	3 Evidence complete and accurate	
Answers applicable to own workplace and irrigation system					
Annual maintenance program an original design					
Specific time allocations apparent					
Specific division of duties apparent					
Specific maintenance tasks apparent					
Total:	/15				

Activity 14 – Program Development

Design an emergency procedure to protect the irrigation system on the farm where you are completing your practical duties against floods.

No model answers provided due to variation in circumstances. Please use the marking matrix below to gather evidence against this activity.

Criteria	Evidence Assessment				Commentary
	0 No evidence found	1 Evidence found but lacking / incorrect	2 Evidence found, but can improve	3 Evidence complete and accurate	
Answers applicable to own workplace and irrigation system					

Emergency procedure specific to irrigation system in question					
Potential emergency situations identified					
Emergency procedures suggested for all identified situations					
Total:	/12				

Activity 15 – Worksheet

Complete the worksheet below.

How would you evaluate the operational efficiency of the following components:	
Pumps	The operational parameters for the pumps, motors, or pump-motor combinations can be obtained from the irrigation design plan. Pay special attention to aspects such as operating flow, operating pressure, operating amps and closed valve pressure. Deviations, such as lower flow pressure, lower or higher amps, or lower closed valve pressure, can indicate lower pump efficiency.
Filters	The efficiency of filters can be assessed by: • The number of back-flushes that are required, which may indicate worn filter material • A visual inspection of the filter material during which holes in sand or worn or broken rings and discs can be detected. • Assessing the load on the secondary filters, which if increasing may indicate a loss of efficiency of the primary filter. It is important to remember to keep to a maintenance schedule. Proper cleaning and inspection of filters keep filters performing as they should.
Valves	Valves are assessed by their ability to open, close and regulate pressure in the case of hydraulic valves. Valves should also be inspected for leaks.
Gauges	Gauges should be maintained properly. Gauges can be evaluated for accuracy by comparing pressure readings with a second gauge.
Water meters	Water meters should be inspected for proper working order, consisting of a visual inspection to see if the dials are rotating while the pump is running, as well as a check to compare flow rates derived from current meter readings with previous meter readings.
Emitters	Emitters are evaluated by performing a coefficient of uniformity test. A coefficient of uniformity (CU) test is performed to assess wear and tear. The CU test determines the delivery rate of a sample of emitters in a block. The deviation between the average and the lowest or highest delivery rate is expressed as a coefficient of uniformity. When measuring the delivery rate of the emitters, the design delivery must also be noted.
Describe how you would use a CU test to determine emitter replacement.	
When the CU test is complete, the results are compared with those of previous CU tests to see if the CU is deteriorating. When the CU is below the SABI (South African Irrigation Institute) norms of 90%, being a 10% deviation, the emitters on the specific block must be inspected. It is important to determine the cause of the poor CU, which may be leakages, blockages, or worn emitters. Blockages are detected by doing a visual inspection. Worn emitters are	

identified by evaluating the delivery rate against the design specifications. Worn emitters will deliver consistently more than the design specifications.

Drippers are more likely to be blocked than to wear out. The blocked drippers will affect the CU test adversely. When the CU test is below 90%, a decision must be taken on whether the drippers are going to be cleaned or replaced.

The cost of cleaning as opposed to replacing blocked drippers should be weighed against the results. The cleaning of drippers should first be discussed with your irrigation consultant and drip manufacturer to estimate the effectiveness of a cleaning operation. When the effectiveness of cleaning is low it is better to replace the drippers.

Describe how you would estimate the operational hours of use for a pump.

The number of operating hours can be read from the hour meter in the starting panel of it is equipped with one. If not, the number of operational hours can be estimated by multiplying the number of operating hours per day, which can be obtained from the irrigation schedule, with the number of operating days per month. Alternatively, one can multiply the number of operating hours per week with 4.33, which will also result in the number of operating hours per month. Daily and weekly operating hours, and the number of operating days per week, can be retrieved from the irrigation schedule. Remember that this information will change for various times during the year. The number of operating hours per annum can be calculated by multiplying the monthly hours by 12. The operating hours can be calculated per semester, quarterly, bimonthly or monthly. The period will depend on pump use during peak and off-peak seasons.

Describe how you would use the estimated operational hours to develop a maintenance schedule.

