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PR19: Wastewater Network plus Growth

September 2018



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Executive summary

Driver for investment

The key driver for this investment is our legal duty under the Water Industry Act 1991 to make arrangements for “maintaining, improving and extending” our sewers and “disposing of the contents”. We support economic development in our operating area and make every effort to ensure that new customers can connect to our sewers. Growth may be restricted for many reasons but we don’t want provision of sewerage infrastructure to be one of them.

The population in our operating area is projected to increase by 50,000, or 1.6%, in AMP7. In the same period, the number of households is expected to increase by 43,700. This is a 30% increase on our projection made for AMP6 at PR14. New developments may need new sewers to connect them to our existing sewerage network. Household growth is the driver for expenditure on sewer requisitions and infrastructure network reinforcement.

As more people and businesses are connected to the system and flows increase, we may also need to increase the capacity of trunk sewers, storage tanks or pumping stations to make sure there is no increase in the risk of flooding - one of the worst impacts our customers can experience - or pollution, detrimental impact on the high quality water environment which we know our customers want us to protect.

The investment

Our proposed programme and associated capital costs are shown in Table 1. We plan to invest £61m capex in AMP7 to allow new customers to connect to our sewerage network and to maintain service to existing customers as the population increases and economic growth is supported.

Requisitions expenditure is now only the ‘on-site’ or ‘site-specific’ element; other work, i.e. off-site, required as a direct consequence of connecting new developments is Infrastructure Network Reinforcement.

Our Network Growth Scheme budget is for strategic capacity improvements (or demand reductions) where our network modelling and analysis confirms there is a critical need. Our Wastewater Treatment Works Growth Schemes programme is for providing additional treatment capacity at overloaded sites where there is a high probability that planned growth will occur.

Sewer diversions are now accounted as opex. Opex increases will also result from the capital expenditure. Taking account of these, Table 1 also shows the totex figures for the AMP7 growth programme.

Programme of work	Proposed capex	Proposed totex
Requisitions (On-site / Site-specific)	£6.3m	£6.6m
Infrastructure Network Reinforcement	£10.8m	£10.8m
Network Growth Schemes	£4.9m	£4.9m
Wastewater Treatment Works Growth Schemes	£39.4m	£39.7m
Sewer Diversions		£22.0m
Total programme (2017-18 price base, pre-efficiency)	£61.3m	£84.0m

Table 1: New Development and Growth capex programme for AMP7

Delivering for our customers

This work will meet the following of our customer promises:



Safeguard our environment for future generations: Provide clean, safe water for new customers with no detriment to levels of service for existing customers.

Delivering for the future

In Welsh Water 2050, we identified a number of future trends which will impact on the way we operate now and in the future. Our proposed New Development and Growth investment will ensure that we can continue to meet the service requirements of our customers in AMP7. The main trends driving this investment are:



Climate change: Climate change will result in more extreme rainfall events, which could lead to an increased risk of flooding and pollution.



Demographic change: A growing population, as well as migration within our area, will place increasing loads on our wastewater assets.

Delivering our Strategic Responses

In Welsh Water 2050, we set out to deliver 18 Strategic Responses. This investment will contribute primarily to the following two:

Cleaner rivers and beaches – With increasing pressure on the natural environment from increased population, changing land use, climate change and new sources of pollution, we will improve our wastewater assets to do our part to help achieve ‘good’ environmental status for our rivers, lakes and coastal waters.

Use nature to reduce flood risk and pollution – RainScaping our communities: confronted with population growth, urban creep and increased intensity of rainfall due to climate change, we are proposing to reduce the risk of sewer flooding and pollution through sustainable urban drainage systems.

Achieving our measures of success

In AMP7 we will continue to measure our performance against our Measures of Success (MoS)/Performance commitments. This investment will contribute to achieving the MoS/Performance commitments shown in Table 2. Should growth occur without investment in increasing capacity, the levels of service provided to customers in these areas would reduce and would impact on our baseline performance. Improvements to service are covered by the Enhancement Investment Case.

Measure of Success	Definition	End of AMP6 Position	End of AMP7 Position
Wastewater Treatment Works compliance (pe) (En1)	Percentage of population equivalent, served by sewage treatment works with numeric limits, which were compliant	100%	100%
Wastewater Treatment Works compliance (nr) (En2)	Percentage of sewage treatment works with numeric limits, which were compliant	100%	100%
Pollution incidents from Wastewater (En3)	Category 1 - 3 pollution incidents, as reported to EA and NRW	107	90
Sewer flooding on customer property (internal) (Rt1)	The number of internal flooding incidents per year, including severe weather events	300	273
Sewer flooding on customer property (external) (Rt2)	The number of external flooding incidents per year within property curtilage.	4121	3800

Table 2: Measures of Success

1 Delivering our customer outcomes

Need for investment

The key driver for this investment is our legal duty under the Water Industry Act 1991 to make arrangements for “maintaining, improving and extending” our sewers and “disposing of the contents”. We support economic development in our operating area and make every effort to ensure that new customers can connect to our sewers. Growth may be restricted for many reasons but we don’t want provision of water infrastructure to be one of them.

The population in our operating area is projected to increase by 50,000, or 1.6%, in AMP7. In the same period, the number of households is expected to increase by 43,700. This is a 30% increase on our projection made for AMP6 at PR14. New developments may need new sewers to connect them to our existing sewerage network. Household growth is the driver for expenditure on sewer requisitions and infrastructure network reinforcement.

As more people and businesses are connected to the system and flows increase, we may also need to increase the capacity of trunk sewers, storage tanks or pumping stations to make sure there is no increase in the risk of flooding - one of the worst impacts our customers can experience - or pollution, detrimental impact on the high quality water environment which we know our customers want us to protect.

Views of our customers and stakeholders

We have undertaken extensive consultation with customers through our PR19 preparation programme, including our Welsh Water 2050 strategy consultation held in the summer of 2017, which engaged with 20,000 of our customers. A detailed description of the methodology and outcome of all our customer consultation is included in supporting document 1.2 PR19 Stakeholder Engagement Report.

In our Welsh Water 2050 research, customers spontaneously identified population growth as the biggest challenge for our future.

Our New Development expenditure is for Requisitions and Infrastructure Network Reinforcement (INR). We have a legal duty under the Water Act 1991 to allow new customers to connect to our sewers. This area of expenditure is not affected by the preferences of our existing customers.

Our existing customers are understandably concerned that the level of service they receive should not deteriorate as a result of new developments. Our proposed investment will maintain existing levels of service in the face of growth. Improving levels of service are dealt with in our Enhancement Investment Case.

Regarding broader stakeholder engagement, we have developed good working relationships with the twenty eight Local Planning Authorities which cover our area. As well as liaising closely over preparation of Local Development Plans (Wales) and Frameworks (England), we are normally consulted on all individual planning applications. This cooperation increases understanding and improves the planning effectiveness of both parties.

Our Developer Services team is the highest ranking of all the companies in Water UK’s performance rankings for services to developers since the scheme was established in 2015.

We have also worked closely with Natural Resources Wales / Environment Agency in relation to environmental capacity. For the ‘No Deterioration’ programme (part of the National Environment Programme), this has included assessing the likelihood of growth thresholds being exceeded at given horizons. In conjunction with water quality modelling, this has allowed NRW/EA to determine the need - or otherwise – for new sanitary permit limits at our assets where population is increasing.

