Dŵr Cymru Welsh Water

Cardigan (Lower Town) SPS Upgrade

WFD Compliance Assessment

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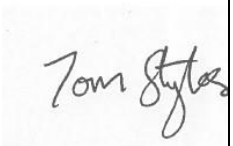
		Signature			
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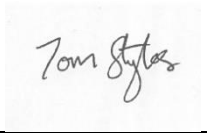
		Signature			Derek Hamer Date: 2021.08.13 17:50:23+01'00'
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Contents

1 Introduction

1.1 Purpose

Arup has been commissioned by Dŵr Cymru Welsh Water (DCWW) to undertake a Water Framework Directive (WFD) Assessment for the scheme known as 'Cardigan (Lower Town) Sewage Pumping Station (SPS) Upgrade'.

Under the WFD[1], all proposed schemes with the potential to impact upon WFD-designated water bodies must be assessed to ensure:

- No deterioration of the current status or potential of any WFD quality elements; and
- No prevention of future attainment of the 'good' status or potential objectives of any WFD quality elements.

This report follows guidance produced by Natural Resource Wales[2] (NRW) to produce a WFD Assessment Report which identifies the activities related to the scheme that may cause deterioration or prevent a water body from meeting its objectives. The report follows the scoping template provided as part of this guidance, along with a detailed impact assessment of residual risk identified.

1.2 Project Description

DCWW are proposing to carry out works to the sewer network in Cardigan to relieve rainfall induced sewer flooding affecting 36 properties in the Lower Town area. These properties are clustered around St Mary's Street and Pwllhai.

The sewage flooding is caused by a combination of storm waters overloading the sewer network and the existing St Marys Street combined sewer overflow (CSO) being unable to discharge due to tidal locking. The existing St Mary's Street CSO has a weir level which is lower than the average high tide. As such, it becomes tide locked during most high tide events, a twice daily occurrence. If a storm occurs during such a period, the CSO is unable to spill and flooding can occur within properties.

Flood water/sewage effluent from flooded properties is discharged to the Afon Teifi as the tide falls and the CSO becomes unlocked and operational. There is currently limited infiltration of polluted flood water in the catchment due to the largely impermeable urban land use. The majority of flood water is therefore delivered to the Afon Teifi via the sewer as the tidal valve becomes operational as the tide recedes. Residual polluted flood water is removed from properties by a clean-up operation, and these volumes are *de minimis* in the context of the overall discharge, and are disregarded for the purposes of the analysis below.

[1] European Commission. Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy.
[2] Natural Resources Wales / Environment Agency. Water Framework Directive assessment: estuarine and coastal water. Available at: https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters

The existing CSO is consented to discharge at 53.7l/s and is predicted to spill (based on a verified hydraulic model of the catchment) 157 times per annum, with a total spill volume of 75,715m^3. A portion of this volume becomes held up in the network, causing flooding to properties in Cardigan when the outfall becomes tide locked. Flow then eventually discharges via the CSO once the tide drops sufficiently enough to allow the CSO to operate. A new secondary outfall pumping station is proposed at the junction of Morgan's Street and St Mary's Street and will operate when St Mary's Street CSO is unable to operate due to tide locking of the outfall. The two outfalls will not operate together.

The pumped water will be discharged at high tide (i.e. when the existing CSO is tide locked) via the secondary outfall, approximately 160m downstream of the existing St Mary's Street CSO discharge point. The secondary outfall will also only be used when the river is in spate (i.e. during a storm event) and the estuary is receiving an elevated volume of freshwater from upstream. Based on modelling data, the proposed secondary outfall is expected to operate approximately 44 times per year, with a total annual volume of 9,664m^3. The effect of the proposed new discharge on water quality will be localised and limited to 44 spills with an average spill of 220 m^3 in the vicinity of the discharge location.

The network is currently restricted by pumping station SPS 2. This pumps 54l/s flow to full treatment, in line with the consent at St Mary's St CSO. Flows rates expected from the new secondary outfall will be in the region of 180-374l/s; this will only pump after the 54l/s has been achieved by SPS 2 and St Mary's Street CSO has backed up due to tide locking. A new discharge consent will be applied for. The spill volume from the existing St. Mary's Street CSO will reduce from 75,715m3 to 66,051m^3 per annum with implementation of the proposed design. The remaining 9,664m^3 will be discharged via the proposed secondary outfall. Therefore, the total annual spill volume to the Afon Teifi will remain the same, but a portion of the spill volume will be delivered via the proposed secondary outfall.