When the annual operating hours is known, a maintenance program can be implemented based on the hours.

- Motors and pumps must be greased every 200 hours or monthly, whichever is soonest.
- Replace the oil and perform an annual inspection every 2,500 hours or annually.
- Replace the bearings and inspect the impeller and wear rings, and replace if necessary every 5,000 to 10,000 hours or every 2 to 5 years. As a general rule, high speed pumps, being pumps that run at 2,900rpm, will be done every 5,000 hours, while low speed pumps, being pumps that run at 1,450 rpm and lower, will be done every 10,000 hours. The best is to confirm the service interval with the pump manufacturer.
- The impeller must be replaced at every 10,000 to 12,500 hours.

Activity 16 – Research and Discover

Research the questions below on the farm where you are completing your practical duties.

No model answers provided due to variation in circumstances. Please use the marking matrix below to gather evidence against this activity.

How do irrigation and the irrigation system affect water use and what plans can be put in place to prevent deterioration?

How do irrigation and the irrigation system affect water quality and what plans can be put in place to prevent deterioration?

What can cause and contribute to pollution of the water source on the farm?

How can these pollution sources be managed or eliminated?

What must happen in the case of a chemical spill which could contaminate the water source?

Criteria	Evidence Assessment				Commentary
	0 No evidence found	1 Evidence found but lacking / incorrect	2 Evidence found, but can improve	3 Evidence complete and accurate	
Answers applicable to own workplace and irrigation system					
Answers provided as per workplace and own understanding for the following:					
How do irrigation and the irrigation system affect water use?					
What plans can be put in place to prevent deterioration?					
How do irrigation and the irrigation system affect water quality?					
What plans can be put in place to prevent deterioration?					
What can cause and contribute to pollution of the water source on the farm?					
How can these pollution sources be managed or eliminated?					
What must happen in the case of a chemical spill which could contaminate the water source?					
Total:	/12				

Activity 17 – Design a Training Session

Design a training session for the staff that work with or around the irrigation system on the farm where you are completing your practical duties in which you explain:

- Personal safety around the irrigation system
- Environmental safety around the irrigation system

Draw a diagram below showing the components and progression of the training session. Attach the pamphlets or hand-outs that you will use for the training session to your portfolio of evidence.

No model answers provided due to variation in circumstances. Please use the marking matrix below to gather evidence against this activity.

Criteria	Evidence Assessment				Commentary
	0 No evidence found	1 Evidence found but lacking / incorrect	2 Evidence found, but can improve	3 Evidence complete and accurate	
Answers applicable to own workplace and irrigation system					
Answers reflected in a training session					
Training session appropriate for staff working with irrigation system					
Personal safety issues addressed					
Environmental safety issues addressed					
Total:	/15				

Activity 18 – Design a Multimedia Presentation

Design and present a multimedia presentation in which you present a strategy for the farm where you work in terms of ensuring that irrigation practices are environmentally sensitive. Attach a printout of the presentation to your portfolio of evidence.

No model answers provided due to variation in circumstances. Please use the marking matrix below to gather evidence against this activity.

Criteria	Evidence Assessment				Commentary
	0 No evidence found	1 Evidence found but lacking / incorrect	2 Evidence found, but can improve	3 Evidence complete and accurate	
Answers applicable to own workplace and irrigation system.					
Answer reflected through a multimedia presentation.					
Environmental issues identified.					
Strategies presented to overcome any dangers posed to the environment by the irrigation system or its operation.					
Total:	/12				

Marking Matrix and Assessor Report for Formative Assessment Activities
Formative Evidence Collection Summary for Unit Standard 116414 – Level 5

