SQIDEP (v1.3)
Independent Evaluators
Joint Report
Atlan Vortceptor

September 2024

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Andrew Allan B,Eng (Env), MIEAust, CPEgg, APEC Engineer IntPE(Aust)
Baden Myers, PhD BE (Civil and Env), DipEngPrac

DOCUMENT VERIFICATION

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Version History

VERSION	COMMENT
1	Final draft report for comment
2	Final report
3	Final report, revised with minor editorial changes

Climate Change Statement

A wide range of sources, including but not limited to the IPCC, CSIRO and BoM, unanimously agree that the global climate is changing. Unless otherwise stated, the information provided in this report does not take into consideration the varying nature of climate change and its consequences on our current engineering practices. The results presented may be significantly underestimated; flood characteristics shown (e.g. flood depths, extents and hazards) are may be different once climate change is taken into account.

Disclaimer

1 Introduction

This document reports on the independent evaluation of an application by Atlan Stormwater (hereafter Atlan) to have Stormwater Australia approve the Atlan Vortceptor under the requirements included in the Stormwater Quality Improvement Device Evaluation Protocol (SQIDEP) v1.3 (hereafter referred to as SQIDEP) published in 2019 by Stormwater Australia. SQIDEP v1.3 is available on Stormwater Australia's website at the time of reporting.

This is a joint report prepared by Independent Evaluators, Dr Baden Myers and Andrew Allan, a Senior Engineer at Afflux Consulting. The Independent Evaluators were engaged by Stormwater Australia on a fee for service basis to carry out an independent evaluation of data from an Atlan Vortceptor field site.

1.1 Evaluators Independence Declarations

It is declared that both evaluators, Andrew Allan and Baden Myers, are completely independent and neither Independent Evaluator has any conflict of interest with respect to this engagement.

It is declared that Baden Myers, in his capacity as a Research Fellow at the University of South Australia, has previously been involved with laboratory testing of some Atlan products. Baden has never examined the Vortceptor. This information was declared to Stormwater Australia and was known by Atlan.

We jointly declare that:

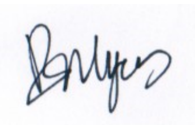
We are not, nor have we ever been employed or commissioned by the Applicant, Atlan, with the exception of the above stated laboratory testing. We have not been involved in the design or development or monitoring of the Atlan Vortceptor. We have undertaken this assessment without prejudice and in good faith.

Signed: Andrew Allan

Signature:

Signed: Baden Myers

Signature:



1.2 Background

Stormwater Australia published the Stormwater Quality Improvement Device Evaluation Protocol (SQIDEP) in January 2019. The SQIDEP process seeks to *"provide a uniform set of criteria to which stormwater treatment measures can be field-tested and reported. These criteria should guide and inform field monitoring programs seeking to demonstrate pollutant removals for stormwater treatment measures included in pollutant export modelling software. Future revisions of the protocol are anticipated to also include laboratory testing."* (Stormwater Australia, 2019).

The SQIDEP process is shown below in Figure 1. Two pathways for evaluation exist under the protocol and this application involved a body of evidence submission based on local field testing. The Independent Evaluators have not been involved with this project prior to this evaluation, for example at the Quality Assurance Project Plan (QAPP) stage, and have not been privy to the QAPP. The field test methodology and disclosure was comprehensive and forthcoming. Issues that would have been highlighted in a prior QAPP stage were anticipated and addressed. On this basis, to proceed with the evaluation was justified.

In this case, the Applicant is pursuing a body of evidence application. This report specifically relates to the section in Figure 1 boxed in dashed red - the independent evaluation panel assessment.

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Baden Myers, PhD BE (Civil and Env), DipEngPrac

