Humber Station Road - Channel Realignment Detailed Design Brief

12519 & 12713 Humber Station Road, Bolton ON

Prologis

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Acronyms and Abbreviations

CEISMP	Comprehensive Environmental Impact Study and Management Plan
CVC	Credit Valley Conservation
ESC	Erosion and Sediment Control
HDF	Headwater Drainage Feature
LIO	Land Information Ontario
MECP	Ministry of the Environment, Conservation and Parks
MNR	Ministry of Natural Resources
OGS	Ontario Geological Survey
SCE	Schaeffers Consulting Engineers
TRCA	Toronto and Region Conservation Authority

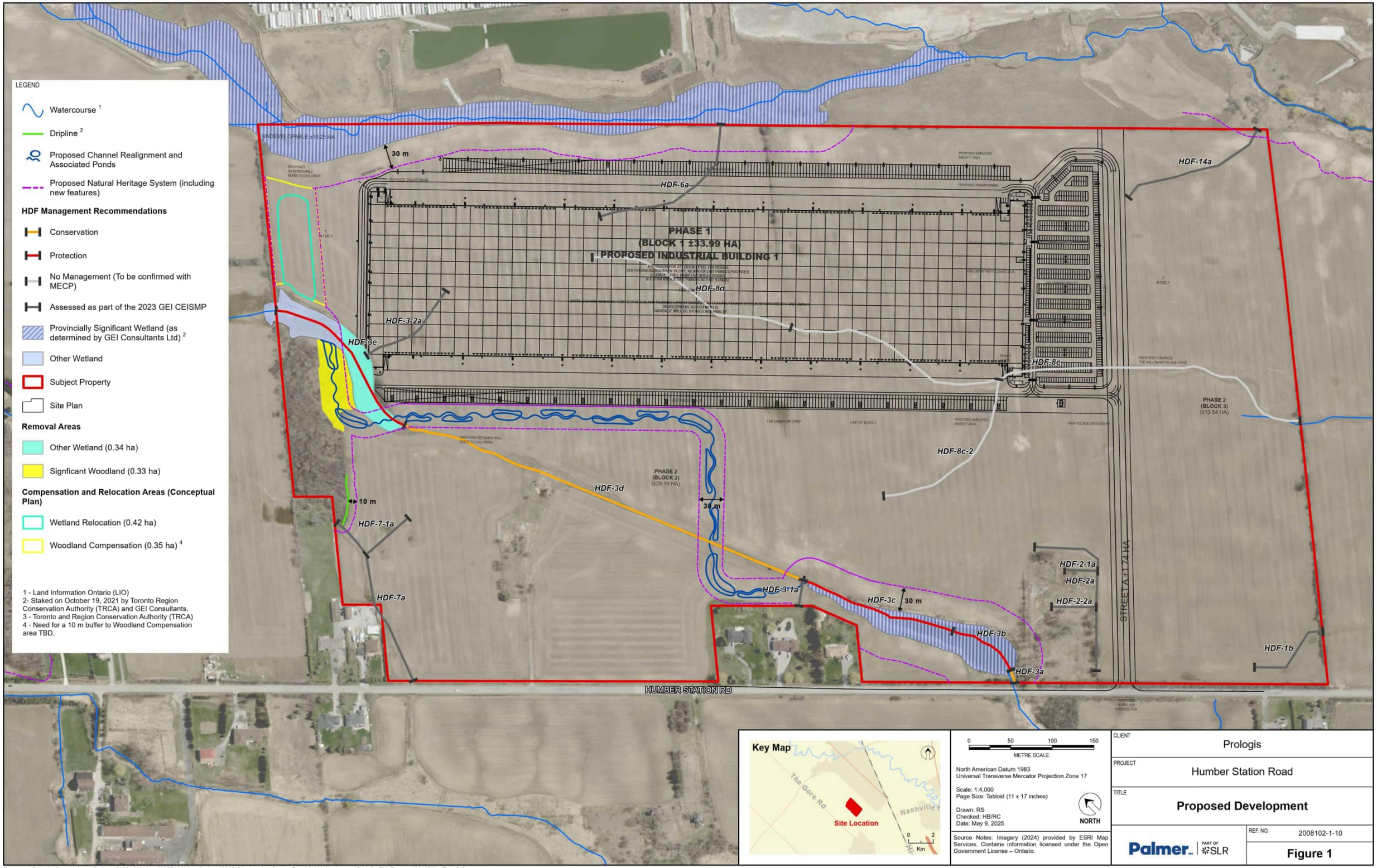
1.0 Introduction

SLR was retained by Prologis to complete a detailed natural channel design for a 750 m long section of a Headwater Drainage Feature (HDF) for the proposed development at 12519 & 12713 Humber Station Road (the Subject Property) in the Town of Caledon, Regional Municipality of Peel (**Figure 1**). The Subject Property is approximately 78 hectares in area and is situated along the east side of Humber Station Road, south of the town of Bolton.

The HDF of interest, to date, has been subject to extensive natural heritage study, and has been classified within an ongoing Comprehensive Environmental Impact Study and Management Plan (CEISMP) currently being prepared by a separate consultant team, and also as part of a site-specific Environmental Impact Study, prepared by SLR, and dated November 2024. In these reports the HDF is divided into several segments, with segments labelled as HDF-3d and HDF-3e being the segments proposed for realignment (see **Figure** 1 for locations). Reference to natural heritage reporting is further detailed in Section 2.0 of this design brief.

It is proposed that the realignment of HDF-3d and the south part of 3e be completed through a natural channel design to accommodate the proposed development. The design aims to establish a floodplain corridor and restore fluvial and riparian functions to the HDF segment, while still maintaining hydrologic and wildlife movement functions between the ponded area associated with HDF-3b and 3c, and the wetland areas associated with HDF-3e.

This design brief provides an overview of the project background (Section 2); existing site conditions (Section 3); a description of the proposed natural channel design, including the objectives and approach, key design elements, channel hydraulics and stone sizing, assumptions and limitations (Section 4); construction phasing and erosion and sediment control, including project work areas and access (Section 5); and recommendations for monitoring (Section 6).



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2.0 Background Review

A variety of data sources were reviewed by SLR to contribute to characterization of the Subject Property and development of the channel designs. Relevant field data, mapping and reports (including regulations and policies), and ongoing draft development plans contribute to the available knowledge base detailing the Subject Property. The following data sources were reviewed for the detailed design development:

- MNR's Land Information Ontario (LIO) databases;
- Ontario Geological Survey's (OGS) mapping;
- Humber Station Villages Comprehensive Environmental Impact Study and Management Plan (CEISMP) Phase 1 - Characterization/Existing Conditions and Baseline Inventory (GEI et al., 2023);
- Humber Station Villages CEISMP Phase 2 - Floodplain Analysis Report (SCE, 2024);
- Humber Station Villages CEISMP Phase 3 – Proposed Drainage Realignment Draft Plan (GEI, 2024);
- Humber Station Distribution Centre – Civil Engineering Drawing Set Draft Plan (Crozier, 2024);
- SCE's updated TRCA HECRAS model for the West Humber River watershed (SCE, 2024);
- Hydrogeological Assessment 12519 & 12713 Humber Station Road, Bolton, Ontario, by Palmer (now SLR) in 2024;
- Environmental Impact Study – 12519 and 12713 Humber Station Road, Caledon – Issued for SPA Submission 1B (SLR, 2024);
- Geomorphic and ecological field data collected on the Subject Property by Palmer (now SLR) in 2022 and 2023; and
- Various proposed development mapping and draft phasing as provided by Crozier.

3.0 Existing Conditions

3.1 Physical Setting

In its current state, the Subject Property exists primarily as agricultural lands with drainage, woodlot, and wetland features. The drainage feature proposed herein for realignment is HDF-3, which originates north of Healey Road and drains an area of 43.86 hectares towards the southeast to its confluence with the Gore Road Tributary on the south side of Humber Station Road (SCE, 2024). The topography of the Subject Property is generally flat with a gentle slope towards the southeast (GEI et al., 2023). The physiography is typified by drumlinized till plains of the South Slope physiographic region (Ontario Geological Survey (OGS), 2014), and the surficial geology of the region is characterized by clayey silt till with shale and siltstone clasts (OGS, 2012).

3.2 Geomorphology

On the Subject Property, HDF-3 flows approximately 750 m from the northwest towards the southeast. At the upstream extent, the drainage feature is poorly defined as it passes through a wetland. HDF-3 flows in a predominantly straight path through the Subject Property, with planform adjustment limited by agricultural activity (**Figure 2**). The existing geometry and bankfull characteristics of HDF-3, as collected during geomorphology field visits completed by GEI and SLR in 2022 and 2023, are summarized in **Table 1**. As HDF-3 was determined to be a headwater drainage feature, a meander belt was not delineated for the feature (GEI, 2023).

Figure 2 HDF-3d in its current condition, with cultivated agricultural fields directly abutting the drainage feature. (June 2022)

Table 1 Summary of Existing Channel Dimensions

	Channel Parameter	Parameter Value
Measured	**Bankfull average depth (m)**	0.32
	Bankfull maximum depth (m)	0.55
	Bankfull average width (m)	1.69
	Bankfull gradient (%)	0.56
	Bed material (mm)	1 – 65 (silt – gravel with some cobble)
Computed	**Bankfull discharge (m^3/s)**	0.47
	Bankfull velocity (m/s)	0.88

The bed material is characterized by fines and small gravel, with localized instances of scattered cobbles. The observed gravel indicates that the HDF has sufficient flow to prevent the accumulation of silt and organic matter from adjacent agricultural fields.

It is anticipated that the upstream wetland and downstream pond features have the capacity to help attenuate high flows and reduce the erosive energy in the drainage feature during flood events. Existing online and offline pocket wetlands throughout the Subject Property further slow drainage into HDF-3. These natural stormwater detention features help moderate the impacts of peak flows and contribute to the overall stability of the HDF.

3.3 Hydrology

Existing conditions flow data for the 2-year (bankfull), 10-year, 25-year, 50-year, 100-year and Regional storms were provided in the Existing conditions HECRAS model developed by Schaeffers Consulting Engineers (SCE, 2024). The site is located within Reach 1 of River HDF-3 of the hydraulic model. The 2-year,10-year, 25-year, 50-year, 100-year and Regional flows, according to the HECRAS model, are summarized in **Table 2**.

Table 2 Existing conditions peak flows for HDF-3 (SCE, 2024)

Return Period (year)	Existing Discharge (m^3/s)*
2 Year **	0.37
10 Year	1.34
25 Year	1.70
50 Year	1.96
100 Year	2.23
Regional	5.69

** Discharge at XS Station 991 in Reach 1 of River HDF-3*
***Representative of a bankfull flow event*

3.4 Natural Heritage

The existing channel conditions along the HDF-3d and HDF-3e segments are understood through review of available background studies, reports, and field data collected by SLR and other supporting consultants. GEI completed appropriately timed seasonal HDF surveys in 2017, 2022, and 2023, while SLR completed additional surveys in 2023, characterizing the hydrologic, fluvial and ecologic functions of HDF-3 in accordance with the *Evaluation, Classification and Management of Headwater Drainage Features Guidelines* (TRCA and CVC, 2014).

From a hydrologic standpoint, the HDF segments are generally considered to be ephemeral, providing early springtime drainage, and sporadic drainage later in the year following seasonal rainfall events. Cross-referencing with groundwater information collected by SLR hydrogeologists (Palmer 2024), it was determined that the HDF segments are not sustained by groundwater inputs, and are predominantly fed by surface water.

The current channel that is proposed for realignment crosses two ELC vegetation community types: Cattail Mineral Shallow Marsh Type mixed with Reed-canary Grass Mineral Meadow Marsh (MAS2-1/MAM2-2) for approximately 100 m (i.e. through about half of HDF3e), and secondly active agricultural lands for approximately 650 m (i.e. through HDF3d). In the first,

wetland, community, species include: Reed-canary Grass (*Phalaris arundinacea*), Narrow Leaved Cattail (*Typha angustifolia*), Panicled Aster (*Symphyotrichum lanceolatum*) and others (**Figure 3** shows early in the growing season).

Figure 3 General conditions within the MAS2-1/MAM2-2 community within the HDF-3e segment (May 2023)

In the second, cultural, community, the agricultural lands are active to within 0.5 to 2 m of the HDF, resulting in a minimal buffer, and these edge areas are actively sprayed with herbicide at times. There are some areas along this stretch where there are patches of cultural meadow or meadow marsh vegetation.

Figure 4 General conditions along the HDF-3d segment.

Outside of the hydrologic and vegetation conditions of the HDF segments, the features do not, in their current state, provide connective habitat functions, such as 'stepping-stone' habitat for wildlife. Historical agricultural activity has narrowed the HDF corridor to just a few metres, with only sparse vegetation cover remaining (**Figure 2 and 4 2**). In terms of fish habitat, HDF-3d may provide some seasonal expansion to the fish habitat provided by the downstream pond; however, this is eventually eliminated when spring flows cease, and remaining fish are once again confined to the pond.

4.0 Proposed Channel Design

4.1 Design Objectives

The ultimate objective of the proposed works detailed in the design drawing package (**Appendix A**) is to realign HDF-3d and the south part of 3e through a natural channel design to accommodate the proposed development and restore fluvial, wildlife movement, and riparian functions to the HDF segment, while still maintaining hydrologic functions between the ponded area associated with HDF-3b and 3c, and the wetland areas associated with HDF-3e. HDF-3a and 3d have an interpreted Management Recommendation of 'Conservation', as per the 2024 EIS (Palmer/SLR, 2024) and the Humber Station Villages CEISMP (GEI 2023).

As described in the HDF Guidelines (TRCA and CVC 2014), the 'Conservation' designation affords the ability to realign drainage features using natural channel design, or to maintain or replace on-site flows using wetland creation:

- Maintain, relocate, and/or enhance drainage feature and its riparian zone corridor;
- If catchment drainage has been previously removed or will be removed due to diversion of stormwater flows, restore lost functions through enhanced lot level controls (i.e., restore original catchment using clean roof drainage), as feasible;

- Maintain or replace on-site flows using mitigation measures and/or wetland creation, if necessary;
- Maintain or replace external flows;
- Use natural channel design techniques to maintain or enhance overall productivity of the reach; and
- Drainage feature must connect to downstream.

