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| **CLIENT:** | | Watercare Services Limited | | **INSPECTION AND TEST PLAN FOR:** | | | | **ITP No:** | **GAJV-ITP-00184\_5.0** |
| **CONTRACT No. #** | | 6661 | | **JOB/ITP TITLE:** | **Concrete work Diversion Chamber & Confluence Chamber** |
| **CONTRACT:** | | Central Interceptor | | **WORK DESCRIPTION: Concrete work - Diversion and Confluence chambers CONTRACTOR NAME: GAJV**  **SUBCONTRACTOR/S NAME: Seipp Construction** | | | | **PACKAGE No:** | **MPS-CON-DTMAN-20-0001.04** |
| **WORKPLACE NAME / ADDRESS:** | | Mangere Pump Station | | **CHAINAGE (if any):** | **N/A** |
| **DATE:** | | **28/04/2023** | | **WORK AREA:** | **Diversion chamber & confluence chamber** |
| **ENGINEERS NAME:** | | Michael Pilkington – Waris Mohamad | | **RELATD CEP No:** | **GAJV-CEP-00330** |
|  | | Tomos Davies (SEIPP) | | **SWMS No (if any):** | **Click or tap here to enter text.** |
| **The purpose of this Inspection and Test Plan is for identifying and tracking stages of completion and product traceability during all phases of construction. ISSUED FOR CONSTRUCTION**  **Packages:** - Discrete components or work areas.  **Inspection and Test Plan:** A sequential work method statement capturing quality related requirements that provide evidence of conformance to specifications.  **Inspection Check Sheet:** A document detailing specific criteria to be checked and recorded, often developed to meet testing requirements of standards and / or technical specifications.  **Punch List / Defects List:** A list of minor rectification type tasks which need to complete to satisfy the term of the contract.  **Surveillance:** Ongoing monitoring  **Hold Point:** A notice of the event must be provided and shall not proceed with the work without the client or its representative being present unless authority to proceed has been provided by the client in writing. Signature required  **Witness Poin**t: A notice of the event must be provided. If the client representative is not present at the designated time and place, work may proceed. | | | | | | | | | |
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| **LEGEND:** | W = WITNESS POINT | | H = HOLD POINT | | S= SURVEILLANCE | GAJV = GHELLA ABERGELDIE JOINT VENTURE | S/C = SUBCONTRACTOR | | WSL = ENGINEER REPRESENTATIVE |

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| **ACTIVITY No. #** | **DESCRIPTION** | **RESPONSIBILITY** | **REQUIREMENTS / REFERENCE** | **CONFORMANCE CRITERIA** | **METHOD** | **FREQUENCY/PROCESS HELD** | **HOLD/WITNESS REQUIREMENTS** | | **RECORDS OR CHECKLISTS** |
| **TYPE** | **ATTENDANCE REQUIRED** |
| **1.0 Preliminaries** | | | | | | | | | |
| 1.1 | Check -Drawings are IFC and current | GAJV | Ensure the latest IFC drawings are used and available onsite | * Sighting of drawings | Retain drawings | Before project execution | **H** | GAJV | DWG register with the drawing revision. |
| 1.2 | Check - CEP, SWMS, TMP and ESCP in place and signed off by personnel | GAJV | Ensure latest IFC plans are used and available  onsite | * Sighting of plans | Retain plans | Before project execution | **H** | GAJV | Plan register with the revision used |
| **2.0 Materials (approval)** | | | | | | | | | |
| 2.1 | Steel reinforcing | SEIPP | DWG 2012036 Series  NZS 4671/ 3109 GC-C4P – 4.1 and  4.1.1.10 | * Grade 500E * Produced using micro-alloy process * GRP 16 * Chemical Anchor | Review mill certificate Reinforcing ID | Each batch | **MAR** | GAJV | Mill Certificates |