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Benefit for our customers

Supporting development without detriment to service

Managing the impacts of population growth is a serious challenge for society. Our New Development and Growth investment will ensure that we can support:

- The projected population increase of 50,000 in our area;
- Receiving wastewater from another 43,700 households;
- Receiving wastewater from another 1,700 businesses.

2 Investing now and for the long-term

Future challenges

Our Welsh Water 2050 strategy identifies significant trends over the next 30 years and how these will impact on our business and our customers. The key trends driving growth expenditure are demographic change and climate change.

Population

The rate of population increase in our area as a whole is relatively stable at about 0.3% per year. However, even this rate will drive construction of 43,700 new households, which will need to be connected to our existing sewerage network. The additional wastewater load generated by these households must not make things worse for the environment or our existing customers, either in the vicinity of new developments or anywhere in our network or treatment works.

Furthermore, the average growth rate disguises the fact that some areas are growing whilst others are shrinking. The population of Cardiff, for example, is projected to grow by 25% between 2016 and 2036, whereas Blaenau Gwent's is set to fall by 6% over the same period.

Climate Change

Climate change is increasing the likelihood of extreme rainfall events, which in turn increase the risk of flooding and pollution. Climate change must be considered alongside demographic change as a factor for consideration in growth planning. Climate change steers us towards more sustainable solutions such as our RainScape programme which reduce demand, rather than those which simply add capacity.

Planning for the future

Long-term planning

Our New Development expenditure – Requisitions and INR – is reactive: new customers have a statutory 'right to connect' to our sewers and can 'requisition' a connecting sewer where necessary.

Our Growth expenditure, however, has a long-term focus. In our strongest growing city, Cardiff, following on from our successful Rainscape programme in Llanelli, we are looking at the benefits of 140 hectares of catchment surface water removal and urban greening, implementing the most cost beneficial schemes through to 2050. This will have long-term benefits through reducing costs compared to piecemeal, 'end-of-pipe' solutions.

Building on progress

AMP6 Progress

This case is built using analysis of historical performance (what it has cost us to connect new properties in recent years) together with a projection of future activity (forecast number of new connections). This section presents the historical data and analysis.

Historical new connections

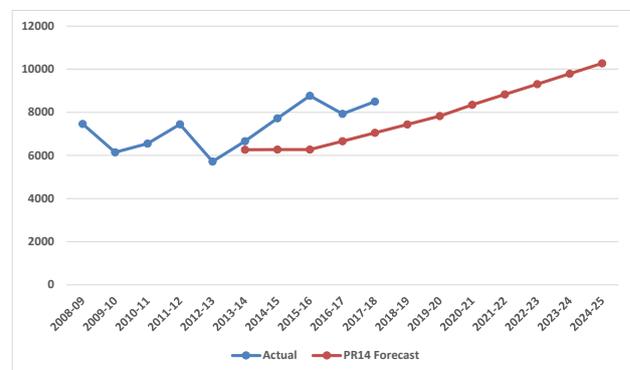


Figure 1: PR14 forecast and actual new property connections

Figure 1 shows how actual connection numbers have varied from those predicted at the last price review, PR14. In hindsight, the PR14 forecast was unduly influenced by a particularly low level of connections experienced in 2012-13. The impact of a low connections forecast would be an under-prediction of requisitions expenditure. 36,792 new property connections were made to our sewerage network in the five years from 2012-13 to 2016-17 inclusive.

Historical expenditure

New Development

In AMP5, our total expenditure on requisitions was £13.3m, adjusted to 2016-17 prices. Over the most recent five years (from 2012-13 to 2016-17 inclusive), the equivalent figure is £13.9m. We connected 36,792 new properties over this period, giving a unit cost of £378. We have used this cost for estimating AMP7 expenditure. This expenditure includes both on and off-site costs, i.e. it includes both the 'on-site' / 'site-specific' requisitions as well as what is now referred to as INR.

Growth - Network

Our network growth expenditure from 2012-13 to 2016-17 inclusive was £1.8m, adjusted to 2016-17 prices. The expenditure in AMP6 to date is lower than anticipated at PR14. Three small growth schemes in West Wales, considered likely back in 2012-13, have not been required to date in AMP6 due to allocated Local Development Plan sites not yet being developed.

The bulk of our AMP6 network growth expenditure has been (and will be) on schemes to increase headroom through removal of infiltration, i.e. demand reduction rather than capacity increase. We completed one of these schemes in Hereford in 2016-17. We relined 820m of trunk sewer and reduced base infiltration by 28 litres/second. This is equivalent to the average foul flow from approximately 16,000 people. We have started a similar but smaller scheme at Lyonshall, also in Herefordshire, and plan to complete a third flow reduction scheme in our Cynon catchment (near Pontypridd) in 2018-19.

Growth - Treatment

Table 3 lists the 'Growth-led' WwTWs schemes we are delivering in AMP6. 'Growth-led' is a reference to how the schemes originated during the PR14 planning process, i.e. the primary trigger for the scheme. A number of other schemes, either 'Quality-led' or 'Maintenance-led', have contributed to the regulatory output of 'capacity enhancement at WwTWs', measured in population equivalent (PE). Some 'Growth-led' schemes which

we planned to complete in AMP5 were not complete on site until the early years of AMP6. These have also contributed to the total capacity enhancement. A full reconciliation of forecast and actual capacity enhancement at WwTWs is provided in Appendix 1.

As in previous AMP periods we have had to adapt our programme to match changing circumstances. Ninety percent of our WwTWs serve only ten percent of our population, an indication of the predominantly rural nature of our service area. A WwTW serving a village can be easily overloaded by increased load from a single new housing development. Should the planned development not proceed, for example, due to other constraints or market forces, we would be able to defer expenditure until it is needed.

We have modified some of our planned schemes following more detailed engineering and economic assessments. An example from West Wales is our scheme at Hook, near Haverfordwest. A WwTW at nearby Johnston had been deferred from our AMP5 programme but still required investment. A new analysis found that the long-term least cost option for addressing both sites would be to abandon treatment at Johnston and pump flows to a new activated sludge plant at Hook.

WwTW Name	Theoretical Load (Total Population Equivalent) in 2017	AMP6 Completion Year
CROES-GOCH	311	Year 1
COWBRIDGE	7,108	Year 2 (Phase 1); Year 3 (Phase 2)
ABERBAIDEN	5,052	Year 3
NEWPORT NASH	289,373	Year 3
HOOK	1,470	Year 4
TRELECH	110	Year 4
KINMEL BAY	66,006	Year 4
CAERNARFON	13,844	Year 4 (Phase 1)
LLANGENNECH	5,068	Year 5
TREGARON	997	Year 5

Table 3: Growth-led WwTWs schemes in AMP6

Other plan adjustments have been made in order to balance the available budget with the need to maintain service in the face of continuing growth. In South Wales, we reviewed needs collectively at seven WwTWs to see how the budget could be optimised. We found that: (a) compliance could be maintained at two of the sites through relatively minor operational adjustments; (b) small scale

interventions could be delivered at four sites, sufficient to allow growth through AMP6 at least, and (c) a full-scale solution was only needed at two of the sites (Llangennech and Tregaron). One consequence of this approach is that some of the planned AMP6 schemes will be considered as phased solutions, with further work required in AMP7 (listed in Table 7).

