Stage 1 & 2 Assessment

Report for:

AvalonBay Communities Inc.

LRQA reference:	RMA10192A
Verification dates:	April - June, 2016
Verification location:	Arlington, VA
Verification criteria:	WRI/WBCSD GHG Protocol (reporting), ISO 14064-3 & LRQA's Verification Approach (verification)
Assessment team:	Derek Markolf – Lead Verifier Heather Moore - Verifier
LRQA office:	Houston

Lloyd's Register LRQA

Contents

Attachments

This report was presented to and accepted by:	
Name:	Mark Delisi
Job title:	Sr. Director Corporate Responsibility

1. Executive report

Verification outcome:

LRQA, Inc. (LRQA), a member of the Lloyd's Register group of entities, was contracted by AvalonBay Communities Inc. (AvalonBay) to verify its Scope 1 (direct emission) and Scope 2 (energy indirect emissions) greenhouse gas (GHG) emissions; energy consumption for Scope 1 and Scope 2; waste generation and water consumption for calendar year 2015 (CY2015).

Water consumption and waste generation data verified by LRQA did not include data from AvalonBay construction operations. This is in alignment with the Global Real Estate Sustainability Benchmark (GRESB) Guidance document.

The verification was conducted to a limited level of assurance and at a materiality level based on the professional judgment of the verifier. The final quantities verified are as follows:

Item	Quantity	Units
Scope 1 Emissions	20,137	MT CO2e
Scope 2 Emissions Location-Based	68,367	MT CO2e
Scope 2 Emissions Market-Based	68,367	MT CO2e
Total Scope 1 Energy	110,762	MWh
Total Scope 2 Energy	192,589	MWh
Water Consumption (Communities only)[1]	11,701,987	M^3
Subset of Waste Generated (Communities only)[2,3]	42,397	MT

1. Water consumption does not include water consumed by the AvalonBay construction division.
2. Waste generation does not include waste generated by the AvalonBay construction division.
3. Waste generation data is only representative of 66% of AvalonBay communities.

AvalonBay excluded refrigerant emissions from HVAC systems and combustion of diesel fuel in emergency generators.

Based on LRQA's approach nothing has come to our attention that would cause us to believe that the total direct GHG emissions and energy indirect GHG emissions disclosed in the Inventory as summarized in the tables above are not materially correct and the Inventory has not been prepared in accordance with the WBCSD/WRI GHG Protocol, except for the following qualification:

- AvalonBay is reporting Scope 1 and 2 GHG emissions related to energy used by retail operations co-located at AvalonBay communities. This misstatement is not material.

Based on LRQA's approach nothing has come to our attention that would cause us to believe that energy, waste and water data assertion summarized in the tables above are not materially correct and have not been prepared in accordance with the AvalonBay's environmental data management processes except for the following qualifications:

- LRQA was unable to verify the complete set of waste generation data for AvalonBay communities because LRQA was only commissioned to verify waste data from 66% of the communities.

LRQA confirms that the contents of this report, together with any evidence or notes taken during this verification will be treated in the strictest confidence and will not be disclosed to any third party, without the prior consent of the client, except as required by the accreditation authorities.

Areas for management attention:

Consider development of a GHG and Environmental Data Management Plan (GHG & EDMP) to provide necessary controls on all environmental data being reported in the Sustainability Report.

