**Appendix A**

***Meteorological Measurement Methods Validation Criteria***

The Meteorological Measurement Methods Validation Criteria table is to be used for the following purposes:

* To provide a "look-up" table of all the significant quality control criteria important for the proper implementation of the Meteorological Measurement methods, and
* As a tool for validating Meteorological Measurement data.

In order to accomplish both objectives the quality control criteria are organized into the following three classes/tables:

***I. CRITICAL CRITERIA TABLE***

Criteria deemed critical to maintaining the integrity of a sample or group of samples reside in the **Critical Criteria Table**. Observations that do not meet each and every criterion on the Critical Table should be invalidated unless there are compelling reasons and justifications for not doing so. Basically, the samples for which one or more of these criteria are not met are invalid unless proven otherwise. The cause for not operating in the acceptable range for each violated criteria must be investigated and minimized to reduce the likelihood that additional samples will be invalidated.

***II. OPERATIONAL EVALUATIONS TABLE***

Criteria important for maintaining and evaluating the quality of the data collection system reside in the **Operational Evaluations Table**. Violation of a criterion or a number of criteria may be cause for invalidation. The decision should consider other quality control information that may or may not indicate the data are acceptable for the parameter being controlled. Therefore, the sample or group of samples for which one or more of these criteria are not met is suspect unless other quality control information demonstrates otherwise. The reason for not meeting the criteria **MUST** be investigated, mitigated and/or justified.

***III. SYSTEMATIC ISSUES TABLE***

Criteria important for the correct interpretation of the data but do not usually impact the validity of a sample or group of samples reside in the **Systematic Issues Table**. For example, the data quality objectives are included in this table; if they are not met, this does not invalidate any of the samples but it may impact the quality of the data and its subsequent use in air quality modeling runs.

***I.*** ***METEOROLOGICAL MEASUREMENT METHODS CRITICAL CRITERIA***

**S- single instrument hourly value, G group of hourly values from 1 instrument**

| **Parameter** | **Criteria** | **Acceptable Range** | **Frequency** | **Samples Impacted** | **EPA -454/R-99-005 Feb 2000** | **EPA Regulation & Guidance** | **ADEC AM&QA QAPP** |
| --- | --- | --- | --- | --- | --- | --- | --- |

