

Project	Exmouth Sea Outfall
Client	South West Water
Document Title or Subject	Exmouth STW: Assessment of Hazardous Pollutants within the Treated Final Effluent - Addendum
Document Reference	110224-PEF-XX-XX-TTN-OP-0002
Revision	P01
Prepared by	
Issued to	
Date	05/09/2025

1. Introduction

This additional technical note is an addendum to the assessment of the hazardous pollutants for Exmouth STW final effluent as defined in the GOV.UK Guidance entitled 'Surface Water Pollution Risk Assessment for Your Environmental Permit'.

The addendum is in response to the comments received from the Environment Agency (EA) on the initial assessment. On the basis of the EA's comments, the final effluent data have been re-analysed in terms of the last three years of data. The background data from the monitoring point, River Exe at the Point (Sample Point Number SW-70510116) which was used in the initial assessment, have also been revised. The average background concentrations have been re-calculated using limit of detection 'face value' data for those samples below the limit of detection, while for those metals with insufficient samples (<12) half the value of the EQS has been used.

2. The Treated Final Effluent Data

The statistics for the last three years of data have been analysed for each of the metals is shown in Table 1 below. Also shown in the Table is the number of less than results.

Last Three Years Data

Metal	Number of Samples	Number of Less Thans (ie. less than the limit of detection)
Total Cadmium	37	37
Total Chromium	37	36
Total Copper	37	8
Total Iron	36	16
Total Lead	36	36
Total Nickel	37	19
Total Zinc	37	22

Table A1. Number of Samples for Each Metal and the Number less than the Limit of Detection – Last Three Years of Data

In the analysis of the final effluent data, the face value of the limit of detection has been used wherever a sample is less than the limit of detection. This represents the 'worst case' in terms of the statistics.

The statistical data for the last three years of sample results are shown in Table A2.

Last 3 Years Data	All in micrograms/l except total iron which is milligrams/l						
	Total Cadmium	Total Chromium	Total Copper	Total Iron	Total Lead	Total Nickel	Total Zinc
Average	3.05	3.26	11.05	0.15	13.13	8.45	42.76
SD	4.71	4.60	10.39	0.16	18.61	9.57	68.13
Median	3.00	3.00	8.00	0.10	12.00	6.00	26.00
Geomean	1.65	2.46	8.79	0.12	10.01	6.72	28.63
Max	30.00	30.00	50.00	1.00	120.00	60.00	370.00
Min	0.20	1.00	5.00	0.04	4.50	2.00	7.00
Count	37	37	37	36	36	37	37
Count of Less thans	37	36	8	16	36	19	22

Table A2. Statistical Data for the Whole Data Set for the Total Metals

3. Test 1

This test compares the average and maximum values in the treated final effluent with the relevant EQS, either as an annual average or Maximum Allowable Concentration (MAC) / 95th percentile.

The relevant EQSs are shown in Table A3 below.

EQS (all in µg/l)	Annual Average	MAC	95 th ile
Cadmium Dissolved	0.2	NA	
Chromium VI Dissolved	0.6		32
Copper Dissolved (Note 1)	3.76	NA	
Iron Dissolved	1000	NA	
Lead Dissolved	1.3	14	
Nickel Dissolved	8.6	34	
Zinc Dissolved	6.8	NA	

NA = Not Applicable

Note 1. The EQS is for a DOC value of < or =1, which is the case for these waters.

Table A3. Relevant EQS Values for the Various Metals

Comparing the average and maximum values for each of the total metals against the EQSs for the dissolved metals gives the following outcomes for last three years of data as shown in Tables A4 below.

Last 3 Years Data	All in micrograms/l except total iron which is milligrams/l						
	Total Cadmium	Total Chromium	Total Copper	Total Iron	Total Lead	Total Nickel	Total Zinc
Average	3.05	3.26	11.05	0.15	13.13	8.45	42.76
Max	30.00	30.00	50.00	1.00	120.00	60.00	370.00

Table A4. Comparison of Average and Maximum Values against EQS for the Whole Data Set

The colour coding of the box infill is green for less than the EQS and light brown for greater than EQS. Where the data have no infill, there is no EQS applicable.

The only metal which consistently passes the test is iron.

4. Tests 2, 3, and 4

These Tests relate to the location of the discharge of the treated effluent. As the discharge is to a coastal location about 300 m offshore into a water depth at low water spring tides of about 8 m, none of the Tests apply.

5. Test 5

This Test looks at the effective volume flux compared with an allowable effective volume flux. The Test in essence is looking at the dilution of the effluent in the coastal waters, taking account of the existing background concentration of a hazardous pollutant in the coastal waters. At the site of the discharge of the final effluent from Exmouth WwTW, the allowable effective volume flux is 3.5 m³/s.

