APPENDIX A

Report on the Appendix 6 Report entitled **HYDROGEOLOGICAL IMPACT APPRAISAL OF TEMPORARY DE-WATERING AT ROCK COMMON.**

INTRODUCION

This document was requested by WSCC and the EA in order to clarify the potential impacts from Veolia's proposed dewatering scheme. Statements presented in this document are interrelated to those presented in both the FLA and Environmental Statement.

Veolia states in its Executive Summary (page 1):

'Based on the conceptual hydrogeological model developed in this report and the subsequent HIA it is assessed that there will be no significant impact on the ground water environment in the study area as a result of the proposed dewatering scheme where drawdown levels will be no lower than present. Following completion of construction there will be a gradual recovery of groundwater elevation and local stream flows, eventually to pre-dewatering levels.

There is a high degree of confidence in this conclusion based on the facts that:

- *The proposed dewatering will not require drawdown on site to a greater depth than current operations;*
- *The proposed dewatering will discharge into the same water course as the current operations;*
- *The existing dewatering operations have been in place for a sufficiently long period that an equilibrium has been established; and*
- *The ultimate recovery of groundwater levels will be gradual and is planned to be in a managed fashion.'*

We do not have a high degree of confidence in Veolia's conclusions or indeed, the report as a whole. It will become clear from our findings below that Veolia has based most of the report on information which has been copied out of other documents but which is not referenced to the authors. The document on which Veolia has based most of this report, and in fact, which underpins its entire planning application is:

*'ROCK COMMON QUARRY ENVIRONMENT ACT REVIEW (Environment Act 1995, Section 96) Hydrogeological and Hydrological Assessment'(Tarmac - 15th January 2004 author Gavin Chaplin)**

The significance of Chaplin's report should not be underrated. It is the only comprehensive, authoritative and thorough piece of scientific research into the hydrogeology and hydrology of Rock Common Quarry. It was commissioned as part of a review of minerals extraction under the Environment Act (1995). Importantly, Veolia has used information in the 2004 Chaplin report as the basis of its own report which seeks to justify a planning application for an entirely different activity - landfilling.

But Veolia's report is a desktop exercise and is not based on field research or original investigation, and in order to make the cap fit, there are countless instances where the meaning of Chalpin's original information has been materially altered. In one case, we found a table which has been referenced to the Chaplin report (Tarmac 2004) where the whole table has been substantially changed. This is indicative of a company which will 'stop at nothing' to achieve its ambitions.

The Environment Agency offers clear guidance regarding impact assessments of dewatering abstractions in:

'Hydrogeological Impact Appraisal For Dewatering Abstractions' EA 2007 (http://publications.environment-agency.gov.uk/pdf/SCHO0407BMAF-e-e.pdf).

Veolia's report is not constructed in accordance with these guidelines.

For the above reasons, we believe the report should be discredited and should not be relied upon to assess Veolia's planning application for landfill at Rock Common Quarry.

** Like other documents included in Section 9 (References and Sources of Information) this important information source has not been referenced correctly. For the sake of clarity, we refer to the Chaplin report below as 'Tarmac 2004' to be consistent with Veolia's shorthand.*

2.0 THE PROPOSED PROJECT:

2.1 Current Groundwater Control Practices

On page 2, paragraph 1, Veolia makes the following statement:

'In order to facilitate safe and efficient working conditions within Rock Common Quarry, the Folkestone beds have been locally dewatered for many years. Dewatering, by pumped removal of groundwater from the workings, discharged to the adjacent Honeybridge Stream, has created a cone of depression within the water table in Folkestone Beds Aquifer.'

Compare this with page 12, section 3.7.3.1 of Section 3.7.3 of *'Rock Common Quarry Hydrogeological and Hydrological Assessment'(Tarmac 15th January 2004):*

'In order to facilitate safe and efficient working conditions within Rock Common Quarry, the Folkestone beds have been locally dewatered for many years. Dewatering, by pumped removal of groundwater from the workings, discharged to the adjacent Honeybridge Stream, has created a localised cone of depression upon the water table within Folkestone Beds Aquifer.'

Veolia makes no reference here to the fact that this paragraph is lifted directly from a previously published document. Instead it is presented as their own work. The alterations to the wording *'localised'*, *'upon'* and *'within'* are deliberate and significant. They seek to suggest that the local hydrogeology is different from what it

actually is. The cone of depression created by the current de-watering operation is indeed 'localised' and confined to a precise area within the Folkestone Beds aquifer in and around the quarry workings.

By altering Tarmac's original statement, Veolia seeks to suggest that the current dewatering scheme at Rock Common results in a far wider reaching depression on the Folkestone beds and surrounding multi layered aquifer system than is actually the case. This intent is further borne out by altering the wording of *'upon'* to *'within'*.

Section 6.3 describes a requirement under EA guidance to consider the *'Radius Of Influence of Quarry Dewatering'* in the formulation of the *'Conceptual Hydrogeological model'*. Implying that the current de-watering operation has a wider influence on ground water depression than it really does, helps to support a view that the depth of dewatering at the site would not need to be increased for the proposed landfill. The opposite is more likely.

On page 2, paragraph 1, Veolia makes the following statement;

'Current dewatering utilises a well point system. This comprises a series of numerous, closely spaced, shallow wells ("well points'') installed to a depth of between 4m and 6m into the Folkestone beds strata at the base of the Quarry workings. There are three lines of well-points each consisting of up to 60 points per line, with well-points spaced at approximately 2m centres. The well-points were installed using high pressure jetting techniques. The individual well-points are connected together using header pipes and flexible hoses laid on the floor of the quarry. Two high capacity vacuum pumps are employed to abstract groundwater from the well-points, thereby lowering the groundwater levels.'

