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Mr Peter Pereira
P75 Investments Pty Ltd
Level 2, 66 Wentworth Avenue
SURRY HILLS NSW 2010

Cc: Rebecca Organo
Principal Environmental Scientist
CONSARA

Re: Conceptual Design of a Treatment System for Extracted Water in a Drained Basement, Site B, 73 Mary Street, St Peters, NSW

1. Introduction

EI was engaged by P75 Investments Pty Ltd ('the client') to reply to Rebecca Organo, from CONSARA, who has provided comments on environmental reports issued for the property located at Site B, 73 Mary Street, St Peters NSW ('the site') via letter dated 10 November 2023 (Consara, 2023). This document addresses specifically (and solely) her requests on further details related to the system to be installed on site to treat the water that would be collected from the basement seeping walls and slab ('the WTP'), should a drained basement solution be selected as the most appropriate for the site.

The conceptual design described in this letter will be also sent to the following parties for their review and approval before any implementation works can commence:

- a NSW EPA-accredited auditor ('the site auditor');
- all relevant permit issuers, such as:
    - the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW), if a discharge to stormwater is proposed; or
    - Sydney Water, if a sewer discharge is proposed.

Some elements of this conceptual design would also affect or be included in the long term environmental plan (LTEMP) to be later prepared for the site. The LTEMP will also involve the site auditor, in a separate review and approval process.

2. WTP Conceptual Design

2.1 Design Basis

The Water Treatment Plant (WTP) to be installed on the site will need to satisfy the following requirements:

- Be able to reduce the concentration of the following compounds to levels below the discharge water criteria (DWC) detailed in **Section 3.2.4.1**:
    - Priority metals (Al, As, Cd, Cr, Cu, Ni, Zn, Hg and Pb);
    - Chlorinated hydrocarbons (CHCs), particularly vinyl chloride, chlorobenzene and 1,2-dichloroethane;
    - Benzene, toluene, ethyl benzene and xylenes (BTEX); and
    - Polycyclic aromatic hydrocarbons (PAHs);
- Not generate any vapours into the basement space to be used by future human receptors at concentrations above the indoor air assessment criteria detailed in **Section 3.2.2.1**.

- Be able to successfully treat an influent flow rate of 13,500 L/day (as per worst case scenario presented in DP (2023));
- Operate under a long-term regime that is safe for operators, maintenance workers and poses no unacceptable human health risks to future users of the basement.

2.2 Treatment Process

The treatment solution proposed does not include the collection and storage of the water to be treated. It comprises the following stages (**Figure 1, Attachment A**):

1) **Equalisation**: the influent pumped out of the sump/storage tank will go through an accumulative flow meter (FM-01) and be transferred to a 200L equalisation tank (ET). This volume will allow for more than 20 minutes of residence time, equalising the influent and absorbing eventual monitoring parameter peaks.

2) **Settling**: from the equalisation tank, the influent will be transferred to two 420L settling tanks (ST-01 and ST-02) installed in parallel, where reagents will be added to promote faster and more efficient coagulation and settling processes. These reagents will comprise:
    a. A caustic agent, typically sodium hydroxide (NaOH), to increase pH and facilitate precipitation;
    b. A coagulating polymer, which will cause suspended solids to coalesce into larger, heavier clusters;
    c. A settling agent, typically aluminium sulfate (Al2(SO4)3), which will bond to the suspended clusters and accelerate the settling process.

    The operation of the settling tanks will alternate automatically, so that a 45-minute residence time, pseudo-continuous regime can be sustained. The settling tank will separate the influent in 2 streams:

    a. The overflow stream will be free of solids to the extent practical and will reach a transfer tank (TT-01) by gravity;
    b. The underflow stream will contain the separated solids and will be transferred via gravity to a transfer tank (TT-02), to be dewatered.

3) **Dewatering**: the underflow stream leaving the settling tanks will be pumped out of TT-02 and go through the filter press (FP), which will be periodically (and manually) operated every time the differential pressure measured at DP-01 indicates readings above the appropriate threshold. The operation of the FP will involve the use of a built-in hydraulic pump, which will increase the internal pressure of the equipment to values close to 400 bar and push out all water from the spaces between the plates. This will cause the stream to be separated again into the following:
    a. The filtered underflow, which will join the settling tank overflow stream in TT01;
    b. The ‘cake’, which will comprise the dewatered mass of solids left inside the FP. The cake will require manual scrapping from the plates and will be collected in a 1 m^3 skip bin, before being classified and disposed offsite as per NSW EPA (2014).