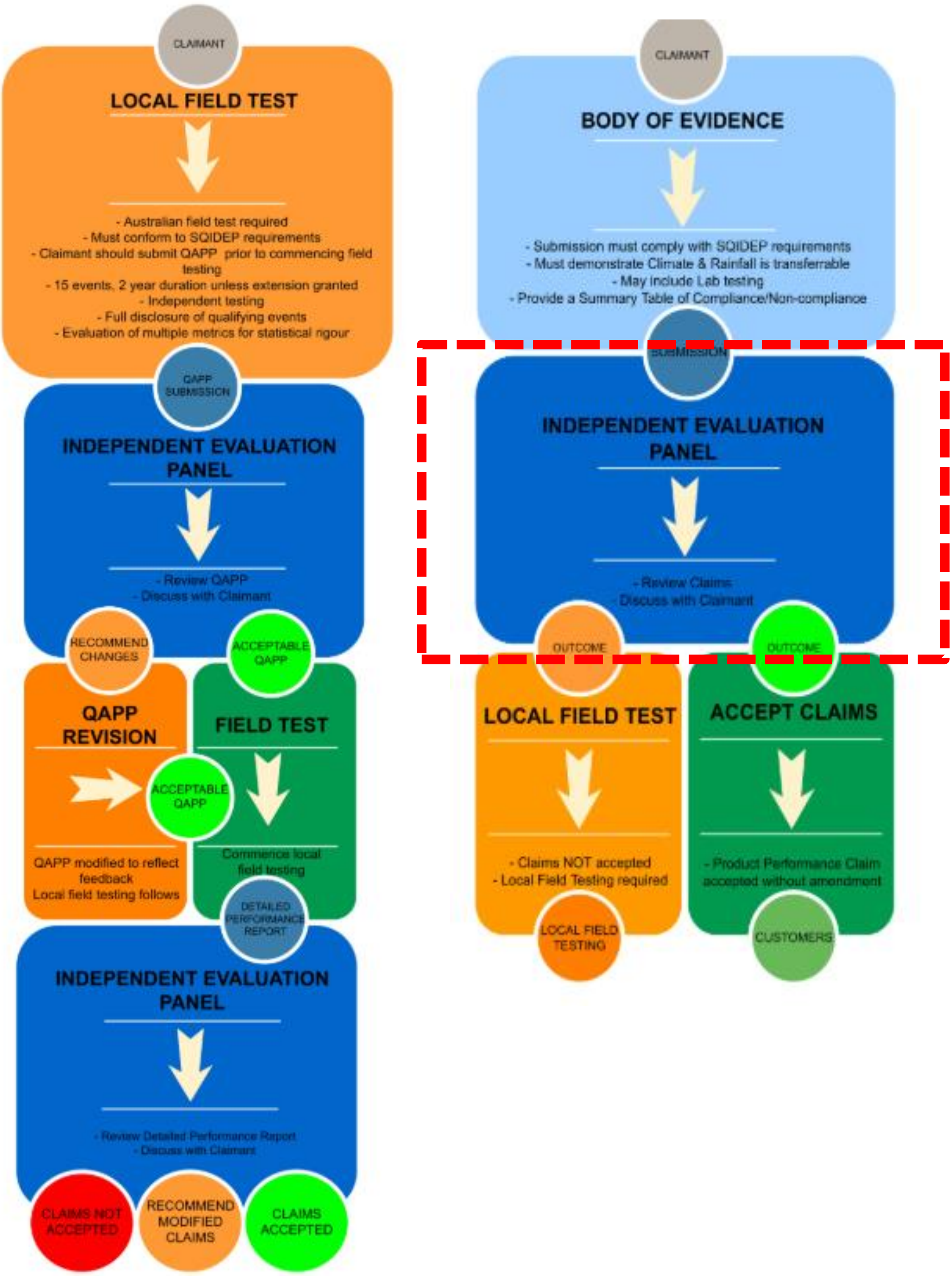

Figure 1: SQIDEP assessment pathways. This report specifically relates to the section boxed in dashed red – the independent evaluation panel assessment

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Baden Myers, PhD BE (Civil and Env), DipEngPrac

1.3 Review Documents

The following documents form the basis of this independent evaluation:

1) Vortceptor Body of Evidence report (Vortceptor BoE) (Issue 2)

Drapper, D.; Nyakas, L.; Waldron, S. Field Monitoring of Atlan Vortceptor (Offline) SQIDEP Body of Evidence Submission; Drapper Environmental Consultants: Crestmead, Queensland, Australia, 2024.

2) Atlan Vortceptor sizing chart 09/08/2019 (SPEL Vortceptor Summary 09082019.pdf) – Spreadsheet data
3) Vortceptor working capacities (VORTCEPTOR WORKING CAPACITIES.pdf) – spreadsheet data
4) Letter from Optimal Stormwater Pty Ltd to Blacktown City Council dated 11 May 2020 – 'RE: Equivalency of the Vortceptor to the CDS Unit Gross Pollutant Trap'
5) Various documents from the water quality analysis laboratory, ALS Laboratories, including chain of custody forms, sample receipt notices, certificates of analysis quality control reporting and QA/QC Compliance Assessments

There were several other documents and reviewed which related to the sizing of the Vortceptor and applicable treatment flow rates including computational fluid dynamics modelling output. There was also information provided by direct correspondence with the applicant.

1.4 The Atlan Vortceptor

According to the Vortceptor BoE, Section 2.1:

> *The ATLAN Vortceptor (Offline) is a Gross Pollutant Trap (GPT) that uses a self-cleaning, vortex style motion inside the screening chamber to separate litter and organic matter from stormwater flows. The device is designed to separate and retain gross pollutants, sediments, total suspended solids, some nutrients, and oil and grease.*

A conceptual diagram of the Vortceptor inflow and outflow arrangement was provided and is presented in Figure 2.

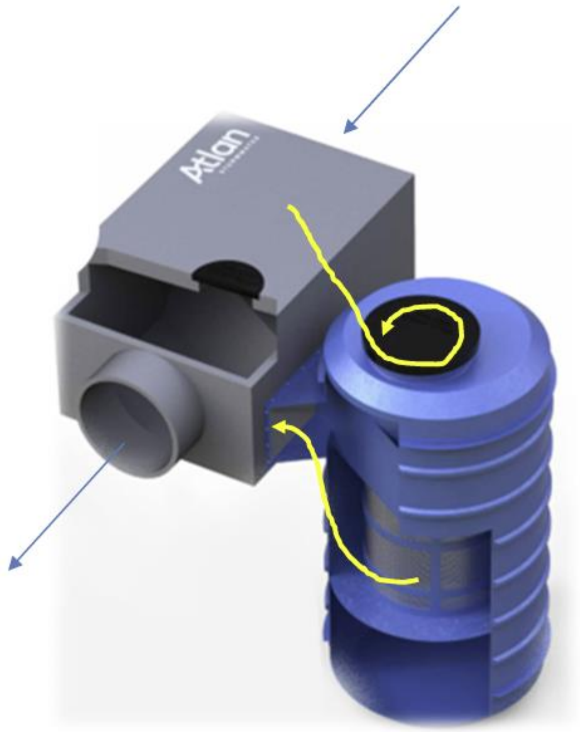

Figure 2: Conceptual image of the Atlan Vortceptor inflow and outflow arrangement. Image sourced from Drapper et al. 2024.

