

Air Quality Monitoring Program

FERROVIAL GAMUDA JOINT VENTURE

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DOCUMENT DETAILS

Document Title	Air Quality Monitoring Program
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DOCUMENT AUTHORISATION

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A	31/08/2022	FGJV Draft for TfNSW and ER Review	Hari Corliss
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C	30/11/2022	Updated to address DPE comments	Hari Corliss
D	11/07/2023	Minor administrative update to address data inaccuracies and adjustments to DDG monitoring locations	Duncan Thomson
E	19/9/23	Adjustments to DDG monitoring location	Duncan Thomson

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GLOSSARY/ABBREVIATIONS

Abbreviation	Expanded Text
CAQMP	Construction Air Quality Management Sub-Plan
BOM	Australian Government Bureau of Meteorology
CEMP	Construction Environmental Management Plan
DAWE	Department of Agriculture, Water and Environment
DDG	Dust Depositional Gauge
DPE	Department of Planning and Environment
DPE, EESG	Department of Planning and Environment – Environment, Energy and Science Group
EIS	Environmental Impact Statement
EP&A Act	Environmental Planning and Assessment Act 1979
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
EPA	NSW Environment Protection Authority
EWMS	Environmental Work Method Statements
FGJV	Ferrovial Gamuda Joint Venture
GREP	Government Resource Efficiency Policy
MCoA	Minister's Condition of Approval
NEPM	National Environment Protection Measures
PM2.5	Fine Particulate Matter
PM10	Particulate Matter
POEO Act	Protection of the Environment Operations Act 1997
REMMs	Revised Environmental Management Measures
TfNSW	Transport for NSW

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1 INTRODUCTION

1.1 CONTEXT

This Air Quality Monitoring Program is an appendix to the Construction Air Quality Management Sub Plan (CAQMP) that forms part of the Construction Environmental Management Plan (CEMP) for the Coffs Harbour Bypass (the Project).

The purpose of this Air Quality Monitoring Program is to provide details on the baseline data available for Coffs Harbour, the parameters, frequency and location of monitoring required for the Project. This program will also outline the reporting requirements and any additional management and mitigation measures to be implemented on the Project. Monitoring undertaken during the construction phase of the project will verify the effectiveness of mitigation and management measures implemented to minimise air quality issues on the Project.

1.2 BACKGROUND

The Coffs Harbour Bypass EIS (Chapter 21) considered the potential air quality impacts during the construction of the project. The background of the Project is described in Section 1 of the CEMP.

The Project includes the construction of a 14-kilometre bypass of Coffs Harbour, including a 12-kilometre new build from south of Englands Road to Korora Hill in the north and a two-kilometre upgrade of the existing highway between Korora Hill and Sapphire. The Project would provide a four-lane divided highway that bypasses Coffs Harbour, passing through the North Boambee Valley, Roberts Hill and then traversing the foothills of the Coffs Harbour basin to the west and north to Korora Hill.

2 ENVIRONMENTAL REQUIREMENTS

Refer to the CAQMP for full list of legislation, regulation and EMMs. Table 1 details the MCoA specific to the Air Quality Monitoring Program.

2.1 MINISTERS CONDITIONS OF APPROVAL

TABLE 1 MINISTERS CONDITIONS OF APPROVAL RELEVANT TO AIR QUALITY MONITORING PROGRAM

CoA No.	Condition Requirements	Document Reference				
C13	The Construction Monitoring Programs in Table 4 must be prepared in consultation with the relevant government agencies identified for each to compare actual performance of construction of the CSSI against the performance predicted in documents listed in Condition A1 or in the CEMP.	Air Quality Monitoring Program				
	<table border="1"> <thead> <tr> <th></th> <th>Required Construction Monitoring Programs</th> <th>Relevant government agencies to be consulted for each Construction Monitoring Program</th> </tr> </thead> <tbody> <tr> <td>(a)</td> <td>Air quality</td> <td>EPA, DPI Agriculture, Council</td> </tr> </tbody> </table>			Required Construction Monitoring Programs	Relevant government agencies to be consulted for each Construction Monitoring Program	(a)
	Required Construction Monitoring Programs	Relevant government agencies to be consulted for each Construction Monitoring Program				
(a)	Air quality	EPA, DPI Agriculture, Council				
C14	Each Construction Monitoring Program must provide:					
	(a) Details of baseline data available;	Section 3.2				
	(b) Details of baseline data to be obtained and when;	Section 3.2				
	(c) Details of all monitoring of the project to be undertaken;	Section 4				
	(d) The parameters of the project to be monitored;	Section 4				
	(e) The frequency of monitoring to be undertaken;	Section 4				
	(f) The location of monitoring;	Section 4				
	(g) The reporting of monitoring results;	Section 0				
	(h) Procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and	Section 0				
(i) Any consultation to be undertaken in relation to the monitoring programs.	Section 2.4					
C15	The Construction Monitoring Programs must be developed in consultation with relevant government agencies as identified in Condition C13 of this approval and must include information requested by an agency to be included in a Construction Monitoring Programs during such consultation. Details of all information requested by an agency including copies of all correspondence from those agencies, must be provided with the relevant Construction Monitoring Program.	Consultation records to be provided to DPE				
C16	The Construction Monitoring Programs must be endorsed by the ER and then submitted to the Planning Secretary for approval at least one month before the commencement of construction.	Document control and approvals detailed in CAQMP version control table				
C17	Construction must not commence until the Planning Secretary has approved all of the required Construction Monitoring Programs, and all relevant baseline data for the specific construction activity has been collected.	Noted				
C18	The Construction Monitoring Programs, as approved by the Planning Secretary including any minor amendments approved by the ER must be implemented for the duration of	Document control and approvals detailed in				

	construction and for any longer period set out in the monitoring program or specified by the Planning Secretary, whichever is the greater.	CAQMP version control table
C19	The results of the Construction Monitoring Programs must be submitted to the Planning Secretary, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program.	Section 0

2.2 ENVIRONMENTAL MANAGEMENT MEASURES

TABLE 2 ENVIRONMENTAL MANAGEMENT MEASURES RELEVANT TO THIS AIR QUALITY MONITORING PROGRAM

Outcome	Ref#	Commitment	Timing	CAQMP Reference
Dust impacts - Agriculture	AG06	Real time dust monitoring will be carried out at representative locations of dust sensitive agricultural receivers along the project alignment to allow for the timely management of dust generation on-site and to minimise potential impacts. The representative locations of dust sensitive agricultural receivers will be determined during detailed design and will include the Oz Group Packhouse. Monitoring will be carried out in accordance with the Approved Methods for the sampling and analysis for air pollutants in NSW (EPA 2017a) where applicable.	Prior to and during construction	Section 4

2.3 ENVIRONMENTAL PROTECTION LICENSE

An Environmental Protection License (EPL) will be sought for the Project. Upon award, this Plan will be updated to reflect any license requirements or conditions applicable to air quality.

2.4 CONSULTATION

In accordance with MCoA C13, this Air Quality Monitoring Program has been developed in consultation with the relevant government agencies including:

- NSW EPA
- DPI Agriculture
- Coffs Harbour Council.

Consultation will be undertaken with the abovementioned stakeholders as required throughout the pre-construction and construction phases of the project.

3 EXISTING ENVIRONMENT

3.1 AMBIENT AIR QUALITY CONDITIONS

There is limited information about local air quality in the vicinity of the Project. Long-term monitoring is not usually undertaken outside metropolitan and/or industrial areas, because pollutants typically do not exist in concentrations that would cause adverse environmental or health impacts. However, there has been short-term air quality monitoring adjacent to a dual carriageway section of the Pacific Highway at Korora, which is located within the construction corridor of the Coffs Harbour bypass. A monitoring station was established at Korora to monitor the background ambient air quality from October 2005 to January 2007. (Sapphire to Woolgoolga Pacific Highway Upgrade, Korora Air Quality Monitoring Paper, Connell Wagner, 2007). Table 7 presents the monitoring results from the monitoring station at Korora in comparison to the NEPM goals.

TABLE 3 KORORA AIR QUALITY MONITORING RESULTS

Pollutant	Averaging period	NEPM Goals		Korora monitoring results	
		Maximum Concentration	10-year goal (max allowable exceedance)	Maximum recorded concentration	Average recorded concentration
National standards and goals for ambient air quality					
Carbon monoxide	8 hr	9.0 ppm (10 mg/m ³)	1 day a year	0.2 ppm (0.3 mg/m ³)	0.03 ppm (0.04 mg/m ³)
Nitrogen dioxide	1 hr	0.12 ppm (246 µg/m ³)	1 day a year	0.036 ppm (73.8 µg/m ³)	0.004 ppm (9.2 µg/m ³)
Particles as PM₁₀	1 day	50 µg/m ³	5 days a year	37.8 µg/m ³	20.3 µg/m ³
Advisory reporting goals					
PM_{2.5}	1 day	25 µg/m ³	Gather data to facilitate review of a goal	15.4 µg/m ³	7.7 µg/m ³

3.2 BASELINE DEPOSITIONAL DUST GAUGE DATA

Background monitoring using DDGs was undertaken in the pre-construction phase of the project. DDG data has been recorded by TfNSW since September 2021, to allow discussion and comparison between pre-construction and construction monitoring results. Baseline monitoring was continued by FGJV until the commencement of Project activities with the potential to generate dust which occurred within the March to April 2023 monitoring period exposure period.

Baseline data is included in graph format, along with the location of the depositional dust gauges in Appendix A.

Where an exceedance of monitoring criteria is identified during construction, background monitoring information will be used to determine if this is consistent with pre-construction conditions, and if the construction can be considered to be the cause of the identified exceedance.

Following the completion of pre-construction monitoring, baseline trigger values were determined and are detailed in Section 0. These trigger values have also been included into a database within which all data will be recorded. The database has been set up to automatically highlight elevated monitoring results and trigger a review to determine whether additional mitigation measures are required to be implemented where results of monitoring are unsatisfactory.

