

Lead Local Flood Authority  
Lancashire County Council  
PO Box 100  
County Hall  
PR1 0LD

24 June 2026  
Our Ref: K39346.004/TM

**For the attention of Harry McGaghey**

Dear Harry

**RESIDENTIAL DEVELOPMENT, CROW TREES FARM, CROW TREES BROW, CHATBURN, BB7 4AA**  
**RIBBLE VALLEY BOROUGH COUNCIL APPLICATION NO: 3/2022/0966**  
**DISCHARGE OF CONDITION 15 & 16 – NEW BUILD PHASE**  
**UPDATE ON DRAINAGE DESIGN**

Further to receipt of your letter dated 11<sup>th</sup> June 2026, and on behalf of Pringle Homes Ltd, please find below additional supporting information regarding the necessary change of the final lengths of foul and surface water sewers into a single combined sewer for the housing development at Crow Trees Farm in Chatburn.

**1. S106 Application to United Utilities**

The Part 1 S106 Sewer Connection Application was submitted to United Utilities on 6<sup>th</sup> December 2024. This was based on the approved plan that showed separate foul and surface water sewers and connection manholes onto the existing 150mm dia. combined sewer located in the public highway (Crow Trees Brow). An email response was received from United Utilities on 13<sup>th</sup> December 2024 (see Appendix A). United Utilities stated:

*"I am assessing your drainage proposals for the above site. I can see you are proposing to make a separate foul and surface water connection to the combined sewer within Crow Tress Brow. A more suitable connection would be that you combine your drainage into the last manhole within your site and then construct 1 combined manhole on the public sewer, rather than 2 manholes for each connection? Also, just to note, you are proposing a 225mm surface water connection, you will need to reduce your connection to a 150mm as it cannot be greater than the receiving sewer which is 150mm in diameter. If you can please amend your drainage plan and re submit I can progress with your approval."*

This option was discussed with Pringle Homes, and it was agreed that construction of a single manhole onto the combined sewer would be the most practical solution and would minimise disruption within the public highway. A revised drainage plan, K39346-20C, was issued to UU on 16<sup>th</sup> December 2024 and approval was granted by UU on 17<sup>th</sup> December 2024 (see Appendix A).

## 2. Site Issues and Constraints

Principal construction activities commenced in January 2025 with the formation of the main access road and installation of the primary drainage infrastructure, including sewers and manholes. During construction planning, Pringle Homes identified significant constraints associated with installing separate foul and surface water sewers within the narrow access corridor serving the existing farm buildings. These constraints included existing underground utilities, stone boundary walls, the restricted nature of the access route, the proximity of existing and historic buildings, and challenging ground conditions.

The Site Investigation confirmed that the site is underlain by the Chatburn Limestone Formation, with suspected bedrock encountered in 14 exploratory locations at depths ranging from 0.6m to 2.3m. These findings reflected the conditions experienced during construction and reinforced the need to minimise trench excavation wherever possible. The drainage route also passed through a highly constrained area adjacent to existing farm buildings, including the Grade II listed farmhouse, where renovation works were being undertaken concurrently. The existing structures have limited or no formal foundations and were considered vulnerable to disturbance during excavation works. Restricted access, scaffolding and limited working space further constrained construction activities within this corridor.

The proposed amendment also built upon a drainage arrangement already accepted by United Utilities as discussed in Item 1 above. As part of the approved Section 106 application, United Utilities required the foul and surface water systems to be combined within the final manhole on-site prior to discharge to the existing public combined sewer, rather than providing separate connection manholes within Crow Trees Brow. In response to the site constraints encountered, Pringle Homes requested that RGP revise the drainage design to extend the combined sewer section by approximately 25.3m into the site and omit the final sections of separate foul and surface water sewer. This amendment was incorporated within revised drainage drawing K39346-20D, issued on 9<sup>th</sup> January 2025.

Maintaining separate foul and surface water sewer runs through this constrained area would have required wider and more extensive excavation in close proximity to existing buildings, boundary walls and underground services. This would have increased the risk of undermining adjacent structures, particularly given the limited foundations of the existing buildings, while also introducing additional health and safety risks associated with working in a confined environment around sensitive assets, scaffolding and live services. The adoption of a single combined sewer section therefore represented the safest and most practical construction solution. It reduced excavation requirements, avoided duplicate trenches and manholes within the most constrained part of the site, minimised the potential impact on adjacent buildings and walls, and facilitated delivery of the United Utilities approved combined sewer connection arrangement.

Excavation works for the sewer connection commenced in April 2025 and revealed that the existing public combined sewer was located further towards the centreline of the highway than indicated on United Utilities' records (see Photo 1 in Appendix B). In addition, several existing utilities, including gas and electricity services, required protection and accommodation during construction (see Photo 2 in Appendix B). As a result, minor amendments were made to the sewer connection design, which were incorporated within the revised drainage drawing K39346-20G, issued on 28<sup>th</sup> April 2025.