1.5 Performance Claim – Atlan Vortceptor

A performance claim for the Atlan Vortceptor has been submitted on the SQIDEP Body of Evidence Pathway submission form. The performance claim is shown in Table 1, based on the performance of an Atlan Vortceptor (offline), model SVO.530 with a volume of 10.3 m^3 and a treatment flow rate of 530 L/s monitored in a residential catchment at Cranbourne South, Victoria. The source of the performance claim is the Vortceptor BoE, Table 6, and is based on the mean efficiency ratio of the claimed field events. Note that the gross pollutant claim was increased to 100% based on discussion between the claimant and reviewers and Stormwater Australia during the review process. The 100% claim was made based on previous devices being assessed and receiving 100% gross pollutant interception using a combination of field inspection and consideration of product design.

Table 1: Performance claim for the Atlan Vortceptor

Parameter	Performance claim (% removal)
Total suspended solids (TSS)	93
Total phosphorous	86
Total nitrogen	49
Gross pollutants	100

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The BoE application did not include specific evidence relating to the treatment of gross pollutants and the assessment is based on a field evaluation using a catch basin for gross pollutant bypass and a field inspection. This is discussed further in Section 3.

1.6 Field site – Cranbourne South, Victoria, Australia

According to the Vortceptor BoE submission, Section 4, the field testing was carried out on a new residential development in Cranbourne South, Victoria, Australia. An aerial view of the catchment from the Vortceptor BoE submission is shown in Figure 3. The device is located on Dynasty Drive (near Authentic Avenue) within the Brompton Lodge Estate, Cranbourne South. The catchment draining to the device was reported to be approximately 7.5 ha, of which approximately 85% is impervious area consisting of roofs, driveways and roads. Pervious areas include street verges and back and front gardens. Field testing in the performance claim was collected from January 2023 through to January 2024. A review of the site and catchment conditions is shown below. The field monitoring claims to have met all the criteria of the SQIDEP protocol, and this claim is evaluated in this report.

Figure 3: Aerial view of the catchment area of the Cranbourne South case study site. The location of the Atlan Vortceptor is shown with a yellow dot. Image sourced from Drapper et al. 2024.

The catchment was checked for any significant changes across the monitoring period. It was stated by the claimant, and evident form the aerial imagery, that residential development was ongoing in the catchment during the monitoring period, particularly in the first few months. Aerial photography was reviewed using Google Earth and is shown below in Figures 4 and 5. The setup of the Vortceptor and associated monitoring equipment is shown in Figure 6.

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Figure 4: Surrounding area of the Cranbourne South site in October 2022, three months before monitoring commenced (Image courtesy of Google Maps).

Figure 5: Surrounding area of the Cranbourne South site in February 2024, one month after the monitoring period ceased (Image courtesy of Google Maps).

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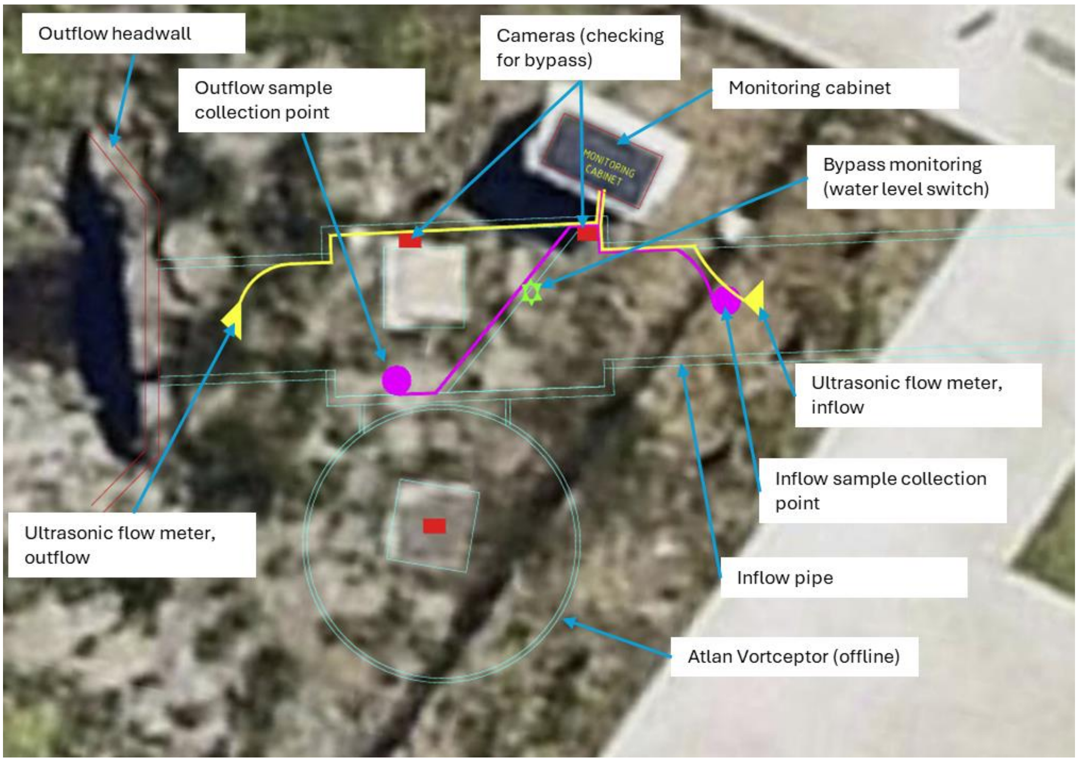

Figure 6: Location of flow measurement and water quality sampling equipment for the Cranbourne South field study site (Image adapted from Drapper et al. 2024)

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2 SQIDEP Compliance

The key criteria for field testing compliance are listed in Table 3 of SQIDEP v1.3 (*Minimum data and qualifying event requirements for assessment)* with additional details provided throughout the protocol document. Table 2 below presents the review of the Atlan Vortceptor performance claim in accordance with the key requirements of SQIDEP v1.3 based on a performance review template developed by Stormwater Australia in 2024.

