M3 Junction 9 Improvement

Scheme Number: TR010055

6.3 Environmental Statement Appendix 13.3 - Chalk Improvement and Stabilisation Technical Note

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Volume 6

November 2022

Infrastructure Planning

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

M3 Junction 9 Improvement
Development Consent Order 202[x]

6.3 ENVIRONMENTAL STATEMENT- APPENDIX 13.3: CHALK IMPROVEMENT AND STABILISATION TECHNICAL REPORT

Regulation Number:	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference:	TR010055
Application Document Reference:	6.3
BIM Document Reference:	HE551511-VFK-EGT-X-XXXX-XX-TN-LE-0002
Author:	M3 Junction 9 Improvement Project Team, Highways England

Version	Date	Status of Version
Rev 0	November 2022	Application Submission

TECHNICAL NOTE

Job Name: M3 Junction 9 Improvement Scheme

Note No: HE551511-VFK-EGT-X_XXXX_XX-TN-LE-0002

Date: 2nd August 2022

Prepared By: **T. King / R. Sears**

Checked by: S. Pettifer

Subject: **M3 JUNCTION 9 – CHALK IMPROVEMENT AND STABILISATION**

Introduction

The *Stage 3B Ground Investigation Report – 2022 Scheme Update (HE551511-VFK-HGT-X_XXXX_XX-RPGE-0001)* presents a review of a ground investigation carried out to provide information on the ground conditions by Soils Ltd in 2019. The report concludes that the majority of the material excavated within the cuttings will be the Seaford Chalk Formation with a small volume of Head Deposits likely to the east and south of the River Itchen.

Chalk as an engineering material in nature in the ground exhibits a wide range of mechanical and physical properties varying from a putty like clay and silt size matrix (that has properties akin to a soil and is called structureless chalk) to a relatively intact calcareous rock (structured chalk) such as that forming much of our coastal scenery.

A key driver for the scheme is to avoid earthworks disposal from site and instead reuse for fill across the scheme. Chalk can be a difficult material to use as an engineering fill as its properties change with moisture content and it is susceptible to crushing and degradation from handling and transportation. Strict materials control will be required on site in accordance with Clause 605 of the Specification for Highways Works Series 600 Earthworks (SHW, 2016). Stockpiles, excavations and placed material will require protection from the weather to avoid deterioration of the chalk. Double handling of excavated chalk should be avoided to reduce the breakdown of the material into fines. There is a significant surplus of fill material to be generated from site, therefore the better-quality structured chalk could be segregated and used as engineering fill and in temporary use for haul roads and the likes. However, the use of binders e.g. lime or cement may be required to allow the wetter chalk to be reused. Note that the chalk moisture content will depend on seasons (wet-weather working).

The northern-most section of the M3 Junction 9 main site boundary is situated within Ground Water Source Protection Zones (SPZ) I (Inner protection zone) and II / III (Outer / Total protection zone) as seen in *Appendix. A*. There are minimal permanent works earthworks requirements at this area of the project in the Stage 3 design however the area may also be used as a temporary haulage route.

Ground Improvement and Stabilisation

Improvement and stabilisation material methods will be determined during Stage 5 detailed design. The preferred method will be predominantly based on reasoning for the treatment and associated design parameters, location of works and buildability. Lime and cement the most common forms of ground improvement but other products and technology are available.

Lime may be preferable to reduce the moisture content and "cook" the chalk material in wet weather. This in-turn improves material properties for use in the fill. Lime use depends on other constituents of the chalk material and would require further review at detailed design stage to confirm appropriate.

Cement acts as a binding agent to the likes of structureless chalk to, again, improve material properties. Additives may also be required depending on design parameters. However, the preference will be to use Ordinary Portland Cement (OPC) only, with additives designed into the binder only if absolutely necessary. This will be confirmed during detailed design. Cement may also be used as a follow-up to initial lime treatment. Lime will render the chalk sufficient to enable cement to be finely mixed to produce a more robust and stronger material.

Qualitative hydrogeological risk assessment

Risk to Controlled Waters from these potential stabilisation and treatment options is considered here for both infiltration capacity and for water quality.