Throughout the works, Pringle Homes maintained close liaison with the United Utilities Inspector, with regular site inspections undertaken to verify compliance and construction quality. United Utilities subsequently issued an Inspection Notice to Pringle Homes on 27<sup>th</sup> June 2025, confirming acceptance of the completed works (see Appendix A). The as-built UU manhole located in Crow Trees Brow is shown in Photo 3 in Appendix B.

Importantly, the amendment did not alter the approved drainage strategy. The attenuation storage volumes, hydrobrake flow control arrangements, discharge destination and approved surface water discharge rate

remained unchanged. The modification should therefore be regarded as a buildability, structural risk and health and safety response to site constraints, rather than a fundamental change to the approved drainage design.

### 3. Pipe Flow Capacity Check

RGP have assessed the pipe flow capacity for the installed 150mm dia. combined sewer pipe using the industry standard Colebrook-White Formulation. Based on the as-built survey information the pipe parameters are as follows:

|                  |   |                                                                                                                     |
|------------------|---|---------------------------------------------------------------------------------------------------------------------|
| - Pipe length    | = | 37.682m                                                                                                             |
| - Pipe gradient  | = | 1 in 140.6                                                                                                          |
| - Pipe roughness | = | 1.5mm (foul water sewer)<br>0.6mm (surface water sewer)                                                             |
| - Pipe inflows   | = | 10.6 lit/sec (attenuated surface water)<br><u>1.8 lit/sec</u> (peak foul water flows – 39no. units at 4000 lit/day) |
| - Total inflow   | = | 12.4 lit/sec                                                                                                        |

The assessment has been completed using both roughness coefficients and are included in Appendix C for reference. Using a roughness coefficient of 1.5mm is considered highly conservative as the peak surface water flows are approx. 6 times the peak foul water flows. As can be seen in the calculations, under both design scenarios the pipe capacity exceeds the total peak inflows, with a max. capacity of 13.13 lit/sec for 1.5mm roughness and max. capacity of 15.16 lit/sec for 0.6mm roughness. It is therefore concluded that the as installed combined sewer pipe is sufficient to convey both the attenuated surface water and peak foul water flows from the development site.

### 4. Requirement for non-return valve

Based on the above hydraulic calculations it has been demonstrated that there is sufficient conveyance capacity and self-cleansing velocity in the final length of combined sewer to take both the attenuated surface water and peak foul water flows from 39no. dwellings. The surface water flows would also help to move/dislodge any potential waste blockages that could impede the flows within the pipework. Furthermore, the existing UU combined sewer located in Crow Trees Brow follows the steep gradient of the road down towards the north-east and can be considered to be at a low risk of blockage or surcharging. Therefore, in accordance with Clause C4.2 from the DCG (Sewerage Sector Guidance Appendix C) it is considered that a non-return valve is not required.

### 5. Run-off from existing farmhouse, barns and access road

Reference should be made to Section 2.5 from the approved Drainage Strategy & Design prepared by RGP (ref: K39346.DS/003, dated 22<sup>nd</sup> March 2024) where the following was confirmed:

*“For the existing farmhouse, farm access road, outbuilding and barns it has been confirmed via a drainage investigation that both surface water and foul water discharge into existing private combined drainage systems. These private systems run towards Crow Trees Brow and discharge into the existing public combined sewer.”*

In Section 3.5 a detailed assessment and comparison of the existing site areas and the proposed redevelopment of the farmhouse and barn conversions was presented. With reference to Table 3.5, it was concluded that the existing positively drained area associated with the farmhouse and barn conversion was 1,244m<sup>2</sup> with 538m<sup>2</sup> attributed to the existing farm access road. There was no proposal to change any of this catchment area, or any request from the LLFA to attenuate or provide betterment of the existing site run-

off. As such, this uncontrolled/unattenuated discharge into the existing private drainage systems and UU combined sewer was to remain as existing. The additional positively drained area from the barn conversion was 370m<sup>2</sup> and a separate surface water attenuation solution was proposed and agreed for this area only.

At the time of preparing the Drainage Strategy & Design report, RGP understood that the existing farm access road was to be reinstated to match existing by Pringle Homes at the end of the construction stage; hence why new road gullies were not shown on RGP drawing K39246-20A, included with the report. However, prior to site works commencing in January 2025 and following a site inspection by Pringle Homes it was requested that new road gullies and pipe connections should be added onto the drainage plan to ensure that there was sufficient allowance in the contract. These were added to RGP drawing K39346-20B issued on 11<sup>th</sup> December 2024.

We have now reviewed this with Pringle Homes and agreed that the new gullies discharging to the new section of combined sewer should not be installed as per the proposals. As such, these have now been removed from the updated as-built drainage drawing, K39346-20K, included in Appendix D. Likewise, the 2no. RWP's serving the front of the barn conversion have now been re-routed so that they discharge into the flow control chamber, S10, instead of directly into the combined sewer.

We trust that this provides sufficient evidence to explain and justify why it was necessary to amend the approved drainage scheme and demonstrate that the installed solution is adequate and fit for purpose. Please do not hesitate to contact us if you require any further information.

