Appendix 11
Landscape and Visual Effects Assessment

Cuttriss

Surveyors. Engineers. Planners.

240 KAPITI ROAD
PARAPARAUMU, KAPITI COAST

designgroupstapletonelliott.co.nz

VISUAL AND LANDSCAPE EFFECTS ASSESSMENT

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CONTENTS

1.0 Introduction

1.1 Purpose

Designgroup Stapleton Elliott (DGSE) has been engaged by the applicant to prepare a Visual and Landscape Impact Assessment of the proposed 139-unit development of 240 Kāpiti Road in the 'General Residential Zone' of the Kāpiti Coast District Plan. This 'proposal-driven' assessment specifically focuses on the characteristics and values of the receiving landscape, the visual change, and the visual absorbance capacity, particularly along with the interface with Kāpiti Road. This proposal will be assessed under the Kāpiti Coast District Plan (KCDP).

The following assessment considers the potential effects of the proposal, on the existing landscape and visual amenity of the surrounding environment, within the context of relevant landscape provisions. Focus has been given particularly to the receiving landscape and viewers on the existing streetscape and the potential impacts/effects. This report does not consider matters other than those relating to landscape/visual impacts on the character and values of the existing natural environment and bordering area.

2.0 Methodology

The methodology of this assessment has been based on the NZILA's *'Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines' [Final Draft subject to final editing, graphic design, illustrations, approved by Tuia Pita Ora/NZILA 5 May 2021].* A standard assessment approach has been used to identify the existing landscape character and values of the site and its surroundings, to assess the potential effect of the proposed access on the landscape and visual amenity.

In summary, this assessment:

- Summarises the key components or aspects of the proposal
- Identifies the receiving environment, describing the existing features and developments that make up the landscape character and values.
- Assesses the proposal against the relevant statutory documents (policies, objective, and rules)
- Identifies the potential landscape and visual effects of the proposal generally, and from the relevant scales of typical viewer locations (via desktop study and photographic analysis)
- Provides potential approaches to avoid, mitigate or remedy any such effects

This visual and landscape assessment has been carried out after undertaking a site visit as well as a further desktop study of the site from the surrounding and publicly accessible areas. A desktop study was undertaken, a photographic study of the area to demonstrate the scale and context of the proposal, and representative viewpoints were identified to represent the qualities and visual amenity experienced by a public audience. A review of the proposed development plans has also been completed:
Effects are rated using the seven-point scale identified in the NZILA '*Best Practice Note – Landscape Assessment and Sustainable Management 10.1'* as shown below:

Very - Low	Low	Moderate- Low	Moderate	Moderate - High	High	Very - High

In combination with assessing the significance of the effects, this assessment also considers the nature of effects in terms of whether it is positive (beneficial), neutral (benign), or negative (adverse) in the landscape context within which they occur. Ratings are determined following the consideration of the nature of the potential effects, the magnitude of the effects and the potential to avoid/remedy or mitigate effects.

3.0 Proposal

3.1 Project Description

The site (240 Kāpiti Road) is located at the north-western end of Kāpiti Road, with an additional interface with Halsey Grove that links to Regent Drive. The site has a total area of 18,994m^2 and has an existing dwelling and accessory building. It is of relatively regular shape with the eastern corner slightly extending out further and is currently composed of an undulating landscape with a series of undulating grassed paddocks containing various scrub and vegetation.

Consent is sought for a residential development at 240 Kāpiti Road, including 139 new units with resident and visitor parking, new internal roading and public green space. Vehicle access to the proposed development is to be solely from Halsey Grove with

pedestrian connections to Kāpiti Road, as well as the internal pedestrian and vehicle circulation. To enable these works, earthworks are required to flatten the site so that it is suitable for residential housing.

There are two existing vehicle access points to the site, the vehicle crossing on Kāpiti Road that is used to access the existing dwelling and the additional access to Halsey Grove. As a result of this proposal, the interface with Halsey Grove will be used to connect into the proposed internal roading network and the existing vehicle crossing to Kāpiti Road will be removed. This results in all vehicle movement to the development entering and exiting via Halsey Grove onto Regent Drive. The existing house and accessory building currently on site will be demolished as part of this proposal. The site will need to undergo earthworks to ensure there are suitable build platforms for each of the proposed units. This will result in most site vegetation being removed, however, all the street trees along the Kāpiti Road frontage of the site will be retained. The development plans include proposed specimen trees to assist in both privacy and visual mitigation of the new built forms.

The proposed residential development is considered necessary to assist and improve the current lack of housing available within the Kāpiti Coast region. The proposed new development plans show new housing units that each have sufficient private outdoor living/service areas, private and visitor parking and an efficient pedestrian/vehicle connection to the adjoining local network as well as the use of the public green space located centrally within the site. This area is zoned as General Residential Zone; however, it is acknowledged that the proposed development is of higher density than the surrounding neighbourhood.

4.0 Statutory Provisions

Planning documents that have been taken into consideration include the Resource Management Act (RMA) and the Kāpiti Coast District Plan (KCDP). Only the key issues relating to landscape and visual matters have been considered as part of this application.

4.1 Resource Management Act 1991 (RMA)

The proposal must meet the requirements of the RMA, and it is therefore important that the assessment of visual, landscape and amenity effects address the requirements of Part 2, of the Act. Section 5 sets out the purpose of the RMA, which is to promote the sustainable management of natural and physical resources and is supported by sections 6, 7, and 8. Concerning landscape, visual, and amenity matters, the key section of the RMA relevant to this application is S6 (a) and (h) & S7 (b), (c), (f), and (i).

Section 6: Matters of National Importance:

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance:

(a) the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development.

(h) the management of significant risks from natural hazards

Under the KCDP, the site is considered as part of the Coastal Environment overlay, as is the majority of the Kāpiti Coast District. The New Zealand Coastal Policy Statement (NZCPS) relates to all land and activities in the coastal environment which under Policy 4 requires that District Plans identify the landward extent of the coastal environment using the provided criteria. The natural character of the existing site, whilst under-developed and made up of various undulating landforms, has been neglected to be preserved of its original 'coastal character' with no presence of significant water bodies, use of land for animal grazing and introduction of exotic vegetation. As the site does not contain any coastal marine areas, significant wetlands, lakes or rivers, it is thought that there is no risk to the areas coastal environment or to be an inappropriate use or development of the area.

The subject site has two areas identified as a ponding flood hazard due to the nature of the existing landform. As the site is going to be modified through earthworks and has stormwater systems implemented, it is considered that an engineered solution and modification to the site could reduce the risk of flooding.

Section 7: Other Matters:

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall have particular regard to:

(b) the efficient use and development of natural and physical resources

(c) the maintenance and enhancement of amenity values

(f) maintenance and enhancement of the quality of the environment.

(i) the effects of climate change

As the development is significantly increasing the density of the existing site, it is important to acknowledge the development of land as a natural resource. Regarding Section 7(c), the adverse effects of the proposed development on the existing visual amenity values have been assessed in Section 7 below and will have an overall low result, with existing visual amenity values essentially being maintained. Amenity values from the selected representative locations will remain, with resultant low effects because of the proposal.

Similarly, consideration has been given in respect to the surrounding residential zone with the built form, layout, materials, and scale, to ensure that the quality of the environment will be maintained and enhanced. Provisions have been made regarding Section 7(i) as part of this proposal to neutralise the effects of the removal of vegetation by replanting a suitable palette to both maintain and enhance the current quality of the environment.

4.2 Kāpiti Coast Operative District Plan 2021 (KCDP)

The site is zoned General Residential Zone and is also part of the Coastal Environments overlay under the KCDP.

The following are the district-wide objectives and the General Residential Zone and Coastal Environment policies that are considered relevant to the proposal regarding visual or landscape amenity, under the KCDP:

> *DO-02 | Ecology and Biodiversity: To improve indigenous biological diversity and ecological resilience through:*
>
> 1. *protecting areas of significant indigenous vegetation and significant habitats of indigenous fauna;*
> 2. *encouraging restoration of the ecological integrity of indigenous ecosystems;*
> 3. *enhancing the health of terrestrial and aquatic ecosystems; and*
> 4. *enhancing the mauri of waterbodies.*
>
> *GRZ-P12 | Landscaping: Landscaping will be required for non-residential activities and intensive residential development in the Residential Zones to enhance residential amenity, while promoting water conservation and biodiversity and allowing for the natural infiltration of surface waters through permeable treatments. Landscaping will be located and designed in accordance with the following principles:*
>
> 1. *the visual impact of large buildings will be reduced by appropriate screening and planting;*
> 2. *service areas, loading areas and outdoor storage areas will be screened;*
> 3. *on-site outdoor living spaces will be defined and enhanced by landscaping;*
> 4. *sunlight access and passive surveillance to adjoining areas will not be unreasonably restricted;*
> 5. *public infrastructure and services will not be damaged or blocked;*
> 6. *planting of locally indigenous vegetation will be encouraged; and*
> 7. *permeable surfaces will be provided for the natural infiltration of surface waters.*

The current vegetation is not considered of any significance and therefore it does not play a critical part in the indigenous biological diversity and ecological resilience within this area. However, the new development proposes a plant palette that is suited to the coastal conditions and complements the existing vegetation outside of the site and in the public park across the road (Te Huarahi Raupo). It is then thought that this new site planting will assist in encouraging the restoration of the ecological integrity of indigenous ecosystems.

> *DO-03 | Development Management: To maintain a consolidated urban form within existing urban areas and a limited number of identified growth areas which can be efficiently serviced and integrated with existing townships, delivering:*
>
> 1. *Urban areas which maximise the efficient end use of energy and integration with infrastructure*
> 2. *A variety of living and working areas in a manner which reinforces the function of vitality of centres*
> 3. *Resilient communities where development does not result in an increase in risk to life or severity of damage to property from natural hazard events*
> 4. *Higher residential densities in locations that are close to centre and public open spaces, with good access to public transport*
> 5. *Management of development in areas of special character or amenity so as to maintain, and where practicable, enhance those special values*
> 6. *Sustainable natural processes including freshwater systems, areas characterised by the productive potential of the land, ecological integrity, identified landscapes and features, and other places of significant natural amenity.*
> 7. *An adequate supply of housing and areas for business/employment to meet the needs of the district's anticipated population which is provided at a rate and in a manner that can be sustained within the finite carrying capacity of the district, and*
> 8. *Management of the location and effects of potentially incompatible land uses including any interface between such uses.*
>
> *GRZ-P7 | Development and Landforms: Subdivision, use and development (including associated driveways) should be sited, designed and undertaken to integrate with the natural topography and landform of the land and to minimise:*
>
> 1. *The visual impact, bulk and scale of buildings and structures on identified landscape values, ecological sites, geological features or areas of high natural character;*
> 2. *The extent of cut and fill;*
> 3. *The need for the height of retaining walls; and*

4. *The mass of buildings on sloping land, by variations in wall and roof lines and by floor plans which complement the contours of the land*

The site is located within the Residential Zone and therefore the proposal is not considered uncommon or unexpected for the area but has, however, been designed at a higher density to the nearby properties. Although this is a different scale development to its immediate surroundings, it is considered appropriate to assist the supply of housing needs for the districts growing demands. The site is also located within walking distance to nearby supermarkets, shops, services, and education facilities, as well as public transport and safe, efficient pedestrian walkways. The proposal is then thought to be capable of providing for a higher level of occupants and has been designed in a way that is to become integrated into the surrounding urban form through connectivity and efficient infrastructure, with an internal green space, whilst still maintaining visual amenity and contributing positively to the surrounding character,

DO-04 | Coastal Environment: To have a coastal environment where:

1. *Areas of outstanding natural character and high natural character, outstanding natural features and landscapes, areas of significant indigenous vegetation and significant habitats of indigenous fauna are identified and protected.*
2. *Areas of outstanding natural character and high natural character are restored where degraded*
3. *The effects of inappropriate subdivision, use and development are avoided, remedied, or mitigated.*
4. *Public access to and along the coast facilitate active and passive recreational use is maintained and enhanced while managing appropriate vehicle access,*
5. *Inappropriate development does not result in further loss of coastal dunes in the area mapped as the coastal environment*

CE-P1 | Coastal Environment Characteristics: Recognise the extent and characteristics of the coastal environment including:

1. *areas or landforms dominated by coastal vegetation or habitat of indigenous coastal species;*
2. *landform affected by active coastal processes, excluding tsunami;*
3. *elements or features, including coastal escarpments, that contribute to the natural character, landscape, visual quality or amenity value of the coast; and*
4. *sites, structures, places or areas of historic heritage value adjacent to, or connected with, the coast, which derive their heritage value from a coastal location.*

CE-P4 | Restore Natural Character: Promote restoration of the natural character of the coastal environment where practicable by:

1. *creating or enhancing indigenous habitats and ecosystems, using local genetic stock;*
2. *encouraging natural regeneration of indigenous species, while effectively managing weed and animal pests;*
3. *rehabilitating dunes and other natural coastal features or processes, including saline wetlands and intertidal saltmarshes;*
4. *restoring and protecting riparian and intertidal margins;*
5. *removing redundant coastal structures and materials that do not have heritage or amenity values; or*
6. *redesign of structures that interfere with ecosystem processes.*

The site is located within the Coastal Environment overlay under the KCDP, as is the majority of the Kāpiti Coast flat plain area. As stated in the *NZILA Te Tangi a te Manu Aotearoa New Zealand Landscape Assessment Guidelines [Final Draft]*, the Coastal Environment is 'the area in which coastal processes, influences or qualities are significant', that 'the extent should derive from the environment rather than potential effects' and that the inland boundary for a Coastal Environment should be identified 'with respect to the physical landscape'. Following these pointers to identify the inland extent of the Coastal Environment, paired with the fact that the site has not been labelled as an area of outstanding natural character, high natural character or outstanding natural feature or landscape, it can be concluded as not holding a significant place in representing the Coastal Environment of the Kāpiti Coast. It is however acknowledged that it may have had a stronger presence in the past that has diminished over time and that the existing vegetation could contain coastal vegetation or habitat of indigenous coastal species and the existing landform could have been influenced by active coastal processes. The proposed development provides an opportunity to restore some of the natural characters of the coastal environment through a carefully selected plant palette that will complement and revive some of the natural character, landscape, visual quality, and amenity value of the coast that may have been lost on-site over time.

DO-05 | Natural Hazards: To ensure the safety and resilience of people and communities by avoiding exposure to increased levels of risk from natural hazards, while recognising the importance of natural processes and systems.

The site currently contains two areas identified as a flood hazard for ponding under the KCDC GIS mapping. The proposal contains earthworks and provides a suitable engineered design solution. Therefore, the appropriate stormwater measures will be implemented to avoid increased levels of flood hazard risk and ensure the safety and resilience of future residents and the community.

DO-08 | Strong Communities: To support a cohesive and inclusive community where people:

1. *have easy access and connectivity to quality and attractive public places and local social and community services and facilities;*
2. *have increased access to locally produced food, energy and other products and resources.*
3. *have improved health outcomes through opportunities for active living or access to health services; and*
4. *have a strong sense of safety and security in public and private spaces.*

Although the site avoids using the existing vehicle crossing onto Kāpiti Road, there are multiple opportunities for pedestrian connectivity to the existing footpath and the proposed units along Kāpiti Road have their front doors facing onto the street edge. This allows for easy access and connectivity to nearby public places and encourages healthy lifestyles for active living to support a cohesive and inclusive community.

DO-011 | Character and Amenity Values: To maintain and enhance the unique character and amenity values of the district's distinct communities so that residents and visitors enjoy:

1. *relaxed, unique and distinct village identities and predominantly low-density residential areas characterised by the presence of mature vegetation, a variety of built forms, the retention of landforms and unique community identities;*
2. *vibrant, lively town centres supported by higher density residential and mixed use areas;*
3. *neighbourhood centres, village communities and employment areas characterised by high levels of amenity, accessibility and convenience;*
4. *productive rural areas, characterised by openness, natural landforms, areas and corridors of indigenous vegetation, and primary production activities; and*
5. *well managed interfaces between different types of land use areas (e.g. between living, working and rural areas and between potentially conflicting land uses, so as to minimise adverse effects.*

GRZ-P10 | Residential Amenity: Subdivision, use and development in the Residential Zones will be required to achieve a high level of on-site amenity for residents and neighbours in accordance with the following principles:

1. *building size and footprint will be proportional to the size of the allotment;*
2. *usable and easily accessible private outdoor living spaces will be provided;*
3. *buildings and structures will be designed and located to maximise sunlight access, privacy and amenity for the site and adjoining allotments;*
4. *buildings and structures will be designed and located to minimise visual impact and to ensure they are of a scale which is consistent with the area's urban form;*
5. *appropriate separation distances will be maintained between buildings;*
6. *yards will be provided to achieve appropriate building setbacks from neighbouring areas, the street and the coast;*
7. *hard and impermeable surfaces will be offset by permeable areas on individual allotments;*
8. *unreasonable and excessive noise, odour, smoke, dust, light, glare and vibration will be avoided;*
9. *non-residential buildings will be of a form and scale which is compatible with the surrounding residential environment; and*
10. *service areas for non-residential activities will be screened, and planting and landscaping will be provided.*

GRZ-P11 | Residential Streetscape: Development, use and subdivision will enhance the amenity, functionality and safety of the streetscape in the Residential Zones. To achieve a positive relationship between development and the street, development will be undertaken in accordance with the Council's Streetscape Strategy and Guideline:

1. *on-site vehicle parking will be provided to reduce demand for on-street vehicle parking;*
2. *minimum distance will be maintained between vehicle access ways, and where practicable, the sharing of vehicle access ways will be encouraged;*
3. *direct pedestrian access will be provided from the street to the front entrance of the primary residential building, where practicable;*
4. *where practicable, at least one habitable room will be orientated towards the street;*
5. *the safety of road users, including pedestrians and cyclists, will not be adversely affected; and*
6. *on-site vehicle manoeuvring will be provided for rear allotments, allotments with significant sloping driveways and on strategic arterial routes.*

Within the residential zones, it is common to have a variety of built forms that create a vibrant and lively neighbourhood and high levels of amenity. The proposal is comprised of a modern townhouse development with a range of building sizes and footprints, planting, public green space and an efficient roading network that enhances the character and amenity values of the Paraparaumu Beach and Kāpiti Road area. The development aims to achieve a high level of onsite amenity for residents and neighbours whilst still providing usable and accessible private outdoor living spaces that are designed to maximise sunlight, access, privacy, and amenity.

The development has been designed to ensure that the future residents have sufficient parking facilities with a clear circulation route of the proposed roads. Direct pedestrian access has been provided to the front entrances of the proposed residential units both from the internal new roading network and for the units facing onto Kāpiti Road as an opportunity to activate the street edge. This is an additional way for the development to enhance the amenity, functionality, and safety of the road edge, and create a positive relationship with the streetscape.

DO-012 | Housing Choice and Affordability: To meet diverse community needs by increasing the amount of housing that:

1. *is of densities, locations, types, attributes, size and tenure that meets the social and economic wellbeing needs of households in suitable urban and rural locations;*
2. *is affordable and adequate for lower income households; and*
3. *can respond to the changing needs of residents, regardless of age, mobility, health or lifestyle preference;*

while enhancing the amenity of living environments and contributing to the sustainability of communities and compatibility with the goals of environmental sustainability, in particular resource, water and energy efficiency.

GRZ-P9 | Residential Activities: Residential activities will be recognised and provided for as the principal use in the Residential Zones, while ensuring that the effects of subdivision, use and development is in accordance with the following principles:

1. *adverse effects on natural systems will be avoided, remedied or mitigated*
2. *new built development will relate to local built identity, character values and the density of the surrounding residential environment*
3. *transport choice and efficiency will be maximised*
4. *housing types which meet the need of households will be provided for*
5. *the number of residential units per allotment will be limited, and*
6. *a limited number of accessory buildings and buildings which are ancillary to residential activities will be provided for.*

Although a high-density development is not currently established within the immediate surroundings, it is considered appropriate use of the site to help assist with the struggling housing availability and affordability of the Kāpiti District and is becoming an increasingly common approach for inclusive and practical communities. Whilst it is considered that the existing site already contains a residential activity with an existing dwelling and accessory building, the proposed development enables a significant increase in housing types with various sizes and tenure to meet the social and economic wellbeing needs of households within the Kāpiti Coast region.

DO-013 | Infrastructure: To recognise the importance and national, regional and local benefits of infrastructure and ensure the efficient development, maintenance and operation of an adequate level of social and physical infrastructure and services throughout the District that:

1. meets the needs of the community and the region, and
2. builds stronger community resilience while avoiding, remedying or mitigating adverse effects on the environment

DO-014 | Access and Transport: To ensure that the transport system in the District::

1. integrates with land use and urban form and maximises accessibility;
2. improves the efficiency of travel and maximises mode choice to enable people to act sustainably as well as improving the resilience and health of communities;
3. contributes to a strong economy;
4. avoids, remedies or mitigates adverse effects on land uses;
5. does not have its function and operation unreasonably compromised by other activities;
6. is safe, fit for purpose, cost effective and provides good connectivity for all communities; and
7. provides for the integrated movement of people, goods and services.

The development is located on Kāpiti Road and is identified as a 'Major Community Connector' under the KCDC, which has a variety of different uses and zones throughout its entirety. Although the site is currently accessed off Kāpiti Road for the existing dwelling, this will be removed, and the vehicle access will be only through Halsey Grove to avoid any unwanted negative effects to the safety and efficiency of the current transport system.

The inclusion of multiple pedestrian links to Kāpiti Road creates a clear path to the various shops, education facilities and light industrial area, as well as a public bus stop 25m north of the site frontage and cycle lane shoulders on either side of the carriageway. Through these design measures, the development has an integrated movement for people within the site that is safe, fit for purpose, cost effective and provides good connectivity, improving the resilience and health of the community. The development then recognises the importance of an efficient social and physical infrastructure to maximise the transport mode choice and avoid adverse effects on the current transport system.

4.3 Streetscape Strategy and Guideline (Kāpiti Coast District Council – July 2008)

The Streetscape Strategy and Guideline was developed to set out the process and tools to establish a clear vision for different streets, the character of specific areas and to ensure a clear understanding of all factors affecting streetscapes and the impact streetscape design has on surrounding environments and choice of travel modes. The subject site property boundaries adjoin two different streetscapes, Kāpiti Road (Community Collector Road) and Halsey Grove (Local Road – Residential)

According to the KCDC Streetscape *Strategy and Guidelines 2008* Effective streetscapes add value to the community by providing:

- Health benefits (through greater pedestrian and cycle movements)
- Social benefits (through greater contact between people and enhancement of cultural awareness)

- Economic benefits (through greater exchange between people)
- Property value benefits (through the 'reflection' of adjacent qualities onto the desirability of a particular property)
- Environmental benefits (through reduced impermeable coverage and piped stormwater, vehicle emissions from less vehicle use, and carbon capture by street trees)

Kāpiti Road is identified as a community collector road which under the guidelines is characterised by high volumes of traffic with wide carriageways, cycle lanes, and flush medians to help fulfil the transport-related requirements of the street. As an attempt to provide an interface that activates the street edge with Kāpiti Road, the development seeks to provide priority for pedestrian's connectivity whilst minimising any vehicle movement or car parking presence. The existing street trees will be retained situated intermittently in front of the site, as well as proposed materials, colours, and façade design to break up the site frontage. The residential units front the road to create a more positive relationship and provide passive surveillance, whilst increasing streetscape amenity and safety.

Halsey Grove is a short residential local road that joins Regent Drive, to serve access to the surrounding residential neighbourhood. Under the guidelines, these streets are described as wholly residential, carrying predominantly local traffic. Halsey Grove and Regent Drive are to be the main form of vehicle access into the development and therefore the development seeks to continue this streetscape character into the site. The proposed continuation of Halsey Grove contains a road carriageway of similar width with pedestrian footpaths extending into the site on either side to create a safe pedestrian environment. These pathways continue through the entirety of the site, with various arrangements of planting and central green space to strive for an attractive streetscape.

5.0 Existing Landscape

5.1 Existing Site and Key Characteristics

Landscape character is a function of the landscape's visual expression. This includes elements that contribute to its appearance and the modifications which have occurred upon it. While assessing this proposal, it is important to consider the existing amenity values and character of the wider landscape as well as the relationship with geographical and natural features.

The Kāpiti Coast's natural and physical landscape is characterised by a high level of amenity, particularly within the urban environment. The subject site is located at 240 Kāpiti Road, towards the coastal town of Paraparaumu Beach, which is predominantly residential, however, south of the site are various shops and services, including as well as the light industrial area of Kāpiti. The site is within a suburban environment comprising of typical established residential properties, opposite the Kāpiti Airport. The properties located on all immediate adjoining boundaries are all zoned as General Residential and predominantly are residential housing apart from St Paul's Anglican Church neighbouring on Kāpiti Road. The urban fabric around the site is of a similar scale and pattern which is currently developed of a similar style. Opposite the site is Te Huarahi Raupo, a landscaped area that has fully established vegetated with pedestrian paths and acknowledges the history of the Kāpiti Coast, relationship to the journey of the waka and the Atua (Māori Gods) with five contemporary pou whenua that represent tangata whenua's strong ancestral bond and connections to the land.

Kāpiti Road extends in an east to west direction and forms the main route between Paraparaumu town centre and Paraparaumu Beach, whilst also facilitating a mix of residential, commercial and light industrial uses. Kāpiti Road is identified as a Major Community Connector in the Kāpiti Coast District Plan and is highly trafficked. In the immediate surroundings of the site, Kāpiti Road can be distinguished as having a pedestrian footpath on either side, large grass berms and established street trees (*Metrosideros sp.*) on the northern edge. Halsey Grove is a short road that connects to Regent Drive, providing a local road for the residential zone towards Kāpiti Road and the surrounding roading network. Currently, there is only one property assigned to Halsey Road and terminates where it meets the subject site, with no cul-de-sac or turning indicating the potential to extend as future development.

The site's existing vegetation varies from east to west. The western half of the site consists of a mixture of exotic and indigenous species, such as Austroderia/Toetoe, Blackberries and immature Pinus radiata. These species are typical of growing land cover after previous animal grazing and low-lying coastal areas. However, the eastern side is predominantly grassed with a couple of established trees. The entire site has an undulating topography but does not appear to have any obvious or significant bodies of water.

This image to the right is a focused aerial image of the proposed site location which is indicated by the blue outline. This demonstrates existing site conditions, including the proximity to the existing roading, nearby Kāpiti Airport, and the bordering residential areas.

Image: Aerial site plan and immediate surroundings with subject site outline in blue.

5.2 Relevant Landscape

The key landscape features that influence perceptions at a macro level of the overall character of the landscape surrounding the subject site can be summarised to include:

- The suburban fabric within a residential setting.
- The generally flat low-lying topography
- The proximity to the open grassed landing strip at the Kāpiti Airport and Te Huarahi Raupo

The landscapes character is further influenced by land use, land management, and development patterns including:

- The existing dwelling on the subject site
- Heavily used arterial road Major Community Collector Road (Kāpiti Road)
- Local Road (Halsey Grove/Regent Drive)

6.0 Landscape and Visual Effects

The proposal will be assessed on the following elements:

- Physical Landscape Characteristics
- Associative Landscape Characteristics
- Perceptual Characteristics

6.1 Physical Landscape Attributes (Natural & Human Features)

Generally, the topography of the surrounding areas is predominantly flat due to the highly developed residential areas and the Kāpiti Airport landing field. The subject site is distinctive in the fact that it does have varying topography with rolling mounds that add various heights within the landform, presumed to be influenced by the proximity to the coastline. There are no significant water bodies on the site, although there are two areas identified as a flood hazard for ponding. As part of the proposal, earthworks are intended to level off the site to ensure that there is suitable living space and access for the proposed units and an efficient circulation route for the proposed roading. Stormwater controls are proposed to ensure measures are in place for any resultant surface flooding, predominantly underground. Whilst this modification through earthworks may have an immediate visual impact and is still an important consideration, it is thought that if the internal rises in topography were retained, the existing internal grassed mounds would still be screened from the newly built forms along Kāpiti Road and Halsey Grove. It is then considered that due to the distance from the road frontages and the rolling nature of the landform, the alteration of topography within the site will visually have low effects.

Whilst the existing site is rather underdeveloped, the existing vegetation on site does not hold much importance regarding the quantity or quality or does not contribute significantly to the characteristics of the subject site. Of note, there is many Austroderia/Toetoe and various bramble in the lower western areas of the site as well some juvenile pine trees. The street frontage is lined with Agapanthus sp. as well as some larger exotic trees located in the centre of the site. Despite the plant palette being of interest, it is acknowledged that these pockets of existing vegetation will provide habitat and opportunity for ecological corridors. As a result of the proposal, all the existing vegetation on site is to be cleared. Appreciation is given, however, to the

existing street trees that line the northern face of Kāpiti Road that provide character to the area. Due to their well maintained and established nature, their presence in the streetscape is recognisable to the Paraparaumu area and are compact and dense in form. As there is no proposed change to these being out of the scope of the site, it is intended that due to their size, shape and form, they will provide screening to mitigate visual change and provide consistency to the streetscape of the area.

The existing rhythm of the built form, direction of the road, and land use contribute to the character of the roading in the area in the context of the streetscape and its relationship with the residential zone. The proposed development of this site is considered to be consistent with what is existing. Currently, Kāpiti Road has minimal vehicle entry and exit points from singular sites, with the majority, only having access from side roads such as Cedar Drive and Langdale Ave. This current character of Kāpiti Road is continued, with the proposed development only having vehicle access from Halsey Grove/Regent Drive. This will increase the number of users that would travel on Cedar Drive; however, this is already a connecting route for residents to access Kāpiti Road from Guildford Drive and other northern surrounding streets. The proposed development does however differ from the existing rhythm on Kāpiti Road through the southern units' front doors facing outwards onto the road frontage. Although this is a different dialogue from what can be found in that area of Kāpiti Road, it is not uncommon if you travel further to both the north and south ends of Kāpiti Road where the dwellings address the road facing the front. It is also an opportunity to activate the interface of the road edge and encourage a method of passive surveillance and connectivity. It is thought that due to the houses being setback with entry planting, this is not considered uncommon within the residential zone and would not adversely impact the character of the area.

The above commentary demonstrates the proposal's overall consistency with the surrounding environment and the existing land use conditions within the area. The increased density of the proposed development will generate temporary effects visually, however, as it is partially screened by the established street trees and the buildings setbacks from the road edge. The effects of this proposal are thought to be subjective and dependent on the sensitivity of the viewer, resulting in low-level effects visually, however it is not considered to have an overall negative impact on the landscape. On a macro scale, the existing neighbourhood is predominantly housing, being on the southern fringe of the residential zone, but the density and urban patchwork of the adjoining residential zone are greatly less than the proposed development.

6.2 Associative Characteristics (Relationship between People and Place - History, Identity, and Narratives)

The landscape has an unavoidable relationship between people and place being a perpetual process. This provides shared and recognised landscape values that give meaning, identity, and history to a place or area.

Historically, the Kāpiti Coast region was predominantly dune lands and described as a long thin coastal plain at the foot of the Tararua's with approx. 38km of coastline. The proposed developments site could be located on historic dune land but is approximately 1.2km from the Paraparaumu coastline. Although this is an aspect of the district's character which was significantly lost through colonisation and as the coastline was developed for residential purposes since the 1800', it is something that can also be celebrated and included within the proposed development through choice of materials, site planting and building form.

Te Huarahi Raupo is the public pathway and park located opposite the site on Kāpiti Road and is an area designed to represent Tangata Whenua's connection to the land and provide a reflective space for the community. The layout and composition of the site are designed to indicate two different journeys. The first is the blue path meandering through the site to represent the journey of the waka across the interior waterways that once dominated the Kāpiti landscape. Secondly, a spiritual journey with swirling 'eddies' and five contemporary pou whenua to represent tangata whenua's strong ancestral bond and connection to the land. A strong method to convey these messages within this landscape is the planting form and palette that is comprised of swirling coastal species that blend and merge to represent these swirling waterways. The development has an opportunity to integrate some of this vegetation with a similar planting species to continue this appreciation of the cultural landscape and connection of people to place.

Kāpiti Road has provided a link from State Highway 1 down to the Paraparaumu Beach township for many years, with the various uses along it changing and evolving. The northern end of Kāpiti Road that is predominantly residential can be summarised as an area with low-lying residential medium density housing with typical 'kiwi' backyards, single driveways and subsequent landscaping and vegetation. The subject site sits at the southern fringe of this area, with the zoning changing to 'General Industrial Zone' which has adapted to more of the town centre since the Kāpiti Expressway was completed in 2017. The General Industrial Zone frontage onto Kāpiti Road can be described as dominated by built form and hardscaping with minimal feature site planting, large-scale signage, cars (sales yards and parking), resulting in a character that is commercially dominating. As the site is located relatively close to the transition area between residential and industrial zones, it is considered that the increased density and built form for the proposed development that fronts Kāpiti Road are less visually invasive than if it was located centrally within medium density housing in the Residential Zone. The façade of the proposed residential units creates an interactive relationship with the street front and public footpath, having the front entries facing Kāpiti Road and multiple pedestrian connections into the site. This provides activation and transparency at the street edge and provides adequate setback and separation from the street edge, reducing visual impact or change to the streetscape character.

Another way for people to identify with the landscape is the land's ability to influence and facilitate how people have inhabited the land. Generally, as the properties get closer to the coastline, they begin to gradually decrease in density as they were developed earlier when there was less population to house. Higher density residential properties have been developed towards the township of Paraparaumu and the Kāpiti Expressway before slowly reducing again as they spread up to the foothills. As the proposed site is bordering the general industrial zone and nearing the Kāpiti Expressway, it is considered consistent with the surrounding area that is a patchwork of residential and industrial developments. Despite this, it is acknowledged that the form and function of the proposed development are still considered, but it is thought that the overall layout and change in site circulation is a directive outcome. The internal circulation and removal of vehicle crossings on Kāpiti Road reduce traffic volumes entering or exiting onto the community collector road and reduces the possibility of disrupting the current traffic flow, is more consistent with its current character, and it keeps all the future resident's movement directed to the local residential road.

6.3 Perceptual Characteristics (Sensory, Aesthetic/Beauty, Experiential)

More generally, the Kāpiti Coast region is known for its impressive coastline sweeping up to meet the Tararua Ranges. Its varied landscapes provide a fabric of flat plain lands hemmed in by mountain ranges and hills which are bordered by the rugged coastline.

Near the subject site and surrounding area is predominantly flat plains which creates a lack of any helpful visual landmark or point of wayfinding vertically, but opposite the site is the Kāpiti Airport which is visible from Kāpiti Road. The airport is predominantly an open grassed section with the main runway and the Wharemaku stream to the south. Due to the vast openness of the site, this exaggerates its presence and emphasises the flat nature of the nearby topography. This creates a mental map or visual queue as a viewer travels north on Kāpiti Road to almost signal a change from the industrial zone and emphasises the fringe of the Residential Zone. The subject site occupies an edge of the residential zone bordering the airport.

Kāpiti Road is considered as the 'main' road of Paraparaumu. The street edges are lined with various uses and zones spread from one end to the other that result in various user and vehicle movements. Kāpiti Road would most likely be experienced by people who work or live in the vicinity, customers or clients of various businesses, visitors to the area, or used as a thoroughfare to reach Paraparaumu Beach or Raumati. The movement is typically east-west, perpendicular to the old State Highway 1 and Kāpiti Expressway, with views being restricted within the road corridor due to the density of the current development and paired with the existing topography. Multiple junctions with various streets can be found dotted along the entirety of Kāpiti Road, with smaller local roads stretching mainly north to the Residential Zone.

The main visual change that would impact the experience surrounding the site, as previously mentioned, is the site's frontage onto Kāpiti Road. Although fleeting and infrequent, a viewing audience that will have a high number of observers are the users of Kāpiti Road. Despite this, it is thought that these views will be partially screened by the existing street trees that dominate the foreground of the viewpoints, decreasing attention from further afield, due to the trees being a consistent and contributing factor of the existing streetscape character.

6.4 Conclusion

It can be concluded that there is potential for temporary effects on the existing landscape and visual amenity due to the change in site frontage onto Kāpiti Road and the increased density of the proposed development only just starting to become a common housing approach within Kāpiti. It is thought, however, these effects will reduce over time as the site planting establishes, the existing street trees being retained, and the development becomes more familiar and a part of the context and character of the space. Overall, the long-term effects on the elements that make up the qualities of the existing landscape (physical, associative, and perceptual) will be low and the effects on the existing character will be neutral.

7.0 Visual Analysis Study

The proposal must be assessed with regards to context and scale in which it might be physically experienced, and the potential effects the proposed development may have. The proposal has been assessed from viewpoints surrounding the subject site and rated using the seven-point scale. Each viewpoint is representative of the public view in and around the identified locations. While the proposal is visible from most of the identified view locations, the effects will vary depending on the context in which they are seen, and the screening that is provided by several factors including existing topography, land use, and distance.

7.1 Visual Catchment

An initial desktop and site study was carried out to determine the potential visual catchment for assessment to identify key viewpoints. A site visit in combination with a desktop review was used to help identify 9 viewpoints, representative of a range of views available from and within the surrounding site. Factors that played a significant role in restricting continuous views of the proposal were predominantly the existing topography, limiting the ability to attain a broad view of the site. Therefore, the views captured are relevant to a typical viewer's perspective and limited to Kāpiti Road and Halsey Grove/Regent Drive.

The key findings (visibility) from the site investigation are:

- The proposed development is most visible near the site and along Kāpiti Road, however, are not considered to be unusual or what would be unexpected within this area.
- View's further north or south of the site on Kāpiti Road are more sheltered from visual impact due to the existing development, and vegetation.
- Views will overall result in a low visual impact in the long term, as the site absorbs potential change, and the increased density of the development becomes more commonly accepted.

The visual effect of the proposed development has been assessed from the viewpoints surrounding the site, using the standard seven-point scale as detailed in section 2.0 of this report. Each viewpoint is representative of the public view in and around the identified locations. Views from the wider landscape are limited, with most available views restricted to within the road reserve of Kāpiti Road and Halsey Grove/Regent Drive.

7.2 Viewing Audience and Location Plan

The potential viewing audience was identified to likely comprise of:

- Residents of nearby dwellings
- Local motorists travelling along Kāpiti Road as a thoroughfare to reach Paraparaumu Beach township or houses.
- General Industrial Zone workers
- Passengers arriving/departing from Kāpiti Airport

Several potential viewpoints were investigated during the preparation of this report. Nine viewpoints were selected for review, based on existing views, viewing frequency, viewer types, and availability of the view from public or private properties. The below image is a location plan with the site location outlined in blue and publicly accessible viewpoints indicated in yellow.

Image: Site location with relevant viewpoints (Appendix 3.0)

7.3 Visual Analysis Commentary

VIEWPOINT	DESCRIPTION	EFFECT LEVEL	EFFECT
1/ Typical view of vehicle/pedestrians, heading south-east on Kāpiti Road (looking towards site)	Viewpoint 1 is located northeast of the site, just south of the entrance to Seven Oaks/Lodge Drive. From this view, due to the neighbouring properties along Kāpiti Road and the existing street trees, the view up to the site frontage is completely obstructed. The distance of the viewpoint being at a significant length away from the site also means that any visual change would not be distinguishable and therefore there will be a neutral visual impact and have a very low effect on the landscape character.	LOW	NEUTRAL
2 / North-east of the site, south of Cedar Drive, on Kāpiti Road (looking south-east towards site)	Viewpoint 2 is a view that would be typical of a pedestrian walking south on Kāpiti Road or a vehicle exiting Cedar Drive. This view is approximately 40m from the site edge and demonstrates the screening role the existing street trees play in limiting the visual impact any changes to the site may have, paired with the bus stop, existing site vegetation and the overall distance of the viewpoint. The elements of the site visible from this point are the existing vehicle crossing that is to be removed and the very fringe of the existing vegetation along the site boundary. The proposed double-storey built forms are setback from the road boundary but have their front	LOW	NEUTRAL

	doors, entry paths and entry paving facing the road. It is then assumed that the user may potentially have fleeting views from this area, however, would be in the background and not take precedent from this viewpoint. It is also considered to not be out of character for a Residential Zone and the existing streetscape has the visual absorption capacity, resulting in a neutral visual effect and an overall low effect on the landscape character.		
3 / View on Kāpiti Road from the northeast corner of the site frontage (looking east towards site)	This viewpoint is the first direct view of the site for users travelling south down Kāpiti Road near the site. From this view it is considered that the proposal will be somewhat visible, however, is not considered to be an unexpected land use of this area and is thought the existing street edge has the visual absorption capacity to reduce the impact over time as viewers become familiar with the development. The existing street trees in the foreground are being retained and will partially screen the development, which will also be assisted by the proposed boundary planting that will increase the 'blurring' of the built form as they establish over time. The streetscape will incur a visual change due to the development, however, the visual effects are considered temporarily moderate due to the increased site density, reducing to a low effect as the viewer becomes more familiar with the development as residential activity will still be found either side of the site and therefore is not out of character for this area.	LOW – MODERATE (TEMPORARY)	NEUTRAL
4 / Pedestrian users of Kāpiti Road heading north on the footpath (looking north towards site)	This viewpoint is specific to those pedestrian users of Kāpiti Road heading north-east as it is out of the direct view of vehicles travelling south-east, therefore having a lower viewing audience than the previous viewpoints on the northern edge of Kāpiti Road. The existing street trees occupy most of the forefront of the view and screen a large portion of the property edge that extends beyond the tree. This demonstrates that although the material change will create a visual change, the built form will be seen in the background of the view. The impact of the development is reduced due to the street trees dominating the foreground, including setbacks and the proximity to the road edge. The existing boundary planting also demonstrates the capability of vegetation being able to soften the introduction of the built form allowing integration into the site. Although there is a secondary footpath proposed, there is new boundary/entry planting to be implemented that is sympathetic to the area and can blur the boundary line, allowing the site to absorb some of the impact and change. This vegetation will also continue to distinguish the public vs private threshold.	LOW – MODERATE (TEMPORARY)	NEUTRAL
5 / South-east of site, north of Langdale Ave (looking north-east towards site)	From this view, the continuation of the street tree planting to the south of the site demonstrates the ability to absorb some of the potential changes to the site edge. The spacing of these established trees increases as the viewer moves further south, also increasing the screening capabilities, occupying the majority of the forefront of this view. The existing boundary planting onsite in the background of the viewpoint continues to reduce the visual impact by blurring the threshold between public and private areas. Although the proposal modifies this edge through the removal of existing vegetation, earthworks, and the proposed new built form and entry planting, it is assumed that similar principles can be applied. The current street planting is shown in this view to be able to screen a large portion of the site behind, demonstrating the ability to be able to absorb and mitigate potential effects which will be a neutral visual effect with a low effect on the landscape character. Also visible from this viewpoint is Te Huarahi Raupo (the public park/walking track opposite the site). This area provides an opportunity for the site to use a similar planting palette to continue the same language and integrate the proposed development edge into the existing environment.	LOW	NEUTRAL
6 / Typical view of vehicles/pedestrians on Kāpiti Road heading north-west	The image provided for this viewpoint is representative of what might be the fixed view from Kāpiti Road users heading north-west both on foot and in a vehicle.	LOW	NEUTRAL

(looking north-west towards site)	The layering of the site's edge is very prominent from this view, with the existing street trees dominating the forefront visually. Due to the angle and spacing of the trees, the canopy foliage creates almost a solid visual barrier to the subject site behind, with only fleeting views within the lower tree and trunk areas. These views are further softened through the site boundary planting, providing the opportunity for this to be used as a mitigation measure in the proposal to minimise visual impact and soften the change of built form through new site boundary planting. The visual type from this viewpoint is neutral, with a low effect on the landscape character, assisted by the street tree screen and mitigation entry planting which will increase as the planting establishes.		
7 / View south of the site on Kāpiti Road, from Te Huarahi Raupo (Looking north-east towards the site)	This viewpoint is located opposite the site, facing towards the southern corner and is indicative of views of those users in Te Huarahi Raupo (the adjacent public park or Kāpiti Road). From this viewpoint, the site is quite visible with an example of windows of fleeting views between the screening street trees. Currently, the street front and site edge take precedent visually, due to the site mainly being grassed with various existing site plantings. It is thought that the change of site density may hinder this visual hierarchy with the built form and hardscape materials being more prominent than the existing softer background components. Whilst this will create a change visually, it is thought that this will only be temporary as the site absorbs the new development.	MODERATE (TEMPORARY) - LOW	NEUTRAL
8 / View north of the site on Kāpiti Road, from Te Huarahi Raupo (Looking north-east towards site)	Viewpoint 8 is located opposite the site on Kāpiti Road, indicative of viewers from Te Huarahi Raupo. It is thought that from this view, the site will be visible and the existing dwelling within this viewpoint hints at the potential contrast of built form at a lower scale within the screening of the street trees. Therefore, the level of effect at this point will temporarily be considered moderate due to the increased density of built forms on site. This would be concentrated mainly to the road edge as the height of the proposed residential units will avoid further views into the development, with the pedestrian paths providing glimpses. This level of effect will diminish over time and reduce to a low-level effect as the existing and proposed planting establish and the viewer becomes accustomed to the new built form's presence. Whilst this will be a visual change, to begin with, it is not considered that these new units will have a negative impact as they use standard building materials and forms and therefore is assumed to have a neutral impact on the streetscape character.	MODERATE (TEMPORARY) - LOW	NEUTRAL
9 / View from Regent Drive, facing down Halsey Grove to the site (Looking south-west towards site)	This viewpoint is indicative of vehicles travelling south on Halsey Grove, pedestrians using the adjoining footpath on Regent Drive or a fixed view by neighbouring properties. From this view, it is considered that the proposal will be most visible, as the site continues the roading layout of Halsey Grove into the site as the main form of vehicle access. Halsey Grove was constructed with a blunt end adjoining the site with no obvious cul-de-sac or 'end' and therefore the proposed extension into the site could be viewed as an expected change. It is then considered that although the initial change will be obvious, and have moderate visual impacts, these will be temporary and reduce to low as the existing streetscape absorbs and blends to accept the new extension of Halsey Grove. The proposed continuation of the road will give the existing road purpose and allow for circulation, turning and increased parking opportunities. Visually it will provide direction and avoid the current situation of a 'dead-end' and could then be considered to have a neutral-positive visual change.	MODERATE (TEMPORARY) - LOW	NEUTRAL-POSITIVE

While there will be a temporary 'moderate' effect from various viewpoints, this will be short-lived as site vegetation establishes and the site absorbs the change. Overall, it is considered that the effects on the surrounding environment will be neutral, with visual effects from these key vantage points being low.

7.4 Visual Absorption Capability

One of the main factors that will influence visual effect is the visual absorption capacity of the surrounding landscape. This is the ability of the landscape to integrate the proposal into its existing visual character without significant change.

The visual absorption capability is an indication of the extent to which the activity is likely to alter the existing character of the landscape or area within which it will occur. Where the intended change is consistent with the relevant policy and rule framework, such change is more likely to be deemed acceptable. Where contrary to the policy and rule framework, such change may be deemed less acceptable, and the level and type of effect considered in detail.

When determining the site's visual absorption capability, the factors considered include:

- The degree to which the proposal is visible
- Expectations around the type of activity achievable under the relevant planning provisions (permitted baseline)
- Visual and physical links with other similar elements or activities in the landscape
- The level of modification to the surrounding landscape (short and long term)
- Appropriateness of scale
- Distance
- Backdrop

The existing elements around the site that provide an opportunity for visual absorption are the existing street trees, the proximity to the site, and the site's location and limitations to where the proposed development can be viewed.

The existing street trees can be found on the northern side of Kāpiti Road stretching between Hurley Road down to the light industrial area. The rhythmic placement of these established trees paired with the successful maintenance of their health and form provides an integral part of the character of the streetscape in this area. This provides an opportunity to ensure that the development responds to the important nature of the street character. By retaining such a vital part of the streetscape, the street trees provide the opportunity to partially screen the built form creating fleeting windows of opportunity to view the development. They also provide the chance to blur and soften the site boundary, with the development implementing edge planting that complements and works alongside these native trees to increase the visual absorption capacity that they provide.

The nature of Kāpiti Road means that the existing berms are wider than typical local roads. These grass berms, paired with the setback of the proposed built form result in the residential units being rather distant from the public road edge and footpath. With the existing berm and proposed setback, the distance from the existing footpath to the proposed buildings is approximately 8.5m which is significantly greater than a typical local road. The increased proximity provides greater distance to public viewpoints and would provide a level of visual absorption capacity as it is reducing the development's visual presence on Kāpiti Road.

The proposed development and built forms surrounding topography are flat plains, restricting the amount of publicly accessible viewpoints. This lack of change in topography and the surrounding land use, allows the proposed built form to be absorbed and integrated into the surrounding area. This means that the main visible elements of the proposal are the interface with Kāpiti Road and Halsey Grove. Although the existing interface will be changing because of the proposal, both road frontages are part of the residential zones under the KCDP and therefore the changes are not considered uncommon and the visual impacts will be reduced through existing site visual absorption capacities and proposed mitigation solutions set out in section 8.

7.5 Existing Situations

Increased density and townhouse developments are becoming a more common approach to new residential housing in the Kāpiti Coast District. Although the surrounding neighbourhood of the proposal is lower density and this townhouse approach has not been used often in the past, several recent developments with this nature can be found within the area of the proposal. With the increasing population and growing demand for various housing options, townhouse developments offer a compact way of living whilst still providing adequate outdoor living and car parking.

384 Kāpiti Road | Waterline Villas

This development is also located on Kāpiti Road, 1km north of the subject site and contains seven 3-storey townhouses that have individual car garaging and outdoor living. The Waterline Villas are nearing the end of construction and are visible from the road, with a large blank wall with cedar cladding and one vehicle access.

55-57 Maclean Street

This recently advertised development is comprised of 16 'boutique' apartments. Whilst no indicative renders have been released of the street view, the internal images show multi-story townhouses/apartments with a range of outdoor amenity options and what looks to be internal garaging.

10 Trieste Way | Florian Kāpiti

Whilst this development is located further away, it is still within Paraparaumu and of a similar size, layout, and density to the proposal. The indicative renders for Florian Kāpiti also do not show the interface with Trieste Way, however, it is also composed of townhouses and subsequent outdoor living areas with an internal roading network providing vehicle access, circulation, and car parking.

8.0 Mitigation Measures and Recommendations

The primary outcome of a visual and landscape assessment is to ensure that the proposal is implemented whilst avoiding or mitigating adverse effects. As part of this, the following mitigation measures and recommendations are provided to assist in ensuring any potential effects are low:

- Proposed site planting should be of a similar palette to vegetation existing in the area and suitable to the coastal conditions to ensure the planting establishes to assist in mitigating visual change. This planting palette should also be used to enhance and retain characteristics of the coastal environment to assist in improving and encouraging local flora and fauna ecosystems. It is considered appropriate that the amount of existing planting along the site boundary to Kāpiti Road is the minimum amount of planting to be re-established as part of the proposal.
- A management plan or similar could assist in implementation measures, vegetation management and maintenance to ensure that the interfaces particularly visible from publicly accessible viewpoints continue to add and increase to the streetscape amenity and character.

9.0 Conclusion

Publicly accessible views of the proposed development have been identified and are predominantly located within the Kāpiti Road corridor as well as Halsey Grove. The viewpoints have demonstrated that the distance, existing street trees, and surrounding character mitigate potential effects and the visual impact is considered low.

From various viewpoints demonstrated, the effects will range from low to a temporary 'moderate-low', with the long-term effects being low as the surrounding streetscape absorbs the proposed visual change and the higher density development becomes more familiar and common over time.

The landscape has the capacity to absorb and accommodate this proposed development as it is in line with what is expected within the residential zone and is necessary to accommodate the increased population and growing demand for housing variety. Whilst it is a significant increase in density from the current situation, the proposal is still respectful of the overall characteristics and values of the area and is not considered to have an overall negative impact.

In summary, DGSE considers that with the proposal's intent to address and activate the interface with Kāpiti Road whilst adapting and continuing the character of Halsey Grove, the overall design of the proposal, will have low adverse visual and landscape effects on the character of the proposed site and surrounding environment, and to this effect, effects in relation to visual amenity and visual outlook can be considered neutral.

Yours faithfully,

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APPENDIX 1.0 – SITE VIEW PHOTOS

Kāpiti Road Frontage




Halsey Grove/Regent Drive Frontage


Kāpiti Road Streetscape

Facing Southeast

Facing Northwest

Facing Northwest towards existing dwelling and vehicle crossing

APPENDIX 2.0 – VISUAL SIMULATIONS
(*Note. Visual simulations are indicative only and not to scale)

Built form along Kāpiti Road

Pedestrian connection link to proposed development

Development entry into Halsey Grove

Streetscape Context Representation – Northern Kapiti Road Frontage

Streetscape Context Representation – Southern Kapiti Road Frontage

Streetscape Context Representation – Halsey Grove Frontage

APPENDIX 3.0 – VISUAL ANALYSIS PHOTOS

VIEWPOINT 1 | Typical view of vehicle/pedestrians, heading south-east on Kāpiti Road (looking towards site)

VIEWPOINT 2 | North-west of the site, south of Cedar Drive, on Kāpiti Road (looking south-east towards site)

VIEWPOINT 3 | View on Kāpiti Road from the northeast corner of the site frontage (looking east towards site)

VIEWPOINT 4 | Pedestrian users of Kāpiti Road heading north on footpath (looking north towards site)

VIEWPOINT 5 | South-east of the site, north of Langdale Ave (looking north-east towards site)

VIEWPOINT 6 | Typical view of vehicle/pedestrians on Kāpiti Road heading north-west (looking north-west towards site)

VIEWPOINT 7 | View south of the site on Kāpiti Road, from the adjacent public park (Looking north-east towards site)

VIEWPOINT 8 | View north of the site on Kāpiti Road, from the adjacent public park (Looking north-east towards site)

VIEWPOINT 9 | View from Regent Drive, facing down Halsey Grove to the site (Looking south-west towards site)

Appendix 12
Urban Design Statement

Cuttriss
Surveyors. Engineers. Planners.

240 KAPITI ROAD
PARAPARAUMU

URBAN DESIGN ASSESSMENT

21 February 2022

For: Gresham Trust

Prepared by: Urban Acumen Ltd

urban
acumen

CLIENT
Gresham Trust

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This document is provided in support of a resource consent application to develop 139 dwellings and associated lots on 240 Kapiti Road, Paraparaumu.

It provides background information and design rationale and through illustration and assessment of the proposed design outcomes, demonstrates the design commitment to achieving good residential amenity at higher density.

This large site is located in the General Residential Zone (Proposed District Plan), and given the nature of the proposed residential, the Kapiti Coast District Council Medium Density Housing Design Guide (Appendix D1.1) is considered an appropriate assessment tool. Whilst this guide is focussed on developments with an average density of between 250m^2 and 350m^2, it does provide relevant guidance for higher density housing typologies.

Assessment is also made with reference to the content of Appendix 6.9 of the Proposed District Plan, Centres Design Principles.

The proposal is the result of a collaborative design process between project team members, during which urban design input has been provided and adopted.

This desk-top report and review should be read in conjunction with other documents included in the consent application, particularly the architectural drawing package and landscape plans.

01
location

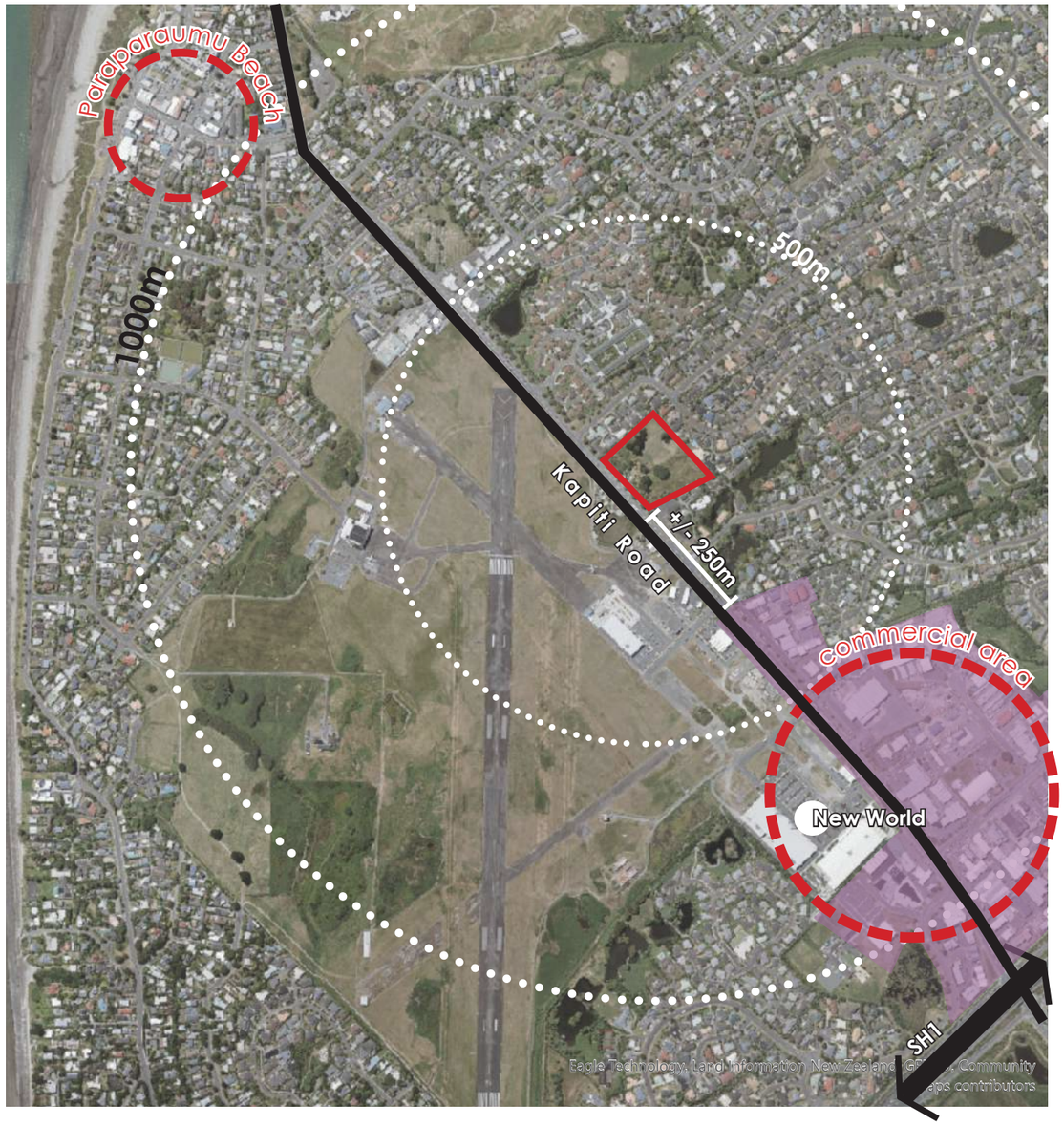


Fig 1 Site Aerial (Kapiti Coast GIS) 1:1500 @A4

02
the site

The site is a grassed, almost square portion of land, measuring approximately 1.9ha. There are some earth mounds and mature trees on the property, along with some minor structures which will be removed.

It has a significant frontage to Kapiti Road which is a busy connector road with relatively high traffic volumes. It also has a regular bus route which connects to shops and train station.

Fig 2 Site Aerial (Kapiti Coast GIS) 1:1500 @A4

03
context

Kapiti Road functions as the primary address for the site. It is a busy road adjacent to the airport, with open vistas in both directions and has public footpaths and on-carriageway cycle lanes on both sides. Public parking is provided along the eastern/site berm. Mature pohutukawa trees line the site's frontage at regular intervals.

Across Kapiti Road is the landscape art installation, Te Huarahi Raupo, a garden with four pou acknowledging the local tangata whenua and providing a place for reflection.

Access to the site is also provided from Regent Street, along Halsey Grove which is a road stub anticipating extention into the site. The Halsey Grove/Regent Steet intersection has contrasting brick patterns in the carriageway which serve to indicate entry and slow traffic.

The surrounding environment is characterised by low density detached housing, predominantly of single storey, although there are a few double storey units.

Halsey Grove/site entry

Kapiti Road looking north

Kapiti Road looking south

Pohutukawa trees along berm

New pedestrian crossing/refuge

Fig 3 Location

04
site analysis

The site is a good opportunity for residential infill. It is large enough to establish a strong "micro-neighbourhood" as well as internalise any potential negative effects on adjacent neighbours.

The key contextual site opportunities as they relate to urban design are described as:

- good location relative to public transport and access to wider services and destinations
- good access to cycle paths on Kapiti Road
- good street frontage/profile to Kapiti Road and proximity to Te Huarahi Raupo
- mature street trees along Kapiti Road provide amenity and opportunity to balance scale of new development
- good outlook over airport
- opportunity to create a central amenity space as a focus for the development
- opportunity to create pedestrian priority and good physical and visual links to Kapiti Road
- level change across the site enables some units to be raised above street level which promotes privacy and outlook

The constraints to design and development include:

- access restrictions along Kapiti Road (no vehicle intersections) and result need to enter and exit from Halsey Grove only
- need for Kapiti Road to be a clear "front", i.e. have front doors, good elevations without vehicle access from Kapiti Road. Note there is street parking along Kapiti Road
- minor level change along Kapiti Road to be managed with respect to providing safe and universal access to those units
- street trees in rear berm which limit potential pathways to units

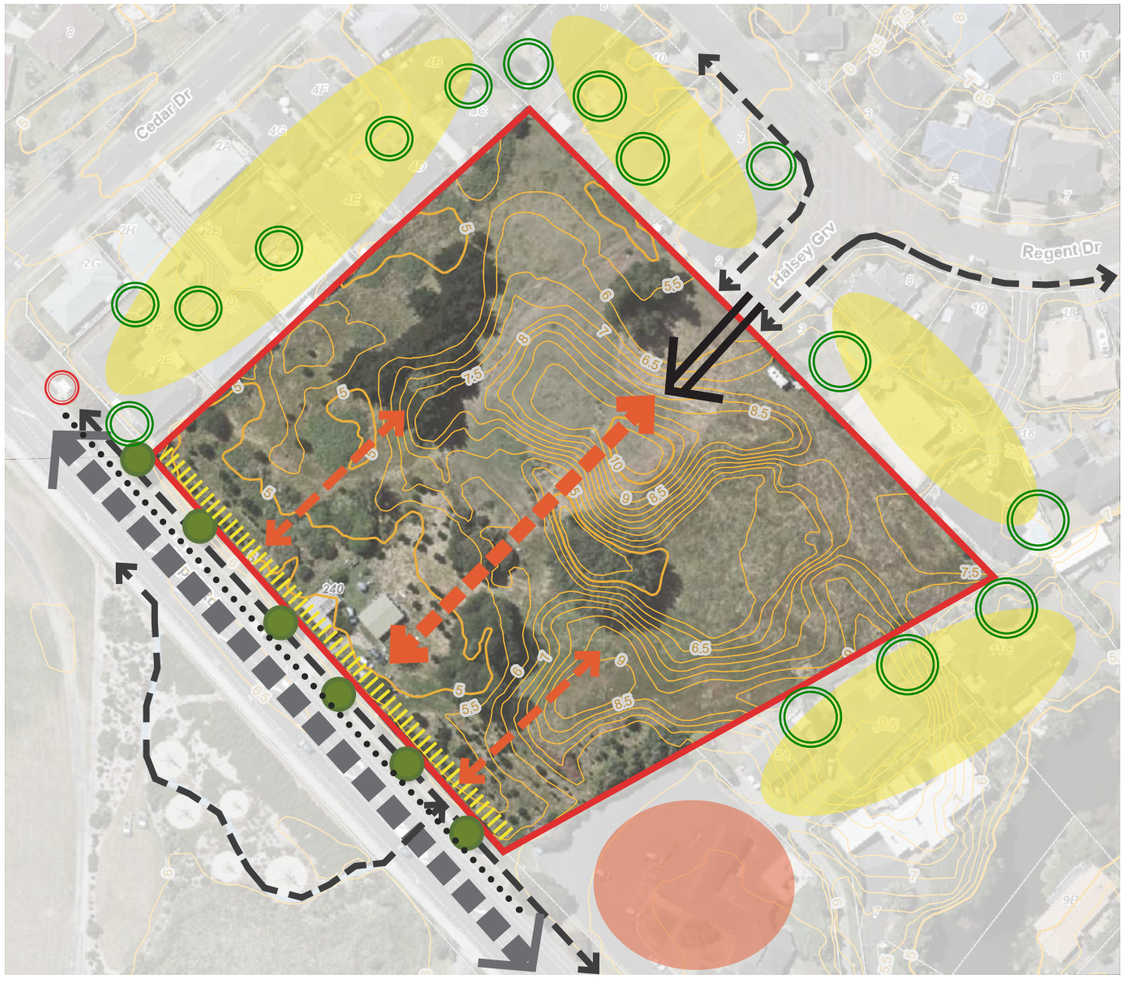


Fig 4 Site Aerial (Kapiti Coast GIS) 1:1500 @A4

05
the proposal

The proposed development includes 139 two storey terrace houses in 18 blocks, arranged around the perimeter of the site and grouped around a central shared open space with 170 car parking spaces The units are either 2 or 3 bedroom typologies and include minor variations in plan and elevation in response to location in the block. The design aesthetic is modern/contemporary and urban in character, with little/no front yards and simple building forms, relieved by the three dimensional articulation of the front and rear facades and variation in the roof lines.

main pedestrian entry from Kapiti Road

view looking east along pedestrian spine

view over central open space

Fig 5 Development Proposal in Context 1:1500 @A4

06
design outcomes + assessment

Using well recognised urban design best practice and informed by the Medium Density Housing Design Guide and relevant principles contained within Appendix 6.9 of the Proposed District Plan, the following design outcomes are assessed:

- access, circulation and parking
- building form, language and components
- external interfaces
- internal interfaces
- outdoor living spaces
- privacy
- solar gain
- servicing
- amenity and character
- legibility and wayfinding
- landscaping

6.1 ACCESS, CIRCULATION AND PARKING

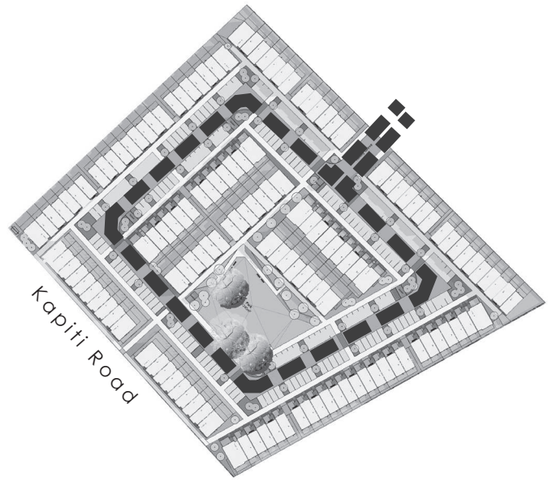
Vehicles

Due to traffic constraints on Kapiti Road, the site is accessed by car only from Halsey Grove. An internal local road loops around the site and returns to Halsey Grove, avoiding the need for cul-de-sacs. The route is efficient and minimises necessary area for vehicles. As a loop, it avoids the need for reverse manoeuvring. This route provides access to car parking along its length, removing the need to have additional parking manoeuvering space (and associated hard surfacing) and promoting a slow speed environment.

There is sufficient parking for residents and visitors which reduces the risk of pressure on Halsey Grove/ Regent Dive to accommodate additional street parking. Parking is also available along this side of Kapiti Road.

Car parks are located to have good proximity to the front doors of units and are overlooked by habitable room windows which promote safety of cars.

The parking areas are softened with trees and car parks are differentiated from the carriageway by a concrete dish channel.



vehicle access and parking

Pedestrians and cyclists

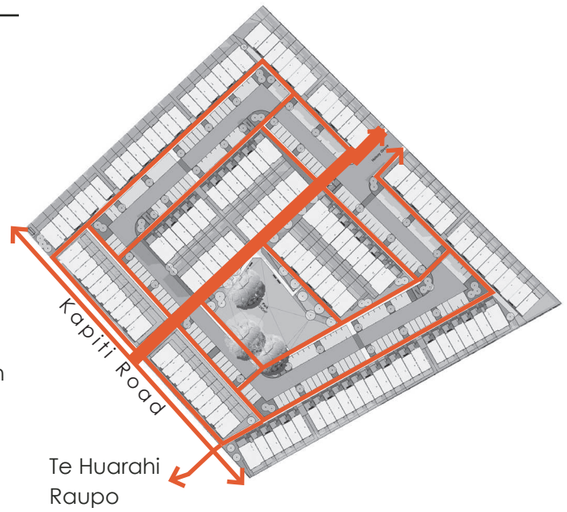
Pedestrian safety and convenience has been delivered through a connected footpath network which is separated from the vehicle carriageway.

The primary pedestrian spine connects Kapiti Road and Halsey Grove as a direct and straight line with good sightlines and maximum convenience. The remaining network provides through out the development and access to units. Direct and convenient connection is also made to the pedestrian crossing point over Kapiti Road to Te Huarahi Raupo. Footpaths also follow the perimeter of the shared open space, maximising connection to it.

The pathway network is not interrupted by driveway crossings, garage doors do not dominate the street elevations and there is no reverse manoeuvring over footpaths. Front doors are clearly visible from both vehicle and pedestrian routes. Clear and safe pedestrian links between the car parks and the units are provided, as well as demarcated crossings which provide access to the wider development.

Along the Kapiti Road, a new footpath provides access to the front doors of units which front it. This enables the existing street trees to be undisturbed by connecting paths across the berm. It also enables level changes to be accommodated without problematic steps in the berm or across the property line. In this way accessibility is safe convenient and universally accessible.

Contrasting surface material at pedestrian crossing points improve legibility and safety and also assist with speed reduction and appropriate driver behaviour. This slow speed environment is also supportive of safe cycling.



pedestrian network

6.2 BUILDING FORM, LANGUAGE AND COMPONENTS

(Please refer to renders in the architectural drawing package)

The building forms are simple, efficient and economical. Whilst the maximum number of units in any on block is twelve, the number of blocks divides the built form along the streetscape. The length of the buildings is relieved by the modulation/projection of components in the front facades as well as colour changes at various intervals. This helps to differentiate units from each other, provides shadows and a sense of movement and rhythm and also breaks the roof line when viewed from ground level. Front doors are clearly legible and sheltered. The architectural language is simple and contemporary. Materials provide colour variation, texture and accentuate the verticality of the units, helping to balance the horizontal blocks. The material and colour palette is narrow and includes complementary natural colours which have contrast.

The application of materials and colours helps to differentiate each unit from its neighbours. End-of-terrace units are different/wider, have projections which wrap around the corner and windows in their side elevations to provide surveillance and visual interest to the street/corners.

6.3 EXTERNAL INTERFACES

Kapiti Road

(Please refer to renders in the architectural drawing package)

Kapiti Road is the primary address for this development and it responds by actively fronting the street with front doors, habitable room windows and interesting facades. Units are located close to the street boundary with narrow front yards. The landscaping, additional footpath, and wide rear berm with existing Pohutukawa trees provides the transition from the carriageway/moving cars to units. Side light windows at front doors provide some visual connection/surveillance of Kapiti Road while maintaining internal privacy for units. Surveillance/outlook over Kapiti road is provided by large bedroom windows at first floor level. Outdoor areas for Kapiti Road units is provided at the rear, away from the busy road and airport.

Landscaping along the Kapiti Road frontage softens the buildings at ground level, provides visual interest and opportunity for residents to personalise their units. There is a small level change along this frontage, with minor cut along the boundary (less than 500mm).

The modulation of the facade and roof forms along Kapiti Road provide a visually interesting streetscape, with each unit clearly expressed and providing significant glazed areas. Where new side elevations adjoin Kapiti Road (Units 1 and 78), these units have windows in these elevations and additional landscaping. Privacy fencing for the outdoor areas of Units 1 and 78 is set back, preventing any high fencing along the property boundary.

The development will provide new and striking “infill” along the Kapiti Road frontage, responding to Te Huarahi Raupo and the overall variety of this long road.

ADJACENT RESIDENTIAL INTERFACE

All other site boundaries adjoin existing residential development. Where levels across the external boundaries are relatively similar, privacy fencing of 1.8m height is proposed. On the northern boundary, there are timber retaining walls of less than 1m, with 1m fencing on top. This limits the combined height of walls and fencing to ensure a good outlook for units.

Units along the southern boundary have their main internal and external living spaces located on the north side which reduces potential loss of privacy for adjacent neighbours along this interface. For all other blocks, outdoor space is located between the units and the external site boundary, pushing new units away from these boundaries.

6.4 INTERNAL INTERFACES

FRONT YARDS

The units all front onto the shared slow speed circulation space which accommodates a footpath to provide direct and legible access to all units. The function of the rooms fronting the shared circulation space responds to the orientation of the unit. For example, units which have font doors to the south, have kitchen windows overlooking the street and north facing garden spaces at the rear. Units which are north facing, have living rooms at the front/adjacent to the street in order to maximise solar gain in indoor and outdoor living spaces. In this condition, these units are raised above the level of the street in order to promote their internal privacy and increase outlook and surveillance.

With respect to the interface with the shared open space, adjacent units actively front onto this space, there is no fencing around it and as such, it has an open aspect with surveillance provided from both moving cars, pedestrians and adjacent habitable rooms.

The developed has been designed to require very little fencing along shared spaces. The front yards accommodate planting to add amenity to the overall development, along with variety and the opportunity for residents to personalise their homes. Where private open spaces are located in front of units in order to ensure solar gain (e.g. Units 54 to 78), rendered concrete walls provide privacy. The elevation of the patio spaces (500mm) above footpath level promotes surveillance over the shared space as well as some internal privacy.

Units which front Kapiti Road as the primary address (Units 79 to 97) are also accessed from internal loop road, are essentially "double-fronted" and have to work hard to balance privacy and surveillance on the loop road. In this instance, these boundaries have low fencing (1.2m high) and generous landscaping to provide a transition between the footpath and the private space.

SHARED SPACES

Internal privacy and surveillance over the shared circulation space is balanced through the use of vertical windows adjacent to the front doors.

Amenity and safety in the pedestrian routes are delivered through soft landscaping and passive surveillance from habitable room windows on adjacent units. Shared landscaped areas are overlooked from habitable room windows on surrounding units to promote safety and social interaction.

The proposed park area is located to enjoy maximum views into and through the space and also connect to the main pedestrian connection between Halsey Grove and Kapiti Road. It has pedestrian routes along all sides, specimen trees are located on the perimeter to keep the central areas flexible and able to accommodate a variety of uses. Seating and lighting provide opportunity for residents to socialise.

6.5 OUTDOOR LIVING SPACES

All units have private outdoor spaces that are directly accessible from primary internal living spaces, providing indoor-outdoor flow. These spaces are compact, accommodate the required living court dimensions and are appropriate given the small size of the units. Three bedroom units generally have greater outdoor areas, anticipating greater family sizes and providing choice in the development.

Outdoor spaces for two bedroom units are typically around 20m^2. Units which have living spaces to the front typically have 13m^2 of outdoor space. Whilst these spaces are small, it is noted that they are free of all service areas (washing lines etc.)

Outdoor areas are located to achieve a northerly aspect as much as possible, given the constraint of the circulation pattern. All outdoor areas are a regular, level and of functional shape. With the exception of outdoor areas located to the front of dwellings, all spaces can accommodate a clear 4m diameter circle. While outdoor spaces on the front of dwellings accommodate stairs, entry pathway, retaining walls and planters, they still have sunny patio areas capable of accommodating outdoor furniture and have good outlook over the loop road. In these units, supplementary open space at the rear accommodates service areas, keeping the patio at the front free of washing lines, storage sheds etc.

Side boundaries are demarcated with full height fencing to ensure privacy and screen washing lines etc. Individual service areas for washing lines and storage are integrated within these spaces and located away from the primary sight lines from the living room.

6.6 PRIVACY

There is a clear demarcation between shared space and private space. All front doors are located in areas that are clearly public while (with the exception of north facing units) private outdoor spaces are located to the rear of dwellings. Where outdoor spaces are located alongside the central loop road (either to achieve sun or because they need to front Kapiti Road), privacy is promoted by either raising the level of the unit (and outdoor space) or using landscaping. In the case of Units 98 to 110, the internal and external living spaces are located such that they are not overlooked by the adjacent block to the south (Units 111 to 123). This condition is also utilised for Units 124 to 132.

6.7 SOLAR GAIN

(please refer to the architectural drawing package for sun studies)

The majority of units have good northerly access and potential for solar gain in both internal and external living spaces. Units have open plan dual aspect living areas at ground floor to maximise the potential for solar gain. Large areas of glazing on facades (living rooms and bedrooms) maximise solar gain. Where units are north-facing, outdoor space has been located at the front of the dwellings to ensure sunny patio areas.

6.8 SERVICING

The looped circulation system enables service and delivery vehicles to access the development without the need for reversing which improves safety. The loop and two-way carriageway allows for the temporary stopping of loading/delivery vehicles without preventing access to the remaining parts of the development.

The communal refuse storage areas are located in convenient places and are easily accessible by both pedestrians and vehicles. They are screened from shared spaces by fencing and soft landscaping and do not negatively impact on the amenity of either the pedestrian route or adjacent private outdoor spaces.

6.9 AMENITY AND CHARACTER

The aesthetic of the development is clearly urban and establishes a modern/contemporary character. With the exception of the Kapiti Road frontage, the development is self-contained and has little impact on adjacent residential streetscapes. The proposed built form along Kapiti Road clearly indicates its residential use and integrates with the variety of uses and building forms along the road.

The hard surfaces are softened by tree planting and other soft landscaping. Specimen trees break up parking areas and soften elevations while balancing the scale of the blocks.

Local identity is promoted through the provision of the central park. Its's size provides for informal ball play and the seating areas foster social interaction.

Building materials are high quality, contemporary and low maintenance. Detailing is clean and simple and the materials have colour variation on both front and rear elevations as well as visual texture to ensure visually interesting elevations.

6.10 LEGIBILITY AND WAYFINDING

The development is clearly legible for both drivers and pedestrians due to the looped circulation system and extensive and logical pedestrian network. The central direct pedestrian spine linking Kapiti Road and Halsey Grove invites people into and through the development and improves pedestrian permeability in the wider neighbourhood.

The side elevations of blocks have full height habitable room windows, variation in facade materials/ components to maximise passive surveillance and visual interest.

All units have clearly visible front doors and numbers in order for visitors or deliveries.

Specimen trees help to identify the entries and central/primary pedestrian spine.

6.11 LANDSCAPING

The proposed landscaping is generally low maintenance and low growing. Native specimen trees add scale and shade while plant beds add colour and texture. Planting in front yards, along pedestrian paths and in car park areas have complementary species which together provide variety in scale and texture. Artificial grass in rear yards provides a low maintenance option while ensuring good outlook from living spaces.

Pedestrian paths in exposed aggregate contrast with asphalt surfaces for vehicles.

Timber fencing at various heights is proposed to ensure privacy between units. Rendered concrete walls are used in combination with concrete retaining walls in front yards to integrate with front facades and provide a high quality architectural feel. Bins stores are screened with timber fencing and planting.

07
conclusion

The proposal to develop 139 dwellings on the site incorporates best practice urban design and is consistent with the outcomes sought by the Medium Density Housing Guide and Appendix 6.9 of the Proposed District Plan.

Overall and in summary, the proposal:

- provides for a more sustainable use of a significant land resource in close proximity to public transport infrastructure, supermarket and community services
- extends the range of living options in the wider neighbourhood and promotes housing affordability
- strongly fronts and activates Kapiti Road, establishing a clear address and identity
- responds sensitively to adjacent residential boundaries
- provides active frontage and passive surveillance of internal shared spaces while ensuring privacy for residents
- improves pedestrian permeability in the wider neighbourhood
- promotes legibility and a strong a sense of address for all units
- promotes social interaction between residents and a sense of community/ownership
- uses good architectural and landscape design to deliver interesting facades and high amenity shared spaces
- provides high amenity indoor and outdoor living spaces

Prepared by

urban acumen

Appendix 13
Integrated Transport Assessment

Cuttriss

Surveyors. Engineers. Planners.

240 Kapiti Road Residential Development, Paraparaumu

INTEGRATED TRANSPORT ASSESSMENT

PREPARED FOR: GRESHAM TRUST | FEBRUARY 2022

Stantec

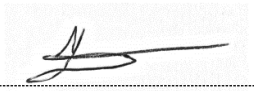
Revision Schedule

Rev No	Date	Description	Signature of Typed Name (documentation on file)			
			Prepared by	Checked by	Reviewed by	Approved by
0	31/01/2022	Draft for client comment	NJ	JW	MGG	MGG
1	14/02/2022	Final	NJ	JW	MGG	MGG

Quality Statement

Project manager	Project technical lead
Jamie Whittaker	Mark Georgeson

PREPARED BY

Niro Jayananthan  11 / 02 / 2022

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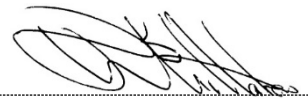
Jamie Whittaker  14 / 02 / 2022

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1 Introduction

Stantec has been commissioned by Gresham Trust to examine and describe the effects of a proposed new residential development located off #240 Kapiti Road (the "**Site**"), in Paraparaumu.

The proposed development plans provide for the construction of 139 townhouses supported by 170 on-site parking spaces and a community park.

This Integrated Transport Assessment (**ITA**) forms part of the resource consent application for development of the Site, and has been progressed with due regard to the rules and standards of the Kapiti Coast District Plan (**District Plan**) and other relevant industry standards. The ITA has been prepared accordingly, to set out and describe:

- the existing local road network and associated existing transport demands;
- the transport related components of the proposal;
- the parking demand expected at the site and arrangements to accommodate this;
- the proposed access arrangements, and description of the mitigation measures proposed to appropriately accommodate site traffic;
- the traffic generated by the proposed development and associated effects on the performance and safety of the surrounding road network;
- the particular servicing demands anticipated at the site; and
- assessment against the relevant transportation rules and standards of the District Plan.

By way of summary, it is demonstrated that with the adoption of the recommendations proposed, the new residential development can be appropriately and safely accommodated within the surrounding transport environment.

2 Existing Transport Environment

2.1 Site Location

The proposal Site is located at #240 Kapiti Road, as illustrated in **Figure 1**, and is zoned 'General Residential' under the District Plan. The Site has frontage to, and access from, both Kapiti Road and Halsey Grove. For the purposes of this report, Kapiti Road is referred to as running generally east-west.

Figure 1: Site Location (Background Image Source: Kapiti Coast District Council GIS)

Access to the strategic State Highway 1 (**SH1**) route is readily available via a grade-separated interchange on Kapiti Road, to the east.

Land use in the immediate vicinity of the Site is predominantly residential, with the exception of the Kapiti Coast Airport which is located immediately opposite the Site on the southern side of Kapiti Road.

Further east along Kapiti Road, land use becomes 'industrial' around the new SH1 interchange. Paraparaumu town centre is located around 2.2km east of the Site, whilst Paraparaumu Beach is around 1.2km to the west.

2.2 Roading Hierarchy

Kapiti Road is classified as a 'Major Community Connector' in the District Plan, as shown in **Figure 2**, and therefore has the major function of providing connection between significant centres of population.

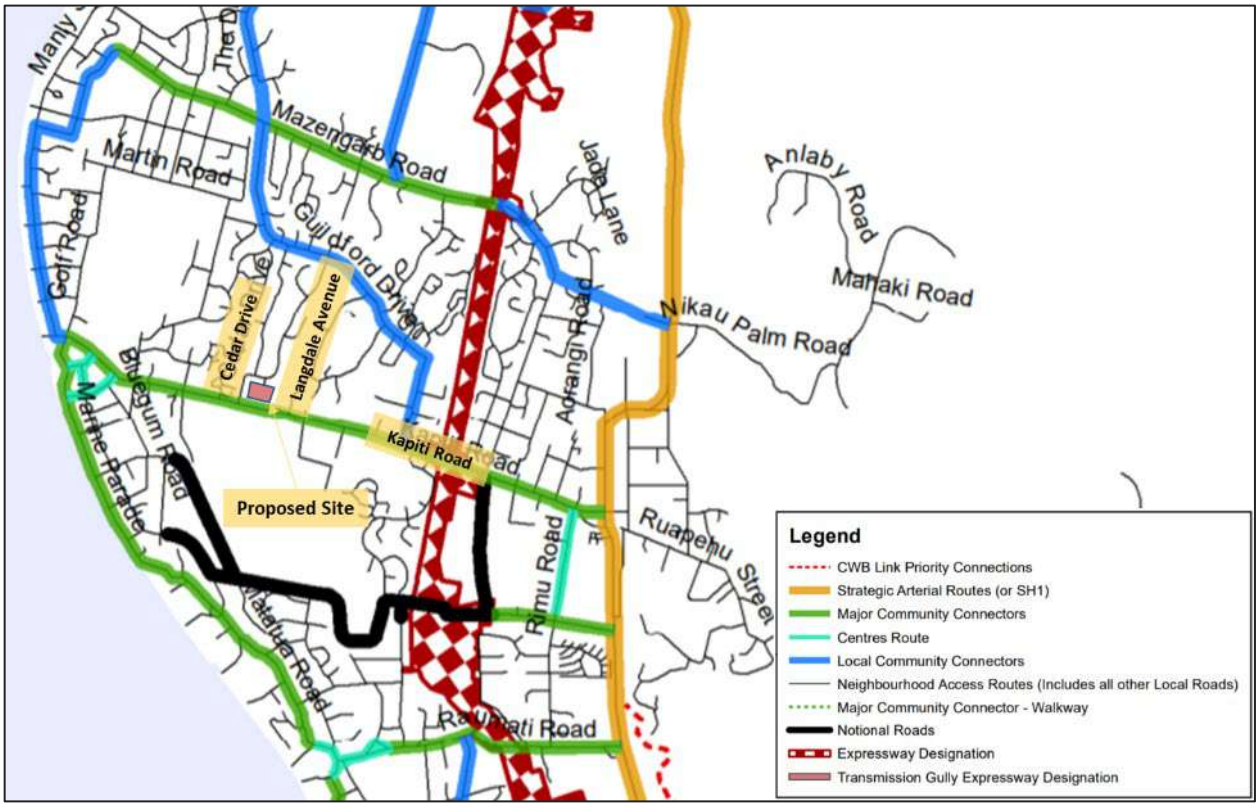


Figure 2: Road Hierarchy Map (District Plan)

Cedar Drive and Langdale Avenue intersect Kapiti Road to the east and west of the Site, respectively. Both are classified as Local / Neighbourhood Access Roads and provide access between Kapiti Road and the wider residential area north of the Site, with each in turn connecting to Guildford Drive ('Local Community Connector').

Halsey Grove, which is also classified as a Local / Neighbourhood Access Road, is a short 'no exit' cul-de-sac accessed off Regent Drive, which itself connects off Cedar Drive. Halsey Grove adjoins the Site's northern boundary, although there is no formal sealed access to the existing property at present.

Halsey Grove and Regent/Cedar Drive will serve as the principal access routes to the Site.

2.3 Road Environment

2.3.1 Kapiti Road

As described earlier, Kapiti Road runs generally east-west providing a link between Paraparaumu Town Centre, the SH1 interchange, and Paraparaumu Beach. It is predominantly a two-lane road (single traffic lane in each direction) with a 14-15m wide carriageway. Localised widening is provided at key intersections to accommodate additional turn lanes.

Kapiti Road in the vicinity of the Site has a posted speed limit of 50kph and comprises a painted central median, on road cycle lanes, and kerbside parking on the northern side of the carriageway only (broken yellow lines prohibit parking on the southern side of the road). A shared path is provided on the southern side of the road, whilst a footpath and grass berm are located on the northern side adjacent to the Site. These roading characteristics are illustrated in the photographs included at **Figure 3**.

Figure 3: View east (left) and west (right) along Kapiti Road

There is provision for kerbside parking on the northern side of Kapiti Road between Cedar Drive and Langdale Avenue, with some instances of broken yellow lines demarcating a bus stop and the existing access driveways that the serve the development Site.

2.3.2 Cedar Drive

Cedar Drive connects between Kapiti Road and Guildford Drive and comprises a two-lane road (single lane in each direction) with a posted speed limit of 50kph. The carriageway is approximately 9m wide, has a painted centreline, and accommodates kerbside parking on either side of the road. Narrow grass berms and footpaths are provided on both sides of the street, as shown in **Figure 4**.