Infiltration capacity

Following cutting, handling and filling operations involving non-stabilised or treated Chalk, it is extremely unlikely that any fissures or conduits would remain in the material. The infiltration capacity of the Chalk will thus be limited to infiltration through the Chalk matrix and infiltration basins located in areas of filled Chalk material have been designed accordingly. It is considered extremely unlikely that treating or stabilising the Chalk would result in any significant change in its infiltration capacity compared to un-treated or stabilised Chalk and no further assessment is considered necessary.

Water quality

Lime is a natural material with a similar chemical composition to Chalk. The addition of lime to Chalk is unlikely to result in any significant change to the Chalk chemistry. The risk to Controlled Waters is thus unlikely to be changed following the addition of lime. We do not consider that any further risk assessment or regulatory approval is required for the stabilisation of Chalk with lime, both for areas within and without the SPZs which can be seen in *Appendix. A*.

Cement treatment is a recognised method of binding contaminants into the host matrix. Therefore, Chalk that has been treated with cement is less likely to release contaminants to Controlled Waters and could have a beneficial impact on Controlled Water quality. We do not consider that any further risk assessment or regulatory approval is required for the treatment of Chalk with cement, both for areas within and without the SPZs.

However, if lime stabilisation or cement treatment work is proposed within the SPZ1, then details of the plan, working methods, quantities of lime used, etc will be provided to the Environment Agency at the detailed design phase of the project. Agreement would then be sought with the Environment Agency that no further risk assessment or other works are required to obtain regulatory approval.

Risk hierarchy

If, during the detailed design phase, it is established that additives will be required and / or different stabilisation or treatment methods are necessary, then the appropriate Controlled Waters risk assessments will be undertaken to determine the likely risk (both for quantity and quality) to Controlled Waters. Prior to undertaking such risk assessments, discussion and agreement will be sought with the Environment Agency to ensure these risk assessments undertaken are appropriate.

The risk assessments will demonstrate that no additives or alternative methods will introduce hazardous substances into Controlled Waters nor cause pollution by non-hazardous pollutants.

On the basis of these risk assessments, it may be concluded that the additives and / or methods introduce such small quantities of potential contaminants that an Environmental Permit is not required. This would be agreed with the Environment Agency at this stage and prior to the works commencing.

Should larger quantities of potential contaminants be required, then it may be concluded, following consultation with the Environment Agency, that the work must be undertaken under an Environmental Permit to ensure the risk to Controlled Waters is acceptable and minimised as far as reasonably practical..

It is recognised that additional complexity of risk assessment may be required for areas within the SPZ I.