Table 2: Compliance review of the Atlan Vortceptor field monitoring methodology and data which supports the SQIDEP performance claim

Field Testing Criteria for Sampling Events			
	Criteria	**IEP comments**	**Compliance**
Minimum number of events	The greater of: a. 15 events, and b. Sufficient events to achieve 90% confidence interval, as determined by defensible statistical method (e.g. ANOVA, t-test) that examines influent and effluent pairs. This may vary between target pollutants (based on catchment variability). In this event, statistical analysis can be undertaken separately for each species of interest.	There were 31 events in the Atlan Vortceptor Body of Evidence (BoE) submission (Vortceptor BoE, Table 6) 90% confidence was assessed including removal of certain events of concern to ensure that significance is still valid.	Complies. See Section 4.2 for further details.
Minimum rainfall depth	Sufficient to collect minimum sample volume (based on laboratory analytical requirements).	Quoting: 'Sampling was triggered by >0.6 mm rainfall within a rolling 30-min window, measured onsite by a 0.2 mm tipping bucket rain gauge (or equivalent). Additionally, a flow volume of 12,000 L past the flow meter location at the inlet/outlet was required to initiate subsequent sample collection. All subsamples collected during a runoff event were composited within the sampler in a 9 L bottle. Each subsample	Complies

		collected was 200 mL to ensure sufficient volume was available for the suite of subsequent chemical analyses. As shown in Table 3, a minimum of 8 influent and 8 effluent subsamples was required for each event with at least 80% of qualifying events having a minimum of 8 aliquots. Where fewer than 5 aliquots were collected, those events were discarded.' (Vortceptor BoE, Section 4.5)	
Recommended inter-event time	Min 6 hours[3]	Quoting: 'The inter-event period (antecedent duration) was set in the datalogger program to 6 hours between the end of one rainfall event and the start of another.' (Vortceptor BoE, Section 4.5)	Complies
Device size	Full Scale (where a 'family' of devices are being included as part of the claim sizing relationships must be provided for evaluation along with any basis of justification).	A full scale device was investigated. It had a design TFR of 530 L/s "The monitored device consists of a 3000 mm by 1800 mm diversion box with a 745 mm high weir diverting low flows into a 3000 mm diameter gross pollutant separation chamber with a total height of 5823 mm, and a 900 mm x 900 mm manhole. The sump capacity below the bottom edge of the screen is ~10.5 m^3." (Vortceptor BoE, Section 2.3) The device is part of a family of devices 'These devices are sized to treat the desired treatable flowrate (TFR) and vary primarily with the diameter and depth of the gross pollutant separation chamber. Diameters commence at	Complies. See Section 4.6 for further details.

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		1500 mm and increase to 4000 mm. Depths start at 3500 mm and increase to 6840 mm.' (Vortceptor BoE, Section 2.3) The scaling and model designs of the device were presented in the Vortceptor BoE, Appendix H. Designed have been independently certified (Vortceptor BoE, Section 2.5).	
Runoff characteristics	Target pollutant profile of influent and effluent	The catchment area of the device is reported to be a residential catchment in within the Brompton Lodge Estate, Cranbourne South, Victoria. The 7.5 ha catchment area leading to the device was going through the greenfield development phase during the monitoring period – it is nearly completed at present. According to the Vortceptor BoE (Table 6), the mean levels of TSS, TP and TN in the claimed inflow samples was 160 mg/L, 0.19 mg/L and 2.5 mg/L. These concentrations are within acceptable mean values for SQIDEP and also within range of expectations from other stormwater quality literature (e.g. Duncan, 2006).	Complies.
Runoff volume or peak flow	At least 2 events should exceed 75% of the design water quality volume/ TFR and 1 event greater than 100% of the TFR.	Based on the event claim in the Vortceptor BoE (Table 6), there was one acceptable event one event that exceeded the TFR (Event 31) and two events which were accepted to exceed 75% of the TFR (peak flow rates were close to 75% of the TFR in this case) (Events 19 and 22). Claimed TFR = 530 L/s 0.75 × claimed TFR = 398 L/s Events exceeding 530 L/s included:	Complies

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		- Event 28, 07/01/2024: peak inflow not available, peak outflow 601.4 L/s - Event 31, 13/02/2024: peak inflow not available, peak outflow 687.8 L/s There were also two events which were *close* to 0.75 × claimed TFR (398 L/s) - Event 19, 3/10/2023: peak inflow 369.9 L/s, peak outflow 201.6 L/s - Event 22, 07/11/2023: peak inflow 360 L/s, peak outflow 300 L/s. Examining each in more detail: Event 28: This event is compromised for two reasons: (1) The inflow peak was not available, and (2) the hydrograph plot for the event indicates that water quality sampling did not occur at the event peak. It is reasonable to reject this event as characterising performance at 0.75 × claimed TFR. The actual peak flow during the water quality sampling period was approximately 50 L/s according to the hydrograph record. Event 31: This event is compromised for one reason; the inflow peak flow rate was not available, we only have an outflow rate record. However, this may be conservative because the outflow rate was typically lower for all events than the inflow rate, suggesting that the device moderated outflow rates. For Event 31, the full hydrograph was sampled for water quality – it is reasonable to retain this record as both one sample above the to 0.75 × claimed TFR, and one sample above the TFR. Event 19: This event had both inflow and	