2. Verification details

Introduction:
This report records the outcome of the LRQA verification of Greenhouse Gas (GHG) emissions for AvalonBay conducted in February to June 2016. The verification activities were conducted by Derek Markolf, Lead Verifier for LRQA with assistance from other LRQA staff where appropriate. This report includes the outcome of LRQA verification activities for the following data: • Scope 1 and 2 greenhouse gas (GHG) emissions • Energy inventory – Scope 1 Total Energy (consumptions of natural gas, propane and fuel oil) and Scope 2 Total Energy (consumption of electricity and steam). • Water consumption • Waste generation The reporting criteria used to evaluate the CY 2015 emissions report was the WBCSD/WRI Greenhouse Gas (GHG) Protocol. LRQA used verification criteria from ISO 14064 Part 3:2006 for the GHG data and LRQA's verification approach for the environmental data to perform the verification. The Stage 1 verification activities included: • Initial review and discussions – to confirm scope, objectives, criteria, level of assurance, materiality and their appropriateness for the verification • Review of the GHG Inventory and systems in place for its derivation • Strategic Analysis and Risk Analysis • Verification Planning for Stage 2 • Site Visit on April 20, 2016 at AvalonBay's Headquarters. The Stage 2 verification activities included: • Assessment of Criteria Conformance • Implementation of the data review based on the LRQA sampling plan • Verification of Data and Information for GHG emissions sources and environmental data sets • Development of issues log and findings This report includes a discussion of the items listed above, together with the Verification Schedule, the Verification Plan, and the findings and their resolution.

Grading of Findings

The following definitions apply to the grading of findings in this report:

Material Misstatement	A misstatement, (omissions, misrepresentations and errors) in an assertion, data, or information that, in the professional judgment of the verifier, could affect the decision of the intended user. If such a finding is left outstanding at the end of the verification then the misstatement **must** be corrected or a positive Assurance Statement will not be possible.
Material Nonconformity	A nonconformity with the requirements of the assurance criteria (including the terms of engagement) that, in the professional judgment of the verifier, could affect the decision of the intended user. If such a finding is left outstanding at the end of the verification then the nonconformity **must** be corrected or a positive Assurance Statement with regard to the assurance criteria will not be possible.
Misstatement	A misstatement (omissions, misrepresentations and errors) in an assertion, data or information that, in the professional judgment of the verifier, is unlikely to affect the decision of the intended user. If such a finding is outstanding at the end of the verification, a positive Assurance Statement will be possible, although qualifications, limitations, and/or recommendations may be included in the Assurance Statement.
Nonconformity	A nonconformity with the requirements of the assurance criteria (including the terms of engagement) that, in the professional judgment of the verifier, is unlikely to affect the decision of the intended user. If such a finding is outstanding at the end of the verification, a positive Assurance Statement will be possible, although qualifications, limitations, and/or recommendations may be included in the Assurance Statement.

Verifier:	Derek Markolf

Verification of:	Terms of Engagement	Auditee(s):	Mark Delisi Parker Smith

Audit trails and sources of evidence:

Contract Conditions Confirmation

Evaluation and conclusions:

- Scope: Data Verification of the following items:
  - Scope 1 (direct) GHG emissions: natural gas, fuel oil, and propane (operational control)
  - Scope 2 (indirect) GHG emissions: purchased electricity and steam (operational control)
  - Energy Consumption:
    - Scope 1: total MWh (operational control)
    - Scope 2: total MWh (operational control)
  - Water consumption (financial control)
  - Waste generation (financial control)

- Objectives: Verification of AvalonBay's GHG emissions, energy consumption, water consumption and waste generation for CY2015. The verification is intended to provide AvalonBay with an independent opinion on the completeness and accuracy of the data provided.

- Criteria:
  - World Resource Institute / World Business Council for Sustainable Development (WRI/WBCSD) GHG Protocol;
  - Verification protocol follows ISO 14064-3: Specification with guidance for validation and verification of greenhouse gas assertions and LRQA verification approach
  - AvalonBay environmental data management processes

Level of Assurance: Limited Assurance

Materiality: Qualitative materiality based on the professional judgment of the verifier

Verification of:	Strategic Analysis and Risk Analysis	Auditee(s):	Mark Delisi Parker Smith Sondra Tosky (Measurabl) Brianna Jackson (Measurabl)

Strategic Analysis:

Through the Strategic Analysis, the Verifier determined the significance of the items of information and data to be verified. This judgement of significance is based on the nature and scale of the information and data as they relate to the scheme requirements.