The south portion of HDF 3e is classed as 'Protection'; however, it is also proposed for re-alignment. This is considered acceptable as, through this approach, it is expected that a net benefit to the localized aquatic environment will be achieved as the HDF-3 drainage area will be improved from a habitat and fluvial processes standpoint, as it is currently an eroded swale traversing active agricultural lands. The net benefit will also enhance the natural heritage system corridor functions associated with the larger HDF-3 feature, effectively linking the existing pond area with upstream natural areas.

The natural channel design will incorporate a detailed riparian planting plan to restore a robust, native riparian corridor including a 15 m wide buffer on either side, for a total of a 30 m wide riparian area. Plants proposed in the planting plan prepared by MHBC for this area include all native species including willow shrub species, dogwood species, Swamp White Oak (*Quercus bicolor*) and Trembling Aspen (*Populus tremuloides*). It is important to note that the total length will increase post-restoration; currently HDF 3d and the southern portion of HDF3e together are approximately 750 m, whereas post-restoration the channel will be approximately 900 m due to increased channel sinuosity. The associated slight reduction in channel gradient will reduce instream shear stress and is appropriate in this headwater-wetland system context.

4.2 Key Design Elements

4.2.1 Site Removals

The anticipated removal of vegetation communities will consist of the removal of mainly agricultural lands, as well as small portions of the northwestern woodland/wetland feature (**Figure 1**). Additional information regarding tree removals is provided in the arborist report and tree protection plan (MHBC, 2025).

Areas to be removed are approximately:

- Non-significant wetland (Cattail Mineral Shallow Marsh Type and Reed Canary Grass Mineral Meadow Marsh or MAS2-1/MAM2-2) – 0.34 ha
- There is also 0.33 ha of woodland being removed (and compensated for) adjacent to the wetland. While considered part of a Significant Woodland by the Town, the portion removed is primarily Buckthorn Cultural Thicket (CUT1) combined with Cultural Meadow (CUM1-1) (0.28 ha).

4.2.2 Wetland Relocation

The removed wetland feature is proposed to be relocated to the north, and will cover an area of 0.42 ha (**Figure 1**). This area has been called variably Wetland Area 2 Relocation and now Wetland Relocation A in the updated CEISMP reporting. The proposed relocation area is located directly adjacent to the impacted community, thus, limiting the impact of community alteration.

The relocated wetland (now Wetland Relocation A under the CEISMP reporting) is proposed to function as an extension of the existing wetland complex and floodplain, which allows water to enter and exit over the full range of flows. The proposed tie-in and wetland grading is set slightly lower than the adjacent wetland to ensure the relocated feature will be hydrologically supported during all flow conditions. It will additionally be supported by rainfall and runoff from the surrounding area.

The proposed relocated area is slightly larger in size (0.42 ha relocation area versus 0.34 ha) than the area being removed. Additionally, this does not consider the benefit that some of the wetland removal area will be returned to naturalized riparian corridor under this proposal. The native wetland restoration proposed is one that would be composed of two types of wetland: cattail shallow marsh and meadow marsh. This has the potential to provide for amphibian breeding habitat (that is not currently present in this location), as well as diversity of habitat. The top 0.3 m of material from the existing wetland feature will be salvaged from the surface and relocated directly to the pre-graded proposed wetland area. The roots and rhizomes of emergent macrophytes (cattails, wetland grasses, sedges and herbs) usually occupy the top 30-40 cm of the soil column (Kadlec & Knight, 1996). Utilizing the existing seed bank within this soil will allow for rapid establishment of vegetation in the proposed wetland area. Also, to supplement, MHBC has prepared restoration drawings for these areas, which includes wet meadow marsh and early succession wet meadow seed mixes for the wetland relocation area. All species used are native to the region and will be applied through terraseeding.

4.2.2.1 Woodland Compensation

The proposed compensation area for the FOD8/CUT1/CUM1-1 Significant Woodland is marginally greater than that being removed (0.33 ha removed; 0.35 ha compensated). The area between the north woodland/wetland and the Clarkway Tributary is the area proposed for compensation. In addition to providing a net benefit in area, the location of the compensation will mean that these two areas will be better connected ecologically than currently, thus providing better movement opportunities for wildlife movement. Tree species proposed to be planted here include: Red Oak (*Quercus rubra*), White Oak (*Quercus alba*), Bur Oak (*Quercus macrocarpa*), Sugar Maple (*Acer saccharum*), Red Maple (*Acer rubrum*), Shagbark Hickory (*Carya ovata*) and Bitternut Hickory (*Carya cordiformis*). MHBC Drawings L2 and L5 illustrate a proposed planting plan. This represents a marked improvement on species composition as the area of woodland removed is dominated by buckthorn.

4.2.3 Channel Design Elements

Two-stage Channel Geometry – A two-stage channel, consisting of a 2 m wide bankfull channel inset within a larger 30 m wide floodplain corridor is proposed. The meandering bankfull channel will convey flow during normal and more frequent flood events before overtopping into the larger flood corridor, which is designed to fully contain the Regional Flood event.

Riffle-Pool Bed Morphology – The channel is designed to be spatially complex with respect to morphology and hydraulics. Riffle and pool sequences will allow for natural instream energy dissipation, thereby reducing shear stress and erosive energy. This morphological variability will also improve diversity of fish habitat.

Bioengineered Bank Treatments – Tiered brush layering is proposed along the outer banks of meanders, where in close contact to low valley walls, for improved fish habitat and long-term stability.

Channel Sinuosity – The existing channel has been straightened through historical agricultural activity. The design increases the overall length of HDF-3 by approximately 150 m by incorporating a meandering planform, thereby increasing sinuosity. Lengthening the channel will increase available aquatic habitat and reduce overall slope and shear stress within the reach. The slight reduction in gradient is appropriate for this low-energy, headwater-wetland type system.

Increased Riparian Habitat Diversity – Riparian habitat diversity is proposed to be enhanced through riparian plantings, including native shrubs and trees and herbaceous (grassy) species favoured by local aquatic species, to be installed at appropriate times following the completion of channel works. Riparian vegetation will increase rooting strength within the banks and increase habitat cover and the availability of allochthonous food sources. Refer to the MHBC landscape planting plan for details.

Online and Offline Wetlands – The proposed design includes re-positioning of the existing wetland feature along HDF3e on the Subject Property, and incorporation of additional online and offline pocket wetlands along the realigned channel margin. The wetlands are intended to provide additional habitat diversity and to help attenuate higher flow events, beyond the low-flow channel. Water level within the wetlands will fluctuate with respect to various flow events and seasonally. The micro-topography of the wetlands is shallow with small undulations to allow for fully submerged, partially submerged, and dry areas. The features will be vegetated using a wet meadow seed mix.

4.3 Channel Hydraulics

The proposed works require modifications to the channel cross-sectional area; therefore, a review and analysis of channel hydraulics was completed. Under post-development conditions the Subject Property will be graded and serviced to capture and convey surface runoff toward stormwater management ponds; therefore, flow rates have also been updated compared to existing conditions. This analysis includes a review of the proposed HECRAS model conditions and refinement of the low flow channel dimensions for the realigned HDF-3.

TRCA's regulatory hydraulic HECRAS model for the West Humber River watershed encompasses the Subject Property. In 2024, SCE developed the existing model to reflect the updated existing conditions by incorporating HDF-3 into the model. The geometry of HDF-3 is found in Reach 1 of River HDF-3 in the model. The existing flows applied to HDF-3 were confirmed by TRCA (SCE, 2024).

Crozier subsequently developed a proposed conditions scenario in the HECRAS model including the proposed corridor realignment, the approximate dimensions of the proposed bankfull channel and post-development flow conditions on the Subject Property (Crozier, 2025). A summary of discharge, resultant velocities and water surface elevations from the proposed conditions modelling at cross section 990 is presented in **Table 2**. This cross section is presented because it exhibits the highest velocities modelled along the length of the channel realignment.

Complete details of the floodplain analysis, cut/fill assessment, model updates and results, including a comparison of updated existing vs proposed conditions, are found within the Humber Station Villages CEISMP Floodplain Analysis Report (Phase 2) (SCE, 2024).

Table 3 HECRAS model results for XS 990 in HDF-3 (Crozier, 2025)

Return Period (year)	Post-Development Discharge (m^3/s)	Proposed Conditions Velocity (m/s)	Proposed Conditions Water Surface Elevation* (m)
Bankfull Flow (2/3 X 2-year)*	0.23	0.67	236.81
2 Year*	0.35	0.54	236.87
5 Year*	0.62	0.63	236.90
10 Year*	1.08	0.73	236.95
25 Year*	1.41	0.76	236.98
50 Year*	1.67	0.80	236.99
100 Year*	1.95	0.83	237.01
Regional**	6.55	1.17	237.22

**Controlled peak flow*
***Uncontrolled peak flow*

To develop the proposed channel geometry, riffle and pool channel dimensions were iteratively assessed and sized according to both the existing HDF-3 dimensions and the bankfull discharge. Bankfull discharge was estimated to be two-thirds of the 2-year flow event, or 0.23 m^3/s, which should allow for channel overtopping flows every 1 to 2 years. The Manning's 'n' values in the HECRAS model vary between 0.03 and 0.05 throughout the cross sections of HDF-3, with higher roughness values along the outer banks of meanders.

In the design calculations, a Manning's 'n' of 0.035 was used for the riffles and 0.030 was used for the pools. A consistent top width will be preserved along the length of the constructed channel for ease and consistency of construction. A summary of the proposed bankfull channel dimensions is presented in **Table 3**, and completed details are provided in the drawings of **Appendix A**.

Table 4 Summary of proposed channel dimensions

Parameter	Riffle	Pool
Bankfull depth (m)	0.30	0.45
Bankfull width (m)	2.0	2.0
Side slopes (H:V)	2:1	1.5:1 outer bank and 3:1 inner bank
Bankfull Gradient (%)	0.40	
Manning's n	0.035	0.030
Calculated discharge (m^3/s)	0.26	0.33

Under these proposed conditions, the channel will accommodate a bankfull discharge of 0.26 m^3/s and 0.33 m^3/s in the riffles and pools, respectively, which is suitable for the modelled bankfull discharge of 0.23 m^3/s. Due to positioning of the realignment and introduction of a meandering planform, the proposed channel will have an increased length and reduced slope compared to existing conditions.

4.4 Stone Sizing and Bank Treatments

Analyses were completed to assess the scour potential along the proposed channel bed and banks and determine an appropriate riverstone size and mix. Hydraulic data from the HECRAS model, including flow depth, flow area, shear stress and velocity, were reviewed for a range of flow rates (2-year through Regional storm event). The D50 stone size for the proposed channel bed and banks was determined based on the results of the hydraulic analysis and the permissible velocity approach (Komar, 1987), represented by the following equation:

$$V_c = 57(D)^{0.46}$$

Where D is the stone diameter (m) and V_c is the critical velocity (m/s). **Table 4** summarizes the stable stone size for flood event return periods ranging from the 2-year to the Regional flood event based on the permissible velocity approach and the velocities from the proposed conditions HECRAS model. For context, bed material in the existing channel is dominated by fines and gravels.

Table 5 Channel shear stress, velocity, and stable stone size

Flood Event Return Period	Proposed Conditions Shear Stress (N/m^2)*	Proposed Conditions Flow Velocity* (m/s)	Stable Stone Size** (mm)
2 Year	9.98	0.54	9
5 Year	13.09	0.63	12
10 Year	16.32	0.73	17
25 Year	17.32	0.76	19
50 Year	18.65	0.80	21
100 Year	19.78	0.83	23
Regional	33.55	1.17	48

**Average shear and velocity of flow in main channel based on HECRAS model (XS 990).*
***Stable stone size based on the permissible velocity approach (Komar, 1987).*

Table 5 provides the recommended stone size gradation for the riffle bed and banks. To provide sufficient scour protection over a broad range of return period events, the D50 is sized according to the Regional event. The D15, D85 and D100 were sized to form a well-graded distribution around the D50, providing material suitable for fish habitat during typical flow conditions. The D50 material should remain stable during the Regional event, promoting long-term channel stability.

Table 6 Proposed stone sizing gradation for riffle bed and banks

% Composition	Proposed Riffle Stone Size*	
	(mm)	(in)
25%	150	6
50%	50-75	2-3
25%	Non-crushed Granular B	
Placed 225 mm Thick (1.5xD_{100}).		

** Stone type shall be river stone and gravel meeting the above gradation*
***Riffle stone to be compacted to 95% SPDD to ensure voids are filled prior to introduction of flows*

The bed of depositional pool features will comprise a mix of 50% native material and 50% Granular B. Existing channel material that meets the above specifications should be recycled and re-used in the proposed works to fill voids and provide a well graded natural substrate. The proposed thickness of stone cover is based upon 1.5 times the D100 stone size to accommodate minor, localized settlement or displacement. Riffle stone should be extended up the bank to the bankfull elevation and vegetated to increase roughness and enhance stability through rooting strength.

Additional soil bioengineering measures consisting of tiered brush layering is proposed along the toe of the valley corridor at outer meander bends. Brush layering comprises alternating layers of seeded soil wrapped with a biodegradable erosion control blanket (i.e., coir cloth), and potted shrubs or live stakes. While the erosion control blanket will provide the initial soil erosion protection, longer term stability will be afforded by the woody plant material and established grasses. The bioengineered banks serve to not only enhance riparian habitat, but also to mitigate erosion to ensure the valley walls remains stable in the long-term. Brush layering treatments have been shown to be stable for shear stresses ranging from 19 N/m^2 (initial) to 299 N/m^2 (grown) (Gray and Sotir, 1996) and are expected to remain stable during the Regional Flood event once established.

4.5 Design Assumptions and Limitations

A number of important assumptions and limitations of the design, some of which are explicitly stated or implied above, are worth acknowledging:

- Upstream tie-ins – The upstream extents of the proposed works tie in to Reach 2, the design of which is being undertaken by a separate landowner group and consultant. Coordination is required to ensure a smooth tie-in and transition to the upstream reach.
- Downstream effects – The partial hardening of the channel banks has the potential to increase flow velocities and promote downstream transfer of energy. This effect is partially moderated through the inclusion of plantings within the proposed bank treatments. There may be potential for increased erosion immediately downstream of the proposed works along the unprotected outer bank. Any localized erosion of the channel reach immediately downstream is not expected to exacerbate existing risks, or introduce new risks, to municipal infrastructure or private property.
- Active gravel veneer layer on constructed riffles – It is understood and expected that some of the smaller gravels will be displaced and transported downstream, while others will remain sufficiently sheltered by the main riffle stone to remain in place during low to moderate flows. During high flows, more of the active veneer layer is susceptible to downstream transport and mixing with other alluvium in the channel. Over time, the gravels may deposit in small bars or where sheltered behind obstructions, providing similar functions for fish and invertebrate species.