		outflow. The peak inflow of 369.9 L/s was 69% of the TFR, slightly below the 0.75 × claimed TFR requirement; since the peak flow rate value is close to the requirement, it is accepted as characteristic of an event at 0.75 × TFR and the hydrograph was well covered by water quality samples. Event 22: This event had both inflow and outflow. The peak inflow of 360 L/s was 68% of the TFR, slightly below the 0.75 × claimed TFR requirement; since the peak flow rate value is close to the requirement, it is accepted as characteristic of an event at 0.75 × TFR and the hydrograph was well covered by water quality samples.	
Sampling Procedures and Techniques			
Automated sampling	Composite samples on a flow-(preferred) or time-weighted basis	Sampling was via composite samples on a flow weighted basis (Vortceptor BoE, Section 4.3.1).	Complies
Minimum number of aliquots	80% of field test collections should have at least 8 per event. Notwithstanding aliquots should be collected to provide hydrograph coverage of rising and falling limbs.	All complying events had at least 8 aliquots (Vortceptor BoE, Table 4).	Complies
Hydrograph coverage	At least 50% of qualifying storms should include the first 70% storm.	All events in the claim are listed in the Vortceptor BoE, Table 6. Of these 31 events, only three (Event 4 – 21/03/2023, Event 10 – 15/04/2023 and Event 20 – 04/10/2023) did not include the first 70% of the storm.	Complies
Grab Sampling	Hydrograph coverage (or, for storms longer than 8 hours, capture of the first 8 hours). Programs should aim to capture full hydrographs for all events, but flexibility will be considered for large volume, long	Not applicable – flow weighted sampling at inlet and outlet.	Complies

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	duration events.		
Sampling Location	Dependent on catchment and rainfall patterns, multiple peaks should be accounted for (at least 1 occurrence).	There were several events which exhibited multiple peaks. These included: - Event 14, 28/07/2023 - Event 16, 18/08/2023 - Event 18, 09/09/2023 - Event 26, 09/12/2023 - Event 30, 19/01/2024	Complies
Chemical and Physical analytes	As identified and agreed in the submitted QAPP.	- Not reviewed, this was a BoE submission and the reviewers did not see the QAPP	Not applicable.
Minimum and maximum (influent) pollutant	Minimum concentrations: exclude if below limit of detection.	Water quality testing was undertaken by ALS Global. Limit of reporting is provided by the ALS Certificate of analysis for each event. Comparing inlet sample concentrations in the claim from the Vortceptor BoE (Table 6) with these limites of reporting: TSS limit of reporting = 5 mg/L; all composite inlet TSS sample concentrations were greater than 5 mg/L. TP limit of reporting = 0.01 mg/L; all composite inlet TP sample concentrations were greater than 0.01 mg/L. TN limit of reporting = 0.1 mg/L; all composite inlet TN sample concentrations were greater than 0.1 mg/L.	Complies
Concentrations for qualifying events	Maximum: mean+2SD for any single event, and mean +1SD in the aggregate dataset. Refer Table 1 of SQIDEP.	Comparing inlet sample concentrations in the claim (from Vortceptor BoE, Table 6) with the maximum and mean inflow concentrations in SQIDEP v1.3 (Table 1):	Complies

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TSS
Maximum concentration for any individual event = 591 mg/L
Adopted maximum average = 371 mg/L
The claim is compliant.*

TP
Maximum concentration for any individual event = 1.1 mg/L
Adopted maximum average = 0.71 mg/L
The claim is compliant.*

TN
Maximum concentration for any individual event = 4.4 mg/L
Adopted maximum average = 3.09 mg/L
The claim is compliant.*

It is noted that events that were non-compliant with these conditions (maximum inflow concentrations too high) were presented in the Vortceptor BoE, Table 5, and subsequently removed from the performance claim dataset to produce the basis of the claim in Table 6. An additional set of results, excluding all events where not enough aliquots were collected, was also presented in Table 7. It is noted that the performance claim was based on the most conservative dataset presented:

	Performance claim (%) for each table (mean efficiency ratio)		
	Table 5	Table 6	Table 7
TSS	94	93	93
TP	86	86	87
TN	59	49	49

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Requirements			
Flow Measurement Location	Inlet, Outlet and Bypass, as applicable. Based on relevant accepted measurement protocols for flow type (e.g. open channel, in pipe)	Monitoring of flow was undertaken using "Starflow QSD ultrasonic area velocity meters installed upstream and downstream of the diversion pit" (Vortceptor BoE, Section 2.6). Bypass was not directly measured. Occurrence was recorded via a water level switch on the bypass weir, which directs flow into the Vortceptor (Vortceptor BoE, Section 2.6).	Complies
Precipitation Measurement	Automatic rain gauge (pluviometer)	A pluviometer was used to measure rainfall (Vortceptor BoE, Table 3).	Complies
Recording Intervals	5 minutes or less	Flow – Flow recording interval was every 10 sec (pers. comm. Darren Drapper, 12/07/2024). Rainfall – Measured using a pluviometer, therefore acceptable.	Complies
Rainfall Recording Increments	No greater than 0.25mm	The pluviometer was fitted with a 0.2 mm tipping bucket (Vortceptor BoE, Table 3).	Complies
Rain Gauge Calibration	Twice during monitoring period	The monitoring period extends from 17/01/2023 to 13/02/2024 (Vortceptor BoE, Table 4) Calibration of the pluviometer was undertaken by Drapper Environmental consultants immediately prior to delivery of monitoring cabinet on 09/06/2022 and once on site during monitoring on 28/06/2023 (Vortceptor BoE Section 4.9). This effectively represents one calibration during the 13 month monitoring period.	Complies

