CLIENT & VERIFICATION BODY

Client

TSMC Washington, LLC

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Verification Body

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Assurance	Limited assurance - where the nature and extent of the verification activities have been designed to provide a reduced level of assurance on historical data and information (ISO 14064-3:2019, 3.6.7)
Audit Type	Streamlined

SUBJECT

AWM has verified the GHG emissions in the responsible party's GHG statement for the period of 1/1/2023 to 12/31/2023, which comprise the following:

- Scope 1: Process & Stationary Equipment
- Scope 2: Electricity
- Scope 3: Upstream & Downstream
- Carbon Offsets for Scope 1
- RECs for Scope 2

Responsibilities of the client

The responsible party is responsible for the preparation and fair presentation of the GHG statement in accordance with the criteria specified in this report. This includes designing, implementing and maintaining a data management system relevant to the preparation and fair presentation of a GHG statement that is free from material misstatement.

Responsibilities of AWM

AWM's responsibility is to express an opinion on the GHG inventory based on our verification. AWM conducted our verification in accordance with ISO 14064-3. This requires that we comply with ethical requirements and plan and perform the verification to obtain the agreed upon level-of-assurance that the GHG emissions in the GHG statement are free from material misstatement.

EVIDENCE GATHERING PROCEDURES

Results of the risk assessment

Strategic analysis

AWM did not identify any material risk from items such as the verification sector, scope of the client and the verification, or significant changes in the client.

Risk assessment

AWM did not identify any material risk to the objectives of this verification as a result of the client's GHG management system or data collection systems.

Site visit requirements

No site visit was required due to the results of the risk analysis. Specific reasons include: limited-assurance type, previous GHG verification experience, previous on-site experience for ISO 14001 and no significant changes.

Description of the verification work

Per the results of the risk analysis, AWM conducted a recalculation of a sampling of TSMC Washington's RY2023 inventory based upon the following: invoices records, gas usage records, Scope 3 records, and RECs & Carbon Offset retirements. The results of this recalculation are as follows:

Recalculation results

Scope 1

Activity	AWM	Client	Difference	% Diff	% Material	Sample %
Stationary Combustion: Natural Gas	14,659.99	14,660.20	-0.21	0.0%	0.0%	19.1%
Process: CF4	13,083.33	13,083.60	-0.27	0.0%	0.0%	17.0%
Process: N2O	6,144.20	6,144.30	-0.10	0.0%	0.0%	8.0%
Process: SF6	11,120.08	11,119.62	0.46	0.0%	0.0%	14.5%
Process: HTF	12,817.45	12,817.19	0.26	0.0%	0.0%	16.7%
Total			*0.14*		*0.0%*	*75.2%*
				Normalized:	0.0%	100.0%

Scope 2 - Location

Activity	AWM	Client	Difference	% Diff	% Material	Sample %
Purchased Electricity	42,350.72	42,350.48	0.24	0.0%	0.0%	100.0%
Total			*0.24*		*0.0%*	*100.0%*
				Normalized:	0.0%	100.0%

Scope 3

Activity	AWM	Client	Difference	% Diff	% Material	Sample %
Employee Commuting	525.27	525.84	-0.57	-0.1%	0.0%	1.1%
Work Related Travel	36.46	36.68	-0.22	-0.6%	0.0%	0.1%
Waste & Wastewater	827.03	827.03	0.00	0.0%	0.0%	1.7%
Downstream Transportation & Distribution	14.57	14.63	-0.06	-0.4%	0.0%	0.0%
Purchased Goods & Services	47,156.55	47,156.55	0.00	0.0%	0.0%	97.1%
Total			*0.00*		*0.0%*	*100.0%*
				Normalized:	0.00%	100.00%

RECs & Offsets

Activity	AWM	Client	Difference	% Diff	% Material	Sample %
Scope 1 - Carbon Offsets / ACR credits retired exceed the Client Scope 1 emissions.	-78,178.00	-78,718.00	540.00	-0.7%	-0.4%	100.0%
Scope 2 - RECs retired exceed the Client Scope 2	-42,596.98	-42,350.48	-246.51	0.6%	0.2%	100.0%

Based upon the percent sampled, low normalized percent material difference, varied emissions types, and site visit experience no additional sampling was determined to be required.

VERIFICATION OPINION

AWM has determined that the client's emissions report for the year of 2023 may be **Verified without qualifications.**

Discrepancies found during this verification total less than the materiality threshold of 5% each for Scope 1, Scope 2, Scope 3, RECs & Offsets.

