

## A6.4 Example worksheets for QC procedures in 2002

### TIER 1: INDIVIDUAL SOURCE CATEGORY CHECKLIST

**Inventory Checked:** 2002  
**Source Category:** 1A3b Mobile combustion from road vehicles  
**Estimates prepared by:** Ministry of Economic Development  
**Working spreadsheet(s)**

Ver 1.0

CO2

Tier 1 QC Activity & Procedures					
QC Activity	Procedures	Procedures adopted for 2004 NIR (2002 data)	Brief description of check applied (include date/person & reference if required)	Results of check (include reference if required)	Corrective Actions Taken
Check that assumptions and criteria for the selection of activity data and emission factors are documented.	Check descriptions of activity data and emission factors and ensure that these are properly recorded and archived.	Check activity data and emission factors are described in the NIR report and any changes from previous years are adequately documented. Ensure any recommended changes to emission factors from the energy sector have been implemented and correctly recorded in the NIR worksheets.	SoniaP 2/3/04; checked description of emission factors for petrol and diesel-these have changed from the 2003 NIR due to review of energy EF's (see Hale and Twomey report). The old petrol EF was 66.6 kt CO2/PJ. The new values used are 66.2 for all petrol until 1995 then 66.2 for regular petrol and 67.0 for premium petrol from 1996. The diesel EF has changed from 68.7 kt CO2/PJ to 69.5 (NZRC derived). Adequate description of activity data and emission factors in NIR	New emission factors used are those recommended by the review report of energy emission factors. The EF's in the NIR worksheet once converted from C to CO2 EF's are the same as those in the Hale and Twomey energy EF review.	None
Check for transcription errors in data input and reference	Confirm that bibliographical data references are properly cited in the internal documentation.	1. Undertake visual checks of module names for consistency in NIR worksheets. 2. Check all references cited in the appropriate source sector chapter in the NIR report and make sure they are correctly referenced at the end of the chapter.	SoniaP 3/3/04; 1. visual check of module names in worksheets 1.1, 1.2 and 1.3 for all energy sector sub categories. 2.	Inconsistencies found in naming of modules on worksheets 1.1 and 1.2. The module name for worksheet 1.1 (1-3 of 5) was Energy 2002 (NZ) while further down table 1.1 (4-5 of 5) and 1.1(supplemental) were labelled as Energy 1990 (NZ). This also occurred in worksheet 1.2 between part 1 (labelled 2002) and part 2 (labelled 1990).	Contacted Stuart Black from MED who was involved with compiling the worksheets. He confirmed that the module titles with 1990 in them were wrong (copying error). The three incorrectly labeled module titles were corrected in the NIR worksheets.
	Cross-check a sample of input data from each source category (either measurements or parameters used in calculations) for transcription errors.	1. Cross check activity data from NIR worksheets with that in the CRF for transcription errors. 2. Check activity data figures from original source (eg MED GHG report for energy sector) with data in the CRF.	SoniaP 3/3/04; 1. visual check by comparing road transportation energy consumption figure from worksheet 1.2 (part 1) in NIR with road transportation energy consumption figure in Table 1A(a) in CRF. 2. Checked petrol activity data-comparing figures in MED's GHG Emissions report with figures in NIR worksheet 1.2 (adding up regular and premium petrol figures).	1. Value in worksheet 1.2 was 183,958 compared with 183,957.55 in the CRF. Test passed. 2. Value in Table 4.2 in MED report is 109.84 PJ while the aggregated petrol activity data in NIR worksheet 1.2 is 109.84 PJ (109842 TJ). Test passed.	None
Check that emissions are calculated correctly.	Reproduce a representative sample of emissions calculations.	Using the figures in the NIR worksheets, calculate emissions manually (using calculator) and compare to emissions figure from worksheet.	SoniaP 3/3/04; Calculated CO2 emissions from road transportation (petrol and diesel) using figures from worksheet 1.2	Values calculated were 5611.17 Gg CO2 compared to 5597.05 in NIR worksheet (petrol-regular); 1623.52 compared to 1621.10 Gg CO2 in NIR (petrol-premium) and 4928.32 compared with 4916.53 Gg CO2 calculated in NIR for diesel. Differences are 0.15-0.25%. Test passed.	None
	Selectively mimic complex model calculations with abbreviated calculations to judge relative accuracy.		SoniaP 3/3/04; Take petrol activity data from Table 4.2 in MED's Energy GHG emissions document (value is 109.84 PJ) multiplied by average weighted petrol EF (66.5 kt/PJ). This figure was multiplied by 0.99 (fraction oxidised) to get Gg CO2 produced	Result is 7231 Gg CO2; Value in working spreadsheet is 7218.15 (regular & premium petrol aggregated together). Difference is 0.18%. Test passed.	None
Check that parameter and emission units are correctly recorded and that appropriate conversion factors are used	Check that units are properly labelled in calculation sheets	Check the units are correctly labelled in the NIR worksheets	SoniaP 3/3/04; visual inspection of units labelled in worksheet 1.1 and 1.2 (including overview sheet)	Labelling fine for worksheets 1.1 and 1.2 (parts 1 & 2). Units missing on worksheet 1.2 (overview) for total energy consumption and CO2 emissions	Units (TJ for activity data and Gg for total CO2 emissions) have been added to the overview spreadsheet table.
	Check that units are correctly carried through from beginning to end of calculations.				
	Check that conversion factors are correct	Check that the correct conversion factors have been used to calculate the emissions in the NIR worksheets-particularly conversion from tonnes to Gg and from C to CO2.	SoniaP 3/3/04; Checked units, including conversion factors in petrol (regular) calculation on worksheet 1.2 in NIR. TJ = tonnes C/TJ = tonnes C. tonnes C/1000= Gg C Gg C * 44/12 (molecular mass CO2/C) = Gg CO2	conversion factors are correct	None
	Check that temporal and spatial adjustment factors are used correctly.		SoniaP 4/3/04; Check data is shown to 2 decimal places for final emissions estimates (Gg)	Checked all energy sector data on NIR worksheets 1.1 and 1.2 Worksheets 1.1 and 1.2 (sectoral tables) are consistent with 2 decimal places for final CO2 emissions. Worksheet 1.2 (overview) does not show any decimal places for final CO2 emissions.	CO2 emissions in worksheet 1.2 (overview) changed to 2 decimal places to be consistent with other tables.