4 MONITORING METHODOLOGY

Air quality will be monitored for the duration of the construction period of the project to provide verification of the effectiveness of mitigation and management measures implemented to minimise air quality issues. Based on the predicted construction air quality impacts described in the EIS, air quality monitoring requirements for the project comprises two primary monitoring functions.

4.1 DUST DEPOSITION GAUGE MONITORING

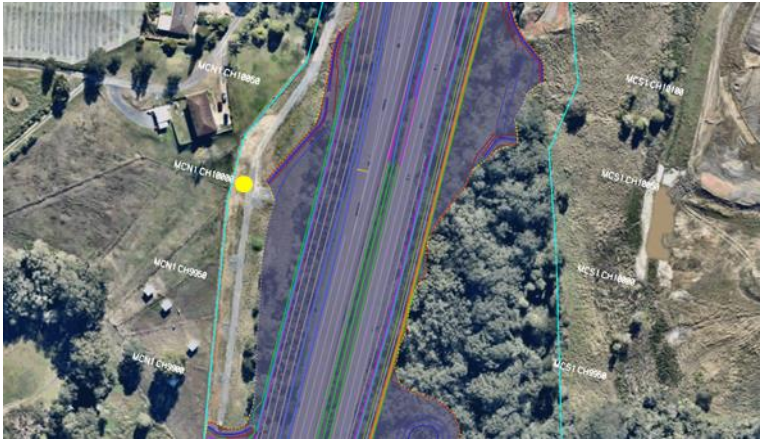
Fifteen dust deposition dust gauges (DDGs) have been installed adjacent to the project alignment at locations considered to be representative of the human and ecological receptors identified in the EIS. Monitoring location mapping have been provided within Table 3.

The dust monitoring locations have been selected based on satisfaction of the criteria prescribed in the *Australian Standard, A/NZS 3580.1.1:2007: Methods for sampling and analysis of ambient air, Part 1.1: Guide to siting air monitoring equipment*. Installation and operation of the DDGs is to be in accordance with the Dust Deposition Gauge Procedure and Field Sampling Sheet – Appendix B and C respectively.

During construction, the monitoring locations specified in Table 3 may be altered slightly so as to not be impacted by construction activities but maintain the same level of sample collection. Any changes to the locations in Table 3 will be made in consultation with the ER and updated into this document. Figures of dust monitoring locations in relation to nearby sensitive receivers are provided in Appendix D.

Data will be obtained on a monthly basis during construction.

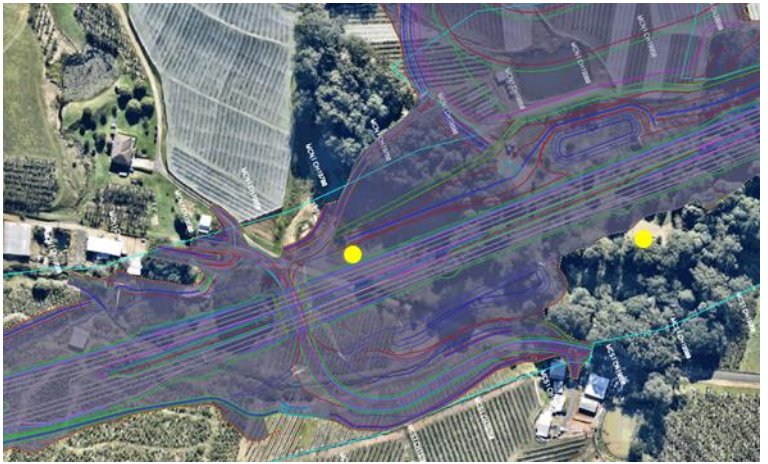
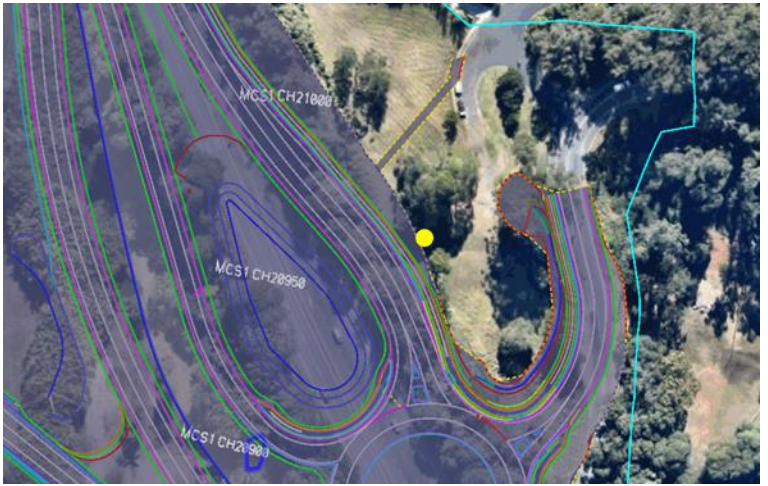
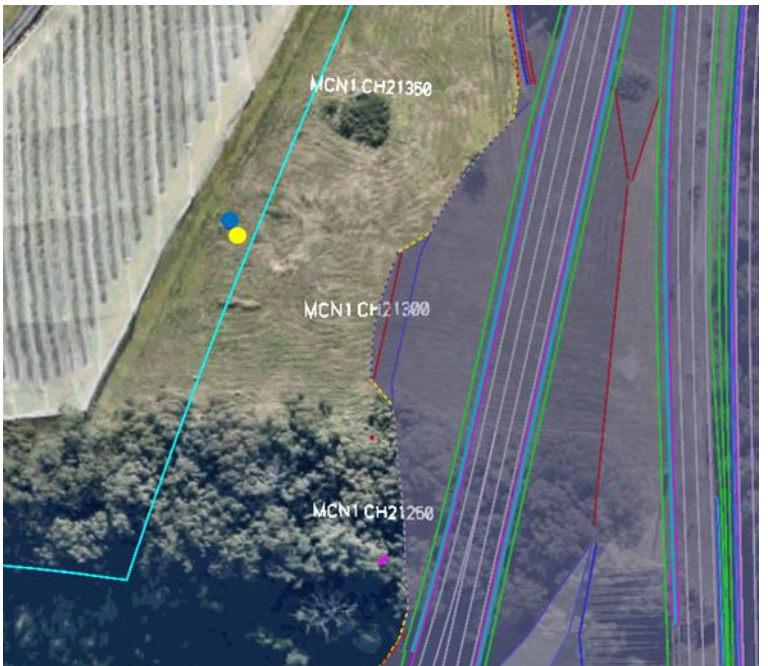
TABLE 4 DUST DEPOSITIONAL GAUGE MONITORING LOCATIONS

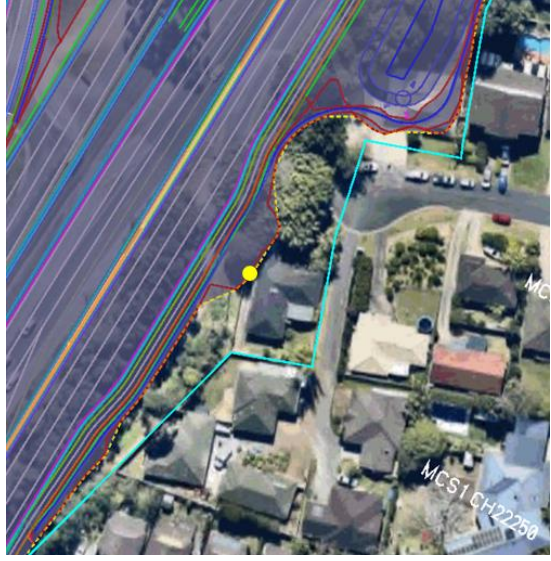
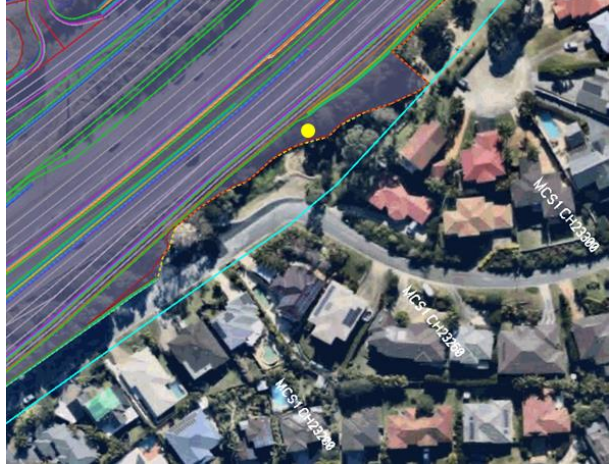

Dust Deposition Gauge Number	Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
DDG1	10000 West	Human / Ecological / Agricultural	

Dust Deposition Gauge Number	Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
DDG2	10750 East (TSP Site 2 (blue circle))	Ecological / Agricultural	
DDG3	12300 East	Human	
DDG4	14500 West	Ecological / Agricultural	

Dust Deposition Gauge Number	Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
DDG5	14800 East	Human	
DDG6	15700 East	Human	
DDG7	16600 East	Human	

Dust Deposition Gauge Number	Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
DDG8	18200 West	Human / Agricultural	
DDG9	18500 West	Ecological / Agricultural	
DDG10	19900 East	Ecological / Agricultural	

Dust Deposition Gauge Number	Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
DDG11	19700 West	Ecological / Agricultural	
DDG12	21000 East	Human	
DDG13	21300 West (TSP Site 1 (blue circle))	Ecological / Agricultural	

Dust Deposition Gauge Number	Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
DDG14	22250 East	Human / Ecological	
DDG15	23250 East	Human	
DDG16	10800 West	Industrial / Agricultural	

4.2 TOTAL SUSPENDED PARTICULATES

In accordance with the REMM AG06 in the EIS Submissions Report, continuous particulate dust monitors are to be installed at two representative locations to monitor potential construction dust impacts to agricultural production and processing.