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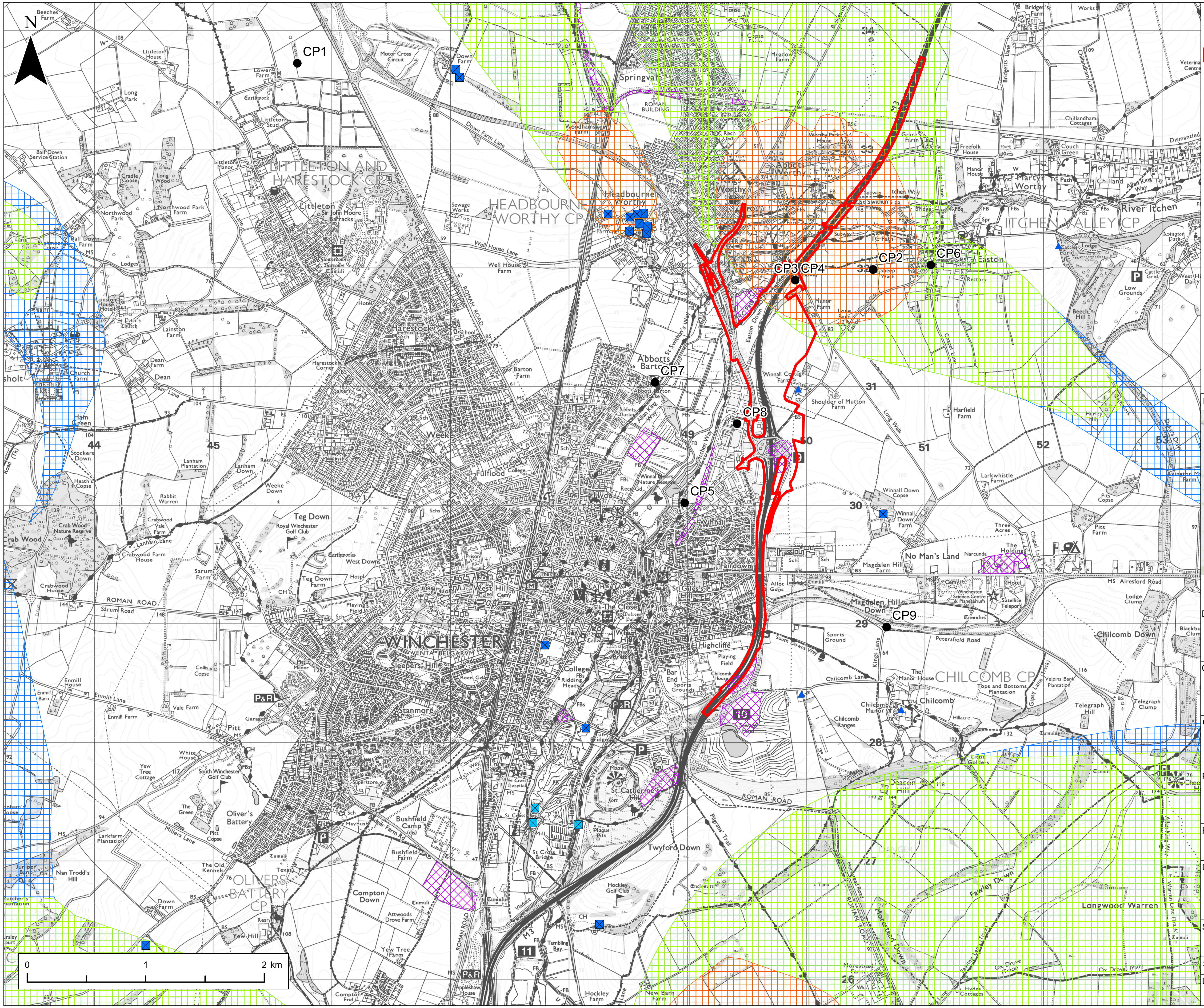


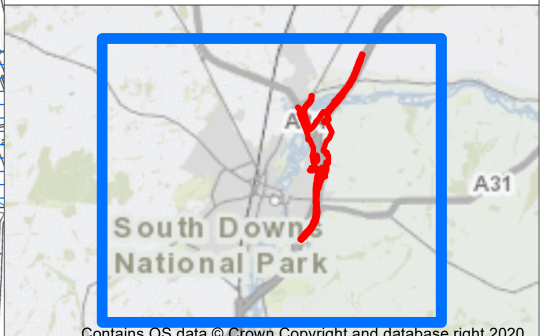
NOTES

1. This drawing has been produced using GIS software, therefore all dimensions are shown in metres unless shown otherwise.

Legend

- Application Boundary
- Groundwater Abstraction License
- Surface Water Abstraction License
- Private Groundwater Abstractions
- Historical Chalk Pit Location
- Source Protection Zone 1
- Source Protection Zone 2
- Source Protection Zone 3
- Historic Landfills

REFERENCE MAP



REV	DATE	REVISION NOTE	ORIG	CHK'D	APP'D
A	10/12/2021		MN	KB	AS

DESIGNER

Stantec

CONTR

VolkerFitzpatrick

CLIENT

national highways

PROJECT TITLE

M3 JUNCTION 9 IMPROVEMENT

PROJECT STAGE

PCF STAGE 3

DRAWING TITLE

FIGURE 9.1 - GEOLOGY AND SOILS: ENVIRONMENTAL INFORMATION DOCUMENT REFERENCE 6.2

SUITABILITY

FOR INFORMATION

SHEET SIZE: A3 | SCALE: 1:30,000 | STATUS: S2

DOCUMENT REFERENCE

HE5515511-VFK-EGT-X_XXXX_XX-DR-LE-0100