Page 13 section 3.7.3.2 of Section 3.7.3 Quarry Dewatering of 'Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'Dewatering utilises a well point system. This comprises a series of numerous, closely spaced, shallow wells (''well points'') installed to a depth of between 4m and 6m into the Folkestone beds strata at the base of workings. Installation is achieved using high pressure water jets. The individual well points are connected upon the floor of the quarry by vacuum hosing. Two high capacity vacuum pumps are employed to abstract groundwater from the well-points, and thus assert a depressed condition upon the watertable.'

This is another example of Veolia reproducing unreferenced information presented in Tarmac 2004 and altering key aspects of the information to suit their purpose. There is no mention by Veolia of the vacuum hosing currently being utilised by Tarmac as part of the current de-watering operation. Rather, they suggest the hosing scheme is 'flexible.' This has significant impact on the credibility of the later proposals they make for the dewatering scheme they seek to suggest would be capable of conserving the integrity of the sensitive hydrogeology of the site during proposed landfilling operations.

In para 2, page 2, Veolia goes on to suggest that the current de-watering operation directly results in a *'lowering of groundwater levels'* as opposed to the true picture - a *'localised depression upon the water table'* - which would not be sustained following 1) suspension of dewatering activity and 2) the proposed alterations to the current de-watering scheme.

On page 2, paragraph 3, Veolia makes the following statement;

'During normal operation, the well point system is operated continually. It is reported that even relatively short breaks in the pumping operation, amounting to no more than a few hours, lead to shallow flooding of the working floor by rising groundwater; this implies that pumping of the well point system holds ground water level only a few metres below the current quarry floor level.'

Page 13 section 3.7.3.3 of Section 3.7.3 Quarry Dewatering of 'Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'To provide effective service, the well point system is operated continually It is reported that even relatively short breaks in the pumping operation, amounting to no more than a few hours, lead to rapid shallow flooding of the working floor by rising groundwater.'

Here is yet another example of unreferenced plagiarised statements from documents commissioned by Tarmac in 2004 with several significant words and phrases altered, primarily in this case to conceal where the information has come from and secondly to subtly alter the inference. The word *'rapid'* has been deleted and *'To provide effective service'* altered to *'during normal operations.'* This has been done to 'dumb down' the potential impact both the existing and proposed de-watering system failing.

On page 2 paragraph 4, Veolia makes the following statement:

'Surveys and assessments of the existing well point system carried out by Tarmac (the existing quarry operators) indicate that the system is installed to a depth of between 4m and 6m below the base of the existing quarry, which is approximately 10mAOD. Therefore based on the typical performance of well point systems it is reasonable to assume that the groundwater below the base of the quarry is maintained at between approximately 10mAOD and 5mAOD.'

Page 13 section 3.7.3.4 of Section 3.7.3 Quarry Dewatering of 'Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'At the time of preparation of his report, the well point system was installed at an elevation of some 10mAOD. It is thus reasonable to assume that ground water below the base of the quarry is maintained at between approximately 10mAOD and 5mAOD...'

Page 13 section 3.7.3.2 of Section 3.7.3 Quarry De-watering of 'Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'… installed to a depth of between 4m and 6m into the Folkestone beds strata at the base of (quarry) workings.'

The significance of these excerpts is to demonstrate how Veolia has attempted to present aged data prepared by others as recent. They misrepresent the data by changing the wording from how it appears in Tarmacs report from *'at an elevation of'* to *'to a depth'* and by altering *'at the base of the quarry workings'* to *'below the base of the existing quarry.'* This is an attempt to demonstrate that their proposed de-watering scheme will not require draw down on site to a greater depth than current operations.

On page 2 para 5 Veolia makse the following statement:

'Water from the dewatering system is discharged directly from the site to Honeybridge stream at NGR TQ124134. Pumping records supplied by Tarmac include records of metered discharge volumes. Tarmac (2004) present data from April 2002 to July 2002, which provided an average rate of discharge of 65 l/s equating to some 5600 m3/d. The maximum discharge rate from Tarmacs records during this period was approximately 77 l/s (6700 m3/d), with a minimum of 56 l/s (4800 m3d)'

Page 13 section 3.7.3.4 – 3.7.3.5 of Section 3.7.3 Quarry Dewatering of 'Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'Water from the dewatering system is discharged directly from the site to Honeybridge stream at NGR (5)124(1)134. EA The operation is authorised under EA discharge consent number P632/S/86, which permits the discharge of 8,637 cubic metres per day (m3/d).

'Pumping records, including records of metered discharge volumes supplied by Tarmac, illustrate a remarkably constant rate of off-site discharge from Rock Common Quarry. Recent data spanning the period April 2002 – July 2002 show an average rate of discharge of some 65 litres per second (l/s) equating to some 5, 610 cubic metres per day (m3/d). the maximum rate derived from Tarmac records during this period was approximately 77/s (6,675m3/d), with a minimum of 561/s (4,800 m3/d).'

The above changes for the source information attempt to disguise the constancy of ground water discharge rates from the current quarry workings into the Honeybridge Stream receptor. As part of the information required to be presented in the *'Conceptual Hydrogeological Model'* it is necessary to risk assess the impacts to water dependant features by the proposed de-watering regime. Tarmac 2004 raises concerns about the potential impact on riverine habitats and surface water habitats ecology by the current de-watering system within the Honeybridge Stream resulting from a possible deviation from the relative consistency of discharge rates currently demonstrated by the current quarry de-watering scheme. They state *' a possible reduction in the hydraulic gradient associated with the partial recovery of the water within the Folkestone beds will impact upon the habitats and utility of the watercourse.'*

2.2 Proposed Groundwater Control

2.2.1 Dewatering Infrastructure Design

In paragraph 1 on page 3, Veolia states:

'Prior to the proposed development of the site as a landfill, the current groundwater management system will be replaced, a continued management of groundwater levels in and around the site will be maintained throughout the initial stages of the sites development and operation.'

Paragraph 4 states:

'Several options for this operation have been considered. Table 1 presents a summary of the groundwater management systems that have been considered.'