	<i>Action Required from Learner to Develop Competence</i>	<i>Competence Assessments</i>	<i>Standard for Activity</i>	<i>Allocation of Marks</i>	<i>Feedback to Learner and Comments on Evidence</i>
<i>Specific Outcome 1: Select an appropriate irrigation system</i> <i>Range:</i> Appropriateness includes but is not limited to all types of irrigation systems, crop type, soil properties, climatic characteristics, economic considerations, etc.	Attend classroom lesson, participate and ask questions	Activities in learner activity book were completed correctly	Activity answers must be at least 85% correct	As per model answer sheet	
<i>Specific Outcome 2: Manage an extended irrigation operation efficiently and cost-effectively</i> <i>Range:</i> Includes but is not limited to optimising on-farm water-use efficiency by the implementation and adaptation of irrigation scheduling programs, optimising pressure and flow rates throughout the system, minimising water losses in the system and ensuring optimum yield vs. water usage	Attend classroom lesson, participate and ask questions	Activities in learner activity book were completed correctly	Activity answers must be at least 85% correct	As per model answer sheet	
<i>Specific Outcome 3: Implement appropriate task related technology in the irrigated agricultural environment in variable water availability scenarios</i> <i>Range:</i> Includes but is not limited to soil moisture measuring devices, weather stations, water saving measures (i.e. drip/micro), control valves, etc.	Attend classroom lesson, participate and ask questions	Activities in learner activity book were completed correctly	Activity answers must be at least 85% correct	As per model answer sheet	

Marking Matrix and Assessor Report for Formative Assessment Activities
Formative Evidence Collection Summary for Unit Standard 116414 – Level 5

	<i>Action Required from Learner to Develop Competence</i>	<i>Competence Assessments</i>	<i>Standard for Activity</i>	<i>Allocation of Marks</i>	<i>Feedback to Learner and Comments on Evidence</i>
Specific Outcome 4: Manage appropriate seasonal (year) irrigation related work programs with reference to crop water requirement, crop value, area irrigated, water availability and water quality <i>Range:</i> Includes but is not limited to meeting peak/sensitive crop water requirements, adjusting irrigation related programs to ensure a specific yield quality requirement (i.e. fruit size, colour and taste), implementation of fertigation programs, sanitation of micro/drip lines, etc.	Attend classroom lesson, participate and ask questions	Activities in learner activity book were completed correctly	Activity answers must be at least 85% correct	As per model answer sheet	
Specific Outcome 5: Recommend a safety, servicing and replacement policy with reference to expenditure implications <i>Range:</i> Includes but is not limited to normal maintenance and replacement of all operational equipment and safety procedures during floods, etc.	Attend classroom lesson, participate and ask questions	Activities in learner activity book were completed correctly	Activity answers must be at least 85% correct	As per model answer sheet	

Marking Matrix and Assessor Report for Formative Assessment Activities
Formative Evidence Collection Summary for Unit Standard 116414 – Level 5

	<i>Action Required from Learner to Develop Competence</i>	<i>Competence Assessments</i>	<i>Standard for Activity</i>	<i>Allocation of Marks</i>	<i>Feedback to Learner and Comments on Evidence</i>
Specific Outcome 6: Ensure that all irrigation practices are environmentally sensitive specifically in terms of water extractions and return flows <i>Range:</i> Requires compliance with Eurepgap and related legislation and regulations. Includes but is not limited to monitoring and recording all water extractions and quality as well as, where relevant, return flows and quality. On large projects a full input and output of relevant water related data could be required	Attend classroom lesson, participate and ask questions	Activities in learner activity book were completed correctly	Activity answers must be at least 85% correct	As per model answer sheet	
US CCFO: Identifying	Attends all lessons, activities, practical and completes activities and workbook as per instructions	Attendance register and facilitator report	Learner must at least be present and no negative commentary about the learner should be made in the facilitator report.	N/a	
US CCFO: Working					
US CCFO: Organising					
US CCFO: Communicating					
US CCFO: Science					
US CCFO: Demonstrating					
US CCFO: Contributing					
US CCFO: Identifying					

Assessment Feedback Form – Activity Workbook			
		Comments / Remarks	
Feedback to learner on assessment			
Feedback from learner to assessor			
Learner's Signature		Date:	
Assessor's Signature		Date:	



Step 6

Summative Assessment

Before the summative task is undertaken, the learner must be reminded of what is expected from him / her in terms of summative and reflexive competence. Read and explain to the learner this section in the learner assessment guide. The learner and assessor must sign off this section to acknowledge that this step was completed.

Critically evaluate the irrigation system found on the farm where you are completing your practical duties and suggest methods to improve the efficacy of the system and methods to ensure that the system will not damage the environment.

- The learner has to evaluate the irrigation system with which they are working practically.
- Adapt the gathering of evidence to the specific irrigation system of the learner each time.
- Please use the marking matrix provided to gather evidence against the evaluation and make detailed commentary in the space provided.