5.0 Construction Phasing and Erosion and Sediment Control

Construction access, phasing and erosion and sediment control are outlined in the ESC plans prepared by Crozier, 2025. The draft phasing plan includes the following five phases:

1. Woodlot and tree removals;
2. Pre-grading of the wetland relocation area;
3. Construction of the retaining wall;
4. Relocation of the wetland; and
5. Flow diversion into the re-aligned channel.

SLR proposes that, in compliance with construction timing windows, construction of the channel realignment be completed within phase 2. Further, bypass pumping must be implemented to divert flows at the upstream and downstream extents prior to the flow diversion of phase 5.

All in-water works will be completed within the Redside Dace timing window of July 1 to September 15, or as per otherwise directed by regulatory agencies. A license to collect fish for scientific purposes must be obtained from the Ministry of Natural Resources prior to a qualified technician conducting a fish salvage once the work area is isolated.

Earth works and overall construction of the valley and channel realignment will be staged as outlined by Crozier in the Civil Design drawing package to ensure environmental protection is optimized. The staging will ensure as much of the main earth works and grading can occur fully isolated from the downstream and upstream connections (tie-ins). Only once the central portion of the reconstructed valley is complete should channel works at the downstream tie-in and upstream tie-in (Stage 5) be initiated.

To minimize the potential for erosion and off-site transport of sediment into surface water features and the natural environment, SLR recommends that the project implement Best Practices related to ESC. ESC measures used by the contractor for all earth and channel works should adhere to guidelines as outlined in *Erosion and Sediment Control Guide for Urban Construction* (TRCA, 2019). The civil design drawing package by Crozier includes an ESC plan that addresses key principles and configurations, while allowing the contractor flexibility to optimally stage and configure the works. All repairs required to ESC measures should be completed within 24 hours of notice, unless otherwise agreed by the contractor, the regulatory authority and the environmental inspector(s). Stockpiles are to be protected immediately and, if place for longer than 45 days, temporarily stabilized.

The accompanying Civil Design drawing package produced by Crozier shows the design and location of environmental protection measures (e.g., sediment fences, flow isolation system, etc.). It is to be noted that these drawings show the minimum protection required and are expected to change during construction due to weather, unforeseen conditions or scheduling changes.

6.0 Monitoring

Channel works that incorporate natural elements and include slight compromises on stability for ecological benefit inherently include some potential for adjustment over time. This expectation for minor adjustment is deliberate and desirable. Baseline monitoring should be completed by a qualified fluvial geomorphologist and engineer prior to initiation of the works to document the existing conditions prior to construction. Construction milestone and storm event-based monitoring should be completed during construction to ensure key elements of the design are implemented properly and to provide the opportunity to guide any field-fit refinements. Final approval should be given by a fluvial geomorphologist or engineer before water is re-introduced into any isolated work areas.

Post-construction monitoring should also be completed, especially following the first significant flood to provide an early opportunity to detect and address any deficiencies. Repeat photographs and perhaps local benchmarks to track any downstream (or upstream) erosion would be worthwhile. The scope and length of the post-construction monitoring plan should generally align with the recommendations in the CEISMP and be tailored according to requirements of the MECP, TRCA, and Town of Caledon permits associated with the works.

7.0 Closure

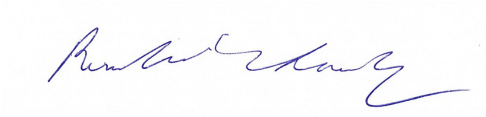
This report was prepared and reviewed by the undersigned. This report is subject to the Statement of Limitations provided at the beginning of the report.

Regards,

SLR Consulting (Canada) Ltd.

Max Osburn, P.Eng.
Senior Water Resources Engineer

Robin McKillop, M.Sc., P.Geo., CAN-CISEC
Climate Resilience Lead, Principal Geomorphologist



Rosalind Chaundy, M.Sc.F
Senior Ecologist

8.0 References

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Appendix A Detailed Channel Realignment and Wetland Relocation Design Drawings

Humber Station Road - Channel Realignment Detailed Design Brief

12519 & 12713 Humber Station Road, Bolton ON

Prologis

SLR Project No.: 243.V24265.00000

August 12, 2025

HUMBER STATION DISTRIBUTION CENTRE
TOWN OF CALEDON

DETAILED CHANNEL REALIGNMENT AND WETLAND RELOCATION DESIGN

SLR PROJECT NO.: 2008102

PROLOGIS®

SLR

KEY MAP SCALE = 1 : 10,000

AERIAL IMAGERY RETRIEVED FROM GOOGLE EARTH

LIST OF DRAWINGS

NOT FOR CONSTRUCTION

LICENSED PROFESSIONAL ENGINEER
M. A. P. OSBURN
100502995
12-AUG-2025
PROVINCE OF ONTARIO

PROFESSIONAL GEOSCIENTIST
ROBIN J. McKILLOP
PRACTISING MEMBER
1443
AUG 12 2025
ONTARIO

BACKGROUND INFORMATION NOTES

1. BACKGROUND INFORMATION AND EXISTING CONDITIONS PROVIDED BY CROZIER CONSULTING ENGINEERS ON JANUARY 28, 2025.
2. SURVEY INFORMATION PROVIDED BY CROZIER CONSULTING ENGINEERS ON JANUARY 28, 2025. HORIZONTAL DATUM CONTROL IS IN NAD 83 (CSRS) / UTM ZONE 17N.
3. AERIAL IMAGERY RETRIEVED FROM GOOGLE EARTH IMAGING ON FEBRUARY 4, 2025.
4. CONTOUR INTERVAL IS 0.25-1.00 METERS (SEE INDIVIDUAL SHEET NOTES).

GENERAL NOTES

1. THE NOTES ON THESE DRAWINGS APPLY TO ALL WORKS UNDER THIS CONTRACT UNLESS OTHERWISE INDICATED ON THESE SETS OF PLANS.
2. THE STANDARD DRAWINGS OF THE TOWN OF CALEDON, REGION OF PEEL, THE TORONTO AND REGION CONSERVATION AUTHORITY AND THE ONTARIO MINISTRY OF TRANSPORTATION CONSTITUTE PART OF THIS SET OF PLANS AND SHALL BE THE REVISION IN EFFECT AS OF THE DATE OF APPROVAL OF THE CONSTRUCTION DRAWINGS.
3. ALL CONSTRUCTION WORK TO BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE "OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS".
4. THE CONTRACTORS ATTENTION IS DRAWN TO THE LIMITS OF THE WORK AREA. CONSTRUCTION ACTIVITY SHALL BE CONFINED TO PUBLIC PROPERTY AND/OR EXISTING EASEMENTS UNLESS OTHERWISE DIRECTED OR DETAILED IN THE CONTRACT DOCUMENTS.
5. INFORMATION REGARDING ANY EXISTING SERVICES AND/OR UTILITIES SHOWN ON THIS SET OF PLANS IS FURNISHED AS THE BEST AVAILABLE INFORMATION AT THE TIME OF PREPARATION. THE CONTRACTOR SHALL INTERPRET THIS INFORMATION AS HE/SHE SEES FIT WITH THE UNDERSTANDING THAT THE OWNER, THE CITY AND ENGINEER DISCLAIM ALL RESPONSIBILITY FOR ITS ACCURACY AND/OR SUFFICIENCY.
6. THE CONTRACTOR SHALL NOTE THAT THERE MAY BE OVERHEAD AND UNDERGROUND UTILITIES WHICH ARE NOT SHOWN ON THESE DRAWINGS. SOME, OR ALL OF THESE UTILITIES MAY REQUIRE SHIELDING OR OTHER APPROPRIATE FORM OF PROTECTION AS SPECIFIED BY THE RESPECTIVE UTILITY COMPANIES, OR ANY OTHER APPLICABLE LEGISLATION IN FORCE. CONTRACTORS SHALL THOROUGHLY FAMILIARIZE THEMSELVES WITH THE NUMBER OF LOCATIONS OF THE OVERHEAD UTILITY CABLES. ANY UTILITY DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE UTILITY COMPANY AT THE CONTRACTOR'S EXPENSE. THE COST OF THE SHIELDING WHERE REQUIRED SHALL BE DEEMED TO BE INCLUDED IN THE UNIT PRICES BID, WITH NO ADDITIONAL PAYMENT TO BE MADE THE CONTRACTOR.
7. ALL DIMENSIONS AND ELEVATIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO ANY CONSTRUCTION AND HE/SHE REPORT ANY DISCREPANCIES TO THE CITY IMMEDIATELY. DETAILS ARE NOT TO BE SCALED FROM THE DRAWINGS. ALL DIMENSIONS ARE SHOWN IN METRES UNLESS OTHERWISE NOTED.
8. CLEARING OF ANY EXISTING VEGETATION OTHER THAN THAT DETAILED ON THE CONTRACT DRAWINGS, SHALL NOT BE UNDERTAKEN WITHOUT SPECIFIC WRITTEN DIRECTION BY THE CONTRACT ADMINISTRATOR. VERTICAL TRENCHING, HAND TRENCHING, AUGERING AND IMMEDIATE BACKFILLING OF ANY TRENCH SHALL BE UNDERTAKEN BY THE CONTRACTOR AS NECESSARY TO ENSURE THAT ALL REASONABLE PRECAUTIONS ARE TAKEN TO PROMOTE THE SURVIVAL OF ANY EXISTING VEGETATION. ALL AREAS DISTURBED BY THE CONTRACTOR DURING CONSTRUCTION OF THE WORKS SHOWN HEREIN SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER. ALL GRASS AND VEGETATION COVERED AREAS SHALL BE RESTORED BY PLACING 100MM OF APPROVED TOPSOIL AND SOD TO ESTABLISH A GRASS COVER, UNLESS OTHERWISE NOTED ON THE PLANS, TO THE SATISFACTION OF THE TOWN OF CALEDON.
9. VEHICULAR TRAFFIC AND ACCESS TO ALL DRIVEWAYS SHALL BE MAINTAINED AT ALL TIMES DURING THE WORK. SHOULD ACCESS TO ANY DRIVEWAYS BE TEMPORARILY CUT-OFF, THE CONTRACTOR SHALL NOTIFY THE RESIDENT OR BUSINESS OWNERS A MINIMUM OF 48 HOURS IN ADVANCE AND ENSURE THAT THE DRIVEWAY OWNERS A MINIMUM OF 48 HOURS IN ADVANCE AND ENSURE THAT THE DRIVEWAY A MINIMUM OF 48 HOURS IN ADVANCE AND ENSURE THAT THE DRIVEWAY 48 HOURS IN ADVANCE AND ENSURE THAT THE DRIVEWAY ACCESS IS RESTORED AS QUICKLY AS POSSIBLE. THE CONTRACTOR SHALL PREPARE A TRAFFIC CONTROL PLAN FOR REVIEW AND APPROVAL BY THE CITY PRIOR TO START OF CONSTRUCTION.
10. APPROVED FILL MATERIAL SHALL BE COMPACTED TO A DRY DENSITY AS PER THE SPECIFICATIONS. COMPACTION TESTING SHALL BE CONDUCTED BY A QUALIFIED SOIL ENGINEER TO ENSURE COMPACTION AND STABILITY OF THE FILL AND TEST RESULTS SHALL BE SUBMITTED TO THE TOWN OF CALEDON, THE CONTRACTOR AND THE CONSULTANT. ANY APPROVED FILL MATERIAL BROUGHT ON SITE SHALL BE CERTIFIED BY A QUALIFIED GEOTECHNICAL ENGINEER AND SHALL INCLUDE AN ENVIRONMENTAL ANALYSIS REPORT FOR METALS AND INORGANIC PARAMETERS.
11. ANY TEMPORARY MODIFICATIONS TO PATH CORNERS TO BE APPROVED BY THE CONTRACT ADMINISTRATOR AND TO BE RESTORED TO EXISTING CONDITIONS OR BETTER POST CONSTRUCTION.

EROSION AND SEDIMENT CONTROL (TRCA STANDARD) NOTES

SECTION 1: SITE MANAGEMENT

1. EROSION AND SEDIMENT CONTROL (ESC) MEASURES WILL BE IMPLEMENTED PRIOR TO, AND MAINTAINED DURING THE CONSTRUCTION PHASES, TO PREVENT ENTRY OF SEDIMENT INTO THE WATER. ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF THE INSPECTION.
2. DISTURBED AREAS WILL BE MINIMIZED TO THE EXTENT POSSIBLE, AND TEMPORARILY OR PERMANENTLY STABILIZED OR RESTORED AS THE WORK PROGRESSES.
3. ALL IN-WATER AND NEAR WATER WORKS WILL BE CONDUCTED IN THE DRY WITH APPROPRIATE EROSION AND SEDIMENT CONTROLS.
4. THE EROSION AND SEDIMENT CONTROL STRATEGIES OUTLINED ON THE PLANS ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO MINIMIZE SEDIMENT LADEN RUNOFF FROM LEAVING THE WORK AREAS. IF THE PRESCRIBED MEASURES ON THE PLANS ARE NOT EFFECTIVE IN PREVENTING THE RELEASE OF A DELETERIOUS SUBSTANCE, INCLUDING SEDIMENT, THEN ALTERNATIVE MEASURES MUST BE IMPLEMENTED IMMEDIATELY TO MINIMIZE POTENTIAL ECOLOGICAL IMPACTS. TRCA ENFORCEMENT OFFICER SHOULD BE IMMEDIATELY CONTACTED. ADDITIONAL ESC MEASURES TO BE KEPT ON SITE AND USED AS NECESSARY.
5. AN ENVIRONMENTAL MONITOR WILL ATTEND THE SITE TO INSPECT ALL NEW CONTROLS IMMEDIATELY AFTER INSTALLATION. INSPECTION OF ESC MEASURES TO BE WILL OCCUR, AT MINIMUM:
   - ON A WEEKLY BASIS;
   - PRIOR TO SIGNIFICANT RAINFALL EVENTS (MINIMUM PREDICTED 25mm OVER 24 HOURS;
   - AFTER EVERY RAINFALL / SNOWMELT EVENT; AND
   - DAILY DURING EXTENDED RAINFALL PERIODS.