| 2.2 | Concrete Mix Design (base, wall, benching) | SEIPP | NZS3104  MS-41P – 5P, 5.2P  DWG 2012036.861 | * Grade 45 MPa OPC | Review mix design | Each mix design | **MAR** | GAJV | Aconex approval mail |
| 2.3 | Block out infill concrete | SEIPP | DWG 201236.862 | * Infill concrete to be S45/10 * Additional dosage of shrink reduction admixture as per drawing to be Sika control plus as or approved equivalent at 2.25% by weight of cement mass and shall comply with manufacturers requirements. * Additional dosage of admixture as per drawing to be Xypex admix C-5000 additive or approved equivalent at 0.6% by weight of cementitious content and shall comply with   manufacturers requirements. | Review dockets | Each delivery | **S** | GAJV | Material dockets |

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| **ACTIVITY No. #** | **DESCRIPTION** | **RESPONSIBILITY** | **REQUIREMENTS / REFERENCE** | **CONFORMANCE CRITERIA** | **METHOD** | **FREQUENCY/PROCESS HELD** | **HOLD/WITNESS REQUIREMENTS** | | **RECORDS OR CHECKLISTS** |
| **TYPE** | **ATTENDANCE REQUIRED** |
| 2.4 | Epoxy grout | SEIPP | DWG 2012036.908  DWG 2012036.863  GC-C4P | * As per manufacturers data sheet * 25W x 20 NITOSEAL SC600 SEALANT | Review product data sheet | Each delivery | **MAR** | GAJV | Material dockets |
| 2.6 | Concrete pipe DN2100 | GAJV | DWG 2012034.183 MS-03 | * RCRRJ Class 4 | Review shop drawings | Each Delivery | **MAR** | GAJV | QA from supplier |
| 2.7 | Hydrophilic Strip | SEIPP | DWG 2012036.873  DWG 2012036.908 | * CJ-0725-3K or approved equivalent | Review product data sheet | Prior to commencement of work | **MAR** | GAJV | Material dockets |
| 2.8 | PE Liner & filler rod | GAJV | CG-C27P - Table 5-1 | * Technical data sheets * Manufacturers certificates of compliance | Manufacturers certificate of compliance | Prior to commencement of work | **MAR** | GAJV | Material certificate and aconex mail approval |
| 2.9 | Approved Curing compounds | SEIPP | MS-41P 11.3P | * Curing to be accepted by the engineer * Curing to meet the requirements of MS-41P * E-cure As per GAJV-MAR-000035 | Review technical data | Prior to commencement of work | **MAR** | GAJV | Material certificate and aconex mail approval |
| 2.10 | Materials for Concrete Repairs | SEIPP | MS-41P | * Technical data sheets | Review technical data | Prior to commencement of work | **MAR** | GAJV | Material data sheet and aconex mail approval |
| 2.11 | Manhole Covers | SEIPP | DWG 2012036 Series  NZS 3996 CG- | * PAMREX DN700 * Gatic GM302C1212D, GM309C66D, GM303C6122D * Class D400 HN-HO-72 rated * Manufacturers certificates of compliance * Shop drawings. | Manufacturers certificate of compliance | Prior to commencement of work | **S** | GAJV | Dockets |
| 2.12 | Stainless Steel Safety Grille | SEIPP | DWG 2012034.161  NZS 3996 | * Manufacturers certificates of compliance * Shop drawings. | Final design and detail to be submitted to Watercare for review and approval | Prior to commencement of work | **MAR** | GAJV | Material Approval |
| 2.13 | Water stop | SEIPP | CG-C4P 4.1.2P DWG 2012036.862 | * Supercast Rearguard R or approved equivalent | Review product data sheet | Prior to commencement of work | **MAR** | GAJV | Material dockets |
| 2.14 | Backfill Material – 7/3 | SEIPP | Table C2-1 - Behind walls or chambers, CG\_1  GAJV-RFI-002719 | * Approved DM7/3 | Material order review | Before procurement | **MAR** | GAJV | Delivery dockets  Quarry material test results for PSD, MDD |