In paragraph 1 on page 4 Veolia states:

'Option 4, the use of widely spaced dewatering bore holes installed with submersible pumps, has been identified as the most appropriate system for control of groundwater levels. It offers the most robust, manageable, economic and serviceable system.'

2.2.2 Installation of Proposed Dewatering Infrastructure

The extracts below concern how Veolia proposes to re-place the current de-watering scheme at Rock Common Quarry. The system described replicates the mechanism described by Tarmac in 2004 as 'scavenger wells.' As is clearly explained in the 2004 report by Tarmac, this system would result in a shorter unsaturated attenuation pathway under the existing Windmill landfill resulting in a contamination of the surface water environment and partial flooding of the quarry.

In paragraph 3 on page 4 Veolia states:

'Prior to any construction operations associated with the landfill development, namely reshaping and re-profiling the base and side slopes of the existing quarry, a number of groundwater abstraction or dewatering boreholes will be installed. The dewatering bore holes will be spaced at nominal 50m to 100m spacing in a ring formation around the perimeter of the site.'

Paragraph 1 on page 5 continues:

'The outline design assumes that each dewatering borehole will have a nominal drilled diameter of 300mm and will be installed with a well casing of 200mm nominal diameter. Submersible pumps will be installed in each borehole and connected to a groundwater perimeter ring main. Each pump will be sized to a capacity and head of at least 7 litres per second and 70m respectively.'

Paragraph 4 on page 5 continues:

'During the initial stages of the site development, should there be limited or restricted access to the proposed position of a perimeter dewatering well, temporary dewatering boreholes will be drilled and installed within the footprint of the base of the site. Temporary wells will be installed at 50m intervals to reduce the risk of accidental damage or loss resulting from development and operation of the proposed landfill. All temporary dewatering boreholes will be completed to the same standard construction detail as the permanent dewatering well.'

Paragraph 7 on page 5 continues:

'Through the combination and variation of power supplies, deep groundwater dewatering wells and the underliner drainage system, there will be little risk of the underlying ground water recharging to levels within the Folkestone beds that will adversely influence or impinge on either the construction of the landfill, or the proposed landfilling operation.'

Page 30 section 5.3.2 – 5.3.4 of Section 5.3 Proposed Restoration of 'Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'It appears that the options for practicable technical solutions to the requirement to control groundwater levels (other than that of continuation of (current) dewatering from Rock Common Quarry), is likely to be limited to a system involving a series of pumping wells (''scavenger wells'') positioned at the perimeter of the landfill for the purpose of depressing the level of the water table.'

The 2004 report continues in 5.3.3:

'Any system employing scavenger wells would be likely to involve a shorter unsaturated attenuation pathway between the (Windmill) landfill and abstraction point (i.e. each individual scavenger well) than currently exists. Reducing attenuation would have the attendant potential for a long term increase in the concentrations of contaminants within discharge. Such discharge would likely require discharge to a local surface water course. Thus, without further treatment, the potential for contamination of the surface water environment is likely to be greater using a scavenger well system than at present.'

The 2004 report states in Section 5.3.4:

'It is considered that any measure other than the use of the existing quarry dewatering system are likely to result in partial flooding of Rock Common Quarry…'

2.2.3 Future Development of Dewatering Infrastructure

In this section, Veolia suggests that following the cessation of de-watering at the Site, ground water levels would return to pre-dewatering levels. As can be seen from the data in Tarmac 2004 this is speculation. Veolia's assumptions are based on information which does not exist. There are no records of the pre-de-watering groundwater level. Further, as we have already seen any return to pre de-watering levels will have an impact on the ability of the existing Windmill landfill site to

maintain it's waste management licence conditions by ensuring an unsaturated zone prevails at the base of the site.

In paragraphs 2 and 3 on page 6 Veolia states:

'By the time the groundwater control system is no longer needed there will be no void remaining at the site that is located below rest groundwater level. Ultimately groundwater levels will recover to pre-dewatering levels.'

'It is understood that some groundwater management may need to be investigated by the owners of Windmill landfill to allow them to maintain compliance with their waste management licence conditions. This requires an unsaturated zone to be maintained below the base of the site, a condition that is currently being met by dewatering at the site.'

Page 14 section 3.7.4.5 of Section 3.7.4 Quarry Dewatering of 'Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'No recent groundwater level data was made available during the course of this (local groundwater head contours) assessment. The contour plot provided (at figure 9) is based upon groundwater level data collected during between 1994 and 1998 (inclusive).'

Page 14 section 3.7.5.2- 3.7.5.3 of Section 3.7.5 Pre dewatering ground water levels of 'Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'The pre dewatering ground water level is of interest as it is the basis of any assessment of the likely recovery level of groundwater at cessation of dewatering.'

'There are no piezometer records for the site or it's immediate area which predate dewatering operations.'

2.2.4 Active Site Aftercare

In this section, Veolia suggests that rest levels for groundwater would be lower than indicated in the 2004 report. It offers no basis for this assertion. Paragraph 6 on page 6 states:

'During this time, and subject to the requirements of the neighbouring Windmill landfill, groundwater and leachate levels may continue to be allowed to rise as described during the operational stage until ground water levels return to rest levels (expected to be in order of 40-45m AOD)'

Page 23 section 4.3.3.3 of Section 4.3.3 Recovery Water Level Within Restoration with Landfill Ground Water Control Measures of 'Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'Investigations carried out since the commencement of landfilling (ref: Southern Science for UK Waste Management Ltd 1994) have indicated that rest groundwater levels following cessation of dewatering at Rock Common are likely to be significantly higher than previously anticipated. (REF: figure 10 Tarmac 2004) a likely recovered water table level of between 40mAOD in the South East of the landfill and to in excess of 55m AOD in its North.'

3.0 GEOLOGY:

3.1 Regional Geology

Paragraph 1 page 7 makes reference to a document detailing regional geology. They reference it as 'Young et al 1988.' The exact reference for this document, which should be given in 9.0 (References and Sources of Information) is:

000275] Young, B.; Lake, R.. Geology of the Country Around Brighton and Worthing (Geological Survey of Great Britain - England and Wales - Memoirs: British Geological Survey - BGS Reports). London, United Kingdom: Stationery Office Books, 1988.