Criteria	Evidence Assessment				Commentary
	0 No evidence found	1 Evidence found but lacking / incorrect	2 Evidence found, but can improve	3 Evidence complete and accurate	
What is the type of irrigation system?					
Why was this irrigation system installed?					
How does the irrigation system handle different soil types?					
How does the irrigation system handle different climatic conditions?					
How does the irrigation system handle different effective root depths?					
How does the irrigation system handle different water quality?					
Can the system adjust delivery volume?					
Is the system easy to maintain?					
What are the advantages of the system?					

Criteria	Evidence Assessment				Commentary
	0 No evidence found	1 Evidence found but lacking / incorrect	2 Evidence found, but can improve	3 Evidence complete and accurate	
What are the disadvantages of the system?					
How can the system and / or the system efficiency be improved?					
How does the system avoid / control pollution of the environment?					
How is information about system efficiency and water delivery gathered?					
What are the safety precautions surrounding the irrigation system?					
What safety gear has to be worn when working with the irrigation system?					
What are the emergency evacuation procedures of the system's components should floods occur?					

Step 7

Integrated Summative Assessment Tool

One assessment tool is provided in this step, being:

1. Attitudes and Attributes Assessment Tool

This assessment tool has been drafted in its entirety and follows below. It must be copied and completed for every learner in the same manner and according to the same procedure.

Learners must not be given these tools in preparation for summative assessment. This corresponding step in the Learner Assessment Guide is a direct reflection of these tools and is drafted in a format that is appropriate to the learner's level of language competence.

1. Attitudes and Attributes Assessment Tool

- Use this rating scale to judge the learner's CCFO competence according to the unit standard.
- The learner's entire performance and all the stages of learning, as well as all gathered evidence must be considered for this section.
- It is advised that the assessor consult with facilitators, mentors, coaches and supervisors in order to ensure that an objective rating is allocated.
- A rating between 1 and 5 should be given, as follows:

Rating	Description
1	No evidence can be found
2	The evidence found is weak and this is still a major development area for the learner
3	The evidence found meets the average expectation for a learner on this level
4	The evidence found is of a high quality and exceeds the average standard expected
5	The evidence found is outstanding and the learner attitudes and traits are very well developed

- Learner must be given constructive feedback on each rating.
- Ensure that you apply the exact same methodology for each learner in order to ensure that VACS principles are adhered to.
- The benchmark for learner competence in this tool is 3:5 in EVERY CCFO.

At the end of this step, an assessment feedback form is provided which must be completed and signed by the assessor, learner and moderator, where applicable.

Attitudes and Attributes Assessment Tool

Use the following rating table in this assessment:

Rating	Description
1	No evidence can be found
2	The evidence found is weak and this is still a major development area for the learner
3	The evidence found meets the average expectation for a learner on this level
4	The evidence found is of a high quality and exceeds the average standard expected
5	The evidence found is outstanding and the learner attitudes and traits are very well developed

CCFO Criteria	Rating
Identifying – The learner can identify problems and deficiencies correctly.	
Working in a Team – The learner is able to work well as member of a team.	
Organising – The learner works in an organised and systematic way whilst performing all tasks and tests.	
Communicating – The learner is able to communicate his or her knowledge orally and in writing, in a way that shows what knowledge he or she has gained.	
Demonstrating – The learner is able to show and perform the tasks required correctly.	
Contributing – The learner is able to link the knowledge, skills and attitudes that he or she has acquired in this module of learning to specific duties in their job or in the community where he or she lives.	
Science – Learner is able to utilise and use science and technology effectively	
Collecting – Learner can effectively gather information	



Assessment Feedback Form			
		Comments / Remarks	
Feedback to learner on assessment and / or overall recommendations and action plan for competence			
Feedback from learner to assessor			
Assessment Judgement	You have been found: ☐ Competent ☐ Not yet competent in this unit standard		Actions to follow: ☐ Assessor report to ETQA ☐ Learner results and attendance certification issued
Learner's Signature		Date:	
Assessor's Signature		Date:	
Moderator's Signature		Date:	

Step 8

Re-Assessment Procedures

- Note that only outcomes on which the learner was found not yet competent must be re-assessed.
- The same procedures in steps 6 and 7 are repeated.
- The tool must be adapted at discretion of the assessor. Best practice is not to present the exact same format and questions if possible.
- Use your expertise and judgement to ensure that the method of re-assessment remains integrated and relevant to the expected outcomes.