Information or Data Source	Significance	Basis of Significance
Natural gas	M	Accounts for 22% of GHG emissions
Fuel oil	L	Accounts for <1% of GHG emissions
Propane	L	Accounts for <1% of GHG emissions
Electricity	H	Accounts for 76% of GHG emissions
Steam	L	Accounts for 1% of GHG emissions

NOTE: Much of the environmental data to be verified are activity data for the GHG emissions quantification, so the above Strategic Analysis is also applicable to this data.

Each of the environmental data parameters included in the Environmental Data Assertion was assessed separately for materiality.

Information or Data Source	Significance	Basis of Significance
Total Scope 1 Energy	H	Separate materiality for each environmental data parameter leads to each being highly significant.
Total Scope 2 Energy	H	Separate materiality for each environmental data parameter leads to each being highly significant.
Water Consumption	H	Separate materiality for each environmental data parameter leads to each being highly significant.
Waste Generation	H	Separate materiality for each environmental data parameter leads to each being highly significant.

Risk Analysis:

Through the Risk Analysis, the Verifier determined the potential risk of an omission, misrepresentation or error in relation to information and data sources. This determination included, but was not necessarily limited to, a judgement based on:

- the inherent risk associated with the data / information management
- the level of control applied to the data / information management
- the control of monitoring and metering used to gather data
- the number of personnel involved in the data management, their competence, attitude, and commitment.

Information or Data Source	Significance	Data Gathering	Measuring Equipment	People	OVERALL RISK
Natural gas	M	L	L	L	M
Fuel oil	L	L	M	L	L
Propane	L	L	M	L	L
Electricity	H	L	L	L	M
Steam	L	M	L	L	L

NOTE: The energy data to be verified are activity data for the GHG emissions quantification, so the above Risk Analysis is also applicable to this data.

Information or Data Source	Significance	Data Gathering	Measuring Equipment	People	OVERALL RISK
Water Consumption	H	L	L	L	M
Waste Generation	H	M	M	L	M

Generally, the outputs of the Risk Analysis influenced the Verification Plan to manage the risk of LRQA detecting omissions, misrepresentations and errors by in the following way:
High Overall Risk – detailed verification and data sampling
Medium Overall Risk – some verification and data sampling
Low Overall Risk – limited verification, simple checks only

Verification Planning:

As a result of the completion of the Strategic Analysis and Risk Analysis, a Verification Plan was developed. The Verification Plan, included in Section 5, defines the key elements of the verification and when those elements will be covered. The Verification Plan is supported by a Data / Information Sampling Plan which defines all the specific items of data and information which the Verification Team has identified as relevant and the depth to which relevant data is to be verified.

The following changes to the original Verification Plan / Data and Information Sampling Plan took place:
The original schedule for the verification plan was delayed due to time necessary for AvalonBay to finalize the GHG and environmental data for verification.

Verification of:	Criteria Conformance	Auditee(s):	Mark Delisi Parker Smith Sondra Tosky (Measurabl) Brianna Jackson (Measurabl)

Audit trails and sources of evidence:

Discussions with corporate representatives
Discussions with Measruabl representative overseeing AvalonBay data management within Measurable platform.
Overview of AvalonBay utility bill management through two third party services (Cass and Conservice)
Careful review of reporting boundaries with AvalonBay representatives

Evaluation and conclusions:

Four findings related to reporting boundaries and one finding related to base year were raised. All but one of these findings were closed. See the findings log for details and resolution.

One observation for improvement was noted during the Stage 1 verification activities:

- Consider development of a GHG and Environmental Data Management Plan (GHG & EDMP) to provide necessary controls on all environmental data being reported in the Sustainability Report.

Refer to the GHG Protocol Verification Checklist for the outcome from the criteria conformity assessment.