Yours sincerely



Troy Melhuish MEng PhD CEng MICE  
Associate  
**R G Parkins & Partners Ltd**

## APPENDIX A

### United Utilities Correspondence

## Troy Melhuish

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**From:** wastewaterdeveloperservices@uuplc.co.uk  
**Sent:** 13 December 2024 13:11  
**To:** Josh Brabbins  
**Cc:** neil@pringlehomes.co.uk; elliot@pringlehomes.co.uk; Troy Melhuish  
**Subject:** RE: United Utilities - Our reference - 06741920 Crow Trees Farm, Chatburn, Ribble Valley, BB7 4AA

Hi Josh,

I am assessing your drainage proposals for the above site. I can see you are proposing to make a separate foul and surface water connection to the combined sewer within Crow Tress Brow.

A more suitable connection would be that you combine your drainage into the last manhole within your site and then construct 1 combined manhole on the public sewer, rather than 2 manholes for each connection?

Also, just to note, you are proposing a 225mm surface water connection, you will need to reduce your connection to a 150mm as it cannot be greater than the receiving sewer which is 150mm in diameter.

If you can please amend your drainage plan and re submit I can progress with your approval.

If you would like to discuss the above, please call me on 07825 358095.

Many thanks

**If you have received a great service from myself today why not tell us?**

**Visit: [The WOW! Awards | Nominate \(thewowawards.co.uk\)](https://thewowawards.co.uk)**



**Shelley McNamara**  
Developer Services Assistant Engineer  
Developer Services & Metering  
Customer Services  
**M:** 07825358095  
unitedutilities.com

----- Original Message -----

**From:** wastewaterdeveloperservices@uuplc.co.uk [wastewaterdeveloperservices@uuplc.co.uk]  
**Sent:** 12/12/2024 15:47  
**To:** accounts@pringlehomes.co.uk; josh.brabbins@rgparkins.com  
**Subject:** United Utilities - Our reference - 06741920 Crow Trees Farm, Chatburn, Ribble Valley, BB7 4AA

Good Afternoon

Thank you for your **bacs** payment of £249 received 11/12/2024 for your sewer application for the above site. Your application has now been processed and passed to the **Assistant Engineer Shelley McNamara**.

We will advise you shortly as to whether the application has been approved or needs further information providing (within 10 working days).

Your reference number is **REF 06741920** please quote on correspondence relating to this application.

If you believe you have received a good service today, you can report this on the link below.

This only takes a minute, and I would really appreciate it.

<https://unitedutilities.thewowawards.co.uk/nominate>

Kind Regards

# S106 Part 1 'Application to connect to a public sewer' Approval Notice



Water for the North West

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                            |                                                                                                                                                                                                                                                                                                                                                                            |               |                          |                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------|----------------------------------------------|
| United Utilities Reference Number:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                            | 06741920                                                                                                                                                                                                                                                                                                                                                                   |               |                          |                                              |
| Applicant details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                            |                                                                                                                                                                                                                                                                                                                                                                            |               |                          |                                              |
| Applicant name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Josh Brabbins                                                              |                                                                                                                                                                                                                                                                                                                                                                            |               |                          |                                              |
| Applicant address<br>(including postcode)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | R G Parkins & Partners Ltd<br>Meadowside, Shap Road,<br>Kendal,<br>LA9 6NY |                                                                                                                                                                                                                                                                                                                                                                            |               |                          |                                              |
| Applicant email                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | josh.brabbins@rgparkins.com                                                |                                                                                                                                                                                                                                                                                                                                                                            |               |                          |                                              |
| Site details: The site / property which is proposed for connection to the public sewer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                            |                                                                                                                                                                                                                                                                                                                                                                            |               |                          |                                              |
| Site address<br>(including postcode)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Crow Trees Farm, Chatburn,<br>Ribbles Valley<br>BB7 4AA                    |                                                                                                                                                                                                                                                                                                                                                                            |               |                          |                                              |
| <b>APPROVED</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                            |                                                                                                                                                                                                                                                                                                                                                                            |               |                          |                                              |
| Your application for connection to the public sewer has been approved, to be made via a new connection:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                            |                                                                                                                                                                                                                                                                                                                                                                            |               |                          |                                              |
| To a private drain                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <input type="checkbox"/>                                                   | You may appoint your contractor and advise your appointed building control body (who should inspect the work).<br>United Utilities should be advised when this work is complete.                                                                                                                                                                                           |               |                          |                                              |
| Direct to the public sewer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <input checked="" type="checkbox"/>                                        | <b>Further action required.</b><br>You may now appoint an appropriately qualified contractor. Your appointed contractor is responsible for obtaining authorisation to work on a public sewer.<br>(The S106 Part 2 application form 'Request for permission to work on a public sewer' is available on our website; <a href="#">Sewer connections - United Utilities</a> ). |               |                          |                                              |
| Mode of connection approved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | New manhole                                                                |                                                                                                                                                                                                                                                                                                                                                                            |               |                          |                                              |
| Sewer connection type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Foul                                                                       | <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                   | Surface water | <input type="checkbox"/> | Combined <input checked="" type="checkbox"/> |
| <p>This approval is valid for 12 months from the date below.</p> <p>This approval does not grant access to third party land, permission should be sought if required between applicant and landowner. If the new connection renders access unsafe or is otherwise detrimental to the manhole or sewer, a new/upgraded manhole will be requested.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                            |                                                                                                                                                                                                                                                                                                                                                                            |               |                          |                                              |
| Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                            |                                                                                                                                                                                                                                                                                                                                                                            |               |                          |                                              |
| <p>Approval granted for a 150mm combined connection via the construction of a new manhole on the 150mm combined sewer located within Crow Tree Brow. Surface water flows restricted to 10.4 l/s.</p> <p>Please be aware there is a pressurised rising main running adjacent to the sewer you wish to connect to, please be very careful when making your connection to ensure that your works will not have an impact on this sewer.</p> <p>The new manhole must be constructed in line with Water UK Sewerage Sector Guidance Appendix C with the appropriate openings, ring size, benching/pipe configuration, channels and landing. Please ensure a plan of your proposals is submitted with your contractor's Part 2 application.</p> <p>For low-lying sites, (where the ground level of the site or the level of a basement is below the ground level at the point where the drainage connects to the public sewer), care should be taken to ensure that the property is not at increased risk of flooding. If these circumstances exist it could affect the detailed design of your site and result in the need to incorporate appropriate mitigating measures in your drainage scheme.</p> <p>Please note, if you are proposing to connect to an existing, unchartered drain or sewer then it is the developer's responsibility to confirm that it communicates with the Public Sewer</p> |                                                                            |                                                                                                                                                                                                                                                                                                                                                                            |               |                          |                                              |