   INSPECTIONS WILL FOCUS ON MEASURES RELATED TO EROSION AND SEDIMENT CONTROLS, DEWATERING OR UNWATERING, RESTORATION AND IN - OR NEAR - WATER WORKS. SHOULD CONCERNS ARISE ON SITE THE ENVIRONMENTAL MONITOR WILL CONTACT THE TRCA ENFORCEMENT OFFICER AS WELL AS THE PROPONENT.
6. ALL ACTIVITIES, INCLUDING MAINTENANCE PROCEDURES, WILL BE CONTROLLED TO PREVENT THE ENTRY OF PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCES INTO THE WATER. VEHICULAR REFUELING AND MAINTENANCE WILL BE CONDUCTED A MINIMUM OF 30 METRES FROM THE WATER.
7. ALL GRADES WITHIN THE REGULATORY FLOOD PLAIN WILL BE MAINTAINED OR MATCHED.
8. THE PROPONENT/CONTRACTOR SHALL MONITOR THE WEATHER SEVERAL DAYS IN ADVANCE OF THE ONSET OF THE PROJECT TO ENSURE THAT THE WORKS WILL BE CONDUCTED DURING FAVOURABLE WEATHER CONDITIONS. SHOULD AN UNEXPECTED STORM ARISE, THE CONTRACTOR WILL REMOVE ALL UNFIXED ITEMS FROM THE REGIONAL STORM FLOOD PLAIN THAT WOULD HAVE THE POTENTIAL TO CAUSE A SPILL OR AN OBSTRUCTION TO FLOW, E.G., FUEL TANKS, PORTA-POTTIES, MACHINERY, EQUIPMENT, CONSTRUCTION MATERIALS, ETC.
9. ALL DEWATERING/UNWATERING SHALL BE TREATED AND RELEASED TO THE ENVIRONMENT AT LEAST 30 METRES FROM A WATERCOURSE OR WETLAND AND ALLOWED TO DRAIN THROUGH A WELL-VEGETATED AREA. NO DEWATERING EFFLUENT SHALL BE SENT DIRECTLY TO ANY WATERCOURSE, WETLAND OR FOREST, OR ALLOWED TO DRAIN ONTO DISTURBED SOILS WITHIN THE WORK AREA. THESE CONTROL MEASURES SHALL BE MONITORED FOR EFFECTIVENESS AND MAINTAINED OR REVISED TO MEET THE OBJECTIVE OF PREVENTING THE RELEASE OF SEDIMENT LADEN WATER.
10. ALL ACCESS TO THE WORK SITE SHALL BE FROM EITHER SIDE OF THE WATERCOURSE. NO EQUIPMENT OR VEHICLES ARE PERMITTED TO CROSS THROUGH THE WATERCOURSE UNLESS APPROVED BY TRCA.
11. THE CONTRACTOR SHALL INSTALL SEDIMENT CONTROL FENCING, AS REQUIRED TO CONTROL THE DISCHARGE OF EXPOSED SOIL OR TEMPORARY PILE(S) OF EXCAVATED SOILS OR, SOILS AND GRANULAR MATERIAL TO BE USED DURING CONSTRUCTION. WHERE POSSIBLE BIODEGRADABLE ALTERNATIVES TO SILT FENCING SHOULD BE CONSIDERED. REUSABLE FENCE SUCH AS FAST FENCE SHOULD BE USED TO ISOLATE THE WORK AREA WHEN SEDIMENT CONTROL FENCING IS NOT REQUIRED.
12. EROSION AND SEDIMENT CONTROL MEASURES ARE TO REMAIN IN PLACE AND IN WORKING ORDER UNTIL ALL ON-SITE CONSTRUCTION IS COMPLETED AND VEGETATION IS RE-ESTABLISHED.
13. AREAS WHICH REMAIN DISTURBED FOR MORE THAN 30 DAYS SHALL BE STABILIZED USING SEED OR APPROVED EROSION CONTROL BLANKET OR SIMILAR. IF CONDITIONS AREN'T SUITABLE FOR SEED APPLICATION AN EROSION CONTROL MATTING WILL BE USED IN ITS PLACE.
14. ALL SLOPES SHALL BE STABILIZED USING MEASURES SUCH AS EROSION CONTROL BLANKET AS PER OPSS 804 OR APPROVED EQUIVALENT. NO EROSION AND CONTROL MEASURE SHALL HAVE ANY PLASTIC, EVEN IF IT IS BIODEGRADABLE.
15. PUBLIC WALKWAYS AND MUNICIPAL ROADS ARE TO BE KEPT CLEAR OF EXCESS SEDIMENT.
16. THE CONTRACTOR MUST HAVE SUITABLE PUMPING CAPABILITIES ON SITE AT ALL TIMES TO FACILITATE CONSTRUCTION ACTIVITIES IN THE DRY.
17. WHERE PRACTICAL, WORKS SHOULD BE COMPLETED IN STAGES TO REDUCE THE DURATION OF SOIL EXPOSURE WITHIN DISTURBED AREAS.
18. CONTRACTOR IS NOT TO DISPOSE OF ANY OF THE MATERIAL USED IN THE PEA GRAVEL METRE BAGS INTO THE CHANNEL OR SURROUNDING AREA. ALL PEA GRAVEL BAGS ARE TO BE REMOVED OFF OF SITE.
19. TEMPORARY STAGING AREAS WILL BE SITUATED WITHIN 15 METRES OF THE WATERCOURSE DUE TO THE CONFINED NATURE OF THE PROJECT AREA. ALL MAJOR/OVERNIGHT STAGING/STOCKPILING AREAS WILL BE A MINIMUM OF 15m AWAY FROM THE WATERCOURSE. CONTRACTOR TO MONITOR WEATHER FORECASTS TO ENSURE MACHINES AND MATERIALS ARE REMOVED WHEN THE INCLEMENT WEATHER IS ANTICIPATED. STOCKPILE HEIGHTS WILL BE KEPT BELOW 1.5 METRES IN HEIGHT.
20. REFER TO EROSION AND SEDIMENT CONTROL GUIDE FOR URBAN CONSTRUCTION, 2019 FOR FURTHER EROSION AND SEDIMENT CONTROL MEASURES APPROVED BY THE TRCA.

SECTION 2: CONSTRUCTION TIMING

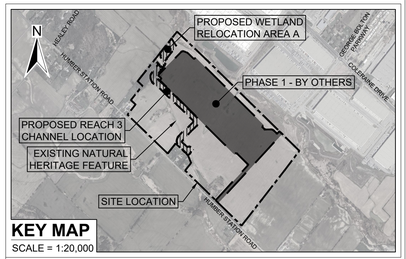
1. PRIOR TO SITE DISTURBANCE THE CONTRACTOR/PROPONENT SHOULD ENSURE THAT THE WORKS ARE IN CONFORMANCE WITH THE *MIGRATORY BIRDS CONVENTION ACT*. PLEASE NOTE THAT THE GENERAL BREEDING BIRD WINDOW FOR THIS AREA IS APRIL 1ST TO AUGUST 31ST, HOWEVER, BREEDING ACTIVITIES MIGHT INITIATE PRIOR TO AND CONTINUE PAST THIS PERIOD.
2. WHERE IMPACTS TO LOCAL FISH POPULATIONS MAY OCCUR DURING THEIR SPAWNING, NURSERY AND MIGRATORY PERIODS, CONSTRUCTION TIMING WINDOWS SHOULD APPLY TO IN-WATER OR NEAR-WATER ACTIVITIES. THE PROPONENT/CONTRACTOR SHOULD CONFIRM APPLICABILITY AND DATES WITH APPROPRIATE PROVINCIAL AND FEDERAL AGENCIES. TO PROTECT LOCAL FISH POPULATIONS DURING THEIR SPAWNING, NURSERY AND MIGRATORY PERIODS, IN-WATER/NEAR-WATER ACTIVITIES MAY ONLY OCCUR DURING THE FOLLOWING TIME PERIOD OF JULY 1ST TO MARCH 31ST.
3. ANY CONSTRUCTION WORK RELATED TO THE EXISTING HDF-3 FEATURE (AND BY EXTENSION ITS ASSOCIATED RIPARIAN WETLANDS), AS WELL AS THE PROPOSED WETLAND COMPENSATION AREA MAY ONLY OCCUR DURING THE FOLLOWING TIME PERIOD OF JULY 1ST TO SEPTEMBER 15TH.

SECTION 3: FISH AND WILDLIFE RELOCATION

1. FISH AND WILDLIFE STRANDED WITHIN THE WORK AREA SHALL BE CAPTURED AND RELEASED LIVE IN SUITABLE HABITAT UPSTREAM OF THE WORK AREA UNDER THE SUPERVISION OF QUALIFIED AQUATIC TECHNICAL STAFF. THE PROPONENT/CONTRACTOR SHOULD CONFIRM REQUIREMENTS DIRECTLY WITH MINISTRY OF NATURAL RESOURCES AND FORESTRY.

SECTION 4: ENVIRONMENTAL COMPLIANCE

1. PLEASE NOTIFY TRCA ENFORCEMENT OFFICER 48 HOURS PRIOR TO COMMENCING CONSTRUCTION.
2. AN ENVIRONMENTAL MONITOR WILL BE ON SITE, AND PROVIDE ADVICE, TO ENSURE THAT ACTIVITIES THAT COULD HAVE A NEGATIVE IMPACT TO THE NATURAL ENVIRONMENT ARE EFFECTIVELY MITIGATED AS CONSTRUCTION PROCEEDS. THE ENVIRONMENTAL MONITOR SHALL NOTIFY THE TRCA ENFORCEMENT OFFICER AND PROJECT MANAGER IF ISSUES ARISE.



KEY MAP
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LEGEND

Revision	By	Chk'd By	dd/mm/yy Date	Comments
1	TR	MO	12/08/25	DETAILED DESIGN SUBMISSION
0	TR	MO	10/03/25	DRAFT DETAILED DESIGN

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12-AUG-2025
PROVINCE OF ONTARIO

PROFESSIONAL GEOSCIENTIST
ROBIN J. McKILLOP
PRACTISING MEMBER
1443
AUG 12 2025
ONTARIO

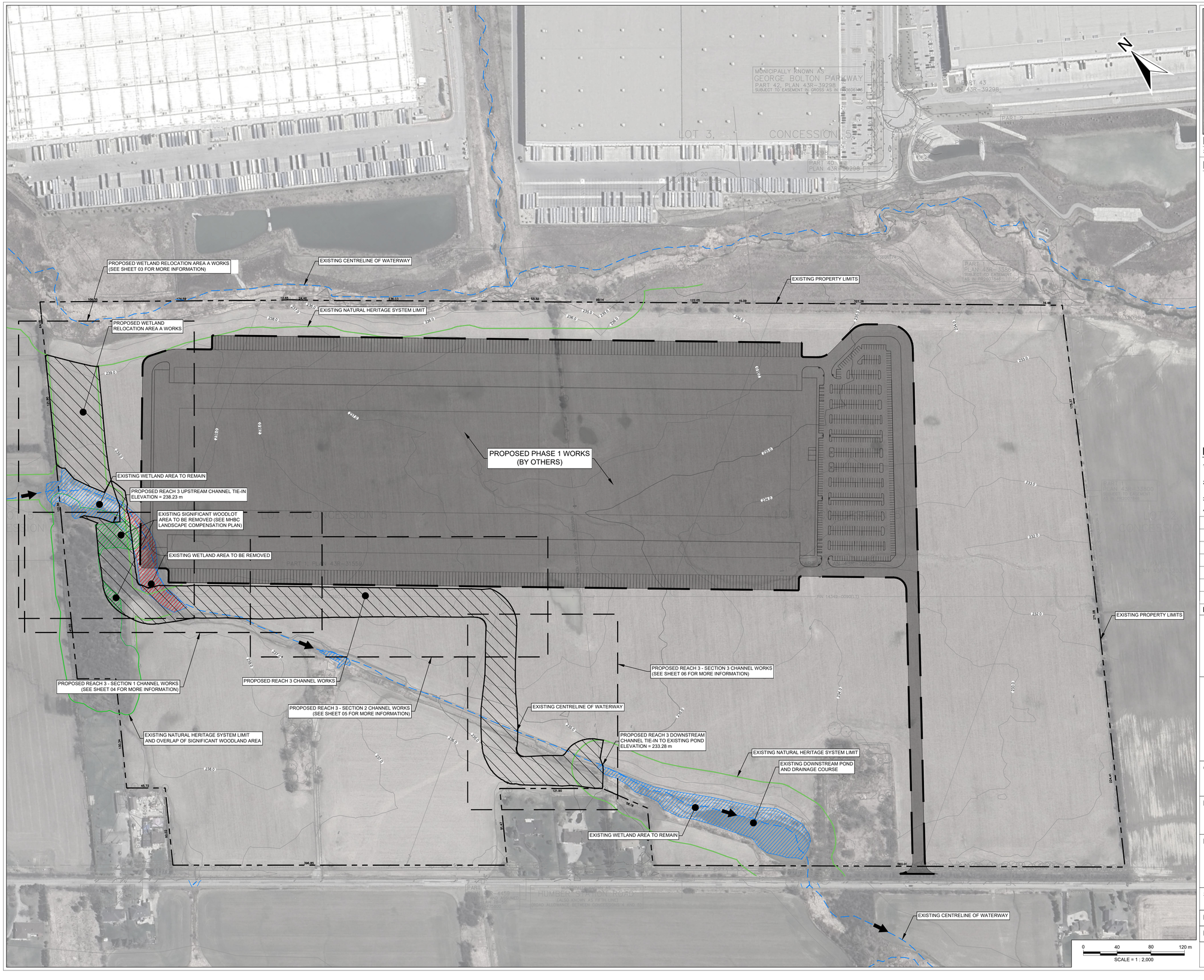
Client:
PROLOGIS - HUMBER STATION

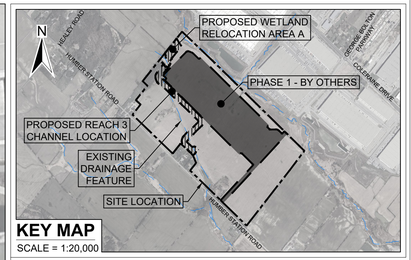
Project:
DETAILED CHANNEL REALIGNMENT AND WETLAND RELOCATION DESIGN

Drawing Title:
CONSTRUCTION NOTES (TYPICAL)

Scale: N/A	Date: MAR. 10, 2025	Drawing No. N-1
Drawn by: TR	Checked by: MO	Sheet No. 01
Designed by: MO	Approved by: RM	

NOT FOR CONSTRUCTION





KEY MAP
SCALE = 1:20,000

LEGEND

- EXISTING CONTOUR (MINOR)
- EXISTING CONTOUR (MAJOR)
- EXISTING SUBJECT PROPERTY BOUNDARY
- EXISTING ADJACENT PROPERTY BOUNDARY
- EXISTING NATURAL HERITAGE SYSTEM LIMIT
- EXISTING SIGNIFICANT WOODLAND AREA
- EXISTING CENTRELINE OF WATERWAY
- EXISTING WETLAND AREA
- PROPOSED WETLAND AREA REMOVAL
- PROPOSED SIG. WOODLOT AREA REMOVAL
- PROPOSED PHASE 1 WORKS (BY OTHERS)
- PROPOSED CHANNEL AND WETLAND WORKS
- PROPOSED LAYOUT AREAS

NOTES

1. BACKGROUND INFORMATION AND EXISTING CONDITIONS PROVIDED BY CROZIER CONSULTING ENGINEERS ON JANUARY 28, 2025.
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3. AERIAL IMAGERY RETRIEVED FROM GOOGLE EARTH IMAGING ON FEBRUARY 4, 2025.
4. CONTOUR INTERVAL IS 1.00 METERS.