However, it would be more appropriately referenced by the original document which is:

'British Geological Survey (BGS) 1:50,000 scale map (sheet numbers 318/333 Solid and Drift Brighton and Worthing 1984 and Solid and Drift - Chichester and Bognor') 1996.

This is one of many examples where Veolia has referenced sources they have cited to support their work inappropriately. This practice makes it almost impossible for the sources to be identified and the information checked.

In paragraph 2 on page 7 Veolia states:

'… The site is situated within the Folkestone beds of the Lower Greensand.'

Page 4 section 3.3.3 of Section 3.3 Geological Setting of 'Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'… The site is situated upon the Folkestone Beds of the Lower Greensand.'

3.2 Local Geology

In paragraph 3 on page 7 Veolia states:

'The Southern margins of the site extend into the overlying Gault clay whilst the Northern boundary of the site approaches the margins of the underlying Sandgate and Hythe Beds outcrop.'

Page 5 Section 3.3.1.1 of Section 3.3.1 Folkestone Beds of Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'The Southern margins of Rock Common extend into the overlying Gault Clay whilst the Northern boundary of the site approaches the outcrop of the underlying Sandgate and Hythe Beds.'

It is clear from the above that whilst using information sourced from Tarmac 2004, Veolia alters the wording in an attempt to change the way in which the geological and hydrogeological setting of Rock Common Quarry is portrayed.

Page 7 table 2 Local Stratigraphy
Veolia states:

'Table 2 presents the local geology according to information presented in Tarmac 2004'

The table presented by Veolia and referenced as that which appears in Tarmac 2004 has been fundamentally and materially altered. The table which appears in the Tarmac document can be found on page 5 in section 3.3.4 of section 3.3 'Geological Setting.'

Firstly, two additional rows have been added to the table by Veolia above the Upper greensand layer. They have added 'Upper and Middle Chalk' and 'Lower Chalk'. Secondly, the Gault Clay layer appears in Veolia's table with an asterisked 2 next to it. According to the 'key' to the table this suggests that 'Gault Clay' is an *'Economic deposit mineral extracted at Rock Common Quarry'*. There is no such suggestion in the original table presented by Tarmac in 2004.

There are other subtle changes to the table:

The local thickness of the Gault Clay layer is described as 54-100m. No thickness was given in Tarmac 2004. Sandgate Beds are accurately represented in the table with a thickness of 17m (14-75) as per the Tarmac information from 2004. However, Veolia has omitted to place *2 next to the thickness which, according to the key, means that the geological make up of the Sandgate beds contains economic mineral extracted at Rock Common Quarry. Veolia makes the same omission next to the thickness of the Hythe Beds.

Atherfield Clay is shown with a '*1' next to it, meaning it is not present in the immediate vicinity of the site. Yet in the table presented by Tarmac 2004 there is no '*1' placed next to the reference to Atherfield clay, which means that it is indeed present in the immediate vicinity of the site.

Veolia's subtle distortion of the original information presented by Tarmac in 2004 alters the geological setting of the site. To imply validity, by referencing the table as reproduced from Tarmac 2004 is ridiculous. It also raises a question about the accuracy of Veolia's conceptual hydrogeological model, and it is further evidence of deliberate intent to massage information to support its case.

3.2.2 LOWER GREENSAND

3.2.2.1 Folkestone Beds

In paragraph 3 on page 8 Veolia states:

'The Folkestone beds consists of pale yellow, medium to coarse sands with patchy iron staining. In the immediate area of the site, the Folkestone Beds strata dip southwards at a general angle of some 6 degrees, concordant with the regional structure imposed by the Wealden Anticline.'

Page 5 section 3.3.1.2 – 3.3.1.2 of Section 3.3.1Folkestone Beds of Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'The Folkestone beds consist of pale yellow, medium to coarse sands with patchy iron staining. In the immediate area of the site, the Folkestone beds have a proven thickness of between 40m and 70m.

The Folkestone beds strata dip southwards at a general angle of some 6 degrees, concordant with the regional structure imposed by the Wealden Anticline.

Local variations exist within the regional structural pattern. At the base of Rock Common Quarry, workings have evidenced a deep valley feature, aligned principally from northeast to southwest.'

3.2.2.2 Sandgate and Hythe Beds

In paragraphs 4-5 on page 8 and paragraph 1 on page 9 Veolia states:

' The Sandgate and Hythe beds underlie the Folkestone Beds throughout the region and are undifferentiated in the area of the Site. The strata do not outcrop within Rock Common Quarry, but have, however, been exposed on land lying immediately adjacent to the northern boundary of the Windmill Landfill. The Sandgate and Hythe Beds comprise inter-bedded soft and hard calcareous sandstones overlain by glauconitic sandstone.

Within the locality, the Sandgate and Hythe Beds contain an upper clayey unit known as the Marehill Clay, based on site specific borehole logs, ranges from -19.9mAOD (Borehole T4/00 towards the south of the site) to +36.07mAOD (Borehole SHB2 north of the site)

The Marehill Clay has been proven in all boreholes drilled at the Site, which are of sufficient depth to have penetrated the base of the Folkestone Beds. The Marehill Clay sub-crops up to greater than 20m in thickness to the east northeast of the Site (and immediately to the north of Windmill landfill), but decreases towards the west and beneath parts of the site to less than 5m.'

Page 6 section 3.3.2.1 – 3.3.2.2 of Section 3.3.2 Sandgate And Hythe Beds of Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'The Sandgate and Hythe beds underlie the Folkestone Beds throughout the region and are undifferentiated in the area of the Site. The strata do not outcrop within Rock Common Quarry, but have, however, been exposed on land lying immediately adjacent to the northern boundary of the Windmill Landfill. The Sandgate and Hythe Beds comprise inter-bedded soft and hard calcareous sandstones overlain by glauconitic sandstone.