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		To investigate further, cross references of rainfall data as logged in the study was compared to nearby pluviography data and radar imagery from the Bureau of Meteorology for three days. We were satisfied that rainfall records during the field monitoring period were representative of actual rainfall. This was accepted by the reviewers.	
Data Analysis and Reporting			
Performance Indicators	Based on the Performance Claim stated in Detailed Performance Report. (Can include but not limited to TSS, Metals, TPH, TP & TN). The target pollutants and testing rationale must be described in the QAPP & Detailed Performance Report. Where a device is claiming total reductions of a particular pollutant, it is not necessary to include speciation. If speciation is not undertaken, then reductions of sub-species cannot be claimed.	Performance claim is based on efficiency ratio of TSS, TP and TN in the Vortceptor BoE (Table 6, Mean ER value); gross pollutant claim is based on a methodology described in the Vortceptor BoE (Section 4.3.7). It is also noted that a backup gross pollutant capture basket was installed in Feb 2024 (after the reported monitoring period). This was reviewed on site by Andrew Allan.	Complies – see Section 4.1 for further discussion on sample records; Sction 4.4 for further discussion regarding gross pollutants.
Performance Indicators Calculation	Concentration Removal Efficiency (CRE) (See Section 6.4.3) (Arithmetic average and median. If difference is 10% or greater, inspect data set closely)	Based on the data in the Vortceptor BoE (Table 6): Average CRE (TSS) = 92% Median CRE (TSS) = 93% Difference between mean and median CRE for TSS was not greater than 10%. Average CRE (TP) = 81% Median CRE (TP) = 86% Difference between mean and median CRE for	Complies

		TP was not greater than 10%. Average CRE (TN) = 38% Median CRE (TN) = 64% Difference between mean and median CRE for TN was greater than 10%. It is apparent that the mean value is influenced by several values below zero – removing these values removes this concern, resulting in a mean CRE of 66% and a median of 72%; but this is far less conservative and the negative values should be retained in the dataset.	
Performance Variability Schematics	Mass Removal Efficiency (MRE) (See Section 6.4.4) (Arithmetic average and median. If difference is 10% or greater, inspect data set closely)	The device is a ‘wet’ system that has no significant retention/detention capacity. Under these conditions, the MRE is effectively the same as the CRE.	Complies
Statistical Significance Testing	Relative Achievable Efficiency (RAE) (See Section 6.4.5) (Arithmetic average and median. If difference is 10% or greater, inspect data set closely	Based on the data in the Vortceptor BoE (Table 6): **<u>TSS</u>** C* for TSS = 6 mg/L (SQIDEP v1.3, Table 2) It was not possible to determine RAE for TSS using the recommended background concentration in SQIDEP (Table 2) of 5 mg/L because outflow concentrations from the field study were occasionally below the recommended C*. Adopting a C* slightly below the observed minimum outflow concentration (4.9 mg/L): Average RAE (TSS) = 97% Median RAE (TSS) = 100%	Complies

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		Difference between mean and median RAE for TSS was not greater than 10%. **<u>TP</u>** C* for TP = 0.06 mg/L (SQIDEP v1.3, Table 2) It was not possible to determine RAE for TP using the recommended background concentration in SQIDEP (Table 2) of 0.06 mg/L because both inflow and outflow concentrations from the field study were occasionally below the recommended C*. Adopting a C* slightly below the observed minimum outflow concentration (0.009 mg/L): Average RAE (TP) = 87% Median RAE (TP) = 92% Difference between mean and median RAE for TP (with modified C* reflecting site conditions) was not greater than 10%. **<u>TN</u>** C* for TN = 1 mg/L (SQIDEP v1.3, Table 2) It was not possible to determine RAE for TN using the recommended background concentration in SQIDEP (Table 2) of 1 mg/L because both inflow and outflow concentrations from the field study were occasionally below the recommended C*. Adopting a C* slightly below the observed minimum outflow concentration (0.09 mg/L): Average RAE (TN) = 38% Median RAE (TN) = 66%	

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		Difference between mean and median RAE for TP (with modified C* reflecting site conditions) was greater than 10%. Investigating the data, it was apparent that the mean, like the case for the CRE above, was heavily influenced by some negative RAE values. Removing these events of concern resolved this problem but it is recommended they be left in because these events, which have negative CREs and ERs, reduce the performance claim for TN and contribute to a conservative performance claim for the Vortceptor.	
Sizing Methodology	Summation of loads (SoL) (See Section 6.4.6) (Arithmetic Average and median. If difference is greater than 10% inspect dataset closely)	The device has no significant retention/detention capacity.	Complies

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3 Compliance Summary

A summary of the compliance resulting from this review is presented in Table 3 based on a template provided by Stormwater Australia.

Table 3: SQIDEP Summary of compliance

Technology Information

Applicant's Verified Performance Claims

Parameter	
Total suspended solids	93%
Total phosphorus	86%
Total nitrogen	49%
Total petroleum hydrocarbons	Not claimed
Gross pollutants	100 %

IEP's comments: Nil.