Sewer Diversions

In AMP5, our total expenditure on sewer diversions was £12.1m, adjusted to 2016-17 prices. AMP5 included the after-effects of the economic recession triggered in 2007-8. Over the most recent five years (from 2012-13 to 2016-17 inclusive), the equivalent figure is higher at £17.9m. We connected 36,792 new properties over this period, giving a unit cost of £486. We have used this cost for estimating AMP7 expenditure. The new property connections figure is used as a general indication of economic activity likely to drive the need for sewer diversions. Some diversions are caused by highways schemes, like the A465 Heads of the Valleys scheme which has driven significant expenditure in AMP6.

Forecast out-turn new connections

Description	2015-16	2016-17	2017-18	2018-19	2019-20
Properties connected in the year (actual to 2017-18)	8,769	7,926	8,499	8,447	8,651
Properties connected in the year (PR14 FBP forecast)	6,274	6,662	7,050	7,438	7,825

Table 4: Actual and forecast property connections in AMP6 (nr)

Description	2015-16	2016-17	2017-18	2018-19	2019-20
Properties connected in the year	8,769	7,926	8,499	8,447	8,651

(actual to 2017-18)					
Properties connected in the year (PR14 FBP forecast)	6,274	6,662	7,050	7,438	7,825

Table 4 shows reported and forecast property connections to the end of AMP6. These numbers are also shown graphically in the next section. Reported figures are from 2017-submitted CAT 6 - WW Properties and Population. 2017-18 and future forecast figures are as per PR19 Table WWS3. This latter source uses the term 'residential' for households, and 'business' for non-households.

The PR14 forecast for new property connections in AMP6 was 35,250. The current AMP6 forecast, using actual completions for the first three years, is now 42,292, about 20% higher than projected at PR14.

Forecast out-turn expenditure

Description	2015-16	2016-17	2017-18	2018-19	2019-20	Total
New Development and Growth	2.9	4.4	5.8	6.4	12.3	31.8
Growth at STWs (excluding sludge treatment)	1.3	5.8	5.8	6.4	12.4	31.7

Table 5: Actual and forecast expenditure in AMP6 (£m)

Description	2015-16	2016-17	2017-18	2018-19	2019-20	Total
New Development and Growth	2.9	4.4	5.8	6.4	12.3	31.8
Growth at STWs (excluding	1.3	5.8	5.8	6.4	12.4	31.7

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sludge treatment)						
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Table 5 shows our submitted expenditure figures for new development and growth. Figures from 2011-12 to 2016-17 are taken from the Cost Assessment Table (CAT) submitted in 2017. Figures for the remainder of AMP6, i.e. 2017-18 to 2019-20 are as per those in PR19 Table WWS2, Lines 25 and 26. 2017-18 figures are also in APR Table 4M.

Note that the figures above for 'Growth at sewage treatment works' are the proportional allocations to growth (Supply Demand Balance) from all schemes, regardless of primary driver.

3 Options

Background

We have a legal duty under the Water Act 1991 to make arrangements for “maintaining, improving and extending” our sewers and “disposing of the contents” This means that the planning focus is primarily on making our best assessment of the likely expenditure requirement.

New property connections (households and non-households) are the key driver for requisitions and INR expenditure. Our company forecast for new connections is the starting point for expenditure forecasts.

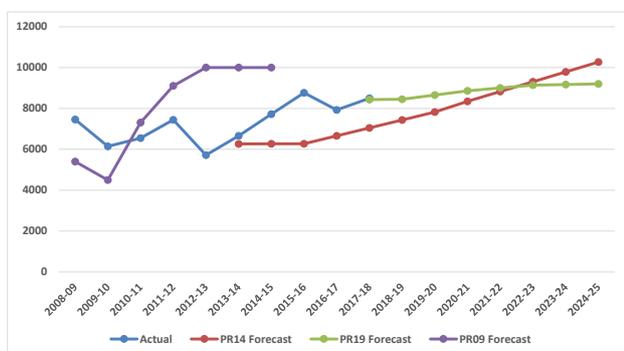


Figure 2 shows our PR19 property connection forecast in context with both the previous price review forecast and actual performance. Over the AMP7 period, we expect to connect 45,372 new properties (households and businesses) to our sewerage network. This is nearly 30% higher than our estimate for AMP6 made at PR14. With hindsight, the PR14 forecast was too low, perhaps unduly influenced by the low number of connections in 2012-13.

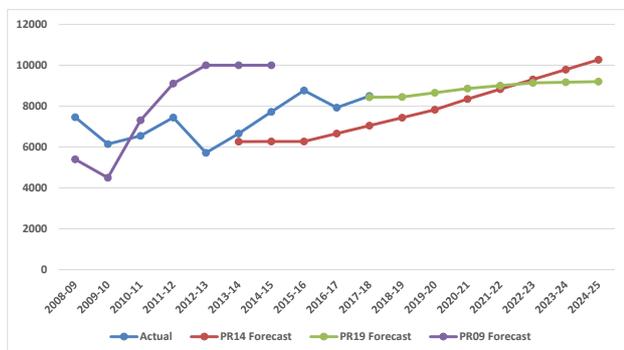


Figure 2: Actual and forecast property connections

Uncertainty and external factors

New development expenditure is strongly influenced by activity in the housing market. Levels of house-building in our area are now more stable than in the first few years after the financial crisis in 2007-8, but they still haven’t recovered to those seen prior to that event.

Whilst there will always be uncertainties, it is generally accepted by all the main political parties, both in Westminster and Cardiff, that there is a need to both increase the supply of housing and to improve affordability for first-time buyers. It is thought that government schemes such as ‘Help to Buy’ have led to an increase in the rate of house-building in recent years.

Our current forecast for new property connections in AMP6 is 20% higher than that made at PR14, when we were closer to the years of high volatility following the financial crisis. We would expect our current forecast for AMP7 to be more accurate, given the circumstances. Our sewer requisitions and INR expenditure is reactive in nature and is offset to some extent by income. This reduces the impact of error in our forecast.

By contrast, growth expenditure is driven predominantly by population increase and this has continued steadily in our area. Population – and therefore the demand on our assets – is projected to carry on increasing, although the most recent government projections suggest a small reduction in the *rate* of growth (due to lower expected net migration). Our population forecast for AMP7 is growth of approximately 0.3% or 10,000 people per year.

Critical to planning of growth expenditure at sewage treatment works is the timing of development. A small works can move quickly from compliance to non-compliance as new properties are built within catchments. However, by their nature, housing construction projects in small communities are the most uncertain in relation to timing. This creates difficulty in setting out an investment plan seven years in advance so we have to create a plan that allows flexibility rather than specifies in detail which schemes will be delivered when.

New Development (Requisitions and INR) expenditure and Growth (Network and WwTWs growth schemes) expenditure require slightly different planning approaches but for simplicity, they are considered together in the following section.

High-level options appraisal

Three high-level options were considered in the development of this investment case for AMP7:

- **Option 1:** Do nothing
- **Option 2:** Maintain expenditure based on historic unit cost rates (new development) and historic programme scale (growth)
- **Option 3:** Increase investment to provide additional strategic capacity.