Figure 4: View north (left) and south (right) along Cedar Drive

Cedar Drive intersects with Kapiti Road at a give-way priority-controlled t-intersection, with priority given to traffic on the latter. A right-turn bay on Kapiti Road provides for right turning traffic to wait, clear of westbound through traffic.

2.3.3 Regent Drive

Regent Drive links between Cedar Drive and Guildford Drive and is a two-lane road (single lane in each direction) with a posted speed limit of 50kph. Similar to Cedar Drive, the carriageway is around 9m wide, with grass berms and footpaths provided on either side of the carriageway, as illustrated in **Figure 5**.

Figure 5: View east along Regent Drive (left) and at the Halsey Grove Intersection (right)

The t-intersection of Cedar Drive and Regent Drive is a give-way priority control t-intersection, with traffic on the west approach (Cedar Drive) and east approach (Regent Drive) having priority.

2.3.4 Halsey Grove

Approximately 60m east of the Cedar Drive intersection, Regent Drive intersects with Halsey Grove at an uncontrolled t-intersection. Halsey Grove is currently formed as an approximately 40m long 'no exit' cul-de-sac, and provides vehicular access to the two adjacent residential properties at #2 and #3 Halsey Grove. Halsey Grove has an 8m wide carriageway, with kerbside parking (between access driveways), grass berms, and footpaths on either side of the street. These roading characteristics are illustrated in **Figure 6**.

Figure 6: View north (left) and south (right) along Halsey Grove

2.4 Existing Site Access

There are two established access driveways that serve the Site off Kapiti Road positioned approximately 25m apart, as shown in **Figure 7**. Of these two crossings, the first provides the primary access point to the Site's existing single residential dwelling, whilst the other connects into the adjacent area of paddock.

Figure 7: Existing Site Access from Kapiti Road

The current Halsey Grove carriageway terminates at the Site's northern boundary, where an existing wooden fence and gate provide access into the development property, as illustrated in **Figure 8**.

Figure 8: Access to Development Site from Halsey Grove

The proposal plans provide for this existing access from Halsey Grove to be formally sealed and used as the primary access point to the proposed residential development. The proposed new main access will be formed and sealed to an appropriate standard, as described in detail at Chapter 6.

2.5 Current Traffic Patterns

Annual Daily Traffic (**ADT**) volumes in vehicles per day (**vpd**), along with associated heavy vehicle proportions, have been sourced from Waka Kotahi's Mobile Road traffic tool for the key routes in the vicinity of the Site, as summarised in **Table 1**.

Table 1: Local Traffic Volumes

Road	Source	Count Date	ADT (vpd)	Heavy Vehicle (%)
Kapiti Road (between Cedar Drive and Langdale Avenue)	Mobile Road	May 2021	20,120	5%
Guildford Drive (between Manhattan Court and Regent Drive)	Mobile Road	June 2020	4,360	6%
Cedar Drive (between Kapiti Road and Regent Drive)	Mobile Road	July 2021	1,550	1%
Regent Drive (between Cedar Drive and Halsey Grove)	Mobile Road	March 2021	790	5%

In addition to the above, week-long tube count surveys along Kapiti Road[1] and Cedar Drive[2] were obtained from Kapiti Coast District Council (**Council**), to better understand existing daily traffic patterns, volumes, and operating speeds on the adjacent roads.

The hourly traffic volume data (by direction) along 'Kapiti Road' and 'Cedar Grove' is illustrated graphically in **Figure 9** and **Figure 10**, respectively.

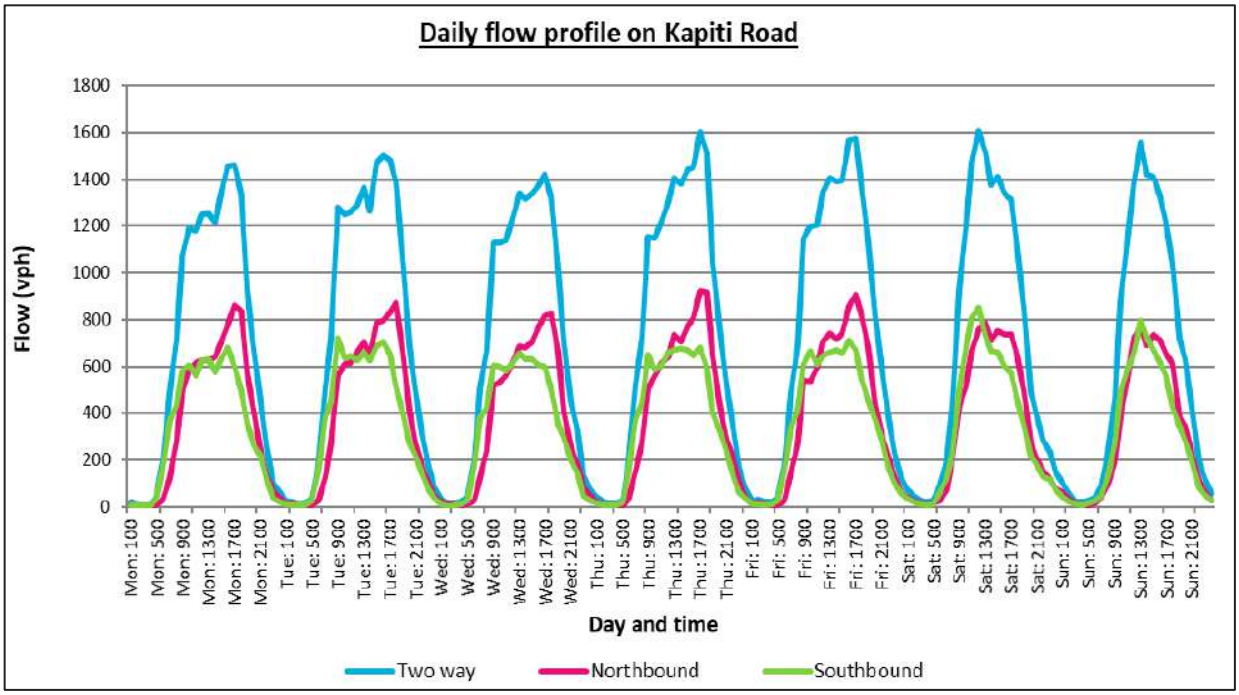


Figure 9: Daily Traffic Volumes on Kapiti Road

As shown in **Figure 9**, two-way traffic volumes on Kapiti Road during weekdays indicate a distinct peak in the evenings around 5pm, involving on average around 1,500 vehicles per hour (**vph**). Outside of this commuter peak, two-way hourly volumes on this part of Kapiti Road generally sit around 1,200-1,300vph through the middle of the day, reflecting its nature as a 'Major Community Connector '.

In addition to count data, the classified tube counter also recorded vehicle speeds. This indicates 85th percentile 'operating' speeds on Kapiti Road between Friendship Place and Lodestar Place, of 47kph in the eastbound direction (travelling away from the Site) and 51kph in the westbound direction (travelling towards the Site).

[1] Tube count data obtained for the week ending 25th November 2020 between Friendship Place and Lodestar Place

[2] Tube count data obtained for the week ending 16th July 2021 between Regent Drive and Kapiti Road

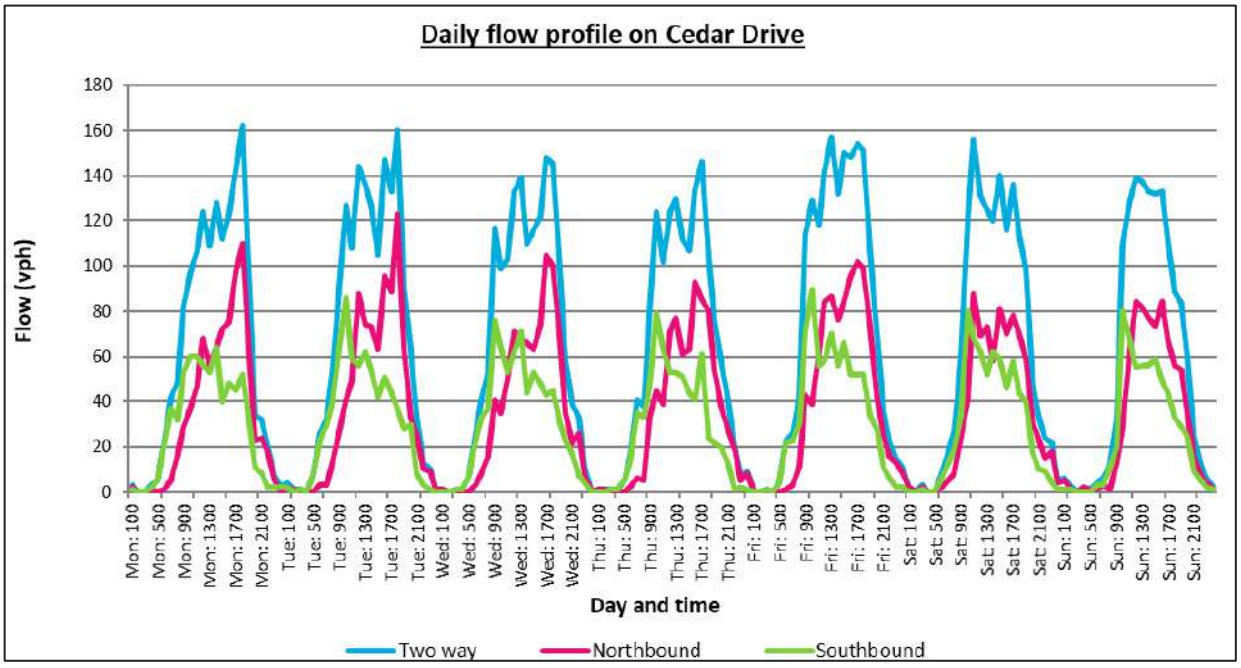


Figure 10: Daily Traffic Volumes on Cedar Drive

Figure 10 shows two-way traffic volumes on Cedar Drive during weekdays show a distinct peak in the evenings around 5pm, involving on average around 140-160vph. Outside of this peak, there are also noticeable peaks around 9am and noon. These observed traffic volumes sit well below the capacity of a Local / Neighbourhood Access Road.

The classified tube count data indicates 85th percentile 'operating' speeds on Cedar Drive (between Regent Drive and Kapiti Road) of 50kph in the southbound direction and 49kph in the northbound direction.

Given these volumes and the corresponding hierarchies, it is appropriate that access to the Site be achieved from Cedar Drive (via Halsey Grove), as proposed, rather than Kapiti Road.

2.5.1 Kapiti Road / Cedar Drive Intersection

To determine the current peak hour traffic flow for the primary road network connection at the intersection of Kapiti Road / Cedar Drive, a turn count survey was undertaken during typical weekday AM and PM peak periods, capturing all vehicle movements, as summarised in **Table 2**.

Table 2: Surveyed Peak Hour Traffic Movements at Kapiti Road / Cedar Drive Intersection

Approach	Movement	AM Peak	PM Peak
Kapiti Road (West)	Left	8	25
	Through	513	460
Cedar Drive (North)	Left	46	25
	Right	22	9
Kapiti Road (East)	Through	462	76
	Right	32	792

As shown, traffic turning to and from Cedar Drive during both the AM and PM peaks is strongly weighted towards the east, reflecting commuter trips to and from the SH1 interchange and town centre.

Site observations at the Kapiti Road / Cedar Drive intersection during the classified turn count survey include:

- queues for the right-turn in and right-turn out of Cedar Drive were no more than 2 vehicles in the AM peak and 3 vehicles in the PM peak;
- average delays for the right-turn out of Cedar Drive was around 10 seconds in the AM peak and 20 seconds in the PM peak;

- some right-turning vehicles from Cedar Drive were observed to turn into the flush median and then wait for a suitable gap to enter the westbound traffic flow (i.e. undertaking a 2-stage right turn manoeuvre); and
- traffic volumes along Kapiti Road in both the westbound and eastbound direction were around 15% lower than recorded during Council's tube count monitoring in November 2020. As set out at Section 7.2, the intersection modelling analysis reported provides for the measured intersection volumes to be factored by 15%.

2.6 Road Safety

A search of the Waka Kotahi 'Crash Analysis System' database has been undertaken for the purposes of reviewing the road safety in the vicinity of the Site for the most recent complete five-year period from 2017 to 2021. The search area is illustrated in **Figure 11** and includes Kapiti Road between Cedar Drive and Langdale Avenue (including the intersections), and the lengths of Cedar Drive and Regent Drive between Kapiti Road and around 50m east of Halsey Grove. This area was considered to be the relevant extent for which movements to/from the proposal site will be concentrated.

Figure 11: Crash Locations Map (2017-2021)

A total of four crashes have been recorded within the search area between 2017 and 2021, as detailed in **Table 3**. All four of these crashes resulted in minor injury, with two including cyclists and one a moped.

Table 3: Summary of Accident Record

Location	Date/Time	Severity	Description
Intersection of Kapiti Road and Cedar Drive	Tuesday 8th June 2021, 2:30PM	Minor injury	Westbound vehicle on Kapiti Road has turned right into Cedar Drive and failed to notice and give-way to a crossing cyclist.
Midblock along Kapiti Road	Sunday 14th November 2021, 11:47AM	Minor injury	Eastbound moped on Kapiti Road rear-ended a vehicle which had suddenly braked when a vehicle pulled out of Langdale Avenue.
	Wednesday 3rd April 2019, 10:05AM	Minor injury	Westbound vehicle on Kapiti Road has hit a vehicle which pulled out from an illegally parked spot (on broken yellows) without giving way.
Intersection of Kapiti Road and Langdale Avenue	Monday, 21st January 2019, 7:50PM	Minor injury	A vehicle turning left from Langdale Avenue to head eastbound along Kapiti Road has failed to notice and give-way to a cyclist. Sunstrike noted to be a causal factor.

As shown, only one accident has been recorded at the intersection of Kapiti Road and Cedar Drive, through which the majority of Site traffic is expected to route. This crash resulted in a minor injury as a vehicle failed to notice and give-way to a cyclist.

Overall, from the analysis above there is nothing to suggest from these records that there are patterns of existing safety concerns that would be exacerbated in respect of the current proposal. Notwithstanding, it is recommended that the green coloured surfacing of the cycle lane at the intersection of Kapiti Road and Cedar Drive is re-surfaced across the entire length of the crossing to improve delineation and visibility of cyclists.

2.7 Sustainable Transport

There is an existing footpath and shared path as well as cycle lanes (on both sides) on Kapiti Road, within proximity of the Site. On the northern side of the road, the footpath is set back behind a berm whilst the cycle lane is accommodated between the kerbside parking and traffic lane. On the southern side of Kapiti Road, the cycle lane runs within the road shoulder and there is no provision for kerbside parking.

Cycle lane crossings at Cedar Drive and Langdale Avenue are supported by continuity lines across the intersection and instances of green coloured surfacing, to highlight the potential presence of cyclists to drivers, although these markings are now due for renewal in some locations.

Bus stops accommodating local route 260, which runs between Raumati Beach, Paraparaumu Beach and Paraparaumu rail station, are situated on Kapiti Road either side of Cedar Drive. These stops are within 30m of Cedar Drive and within a 5-minute walk of the Site and Halsey Grove.

2.8 Programmed Future Works

A review of the various Council infrastructure and asset management plans shows there are currently no scheduled works for Kapiti Road or the other connecting routes in the vicinity of the Site.

In terms of the strategic network, of note is the Waka Kotahi Mackays to Peka Peka expressway, which was opened in 2017. The revocation process of the old state highway is currently in progress, with corridor improvements underway to ensure the road is ‘fit for purpose’ before being transferred to the management of Council. These works are largely focused around the old state highway near Paraparaumu town centre, and hence, are not expected to have an effect on the transport environment adjacent to the Site.

3 Development Proposal

3.1 Existing Site Use

This existing Site is currently occupied by a single residential dwelling, with the balance of land given over to predominantly pasture for livestock.

3.2 Proposed Development

The proposal seeks to develop the Site to provide for 139 residential townhouses, as shown in the proposal plans included in **Appendix A**. The development plans include the following:

- 120 two-bedroom townhouses;
- 19 three-bedroom townhouses;
- 170 on-site car parking spaces;
- 6 centralised refuse collection areas;
- a local community park; and
- supporting walkways to facilitate pedestrian connectivity to, through and within the Site.

All vehicular access to the Site will be achieved via Halsey Grove. Pedestrian/cycle connections to Kapiti Road at the southern end of the Site will provide direct access to the associated footpaths and cycling provision on this key 'Major Community Connector' route.

The Site will be supported by a total of 170 on-site car parks. Access and parking has been designed with consideration of the District Plan and relevant industry standards, including 'AS/NZS2890.1:2004 Parking Facilities Part 1: Off-street car parking' (**AS/NZS2890.1**), as described in more detail in Chapters 5 and 6.

4 District Plan

The development Site is zoned 'General Residential' within the provisions of the District Plan, and an assessment of the proposal's compliance with the relevant transport rules and standards has been undertaken, as described in **Table 4**.

Table 4: District Plan Compliance Assessment

Standard	Requirement	Compliance
Part 2 – District-Wide Matters: Transport		
TR-R2	Vehicle movements 1. N/A 2. In all other zones, any activity must not generate more than 100vpd, except extractive activities that are provided for as a restricted discretionary activity under EW-EXT-R13.	**Does not Comply -** the proposed development is expected to generate more than 100vpd. Accordingly, this transport assessment has been prepared to examine the associated traffic impacts of the development which, as further detailed in Chapter 7, will not result in any adverse safety or capacity effects on the surrounding transport network.
TR-R3	Site access and loading for vehicles 1. Access – every site must provide vehicular access over land or by mutual right of way or service lane for parking and/or loading and shall be in accordance with TR-Diagram - 2. 2. Access – all vehicle accesses must be designed, constructed and maintained to ensure that: a. they are able to be used in all weather conditions; b. they have no adverse impact on the roadside drainage system; and c. surface water and detritus does not migrate onto the highway pavement. 3. Access – all accesses must meet the following: a. be a minimum of 3.5m wide, except for as set out in TR-Table 1. b. be a maximum of 9 metres wide. 6. Access spacing – at intersections carrying traffic volumes of 1,000 vehicles or more in any peak hour, no part of a crossing point must be located within 30 metres of an intersection. 7. Access spacing – where a site is located near an intersection having less than 1,000 vehicles per day in any peak hour, the minimum distance between the crossing point and the roadway edge or kerb must be: a. 9 metres measured from the intersecting point of the kerb lines or road edge whichever is greater, and b. 12 metres where a "Stop" of "Give Way" control exists on the roadway measured from the intersecting point of the kerb lines or road edge lines. 8. Access spacing for major traffic activities – no crossing point must be located closer to any intersection than the distance specified in TR-	**Complies** – vehicular access to the Site will be via Halsey Grove, with access to individual units and parking within the development achieved via private Rights-of-Way (**RoW**). **Complies** – the Site's RoWs will be formed and sealed with appropriate drainage systems to avoid the collection of surface water and detritus. **Complies** – the initial section of the RoW connection to Halsey Grove is 8m wide, whilst the balance of RoWs within the Site have been designed to a 5.8m width. The proposed design thereby satisfies the minimum and maximum standards set out in TR-Table-1. **Does not Apply** – Vehicle access to the Site will be via an extension of the established Halsey Grove cul-de-sac, noting the adjacent Halsey Grove / Regent Drive intersection carries less than 1,000vph. **Complies** – Vehicle access to the Site, which extends off the end of the established Halsey Grove cul-de-sac, is located approximately 35m from the adjacent intersection of Regent Drive. **Complies** – as per above, the Site access is located approximately 35m from the nearest

	Table 2. Distances are measured in metres to the intersection kerb line. 9. Access spacing sight distances – the required minimum sight distance between the access and the road must be in accordance with TR-Diagram 3 and TR-Table 3. 12. Manoeuvring – a. Private residential access – unless the driveway accesses directly from a Neighborhood Access Route, sufficient manoeuvring space must be provided on-site to ensure no reversing onto the road is necessary. 15. Landscaping – all landscaping adjoining the road boundary of subject sites, must be designed and maintained so that visibility to and from the crossing point complies at all times with the minimum standards sight distances set out in TR-Table 3.	intersection of Halsey Grove / Regent Drive, thereby satisfying the 15m minimum requirement for a Neighbourhood Access route. **Technical Non-Compliance** – sight distances for vehicles exiting the Site extend along the full length of Halsey Grove to its intersection with Regent Drive (approximately 35m). Whilst this is less than the required 50m for access onto 50kph local roads, the Site access will form a continuation of the current Halsey Grove carriageway, with vehicles egressing the Site afforded ample sight distance to the adjoining Regent Drive intersection. **Complies** – sufficient manoeuvring space is provided within the Site's RoWs to enable vehicles to turn on-site, removing the need for any reverse manoeuvres to/from Halsey Grove. **Will comply** – landscaping will be arranged and maintained to avoid obstructing visibility at crossing points on Halsey Grove.
TR-R4	<u>Design and layout of vehicle parking for all activities</u> 1. All parking must be formed, marked out and maintained for use in all weathers. 2. Surface water originating from the parking area must be managed without adversely impacting other properties either upstream or downstream of the development subject site. 3. Vehicles using the parking area must only use the formed vehicle access point (crossing point) to enter and exit the vehicle parking areas.	**Complies** – parking spaces will be formed to an all-weather sealed surface, with access to/from the Site's parking areas provided via the Halsey Grove connection only. Surface water will be adequately accommodated for in the engineering design.
TR-R6	<u>Heavy trade vehicle access</u> 1. Heavy trade vehicle accesses, including those for milk tankers and stock trucks, must be designed and constructed to carry the volume and weight of traffic likely to use the access and shall be designed in accordance with TR-Diagram 4. 2. The surface of a heavy trade vehicle access must be constructed to the same standard as the adjoining road carriageway. This requirement must be deemed to have been complied with if the first 12 metres of the vehicle access, measured from the near edge of the carriageway, is so constructed. 3. Heavy trade vehicle accesses must be designed and constructed so that no heavy trade vehicle has to cross the road carriageway centre line when making a left-turn.	**Complies** – the Site's proposed vehicle access and RoW circulation routes have been designed to accommodate a large rigid truck (10.5m length), which provides for rubbish/recycling, residential deliveries and emergency services to visit the Site. Further detail on provision for service vehicle access and internal manoeuvring is described in Chapter 8.
TR-R9	<u>New roads including where they are to serve a subdivision</u>	**Technical non-Compliance** – Provision for cyclists is provided for within the RoW carriageway, noting these laneways have been

	2. Cycle paths must be provided either as on-street cycle lanes, off-street shared paths or off-street dedicated cycle paths.	designed as a slow speed environment where vehicles and cyclists can safely coexist. In addition, the proposal plans include footpaths on either side of the RoW carriageways, along with dedicated pedestrian connections that link through the Site and with the adjacent public road network on Halsey Grove and Kapiti Road.
TR-R10	Vehicle movements that do not meet the permitted activity standards under TR-R2 (therefore deemed a major traffic activity). 2. A Transport Assessment and a Travel Plan must be prepared by a suitably qualified person and submitted to Council with the application for resource consent.	The proposed development will generate more than 100vpd and is therefore considered a restricted discretionary activity under TR-R2. Accordingly, this transport assessment has been prepared to examine the proposal's traffic and transport effects on the adjacent transport network. Given the residential nature of the proposed development, a specific Travel Plan has not been prepared however, a number of measures are set out and described at Section 5.4 that will assist in managing vehicle demands at the Site.
Parking:		
TR-R19	Residential activities: 1. A minimum of 2 carparks (including garages or carports) per residential unit.	**Does not Comply** – the proposed development includes 139 townhouses supported by 170 parking spaces. This is less than the minimum requirement of 2 carparks per residential unit. An assessment of the Site's anticipated parking demand is set out in detail in Chapter 5, which draws from surveyed parking demand from an established analogous medium density typology development, alongside a review of the current utilization of kerbside parking within a short walk of the Site, to demonstrate the adequacy of the proposed parking provision.

As shown, the development proposal aligns well with the traffic and transport provisions of the District Plan in satisfying each of the relevant standards, with the exception of the minimum on-site car parking and vehicle movement threshold (deemed a major traffic activity). The technical non-compliances relating to sightlines for vehicles at the Halsey Grove access, and provision for cyclists within the development, are discussed in Table 4 above and later at Chapter 6, noting that neither are assessed as generating any adverse safety impacts.

With respect to parking, it is noted that the car park provision for the Site has been determined by demand measured at comparable medium density residential developments around the Wellington region[3]. In addition, kerbside parking utilisation surveys have been undertaken within the adjacent streets, to identify the quantum of existing residual capacity that could accommodate any overspill demand from the Site. Further detail on this parking rationale and assessment is set out in Chapter 5, and demonstrates that any parking demand generated beyond the Site can be adequately accommodated within the available nearby kerbside resource, and without impacting on the parking amenity of these surrounding streets.

The proposed development is considered a major traffic activity under TR-R2, and as such a detailed assessment of the associated Site traffic impacts on the performance of the adjacent network has been undertaken at Chapter 7. By way of

[3] Including the 'Te Ara O Paetutu' residential development comprising approximately 60 x predominantly 2-bed townhouse units, located on Jackson Street in Petone.

summary, this shows that with the additional vehicle trips added, impacts on the current levels of service at the nearby Cedar Drive / Kapiti Road intersection are minor.

5 Parking

5.1 Proposed Parking Provision

The proposal includes a total of 170 car parking spaces to support the residential development, with these spaces comprising private unit-allocated parking (and potential visitor parks), with this arrangement to be managed by the resident's society.

5.2 District Plan Requirement

Transport Rule 19 (TR-R19) of the District Plan sets out parking space requirements based on activity type, and in relation to the development proposal includes:

- a minimum of two car parking spaces per residential unit.

The proposal allows for 139 townhouses, therefore requiring a total of 278 parking spaces to satisfy the District Plan.

Notwithstanding the above, it is noted that the National Policy Statement for Urban Development (**NPS**) states that Councils are required to remove district plan rules, assessment criteria, policies and objectives that have the effect of setting minimum parking rates, in a move to:

> *"enable urban space to be used for higher value purposes other than car parking, and remove a significant cost for higher density developments. Developers may still choose to provide car parking in many areas, but the number of car parks will be driven by market demand."*

The deadline for Council's to enact the NPS parking changes is February 2022. Whilst the existing parking minimum rules within the Kapiti Coast District Plan continue to remain operative, territorial authorities considering resource consents must (under section 104(1)(b) of the RMA) have regard to the car parking provisions of the NPS from the date of its commencement (July 2020).

Accordingly, this assessment has been progressed in a manner that acknowledges this requirement and, as anticipated by the NPS where a proposal is considered a discretionary activity, includes an assessment of any associated parking demand impacts the development may have on the local transport network.

5.3 Existing On-Street Parking Demand

For the purposes of informing this assessment, a kerbside parking survey was undertaken on a typical weekday[4] within the vicinity of the Site, to understand localised parking occupancy during a weekday morning and evening. In doing so, the existing kerbside parking provision in the vicinity was separated into five zones, for the purposes of identifying any localised trends.

The study area adopted for the parking review captures the length of Kapiti Road between Cedar Drive and Langdale Avenue, along with the nearby local road network as illustrated in **Figure 12**.

[4] Monday 15th November 2021

Figure 12: Kerbside Parking Provision / Survey Extent Map

The corresponding parking capacity (assuming a 6m kerbside length for a parallel parking space) and the measured occupancy within the study area by 'zone', is summarised in **Table 5**.

Table 5: Existing Parking Capacity and Demand

Parking Zone	1	2	3	4	5	Total	
Capacity	28	29	21	22	20	120	
Existing Parking Demand							**Occupancy (%)**
Morning Peak (9:30)	0	0	2	0	0	2	2%
Evening Peak (18:30)	10	0	0	0	0	10	8%

The data indicates that there is significant residual kerbside parking in near vicinity of the Site to be able to accommodate any surplus demand from the proposed residential development, which is not surprising given the majority of residential lots in the area include off-street parking.

The data demonstrates there is residual capacity of over 100 spaces which exists within the adjacent kerbside resource within a five-minute walk of the Site, that could accommodate a component of the Site demand if needed, without impacting on the current residential parking amenity.

5.4 Forecast Development Site Parking Demand

By way of providing an assessment of the quantum of parking demand generated by the proposed development, it is worthy of note that the development Site is well placed to encourage travel by modes other than private car, as follows:

- convenient access to the local public transport network via adjacent bus stops on Kapiti Road, which provide connection into Paraparaumu town centre and rail station (which in turn provides for connectivity to Wellington CBD and the wider region rail network); and
- direct connection to the footpaths and established cycleways on Kapiti Road will support the use of active modes including walking, cycling and micro-mobility.

These measures will help to promote and support lower reliance on private vehicle ownership. Further, with the smaller predominantly 2-bedroom nature of the proposed dwellings, car ownership can be expected to be significantly lower than standard lower density residential suburban setting, for which the historic District Plan ratios more typically relate.

In this respect, vehicle ownership data collected at other established analogous 2-3 bedroom townhouse unit developments around Wellington indicates car ownership rates of approximately 1.2 vehicles per dwelling. Applying this ratio to the proposed development gives a forecast parking demand for 167 vehicles.

On this basis, and taking account of the typical 'one park per dwelling' provided for within the development, the on-street residual parking capacity (of 100+ spaces) could more than adequately accommodate an overspill of potentially 20-30 vehicles (spread across the surrounding streets) without materially impacting on the existing kerbside parking amenity, and even ensure an allocation of visitor spaces on-site could be available to non-residents.

5.5 Parking Layout

The on-site parking spaces provided have been designed to meet the dimension requirements and minimum aisle widths prescribed within the District Plan and AS/NZS2890.1, with parking stalls marked at 4.8m deep (allowing for a 600mm overhang at the kerb) and minimum 5.8m wide manoeuvre aisles.

Provision for cycle storage is provided within the courtyards of the proposed units, with residents able to install a slim shed / storage locker within these outdoor areas to provide an additional level of security for bikes/other items.

6 Access

As described earlier, the proposal plans provide for a new main vehicle connection to the Local / Neighbourhood Access Road frontage of Halsey Grove. To appropriately accommodate the increased vehicle movements to and from the Site, the current unsealed access to the Halsey Grove cul-de-sac will be upgraded to a widened / sealed formation to safely serve the forecast traffic demands. The two established private vehicle driveways off Kapiti will be closed.

Details of the proposed arrangements for the access and connecting internal carriageways are described in turn below.

6.1 Vehicle Access

Access to the internal Site RoWs and parking areas will be achieved via a new two-way vehicle access off Halsey Grove. The initial portion of the access will be formed to an 8m wide carriageway with footpaths and grass berms on either side (to tie-in with the established Halsey Grove cross section), and therefore satisfies the design criteria of the District Plan in being between 3.5m and 9m in width. This access and the internal laneways serving the Site are proposed as private RoWs that will be maintained by the resident's society.

As described in Chapter 4, a minimum sight distance of 50m is required for new vehicle accesses onto public roads with 50kph posted speed limits. The Halsey Grove 'Site access' is located approximately 35m from the Halsey Grove / Regent Drive intersection and, whilst therefore falling short of the 50m requirement, the straight alignment of Halsey Grove and connecting site access will ensure that vehicles leaving the development have clear sightlines to the intersection. In this manner, vehicles manoeuvring at the two established residential driveways on Halsey Grove will also have adequate sightlines to vehicles accessing/egressing the development Site.

With the increase in traffic volumes generated from the Site on Halsey Grove, it is recommended that the current uncontrolled t-intersection with Regent Drive be formalised as a give-way, to provide priority to traffic on the latter.

The internal vehicle circulation arrangements provide for a single loop road, which will be formed to a 5.8m width to allow for two-way vehicle flow throughout the development and ensure adequate aisle widths for vehicles manoeuvring at adjacent 90-degree parks. Localised widening has been included around bends to ensure tracking of larger vehicles (e.g., rubbish trucks) can be safely accommodated, as illustrated in the vehicle tracking plans in **Appendix B** . The Site's access and internal circulation routes will be formed and sealed to an appropriate heavy vehicle standard.

6.2 Pedestrian/Cycle Access

Provision for pedestrians is provided via a series of footpaths and internal walkway connections through the development. The primary pedestrian routes have been designed to a 2.1m width, including those footpaths provided on either side of the internal loop road to allow 600mm overhang of vehicles at the kerb and ensure a clear width of 1.5m is maintained for pedestrians.

In addition to the footpaths flanking the RoW loop, a central north-south pedestrian RoW will provide 'public' connectivity between Halsey Grove and Kapiti Road. Additional pedestrian routes to and through the park will provide additional internal Site permeability for residents and visitors.

Cyclists accessing the development will share the vehicle RoW carriageway, noting these have been designed to encourage a slow speed environment, with the slower speed supported by a 15kph speed limit.

7 Assessment of Traffic Effects

An assessment of the traffic effects arising from the proposed residential activity has been undertaken based on proposed townhouse numbers and anticipated trip generation rates.

7.1 Forecast Development Traffic Generation

Trip generation rates have been determined using survey data collected by Stantec at other established analogous medium density townhouse residential developments around the Wellington region[5], along with industry standard rates from Waka Kotahi Research Report 453 'Trips and parking related to land use' (**Report 453**). These associated weekday peak hour trip generation rates are summarised in **Table 6**.

Table 6: Trip generation rates for a residential development

Source	AM Peak Rate (per townhouse unit)	PM Peak Rate (per townhouse unit)
Stantec Medium Density Residential Surveys	0.52	0.4
RR453[6]	0.9	0.9
Adopted average	**0.71**	**0.65**

Noting the RR453 rates are more representative of lower density detached suburban dwellings, which is not what is proposed in the case of the development Site, these industry and surveyed rates have been averaged to provide what is considered a conservative trip generation rate for the Site, given its predominant smaller 2-bedroom typology. In this manner, the development is expected to generate around 0.7 vph in the AM peak period and 0.65 vph in the PM peak, per townhouse unit. Applying these rates to the proposed 139 dwellings indicates a total of approximately 90-100vph can be expected to be generated on the adjacent network, or the equivalent of 1-2 vehicles per minute on average.

7.2 Kapiti Road/Cedar Drive Intersection

An assessment of the additional development trips on the operation of the Kapiti Road / Cedar Drive intersection has been undertaken using the industry-recognised modelling package SIDRA, to quantify any associated performance change.

The assumptions adopted for the assessment can be summarised as follows:

- current traffic volumes along Kapiti Road (as surveyed on Wednesday 17th November) have been scaled up by 15%, to align with tube count data from 2020 which was captured during Covid Alert level 1, which is expected to be more representative of 'typical' business as usual conditions;
- all development trips are assumed to route directly to/from Kapiti Road, conservatively assuming no distribution via the local road network to the north;
- turning patterns at the intersection have been based on the existing turn count proportions recorded on-site;
- all right turns out of Cedar Drive have been modelled as a single movement ((i.e. no 2-stage movements using the central median, as some vehicles were observed to do on-site); and
- the critical gap acceptance value for the right-turn out of Cedar Drive has been calibrated to align with the observed delay and queues.

[5] Including a trip generation survey of the 'Te Ara O Paetutu' in Petone, undertaken on Tuesday November 16th 2021.

[6] 85th percentile peak hour trip generation rates for an inner suburban residential dwelling

The resultant Level of Service[7] (**LoS**) and average delay (seconds) for the Kapiti Road / Cedar Drive intersection is summarised in **Table 7**.

Table 7: Kapiti Road / Cedar Drive - SIDRA Modelling Summary

Approach	Movement	Base 2021		Base + Development Trips	
		AM Peak	**PM Peak**	**AM Peak**	**PM Peak**
Kapiti Road (West)	Left	A (4.7)	A (4.7)	A (4.7)	A (4.7)
	Through	A (-)	A (-)	A (-)	A (-)
Cedar Drive (North)	Left	A (7.6)	A (7.0)	A (8.7)	A (7.7)
	Right	C (19.2)	E (40.2)	C (22.1)	E (46.0)
Kapiti Road (East)	Through	A (-)	A (-)	A (-)	A (-)
	Right	A (7.5)	A (7.3)	A (7.6)	A (7.5)

The above analysis confirms that the Kapiti Road/Cedar Drive intersection is currently performing well during each of the AM and PM peaks, with an LoS A on all movements on Kapiti Road and the left turn out of Cedar Drive. The only notable delays are experienced on the right-turn out of Cedar Drive, which is shown to be operating at LoS C and E in the AM and PM peaks, respectively. With the additional development traffic added the intersection continues to perform at equivalent Levels of Service, with only a minor increase in delay (of around 6-seconds) for the right turn out on to Kapiti Road, during the PM peak.

As shown, the added delays occurring at the intersection as a result of the proposed development Site trips are minor, with changes likely to be imperceptible to existing users on the network.

[7] Level of Service (LOS) is a six-level grading system for intersection performance (A to F), where Level A represents totally uncongested operation with minimal delays and queues, and Level F represents highly congested operation with long delays and extensive queuing.

8 Servicing

Residential developments do not typically generate any servicing requirements outside of rubbish and recycling collections and occasional furniture moving activities.

A series of six dedicated refuse collection points are located throughout the Site, as illustrated within the development plans at **Appendix A**. Collection of refuse and recycling will be undertaken by trucks circulating through the Site emptying bins from the RoW, adjacent to the collection points. During occasions when rubbish/recycling trucks are stationary, development Site traffic will still be able to pass within the remaining carriageway or, alternately route around the opposite side of the internal loop road.

Example tracking paths demonstrating both a standard 8m rubbish truck along with a larger 10.5m rigid truck (furniture mover) accessing the development, manoeuvring through the Site, and exiting to Halsey Grove, are provided in **Appendix B** .

Accordingly, all servicing requirements generated by the proposed development can be accommodated within the site itself, and without the need for service vehicles to undertake reverse manoeuvres to and from the adjacent street network.

9 Conclusion

A detailed assessment of the transport related effects of a proposed residential development off Kapiti Road in Paraparaumu, has been undertaken with due regard to the provisions and requirements set out within the Kapiti Coast District Plan and relevant best practice.

A suitable access strategy has been developed that provides for an appropriate Site connection to Halsey Grove that can accommodate the associated vehicle demands generated by the proposed activity. The proposed pedestrian and cycle facilities provide for an attractive and convenient environment for both circulation within the Site as well connection to the wider footpath and cycleway network.

All servicing demands generated by the residential activity (i.e. rubbish trucks) can be accommodated on-site, with all associated vehicles able to enter and exit in a forward direction.

The site will include a total of 170 on-site car parks to serve the 139 dwellings, which is assessed as being sufficient to accommodate the majority of parking demand generated at the Site. Should additional demand occur, it can be accommodated within the adjacent residual kerbside parking resource without materially impacting the existing on-street parking amenity in the local streets.

Overall, and with the adoption of the recommendations for Council to formalise priorities at the Halsey Grove / Regent Drive intersection, and to remark / extend the green coloured surfacing of the cycle lane at the t-intersection of Kapiti Road and Cedar Drive across the full intersection, this assessment finds that the resultant traffic generated by the proposed activity will not materially alter the existing traffic characteristics of the local road network, trigger safety concerns, or create new capacity issues.

Appendices

We design with community in mind

Appendix A Development Plans

	Unit Type	No.	Unit Area
	2 Bedroom	120	72m² - 75m²
	3 Bedroom	19	106m² - 109m²
	Total:	139	
	Carparks	170	
	Road		
	Outdoor Living Patio		
	Grass		
	Planting / Landscaping		
	Footpath		
	Tree		
	Property Line		

RC07 REV.1

SITE PLAN - GROUND FLOOR

THAMES PACIFIC

RESIDENTIAL DEVELOPMENT

240 KAPITI ROAD

RESOURCE CONSENT

PROJECT No. **T675**

PLOT DATE. **17/02/2022 11:01:09 am**

NO.	DESCRIPTION	DATE
1	Resource Consent	17/02/2022

Site Information

Rainfall Intensity: 70 mm/h

Climate Zone: 2

Corrosion Zone: C

Legal Description: Lot 1 DP 88870

Wind Zone: Very High

NZBC E2 Compliance: Compliance with NZBC E2 is by means of NZBC E2 AS1. Refer Risk Matrix provided.

N

0 5 10 20 30 50 mm

A3 Print Scale 1 : 1
A1 Print Scale 1 : 0.5

Site Plan - Ground

SCALE @ A3 -1 : 750 | SCALE @ A1 - DOUBLE SCALE

Wellington +64 4 920 0032 wn@dgse.co.nz
Palmerston North +64 6 357 4534 pn@dgse.co.nz
Tauranga +64 7 925 6238 tr@dgse.co.nz
Napier +64 6 835 6173 np@dgse.co.nz
Auckland +64 9 976 8288 ak@dgse.co.nz

designgroup
stapleton elliott

Appendix B Vehicle Tracking

HALSEY GR

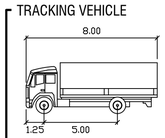
5 0 5 10m

SCALE 1:250

ORIGINAL SIZE A1

DO NOT SCALE - IF IN DOUBT, ASK

TRACKING VEHICLE



LTNZ-8T-125R

meters

Width	: 2.50
Track	: 2.50
Lock to Lock Time	6.0
Steering Angle	: 27.5

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE
B	SITE PLAN UPDATED (T675 - 240 Kapiti Road - SITE PLAN - DWG - 17-02-2022)	AKJ	JW		17.02.22
A	BASE:7675-MASTERPLAN-01102021	CTM	JW		28.10.21

SURVEYED		
DESIGNED		
DRAWN	C.MAAKA	28.10.21
CAD REVIEW	J.WHITTAKER	28.10.21
DESIGN CHECK		
DESIGN REVIEW		
APPROVED		
PROF REGISTRATION:		

Stantec

Client:

240 KAPITI ROAD

VEHICLE TRACKING
8m TRUCK - CIRCULATION

Status Stamp: **WORKING PLOT**

Date Stamp: **17.02.2022**

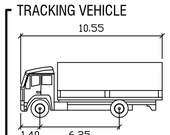
Scales: 1:250@A1 / 1:500@A3

Drawing No.: 310205039-01-001-SK001-03 Rev.: B

H:\310205039-01-001-SK001

HALSEY GR

TRACKING VEHICLE



CAMION LIGERO

	meters
Width	: 2.55
Track	: 2.55
Lock to Lock Time	6.0
Steering Angle	: 43.4

SCALE 1:250

ORIGINAL SIZE A1

DO NOT SCALE - IF IN DOUBT, ASK

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE
B	SITE PLAN UPDATED (T675 - 240 Kapiti Road - SITE PLAN - DWG - 17-02-2022)	AKJ	JW		17.02.22
A	BASE:7675-MASTERPLAN-01102021	CTM	JW		28.10.21

SURVEYED		
DESIGNED		
DRAWN	C.MAAKA	28.10.21
CAD REVIEW	J.WHITTAKER	28.10.21
DESIGN CHECK		
DESIGN REVIEW		
APPROVED		
PROF REGISTRATION:		

Stantec

Client:

240 KAPITI ROAD

VEHICLE TRACKING
10.5m TRUCK - CIRCULATION

Status Stamp: **WORKING PLOT**

Date Stamp: **17.02.2022**

Scales: 1:250@A1 / 1:500@A3

Drawing No.: 310205039-01-001-SK001-04

Rev.: B

H:\310205039-01-001-SK001

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Appendix 14
Geotechnical Liquefaction Assessment

Cuttriss
Surveyors. Engineers. Planners.

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Project Number #19667.000.001

Site Investigation and Geohazard Assessment

240 Kapiti Road, Paraparaumu Beach, Wellington

Submitted to:
Gresham Trustee Limited
Level 2, 161 Cuba Street
Te Aro
Wellington 6011

Contents

Tables

Figures

Appendices

ENGEO Document Control:

Report Title	Site Investigation and Geohazard Assessment - 240 Kapiti Road, Paraparaumu Beach			
Project No.	19667.000.001	Doc ID	02	
Client	Gresham Trustee Limited	Client Contact	Jim Fraser	
Distribution (PDF)				
Date	Revision Details / Status	Author	Reviewer	WP
28/01/2022	Issued to Client	HB	NC	JT

1 Introduction

ENGEO Ltd was requested by Gresham Trustee Limited to undertake a site investigation and geohazard assessment of the property at 240 Kapiti Road, Paraparaumu Beach, Wellington (herein referred to as 'the site'). The purpose of the assessment was to support the client's application for resource consent for a proposed new residential housing development.

We have previously issued a geotechnical desktop study report (ref: 19667.000.001_01 dated 18.11.2021). The desktop study reviewed the conceptual development plans, published geotechnical and geological information relevant to the site, historical aerial photographs, and discussed the potential geotechnical hazards that could affect the site.

This work has been carried out in accordance with our signed agreement (dated 10.11.2021).

2 Scope of Work

We carried out the following as part of the site investigation and geohazard assessment:

- Site walk over by an experienced ground engineering professional.
- Supervision of CPT subsurface soil investigation, in six locations across the site.
- Supervision of a machine excavated test pit investigation, including logging of the encountered materials by an experienced ground engineering professional.
- Analysis of field data and production of a conceptual geological site model.
- Discussion of the typical subsurface geology including natural features that may adversely affect the development site; specifically addressing Section 106 of the Resource Management Act.
- Computational liquefaction analysis.
- Production of this geotechnical report based on the findings of our enquiries and ground investigation, including preliminary geotechnical recommendations for house foundations, discussion of liquefaction potential at the site, and seismic subsoil category.

3 Site Investigation

A geotechnical site investigation was undertaken on 15 December 2021 and comprised a series of 15 test pit excavations with associated Scala penetrometer testing. The testing was carried out by two Engineering Geologists from ENGEO.

The investigation locations are presented in Appendix 1. Logs of the test pit excavations are presented in Appendix 2. Logging was carried out in general accordance with the New Zealand Geotechnical Society Field Description of Soil and Rock for Engineering Purposes, 2005.

3.1 Visual Observations

- The site is comprised mainly of undulating windblown sand dunes, which are grassed with a few small areas of trees. The majority of the site is being used as pasture for two horses.
- A small dwelling exists on the southern side of the site, adjacent to Kapiti Road.
- A pond has formed in a low-lying area towards the centre of the site. The pond is approximately 0.5 m – 1 m deep.
- A large flat area (approximately 1000 m^2) was observed at the eastern side of the site, which contrasted with the generally undulating terrain. It is likely that this area has been subject to some cut to fill earthworks. Further evidence was observed through our subsurface investigations in this area, where sand mixed with inclusions of topsoil was observed (Test Pit 8, 10, 15).

Figure 1: Site Photos

Photo 1: Central high point, looking south

Photo 2: Pond towards centre of site (to be filled in)

Photo 3: Eastern boundary, looking west

Photo 4: North-western corner, looking southeast

3.2 Subsurface Investigations

3.2.1 Test Pit Excavations

The test pit boreholes extended to variable depths from 1.6 m to 3.2 m below ground level. Test pits 9 and 13 were the only test location to meet target depth of 3.2 m below ground level (both at the crest of dune features), with all other test pits meeting practical refusal due to hole collapse in sand.

The site was generally underlain by fine to medium dune sand down to the maximum extent of the test pit excavations. Lenses of organic sand with pockets of amorphous peat was observed within test pit three at the western edge of the site.

ENGEO observed that a sandy fill material was present within the top 0.7 m in the flat, low-lying area in the central / western side of the site. This was comprised mainly of dune sand mixed with small inclusions of topsoil. The inferred extent of the fill material has been shown in the site plan included as Appendix 2 to this report.

Scala penetrometer tests were performed in conjunction with 11 of the 15 test pits. The Scala's extended to depths between 1.0 m and 3.9 m below ground level and met refusal on dense / hard ground or extended to target depth (3.9 m).

Standing groundwater was generally encountered around 2 m below ground level across the site. However, due to the undulating nature of the site ground water was encountered as shallow as 1 m bgl in the low-lying area at the southern boundary of the site (TP11). Groundwater was not encountered within some of the test pits conducted at the top of dunes (TP9, 13, 14).

Test pit six was not completed due to its proximity to other test locations.

3.2.2 Cone Penetrometer Tests

Griffiths undertook six Cone Penetration Tests (CPTs) which extended to a maximum depth of 15 m below existing ground level before meeting target depth. CPT test locations are provided as Appendix 1; plots of the CPT data are presented in Appendix 3.

CPT 1 and CPT 6 refused on dense material at 4.0 m and 5.3 m below ground level respectively. All other tests extended to the target depth of 15 m bgl.

All CPTs indicated broadly similar soil profiles consisting of dune sands with small lenses of silty sand typically 0.2 – 0.5 m thick. CPT3, 4, and 5 located towards the centre west / western side of the site indicated more silty sand within the upper 1 – 3 m than the CPTs located on the eastern half of the site. Potentially liquifiable layers were generally consistent across the site under ULS conditions, and were identified within between 1.5 – 8 m, 8.5 – 13.5 m, and 14.5 m to the maximum test depth of 15 m below existing ground level

3.3 Summary of Subsurface Conditions

A generalised summary of the subsurface conditions is provided within Table 1.

Table 1: Summary of Subsurface Conditions

Description	Depth to Top of Layer (m)	Depth to Bottom of Layer (m)	Material Consistency / Density
SAND [TOPSOIL]	0	0.3 – 0.4	Loose
SAND* [FILL]	0	0.6 – 0.7	Loose
SAND [Dune Sands]	0.3 – 0.7	Unknown	Medium Dense to Very Dense

* Not encountered in all locations

3.4 Local Peat Deposits

Based on our previous experience in the Kapiti Coast area, localised peat deposits with thicknesses up to 2.5 m can occur. ENGEO site investigations encountered peat deposits within one test pit the proposed development area, however, due to the variable nature of peat deposits, it is possible peat deposits could be present on site. The project and construction teams should be aware that peat deposits may be uncovered during the construction phase. Appropriate mitigation options have been discussed in Section 5 of this report

4 Geohazard Assessment

Section 4 of this report considers the geohazards that could affect the site and suggests mitigation options to meet the requirements of the RMA where required.

4.1 Site Subsoil Class

Based on the findings of our desktop study and subsurface investigations, we consider that the seismic site classification in line with NZS 1170.5:2004 to be 'Class D – Deep or Soft Soil' for the purposes of seismic design.

4.2 Seismic Design Considerations

The New Zealand Geotechnical Society (NZGS) and Ministry of Business, Innovation and Employment (MBIE) Geotechnical Guidance Modules 1 to 6 (2016) provide recommendations for the assessment of liquefaction and lateral spreading. This has been considered in our discussion below.

From our understanding of the proposed development plans, we consider the proposed development to be classified as an Importance Level 2 building. According to NZS 1170.0:2002, Importance Level 2 (IL2) buildings are required to be designed to resist earthquake shaking with an annual probability of exceedance of 1/500 (i.e. a 500-year return period). This is the Ultimate Limit State (ULS) design seismic loading. Buildings must be designed to tolerate ULS deformations without collapse or endangering life. Furthermore, IL2 buildings should sustain little or no structural damage under a Serviceability Limit State (SLS) design load case, which is based on earthquake shaking with a 25-year return period.

Peak horizontal ground accelerations (a_{max}) have been used in accordance with the Bulletin of the New Zealand Society for Earthquake Engineering, Vol. 54 (Cubrinovski et al. 2021). The paper from Cubrinovski states that the current accepted advice from the Ministry of Business Innovation and Employment (MBIE) / NZGS Module 1 (2016), the Bridge Manual 2018 updates, and NZS1170, significantly under-estimates the potential intensity of ground shaking in a number of areas in New Zealand, of which the Wellington Region is one. Cubrinovski recommends interim hazard updates to the existing standards, including a summary of appropriate Peak Ground Acceleration (PGA) and Magnitude (M) values for various return periods in six locations. Accordingly, we have adopted magnitude and PGA in line with Table 1 of Cubrinovski 2021.

$$a_{max} = 0.68$$

Table 2 presents the calculated peak ground acceleration for the design cases.

Table 2: Calculated Peak Ground Acceleration

Design Case	Moment Magnitude (M_w)	Acceleration (a_{max})
ULS (1 in 500 Year Event)	7.7	0.68
1 in 100 Year Event	7.1	0.28
SLS (1 in 25 Year Event)	6.5	0.13

4.3 Liquefaction Analysis

Soil liquefaction results from loss of strength during cyclic loading, such as imposed by earthquakes. Soils most susceptible to liquefaction are clean, loose, saturated, uniformly graded fine-grained sands. Empirical evidence indicates that loose to medium dense gravels, silty sands, low-plasticity silts and some low-plasticity clays are also potentially liquefiable.

We have analysed the liquefaction potential of the site in accordance with the recommendations presented within the MBIE / NZGS Earthquake Geotechnical Engineering Module 3. The following methods and parameters were utilised for the analysis:

- Liquefaction triggering method: Boulanger and Idriss (2014) as recommended by MBIE / NZGS.
- The ground motions listed in Table 2.
- A threshold probability of liquefaction (P_L) of 15%.
- Estimated fines content based on CPT data methods outlined by Robertson and Wride (1998).
- A soil behaviour type index (I_c) cut-off value of 2.6 to differentiate between susceptible and non-susceptible to liquefaction soils for the CPT analysis.
- The Zhang, Robertson and Brachman (2002) procedure for estimating volumetric strain and vertical settlement for the CPT analysis.
- The Boulanger and Idriss relationship between fines content and I_c with a fitting parameter (C_{FC}) of 0.0 for the CPT analysis.

Groundwater was assumed to be at 2.0 m below ground level, based on the observed water table at the time of our site visit and within our subsurface investigations.

A summary of the calculated free-field settlements is presented in Table 3 (rounded to the nearest 10 mm). Full results are presented in Appendix 3. Settlements could be greater than this under buildings, particularly if the buildings are heavily loaded.

Table 3: Calculated Vertical Free-Field Settlement

CPT Identifier (All investigations to 15 m below ground level)	SLS (1 in 25 Year Event)	1 in 100 Year Event	ULS (1 in 500 Year Event
	Calculated Vertical Settlement (mm)	Calculated Vertical Settlement (mm)	Calculated Vertical Settlement (mm)
*CPT01	Negligible	10	30
CPT02	Negligible	40	110
CPT03	Negligible	40	130
CPT04	Negligible	60	140
CPT05	Negligible	80	140
*CPT06	Negligible	Negligible	25

*CPT01 and CPT06 refused on dense material at 4.0 and 5.3 m bgl. It is possible more liquefiable layers are present at depth in these locations.

Our analysis indicates negligible liquefiable layers under SLS ground shaking conditions.

Under 1 in 100-year seismic conditions, the analysis indicated liquefiable layers primarily within the upper 10 m of the soil profile. These were observed within CPT2, CPT4, and CPT5, with liquefiable layers identified between 2 – 3.5 m bgl, 5 – 7.5 m bgl, and 8.5 – 10 m bgl. Total settlements of up to 80 mm were calculated. CPT6 indicated negligible liquefiable layers under these conditions.

More extensive liquefiable layers are identified under ULS ground shaking conditions with total settlements varying from 25 mm to 140 mm. These settlements result from potentially liquefiable layers up to 9 m thick, all located below the groundwater table at 1.5 m (assuming the ground water table is raised to 1.5 m bgl during ground shaking), within the sand and silty sand layers.

CPT01 and CPT06 refused on dense material at 4.0 m bgl and 5.3 m bgl respectively. Given that the other CPTs indicated significant liquefiable layers below 5 m depth, it is likely that liquefaction induced settlements in these areas will be greater than the 25 – 30 mm indicated by this analysis, and more in line with the 110 mm to 140 mm settlements observed in the other testing locations.

4.3.1 Slope Stability

We have been advised that the site will be levelled in conjunction with the preparation works for forming the required building platform and associated car parking. Accordingly, we have not undertaken a specific slope stability assessment of the dune slopes as we understand that these will be removed as part of the development.

No obvious evidence of instability was observed across the dune features at the time of our site visit. However, should it be deemed that the dunes shall remain at the site, further guidance can be provided to inform appropriate development set-backs or retaining solutions.

4.3.2 Lateral Spreading

ENGEO has considered the potential for lateral spreading occurring towards the ponds to the east of the proposed development area. The nearest free face (waterway) is located approximately 50 m from the easternmost corner of the site, with the toe of the free face estimated to be approximately 2 – 2.5 m below existing ground level at the eastern corner of the development.

ENGEO considers that lateral spreading poses a plausible hazard to future development of the site under ULS conditions. In this situation, the soils above the water table could move laterally in the direction of the free face (ponds in this instance). As the ponds are to the east of the proposed houses, then soil movement would be towards the east. Generally, soils move more the closer to the ponds they are. Without mitigation, lateral spread can severely damage buildings.

This hazard has the potential to affect the easternmost corner of the proposed development (area closest to the pond).

4.4 Consideration of Section 106 of the Resource Management Act (1991)

A summary of geotechnical hazards that could affect the site and suitable mitigation options for each hazard are outlined in Table 3 and discussed in more detail in Section 5 of this report.

As outlined in Section 106 of the Resource Management Act (1991):

Consent authority may refuse subdivision consent in certain circumstances

1. *A consent authority may refuse to grant a subdivision consent, or may grant a subdivision consent subject to conditions, if it considers that—*
   a. *there is a significant risk from natural hazards; or*
   b. *[Repealed]*
   c. *sufficient provision has not been made for legal and physical access to each allotment to be created by the subdivision.*

1(A). *For the purpose of subsection (1)(a), an assessment of the risk from natural hazards requires a combined assessment of—*

   a. *(a)the likelihood of natural hazards occurring (whether individually or in combination); and*
   b. *(b)the material damage to land in respect of which the consent is sought, other land, or structures that would result from natural hazards; and*
   c. *(c)any likely subsequent use of the land in respect of which the consent is sought that would accelerate, worsen, or result in material damage of the kind referred to in paragraph (b).*

Table 4: Considered Geotechnical Hazards and Potential Mitigation Options

Hazard	Potential Mitigation Options	Comments
Ground shaking	Design to the NZ building code	-
Consolidation settlement in peat / organic soils	Foundations to be designed to mitigate against effects of static settlement. Removal and replacement of peat / organic soils, where encountered.	Organic soils only encountered in one test location, however isolated pockets could be present across the site.
Liquefaction	Placement and compaction of geogrid reinforced, engineered fill rafts beneath the building footprint, potentially combined with Rib Raft, or waffle slabs.	-
Lateral Spreading	Building set back zones in areas where lateral spreading may pose a hazard to development. Placement and compaction of geogrid reinforced, engineered fill rafts beneath the building footprint, potentially combined with Rib Raft, or waffle slabs.	-
Shallow slope failure	Regrade the site to form flatter slope angles. Creation of setback zones and / or site-specific mitigation works where flatter batters are not suitable.	At the time of writing this report it is understood that the site will be largely relevelled using cut to fill earthworks. Removal of the dune features will remove the slope failure hazard.

We have also considered the likelihood of material damage to the development by erosion, falling debris, slippage, or inundation (by soil), however we consider these geohazards to be low risk at this site. We consider that the proposed development of the site will not accelerate any of these hazards assuming that the recommendations in this report are followed.

5 Geotechnical Considerations and Recommendations

5.1 Mitigation of Potential Geohazards

As discussed in Section 4 of this report, liquefaction induced settlement, lateral spreading, and consolidation of organic soils are geohazards that could potentially affect future development of the site. We consider that these geohazards can be suitably mitigated using the methods discussed below.

5.1.1 Liquefaction Induced Settlements

From our liquefaction analysis, we consider that the potential for seismically induced settlements at the site during SLS shaking is low and within building code tolerance. In a 1 in 100 year event, it is possible that settlements up to 80 mm could occur within the liquefiable layers. Under ULS shaking events up to 130 mm of settlement may occur within the liquefiable layers.

The project team should consider the impact of a 1 in 100 year shaking event on the proposed structures, which our analysis indicates could cause liquefaction induced settlements of up to 80 mm. To accommodate the anticipated settlements indicated by our analysis, and the possibility for punching of foundations into the liquefied soil, it is likely that some form of ground improvement will be required. This may take the form of stone columns or soil stabilisation to reduce liquefaction triggering, or possibly geogrid reinforced gravel rafts located above the liquefiable soils to reduce the effects of liquefaction on buildings above. It could be possible to reuse the sand encountered on site in place of gravel, however this will require laboratory testing of the sand material to confirm its engineering properties. Using site won sandy fill material will reduce the volume of fill that needs to be imported to site and also reduce the amount of cut to waste earthworks.

It is likely that shallow foundations will be suitable to support buildings on top of either improved ground or a gravel raft.

5.1.2 Lateral Spreading Potential

As discussed in section 4.3.2 of this report, the nearest free face (waterway) is located approximately 50 m from the easternmost corner of the site, with the toe of the free face estimated to be approximately 2 – 2.5 m below existing ground level at the eastern corner of the development.

We consider the likelihood of lateral spreading at the site to be low across the majority of the site, however lateral spreading poses a plausible hazard to the easternmost corner of the site under ULS conditions. It is likely that ground improvement works required to mitigate the vertical settlements described above will also control lateral displacements, but further assessment will be required at Building Consent stage.

5.1.3 Consolidation Settlement

Organic soils were encountered within one of our test pit excavations, on the western side of the site (test pit 3). Based on our previous experience in the Kapiti Coast area, localised peat deposits with thicknesses up to 2.5 m have been observed. Due to the variable nature of organic soils / peat deposits, it is possible they could be present on site. Organic soils can be prone to static settlement through both surcharge and decay, which may cause settlement of overlying structures. There is a potential for ongoing creep settlements within these organic soils, and if encountered we recommend these materials are excavated and replaced with engineer certified hardfill to mitigate future differential settlements.

5.2 Site Preparation and Earthworks

We provide the following considerations for the earthworks on this project:

- We recommend that all organic and fill material is stripped from site prior to earthworks commencing. Any organic soils that are uncovered should be removed and replaced with engineered hardfill.

- Engineered Fill may comprise either site won sandy soils or imported hardfill (such as AP65). We recommend that fill is placed in accordance with NZS 4431:1989 and compacted to at least 98% of the maximum dry density.
- To calibrate the calculation of maximum dry density of the placed fill, laboratory testing to obtain a proctor curve will be required. We recommend that this is considered prior to commencement of earthworks to avoid any delays to the program while awaiting these results.

6 Sustainability

We encourage you to consider sustainability when assessing the options available for your project. Where suitable for the project, we recommend prioritising the use of sustainable building materials (such as timber in favour of concrete or steel), locally sourced (materials readily available to Contractors as opposed to materials requiring import), and installed in an environmentally friendly way (e.g., reduced carbon emissions and minimal contamination). If you would like to discuss these options further, ENGEO staff are available to offer suggestions.

7 Conclusions & Future Work

ENGEO has reviewed the conceptual plans provided by Design Group Stapleton Elliot and the project team for the proposed development at 240 Kapiti Road, Paraparaumu Beach. **We consider that the plans, as currently shown, are suitable for the site, provided the recommendations in this report are taken into account**.

We consider that the geohazards assessed within this report either do not pose a significant risk to the proposed development, or where risks are identified, they can be suitably mitigated via the methods discussed within this report.

ENGEO should be given the opportunity to review the final working drawings for proposed dwellings to assess if our recommendations have been interpreted as intended. We reserve the right to revisit and modify our recommendations when these plans are made available.

The construction of the building foundations, and any earthworks shall be observed by a geotechnical professional to confirm that adequate embedment / bearing capacity is achieved and that our recommendations have been interpreted as intended.

8 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Gresham Trustee Limited, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the Engineering NZ/ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (04) 472 0820 if you require any further information.

Report prepared by

Hugh Brenstrum

Engineering Geologist

Report reviewed by

Neil Charters, CMEngNZ (CPEng)

Principal Geotechnical Engineer

APPENDIX 1:

Test Pit Logs

LOG OF TEST PIT TP01

Geotechnical Investigation
240 Kapiti Road
Paraparaumu Beach
19667.000.000

Client : Kurt Kerrison
Date : 14/12/2021
Max Test Pit Depth : 1.7 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 600 mm

Shear Vane No : NA
Logged By : HB/JL
Reviewed By :
Latitude : -40.899563
Longitude : 174.990442

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TS		SP	Fine to medium SAND; dark brown. Poorly Graded. Contains rootlets.					L		
0.5	DUNE SANDS		SP	Fine to medium SAND; orange brown. Poorly Graded. Becomes grey brown from 0.5 m depth.				M	MD - D		
1.0				Becomes saturated from 1.2 m depth.			▼	W			
1.5								S			
2.0				Depth of Excavation: 1.7 m Termination Condition: Practical refusal							
2.5											
3.0											

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth at 1.7 m depth .

TS = TOPSOIL
L = LOOSE MD = MEDIUM DENSE D = DENSE

TS = TOPSOIL

LOG OF TEST PIT TP02

Geotechnical Investigation
240 Kapiti Road
Paraparaumu Beach
19667.000.000

Client : Kurt Kerrison
Date : 14/12/2021
Max Test Pit Depth : 2.2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 600 mm

Shear Vane No : NA
Logged By : HB/JL
Reviewed By :
Latitude : -40.899618
Longitude : 174.991057

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TS		SP	Fine to medium SAND; dark brown. Poorly Graded. Contains rootlets.					L		
0.5	DUNE SANDS		SP	Fine to medium SAND; orange brown. Poorly Graded. Becomes grey brown from 0.5 m depth.				M	MD - D		
1.0											
1.5								W			
2.0				Becomes saturated from 2.0 m depth.			▼	S			
2.5				Depth of Excavation: 2.2 m Termination Condition: Practical refusal							
3.0											

Scala Penetrometer Blows per 100mm: 2 4 6 8 10 12

Test Pit met target depth at 2.2 m depth .

TS = TOPSOIL
L = LOOSE MD = MEDIUM DENSE D = DENSE

TS = TOPSOIL

LOG OF TEST PIT TP03

Geotechnical Investigation
240 Kapiti Road
Paraparaumu Beach
19667.000.000

Client : Kurt Kerrison
Date : 14/12/2021
Max Test Pit Depth : 2.2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 600 mm

Shear Vane No : NA
Logged By : HB/JL
Reviewed By :
Latitude : -40.899301
Longitude : 174.990765

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		SP	Fine to medium SAND; dark brown. Poorly Graded. Contains rootlets.					L		
	DUNE SANDS			Fine to medium SAND; orange brown. Poorly Graded.							
0.5				Becomes grey brown from 0.5 m depth.				M			
1.0			SP						MD - D		
1.5				Becomes orange brown, organic smell from 1.7 m depth.				W			
2.0				Encountered pockets of amorphous peat from 1.9 m depth.							
				Depth of Excavation: 2.2 m Termination Condition: Practical refusal							
2.5											
3.0											

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth at 2.2 m depth .

TS = TOPSOIL
L = LOOSE MD = MEDIUM DENSE D = DENSE

TS = TOPSOIL

LOG OF TEST PIT TP04

Geotechnical Investigation
240 Kapiti Road
Paraparaumu Beach
19667.000.000

Client : Kurt Kerrison
Date : 14/12/2021
Max Test Pit Depth : 2.4 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 600 mm

Shear Vane No : NA
Logged By : HB/JL
Reviewed By :
Latitude : -40.899173
Longitude : 174.991218

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm (2 4 6 8 10 12)
0.0	TS		SP	Fine to medium SAND; dark brown. Poorly Graded. Contains rootlets.							
0.5	DUNE SANDS		SP	Fine to medium SAND; light grey mottled with brownish grey. Poorly Graded.				M			
1.0											
1.5											
2.0				Becomes saturated from 2.3 m depth.			▼	W			
2.5				Depth of Excavation: 2.4 m Termination Condition: Practical refusal				S			
3.0											

Test Pit met target depth at 2.4 m depth .

TS = TOPSOIL
L = LOOSE MD = MEDIUM DENSE D = DENSE

TS = TOPSOIL

GEOTECH TEST PIT LOG TEST PIT LOGS 240 KAPITI ROAD.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/22

LOG OF TEST PIT TP05

Geotechnical Investigation
240 Kapiti Road
Paraparaumu Beach
19667.000.000

Client	: Kurt Kerrison	**Shear Vane No**	: NA
Date	: 14/12/2021	**Logged By**	: HB/JL
Max Test Pit Depth	: 2 m	**Reviewed By**	:
Digger Type/Size	: Bucket Excavator	**Latitude**	: -40.899371
Bucket Type/Size	: 600 mm	**Longitude**	: 174.991581

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		SP	Fine to medium SAND; dark brown. Poorly Graded. Contains rootlets.					L		
0.5	DUNE SANDS		SP	Fine to medium SAND; light grey mottled with brownish grey. Poorly Graded.				M	MD - D		
1.0											
1.5								W			
2.0				Becomes saturated from 1.9 m depth.			▼	S			
2.5				Depth of Excavation: 2 m Termination Condition: Practical refusal							
3.0											

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth at 2 m depth .

TS = TOPSOIL
L = LOOSE MD = MEDIUM DENSE D = DENSE

TS = TOPSOIL

GEOTECH TEST PIT LOG TEST PIT LOGS 240 KAPITI ROAD.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/22

LOG OF TEST PIT TP07

Geotechnical Investigation
240 Kapiti Road
Paraparaumu Beach
19667.000.000

Client	: Kurt Kerrison	**Shear Vane No**	: NA
Date	: 14/12/2021	**Logged By**	: HB/JL
Max Test Pit Depth	: 3.2 m	**Reviewed By**	:
Digger Type/Size	: Bucket Excavator	**Latitude**	: -40.899519
Bucket Type/Size	: 600 mm	**Longitude**	: 174.991925

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		SP	Silty fine to medium SAND; dark brown. Poorly Graded. Contains rootlets.					L		
	DUNE SANDS			Fine to medium SAND; brownish grey. Poorly Graded.				M			
1.0											
1.5			SP						MD		
2.0											
2.5								W			
3.0				Becomes saturated from 3.0 m depth.			▼	S			
				Depth of Excavation: 3.2 m Termination Condition: Target depth							
3.5											
4.0											

Test Pit met target depth at 3.2 m.

TS = TOPSOIL
L = LOOSE MD = MEDIUM DENSE D = DENSE

TS = TOPSOIL

LOG OF TEST PIT TP08

Geotechnical Investigation
240 Kapiti Road
Paraparaumu Beach
19667.000.000

Client : Kurt Kerrison
Date : 14/12/2021
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 600 mm

Shear Vane No : NA
Logged By : HB/JL
Reviewed By :
Latitude : -40.899937
Longitude : 174.99185

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm (2 4 6 8 10 12)
0	TS		SP	Silty fine to medium SAND; dark brown. Poorly Graded. Contains rootlets.							
0.5	DUNE SANDS		SP	Fine to medium SAND; brownish grey. Poorly Graded. Inclusions of dark brown topsoil.				M			
1.0			SP	Fine to medium SAND; brownish grey. Poorly Graded. Becomes wet from 1.0 m depth.				W			
1.5				Becomes brownish grey from 1.8 m depth.			▼				
2.0				Becomes saturated from 1.9 m depth.				S			
2.5				Depth of Excavation: 2 m Termination Condition: Practical refusal							
3.0											

Test Pit met target depth at 2 m depth .

TS = TOPSOIL
L = LOOSE MD = MEDIUM DENSE D = DENSE

TS = TOPSOIL

LOG OF TEST PIT TP09

Geotechnical Investigation
240 Kapiti Road
Paraparaumu Beach
19667.000.000

Client : Kurt Kerrison
Date : 14/12/2021
Max Test Pit Depth : 3.1 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 600 mm

Shear Vane No : NA
Logged By : HB/JL
Reviewed By :
Latitude : -40.899865
Longitude : 174.992424

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		SP	Silty fine to medium SAND; dark brown. Poorly Graded. Contains rootlets.					L		
0.5	DUNE SANDS		SP	Fine to medium SAND; brownish grey. Poorly Graded.				M	MD		
1.0											
1.5											
2.0											
2.5											
3.0				Depth of Excavation: 3.1 m Termination Condition: Target depth							
3.5											
4.0											

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth at 3.1 m.

TS = TOPSOIL
L = LOOSE MD = MEDIUM DENSE D = DENSE

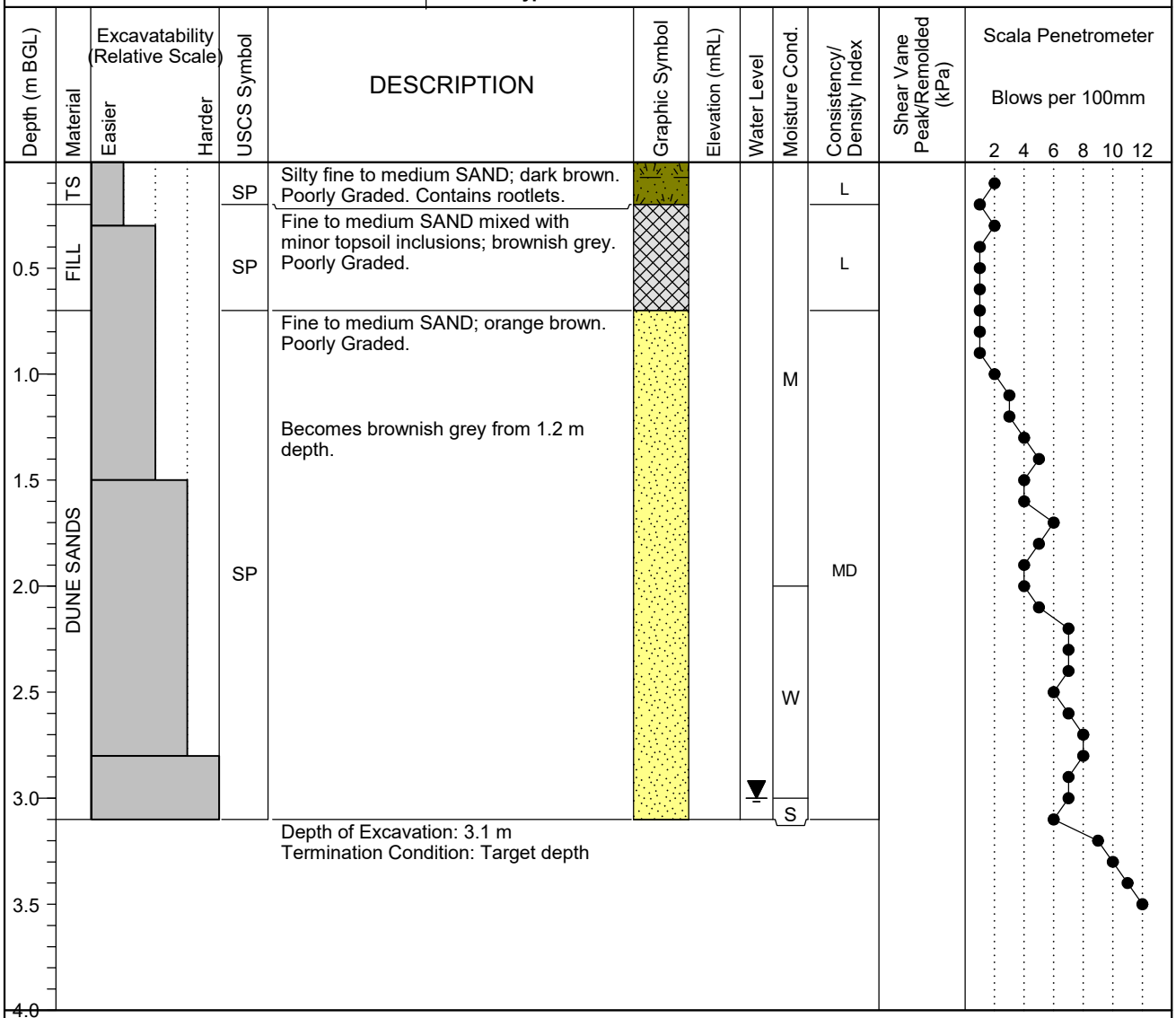
TS = TOPSOIL

LOG OF TEST PIT TP10

Geotechnical Investigation
240 Kapiti Road
Paraparaumu Beach
19667.000.000

Client : Kurt Kerrison
Date : 14/12/2021
Max Test Pit Depth : 3.1 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 600 mm

Shear Vane No : NA
Logged By : HB/JL
Reviewed By :
Latitude : -40.900035
Longitude : 174.991979



Test Pit met target depth at 3.1 m.

TS = TOPSOIL
L = LOOSE MD = MEDIUM DENSE D = DENSE

TS = TOPSOIL

LOG OF TEST PIT TP11

Geotechnical Investigation
240 Kapiti Road
Paraparaumu Beach
19667.000.000

Client	: Kurt Kerrison	**Shear Vane No**	: NA
Date	: 14/12/2021	**Logged By**	: HB/JL
Max Test Pit Depth	: 1.8 m	**Reviewed By**	:
Digger Type/Size	: Bucket Excavator	**Latitude**	: -40.900113
Bucket Type/Size	: 600 mm	**Longitude**	: 174.9908

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		SP	Fine to medium SAND; dark brown. Poorly Graded. Contains rootlets.					L		
	DUNE SANDS			Fine to medium SAND; brownish grey. Poorly Graded.				M			
0.5											
1.0			SP	Becomes saturated from 1.0 m depth.			▼	W	MD - D		
1.5								S			
				Depth of Excavation: 1.8 m Termination Condition: Practical refusal							
2.0											
2.5											
3.0											

Test Pit met target depth at 1.8 m depth .

TS = TOPSOIL
L = LOOSE MD = MEDIUM DENSE D = DENSE

TS = TOPSOIL

LOG OF TEST PIT TP12

Geotechnical Investigation
240 Kapiti Road
Paraparaumu Beach
19667.000.000

Client : Kurt Kerrison
Date : 14/12/2021
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 600 mm

Shear Vane No : NA
Logged By : HB/JL
Reviewed By :
Latitude : -40.899932
Longitude : 174.991364

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TS		SP	Fine to medium SAND; dark brown. Poorly Graded. Contains rootlets.					L		
0.5	DUNE SANDS			Fine to medium SAND; brownish grey. Poorly Graded.				M			
1.0			SP						MD - D		
1.5				Becomes saturated from 1.5 m depth.			▼	W			
2.0				Depth of Excavation: 2 m Termination Condition: Practical refusal				S			
2.5											
3.0											

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth at 2 m depth .

TS = TOPSOIL
L = LOOSE MD = MEDIUM DENSE D = DENSE

TS = TOPSOIL

LOG OF TEST PIT TP13

Geotechnical Investigation
240 Kapiti Road
Paraparaumu Beach
19667.000.000

Client : Kurt Kerrison
Date : 14/12/2021
Max Test Pit Depth : 3 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 600 mm

Shear Vane No : NA
Logged By : HB/JL
Reviewed By :
Latitude : -40.900147
Longitude : 174.991466

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm (2 4 6 8 10 12)
0	TS		SP	Fine to medium SAND; dark brown. Poorly Graded. Contains rootlets.							
0.5	DUNE SANDS		SP	Fine to medium SAND; orange brown. Poorly Graded. Becomes grey brown from 0.5 m depth.				M			
1.0											
1.5											
2.0											
2.5											
3.0				Depth of Excavation: 3 m Termination Condition: Practical refusal							

Test Pit met target depth at 3 m depth .

TS = TOPSOIL
L = LOOSE MD = MEDIUM DENSE D = DENSE

TS = TOPSOIL

GEOTECH TEST PIT LOG TEST PIT LOGS 240 KAPITI ROAD.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/22

LOG OF TEST PIT TP14

Geotechnical Investigation
240 Kapiti Road
Paraparaumu Beach
19667.000.000

Client : Kurt Kerrison
Date : 14/12/2021
Max Test Pit Depth : 2.2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 600 mm

Shear Vane No : NA
Logged By : HB/JL
Reviewed By :
Latitude : -40.89977
Longitude : 174.99191

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm (2 4 6 8 10 12)
0.0	TS		SP	Fine to medium SAND; dark brown. Poorly Graded. Contains rootlets.							
0.3	DUNE SANDS		SP	Fine to medium SAND; orange brown. Poorly Graded. Becomes light grey from 0.4 m depth.				M			
2.2				Depth of Excavation: 2.2 m Termination Condition: Practical refusal							

Test Pit met target depth at 2.2 m depth .

TS = TOPSOIL
L = LOOSE MD = MEDIUM DENSE D = DENSE

TS = TOPSOIL

LOG OF TEST PIT TP15

Geotechnical Investigation
240 Kapiti Road
Paraparaumu Beach
19667.000.000

Client : Kurt Kerrison
Date : 14/12/2021
Max Test Pit Depth : 2.2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 600 mm

Shear Vane No : NA
Logged By : HB/JL
Reviewed By :
Latitude : -40.899743
Longitude : 174.991906

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TS		SP	Fine to medium SAND; dark brown. Poorly Graded. Contains rootlets.					L		
0.5	FILL		SP	Fine to medium SAND with topsoil inclusions; greyish brown. Poorly Graded.				M	MD		
1.0	DUNE SANDS			Fine to medium SAND; brownish grey. Poorly Graded. Becomes orange brown from 1 m depth.							
1.5			SP	Becomes brownish grey from 1.4 m depth.				W	MD - D		
2.0				Becomes saturated from 1.9 m depth.			▼	S			
2.5				Depth of Excavation: 2.2 m Termination Condition: Practical refusal							
3.0											

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12 >>

Test Pit met target depth at 2.2 m depth .

TS = TOPSOIL
L = LOOSE MD = MEDIUM DENSE D = DENSE

TS = TOPSOIL

GEOTECH TEST PIT LOG TEST PIT LOGS 240 KAPITI ROAD.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/22

LOG OF TEST PIT TP16

Geotechnical Investigation
240 Kapiti Road
Paraparaumu Beach
19667.000.000

Client : Kurt Kerrison
Date : 14/12/2021
Max Test Pit Depth : 2.5 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 600 mm

Shear Vane No : NA
Logged By : HB/JL
Reviewed By :
Latitude : -40.899768
Longitude : 174.992154

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm (2 4 6 8 10 12)
0	FILL		SP	Fine to medium SAND with topsoil inclusions; greyish brown. Poorly Graded.							
0.5	BTS		SP	Fine to medium SAND; dark brown. Poorly Graded. Contains rootlets.							
1.0	DUNE SANDS		SP	Fine to medium SAND; orange brown. Poorly Graded. Becomes brownish grey from 1 m depth.				M			
1.5			SP	Becomes brownish grey from 1.4 m depth.				W			
2.0							▼				
2.5				Becomes saturated from 2.4 m depth. Depth of Excavation: 2.5 m Termination Condition: Practical refusal				S			
3.0											

Test Pit met target depth at 2.5 m depth .