**Measurement Method Characteristics**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Reporting Units** | **Range** | **Accuracy** | **Resolution** | **Starting Speed** | **Distance Constant** | **Recording Frequency** | **Raw Data Collection Frequency** |  |  |  |  |
| Wind Speed (WS) | Cup, blade, or heated/unheated sonic anemometer | m/s | 0.5 m/s – 50 m/s | ± 0.2 m/s | 0.25 m/s | ≤ 0.5 m/s | ≤ 5 m @ 1.2 kg/m3 | hourly | 1/second with 15 minute average stored | All Data | Chapter 2 Sec 1 & 8, Chapter 5 Sec 1 & 2 Chapter 8 Sec 1 | QA Handbook Vol IV Section 0  Tables 0-3, 0-4, 0-5, 0-6  and  EPA Met Monitoring Guidance for Regulatory Modeling Applications Section 8 | Section 7 Table A8 |
| Vertical WS (VWS) | -25 m/s – +25 m/s | ± 0.2 m/s | 0.1 m/s | ≤ 0.25 m/s | ≤ 5 m @ 1.2 kg/m3 | hourly | All Data |  |
|  |  | **Reporting Units** | **Range** | **Accuracy** Total | **Resolution** | **Starting Speed** | **Damping Ratio** | **Recording Frequency** | **Raw Data Collection Frequency** |  |  | **Delay Distance** |
| WD (azimuth & elevation | Vane or heated/unheated sonic sonic anemometer | Degrees (°) | 1° – 360° or 540° | ± 5 degrees | 1.0 degree | ≤ 0.5 m/s @ 10 degrees | 0.4 to 0.7 @ 1.2 kg/m3 | hourly | 1/sec with 15 minute average stored | All Data |  | ≤ 5 m @ 1.2 kg/m3 |
|  |  | **Reporting Units** | **Range** | **Accuracy** | **Resolution** | **Time Constant** | **Spectral Response** | **Recording Frequency** | **Raw Data Collection Frequency** |  |  |  |
| Ambient Temp | Thermistor  10m – 2m | Degrees Celsius (°C) | -40°C to +40°C  **Note:** State of Alaska criteria | ± 0.5°C | 0.1°C | ≤ 1 minute |  | hourly | 1 minute | All Data | Chapter 2 Sec 3 & 8,  Chapter 3 Sec 6 Chapter 5 Sec 1 & 2 Chapter 8 Sec 1 | Section 7 Table A8 |
| Vertical Temp Difference (ΔT) | ± 0.1°C | 0.02°C | ≤ 1 minute |  | hourly | 1 minute | All Data |
| Dew Point Temperature | Psychrometer/Hygrometer % | °C | ± 1.5°C | 0.1°C | ≤ 30 minutes |  | hourly | 1 minute | All Data | Chapter 2 Sec 4 & 8, Chapter 5 Sec 1 & 2 |
| Relative Humidity/ | % | 0 – 100% | ± 7% | 0.5 % | ≤ 30 minutes |  | hourly | 1 minute | All Data |
| Barometric Pressure (BP) | Aneroid Barometer | mbHg | 950 mb to 1050 mb Hg | ± 3 mb Hg  (0.3 kPa) | 0.5 mb Hg |  |  | hourly | 1 minute | All Data | Chapter 2 Sec 6 & 8, Chapter 5 Sec 1 & 2 |
| Solar Radiation | 1st or 2nd class Pyranometer | Watts/m2 | 0 – 1300 W/m2 | ± 5% of observed | 10 W/m2 | 5 seconds | 285 nm to 2800 nm | hourly | 1 minute | All Data | Chapter 2 Sec 7 & 8, Chapter 5 Sec 1 & 2 |
| Precipitation | Tipping Bucket (with Alter type windscreen & heater) | mm H20 | 0 – 50 mmH20/hr | ± 10% of observed or ± 0.5 | 0.3 mm H20 |  |  | hourly | 1 minute | All Data | Chapter 2 Sec 5 & 8, Chapter 5 Sec 1 & 2 |
|  |  | **Reporting Units** | **Range** | **Accuracy** | **Resolution** | **Signal conditioner time constant** |  | **Recording Frequency** | **Raw Data Collection Frequency** |  |  |  |  |
| Vector Data  WS | DAS Calculation | m/s | 0 – 50.0 m/s | ± 0.2 m/s | 0.1 m/s |  |  | hourly | 1/second with 15 minute average stored | All Data | Chapter 4 Section 6 Chapter 8 | QA Handbook Vol IV Section  Tables 0-3, 0-4, 0-5, 0-6 |  |
| Vector Data  WD | DAS Calculation | Degrees (°) | 0 - 360° | ± 5° | 1.0° |  |  | hourly | All Data | Chapter 4 Section 6 Chapter 8 |  |
| sigma theta (σθ) | DAS Calculation SD of azimuth angle of WD | Degrees (°) | 0 - 105° | ± 5° | 1.0° | <0.2 seconds |  | hourly | 15 minute | All Data | Chapter 4 Section 6 Chapter 8 | Section 7 Table A8 |
| sigma phi (σw) | DAS Calculation SD of vertical component of WS | m/s | 0 – 10 m/s | ± 0.2 m/s | 0.1 m/s |  |  | hourly | 1 minute | All Data | Chapter 4 Section 6 Chapter 8 | Section 7 Table A8 |
|  |  | **Radiation Range** | **Flow Rate** | **Radiation Error** | **Type** | **Estimates of Means** | | **Estimates of Variance** | |  |  |  |  |
| Motor aspirated temp radiation shield (T, Δ,T RH/Dew Point ) | | -100 to 1300 W/m2 | ≥ 3 m/s | < 0.2°C |  |  | |  | |  | Chap 2 Sec 3 & 4 Chapter 8 Sec 1 |  |  |
| Data Acquisition System (DAS) |  |  |  |  | Microprocessor- based digital | 1/min for hourly mean  (60 samples/hour) | | 6 samples/minute for hourly variance  (360 samples/hour) | |  | Chapter 4 Section 6 Chapter 8 |  |  |

**Reporting Intervals**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| All parameters | Hourly average |  | Quarterly | All | Chapter 5  Section 1 |  | Section 7 |
|  |  |  |  |  |  |  |  |

**Data Completeness**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| All parameters | Valid data capture | ≥75 % | Hourly | G | Chapter 5  Sections 3 & 4 | QA Handbook Vol IV Section 0  Tables 0-3, 0-4, 0-5, 0-6 | Section 7  18 AAC 50.010 |
| (PSD Quality Monitoring)  Valid data capture | ≥ 90% hourly data, joint collection of WS, WD , and stability (SRDT, σθ, or σw depending upon model selection) | Quarterly  (4 consecutive quarters) | G |
|  |  |  |  |  |  |  |  |