Connections may be made to private lateral drains or to existing neighbouring drain. A part 1 approval does not give permission to access third party land. The applicant must seek permission from the relevant landowner.



**Developer Services Inspector** Shelley McNamara

**Contact number** 07825 358095

**Date** 17/12/2024

# United Utilities Inspection Notice

This form is to confirm a new connection has been made  
to an existing public sewer under Section 106 of the  
Water Industry Act 1991



| Site details: Details of the site or premise that have been connected to the public sewer |                                                               |  |
|-------------------------------------------------------------------------------------------|---------------------------------------------------------------|--|
| United Utilities notification reference (EC/NC/SC/WC)                                     | 7136324                                                       |  |
| Site address                                                                              | Crow Trees Farm, Crow Trees Brow, Chatburn, Clitheroe BB7 4AA |  |
| Development type                                                                          | New property                                                  |  |

| Contractor Details                                    |                                                                     |
|-------------------------------------------------------|---------------------------------------------------------------------|
| Contractor name / Company Name                        | NMS Civil Engineering Ltd                                           |
| Contractor Email Address                              | info@nmsltd.co.uk                                                   |
| Works Supervisor                                      | Steve Hunt                                                          |
| Confirm sewer 'log on' & 'log off' procedure followed | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> |

| Principal Contractor Details (if applicable)             |                            |
|----------------------------------------------------------|----------------------------|
| Company name (if applicable)                             | Pringle Homes              |
| Name of Contact for Project                              | Anthony Mason              |
| Email Address                                            | anthony@pringlehomes.co.uk |
| Number of site inspections conducted by United Utilities | 2                          |

| Connection details               |                                  |
|----------------------------------|----------------------------------|
| Sewer connection type            | Combined                         |
| Combined sewer pipesize diameter | 150                              |
| Connecting into:                 | 225 Existing Sewer Type Combined |
| Connecting to asset:             | New manhole                      |
| Connection Location              | Crow Trees Brow, Chatburn        |

| Outcome           |              |
|-------------------|--------------|
| Connection status | Satisfactory |

| Comments                                                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I can confirm that the Combined Sewer connection is SATISFACTORY - 150 Combined Sewer connecting into the 225 Combined connected via New manhole in Crow Trees Brow, Chatburn |

Approved: I confirm the sewer connection detailed above has been satisfactorily completed and inspected

|                              |            |
|------------------------------|------------|
| Developer Services Inspector | M Younas   |
| Date of Inspection           | 27/06/2025 |