Assessment of:	Data & Information Verification	Auditee(s):	Mark Delisi Parker Smith Sondra Tosky (Measurabl) Brianna Jackson (Measurabl)

Audit trails and sources of evidence:

Measurabl CDP and GRESB reports with final data to be verified
Measurable Scope 1 and Scope 2 emissions data excel downloads
Scope of activity data, references for EFs and GWPs and calculation methodologies within Measurabl software.
Utility bill (NG, electricity and water) data downloads from Cass and Conservice
2015 AvalonBay Waste Data.xls
Email communications and waste hauler reports
Fuel oil consumption records

Evaluation and conclusions:

The revised Verification Plan and Data Sampling / Evidence Gathering Plan were followed to completion.

AvalonBay utilised a cloud based climate change and sustainability data management and reporting platform called Measurabl who caters primarily to the real estate sector. The two reports generated by Measurabl for AvalonBay are the CDP report and the GRESB report, both of which are intended to be uploaded directly to the CDP and GRESB in the form of completed questionnaires.

AvalonBay populates energy and water data for each of their 276 communities in the US EPA Energy Star platform. Measruabl is then populated by a direct automated transfer of data from Energy Star to Measurabl. For waste data, AvalonBay enters the data directly into Measurabl.

Scope 1 and Scope 2 GHG Emissions:
A high level review of Measurabl energy data and GHG emissions data reported to CDP and GRESB was performed to identify areas where the data differs. LRQA noted numerous differences and was then informed of the unique reporting criteria that GRESB has and how it differs from standard GHG emissions accounting principles.

The raw utility bill data for natural gas and electricity was checked against final data reported in Measruabl for a representative sample of facilities. During this check the emissions factors for natural gas combustion and electricity grid factors were checked for accuracy.

Two findings were raised related to natural gas combustion and one related to steam. All three were closed. See the findings log for details and resolution.

AvalonBay reported both location-based and market-based Scope 2 emissions. For market-based emissions, AvalonBay has opted to utilise the lowest tier on the GHG Protocol Scope 2 Guidance market-based hierarchy, which results in the same Scope 2 emissions data being reported for both location-based and market-based methods.

Verification of environmental data parameters included in Environmental Data Assertion:
The energy data reported by AvalonBay are closely related to GHG activity data. LRQA performed checks against the Measurabl GHG emissions reports to confirm all environmental data being verified was consistent with verified GHG emissions activity data.

For the other environmental data parameters related to water consumption and waste generation, LRQA gained an understanding of the processes and procedures in place through interviews with AvalonBay personnel whom oversee the respective data management systems. Key files from the system were sampled, and data was tracked from source to sink (Measurabl).

LRQA was only contracted to verify waste generation related to a subset of the AvalonBay communities (66%). LRQA verified the percentage of communities represented and will include clear documentation of the scope of the verification in the assurance statement. Also, the boundaries for AvalonBay waste and water data exclude waste and water data related to construction activities. This is in alignment with the GRESB reporting guidelines.

One finding was raised related to water data which was subsequently closed. See the findings log for details and resolution.

Assessment of:	Errors and Corrections	Auditee(s):	Mark Delisi Parker Smith Sondra Tosky (Measurabl) Brianna Jackson (Measurabl)

Audit trails and sources of evidence:

2016-CDP-Response-v1-6-20-16.doc
2016-GRESB-Response-v1-6-20-16.doc
facilityscope1-6-20-16-DM-rev.1.xls
facilityscope2-6-20-16-DM-rev.1.xls
Water by Facility.xls
Worksheet in 2016-CDP-Response-v1-5-25-16-pg25-DM.xls
Avalon Bay - Workbook-v.2-DM.xls

Evaluation and conclusions:

During the verification activities AvalonBay provided clarification regarding discrepancies noted by LRQA between various data sources. LRQA confirmed that appropriate amendments were made to the GHG emissions inventory and the environmental data assertion.