The proposed solution therefore prevents sewer flooding whilst causing no net increase in volume discharged to the Afon Teifi.

With the addition of a second screened overflow all flows will be screened and controlled thus providing an improvement to the current environmental discharge of unscreened flood water via the highway drains.

Other options aside from a new CSO have been explored including surface water removal (Rainscape) but assessment has shown that these are not feasible to implement.

2 Project Details

Your activity	Description, notes or more information
Applicant name	Morgan Sindall (On behalf of Dŵr Cymru Welsh Water)
Name of activity	Installation of the discharge chamber for the Cardigan SPS outfall pipe.
Brief description of activity	The purpose of the works is to prevent flooding at 36 properties on the Definitive Flooding List. The proposed works involve: • Construction of a new secondary outfall pumping station off Morgan Street to take flows from sewers along St. Mary's Street and Pwllhai. • The new secondary outfall will operate when St Mary's Street CSO is unable to operate due to tide locking of the outfall. The two outfalls will not operate at the same time. • Flow in the sewers along Pwllhai and St. Mary's St will then back up. An overflow point will be constructed on each of these sewers, with a connection to the new secondary outfall. • Once the backed up flows in the sewer have reached the new screen weir, flows will pass over a mechanically raked, 6mm screen and then into the pumping station. • The pumped main will be constructed along the Strand and will discharge to a new outfall location into the River Teifi, just off The Strand. The new secondary outfall will only operate during storm events and when the River Teifi has tide-locked the existing St Mary's St CSO. • The new secondary outfall is expected to spill 44 times per year with an a total annual volume of 9,664m^3. This report will assess the impact of the proposed new discharge chamber, outfall and headwall on the water framework directive status of the transitional Afon Teifi (Estuary). The outfall SPS requires the following: • One wet well complete with integrated 6mm mechanical screen on inlet and a pumping station valve chamber. • Two submersible centrifugal pumps (duty/assist) and associated station pipework, isolation valves, non-return valves, Bauer connection, flow meter and air valve. Note: Pipework, valves, Bauer and flow meter- all to be located below ground in a buried valve chamber. • 600mm diameter plastic rising main to a new river outfall. A schematic summarising the proposed works is shown in Appendix A.

Location of activity (central point XY coordinates or national grid reference)	SN 17894 46030
Footprint of activity (ha)	<0.1ha
Timings of activity (including start and finish dates)	Approximate start date: September 2021 Approximate finish date: November 2021 Approximate number of working days: 30
Extent of activity (for example size, scale frequency, expected volumes of output or discharge)	Flow rates expected from the proposed St Mary's Street secondary outfall will be in the region of 180-374l/s. It should be noted that the discharge to the Afon Teifi will be from either of the two discharge points (the existing CSO is consented to discharge at 53.7l/s). The secondary outfall is expected to discharge 44 times a year with a total annual volume of 9,664m^3.
Use or release of chemicals (state which ones)	No chemicals will be used or released.

3 WFD Baseline Information

Water body[3]	Description, notes or more information
WFD water body name	Teifi Estuary
Water body ID	GB511006206900
River basin district name	Western Wales
Water body type (estuarine or coastal)	Estuarine
Water body total area (ha)	100,800 (including catchment)
Overall water body status	Moderate
Ecological status	Moderate. The reason for not achieving good ecological status in 2018 appears to be 'moderate' records for Dissolved Inorganic Nitrogen and Angiosperms.
Chemical status	Good
Target water body status and deadline	The Teifi estuary is to achieve 'good' overall waterbody status by 2021.
Hydromorphology status of water body	Not high.
Heavily modified water body and for what use	The waterbody is not classified as Heavily Modified.
Higher sensitivity habitats present	There is an area (0.5ha) of Saltmarsh located 1km downstream of the proposed outfall.
Lower sensitivity habitats present	The transitional Afon Teifi has 'Intertidal Soft Sediment' (Sand and Mud) and 'Gravel and Cobbles' dispersed along both bank faces. The closest lower sensitivity habitat being intertidal soft sediment located on the left-hand bank immediately opposite the outfall.
Phytoplankton status	High
History of harmful algae	Not monitored
WFD protected areas within 2km	The only WFD protected area within 2km of the site is the Afon Teifi itself which is designated as a Special Area of Conservation (SAC) (UK0012670).