Step 9

Documentation

The following documentation is addressed in this step:

1. Learner and assessor information reports;
2. Assessor report and summative evidence collection summary;
3. Learner assessment re-actionnaire;
4. Assessor's assessment review and improvement document;
5. Assessment appeal form

1. Learner and Assessor Information Forms

The learner information form is in the assessment guide for learners. The assessor information form follows. These forms must be completed for each individual learner and placed in the learner's portfolio of evidence.

2. Assessor Report and Summative Evidence Collection Summary

This report follows after the information report. Use it to summarise the findings during assessment. Please complete the copy of this report that is in the learner assessment guide.

3. Learner Assessment Re-Actionnaire

A pro-forma for the learner assessment re-actionnaire is included in the learner assessment guide. Ask the learner to complete this form and sign it.

4. Assessor's Assessment Review and Improvement Document

The assessor is expected to complete the assessor review of the assessment process, using the pro-forma document of which an example follows. Please complete the copy of the document in the learner assessment guide. This document must be discussed with the learner and any learner commentary should be recorded.

5. Assessment Appeal Form

The assessment appeal form is also provided in the learner assessment guide. Assist the learner to complete the document if necessary.

The learner must be requested to sign-off all reports and documents before they are placed in the portfolio of evidence.

Assessor Information Form			
Unit Standard	116414		
Program Date(s)			
Surname			
First Name			
Company Name			
Job / Role Title			
Home Language			
Gender	Male	Female	
Race	African	Coloured	Indian/Asian White
Employment	Permanent	Non-permanent	
Disabled	Yes	No	
Date of Birth			
ID Number			
Contact Telephone Numbers			
Email Address			
Postal Address			

Assessor Report and Summative Evidence Collection Summary for Unit Standard 116414 – Level 5

<i>Description</i>	<i>Evidence Gathered</i>		<i>Benchmark</i>	<i>Competent / Not yet Competent</i>	<i>Feedback and Comments</i>
	Foundational and Embedded Knowledge	Practical Skills, Underpinning Knowledge and Reflexive Competence			
Specific Outcome 1: Select an appropriate irrigation system <i>Range:</i> Appropriateness includes but is not limited to all types of irrigation systems, crop type, soil properties, climatic characteristics, economic considerations, etc.	Attend all lectures Complete workbook as per instruction Summative logbook Summative interview	Attend all lectures Complete workbook as per instruction Summative logbook Summative interview	85% competence in all areas		
Specific Outcome 2: Manage an extended irrigation operation efficiently and cost-effectively <i>Range:</i> Includes but is not limited to optimising on-farm water-use efficiency by the implementation and adaptation of irrigation scheduling programs, optimising pressure and flow rates throughout the system, minimising water losses in the system and ensuring optimum yield vs. water usage	Attend all lectures Complete workbook as per instruction Summative logbook Summative interview	Attend all lectures Complete workbook as per instruction Summative logbook Summative interview	85% competence in all areas		
Specific Outcome 3: Implement appropriate task related technology in the irrigated agricultural environment in variable water availability scenarios <i>Range:</i> Includes but is not limited to soil moisture measuring devices, weather stations, water saving measures (i.e. drip/micro), control valves, etc.	Attend all lectures Complete workbook as per instruction Summative logbook Summative interview	Attend all lectures Complete workbook as per instruction Summative logbook Summative interview	85% competence in all areas		

Assessor Report and Summative Evidence Collection Summary for Unit Standard 116414 – Level 5

<i>Description</i>	<i>Evidence Gathered</i>		<i>Benchmark</i>	<i>Competent / Not yet Competent</i>	<i>Feedback and Comments</i>
	Foundational and Embedded Knowledge	Practical Skills, Underpinning Knowledge and Reflexive Competence			
<i>Specific Outcome 4: Manage appropriate seasonal (year) irrigation related work programs with reference to crop water requirement, crop value, area irrigated, water availability and water quality</i> <i>Range:</i> Includes but is not limited to meeting peak/sensitive crop water requirements, adjusting irrigation related programs to ensure a specific yield quality requirement (i.e. fruit size, colour and taste), implementation of fertigation programs, sanitation of micro/drip lines, etc.	Attend all lectures Complete workbook as per instruction Summative logbook Summative interview	Attend all lectures Complete workbook as per instruction Summative logbook Summative interview	85% competence in all areas		
<i>Specific Outcome 5: Recommend a safety, servicing and replacement policy with reference to expenditure implications</i> <i>Range:</i> Includes but is not limited to normal maintenance and replacement of all operational equipment and safety procedures during floods, etc.	Attend all lectures Complete workbook as per instruction Summative logbook Summative interview	Attend all lectures Complete workbook as per instruction Summative logbook Summative interview			