## **APPENDIX B**

### **Photographs**

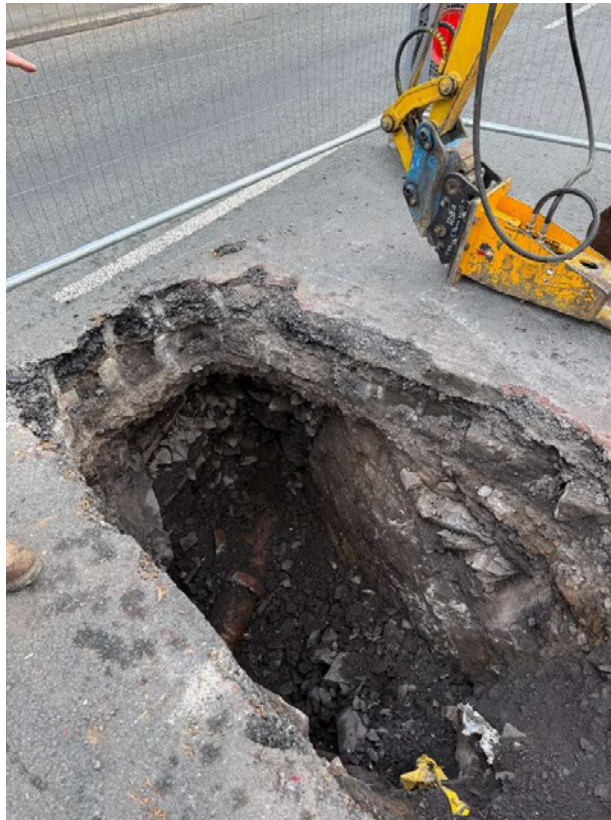


Photo 1 – location of UU combined sewer in Crow Trees Brow



Photo 2 – location of existing public utilities in Crow Trees Brow



Photo 3 – as-built adopted combined sewer manhole in Crow Trees Brow

## **APPENDIX C**

### **Pipe Flow Capacity Calculations**

|                                                                                                                                                     |            |             |            |             |                                                                |             |            |            |                 |         |        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------|------------|-------------|----------------------------------------------------------------|-------------|------------|------------|-----------------|---------|--------|
| <div>R G PARKINS</div> <div>97 King Street   Lancaster   LA1 1RH</div> <div>Tel:01524 32548</div> <div>Email: office@rgparkinslancaster.co.uk</div> |            |             |            |             | PIPE FLOW CAPACITY DESIGN CHECK<br>COLEBROOK WHITE FORMULATION |             | Job Number |            | Page Number     |         |        |
|                                                                                                                                                     |            |             |            |             |                                                                |             | K39346     |            | 1 of 1          |         |        |
|                                                                                                                                                     |            |             |            |             |                                                                |             | Calc by    |            | check by        |         |        |
|                                                                                                                                                     |            | TM          |            | OS          |                                                                |             |            |            |                 |         |        |
|                                                                                                                                                     |            | Date        |            | Revised     |                                                                |             |            |            |                 |         |        |
|                                                                                                                                                     |            | 12/06/2026  |            |             |                                                                |             |            |            |                 |         |        |
|                                                                                                                                                     |            |             |            |             |                                                                |             |            |            |                 |         |        |
| Roughness                                                                                                                                           |            | 1.5         | mm         | 0.0015      |                                                                | U/S level   |            | 97.391     | m               |         |        |
| Diam(mm)                                                                                                                                            |            | 150         | mm         | 0.15        |                                                                | D/S level   |            | 97.123     | m               |         |        |
| Length                                                                                                                                              |            | 37.682      | m          |             |                                                                | Gradient    |            | 0.00711215 | 1 in 140.604478 |         |        |
|                                                                                                                                                     |            |             |            |             |                                                                |             |            |            |                 |         |        |
| PROPOR'N                                                                                                                                            | WETTED     | AREA OF     | HYDRAULIC  | (32mg/l)^.5 | Ks                                                             |             | VELOCITY   | DISCHARGE  | DEPTH           | SURFACE | V^2/2g |
| DEPTH                                                                                                                                               | PERIMETER  | FLOW        | MEAN DEPTH |             | 14.8m                                                          | LOG         | (m/s)      | (l/s)      | (mm)            | WIDTH   |        |
|                                                                                                                                                     | (mm)       | (m2)        |            |             |                                                                |             |            |            |                 | (mm)    |        |
| 1%                                                                                                                                                  | 0.03005023 | 2.99098E-05 | 0.0009953  | 0.047       | 0.101827064                                                    | -0.99213678 | 0.05       | 0.00       | 2               | 30      | 0.00   |
| 2%                                                                                                                                                  | 0.04256912 | 8.43419E-05 | 0.0019813  | 0.066       | 0.051154163                                                    | -1.29111902 | 0.09       | 0.01       | 3               | 42      | 0.00   |
| 3%                                                                                                                                                  | 0.0522249  | 0.000154474 | 0.0029579  | 0.081       | 0.034265082                                                    | -1.46514822 | 0.12       | 0.02       | 5               | 51      | 0.00   |
| 4%                                                                                                                                                  | 0.06040738 | 0.000237099 | 0.0039250  | 0.094       | 0.025821984                                                    | -1.58801039 | 0.15       | 0.04       | 6               | 59      | 0.00   |