BTS = BURIED TOPSOIL
L = LOOSE MD = MEDIUM DENSE D = DENSE

BTS = BURIED TOPSOIL

APPENDIX 2:

Site Location Plan

Legend

- CPT Testing
- Test Pit Locations
- Site Boundary

Contours_2017

Contours_2017

- Potenital Fill Material

0 10 m 20 m

ENGEO

Produced by **Datanest.earth**

Title: Test Location Plan		
Client: Thames Pacific		Figure No: 1 Size: A3
Project: 240 Kapiti Road	Drawn: HB	
Date: 25-01-2022	Checked: HB	
Proj No: P2021.005.788	Scale: 1:750	Version: 1

APPENDIX 3:

Liquefaction Analysis

GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

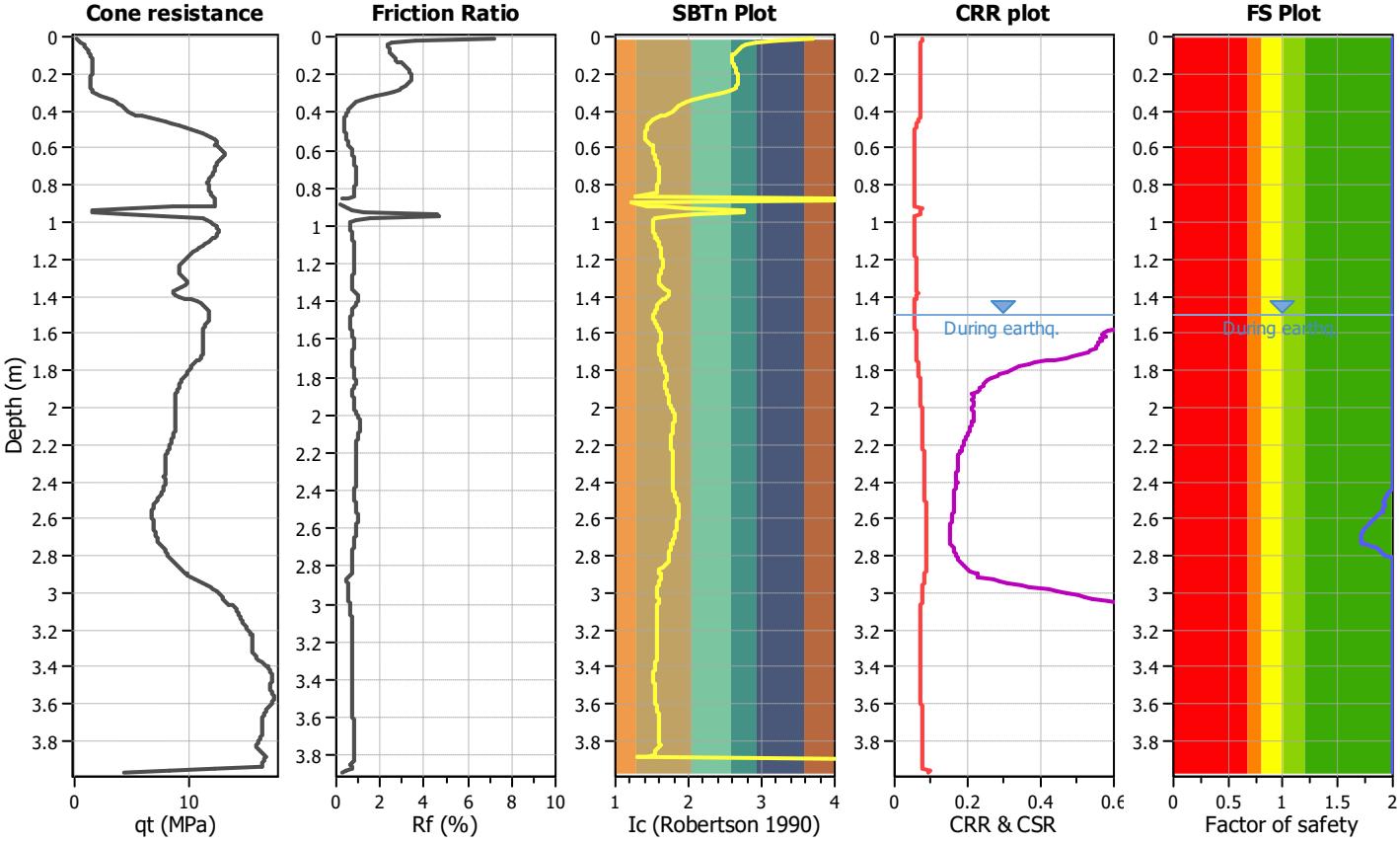
LIQUEFACTION ANALYSIS REPORT

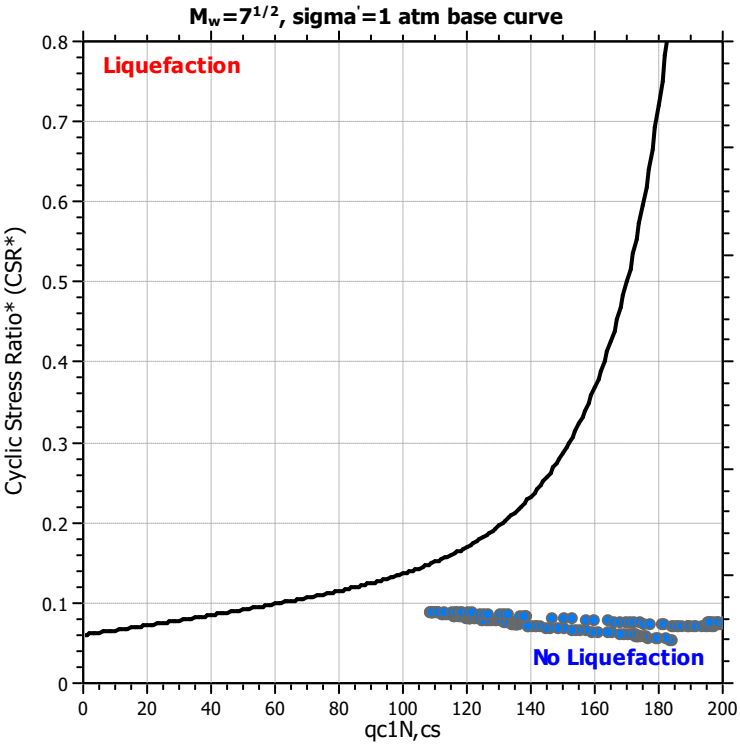
Project title : **Location :**

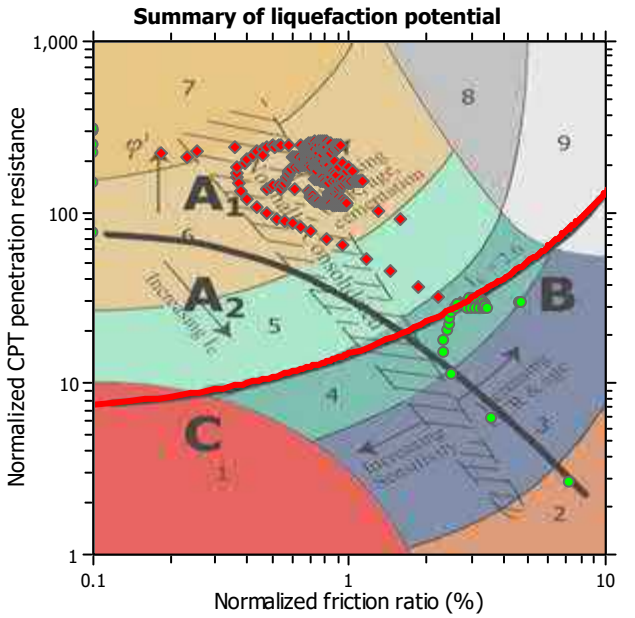
CPT file : CPT 1

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

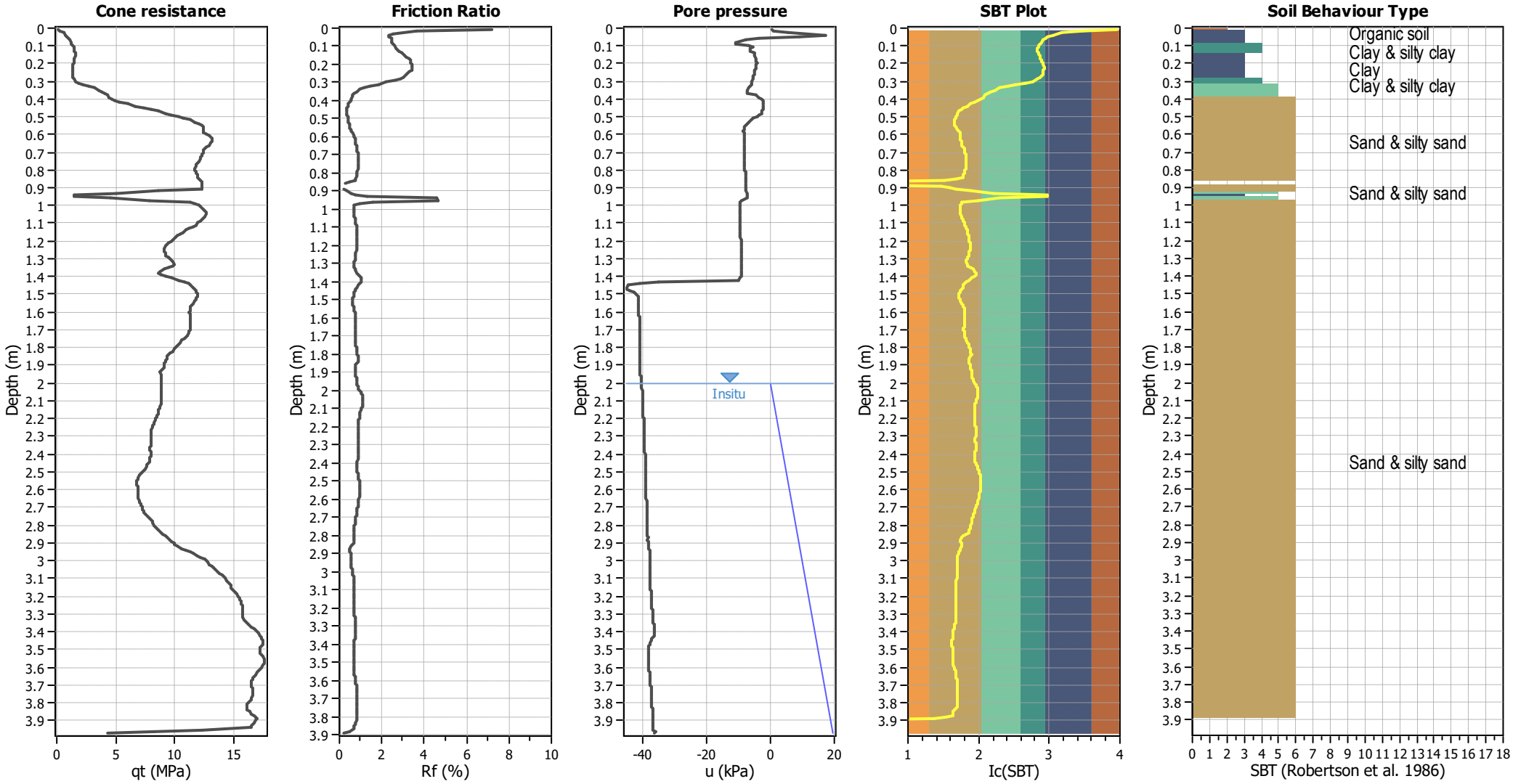






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



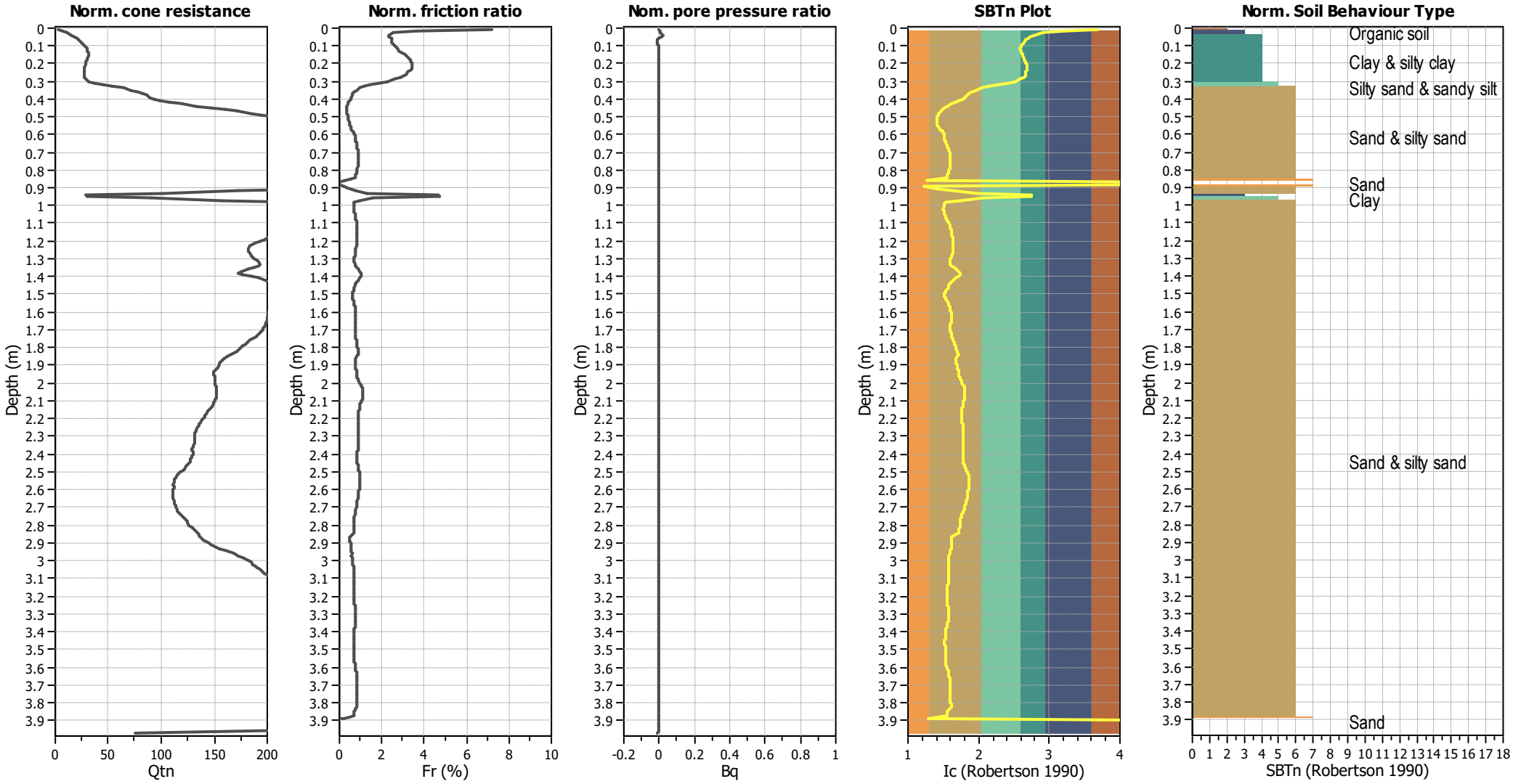
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

CPT basic interpretation plots (normalized)



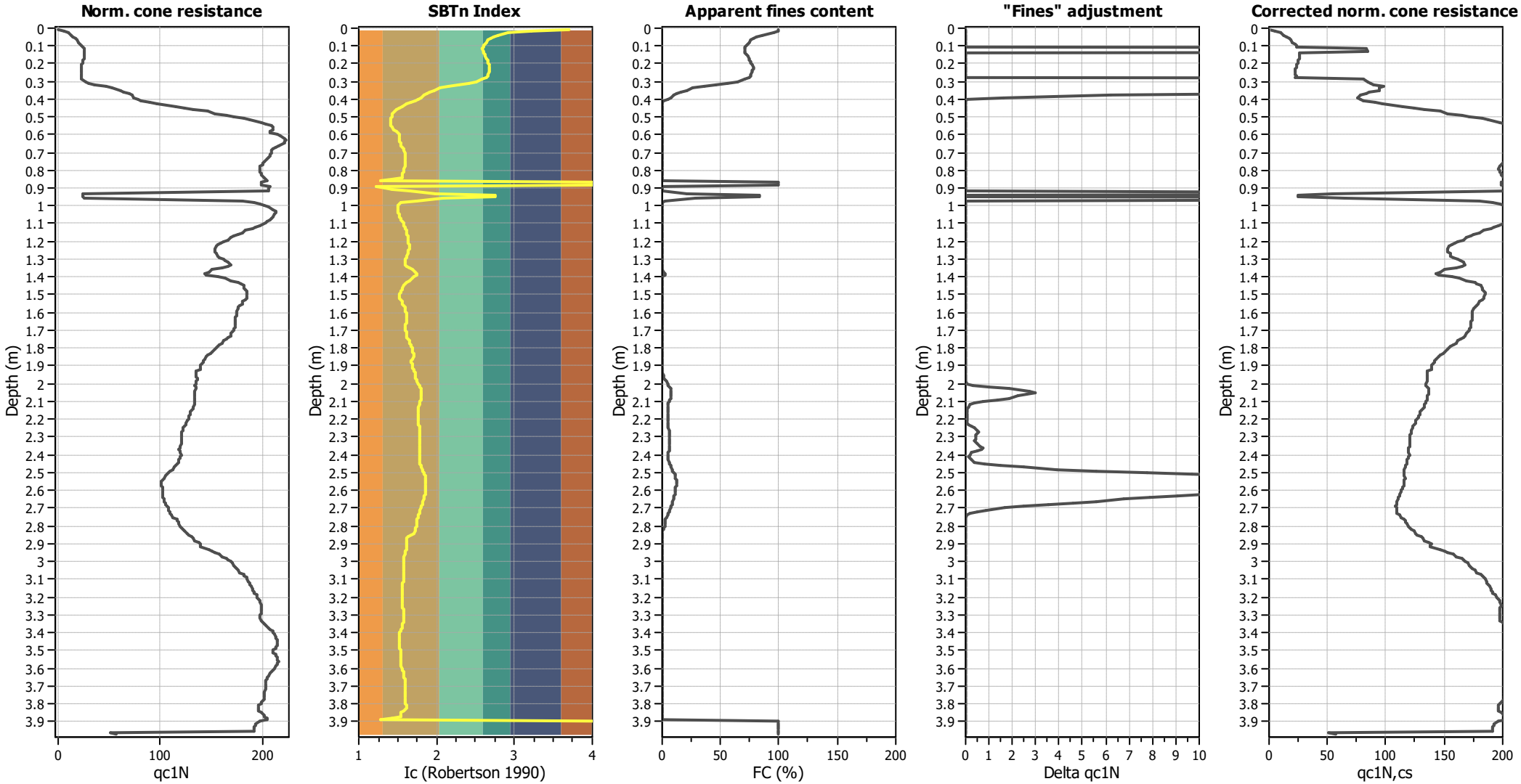
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

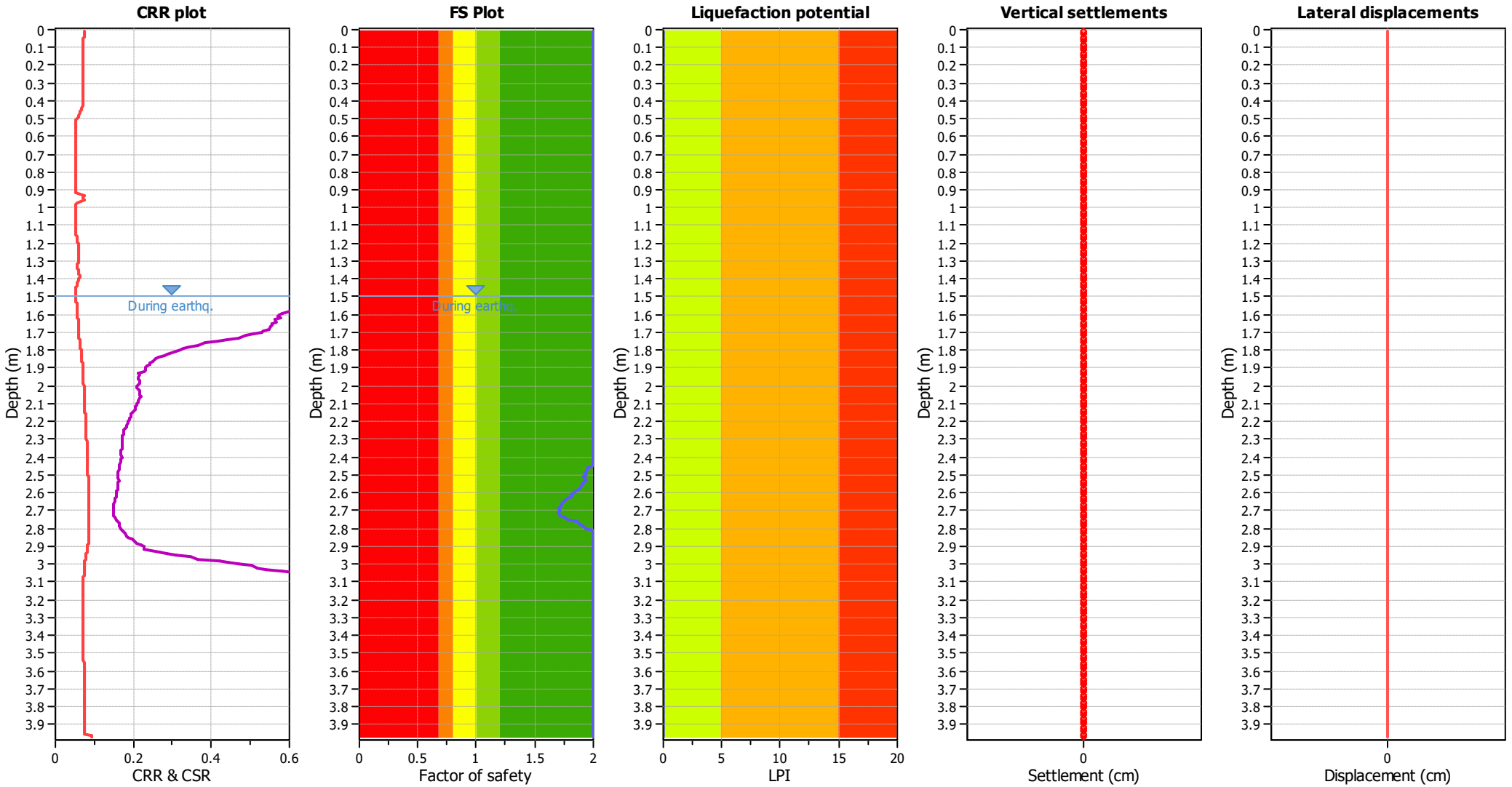
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

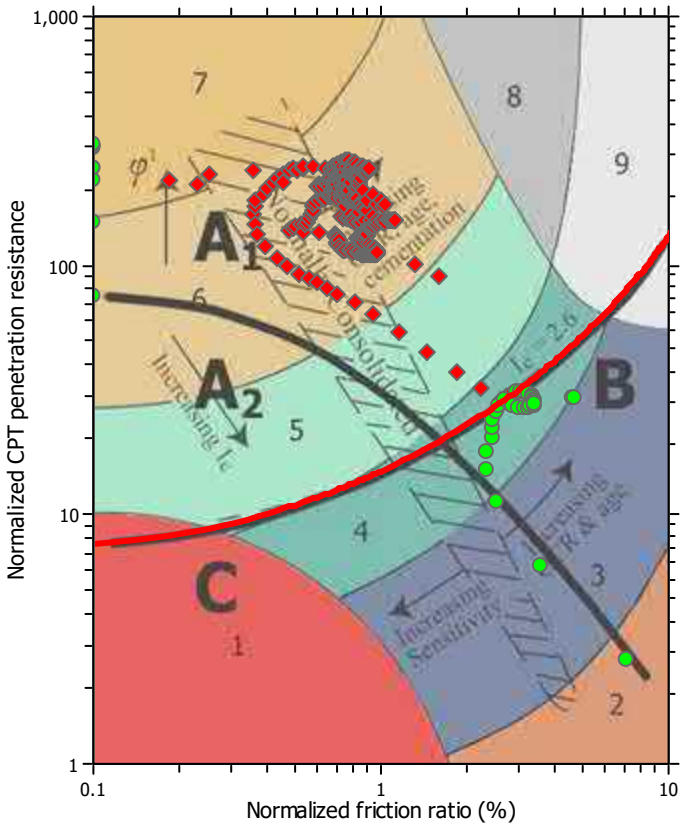
F.S. color scheme

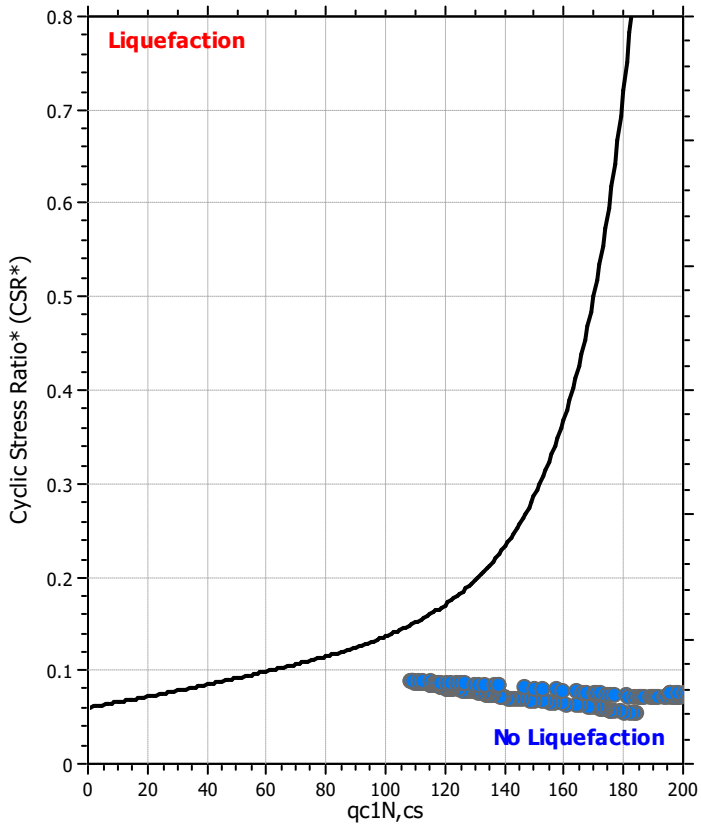
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

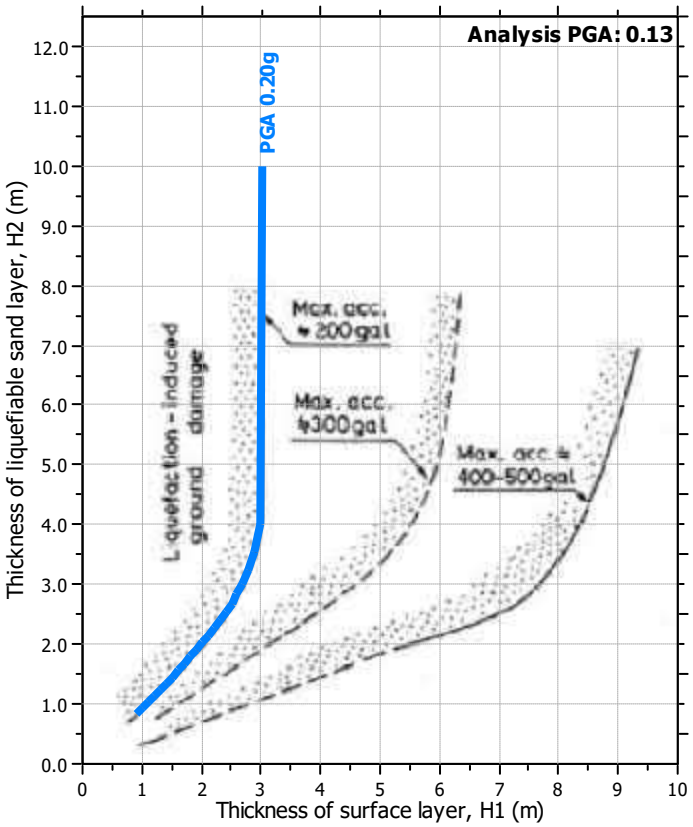
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



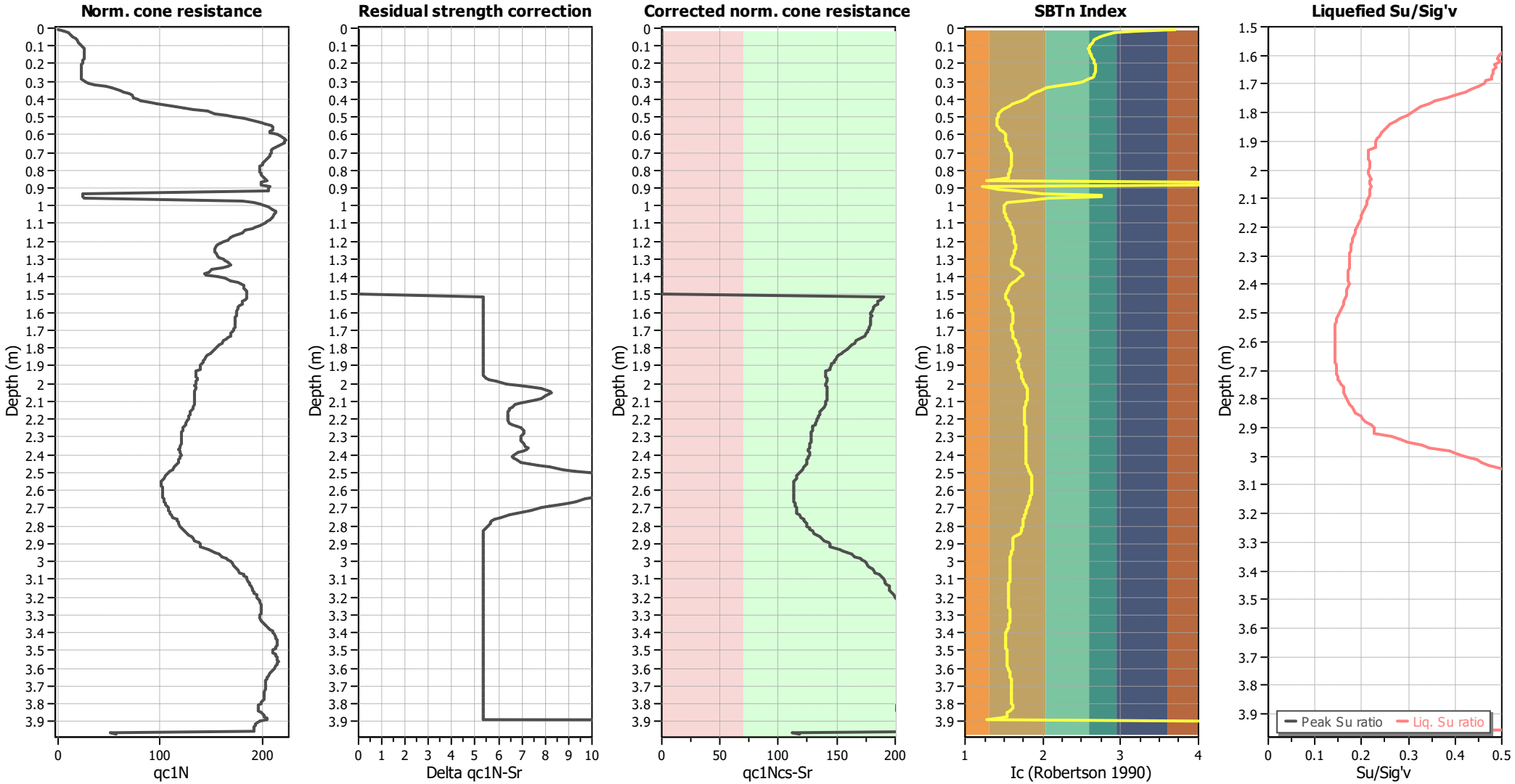




Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

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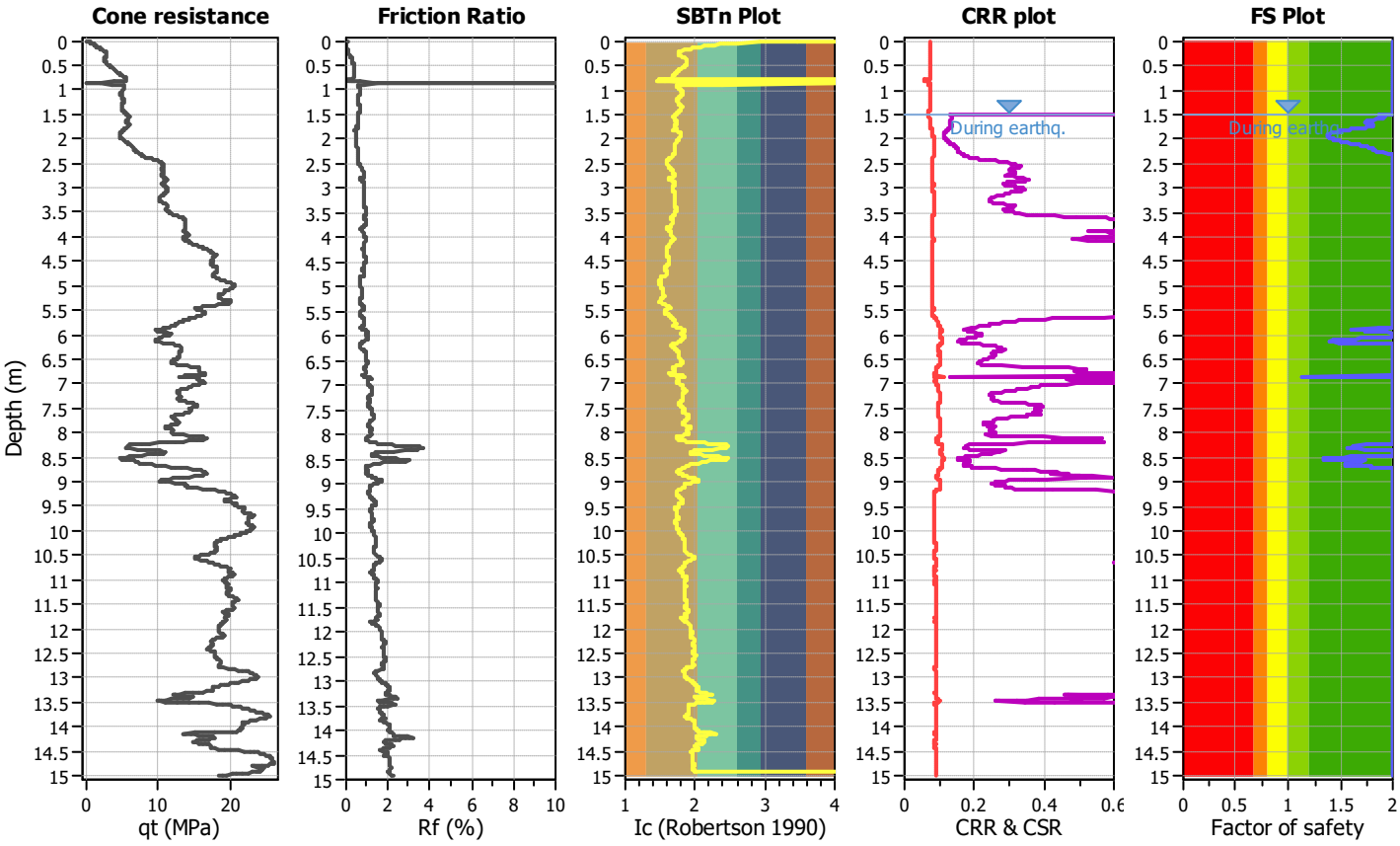
LIQUEFACTION ANALYSIS REPORT

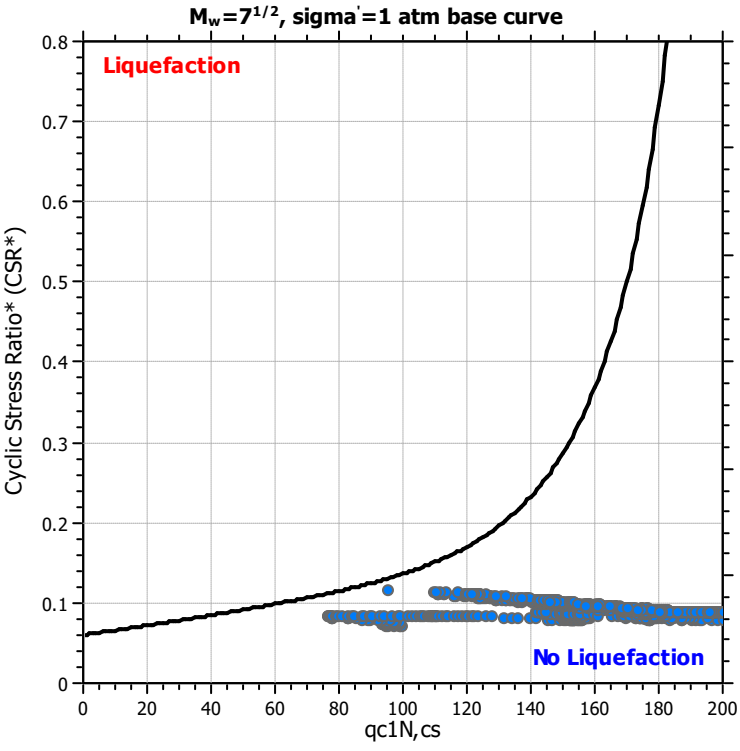
Project title : **Location :**

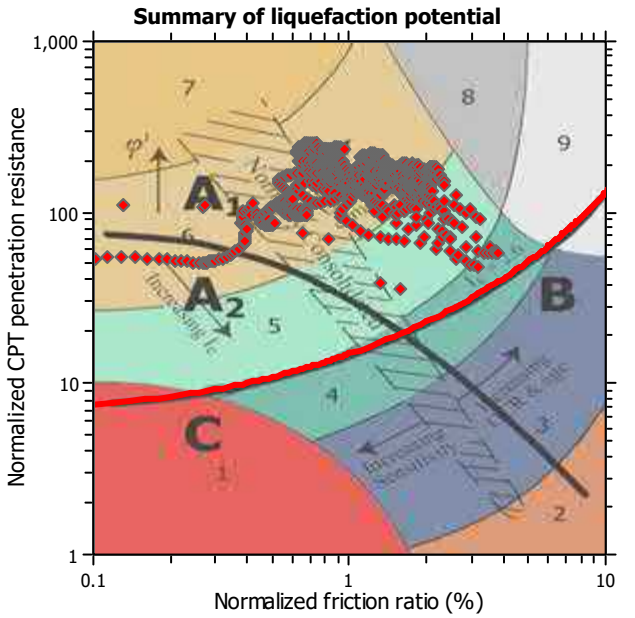
CPT file : CPT 2

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

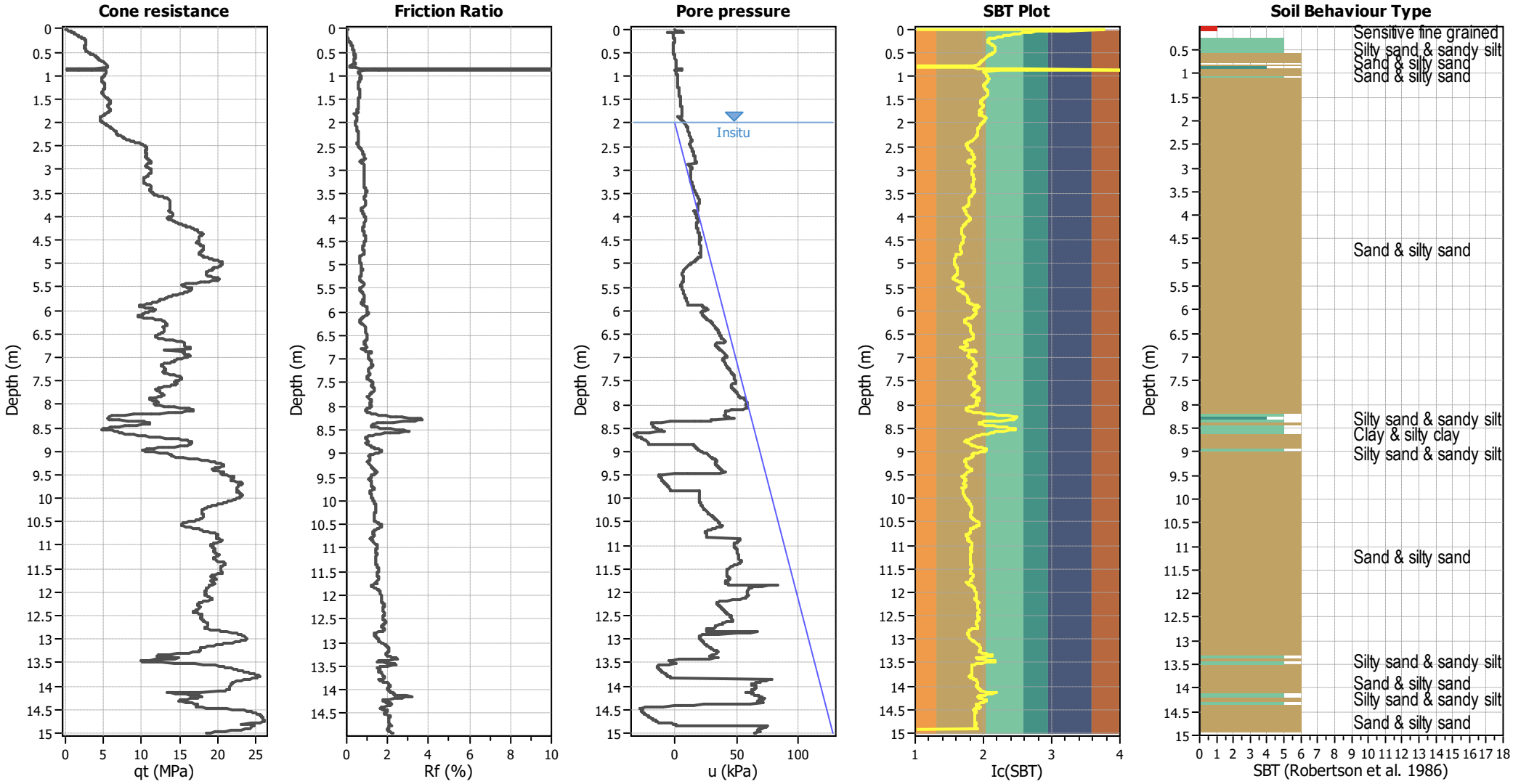






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



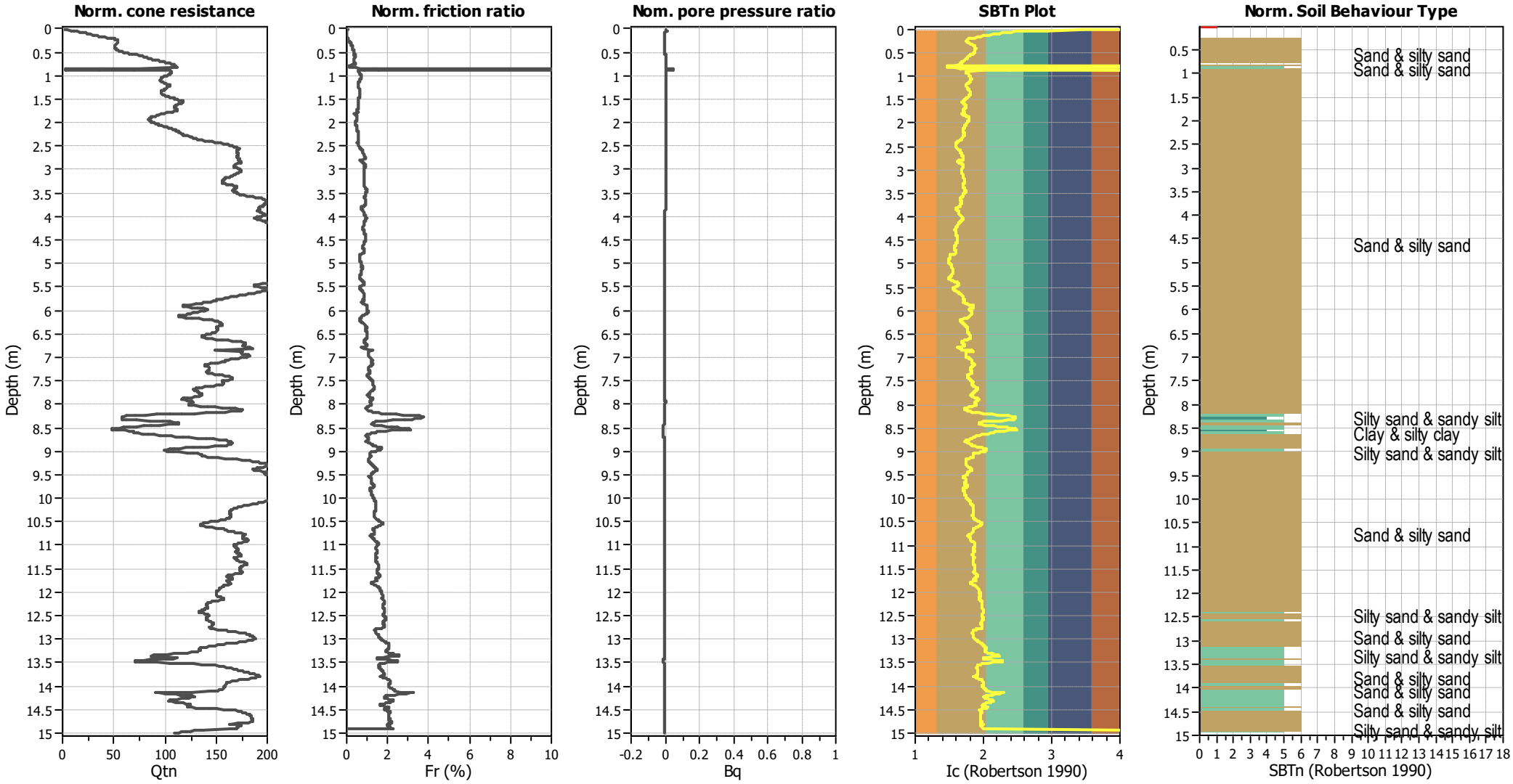
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



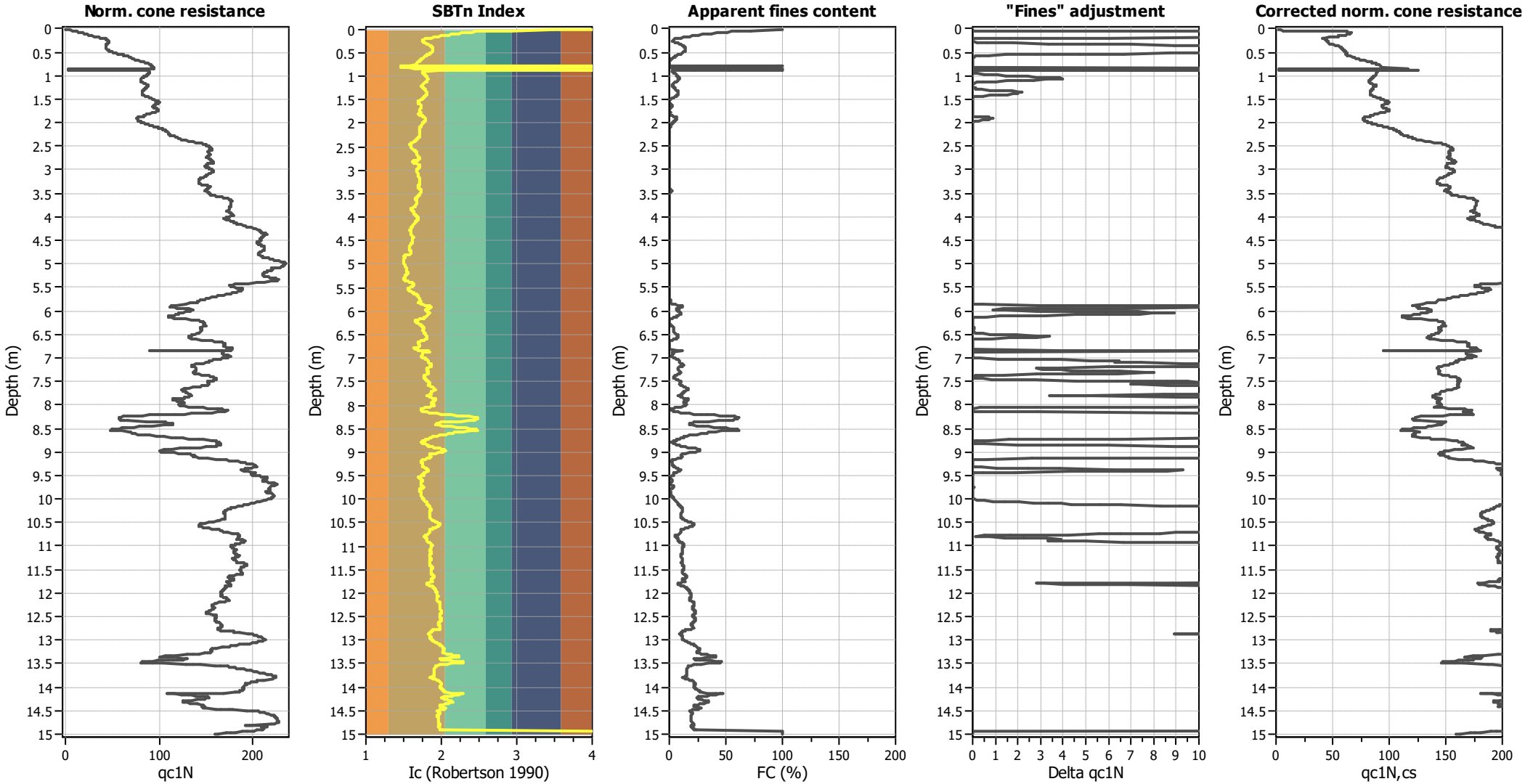
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

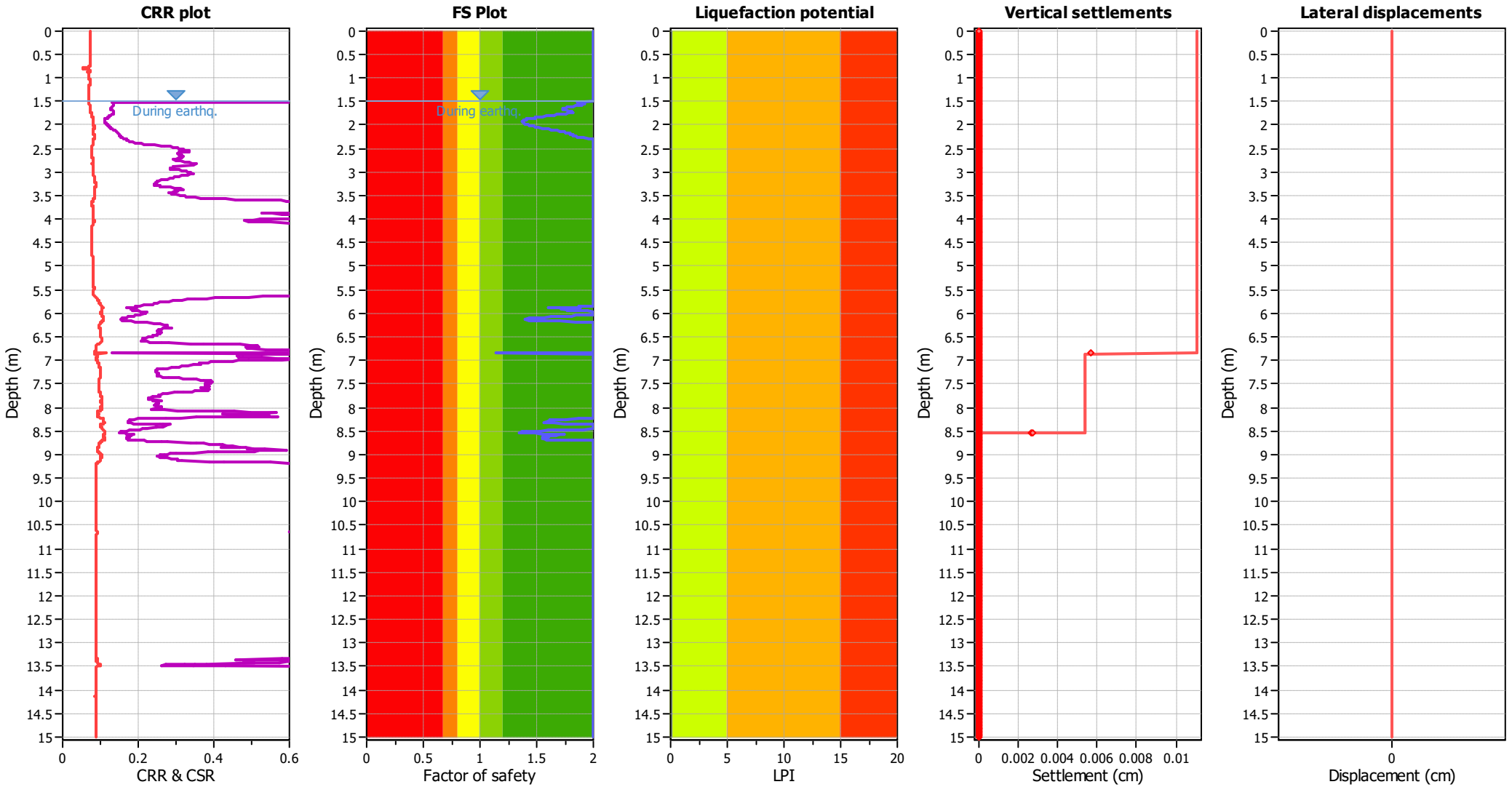
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

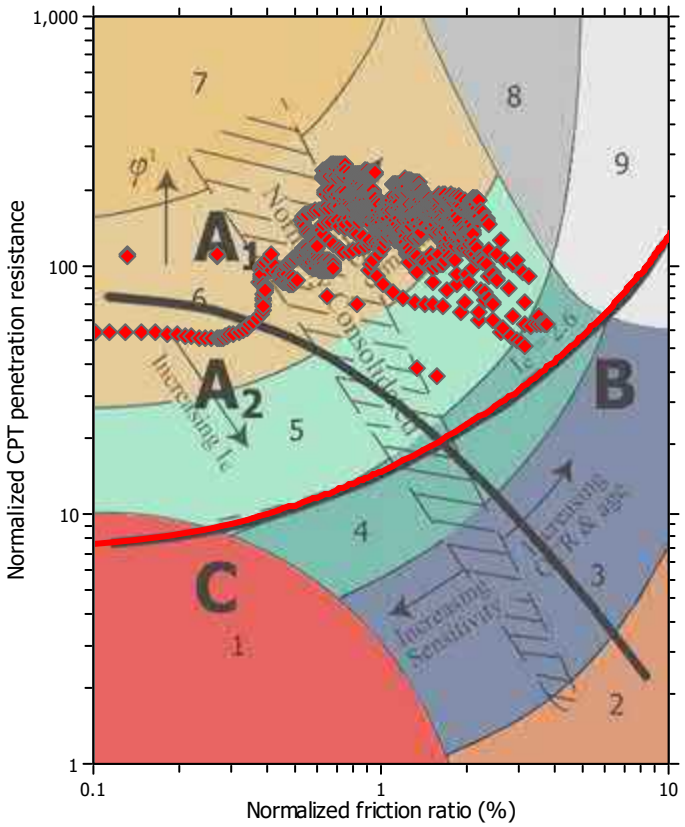
F.S. color scheme

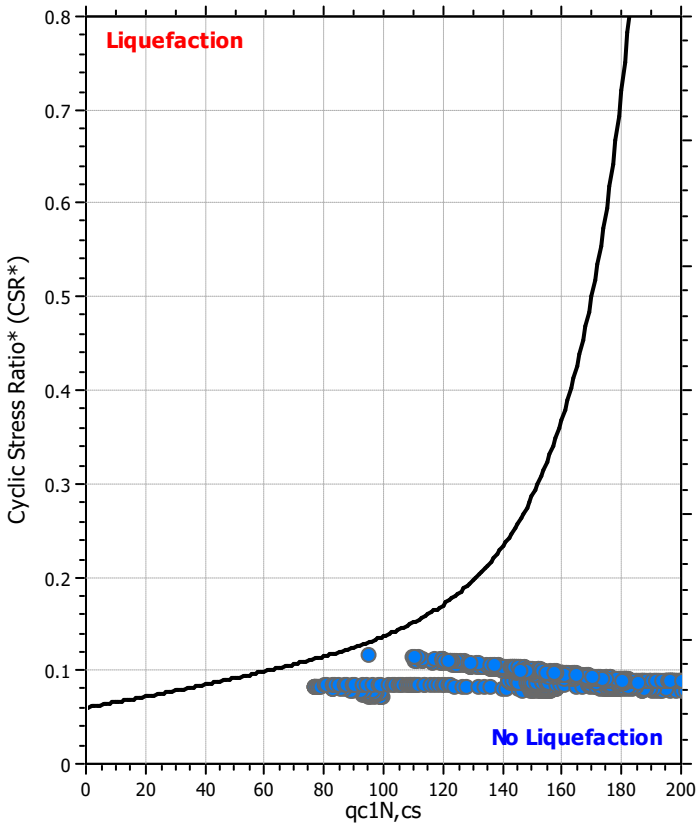
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

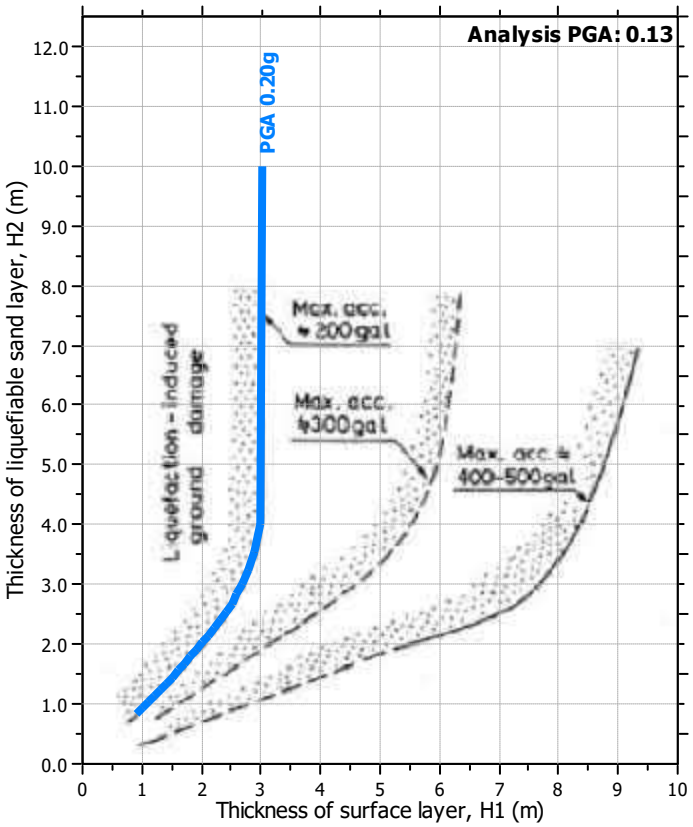
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



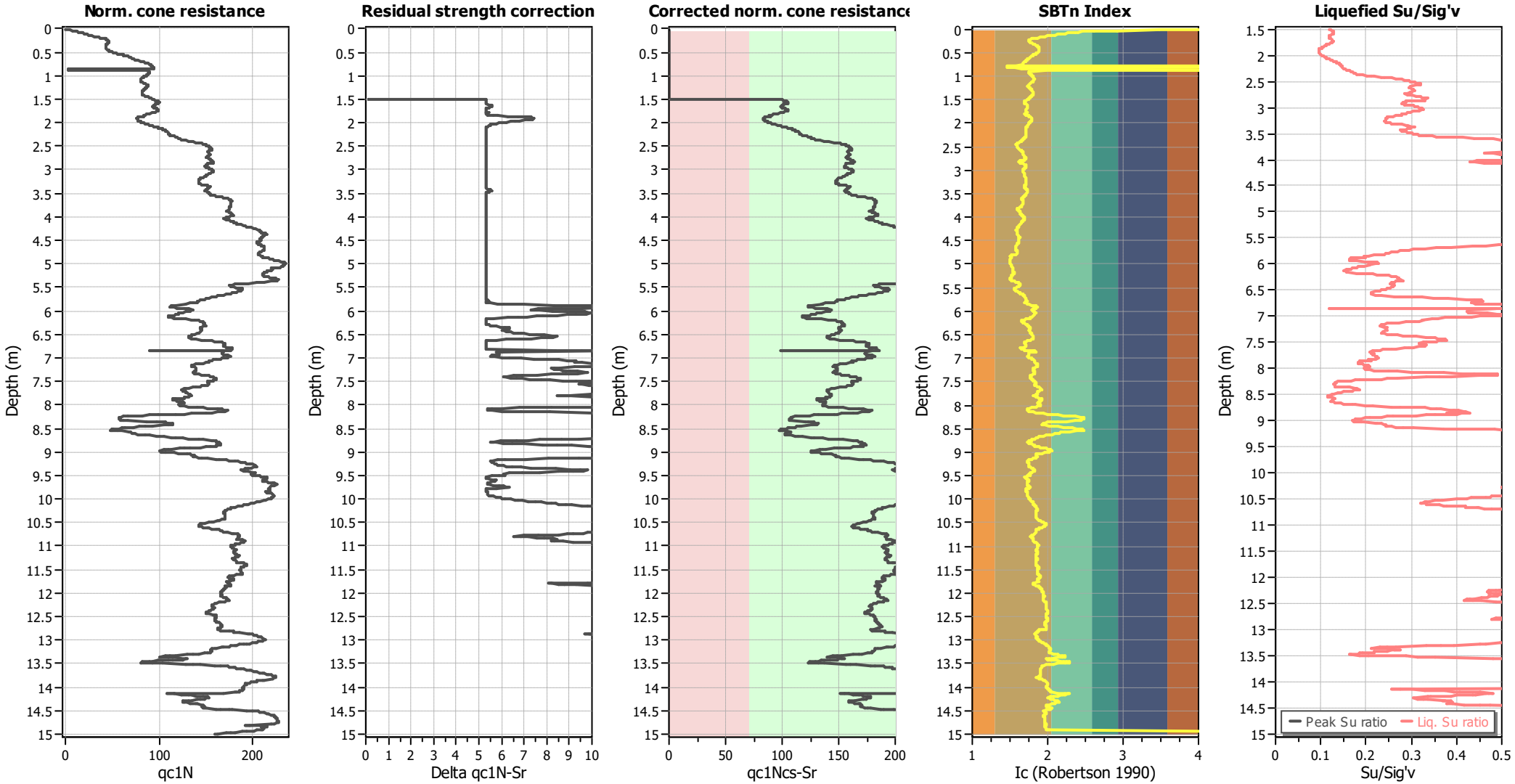




Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

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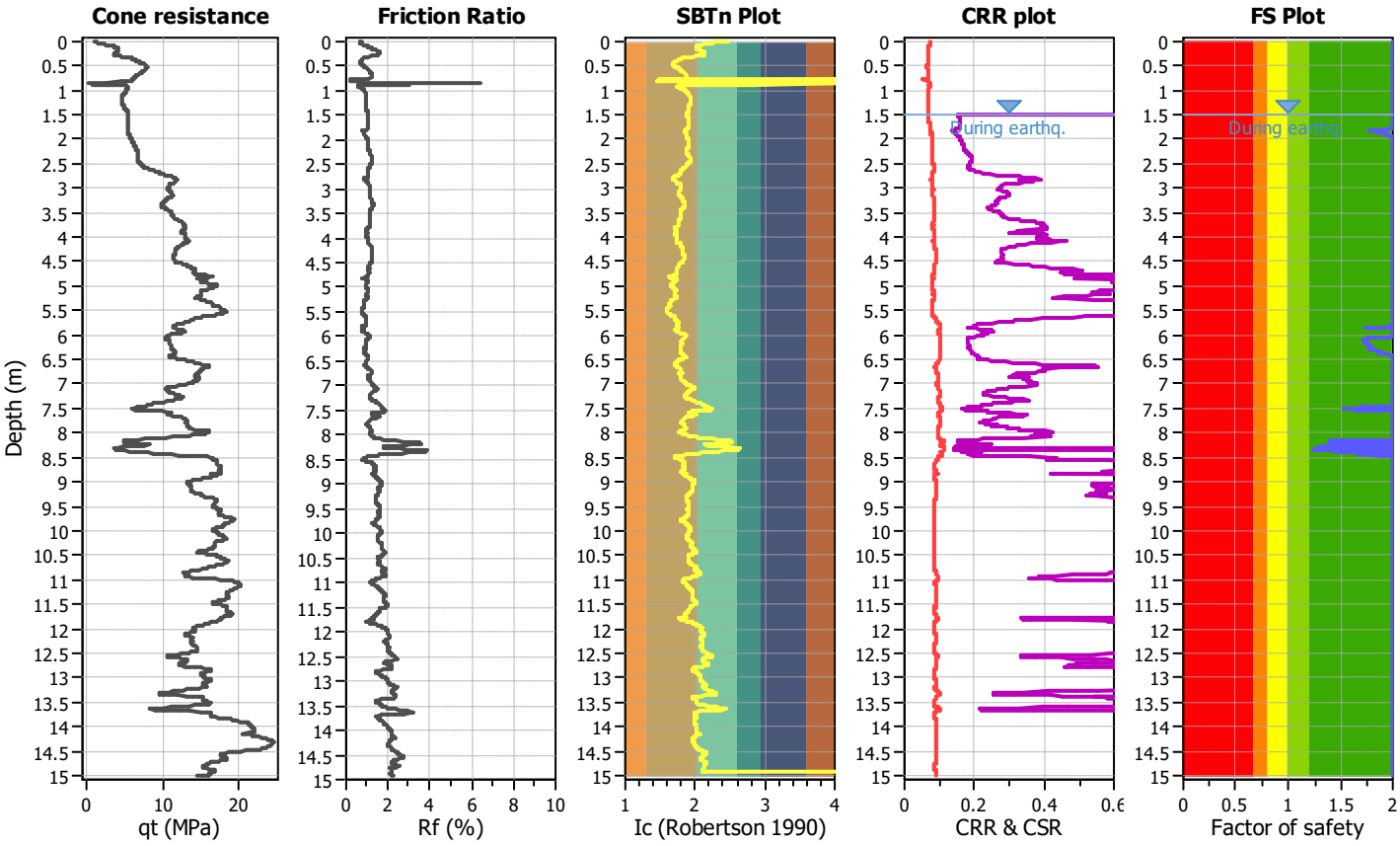
LIQUEFACTION ANALYSIS REPORT

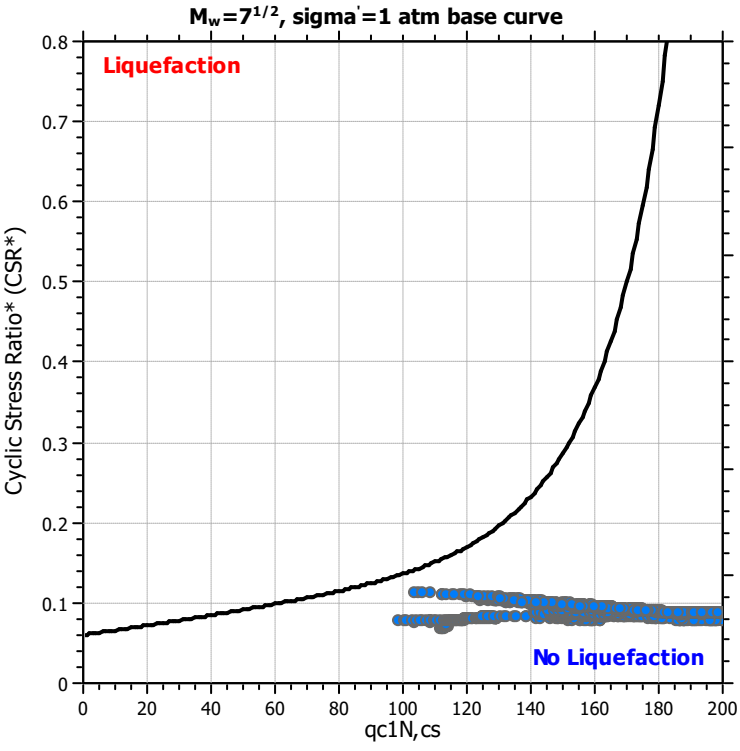
Project title : **Location :**

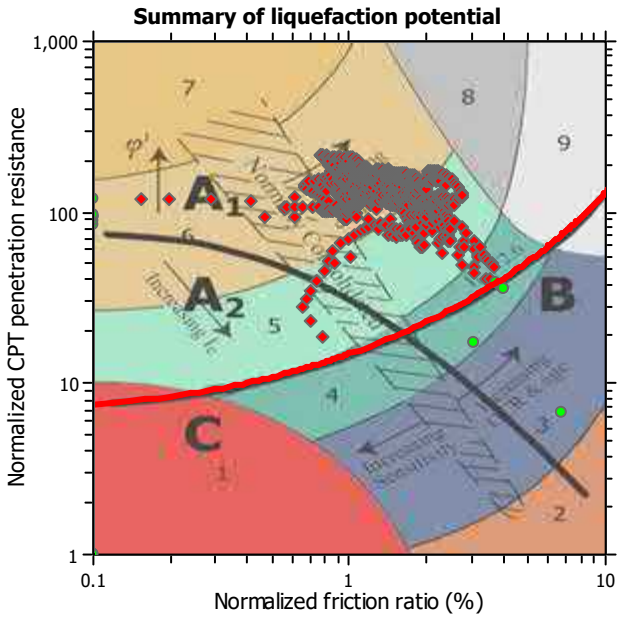
CPT file : CPT 3

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

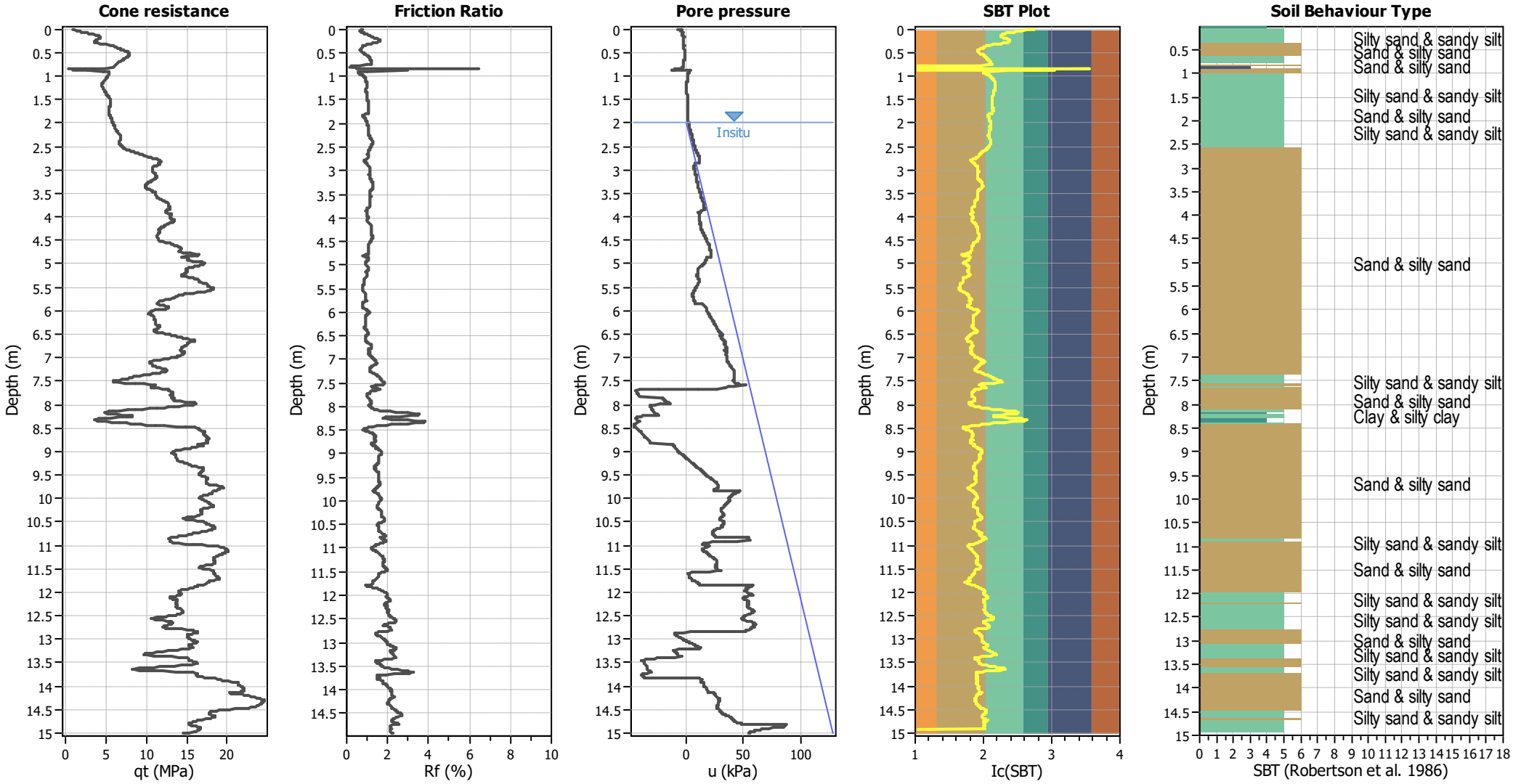






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



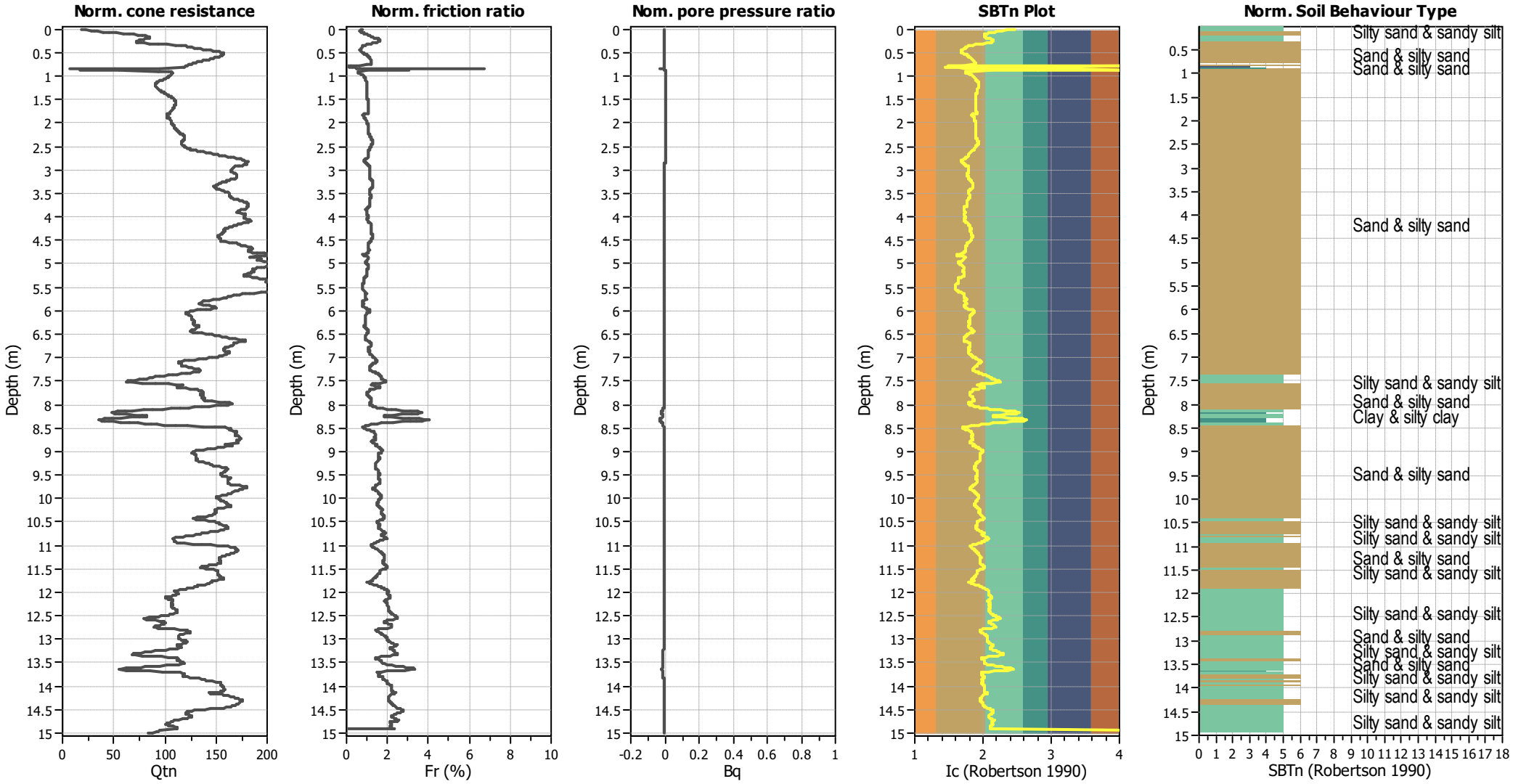
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



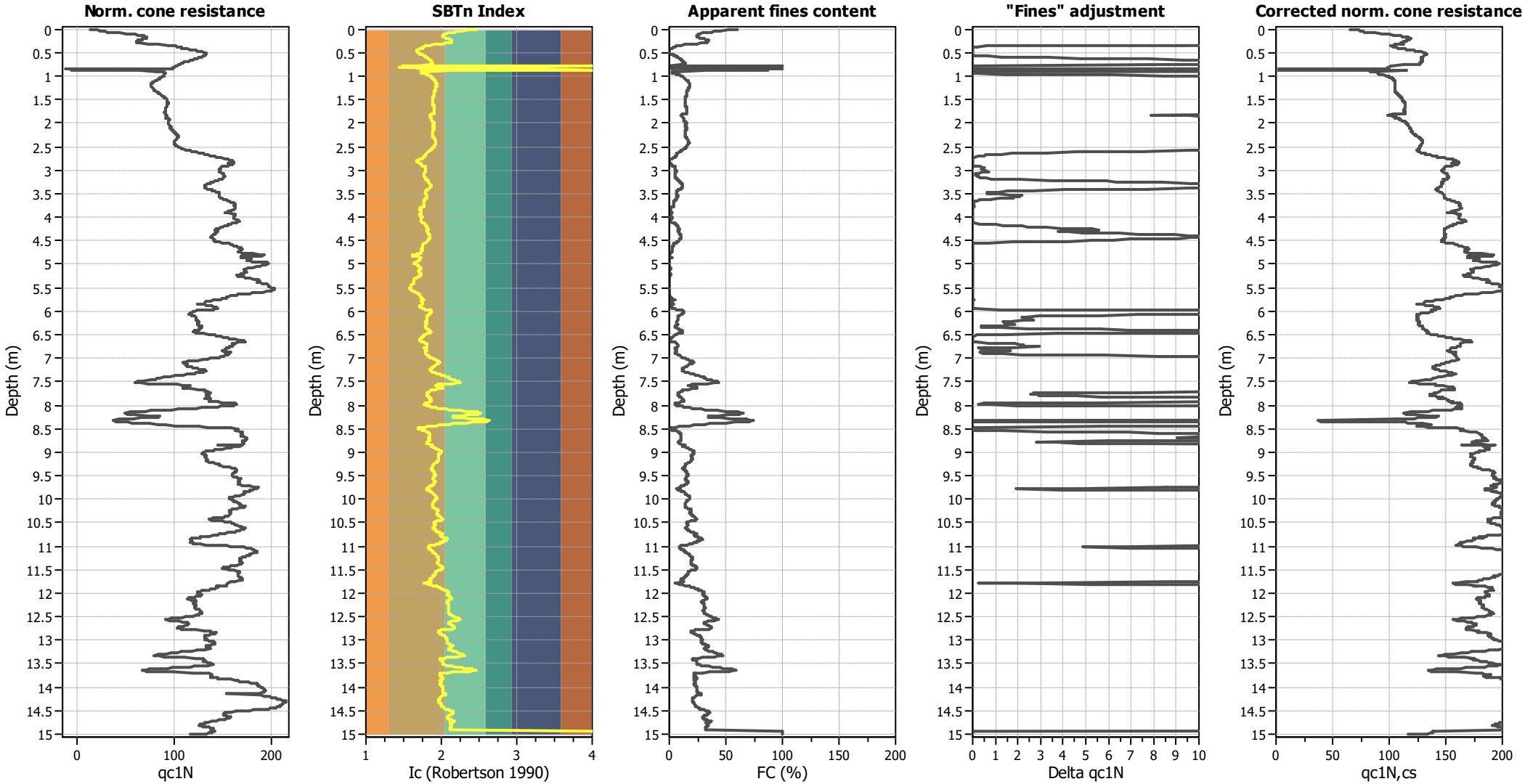
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

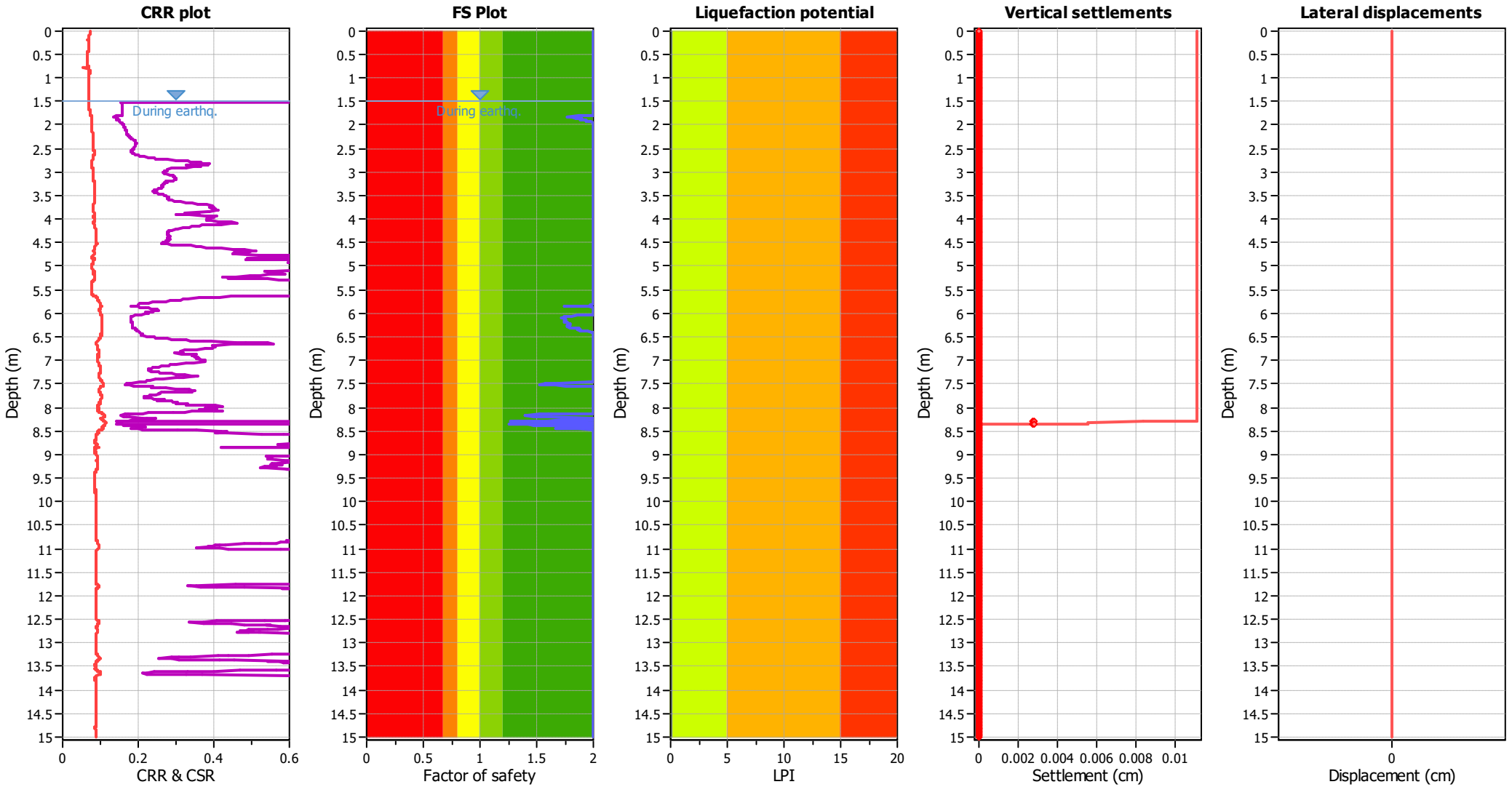
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

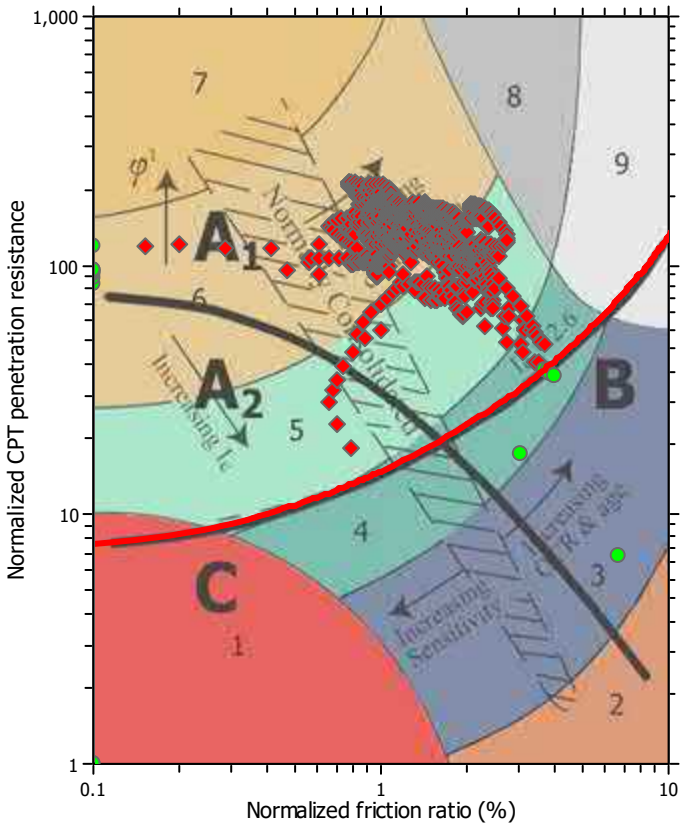
F.S. color scheme

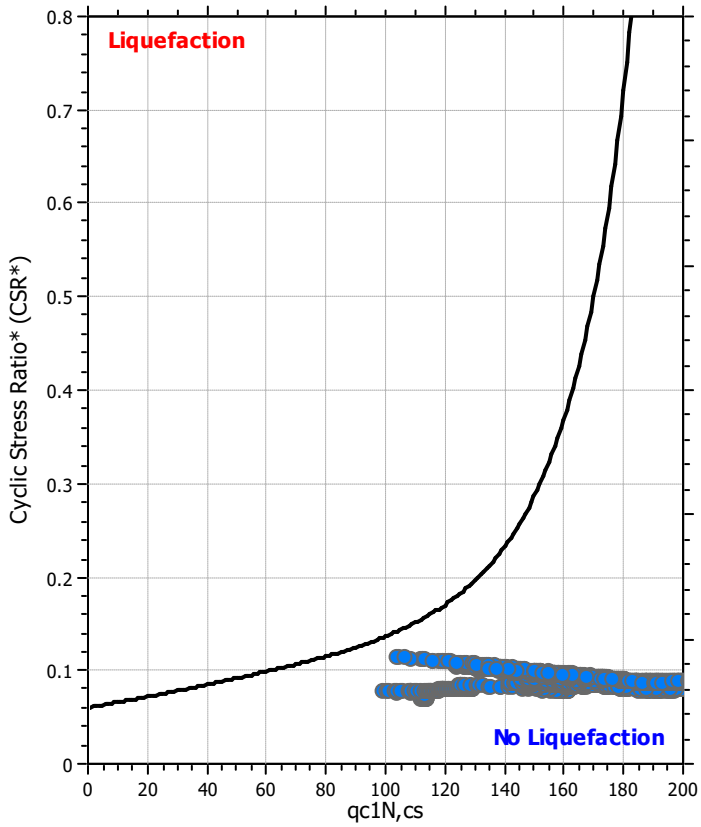
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

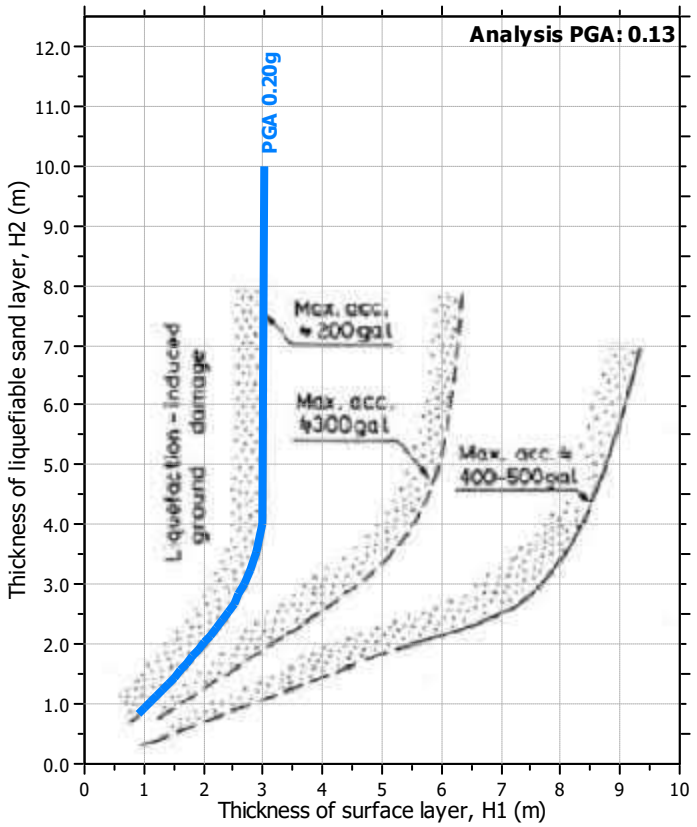
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



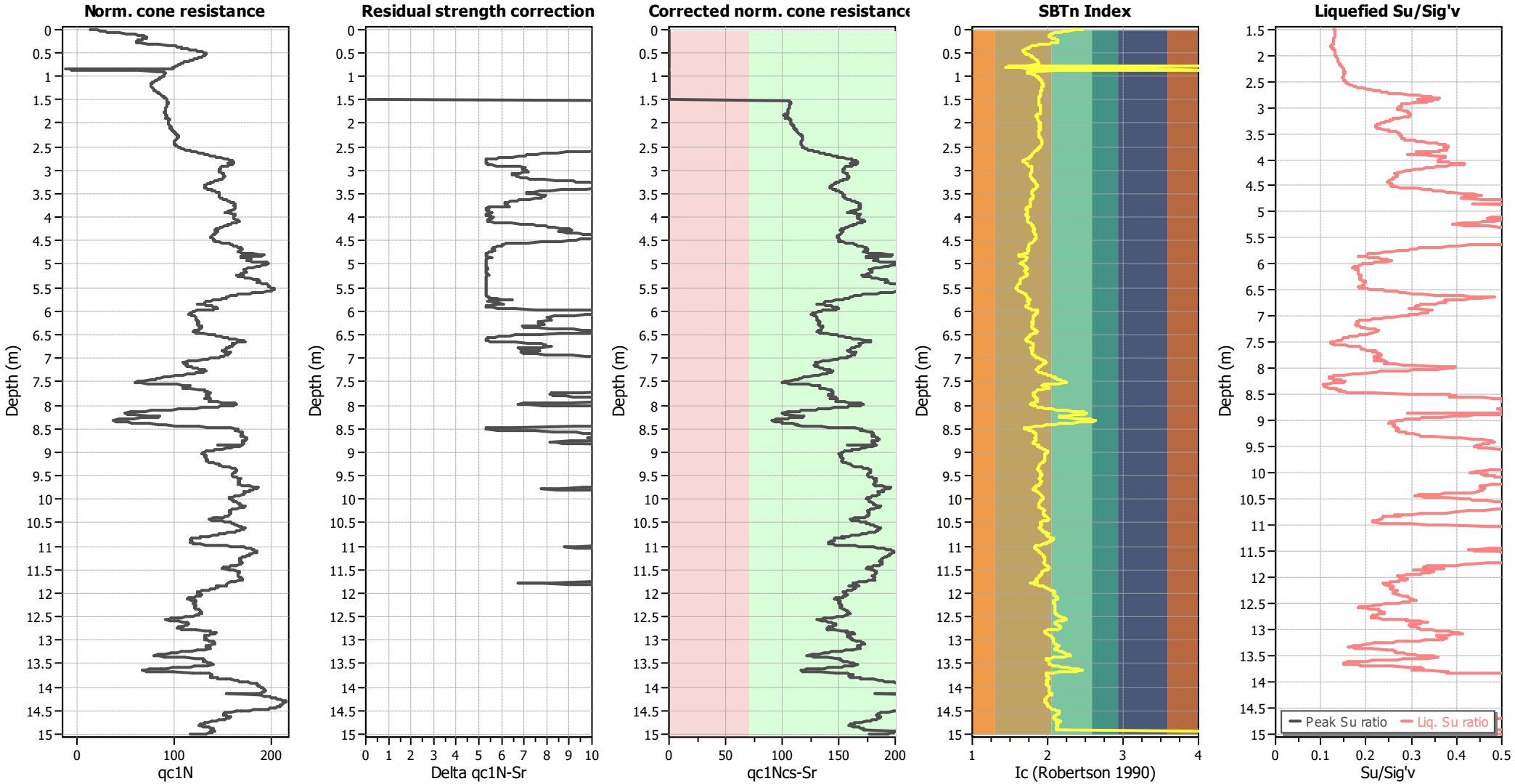




Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

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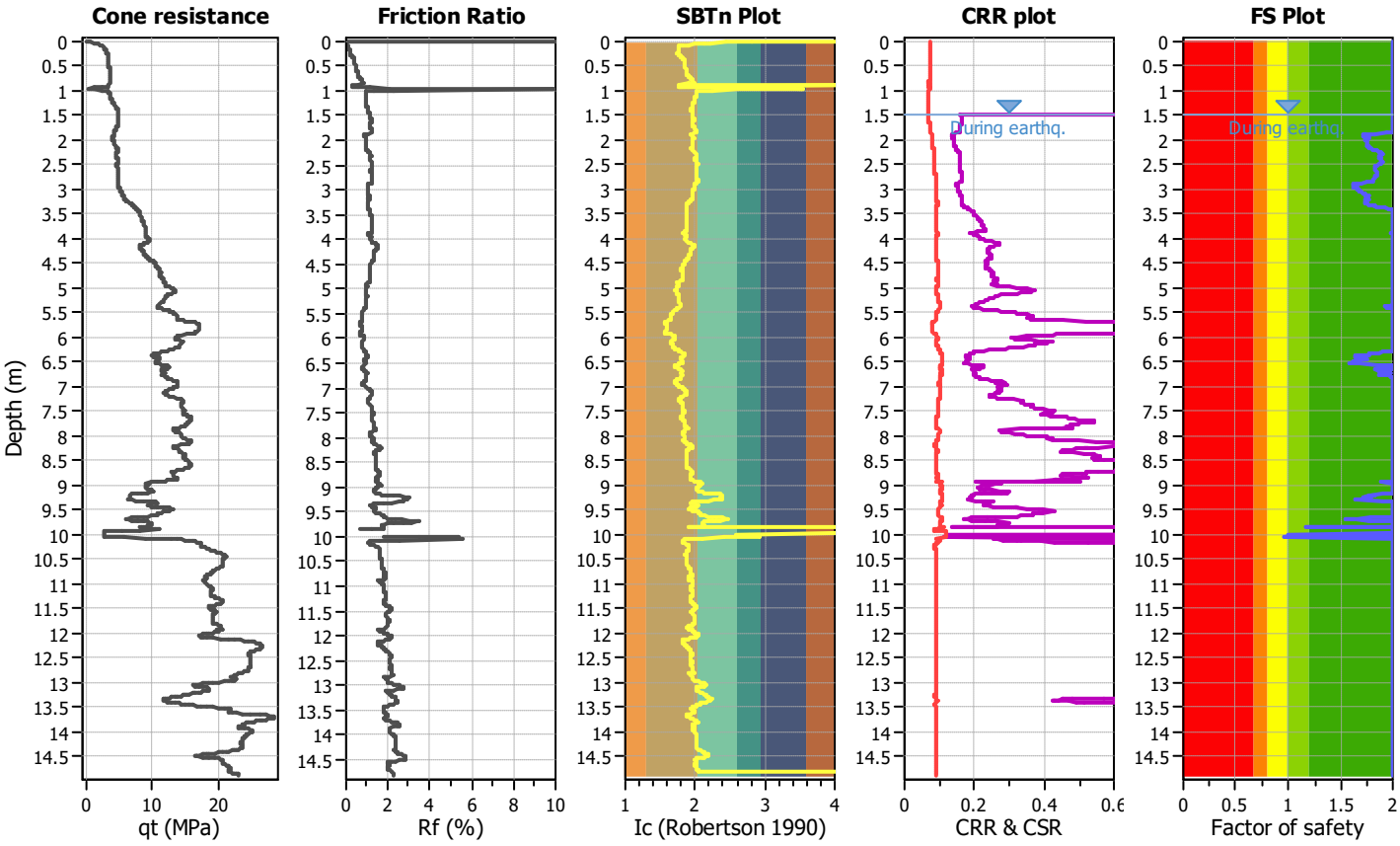
LIQUEFACTION ANALYSIS REPORT