Further detail on these options is provided below.

Option 1 - Do nothing: do nothing in AMP7 and defer any interventions until AMP8 or later.

Option 2 - Maintain expenditure at historic rates: Use our historically achieved unit cost rates (£ per new connection) together with AMP7 forecast new property connection numbers to determine the new development expenditure requirement. Continue growth expenditure at a similar level to AMP6.

Option 3 – Increase investment: increase growth expenditure to provide additional strategic capacity at more locations, i.e. where growth rates and demand are highest.

Assessment

Option 1 is not compatible with our legal obligation to allow new customers to connect to our sewerage network. New Development expenditure is reactive and we will need to continue reacting to developers' and individuals' requests for a sewer connection. Growth expenditure is planned but doing nothing to address existing capacity constraints now would lead to higher costs in future. For these reasons, we cannot select Option 1.

Option 2 allows us to meet our legal obligations and maintain service to existing customers whilst

supporting economic growth in our area. The calculation of new development expenditure takes account of the company's projected new connections forecast and does not propose any increase above the historic unit cost rate for connecting new customers. The growth programme is maintained at a similar level to AMP6 because forecast population increase is similar.

Although we have identified several more potential growth schemes than this option's budget would allow, there are many other pressing demands on the wastewater programme – such as reducing the risk of sewer flooding for existing customers, delivering the quality improvements required by the environmental regulators and reducing the number of pollution incidents – and through careful prioritisation we have managed at current budget levels to deliver capacity improvements where the need is most pressing.

Option 2 is our preferred and proposed solution.

Option 3 is as per Option 2 for new development but includes increased expenditure on WwTWs growth-led schemes and network growth schemes.

We could significantly increase our expenditure on growth schemes, providing additional capacity in trunk sewers, at pumping stations and at WwTWs. However, we don't want to increase bills for customers so difficult decisions have to be made. There is always a degree of uncertainty around growth forecasts. Adopted Local Development Plans show sites allocated for development but it is the market which determines where and when building will actually take place.

The smaller WwTWs are particularly sensitive in this regard and we have a large number of these assets in Wales – 574 (nearly 70%) of our 835 WwTWs serve a population equivalent below 500. At larger sites, there is a greater likelihood that loads will increase overall, even if there is variable progress on individual development sites. At our larger sites, we propose to use detailed process modelling (BIOWIN) to try and identify as accurately as possible when a growth intervention will become essential.

We know that population growth in AMP7 is forecast to continue at a similar rate to AMP6 so a similarly sized growth programme is justifiable. However, an increase beyond that would require

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sacrifices in other areas of the wastewater programme – like sewer flooding or river pollution - important to our existing customers, as demonstrated by our customer research.

In conclusion, whilst Option 3 would deliver many desirable schemes, providing significant capacity improvements across our area, we have challenged ourselves in AMP7 to 'do more for less' and Option 2 is preferred.

4 Preferred option

Preferred option

Option 2 is our preferred solution. The proposed programme elements and costs are shown in Table 6.

Element	Proposed capex	Proposed totex
Sewer requisitions (On-site / Site-specific)	£6.3m	£6.6m
Infrastructure Network Reinforcement	£10.8m	£10.8m
Sewer Network Growth Schemes	£4.9m	£4.9m
WwTWs Growth Schemes	£39.4m	£39.7m
Sewer Diversions	-	£22.0m
Total programme (pre-efficiency)	£61.3m	£84.0m

Table 6: AMP7 Proposed expenditure

The 'WwTWs Growth Schemes' expenditure is the full-scheme cost of 'Growth-led' schemes, not just the proportional allocation to the growth (supply demand balance) regulatory accounting category. Similarly, this expenditure does not include any proportional allocations to growth from 'other driver' investment, i.e. Maintenance-led or Quality-led schemes – these are described elsewhere in our Business Plan.

PR19 Table WWS2 has two lines – 25 (new Development and Growth) and 26 (Growth at Sewage Treatment Works) which capture 'regulatory' growth expenditure. A build-up of this expenditure is given in Appendix 2.

The £39.4m capex includes £0.4m for WwTWs Headroom Assessments, which includes BIOWIN process modelling. We have found that detailed headroom assessments – and process modelling in particular - can provide confidence that some interventions, initially considered necessary, can be deferred to a subsequent AMP period, saving funds for where investment is essential.

New Development – Requisitions and Infrastructure Network Reinforcement

Our forecast combined expenditure on sewer requisitions and INR in AMP7 is £17.1m. This is based on connecting 45,372 new properties at a unit cost of £378/property, as derived from the historical analysis described above. The historic unit cost is approximately 25% lower than that derived and used at PR14.

2017-18 is the first year that Ofwat has required separation of 'old' requisitions expenditure into (a) requisitions 'on-site / site-specific' expenditure and (b) INR expenditure. The split is required in APR Table 2J. We analysed schemes in 2017-18 to identify this split and have applied the same proportions to our forecast for AMP7. We found the proportion to be 33% 'on-site/site-specific' and 67% INR.

This expenditure is offset to some degree by income from developer contributions and infrastructure charges. Assumptions regarding income have been set out in our Tables Commentary.

Sewer Network Growth Schemes

We have a set a budget of £5m for 'Growth-led' sewerage network schemes in AMP7. This is higher than our forecast out-turn for AMP6 (£2.5m). At PR14 we named three small growth schemes in West Wales, none of which has been required to date due to allocated Local Development Plan sites not yet coming forward for development. For AMP7, we are planning a different approach, focussing activity on our two largest cities, Cardiff and Swansea, where there is a much higher likelihood that planned development will happen by 2025.

Cardiff's population is projected to grow by 6% between 2020 and 2025, more than three times the rate for Wales as a whole. Cardiff City Council's LDP (2006 to 2026) has allocated land for 41,500 houses, much of which is shared between a few

large strategic development areas. Our Welsh Water 2050 vision document sets out a plan to deliver our 'RainScape' flow reduction approach in our largest cities, including Cardiff. Offsetting growth impacts - from population increase, creep of impermeable areas, and higher rainfall intensities due to climate change – using RainScape is our preferred long-term solution.

In Cardiff, we propose to:

- Produce fully-detailed reference mapping of 'RainScape potential' for the catchment draining to our Cardiff WwTW, which serves a quarter of our total population. Building on our experience in the Loughor catchment (Llanelli, Carmarthenshire), we will carry out impermeable area surveys to properly understand connectivity and identify potential for disconnection of surface water flows. The project will define potential areas of land for installation of RainScape elements, such as swales or attenuation areas in public open space. We will include mapping of potential for flow reduction through infiltration removal. Initial assessments have identified 140 hectares for surface water removal and urban greening.
- Following the above work, carry out selected schemes shown to have the highest benefit-cost ratio. We will also use this resource to support development: where additional flows from new developments can be offset by reduction of flows through RainScape measures. This will provide a more sustainable solution than laying long lengths of new sewers to reach a point of adequacy in the network, or increasing capacity downstream. Our 'Greener Grangetown' partnership project with Cardiff City Council and NRW, has shown that sustainable drainage (SUDS) can be retrofitted in a densely populated urban area. We are working closely with Cardiff City Council to identify further areas where the collaborative working approach is beneficial.