Assessment of:	Materiality Conclusion	Auditee(s):	Mark Delisi Parker Smith Sondra Tosky (Measurabl) Brianna Jackson (Measurabl)

Audit trails and sources of evidence:

2016-CDP-Response-v1-6-20-16
2016-GRESB-Response-v1-6-20-16
Avalon Bay - Workbook-v.2-DM.xls

Evaluation and conclusions:

Based on LRQA's approach nothing has come to our attention that would cause us to believe that the total direct GHG emissions and energy indirect GHG emissions disclosed in the Inventory as summarized in the tables above are not materially correct and the Inventory has not been prepared in accordance with the WBCSD/WRI GHG Protocol, except for the following qualification:

- AvalonBay is reporting Scope 1 and 2 GHG emissions related to energy used by retail operations co-located at AvalonBay communities. This misstatement is not material.

Based on LRQA's approach nothing has come to our attention that would cause us to believe that energy, waste and water data assertion summarized in the tables above are not materially correct and have not been prepared in accordance with the AvalonBay's environmental data management processes except for the following qualifications:

- LRQA was unable to verify the complete set of waste generation data for AvalonBay communities because LRQA was only commissioned to verify waste data from 66% of the communities.

3. Findings log – WRI/WBCSD GHG Protocol & Environmental Data

Grade 1	Status 2	Finding 3	Correction, root cause & corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
MIS	Closed	LRQA noted that vacant properties are currently not reported in the GHG emissions inventory. Based on the operational control logic explained to LRQA for determining the reporting boundary, GHG emissions for these properties should be included. If AvalonBay is unable to correct and close this finding, LRQA will need documentation of the occupancy rate for CY2015 in order to determine the effect on materiality.	AvalonBay updated the energy and GHG emissions data to include emissions from vacant properties.	Vacant Properties	4/20/16	1605HM01	Chapter 3. Boundary
MMIS	Closed	LRQA noted that for approximately 30% of NG utility bills and some of the Electricity utility bills AvalonBay pays the entire bill for the buildings and then passing on these expenses in a bill to tenants. In these instances AvalonBay is reporting the Scope 1 NG combustion and Scope 2 electricity emissions in their emissions inventory. Per the operational control reporting boundary, these emissions should not be included. This could equate to over-reporting of total GHG emission by as much as 15-20%.	AvalonBay updated the energy and GHG emissions data to exclude the energy and GHG emissions associated with the bills passed on to tenants.	Boundary Determination	4/20/16	1605HM02	Chapter 3. Boundary

1. Grading of the finding * 2. New, Open, Closed 3. Description of the LRQA finding 4. Review by LRQA 5. Process, aspect, department or theme
6. Date of the finding 7. YYMM<Initials>seq.# 8. Clause of the applicable standard

* MMIS = Material Misstatement MNC = Material Nonconformity MIS = Misstatement NC = Nonconformity

Grade 1	Status 2	Finding 3	Correction, root cause & corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
MIS	Open	LRQA noted that AvalonBay is paying the bill for a number of retail spaces within their buildings. LRQA understands that if it is noted “Direct” or “Sub-metered” in columns N-T in the “AVG Retail Space Detail” tab of the Excel document entitled “AVB Retail Space Summary.xls”, then the tenant pays the utility bill. If it states “no meter” then AvalonBay pays the bill. Under the operational control boundary determination, AvalonBay should not be reporting GHG emissions related to Electricity and NG consumption for any of the occupied retail spaces. As a number of the fields under the columns mentioned above are blank, it is not clear to LRQA how large the impact of this misstatement is. It could be a material misstatement, especially in conjunction with other open findings.	AvalonBay has provided sufficient evidence to demonstrate this is not a material misstatement. It is standard practice at AvalonBay that retail spaces be direct metered for electric and gas. The blank entries are intended to be considered direct metered since that is the standard.	Boundary Determination	4/20/16	1605HM03	Chapter 3. Boundary
MNC	Closed	AvalonBay has not documented the reason for choosing CY 2013 as the base year. Also, a base year emissions re-calculation policy has not been documented.	AvalonBay created a base-year re-calculation policy which meets the requirements of the standard. It also includes sufficient explanation of the selection of CY 2013 as the base year.	Base Year	4/20/16	1605HM04	Chapter 5. Base Year