VERIFICATION TEAM AND OBSERVERS

Team Leader	Andrew Machalick
Team	Rob Ellis
Peer Reviewer	Richard Ellis

SUMMARY GHG STATEMENT

Reference: TSMC WA ROW EY2023 Scope 1 Emissions Summary (IPCC) Rev 2. 3-25-24

Emission Type	MT CO2e
Total Scope 1	76,851.15
Total Carbon Offsets	-78,718.00
Total Scope 2 Location	42,350.48
Total RECs	-42,350.48
Total Scope 3	48,560.73

CRITERIA

Criteria for this verification were:

- ☐ The Climate Registry
  - ☐ General Reporting Protocol (v3.0, May 2019)
  - ☐ General Verification Protocol (v2.1, June 2014)
  - ☐ GVP Updates and Clarifications (October 2019)
- ☑ ISO 14064-1:2018 Part 1: Greenhouse gases — Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals
- ☐ Ontario Regulation 390/18 Greenhouse Gas Emissions: Quantification, Reporting, and Verification
- ☑ the client's GHG management system

VERIFICATION SCOPE

Boundaries (ISO 14043-3:2019, 5.1.6.a)

TSMC Washington (TSMC FAB 11) is a wholly owned Subsidiary of Taiwan Semiconductor (TSMC), located at 5509 NW Parker St. Camas, WA. Operational boundaries are the property boundaries and include the onsite Gas Yard.

Facilities, physical infrastructure, activities, technologies, and processes (ISO 14043-3:2019, 5.1.6.b):

TSMC Washington manufactures integrated circuits (ICs) for customers. No research or design is performed at this facility. TSMC Washington is a 200mm fab, with a diverse portfolio of semiconductor processing technologies. Customers products include computers, cellular phones, computer game consoles, telephone switches, MP3 players, DVD players, cameras and automotive.

GHG sinks, sources, and reservoirs (ISO 14043-3:2019, 5.1.6.c)

Fluorinated GHGs and N2O purchased for the semiconductor manufacturing production process, byproducts from these gases during the production process, fluorinated GHGs emitted from heat transfer fluid use and CO2, CH4 and N2O combustion emissions from stationary equipment.

Types of GHGs (ISO 14043-3:2019, 5.1.6.d)

CO2, CH4, N2O, HFCs, PFCs, SF6, NF3, HTFs

Time period (ISO 14043-3:2019, 5.1.6.e)

1/1/2023 - 12/31/2023

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

Remote Verification

An online video conferencing system (Microsoft Teams) was utilized to conduct the remote verification, including displaying documents and records, conducting interviews, and conducting site tours as necessary.

It is the opinion of the audit team that the use of ICT was effective in achieving the verification objectives.