**Calibration**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| WS, VWS (cup or aerovane) | Multi-point Calibration | 5 points including zero, 2 m/s and 3 additional evenly spaced upscale points covering expected wind speeds for the site  All test points **≤** ± (0.2 m/s + 5% of observed)  WS bearing torque threshold≤ PSD quality sensor’s manufacturer’s specs | Initially,  1/6 months thereafter | G | Chapter 5 | QA Handbook Vol IV , All Sections and 0  Tables 0-3, 0-4, 0-5, 0-6 | Section 7 MQO Table A8 |
| WS/WD, VWS/VWD (Sonic Anemometer) | Multi-point Calibration | Multipoint calibration via wind tunnel by manufacturer | Initially,  1/year thereafter |  |  |
| WD, VWD (blade or aerovane) | Multi-point Calibration | Alignment to True North + linearity test points at:  0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°, 360°  Alignment ≤ ± 5°  Linearity (All Points) ≤ ± 3° (included in ≤ ± 5° above)  WD bearing torque threshold≤ PSD quality sensor’s manufacturer’s specs | Initially,  1/6 months thereafter | G | Chapter 5  Chapter 8 |
| Temp | Multi-point Calibration | Minimum 3 point calibration representative of min avg low to max avg high temps for the location. (e.g., -30°C, 0°C, +30°C)  **Note:** State of Alaska criteria  Each point **≤** ±0.5°C of NIST Traceable Standard | Initially,  1/6 months thereafter | G | Chapter 5  Chapter 8 | MQO Table, Table A8  Section 16 |
| ΔT | Multi-point Calibration | Side-by-side calibration of 10m and 2m temp probes with a  Minimum 3 point calibration representative of min avg low to max avg high temps for the location. (e.g., -30°C, 0°C, +30°C)  **Note:** State of Alaska criteria  Each point ≤ ±0.5°C of NIST Traceable Standard  and  10m sensor ≤ ±0.1°C of 2 m sensor at all points | Initially,  1/6 months thereafter | G | Chapter 5  Chapter 8 | MQO Table, Table A8  Section 16 |
| RH/Dew point | Multi-point Calibration | Factory multi-point calibration followed by on-site 1-point verification of RH/DP sensor against NIST Traceable RH Standard ( RH Std ≤±2% RH accuracy)  RH sensor ≤ ± 7% of RH Standard | Initially,  1/6 months thereafter | G | Chapter 5  Chapter 8 | MQO Table, Table A8  Section 16 |
| Solar Radiation (SR) | Multi-point Calibration | Factory multi-point calibration followed by on-site zero check with opaque cover and 1-point verification against in-cert. First or second Class collocated Pyranometer  SR sensor ≤ ± 5% of Pyranometer | Initially,  1/6 months thereafter | G | Chapter 5  Chapter 8 | MQO Table, Table A8  Section 16 |
| Barometric Pressure (BP) | Multi-point Calibration | Factory multi-point calibration followed by on-site 1-point verification against pressure standard of known quality (see pressure std. min requirements)  BP sensor ≤ ± 3 mb (0.3 kPa) | Initially,  1/6 months thereafter | G | Chapter 5  Chapter 8 | MQO Table, Table A8  Section 16 |
| Precipitation | Multi-point Calibration | Minimum 3 point calibration  Each point ≤ ± 10% of measured H20 input, or  ≤ ± 5 mm H20 | Initially,  1/6 months thereafter | G | Chapter 5  Chapter 8 | QA Handbook Vol IV Sec 4 and Sec 0  Tables 0-3, 0-4, 0-5, 0-6 | MQO Table, Table A8  Section 16 |
| Vector Data/DAS (WS, WD, σθ, σw) | Multi-point Calibration | Calibrate/check DAS voltage input against sensor inputs  WS , σw ≤± 0.2 m/s  WD, σθ ≤± 5° | Initially,  1/6 months thereafter | G | Chapter 5  Chapter 8 | QA Handbook Vol IV Sec 9 and Sec 0  Tables 0-3, 0-4, 0-5, 0-6 |  |
|  |  |  |  |  |  |  |  |

| ***II.– METEOROLOGICAL MEASUREMENT METHODS OPERATIONAL EVALUATIONS***  **S- single instrument hourly value, G group of hourly values from 1 instrument** |
| --- |