Total suspended particulate monitors will operate in a real time capacity. These will be reviewed monthly (at the same time as DDG collection) and also in response to complaint or during adverse weather conditions.

Monitoring will be carried out in accordance with the Approved Methods for the sampling and analysis for air pollutants in NSW (EPA 2017a) at the locations detailed in Table 4 and below.

TABLE 5 TOTAL SUSPENDED PARTICULATES MONITORING LOCATIONS

Site	Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (yellow diamond)
Site 1 – Korora Hill	21300 West <ul style="list-style-type: none"> DDG13 Monitoring Location (red diamond) 	Ecological / Agricultural This site was selected as it is adjacent to the largest blueberry agricultural production area nearby the project alignment	
Site 2 – OzGroup Blueberry Processing Facility	10750 East <ul style="list-style-type: none"> DDG13 Monitoring Location (red diamond) 	Ecological / Agricultural This location was selected due to concerns raised in EIS submissions that the large processing facility may be impacted by dust as a result of nearby road construction.	

4.3 AIR QUALITY CRITERIA

In NSW, the statutory methods that are used to assess the air pollution impacts of projects are detailed in the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA 2017a). The relevant air quality standards are shown in Table 6 and Table 7 that form the assessment criteria for dust monitoring to be undertaken. Total Suspended Particulates and deposited dust is to be monitored.

TABLE 6 TOTAL SUSPENDED PARTICULATES AIR QUALITY CRITERIA DURING CONSTRUCTION

Pollutant	Averaging period	Standard (µg/m ³)
Total Suspended Particulates	Annual	90

TABLE 7 AIR QUALITY MONITORING CRITERIA FOR DEPOSITED DUST^A

Pollutant	Annual Concentration		Source
Deposited dust ^b	2 g/m ² /month ^c	4 g/m ² /month ^d	NERDDC (1998)

- Note:
- a. Adapted from EPA NSW guideline; Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2017).
 - b. Dust is assessed as insoluble solids as defined by AS 3580.10.1-1991 (AM-19).
 - c. Maximum increase in deposited dust level.
 - d. Maximum total deposited dust level.

Where baseline data on deposited dust levels exists, the 2g/m²/month criteria is used as a maximum increase value to assess annualised averages and determine compliance. Monthly results above this criterion are not considered to be actual exceedances, however they do provide an opportunity for compliance checks on a monthly basis. The 4g/m²/month criteria is used when no baseline data exists.

Location-specific criteria have been determined for each DDG based on the pre-construction annual rolling averages as detailed in Table 8.

Data from monthly DDG monitoring will be incorporated into a database and assessed against baseline criteria contained in Table 8. Where exceedances are identified and confirmed to be caused by construction activities, the construction methodology and appropriateness of mitigation measures will be reviewed by the Environment Manager and relevant construction lead (in accordance with section 7.5 and 8.1 of the Air Quality Management plan), and additional measures will be implemented where reasonable and feasible. Any changes will be captured in EWMS where applicable, and be updated into the CAQMP if required.

Mitigation measures to be implemented are detailed in the CAQMP, to which this Monitoring Program will be appended.

TABLE 8 LOCATION-SPECIFIC CRITERIA FOR DEPOSITED DUST

Dust Deposition Gauge Number	Baseline Average Deposited Dust ^a (g/m ² /month)	Construction Phase Deposited Dust Trigger Level (g/m ² /month)
DDG1	1.1	3.1
DDG2	1.6	3.6
DDG3	0.7	2.7
DDG4	1.3	3.3
DDG5	0.9	2.9
DDG6	0.8	2.8
DDG7	0.7	2.7
DDG8	0.9	2.9

Dust Deposition Gauge Number	Baseline Average Deposited Dust ^a (g/m ² /month)	Construction Phase Deposited Dust Trigger Level (g/m ² /month)
DDG9	0.2	2.2
DDG10	0.3	2.3
DDG11	0.2	2.2
DDG12	0.4	2.4
DDG13	0.3	2.3
DDG14	0.5	2.5
DDG15	0.8	2.8
DDG 16	NA	4.0

Note: a, Calculated from monthly pre-construction data from April 2022 to March 2023

5 REPORTING

Results of depositional and particulate dust monitoring are to be reported on a 6-monthly basis, this report is to be provided to TfNSW and regulatory agencies as required by an EPL. The 6-monthly report will include the following details:

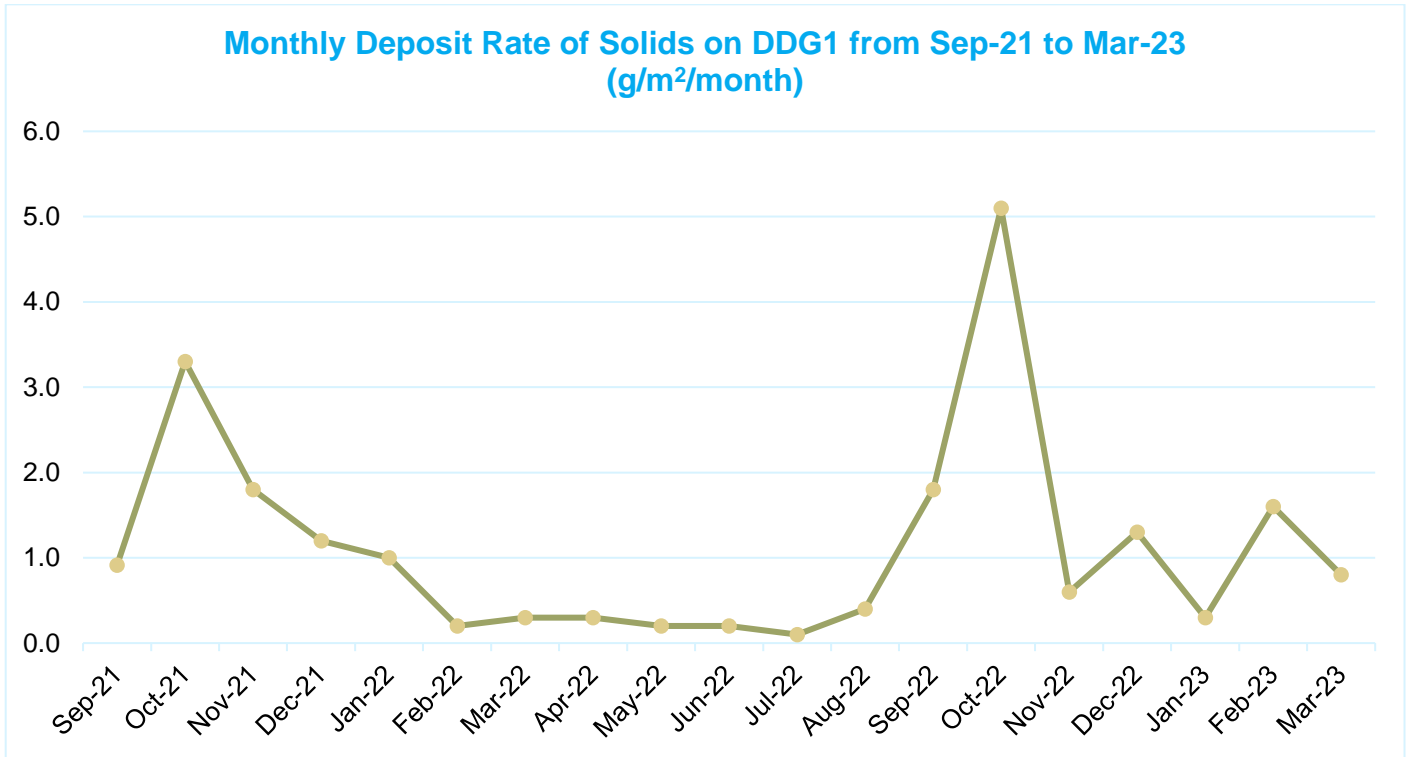
- A summary of the monitoring undertaken
- An assessment of monitoring results assessed against relevant criteria including annualised averages
- Provide details of any exceedance of assessment criteria
- Provide discussion of monthly and annualised monitoring results against the baseline data obtained during the preconstruction stage of the project
- Provide details of construction activities or circumstances that may have contributed to the exceedance
- Details of corrective actions implemented to prevent the recurrence of exceedance of assessment criteria