APPROVAL

Lead Verifier

Apr 03 2024 16:32 EDT

Date

5 GHG inventory boundaries

5.1 Organizational boundaries	NC	Auditor Notes
The organization shall define its organizational boundaries.		TSMC Washington has defined its organizational boundaries within Section 6.4 of the FAB11 GREEN HOUSE GAS MANAGEMENT PLAN C.I. (A-RMS-02-03-013, Version 18).
The organization may comprise one or more facilities. Facility-level GHG emissions or removals may be produced from one or more GHG sources or sinks.		TSMC Washington reports as a single facility with multiple GHG sources within the site boundary.
The organization shall consolidate its facility-level GHG emissions and removals by one of the following approaches:		n/a
a) control: the organization accounts for all GHG emissions and/or removals from facilities over which it has financial or operational control;		TSMC Washington consolidates its facility-level GHG emissions by the control approach.
b) equity share: the organization accounts for its portion of GHG emissions and/or removals from respective facilities.		n/a
The consolidation approach shall be consistent with the intended use of the GHG inventory.		Use of the control approach is consistent with the use of the inventory (emissions the site is responsible for).
The organization may use different consolidation approaches in the case of multiple reporting goals and requirements defined, for example, by the GHG programme, legal contract or different types of intended users.		TSMC Washington is not using different control approaches.
When a facility is owned or controlled by several organizations, these organizations should adopt the same consolidation approach for that facility. The organization shall document and report which consolidation approach it applies.		TSMC Washington is wholy owned by TSMC.
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5.2 Reporting boundaries	NC	Auditor Notes
5.2.1 Establishing reporting boundaries		
The organization shall establish and document its reporting boundaries, including the identification of direct and indirect GHG emissions and removals associated with the organization's operations.		Operational boundaries are defiend in section 6.4, including a list of exclusions (Other TSMC Sites, offsite chemical storage, mobile sources).
5.2.2 Direct GHG emissions and removals		
The organization shall quantify direct GHG emissions separately for CO2, CH4, N2O, NF3, SF6 and other appropriate GHG groups (HFCs, PFCs, etc.) in tonnes of CO2e.		Section 6.5 of the GHGMP describes the direct GHG emissions. Emissions are quantified separately for each GHG group in MT CO2e (e.g. process gases, stationary equipment, etc.).
The organization should quantify GHG removals.		No removals are quantified (although ACR Credits have been purchased as offsets).
5.2.3 Indirect GHG emissions		
The organization shall apply and document a process to determine which indirect emissions to include in its GHG inventory.		Section 6.6 describes the indirect GHG emissions as imported electricity.
As part of this process, the organization shall define and explain its own pre-determined criteria for significance of indirect emissions, considering the intended use of the GHG inventory.		Section 6.6 defines the indirect GHG emissions selected to be included in the inventory (electricity).
Whatever the intended use is, criteria should not be used to exclude substantial quantities of indirect emissions or evade compliance obligations.		No substantial quantities of indirect emissions are excluded.
Using those criteria, the organization shall identify and evaluate its indirect GHG emissions, to select the significant ones.		As stated, electricity has been selected as the indirect emission source included.
The organization shall quantify and report these significant emissions. Exclusions of significant indirect emissions shall be justified.		Emissions from electric consumption are included in the 2023 inventory.
The criteria to evaluate significance may include the magnitude/volume of the emissions, level of influence on sources/sinks, access to information and the level of accuracy of associated data (complexity of organization and monitoring). A risk assessment or other procedures (e.g. buyer requirements, regulatory requirements, concern of interested parties, scale of operation, etc.) may be used (see ISO 13065). More guidance is provided in Annex H.		Electric consumption is the significant contributor to indirect emissions.
The criteria for evaluating the significance may be periodically revised. The organization should retain documented information about the revisions.		The GHGMP is reviewed annually.
5.2.4 GHG inventory categories		
GHG emissions shall be aggregated into the following categories at the organizational level:		The 2023 GHG inventory continues to aggregate emissions into categories, including:
a) direct GHG emissions and removals;		direct GHG emissions (process, stationary)
b) indirect GHG emissions from imported energy; indirect GHG emissions from transportation; indirect GHG emissions from products used by organization; indirect GHG emissions associated with the use of products from the organization; indirect GHG emissions from other sources.		indirect GHG emissions from imported energy (electricity)
c) indirect GHG emissions from transportation;		n/a
d) indirect GHG emissions from products used by organization;		n/a

e) indirect GHG emissions associated with the use of products from the organization;	n/a
f) indirect GHG emissions from other sources.	n/a
In each category, non-biogenic emissions, biogenic anthropogenic emissions and, if quantified and reported, biogenic non-anthropogenic emissions shall be separated (see Annex D).	No biogenic emissions.
The organization should document the above categories separately at the facility level.	Categories are listed as seperate line items in the inventory.
GHG emissions should be further subdivided into subcategories consistent with the above categories. An example of subcategories is provided in Annex B.	Process emissions (direct) are further borken down by gas type (CF4, C2F6, CHF3, N2O, SF6, C4F8, NF3, C3F8, CH2F2, CH3, CO2, HTFs).
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6 Quantification of GHG emissions and removals