Assessor Report and Summative Evidence Collection Summary for Unit Standard 116414 – Level 5

<i>Description</i>	<i>Evidence Gathered</i>		<i>Benchmark</i>	<i>Competent / Not yet Competent</i>	<i>Feedback and Comments</i>
	Foundational and Embedded Knowledge	Practical Skills, Underpinning Knowledge and Reflexive Competence			
Specific Outcome 6: Ensure that all irrigation practices are environmentally sensitive specifically in terms of water extractions and return flows <i>Range:</i> Requires compliance with Eurepgap and related legislation and regulations. Includes but is not limited to monitoring and recording all water extractions and quality as well as, where relevant, return flows and quality. On large projects a full input and output of relevant water related data could be required	Attend all lectures Complete workbook as per instruction Summative logbook Summative interview	Attend all lectures Complete workbook as per instruction Summative logbook Summative interview			
Embedded Knowledge: The learner is able to demonstrate a basic knowledge of: 1. Soils, plant physiology, climatic conditions. 2. Different irrigation systems. 3. Influence of irrigation on quality of crop. 4. Environmental issues. 5. Mechanics of pumps and motors. 6. Recordkeeping. 7. Forward planning.	Attend all lectures Complete workbook as per instruction Practical questionnaire Summative test	Attend all lectures Complete workbook as per instruction Practical questionnaire Summative test	Overall minimum test score of 85%		

Assessor Report and Summative Evidence Collection Summary for Unit Standard 116414 – Level 5

<i>Description</i>	<i>Evidence Gathered</i>		<i>Benchmark</i>	<i>Competent / Not yet Competent</i>	<i>Feedback and Comments</i>
	Foundational and Embedded Knowledge	Practical Skills, Underpinning Knowledge and Reflexive Competence			
Unit Standard CCFOs: 1. Problem solving relates to all specific outcomes 2. Teamwork relates to all specific outcomes 3. Self-management relates to all specific outcomes 4. Interpreting information relates to all specific outcomes 5. Communication relates to all specific outcomes 6. Use science and technology relates to all specific outcomes 7. The world as a set of inter-relatedness systems relates to all specific outcomes 8. Self development relates to all specific outcomes	N/a	Rating Scale	Minimum rating of 3:5 in each criteria or overall average of 3:5		

Assessor's Assessment Review and Improvement Document	
Issues	Comments
Did the assessment go according to plan?	
Did anything unexpected happen?	
Were you pleased with the assessment decision; i.e. was it what you expected?	
How could the process have been carried out more efficiently?	
How could the process of assessing the knowledge be improved?	
How could the Performance Observation checklist be improved?	
Was the evidence you gathered sufficient to make a judgment of competence?	
Was the way you obtained feedback from the learner effective?	
Were you pleased with the way you communicated your decision to the learner? If not, how could this have been improved?	
How would you improve the assessment process?	

Any learner has the right of appeal against any not-yet-competent decision by the assessor. If the learner wishes to appeal, please assist him / her to complete the form below.

Appeal Form			
I hereby appeal against the outcome of my assessment.			
Date:			
Learner's Name:			
Assessors Name:			
Organisation:			
Assessment Details: Criteria, role, standards Used, etc.			
Issue to be Reviewed:			
Learner's Signature		Date:	
Assessor's Signature		Date:	

Step 10

Administration and Completion of Portfolio of Evidence

All the documents or copies thereof, as prescribed previously, must be kept on file as part of the learner portfolio of evidence.

Learner's portfolio of evidence must be readily available for internal and external moderation and verification by the appropriate practitioners, until after the verification process has taken place. The portfolio of evidence may then be kept or returned to the learner according to the service provider's policy.

The prescribed learner results form should be submitted to the ETQA or the National Learner Database as per the SETA procedure.