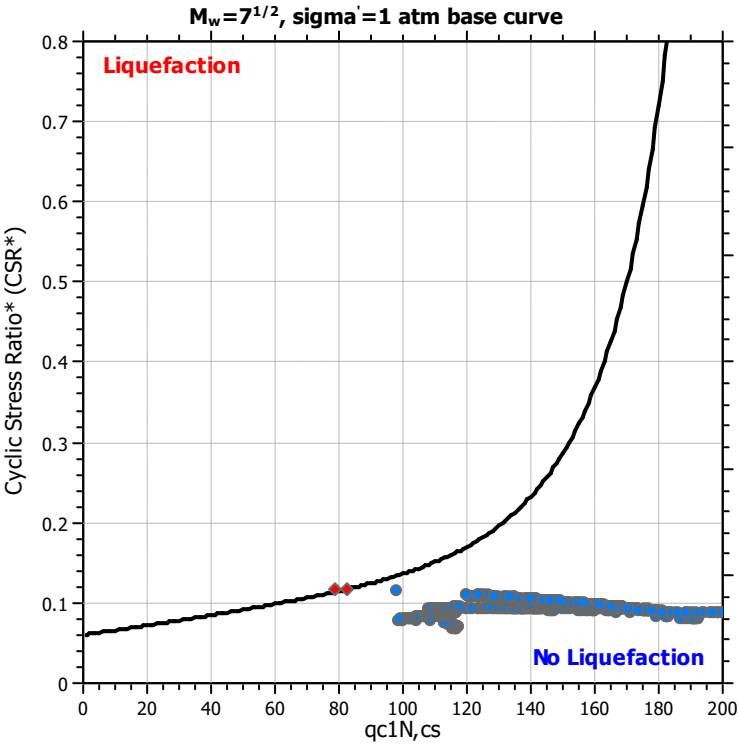
Project title : **Location :**

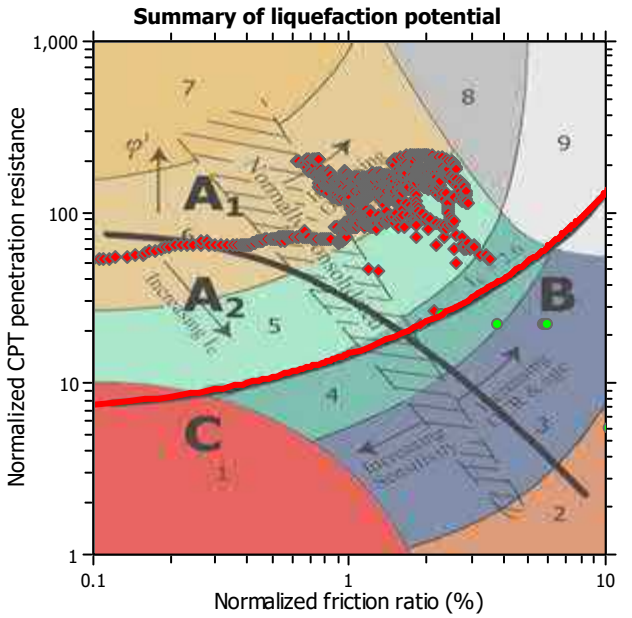
CPT file : CPT 4

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

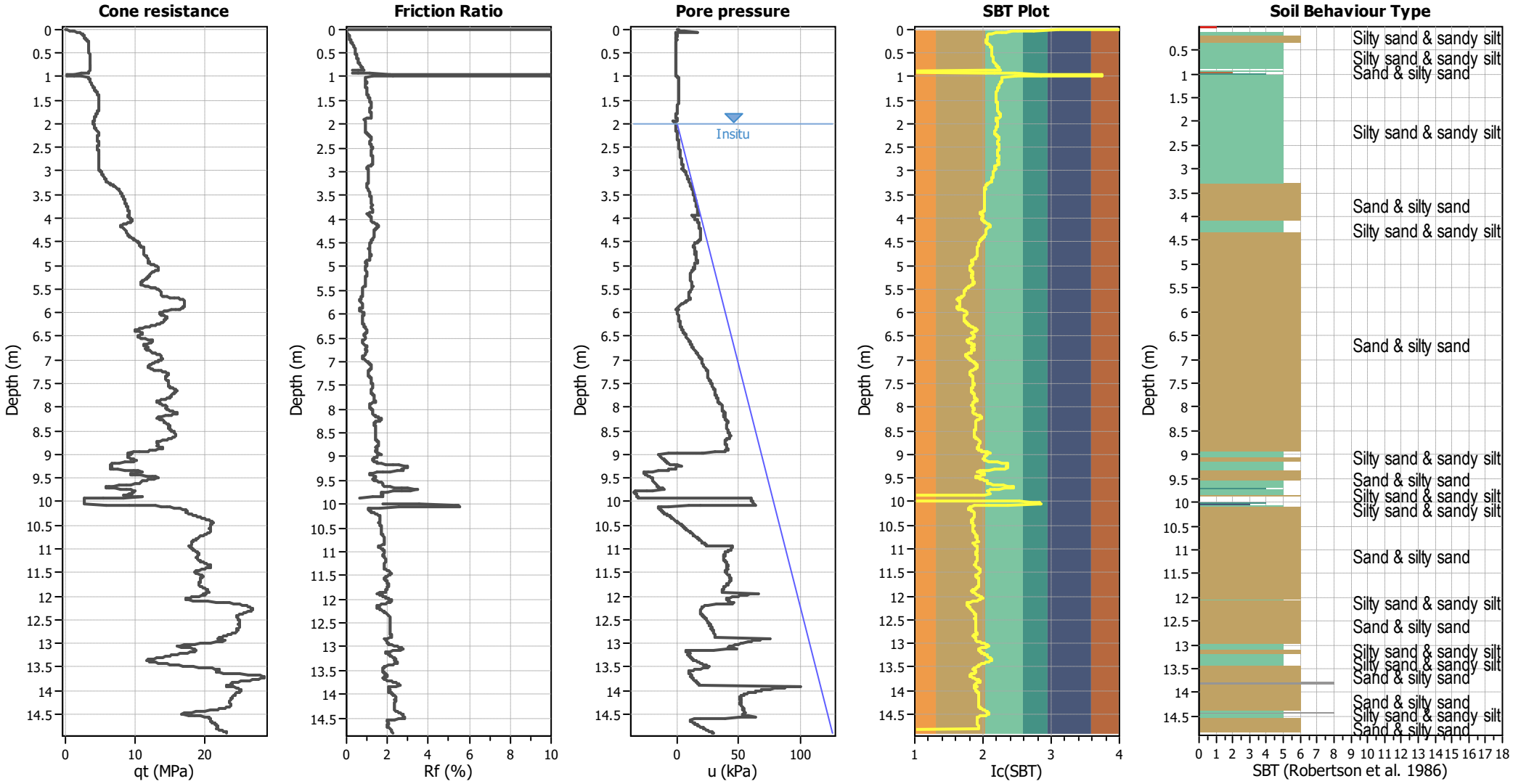






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



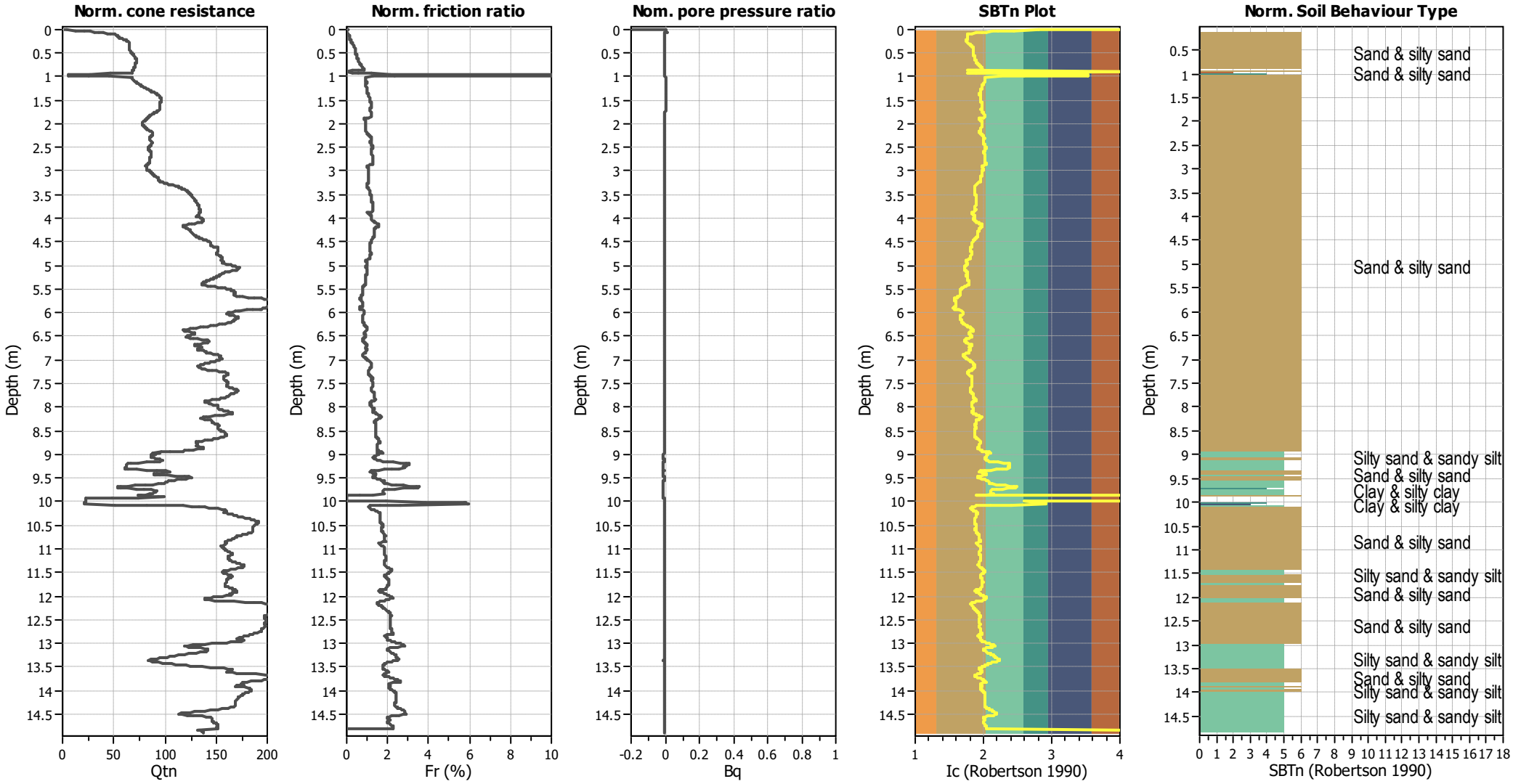
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



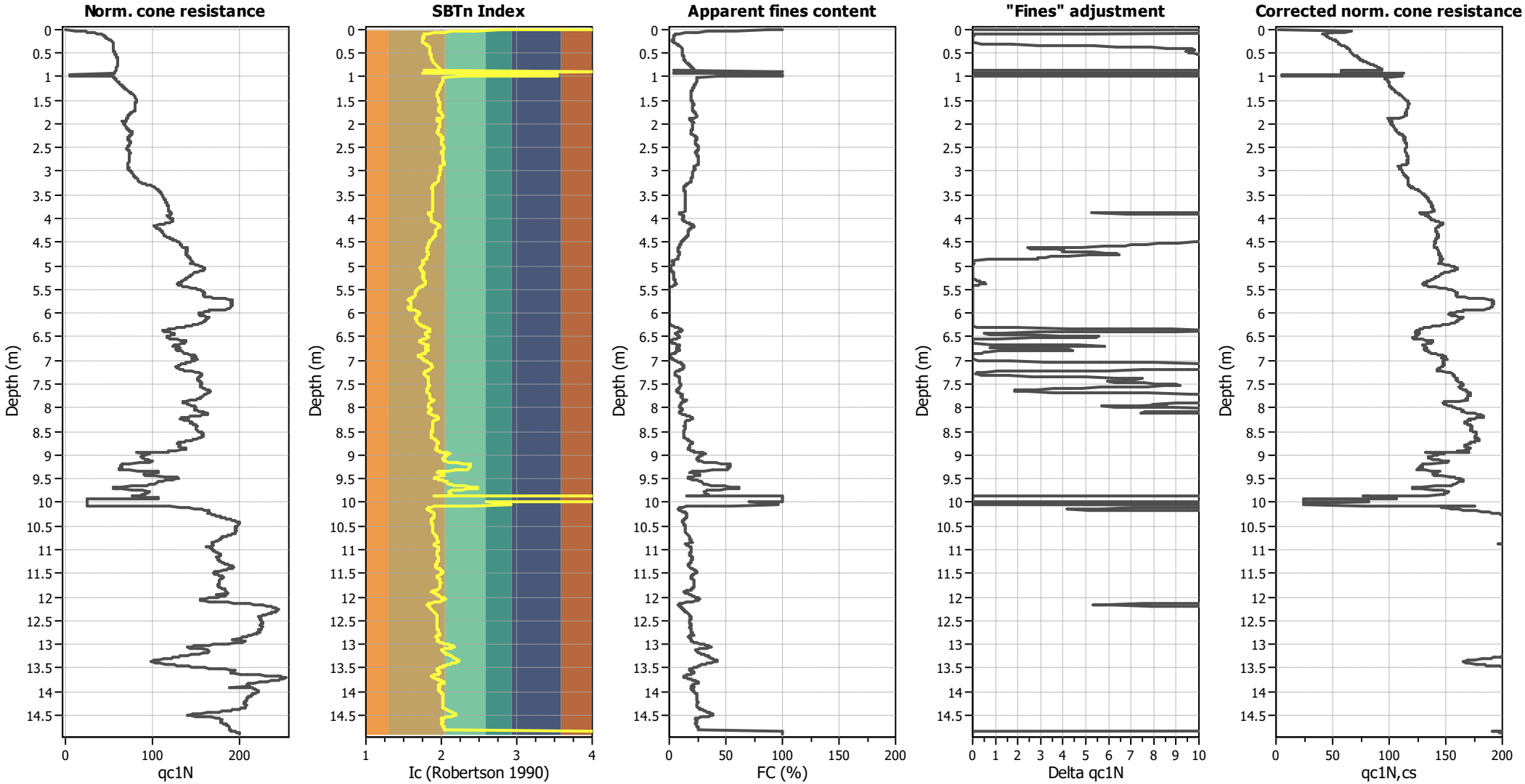
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

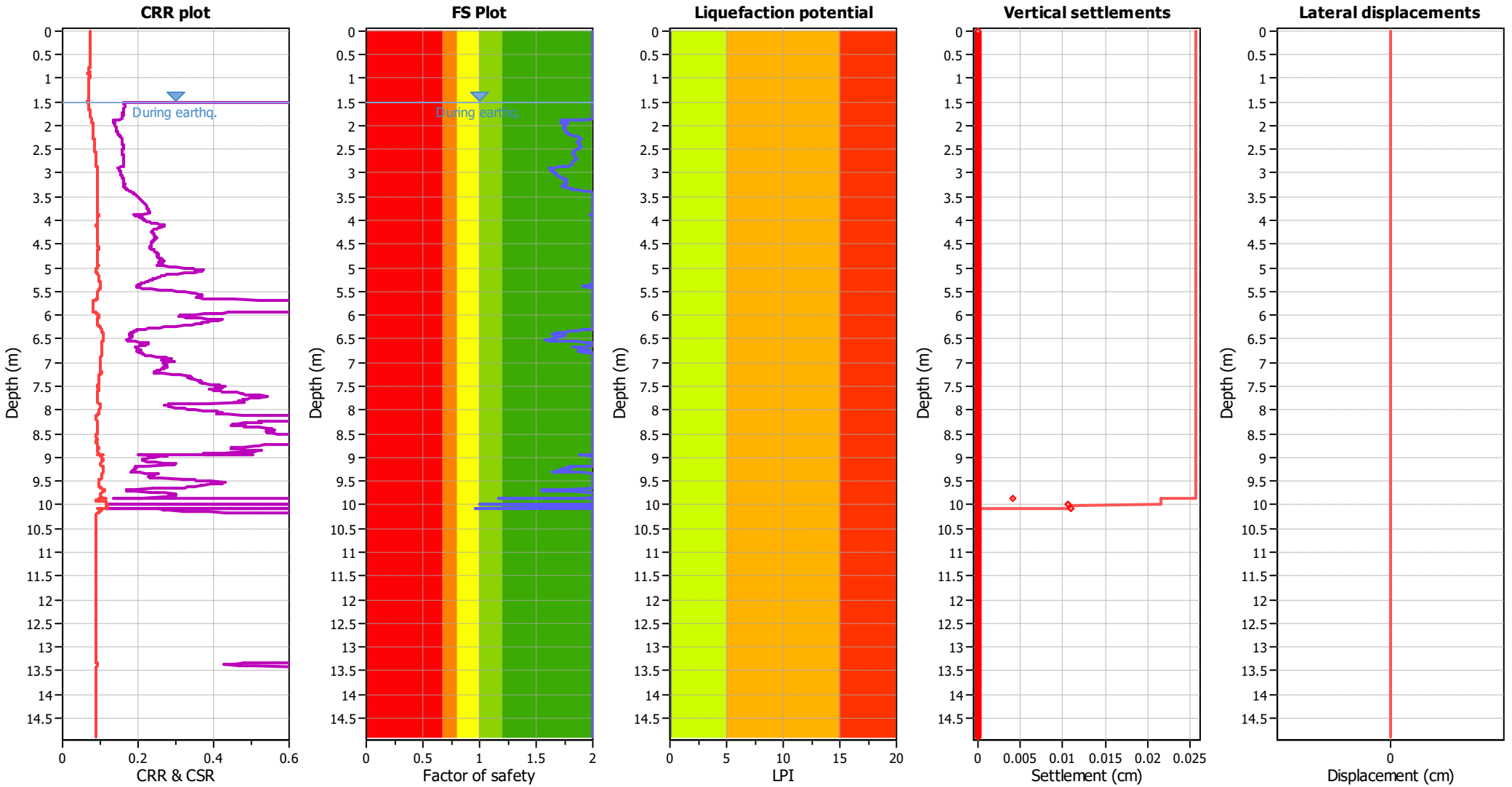
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

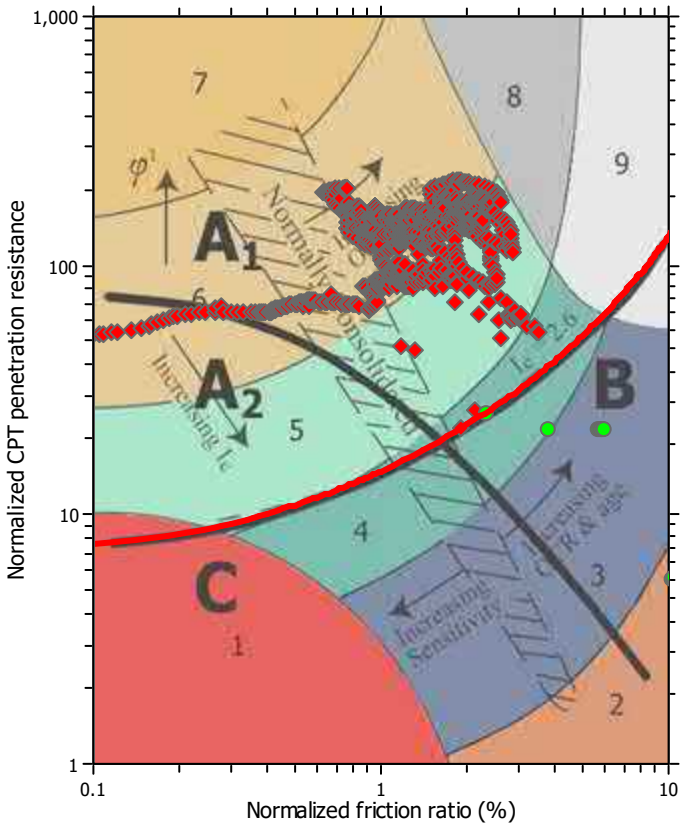
F.S. color scheme

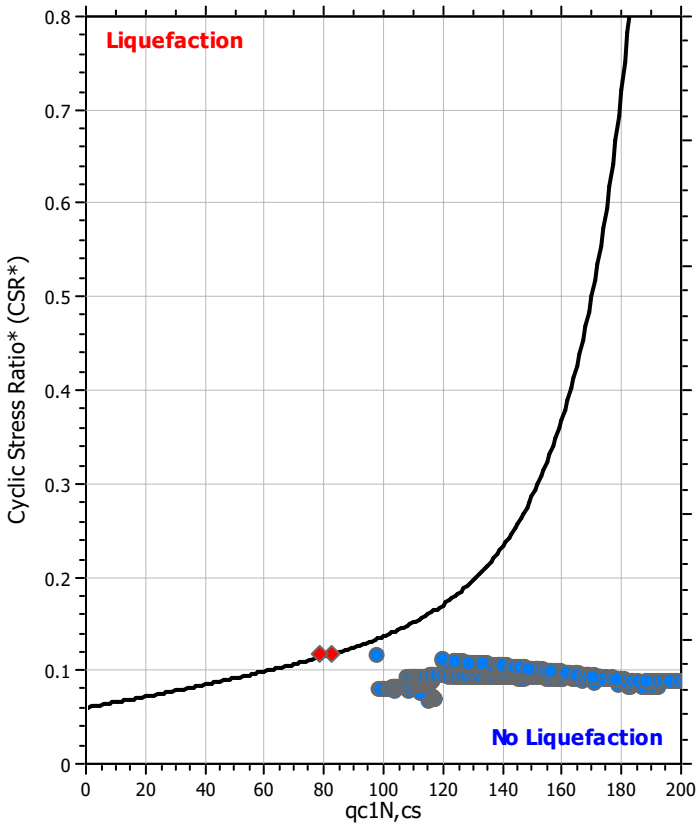
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

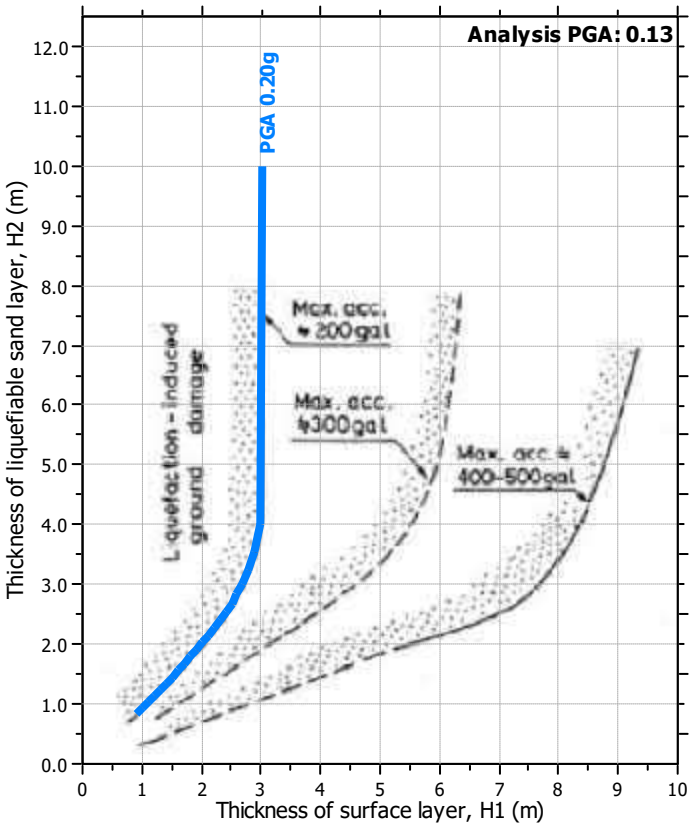
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



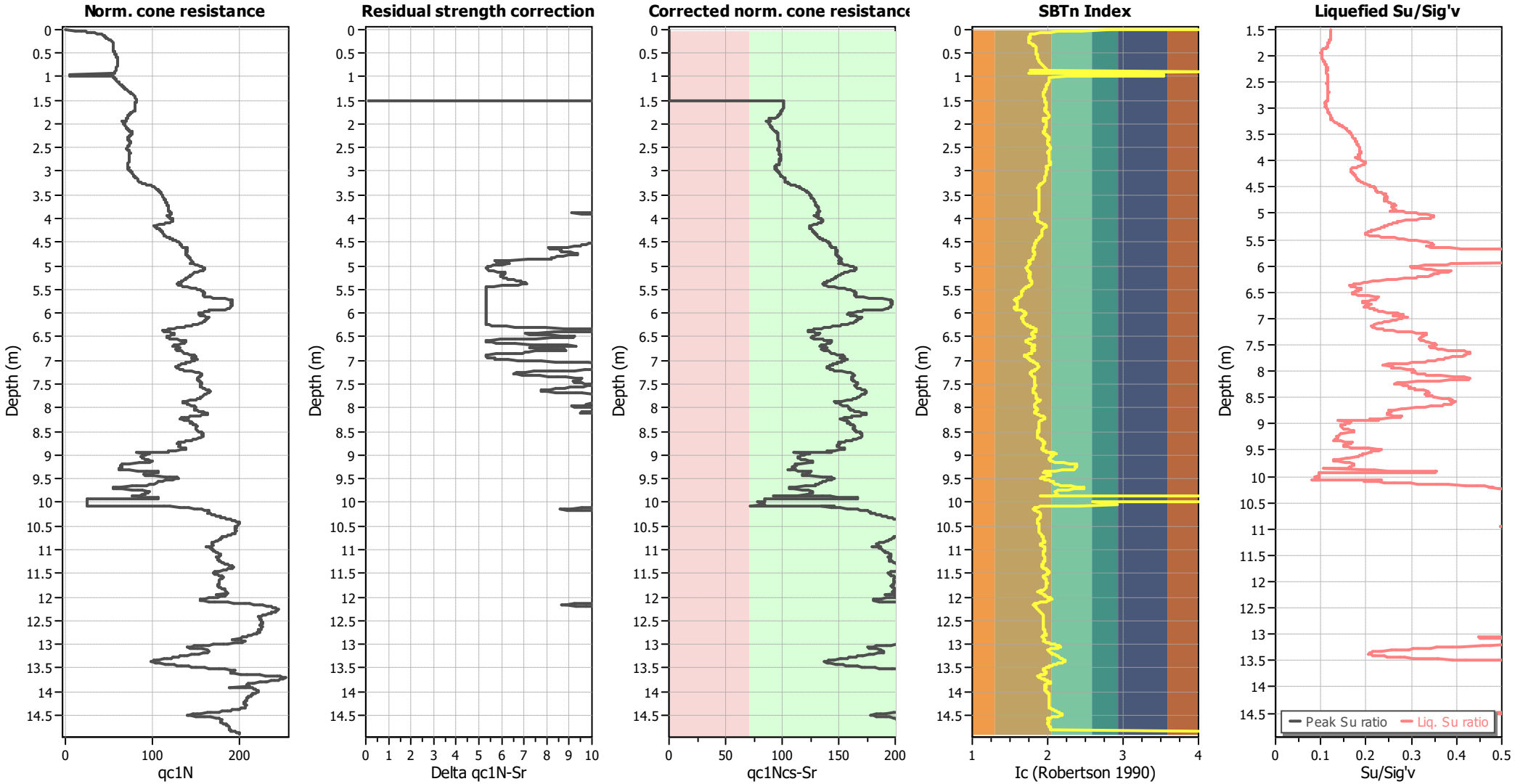




Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

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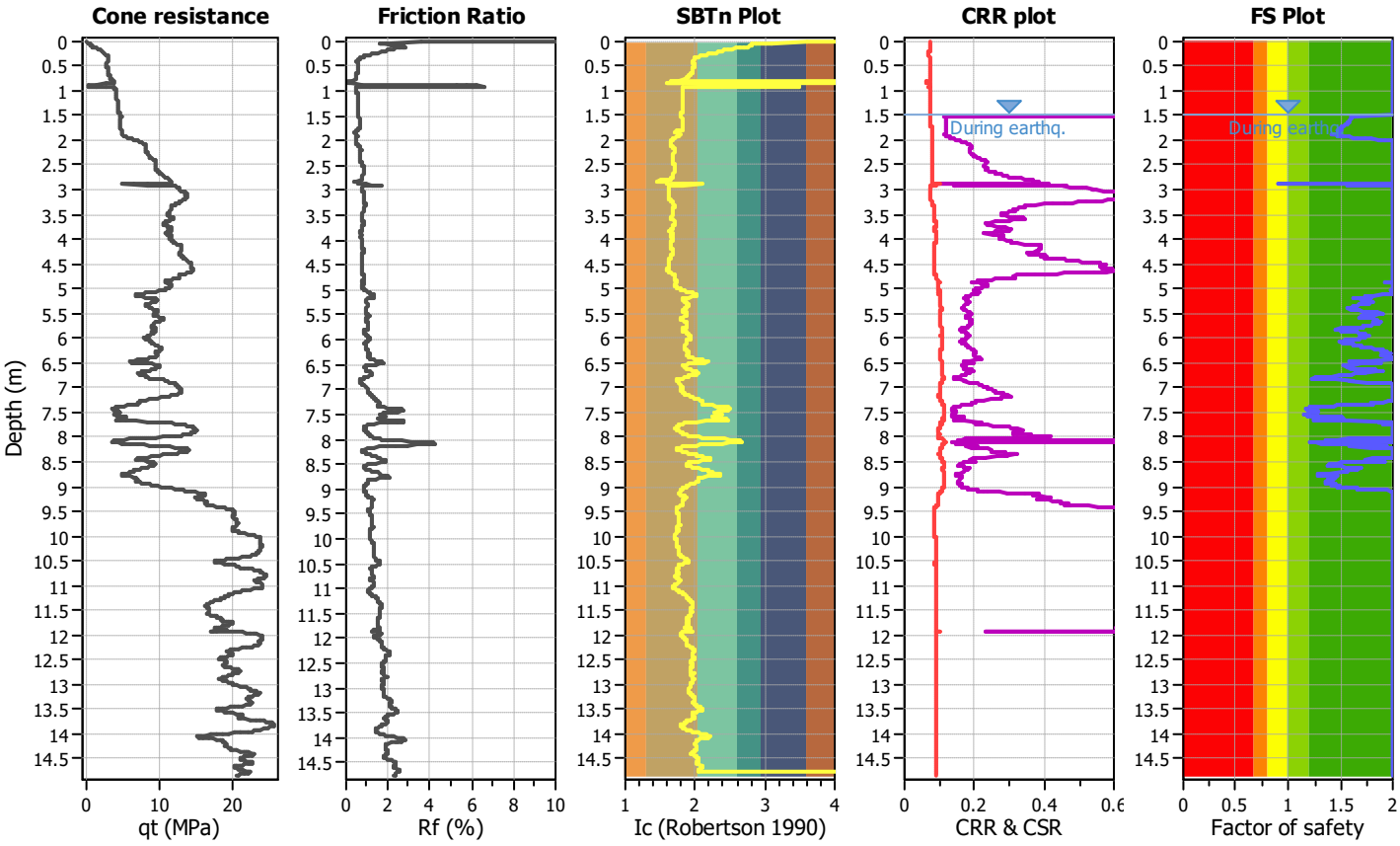
LIQUEFACTION ANALYSIS REPORT

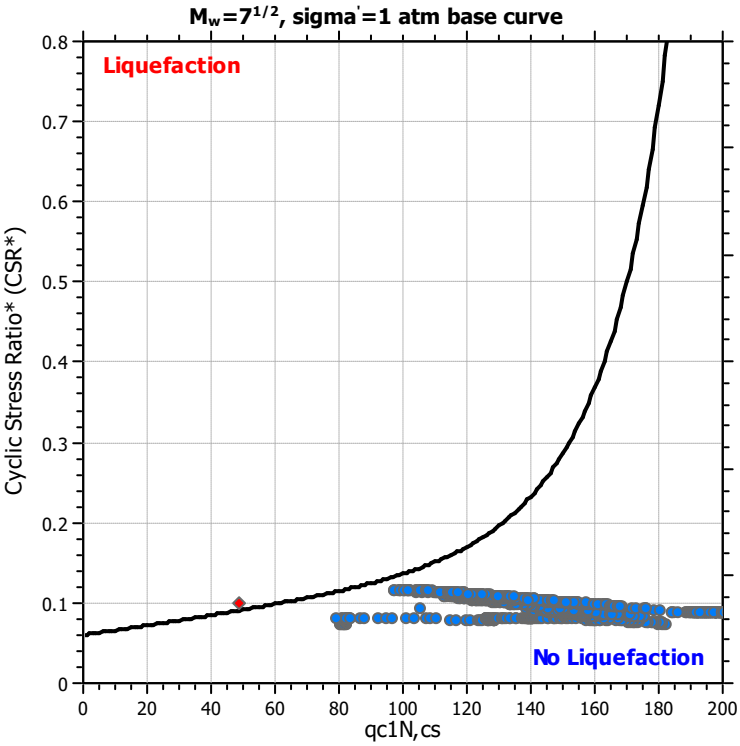
Project title : **Location :**

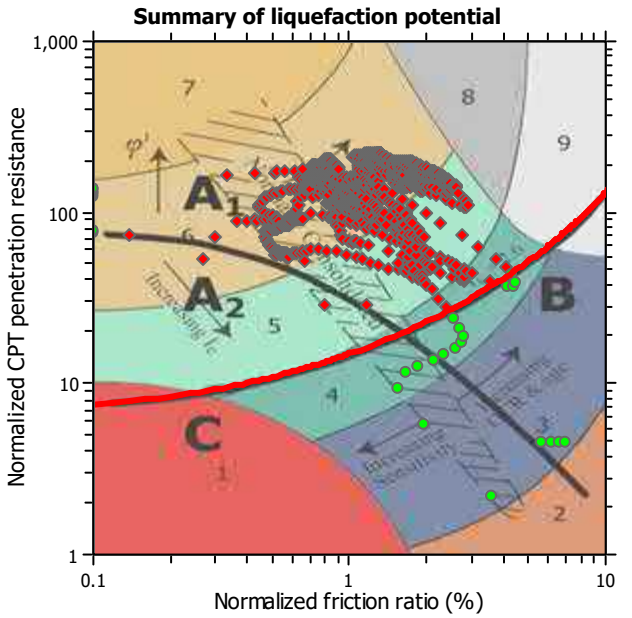
CPT file : CPT 5

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

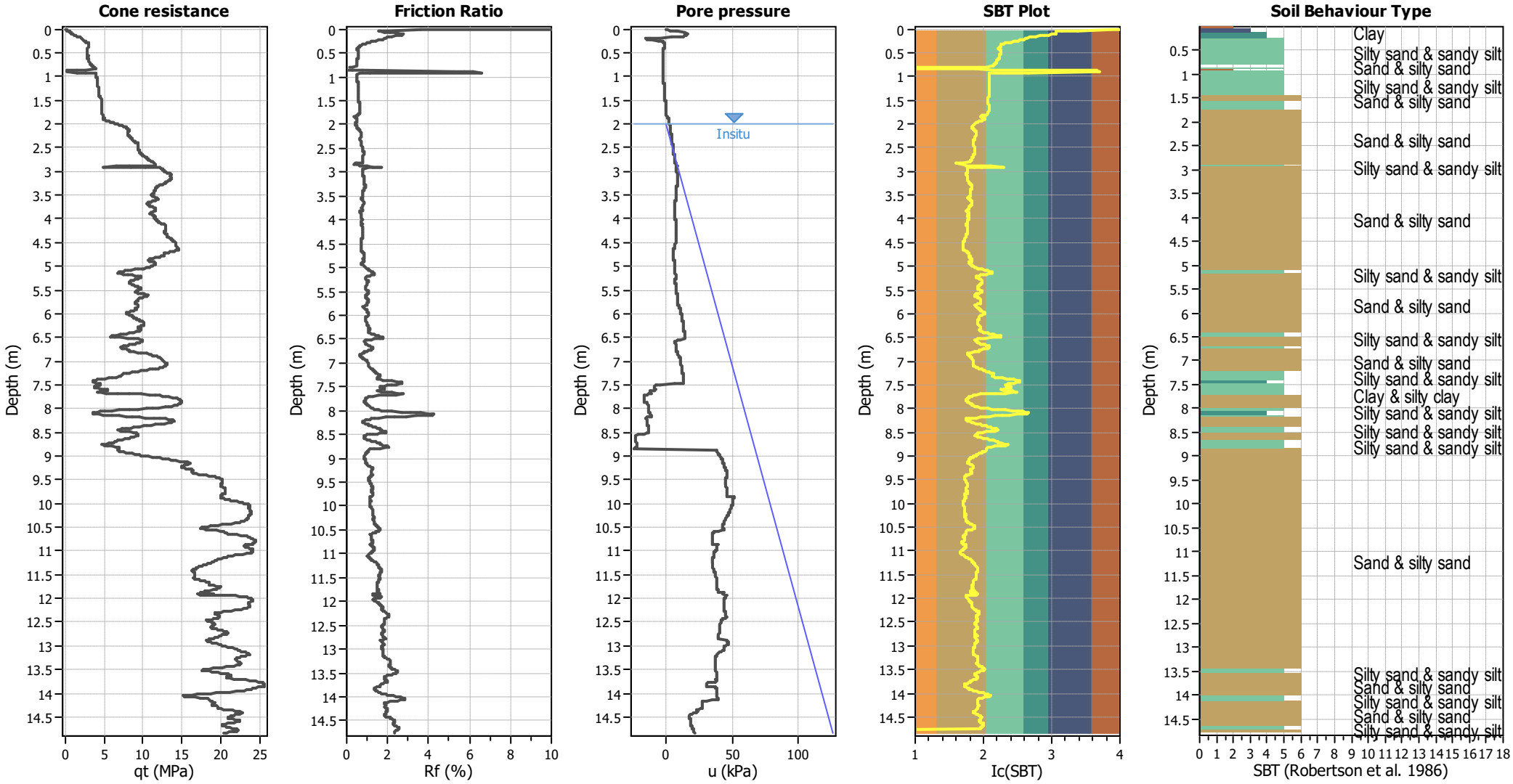






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



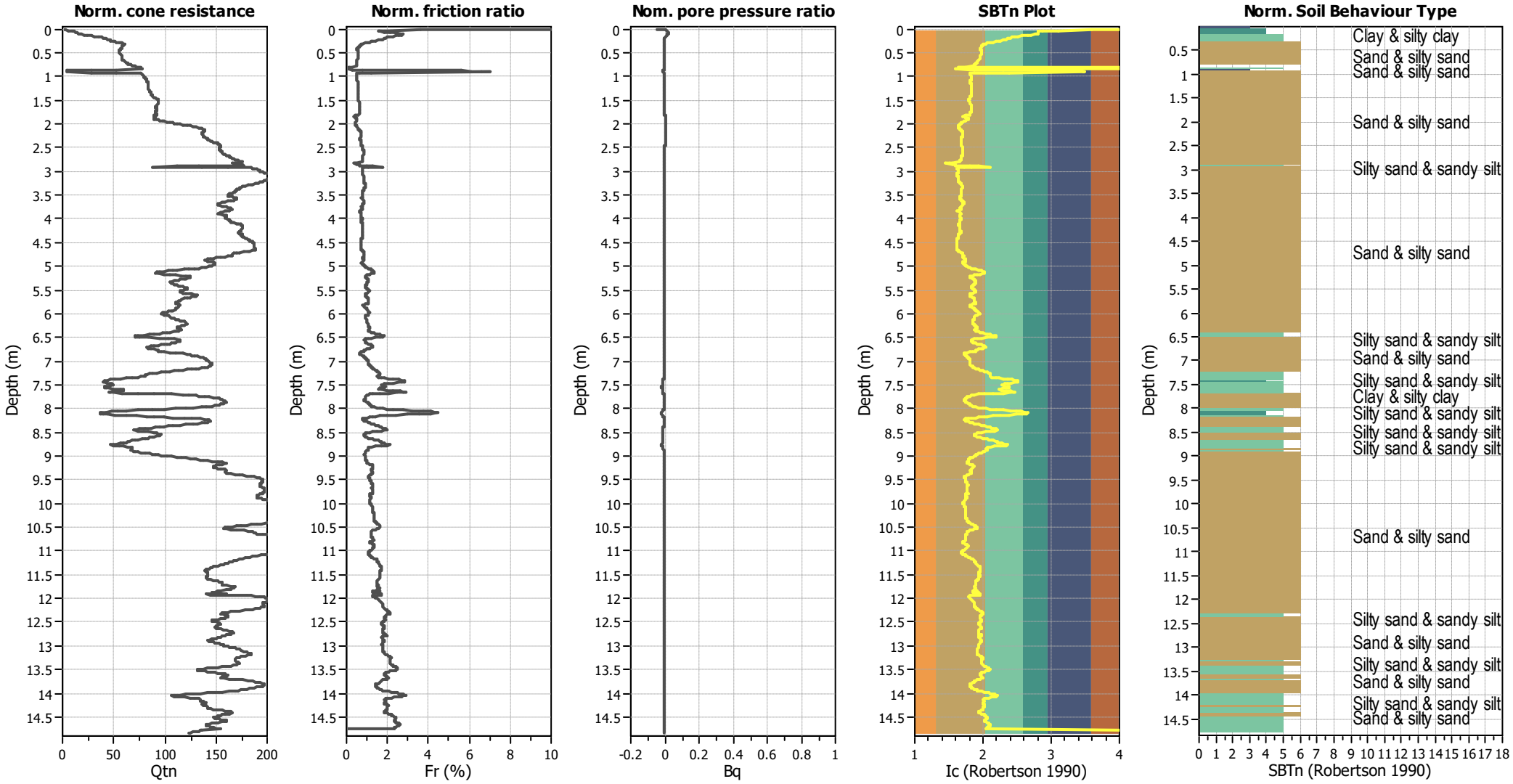
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



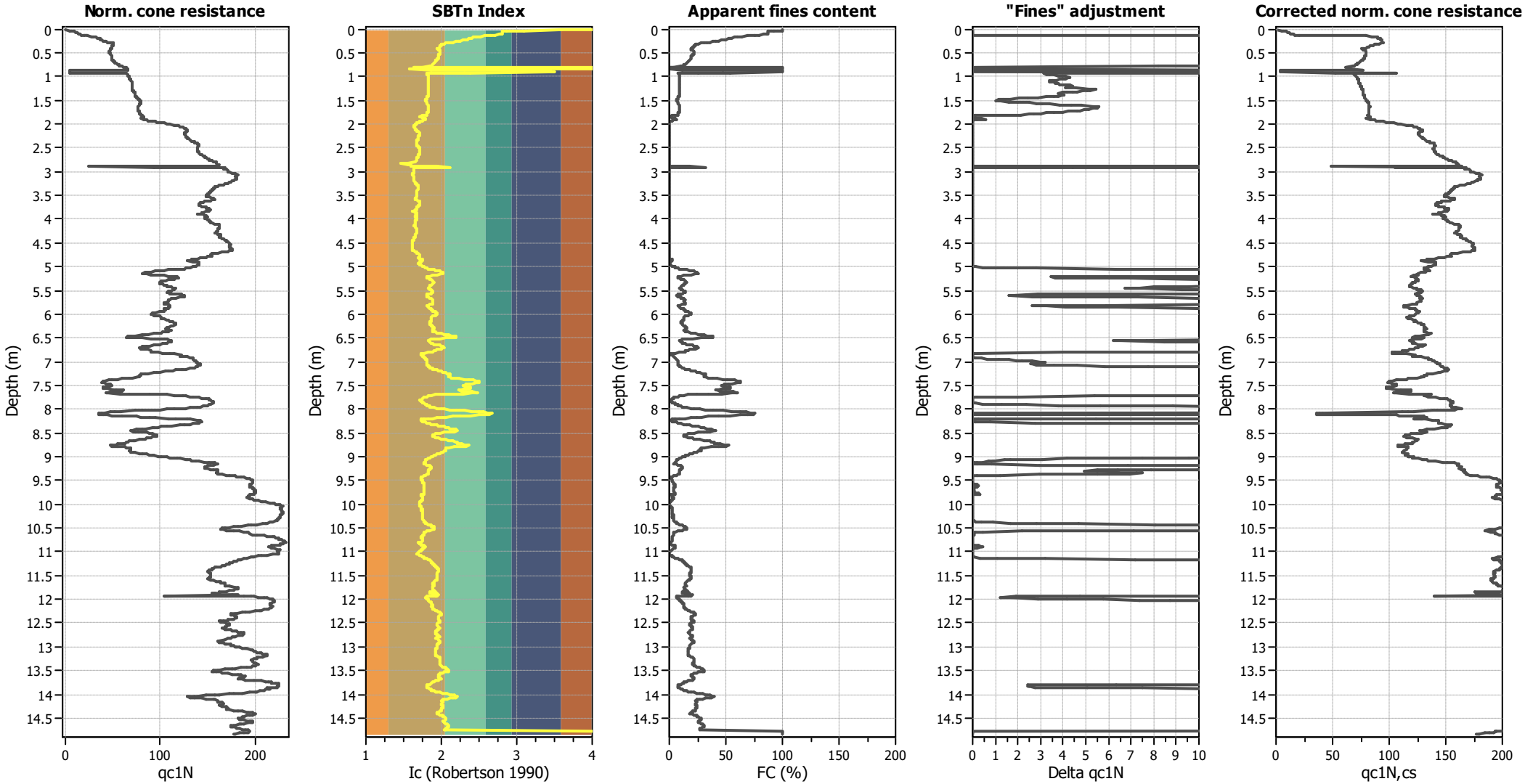
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

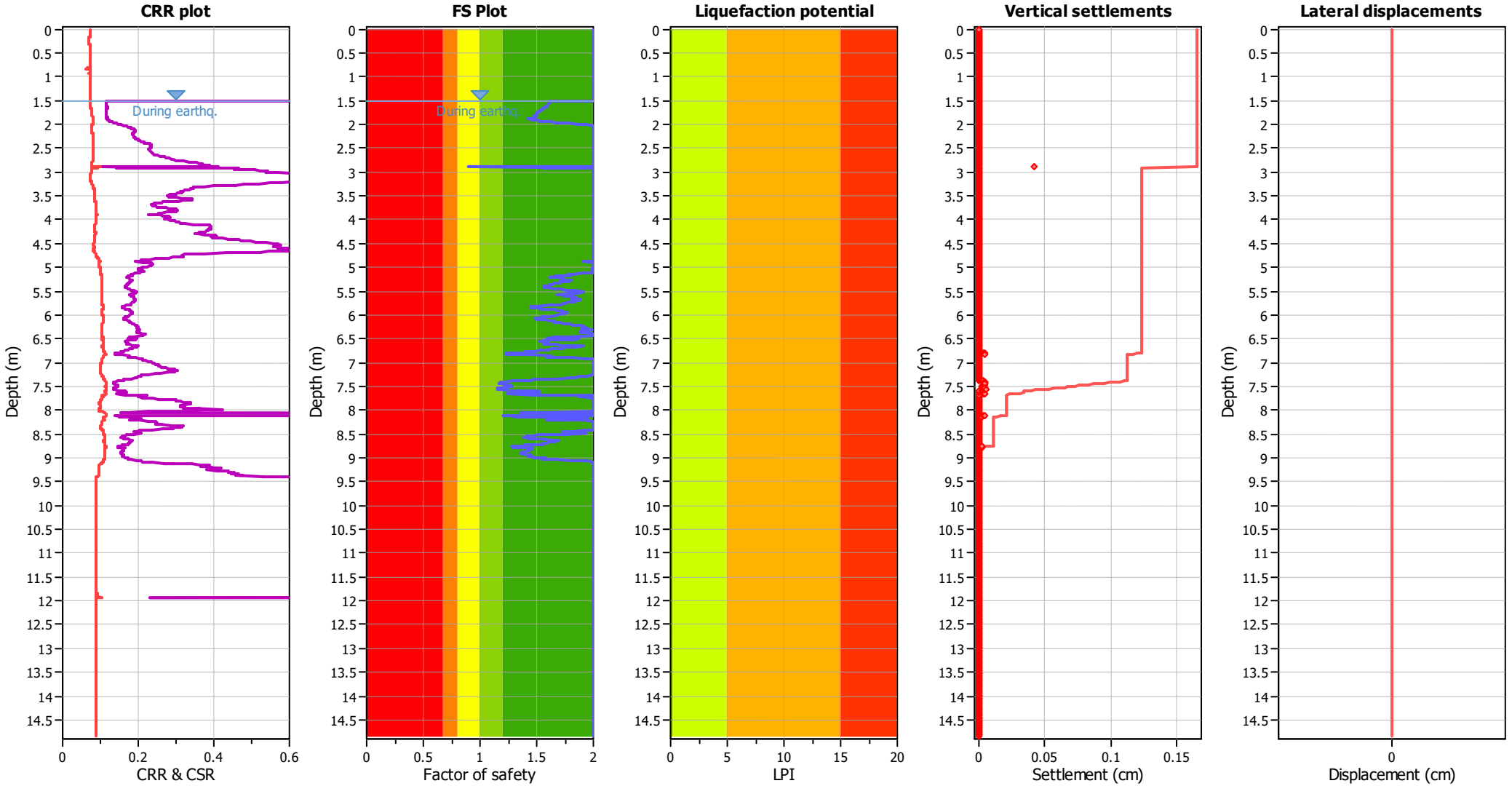
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

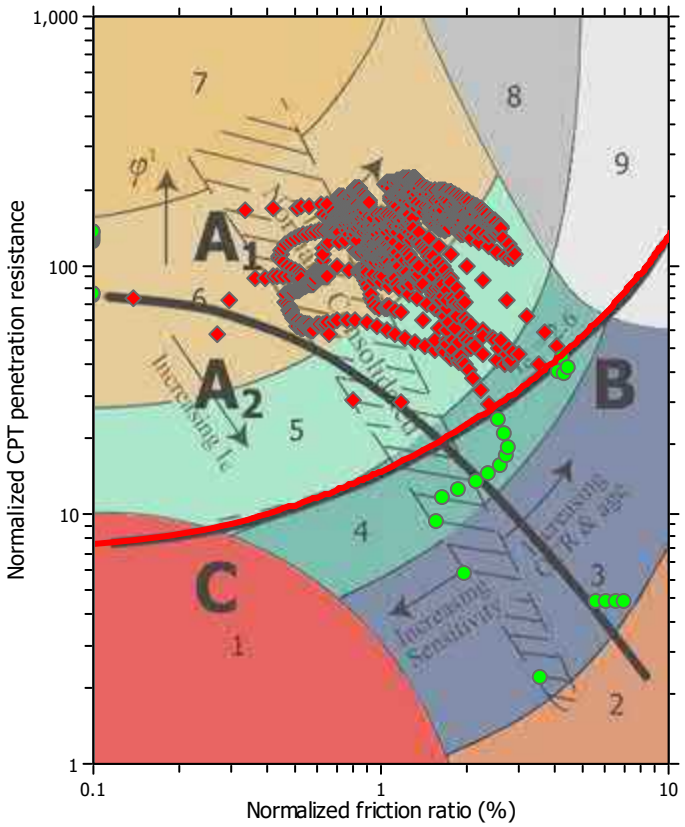
F.S. color scheme

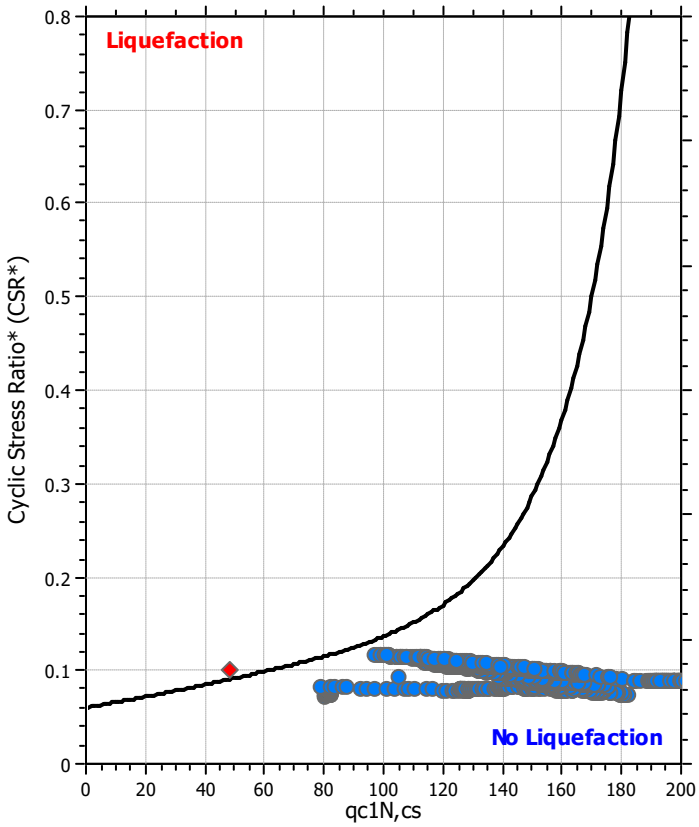
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

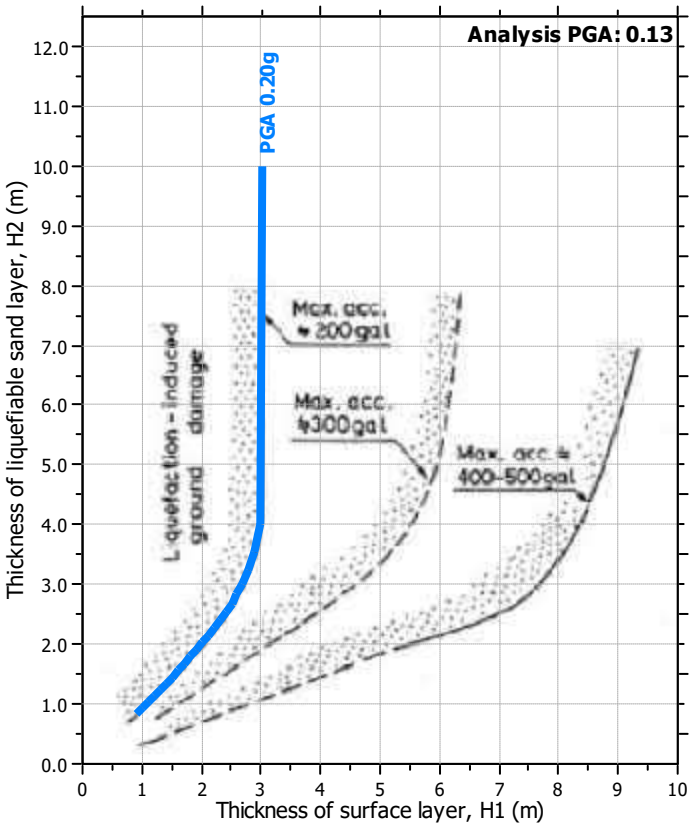
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



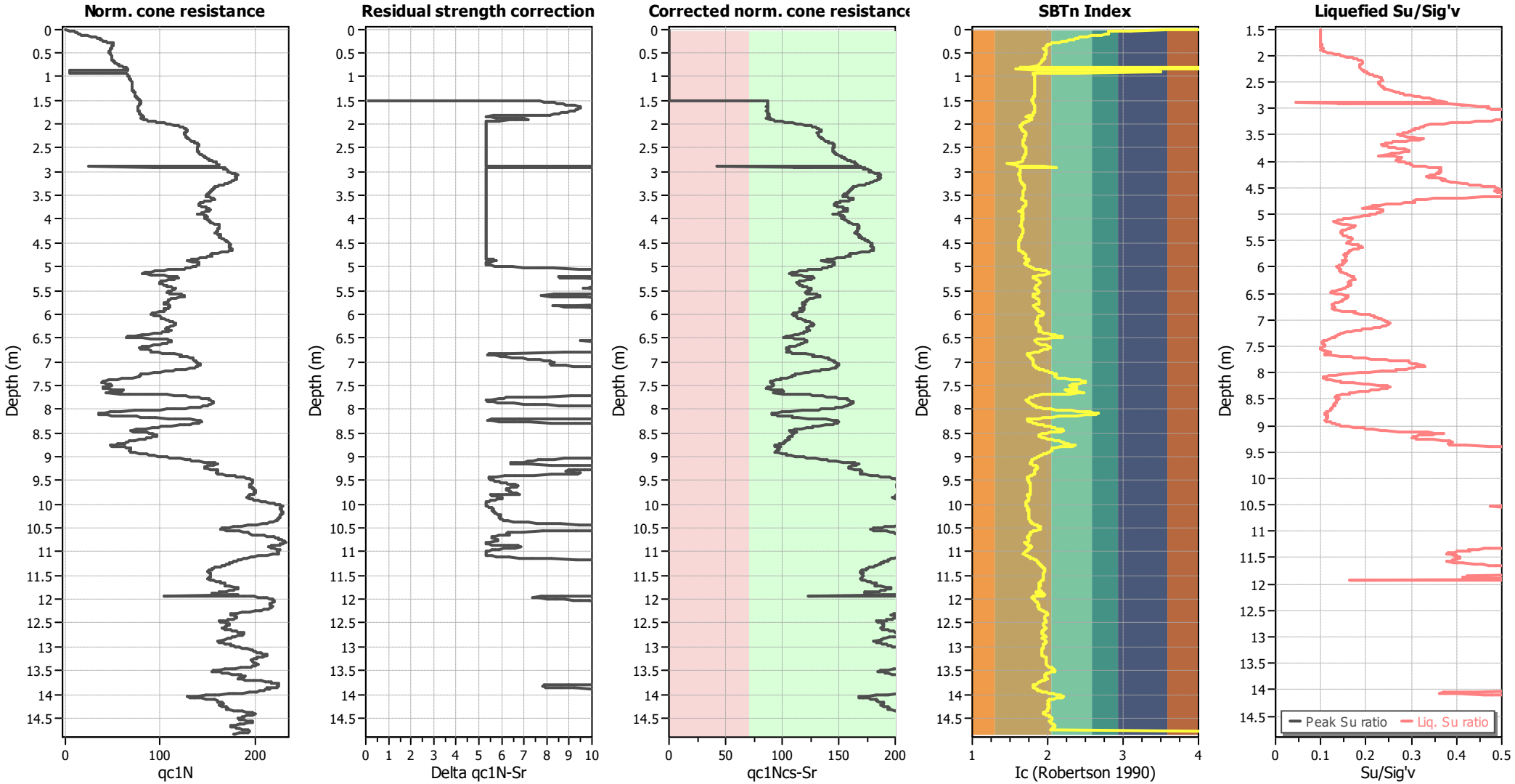




Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

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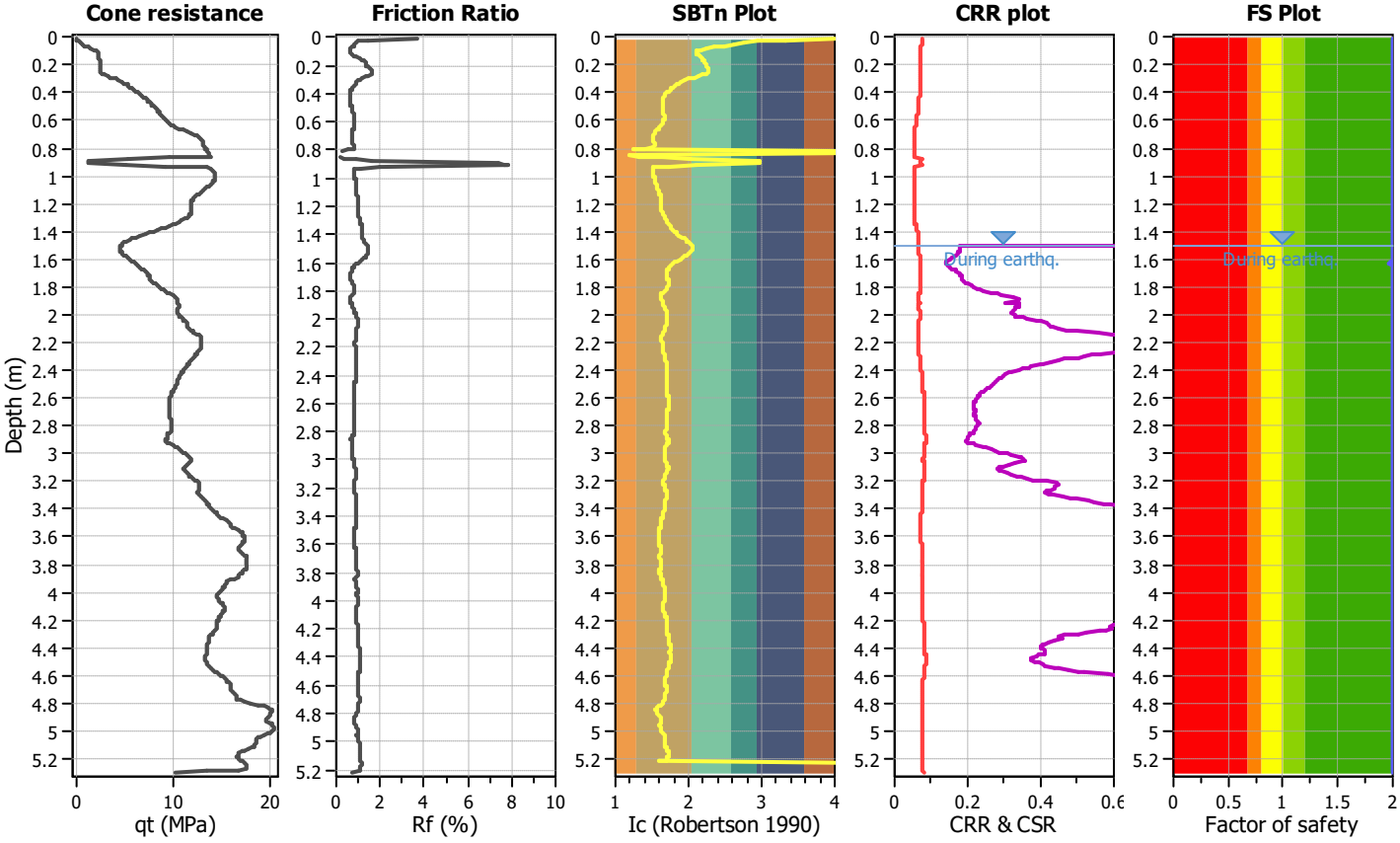
LIQUEFACTION ANALYSIS REPORT

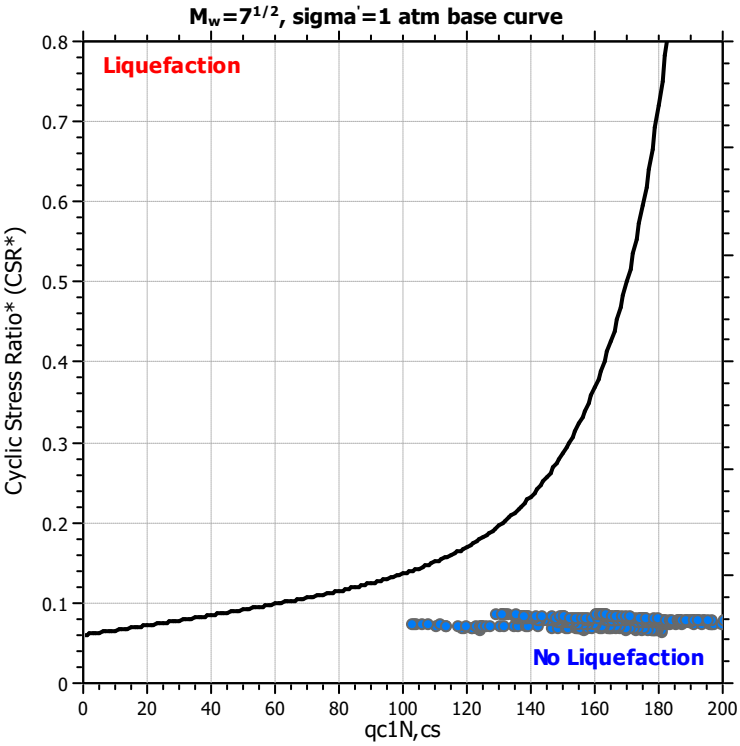
Project title : **Location :**

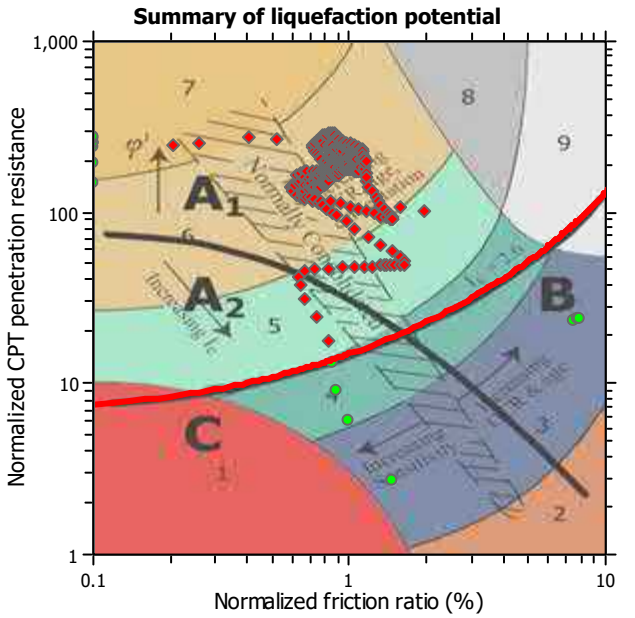
CPT file : CPT 6

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

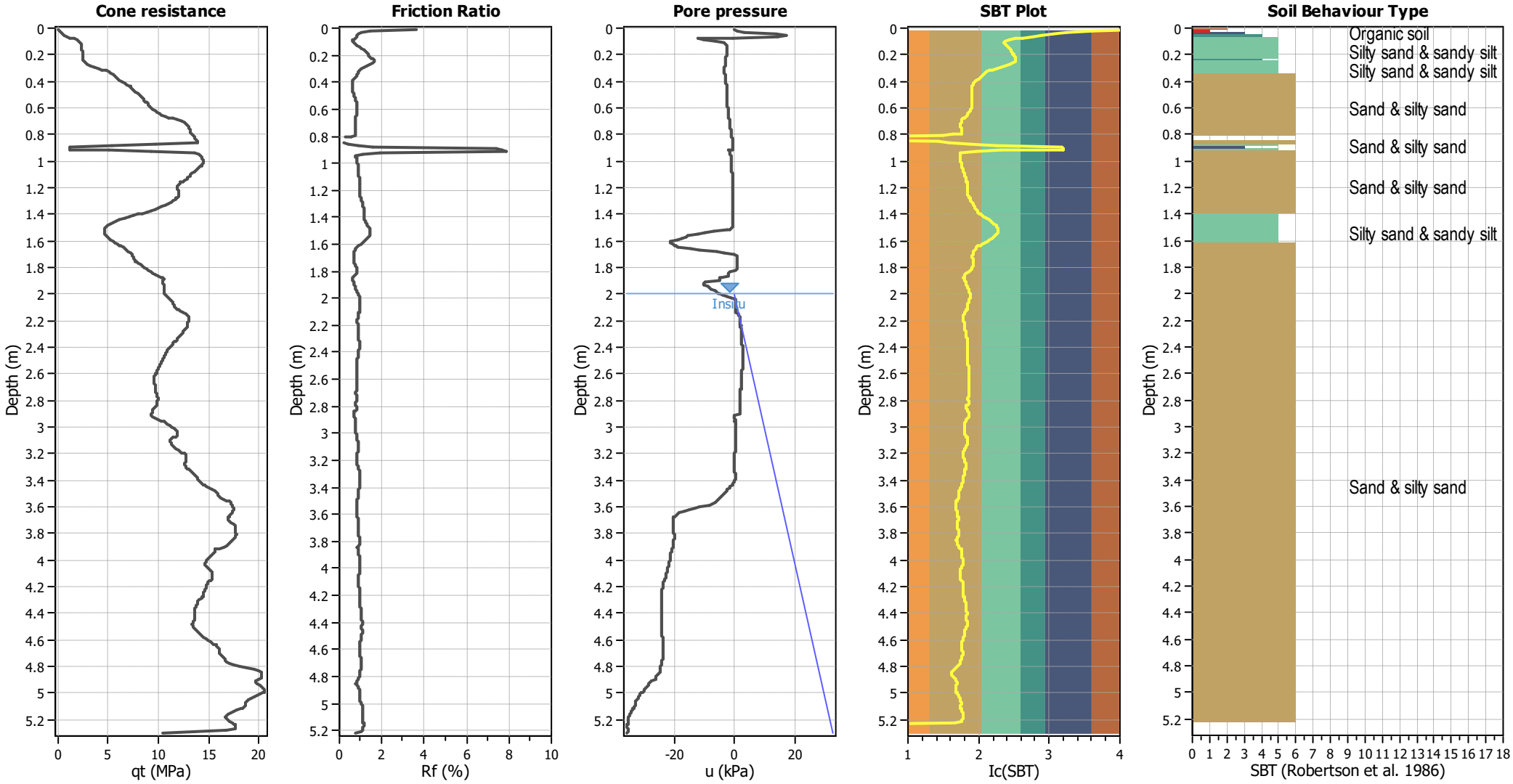






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



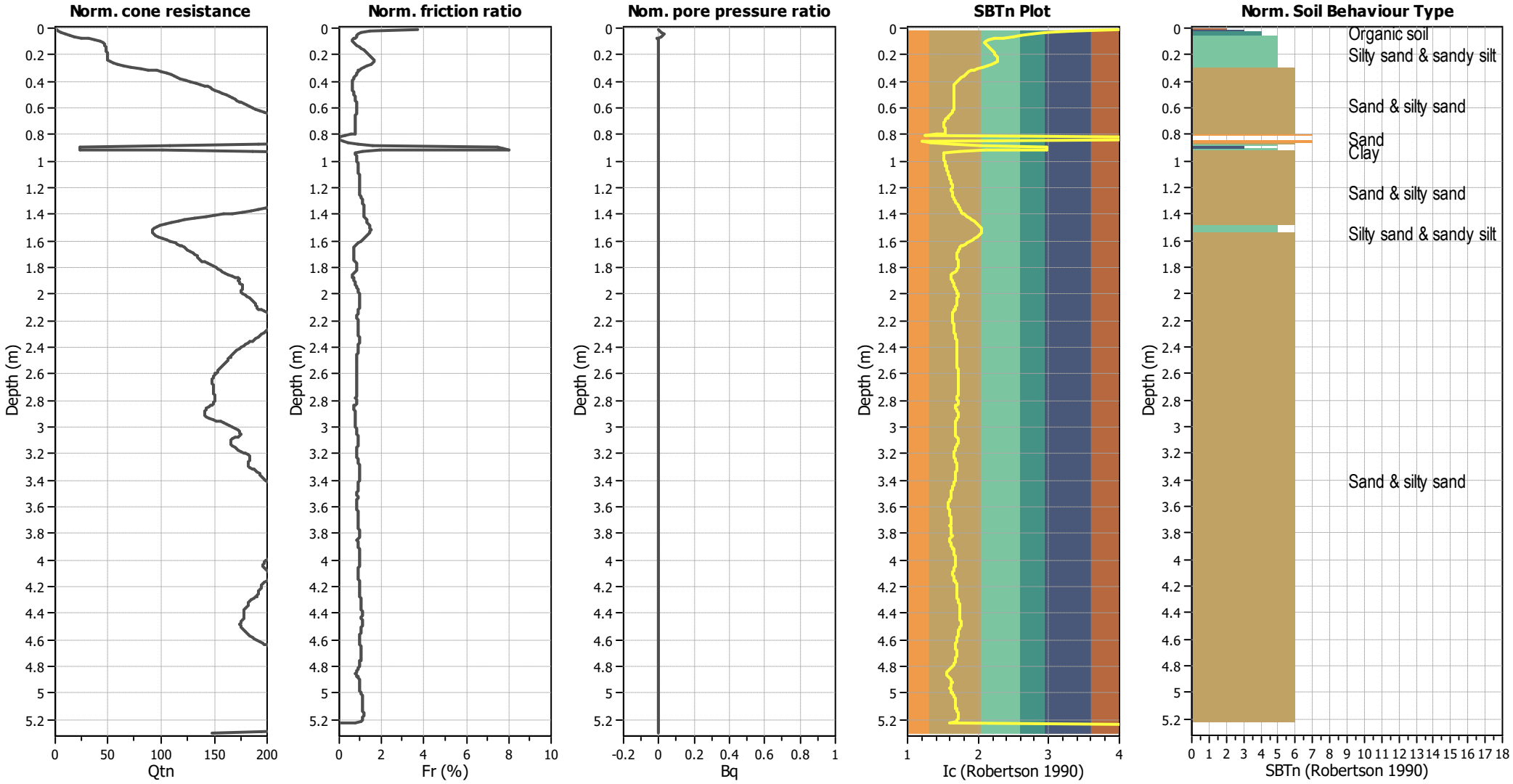
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



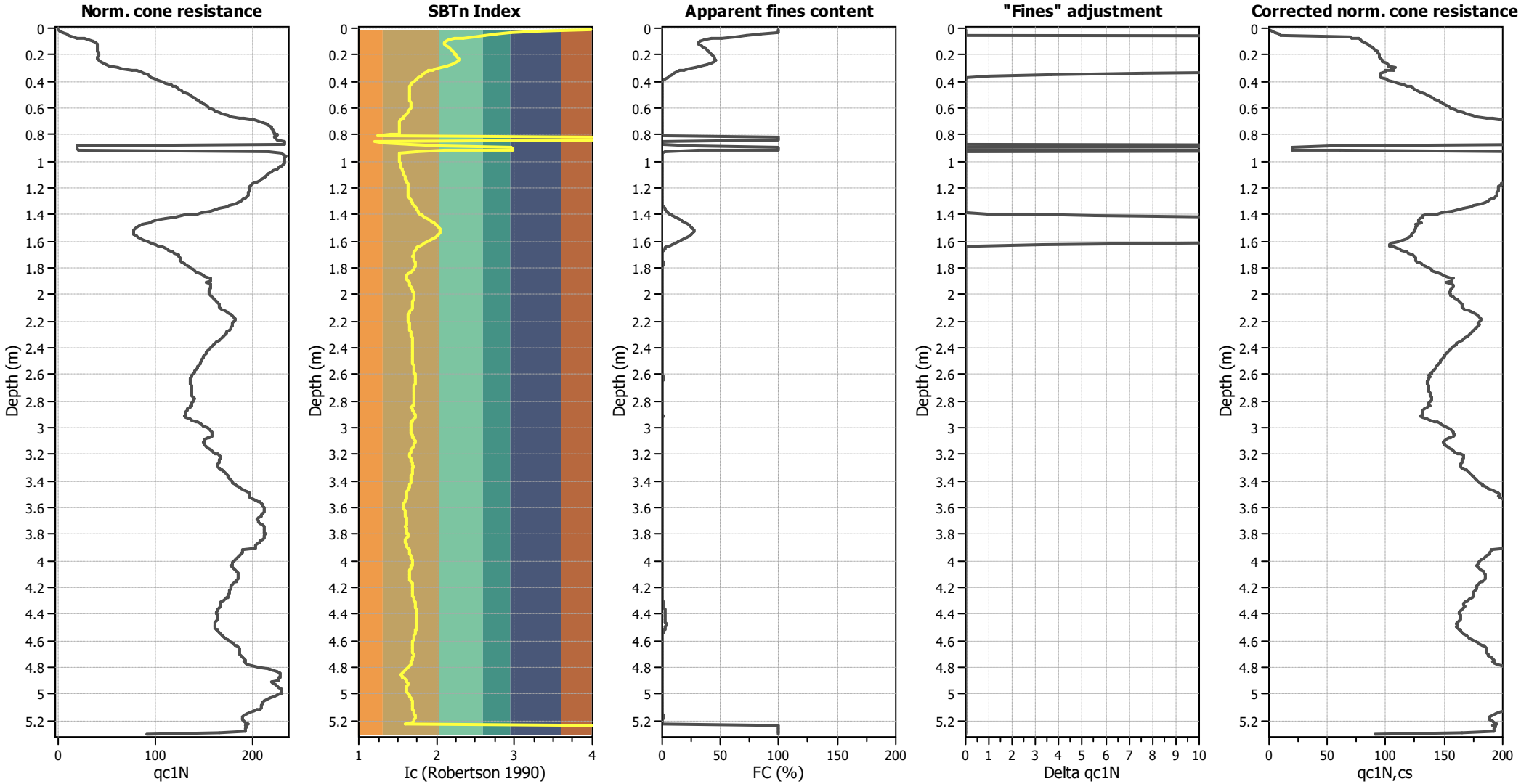
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

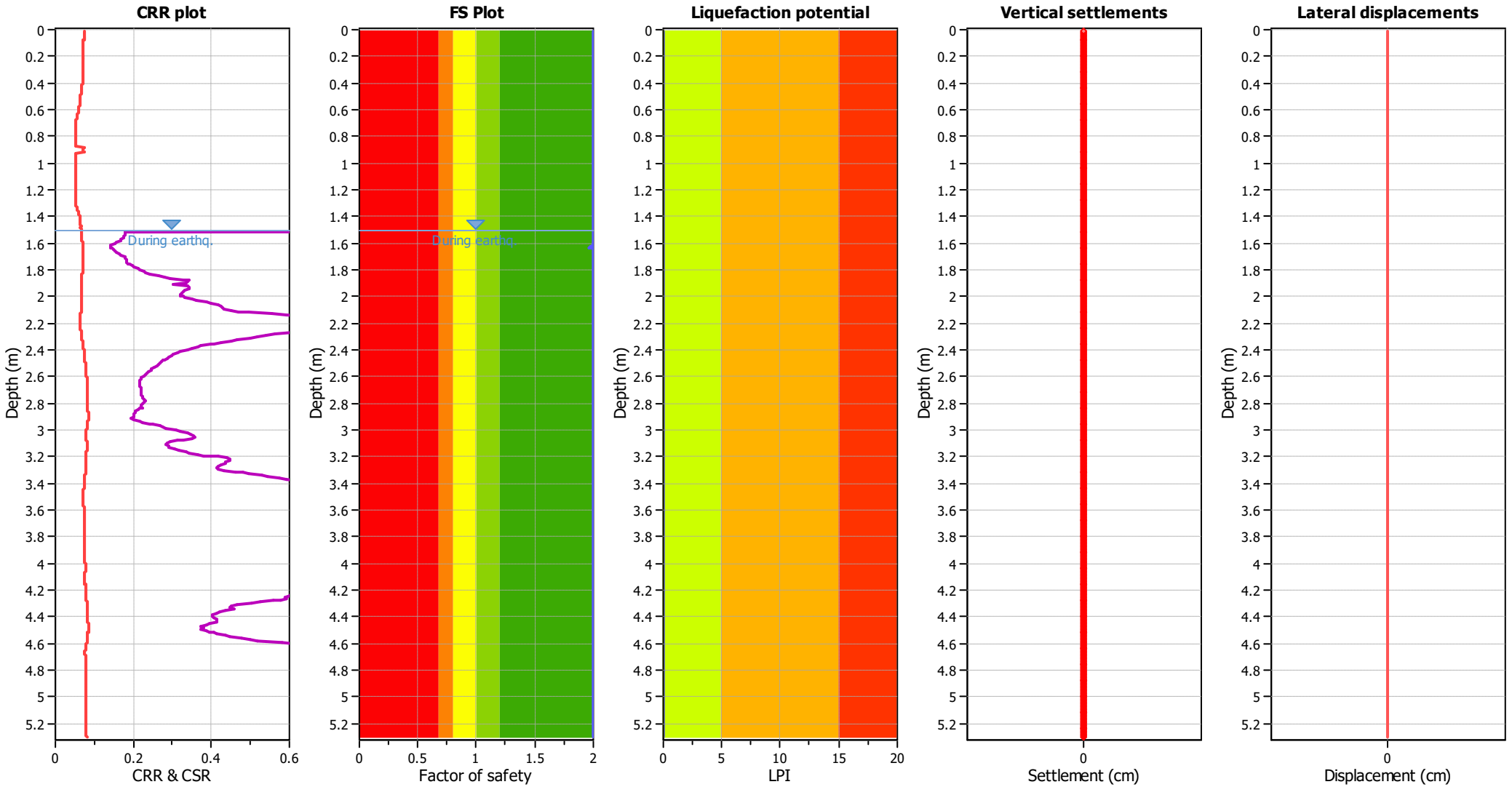
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

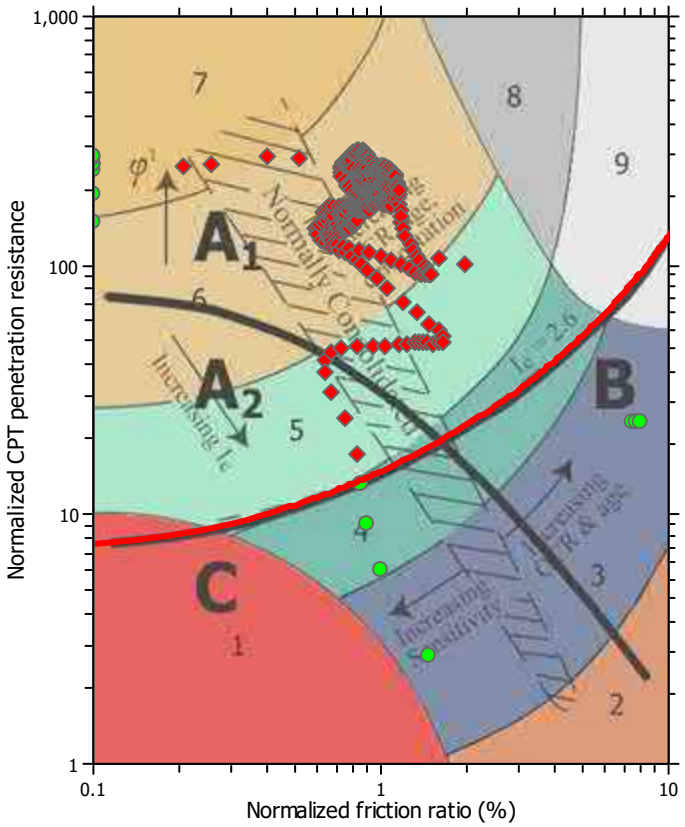
F.S. color scheme

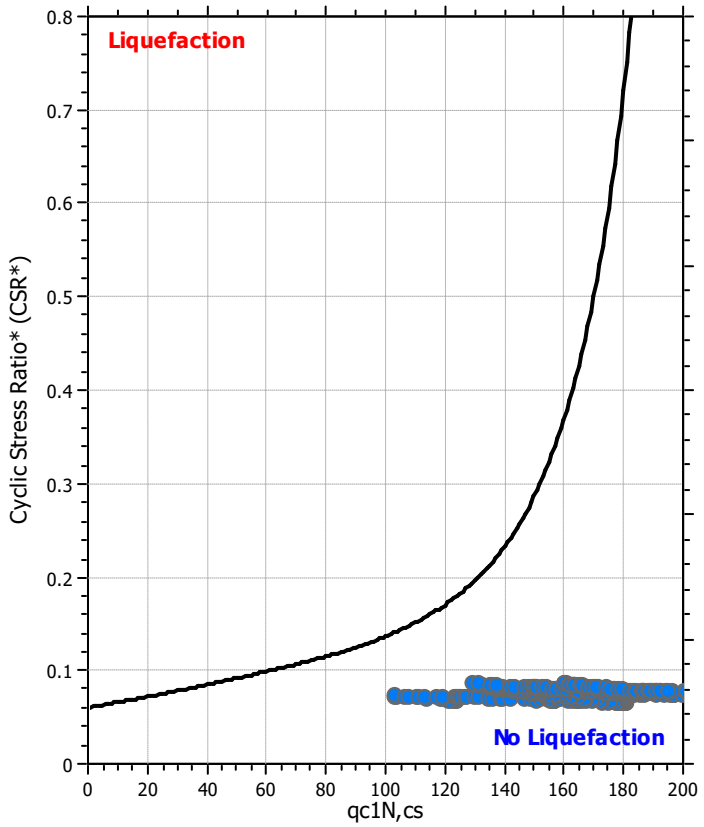
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

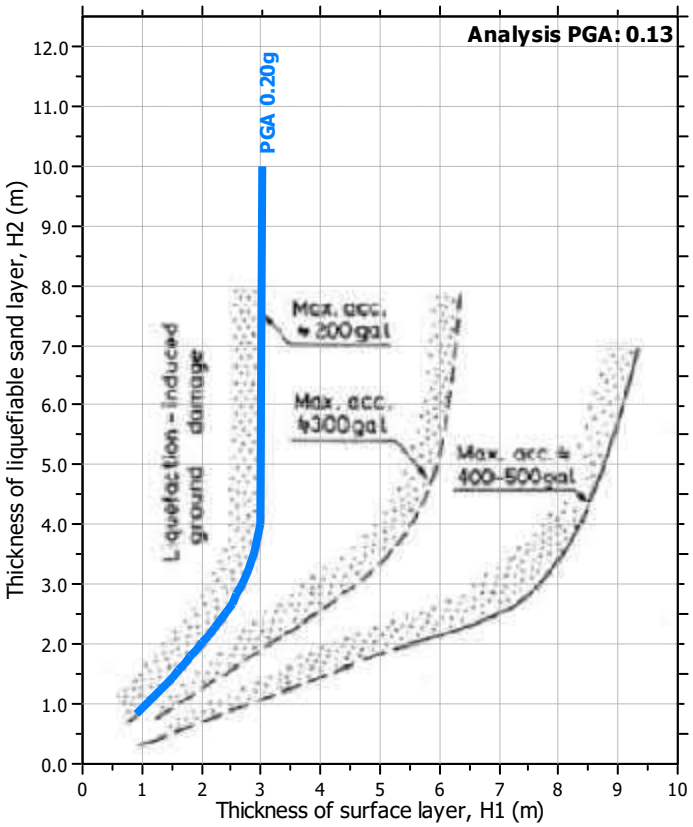
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