6.1 Identification of GHG sources and sinks	NC	Auditor
The organization shall identify and document all relevant GHG sources and sinks included in its reporting boundaries. The organization shall include all relevant GHGs.		GHG emissions and removals are recorded in section 6 of the GHGMP.
GHG sources and sinks shall be identified in accordance with the categories defined in 5.2.4.		AWM confirmed thorughout this verification that GHG sources have been identified in accordance with the categories defined in 5.2.4.
If the organization quantifies GHG removals, the organization shall identify and document GHG sinks contributing to its GHG removals.		n/a
The detail with which sources and sinks are identified and categorized shall be consistent with the quantification approach used.		AWM confirmed throughout this verification that the detail with which the sources and sinks are identified is consistent with the quantification approach.
The organization may exclude GHG sources or sinks for which the contribution to GHG emissions or removals is not relevant. It shall identify and explain why the GHG sources or sinks are excluded in accordance with the categories and any categorical subdivisions included in the report (see 5.2.3).		No mobile sources are included in the WaferTech GHG inventory as described in section 6.6.1 of the GHGMS (not reportable to EPA).
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6.2 Selection of quantification approach	NC	Auditor
6.2.1 General		
The organization shall select and use quantification methodologies that minimize uncertainty and yield accurate, consistent and reproducible results.		AWM confirmed via recalcilation that TSMC Washington is using quantification methodologies that minimiuze uncertainty and yield accurate, consistent, and reproducable results. In addition, section 6.8 of the GHGMP addresses TSMC Washington's assessment of uncertainty per input, data source, and estimated risk (e.g. Purchasing data for C4F8, CF4, C2F6, CH2F2, CHF3, N2O & SF6 cylinders is <1% estimated risk).
The quantification approach should also consider technical feasibility and cost.		These methodologies consider technical feasibility and cost (not relevant).
The organization shall explain and document its quantification approach and any changes inquantification approach.		Section 6.7 of the GHGMS explains and documents TSMC Washington's quantification approach.
6.2.2 Data selection and collection used for quantification		
The organization shall identify and document its data for each source or sink classified as direct or indirect emissions and removals. It shall determine and document the characteristics for each relevant data used for quantification (see 5.2.3).		Section 6.7.1 documents the data source for each input.
Annex C provides guidance on the selection and collection of data used for quantification.		n/a.
6.2.3 Selection or development of GHG quantification model		
Except in the case of measurement of emissions and removals, the organization shall select or develop models for the quantification approach.		TSMC Washington is using direct measurement for emissions and removal (input gases).
A model is a representation of how the source or sink data used for quantification are converted into emissions or removals. A model is a simplification of physical processes that has assumptions and limitations.		n/a
The organization shall explain and document the justification for the selection or development of the model, considering the following model characteristics:		n/a
a) how the model accurately represents the emissions and removals;		n/a
b) its limits of application;		n/a
c) its uncertainty and rigour;		n/a
d) the reproducibility of results;		n/a
e) the acceptability of the model;		n/a
f) the origin and level of recognition of the model;		n/a
g) the consistency with the intended use.		n/a
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6.3 Calculation of GHG emissions and removals	NC	Auditor
The organization shall calculate GHG emissions and removals in accordance with the quantification approach selected (see 6.2).		Attachment 15 records TSMC Washington's 2023 calculations in accordance with the quantification approach selected.
The period for which GHG emissions and removals have been calculated shall be reported.		TSMC Washington reports emissions annually (calendar year).
The organization shall convert the quantity of each type of GHG to tonnes of CO2e using appropriate GWPs.		Attachment 15 references TSMC Washington's inventory in tonnes of CO2e. AWM verified appropriate GWPs were used.
The latest IPCC's GWP should be used. If not, justification shall be provided. The GWP time horizon shall be 100 years. Other GWP time horizons may be used, but reported separately.		See above.
The organization shall quantify biogenic emissions or removals in accordance with Annex D.		No biogenic emissions reported for RY2023.
The organization shall quantify emissions or removals from imported electricity that is consumed by the organization, and of exported electricity generated by the organization, in accordance with Annex E.		Electricity consumption was quantified in the RY2023 inventory, and there was no electricity exported from generation.
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6.4 Base-year GHG inventory	NC	Auditor
6.4.1 Selection and establishment of base year		
The organization shall establish a historical base year for GHG emissions and removals for comparative purposes or to meet GHG programme requirements or other intended uses of the GHG inventory.		TSMC Washington has selected 2011 as the baseline year (as stated in section 1.1 of the GHGMS).
Base-year emissions or removals may be quantified based on a specific period (e.g. a year or part of a year where seasonality is a feature of the organization's activity) or averaged from several periods (e.g. several years).		This baseline year is quantified on the same calendar year basis as all other inventory years.
If sufficient information on historical GHG emissions or removals is not available, the organization may use its first GHG inventory period as the base year.		Reporting year 2011 was the first year reported under the ISO 14064-1 GHGMS.
In establishing the base year, the organization:		Section 6.10 of the GHGMP records TSMC Washington's decision on selecting 2011 as the base-year inventory, in addition to criteria which may trigger a new baseline. There has been no change to baseline.
a) shall quantify base-year GHG emissions and removals using data representative of the organization's current reporting boundary, typically single-year data, a consecutive multi-year average or a rolling average;		See above.
b) shall select a base year for which verifiable GHG emissions or removals data are available;		See above.
c) shall explain the selection of the base year;		See above.
d) shall develop a GHG inventory for the base year consistent with the provisions of this document.		See above.
The organization may change its base year, but shall justify any change to the base year.		See above.
6.4.2 Review of base-year GHG inventory		
To ensure the representativeness of the base-year GHG inventory, the organization shall develop, document and apply a base-year review and recalculation procedure to account for substantial cumulative changes in base-year emissions resulting from:		As stated in 6.10.2 of the GHGMP, TSMC Washington has established a set of criteria prompting recalcuation of the base-line inventory (e.g. EPA revised GHG reporting regulations require changed reporting for 2011 GHG emissions).
a) a structural change in reporting or organizational boundaries (i.e. merger, acquisition or divestiture), or		See above.
b) a change in calculation methodologies or emission factors, or		See above.
c) the discovery of an error or a number of cumulative errors that are collectively substantial.		See above.
The organization shall not recalculate its base-year GHG inventory to account for changes in facility production levels, including the closing or opening of facilities.		n/a
The organization shall document base-year recalculations in subsequent GHG inventories.		RY2011 baseline calculations are included in the GHGMP as Attachment 1.
	0	