| 5%                                                                                                                                                  | 0.06765402 | 0.000330333 | 0.0048827  | 0.104       | 0.020757302                                                    | -1.6828291  | 0.18       | 0.06       | 8               | 65      | 0.00   |
| 10%                                                                                                                                                 | 0.09652517 | 0.000919694 | 0.0095280  | 0.146       | 0.010637189                                                    | -1.97317313 | 0.29       | 0.26       | 15              | 90      | 0.00   |
| 15%                                                                                                                                                 | 0.11930982 | 0.001662181 | 0.0139316  | 0.176       | 0.007274907                                                    | -2.13817256 | 0.38       | 0.63       | 23              | 107     | 0.01   |
| 20%                                                                                                                                                 | 0.13909428 | 0.002516036 | 0.0180887  | 0.201       | 0.005603018                                                    | -2.25157796 | 0.45       | 1.14       | 30              | 120     | 0.01   |
| 25%                                                                                                                                                 | 0.15707963 | 0.00345479  | 0.0219939  | 0.222       | 0.004608163                                                    | -2.33647221 | 0.52       | 1.79       | 38              | 130     | 0.01   |
| 30%                                                                                                                                                 | 0.17389192 | 0.004458788 | 0.0256411  | 0.239       | 0.003952684                                                    | -2.40310787 | 0.58       | 2.56       | 45              | 137     | 0.02   |
| 35%                                                                                                                                                 | 0.18991555 | 0.005512061 | 0.0290237  | 0.255       | 0.003492015                                                    | -2.45692392 | 0.63       | 3.45       | 53              | 143     | 0.02   |
| 40%                                                                                                                                                 | 0.20541576 | 0.006600821 | 0.0321340  | 0.268       | 0.003154027                                                    | -2.50113463 | 0.67       | 4.42       | 60              | 147     | 0.02   |
| 45%                                                                                                                                                 | 0.22059434 | 0.007712607 | 0.0349629  | 0.279       | 0.00289883                                                     | -2.53777731 | 0.71       | 5.47       | 68              | 149     | 0.03   |
| 50%                                                                                                                                                 | 0.23561945 | 0.008835729 | 0.0375000  | 0.289       | 0.002702703                                                    | -2.56820172 | 0.74       | 6.56       | 75              | 150     | 0.03   |
| 55%                                                                                                                                                 | 0.25064456 | 0.009958852 | 0.0397330  | 0.298       | 0.002550813                                                    | -2.59332143 | 0.77       | 7.69       | 83              | 149     | 0.03   |
| 60%                                                                                                                                                 | 0.26582314 | 0.011070638 | 0.0416466  | 0.305       | 0.002433603                                                    | -2.61375033 | 0.80       | 8.82       | 90              | 147     | 0.03   |
| 65%                                                                                                                                                 | 0.28132335 | 0.012159398 | 0.0432221  | 0.311       | 0.002344894                                                    | -2.62987675 | 0.82       | 9.93       | 98              | 143     | 0.03   |
| 70%                                                                                                                                                 | 0.29734698 | 0.013212671 | 0.0444352  | 0.315       | 0.00228088                                                     | -2.64189754 | 0.83       | 10.99      | 105             | 137     | 0.04   |
| 75%                                                                                                                                                 | 0.31415927 | 0.014216669 | 0.0452531  | 0.318       | 0.002239657                                                    | -2.64981843 | 0.84       | 11.97      | 113             | 130     | 0.04   |
| 80%                                                                                                                                                 | 0.33214462 | 0.015155423 | 0.0456290  | 0.319       | 0.002221205                                                    | -2.6534113  | 0.85       | 12.84      | 120             | 120     | 0.04   |
| 85%                                                                                                                                                 | 0.35192907 | 0.016009278 | 0.0454901  | 0.319       | 0.002227989                                                    | -2.65208705 | 0.85       | 13.53      | 128             | 107     | 0.04   |
| 90%                                                                                                                                                 | 0.37471373 | 0.016751765 | 0.0447055  | 0.316       | 0.002267089                                                    | -2.64453142 | 0.84       | 13.99      | 135             | 90      | 0.04   |
| 95%                                                                                                                                                 | 0.40358488 | 0.017341125 | 0.0429677  | 0.310       | 0.002358778                                                    | -2.62731285 | 0.81       | 14.12      | 143             | 65      | 0.03   |
| 100%                                                                                                                                                | 0.4712389  | 0.017671459 | 0.0375000  | 0.289       | 0.002702703                                                    | -2.56820172 | 0.74       | 13.13      | 150             | 0       | 0.03   |
| 77.40%                                                                                                                                              | 0.32261516 | 0.014676513 | 0.0454923  | 0.319       | 0.002227878                                                    | -2.65210857 | 0.85       | 12.40      | 116             | 125     | 0.04   |