Revision	By	Chk'd By	dd/mm/yy Date	Comments
1	TR	MO	12/08/25	DETAILED DESIGN SUBMISSION
0	TR	MO	10/03/25	DRAFT DETAILED DESIGN

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ROBIN J. McKILLOP
PRACTISING MEMBER
1443
ONTARIO

Client:
PROLOGIS - HUMBER STATION

Project:
DETAILED CHANNEL REALIGNMENT AND WETLAND RELOCATION DESIGN

Drawing Title:
SITE LAYOUT PLAN

Scale: 1:2,000	Date: MAR. 10, 2025		Drawing No. SL-1
Drawn by: TR	Checked by: MO		
Designed by: MO	Approved by: RM		Sheet No. 02

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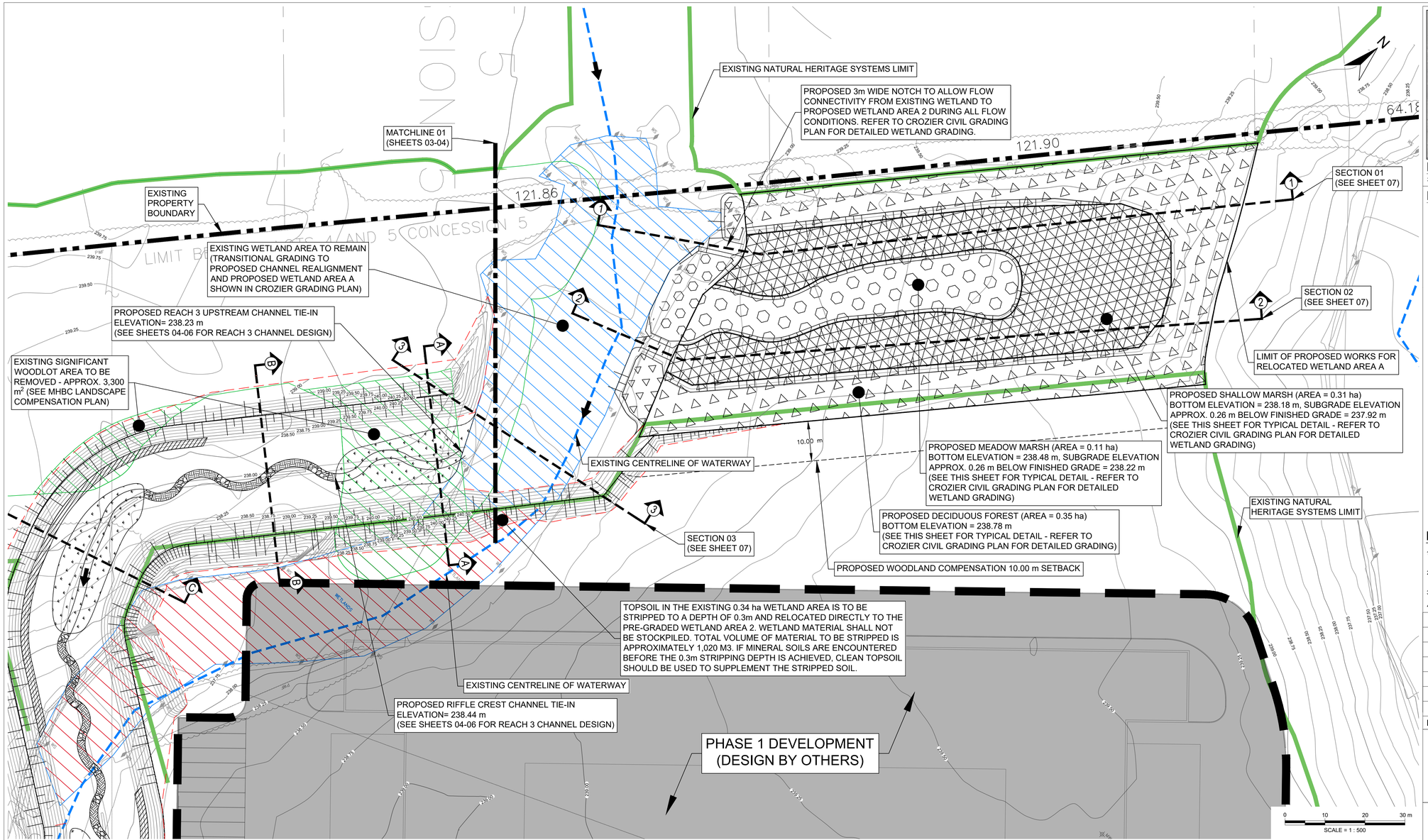

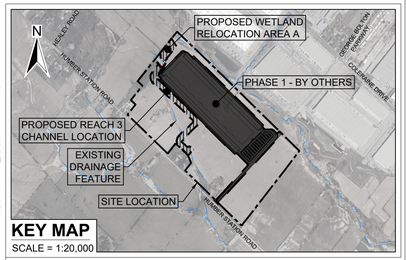

KEY MAP
SCALE = 1:20,000

LEGEND

- 200.00 — EXISTING CONTOUR (MINOR)
- 201.00 — EXISTING CONTOUR (MAJOR)
- EXISTING SUBJECT PROPERTY BOUNDARY
- EXISTING ADJACENT PROPERTY BOUNDARY
- EXISTING NATURAL HERITAGE SYSTEM LIMIT
- EXISTING SIGNIFICANT WOODLAND AREA
- EXISTING CENTRELINE OF WATERWAY
- EXISTING WETLAND AREA
- PROPOSED WETLAND AREA REMOVAL
- PROPOSED SIG. WOODLOT AREA REMOVAL
- PROPOSED DECIDUOUS FOREST AREA
- PROPOSED SHALLOW MARSH AREA
- PROPOSED MEADOW MARSH AREA
- PROPOSED CENTRELINE OF CHANNEL
- PROPOSED RIFFLE STONE AREA
- PROPOSED BED MATERIAL AREA
- PROPOSED BRUSH LAYERING AREA
- PROPOSED ONLINE/OFFLINE WETLAND AREA
- 200.00 — PROPOSED GRADING CONTOURS
- PROPOSED 3:1 GRADING AREA
- PROPOSED PHASE 1 WORKS (BY OTHERS)

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Revision	By	Chk'd By	dd/mm/yy Date	Comments
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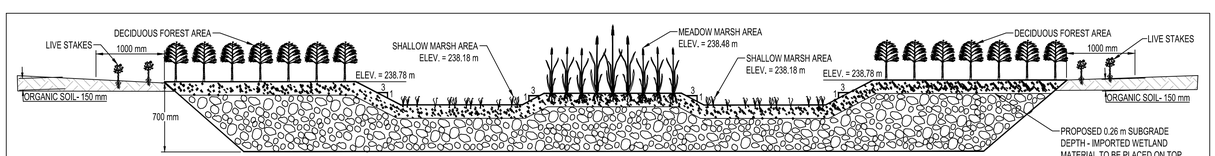

WETLAND AREA A DESIGN NOTES:

1. EXISTING WETLAND AREA TO BE REMOVED AND TOP 0.3m OF MATERIAL RELOCATED TO PROPOSED WETLAND AREA A.
2. RELOCATED SOIL WILL CONTAIN THE EXISTING WETLAND SEED BANK WHICH IS EXPECTED TO ACCELERATE VEGETATION ESTABLISHMENT IN THE PROPOSED WETLAND.
3. THE PROPOSED WETLAND AREA A IS DESIGNED AS AN EXTENSION OF THE EXISTING WETLAND AND WILL BE HYDROLOGICALLY CONNECTED TO THE EXISTING DRAINAGE FEATURE DURING ALL FLOW CONDITIONS.
4. REFER TO CROZIER CIVIL GRADING PLAN FOR DETAILED SITE GRADING.
5. REFER TO MHBC LANDSCAPE PLAN FOR WETLAND AND RESTORATION PLANTING PLAN.

RELOCATED WETLAND AREA A DETAIL (TYP.)
N.T.S.

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Client:
PROLOGIS - HUMBER STATION

Project:
DETAILED CHANNEL REALIGNMENT AND WETLAND RELOCATION DESIGN

Drawing Title:
PLAN AND PROFILE
RELOCATED WETLAND AREA A

Scale:	Date:	Drawing No.
1:500	MAR. 10, 2025	PP-1
Drawn by: TR	Checked by: MO	Sheet No. 03
Designed by: MO	Approved by: RM	

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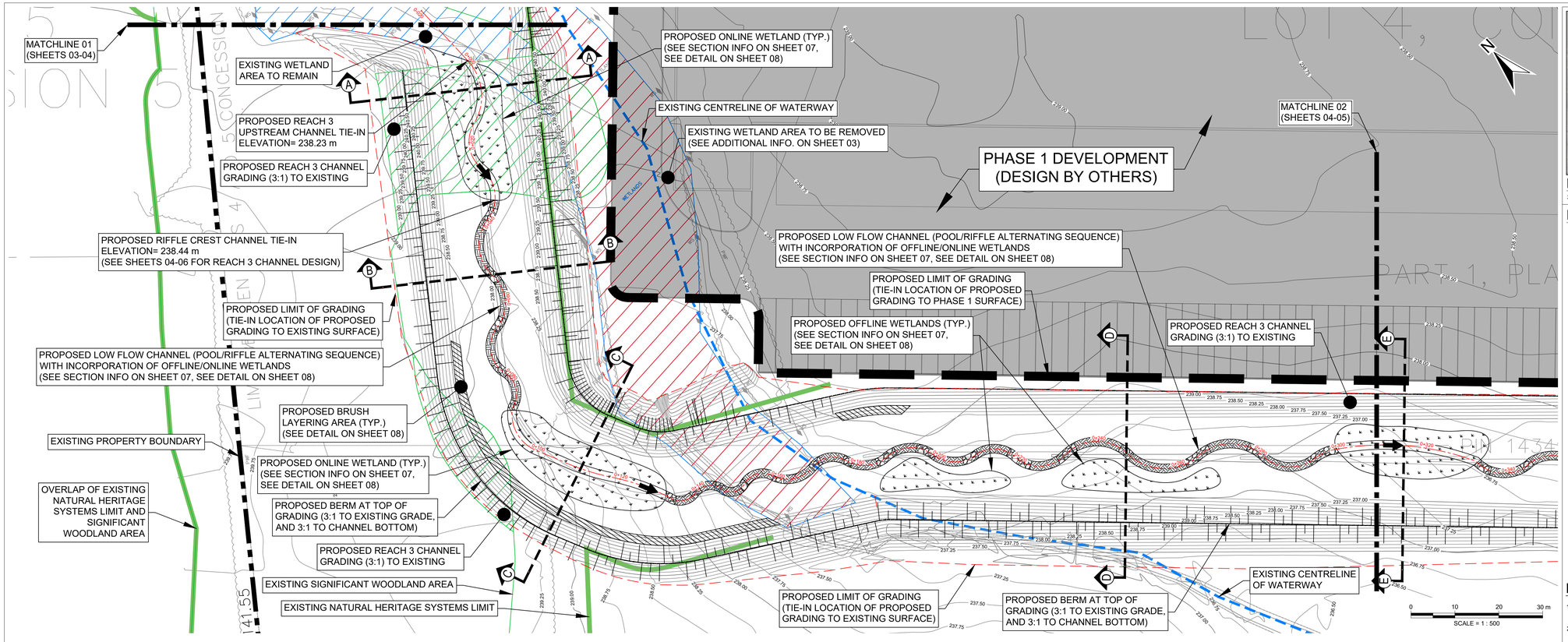
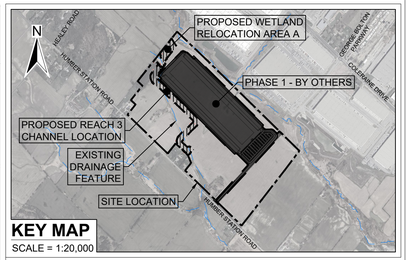




