APPENDIX D: ALTERNATIVES TO ADDRESS THIRD KEY DRIVER

1. A number of alternatives have been considered for reducing wastewater overflows in wet weather events. These are discussed in brief below.

Local storage tanks

2. Local storage tanks can provide a practical way of mitigating the effects of wastewater overflows in particular circumstances. Watercare has approximately 10 operating local storage tanks and a number of others are either at the design stage or planned. Local storage tanks were also used in North Shore where the North Shore City Council implemented a dual programme to reduce stormwater infiltration into its sewer network and underground storage tanks were used to collect the most damaging and frequent overflows.

3. Based on international best practice and local experience (e.g. North Shore and Auckland) distributed storage tanks are the best approach to addressing overflows in some cases. However, in many cases storage tanks are neither a viable solution nor an optimal solution in lieu of a tunnel.

4. In this instance the situation in the central area of Auckland is very different from the North Shore – both in terms of the nature, scale and magnitude of issues to be addressed. Local storage tanks are not a practical option for the following reasons:

   (a) The Central Interceptor Scheme is targeting 122 overflow locations spread out across a reasonably large area. These overflows are all in systems that are either served by combined sewers or by systems which behave like combined sewers.

   (b) Local storage tanks require adequate capacity to be available in downstream sewers after the storm to allow the tank to be emptied within around 24 hours. Currently, there is insufficient conveyance capacity to drain the storage tanks in a sufficient time to prevent the stored wastewater from going septic which would cause significant problems with odour and corrosion. This capacity does not exist in the existing Orakei Main Sewer and Eastern Interceptor, so local storage tanks alone would not be viable without upgrading sewer capacity of these pipelines first. Unlike most other trunk sewers in the network, the Central Interceptor will provide both a conveyance and storage functionality in one element.

(c) Utilising storage tanks to address all of these overflows is not practical due to the number of required tanks and space to locate those tanks, the surface piping required to get flows to the tanks, the space requirements to build the tanks (many of the overflows are in high density developed areas) and the general practicalities around operating these tanks including hydraulic control issues, odours and cleaning requirements.

(d) The storage capacity that could practically be provided by local storage tanks is much lower than the main tunnel, which provides approximately 200,000 m^3 of storage. As a comparison, there are only four storage tanks on the North Shore which are greater in size than 1,000 m^3, with a maximum storage tank size of 6,000 m^3.

(e) Finally, the use of local storage tanks does not address two of the three key drivers for the Central Interceptor Scheme:

(i) duplication of key assets approaching the end of their design life - primarily the Western Interceptor; and

(ii) the need for additional network capacity for growth and development through providing additional conveyance capacity.

5. The main tunnel provides both a conveyance and storage functionality, and can be constructed in such a way as to minimise local community disruption. The main tunnel is also the most cost effective means to address all three key Project drivers, and manage issues around operational requirements and control of flow into the Mangere WWTP.

Comprehensive sewer separation

6. Separation of the combined sewer systems has been carefully assessed, including evaluation of small areas which have previously been separated in Auckland. Similar to most other cities around the world that have combined sewer systems, Watercare has determined that continued separation is not cost effective and typically does not achieve targeted results. Therefore, it is not the preferred option to address wastewater overflows.

7. Comprehensive sewer separation has been trialled by one of Auckland Council's predecessors and has been found to be substantially more expensive than original estimates. The most recent example was separation of a small area within the Motions Catchment as part of the Clear Harbour Alliance managed by the former Metrowater.

This separation trial resulted in an average cost of $55,000 per property,[1] which would result in a substantially higher cost than the Central Interceptor Scheme. Post separation assessments have revealed problems in terms of excessive stormwater infiltration in the wastewater system, and evidence of wastewater in the stormwater system. Mr Mcilroy will discuss this experience in greater detail.

8. International best practice shows that combined sewer separation is not a preferred option. Mr Cantrell has advised that, in many cases, separation programmes have been abandoned in lieu of options similar to the Central Interceptor Scheme. The evidence of Mr Mcilroy explains the Auckland Council's experience with sewer separation and confirms it is not a preferred option. It also results in much more substantial environmental and community effects during construction, including the need to implement new sewers and private home connections using an open trench construction method.

9. Consistent with international experience and best practice, it has been found in Auckland that sewer separation:

(a) Is much more expensive than original estimates: In Auckland the actual cost of separation was more than three times the amount originally estimated. Internationally, separation of combined sewer systems is generally considered not practical, cost effective or the best solution for the environment. The general conclusion is that complete separation of the entire combined sewer system is not affordable, and would cost much more than the proposed Central Interceptor Scheme.