| 2.15 | Backfill Material – Flowable Fill | SEIPP | GAJV-RFI-002719 | * Min 5 MPa flowable fill | Review mix design | Each mix design | **MAR** | GAJV | Aconex approval mail |
| **3.0 Construction: Reinforcing Cages** | | | | | | | | | |
| 3.1 | Reinforcement Placement | SEIPP | DWG 2012036 Series  DWG 2012036.861  DWG 2012036.909  DWG 2012036.907  DWG 2012036.906  DWG 2012036.903  DWG 2012036.902  DWG 2012036.900  DWG 2012036.893  DWG 2012036.891  DWG 2012036.890  DWG 2012036.889  DWG 2012036.888  DWG 2012036.887  DWG 2012036.886  DWG 2012036.883 | * Ensure that the placed reinforcement complies in all respects with the Design Drawings and this Specification * Minimum cover over reinforcement shall be as   noted on the Design Drawings   * Lap lengths shall generally be as detailed on the Design Drawings or otherwise as per 2012036.861 * Not more than 50% of the reinforcing bars shall be lapped at any one section, i.e. laps shall be staggered. | Visual Inspection and measurement on site | During and after steel placement | **HP** | WSL/GAJV | Pre-pour checklist Photographs |

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| **TYPE** | **ATTENDANCE**  **REQUIRED** |
|  |  |  | DWG 2012036.882  DWG 2012036.881  DWG 2012036.880  DWG 2012036.879  DWG 2012036.878  DWG 2012036.877  DWG 2012036.876  DWG 2012036.875  DWG 2012036.872  DWG 2012036.871  DWG 2012036.870  CG-C4P - 4.1.1 and  4.1.1.17 in accordance to  NZS3109 |  |  |  |  |  |  |
| 3.2 | Chemical Anchors/ Chem Set Bars | SEIPP | DWG 2012036.909  DWG 2012036.861 | * SAF2507 Stainless Steel Anchors. * HILTI RE-500-SD Injection Adhesive | Review product data sheet.  Manufacturers certificate of compliance. | Prior to and after installation. | **HP** | WSL/GAJV | Installation checklist |
| 3.3 | Rebar Couplers | SEIPP | NZS 3101  DWG 2012036.862 | * ReidBar Steel coupler * Use EPCON C8 XTREME as per manufactures instructions. * RB25CS instead. | Review product data sheet.  Visual inspection. | During and after placement | **HP** | WSL/GAJV | Pre-pour checklist |
| 3.4 | Construction Joints and Water Stop Placement | SEIPP | CG-C4P - 4.1.2P  NZS 3109, Clause 5.6.3  DWG 2012036 Series  DWG 2012036.861  DWG 2012036.862  DWG 2012036.863  DEG 2012036.873  DWG 2012036.903 | * Construction joints shall conform to NZS 3109, Clause 5.6.3, type B * Joint position shall be as shown on the Design Drawings unless otherwise agreed with the engineer * Water stops shall be placed as indicated on the drawings * Installed as per manufacturer’s specification * and care taken to prevent damage during concrete placement. | Visual inspection with reference to DWGS | Before concrete pour | **WP** | GAJV | Pre-pour checklist |
| **4.0 Construction: Formwork** | | | | | | | | | |
| 4.1 | Formwork | SEIPP | DWG 2012036 Series CG-C4P - 4.5P  NZS 3109 Section 5 | * Formwork adequately supported and restrained – Design approved if necessary. * Formwork to be treated with release   agent where in direct contact with concrete.   * Formwork must produce cast surfaces within a tolerance of +15 or -12mm on the given dimensions for width and ± 12mm for vertical height, and without visible offsets, bulges,   or misalignment of the concrete. | Visual Inspection | Prior to concrete pour | **WP** | GAJV | Pre-pour checklist Photographs |