City and County of Swansea Council's LDP includes a particularly high concentration of large development sites within our Gowerton WwTW catchment area, with 20,000 housing units proposed between 2010 and 2025. This is part of the Loughor area where we have been pioneering our RainScape approach since AMP5. However, the

number, scale and distribution of development sites here has raised concerns that some strategic network reinforcement will be required to convey foul flows to the wastewater treatment works. Work by our in-house sewerage modelling team has shown that full development would lead to unacceptable risk of flooding and pollution.

We have commenced work on a new Sustainable Drainage Plan (SDP) for Gowerton, with work due for completion by early 2019. The SDP will identify all deficiencies and propose strategic schemes to cater for growth.

WwTWs Growth Schemes

We plan to invest £39m in growth-led WwTWs schemes in AMP7. We have identified potential growth-led schemes totalling over £100m but have had to challenge ourselves to manage the problem for less due to equally important pressures elsewhere in the wastewater programme. In AMP6, we have challenged our Alliance partners to find innovative solutions and explore all options to maintain compliance at WwTWs; we will continue and develop this approach in AMP7.

Our risk-based planning approach for PR19 has followed that set out in UKWIR's 'Long Term Least Cost Planning for Wastewater Supply-Demand'. We maintain a 'WwTWs Headroom Database' to assess the balance between asset capacity (supply-side) and asset loading (demand-side). It enables us to identify and predict headroom deficiencies at WwTWs by considering:

- Theoretical capacity versus assessed load;
- Dry weather flow permits versus long-term measured flows, i.e. permit headroom;
- Components of dry weather flow, such as domestic foul, trade effluent, infiltration;
- Long-term trends in sanitary performance (max, min and 95%ile - BOD, Ammonia and Suspended Solids) compared to acceptable thresholds;
- Operational experience/interventions and evidence of overloading;

Wastewater Network plus Growth

- Alternative demand scenarios, for example past trend-based and local authority plan-based.

We identified fifteen WwTWs considered worthy of taking forward through the initial stages of our capital delivery 'Gateway' process. Our co-located 'Solution Development Team' carried out site surveys, root cause analysis, process calculations and options development for these sites. Option cost estimates were prepared by our in-house costing team, using our Unit Cost Database (UCD).

As discussed above, the AMP7 growth programme will also have to manage 'second phase' work at five sites where some investment has occurred, or will occur, in AMP6. The scope and cost of work required at these sites has been identified at the feasibility stage of the AMP6 work. Three other sites are being assessed for growth solutions by our AMP6 Alliance partners due to other ongoing work

at those sites. One other scheme has been developed by our in-house process team, as an extension to a development impact assessment study for a developer.

Between them, these add up to twenty four potential Growth-led WwTWs schemes for AMP7, listed in Table 7.

We have estimated the combined cost of delivering all these would be over £100m. Whilst we intend to make the proposed budget of £39m stretch as far as possible, we expect that we will be able to deliver seven to ten full schemes. As always, it is likely that some schemes will not be required before 2025 due to actual growth being lower than forecast. At other sites, we will carry out short-term mitigation, i.e. minor work or operational changes sufficient to maintain compliance with environmental permits.

WwTW Name	Region	Local Authority	Theoretical Load - 2017 (Population Equivalent)	Indicative Priority / Category
KINMEL BAY	N	DENBIGHSHIRE	66,006	AMP6 Carryover
LOWER CLEEVE (SW OF ROSS-ON-WYE)	SE	HEREFORDSHIRE	14,079	AMP6 Carryover
LAUGHARNE	SW	CARMARTHENSHIRE	1,389	AMP6 Carryover
BRECON	SE	POWYS	10,005	AMP6 Carryover
LLANDOVERY	SW	CARMARTHENSHIRE	2,013	AMP6 Carryover
GANOL	N	CONWY	88,627	G1
FIVE FORDS (WREXHAM)	N	WREXHAM	114,418	G1
CYNON	SE	RHONDDA CYNON TAFF	66,541	G1
TREBANOS	SW	NEATH PORT TALBOT	16,595	G1
MONMOUTH WWTW (WYESHAM)	SE	MONMOUTHSHIRE	11,717	G1
WEST ABERTHAW	SE	VALE OF GLAMORGAN	8,518	G1
MERLINS BRIDGE	SW	PEMBROKESHIRE	17,720	G1
GREENFIELD	N	FLINTSHIRE	17,730	G1
FFAIRFACH	SW	CARMARTHENSHIRE	3,235	G1
USK	SE	MONMOUTHSHIRE	3,057	G1
BALA	N	GWYNEDD	2,665	G1
CAERNARFON	N	GWYNEDD	13,844	G1
FARNDON	N	CHESTER	1,801	G2
THREE COCKS ABERLLYNFI	SE	POWYS	435	G2
PEMBREY	SW	CARMARTHENSHIRE	2,220	G2
Y FFOR	N	GWYNEDD	492	G3
BUCKLEY TY GWYN	N	FLINTSHIRE	15,675	G3
BUILTH WELLS	SE	POWYS	3,764	G3
WALTON WEST (NR BROAD HAVEN)	SW	PEMBROKESHIRE	1,783	G3

Table 7: Potential AMP7 growth-led WwTWs schemes

The prioritisation categories – G1/G2/G3 – are an approximate ranking, used in the early stages of our PR19 preparation to assist selection of sites for scheme development and costing. Given our budget challenge, it is likely that most of the schemes we deliver in AMP7 will be in the G1 category. The category definition is:

- G1 – Current load exceeds theoretical capacity, i.e. already overloaded. Development sites are in an adopted Local Development Plan. There are development sites with planning permission, or already under construction. Some planning applications have been objected to on grounds of WwTW capacity. Political or developer pressure for a solution.
- G2 - Current load exceeds theoretical capacity, i.e. already overloaded. Development sites are in an adopted Local Development Plan. Some development sites may have planning permission but there is not yet full certainty regarding commitment to start building. Other sites may have other infrastructure constraints.
- G3 - Current load exceeds theoretical capacity, i.e. already overloaded, but current performance acceptable. There is planned growth in the catchment but there is lower confidence that this will happen in AMP7. The local development plan may not yet have been adopted, or there may be other known constraints likely to delay sites.

We will also be delivering numerous ‘other driver’ WwTWs schemes in AMP7, some of which are expected to be major interventions with significant process changes or additions. Delivering these in accordance with our standard process specifications and applying an appropriate design

horizon, will mean that treatment capacity is enhanced. These schemes are described in other investment cases.

In light of the above, our assessment of total capacity enhancement in AMP7 (measured in population equivalent and reported in Ofwat Table WWn4) must also be considered a best estimate. The total capacity enhancement estimate for AMP7 is 68,846 PE, slightly higher than the projected population increase in our area between 2020 and 2025. We explain the derivation of this figure in Appendix 1.

Sewer Diversions

Diversions are now classed as opex.

Our forecast expenditure on sewer diversions in AMP7 is £22.0m. This is based on connecting 45,372 new properties at a unit cost of £486/property, as derived from the historical analysis described above.