1. Grading of the finding *	2. New, Open, Closed	3. Description of the LRQA finding	4. Review by LRQA	5. Process, aspect, department or theme
6. Date of the finding	7. YYMM<Initials>seq.#	8. Clause of the applicable standard		
* MMIS = Material Misstatement	MNC = Material Nonconformity	MIS = Misstatement	NC = Nonconformity	

Grade 1	Status 2	Finding 3	Correction, root cause & corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
MMIS	Closed	During the site visit, LRQA noted that GHG emissions from construction operations are not included in the emissions inventory. This can be documented as an exclusion, as long as AvalonBay demonstrates that the total emissions from construction operations can conservatively be considered de minimis. The de minimis determination would need to take into account the materiality of any other findings that remain open at the end of verification activities. In other words, the impact of the exclusion of construction emissions combined with open findings would be considered for overall materiality.	After careful review of the Construction data, it was determined that this was a material misstatement. AvalonBay added energy data and GHG emissions from construction to its 2015 data set and recalculated its 2014 and 2013 numbers accordingly. The CRESB reporting standard states water and waste from construction operations should not be included. LRQA will clarify this differentiation in reporting boundaries in the report and assurance statement.	Boundary - Construction Emissions	4/20/16	1605HM06	Chapter 6. Identifying Emissions
MIS	Closed	LRQA noted that total Scope 2 GHG emissions reported in Measurabl does not include emissions from heat and steam.	The Measurabl system was updated to include energy data and GHG emissions from heat and steam. LRQA confirmed the update was applied to AvalonBay data.	Scope 2 Heat & Steam	6/1/16	1605SM07	Chapter 6. Identifying Emissions
MIS	Closed	The emissions factor (EF) of 0.00505 MT CO2e/therm which is used in Measurabl for converting NG therms to CO2e emissions is in error. Measurabl references TCR 2014 Default EFs as the source. Using the TCR 2014 Default EFs, Tables 12.1, 12.9 and B1 (A4), LRQA derived an EF of 0.005317 MT CO2e/therm. This error equates to total GHG emissions from NG combustion being under-reported by 5%.	The Measurabl system was updated to include the correct emission factor for NG combustion. LRQA confirmed the update was applied to AvalonBay data.	NG Combustion	6/6/16	1605DM08	Ch. 6 Calculating Emissions

1. Grading of the finding *	2. New, Open, Closed	3. Description of the LRQA finding	4. Review by LRQA	5. Process, aspect, department or theme
6. Date of the finding	7. YYMM<Initials>seq.#	8. Clause of the applicable standard		
* MMIS = Material Misstatement	MNC = Material Nonconformity	MIS = Misstatement	NC = Nonconformity	

Grade 1	Status 2	Finding 3	Correction, root cause & corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
MIS	Closed	Of the 20 communities that LRQA sampled, the following three communities are not included in the AvalonBay file entitled “2015 Gas Data v2.xls” and do not include any emissions from NG combustion in Measurabl: VA556, WAC50, WA539. LRQA also noted that there are 22 communities in total that have zero Scope 1 emissions reported in Measurabl.	AvalonBay believes these omissions of Scope 1 data to be an accurate reflection of the buildings' energy usage. There are several communities in the AvalonBay portfolio which have no gas consumption at the property. It is confirmed that VA556, WAC50 and WA539 do not have any gas consumption. There are 24 communities with no gas, propane or oil combustion on site.	NG Combustion	6/6/16	1605DM09	Ch. 6 Calculating Emissions