The upper most horizon of the Sandgate and Hythe beds consists of a sequence of poorly sorted, fine grained sands, silts and clays. These materials, identified as the stratigraphic equivalent of the Marehill Clay, have been proved in all boreholes drilled at the site of sufficient depth to have penetrated the base of the Folkestone Beds. The Marehill Clay averages some 10m thickness at Rock Common Quarry. The deposit thickens eastwards, attaining some 25m immediately to the north of the Windmill Landfill.'

3.2.3 WEALD CLAY

In this section there are more examples of how Veolia has plagiarised and altered information from Tarmac 2004. In paragraph 2 on page 9 Veolia states:

'The BGS Washington borehole proved the Weald Clay to be present immediately beneath the Sandgate and Hythe Beds, at an elevation of some -58m AOD (Young et al 1988) the Atherfield Clay (basal unit of the lower Greensand group), which is of variable thickness throughout the region, is recorded by the borehole to be absent beneath the Site.'

Page 6 section 3.3.3.1 of Section 3.3.3 Weald Clay of Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'The BGS Washington borehole (NGR (5) 1264, (1) 1345: drilled within Rock Common Quarry) proved the Weald Clay to be present immediately beneath the Sandgate/ Hythe Beds, at an elevation of some 58 metres below Ordanance datum (mbOD). The Atherfield Clay, which is of variable thickness throughout the region, is recorded by the borehole to be absent beneath the Site.'

4.0 HYDROGEOLOGY

4.1 Aquifer Status and Classification

In paragraph one of this section, Veolia outlines the hydrogeology of the area and states that its operations would not have any bearing on groundwater in the Upper Greensand and Chalk layers. By comparing Veolia's statement with the Tarmac 2004 report, it is evident that a key section of the 2004 report, which was concerned with the winning of sand of course, has simply been lifted complete and used out of context to justify a proposed landfilling operation. This comparison indicates that Veolia's submission cannot be regarded as technically competent:

Paragraphs 1 and 2 on page 10 state:

'The hydrogeology of the area comprises a multi layered aquifer system. The chalk and upper Greensand constitutes an aquifer separated by the Gault Clay from underlying Lower Greensand aquifers, the base of which is formed by the underlying Weald Clay. In terms of the regional groundwater system, the Gault and Weald Clay are considered to be aquitards. Quarrying at Rock Common in undertaken from the Folkestone Beds (part of the Lower Greensands aquifer). Therefore, operations undertaken at the site are not envisaged to have any bearing upon groundwater in the Upper Greensands and chalk aquifers.

The Folkestone beds comprise a hydrostratigraphic unit of the Lower Greensand and are classified as a major aquifer by the agency. In the vicinity of the site the Folkestone Beds are unconfined and are considered to be hydraulically separated from the underlying Sandgate and Hythe beds aquifer by the Marehill Clay, which acts as an intervening aquitard.'

Comparison with the 2004 report is illuminating. Page 11 sections 3.7.1.1- 3.7.1.4 of Section 3.7.1 Hydrogeological Setting of Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'The hydrogeology of the area comprises a multi layered aquifer system. The chalk and upper Greensand constitutes an aquifer separated by the Gault Clay from underlying Lower Greensand aquifers, the base of which is formed by the underlying Weald Clay. In terms of the regional groundwater system, the Gault and Weald Clay are considered to be aquitards (i.e. low permeability units acting as barriers to ground water flow between the aquifers of the area).

The Northernmost extent of the Chalk and Upper Greensand system is situated some 400m to the south of the workings within Rock Common Quarry. Quarrying at Rock Common is undertaken from the Folkestone Beds, which are separated from the overlying Upper Greensand and Chalk aquifers by a considerable thickness of ubiquitous Gault Clay. Therefore operations undertaken at the site can have no significant bearing upon the Upper Greensand and Chalk Aquifers, which are thus not discussed further herein.

The Folkestone Beds, which constitute the economic mineral extracted at Rock Common Quarry, comprise a hydrostratigraphic unit of the Lower Greensand. In the vicinity of the Site, the Folkestone Beds are unconfined and are hydraulically separated from the underlying Sandgate and Hythe beds aquifer by the Marehill Clay, which acts as an intervening aquitard South of the Site, the Folkestone Beds first become concealed, and then confined, beneath the overlying Gault Clay.

The Folkestone Beds comprise a Major Aquifer with an areal extent of many tens of square kilometres, groundwater movement being dominated by intergrannular flow approximating to the ideal as described by Darcy.'

4.2 Catchment Abstraction Management Strategies Status

Veolia"s suggestion that the transfer of groundwater to surface water at the site is 'unlikely' to have a significant impact, directly contradicts information presented in Tarmac 2004.

In paragraph 5 on page 11, Veolia states:

'In summary the Site is not situated in an area that has been assessed as part of the CAMS (Catchment Abstraction Management Strategy) process for the Adur and Ouse. However, the information available on the Adur upstream of the project area indicates that water resources are available and that the Adur catchment is not overly sensitive to groundwater or surface water abstraction. Therefore the transfer of groundwater to surface water as a result of dewatering operations, such as undertaken at the Site is unlikely to have a significant impact'

Page 17 sections 3.4.1.1- 3.4.2.5 of Sections 3.4.1 Overview and Local Watercourses of Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'The River Adur, located some 7.3km east of the Site at its closest approach, constitutes the principal drainage channel of the area. The river flows generally from north to south discharging to the English Channel at Shoreham By Sea, some 14.5km southeast of the site.

The dominant surface water flow direction in the area of the Site is from south to north. Several minor streams, commonly spring fed, have their headwaters rising upon the lower reaches of the north facing South Downs scarp slope. These streams contribute to flow within a sub-catchment of the River Adur which principally comprises the Honeybridge/Buncton Stream system. This system directs flow north to northeastwards through the general area of the Site, discharging to the Adur some 7.6km to the Northeast of the site at NGR (5)194 (1)146.