4) **Particle filtration**: the volume inside TT01, comprising the two clarified streams coming from the STs and the FP, will be pumped through particle filters (20µm) (PF-01 and PF-02) installed in parallel, to remove any suspended solids not captured by the settling or the dewatering processes. The filtering elements of the PFs will be periodically (and manually) replaced every time the differential pressure measured at DP-02 indicates readings above the appropriate threshold (1 bar).

5) **Adsorption**: the stream leaving the FPs will go through three 400L adsorption filters (AF-01, AF-02 and AF-03) installed in series, which will remove the dissolved contaminants from

water by using granular activated carbon (GAC) as the adsorbent media. The adsorbent media inside each AF will be periodically (and manually) replaced (the 'changeover events') once one of the two triggering conditions are observed (whichever occurs first):

a. The respective differential pressure readings measured at DP-03, DP-04 and DP-05 indicate readings above the appropriate threshold (1 bar); or
b. The analytical results for the samples collected from the sampling points SP-04, SP-05 or SP-06 are uncompliant with the DWC (**Section 3.2.4.1**).

Once the changeover event is complete, the hoses between the AFs will need to be rearranged so that the most impacted AF is positioned first, in the process. All saturated media removed from the AFs will require classification before offsite disposal, as per NSW EPA (2014).

6) **Final discharge**: the effluent leaving AF-03 will go through an accumulative flow meter FM-02 before being finally discharged at either the nearest stormwater ingress point (to be determined), or the nearest sewer access, after all pertinent permits are obtained from the Council, WaterNSW and Sydney Water (as applicable).

2.3 Vapour Controls

The following control measures will ensure that no vapours escape the treatment equipment and reach the basement space to be used by human receptors in the future:

- All fluids will be transferred by pneumatically operated, double-diaphragm pumps. No centrifugal pumps will be used.

- All atmospheric tanks (ET, ST-01, ST-02, TT-01 and TT-02) will be equipped with GAC cartridges (Ø150mm x 500mm) (GC-01, GC-02, GC-03, GC-04 and GC-05) installed on top of sealed lids, which will serve as breathers during the pumping cycles.

- The filter press (FP) will be installed in a separate room, kept under negative pressure at all times by a radial compressor (RC). The discharge of the RC will go through two 200L adsorption filters (AF-04 and AF-05) installed in series. Samples will be collected from ports SP-07 and SP-08 during the DQMEs (**Section 3.2.4**), to check for saturation conditions at these AFs. If saturation is observed, the adsorbent media (GAC) inside each AF will be replaced. All saturated media removed from the AFs will require classification before offsite disposal, as per NSW EPA (2014).

- A photo-ionisation detector (PID)[1] will continuously measure and log the concentration of volatile organic compounds (VOCs) in the atmosphere close to the WTP. If concentrations in excess of 50 ppm are detected an alarm will sound and the pump extracting from the collection sump will stop.

2.4 Operational Changes

The DQME results might trigger the need for operational changes in the WTP, such as:

- Changes in the reagents used or reagent dosages;
- Equipment retrofits, temporary by-passes or permanent decommissioning; and/or
- Changes in the required frequency of the DQMEs.

The need for these changes will be assessed and implemented by the environmental contractor (or water treatment specialist) engaged by the client.

[1] The PID can be calibrated for either benzene or TCE, equipped with a 10.6 eV lamp.

3. Scope of Works

The installation of the WTP will involve the following stages of work.

3.1 Project Management

3.1.1 Project Setup

Internal tasks to be started immediately after commercial approval is obtained from the client:

- Internal kick off meetings;
- Selecting the project team;
- Assigning tasks;
- Preparing target schedules;
- Preparing server folders and other quality system requirements.

3.1.2 Health and Safety Plan

Prepared before any site mobilisation, this document will include:

- Emergency plan;
- Site-related hazards;
- Task-related hazards;
- Controls for all identified hazards;
- Safety risk assessment;
- Site work methods (SWMs).