1. Grading of the finding *	2. New, Open, Closed	3. Description of the LRQA finding	4. Review by LRQA	5. Process, aspect, department or theme
6. Date of the finding	7. YYMM<Initials>seq.#	8. Clause of the applicable standard		
* MMIS = Material Misstatement	MNC = Material Nonconformity	MIS = Misstatement	NC = Nonconformity	

Grade 1	Status 2	Finding 3	Correction, root cause & corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
MIS	Closed	Of the 20 communities that LRQA sampled, the water data in Measurabl for the following three communities did not match data in the utility bills spreadsheet: CA101 14.64% variance (Bills=13,561 Kgal, Measurabl=11,575 Kgal), NY02213.35% variance (Bills=15,203 Kgal, Measurabl=17,232 Kgal), NY007 0.19% variance (Bills=14,713 Kgal, Measuarbl=14,685 Kgal)	LRQA recognizes there were some differences in the numbers reported in the original data files and what is now reported in Energy Star and Measurabl. When Heather was on site it was discussed that there would likely be additional changes because the data clean-up process was on going. The data in Measurabl matches the updated water data file. The change at CA101 was due to a 2015 rebill. The water file provided to LQRA has annual usage of 14,685 Kgal for NY007. The source of the 14,713 Kgal number was unknown. The consumption of 15,203 Kgal at NY022 only covered through October 2015. At the time of the LRQA site visit, AvalonBay did not have full month November or December data. The usage for the two remaining months was estimated by using the 2014 November and December water consumption numbers at NY022.	Water	6/6/16	1605DM10	Accuracy

1. Grading of the finding *	2. New, Open, Closed	3. Description of the LRQA finding	4. Review by LRQA	5. Process, aspect, department or theme
6. Date of the finding	7. YYMM<Initials>seq.#	8. Clause of the applicable standard		
* MMIS = Material Misstatement	MNC = Material Nonconformity	MIS = Misstatement	NC = Nonconformity	

4. Verification plan and schedule

Headquarters Visit Agenda

Verification type	Verification criteria
GHG Emissions Inventory	**WBCSD/WRI GHG Protocol**

Verification team	Site Visit date
Heather Moore	**April 20, 2016**

Avalon Bay

Arlington - 9th Floor Medium Conference Room (cap. 12)

Participants: Mark Delisi, Sunita Jofferion, Parker Smith, Christina Wilson

11:00 AM LRQA On-Site

Introductions

a. Organizational Boundary
   1. Consolidation Method
   2. Facilities included
   3. Acquisitions/Divestitures
   4. Exclusions

b. Operational Boundary
   1. Identification of GHG Emission Sources
   2. Ensuring continued completeness

c. GHG Protocol Checklist

Data Management and Calculation Processes

a. Review Data Management Process
   1. GHG/Energy
   2. Water
   3. Waste

b. Review QA/QC Processes

c. GHG Quantification Methodologies / Emission Factors

12:00 PM Working Lunch

Continuation of Review / Sampling

3:30 PM LRQA Closing Meeting / Questions / Next Steps

4:00 PM LRQA Off-Site

Avalon Bay Communities, Inc.

ISO 14064 Greenhouse Gas Emissions Inventory, CY CY 2015

Verification Plan

2/22/2016

Verification Objectives:	To provide Avalon Bay Communities, Inc. (Avalon Bay) with an independent opinion on the completeness of the data and information being submitted to CDP.