|                                                                                                                                                      |  |    |  |  |                                                                |  |            |  |             |         |
|------------------------------------------------------------------------------------------------------------------------------------------------------|--|----|--|--|----------------------------------------------------------------|--|------------|--|-------------|---------|
| <div>R G PARKINS</div> <div>97 King Street   Lancaster   LA1 1RH</div> <div>Tel: 01524 32548</div> <div>Email: office@rgparkinslancaster.co.uk</div> |  |    |  |  | PIPE FLOW CAPACITY DESIGN CHECK<br>COLEBROOK WHITE FORMULATION |  | Job Number |  | Page Number |         |
|                                                                                                                                                      |  |    |  |  |                                                                |  | K39346     |  | 1 of 1      |         |
|                                                                                                                                                      |  |    |  |  | Crow Trees Farm, Chatburn -<br>design check for combined sewer |  |            |  |             | Calc by |
| TM                                                                                                                                                   |  | OS |  |  |                                                                |  |            |  |             |         |
|                                                                                                                                                      |  |    |  |  | Date                                                           |  | Revised    |  |             |         |
|                                                                                                                                                      |  |    |  |  | 12/06/2026                                                     |  |            |  |             |         |

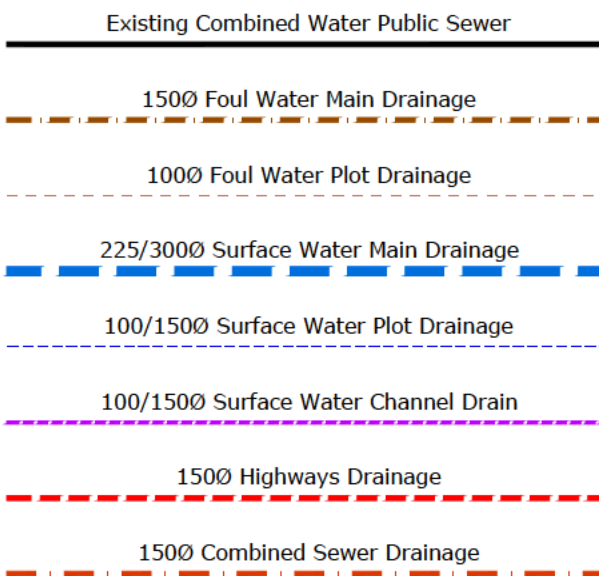
|           |        |    |        |           |            |                 |
|-----------|--------|----|--------|-----------|------------|-----------------|
| Roughness | 0.6    | mm | 0.0006 | U/S level | 97.391     | m               |
| Diam(mm)  | 150    | mm | 0.15   | D/S level | 97.123     | m               |
| Length    | 37.682 | m  |        | Gradient  | 0.00711215 | 1 in 140.604478 |

| PROPOR'N | WETTED     | AREA OF     | HYDRAULIC  | (32mg/l)^.5 | Ks          |             | VELOCITY | DISCHARGE | DEPTH | SURFACE | V^2/2g |
|----------|------------|-------------|------------|-------------|-------------|-------------|----------|-----------|-------|---------|--------|
| DEPTH    | PERIMETER  | FLOW        | MEAN DEPTH |             | 14.8m       | LOG         | (m/s)    | (l/s)     | (mm)  | WIDTH   |        |
|          | (mm)       | (m2)        |            |             |             |             |          |           |       | (mm)    |        |
| 1%       | 0.03005023 | 2.99098E-05 | 0.0009953  | 0.047       | 0.040730826 | -1.39007679 | 0.07     | 0.00      | 2     | 30      | 0.00   |
| 2%       | 0.04256912 | 8.43419E-05 | 0.0019813  | 0.066       | 0.020461665 | -1.68905903 | 0.11     | 0.01      | 3     | 42      | 0.00   |
| 3%       | 0.0522249  | 0.000154474 | 0.0029579  | 0.081       | 0.013706033 | -1.86308823 | 0.15     | 0.02      | 5     | 51      | 0.00   |
| 4%       | 0.06040738 | 0.000237099 | 0.0039250  | 0.094       | 0.010328794 | -1.9859504  | 0.19     | 0.04      | 6     | 59      | 0.00   |
| 5%       | 0.06765402 | 0.000330333 | 0.0048827  | 0.104       | 0.008302921 | -2.08076911 | 0.22     | 0.07      | 8     | 65      | 0.00   |
| 10%      | 0.09652517 | 0.000919694 | 0.0095280  | 0.146       | 0.004254876 | -2.37111314 | 0.35     | 0.32      | 15    | 90      | 0.01   |
| 15%      | 0.11930982 | 0.001662181 | 0.0139316  | 0.176       | 0.002909963 | -2.53611257 | 0.45     | 0.74      | 23    | 107     | 0.01   |
| 20%      | 0.13909428 | 0.002516036 | 0.0180887  | 0.201       | 0.002241207 | -2.64951797 | 0.53     | 1.34      | 30    | 120     | 0.01   |
| 25%      | 0.15707963 | 0.00345479  | 0.0219939  | 0.222       | 0.001843265 | -2.73441221 | 0.61     | 2.09      | 38    | 130     | 0.02   |
| 30%      | 0.17389192 | 0.004458788 | 0.0256411  | 0.239       | 0.001581074 | -2.80104788 | 0.67     | 2.99      | 45    | 137     | 0.02   |
| 35%      | 0.18991555 | 0.005512061 | 0.0290237  | 0.255       | 0.001396806 | -2.85486393 | 0.73     | 4.01      | 53    | 143     | 0.03   |
| 40%      | 0.20541576 | 0.006600821 | 0.0321340  | 0.268       | 0.001261611 | -2.89907464 | 0.78     | 5.12      | 60    | 147     | 0.03   |
| 45%      | 0.22059434 | 0.007712607 | 0.0349629  | 0.279       | 0.001159532 | -2.93571732 | 0.82     | 6.32      | 68    | 149     | 0.03   |
| 50%      | 0.23561945 | 0.008835729 | 0.0375000  | 0.289       | 0.001081081 | -2.96614173 | 0.86     | 7.58      | 75    | 150     | 0.04   |
| 55%      | 0.25064456 | 0.009958852 | 0.0397330  | 0.298       | 0.001020325 | -2.99126144 | 0.89     | 8.87      | 83    | 149     | 0.04   |
| 60%      | 0.26582314 | 0.011070638 | 0.0416466  | 0.305       | 0.000973441 | -3.01169034 | 0.92     | 10.16     | 90    | 147     | 0.04   |
| 65%      | 0.28132335 | 0.012159398 | 0.0432221  | 0.311       | 0.000937958 | -3.02781676 | 0.94     | 11.43     | 98    | 143     | 0.05   |
| 70%      | 0.29734698 | 0.013212671 | 0.0444352  | 0.315       | 0.000912352 | -3.03983755 | 0.96     | 12.64     | 105   | 137     | 0.05   |
| 75%      | 0.31415927 | 0.014216669 | 0.0452531  | 0.318       | 0.000895863 | -3.04775844 | 0.97     | 13.78     | 113   | 130     | 0.05   |
| 80%      | 0.33214462 | 0.015155423 | 0.0456290  | 0.319       | 0.000888482 | -3.05135131 | 0.97     | 14.76     | 120   | 120     | 0.05   |
| 85%      | 0.35192907 | 0.016009278 | 0.0454901  | 0.319       | 0.000891195 | -3.05002706 | 0.97     | 15.56     | 128   | 107     | 0.05   |
| 90%      | 0.37471373 | 0.016751765 | 0.0447055  | 0.316       | 0.000906836 | -3.04247143 | 0.96     | 16.10     | 135   | 90      | 0.05   |
| 95%      | 0.40358488 | 0.017341125 | 0.0429677  | 0.310       | 0.000943511 | -3.02525286 | 0.94     | 16.25     | 143   | 65      | 0.04   |
| 100%     | 0.4712389  | 0.017671459 | 0.0375000  | 0.289       | 0.001081081 | -2.96614173 | 0.86     | 15.16     | 150   | 0       | 0.04   |
| 68.94%   | 0.29389435 | 0.012993001 | 0.0442098  | 0.314       | 0.000917004 | -3.03762872 | 0.95     | 12.40     | 103   | 139     | 0.05   |