[3] *Water body information can be found in Natural Resource Wales – Water Watch Wales data and information and the Environment Agency's water body summary table. Magic maps provide additional information on habitats and protected areas.*

4 Scoping Assessment

4.1 Hydromorphology

Consider if your activity:	Yes	No	Hydromorphology risk issue(s)
Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status		No - Impact assessment not required	Water body is not of at high status.
Could significantly impact the hydromorphology of any water body		No - Impact assessment not required	During construction, the proposed outfall will result in localised modification of the hydromorphology around the outfall. The modifications include: • Installation of Althon SFA15A headwall. • River bank to be cut away and existing bank to be re-graded with approx. 1.3 slope. • In front of the regraded river bank the soft ground will be removed to a depth of 250mm and filled with pre-filled rock mattress. If bedrock is encountered, rock filled mattresses are not required. • Installation of a Bionet erosion control blanket (Coconut fibre, 100% biodegradable Jute). At a water body scale, this would not result in a significant impact upon hydromorphology. During operation, the existing CSO spill volume from St Mary's Street will reduce from 75,715m^3 to 66,051m^3 per annum with implementation of the proposed design. The proposed secondary outfall is expected to operate approximately 44 times per year, coinciding with high tides and storm events, with a total annual volume of 9,664m^3. Therefore, a total of 75,715 m^3 of screened flow will therefore discharge to the environment. The new secondary outfall discharge is limited to an average spill of 220 m3 in the vicinity of the discharge location. This is not considered to impact the hydromorphology of the Afon Teifi during construction.

Is in a water body that is heavily modified for the same use as your activity		No - Impact assessment not required	Proposal is not located in a HMWB.

4.2 Biology

4.2.1 Habitats

The list of habitats considered to be higher sensitivity and lower sensitivity by the WFD which should be considered within an assessment are shown below.

Higher sensitivity habitats[4]	**Lower sensitivity habitats**[5]
chalk reef	cobbles, gravel and shingle
clam, cockle and oyster beds	intertidal soft sediments like sand and mud
intertidal seagrass	rocky shore
maerl	subtidal boulder fields
mussel beds, including blue and horse mussel	subtidal rocky reef
polychaete reef	subtidal soft sediments like sand and mud
saltmarsh	
subtidal kelp beds	
subtidal seagrass	

Consider if the footprint[6] **of your activity is:**	**Yes**	**No**	**Biology habitats risk issue(s)**
50ha or larger 1% or more of the water body's area Within 500m of any higher sensitivity habitat 1% or more of any lower sensitivity habitat	Yes		The footprint of the activity is approximately <0.1ha this is less than 1% of the Afon Teifi area. There is saltmarsh (higher sensitivity habitat) located 462m south east (upstream) of the proposed works. The footprint of the activity is not within 1% or more of any lower sensitivity habitat.

[4] Higher sensitivity habitats have a low resistance to, and recovery rate, from human pressures.
[5] Lower sensitivity habitats have a medium to high resistance to, and recovery rate from, human pressures.
[6] Note that a footprint may also be a temperature or sediment plume. For dredging activity, a footprint is 1.5 times the dredge area.

4.2.2 Fish

Consider if your activity:	Yes	No	Biology fish risk issue(s)
Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary		No	The proposed outfall is within the Afon Teifi estuary. The construction of the outfall and discharge chamber has the potential to cause a pollution event or sediment discharge. This construction risk has been minimised by the following standard pollution prevention procedures: • Construction works will be undertaken during daylight hours and mid week only. Therefore disturbance will be minimised. • Works will take place during low tide periods so are not within the wetted river. • In the area marked out a sand bag bund will be created by lifting in several jumbo bags to form a perimeter bund adjacent to the water's edge. • Works will take place within an oil absorbent boom and silt curtain will sit within the bund. The operation of the outfall is not expected to cause any erosion or increase in sediment suspension due to the

Consider if your activity:	Yes	No	Biology fish risk issue(s)
			stone mattress (if required) and bionet erosion blanket being installed to prevent this. Any sediment release due to the works will be localised and contained (cofferdam with silt netting). During operation, increases in nutrients are not expected as the spill volume will remain at 75,715 m^3, however modelling estimates that 9,664m^3 will be released via the new secondary outfall. As the 9,664m^3 will be released at high tide, it will be rapidly dissipated and hence will not impact fish species. The 9,664m^3 will also be subject to improved screening. Therefore, the construction works or operation of the proposed CSO will not adversely affect fish (including the qualifying species the SAC) or impede fish passage through the Teifi Estuary or associated tributaries.
Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)		No	As above.
Could cause entrainment or impingement of fish		No	The construction works are proposed to take place on the bank face during low tide and be removed before high

Consider if your activity:	Yes	No	Biology fish risk issue(s)
			tide. Where pumps are needed, the water will be visually inspected to check for fish. Where present, these will be manually removed and placed back to the Estuary. The remaining water will then be pumped via a silt trap.