Verification Criteria:		
	Protocols and Standards:	WRI/WBCSD GHG Protocol
		ISO 14064-3 (Varification standard)
Verification Scope:		
	Description of Industry/Sources:	REIT which owns, operates, develops and re-develops multi-family communities.
	Geographic Boundaries:	North America
	Reporting Period:	CY 2015
	Greenhouse Gas Verified:	CO2, CH4, N2O, HFCs, PFCs, SF6, Energy use, Water use, Waste (subset)
	Scopes covered:	Scope 1 and 2
	Reporting Basis:	Financial control
Level of Assurance:		Limited
Materiality Threshold:		
	Professional judgement of the verifier	
LRQA Verification Team:		
	Lead Verifier:	Derek Markolf
	Verifer:	Heather Moore
	Technical Reviewer (QA/QC):	Madlen King
Verification Activities and Schedules:		
	Scheduled for week of:	Task
	February 22, 2016	Kick-Off Meeting
	March 7, 2016	**Delivery to GHG Inventory & Environmental data to LRQA**
	March 14, 2016	Strategic Review / Risk Assessment
	March 14, 2016	Initial Data Request
	April 20, 2016	**Initial Data submitted to LRQA**
	April 20, 2016	Site Visit
	May 9, 2016	Final data submitted to LRQA
	May 23, 2016	LRQA Final Review
	June 6, 2016	Delivery of Final List of Findings
	June 6 & June 13, 2016	**Client to address Findings**
	June 20, 2016	LRQA to conduct internal Technical Review and Assurance Statement Review
	June 20, 2016	Delivery of Final Verification Report and Verification Statement

Verification Plan approval:

Name:	Derek Markolf
Date:	February 19, 2016
Revision Date:	February 22, 2016
Revision Date:	May 22, 2016

*Plan must be approved by the Lead Verifier

5. Data and Information Sampling Plan

Verification type	Verification criteria
GHG Protocol & Environmental Data	**GHG Protocol and AvalonBay environmental data management processes**

Verification team	Verification dates	Issue date
Derek Markolf – Lead Verifier **Heather Moore - Verifier**	**February – June 2016**	**6/20/16**

Sampling Code #	Item to be Sampled	Data and Information Requirement (evidence gathering plan)	Lead Verifier Reasoning
01	Scope 2 GHG Emissions & Electricity Use	Check total CY 2015 elect. utility bill data against Measurabl GHG emissions for 20 communities. Divide Measurabl Scope 2 GHG emissions by utility bill elctricity use and confirm results in correct eGRID EF.	This will check revenue metered data from utility bills (first tier of data aggregation) against final data in Measurabl used for reporting total GHG emissions (final tier of data aggregation). Will also confirm correct EFs used.
02	Scope 1 GHG Emissions from NG combution.	Check total CY 2015 NG utility bill data against Measurabl GHG emissions for 20 communities. Divide Measurabl Scope 1 GHG emissions by NG consumption and confirm results in correct EF for NG combustion.	This will check revenue metered data from utility bills (first tier of data aggregation) against final data in Measurabl used for reporting total GHG emisisons (final tier of data aggregation). Will also confirm correct EFs used.
03	Water Data	Check total CY 2015 water utility bill data against Measurabl water consumption for 20 communities.	This will check revune metered data from utility bills (first tier of data aggregation) against final data in Measurabl used for reporting.
04	Total GHG Emissions calculated in Measurabl	Confirm all GHG emisisons source categories are included in Measurabl calculated GHG emissions.	High level check of aggregate Scope 1 and Scope 2 activity data against aggregate GHG emissions calculated in Measurabl.
05	Construction energy use and GHG emissions.	Confirm de minimis	During SV found construction emissions not included in inventory.

06	Waste	(1) Confirm each tab in waste spreadsheet is direct from the hauler's data tracking system. (2) Confirm summary calculations are performed accurately in the waste spreadsheet. (3) Confirm percent coverage of the waste data is accurately calculated. (4) Confirm total waste in summary spreadsheet matches totals in Measurabl and correct units used.	Waste measured and billed by haulers is relatively straightforward, as the date is straight from the haulers billing systems.
07	Boundaries	Confirm operational control (GHG emissions) and financial control (water & waste) are accurately applied throughout all communities.	There was some confusion during the site visit about application of boundaries.