3.1.3 Procurement

To be started once project is setup:

- Purchase of all material and equipment to be used in the water treatment plant (WTP), such as pumps, tanks, filters, instruments, reagents, adsorbent media, collective protective equipment (fencing, handheld PIDs, LELs[2]), pipes, fittings, conduits and brackets;
- Sourcing of the control panel detailed design and fabrication;
- Sourcing of delivery services for all the above.

3.2 Fieldworks

3.2.1 Mobilisation / Demobilisation

To be started once tasks described in **Sections 3.1.1**, **3.1.2** and **3.1.3** are completed:

- Supervise the delivery of all items listed in **Section 3.1.3**;
- Arrange safe storage of the delivered items on site;
- Kick-off meeting with the client, explaining scope, hazards, storage and exclusion zones to site personnel;
- Removal of all rubbish and unused materials from the site once commissioning is complete.

3.2.2 Indoor Air Monitoring Events (IAMEs)

To be completed before the installation of the WTP and (at least) three more times after start up[3]. The purpose of the IAMEs is to confirm that the operation of the WTP is not contributing to any increase in VOC concentrations inside the basement space being used by human receptors. Ideally, they should

[2] LEL: low explosivity limit meter.

[3] More monitoring events might be deemed necessary, depending on the post commissioning monitoring results or on the need to further modify/retrofit the WTP.

be completed quarterly, to account for different seasonal effects and meteorological conditions. Each indoor air monitoring event will include:

- 15 sampling locations inside the basement space[4];
- Inter- and intra-lab duplicates;
- Summa® canister samplers;
- TO-15 analysis for each sample;
- COC documentation;
- Liaison with laboratories.

3.2.2.1 Indoor Air Assessment Criteria

The analytical results will be assessed against the following criteria:

- NEPC (2013) Interim Health Investigation Levels (HILs) for trichloroethylene (TCE), 1,1,1-trichloroethane (1,1,1-TCA), perchloroethylene (PCE), cis-1,2-dichloroethene (cis-DCE) and vinyl chloride (VC), multiplied by a factor of 0.1, to account for slab attenuation;
- Target Indoor Air Concentrations (TIAC), calculated using the USEPA VISL Calculator[5], for the remaining analytes listed in the TO-15 suite.

3.2.3 WTP Installation

To be completed as per WTP Detailed Design (**Section 3.3.1**), it will include:

- Fastening of all equipment to the local slab;
- Installation of all pipework between equipment, including brackets;
- Installation of all instrumentation and connection with the control panel (where applicable);
- Loading of adsorbent and filtering media into the respective vessels;
- Installation of the control panel and connection with all equipment and instrumentation;
- Tests, commissioning and pre-start trouble shooting.

3.2.4 Discharge Quality Monitoring Events (DQMEs)

The purpose of the DQMEs is to ensure that the WTP is operating as intended and that all discharged water is compliant with the discharge water criteria (DWC) detailed in **Section 3.2.4.1**. Water samples will be periodically collected at the following 6 strategic locations within the WTP (**Figure 1, Attachment A**) by a competent Environmental Scientist/Engineer:

- SP-01: Inlet;
- SP-02: Before PF-01/02;
- SP-03: Before AF-01;
- SP-04: Before AF-02;
- SP-05: Before AF-03;
- SP-06: Before discharge;
- SP-07: After AF-04 (vapour sample);
- SP-08: After AF-05 (vapour sample).

The samples will be collected during the following monitoring events:

- DQME1: After start-up, before actual discharge into local assets (discharge flow rate to be temporarily redirected to storage tank(s));
- DQME2: After DQME1 results are assessed and are able to demonstrate that the WTP is working as intended;
- Subsequent events: frequency to be determined[6,7,8].

[4] Locations more likely to concentrate vapours should be selected, such as waste rooms, the WTP room, small storage rooms, etc.
[5] https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-level-calculator

The collected samples will be analysed for the following parameters:

- Priority Metals:
  - Aluminium
  - Arsenic (3+)
  - Arsenic (5+)
  - Cadmium
  - Chromium (3+)
  - Chromium (6+)
  - Copper
  - Lead
  - Mercury
  - Nickel
  - Zinc
- Petroleum Hydrocarbons:
  - Oil and grease (no visible sheens or films on water surfaces)
  - No hydrocarbon odours
  - Total Recoverable Hydrocarbons (TRHs)
  - Benzene
  - Toluene
  - Ethylbenzene
  - Xylenes
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Chlorinated volatile organic compounds (CVOCs)
- Physiochemical Parameters:
  - pH
  - Turbidity (NTU)

The DQMEs will include quality control/assurance (QA/QC) procedures, such as:

- Analysis of field/rinsate/trip blanks;
- Analysis of intra- and inter-lab duplicates;
- Calculation and interpretation of RPDs[9].
- COC documentation;
- Liaison with laboratories.