4.3 Water Quality

Consider if your activity:	Yes	No	Water quality risk issue(s)
Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)	Yes – impacts could occur during operation		Construction activities will occur for longer than 20 working days. However, the construction is not anticipated to pose risk to: water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days). The construction poses minimal risk to water quality of the Afon Teifi due to the standard pollution prevention measures (stated in 4.2.2). The introduction of an additional outfall could increase the rate at which discharge enters the estuary causing resulting impacts on oxygen levels and nutrients. A new discharge consent will be applied for and agreed with NRW.
Is in a water body with a phytoplankton status of moderate, poor or bad		No - impact assessment not required.	Phytoplankton status ‘high’. This is due to the high dissolved inorganic nitrogen which causes eutrophication. The proposed works will not impact dissolved inorganic nitrogen levels and hence are unlikely to impact phytoplankton status of the waterbody.
Is in a water body with a history of harmful algae		No – Impact assessment not required	N/A (Not a category in Wales data)

If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if:	Yes	No	Water quality risk issue (s)
The chemicals are on the Environmental Quality Standards Directive (EQSD) list		No – Impact assessment not required	Accidental spills from vehicles may occur through the construction process. The risk of accidental spillage are present at all construction sites and it is assumed that the contractor will be experienced in the implementation of best practice working practices (e.g. Guidance for Pollution Prevention 5: Work and maintenance in or near water) suitable to minimise the risks posed by these activities to the water environment. Such practices are included in the CEMP as part of the RAMS. As a result, no release of chemicals from the EQSD list is anticipated.
It disturbs sediment with contaminants above Cefas Action Level 1.		No – Impact assessment not required	The release / disturbance of sediment as a result of the proposed works is anticipated to be localised and contained (cofferdam with silt netting). The sediment disturbed is not expected to have contaminants above Cefas Action Level 1.

If your activity has a mixing zone (like a discharge pipeline or outfall) consider if:	Yes	No	Water quality risk issue(s)
The chemicals released are on the Environmental Quality Standards Directive (EQSD) list		No – Impact assessment not required	The proposed outfall is not anticipated to release any chemicals which are on EQSD list. A new discharge consent will be applied for and agreed with NRW.

4.4 WFD Protected Areas

Consider if your activity is:	Yes	No	Protected areas risk issue(s)
Within 2km of any WFD protected area[6]	Yes		The proposed activities will take place adjacent to the Afon Teifi Special Areas of Conservation (SAC).

4.5 Invasive Non-Native Species (INNS)

Consider if your activity could:	Yes	No	INNS risk issue(s)
Introduce or spread INNS		No	No evidence of invasive non-native species was identified during the Extended Phase 1 Habitat Survey, as specified in the Habitat Regulation Assessment (HRA).

4.6 Scoping Summary

Receptor	Potential risk to receptor?	Note the risk issue(s) for impact assessment
Hydromorphology	No	The proposed construction and operation of the outfall is not anticipated to impact on the Hydromorphology of the Afon Teifi at a waterbody scale.
Biology: habitats	Yes	The footprint of the activity is within 500m (upstream) of saltmarsh (higher sensitivity habitat).
Biology: fish	No	The proposed construction and operation of the outfall is not anticipated to impact on fish entering or migrating through the estuary.
Water quality	Yes	Construction activities will occur for longer than 20 working days. However construction is not anticipated to pose a risk to the following parameters water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than 14 days. The construction poses minimal risk to water quality of the Afon Teifi due to the standard pollution prevention measures (stated in 4.2.2). Has .
Protected areas	Yes	The proposed site is directly adjacent to Afon Teifi SAC (UK0012670).
Invasive non-native species	No	No evidence of invasive non-native species was identified during the Extended Phase 1 Habitat Survey.

5 Detailed Assessment

The WFD Scoping Assessment identified potential risks to the following receptors: habitats, water quality and protected areas.

A Habitats Regulation Assessment (HRA)[7] has been prepared for the works (Appendix G of the Marine Licence) which assesses the potential for impacts to protected areas, habitats and species in detail. For brevity, the findings of the HRA have been used to inform the conclusions of this assessment as they relate to the same works and protected areas/habitats. Both assessments will support a Marine Licence application for the works.