KEY MAP
SCALE = 1:20,000

LEGEND

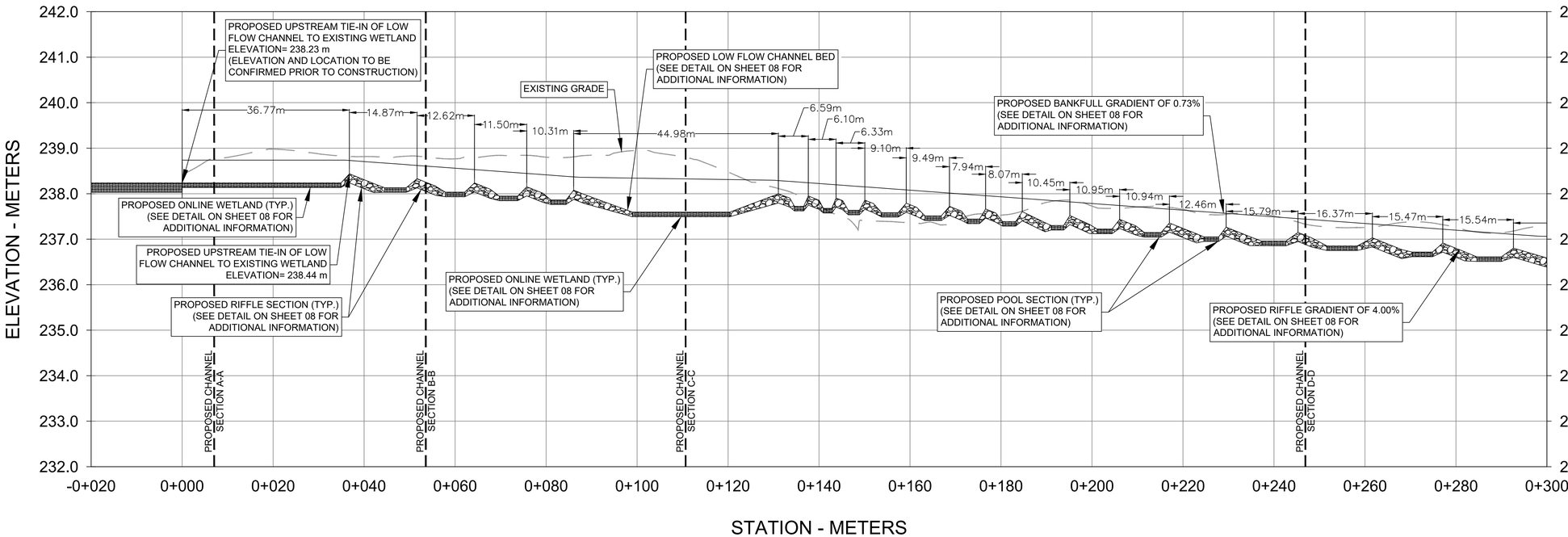
- EXISTING CONTOUR (MINOR)
- EXISTING CONTOUR (MAJOR)
- EXISTING SUBJECT PROPERTY BOUNDARY
- EXISTING ADJACENT PROPERTY BOUNDARY
- EXISTING NATURAL HERITAGE SYSTEM LIMIT
- EXISTING SIGNIFICANT WOODLAND AREA
- EXISTING CENTRELINE OF WATERWAY
- EXISTING WETLAND AREA
- PROPOSED WETLAND AREA REMOVAL
- PROPOSED SIG. WOODLOT AREA REMOVAL
- PROPOSED DECIDUOUS FOREST AREA
- PROPOSED SHALLOW MARSH AREA
- PROPOSED MEADOW MARSH AREA
- PROPOSED CENTRELINE OF CHANNEL
- PROPOSED RIFFLE STONE AREA
- PROPOSED BED MATERIAL AREA
- PROPOSED BRUSH LAYERING AREA
- PROPOSED ONLINE/OFFLINE WETLAND AREA
- PROPOSED GRADING CONTOURS
- PROPOSED 3:1 GRADING AREA
- PROPOSED PHASE 1 WORKS (BY OTHERS)

NOTES

1. BACKGROUND INFORMATION AND EXISTING CONDITIONS PROVIDED BY CROZIER CONSULTING ENGINEERS ON JANUARY 28, 2025.
2. SURVEY INFORMATION PROVIDED BY CROZIER CONSULTING ENGINEERS ON JANUARY 28, 2025. HORIZONTAL DATUM CONTROL IS IN NAD 83 (CSRS) / UTM ZONE 17N.
3. AERIAL IMAGERY RETRIEVED FROM GOOGLE EARTH IMAGING ON FEBRUARY 4, 2025.
4. CONTOUR INTERVAL IS 0.25 METERS.

PROPOSED REACH 3, SECTION 1 - LONG PROFILE

SCALE: H=1:500 , V=1:50



Revision	By	Chk'd By	dd/mm/yy Date	Comments
1	TR	MO	12/08/25	DETAILED DESIGN SUBMISSION
0	TR	MO	10/03/25	DRAFT DETAILED DESIGN

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100502995
12-AUG-2025
PROVINCE OF ONTARIO

PROFESSIONAL GEOSCIENTIST
ROBIN J. McKILLOP
PRACTISING MEMBER
1443
ONTARIO

Client:
PROLOGIS - HUMBER STATION

Project:
DETAILED CHANNEL REALIGNMENT AND WETLAND RELOCATION DESIGN

Drawing Title:
PLAN & PROFILE
REACH 3, SECTION 1 OF 3

Scale:	Date:	Drawing No.
1:500	MAR. 10, 2025	PP-2
Drawn by: TR	Checked by: MO	Sheet No. 04
Designed by: MO	Approved by: RM	

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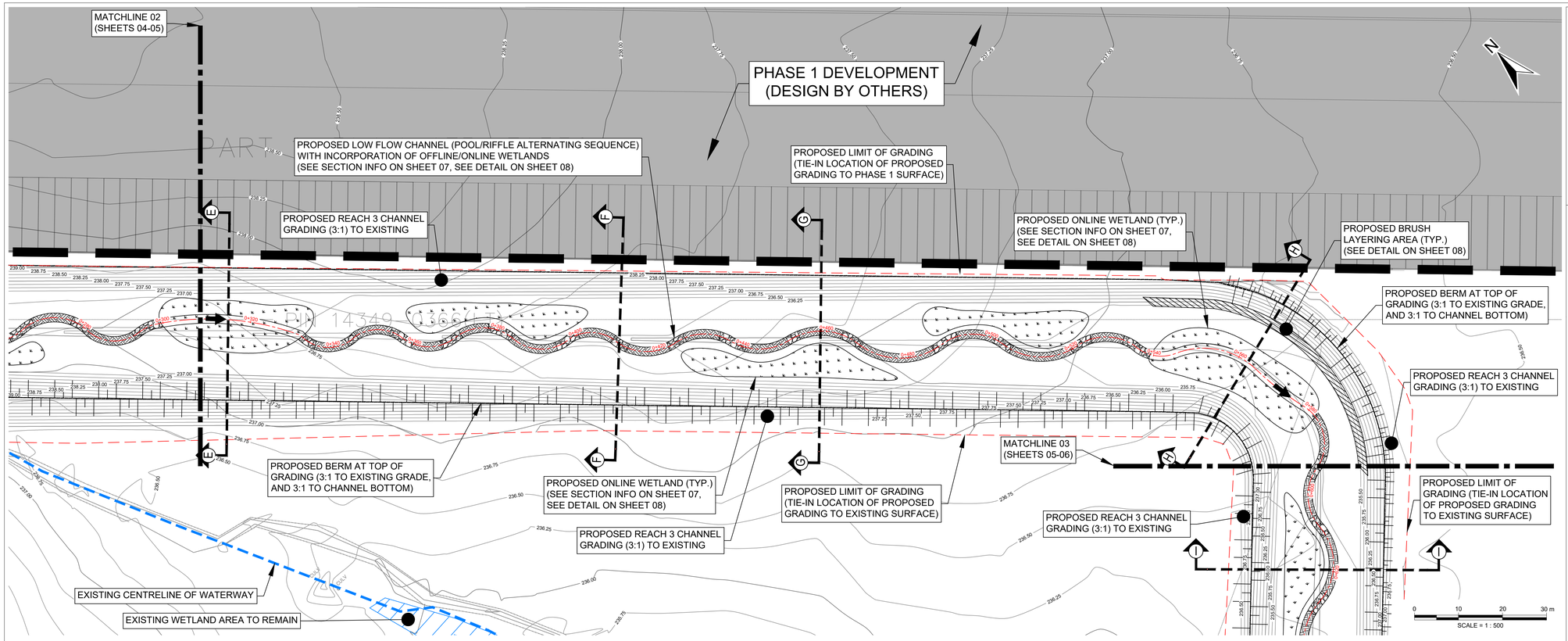

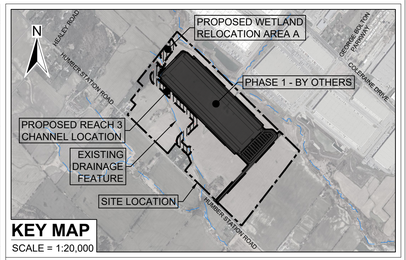

KEY MAP
SCALE = 1:20,000

LEGEND

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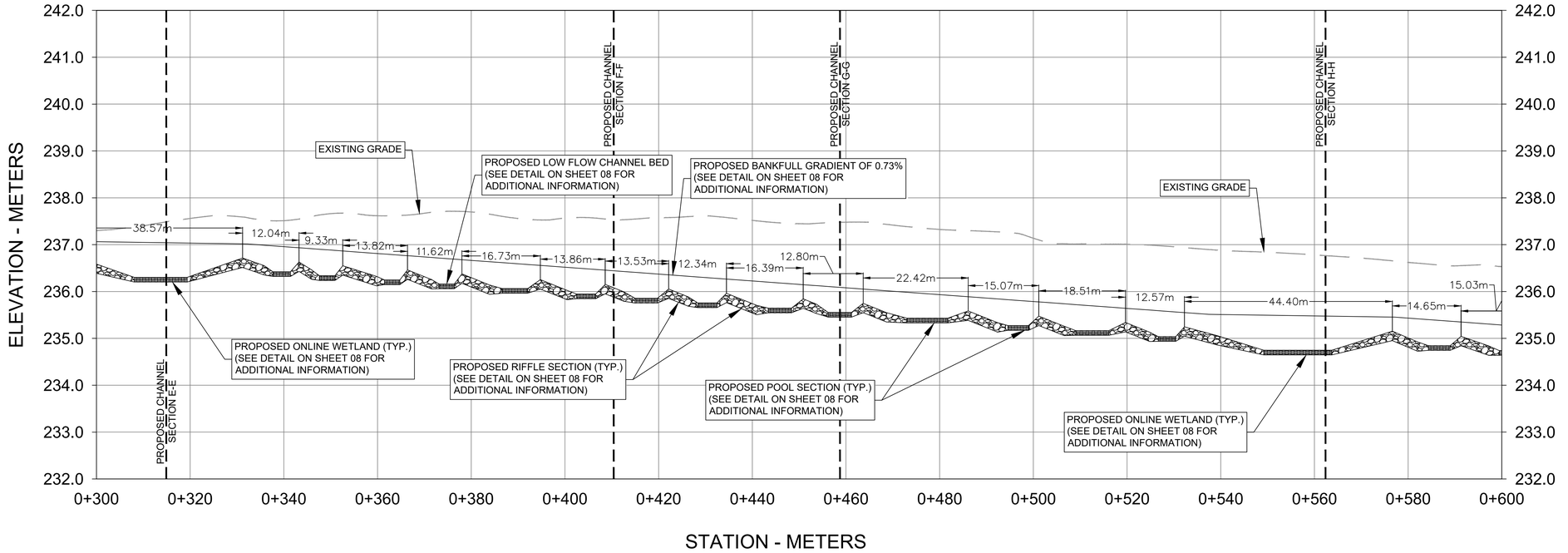
PROPOSED REACH 3, SECTION 2 - LONG PROFILE
SCALE: H=1:500 , V=1:50



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DETAILED CHANNEL REALIGNMENT AND WETLAND RELOCATION DESIGN

Drawing Title:
PLAN & PROFILE
REACH 3, SECTION 2 OF 3

Scale:	1:500	Date:	MAR. 10, 2025	Drawing No.	PP-3
Drawn by:	TR	Checked by:	MO	Sheet No.	05
Designed by:	MO	Approved by:	RM		

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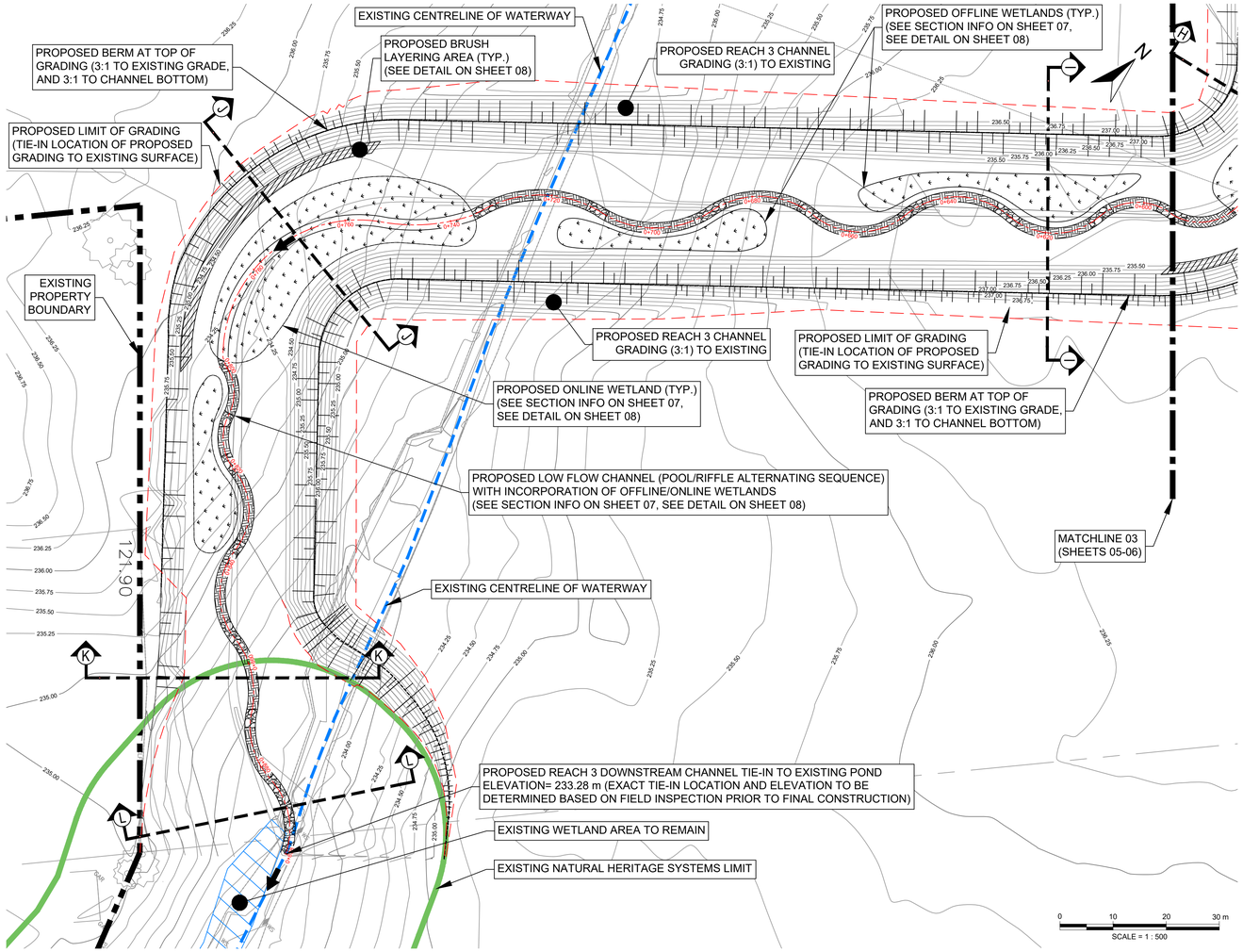