APPENDICES



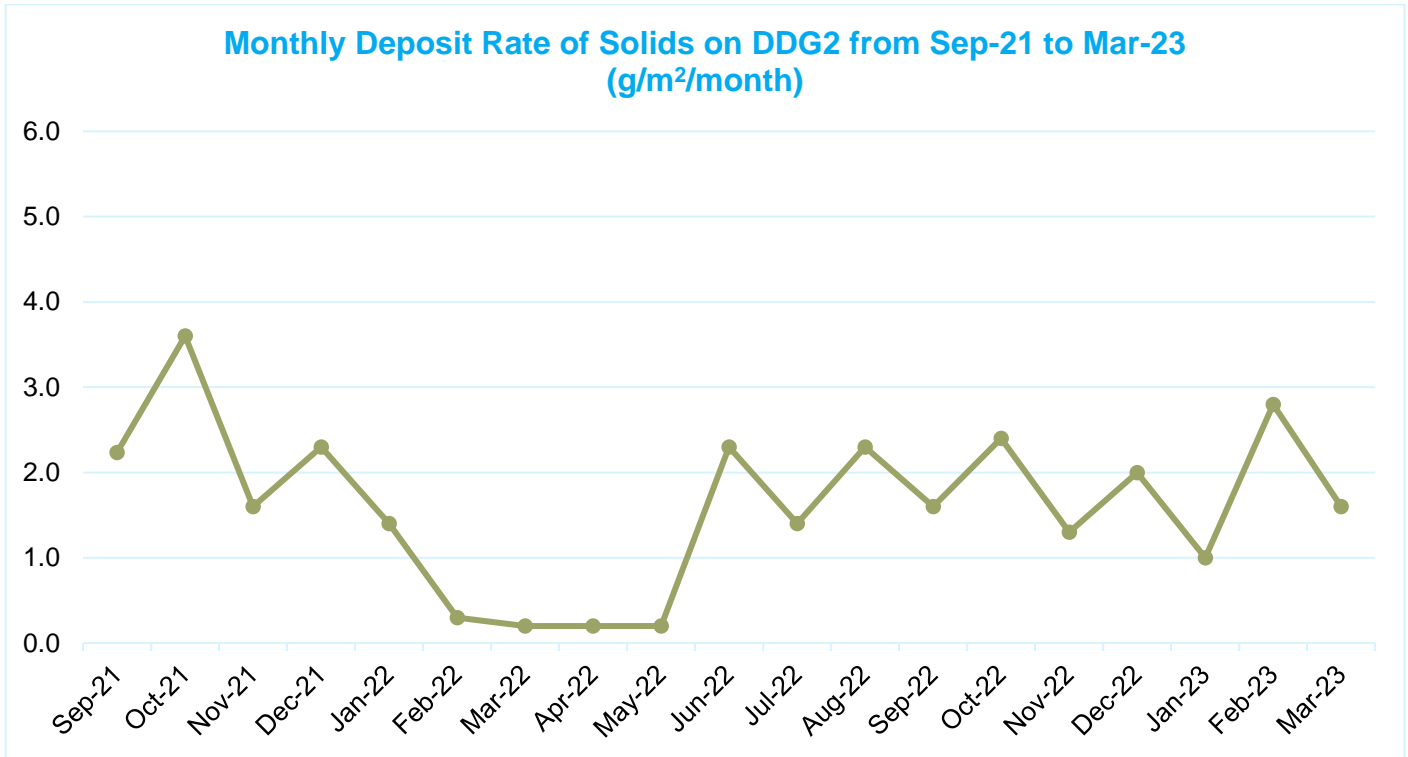
APPENDIX A BACKGROUND DUST DEPOSITION GAUGE DATA

Dust Deposition Gauge 1



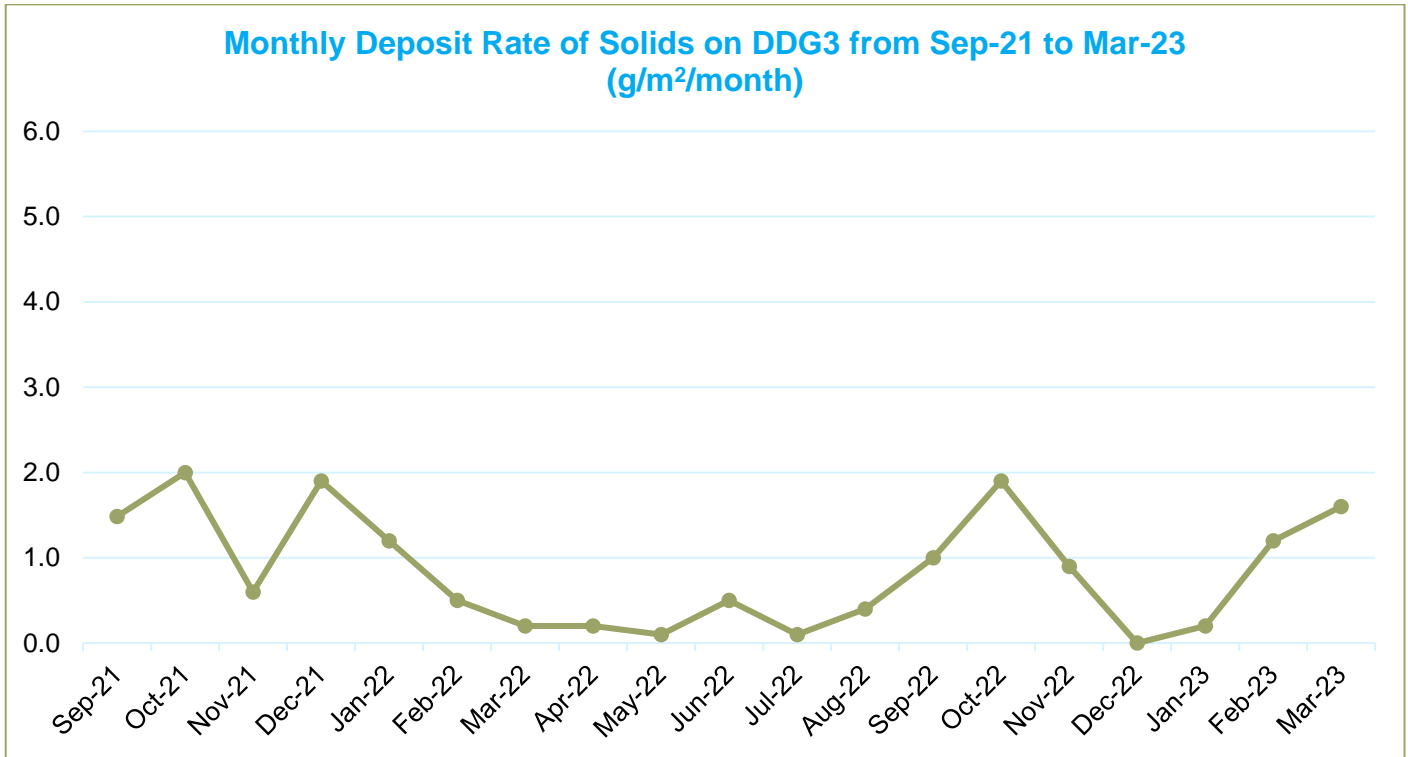
Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
10000 West	Human / Ecological / Agricultural	

Dust Deposition Gauge 2



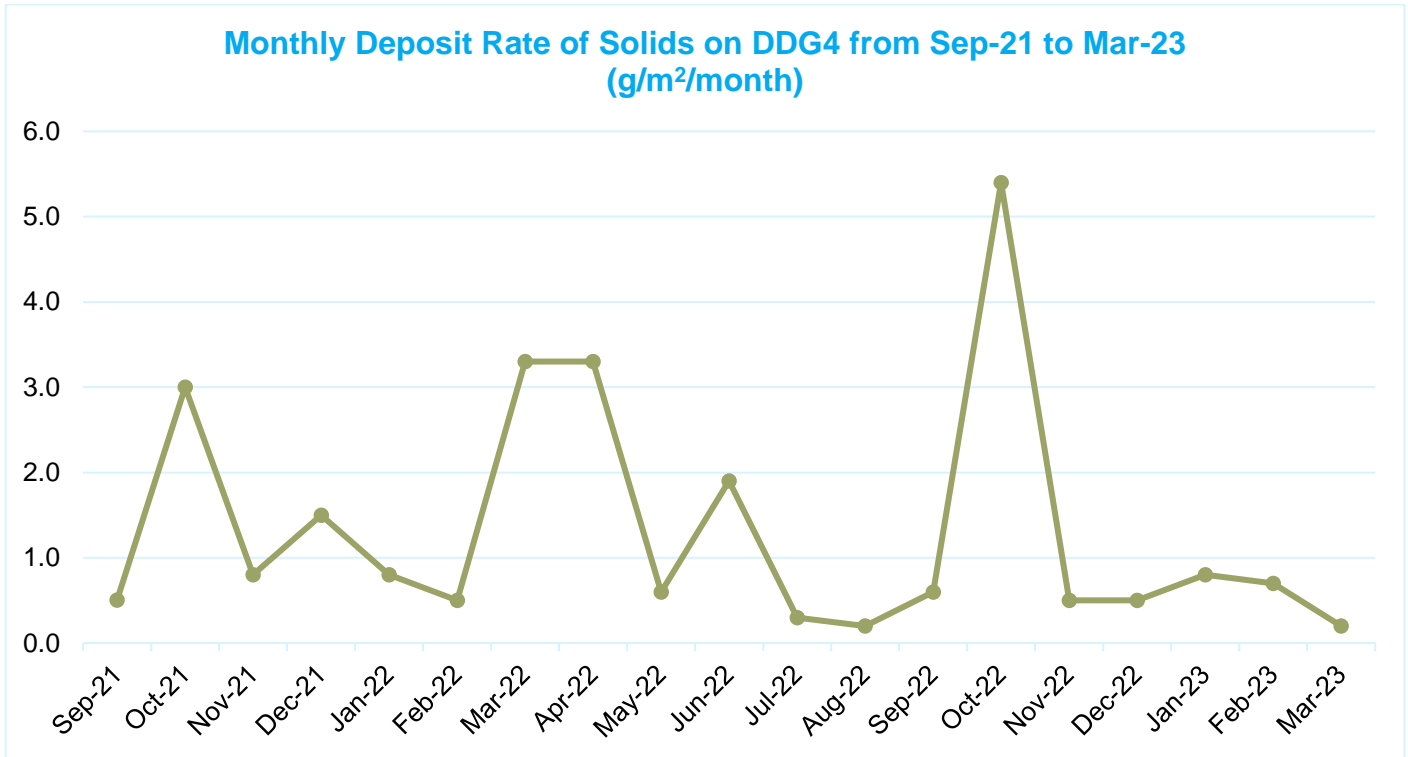
Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
10750 East (PM10 and PM2.5 Monitoring Location -Site 2)	Ecological / Agricultural	