4.3 Folkestone Beds Aquifer Properties

In this section of the report, critical information concerning hydraulic connectivity has been used from the Tarmac 2004 report, specifically with regards to the vertical migration of water from the Sandgate and Hythe Beds to the Folkestone Beds through the Marehill Clay. Also omitted from Veolia's statement is the hydrogeological significance of the horizontal movement of water as pointed out by Tarmac below.

Paragraph 1 on page 11 states:

'Groundwater flow in the Folkestone Beds is predominantly intergranular. Hydraulic conductivity values for this unit at the Site have previously been estimated using grading results and laboratory analyses (Tarmac 2004). Values ranging between 2.25m/d and (2.6 x 10(5)m/s) and 9.5m/d (1.1 x 10(4) m/s) have been established.'

Paragraph 3 on page 12 states:

'Environment Agency (2003) states that records of testing within the locality show that the Marehill Clay has a low hydraulic conductivity (1x 10 -9 m/s) and as such could form a suitable mineral liner and that it will also act as an aquitard between the Folkestone Beds and Sandgate and Hythe Beds.'

In comparison, Page 16 sections 3.7.6.1- 3.7.6.3 of Section 3.7.1 Aquifer Properties Setting of Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'Hydraulic conductivity values for this unit at the Site have previously been estimated using grading results and laboratory analyses (Tarmac 2004). Values ranging between 2.25m/d and (2.6 x 10(5)m/s) and 9.5m/d (1.1 x 10(4) m/s) have been established.

Laboratory tests have also been undertaken to assess the hydraulic conductivity of the Marehill Clay. Analysis indicates a vertical permeability of 3.5x10(-5)m/d with a horizontal permeability of 4x10(-4) m/d.

The above data has been utilised to examine the hydraulic relationship between the Folkestone Beds and the underlying Sandgate and Hythe Beds. Within Rock Common Quarry, upward leakage from the underlying aquifer is estimated at some 2m(3) / day (assuming a potentiometric head in the Sandgate and Hythe Beds some 10m above the groundwater level within the Folkestone Beds, together with a thickness of 10m for the Marehill Clay). This rate of upward (vertical) leakage is very small when compared to the general rate of (sub) horizontal groundwater movement within the Folkestone Beds and underlying Sandgate and Hythe Beds.'

Page 15 sections 3.7.4.7 of Section 3.7.4 Local Groundwater Head Contours of Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'Comparison of the groundwater level contours with the contours deduced for the base of the Folkestone beds/top of Marehill Clay, strongly indicates that, in addition to the affects of de-watering, groundwater movement in the area is strongly influenced by the geological structure.'

4.4 Groundwater Flow

Paragraph 4 on page 12 states:

'As a result of the de-watering operations, the prevailing local hydrogeological regime differs significantly from that which was manifested prior to de-watering. The relative importance of these mechanisms will change throughout the lifecycle of the landfill as de-watering operations are scaled back. The precise natural direction of groundwater flow in the vicinity of the site is uncertain.'

'….however, it is assumed that in the absence of pumping in the unconfined Folkestone beds, in the immediate area of the Site the groundwater would flow

towards the surface water courses rising on the overlying Gault Clay and flowing across the Folkestone Beds outcrop from South to North.'

The information presented below from Tarmac 2004 suggests that the natural groundwater flow direction is completely different. In addition Tarmac's consultants are at pains to point out that any accurate assessment of likely groundwater recovery must be based on the establishment of pre-dewatering groundwater levels. Veolia suggests that the relative importance of these factors are an unknown variable.

Page 12 sections 3.7.2.3 of Section 3.7.2 Regional Groundwater Flow Pattern of Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'…it is likely that the dominant regional direction of groundwater flow at the Site is from West to East towards the river Adur. This conceptualisation of the regional pattern of groundwater flow within the Lower Greensand auifer suggests the presence of an east –west flow divide, located some 3km to 4km west of the Site.'

Page 15 sections 3.7.5.2 of Section 3.7.5 Pre-dewatering Groundwater levels of Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

' the pre-dewatering groundwater level is of interest as it is the basis of any assessment of the likely recovery level of groundwater at cessation of de-watering.'

4.5 Groundwater Quality

Paragraphs 5 to 7 on page 13, and paragraphs 1 to 2 on page 14 state:

'A programme of groundwater quality sampling and analysis has previously been undertaken in connection with earlier hyrogeological investigations carried out at the site.

Tarmac 2004 found that there is a distinct difference between the groundwater chemistry of the Folkestone Beds and that of the Sandgate and Hythe Beds. This is primarily considered to be a consequence of the differing calcite concentrations present within the two aquifers leading to differing reactions to rainfall recharge, thus;

- *The Folkestone Beds have a relatively low calcite concentration, sulphate levels are relatively high and pH values are less than 7. Additionally, chloride concentrations are comparatively high;*
- *The Sandgate and Hythe Beds exhibit relatively high calcite contents, resulting in relatively high bicarbonate concentrations and pH values that are predominantly greater than 7.*

The distinct chemical differences between groundwater abstracted from the Folkestone Beds and the Sandgate and Hythe Beds is further evidence of the hydraulic separation afforded the two systems by The Marehill Clay.'

In the above statement, once again selectively transposed from Tarmac 2004, Veolia seeks to suggest that the water quality data presented is recent. It also cites Tarmac 2004 as a reference. Yet a comparision with the Tarmac 2004 report shows that far from this water quality data is actually from research carried out in *1994*.

Page 17 sections 3.7.7.1- 3.7.7.4 of Section 3.7.7 Groundwater Quality of Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'A programme of groundwater quality sampling and analysis has previously been undertaken in connection with earlier hyrogeological investigations carried out in respect of the Site. (ref. vii, paragraph 2.1 of this (Tarmac 2004) report)

Groundwater quality analysis reported during previous investigations are summarised here at appendix 5. The analyses have been used previously for the interpretation of groundwater quality at the Site. The following report is based upon the findings of this earlier work.'