3.2.4.1 Discharge Water Criteria

The discharge water criteria (DWC) to be adopted will be:

- The ANZG (2018) 95% Default Guideline Values (DGVs) for the protection of slightly - moderately disturbed freshwater ecosystems[10], with the 99% DGVs applied for the bio-accumulative parameters cadmium, mercury and benzo(a)pyrene.

[6] This frequency can start as monthly, once the available results demonstrate the WTP is operating in a stable and reliable manner.
[7] The monthly monitoring events will need to be completed for the remaining operational life of the WTP.
[8] The DQME results might also trigger changes in the required frequency of these sampling events. The need for these changes will be assessed by the environmental contractor engaged by the client.
[9] RPD: relative percentage difference between original and duplicate samples.
[10] Although the site is surrounded by a heavily urbanised area, the man-made Alexandria Canal and the notoriously impacted Cooks River, an ANZG (2018) protection level corresponding to 'slightly to moderately disturbed systems' was selected, as a conservative measure.

- The NHMRC (2008) recreational criteria will be applied for Oil and Grease (no visible film or sheen at the water surface) and hydrocarbon odours, to account for potential direct contact to humans.

- In the absence of ANZG (2018) criteria for pH and turbidity, the ANZECC / ARMCANZ (2000) screening levels will be used.

- If a sewer discharge is implemented, the criteria above (or even the parameters listed earlier in this **Section 3.2.4**) might not be applicable, potentially replaced by criteria to be detailed by the local sewer collection/treatment service provider, in a site-specific trade waste agreement.

3.2.4.2 Visual Inspections

The DQMEs will also include a visual inspection of the WTP, ensuring that:

- No leaks are observed;
- Reagent tanks are full;
- Filter press is not saturated (operation pressure is below threshold);
- Particle filters are not saturated (differential pressure is below 1 bar);
- Adsorption filters are not saturated (differential pressure for each filter is below 1 bar);
- Flow meter readings are recorded;
- No odours are generated inside the basement;
- PID and LEL readings inside the basement are below thresholds.

If any of the operational conditions above is not observed, a maintenance site visit (MSV) will be scheduled by EI. The data collected during the DQMEs and MSVs should be carefully recorded, so they can later be included in the DQME Reports (**Section 3.3.4**). These data will include:

- Volumes of reagents used;
- Filter press pressure readings;
- Particle filter pressure readings;
- Adsorption filter pressure readings;
- Volume of cake[11] produced;
- Filtering media changeover events;
- Flow rate readings.

3.3 Reporting

3.3.1 WTP Detailed Design

Detailed documentation about the equipment to be deployed will be provided before the mobilisation to site, containing:

- Process flow diagram (PFD) (**Figure 1, Attachment A**);
- Control panel single line diagrams;
- Top and elevation view drawings;
- Equipment data sheets;
- Pipework details (materials, diameters, brackets, valves and fittings);
- Operation Manual;
- Inspection forms;

[11] "cake": dewatered material leaving the filter press.

3.3.2 WTP As-built Drawings and Commissioning Report

Once the commissioning and start-up[12] phases are complete, the WTP Detailed Design documentation (**Section 3.3.1**) will be updated to incorporate any changes from the original plans, which might be required due to:

- Changes in the commercial availability of equipment or materials;
- Unexpected site-specific constraints;
- New data collected during the commissioning phase.

A Commissioning Report will also be produced, detailing the works completed and the findings obtained during the commissioning period.

3.3.3 IAME Reports

The IAME Reports will be prepared upon receipt of laboratory data for each IAME and will include:

- Sampling methodology;
- Analytical results;
- Field and Laboratory QA/QC results;
- Assessment against the Indoor Air Assessment Criteria (**Section 3.2.2.1**), highlighting exceedances (if any);
- Corrective actions and recommendations based on the assessed results.