| 4.2 | Cast in items | SEIPP | CG-P  DWG 2012034.185  DWG 2012036.863 | * Carry out inspection and confirm correct position prior to concrete pour. * Ensure correct cover is achieved around the item. | Visual Inspection | Prior to concrete pour | **HP** | WSL/GAJV | Pre-pour checklist |
| 4.3 | Block-out infill pipe penetration (if required) | SEIPP | CG-C4P-4  DWG 2013036.862 | * Ensure all reinforcement is to be continuous through block-outs during construction. * Ensure correct cover is achieved prior to concrete pour. | Visual Inspection  Construction methodology and associated reinforcement curtailment details for approval before  construction | Prior to concrete pour | **HP** | WSL/GAJV | Pre-pour Checklist |
| **5.0 Post Construction: Concrete Works** | | | | | | | | | |

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| **TYPE** | **ATTENDANCE REQUIRED** |
| 5.1 | Concrete Testing   * Consistency * 28-day compressive strength * Shrinkage * Permeability * Water absorption * Sulphite content * Alkali content * Chloride content * Temperature rise | SEIPP | MS-41P - 5P MS-41P - 12P  MS-41P – table 6.1P  **Consistency:** NZS 3109  and NZS 3112  **28-day compressive strength:** NZS 3109  Section 9 and NZS 3112  **Shrinkage:** AS 1012.13  **Permeability:** DIN 1048  **Water absorption:** AS 4058  Appendix F  **Sulphite content:** AS 1012.14  **Alkali content: Chloride content:** AS 1012.14  **Temperature rise**: Not  applicable as pours are less than 0.9m thick (as per MPS Temperature Control Plan) | * **Consistency:** For water retaining structures, slump tolerances shall be half those given in Table   9.1 of NZS 3109   * **28-day compressive strength:** 45 MPa * **Shrinkage:** 430mS at 21 days, 600 mS at 56 * days with variance 10% precast & 15% for cast * in-situ * **Permeability:** <20mm * **Water absorption:** <6.5% * **• Sulphite content:** <4% by mass * **• Alkali content:** <2.5kg/m3 * **• Chloride content:** As per table 5-1 of MS-41P * **• Temperature rise:** The lesser of: Thermal Control Plan limits * <70°C maximum * <40°C temperature rise from its fresh concrete casting temperature | IANZ Lab tests | **Consistency:** Slump test every batch  **28 days compressive**  **strength:** 3 Cylinders (1x7day, 2x28 day per shift or per 75m3 poured (NZS 3104), whichever is more frequent.  **Shrinkage:** Every 1,500m3 of concrete  **Permeability:** Every 1,500m3 of concrete **Water absorption:** Every 1,500m3 of concrete **Sulphite content:** Every 1,500m3 of concrete  **Shrinkage:** Every 1,500m3 of concrete  **Permeability:** Every 1,500m3 of concrete **Water absorption:** Every 1,500m3 of concrete **Sulphite content:** Every 1,500m3 of concrete  **Temperature rise:** Not applicable as pours are less than 0.9m thick (as per MPS Temperature  Control Plan) | **WP** | WSL/GAJV | Lab Results.  Witness point release after witnessing of in-situ/immediate tests and sampling for longer tests |
| 5.2 | Concrete Curing | SEIPP | NZS 3109 Clause 7.8 MS-41P 11P | * Curing of cast-in-situ concrete elements shall be undertaken in accordance with the appropriate   Material Specification | Visually monitored on site as per thermal  control plan | Hourly during peak sun hours and as required  elsewhere | **WP** | SEIPP | Post pour check sheet |
| 5.3 | Concrete finishes | SEIPP | CG-C4P - 4.1.6P DWG 2012036.900 | * Concrete finishes to be in line with the design drawings and specification. * Concrete finish to be U3/ F3 or approved finish where not PE lined. | Visual Inspection | Post pour | **WP** | SEIPP | Post pour check sheet |