There is a distinct difference between the groundwater chemistry of the Folkestone Beds and that of the Sandgate and Hythe Beds. This is primarily considered to be a consequence of the differing calcite concentrations present within the two aquifers leading to differing reactions to rainfall recharge, thus:

- *The Folkestone Beds have a relatively low calcite concentration, sulphate levels are relatively high and pH values are less than 7. Additionally, chloride concentrations are comparatively high;*
- *The Sandgate and Hythe Beds exhibit relatively high calcite contents, resulting in relatively high bicarbonate concentrations and pH values that are predominantly greater than 7.*

The distinct chemical differences between groundwater abstracted from the Folkestone Beds and the Sandgate and Hythe Beds is further evidence of the hydraulic separation afforded the two systems by The Marehill Clay.'

5.0 HYDROLOGY

5.1 Meteorology

Paragraph 1 on page 15 states:

'The annual average rainfall at the site is 914mm (CEH Institute of Hydrology, 1999). Annual average potential evapo-transpiration for the area is 546mm (MAFF, 1976). Therefore, long term effective rainfall is estimated to be in the order of 368mm/year. Using the MAFF monthly rainfall data (totalling 820mm/year) and calculating effective rainfall on a monthly basis, the total annual effective rainfall is 398mm.'

Comparison with Tarmac 2004 is interesting. Page 11 sections 3.6.1- 3.6.2 of Section 3.6 Rainfall of Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'The nearest rainfall gauging station, which is at around the same elevation as Rock Common is situated approximately 1km to the West of the (quarry) workings at NGR(5)1118 (1)1350. Mean annual rainfall at this station, based on data for the period 1961 to 1990, has been calculated at 910mm/year.

Mean annual evaporation rates (after satisfying soil moisture requirements) are 473.6 mm/year. These rates have been estimated using monthly data collected between 1961 and 1985 for MORECS (Meteorological Office Rainfall and Evaporation Calculating System)square 184, which encompasses the Rock Common area.'

Both reports indicate very similar mean average rainfall. Veolia concludes that the effective rainfall contribution after evaporation would be 398mm. Yet Tarmac 2004 indicates mean annual evaporation rates are considerably lower than Veolia suggests (473.6mm/year as against 546mm/year). If Tarmac 2004 is right, the effective rainfall contribution is 38.4mm higher than Veolia states. Bearing in mind the amount of information Veolia has copied directly from the Tarmac 2004 document to support its case, it cannot be for anything other than strategic reasons that Veolia has chosen not to replicate the meteorological data from Tarmac, seeking instead to produce it from elsewhere to deliver a completely different set of data.

5.2 Local Watercourses

In this section, using wording mainly copied from the Tarmac 2004 report, Veolia provides an overview of the local watercourses:

'The Site is located within a sub- catchment of the River Adur, which is located some 7.3km east of the Site at its closest approach and is the closest Main River. The river flows generally from north to south discharging to the English Channel at Shoreham By Sea, some 14.5km southeast of the site.

The local topography in the sub-catchment of the River Adur dictates that the watercourses which are commonly spring fed, flow from south to north in the general area of the site. Accordng to the EA, the watercourses in the immediate vicinity are named the Honeybridge Stream, Rosbrook Sewer and Clayland Sewer. The Buncton Brook is a further stream, to the east of the site which joins the Honeybridge Stream approximately 2.8km to the northeast. These are small watercourses, which have their headwaters rising upon the lower reaches of the north-facing South Downs and discharge to the River Adur some 7.6km to the northeast of the site at NGR TQ194167.

The closest watercourse to the Site is the Honeybridge Stream, which flows northwards along the western boundary of Rock Common Quarry. The Honeybridge Stream is culverted along a section located immediately to the southwest of the Site, where the stream has been re-routed to avoid the Quarry workings.

The invert elevation (bed level) of the Honeybridge Stream adjacent to the site has previously been surveyed at between 50.8m AOD at the South Western Site boundary and 43.1m AOD at the northwestern Site boundary. It is considered likely that the stream currently flows over the Gault Clay to the south of the site; has the potential to lose some seepage to the underlying unsaturated Folkestone Beds as it flows past the Quarry; and is in hydraulic continuity with the Sandgate and Hythe Beds downstream (to the north). When in the future, dewatering is terminated at the Site, it is envisaged that the point where groundwater currently starts to form baseflow to the stream (or where hydraulic continuity is achieved), will migrate upstream in the direction of the Gault Clay.'

A comparison of Veolia's report with Tarmac 2004 shows how the original description has been altered to mitigate any consideration being given to the Buncton stream as a local receptor. The 2004 report describes a site surrounded by a network of local watercourses comprising the Honeybridge/Buncton Stream System. Page 17 Sections 3.4.1.1- 3.4.2.5 of Sections 3.4.1 (Overview and Local Watercourses of Rock Common Quarry) Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'The River Adur, located some 7.3km east of the Site at its closest approach, constitutes the principal drainage channel of the area. The river flows generally from north to south discharging to the English Channel at Shoreham By Sea, some 14.5km southeast of the site.

The dominant surface water flow direction in the area of the Site is from south to north. Several minor streams, commonly spring fed, have their headwaters rising upon the lower reaches of the north facing South Downs scarp slope. These streams contribute to flow within a sub-catchment of the River Adur which principally comprises the Honeybridge/Buncton Stream system. This system directs flow north to northeastwards through the general area of the Site, discharging to the Adur some 7.6km to the Northeast of the site at NGR (5)194 (1)146.

***Local Watercourse**s*
The closest watercourse to the site is the Honeybridge Stream, which flows northwards immediately upon the western boundary of Rock Common Quarry. The course of a major headwater tributary of the Honeybridge Stream is culverted along a section located immediately to the southwest of the Site, where the stream has been re-routed to avoid the quarry workings.