## **APPENDIX D**

### **As-Built Drainage Plan**

Drainage Key



NOTE  
Verification Information for new build  
development phase (Plots 1 - 37)

| Manhole Ref. | Easting (m) | Northing (m) |
|--------------|-------------|--------------|
| S01          | 376723.032  | 443941.260   |
| S02          | 376719.909  | 443933.298   |
| S03          | 376756.216  | 443873.589   |
| S04          | 376779.190  | 443875.563   |
| S05          | 376795.924  | 443887.906   |
| S06          | 376801.957  | 443911.006   |
| S07          | 376817.510  | 443922.496   |
| S08          | 376805.520  | 443961.953   |
| S09          | 376796.148  | 443974.223   |
| S10          | 376778.986  | 443983.863   |
| F01          | 376779.969  | 443878.549   |
| F02          | 376794.690  | 443891.608   |
| F03          | 376798.603  | 443909.983   |
| F04          | 376814.661  | 443923.760   |
| F05          | 376796.606  | 443956.456   |
| F06          | 376801.653  | 443964.529   |
| F07          | 376796.345  | 443971.935   |
| C03          | 376769.432  | 444000.342   |
| C02          | 376751.065  | 444033.245   |

|     |                                                                      |          |            |            |          |
|-----|----------------------------------------------------------------------|----------|------------|------------|----------|
| K   | Gullies in farm road removed. Barn conversion roof drainage amended  | 19/06/26 | TM         | TM         | TM       |
| J   | Updated for as-built survey information & co-ordinates               | 11/05/26 | TM         | TM         | TM       |
| H   | Updated as requested by Pringle Homes                                | 27/08/25 | TM         | TM         | TM       |
| G   | Updated for revised manhole connection onto UU sewer in highway      | 28/04/25 | TM         | TM         | TM       |
| F   | Minor addition to SW plot drainage to garden room to barn conversion | 10/03/25 | TM         | TM         | TM       |
| E   | Plot drainage to barn conversion and Dutch barn updated              | 25/02/25 | TM         | TM         | TM       |
| D   | Manholes S10 & F08 replaced with C03 as requested by Pringle Homes   | 09/01/25 | TM         | TM         | TM       |
| C   | Connection onto UU sewer changed to single combined sewer            | 16/12/24 | TM         | TM         | TM       |
| B   | Road gullies added to private farm access                            | 11/12/24 | TM         | TM         | TM       |
| A   | Plot 26 & 27 FFLs updated                                            | 17/04/24 | TM         | TM         | TM       |
| Rev | Description                                                          | Date     | Revised by | Checked by | Approved |

As-Built

Do not scale from this drawing

R G PARKINS

Kendal | 01539 729393 Lancaster | 01524 32548

Client: Pringle Homes  
Project: Crow Trees Farm, Chatburn  
Drawing Title: Foul and Surface Water Drainage Plan

Scale @ A1: 1:250  
First Issue: 21/03/24  
Checked by: TM  
Drawing No: 20  
Rev: K