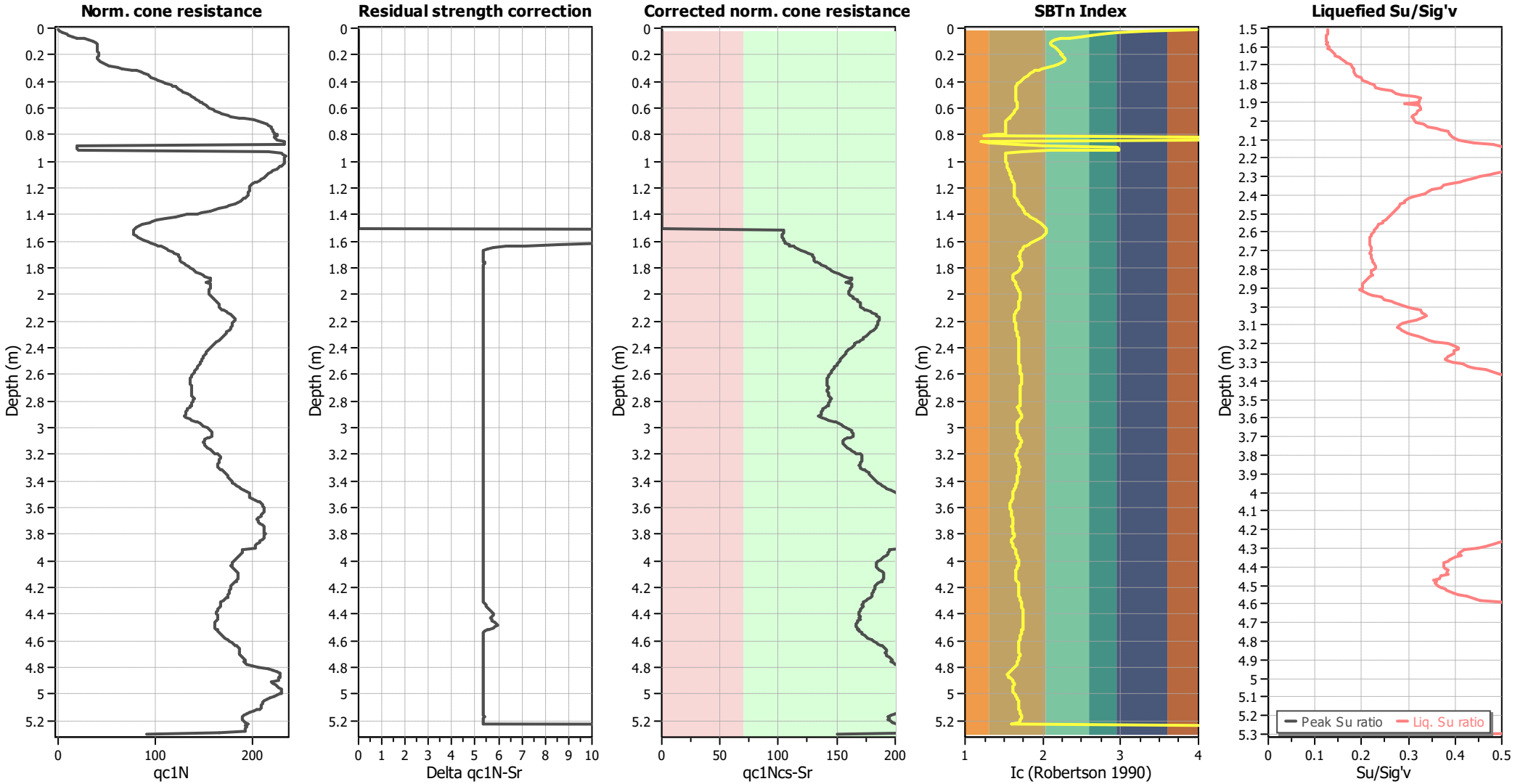




Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

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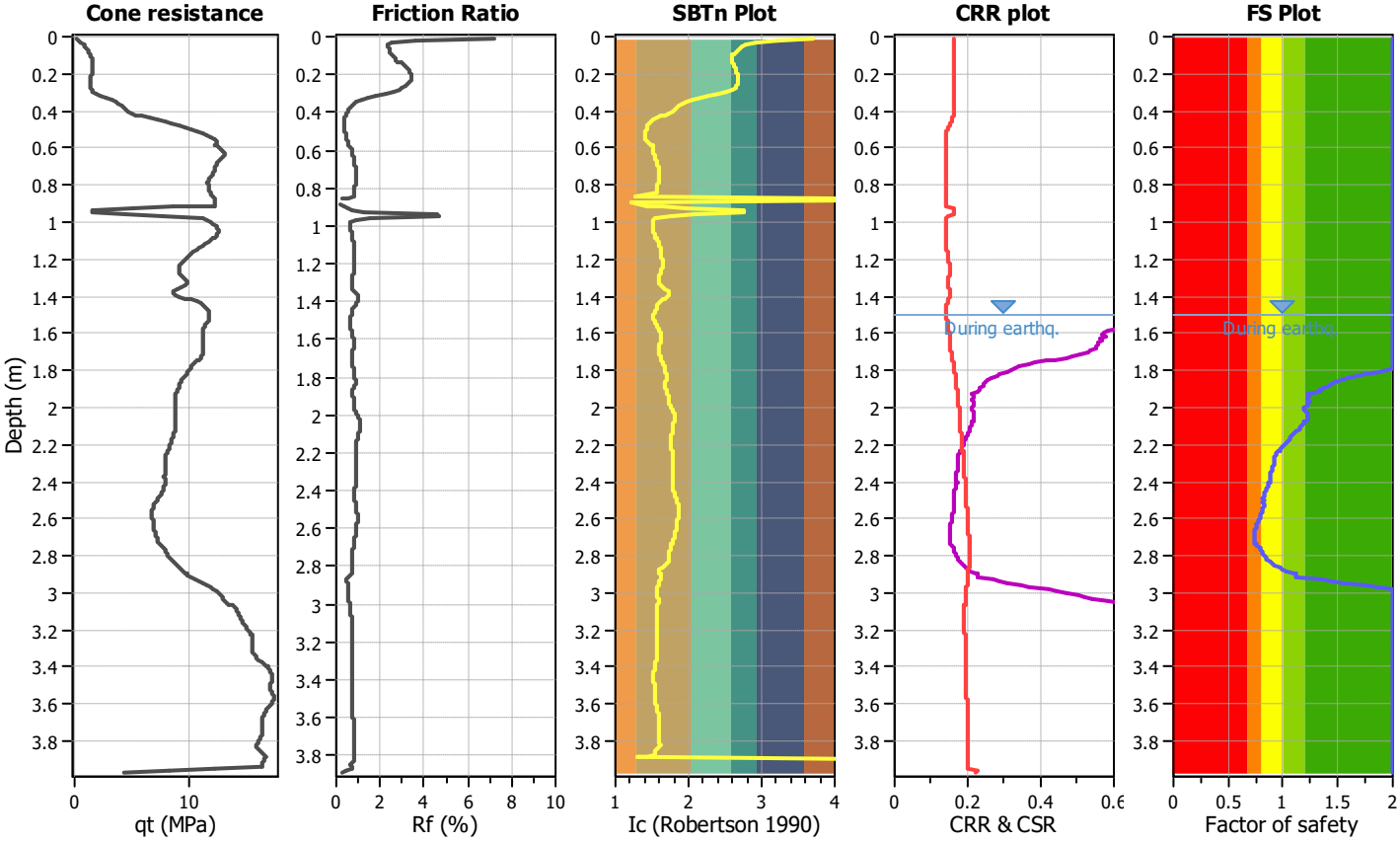
LIQUEFACTION ANALYSIS REPORT

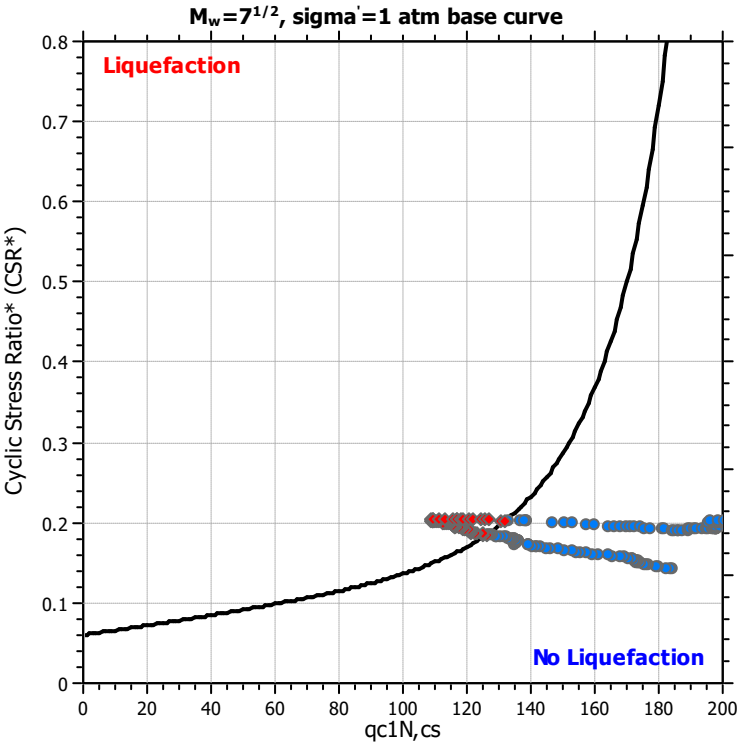
Project title : **Location :**

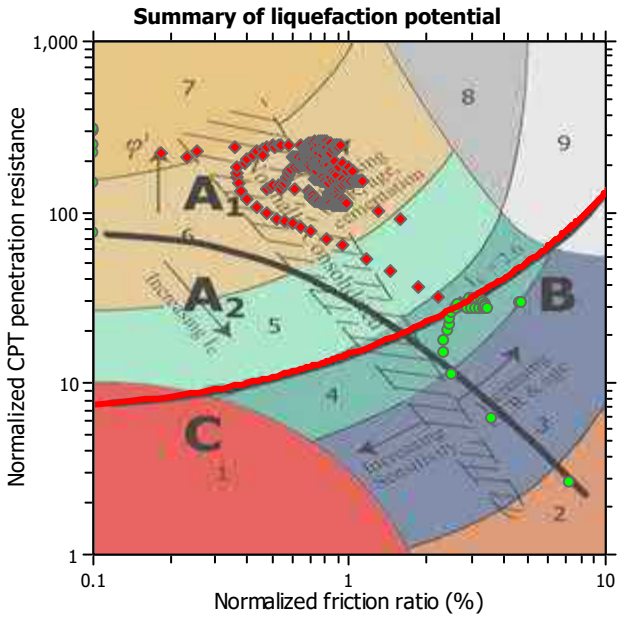
CPT file : CPT 1

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	15.00 m
Earthquake magnitude M_w:	7.10	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

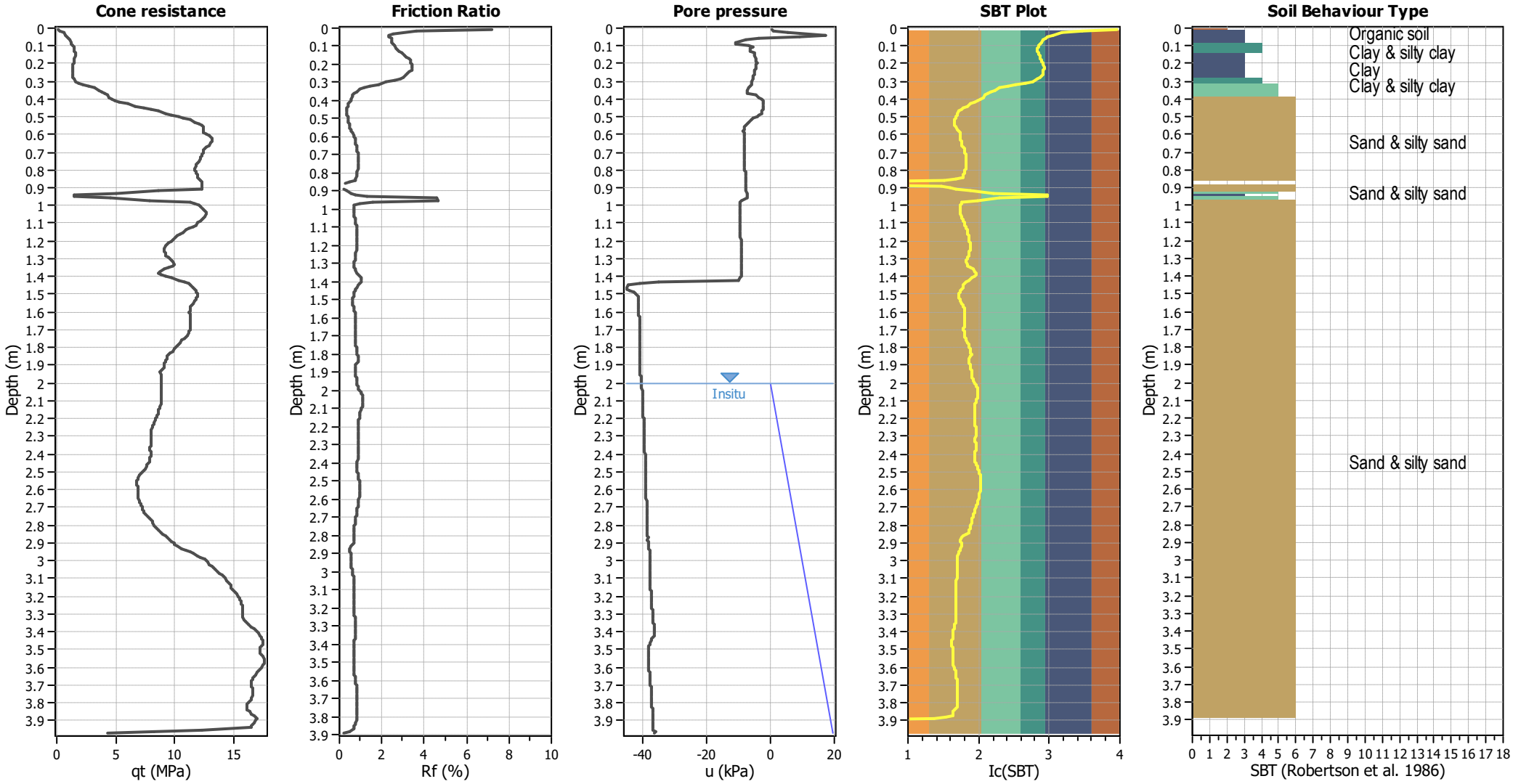






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



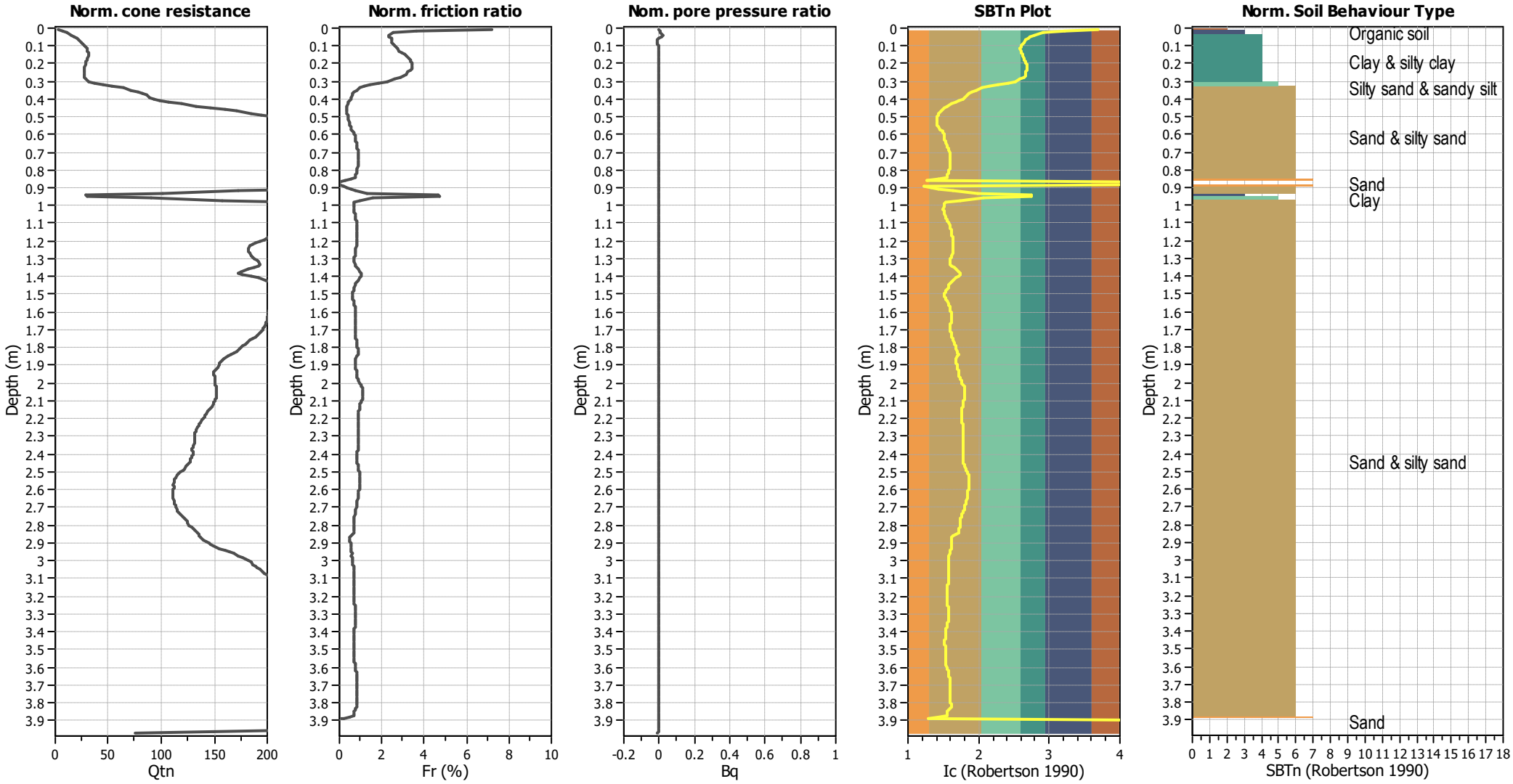
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



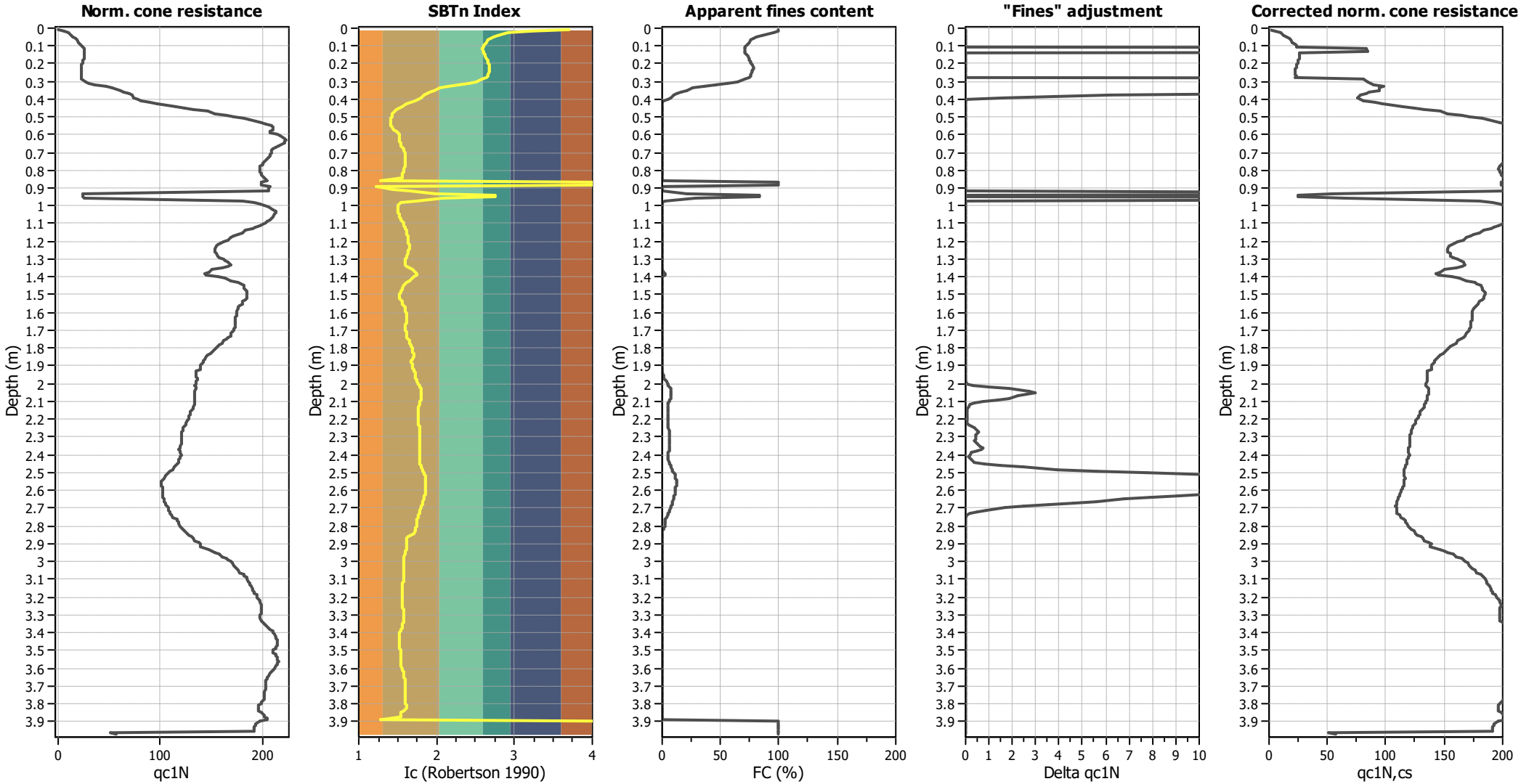
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

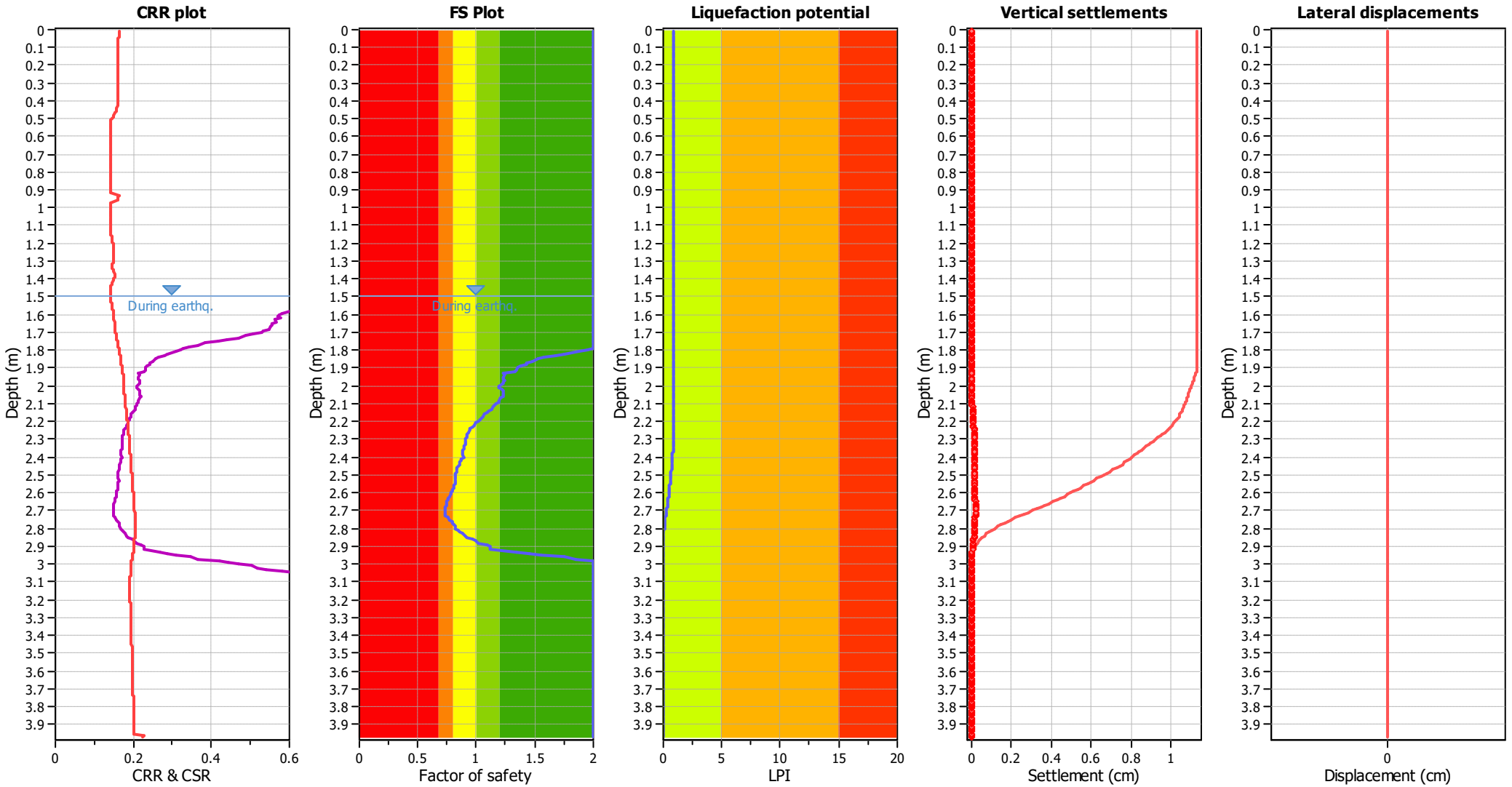
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

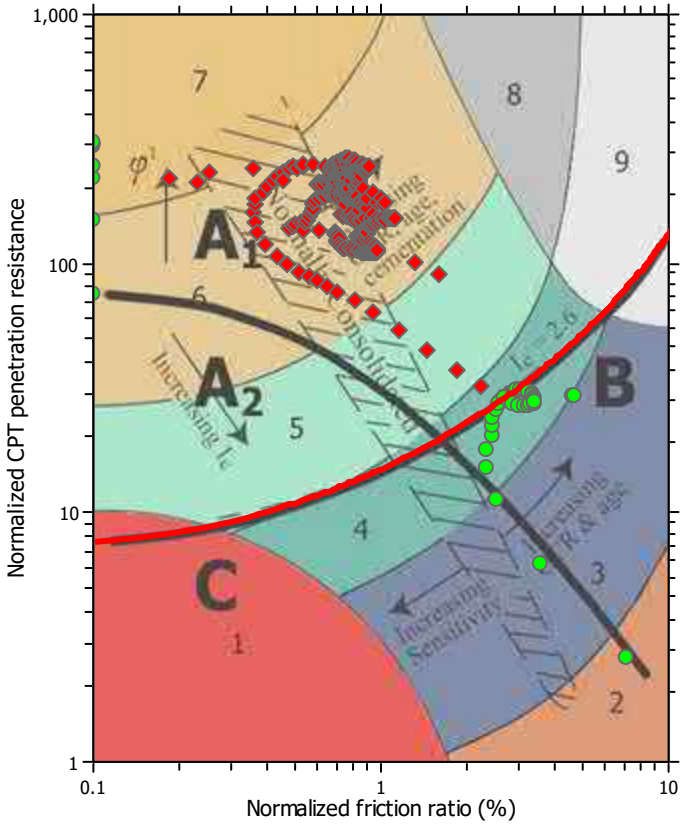
F.S. color scheme

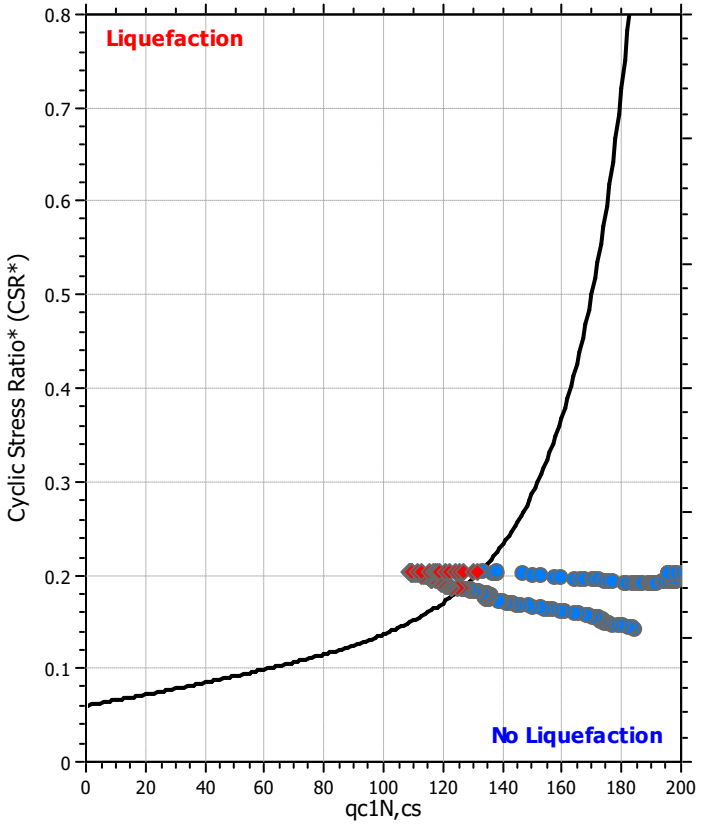
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

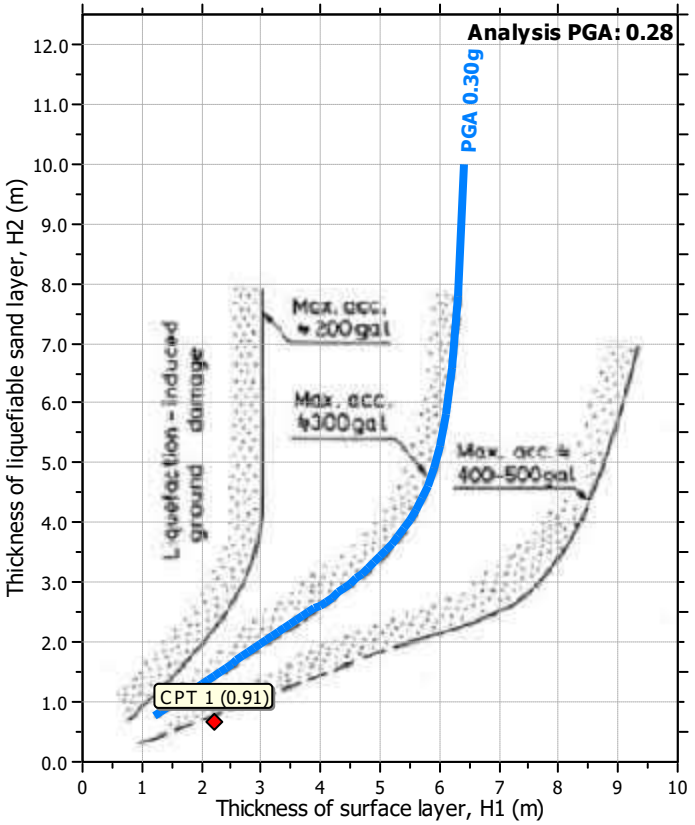
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



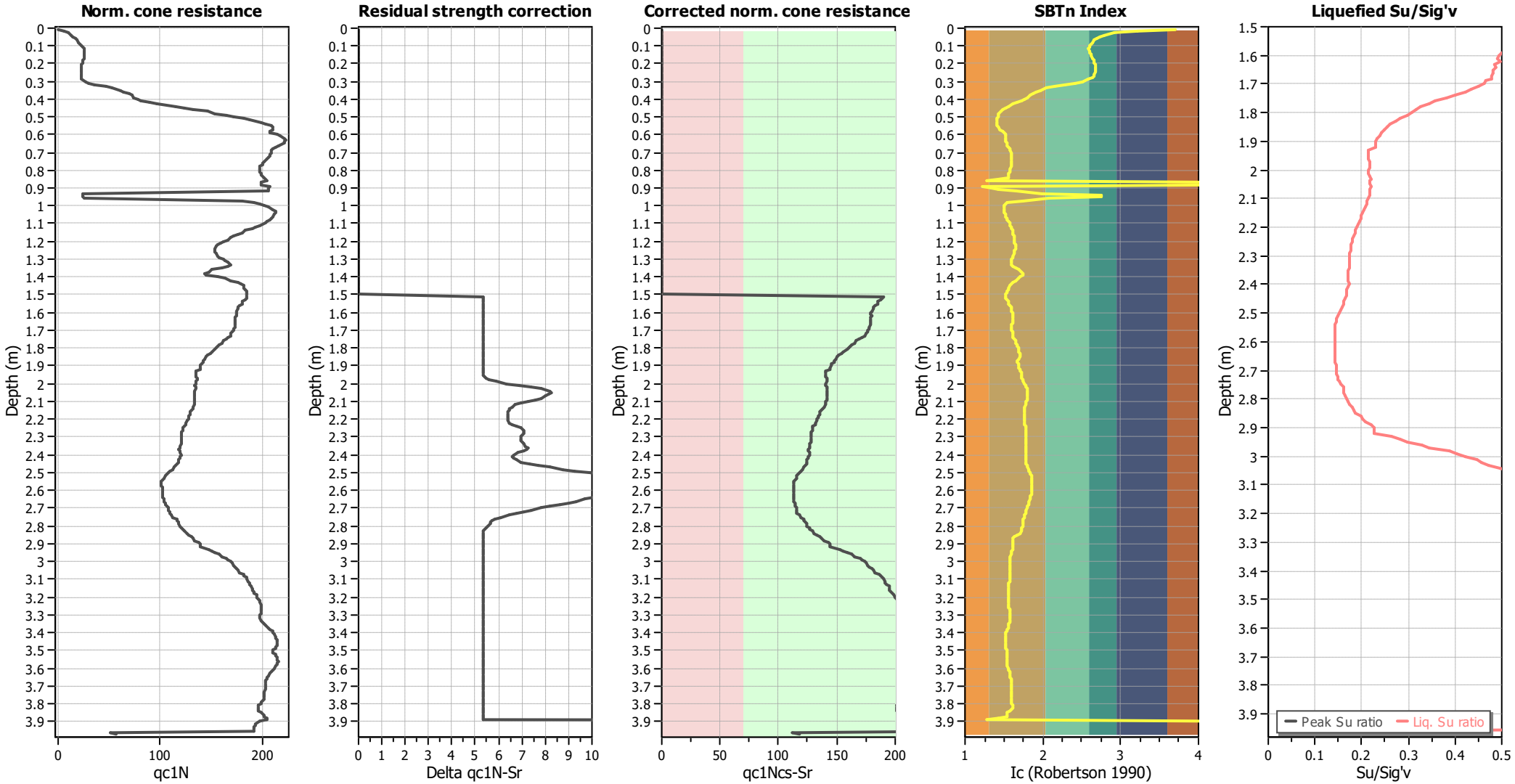




Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

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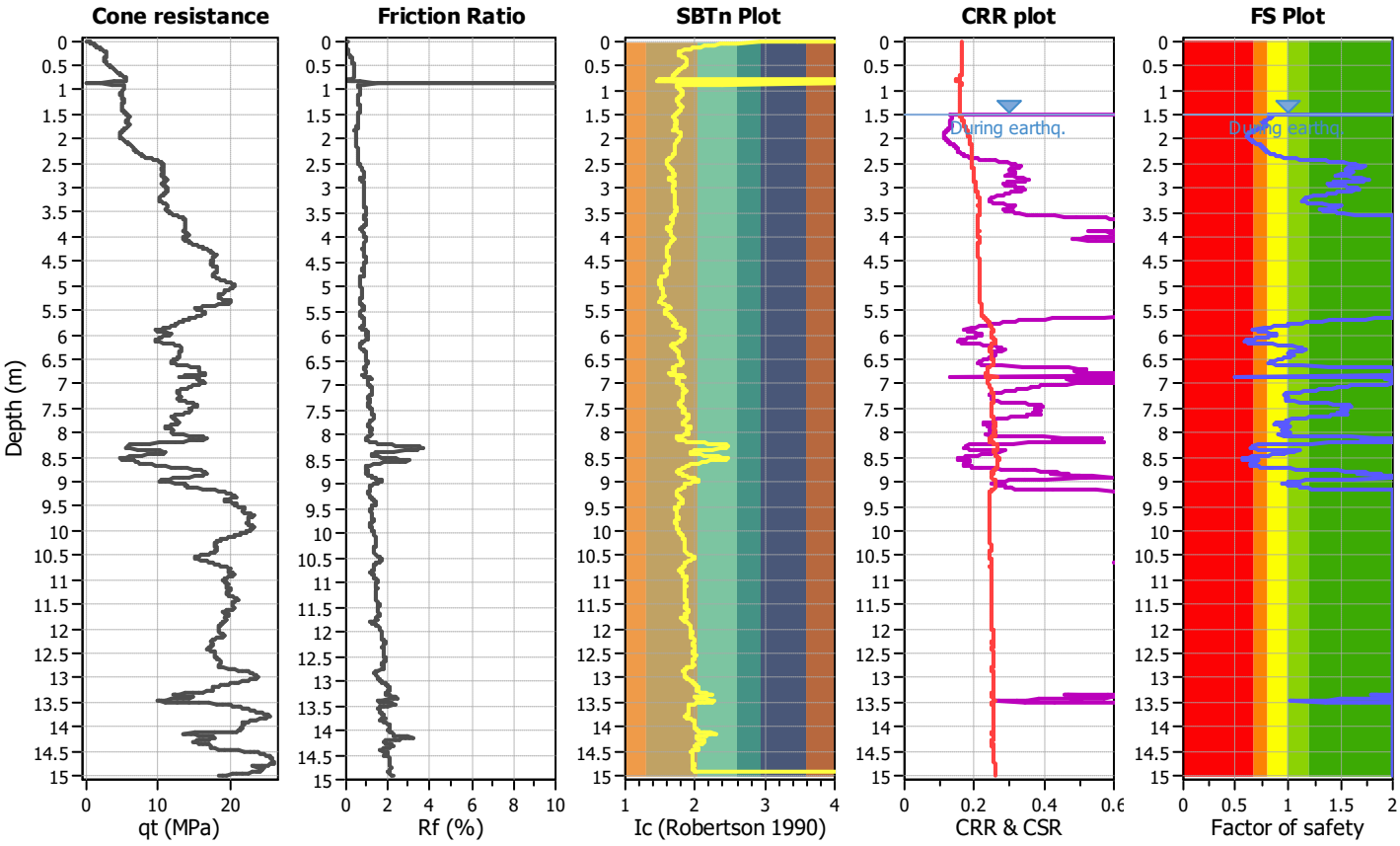
LIQUEFACTION ANALYSIS REPORT

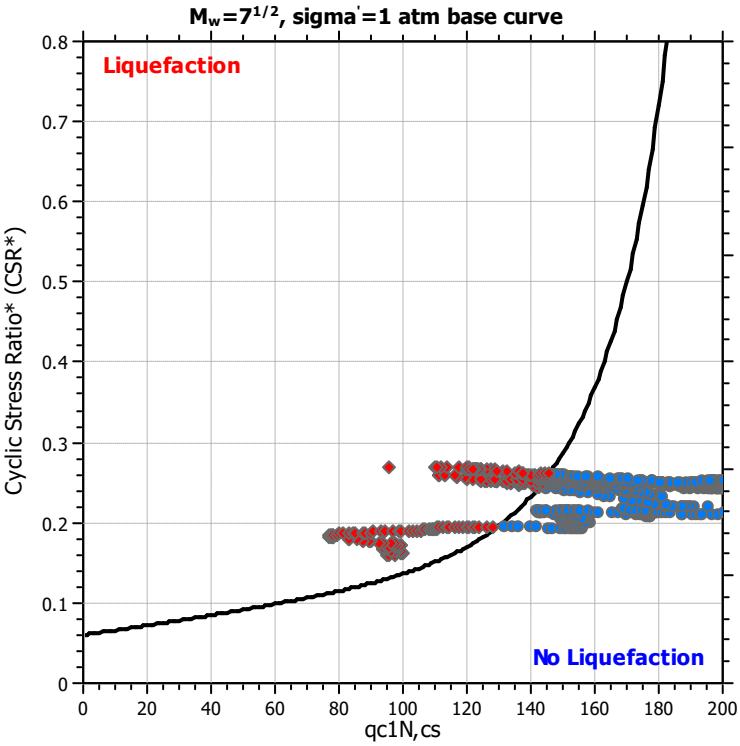
Project title : **Location :**

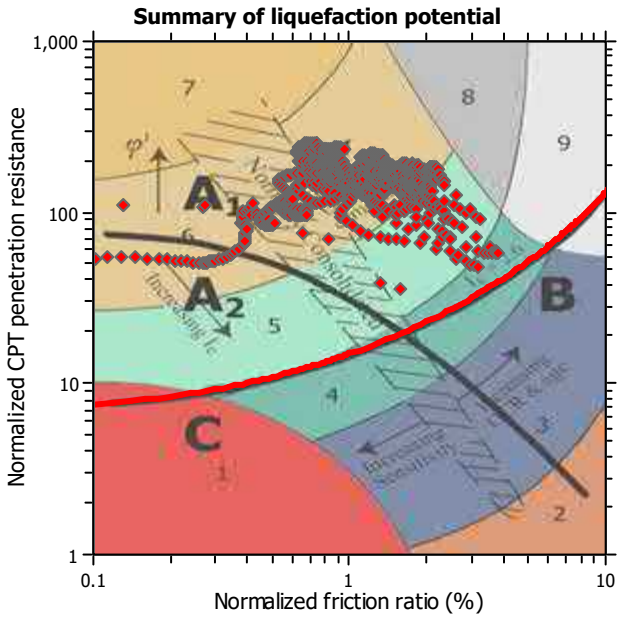
CPT file : CPT 2

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	15.00 m
Earthquake magnitude M_w:	7.10	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

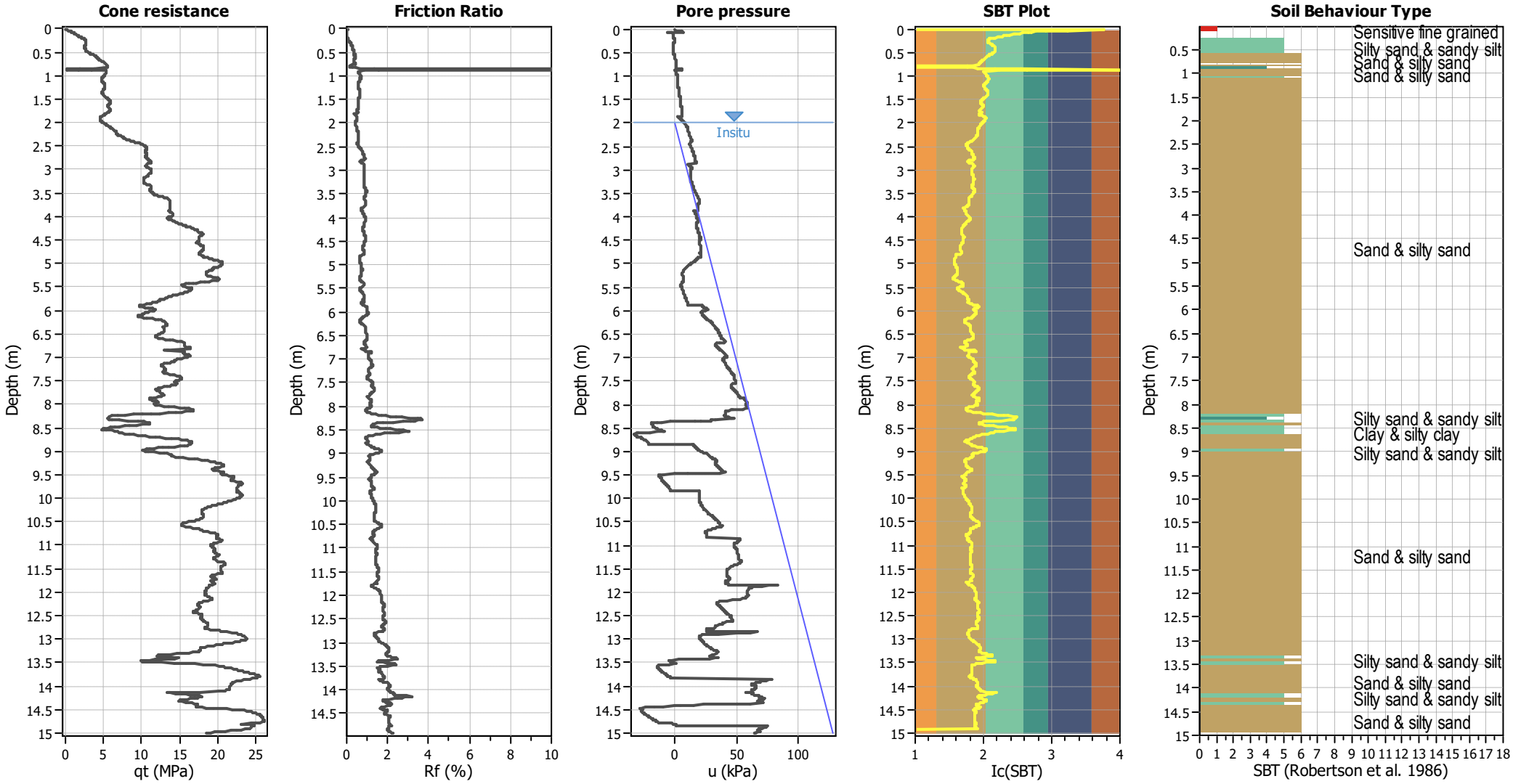






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



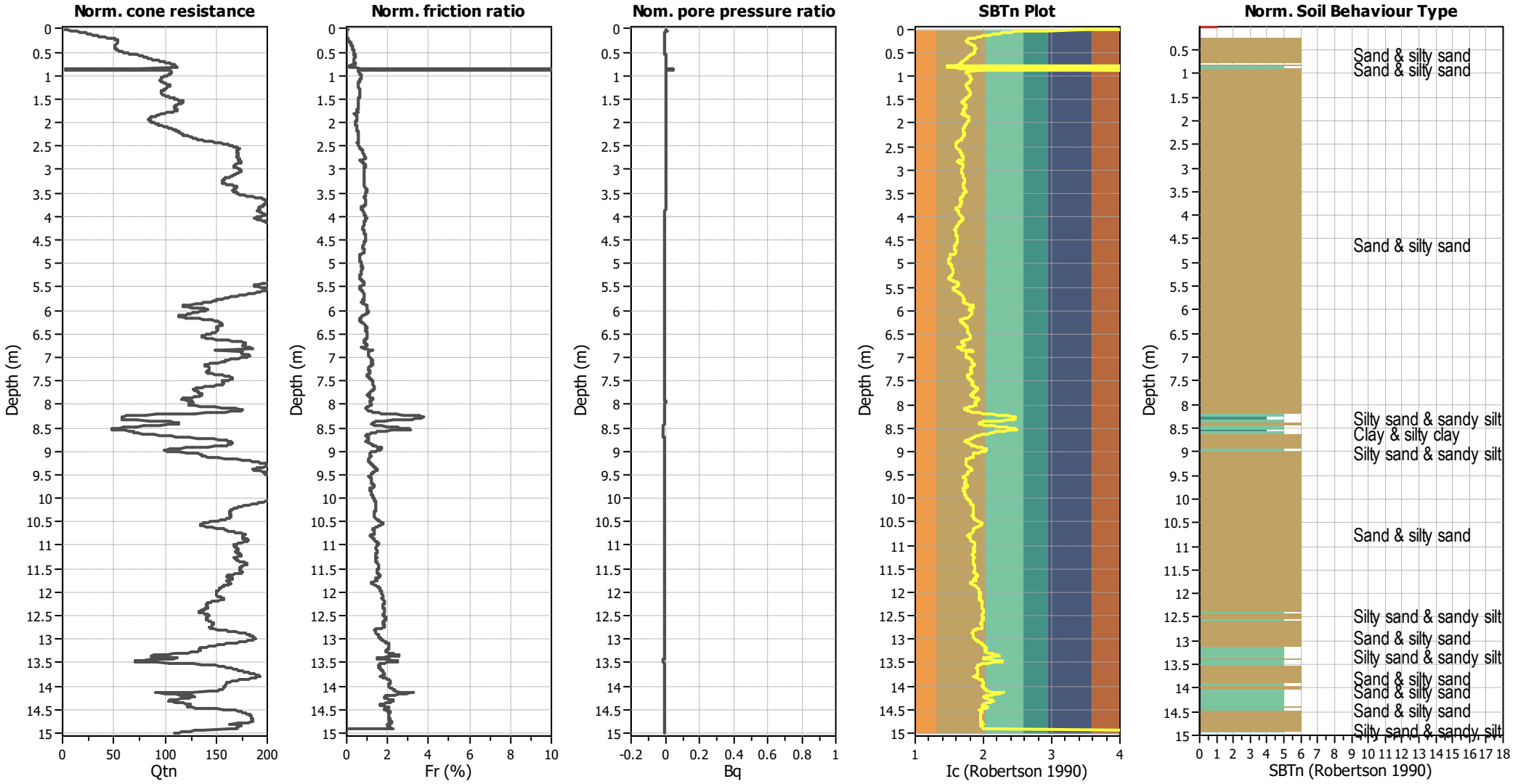
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



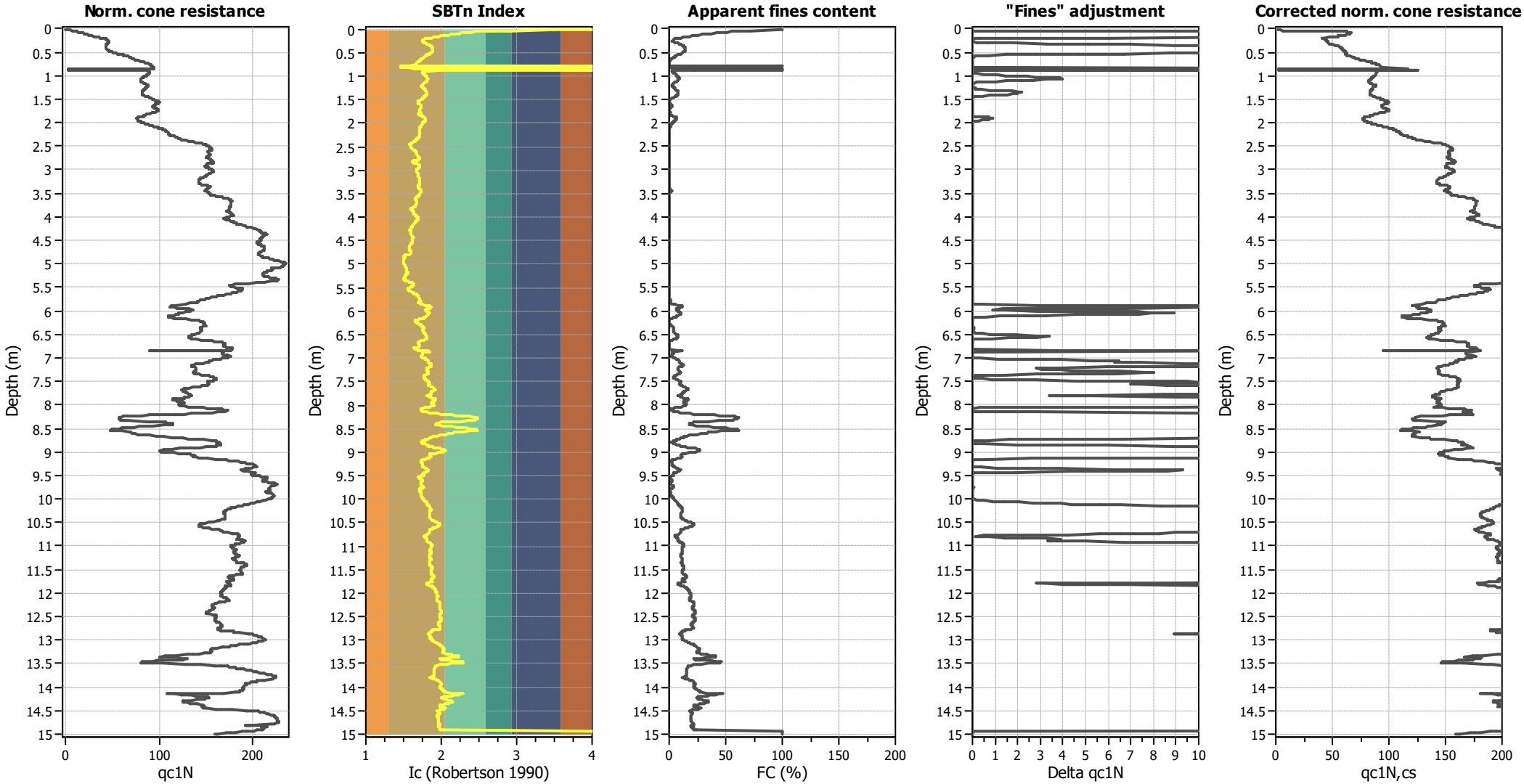
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

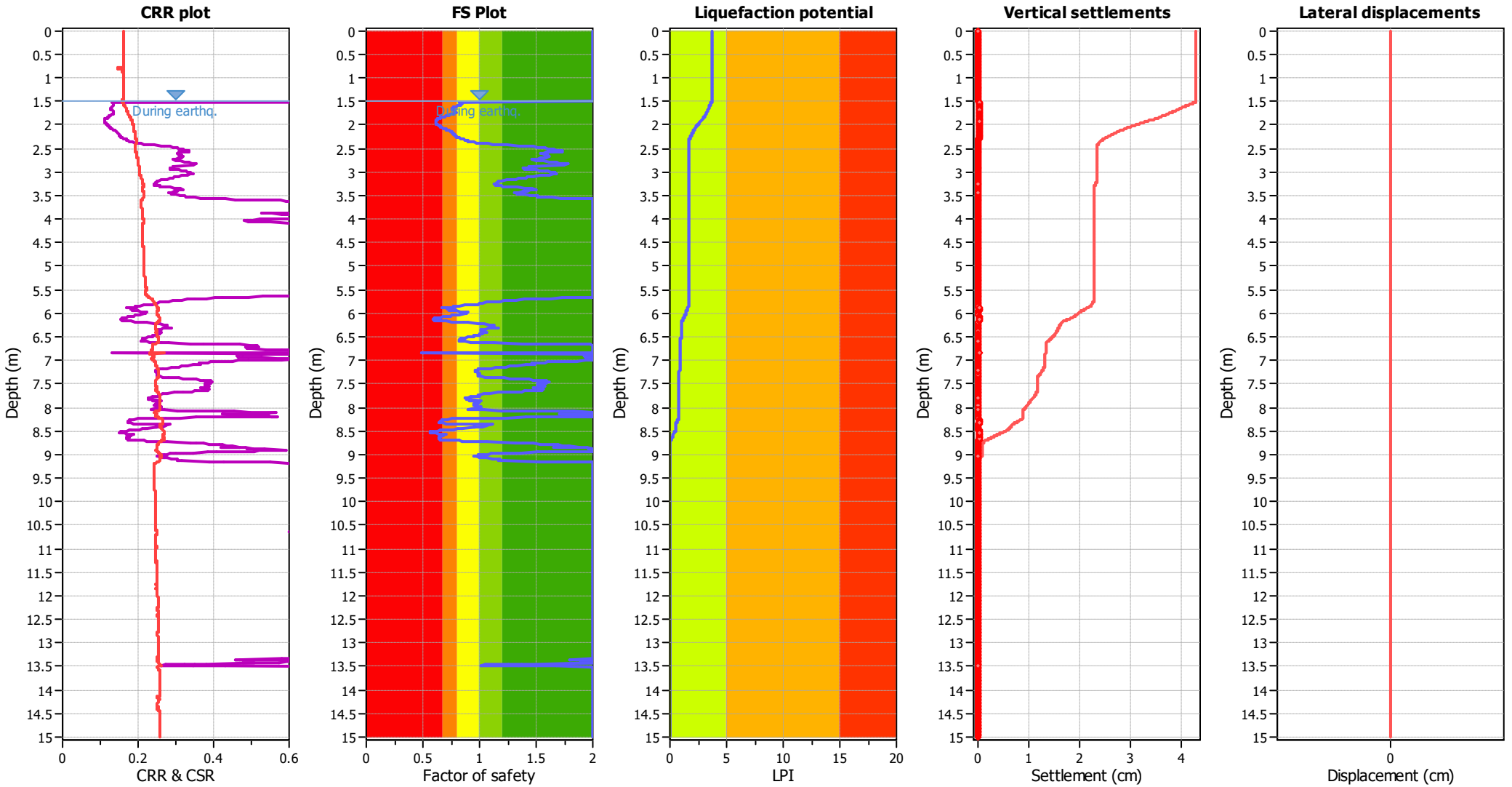
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

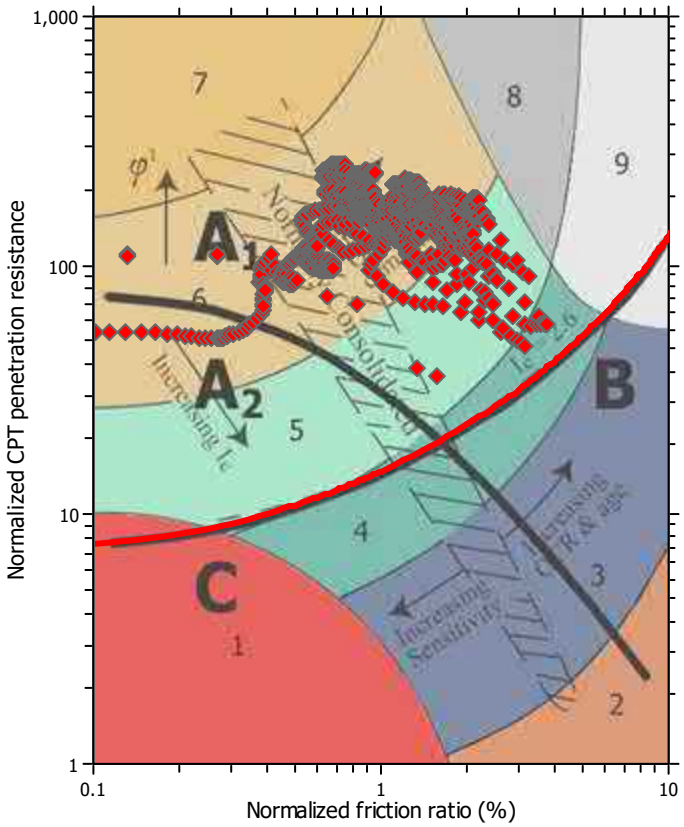
F.S. color scheme

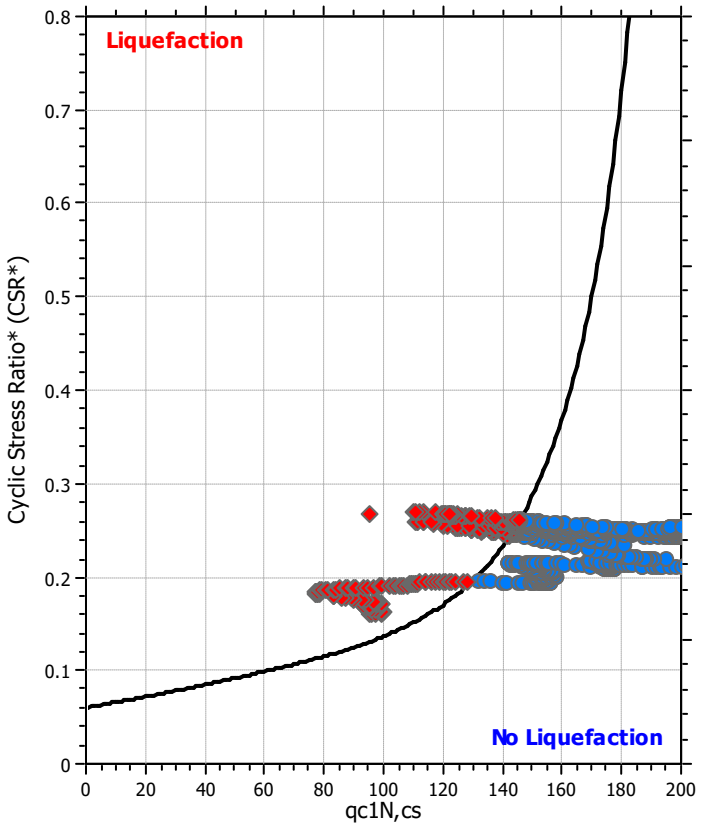
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

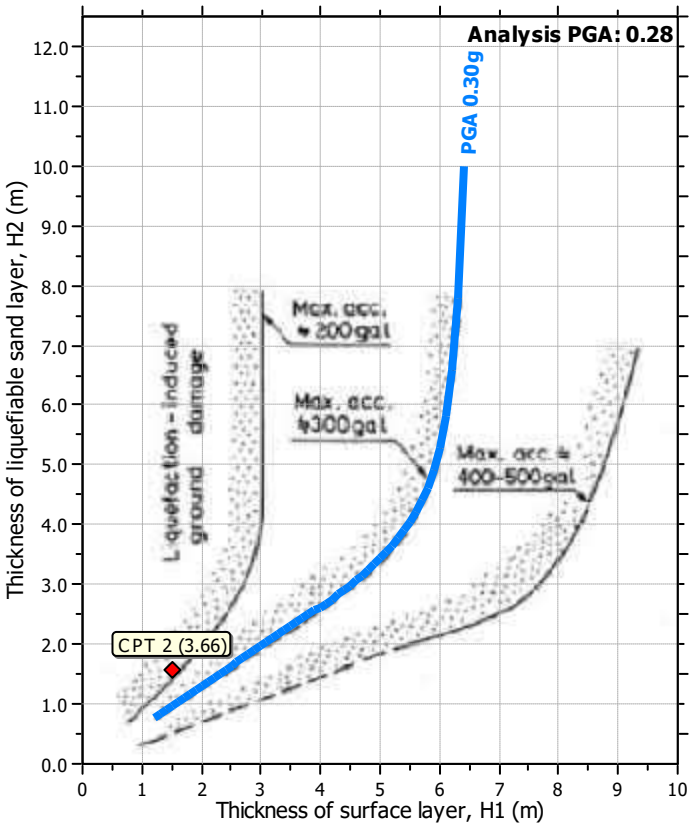
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



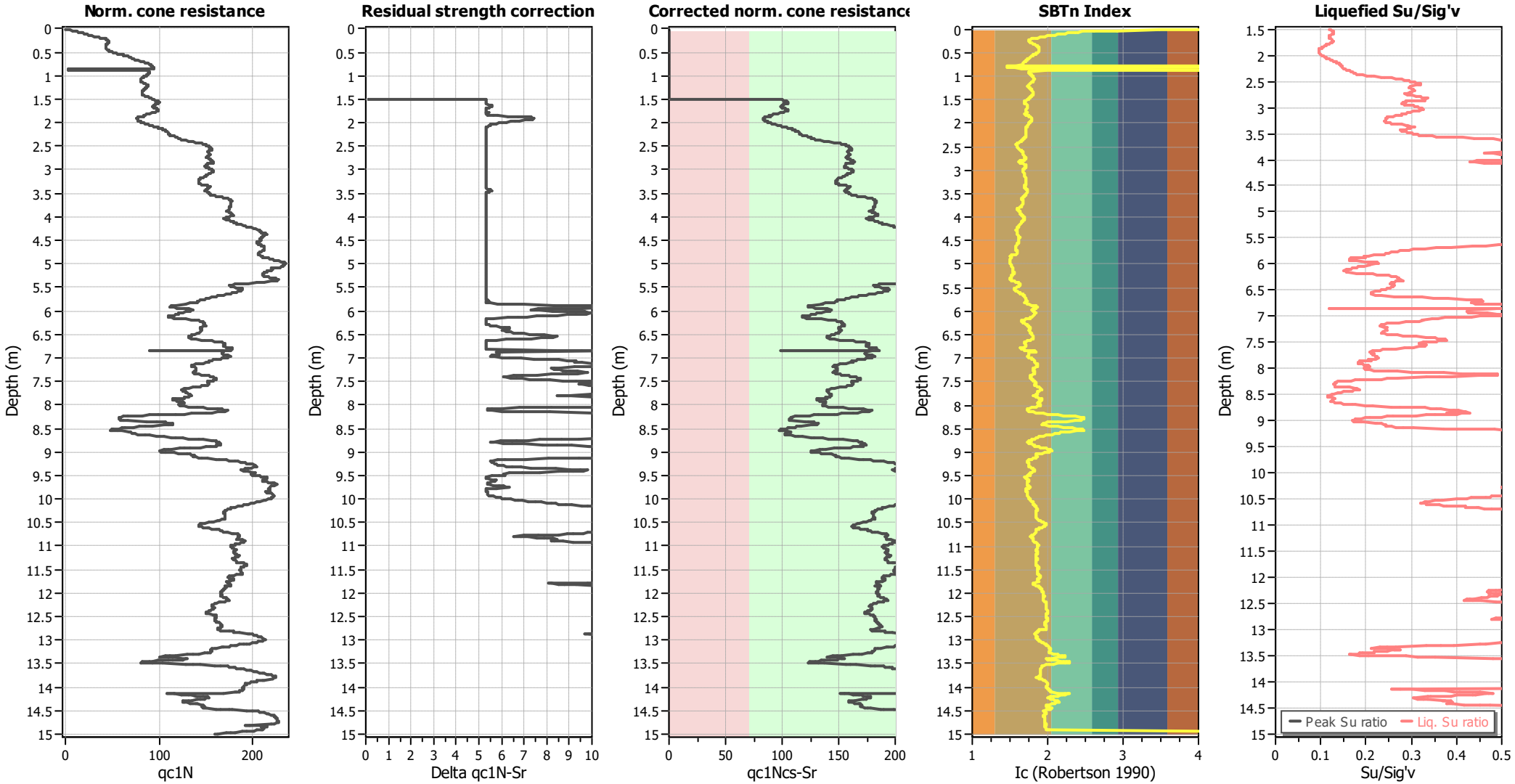




Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

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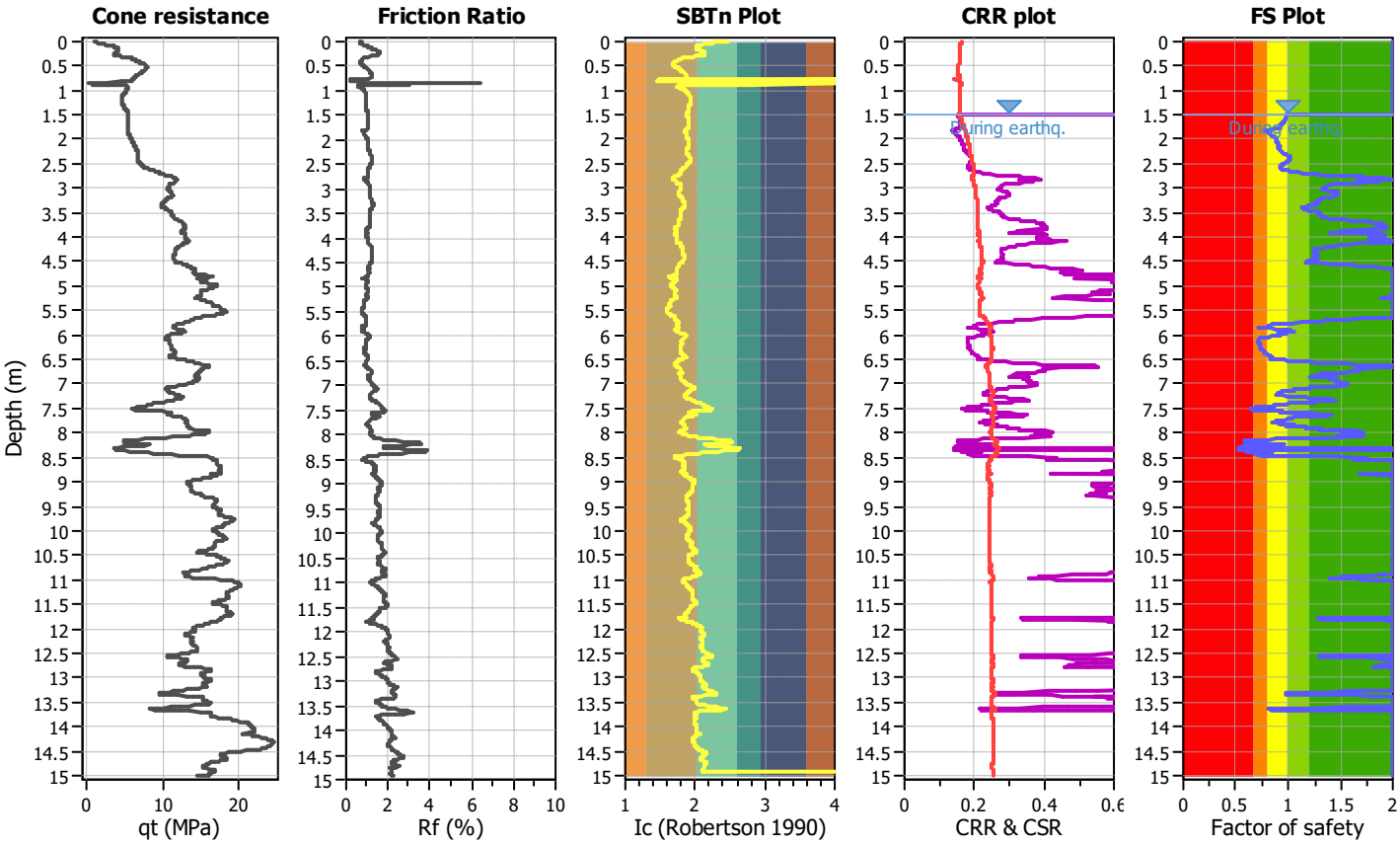
LIQUEFACTION ANALYSIS REPORT

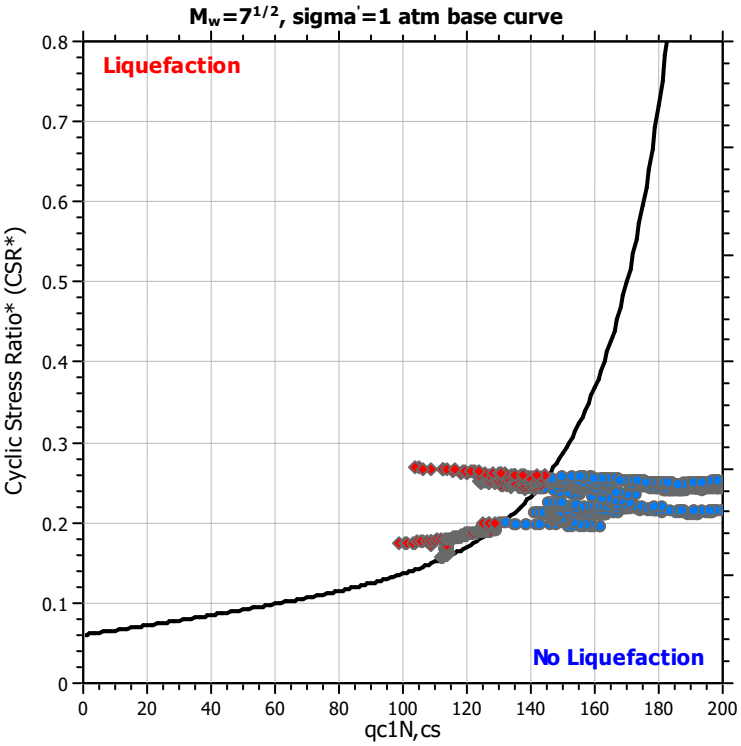
Project title : **Location :**

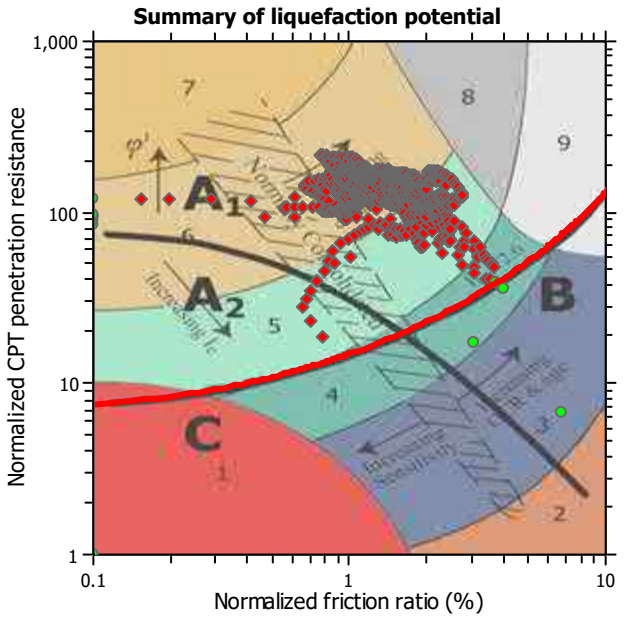
CPT file : CPT 3

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	15.00 m
Earthquake magnitude M_w:	7.10	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

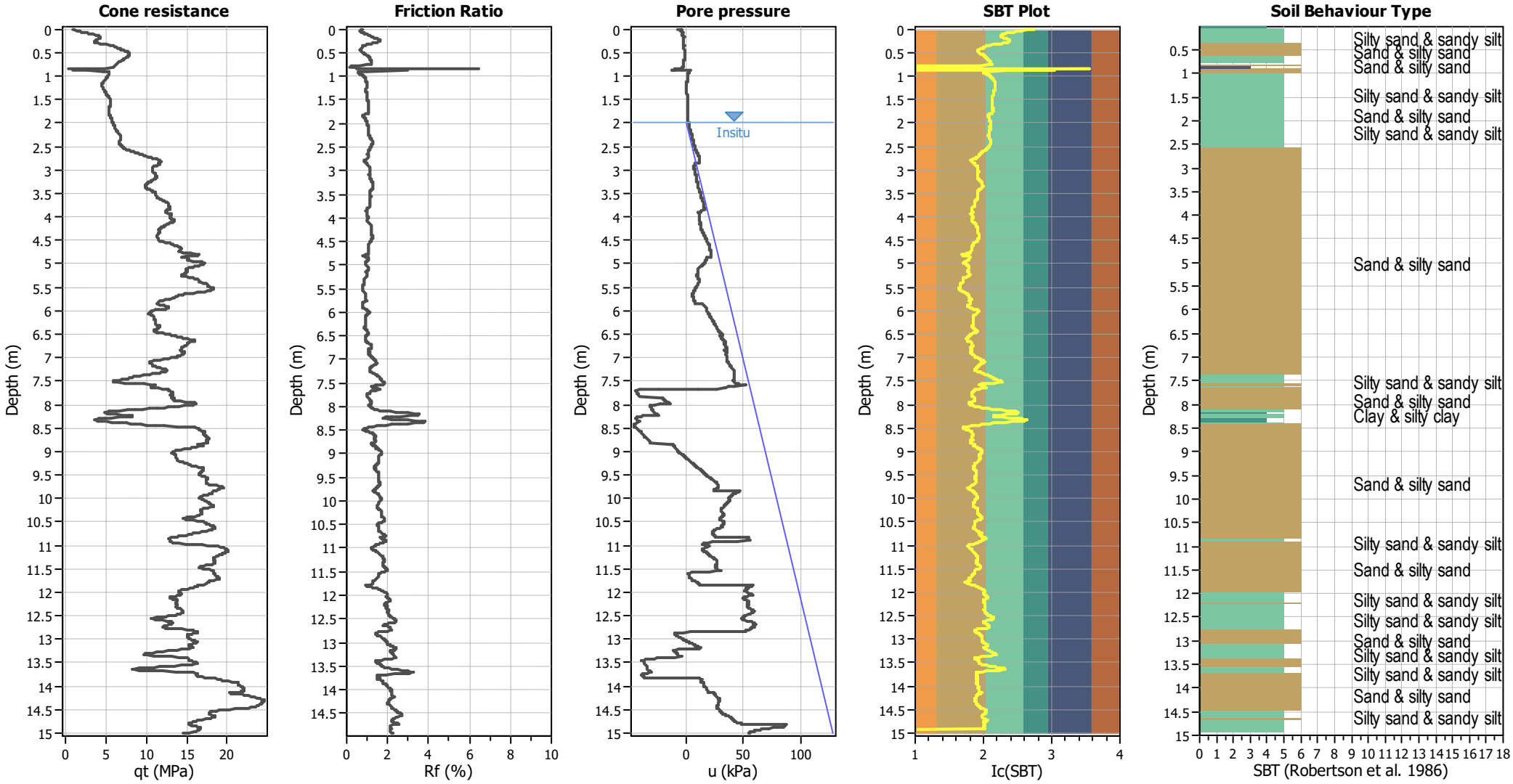






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



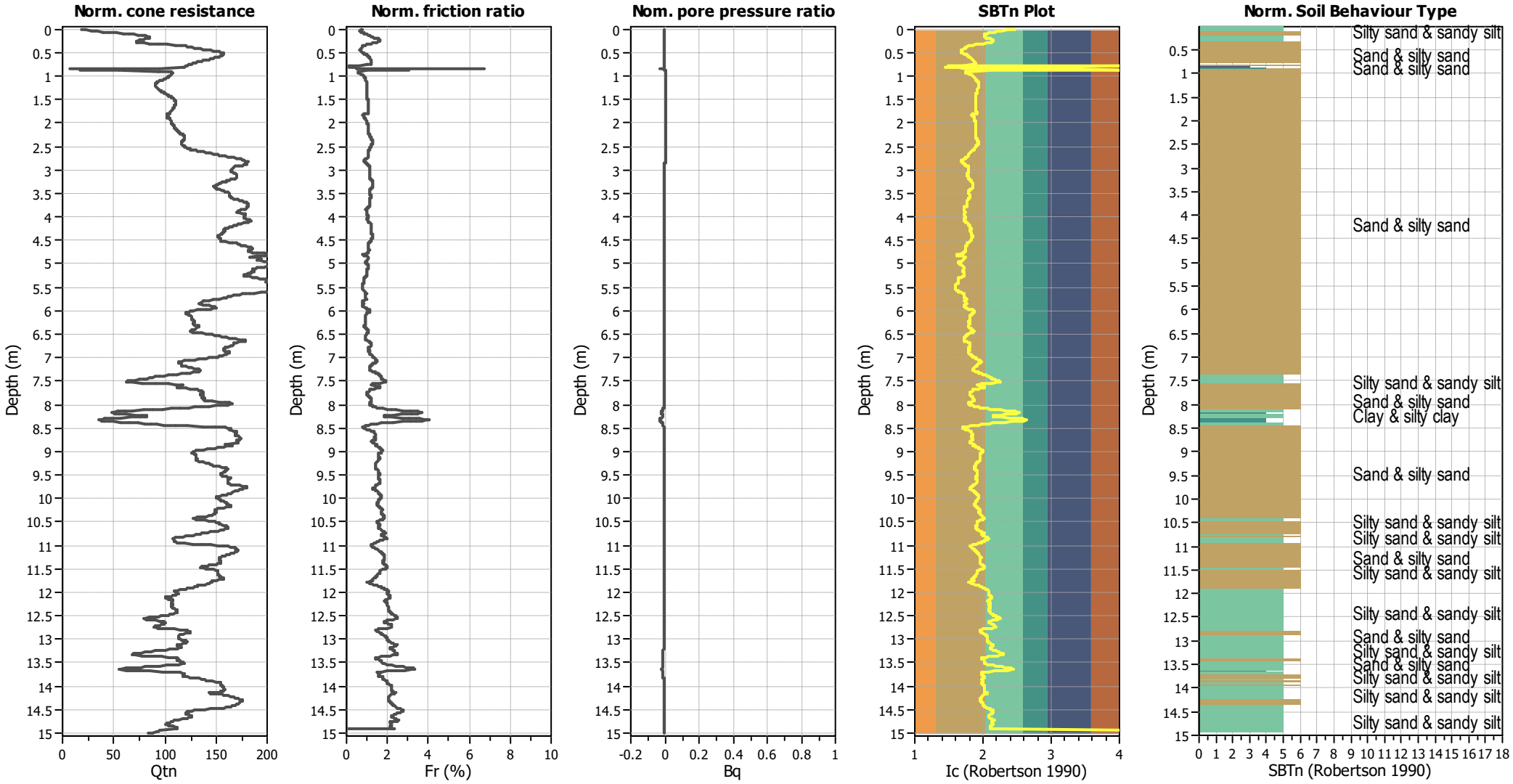
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



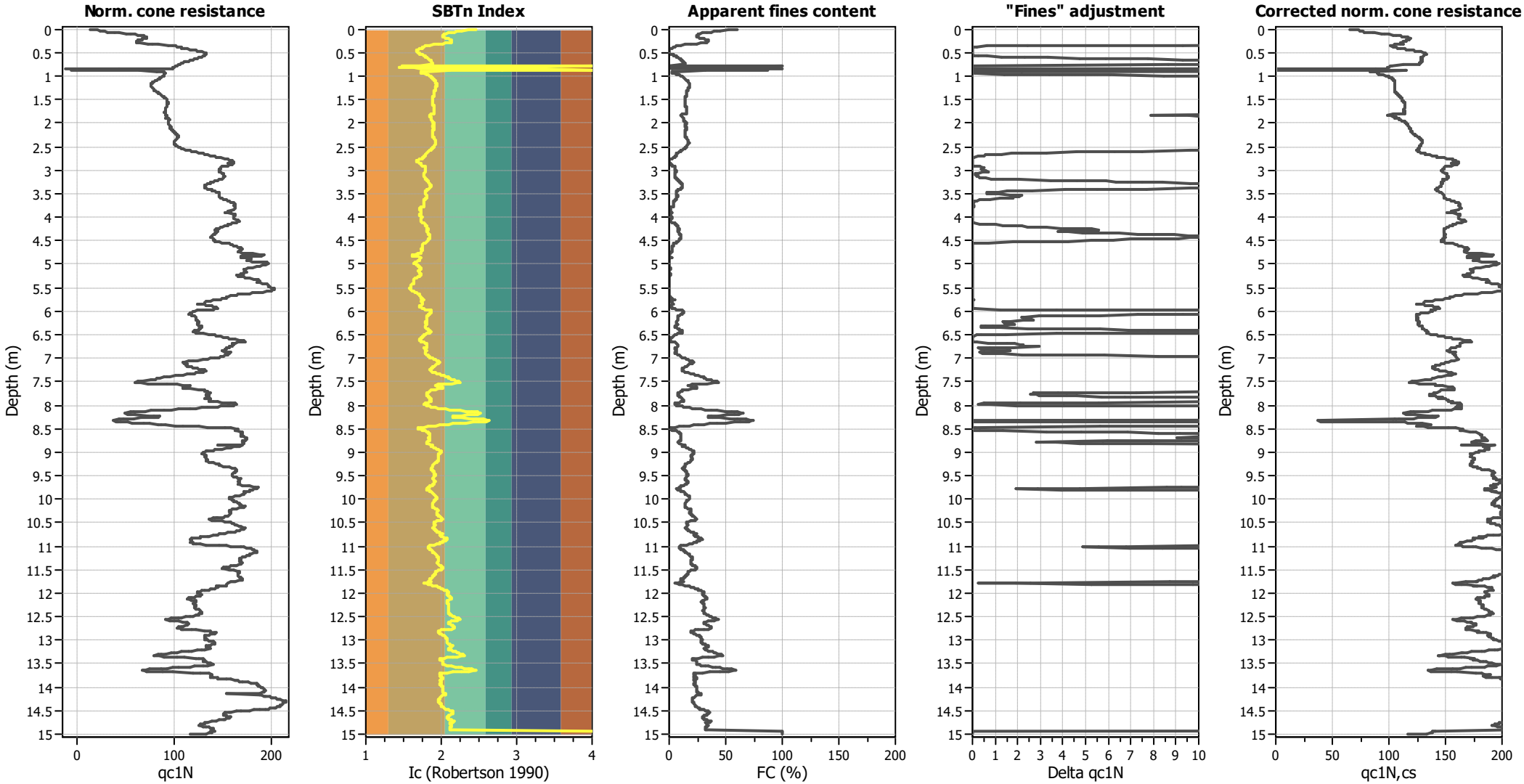
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBTn legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

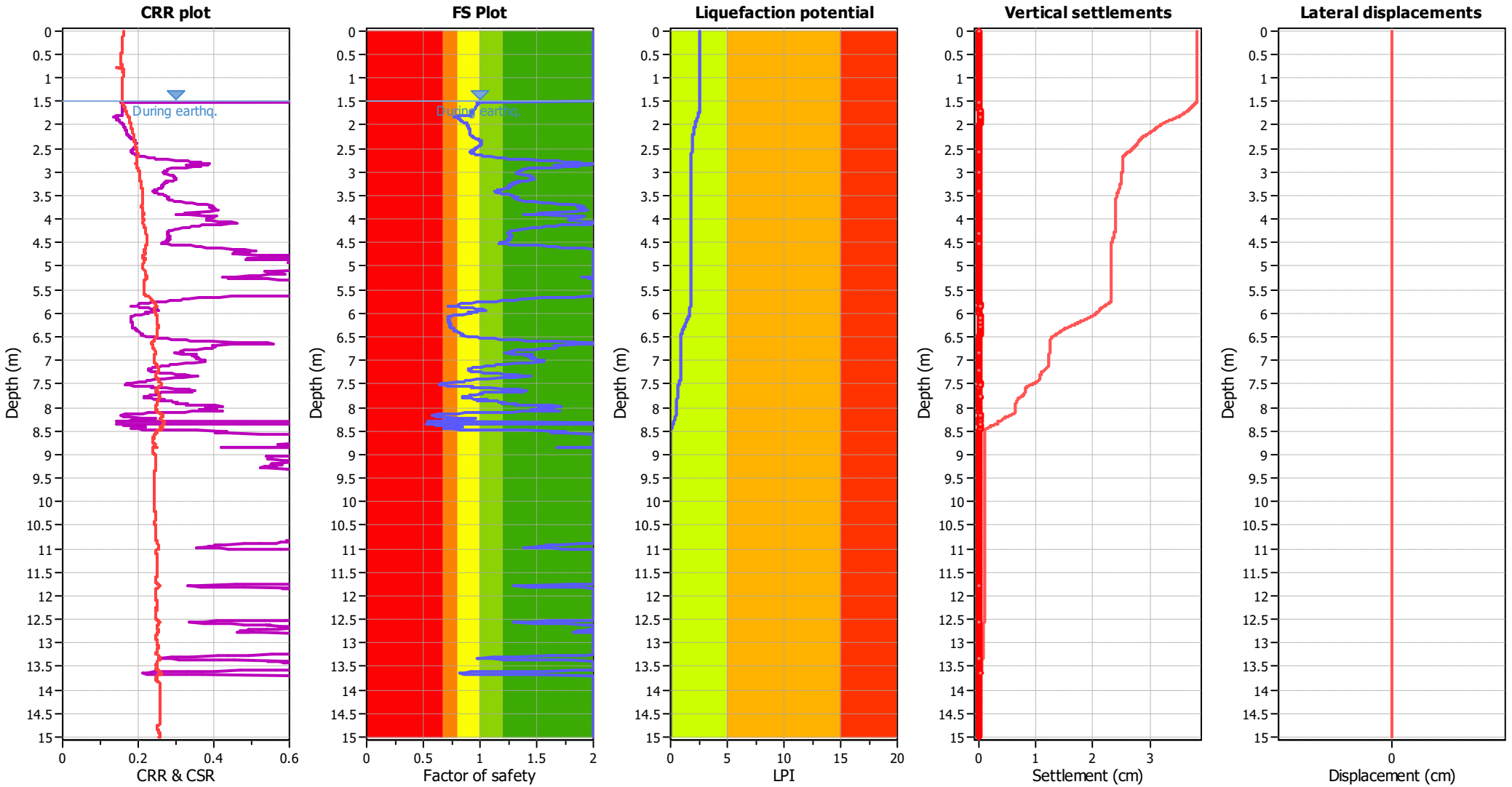
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