The invert elevation (bed level) of the Honeybridge Stream adjacent to the site has previously been surveyed at between 50.8m AOD at the South Western Site boundary and 43.1m AOD at the northwestern Site boundary.

The Buncton Stream, located some 440m east of Rock Common Quarry at its closest approach, is sourced by two principal tributaries (eastern and western tributaries) with headwaters located in the area of the Site.

The western tributary of the Buncton Stream flows north- eastwards, serving two small surface catchments: (i) land to the northwest of the Windmill landfill (ii)land to the immediate south of the Windmill landfill (via a culverted section installed through

the centre of the landfill). At its closest approach, the eastern tributary flows within some 75m of the south eastern boundary of the Windmill landfill, turning to flow northeast. The two tributaries converge at the Village of Wiston at NGR 5%) 144 (1) 143.

The Buncton and Honeybridge Streams converge some 3km to the northeast of the site, at NGR (5) 146 (1) 156.'

5.3 Surface Water Flow

In paragraphs 3 to 6 on page 16, Veolia states:

'It is considered that under current conditions, the major source of flow in the Honeybridge Stream is the discharge from the Rock Common Quarry groundwater management system. Hydrometric flow data gathered from the Honeybridge stream between 1992 and 1994 are presented in Appendix 3 of Tarmac (2004). These data detail that upstream of the discharge point from the Site, flow in the Honeybridge Stream was recorded at between 1.6 and 7.9m^3d. Downstream of the discharge point, flows were recorded between 205 and 312m^3/hr.

These data indicate that the vast majority of the surface water flow in the Honeybridge Stream is the discharge of abstracted ground water from Rock Common Quarry. Therefore high flows in the stream can be controlled by managing the discharge from the Site.

More detailed data on flow volumes within the Honeybridge stream was presented in RCL (2004). Data collected during a gauging exercise in May 1992 suggested that downstream of the Site close to the Folkestone Beds /Sandgate and Hythe Beds boundary, the Honeybridge Stream gains some 50m^3/hr of groundwater through the stream bed. A further study from May 1994 calculated the gain to be 30m^3/hr.

As the landfill is developed and the need for de-watering at the site reduces and then ends, it follows that the artificial groundwater contribution to the stream will reduce significantly. Flow to the stream past the Site will ultimately return to surface water run off and drainage from the upstream Gault Clay, and a baseflow contribution will ultimately be re-established from the Folkestone Beds aquifer.'

Page 10 sections 3.4.5.1- 3.4.5.3 of Sections 3.4.5 Surface Water Flow rates of Rock Common Quarry Hydrogeological and Hydrological Assessment Tarmac 15th January 2004' states:

'Two current metering surveys have been undertaken upon the Honeybridge Stream as part of two previous hydrogeological investigations in the area (refs vii and viii paragraph 2.2 of this report. The location of gauging points is illustrated at figure 5, and the measured flows presented at appendix 3.

A survey undertaken in May 1992 established the flow of the Honeybridge Stream upstream of the discharge point from Rock Common Quarry as 9.5 cubic metres per hour (m^3/hr). The flow rate downstream of the discharge point averaged 253m^3/hr. No significant loss in flow was observed immediately downstream of the discharge point

along the stream reach flowing upon the Folkestone Beds. Data collected during the May 1992 gauging exercise suggested that the stream is augmented by diffuse groundwater ingress, amounting to some 50m^3/hr, entering via the bed of the watercourse close to the Folkestone Beds/Sandgate and Hythe Beds boundary downstream of Rock Common Quarry.

A further survey of the Honeybridge Stream was performed in May 1994. Stream flow upstream of the Rock Common Quarry dewatering discharge point was measured at some 3.6m^3/hr. Flow increased downstream of the discharge to some 239m^3/hr. As with the earlier gauging exercise, no evidence was found of any significant loss in flow across the outcrop of the Folkestone Beds. A gain in flow was again observed (some 30m^3/hr) in the area of the contact between the Folkestone Beds and the underlying Sandgate and Hythe Beds, suggesting a diffuse groundwater ingress to the watercourse.'

The above two comparisons demonstrate once again how information has been plagiarised and massaged. A small but important point is that in paragraph three of this section, it is stated that according to Tarmac 2004, hydrometric flow data upstream of the discharge point recorded flows of between 1.6 and 7.9m^3 per day. It should say *per hour*.

In paragraph 5, Veolia makes reference to RCL (2004) as the source of this information and present the full reference in section 9.0 as:

'RCL Consultant Hydrogeologists Ltd 2004 Envir Sec 1: Rock Common Quarry Environment Act Review (Environment Act 1995, Section 96) Hydrogeological and Hydrological Assessment January 2004.'

The actual reference should be:

'BCL Consultant Hydrogeologists Ltd on behalf of Tarmac Rock Common Quarry Environment Act review 1995 Section 96 Hydrogeological and Hydrological Assessment 15th January 2004.'

Deliberate mis-referencing in this way prevents detailed and accurate cross referencing of Veolia's report.

There is no mention here of the relationship between groundwater and surface water in the Honeybridge and Buncton Streams. In Tarmac 2004, Section 3.7.8 (page 17) the relationship is made clear:

'the groundwater level contours for the Folkestone Beds have been compared with the streambed elevations in the Honeybridge and Buncton Streams. Given the broadly co-incident levels, it is considered probable that hydraulic continuity exists between ground and surface waters within a limited area in the vicinity of the Northern limit of the Folkestone Beds outcrop area, close to the Boundary with the underlying Marehill clay.'

CONCLUSION

We have shown that Veolia's report entitled '**HYDROGEOLOGICAL IMPACT APPRAISAL OF TEMPORARY DE-WATERING AT ROCK COMMON** is based on extracts from other documents which have been selectively 'changed' by the authors and are represented often completely out of context, as the work of Golder Associates. It is doubtful the original authors would have given permission for their work to be plagiarized in this way and in fact it does mean the report lacks professional credibility. On this basis alone, the findings of the report must be considered suspect and we believe they should not be relied on for planning purposes.