Tier 1 QC Activity & Procedures					
QC Activity	Procedures	Procedures adopted for 2004 NIR (2002 data)	Brief description of check applied (include date/person & reference if required)	Results of check (include reference if required)	Corrective Actions Taken
Check the integrity of database and/or spreadsheet files.	Confirm that the appropriate data processing steps are correctly represented in the database.				
	Confirm that data relationships are correctly represented in the database.	1. Check labels on NIR worksheets are consistent with previous year's NIR 2. Ensure the addition or deletion of datalines are adequately explained			
	Ensure that data fields are properly labelled and have the correct design specifications.		SoniaP 3/3/04; Visual check-compared data field labels for worksheets 1.1 and 1.2 with the 2003 NIR worksheets.	Gasoline has been split into two separate data lines (for regular and premium gasoline). Av Gas is a new data line (split aviation fuel) compared to 2003 NIR worksheet 1.1 (1-3 of 5) Bitumen has been added as a new data line under liquid fossil fuels in worksheet 1.1 (4-5 of 5) compared to 2003 NIR. In worksheet 1.2 gasoline has once again been split as well as fuel oil (heavy and light) and Av gas has been added as an extra data line. All of these additions were due to recommendations in the 2003 energy sector EE review.	None
	Ensure that adequate documentation of database and model structure and operation are archived.	energy sector-AI production agricultural sector-use of animal numbers for methane and nitrous oxide emission calculations			
Check for consistency in data between source categories	Identify parameters (e.g. activity data, constants) that are common to multiple source categories and confirm that there is consistency in the values used for these parameters in the emissions calculations.	Check the totals (activity data and emissions) in the overview/summary tables in the NIR worksheets reference to the correct cells in the sectoral worksheets.	SoniaP 5/4/04; Check mobile road combustion activity data and CO2 emissions totals from worksheet 1.2 and the overview worksheet.	Activity data exactly the same and CO2 emissions 12,293 in worksheet 1.2 compared with 12,292.63 Gg in overview worksheet. Test passed.	None
Check that the movement of inventory data among processing steps is correct.	Check that emissions data are correctly aggregated from lower reporting levels to higher reporting levels when preparing summaries.	no check in 2002 apart from other checks already done on checking NIR worksheets and CRF. In the future checks on the QA/QC procedures of external agencies (MED, MAF, Statistics NZ & contractors) will show correct transcription between intermediate worksheets/reports & final NIR worksheets & CRF.	SoniaP 4/3/04; Check road transportation energy consumption and CO2 emissions totals from worksheet 1.2 and the overview worksheet.	Energy consumption totals are the same-visual inspection checked cells correctly referenced from overview table to sectoral worksheet 1.2.	None
	Check that emissions data are correctly transcribed between different intermediate products				
Check that uncertainties in emissions and removals are estimated or calculated correctly.	Check that qualifications of individuals providing expert judgement for uncertainty estimates are appropriate.				
	Check that qualifications, assumptions and expert judgements are recorded. Check that calculated uncertainties are complete and calculated correctly.				
	If necessary, duplicate error calculations or a small sample of the probability distributions used by Monte Carlo analyses.				