PROPOSED REACH 3, SECTION 3 - LONG PROFILE

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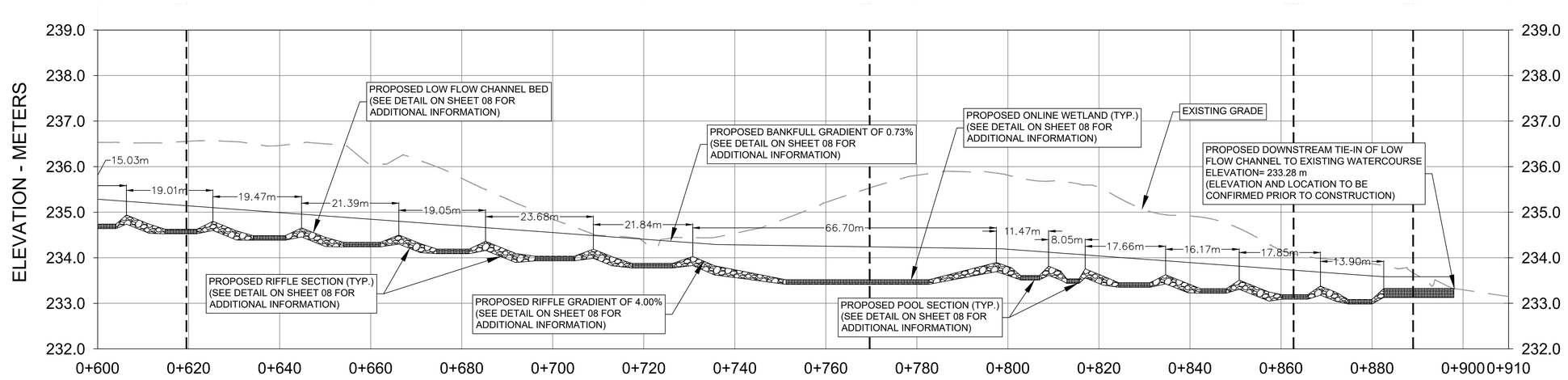

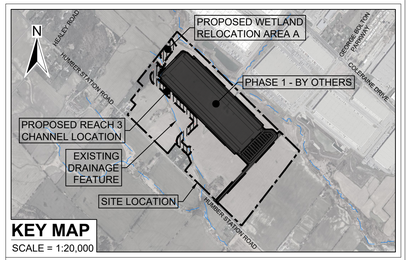

KEY MAP

SCALE = 1:20,000

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Drawing Title:
PLAN & PROFILE
REACH 3, SECTION 3 OF 3

Scale:	1:500	Date:	MAR. 10, 2025	Drawing No.	PP-4
Drawn by:	TR	Checked by:	MO	Sheet No.	06
Designed by:	MO	Approved by:	RM		

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PROPOSED WETLAND - SECTION 1-1

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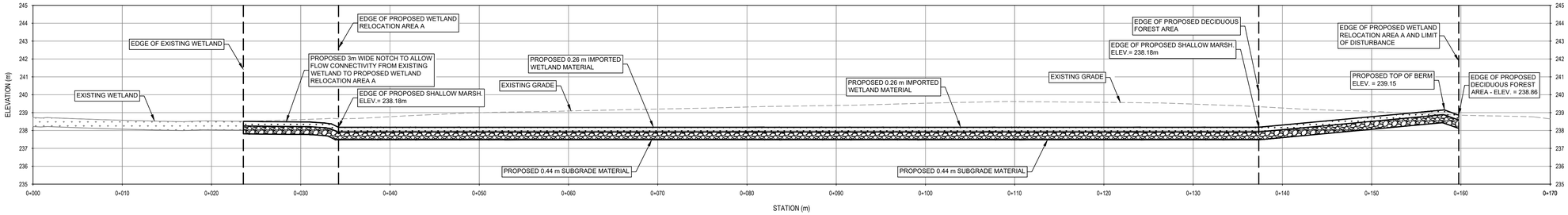

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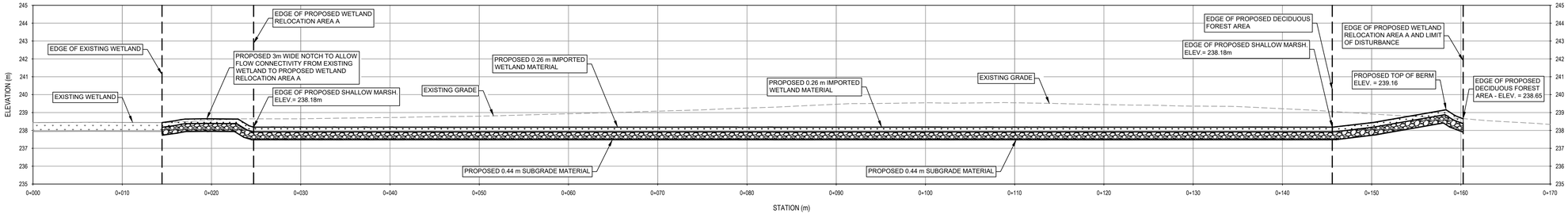

PROPOSED WETLAND - SECTION 3-3

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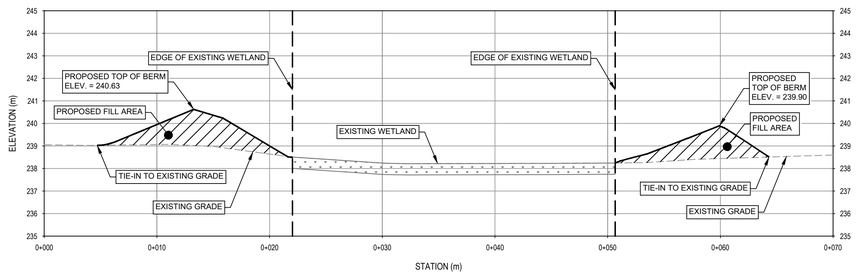

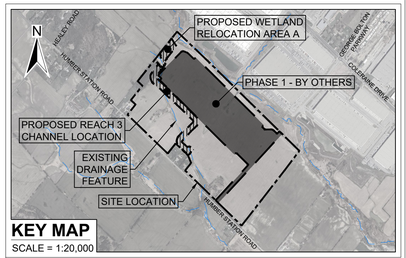

KEY MAP

SCALE = 1:20,000

LEGEND

- EXISTING GRADE
- PROPOSED GRADE
- EXISTING WETLAND AREA
- PROPOSED IMPORTED WETLAND MATERIAL
- PROPOSED SUBGRADE MATERIAL

Revision	By	Chk'd By	dd/mm/yy Date	Comments
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ONTARIO

Client:

PROLOGIS - HUMBER STATION

Project:

DETAILED CHANNEL REALIGNMENT AND WETLAND RELOCATION DESIGN

Drawing Title:

DESIGN WETLAND CROSS SECTIONS

Scale:	Date:	Drawing No.
AS SHOWN	MAR. 10, 2025	XS-1
Drawn by: TR	Checked by: MO	Sheet No.
Designed by: MO	Approved by: RM	07

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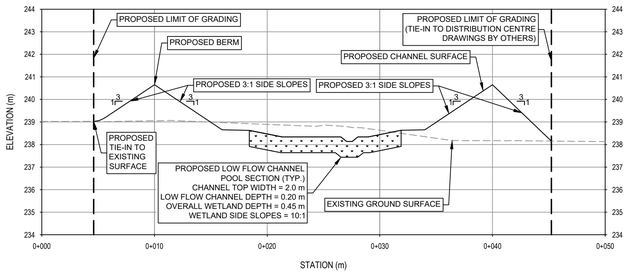
PROPOSED CHANNEL - SECTION A-A

STN: 0 + 007

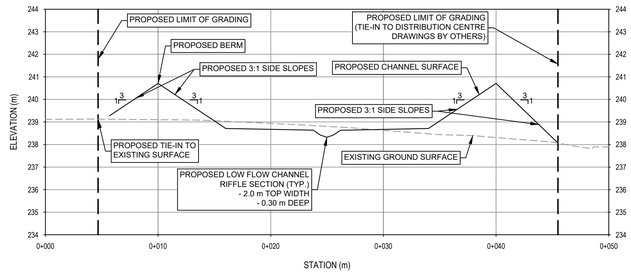
SCALE: H=1:250 , V=1:125



PROPOSED CHANNEL - SECTION B-B

STN: 0 + 054

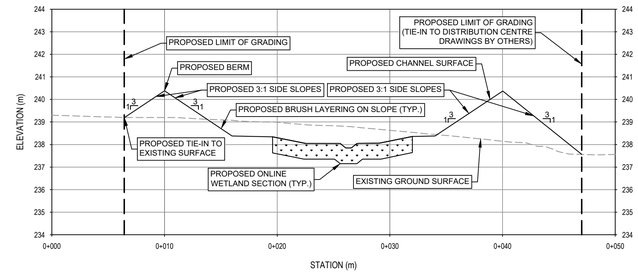
SCALE: H=1:250 , V=1:125



PROPOSED CHANNEL - SECTION C-C

STN: 0 + 111

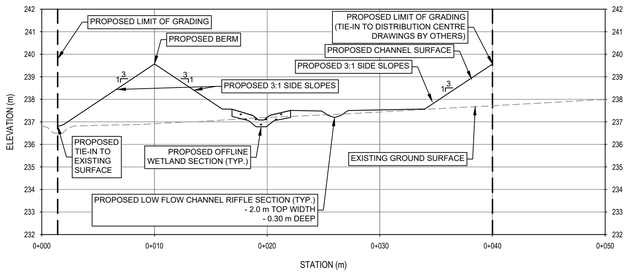
SCALE: H=1:250 , V=1:125



PROPOSED CHANNEL - SECTION D-D

STN: 0 + 248

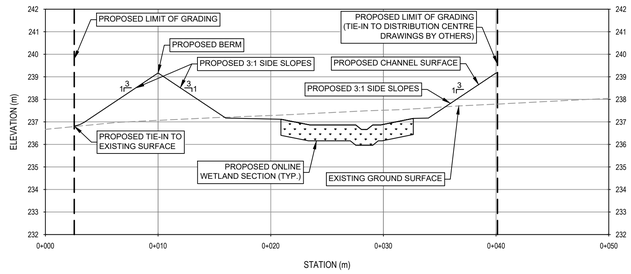
SCALE: H=1:250 , V=1:125



PROPOSED CHANNEL - SECTION E-E

STN: 0 + 317

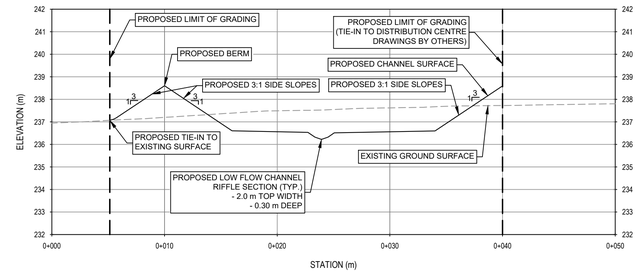
SCALE: H=1:250 , V=1:125



PROPOSED CHANNEL - SECTION F-F

STN: 0 + 412

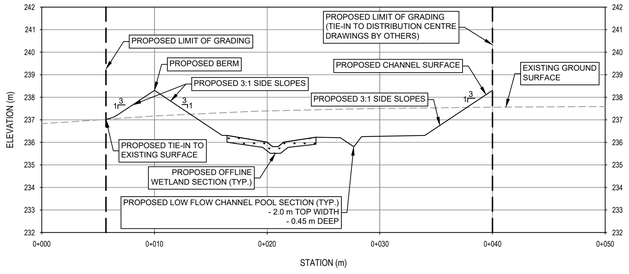
SCALE: H=1:250 , V=1:125



PROPOSED CHANNEL - SECTION G-G

STN: 0 + 460

SCALE: H=1:250 , V=1:125



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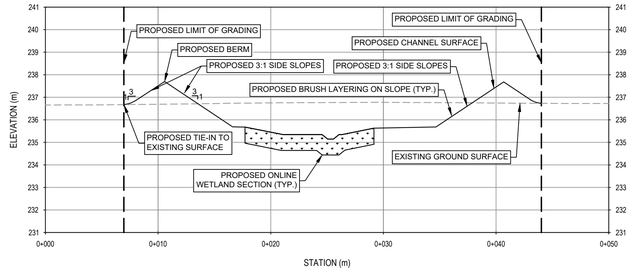

PROPOSED CHANNEL - SECTION I-I

STN: 0 + 621

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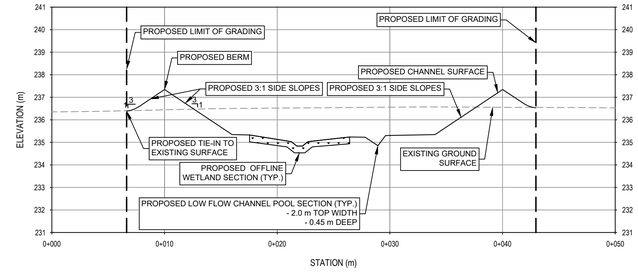

PROPOSED CHANNEL - SECTION J-J

STN: 0 + 771

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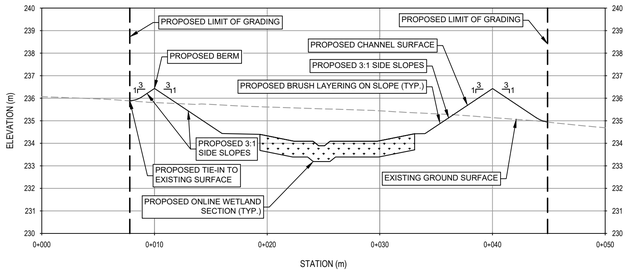
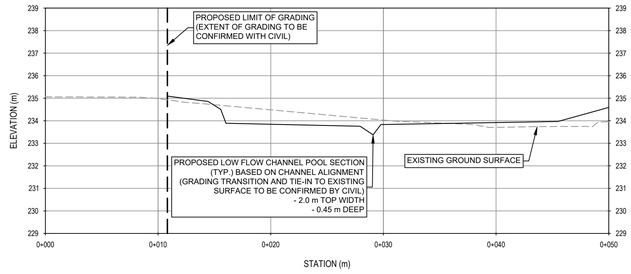