**Siting & Exposure Criteria**

| **Parameter** | **Criteria** | **Acceptance Range** | **Frequency** | **Samples Impacted** | **EPA -454/R-99-005**  **Feb 2000** | **EPA Regulation & Guidance** | **ADEC AM&QA QAPP** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| All met parameters | Representativeness | Site must be representative for the intent of the monitoring scale , No prescribed quantitative criteria See references | All | All | Chapter 3 Sec 1 | QA Handbook Vol IV , Section 10-6 specific to equipment under Installation |  |
| All met parameters | Probe Siting | *See references for specific siting criteria for simple, complex, coastal and urban terrain locations* | All | All | Chapter 3 Sec 2 & 3 |  |
| **Calibration/Audit Standards** | | | | | | | |
| WS/ VWS | WS standard  Sonic Anemometers calibrated @ factory | NIST Traceable Synchronous motor, or  Series of NIST Traceable constant speed motors to generate WS in range of 2 m/s thru 50 m/s | Purchase,  recalibrate 1/year or at frequency dependent upon use | G |  | QA Handbook Vol IV Section 0  Tables 0-3, 0-4, 0-5, 0-6  Section 2 | Sections 16 |
| WS/WD | Collocated Transfer Standard (CTS) for sonic anemometer audits | CTS must be cup/vane or aerovane anemometer that is calibrated on-site with standards/personnel independent from routine operator/calibration staff and equipment/standards. CTS must meet all PSD quality criteria | Purchase,  Calibrate CTS on site prior to conducting each site audit, and  CTS collocated for 72 hr minimum | G |  |
| WD/VWD | WD Standard | Alignment to True North   * Solar Noon method, and or * Transit & Compass, map, and site magnetic declination, or * GPS accuracy ≤3 meters with lock on minimum 3 satellite signals   Linearity  Linearity wheel with evenly spaced preset markings, e.g., 0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°, 360° | Purchase,  recalibrate 1/year or at frequency dependent upon use | G |  |
| Temperature | Thermister | * measurement range -40°C to + 40°C * Accuracy ≤±0.2°C NIST traceable certified over -30°C to +30°C (**Note:** State of Alaska criteria) * Resolution ≤±0.1°C | Purchase,  recertify 1/year or per NIST/ASTM certification frequency | G |  | QA Handbook Vol IV Section 3, and  Section 0  Tables 0-3, 0-4, 0-5, 0-6 |
| RH/Dew Point | RH meter or  Psychrometer | RH meter  NIST Traceable Standard ± 2% RH  Psychrometer  with matched pair NIST Traceable/ASTM Thermometers with measurement Resolution 0.1° C each and appropriate temp range  **Note:** State of Alaska criteria  **No Sling Psychrometers Acceptable** | Purchase,  recertify 1/year or per NIST traceable certification frequency | G |  | QA Handbook Vol IV , Section 5 and  Section 0  Tables 0-3, 0-4, 0-5, 0-6 |
| Solar Radiation | NIST Traceable Pyranometer | 1st or 2nd Class Pyranometer  Measurement range  Measurement resolution  Measurement accuracy | Purchase,  recertify 1/year or per NIST traceable certification frequency | G |  | QA Handbook Vol IV Section 6, and  Section 0  Tables 0-3, 0-4, 0-5, 0-6 | Sections 16 |
| Barometric Pressure | NIST Traceable Aneroid Barometer | Measurement accuracy ± 1mb, Measurement resolution 0.1 mb,  Measurement range 950 – 1050 mbHg | Purchase,  verify 1/year against NWS-FAA or NIST Traceable Std. or per NIST traceable certification frequency | G |  | QA Handbook Vol IV Section 7, and  Section 0  Tables 0-3, 0-4, 0-5, 0-6 |
| Precipitation | Separatory funnel,  graduated cylinder, and  deionized water | Volumetric Glassware  Calibrated (50ml or 100 ml, 1 ml divisions),  and  Deionized H20 | Purchase | G |  | QA Handbook Vol IV Section 5, and  Section 0  Tables 0-3, 0-4, 0-5, 0-6 |