Dust Deposition Gauge 3



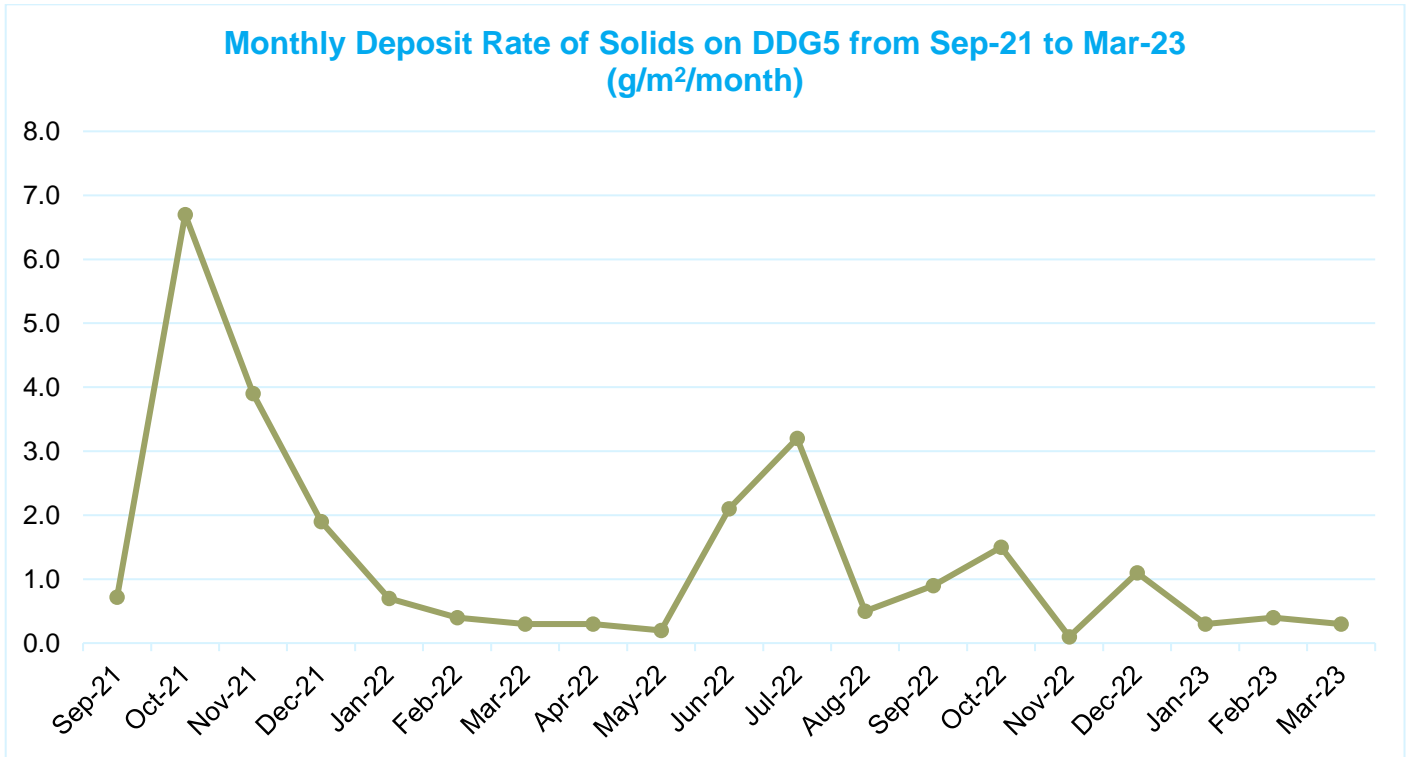
Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
12250 East	Human	

Dust Deposition Gauge 4



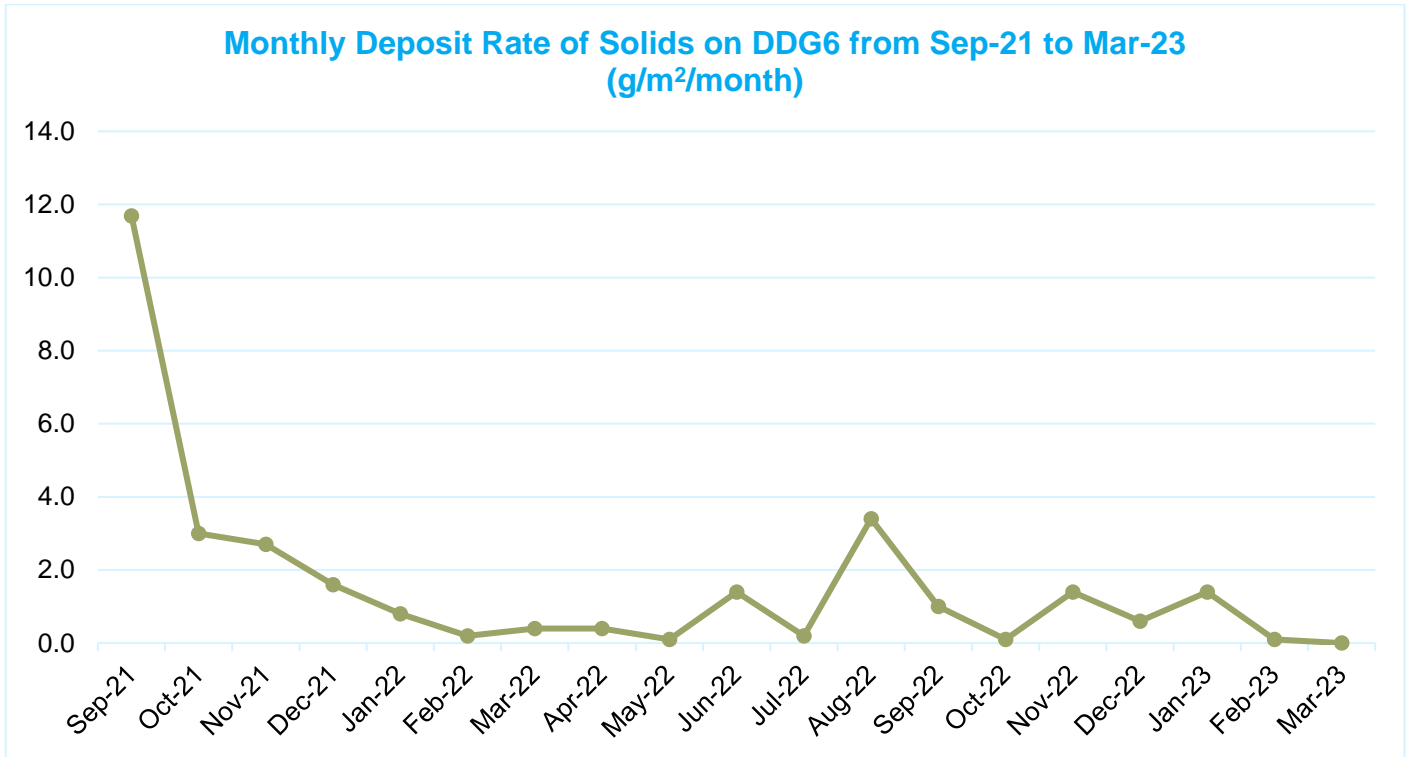
Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
14500 East	Ecological / Agricultural	

Dust Deposition Gauge 5



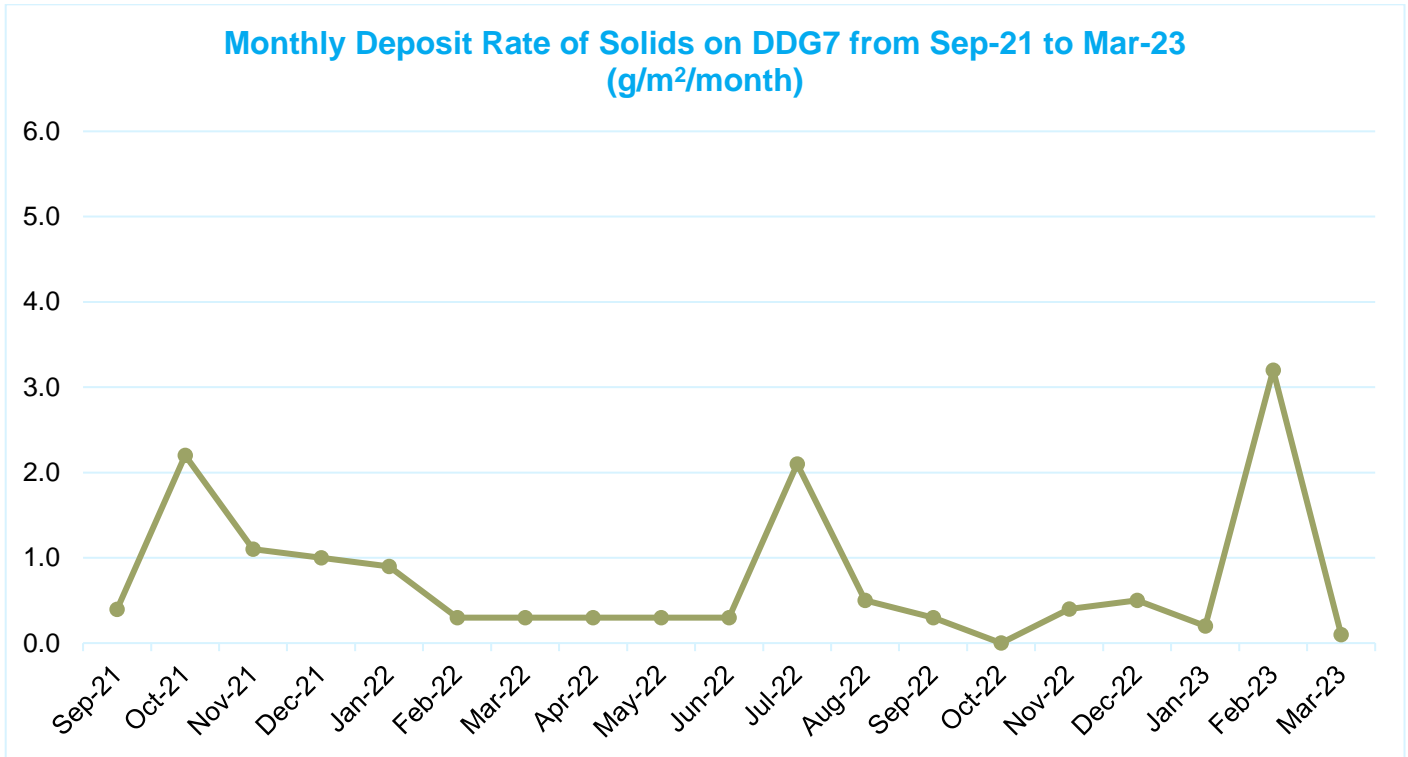
Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
14800 East	Human	