| 5.4 | Concrete Benching | SEIPP | DWG 2012034.161  DWG 2012034.183 CG-C4.2.1 | * Benching slope shall be 1:12 minimum unless otherwise noted in the drawings. * Plastering over the concrete finish is not accepted. The troweled finish is to be a U2 finish. * Should have the same grade as walls and base slab. | Visual inspection | Post pour | **WP** | GAJV | Post-pour check sheet |
| 5.5 | Concrete Grouting lid panel joints | SEIPP | DWG 2012036.908 | * Ensure joint details are as per the drawings | Visual inspection | Before epoxy | **WP** | SEIPP | QA Check sheet |
| 5.6 | Post Pour Inspection | SEIPP | MS-41P | * Full post pour inspection review of the concrete finish to identify surface defects, ensuring the specified curing has been undertaken, concrete cover checks or any other defects identified or   non-conformances. | Visual Inspection | Post pour | **HP** | WSL/GAJV | Post pour check sheet |
| 5.7 | Concrete Repairs | SEIPP | CG-C4P-4.6.1.4P | * Concrete repair using resin as per concrete structures specification. * As per GAJV-CEP-00272 Mangere Pump Station Defect Repair Procedure | Visual Inspections | Post Pour | **HP** | WSL/GAJV | Post pour check sheet |

***Mr Simon Ferris***

*2023-05-30 01:25:54*

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Please update to be in accordance with spec.

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| **ACTIVITY No. #** | **DESCRIPTION** | **RESPONSIBILITY** | **REQUIREMENTS / REFERENCE** | **CONFORMANCE CRITERIA** | **METHOD** | **FREQUENCY/PROCESS HELD** | **HOLD/WITNESS REQUIREMENTS** | | **RECORDS OR CHECKLISTS** |
| **TYPE** | **ATTENDANCE REQUIRED** |
| **6.0 Construction: Construction PE Liner** | | | | | | | | | |
| 6.1 | PE Liner shop drawing | GAJV | CG-C27P | * Shop drawing to be submitted to WSL | Submission | 4 weeks prior to installation | **HP** | GAJV | Shop drawing submission |
| 6.2 | Extrusion weld certificates | SEIPP | CG-C27P | * Welders’ certificates for welding | Copy of certificates | All welders | **WP** | GAJV | Copy of certificates |
| 6.3 | PE Liner Prior To Pour | SEIPP | CG-C27P | * Final inspection of the liner to ensure its adequately restrained, no visible holes, no fixings left on the inside face, drainage lines are correctly positioned, no folds, bulges, all * joints on the liner are adequately secured. | Visual Inspection | Each pour | **HP** | WSL/GAJV | Pre-Pour Inspection |
| 6.4 | Extrusion weld testing | SEIPP | CG-C27P  ASTM D4437, ASTM D5641  DVS 2227-1 | * As a minimum all site welds shall be tested. | Either vacuum box testing or high voltage spark testing  Visual inspection | All welds | **WP** | WSL/GAJV | As recommended by the manufacturer  Checklist for visual inspection |
| 6.5 | Tapping Survey | SEIPP | AGRU Design & Installation Handbook. CG-C27P | * Tapping survey to identify voids * Voids to be repaired as recommended by the manufacturer. * Pages 24 & 34 of Design & Installation handbook. | As recommended by the manufacturer. Rubber mallet  delamination survey. | As recommended by the manufacturer | **WP** | WSL/GAJV | Post pour check sheet |
| 6.6 | Liner repairs | SEIPP | AGRU Design & Installation Handbook. CG-C27P  DVS 2227-1 | * As recommended by the manufacturer * Clearly mark out areas for repair * Extrusion welding * As per GAJV-CEP-00272 Mangere Pump Station Defect Repair Procedure | Visual Inspection. Surfacing welds. Blanks.  Panel strips. | As recommended by the manufacturer | **HP** | WSL/GAJV | PE Liner Checklist |