**Visual QC Checks-Field**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Sky Check | Note & Record sky conditions (cloud cover, temp/WS/WD, etc estimates) | Each site visit | G |  | QA Handbook Vol IV  Section 10.2 |  |
| WS | WS sensor | Moving freely, no visual damage | Each site visit | G |  |  |
| WD | WD sensor | Moving freely, no visual damage | Each site visit | G |  |  |
| Temperature, ΔT | Temperature sensors and aspirated temperature shields | No visual damage or obstruction,  Motor in aspirated shield working | Each site visit | G |  |  |
| SR | Solar Radiation Sensor | Radiometer/pyranometer face clear of dirt/debris/snow | Each site visit | G |  |  |
| BP | Pressure sensor | No visual damage or obstruction | Each site visit | G |  |  |
| RH | RH sensor, aspirated shield | No visual damage or obstruction,  Motor in aspirated shield working | Each site visit | G |  |  |
| Precipitation | Precipitation sensor | No visual damage or obstruction, free of ice and snow, Heater working | Each site visit | G |  |  |
| DAS | Data Acquisition System | DAS time ≤ 1 minute NIST Alaska Standard Time (AST) | Each site visit | G |  |  |

**Data Screening Criteria**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| WS/ VWS | Hourly Recorded WS | 0 m/s ≤ WS ≤ 25 m/s,  WS varies > 0.1 m/s/3 consecutive hours,  WS varies > 0.5 m/s/12 consecutive hours,  per site specific climatology criteria | 1/week or more frequent | G | Chapter 8,Table 8-4 | QA Handbook Vol IV  Section 10.4 |  |
| WD/VWD | Hourly Recorded WD | 0°≤ WD ≤ 360°,  WD varies > 1°/3 consecutive hours,  WD varies > 10°/12 consecutive hours,  per site specific climatology criteria | 1/week or more frequent | G | Chapter 8,Table 8-4 |  |
| Temperature | Hourly Recorded Ambient Temperature | Local record low ≤ Temp≤ local record high,  Temp ≤ 5°C from previous hourly record,  Temp varies ≥ 0.5°C/12 consecutive hours, per site specific climatology criteria | 1/week or more frequent | G | Chapter 8,Table 8-4 |  |
| 10m – 2 m ΔT | Hourly Recorded 10m – 2m Temperature Difference | Day time ΔTemp ≤ 0.1°C/m,  Night time ΔTemp > -0.1°C/m,  -3.0°C ≤ ΔT ≤ 5.0°C, or  Per site specific climatology criteria | 1/week or more frequent | G | Chapter 8, Table 8-4 |  |
| RH/Dew Point | Hourly Recorded Relative Humidity | Dew Pont Temp ≤ Amb Temp for time period,  Δ Dew Pont Temp ≤ 5°C change from previous hour,  Δ Dew Pont Temp ≥ 0.5°C over 12 consecutive hours  Dew Pont Temp ≠ Ambient Temp for 12 consecutive hrs. | 1/week or more frequent | G | Chapter 8, Table 8-4 |  |
| Solar Radiation | Hourly Recorded Solar Radiation | Night time SR = 0,  Day time SR < max SR for date and latitude | 1/week or more frequent | G | Chapter 8, Table 8-4 |  |
| Barometric Pressure | Hourly Recorded Barometric Pressure | BP < 1050 mb (sea level),  BP > 945 mb (sea level), or  Per site specific climatology criteria | 1/week or more frequent | G | Chapter 8, Table 8-4 |  |
| Precipitation | Hourly Recorded Precipitation | Note: Develop site specific climatology criteria for each season | 1/week or more frequent | G | Chapter 8, Table 8-4 |  |

**Maintenance**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| WS/VWS | Sensor bearings | Replace | 1/6 months | G |  |  |  |
| WD/VWD | Sensor Bearings | Replace | 1/6 months | G |  |  |  |
| SR |  | Per manufacturer’s recommendations | Per manufacturer’s recommendations | G |  |  |  |
| DAS | Data Acquisition System (internal battery back-up) | Check Battery Back-up, Replace as needed | 1/6 months | G |  |  |  |