IEP's recommendations: All performance claims were considered compliant up to the treatment flow rate for the applicable device. Verified flow rates are included in the table below:

Model of Vortceptor (mm)	**TFR (m^3/s)**
SVO.096	0.096
SVO.140	0.136
SVO.180	0.180
SVO.220	0.270
SVO.360	0.373
SVO.530	0.530
SVO.800	0.800
SVO.810	0.810
SVO.1200	1.150
SVO.1600	1.600

Maintenance performed during monitoring

IEP' comments: Maintenance was performed during monitoring due to the excessive sediment loads that occurred during construction of the nearby residential development. This included removing sediment accumulated in the stormwater pipe system upstream of the device. This is considered to have been reasonable – by removing this sediment, it is likely that this was effectively removing larger, heavier particles of sediment would have been removed by the Vortceptor anyway due to being larger and heavier (as they were settling in the drainage system subject to flow events). The Vortceptor BoE also indicates that the retained sludge within the Vortceptor was inspected every six

	months, with the system emptied by vacuum immediately prior to the trial, and in February 2024 (after the cessation of the reported monitoring). **IEP's recommendations:** Accept that the device performance was not overstated because of the maintenance that occurred.
Verified method to model in MUSIC	**IEP's comments:** Nil. **IEP's recommendations:** A generic node is to be used in MUSIC with a high flow bypass set to the applicable TFR for the size of the Atlan Vortceptor proposed and with inlet and outlet concentrations as follows:

Pollutant	Inlet concentration	Outlet Concentration
TSS	100	7
TP	100	14
TN	10	5.1

Model of Vortceptor (mm)	**TFR – or high flow bypass to be adopted in MUSIC modelling (m^3/s)**
SVO.096	0.096
SVO.140	0.136
SVO.180	0.180
SVO.220	0.270
SVO.360	0.373
SVO.530	0.530
SVO.800	0.800
SVO.810	0.810
SVO.1200	1.150
SVO.1600	1.600

Conditions	**IEP's comments:** Nil. **IEP's recommendations:** None.

Andrew Allan B,Eng (Env), MIEAust, CPEgg, APEC Engineer IntPE(Aust)
Baden Myers, PhD BE (Civil and Env), DipEngPrac

4 Discussion

The following details additional information that formed part of the performance review of the Atlan Vortceptor.

4.1 Water quality sample records

A review of laboratory quality control information, including chains of custody, sample receipt notices and quality assurance reports was undertaken. While there were a number of technical breaches with holding times for some analytes after samples had been delivered to the laboratory, other documentation indicated samples had arrived with correct preservation techniques and suitably chilled.

Sensitivity checks were undertaken to exclude samples with holding time breaches and showed no significant changes in treatment outcomes, and still yielding sufficient sample numbers to achieve requirements. Based on these sensitivity checks, we are comfortable with accepting the entire dataset. Explanations were sought from Atlan Stormwater and their representatives as to why some samples were not submitted for laboratory testing. We were satisfied that these instances have been disclosed and the reasons for not undertaking laboratory testing were sound.

4.2 Sensitivity testing

Generally, SQIDEP requires transparent reporting of data and avoidance of ‘cherry picking’ results to benefit a performance claim. Overall, these checks are undertaken to ensure results are not significantly biased by inclusion or removal of datapoints, but also to ensure that the performance claim metric (e.g. CRE, MRE) does not significantly skew the performance claim. Depending on the dataset, it is understood that some metrics can lead to more favourable results over others.

In SQIDEP v1.3, the claimant has control over which claims is preferred to be assessed. As assessors we acknowledge there are statistical nuances in what specific metrics are and datapoints are included to examine statistical significance. Our assessment should ensure the claims are robust when scrutinized from different perspectives.

We have tested full dataset against different metrics, and our assessment process includes several sensitivity tests including:

- Removing selected results
- Testing of the proposed MUSIC node with selected results removed

If removal of certain events caused reductions in the performance claim or modelling outcomes that caused concern, we would have difficulty in accepting claims. Table 4 presents a summary of the claim (from Table 13 of the Vortceptor BoE). Note that the gross pollutant claim was increased to 100% based on discussion between the claimant, reviewers and Stormwater Australia during the review process. The 100% claim was made based on previous devices being assessed and receiving 100% gross pollutant interception using a combination of field inspection and consideration of product design.

Andrew Allan B,Eng (Env), MIEAust, CPEgg, APEC Engineer IntPE(Aust)
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Table 4: Summary of performance metrics based on the performance of the Atlan Vortceptor at Cranbourne South, Victoria

ATLAN Vortceptor (Offline)	TSS	TP	TN	GP
AvCRE	92%	81%	38%	
Median CRE	93%	86%	64%	
Average ER	**93%**	**86%**	**49%**	
Median ER	95%	88%	67%	
Average both ER & AvCRE metrics	93%	84%	43%	
Proposed Claims	**TSS**	**TP**	**TN**	
ATLAN Vortceptor (Offline) metrics	**93%**	**86%**	**49%**	**90%**

As a sensitivity test, we excluded a number of results from the claim (that is, from the events in Table 6 of the Vortceptor BoE) that were identified through a review of laboratory QA data to have sub optimal holding times against specific tests requested. Based on Sample Receipt notices provided by the laboratory these breaches do not appear related to sample collection or preservation. As a result, it is expected that the holding time breaches occurred while samples were in laboratory custody and more likely relate to internal laboratory notifications. Omitting results as part of this sensitivity testing does not result in insufficient 'compliant' samples to achieve SQIDEP requirements for the purpose of making performance claims.

The examination indicated that the sensitivity results do not change the overall assessment of data. It is noted that the removal of events that may be considered 'outliers' from the dataset did not have an influence on the efficiency ratio-based performance claim, nor did it affect statistical significance of the samples using the same techniques as outlined in the performance report.