PROPOSED CHANNEL - SECTION K-K

STN: 0 + 864

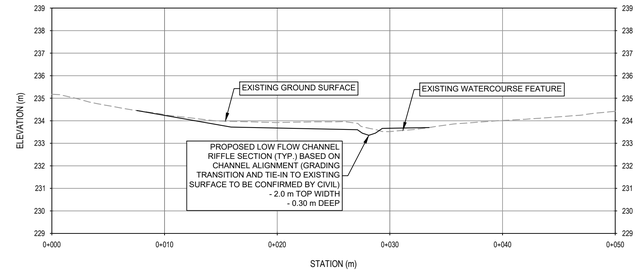
SCALE: H=1:250 , V=1:125

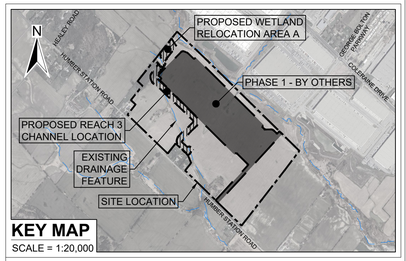


PROPOSED CHANNEL - SECTION L-L

STN: 0 + 890

SCALE: H=1:250 , V=1:125





KEY MAP

SCALE = 1:20,000

LEGEND

- EXISTING GRADE
- PROPOSED GRADE
- PROPOSED IMPORTED WETLAND MATERIAL

Revision	By	Chk'd By	dd/mm/yy Date	Comments
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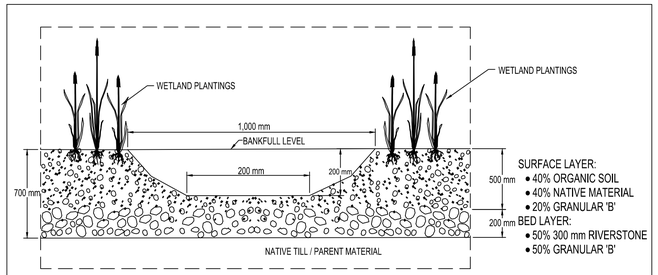
DETAILED CHANNEL REALIGNMENT AND WETLAND RELOCATION DESIGN

Drawing Title:

DESIGN CHANNEL CROSS SECTIONS

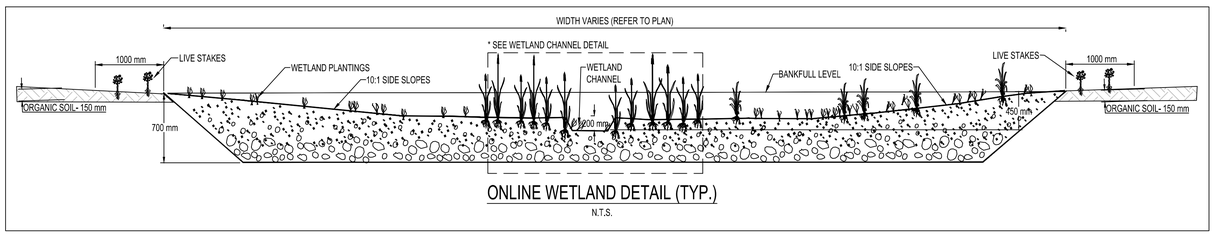
Scale: AS SHOWN	Date: MAR. 10, 2025	Drawing No.	XS-2
Drawn by: TR	Checked by: MO	Sheet No.	08
Designed by: MO	Approved by: RM		

NOT FOR CONSTRUCTION



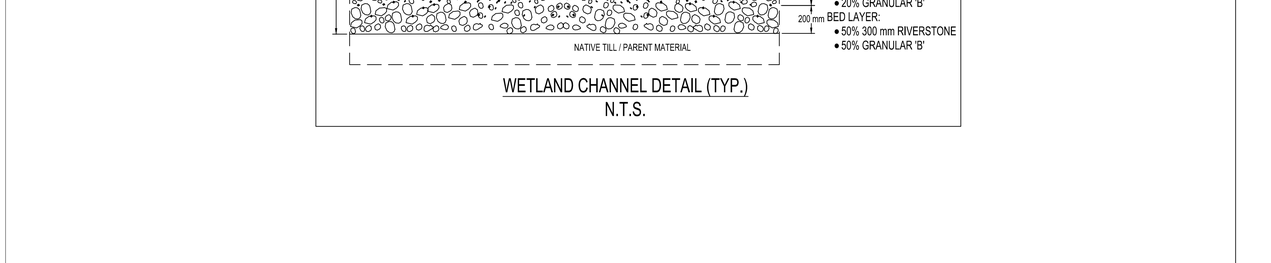
WETLAND CHANNEL DETAIL (TYP.)

N.T.S.



ONLINE WETLAND DETAIL (TYP.)

N.T.S.



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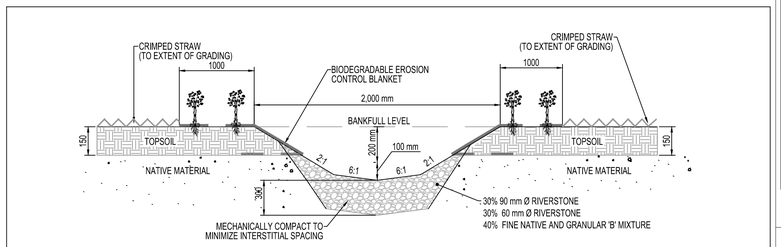

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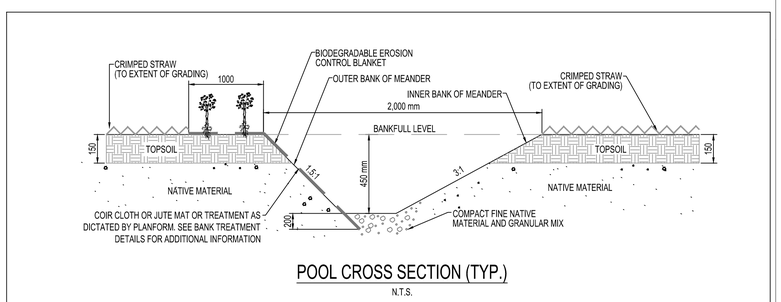
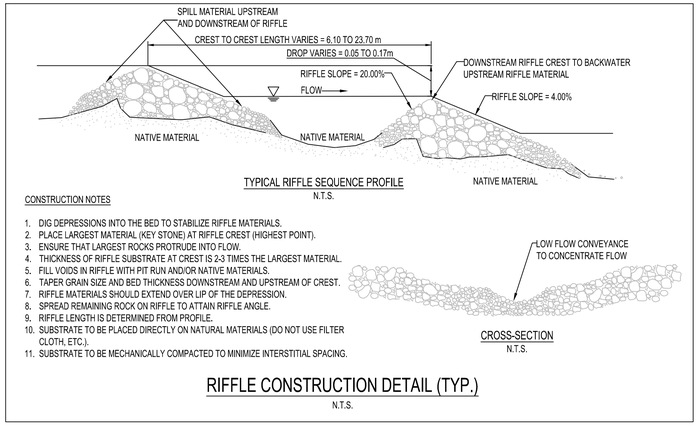


POOL CROSS SECTION (TYP.)

N.T.S.



TYPICAL RIFFLE SEQUENCE PROFILE

N.T.S.

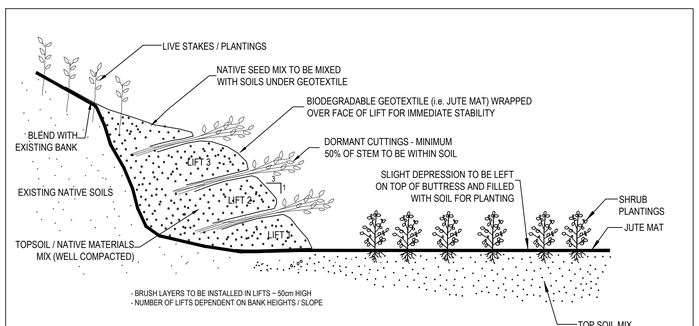
CONSTRUCTION NOTES

1. DIG DEPRESSIONS INTO THE BED TO STABILIZE RIFFLE MATERIALS.
2. PLACE LARGEST MATERIAL (KEY STONE) AT RIFFLE CREST (HIGHEST POINT).
3. ENSURE THAT LARGEST ROCKS PROTRUDE INTO FLOW.
4. THICKNESS OF RIFFLE SUBSTRATE AT CREST IS 2-3 TIMES THE LARGEST MATERIAL.
5. FILL VOIDS IN RIFFLE WITH PIT RUN AND/OR NATIVE MATERIALS.
6. TAPER GRAIN SIZE AND BED THICKNESS DOWNSTREAM AND UPSTREAM OF CREST.
7. RIFFLE MATERIALS SHOULD EXTEND OVER LIP OF THE DEPRESSION.
8. SPREAD REMAINING ROCK ON RIFFLE TO ATTAIN RIFFLE ANGLE.
9. RIFFLE LENGTH IS DETERMINED FROM PROFILE.
10. SUBSTRATE TO BE PLACED DIRECTLY ON NATURAL MATERIALS (DO NOT USE FILTER CLOTH, ETC.).
11. SUBSTRATE TO BE MECHANICALLY COMPACTED TO MINIMIZE INTERSTITIAL SPACING.

CROSS-SECTION
N.T.S.

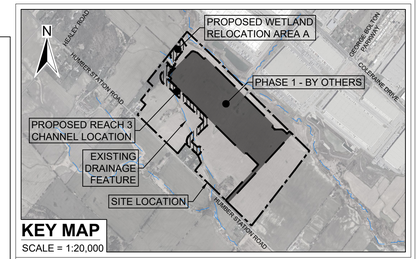
RIFFLE CONSTRUCTION DETAIL (TYP.)

N.T.S.



TIERED LIVE BRUSH LAYERING (TYP.)

N.T.S.



KEY MAP
SCALE = 1:20,000

Revision	By	Chk'd By	dd/mm/yy Date	Comments
1	TR	MO	12/08/25	DETAILED DESIGN SUBMISSION
0	TR	MO	10/03/25	DRAFT DETAILED DESIGN

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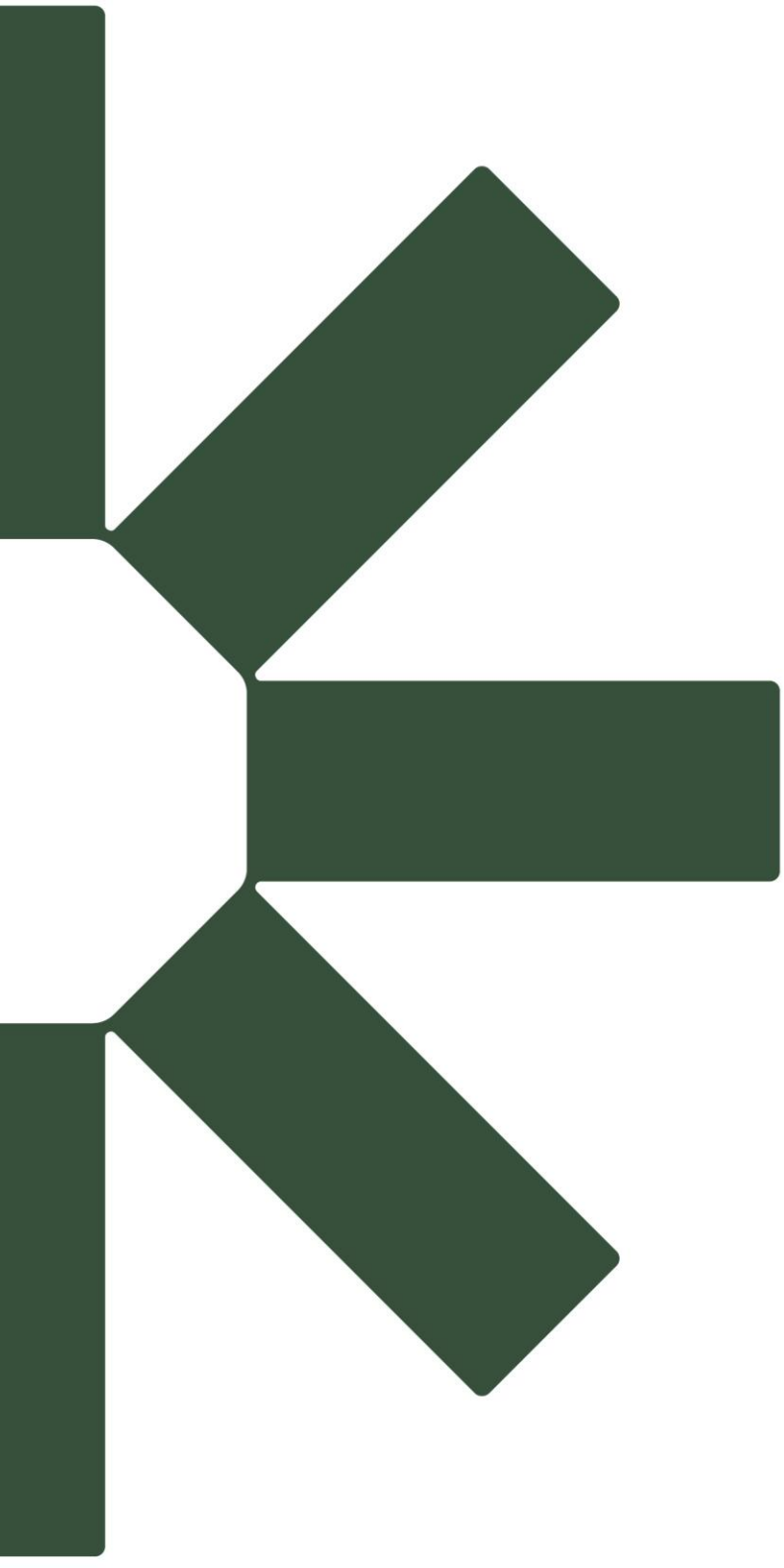
Client:
PROLOGIS - HUMBER STATION

Project:
DETAILED CHANNEL REALIGNMENT AND WETLAND RELOCATION DESIGN

Drawing Title:
CONSTRUCTION DETAILS

Scale:	Date:	Drawing No.
AS SHOWN	MAR. 10, 2025	CD
Drawn by: TR	Checked by: MO	Sheet No.
Designed by: MO	Approved by: RM	09

NOT FOR CONSTRUCTION



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