3.3.4 DQME Reports

The DQME Reports will be prepared upon receipt of laboratory data for each DQME and will include:

- Sampling methodology;
- Analytical results;
- Field and Laboratory QA/QC results;
- Assessment against the DWC (**Section 3.2.4.1**), highlighting exceedances (if any);
- Operational data collected from the WTP;
- Corrective actions and recommendations based on the assessed results.

4. Conclusion

In conclusion, subject to the limitations presented in **Section 6**, EI is of the opinion that it is technically possible to implement a solution in a reasonable timeframe, that would treat the water to be collected from the basement seeping walls and slab, should a drained basement solution be selected as the most appropriate for the site, while still complying with the design basis conditions listed in **Section 2.1**.

The conceptual design described in this letter will be also sent to the following parties for their review and approval before any implementation works can commence:

- a NSW EPA-accredited auditor (‘the site auditor’);
- all relevant permit issuers, such as:
    - the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW), if a discharge to stormwater is proposed; or
    - Sydney Water, if a sewer discharge is proposed.

Some elements of this conceptual design would also affect or be included in the long term environmental plan (LTEMP) to be later prepared for the site. The LTEMP will also involve the site auditor, in a separate review and approval process.

[12] For the purposes of this document, ‘start-up’ is defined as a zero-duration event (i.e. a milestone), conducted once the commissioning phase is complete. ‘Commissioning’ refers to the period between the completion of installation and the start-up event. It includes all tests and retrofits required to ensure that the WTP works as intended.

5. References

Consara (2023) Section 4.56 Modification Application (Drained Basements), 2021/0800 73 Mary Street St Peters NSW ('Precinct 75') *Feedback and Opinion on Modification Application* – Contamination, issued 10 November 2023.

DP (2023) *Revised Groundwater Assessment, Proposed Mixed-use Development, 75-85 Mary Street, St Peters*, prepared by Douglas Partners Pty Ltd, issued 28 August 2023.

NSW EPA (2014) *Waste Classification Guidelines - Part 1: Classifying Waste*, Environment Protection Authority of New South Wales, EPA 2014/0796, November 2014.

6. Limitations

This letter has been prepared for the exclusive use of its recipients, who are the only intended beneficiary of EI's work.

No other party should rely on this document without the prior written consent of EI, and EI undertakes no duty, or accepts any responsibility or liability, to any third party who purports to rely upon this document without EI's approval.

EI has used a degree of care and skill ordinarily exercised by reputable members of the environmental industry in Australia, as at the date of this document. No other warranty, expressed or implied, is made or intended. Each section of this letter must be read in conjunction with the whole of this letter, including its appendices and attachments. The findings presented in this letter are the result of discrete and specific sampling methodologies used in accordance with best industry practices and standards.

While normal assessments of data reliability have been made, EI assumes no responsibility or liability for errors obtained from sources outside of EI, or developments resulting from situations outside the scope of works of this letter.

The conclusions presented in this letter are based on a limited investigation of conditions, with specific sampling locations chosen to be as representative as possible under the given circumstances.

EI's professional opinions are based on its professional judgment, experience, training and results from analytical data. EI may also have relied upon information provided by the client and other third parties to prepare this document, some of which may not have been verified by EI.

Should you have any queries regarding this letter, please do not hesitate to contact the undersigned.