7 Mitigation activities

7.1 GHG emission reduction and removal enhancement initiatives	NC	Auditor
The organization may plan and implement GHG reduction initiatives to reduce or prevent GHG emissions or enhance GHG removals.		Reductions are described in Section 6.9.6 of the GHGMP - GHG Emission Reductions and Removal Actions.
If implemented, the organization should quantify GHG emission or removal differences attributable to the implementation of GHG reduction initiatives.		Example: In 2023, TSMC Washington converted several chillers from using a high GWP f-HTF to Opteon SF10, which has a GWP ranging from 1-2.5 depending on methodology used to determine emissions. TSMC Washington will convert the remaining chiller to SF10 in 2024-2025 which will avoid several thousand MTCO2e of emissions annualy.
If quantified and reported, the organization shall document GHG reduction initiatives and associated GHG emission or removal differences separately, and shall describe:		Reductions are described in Section 6.9.6.

a)	the GHG reduction initiatives;	see above.
b)	the spatial and temporal boundaries of the GHG reduction initiatives;	see above.
c)	the approach (appropriate indicators) used to quantify GHG emission or removal differences;	see above.
d)	the determination and classification of GHG emission or removal differences attributable to GHG reduction initiatives as direct or indirect GHG emissions or removals.	see above.
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7.2 GHG emission reduction or removal enhancement projects	NC	Auditor
If the organization reports offsets purchased or developed, the organization shall list such offsets separately from GHG reduction initiatives.		Per GHGMP section 6.9.6.10 - In 2020-2023 TSMC Washington purchased Green-e Renewable Energy Certificates for 100% of their energy usage (Scope 2). Also, 6.9.6.11 - In 2022 and 2023, TSMC Washington purchased Carbon Offsets to offset 100% of its direct emissions (Scope 1).
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7.3 GHG emission reduction or removal enhancement targets	NC	Auditor
The organization may set targets to reduce GHG emissions.		No GHG reduction targets have been set for RY2023.
If the organization reports a target, the following information shall be specified and reported:		n/a
— period covered by the target, including the target reference year and the target completion year;		n/a
— type of target (intensity or absolute);		n/a
— category of emissions included in the target;		n/a
— the amount of reduction and its unit expressed in accordance with the type of target. For setting the target, the following criteria should be considered:		n/a
— climate science;		n/a
— reduction potential;		n/a
— international, national context;		n/a
— sectorial context (e.g. voluntary sectorial commitment, cross-sectorial effect).		n/a
	0	

8 GHG inventory quality management

8.1 GHG information management	NC	Auditor
8.1.1 The organization shall establish and maintain GHG information management procedures that:		See below:
a) ensure conformity with the principles of this document;		The GHGMP overall contains these procedures, specifically Section 6.11 GHG Information Management, and the FAB11 EMS Records Managment O.I.
b) ensure consistency with the intended use of the GHG inventory;		see above
c) provide routine and consistent checks to ensure accuracy and completeness of the GHG inventory;		Section 6.12 Auditing & Verification, Section 6.13 Management Review, and Section 6.14 Corrective Action define these checks.
d) identify and address errors and omissions;		see above
e) document and archive relevant GHG inventory records, including information management activities and GWPs.		Section 6.11.12 Records Management and Reducing Uncertainty contains information on retention of records, which were available as requested during the re-calculation.
8.1.2 The organization's GHG information management procedures shall document their consideration of the following:		See below:
a) identification and review of the responsibility and authority of those responsible for GHG inventory development;		Section 6.11.3.3 states the The EH&S Manager & Facilities Director are responsible for the final review and approval for the GHG emission reports.
b) identification, implementation and review of appropriate training for members of the inventory development team;		Section 6.11.3 covers formal and informal training for identified roles in preparing the report
c) identification and review of organizational boundaries;		Section 6.12 states that the GHGMP is internally audited annually.
d) identification and review of GHG sources and sinks;		Section 6.12 states that the GHGMP is internally audited annually.
e) selection and review of quantification approaches, including data used for quantification and GHG quantification models that are consistent with the intended use of the GHG inventory;		Section 6.12 states that the GHGMP is internally audited annually.
f) review of the application of quantification approaches to ensure consistency across multiple facilities;		Section 6.12 states that the GHGMP is internally audited annually.