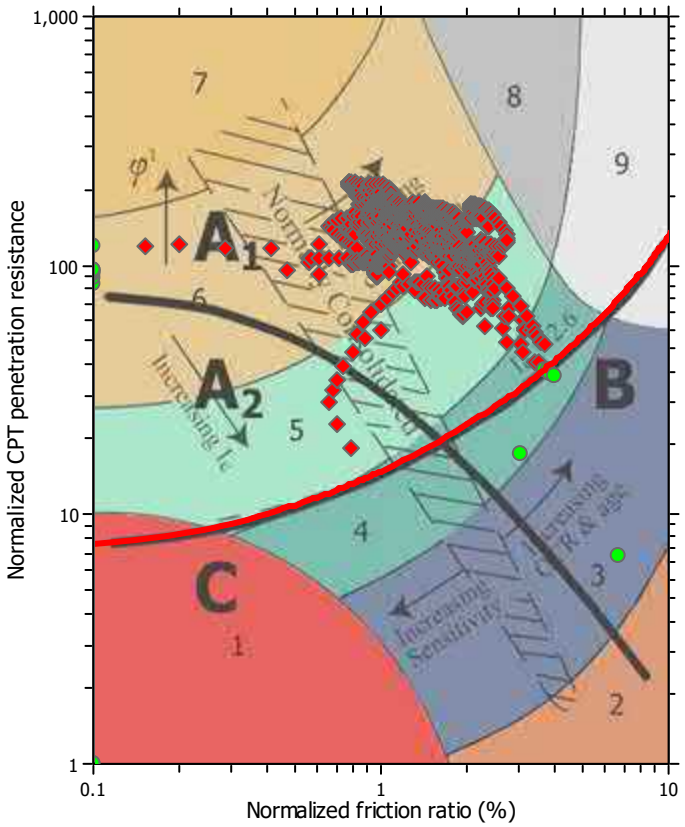
F.S. color scheme

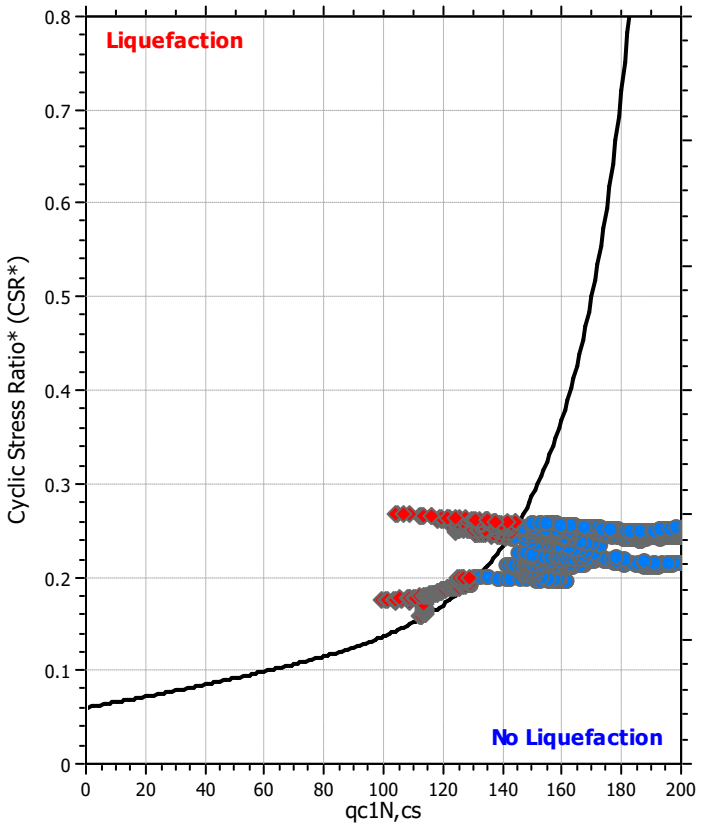
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

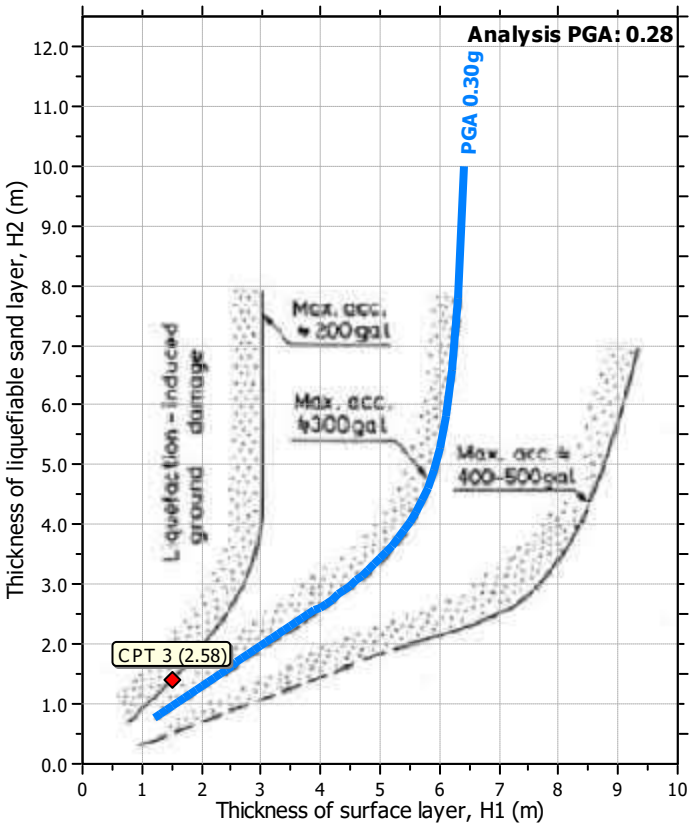
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



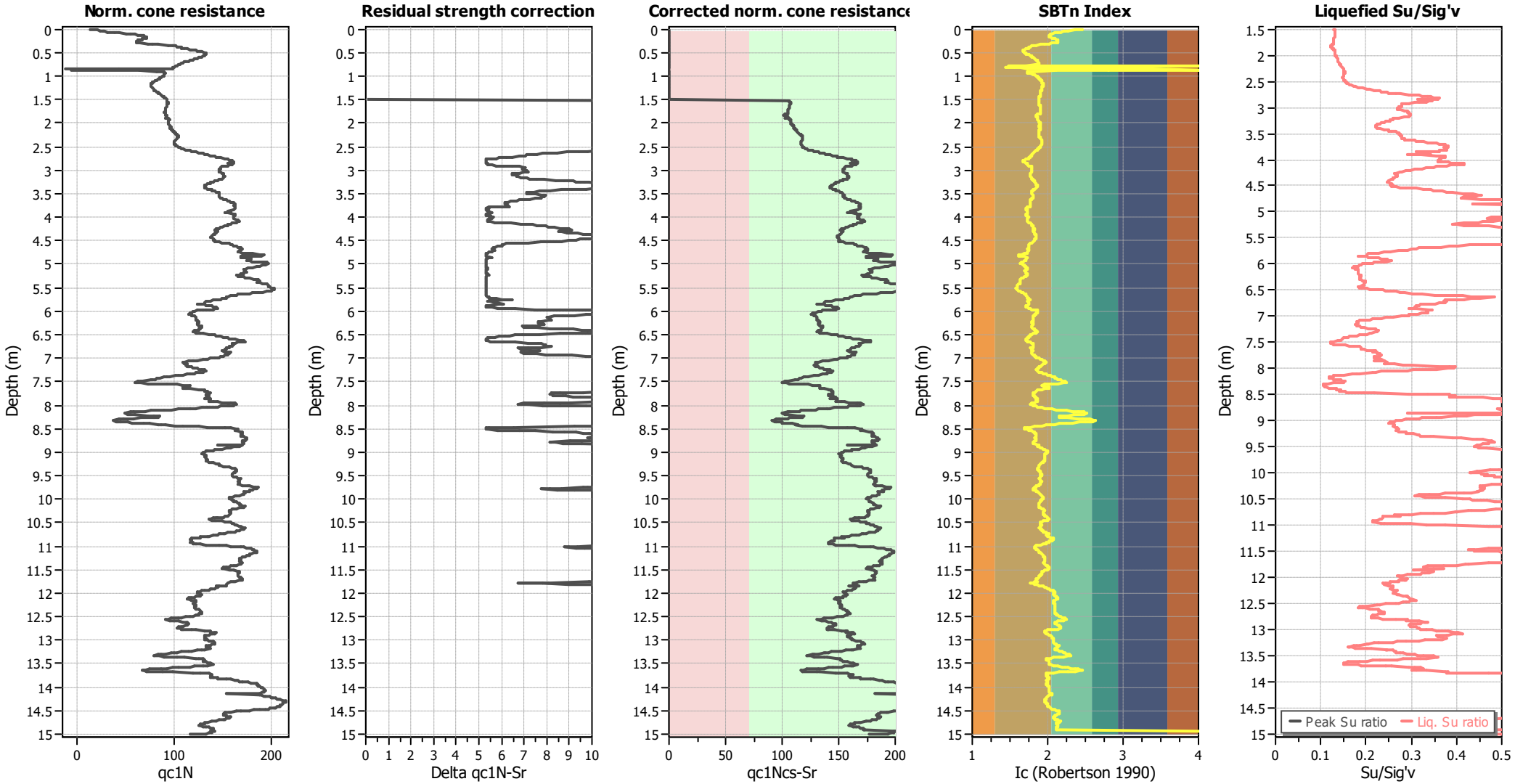




Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

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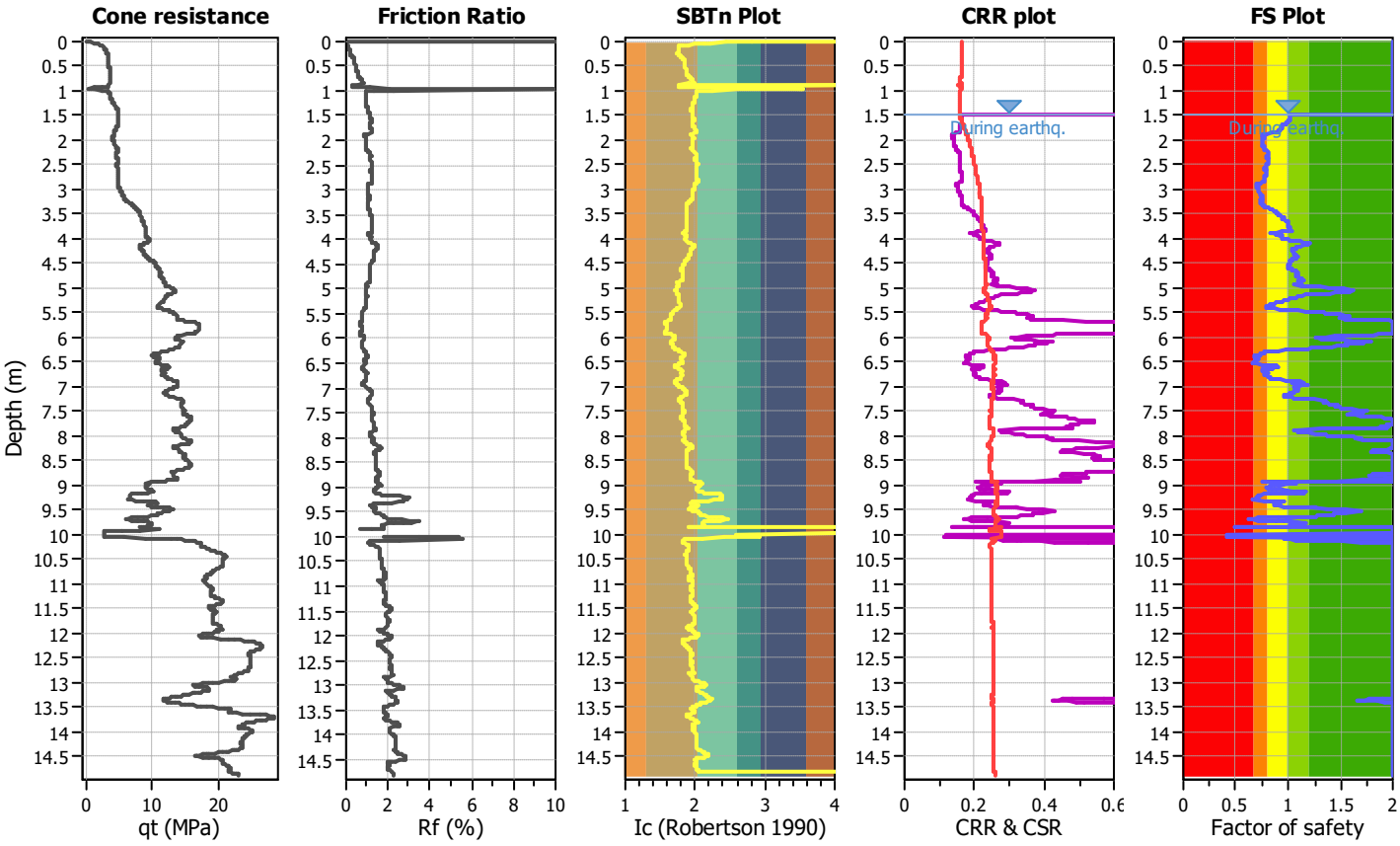
LIQUEFACTION ANALYSIS REPORT

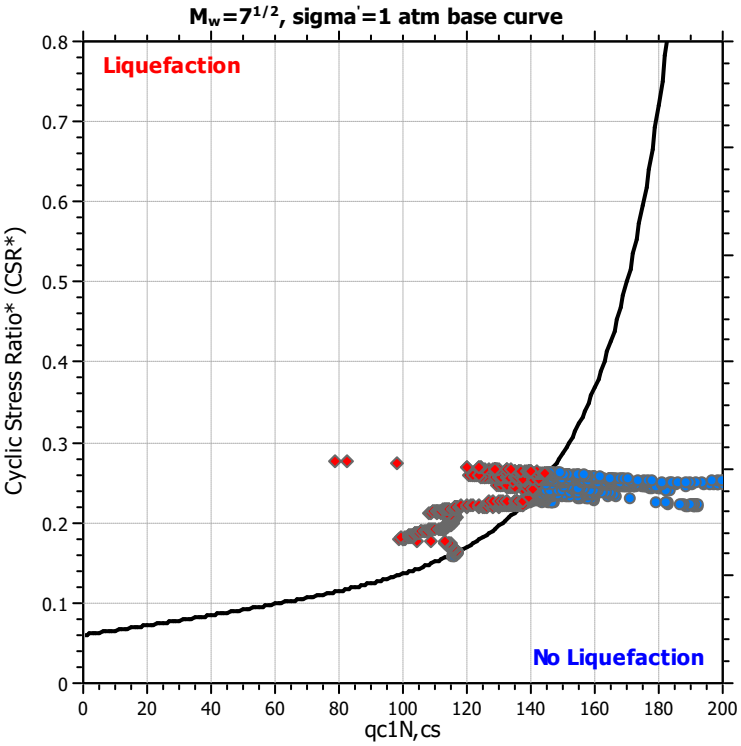
Project title : **Location :**

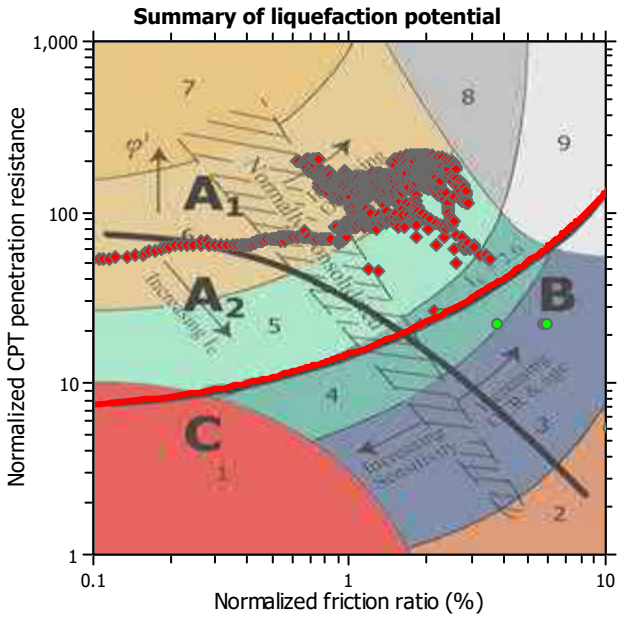
CPT file : CPT 4

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	15.00 m
Earthquake magnitude M_w:	7.10	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

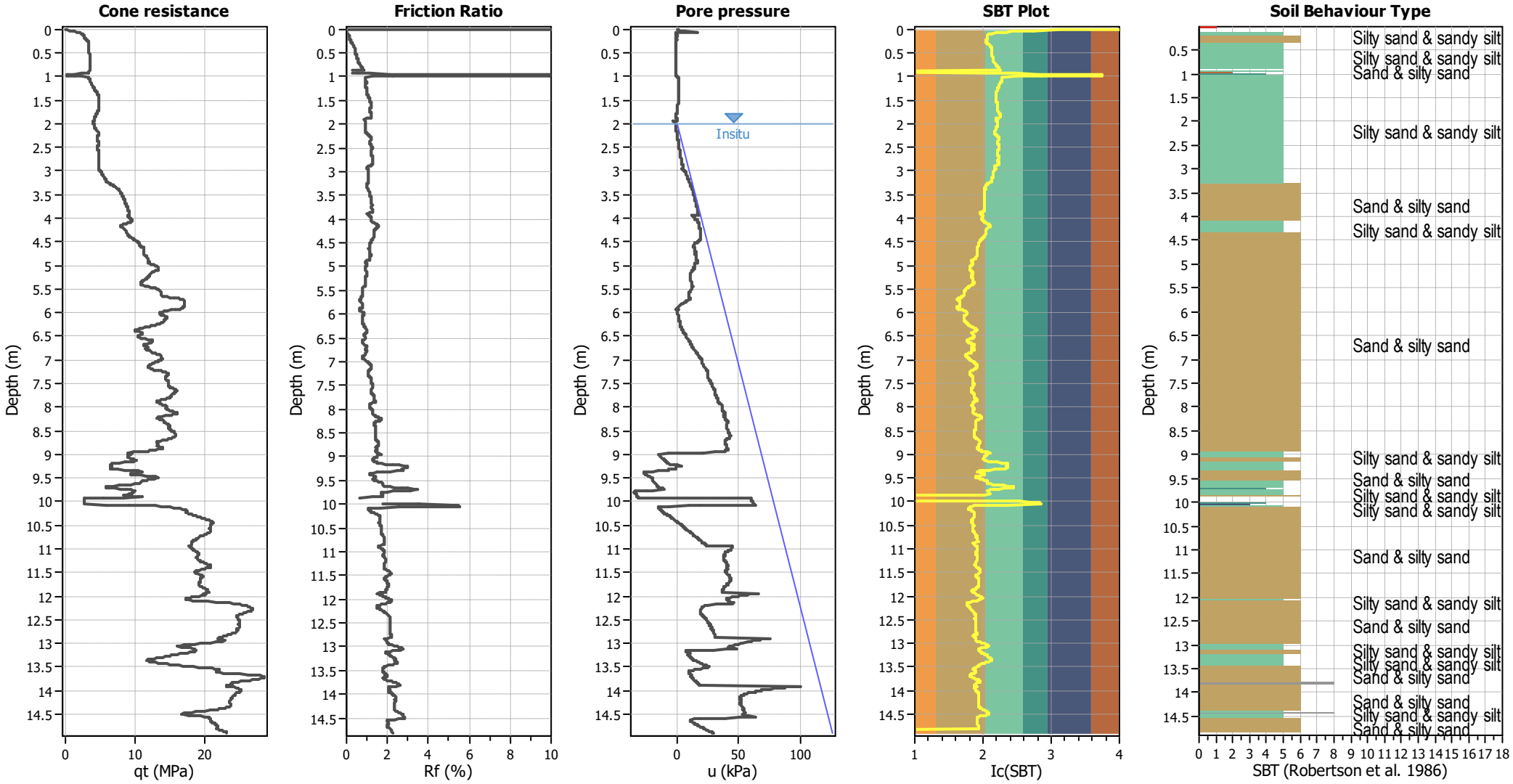






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



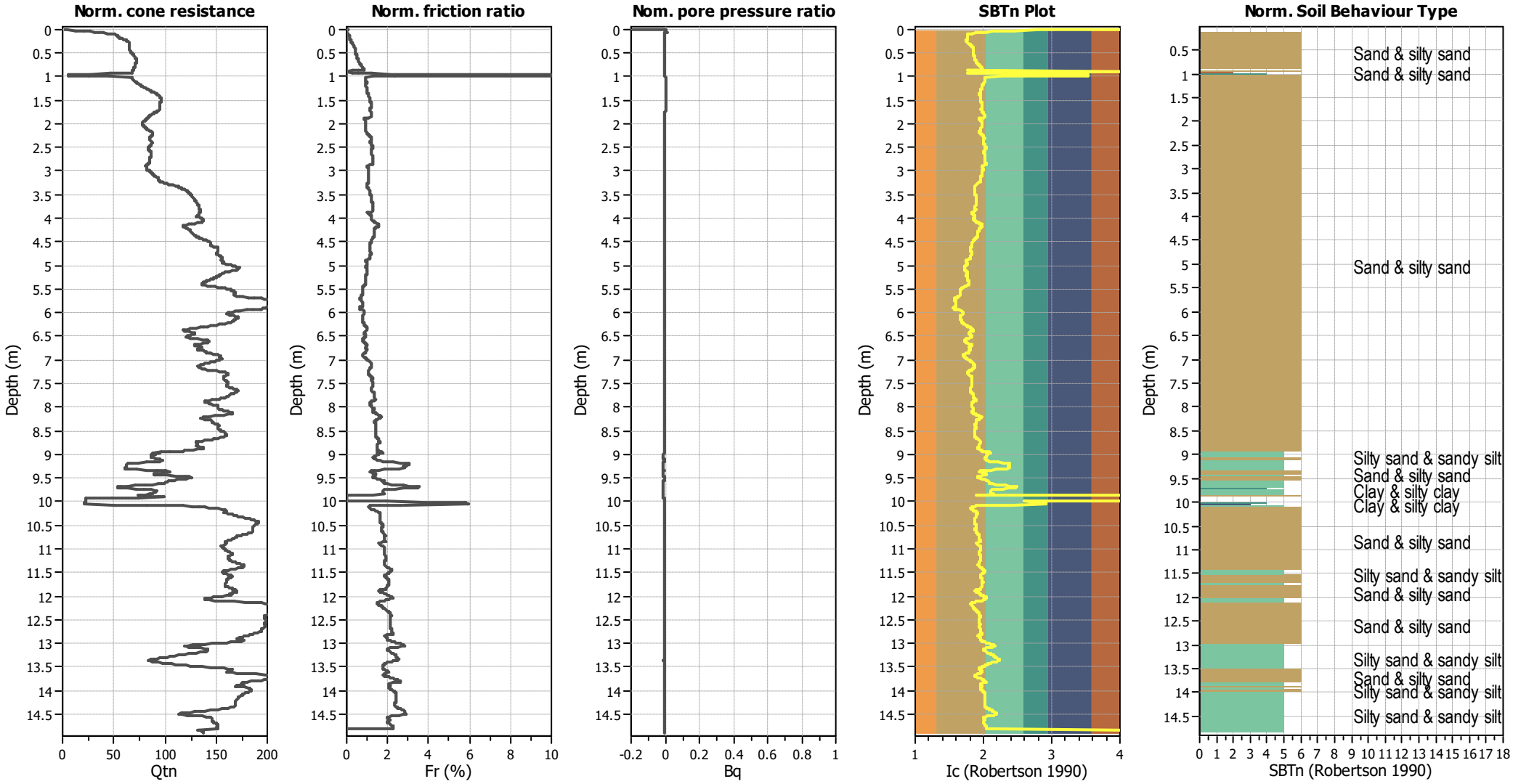
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



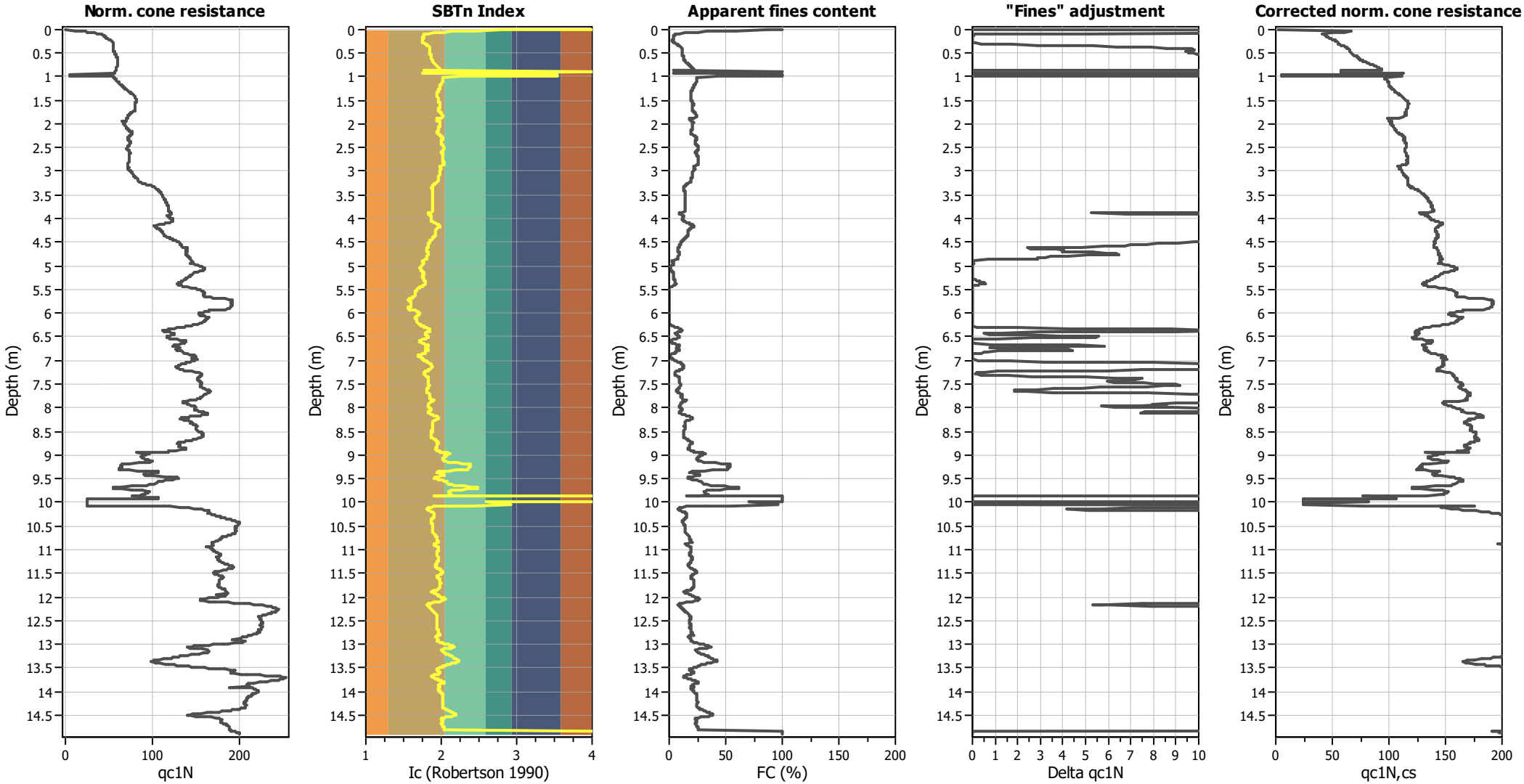
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

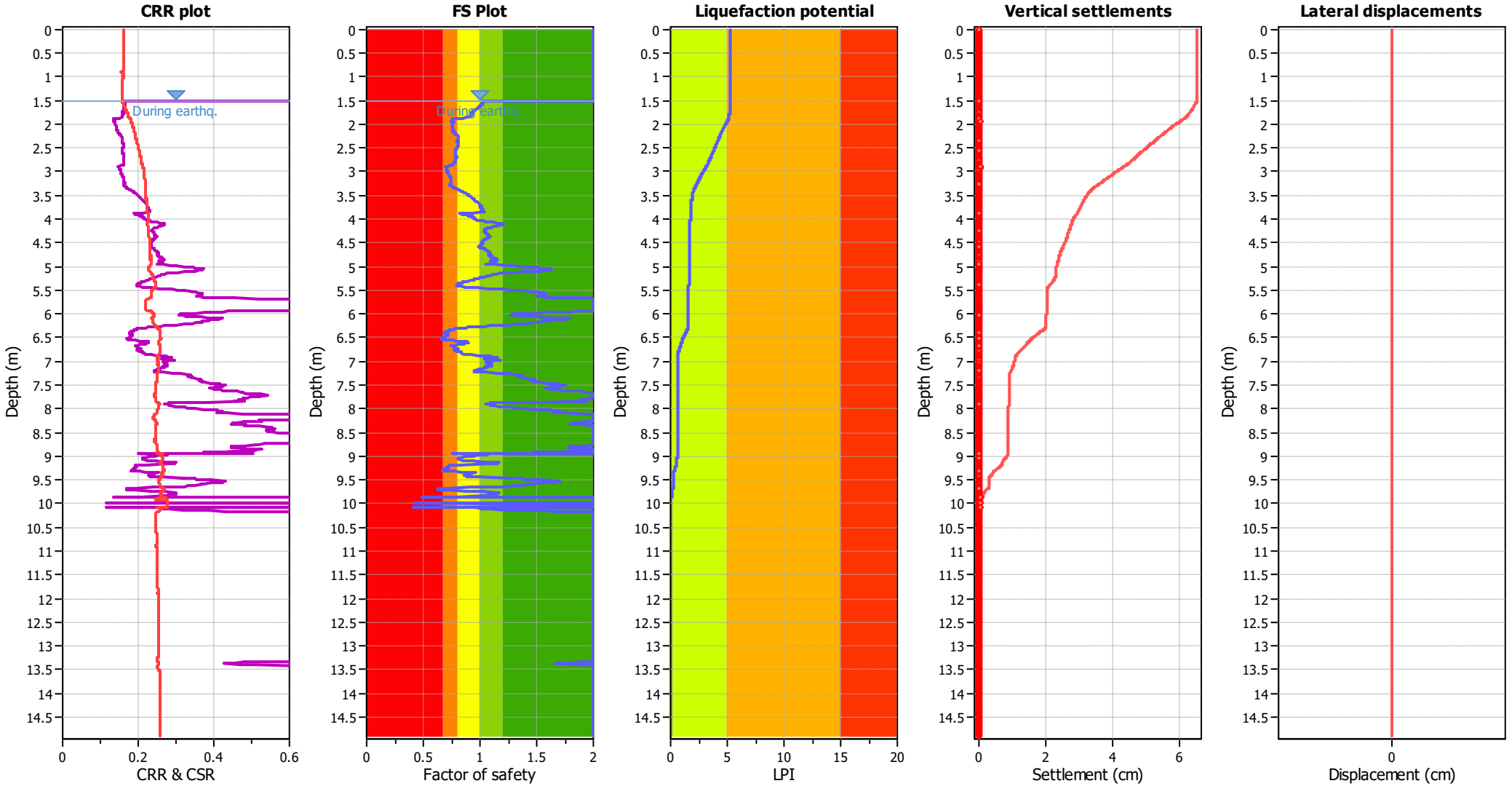
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

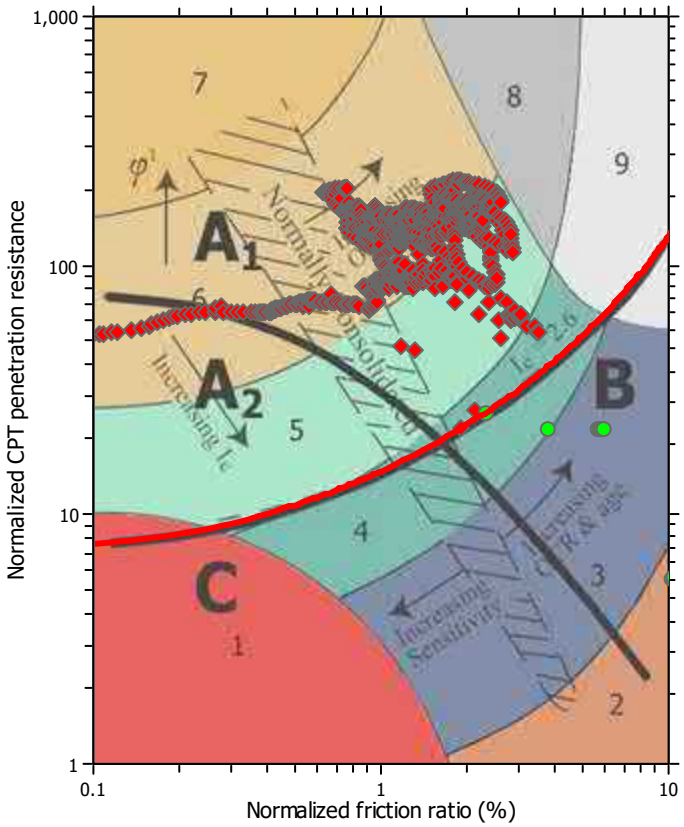
F.S. color scheme

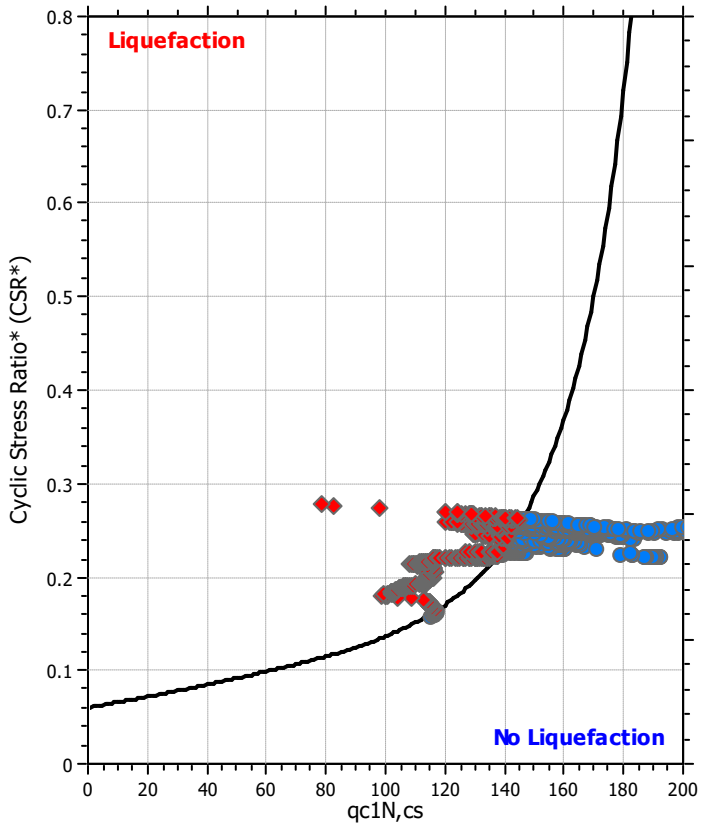
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

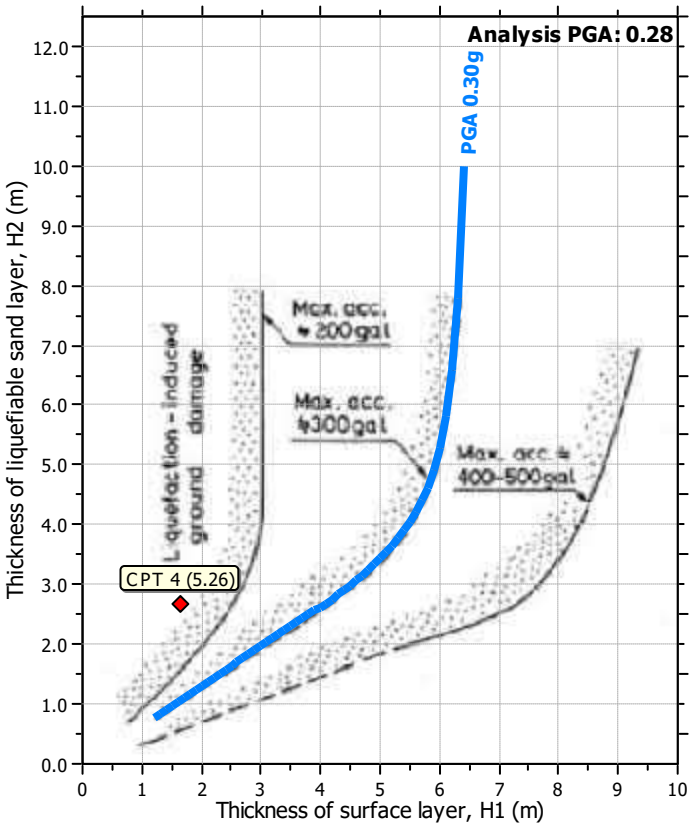
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



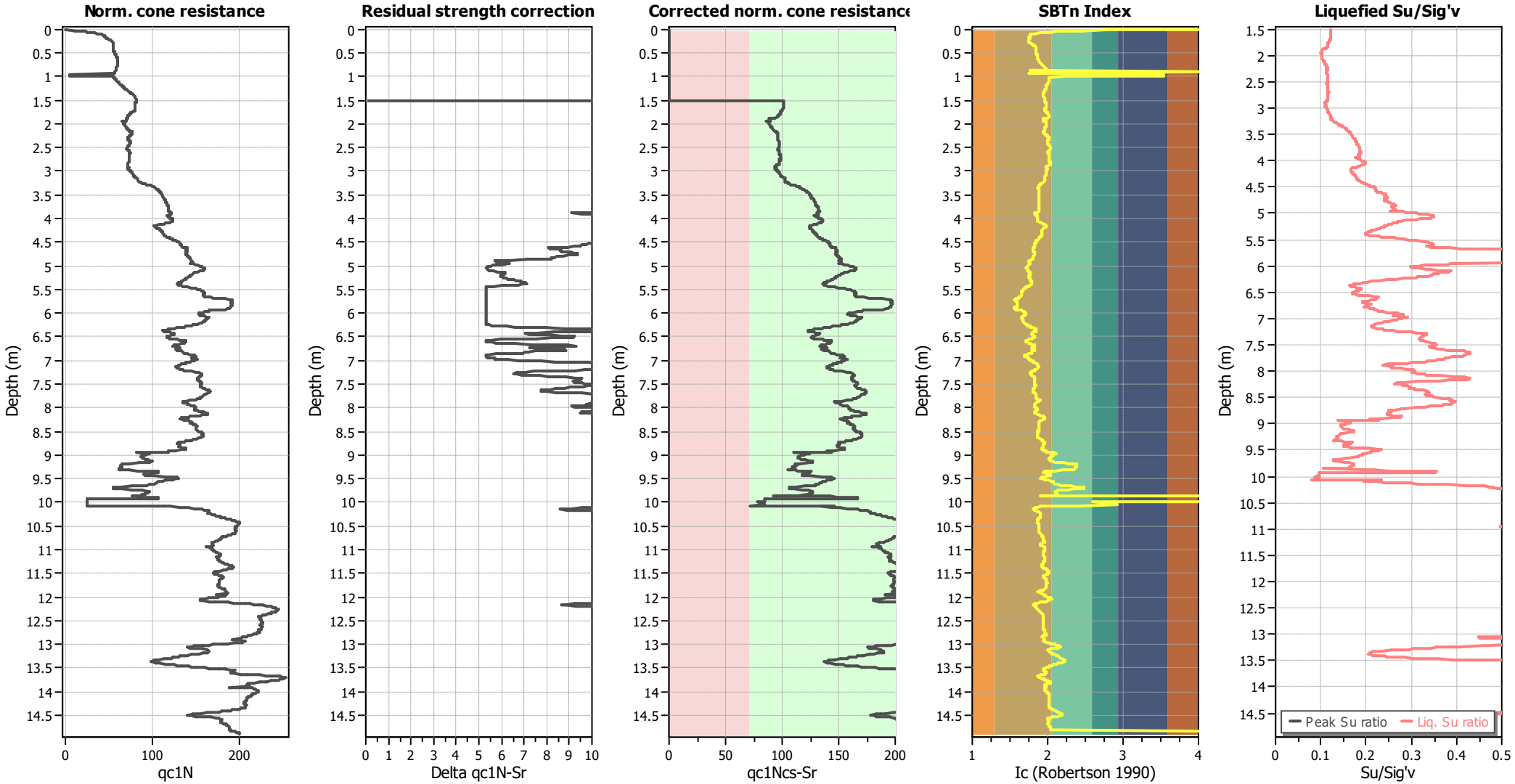




Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

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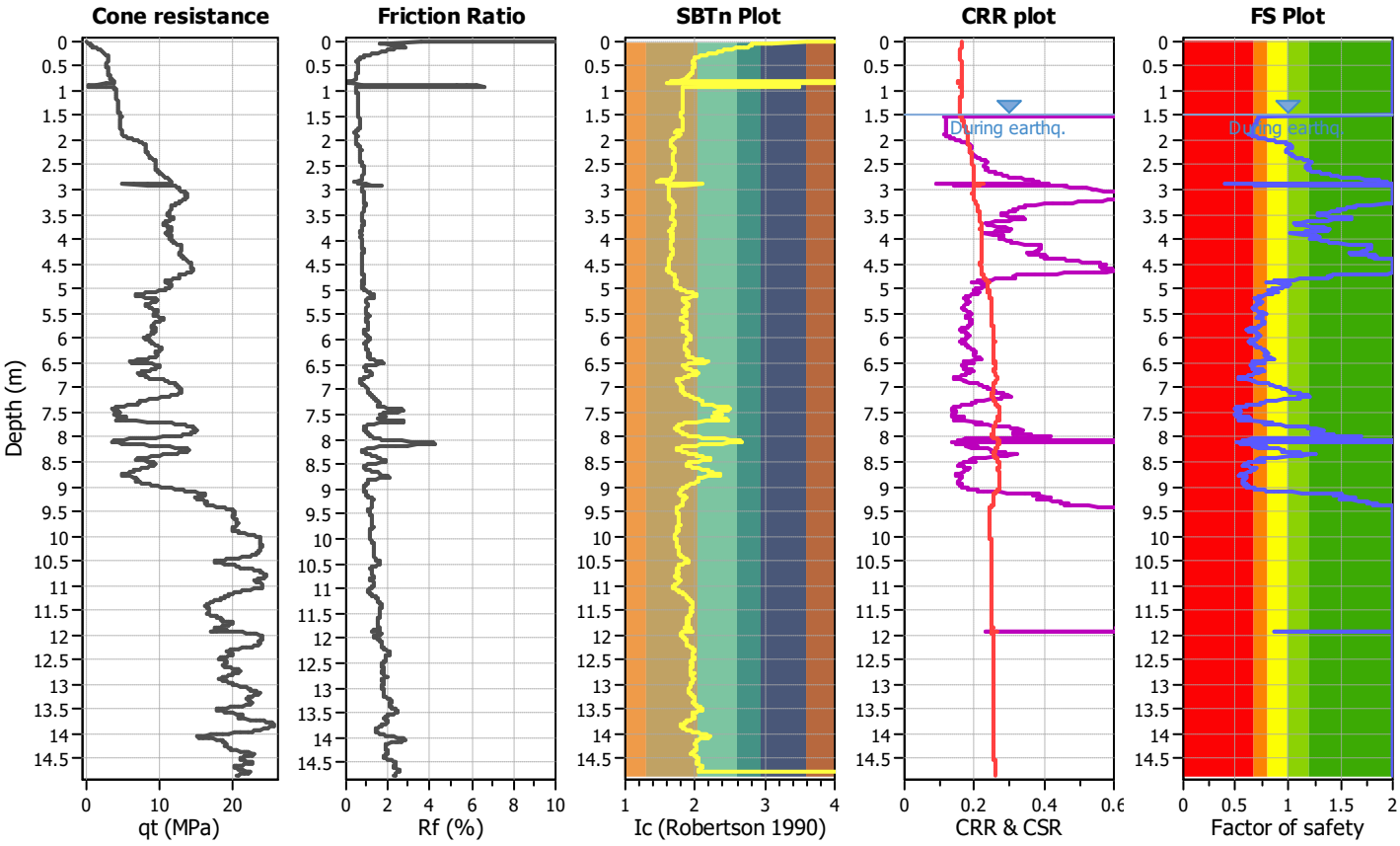
LIQUEFACTION ANALYSIS REPORT

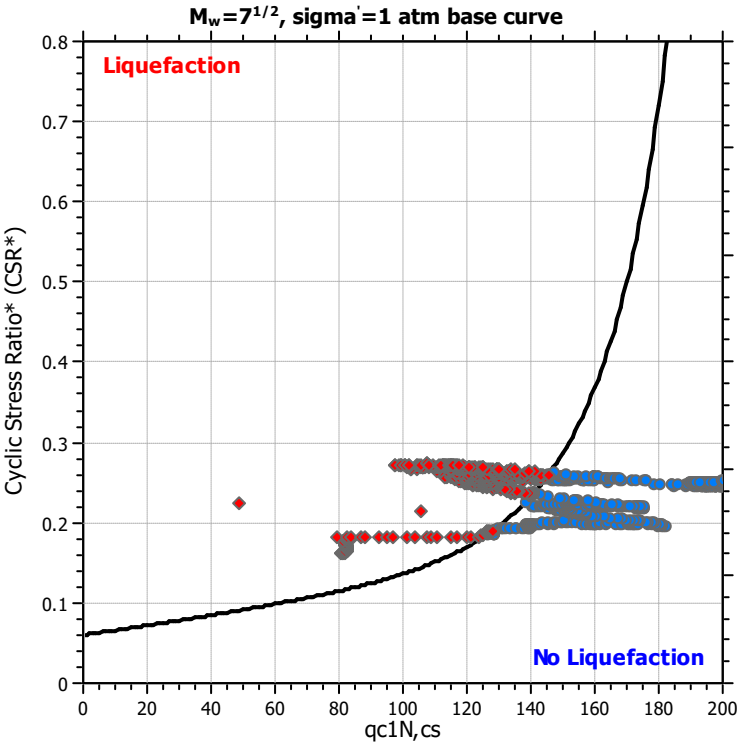
Project title : **Location :**

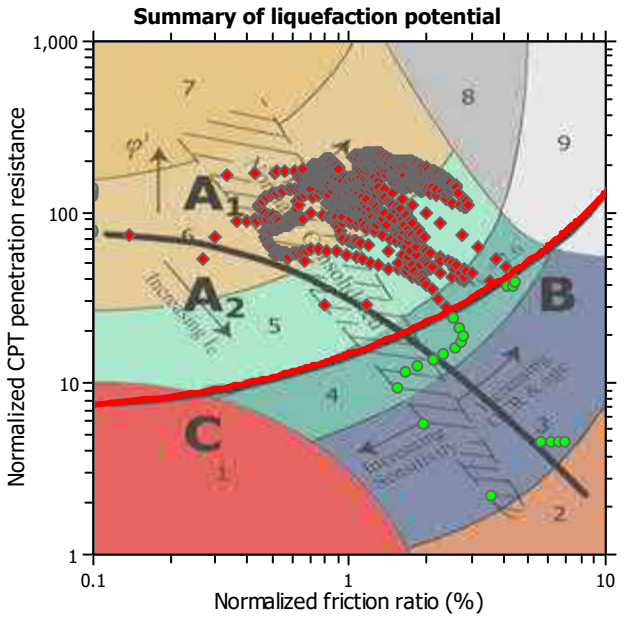
CPT file : CPT 5

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	15.00 m
Earthquake magnitude M_w:	7.10	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

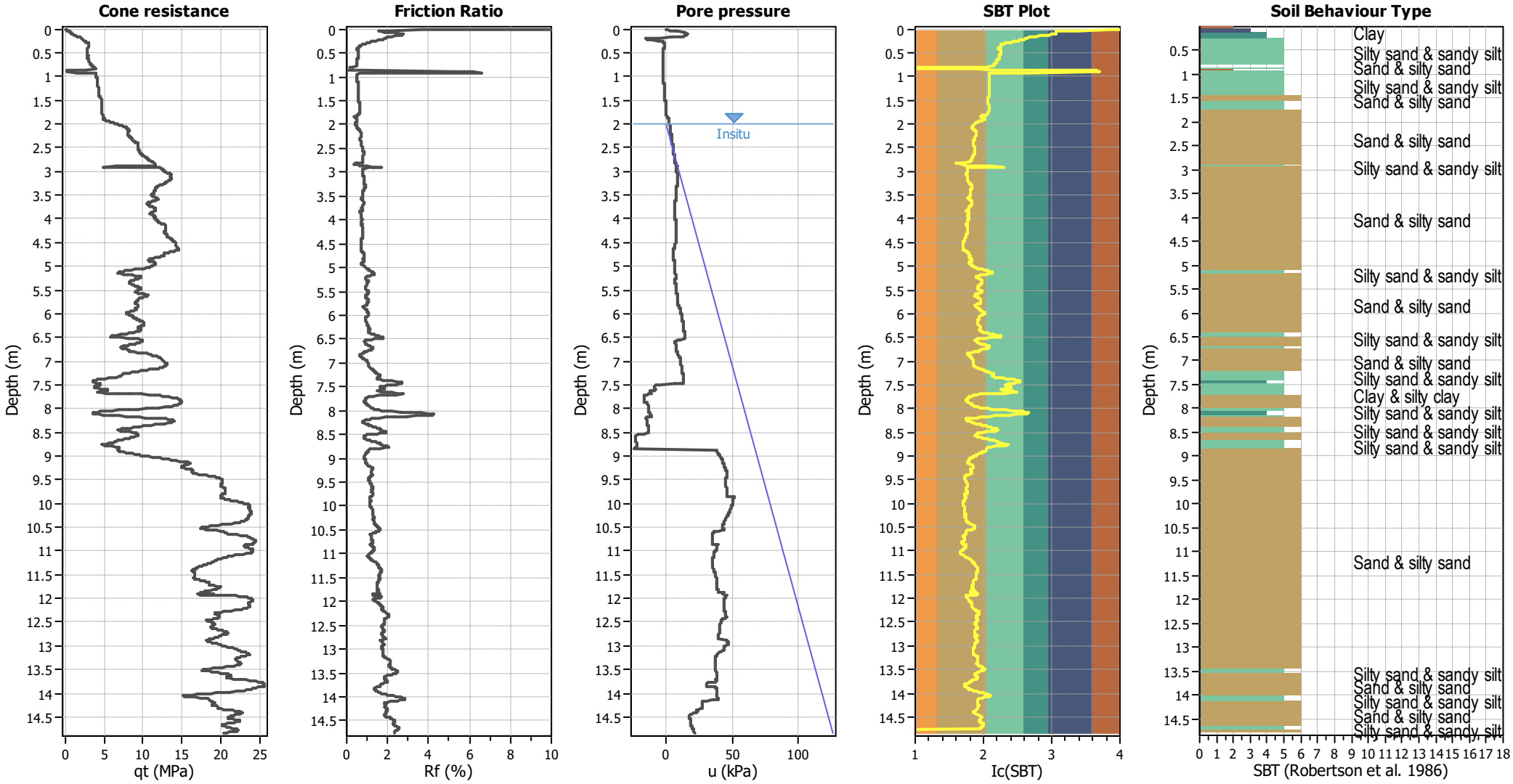






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



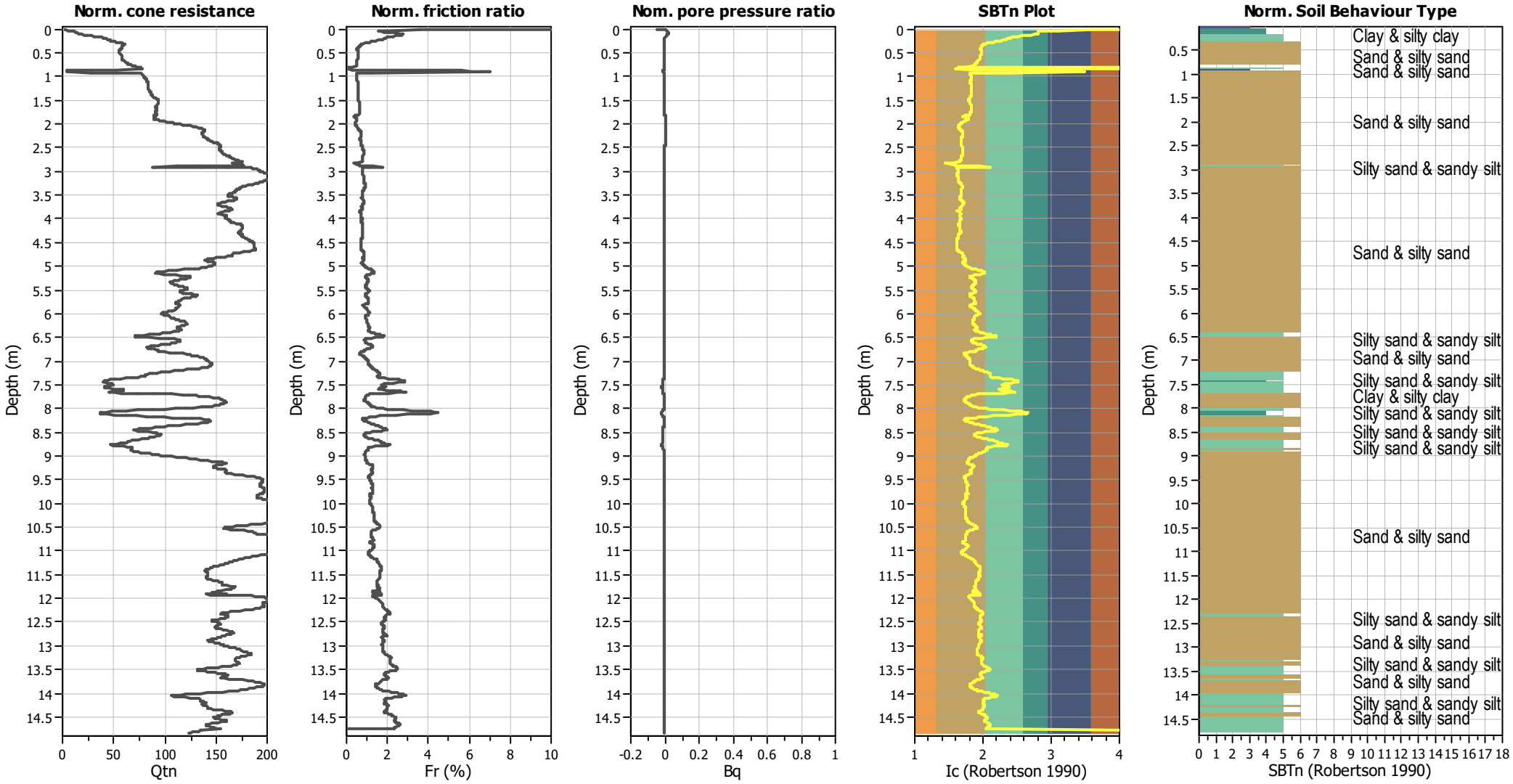
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



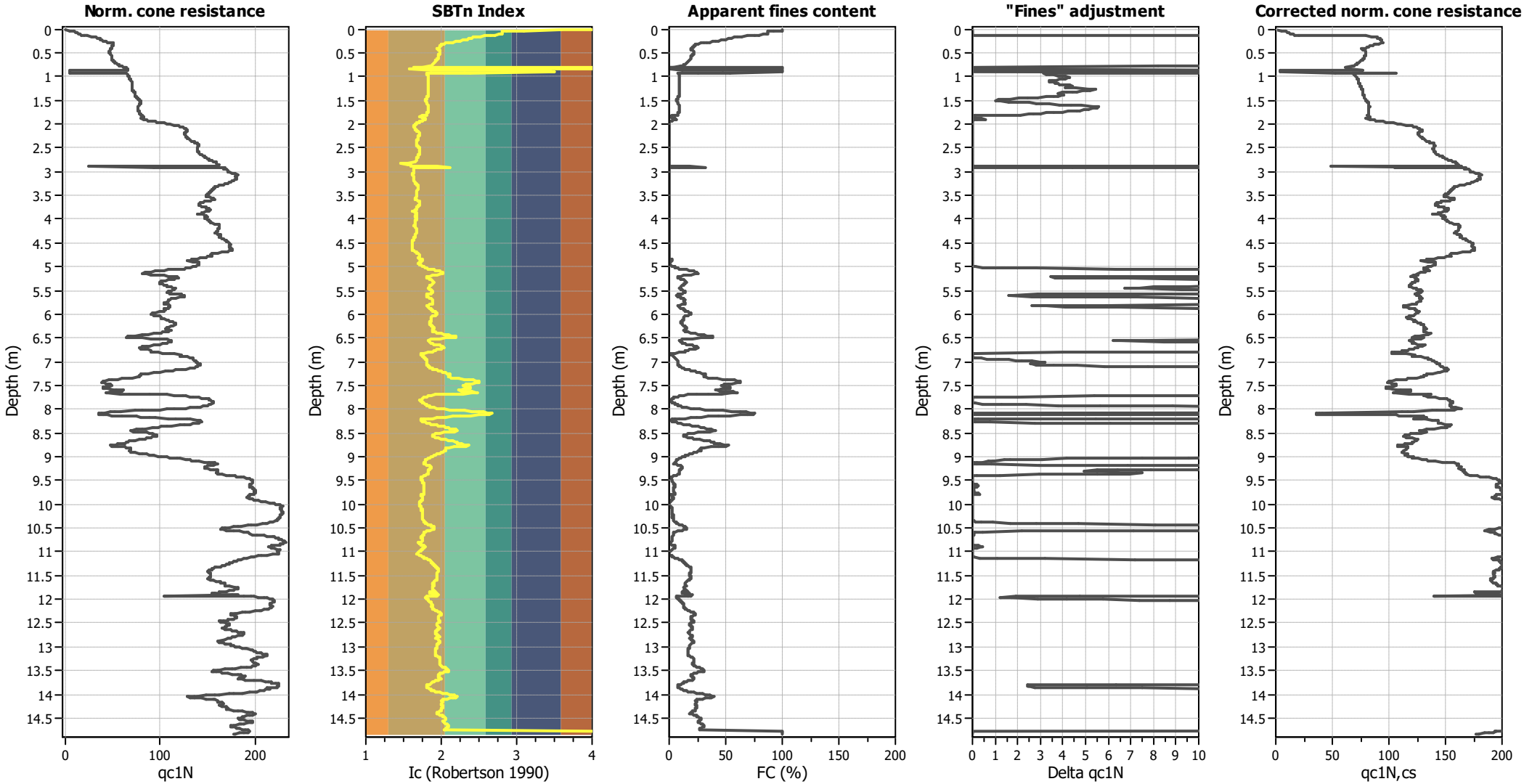
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

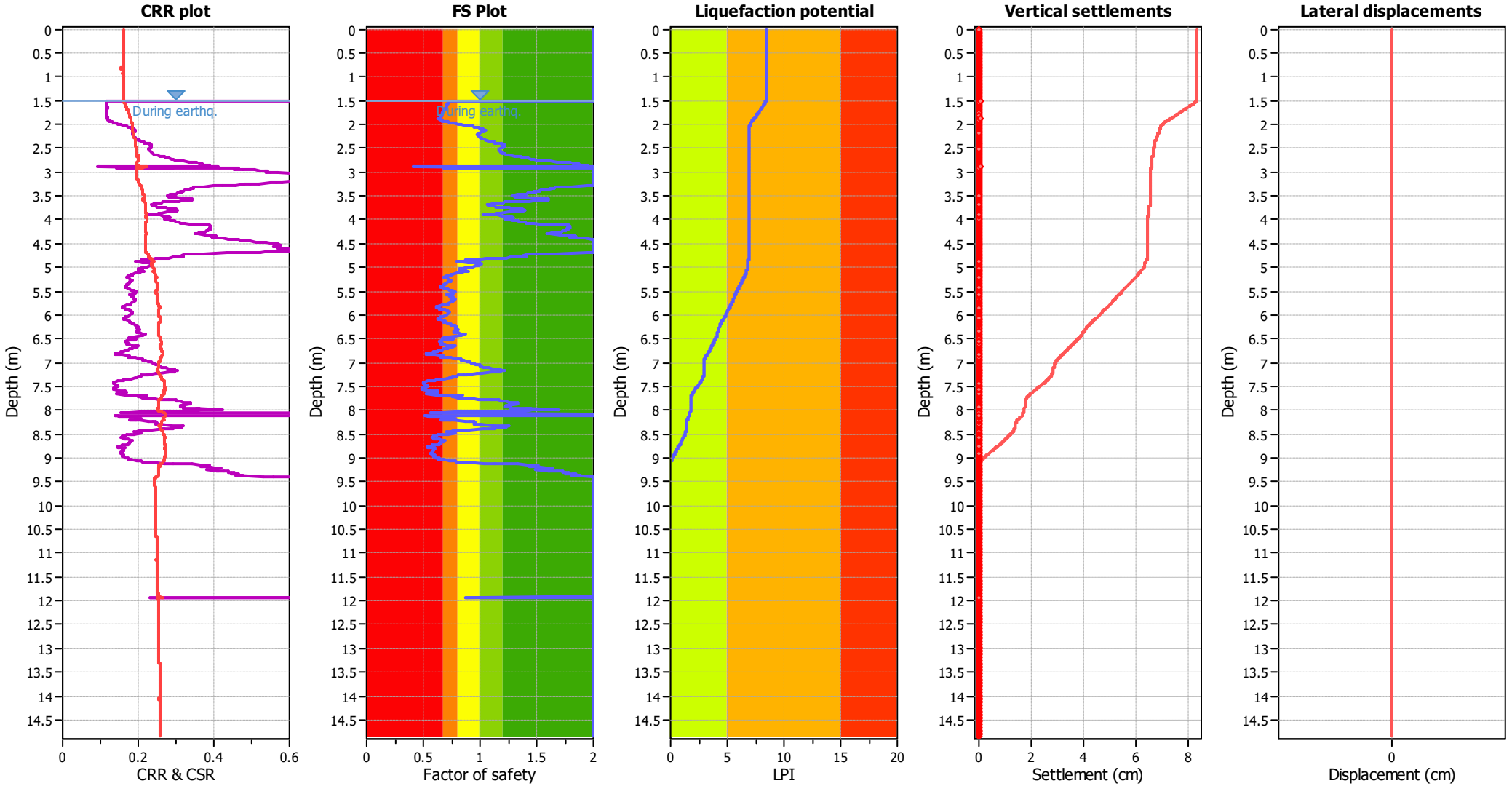
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

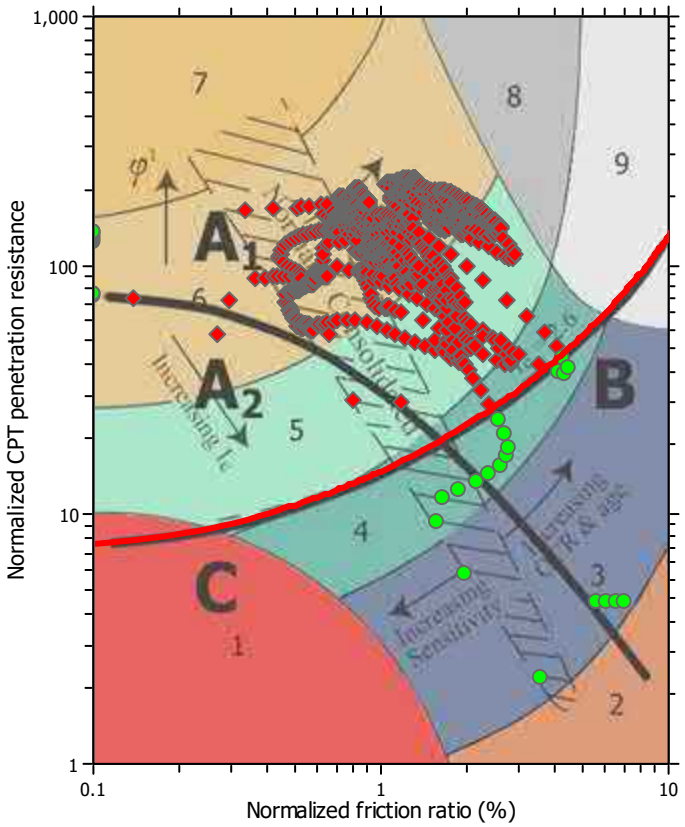
F.S. color scheme

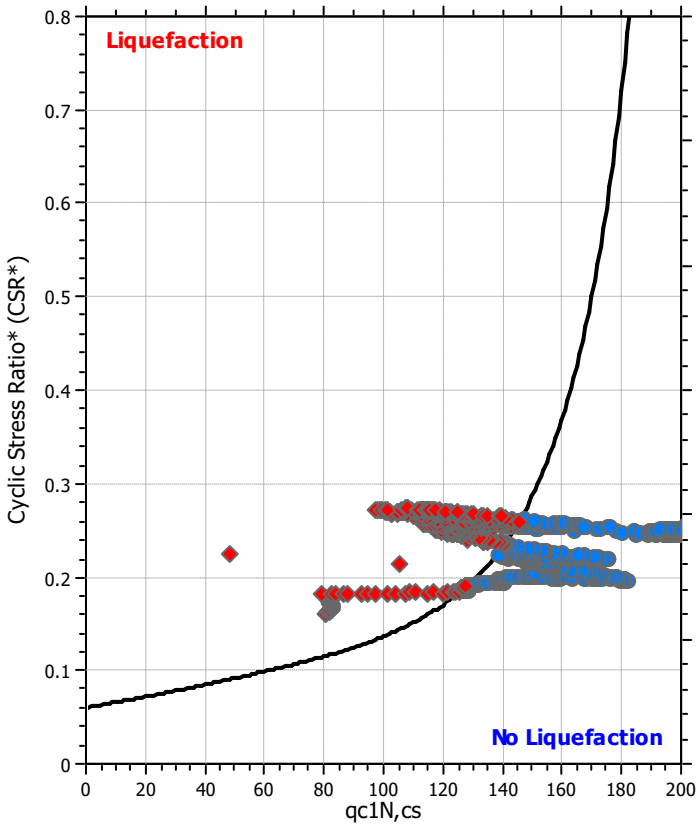
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

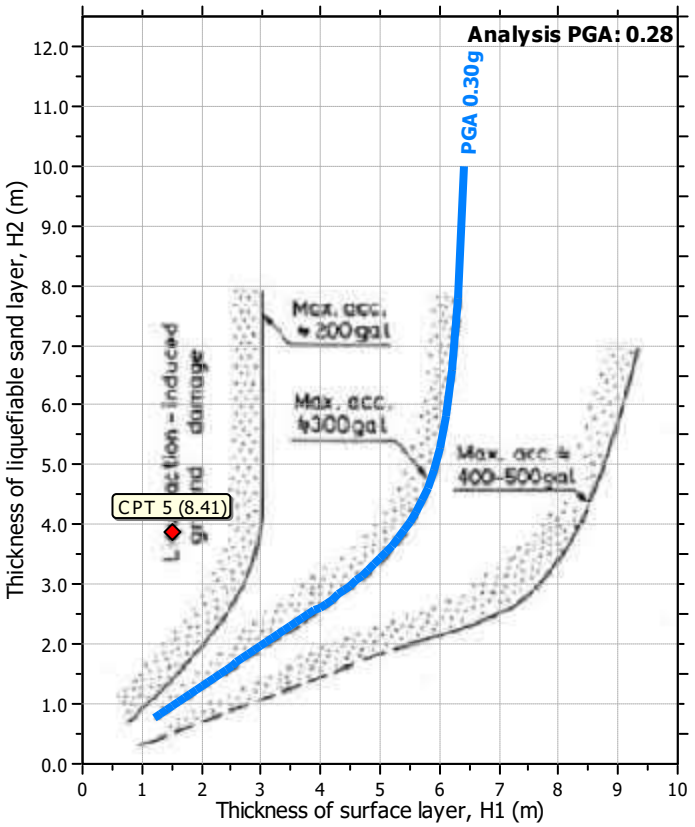
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



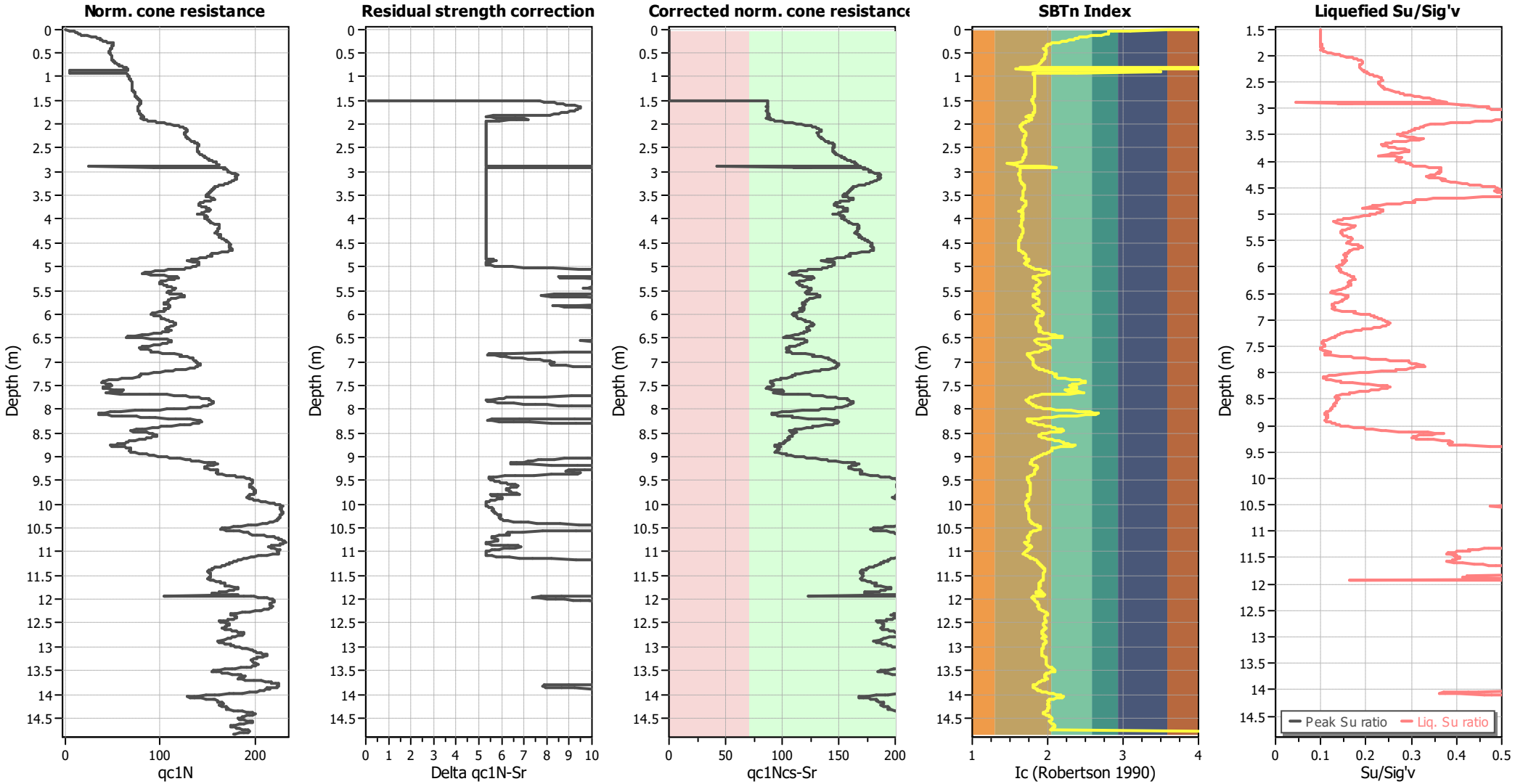




Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

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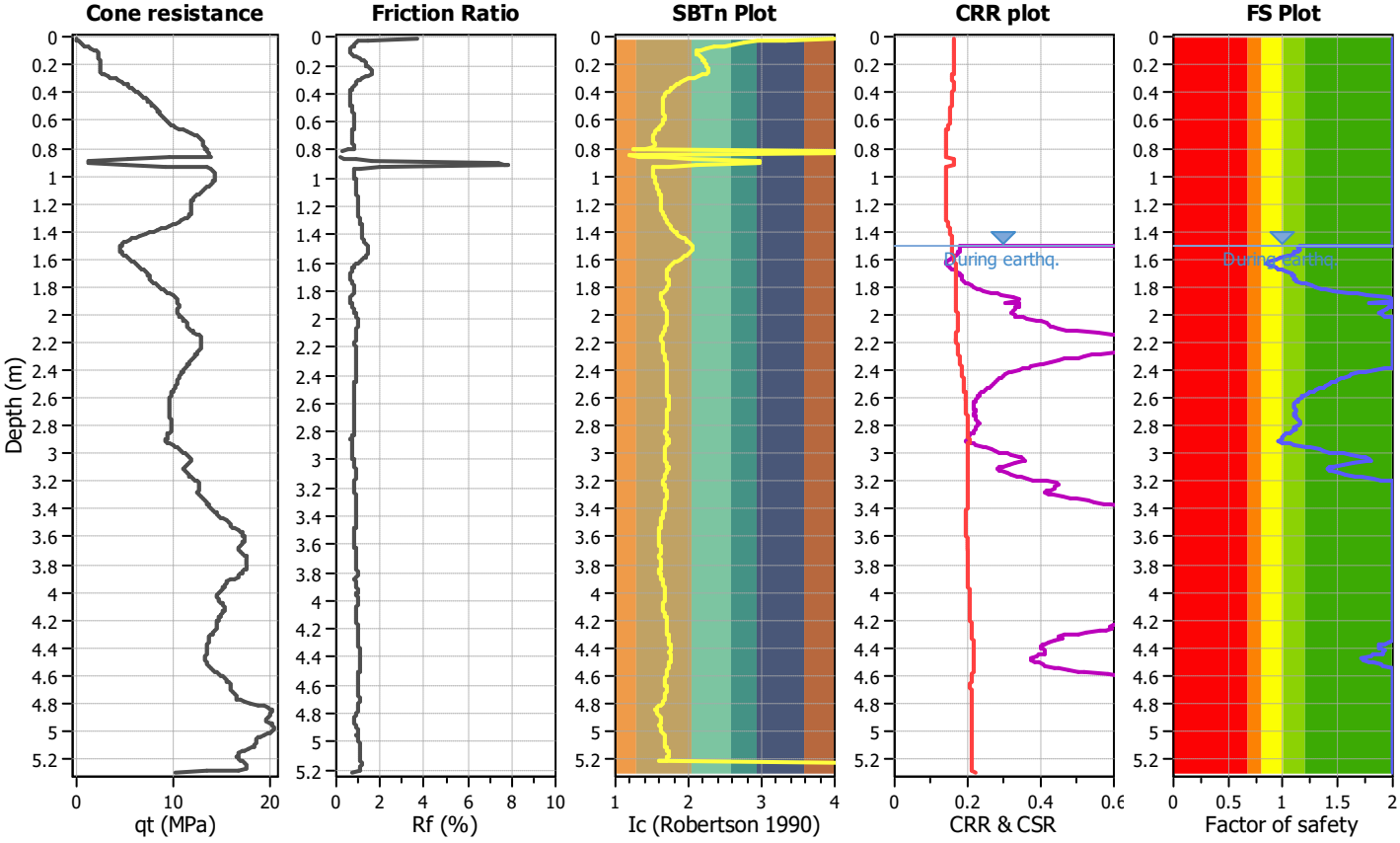
LIQUEFACTION ANALYSIS REPORT

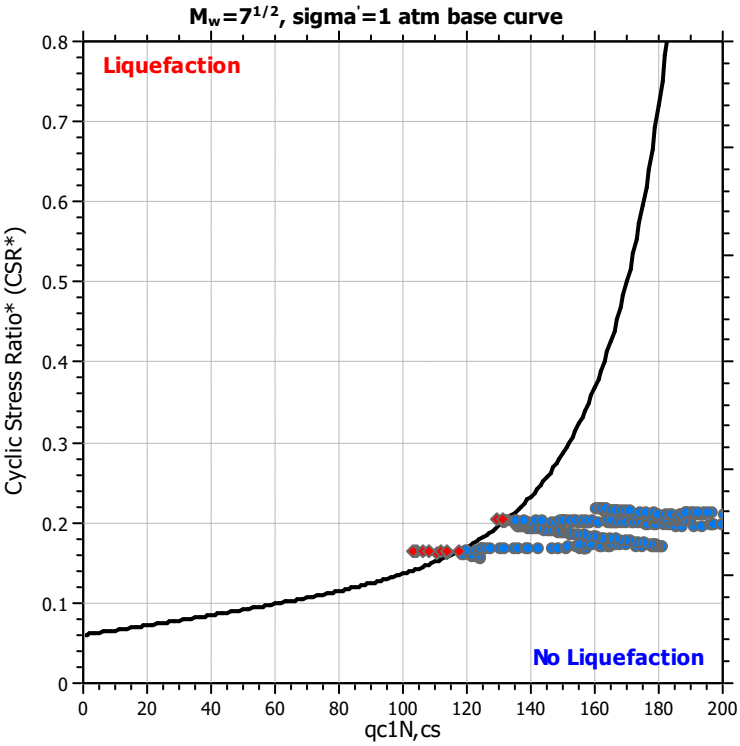
Project title : **Location :**

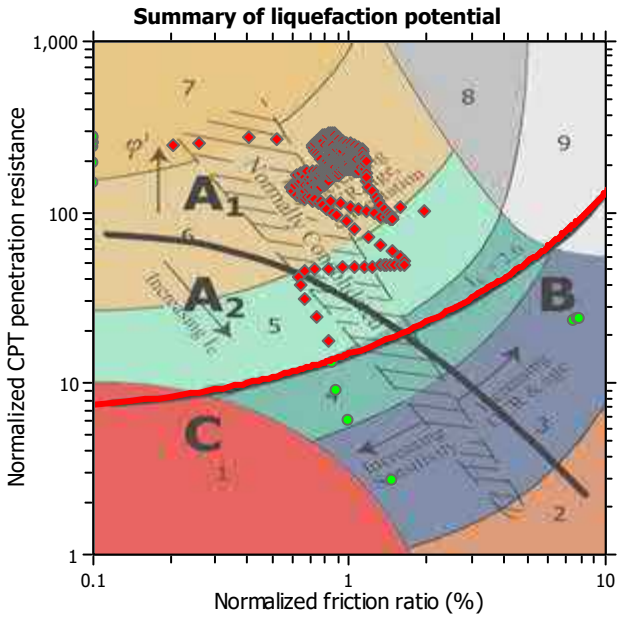
CPT file : CPT 6

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	15.00 m
Earthquake magnitude M_w:	7.10	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

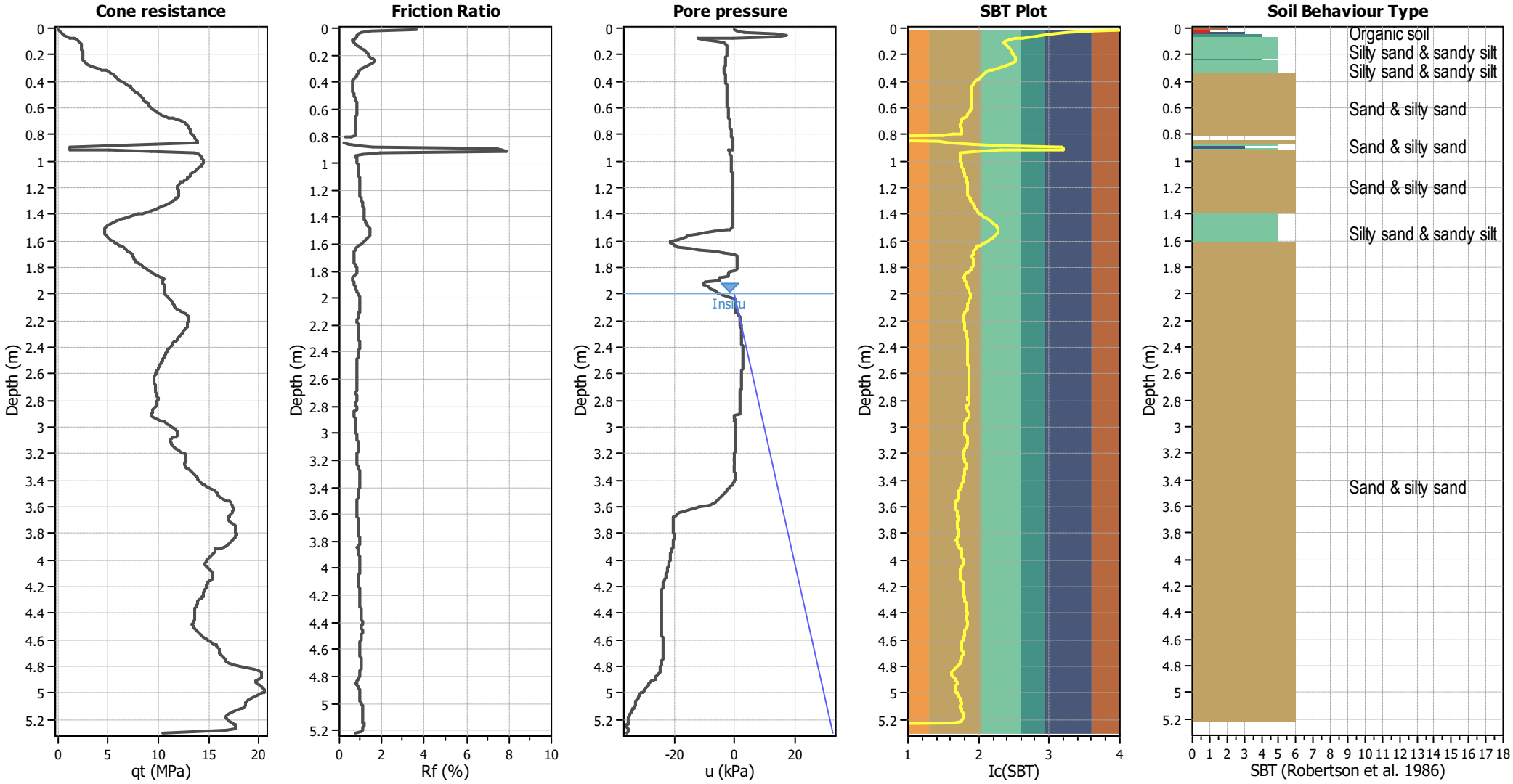






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



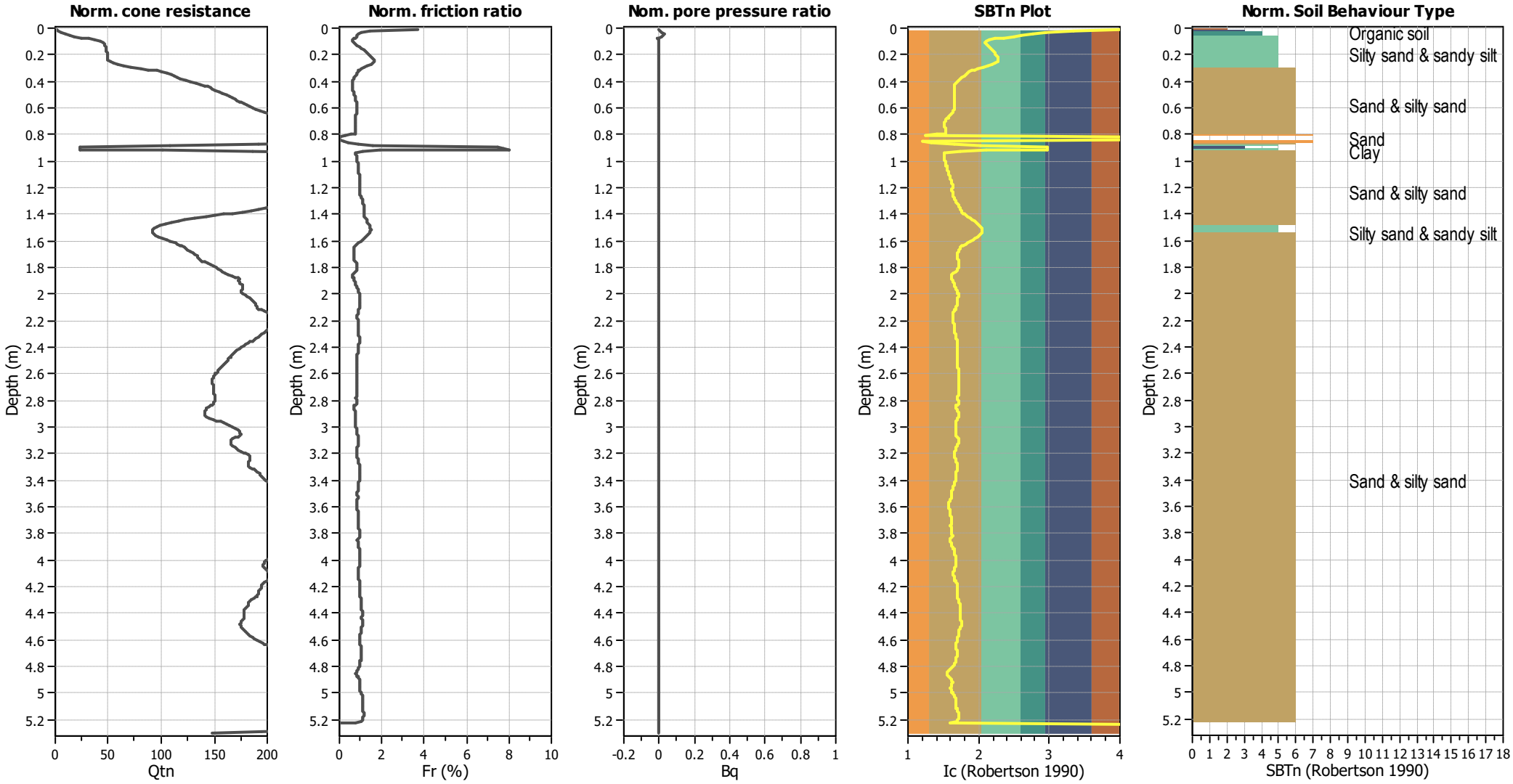
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



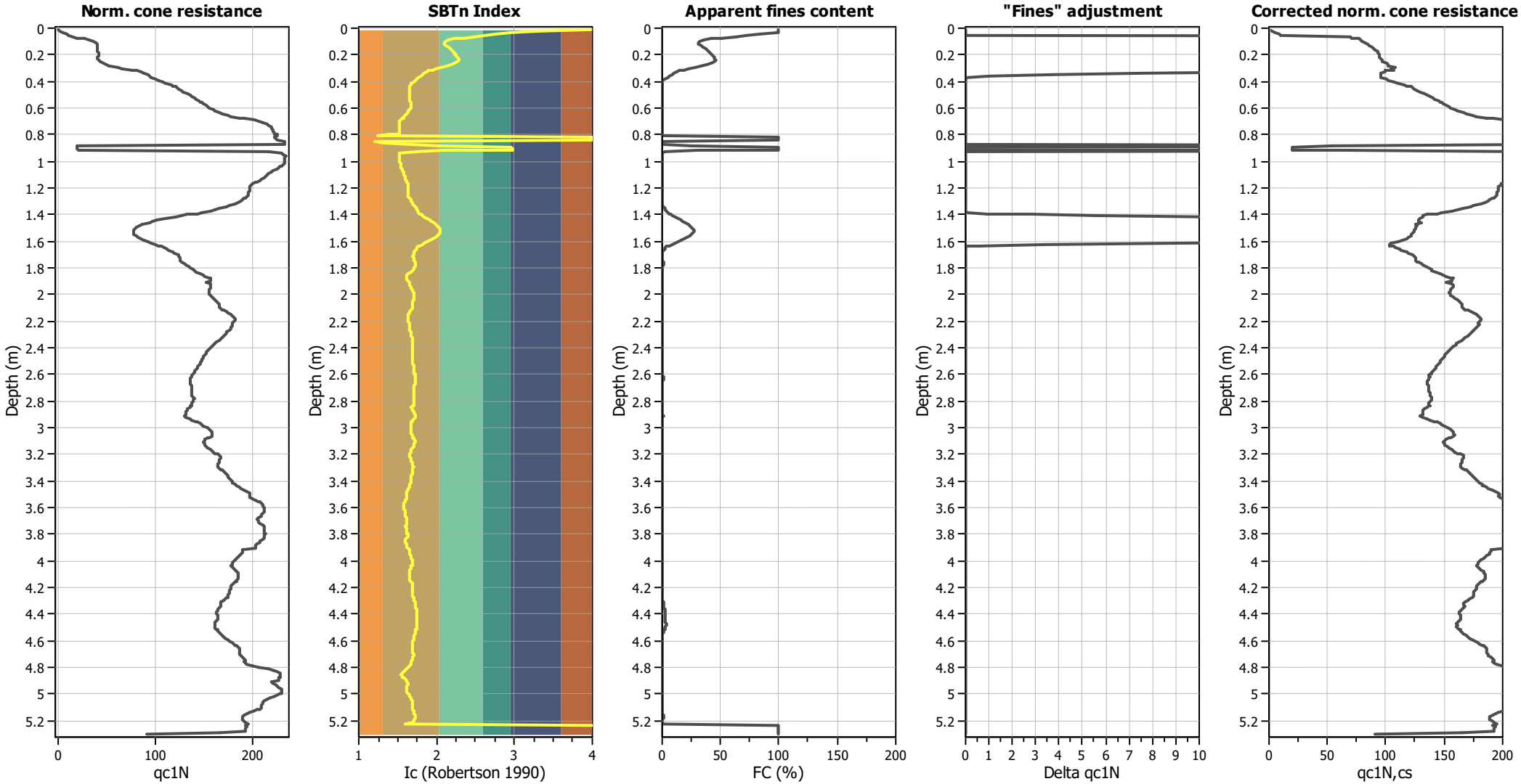
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