**Bias**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| WS, VWS | Performance Audit | 5 points including zero, 2 m/s and 3 additional evenly spaced upscale points covering expected wind speeds for the site  Audit points **≤** ± (2 m/s + 5% of observed)  WS bearing torque threshold≤ PSD quality sensor’s manufacturer’s specs | NCore/SLAMS  1/year  SPM  1/yr (suggested)  PSD  Every sensor Within 30 days of start-up and  1/6 months thereafter | G | Chapter 5 | QA Handbook Vol IV  Section 2.7 | Section 7 MQO Table A8 |
| WS/WD (Sonic Anemometer) | Performance Audit | Collocated for min 72 hrs, compare hourly data against hourly on-site calibrated cup/vane or aerovane anemometer CTS  WS criteria   * ≤±0.2 m/s + 5% observed CTS * SD of differences ≤±0.2 m/s * Qualifications WS > 1 m/s   WD criteria   * ≤±5° observed CTS CTS * SD of differences ≤± 2° * Qualifications WS > 1 m/s |  |  | QA Handbook Vol IV  Section 2.7.3.2 CTS Method |  |
| WD, VWD | Performance Audit | Alignment to True North + linearity audit points at:  0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°, 360°  Alignment **≤** ± 5°  Linearity (All Points) ≤ ± 3° (included in  ≤ ± 5° above)  WD bearing torque threshold**≤** PSD quality sensor’s manufacturer’s specs | G | Chapter 5  Chapter 8 | QA Handbook Vol IV  Section 2.7 | MQO Table, Table A8  Section 16 |
| Vector Data/DAS (WS, WD, σθ, σw) | Performance Audit | WS , σw ≤± 0.2 m/s  WD, σθ ≤± 5° | G |  | QA Handbook Vol IV  Section 2.8 |  |
| Temp | Performance Audit | Minimum 3 point audit  representative of min avg low to max avg high temps for the location. (e.g., -30°C, 0°C, +30°C) **Note:** State of Alaska criteria  Each point ≤ ±0.5**°C** of NIST Traceable Standard | G | Chapter 5  Chapter 8 | QA Handbook Vol IV  Section 3.6 | MQO Table, Table A8  Section 16 |
| ΔT | Performance Audit | Side-by-side audit of 10m and 2m temp probes with a Minimum 3 point audit  representative of min avg low to max avg high temps for the location. (e.g., -30°C, 0°C, +30°C) **Note:** State of Alaska criteria  Each point ≤ ±0.5°C of NIST Traceable Standard  and  10m sensor ≤ ±0.1°C of 2 m sensor at all points | G | Chapter 5  Chapter 8 | QA Handbook Vol IV  Section 3.6 | MQO Table, Table A8  Section 16 |
| RH/Dew point | Performance Audit | 1-point audit of RH/DP sensor against NIST Traceable RH Standard (±2% RH accuracy)  RH sensor ≤ ± 7% of RH Standard | G | Chapter 5  Chapter 8 | QA Handbook Vol IV  Section 5 | MQO Table, Table A8  Section 16 |
| Solar Radiation (SR) | Performance Audit | One diurnal cycle against in-cert. First Class Pyranometer. If a full diurnal cycle is not possible, audit should be conducted several hours prior to and after peak solar radiation at the time of audit.  SR sensor ≤ ± 5% of First Class Pyranometer | G | Chapter 5  Chapter 8 | QA Handbook Vol IV  Section 6 | MQO Table, Table A8  Section 16 |
| Barometric Pressure (BP) | Performance Audit | 1-point audit against pressure standard of known quality (see pressure std. min requirements)  BP sensor ≤ ± 3 mb (0.3 kPa) | G | Chapter 5  Chapter 8 | QA Handbook Vol IV  Section 7 | MQO Table, Table A8  Section 16 |
| Precipitation | Performance Audit | Minimum 3 point audit  Each point ≤ ± 10% of measured H20 input, or  ≤ ± 5 mm H20 | G | Chapter 5  Chapter 8 | QA Handbook Vol IV  Section 4 | MQO Table, Table A8  Section 16 |
|  |  |  |  |  |  |  |  |

***III.– METEOROLOGICAL MEASUREMENT METHODS SYSTEMATIC ISSUES***

**S- single instrument hourly value, G group of hourly values from 1 instrument**

| **Parameter** | **Criteria** | **Acceptable Range** | **Frequency** | **Samples Impacted** | **EPA -454/R-99-005**  **Feb 2000** | **EPA QA Handbook**  **Volume IV** | **ADEC AM&QA QAPP** |
| --- | --- | --- | --- | --- | --- | --- | --- |

**Data Completeness**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| All Met Parameters |  | > 90% NCore, SLAMS, SPM | quarterly | G |  |  |  |

**QC Checks**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | DAS Clock/timer Verification | < ± 1 minute. | Each site visit | G |  |  |  |

**Bias**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| All Met parameters | Technical Systems Audit | NCore/SLAMS/SPM networks | 1/3 years. | G |  | QA Handbook Vol IV  Section 10 & Appendix A |  |
| PSD | Within 1 month of start-up and annually thereafter | G |  |  |
|  |  |  |  |  |  |  |  |