g) use, maintenance and calibration of measurement equipment (if applicable);		Section 6.9 Data Management contains information on collection of data
h) development and maintenance of a robust data-collection system;		Section 6.9 Data Management contains information on collection of data
i) regular accuracy checks;		Section 6.12 states that the GHGMP is internally audited annually.
j) periodic internal audits and technical reviews;		Section 6.12 states that the GHGMP is internally audited annually.
k) periodic review of opportunities to improve information management processes.		Section 6.13 states that the IMP will be reviewed by senior management annually.
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8.2 Document retention and record keeping	NC	Auditor
The organization shall establish and maintain procedures for document retention and record keeping.		TSMC Washington references A-RMS-08-03-156 FAB11 EMS RECORDS MANAGEMENT O.I. for document and records management.
The organization shall retain and maintain documentation supporting the design, development and maintenance of the GHG inventory to enable verification. The documentation, whether in paper, electronic or other format, shall be handled in accordance with the organization's GHG information management procedures for document retention and record keeping.		Section 6.9 Data Management lays out processes for maintaining information on the GHG inventory. Per verification activities, all required documentation was available to complete re-calculations.
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8.3 Assessing uncertainty	NC	Auditor
The organization shall assess the uncertainty associated with the quantification approaches (e.g. data used for quantification and models) and conduct an assessment that determines the uncertainty at the GHG inventory category level.		Uncertainty is assessed in Section 6.8 Assesssment of Uncertainty.
Where quantitative estimation of uncertainty is not possible or cost effective, it shall be justified and a qualitative assessment shall be conducted.		Quantitative estimates are available for each, ranging from <1% (purchasing records) to 15% (facilities trends and kitchen use assumptions).
The organization may apply the principles and methodologies of ISO/IEC Guide 98-3 in completing the uncertainty assessment.		n/a
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9 GHG reporting

9.1 General	NC	Auditor
The organization should prepare a GHG report, consistent with the intended uses of the GHG inventory, to facilitate GHG inventory verification. For example, a GHG report may be necessary for participation in a GHG programme or to inform external or internal users.		TSMC Washington has prepared a report in accordance with procedures and included as Attachment 15.
A GHG report shall be prepared if the organization chooses to have its GHG inventory verified or makes a public GHG statement claiming conformity with this document.		see above.
GHG reports shall be complete, consistent, accurate, relevant, transparent and planned in accordance with 9.2.		Per review of the program and verification of the data, the GHG report was complete and accurate.
If the organization's GHG statement has been independently (third-party) verified, the verification statement shall be made available to intended users.		TSMC Washington provides the verification statement to the intended user of TSMC.
If confidential data are withheld from inclusion in a GHG report, this shall be justified. If the organization decides to prepare a GHG report, 9.2 and 9.3 apply.		No confidential data is withheld from the report.
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9.2 Planning the GHG report	NC	Auditor
The organization shall explain and document the following in planning its GHG report:		See below:
a) purpose and objectives of the report in the context of the organization's GHG policies, strategies or programmes, and applicable GHG programmes;		GHGMP purpose and objectives are included in Section 1.
b) intended use and intended users of the GHG inventory;		GHGMP intended use and users are documented in Section 6.15 Reporting of GHG (US EPA and WA State, Department of Ecology, and TSMC).
c) overall and specific responsibilities for preparing and producing the report;		The responsibilities preparing and producting the report are assigned to an EH&S Engineer, per GHGMP Section 6.15.3.
d) frequency of the report;		GHGMP Section 6.15 defines this as annually.
e) report structure and format;		GHGMP Section 6.15.3 defines the structure and format: 6.15.3.1 Direct emissions, quantified separately by GHG and by-product, 6.15.3.2 Heat transfer fluid emissions, 6.15.3.3 Stationary (combustion) equipment emissions, 6.15.3.4 Indirect GHG emissions from electricity, 6.15.3.5 Explanations of any change to the base year or other historical GHG data.
f) data and information to be included in the report;		see above