The current forecast AMP6 expenditure on diversions is £21m, two and a half times our estimate of £8m at PR14 when we used a different estimating method. We believe our new method will be more accurate, although this is a difficult element to forecast. The timing of major infrastructure schemes, like the proposed M4 duplication around Newport, will have a significant influence on expenditure.

The wider consequences of this timing uncertainty are limited by the fact that diversions expenditure is mostly offset by income from contributions. Assumptions regarding income have been set out in our PR19 Tables Commentary (Table App28).

5 Cost efficiency and innovation

Cost efficiency

We are proposing to deliver £6.4m (capex) and £7.8m (totex) efficiencies under this investment programme, as shown in Table 8.

We will deliver these savings by challenging our Capital Delivery Alliance partners to improve efficiency and by maximising opportunities to innovate.

Element	Proposed capex	Proposed totex
Sewer requisitions (On-site / Site-specific)	£6.3m	£6.6m
Infrastructure Network Reinforcement	£10.8m	£10.8m
Sewer Network Growth Schemes	£4.9m	£4.9m
WwTWs Growth Schemes	£39.4m	£39.7m
Sewer Diversions	-	£22.0m
Total programme (pre-efficiency)	£61.3m	£84.0m
Total programme (post-efficiency)	£54.9m	£76.2m

Table 8: AMP7 Pre and post-efficiency expenditure

Innovation

We will continue to explore any opportunities to deliver cost savings through innovation. Although requisitions and infrastructure network reinforcement are reactive programmes, there will still be opportunities to benefit from innovation in design and construction techniques.

Our sewer network growth programme will be focused on RainScape, our industry-leading and award-winning sustainable drainage approach. By pioneering sustainable drainage methods in AMP6, we have acquired the knowledge and tools to maximise the effectiveness of this approach.

We are currently investigating cost-effective, low-opex, bolt-on treatment processes, such as modular reed beds, for increasing capacity at lower whole life cost. The outcomes of these types of innovations will be available to inform our AMP7 delivery. We will continue to identify the most totex-efficient processes with our partners as we take schemes through feasibility.

Partnering and co-creation

Working closely with our partners is essential to the way we plan to work in the future. Our 2050 strategy highlights this through identifying partners for each of our programmes of future work.

We aim to undertake this work in partnership with customers and communities, developers and local authorities.

6 Value for money and affordability

Impact on customer bills

We understand the importance of balancing the need for investment with the affordability of our bills. We believe the investment will help to deliver the level of service our customers and regulators expect, and represents an optimal approach for sustained long term improvement.

Value for money

We recognise the need to demonstrate value for money in everything that we do. In arriving at the proposed investment, we have applied further efficiencies to our historically achieved unit costs to make sure that the investment represents value to our customers.

Whilst the new development elements – requisitions and infrastructure network

reinforcement – are reactive programmes, our growth investment will provide long-term value by using detailed analysis to identify the most cost-beneficial interventions to remove capacity restrictions. These planned schemes will reduce the cost to customers in the long term by reducing the size of reactive solutions carried out on a piecemeal basis.

As outlined in the previous section of this document, we will also seek to ensure value for money by promoting innovation throughout delivery, by learning lessons from the work we have delivered to date, and by working closely with our partners to encourage best practice and incentivise efficiency.

7 Delivery

Procurement

The programmes will be managed by our Developer Services (New Development) and Wastewater Assets (Growth) teams through AMP7, with scope and programme adjustments being made to meet current operational and other issues. We will monitor performance month by month so that we can respond quickly to emerging signs if we are not getting the benefits we have projected.

Programme

Requisition schemes and infrastructure network reinforcement (required as a consequence of new developments) are reactive work but there may still be opportunities to reduce costs through awareness of interactions with any other capital schemes in the wastewater programme.

For the network growth schemes, detailed mapping, modelling and analysis will be the first stage. Following this, a prioritised programme will be developed linked to the wider wastewater programme and associated benefits of the interventions.

Similarly for the WwTWs growth programme, careful prioritisation will be essential. We will use

detailed process modelling to identify any schemes from our longlist which we may be able to defer to AMP8. We will explore any opportunities for mitigation and only deliver a full capacity enhancement scheme where there is no alternative.

Risk mitigation and customer protection

Our new development expenditure is low risk in that we are responding to requests from customers for new connections. We have an experienced and high-performing Developer Services team which has managed a large number of similar schemes. Our Developer Services team will deliver requisition schemes and achieve efficiencies through both economies of scale and ongoing learning.

Our growth programme is more open and flexible. Our planned approach is for scheme delivery only after carrying out the preliminary modelling and analysis specifically required for this task. This will provide customer protection by ensuring that all interventions under the growth programme are carefully assessed, prioritised and selected.

8 Assurance

Governance

Our overall business management framework has established the people, processes and resources necessary to fulfil our legal obligation to provide new connections for customers. Maintenance of this provides the governance needed for the reactive element of this investment, i.e. requisitions and infrastructure network reinforcement.

For the growth programme, our Wastewater Assets team manage our Capital Gateway Process and they work with our Capital Delivery team and Alliance partners to ensure that the most cost beneficial schemes are delivered, considering the relevant growth time frames. Governance of these schemes is provided by our Capital Programme Board (CPB) which meets monthly. Papers are submitted for key decisions on significant individual schemes.

We have also established a Growth Steering Group (GSG), which meets quarterly. The GSG includes representatives from our Wastewater Assets team, Operations, Developer Services, Asset Strategy and Environment teams, and is a forum for managing the change which is unavoidable in this area of the programme. The GSG also drives improvements to growth processes and systems, where the need has been identified.

Cost assurance

Our costs for New Development are based on historically achieved unit costs combined with a forecast of new property connections, and reduced by application of an efficiency challenge.

Our unit cost for New Development (requisitions plus INR) is approximately 25% lower than that derived and used at PR14. Although we try and smooth out variations by using a five-year rolling average, there is considerable volatility in this measure. This brings a degree of risk and it is possible that our forecast expenditure is too low for AMP7. Conversely, from a cost assurance angle, the risk that this programme cost is too high is low.

Our proposed AMP7 Growth programme expenditure is lower, after efficiency, than that for

AMP6. This will be a real challenge but does provide assurance that the proposed expenditure is fair.

Customer consultation assurance

Our future customers expect us to fulfil our legal obligations to provide new connections. Our existing customers don't want the current levels of service they receive to be reduced due to new developments and population growth.

Our customer consultations have shown that customers value clean rivers and beaches in our area. Growth investment permits environmental protection whilst we continue to support economic growth.

Measures of Success

Our customers did not support the creation of a specific Measure of Success to cover our performance in supporting population growth and economic development. There are, however, MoSs which would be detrimentally affected were it not for our investment in this area. The relevant MoSs and targets for improvement over AMP7 are shown in Table 9.

Measure of Success	Start of AMP7	End of AMP7
Wastewater Treatment Works compliance (pe) (En1)	100%	100%
Wastewater Treatment Works compliance (nr) (En2)	100%	100%
Pollution incidents from Wastewater (En3)	107	90
Sewer flooding on customer property (internal) (Rt1)	300	273
Sewer flooding on customer property (external) (Rt2)	4121	3800

Table 9: Measures of Success

Wastewater Network plus Growth



Future assurance

We have strong governance procedures for the planning and delivery of our capital investment. Our Board will continue to provide the high level

overview and governance to ensure that we deliver these services in the interests of our customers.