5.1 Potential Risks

5.1.1 Habitats

During construction, the footprint of the proposed works is located within 500m of the higher sensitivity habitat 'saltmarsh'. The saltmarsh is located 462m (southeast) upstream of the proposed works so no direct effect will occur, and the works are proposed to take place during the low tide period hence there is no pathway for indirect effect.

During operation, discharge via the existing CSO will remain as existing. Discharge via the new secondary outfall is expected to be 9,664m^3 per annum and 220m^3 per average spill meaning impacts are localised. As the secondary outfall will discharge during high tide, discharge will be rapidly dispersion. Impacts on the habitats as a result of operation effects is therefore anticipated to be negligible with mitigation not required.

5.1.2 Water Quality

The proposed secondary outfall will only operate when St Mary's Street CSO is unable to operate due to tide locking of the outfall. The two discharge points will not operate together.

The restriction on the network currently is and will remain, the pass forward flow (PFF) of Gloster Row pumping station. This pumps 53.7l/s, in line with the consent, ensuring no downstream detriment.

Once flow in the system exceeds 53.7l/s, it will back up to St Mary's Street CSO initially. If this CSO is not tide locked, it will discharge, as it currently does. If it is tide-locked, flows will continue to back up in the network, along Pwllhai and St Mary's Street, to the new secondary outfall, from where discharge flows will be screened via a 6mm-2D screen and pumped to a new outfall point, approximately 160m downstream of the existing St Mary's Street CSO discharge point.

[7] DCWW Cardigan Lower Town SPS, Habitats Regulations Assessment (HRA) – Marine Licence Appendix G.

It should be noted that the discharge to the Afon Teifi will be from either of the two discharge points, they will not operate simultaneously.

The existing CSO spill volume from St Mary's Street will reduce from 75,715m^3 to 66,051m^3 per annum with implementation of the proposed design. The proposed secondary outfall is expected to operate approximately 44 times per year, coinciding with high tides and storm events, with a total annual volume of 9,664m^3. Therefore, a total of 75,715 m^3 of screened flow will therefore discharge to the environment. As the proposed secondary outfall discharges during high tide rather than low tide, it enables greater dilution of discharge thereby benefitting water quality. Based on modelling data, the effect of the proposed new discharge on water quality will be localised and limited to an average spill of 220 m^3 in the vicinity of the discharge location. The discharge from the secondary outfall during a spill event is estimated to equate to no more than 0.25% of the total river flow[8] and will be rapidly dispersed by the watercourse. Therefore impacts on nutrients (including dissolved inorganic nitrogen) and bacteria are not anticipated.

The proposed solution therefore prevents sewer flooding whilst causing no net increase in volume discharged to the watercourse and no detrimental impact on water quality.

With the addition of a second screened overflow all flows will be screened and controlled thus providing an additional improvement to the current environmental discharge of unscreened flood water via the highway drains.

Considering only one outfall operating at any one time, restricted discharge rate, secondary outfall discharges at high tide only and screening of flows, it is not considered that water quality in the Afon Teifi will be adversely impacted.

5.1.3 Protected Areas

The working area is located adjacent to the Afon Teifi SAC. The footprint of the works is small in size (45m^2) and hence any potential impacts associated with the construction and operation of the outfall are not considered to be significant, particularly when considered alongside the standard pollution preventions measures (outlined in section 4.2.2. and 5.2) and alongside the natural transfer of sediment in this area.

The HRA prepared for the works have assessed the impacts on the protected areas and proposed suitable mitigation to minimise potential impacts on the areas. In addition, the Contractor's Risk Assessment / Method Statement (RAMS) will include requirements to adhere to standard practice pollution prevention e.g. GPP5 and CIRIA guidance. No further mitigation is considered necessary.

[8] This precautionary estimate is based on the following calculation and associated assumptions. The proposed CSO will discharge through 2 No. 500mm diameter pipes and therefore the velocity of flow will be approximately 1.0m/s. Assuming the riverbed level is 1.0mAOD (based on a low river level of 1.3mAOD) and the mean high tide is 2.5mAOD; the river is approximately 60m wide at the discharge point (assuming 50m to allow for sloped banks) equating to approximately 150,000l/s at a river flow of 2m/s. The 400l/s from the CSO therefore equates to 0.25% of the total river flow.