g)	policy on availability and methods of dissemination of the report.	see above
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9.3 GHG report content	NC	Auditor
9.3.1 Required information		
The organization's GHG report shall describe the organization's GHG inventory. Its content may be structured as recommended in Annex F.		see below
GHG report content shall include the following:		see below
a) description of the reporting organization;		Included in section 2 Scope.
b) person or entity responsible for the report;		Section 6.11.3.3 - The EH&S Manager & Facilities Director are responsible for the final review and approval for the GHG emission reports.
c) reporting period covered;		2023 - Attachment 15
d) documentation of organizational boundaries (5.1);		Included in section 2 Scope.
e) documentation of reporting boundaries, including criteria determined by the organization to define significant emissions;		Included in section 2 Scope, Section 6.4 Operational Boundaries.
f) direct GHG emissions, quantified separately for CO2, CH4, N2O, NF3, SF6 and other appropriate GHG groups (HFCs, PFCs, etc.) in tonnes of CO2e (5.2.2);		Section 6.7 contains mentions of all of these - confirmed through report review.
g) a description of how biogenic CO2 emissions and removals are treated in the GHG inventory and the relevant biogenic CO2 emissions and removals quantified separately in tonnes of CO2e (see Annex D);		No biogenic sources or removals.
h) if quantified, direct GHG removals, in tonnes of CO2e (5.2.2);		No removals.
i) explanation of the exclusion of any significant GHG sources or sinks from the quantification (5.2.3);		No significant sources were excluded.
j) quantified indirect GHG emissions separated by category in tonnes of CO2e (5.2.4);		Recorded in Attachment 15.
k) the historical base year selected and the base-year GHG inventory (6.4.1);		The base-year selection of 2011 is defined in Section 6.10.
l) explanation of any change to the base year or other historical GHG data or categorization and any recalculation of the base year or other historical GHG inventory (6.4.1), and documentation of any limitations to comparability resulting from such recalculation;		No changes have been made to the base year.
m) reference to, or description of, quantification approaches, including reasons for their selection (6.2);		Section 6.7 Quantification of GHG Emissions & Removals defines these approaches.
n) explanation of any change to quantification approaches previously used (6.2);		No changes have been made to the quantification approaches for RY2022.
o) reference to, or documentation of, GHG emission or removal factors used (6.2);		No removals are made.
p) description of the impact of uncertainties on the accuracy of the GHG emissions and removals data per category (8.3);		Uncertainties are detailed in Section 6.8 Assessment of Uncertainty.
q) uncertainty assessment description and results (8.3);		Uncertainties are detailed in Section 6.8 Assessment of Uncertainty.
r) a statement that the GHG report has been prepared in accordance with this document;		Section 1 Purpose lists ISO 14064-1 as a criteria for reporting.
s) a disclosure describing whether the GHG inventory, report or statement has been verified, including the type of verification and level of assurance achieved;		n/a - per this report.
t) the GWP values used in the calculation, as well as their source. If the GWP values are not taken from the latest IPCC report, include the emissions factors or the database reference used in the calculation, as well as their source.		GWPs are included in Attachment 15.
9.3.2 Recommended information		
The organization should consider including in the GHG report:		Considerations were made to include recommended information where applicable. For example, EHS policy is include in Section 6.2 Environmental, Health and Safety Policy.
a) description of the organization's GHG policies, strategies or programmes;		See above.
b) if appropriate, description of GHG reduction initiatives and how they contribute to GHG emission or removal differences, including those occurring outside organizational boundaries, quantified in tonnes of CO2e (7.1);		See above.
c) if appropriate, purchased or developed GHG emission reductions and removal enhancements from GHG emission reduction and removal enhancement projects, quantified in tonnes of CO2e (7.2);		See above.
d) as appropriate, description of applicable GHG programme requirements;		See above.
e) GHG emissions or removals disaggregated by the facility;		See above.
f) total quantified indirect GHG emissions;		See above.
g) description and presentation of additional indicators, such as efficiency or GHG emission intensity (emissions per unit of production) ratios;		See above.
h) assessment of performance against appropriate internal and/or external benchmarks;		See above.
i) description of GHG information management and monitoring procedures (8.1);		See above.