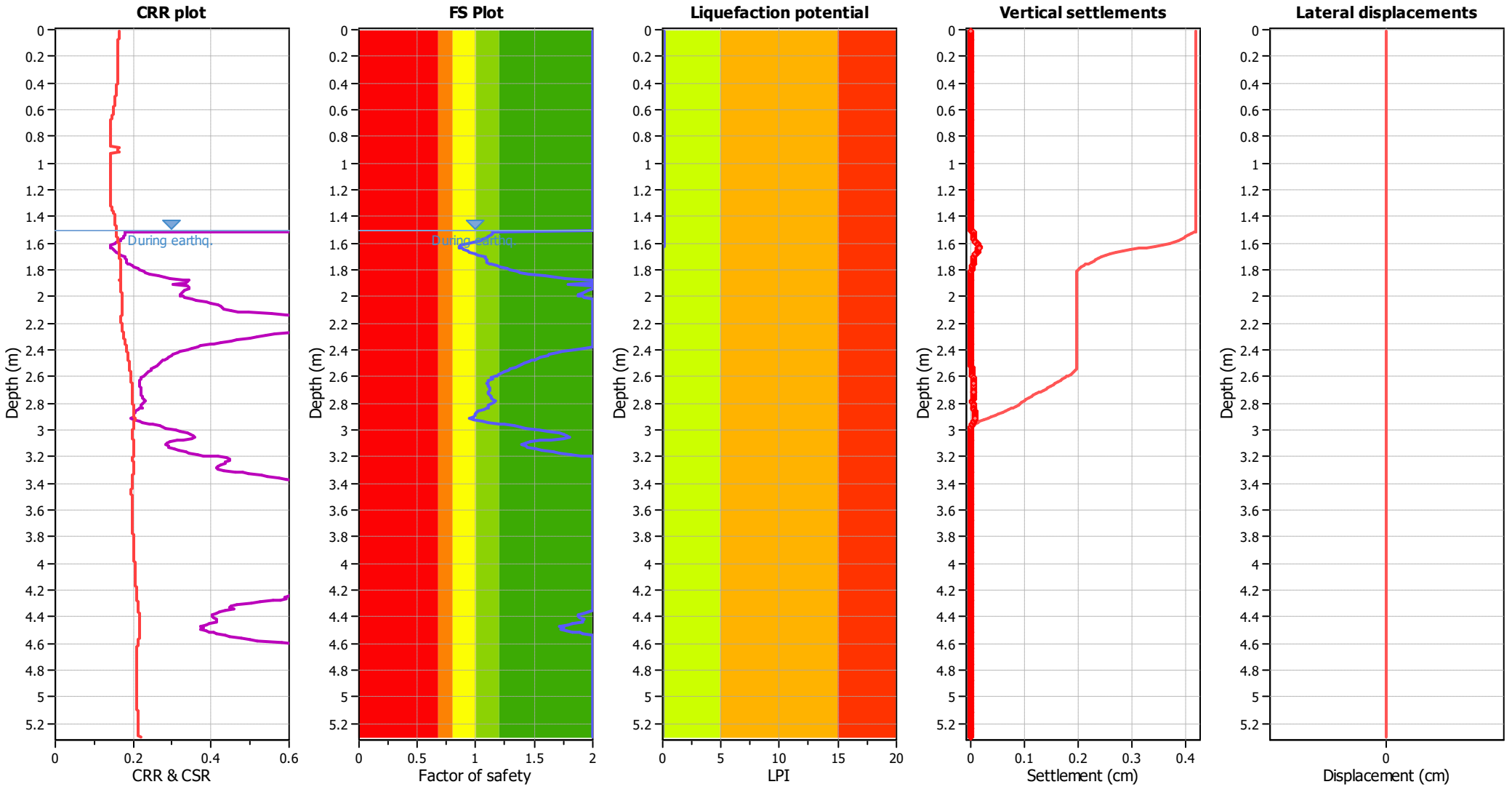
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

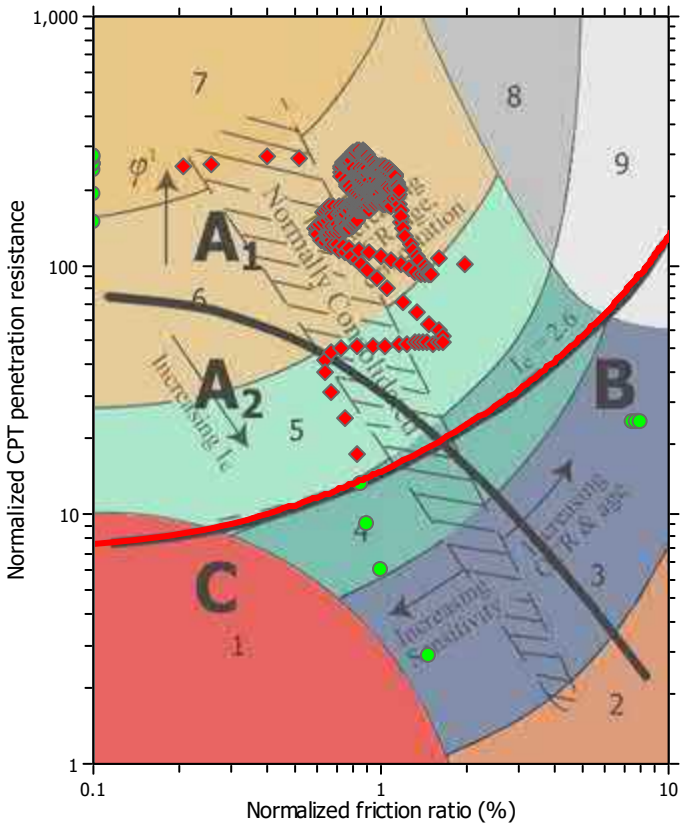
F.S. color scheme

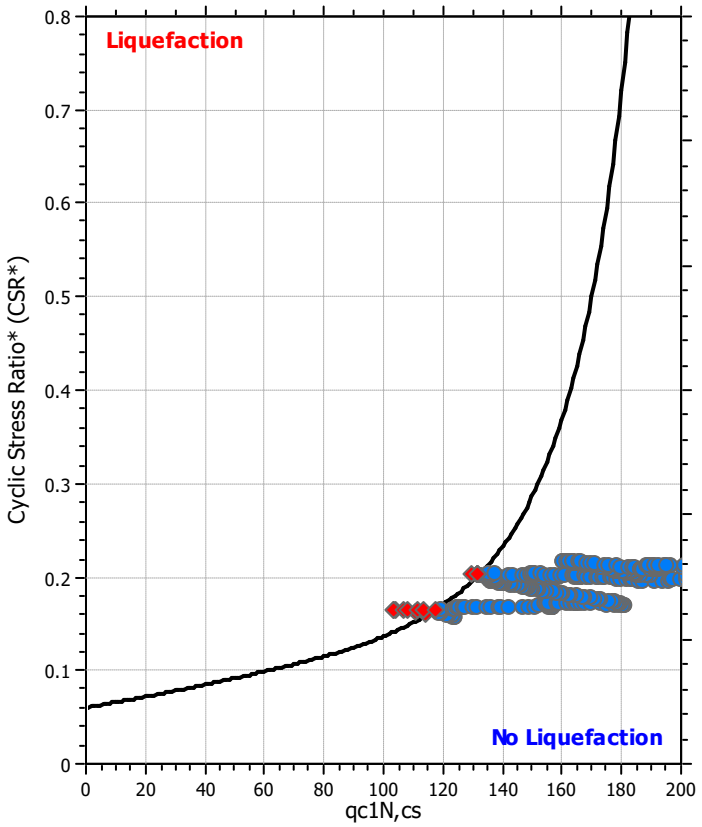
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

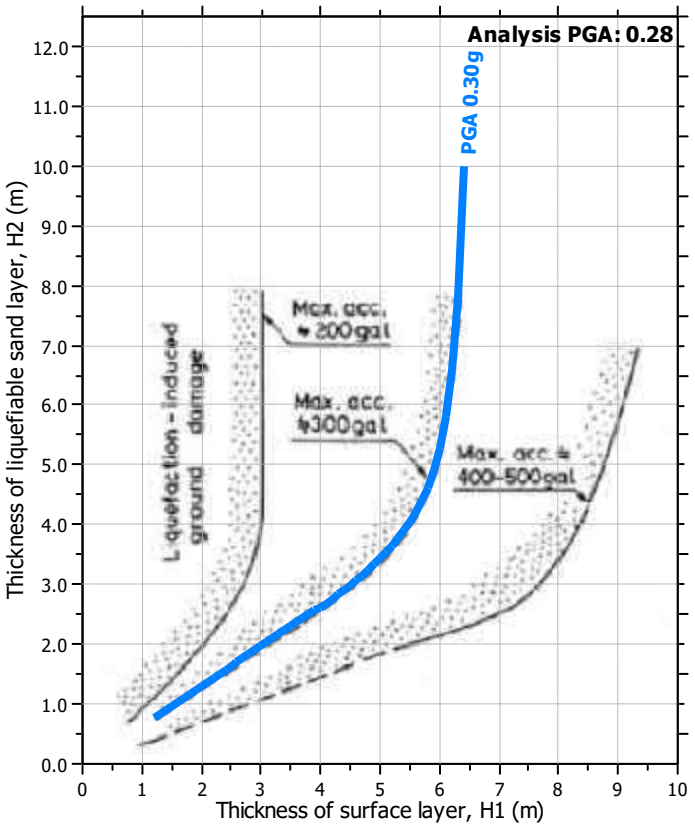
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



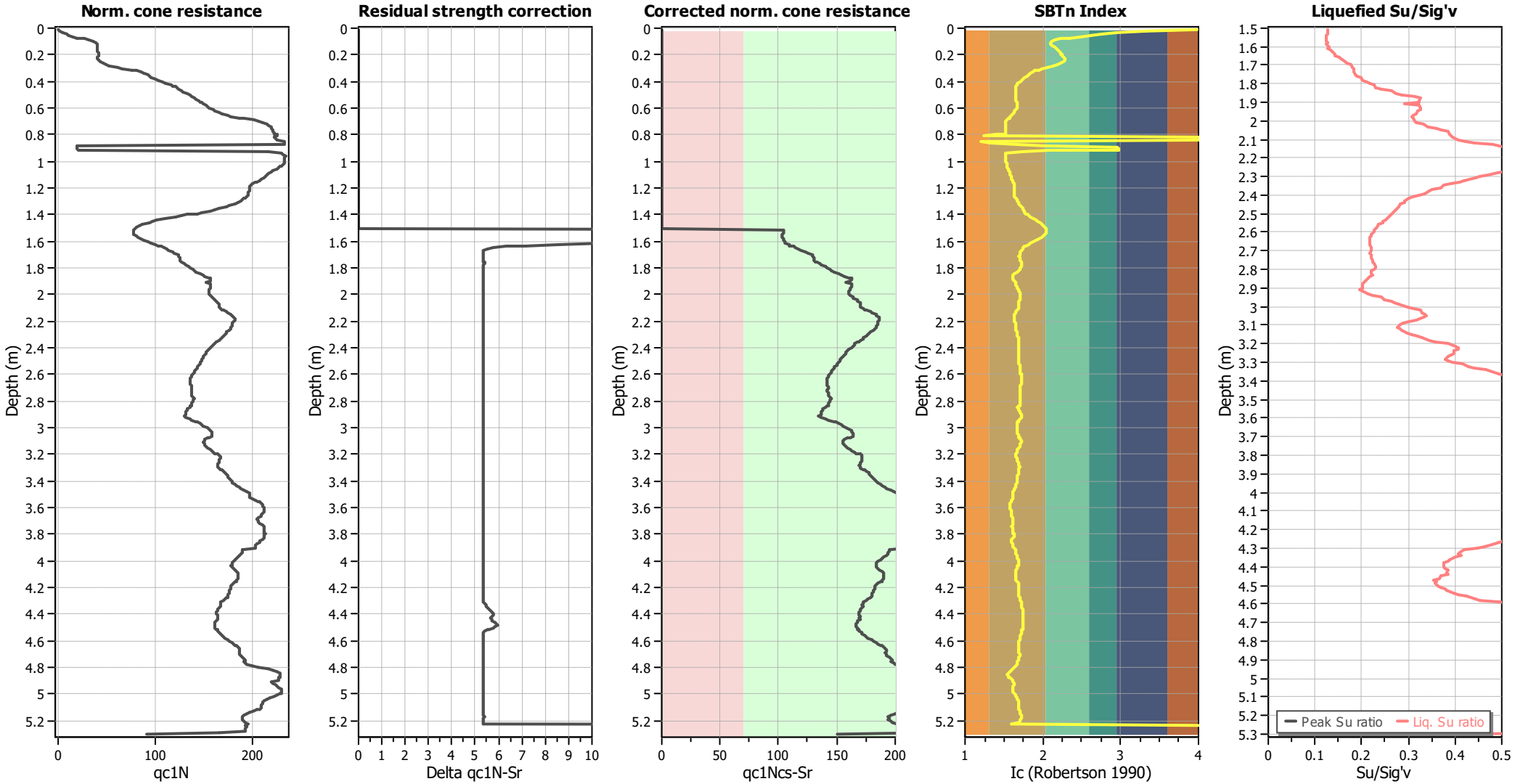




Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	15.00 m

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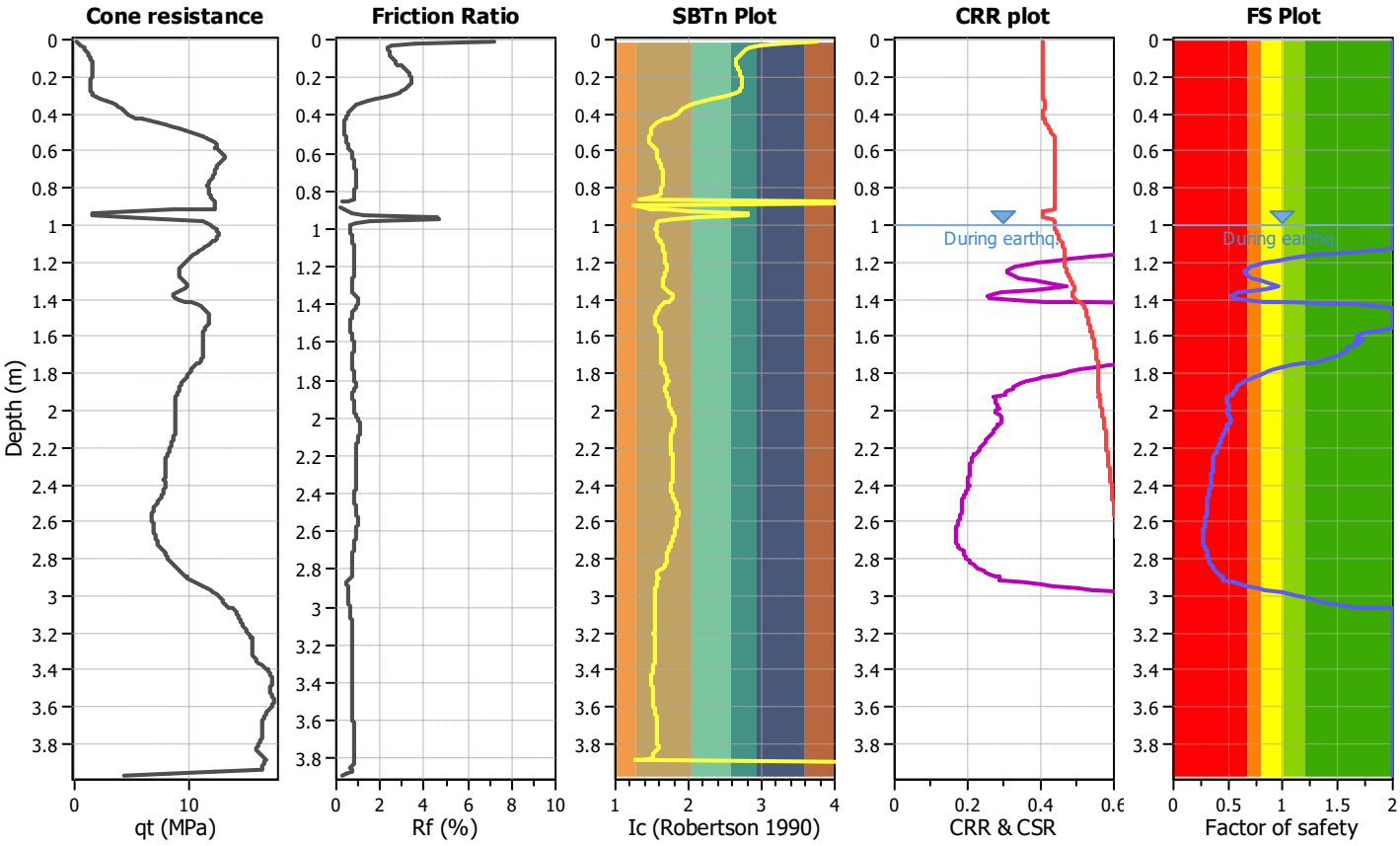
LIQUEFACTION ANALYSIS REPORT

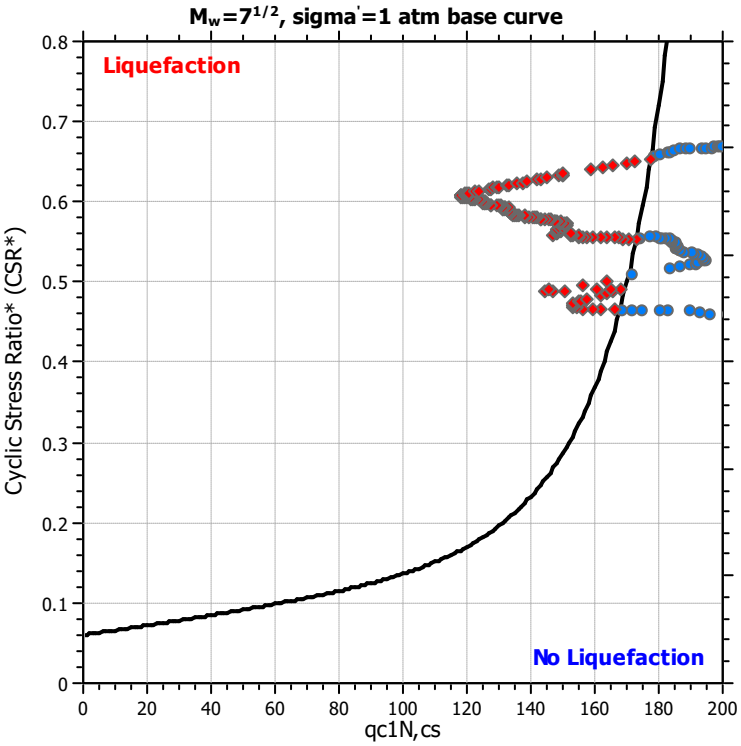
Project title : **Location :**

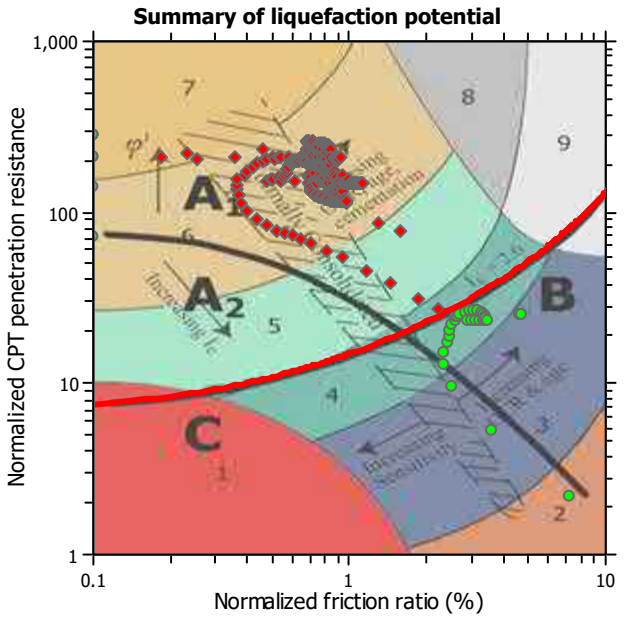
CPT file : CPT 1

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	15.00 m
Earthquake magnitude M_w:	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

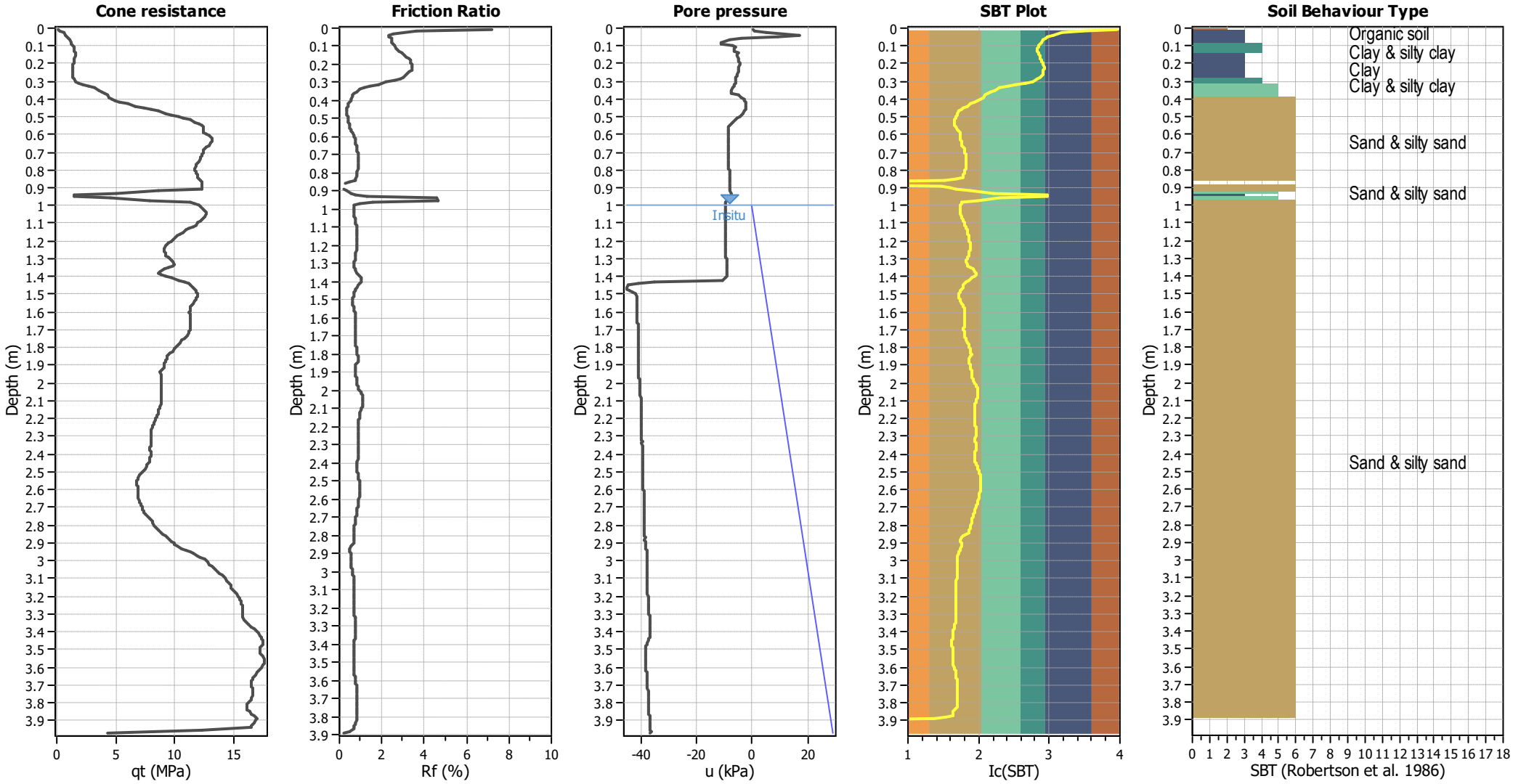






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



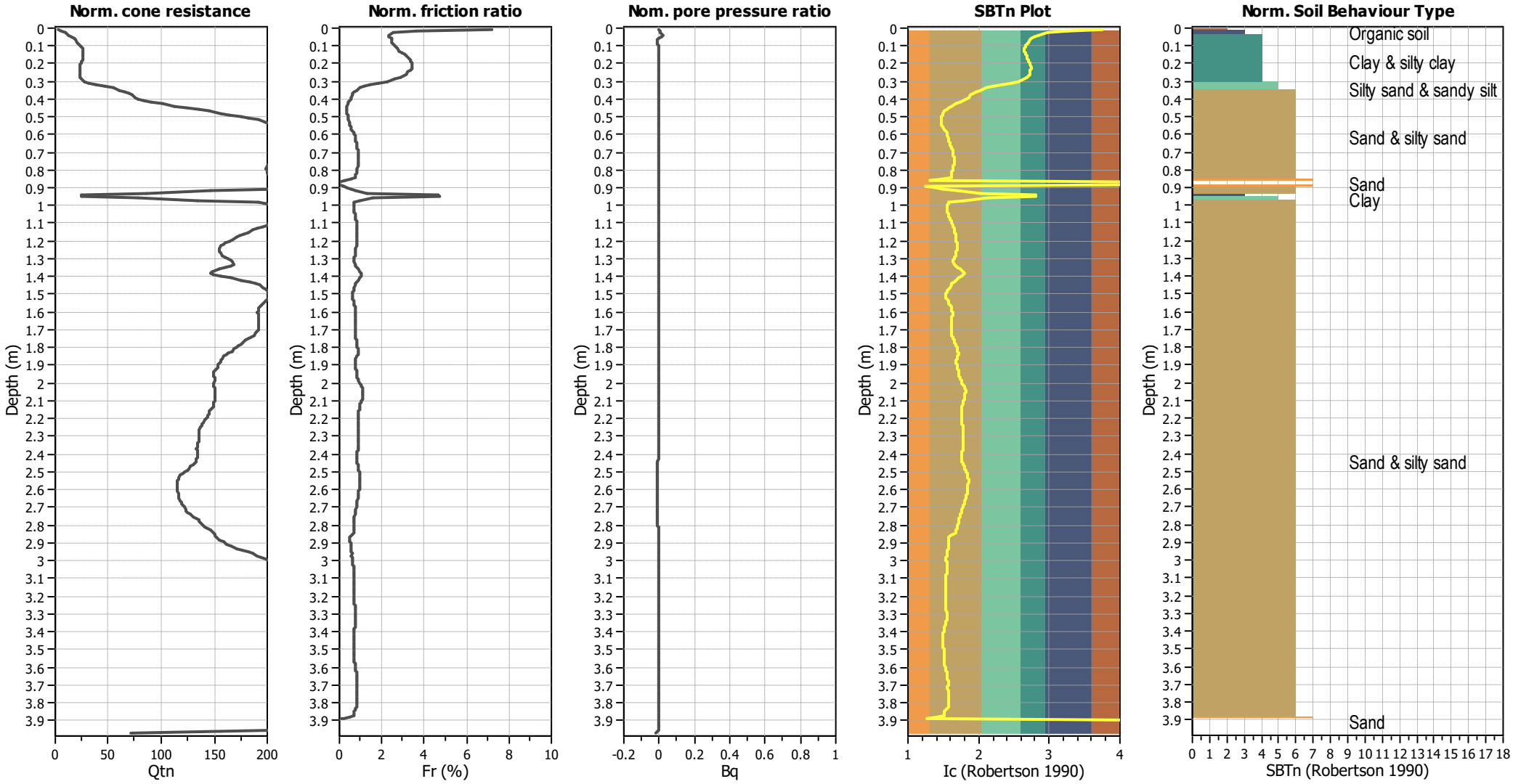
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBTn legend

1. Sensitive fine grained
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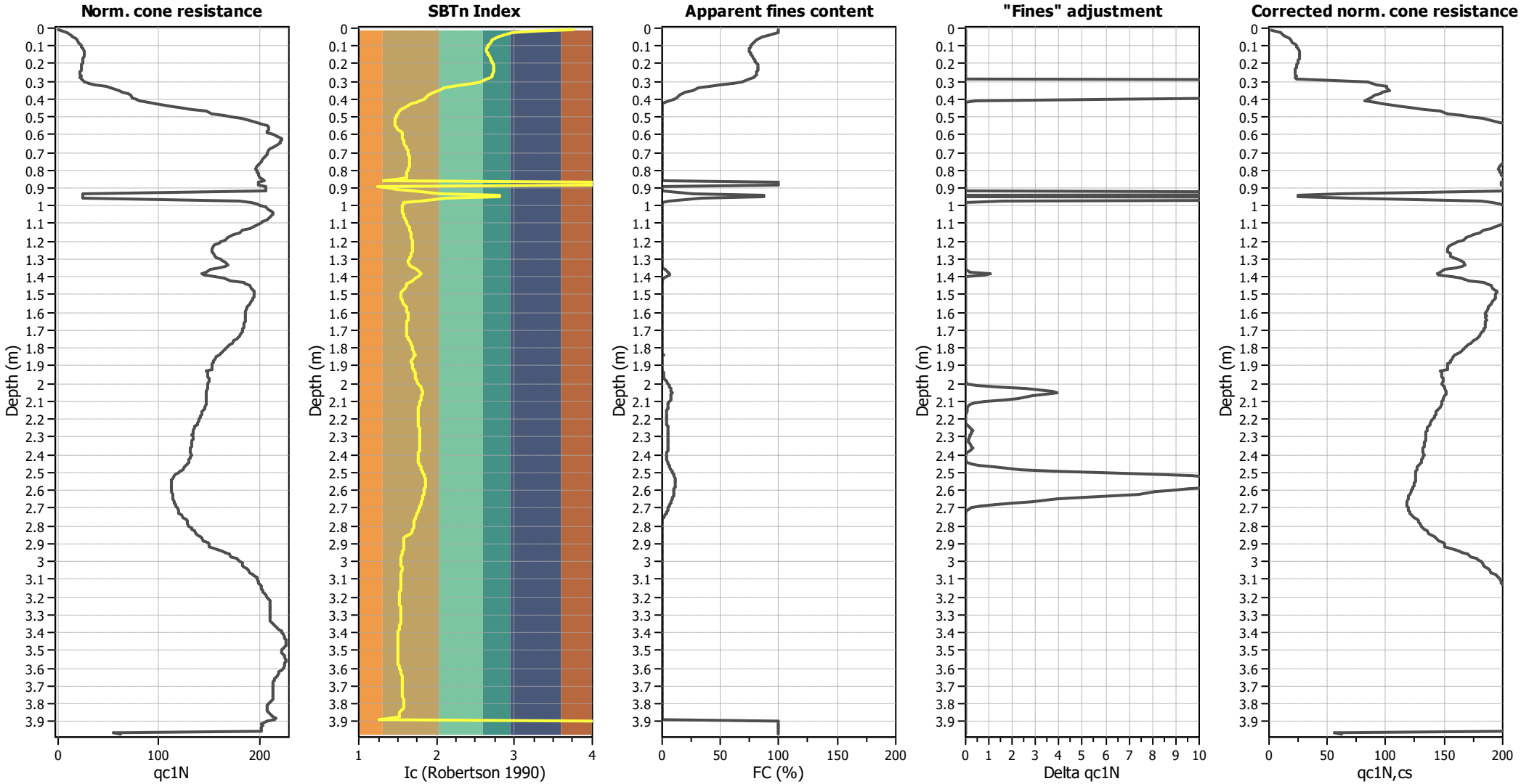
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

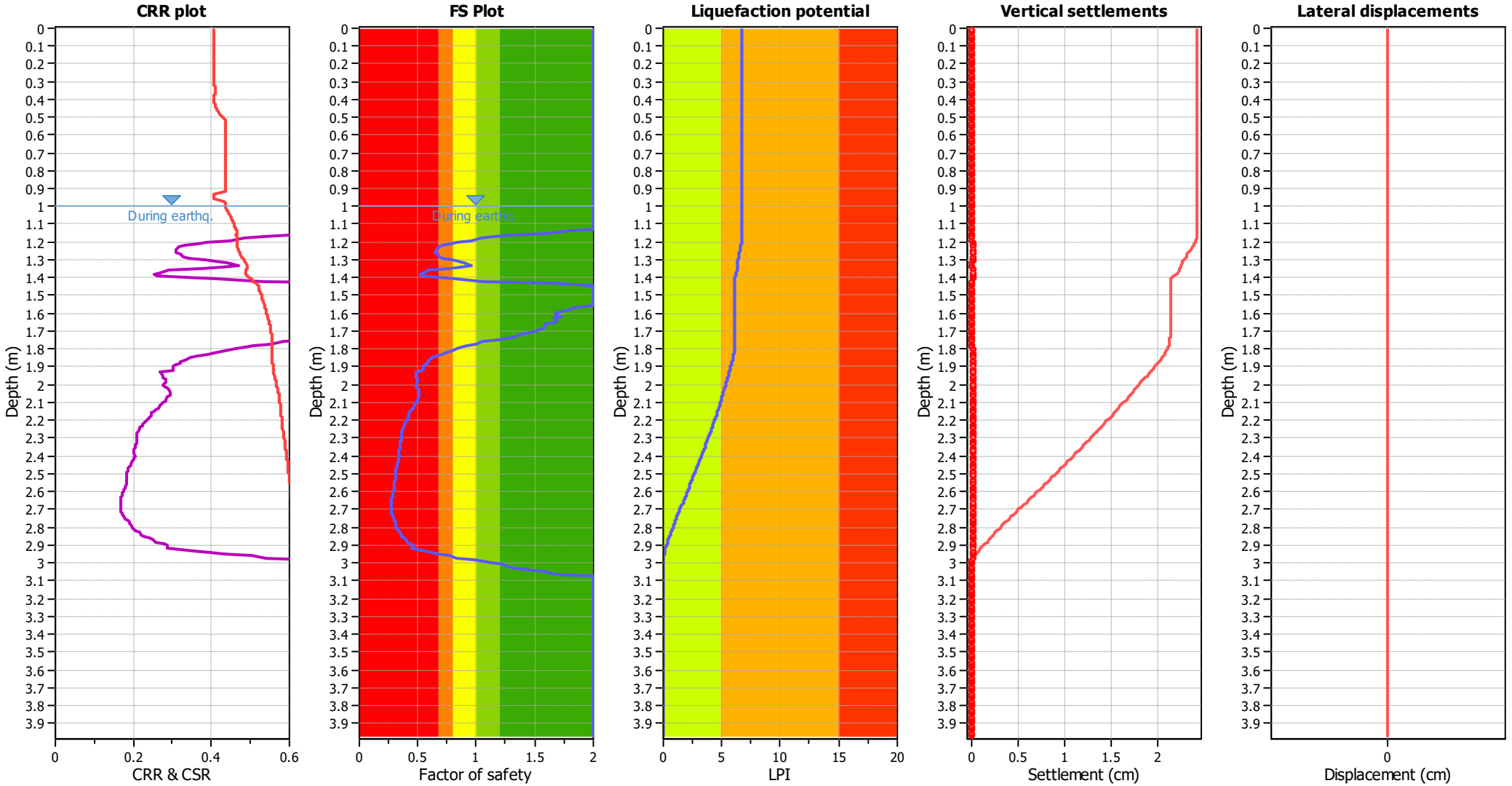
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

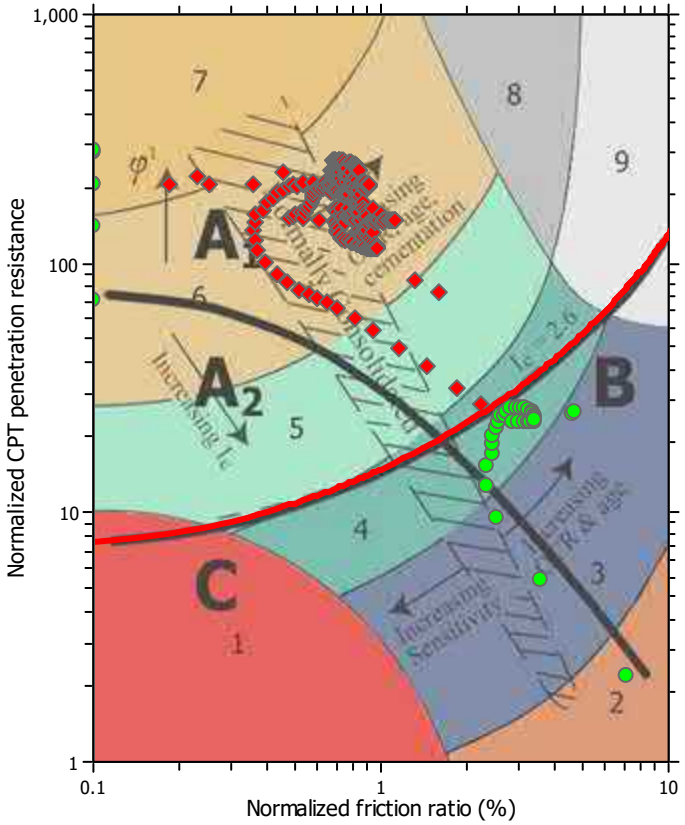
F.S. color scheme

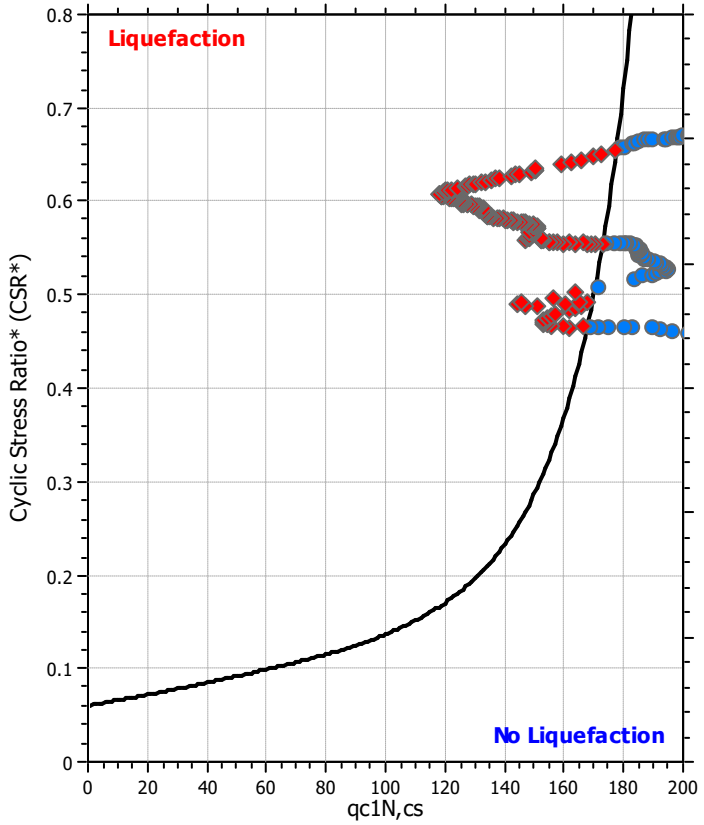
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

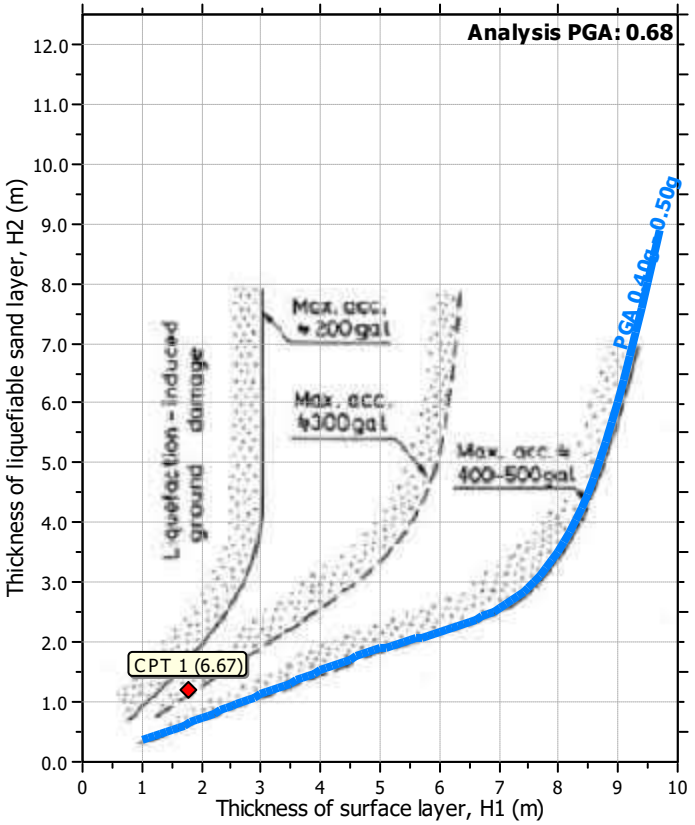
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



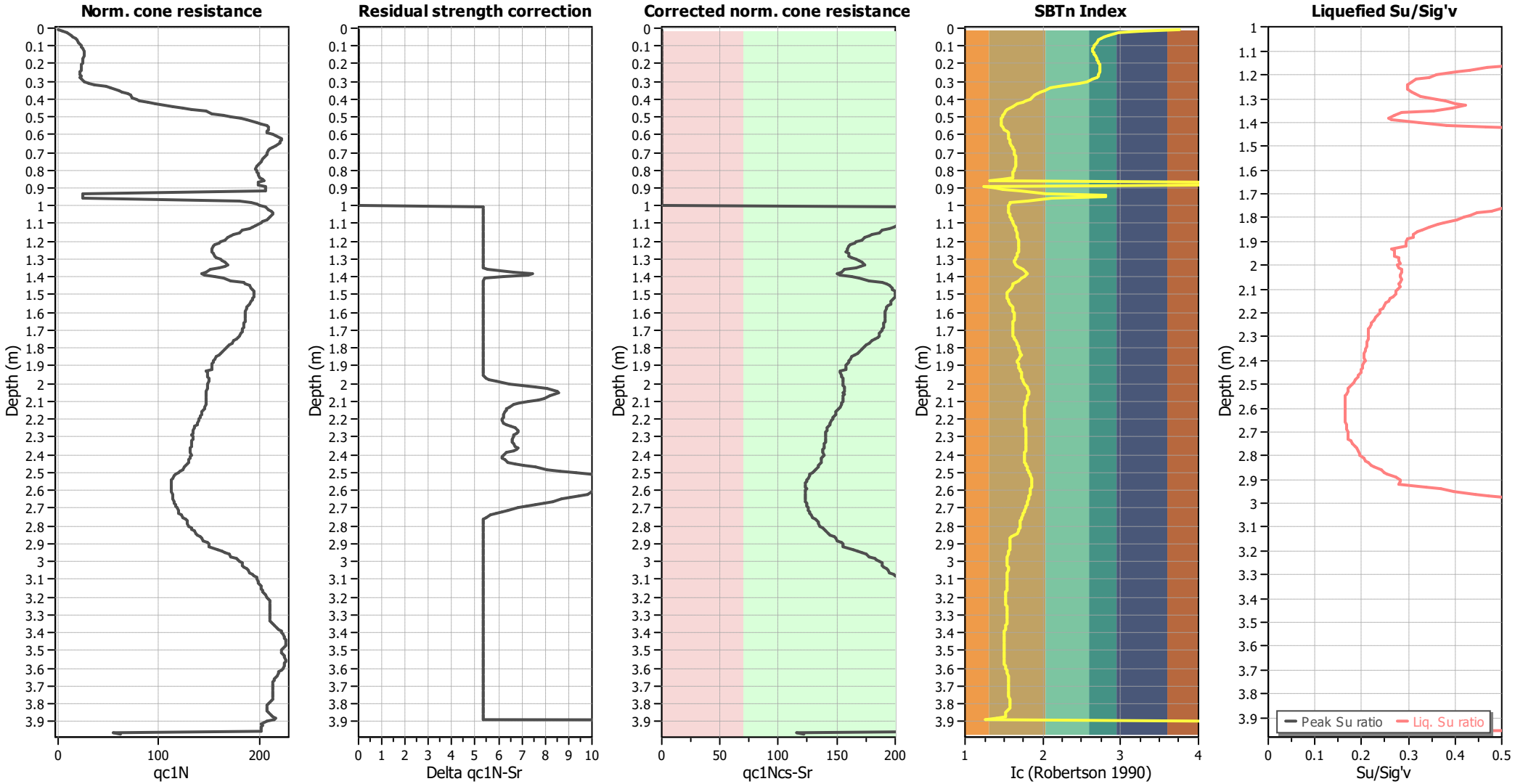




Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

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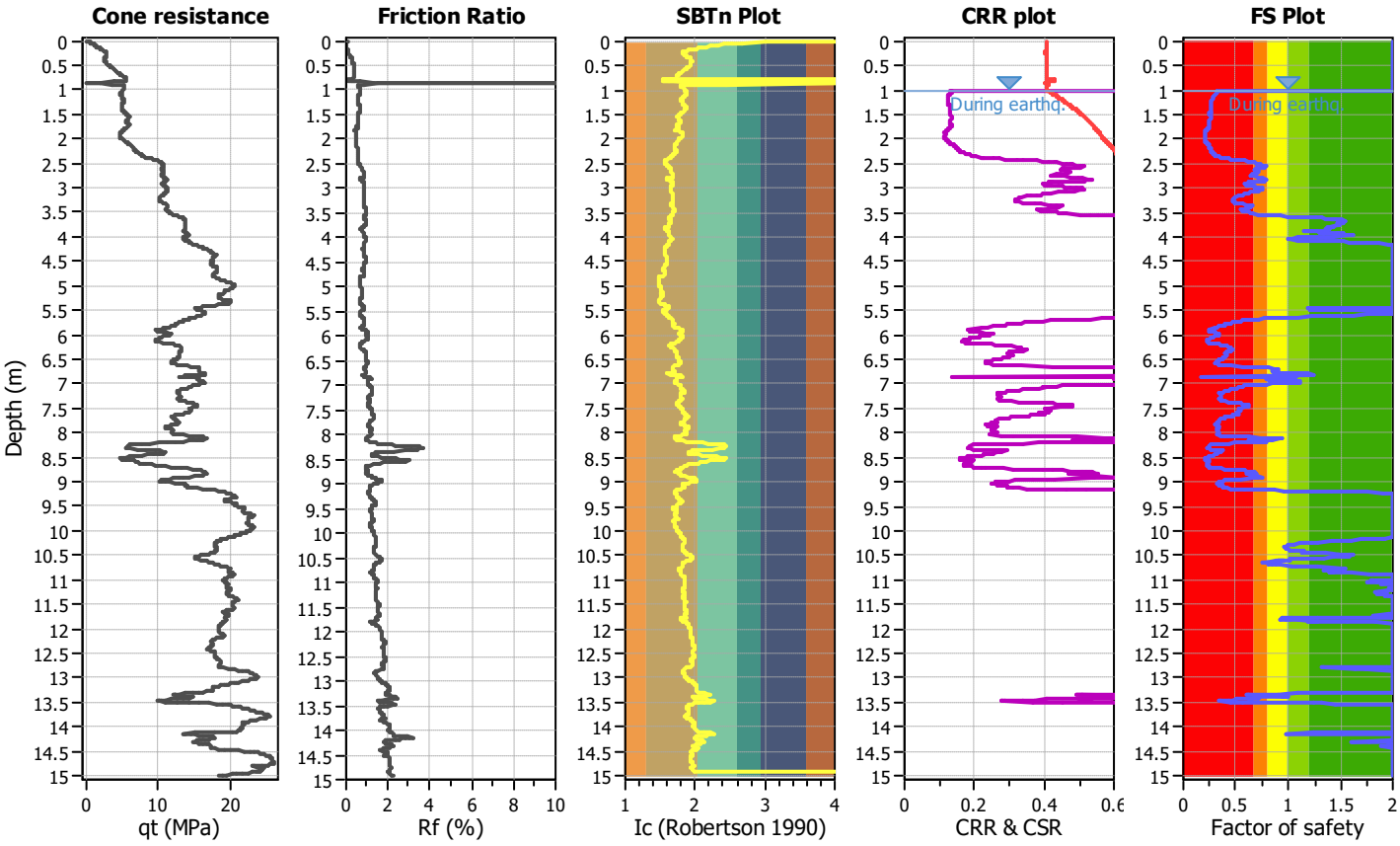
LIQUEFACTION ANALYSIS REPORT

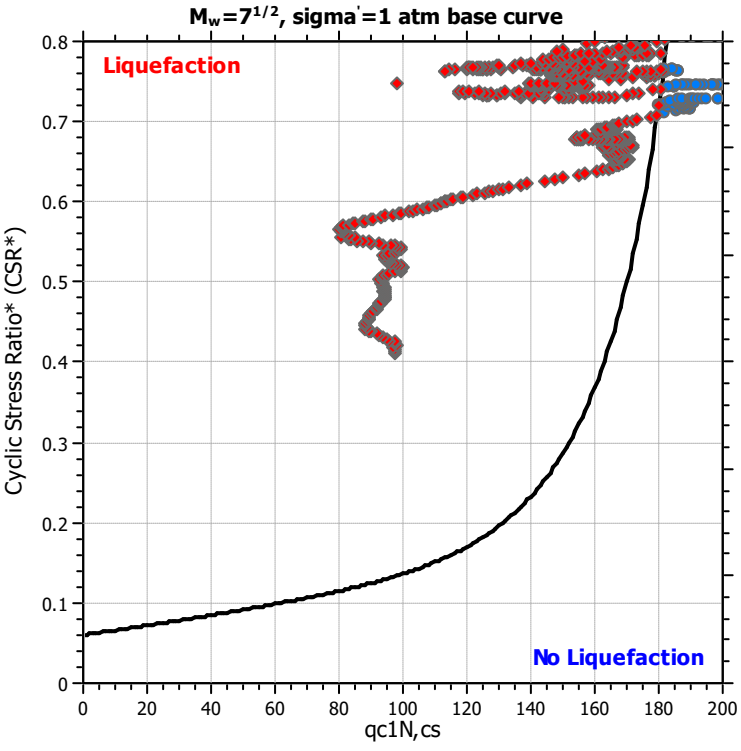
Project title : **Location :**

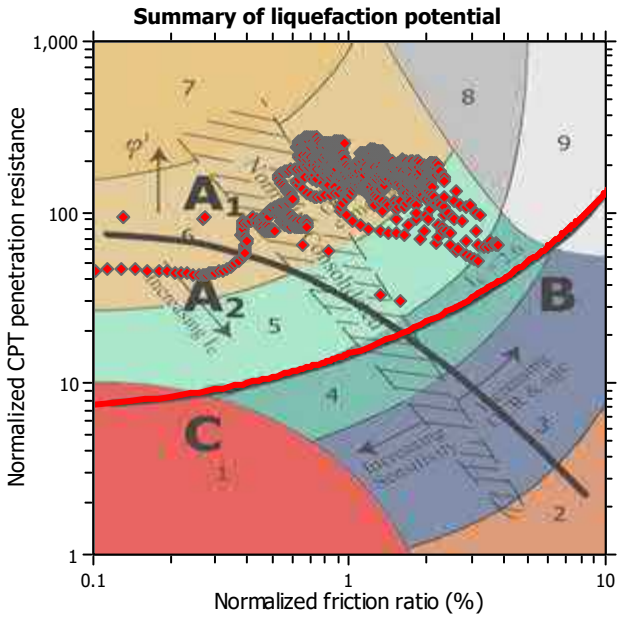
CPT file : CPT 2

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	15.00 m
Earthquake magnitude M_w:	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

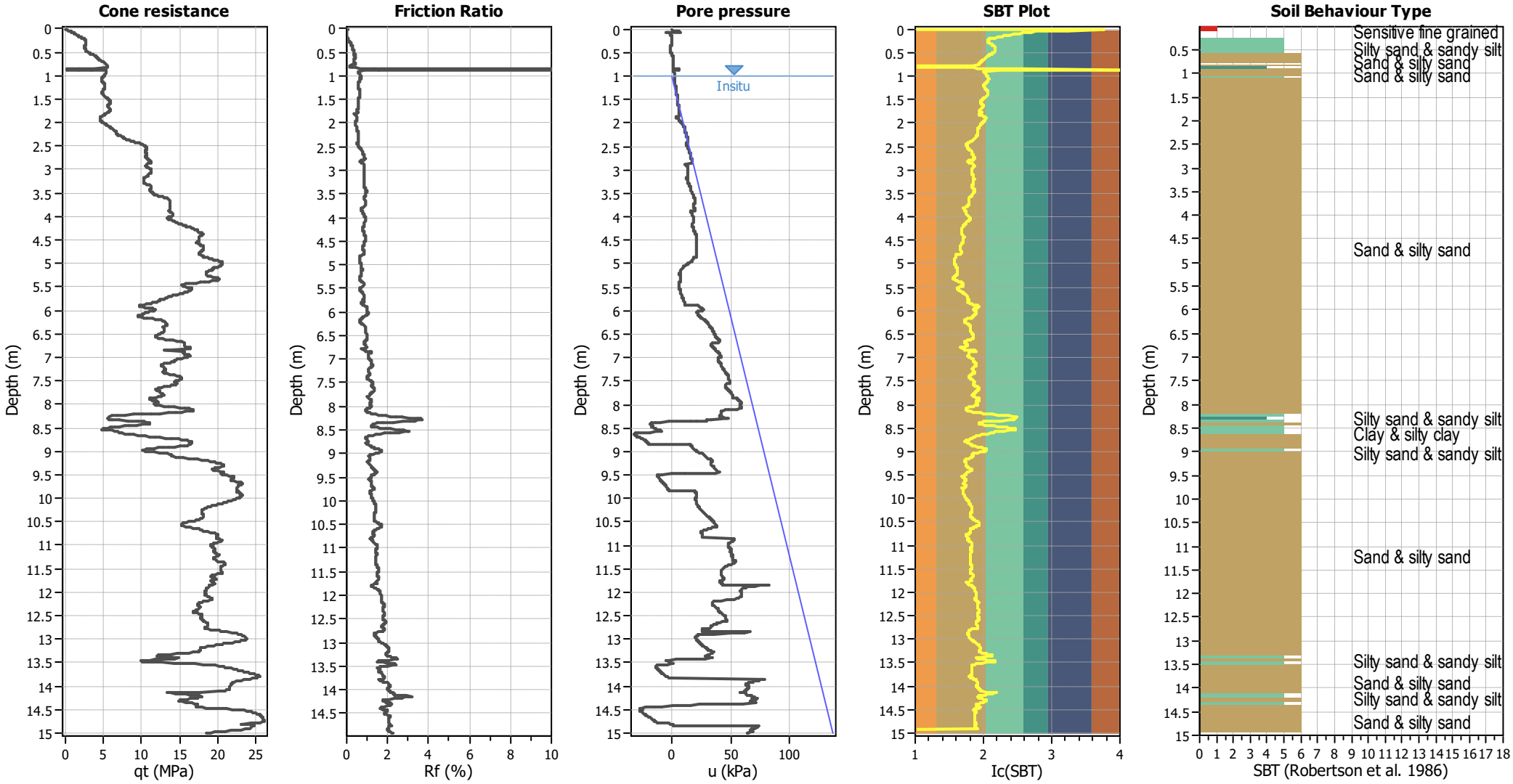






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



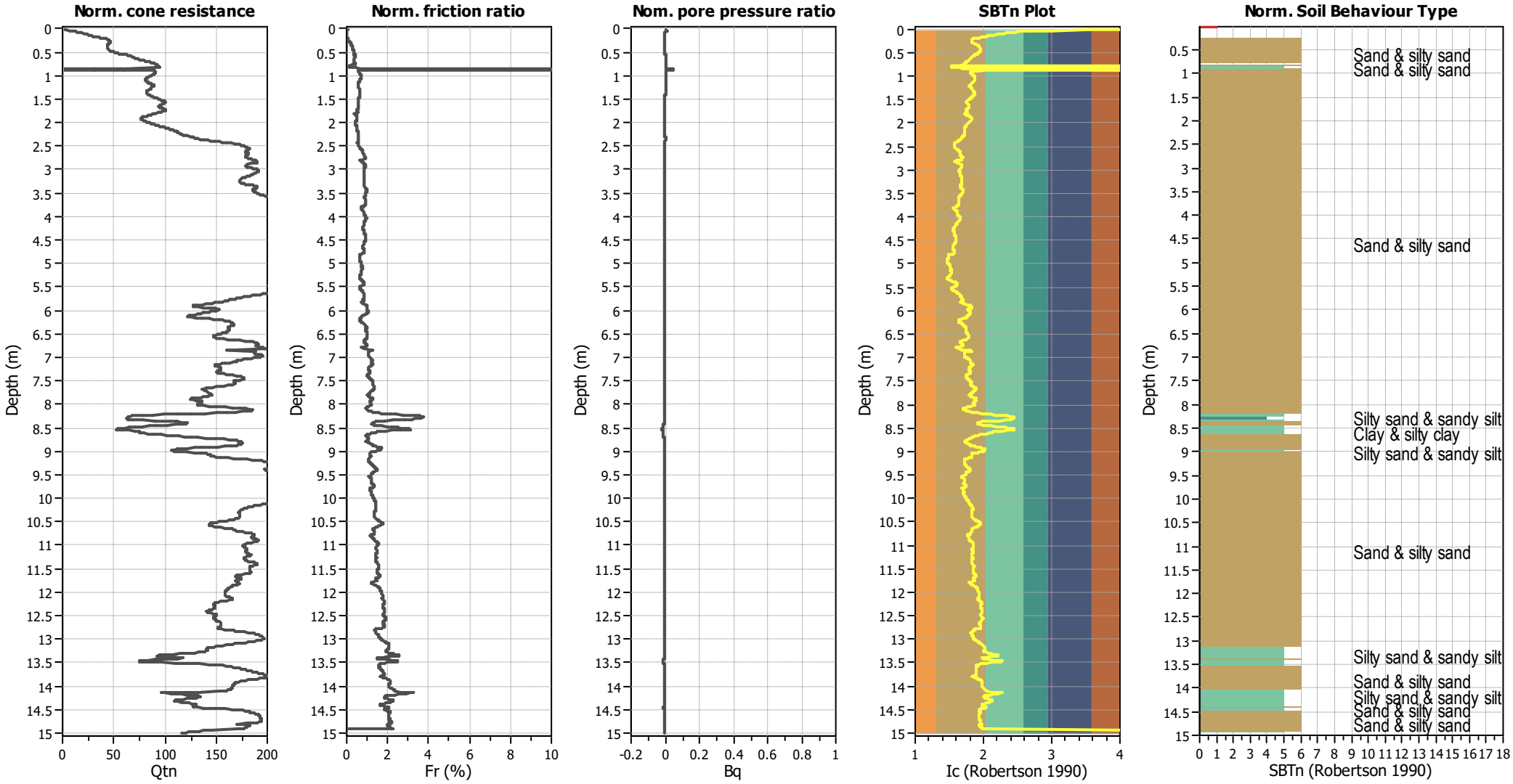
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



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Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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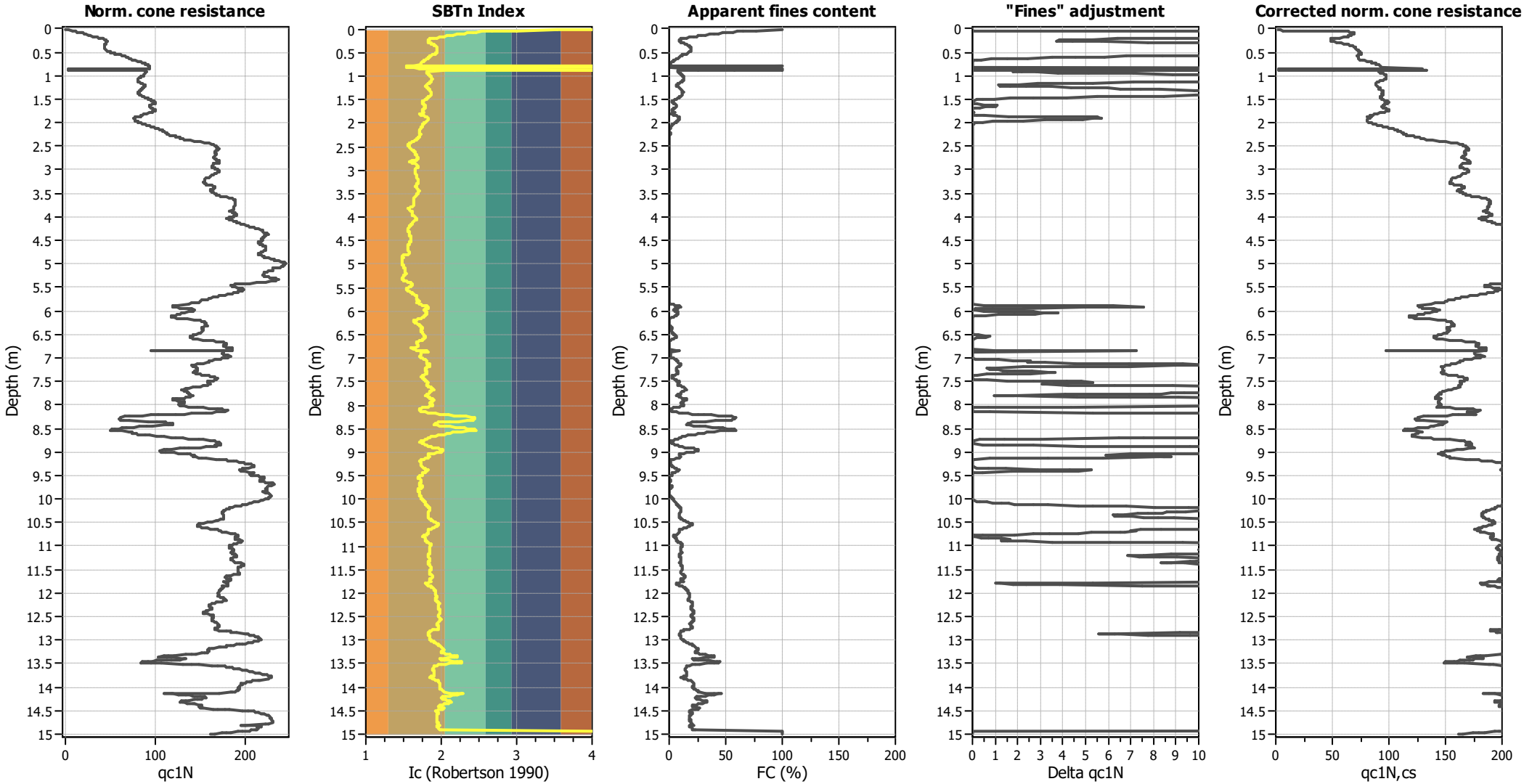
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

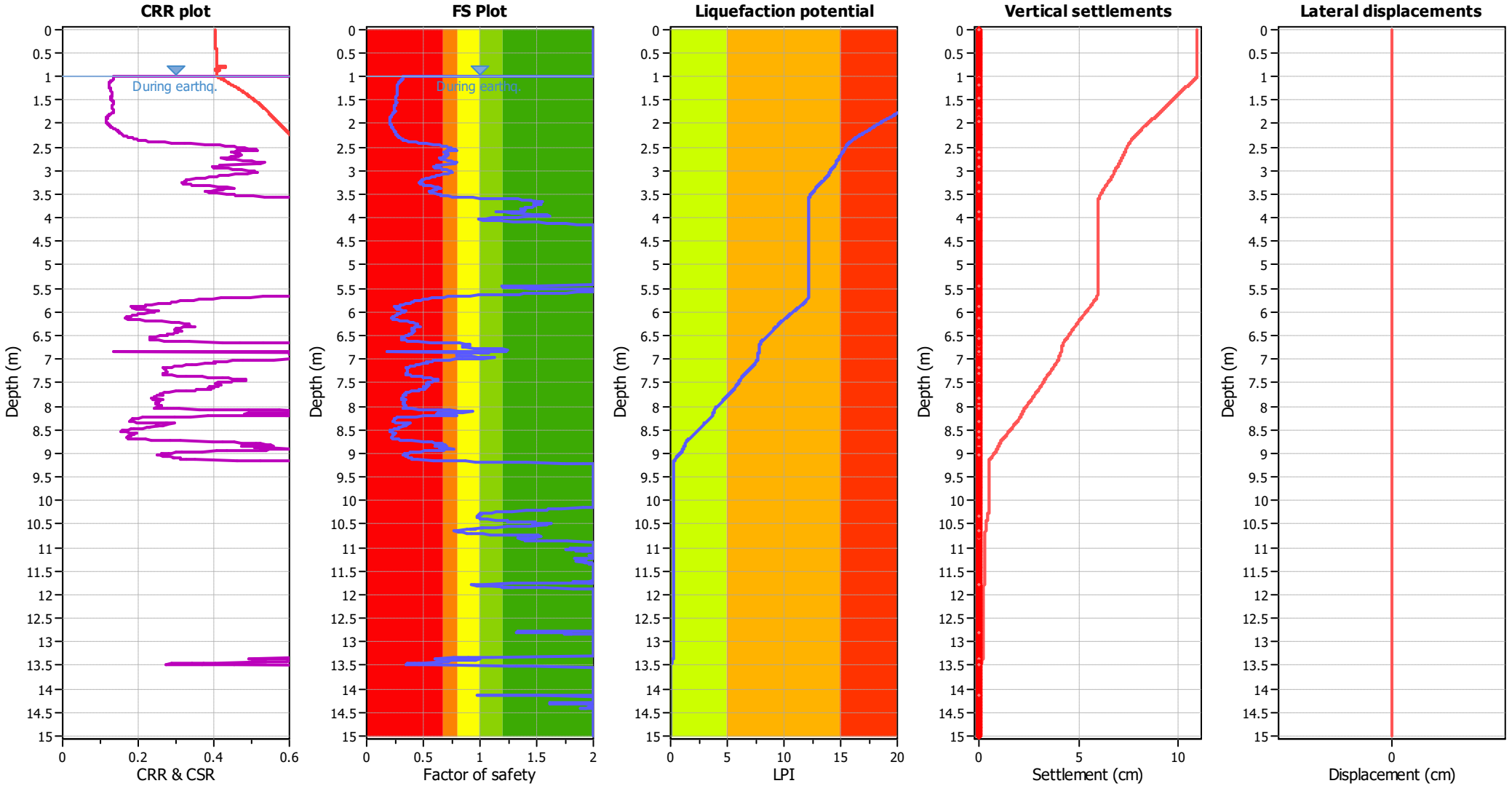
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

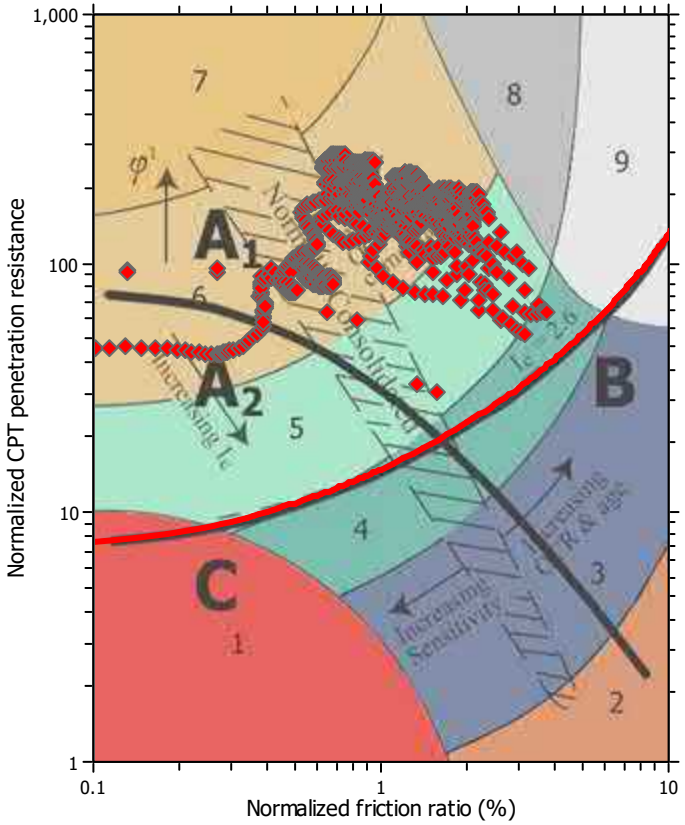
F.S. color scheme

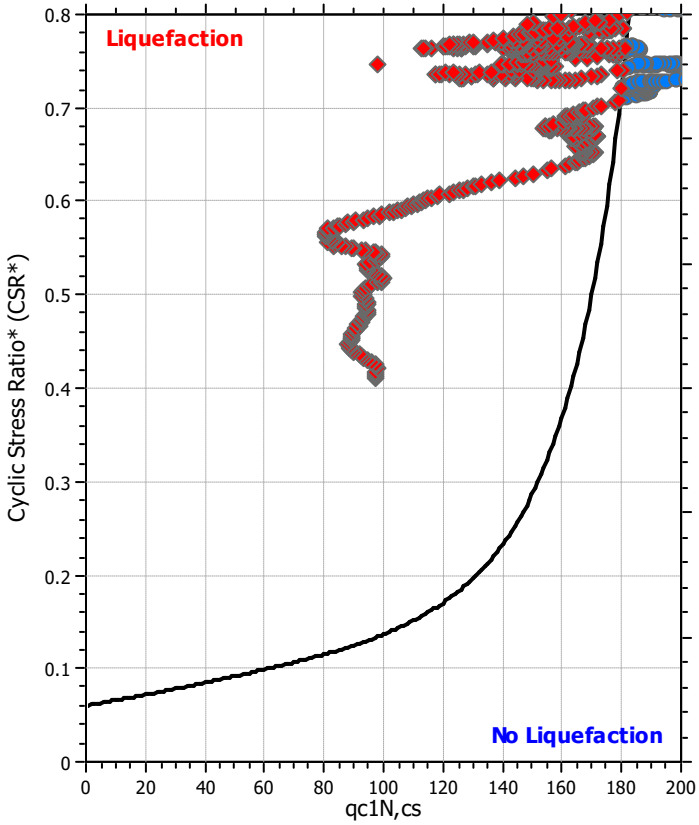
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

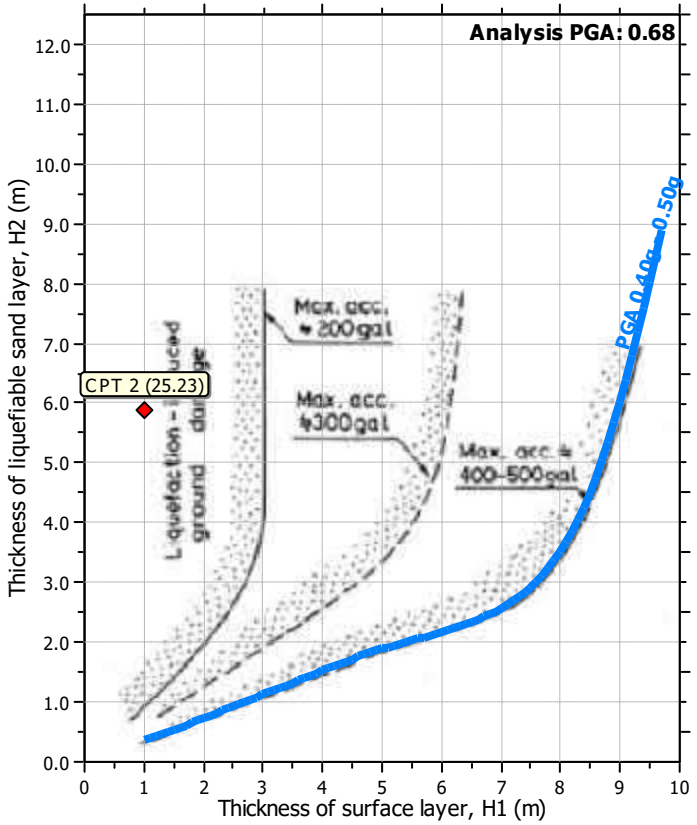
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



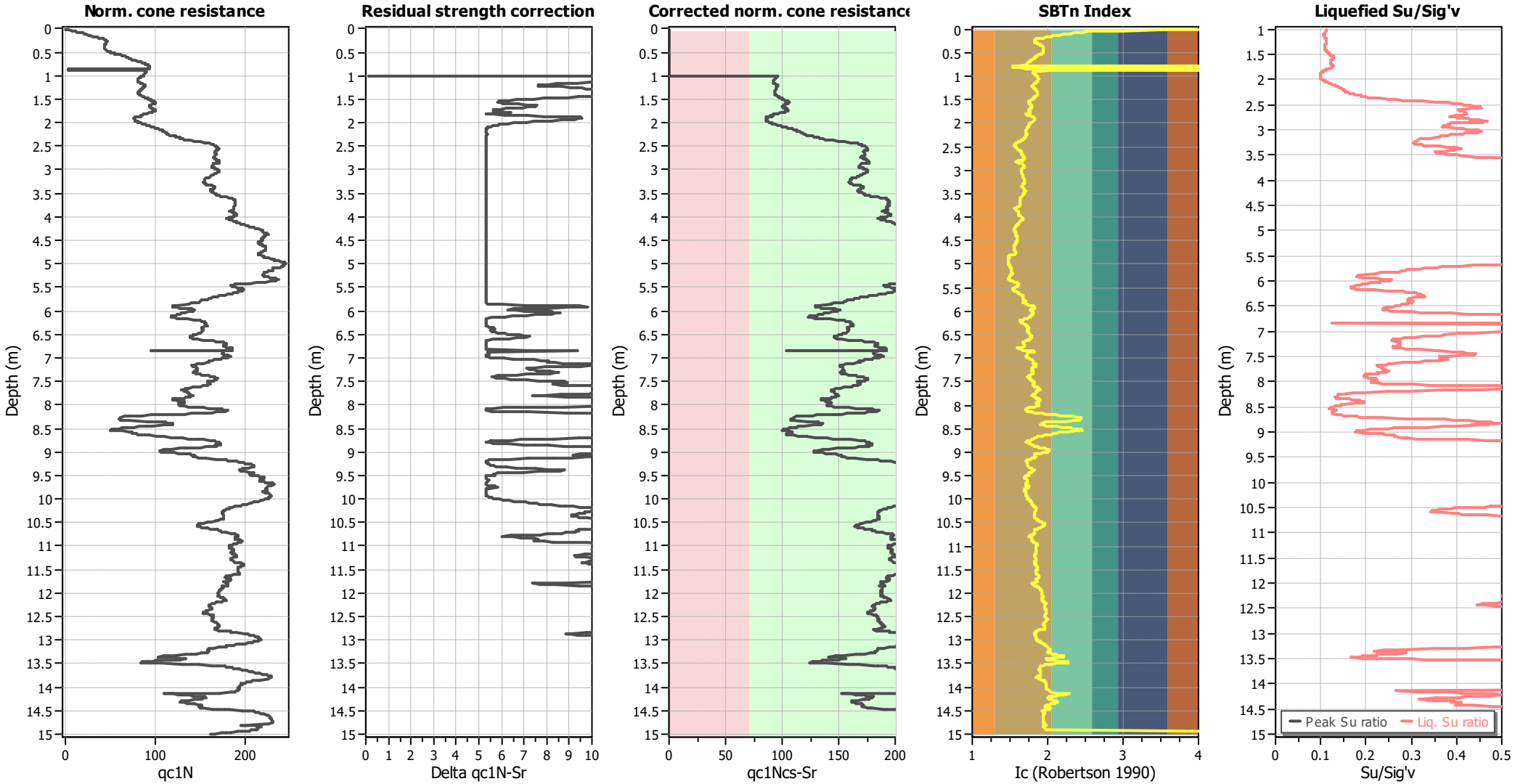




Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

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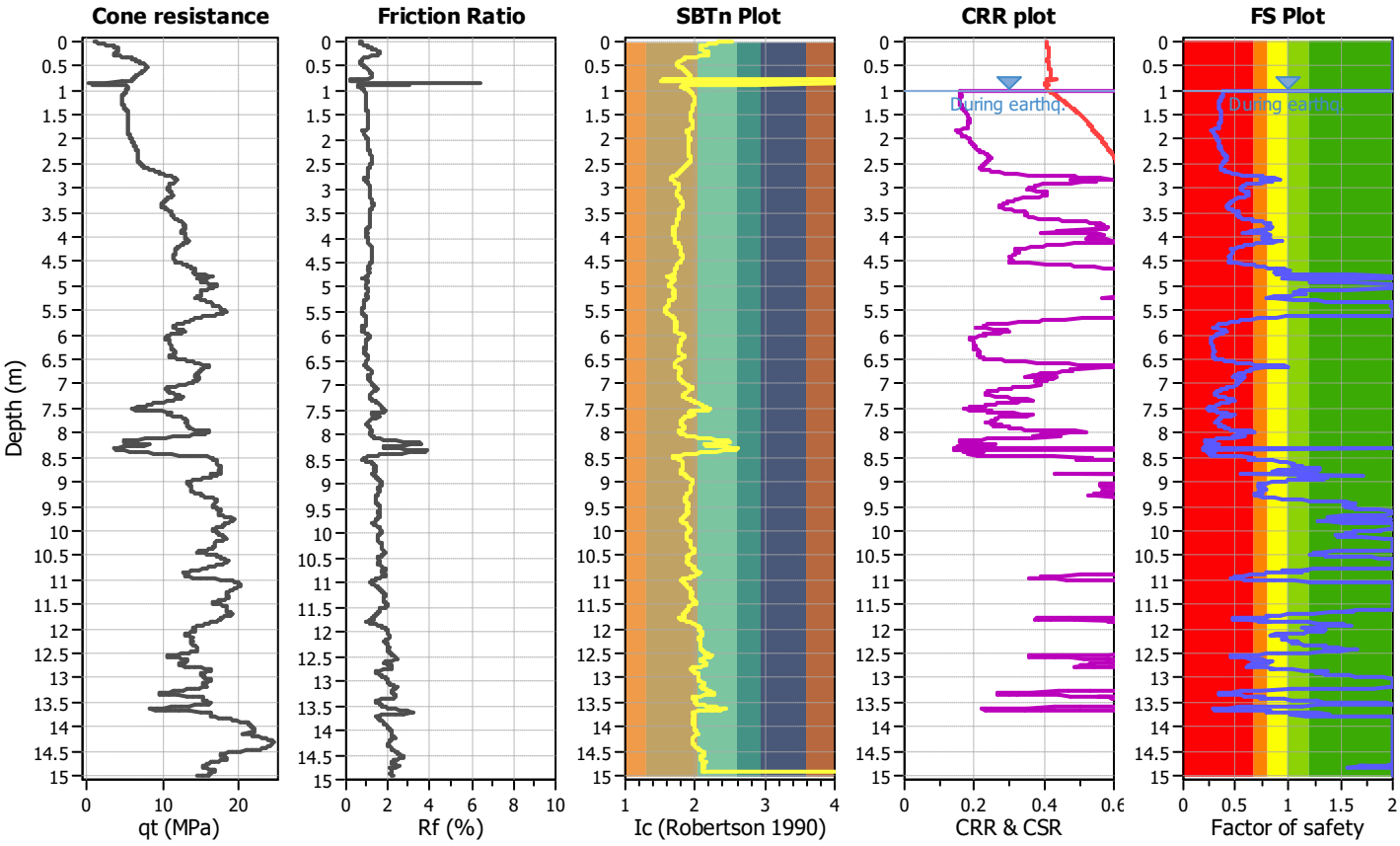
LIQUEFACTION ANALYSIS REPORT

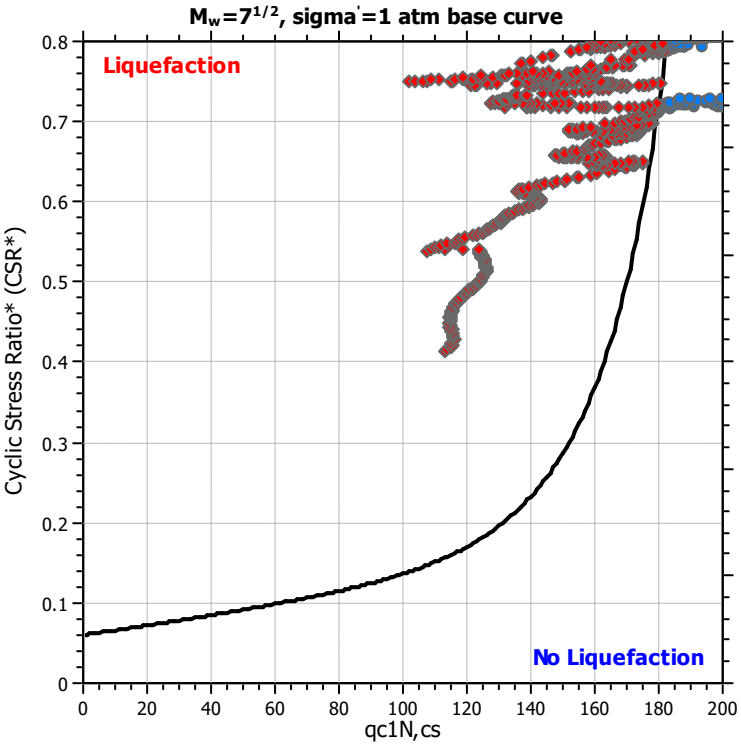
Project title : **Location :**

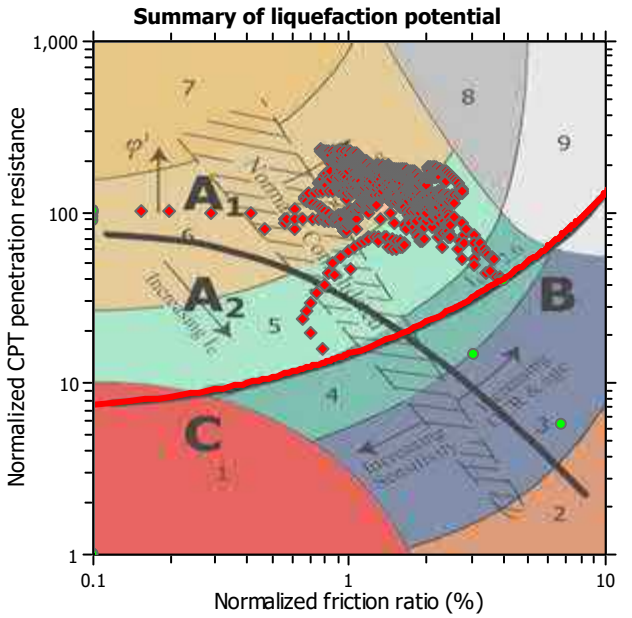
CPT file : CPT 3

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	15.00 m
Earthquake magnitude M_w:	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

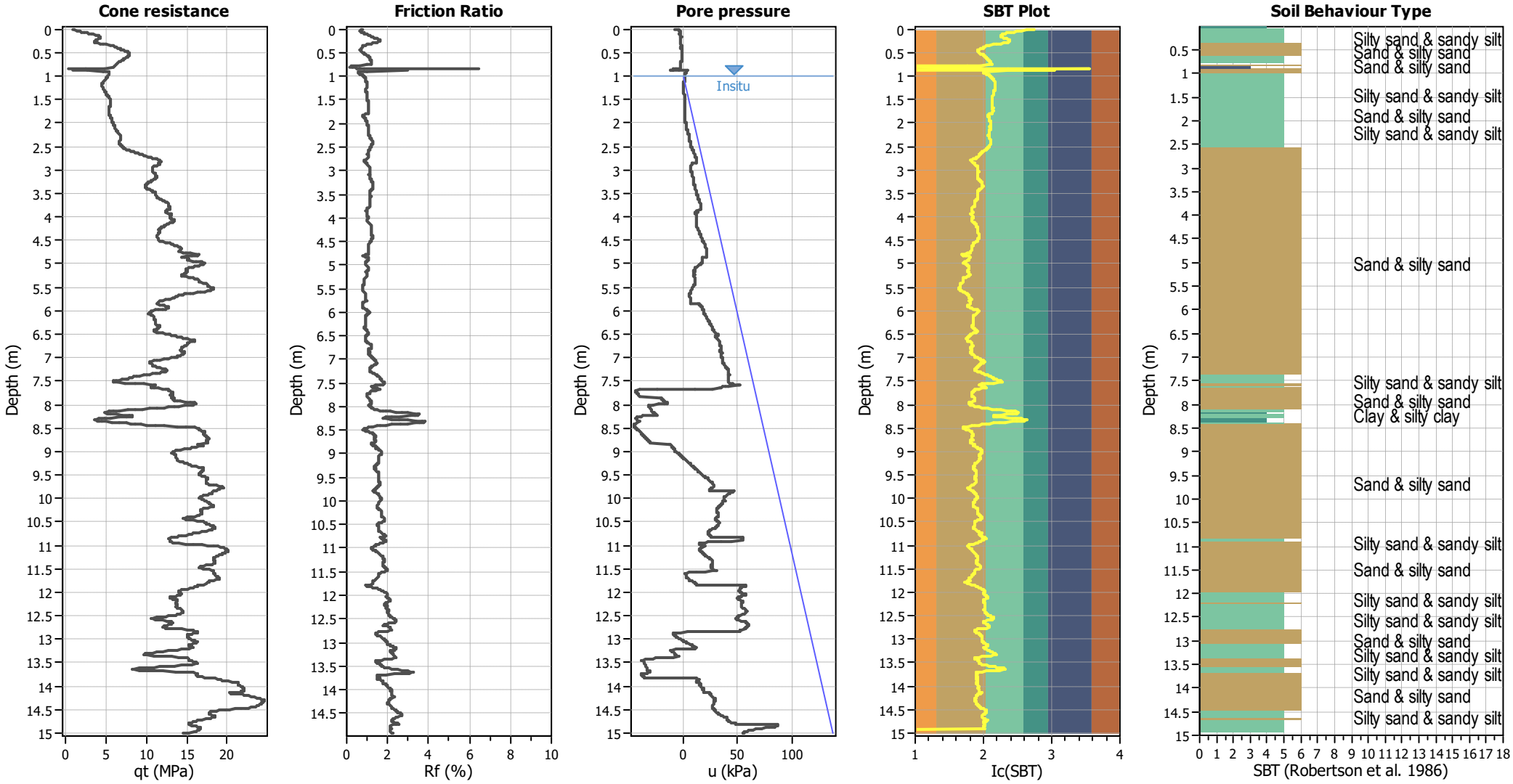






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



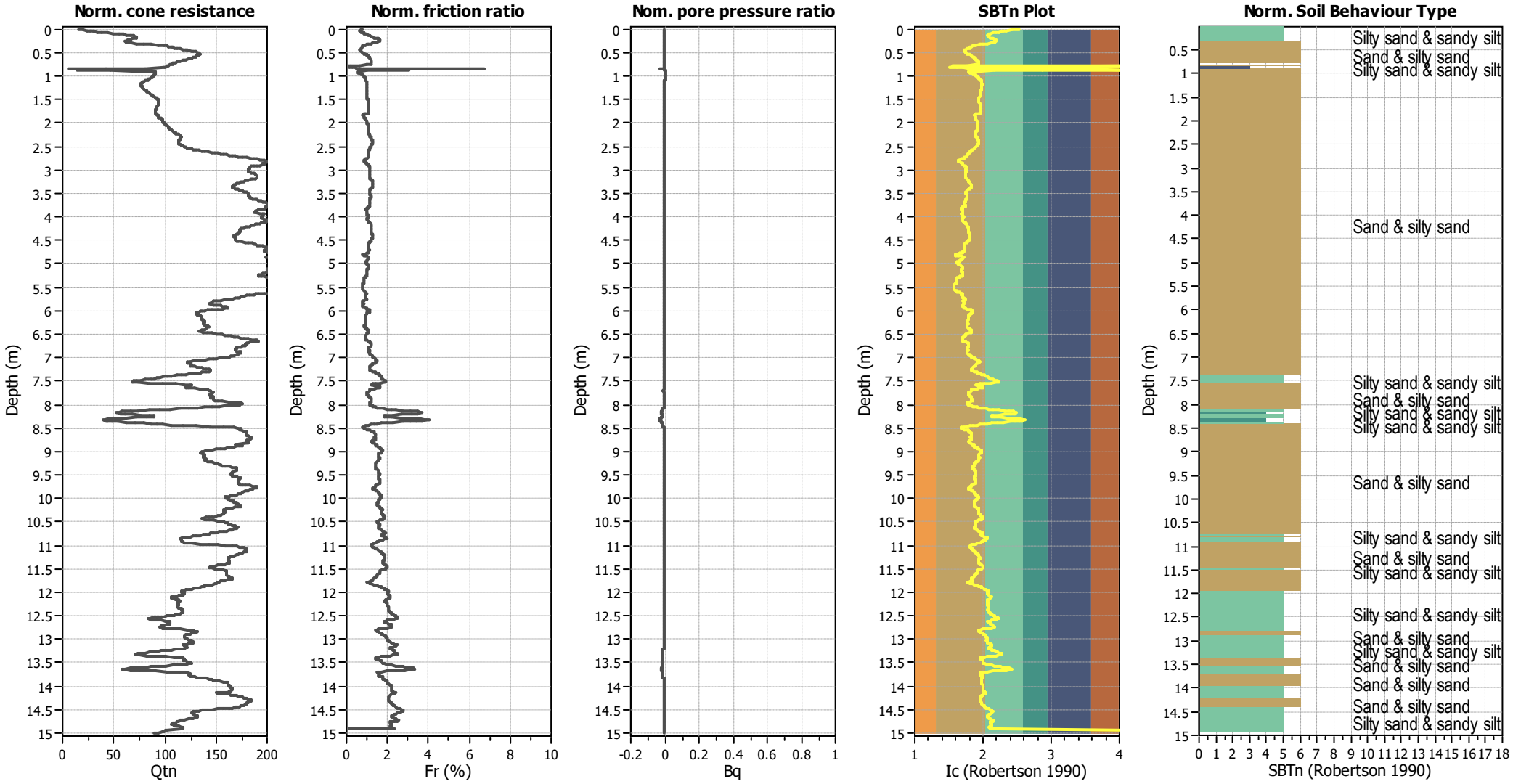
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