Tier 1 QC Activity & Procedures					
QC Activity	Procedures	Procedures adopted for 2004 NIR (2002 data)	Brief description of check applied (include date/person & reference if required)	Results of check (include reference if required)	Corrective Actions Taken
Undertake review of internal documentation.	Check that there is detailed internal documentation to support the estimates and enable duplication of the emission and uncertainty estimates.				
	Check that inventory data, supporting data, and inventory records are archived and stored to facilitate detailed review.	Check to ensure copies of reports of sector reviews and methodologies are archived	SoniaP 4/3/03; make sure energy sector emission factor review by Hale and Twomey is archived in the NZCCO and easily accessible. Also ensure other reports written in response to that report are archived.	Found reports stored on MfE computer network: m:\ClimateChange\greenhouse gas inventory\sector information\Energy * Emissions Factor Review Report * Implications for energy emissions June 2003 * Energy EF review-changes resulting from peer review of HT report	None
	Check integrity of any data archiving arrangements of outside organisations involved in inventory preparation.				
Check methodological and data changes resulting in recalculations.	Check for temporal consistency in time series input data for each source category.				
	Check for consistency in the algorithm/method used for calculations throughout the time series.	Check table 10 in CRF to ensure source category data is entered for all years-1990 to 2002.	SoniaP 1/4/04; Check Table 10 for completeness	energy sector is complete in Table 10-sheets s1-s3 and s5.	None
Undertake completeness checks.	Confirm that estimates are reported for all source categories and for all years from the appropriate base year to the period of the current inventory.				
	Check that known data gaps that result in incomplete source category emissions estimates are documented.				
Compare estimates to previous estimates.	For each source category, current inventory estimates should be compared to previous estimates. If there are significant changes or departures from expected trends, recheck estimates and explain any difference.	Compare current inventory source category estimates with Table 10 estimates for all previous years and explain any significant changes. Make sure changes due to the energy sector EFs are documented in table 8(b) of the CRF.	SoniaP 5/4/04; Graphed transport from Table10s1, s3 and s3 to find any outliers or inconsistencies.	Found drop in CH4 emissions from ~7 Gg to ~2 Gg (1996-2001). When checking summary tables in the CRF for for those particular years found the values around 2Gg were incorrect. Looks like data was entered in the incorrect dataline.	Corrected CH4 emissions from transport in Table 10 from 1996-2001 for CRFs 1997-2002.