j) GHG emissions and removals from the previous reporting period;	See above.
k) if appropriate, explanation of GHG emissions differences between the present inventory and the previous one.	See above.
The organization may aggregate direct emissions and direct removals.	n/a
9.3.3 Optional information and associated requirements	
The organization may report optional information separately from the required information and the recommended information. Each type of optional information described below should be reported separately from the others.	see below
The organization may report the results of contractual instruments for GHG attributes (market based approach), expressed in GHG emissions (tCO_2e) as well as in the unit of transfer (e.g. kWh). The organization may report the amount purchased compared to the amount consumed.	RECs were purchased to offset electrical consumption.
The organization may report offsets or other types of carbon credits. If so, the organization:	Carbon Offsets were used for Scope 1 emissions.
— shall disclose the GHG scheme under which they were generated;	Described in section 6.3 of the GHGMP (i.e. TSMC Washington will use recognized methodologies outlined in this document to determine Scope 1 and Scope 2 emissions. Residual Scope 1 emissions will be offset through the purchases and retirement of carbon offsets.)
— may add offsets or other types of carbon credits together if they originate from the same GHG scheme and are of appropriate vintage;	n/a
— shall not add or subtract offsets or other types of carbon credits from the organization's inventory of its direct or indirect emissions.	n/a
The organization may report GHGs stored in GHG reservoirs.	n/a
0	

10 Organization's role in verification activities

10 Organization's role in verification activities	NC	Auditor
The organization may decide to conduct a verification.		AWM has been contracted to conduct an independant verfiication of EY2023 data.
To review GHG emissions and removals information, impartially and objectively, the organization shall conduct a verification consistent with the needs of the intended user. Principles and requirements are described in ISO 14064-3.		Per AWM's verification program.
Requirements for verification bodies are described in ISO 14065.		Per AWM's verification program.
Requirements for the competence of validation teams and verification teams are described in ISO 14066.		Per AWM's verification program.
0		

Site	Source	Status	Issue / CA
Risk Analysis			
none			
Calculations			
Scope 1	Natural Gas	Closed	Per review of NW Natural invoices and "TSMC WA AR5 NG 2023" Subpart C calculations, fuel input data appears to be entered in CCF units instead of SCF. This is resulting in a 4.87% difference in MT CO2e (immaterial), with mandatory corrective action. I found where they may be confusion with the issue below. We record usage data as CCF into our fuel tracking spreadsheet from the usage emails which was 2,656,093 CCF in 2023. I entered 256,509,300 SCF into the Subpart C Calculation Spreadsheet because 1 CCF is 100 SCF and 2,656,093 CCF multiplied by 100 SCF/CCF is 256,509,300 SCF. To explain further, the question is whether or not the CCF/CF values are already "standardized" and thus be converted directly to SCF. Further, subpart C describes: "(i) Use Equation C–1 except when natural gas billing records are used to quantify fuel usage and gas consumption is expressed in units of therms or million Btu. (ii) If natural gas consumption is obtained from billing records and fuel usage is expressed in therms, use Equation C–1a." In this case, billing records fuel usage is expressed in therms. We agree with the 4.87% difference in NG MTCO2e emissions. We have used the C-1a calculation spreadsheet and input the total therms of NG delivered in 2023 to determine NG MTCO2e emissions. The summaries of Scope 1 emissions have been updated and have been provided along with the Natural GAs C-1a calculation spreadsheet for EY 2023 to AWM. Since this will increase 2023 scope 1 emissions by approximately 681 MTCO2e, we are requesting to have an additional 681 Carbon Offsets retired on our behalf for 2023 scope 1 emissions.
Scope 1	Process: SF6	Closed	Per review of "TSMC WA ROW EY2023 Scope 1 Emissions Summary (IPCC).pdf," for SF6: what is Process Type "Implant" and how is it being calculated? SF6 emissions from implant are not process emissions. SF6 is used as an electrical insulator in 2 pieces of Implant equipment, called tools, specifically in the RF Cans. Implant is a process where dopant ions are accelerated and implanted into exposed parts of the wafers. These 2 tools use RF to change voltages rapidly which accelerates beams of ions and must be electrically isolated from other parts of the tool in order to work properly. Each tool has a Mass Flow Controller (MFC) that has a totalizer reading for usage that is recorded during monthly preventive maintenance activities and the total amount used is sent to EH&S annually. The SF6 used in implant is not destroyed and is not abated before being purged from the tool to our exhaust system and released to the ambient air. As a passthrough gas, an emissions factor of 1 is appropriate for SF6 used in our implant tools. We subtract this usage from overall SF6 usage to determine SF6 usage in our Etch Processes.
Site Visit(s) - n/a			