5.2 Pollution Prevention Measures

The RAMS incorporates the following mitigation measures:

- Limiting the physical works footprint and the dimensions of the access corridor as far as reasonably practicable.
- Vehicles will be loaded with all plant and materials necessary to undertake the works to minimise plant movements.
- Minimal quantities of fuels, materials, etc. will be taken on to the foreshore with biodegradable fuel oils used on relevant plant.
- All storage containers will remain within the site compound and be appropriately bunded to prevent any spillages or leaks. No storage of materials or refuelling operations will be permitted outside the site compound.

6 Conclusion

The assessment has established the potential risks to receptors associated with the proposed installation of the discharge chamber for the Cardigan SPS outfall pipe.

The impact on the saltmarsh habitat upstream of the proposed works was assessed. As the site is located upstream, no direct effects will occur and as construction will take place during low tide, no indirect effects are anticipated. During operation, discharge will be of equal quality, localised to the area surrounding the outfall and will rapidly disperse therefore impacts are not anticipated.

Impacts associated with water quality impairments have also been assessed. As only one discharge outfall will operate at any one time, it is not considered that there will be any change from existing conditions. The total spill volume will remain as existing however 9,664m^3 will be discharged via the new secondary outfall at high tide, providing water quality benefits through rapid dispersion. The new CSO will also provide screening to flows that will be discharged providing a slight betterment on flows that currently enter the watercourse unscreened via highway drains. Impacts on water quality during operation are therefore no anticipated.

The key receptor identified was the WFD protected site of the Afon Teifi SAC located adjacent to the proposal. Given the potential impacts relate to protected areas, the findings of the HRA prepared for the works have been used to inform the conclusions of this assessment.

Following adherence to requirements specified within this report, the proposed works are not anticipated to give rise to any adverse effects upon WFD water bodies or habitats or prevent them from attaining good status in the future.

This assessment has been based on currently available WFD baseline data and design information for the scheme. It is considered a ‘live’ document and should be reviewed and updated during construction, particularly if:

- NRW update or provide additional WFD baseline data for the relevant water bodies; and/or
- Significant changes to the nature, spatial extent, scale or construction methods of the scheme are made.

The outcomes of this assessment should be shared and agreed with NRW (as the regulatory authority for the WFD in Wales) as part of the Marine Licensing process.

Appendix A: Schematic of proposed solution

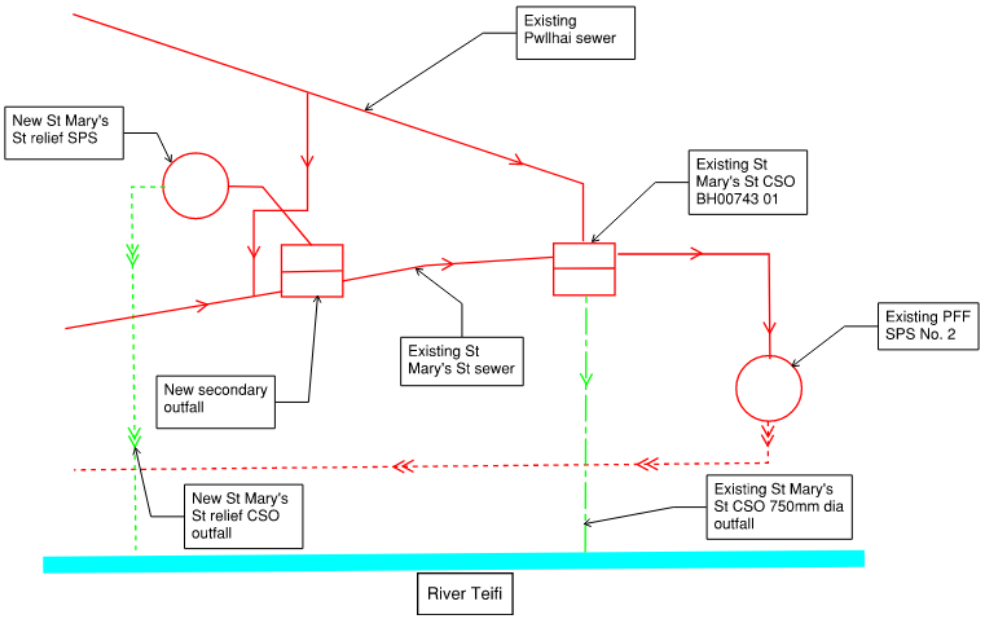

Figure 1: Outline of proposed solution