Dust Deposition Gauge 6



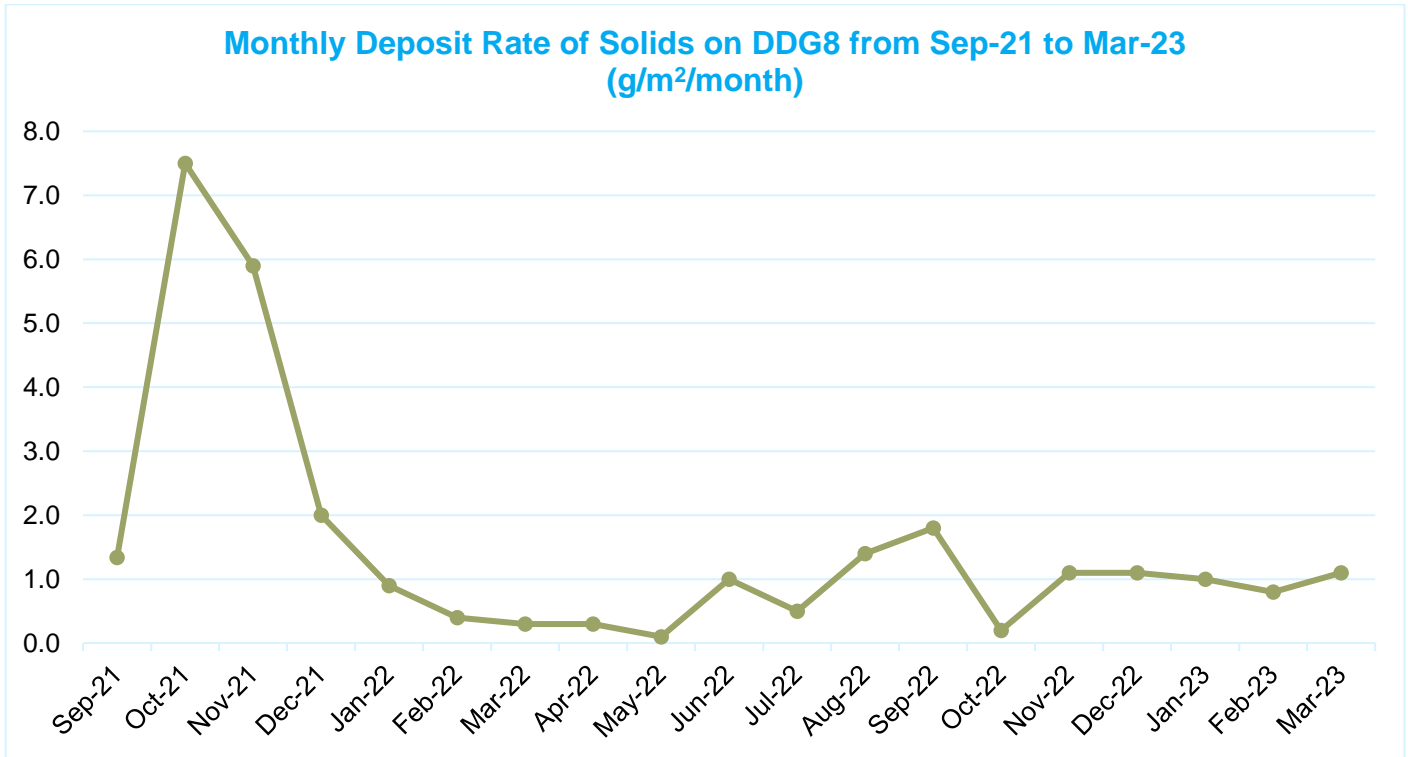
Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
15500 East	Human	

Dust Deposition Gauge 7



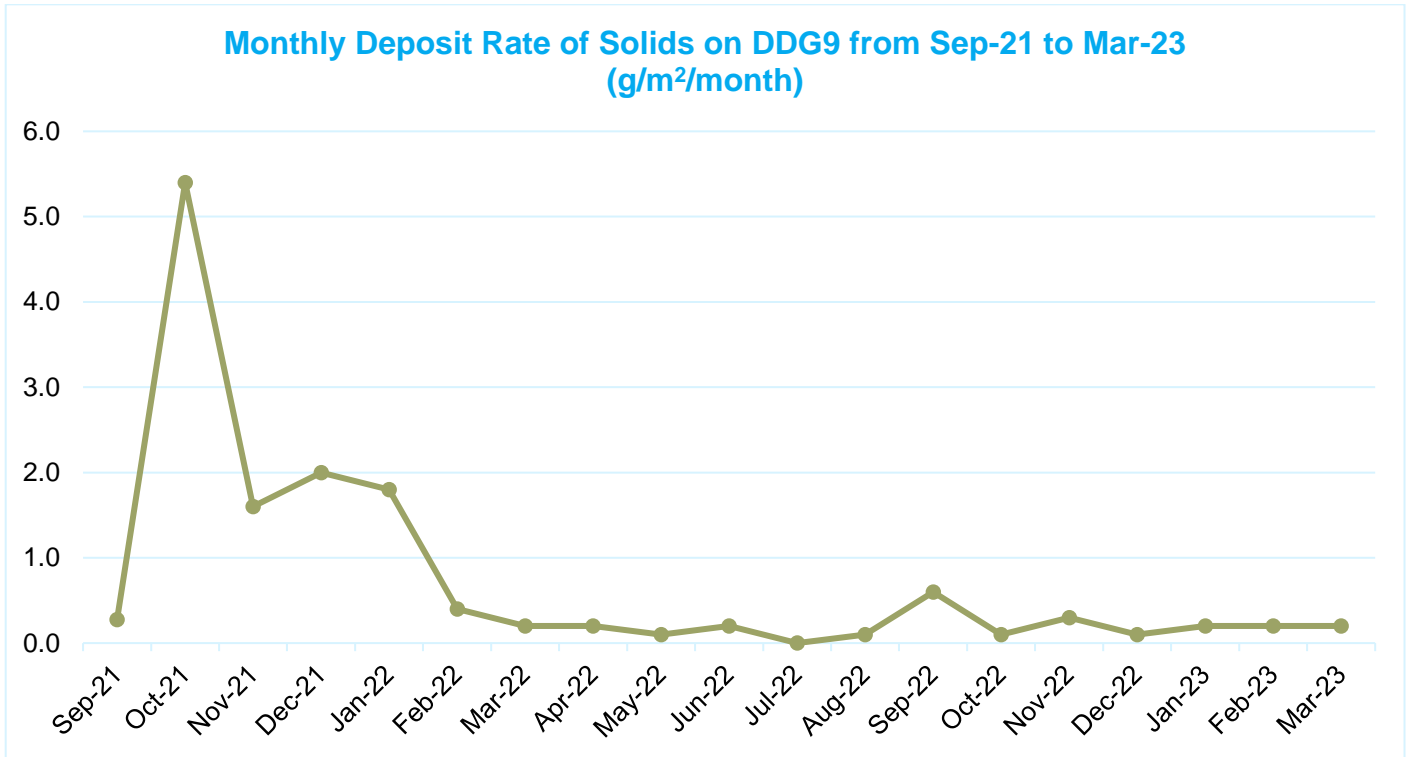
Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
16600	Human	

Dust Deposition Gauge 8



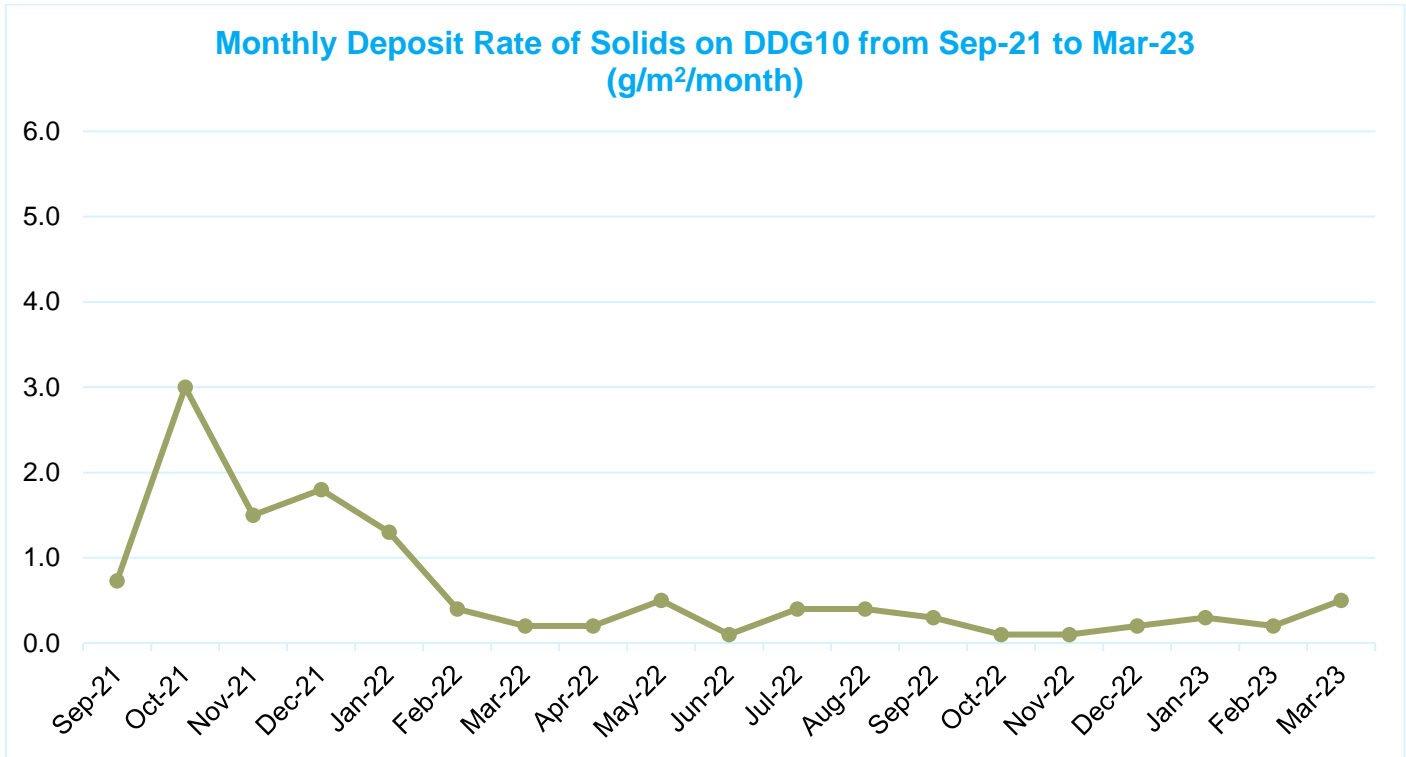
Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
18000	Human	