Appendix 1: Capacity enhancement at WWTWs

We have reported historical capacity enhancement at WwTWs in APR Table 4S (Line 25) and CAT Table 14 WWW Sewage Treatment (Line 100), reproduced below:

Line description		Unit	DPs	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
100	Population equivalent treatment capacity enhancement	000s	3	10.670	10.400	9.740	4.490	39.560	13.620	5.627

Our forecast capacity enhancement is given in PR19 Table WWn4 (Line 25), reproduced below:

Line description		Unit	DPs	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
25	Population equivalent treatment capacity enhancement	000s	3	130.932	63.634	1.587	3.927	7.920	17.188	5.016	34.647

From these, our forecast outturn capacity enhancement for AMP6 is 215,403 pe. This is 55% higher than our forecast figure provided at PR14, 139,319 pe. Over 80% of the 215,403 pe is achieved at just three sites: Newport Nash, Chester and Kinmel Bay. These are all large sites, where significant capacity increases were achieved through relatively simple schemes such as the addition of a single primary or final settlement tank.

A full reconciliation between our PR14 and current forecasts for AMP6 capacity enhancement is given in Table 10. AMP6 years 1 to 3 are actuals, years 4 and 5 are projected. The 'Source' column shows the scheme's lead driver: G is Growth, M is Maintenance, Q is Quality. 'No-det' is an abbreviation of 'No deterioration', a type of Quality scheme. 'P scheme' is also a Quality scheme, where P stands for phosphorous removal. (N.B. the minor difference between Table 10's PR14 total of 139,315 and the reported 139,319 is due to rounding errors).

Table 10 shows that schemes have not been required at many of the originally planned locations. Some of these schemes have been deferred to AMP7; others are no longer required because Local Development Plan sites have remained un-developed. We have, however, added capacity through several other schemes, either Quality-led or Maintenance-led, which were not known or confirmed at PR14 submission.

Even for those schemes which were both planned at PR14 and delivered in AMP6, there are often differences between the anticipated and delivered capacity enhancement. This is due to: (a) ongoing development of our Standard Specification process design parameters - these are used to calculate theoretical capacity from process unit dimensions; (b) changes to demand forecasts over the several years between initial planning and detailed design, and; (c) design changes which occur as a project progresses from early planning through feasibility, outline and detailed design.

The derivation of our estimated AMP7 forecast capacity enhancement is given in Table 11. The table shows both Growth-led (G-led) and Quality-led (Q-led) schemes. The growth programme for AMP7 is not yet confirmed so the schemes shown are just a best estimate at this stage, based on current priorities and having a combined cost at the proposed budget level. The quality schemes are named in the National Environment Programme, driven either by new phosphorous permits or tightened sanitary limits (or both).

WwTW ID	WwTW Name	Source	Pre-scheme capacity (PE) - PR14 submission	Post-scheme capacity (PE) - PR14 submission	Capacity enhancement (PE) - PR14 submission December Tables (source of 139,319 PE target)	Year Claimed	Pre-scheme capacity (PE) - PR19 position	Post-scheme capacity (PE) - PR19 position	Capacity enhancement (PE) - PR19 position
501	RHOESMOR (NR NORTHOP)	G-led	379	1,036	657	n/a			
914	PEN-Y-STRYT	G-led	334	410	76	n/a			
50639	HUNDETON	G-led	263	723	460	n/a			
50652	LAUGHARNE	G-led	2,000	2,379	379	n/a			
50666	LLANFYRNACH	G-led	269	721	452	n/a			
50805	WALTON EAST (NE OF HAVERFORDWEST)	G-led	60	275	215	n/a			
50809	WHITLAND	G-led	1,008	4,052	3,044	n/a			
661	GREENFIELD	G-led	11,513	17,223	5,710	n/a			
50813	YSTRADGYNLAIS	G-led	12,970	14,142	1,172	n/a			
31032	PEMBRIDGE	G-led	291	810	519	n/a			
50695	LLWYNCELYN (S OF ABERAERON)	G-led	406	1,133	727	n/a			
50754	PUNCHESTON	G-led	91	286	195	n/a			
53012	DEVILS BRIDGE (PONTARFYNACH)	G-led	7	299	292	n/a			
50613	FFAIRFACH	G-led	2,863	4,427	1,564	n/a			
50578	CYNWYL ELFED	G-led	107	478	371	n/a			
50527	ABERCYCH	G-led	39	287	248	n/a			
30828	CANON PYON	G-led	69	352	283	n/a			
50580	COSHESTON	G-led	576	1,000	424	n/a			
50800	TREFIN	G-led	159	730	571	n/a			
50801	TRIMSARAN	Q-led No-Det			1,800	n/a			
30981	LYONSHALL	G-led	317	442	125	n/a			
31450	CAERWENT	G-led	1,481	1,661	180	n/a			
30809	BRECON	G-led	7,110	11,639	4,529	n/a			-
31070	LOWER CLEEVE (SW OF ROSS-ON-WYE)	G-led	14,265	19,625	5,360	n/a			-
50659	LLANDOVERY	G-led	1,867	2,835	968	n/a			-
30795	ABERBAIDEN	G-led	2,444	6,718	4,274	1	2,074	3,586	1,512
53021	LLANELLI COASTAL	Q-led				1	53,245	62,154	8,909
50751	PONTYBEREM	Q-led				1	4,300	6,612	2,312
50583	CROES-GOCH	G-led (AMP5 Carryover)				1	52	455	403
50634	HENLLAN (NR NEWCASTLE EMLYN)	M-led				1	439	926	487
30851	COWBRIDGE	G-led	5,188	6,908	1,720	2	6,068	8,089	2,021
50682	LLANPUMSAINT	M-led (DWF)				2	893	1,351	458
1009	TILSTON	M-led				2	221	568	347
50586	CROSS HANDS	Q-led				2	8,123	10,924	2,801
944	PENISARWAUN	M-led				3	475	567	92
30996	NEWPORT NASH	G-led	185,845	272,342	86,497	3	282,464	375,181	92,717
858	CHESTER	M-led			25,963	3	142,046	178,282	36,236
50644	KEESTON (NW OF HAVERFORDWEST)	Q-led No-Det			227	3	229	941	712
872	LLANFAETHLU	M-led				3	154	387	233
50575	CLARBESTON ROAD NO 1	Q-led No-Det				3	358	761	403
722	CERRIGYDRUDION	Q-led No-Det				3	138	434	296
548	LLANFAIR DYFFRYN CLWYD	Q-led No-Det				3	243	486	243
50588	CRYMMYCH	Q-led No-Det				4	616	931	315
32937	HIRWAUN INDUSTRIAL ESTATE	Q-led No-Det				4	2,612	5,674	3,062
50638	HOOK	G-led	687	1,578	891	4	1,326	5,302	3,976
3137	KINMEL BAY	G-led	62,532	69,006	6,474	4	58,025	102,976	44,951
50798	TRELECH	G-led	160	250	90	4	66	143	77
30948	LLANFOIST	M-led				4	13,411	24,485	11,074
30889	GOYTRE	M-led				4	1,504	1,645	141
996	SEION	M-led				4	29	67	38
31060	RAGLAN	Q - P scheme				5	1,514	1,653	139
31066	CARDIFF RHYDLAFAR (NR ST FAGANS)	Q-led No-Det			296	5	-	-	-
30820	BRYNMAWR BLACKROCK	Q - P scheme				5	5,967	6,357	390
50669	LLANGENNECH	G-led	3,443	7,636	4,193	5			627
50797	TREGARON	G-led	788	1,363	575	5			431
	Totals				139,315				215,403