(b) Can result in problems and issues in terms of performance: This is also consistent with international and local experience. Examples of issues include wastewater present in the separated storm system due to incomplete and/or incorrect disconnections of private and commercial properties. Also, the sewers show very high levels of inflow and infiltration due to incorrect connections of stormwater sources and defects in the connections to private properties.

(c) Leads to an increase in the amount of stormwater associated pollution: Local and international evidence shows that separation can lead to an actual increase in pollution discharged to the environment. Combined sewer systems provide a means to capture the first flush, small volume components of stormwater pollution from heavily urbanised areas. In the central Auckland

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1 Metrowater Motions South Clear Harbour Alliance Separation Programme.

area it is not practical to implement additional stormwater treatment systems on a large scale because the surface space required does not exist.

10. Sewer separation also does not address the need to duplicate the Western Interceptor, or augment conveyance capacity to address projected growth. This means that the Project would still be needed, and would not be much smaller due to constraints around construction requirements. It is also worth noting that the adverse construction effects of sewer separation are substantially greater than for construction of the Central Interceptor tunnel, given the location of works on the surface. This is due to the extent of disruption to the community across a far greater geographic area.

11. In terms of Watercare's approach to sewer separation the plan is to evaluate small areas where some separation has already occurred (e.g. Point Chevalier) and determine if it is feasible and cost effective to complete separation to aid in reducing the amount of stormwater which the Central Interceptor tunnel will deal with. This also requires an assessment working with Auckland Council to determine if small local separation schemes will yield the best results for catchment pollution management (stormwater and wastewater).

12. Watercare is also working closely with Auckland Council to pursue opportunities to reduce stormwater into the wastewater system where Auckland Council must deal with surface flooding issues. In locations where Auckland Council must install additional stormwater networks to prevent property flooding, Watercare will work with Council to optimise how these systems can divert public sources of stormwater runoff from going into the wastewater system. This will assist to enhance the local wastewater network performance, and enhance the overflow control provided by the Central Interceptor tunnel.

Infiltration reduction

13. Inflow and Infiltration reduction ("**I & I**") is a method used to reduce stormwater into already separated sewer systems. Overflows targeted by the Central Interceptor tunnel are mostly in combined sewer systems, or systems which behave like combined sewers due to the excessive amount of direct stormwater connections (public and private). Therefore, I & I is not a practical means of controlling overflows in the combined areas targeted by the Central Interceptor tunnel.

14. The general local and international conclusion is that I & I programmes have highly variable results and are very expensive on a comprehensive basis. I & I almost never results in effective control of large overflows on a large area basis as it is impossible to remove all sources on public and private property. Typically there is also a significant

challenge in determining how rehabilitation of private property systems will be funded and implemented.

15. In North Shore, storage tanks were still required to address overflows even after I & I programmes had been implemented. However despite this limited success, Watercare will evaluate areas where it is practical to reduce I & I at locations where rehabilitation is required to address pipeline structural issues, and areas where opportunities exist through planned improvements by Auckland Council Stormwater.

16. This is discussed in more detail in the evidence of Mr Mcilroy.

Satellite wet weather treatment systems

17. Satellite wet weather treatment systems were determined to be much more expensive than use of the Central Interceptor Scheme, and multiple facilities would be required to address all targeted overflows. Such facilities would have significantly greater effects on local residents than the short-term effects of the Project's 19 construction sites. Treatment also does not provide additional conveyance capacity, and would not provide duplication of the Western Interceptor.

Wastewater minimisation

18. Wastewater minimisation involves reducing the production of wastewater at source through a variety of measures including water efficiency strategies. While Watercare will continue to implement measures such as water efficiency that can result in reductions to wastewater generation, this will have a minimal effect on targeted overflows and the timeframe when capacity is reached in existing key sewers. Wastewater minimisation also does not address the need to duplicate the Western Interceptor.

Local treatment and disposal of combined sewer overflows

19. This option involves conveyance of overflows to a series of acceptable local treatment locations dispersed throughout the targeted catchments. Localised treatment of overflows to an acceptable level would include fine screening, treatment using a high rate technology followed by disinfection in the form of UV. These treatment systems are complex and generally require operational personnel to be present during each overflow activation event (for many overflows this occurs as many as 100 times per year). This option requires construction of pipelines to convey overflows to locations large enough to site the treatment systems. Such facilities would also have significantly greater effects on local residents than the short-term effects of the Project's 19 construction sites.

20. It also does not address the need to duplicate the Western Interceptor, nor does it address capacity required for projected growth. This means that the Project would still be required even if local treatment systems were implemented.