**TIER 1: INDIVIDUAL SOURCE CATEGORY CHECKLIST**

**Inventory Checked:** 2002  
**Source Category:** 4A Enteric fermentation  
**Estimates prepared by:** Ministry of Agriculture and Forestry with data from Statistics New Zealand and Agresearch  
**Working spreadsheet(s)**

Ver 1.0

CH4

Tier 1 QC Activity & Procedures					
QC Activity	Procedures	Procedures adopted for 2004 NIR (2002 data)	Brief description of check applied (include date/person & reference if required)	Results of check (include reference if required)	Corrective Actions Taken
Check that assumptions and criteria for the selection of activity data and emission factors are documented.	Check descriptions of activity data and emission factors and ensure that these are properly recorded and archived.	Check activity data and emission factors are described in the NIR report and any changes from previous years are adequately documented. Ensure any recommended changes to emission factors from the energy sector have been implemented and correctly recorded in the NIR worksheets.	SoniaP 1/4/04; checked description of activity data and emission factors in the NIR	Well documented in chapter 6 and Annex 3A of the NIR	None
Check for transcription errors in data input and reference	Confirm that bibliographical data references are properly cited in the internal documentation.	1. Undertake visual checks of module names for consistency in NIR worksheets. 2. Check all references cited in the appropriate source sector chapter in the NIR report and make sure they are correctly referenced at the end of the chapter.	SoniaP 1/4/04; 1. visual check of module names in NIR worksheets for all agriculture sources. 2.	The year 2001 was still on the name of the tables in timeseries ag data rev 2004.xls (animal number tables). Other tables were correctly named with the year 2002.	Tables were updated with titles using correct years.
	Cross-check a sample of input data from each source category (either measurements or parameters used in calculations) for transcription errors.	1. Cross check activity data from NIR worksheets with that in the CRF for transcription errors. 2. Check activity data figures from original source (eg MED GHG report for energy sector) with data in the CRF.	SoniaP 1/4/04; 1. Visual check by comparing enteric fermentation figures from NIR worksheet 4.1 with CRF Table 4s1.	1. Total value in NIR worksheet was 1123.08Gg compared with 1123.08Gg. Test passed.	None
Check that emissions are calculated correctly.	Reproduce a representative sample of emissions calculations.	Using the figures in the NIR worksheets, calculate emissions manually (using calculator) and compare to emissions figure from worksheet.	SoniaP 1/4/04; Calculated dairy cattle CH4 enteric fermentation emissions using figures from worksheet 4.1	Value calculated was 372.66 Gg compared with 372.52 Gg on the worksheet. Test passed.	None
	Selectively mimic complex model calculations with abbreviated calculations to judge relative accuracy.				
Check that parameter and emission units are correctly recorded and that appropriate conversion factors are used	Check that units are properly labelled in calculation sheets	Check the units are correctly labelled in the NIR worksheets	SoniaP 1/4/04; visual inspection of units labelled in worksheets 4.1-4.5 and all related tables in agricultural sector.	Units labelling O.K for all worksheets in agricultural sector.	None
	Check that units are correctly carried through from beginning to end of calculations.				
	Check that conversion factors are correct	Check that the correct conversion factors have been used to calculate the emissions in the NIR worksheets-particularly conversion from tonnes to Gg and from C to CO2.	SoniaP 1/4/04; Checked conversion from kg (kg/head/yr as emission factor) to Gg for final emissions for CH4 (for enteric fermentation & manure management) were taken into account in NIR worksheet 4.1	Conversion factors are correct	None
	Check that temporal and spatial adjustment factors are used correctly.				