For and on behalf of
EI AUSTRALIA

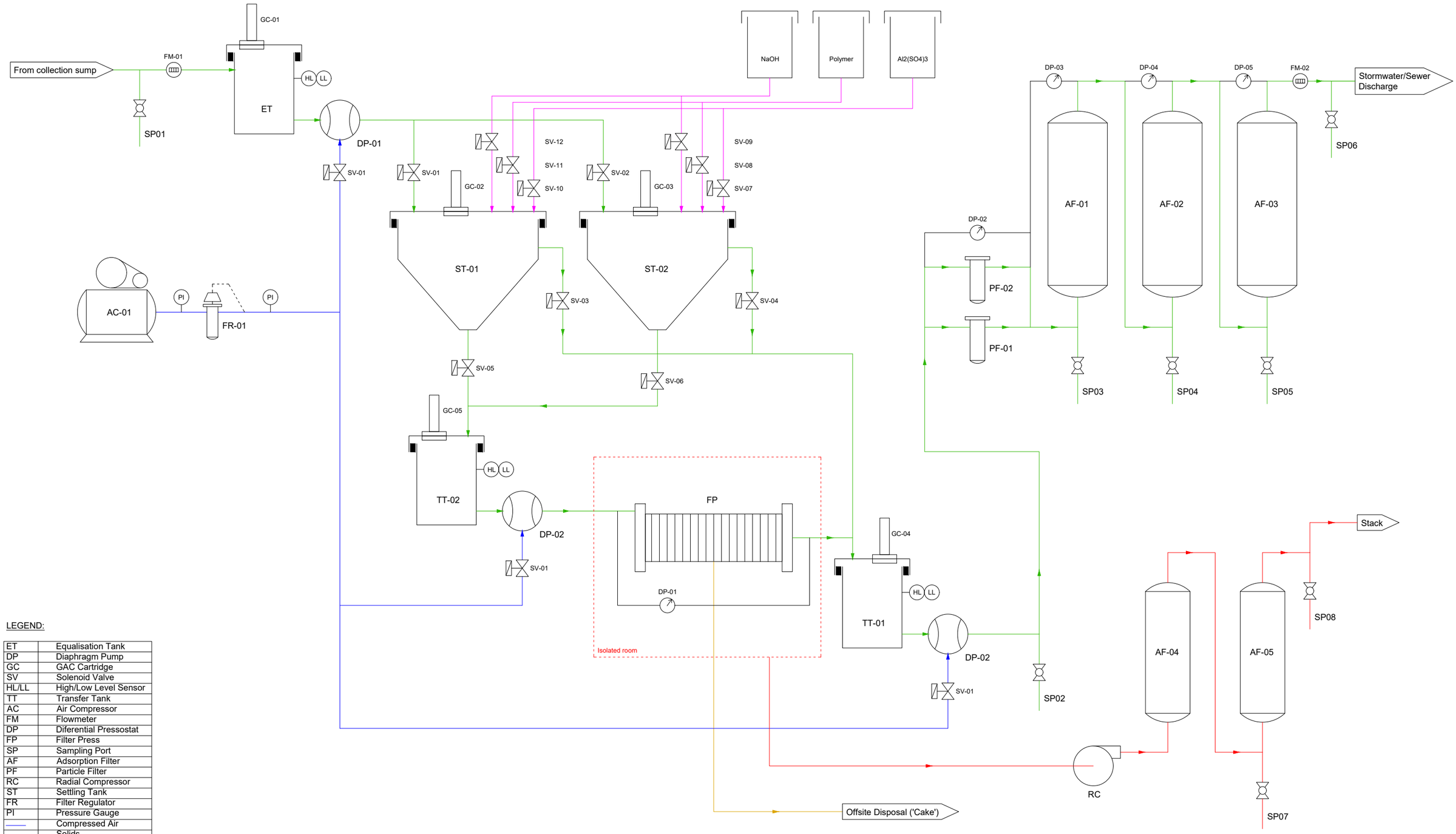
PEDRO BALBACHEVSKY
Principal Environmental Engineer
SC-CEnvP Cert.No: SCC41198

Attachments

Figure 1 – Process Flow Diagram

Attachment A

Figures



LEGEND:

ET	Equalisation Tank
DP	Diaphragm Pump
GC	GAC Cartridge
SV	Solenoid Valve
HL/LL	High/Low Level Sensor
TT	Transfer Tank
AC	Air Compressor
FM	Flowmeter
DP	Diferential Pressostat
FP	Filter Press
SP	Sampling Port
AF	Adsorption Filter
PF	Particle Filter
RC	Radial Compressor
ST	Settling Tank
FR	Filter Regulator
PI	Pressure Gauge
	Compressed Air
	Solids
	Liquids
	Vapours

Rev	Date	By	App	Amendment Details
0	29/02/24	PB	--	Original

Design		
Drawn	PB	29/02/2024
Design Check		
Drafting Check		
Final Approval		
Azimuth	Datum	

EI Australia Pty Ltd
Suite 6.01, 55 Miller Street Pyrmont, NSW 2009

Client: Coronation Pty Ltd

Project: Water Treatment System
St Peters / NSW

Drawing Title: Process Flow Diagram

Project No.: E26319

Drawing No.: Figure 1

Status: DRAFT

Scale (A3): n/a

Rev: 0