The Test requires flow data for the discharge and background concentration data for the coastal waters at the location of the discharge. The average flow for the treated final effluent at Exmouth WwTW has been determined from the daily volume flows monitored by South West Water and provided to the Environment Agency as an annual return. The average flow has been calculated from the daily volume data for the period from 2020 to 2024. It is 14,680 m³/day which equates to 0.17 m³/s. The maximum flow for the final treated effluent has been taken to be the flow to full treatment which is 0.273 m³/s.

Background concentrations of the dissolved metals have been assessed from data for a monitoring site at the mouth of the Exe Estuary, River Exe at the Point (Sample point Number SW-70510116). This site has been taken to provide the most representative recent data close to the discharge location. The background data have been assessed from the available data for the period 2020 to 2024. For certain metals, the data are quite limited, while others are all below the limit detection (see Table A5 below).

Data for River Exe at the Point 2020 to 2024

Metal	Number of Samples	Number of Less Thans (ie. less than the limit of detection)
Cadmium Dissolved	14	14
Chromium VI Dissolved	3	2
Copper Dissolved	4	1
Iron Dissolved	4	4
Lead Dissolved	14	10
Nickel Dissolved	14	9
Zinc Dissolved	4	2

Table A5. Number of Samples for Each Metal and the Number less than the Limit of Detection – Monitoring Site: River Exe at the Point from 2020 to 2024

In the first assessment, where data were less than the limit of detection, half the value of the limit of detection was used. Following the EA's comments, the face value of the limit of detection has been used and where there are less than 12 samples, then half the value of the EQS has been used.

The resulting background concentrations are shown in Table A6 below.

	Average Background Concentration µg/l	Max Background Concentration µg/l
Cadmium Dissolved	0.030	
Chromium VI Dissolved *	0.300	16.000
Copper Dissolved *	1.880	
Iron Dissolved *	500.000	
Lead Dissolved	0.049	0.110
Nickel Dissolved	0.394	0.950
Zinc Dissolved *	3.400	

* Indicates metals for which half of EQS used

Table A6 Average Background Concentrations for Dissolved Metals

Based on the discharge flow figures, the measured levels of total metals in the treated final effluent, and the background concentrations, the effective volume fluxes have been calculated for the final effluent data from the last three years of samples. The effective volume fluxes have been calculated for all metals, even though iron was considered to be insignificant in the treated final effluent as it is below the EQS.

The effective volume flux (EVF) is calculated as follows:

$$EVF (m^3/s) = (EFR * RC) / (EQS - BC) ;$$

where: EFR = Effluent Flow Rate

RC = Release Concentration of Substance

EQS = EQS of Substance

BC = Background Concentration in the Coastal Waters near the Discharge Point

For an annual average EQS, the average discharge flow and the average release concentration have been used in the calculation, while for a MAC or 95%ile EQS, the flow to full treatment and the maximum release concentration have been used.

The results are shown in Table A7. The colour coding is similar to before, where green indicates that the EVF is less than the AEFV, while light brown indicates that it is greater.

Last 3 Years Data	Average Data			Max Data			
	EFR * RC	EQS - BC	EVF	EFC * RC	MAC - BC	EVF	AEVF
Cadmium	0.518	0.170	3.047	NA			3.5
Chromium	0.554	0.300	1.848	8.190	16.000	0.512	3.5
Copper	1.877	1.880	0.998	NA			3.5
Iron	24.759	500.000	0.050	NA			3.5
Lead	2.230	1.251	1.783	32.760	13.890	2.359	3.5
Nickel	1.435	8.206	0.175	16.380	33.050	0.496	3.5
Zinc	7.265	3.400	2.137	NA			3.5

Table A7. Comparison of EFVs with the AEFV – Last Three Years of Data

Based on these calculations using the last three years of final effluent data for Exmouth STW and the revised background concentrations, there are no metals for which the EVF exceeds the AEFV.

Conclusions

No metal present in the treated final effluent from Exmouth WwTW requires further assessment in terms of modelling. All the metals assessed, cadmium, chromium, copper, iron, lead, nickel, and zinc, which enter the sewage system via a consented trade effluent, meet the allowable effective volume flux test, and iron was screened out as insignificant, being below the EQS in the discharge.

It is recommended that the metal sampling and analysis undertaken by South West Water on the treated final effluent is revised to give data which would allow a more robust assessment against the relevant EQSs. In this context, the sampling should be for both dissolved and total metals, and the analysis should be made to an appropriate limit of detection. These two recommendations implemented together should provide information for any future assessment of the hazardous pollutants in the final effluent from Exmouth STW.

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Report Ref.	110224 -PEF-XX-XX-TTN-OP-0002 Exmouth STW_Assessment Of Hazardous Pollutants_Addendum					
File Path	P:\Data\PROJINFO\107201 - Exmouth Sea Outfall\01 - WIP\Documents\General					
Rev	Suit	Description	Date	Originator	Checker	Approver
P01	S4	First Issue	05/09/2025	P Jonas	M Duquemin / L Wardell	L Wardell
Ref. reference. Rev revision. Suit suitability.						