QC Activity	Procedures	Procedures adopted for 2004 NIR (2002 data)	Brief description of check applied (include date/person & reference if required)	Results of check (include reference if required)	Corrective Actions Taken
Check the integrity of database and/or spreadsheet files.	Confirm that the appropriate data processing steps are correctly represented in the database.				
	Confirm that data relationships are correctly represented in the database.				
	Ensure that data fields are properly labelled and have the correct design specifications.	1. Check labels on NIR worksheets are consistent with previous year's NIR 2. Ensure the addition or deletion of datalines are adequately explained	SoniaP 1/4/04; Visual check- compared data field labels for worksheets in 2004 NIR with those in 2003.	Consistent with labels and worksheet labels in 2003 NIR	None
	Ensure that adequate documentation of database and model structure and operation are archived.				
Check for consistency in data between source categories	Identify parameters (e.g. activity data, constants) that are common to multiple source categories and confirm that there is consistency in the values used for these parameters in the emissions calculations.	energy sector-AI production agricultural sector-use of animal numbers for methane and nitrous oxide emission calculations	SoniaP 5/4/04; Checked animal numbers in NIR worksheet and CRF tables for consistency	NIR worksheet 4.1 and CRF tables 4A and 4B(a) consistent. Found Table 4B(b) values for swine (356 vs 351), goats (165 vs 155) and poultry (20864 vs 20917) were inconsistent with those in NIR worksheet.	Corrected swine, goat and poultry numbers in Table 4B(b) of CRF
Check that the movement of inventory data among processing steps is correct.	Check that emissions data are correctly aggregated from lower reporting levels to higher reporting levels when preparing summaries.	Check the totals (activity data and emissions) in the overview/summary tables in the NIR worksheets reference to the correct cells in the sectoral worksheets.	SoniaP 5/4/04; Visual check of enteric fermentation values in Summary1As2 sheet with table 10s2 in CRF. Also checked correct summation of CH4 from different animal classes in Table 4s1.	All total values of CH4 from enteric fermentation agree between summary sheets at 1123.08Gg.	None
	Check that emissions data are correctly transcribed between different intermediate products	no check in 2002 apart from other checks already done on checking NIR worksheets and CRF. In the future checks on the QA/QC procedures of external agencies (MED, MAF, Statistics NZ & contractors) will show correct transcription between intermediate worksheets/reports & final NIR worksheets & CRF.			
Check that uncertainties in emissions and removals are estimated or calculated correctly.	Check that qualifications of individuals providing expert judgement for uncertainty estimates are appropriate.				
	Check that qualifications, assumptions and expert judgements are recorded. Check that calculated uncertainties are complete and calculated correctly.				
	If necessary, duplicate error calculations or a small sample of the probability distributions used by Monte Carlo analyses.				
Undertake review of internal documentation.	Check that there is detailed internal documentation to support the estimates and enable duplication of the emission and uncertainty estimates.				
	Check that inventory data, supporting data, and inventory records are archived and stored to facilitate detailed review.	Check to ensure copies of reports of sector reviews and methodologies are archived	SoniaP 5/4/04; Ensure report on methane emissions from enteric fermentation is stored in an easily accessible place.	Found report in Len Brown's office-Ag Sector Methane Filemaster box	None
	Check integrity of any data archiving arrangements of outside organisations involved in inventory preparation.				

Tier 1 QC Activity & Procedures					
Check methodological and data changes resulting in recalculations.	Check for temporal consistency in time series input data for each source category.				
	Check for consistency in the algorithm/method used for calculations throughout the time series.				
Undertake completeness checks.	Confirm that estimates are reported for all source categories and for all years from the appropriate base year to the period of the current inventory.	Check table 10 in CRF to ensure source category data is entered for all years-1990 to 2002.	SoniaP 5/4/04; Check Table 10s2 (CH4) for enteric fermentation is filled out for years 1990-2002	Table 10s2 is completed.	None
	Check that known data gaps that result in incomplete source category emissions estimates are documented.				
Compare estimates to previous estimates.	For each source category, current inventory estimates should be compared to previous estimates. If there are significant changes or departures from expected trends, recheck estimates and explain any difference.	Compare current inventory source category estimates with Table 10 estimates for all previous years and explain any significant changes. Make sure changes due to the energy sector EFs are documented in table 8(b) of the CRF.	SoniaP 5/4/04; Visual check of Table 10s2 to look for any outliers for the time period 1990-2002	No outliers detected	None