Dust Deposition Gauge 9



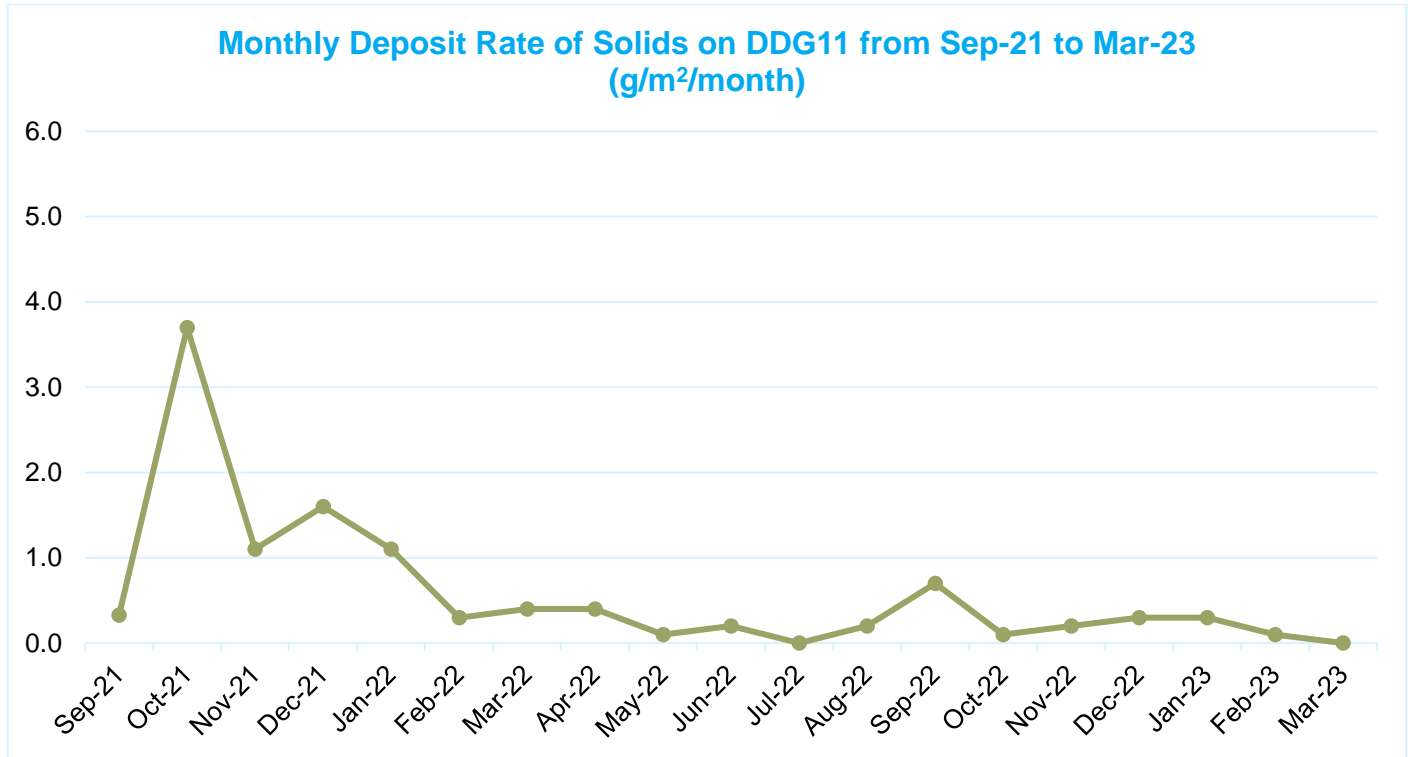
Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
18500 West	Ecological / Agricultural	

Dust Deposition Gauge 10



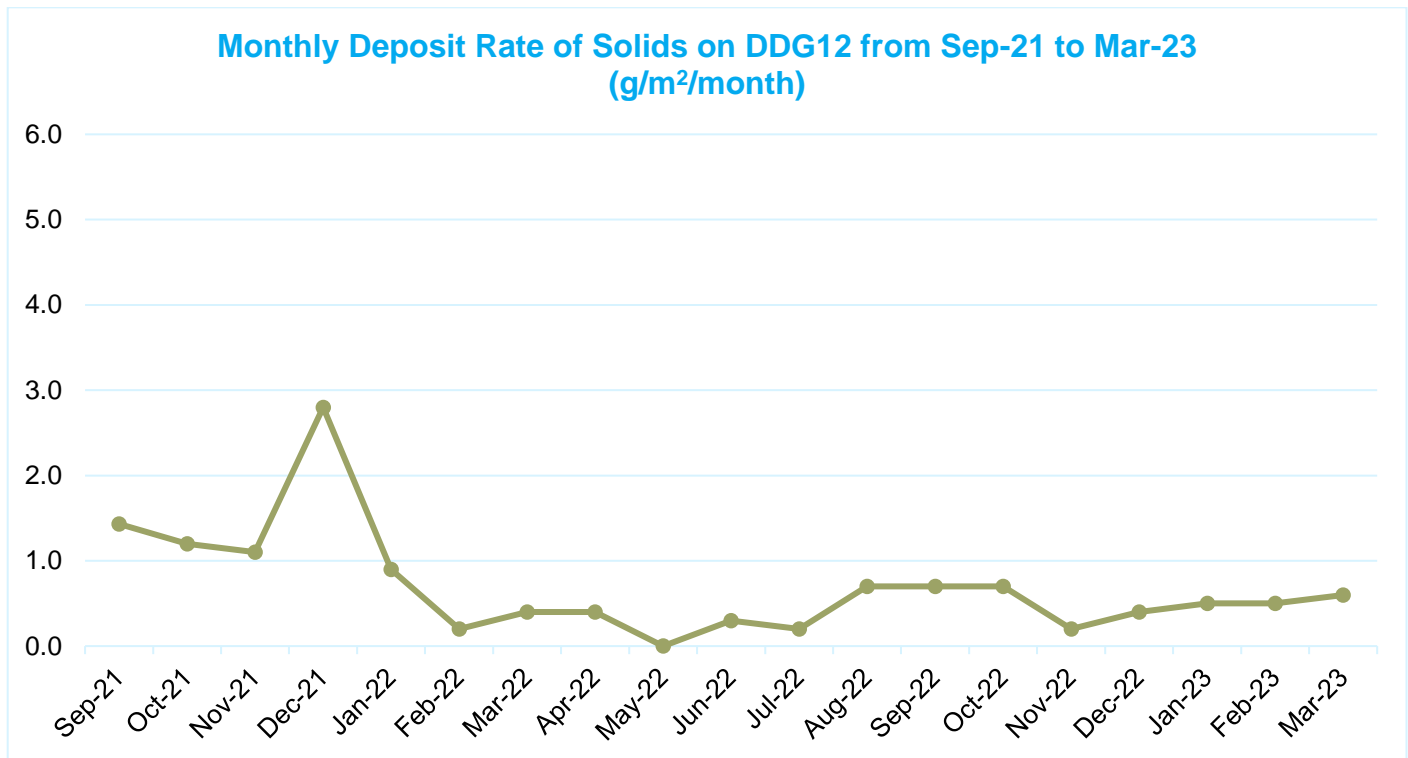
Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
19700 East	Ecological / Agricultural	