Table 10: AMP6 Capacity enhancement

FL ID	Functional Location Name	Driver	Current Load PE (2017)	15 yrs load increase (pe)
31070	LOWER CLEEVE (SW OF ROSS-ON-WYE)	G-led	14,079	1,683
30809	BRECON	G-led	10,005	2,244
675	FIVE FORDS (WREXHAM)	G-led	114,418	11,616
30861	CYNON	G-led	66,541	5,412
50795	TREBANOS	G-led	16,595	2,376
30988	MONMOUTH WWTW (WYESHAM)	G-led	11,717	3,465
50706	MERLINS BRIDGE	G-led	17,720	4,818
50613	FFAIRFACH	G-led	3,235	726
508	BALA	G-led	2,665	198
486	HENLLAN (NR DENBEIGH)	Q-led	810	198
488	Malpas WwTW	Q-led	1,707	759
955	Farndon WwTW	Q-led	1,801	495
1029	Whitchurch WwTW	Q-led	11,038	3,300
1036	Tattenhall WwTW	Q-led	2,276	594
30806	BONVILSTON EAST STW	Q-led	139	344
30822	BUILTH WELLS STW	Q-led	3,764	528
30847	Clyro	Q-led	406	99
30903	EIGN STW	Q-led	154,725	7,871
30919	KINGSTONE AND MADELY STW	Q-led	3,815	314
30925	LEOMINSTER STW	Q-led	11,295	4,830
30929	LLANARTH STW LLANARTH MONMOUTHSHIRE	Q-led	81	22
30942	LLANDRINDOD WELLS STW	Q-led	6,460	1,353
31024	NORTON (OLD)	Q-led	319	33
31051	PONTRILAS STW	Q-led	1,541	39
31057	PRESTEIGNE STW	Q-led	2,098	330
31059	PRESTON ON WYE STW	Q-led	221	80
31062	RHAYADER STW	Q-led	2,137	627
31085	ST NICHOLAS (NR BOLVILSTON)	Q-led	307	303
31119	WEOBLEY STW	Q-led	1,115	159
50769	ROSEMARKET	Q-led	456	160
TBC	Gwili Gwendraeth Scheme	Q-led	25,524	13,723
	Total			68,698

Table 11: Estimated AMP7 Capacity Enhancement

Table 11 uses load increase as a surrogate for capacity increase. It is appropriate because the 'programme approach' means we haven't had the opportunity to formally assess existing capacity for every potential scheme. Future/design capacity is usually set to be equal to design horizon load, but existing capacity (a calculation based on existing process unit sizes and our specification parameters) may be either higher or lower than existing load.

Wastewater Network plus Growth



In practice, changes over the period between initial planning and delivery are likely to occur on both sides, i.e. both the assessed 'pre-scheme' capacity and the required 'post-scheme'/design capacity. The 15-year load increase is considered a reasonable measure in the circumstances.

Appendix 2: Regulatory growth expenditure

PR19 Table WWS1 - Capital expenditure – states “Where projects have drivers both of enhancement and capital maintenance, companies should apply a method of proportional allocation to allocate costs between enhancement and capital maintenance.”

To comply with this, we have: (a) assessed individual projects, and; (b) used historical, programme-level, analysis of the proportional allocation between Maintenance and Enhancement. Within the Enhancement category, we have distinguished between Quality, Growth and Enhanced Service Level.

PR19 Table WWS2 summarises enhancement expenditure and includes two lines each for growth capex and opex. The line definitions are reproduced in Table 12.

25/72	New Development and Growth	Capital / operating expenditure associated with the provision of new development and growth in sewerage services. Includes Capital / operating expenditure associated with the provision of local network assets for sewerage services to provide for new customers with no net deterioration of existing levels of service (new development) and Capital / operating expenditure associated with changes in sewage collected from new and existing customers whilst maintaining existing levels of service (growth). This should exclude Capital / operating expenditure for the purpose of reducing the risk to properties and external areas of flooding from sewers that should be reported in line 30, unless an increase in risk is clearly the result of new development.
26/73	Growth at Sewage Treatment Works (excluding sludge treatment)	Capital / operating expenditure associated with meeting or offsetting changes in demand from new and existing customers at sewage treatment works but excluding sludge treatment centres. Expenditure at sludge treatment centres should be reported in table WWS2 line 3.

Table 12: WWS2 Growth Line Definitions

This Growth Investment Case describes ‘Growth-led’ schemes, which may contain elements of Maintenance expenditure within the total scheme cost. Similarly, other investment cases, such as the Water Quality NEP, contain ‘Quality-led’ schemes which may contain elements of Maintenance or Growth expenditure, i.e. when analysed using a method of proportional allocation.

Table 13 shows the planned contributions to Line 25 – New Development and Growth. Table 14 shows the equivalent for Line 26 – Growth at Sewage Treatment Works. In both of these tables, the expenditure figures are the cost allocations to the regulatory category growth and post-efficiency.

The major NEP scheme, Gwili Gwendraeth, is Quality-led but the solution – one new WwTW to replace seven existing WwTWs – will be sized to allow for growth to a future design horizon. The scheme comprises: (a) new transfer mains and pumping stations, i.e. network assets, which contribute to Line 25, and; (b) a new treatment works, which contributes to Line 26.

Similarly, Dry Weather Flow (DWF) solutions may involve either network or treatment solutions and in both cases these solutions may be sized to accommodate growth where appropriate. Where infiltration reduction is not sufficient to achieve compliance, sites may require new, higher DWF permits, which in turn may lead to new, tighter sanitary limits. The solution to this may be new treatment process units, or even whole new package plants, sized for a suitable design horizon.

Investment Case	Projects/Programmes	Expenditure (post-efficiency)
Wastewater NEP	Gwili Gwendraeth transfer mains and pumping stations; EDM schemes	£12.231m
Wastewater Growth	Requisitions, Infrastructure Network Reinforcement and Network Growth schemes	£19.094m
Wastewater Network Maintenance	Sewage pumping station schemes	£3.318m
Wastewater Network+ Enhancement	Newport Tunnel	£1.726m
Wastewater Treatment Maintenance	Dry Weather Flow compliance schemes (network solutions)	£0.643m
Total		£37.012m

Table 13: Table WWS2 Line 25 contributions

Investment Case	Projects/Programmes	Expenditure (post-efficiency)
<i>Wastewater NEP</i>	Gwili Gwendraeth schemes, P-removal and 'Reduction of Sanitary Parameters' schemes, Increase FFT schemes	£19.409m
<i>Wastewater Growth</i>	WwTWs Growth-led schemes	£28.710m
<i>Wastewater Treatment Maintenance</i>	Planned maintenance schemes; Dry Weather Flow compliance schemes	£3.359m
Total		£51.477m

Table 14: Table WWS2 Line 26 contributions