| **7.0 Post Construction** | | | | | | | | | |
| 7.1 | Final As built including PE membrane | GAJV | IFC Drawings –  2012036 series  2012034 series | * Survey | Survey | At completion | **WP** | GAJV | As built drawings |
| 7.2 | Hydrostatic testing | SEIPP | GC\_1 10.5.2 D) | * Infiltration test for manholes over 3.5m deep * There are no visible leaks, wet patches or “sweating” at any of the pipe penetrations, seals or riser joints. | Infiltration test | At completion | **HP** | WSL/GAJV | Test record sheet |
| 7.3 | Backfilling – 7/3 | SEIPP | GAJV-RFI-002719 | * Compacted to 90% of Maximum Dry Density | NDM Test | 1 Test per 500mm layer surrounding chamber | **HP** | GAJV | NDM Test Results |
| 7.4 | Concrete Testing – Flowable Fill   * Consistency * 28-day compressive strength | SEIPP | GAJV-RFI-002719  **Consistency:** NZS 3109  **28-day compressive strength:** NZS 3109  Section 9 and NZS 3112 | * **Consistency:** +/- 40mm - NZS 3109 * **28-day compressive strength:** 5 MPa | IANZ Lab tests | **Consistency:** Slump test every batch  **28 days compressive**  **strength:** 3 Cylinders (1x7day, 2x28 day per shift | **WP** | GAJV | Lab Results.  Witness point release after witnessing of in-situ/immediate tests and sampling for longer tests |

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| **ITEM** | **QA DOCUMENT CHECKLIST** | **TICK APPROPRIATE**  **BOX** | **COMMENTS** | **ITEM** | **QA DOCUMENT CHECKLIST** | **TICK APPROPRIATE**  **BOX** | **COMMENTS** |
| 1 | Completed Inspection and Test Plan | ☐ |  | 12 | Check sheets Completed and signed | ☐ |  |
| 2 | Material Delivery Dockets (if applicable) | ☐ |  | 13 | Independent Reviewer Report | ☐ |  |
| 3 | Incoming Material Inspection Checklist | ☐ |  | 14 | Operation and Maintenance Manuals (if applicable) | ☐ |  |
| 4 | All Aconex Mails Closed-Out - Related to Lots | ☐ |  | 15 | Warranties / Guarantees (if applicable) | ☐ |  |
| 5 | Conformance Certificates (if applicable) | ☐ |  | 16 | Producer Statements | ☐ |  |
| 6 | Test Reports | ☐ |  | 17 | Compliance Statement | ☐ |  |
| 7 | Engineers Red-Line mark ups | ☐ |  | 18 | Relevant RFIs - | ☐ |  |
| 8 | As Built Survey | ☐ |  | 19 | Instructions - | ☐ |  |
| 9 | Photos | ☐ |  | 20 | Factory Acceptance Test (if applicable) | ☐ |  |
| 10 | Geotechnical Site Inspection Report (if applicable) | ☐ |  | 21 | Other - | ☐ |  |
| 11 | QA Engineer Site Inspection Report | ☐ |  | 22 | Other - | ☐ |  |

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| **CONFORMANCE / VERIFICATION STATEMENT** | | | | | | |
| This closed lot conforms in all respects with the standards and requirements specified in the Contract Documents. The lot verification records are complete, and any non-conformances have been closed out in accordance with the Projects requirements. | | | | | | |
| **Construction Lot checked by the Senior Project Engineer responsible for the works** | **PRINT NAME** | Click or tap here to enter text. | **SIGNATURE** |  | **DATE** | Click or tap to enter a date. |
| **Construction Lot verified and closed by Quality Management Representative** | **PRINT NAME** | Click or tap here to enter text. | **SIGNATURE** |  | **DATE** | Click or tap to enter a date. |
| **Independent Verification Review (if required) by:** | **PRINT NAME** | Click or tap here to enter text. | **SIGNATURE** |  | **DATE** | Click or tap to enter a date. |