Dust Deposition Gauge 11



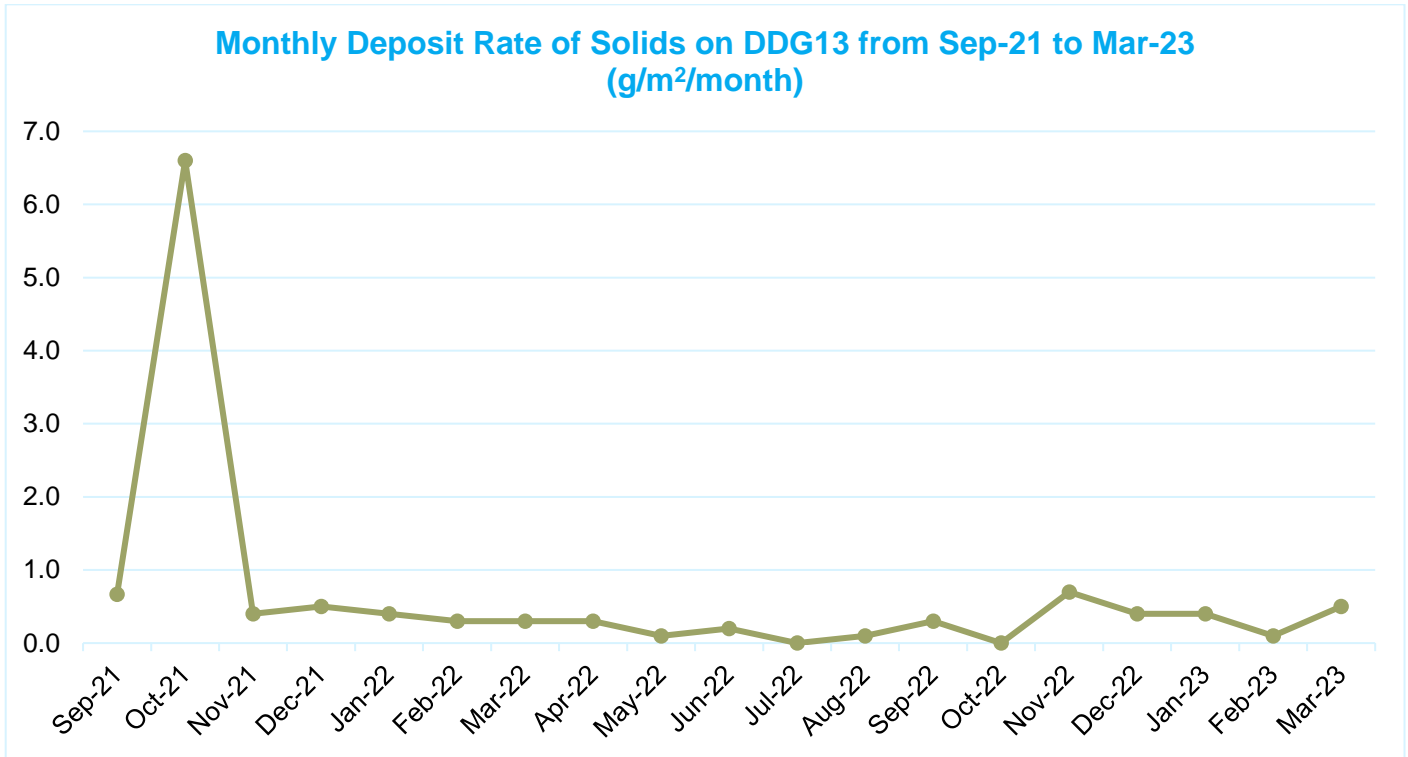
Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
19700 West	Ecological / Agricultural	

Dust Deposition Gauge 12



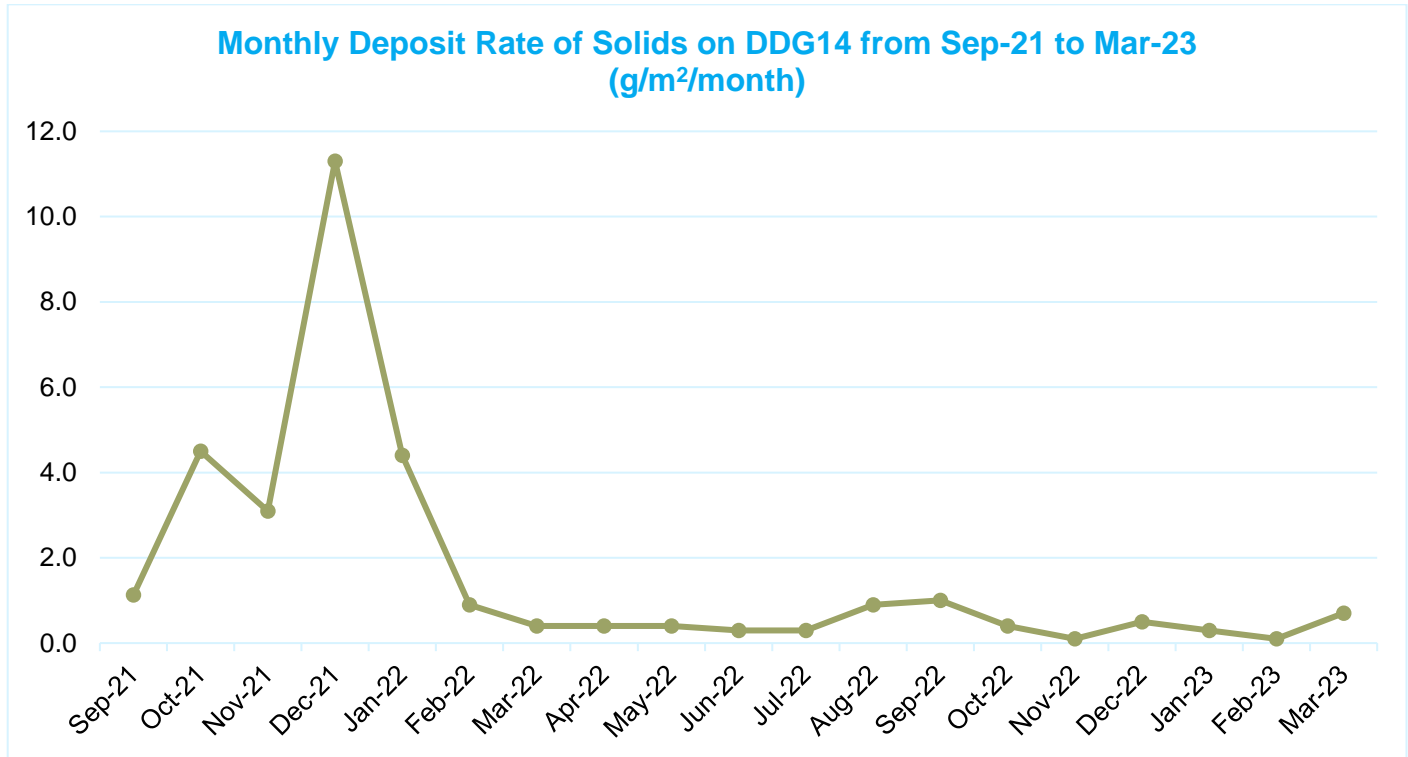
Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
21000 East	Human	

Dust Deposition Gauge 13



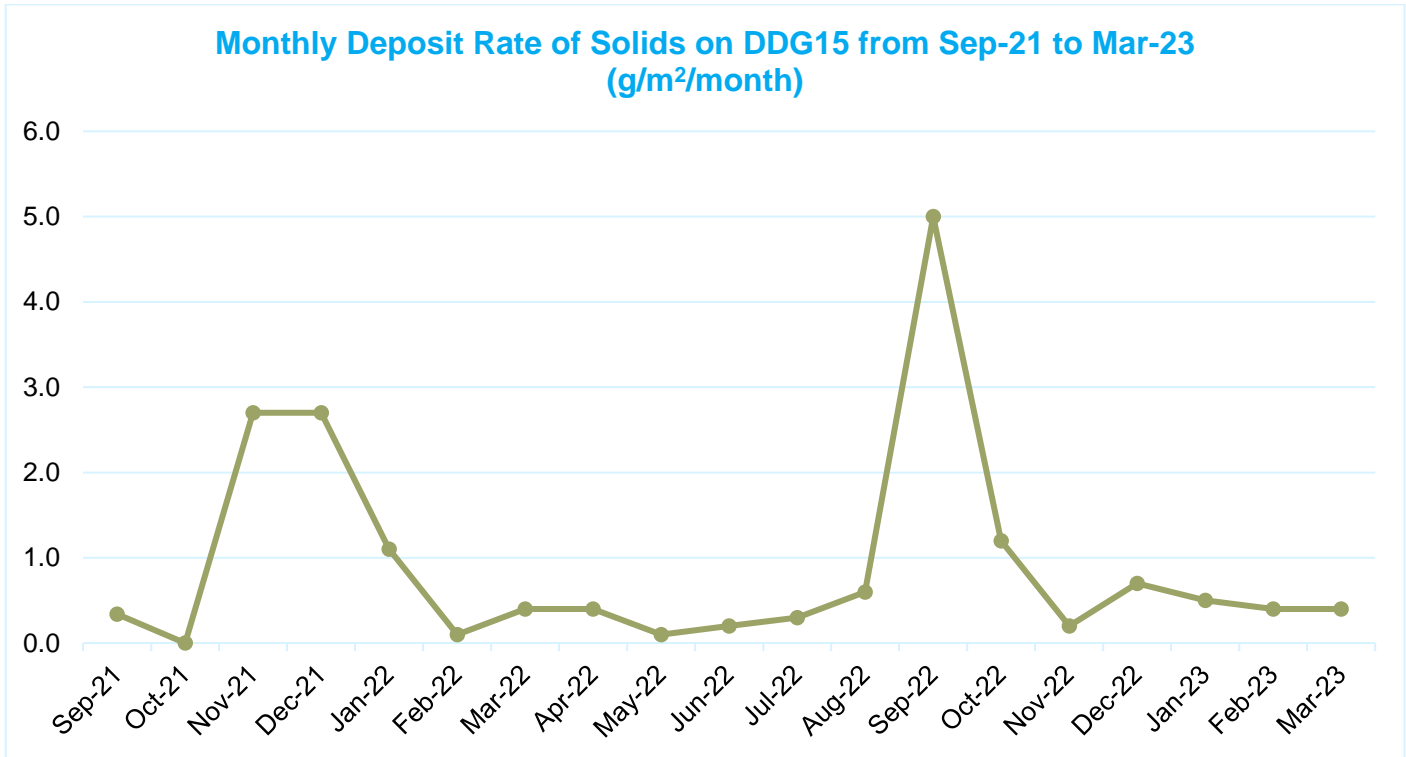
Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
21300 West (PM10 and PM2.5 Monitoring Location - Site 1)	Ecological / Agricultural	

Dust Deposition Gauge 14



Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
22000 East	Human / Ecological / Agricultural	

Dust Deposition Gauge 15



Chainage/Location Alignment Side	Target Sensitive Receiver Types	Monitoring Location Mapping DDG Site shown as (red diamond)
23000	Human	

APPENDIX B DUST DEPOSITION GAUGE PROCEDURE

APPENDIX C DUST DEPOSITION GAUGE FIELD SAMPLING SHEET

APPENDIX D DUST MONITORING LOCATIONS AND SENSITIVE RECEIVERS