4.3 Other observations

- Speciation of pollutants is an area of conjecture, and variability in Nitrogen is an area of debate. The claim was presented for Total Nitrogen reductions, although results were presented for various Nitrogen species. We have not examined the nuances of the speciation, instead focussing on the TN claims.
- The expected regulatory monitoring tool (MUSIC) is not normally configured to predict performances on sub species, nor is it in our experience common practice to assess against these.
- A number of results indicated an increase in TN at outlet samples. Again, sensitivity testing was used to examine the significance of these results and concluded that they had no significant impact on the overall assessment of results.

4.4 Gross pollutant capture - Field inspection

A field inspection of the Atlan Vortceptor device at Cranbourne South was conducted in July 2024 due to proximity of the installation to reviewers. The inspection required representatives of the local Atlan team to be onsite to provide access and ensure safety. A relatively short timeframe was provided to arrange the inspection (i.e. days).

Andrew Allan B,Eng (Env), MIEAust, CPEgg, APEC Engineer IntPE(Aust)
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In February 2024, the claimant had previously installed a ‘basket’ downstream of the Vortceptor outlet to trap any gross pollutants from the catchment coming out of or bypassing the device. This appeared to be well secured and constrained to catch any direct outfall, regardless of whether it had passed through the device or was a bypass flow.

No gross pollutants were observed at the device outlet during the inspection, and no gross pollutants were observed in the open channel downstream of the device. In addition, large debris (polystyrene) was observed to be retained by the device during the inspection. A further inspection of the contributing catchment area identified a range of construction activities and general litter in the surrounding estate. While there is currently no agreed protocol for gross pollutant performance evaluation in SQIDEP, the evidence presented in the field, and a review of the device operation, was determined as reasonable to conclude the device is performing well to achieve the performance claim of 100% retention. The main reasons for this include:

1. Design - we are comfortable that gross pollutants entering this offline system - while not very well defined by SQIDEP, but generally perceived to be items > 5 mm in size - will not leave the system at flow rates below the treatment flow rate
2. Monitoring - the implementation of the backup catch system and the fact it was empty when physically inspected by the review team provides field evidence, and it is the only claim we are currently aware of that had this kind of monitoring system in place for inspection.
3. Precedent - other devices have received 100% with similar evidence base (including design review and field inspection via photography).

4.5 Examination of the proposed MUSIC node.

We consider the MUSIC modelling advice based on a generic node to be well constructed based on a description of the device’s operation and field inspections undertaken. In essence the device does not provide excessive storage characteristics that would fundamentally alter the relationship between inflows and outflows. Bypass and treatable flow rates have been provided and seem reasonable for the device based on information provided.

4.6 Device size / scaling relationship

The reviewers undertook a review of the scaling calculations to ensure that the results of this study were able to be reasonably extrapolated across the range of available devices. A desktop data review was undertaken because other methods, such as laboratory testing, are difficult to achieve due to the high flow rates required.

- Scaling calculations were provided as an Appendix to the main report
- The report indicated these scaling relationships were separately produced and certified by a third party.
- No details were (initially) provided on the methodology undertaken to elicit these relationships.
    - Based on an understanding of the mechanisms for treatment by the device, the results appeared to focus on the storage characteristics and resulting residence times within the device based on corresponding treatable flow rates.

Andrew Allan B,Eng (Env), MIEAust, CPEgg, APEC Engineer IntPE(Aust)
Baden Myers, PhD BE (Civil and Env), DipEngPrac

    - The physical structure of the device was expected to force particular pollutants through the screening apparatus and result in these being excluded from the effluent stream.
    - It is expected that this mechanism was responsible for the removal rates demonstrated in the current trial

- From the presented data, it appears that the TFR divided by the device volume was the residence time, and has been used as a simplified scaling relationship for application sizing. This was considered acceptable and is similar to the approach taken for other SQIDEP approved devices.

- Based on the assessments above, as reviewers we requested additional information to help form an opinion based on the best available evidence provided. Specifically, we requested CFD analysis mentioned in meetings with Atlan Stormwater, and clarification of their third party 'certification' that was provided with initial documentation.
    - Neither of the reviewers purports to be experts in CFD analysis, however we have reviewed the additional information provided to assess whether the findings were reasonable and consistent with field testing results.

- From the information received we were satisfied that:
    - The Vortceptor is similar to existing CDS hydrodynamic separator technology in configuration
    - Additional CFD modelling was provided that reported on Vortceptor design configurations and indicate the presence of a vortex (being a key aspect responsible for the removal of pollutants through the screen)
    - Modelling indicated that under varying flow rates the extent of the vortex changes, and the varying influence in excluding or remobilising pollutants based on inflow
    - Despite these factors, the in-field performance of the tested device shows a reduction in pollutants across a range of events.
    - To avoid unwanted resuspension, maintenance intervals will be important and should be addressed in operational instructions.
    - Atlan have confirmed that the device tested in the field, and those on the market, used a 'shear cone' in the design, and as such the assessment was based on the CFD results with respect to this configuration.

Andrew Allan B,Eng (Env), MIEAust, CPEgg, APEC Engineer IntPE(Aust)
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5 Conclusions

It is recommended that Stormwater Australia grant an approval to the Atlan Vortecptor family of devices in accordance with the recommendations in the compliance summary (Table 3 of this report).

Andrew Allan B,Eng (Env), MIEAust, CPEgg, APEC Engineer IntPE(Aust)
Baden Myers, PhD BE (Civil and Env), DipEngPrac