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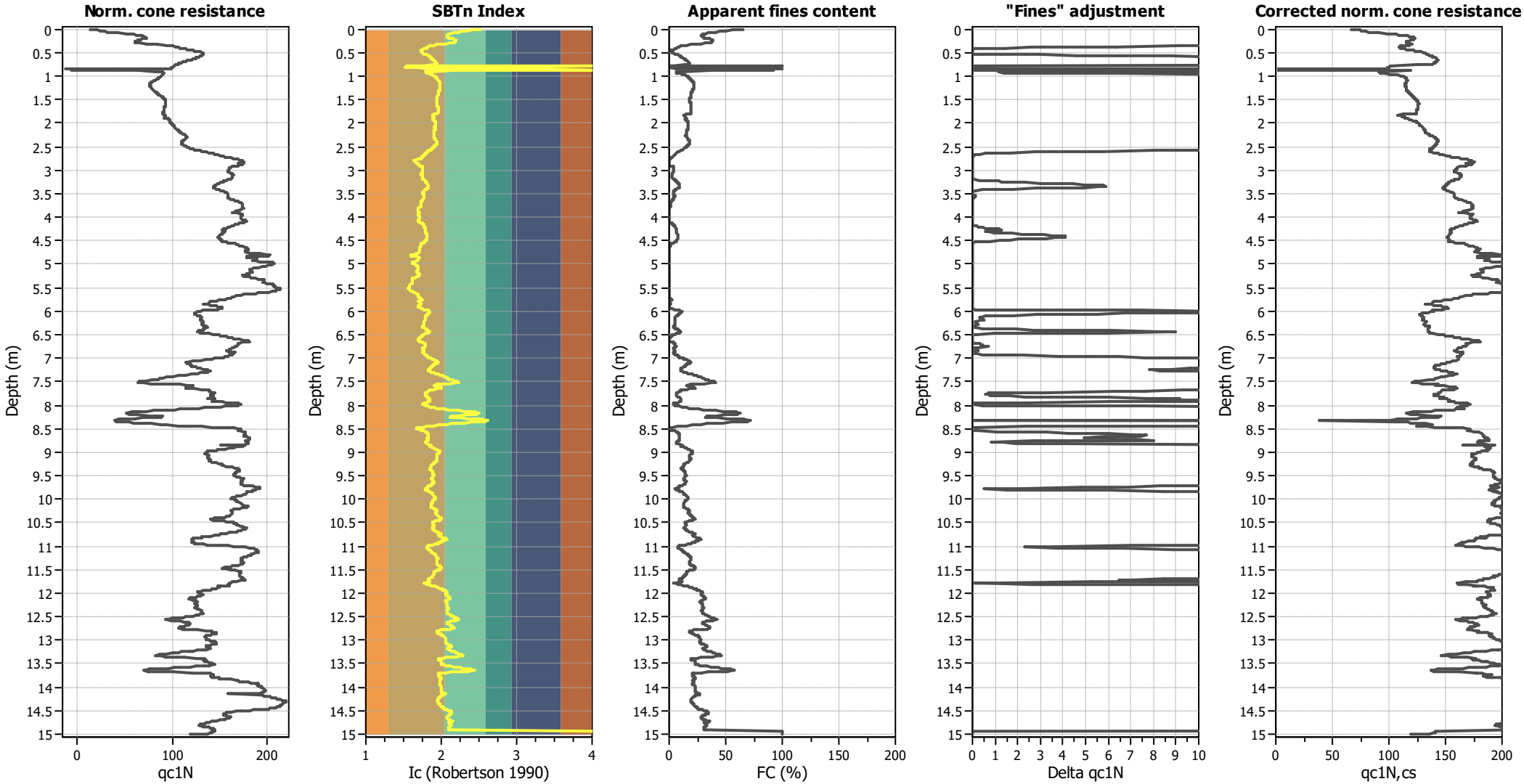
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBTn legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plots (intermediate results)



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Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
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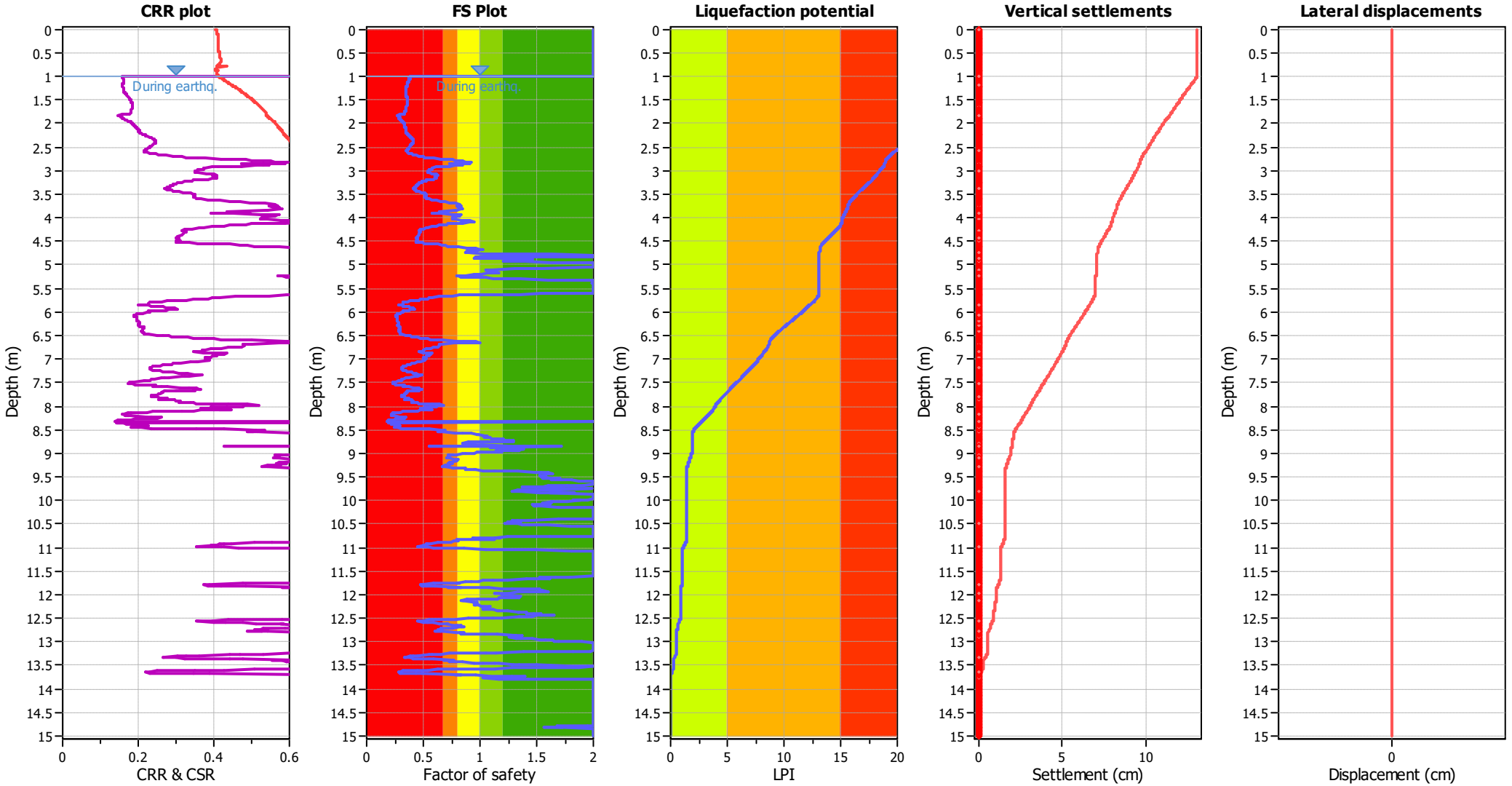
Liquefaction analysis overall plots



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Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
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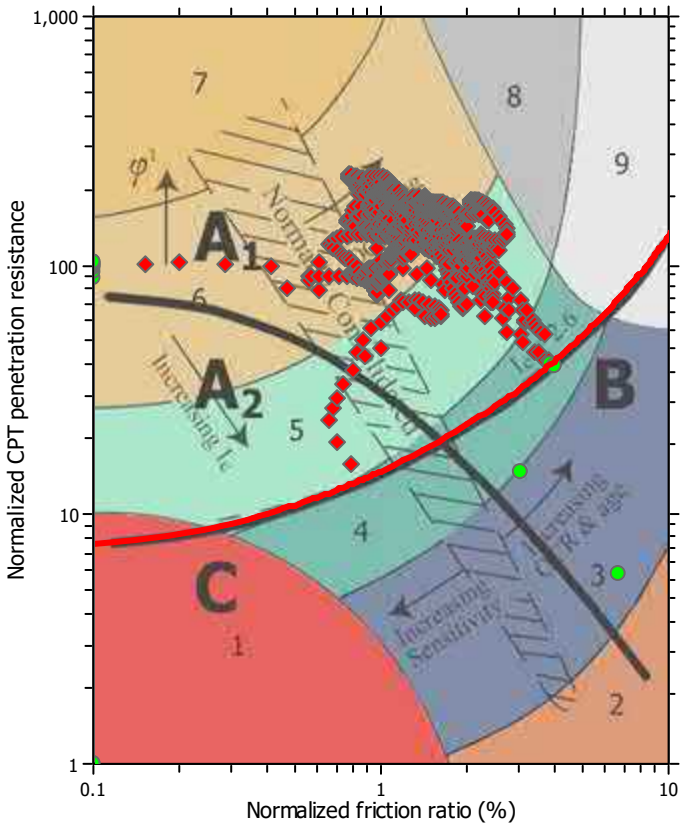
F.S. color scheme

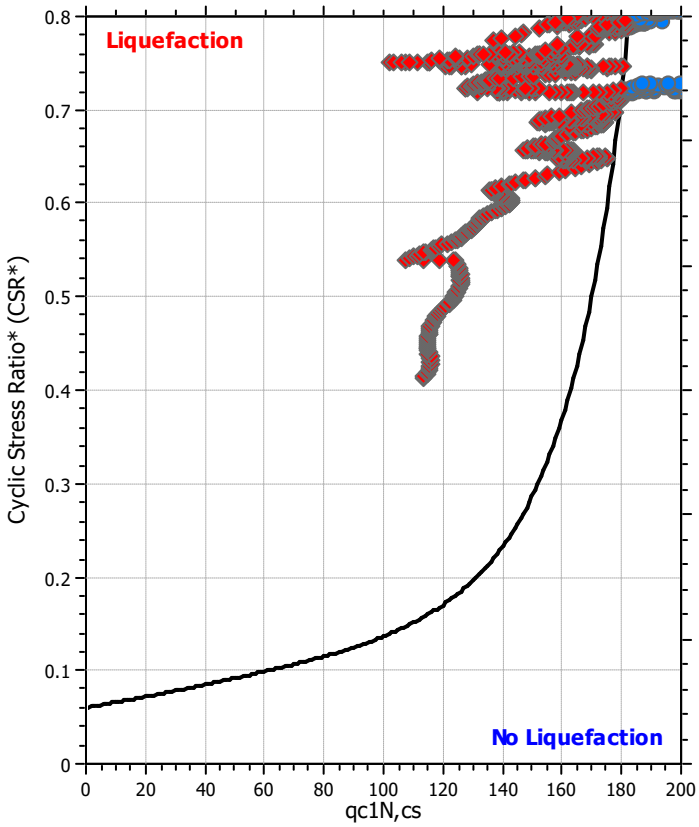
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

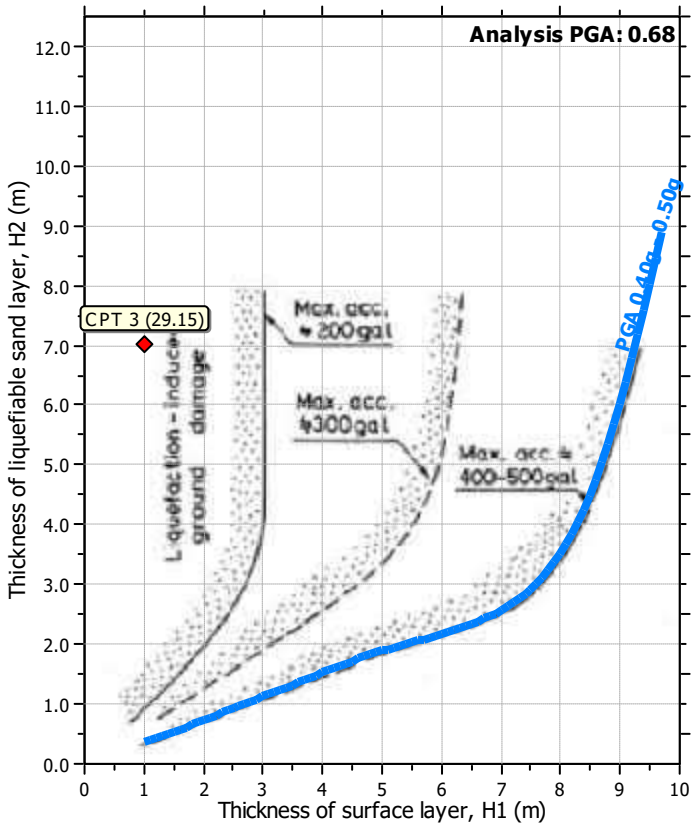
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots







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Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
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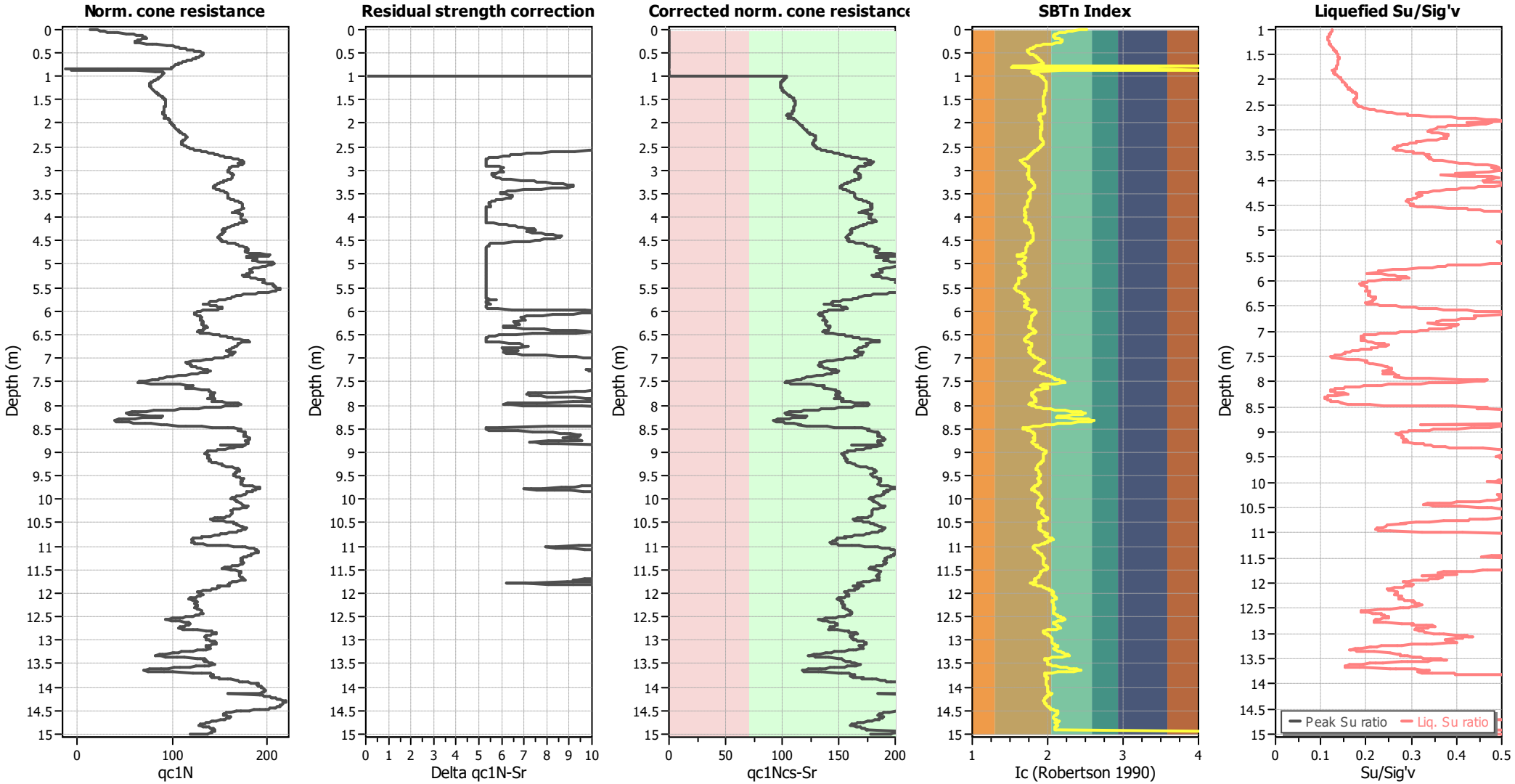
Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
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Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

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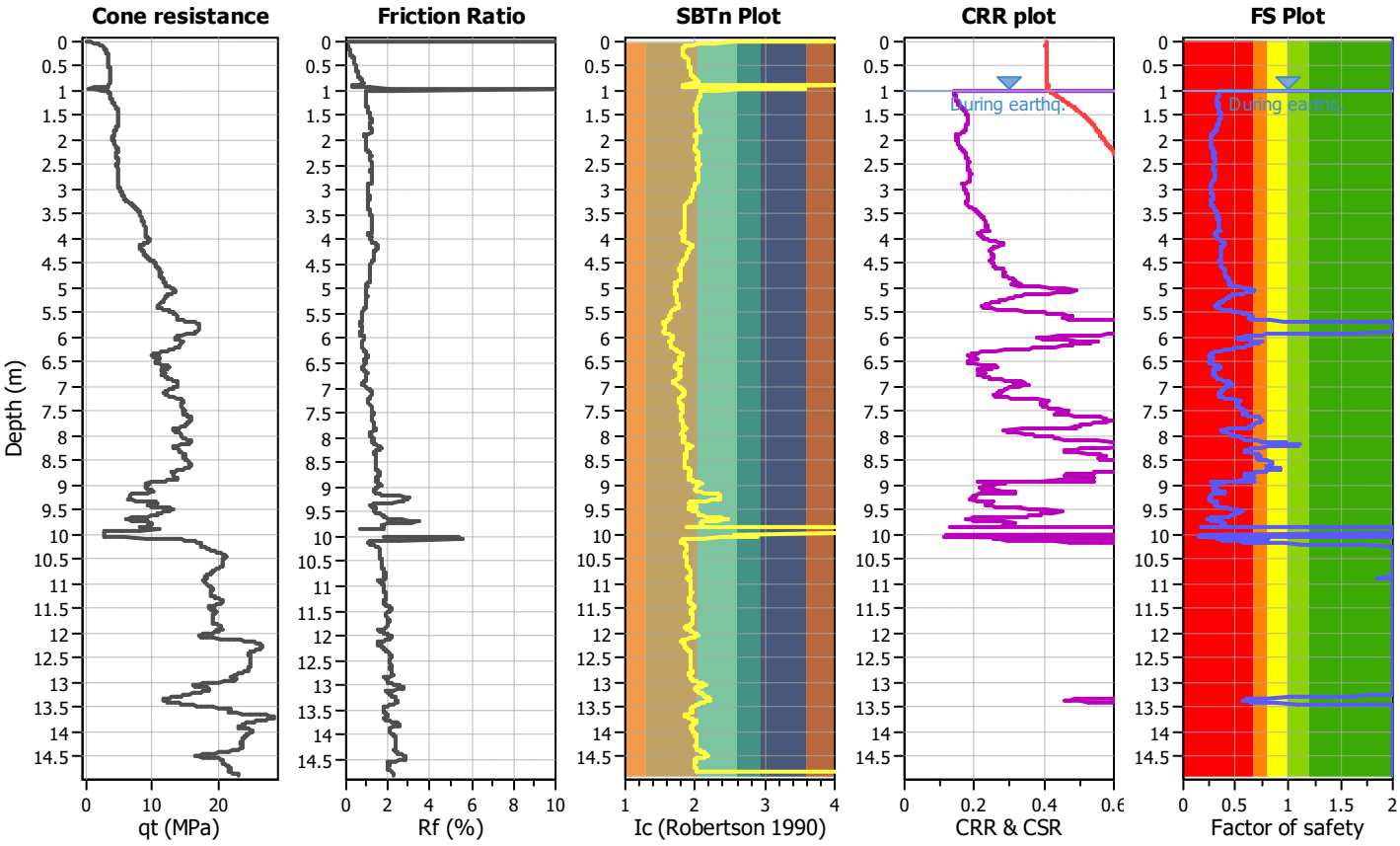
LIQUEFACTION ANALYSIS REPORT

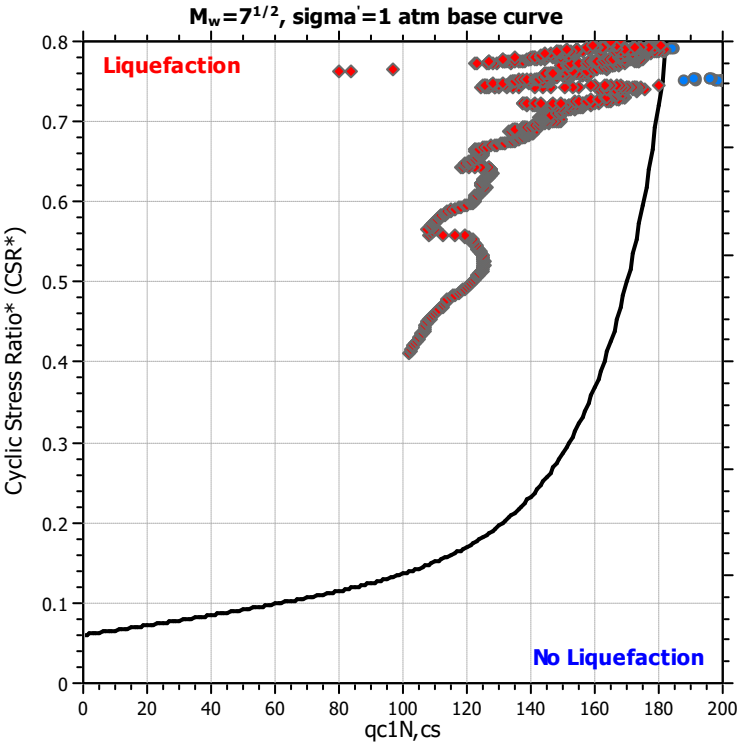
Project title : **Location :**

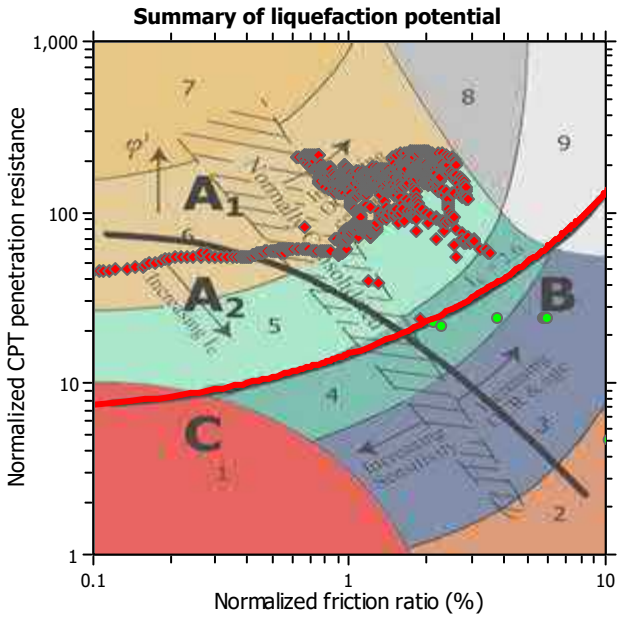
CPT file : CPT 4

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	15.00 m
Earthquake magnitude M_w:	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

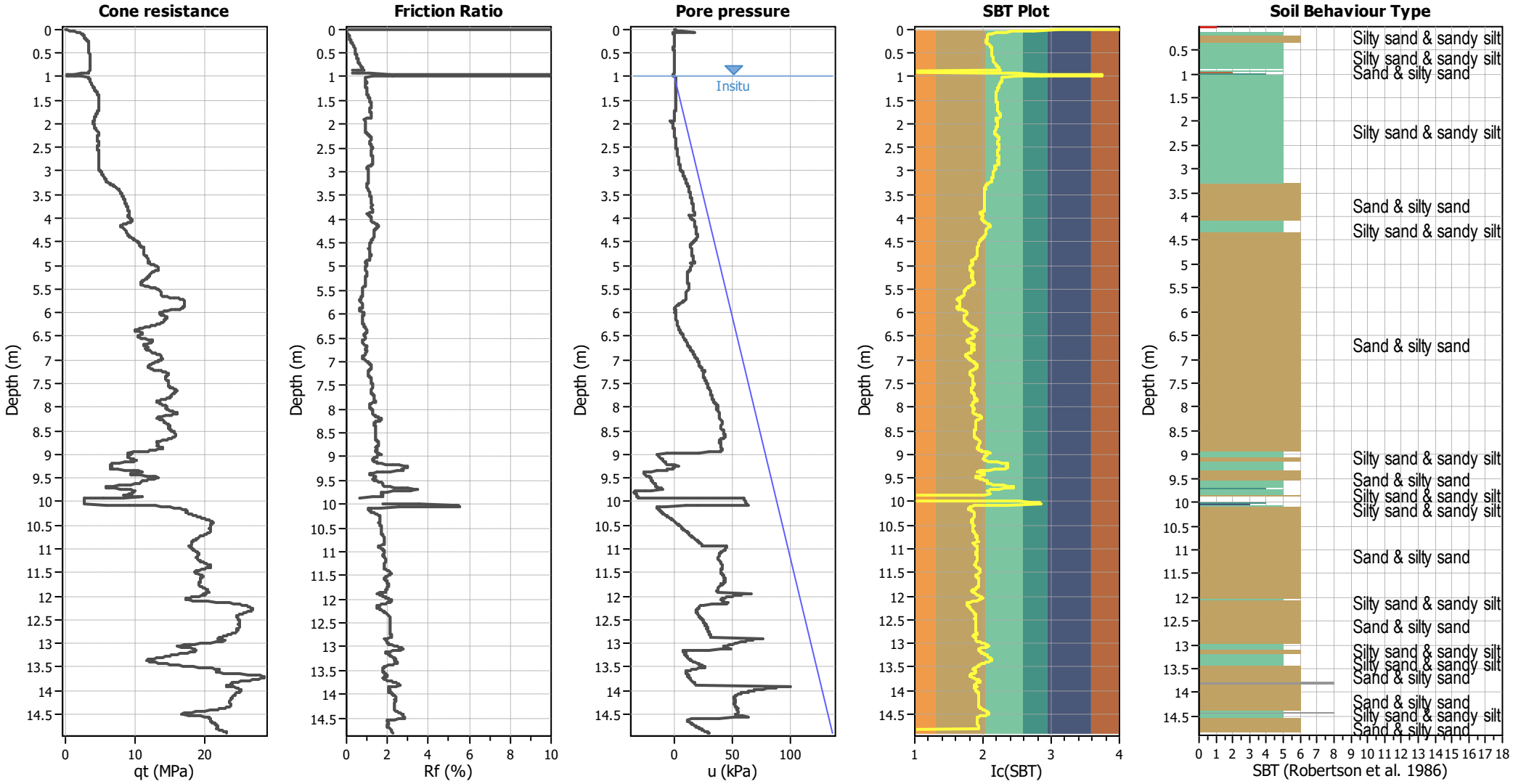






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
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5. Silty sand to sandy silt
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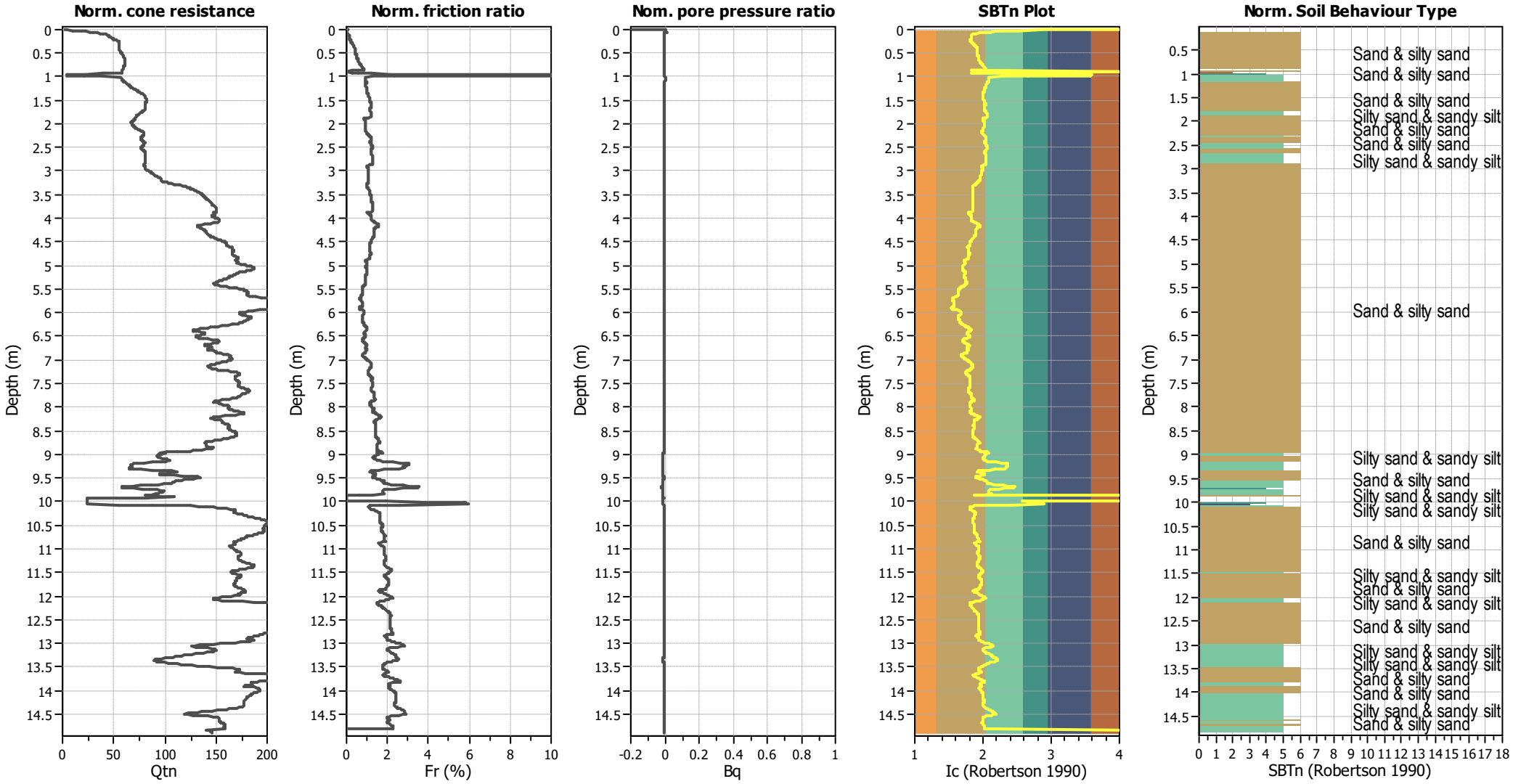
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
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SBTn legend

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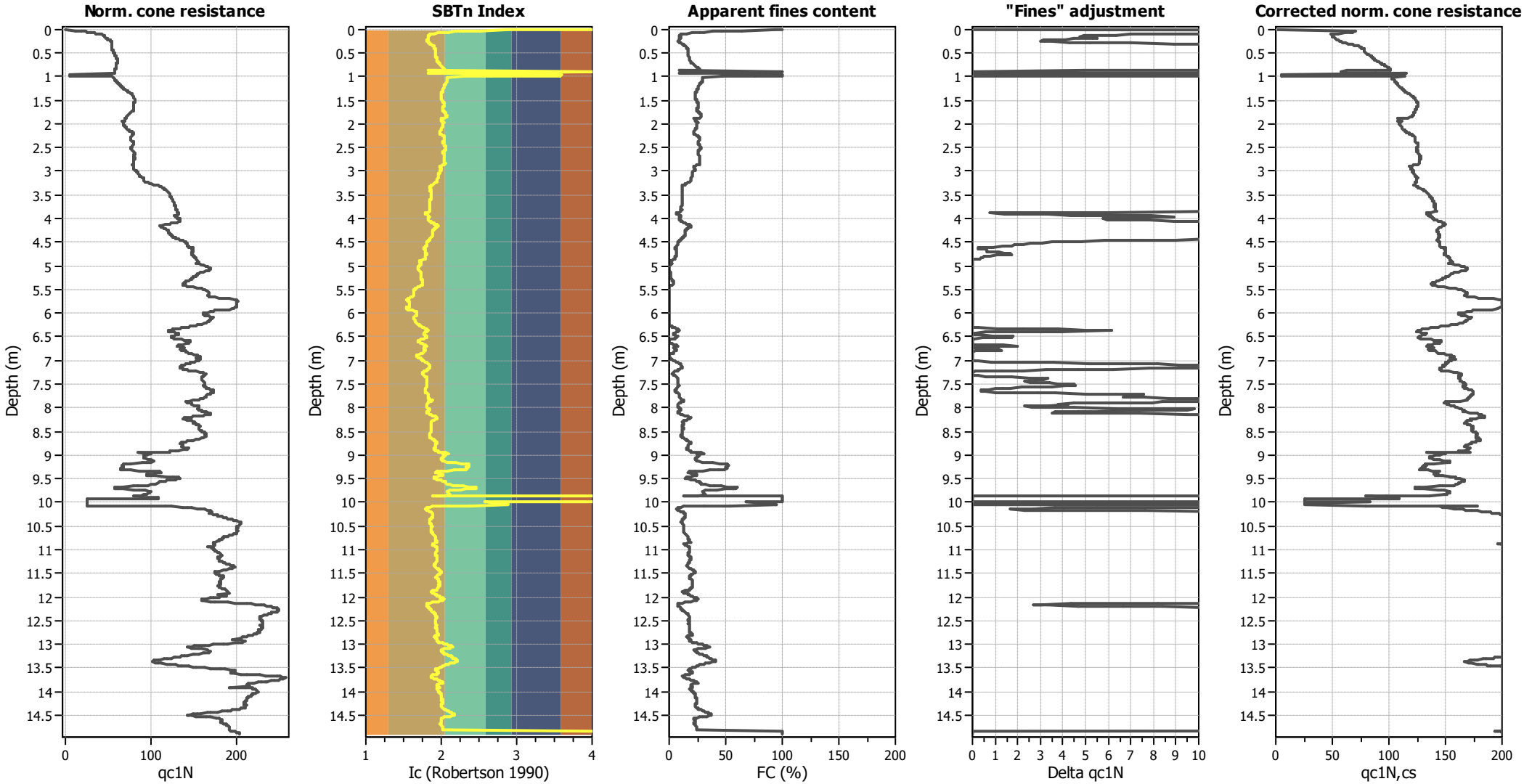
9. Very stiff fine grained

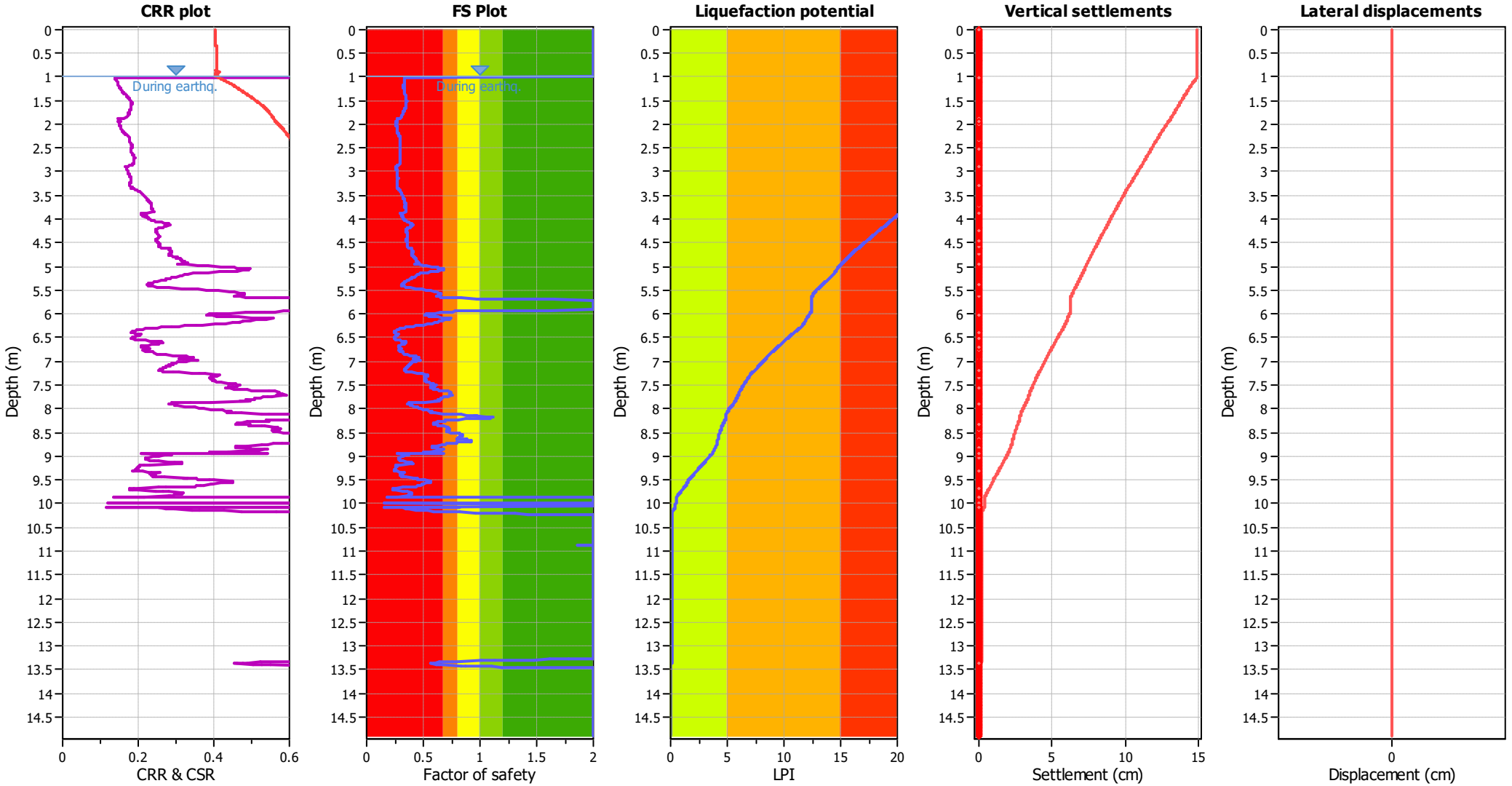
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

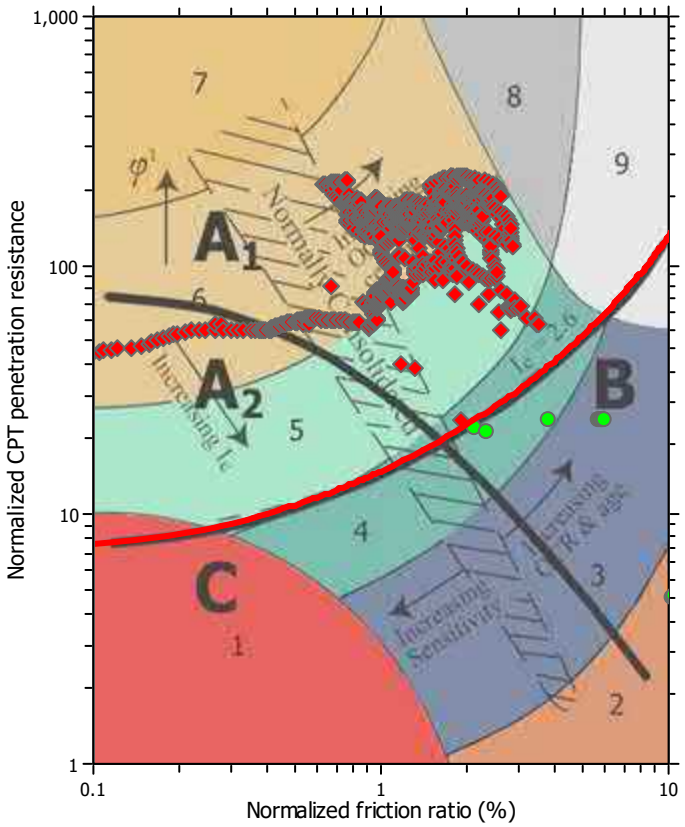
F.S. color scheme

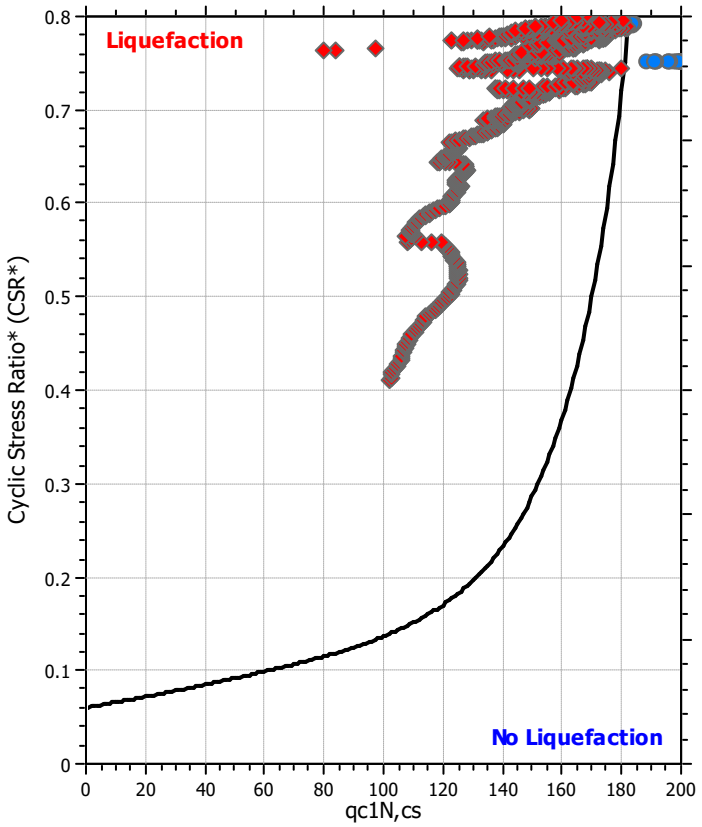
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

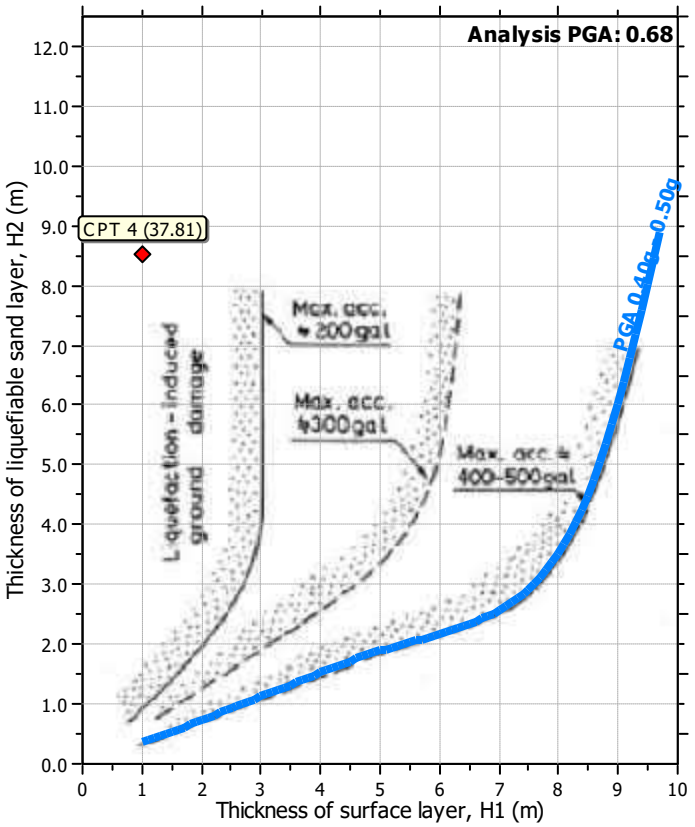
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



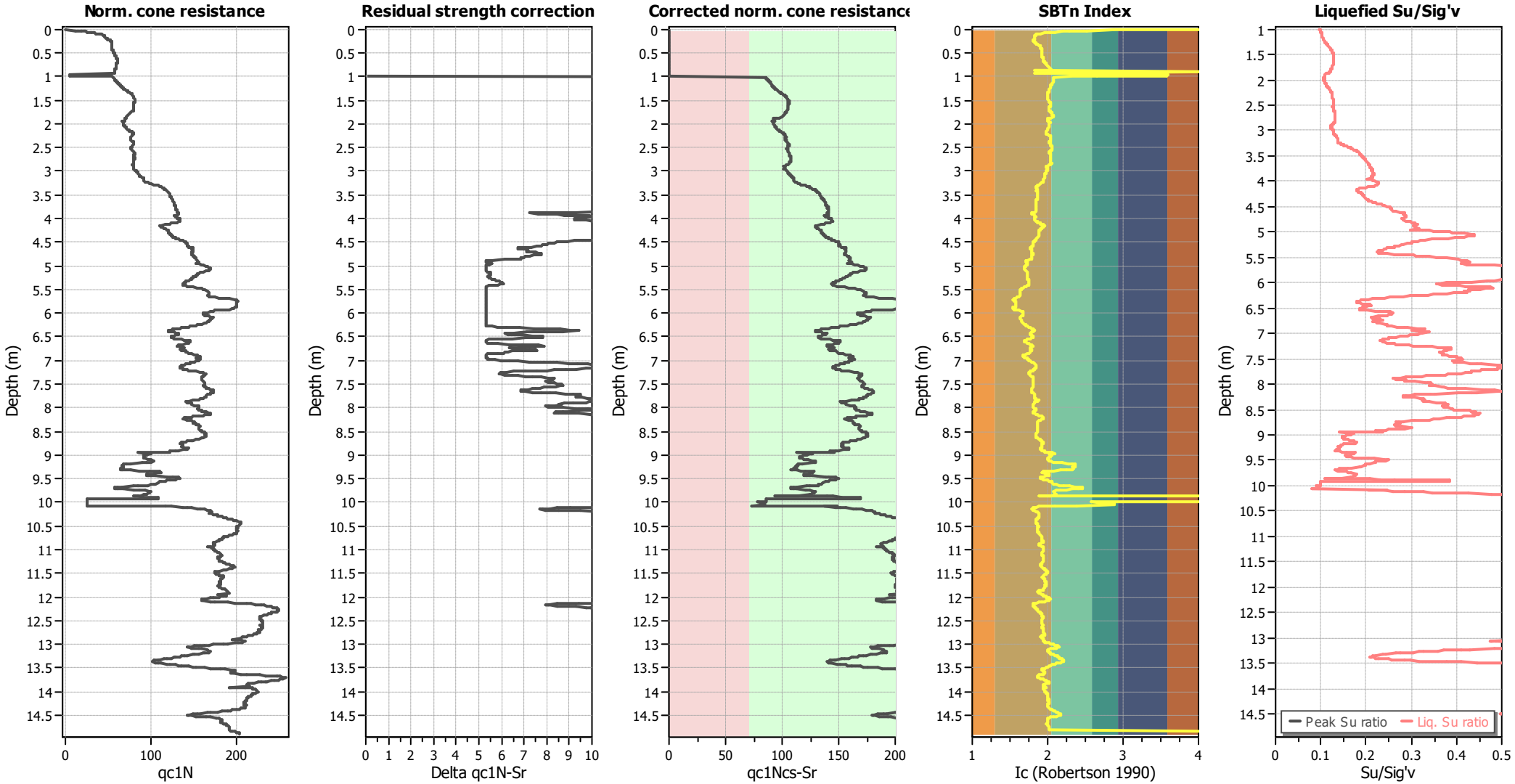




Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

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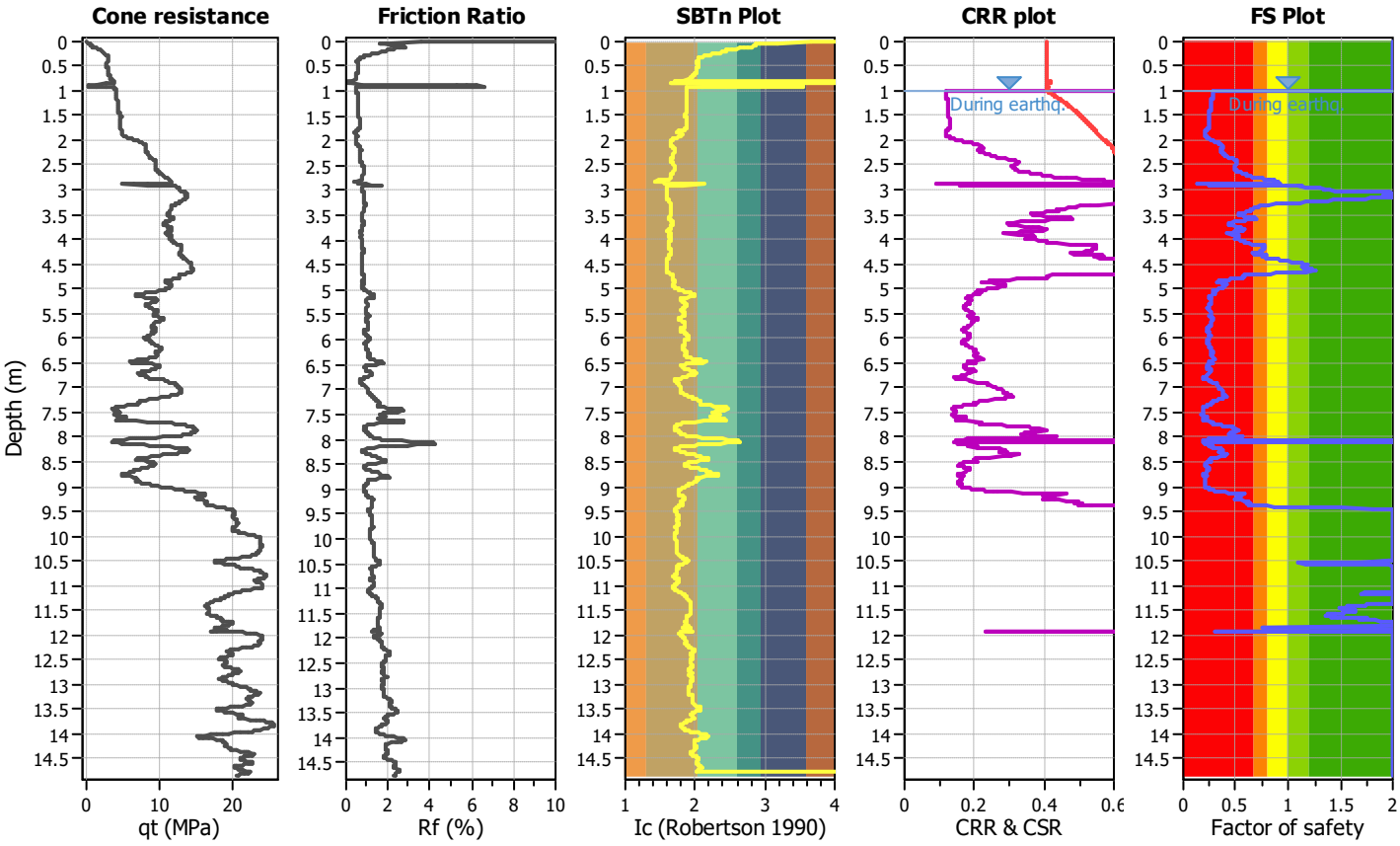
LIQUEFACTION ANALYSIS REPORT

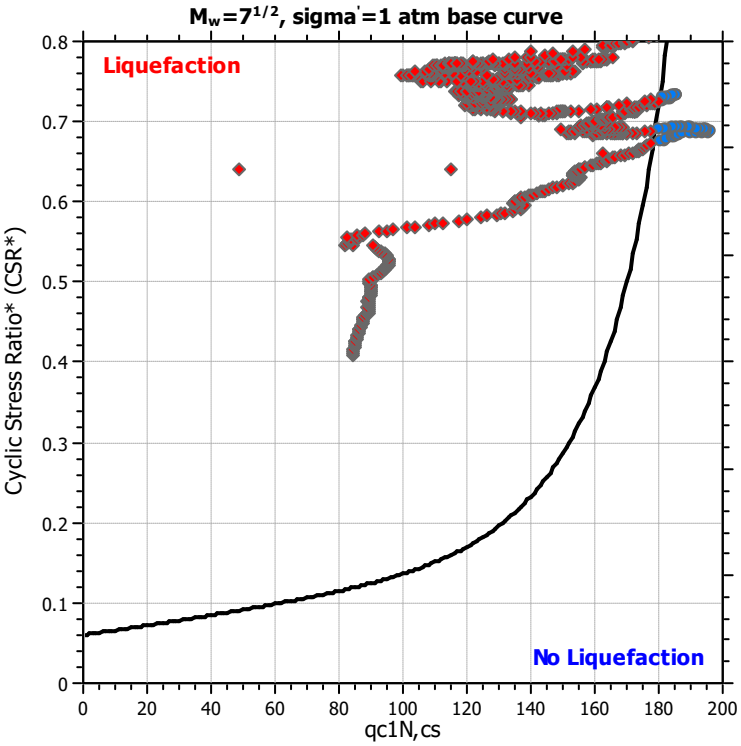
Project title : **Location :**

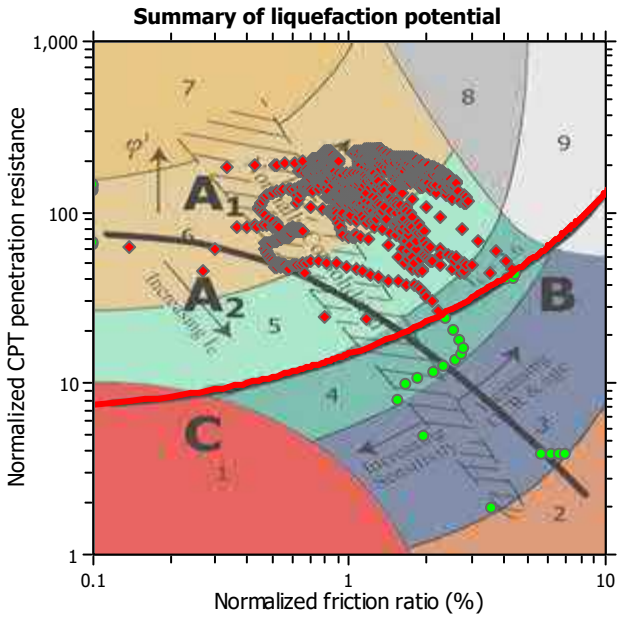
CPT file : CPT 5

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	15.00 m
Earthquake magnitude M_w:	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

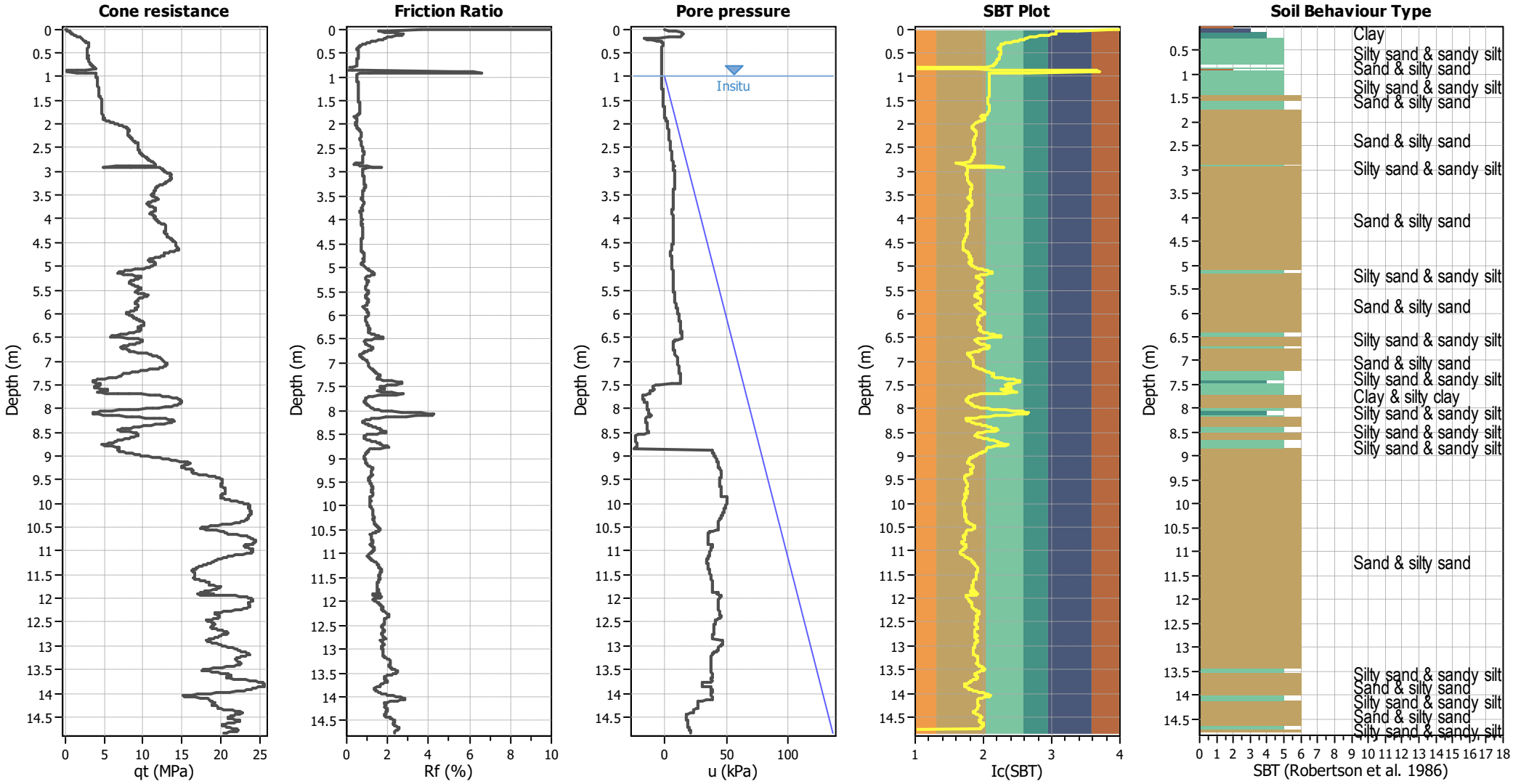






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



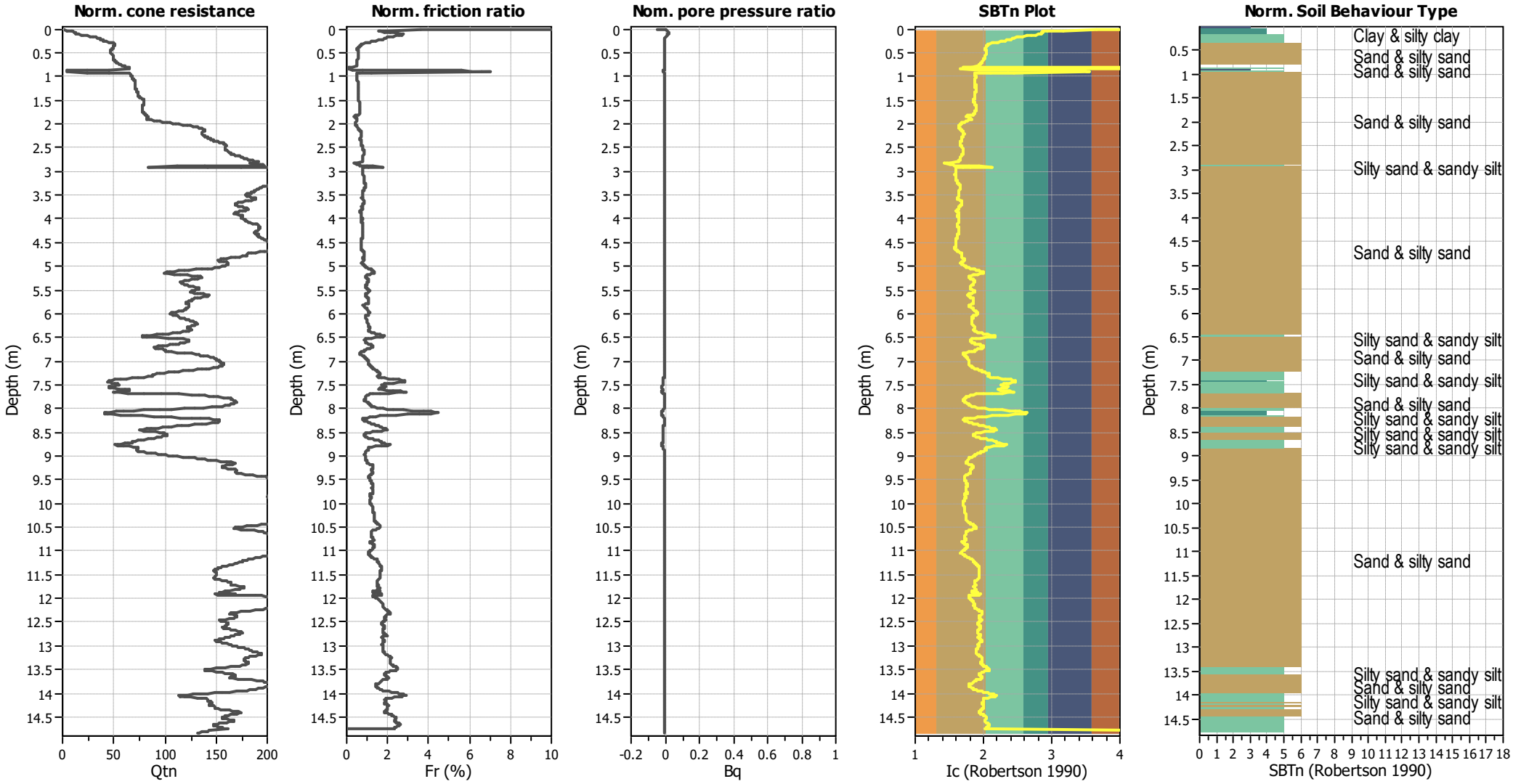
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



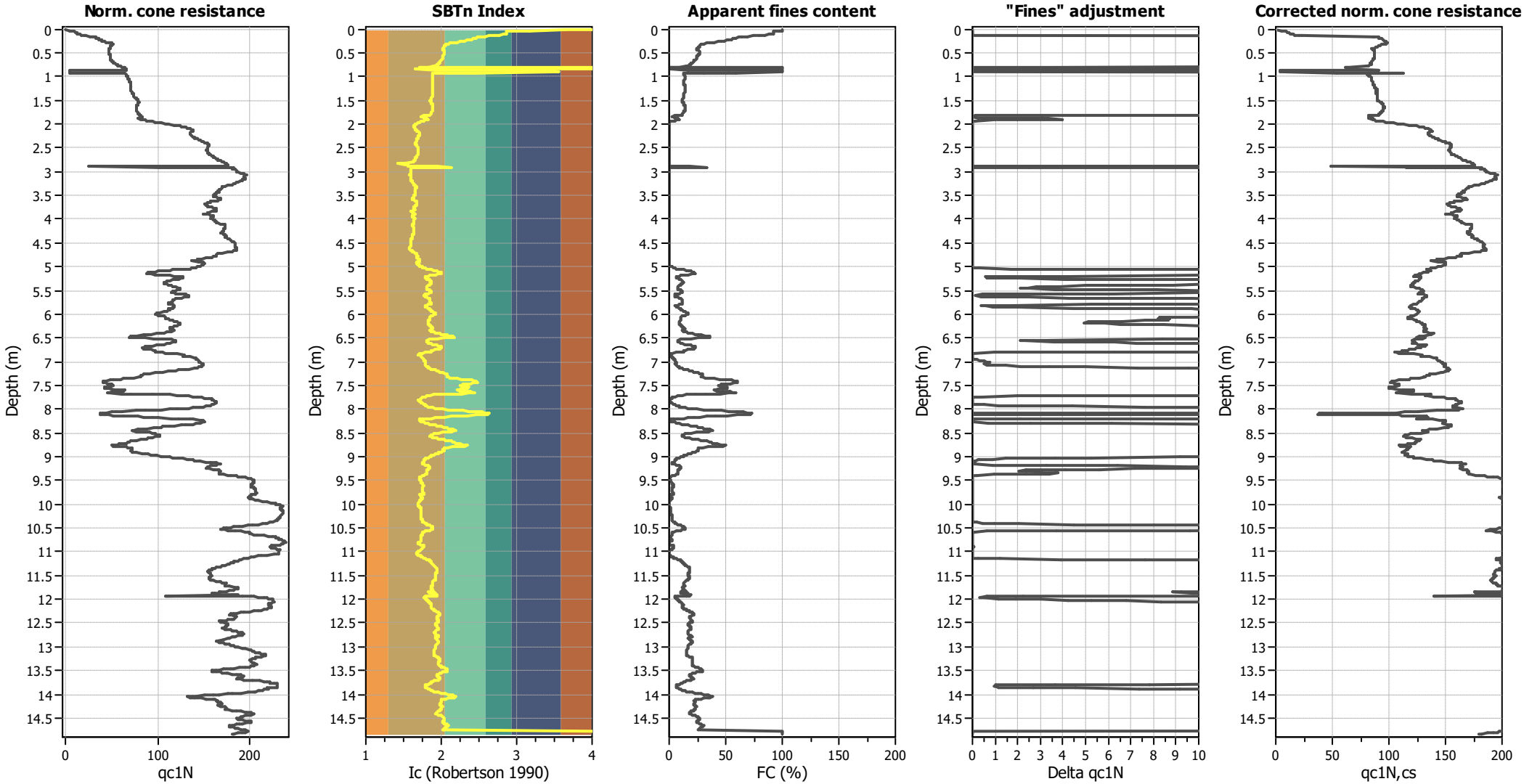
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

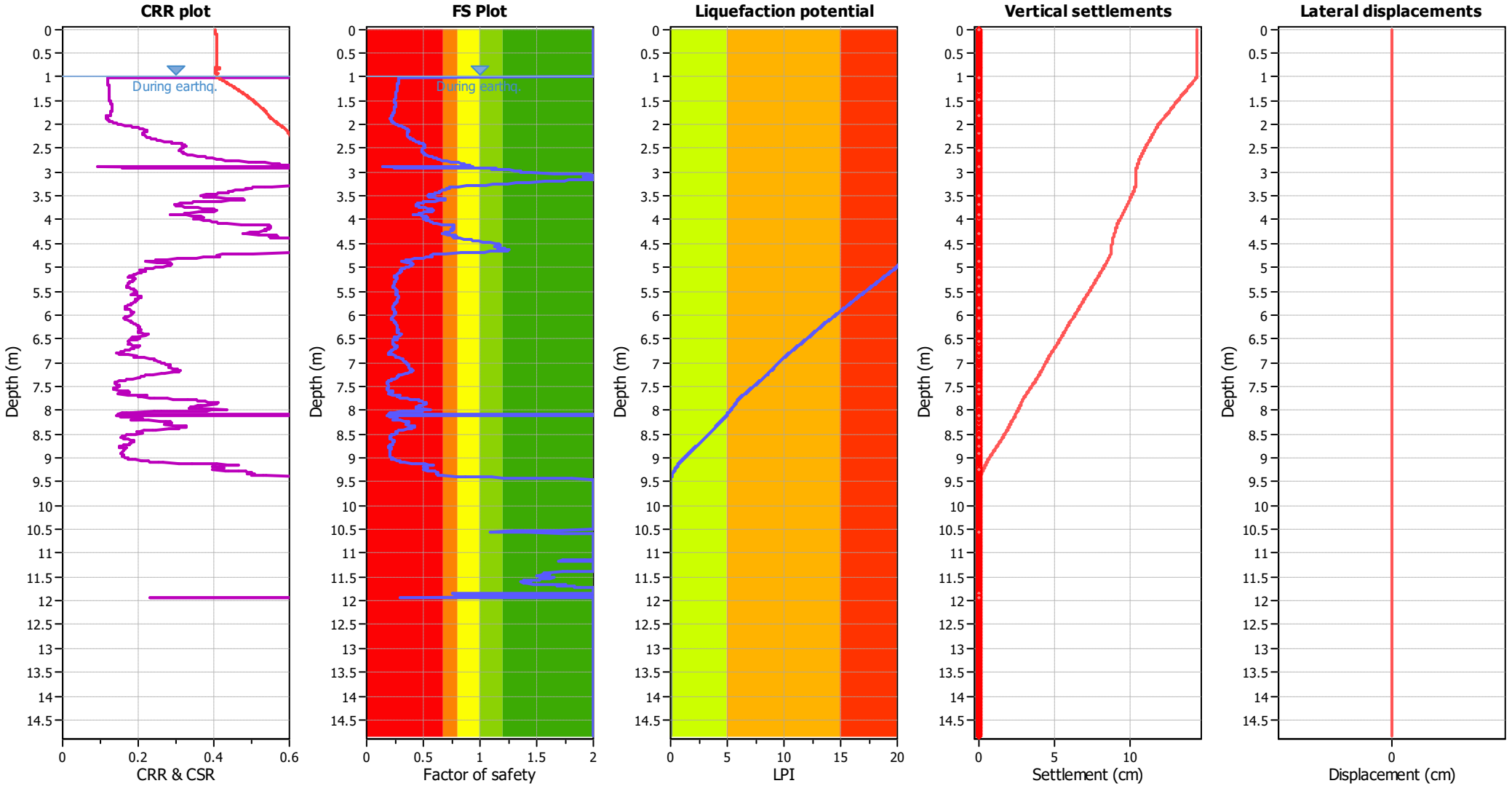
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

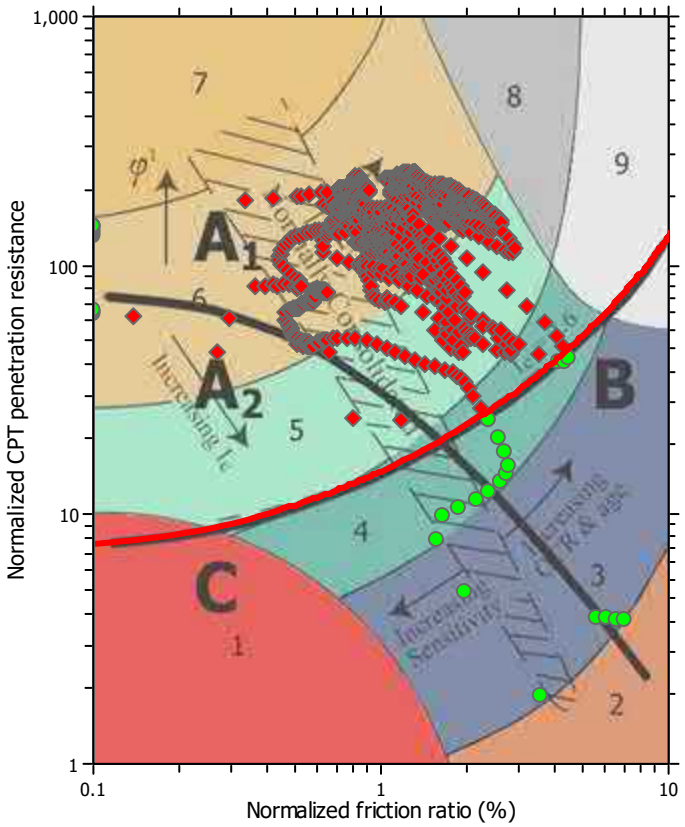
F.S. color scheme

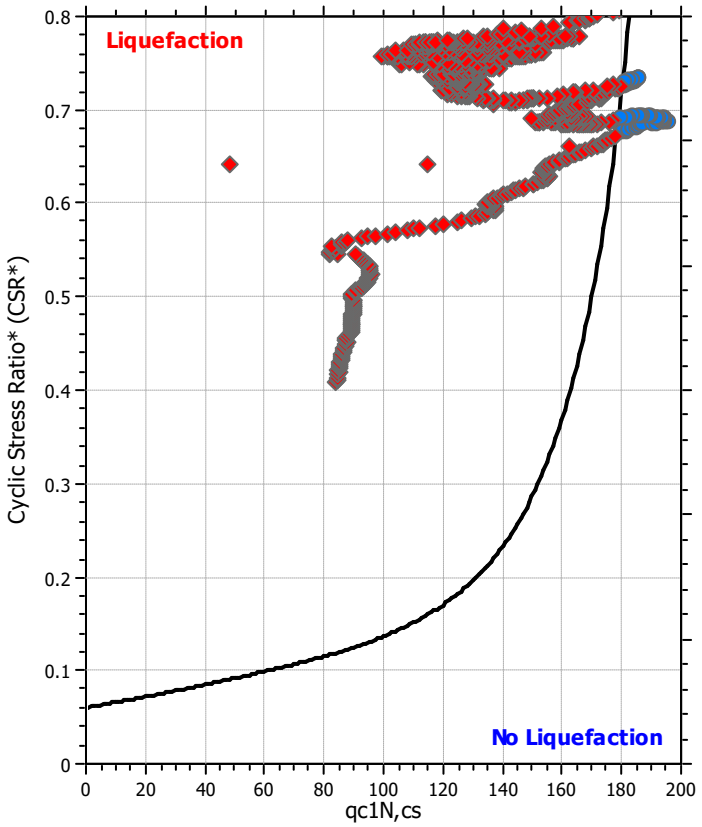
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

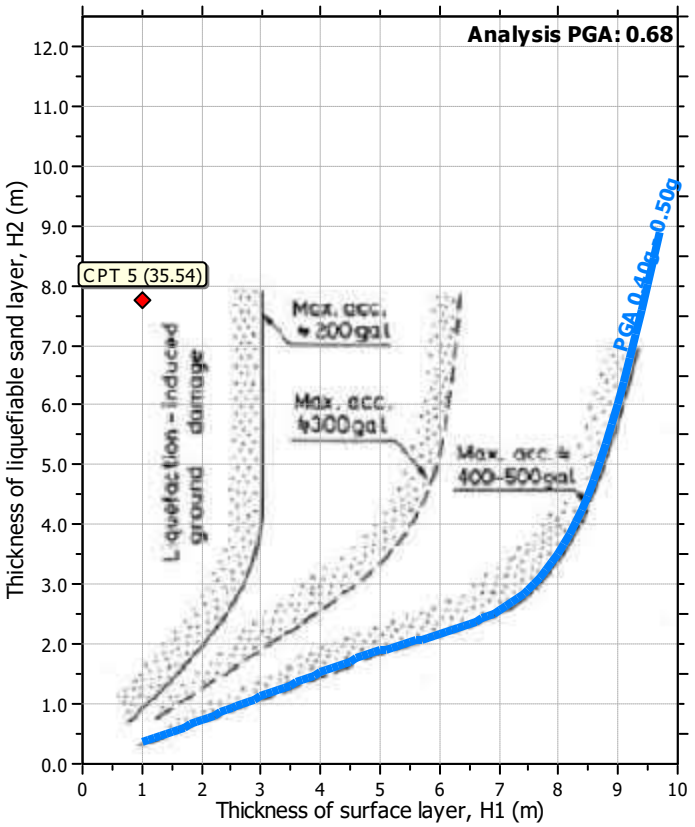
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



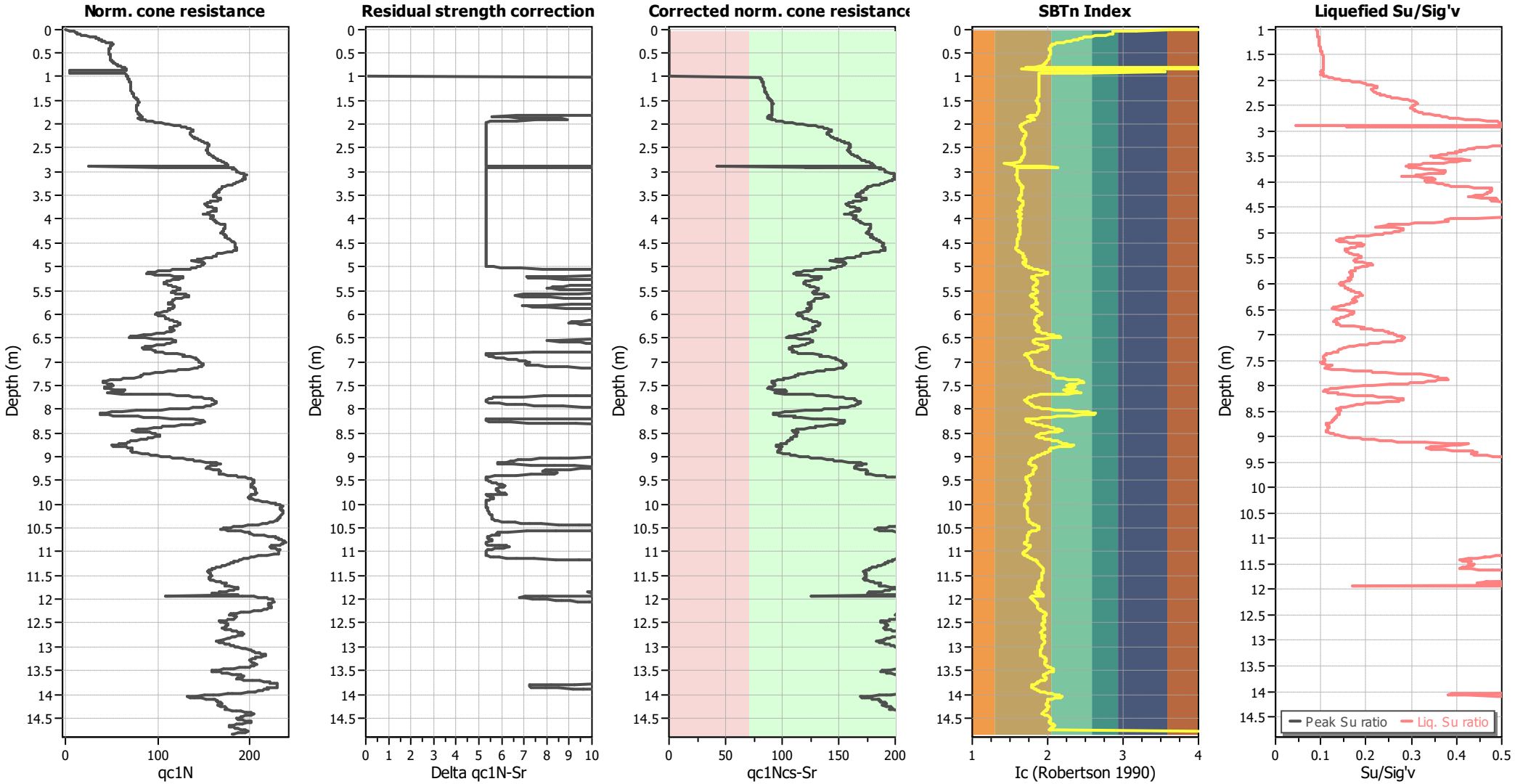




Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

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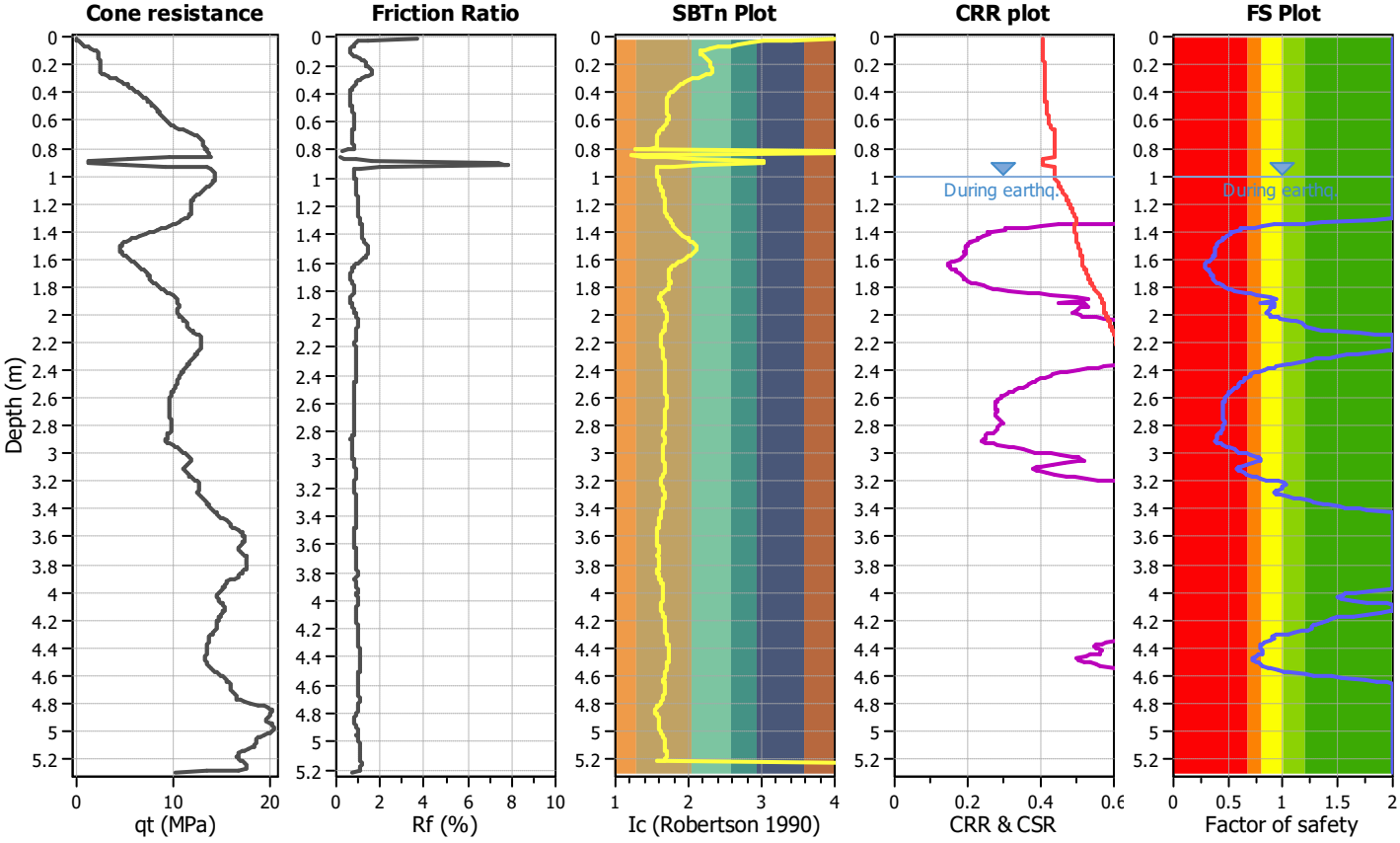
LIQUEFACTION ANALYSIS REPORT

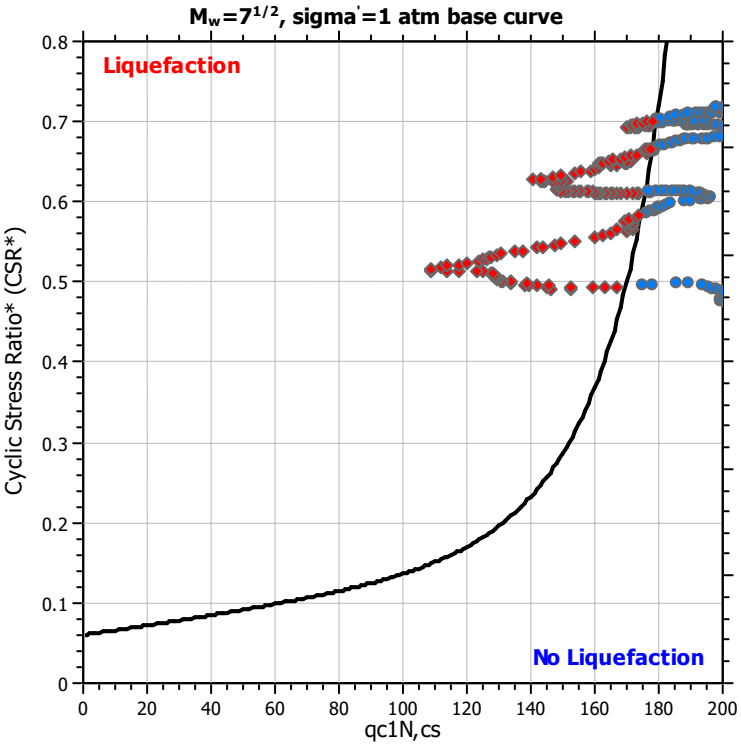
Project title : **Location :**

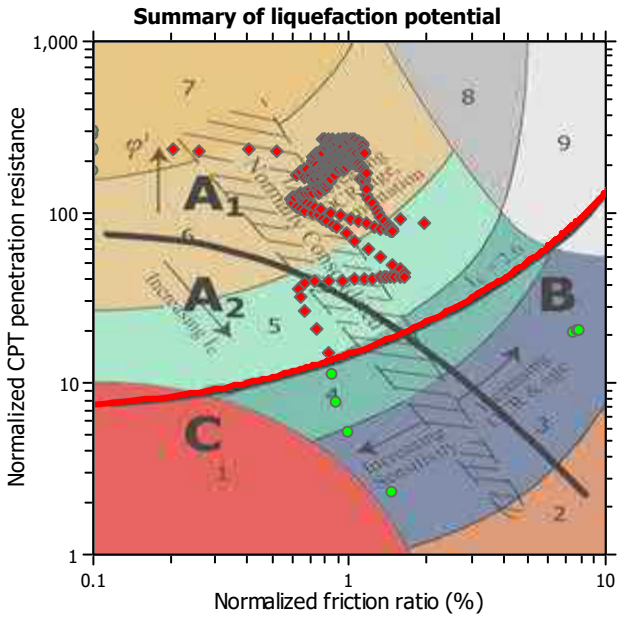
CPT file : CPT 6

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	15.00 m
Earthquake magnitude M_w:	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

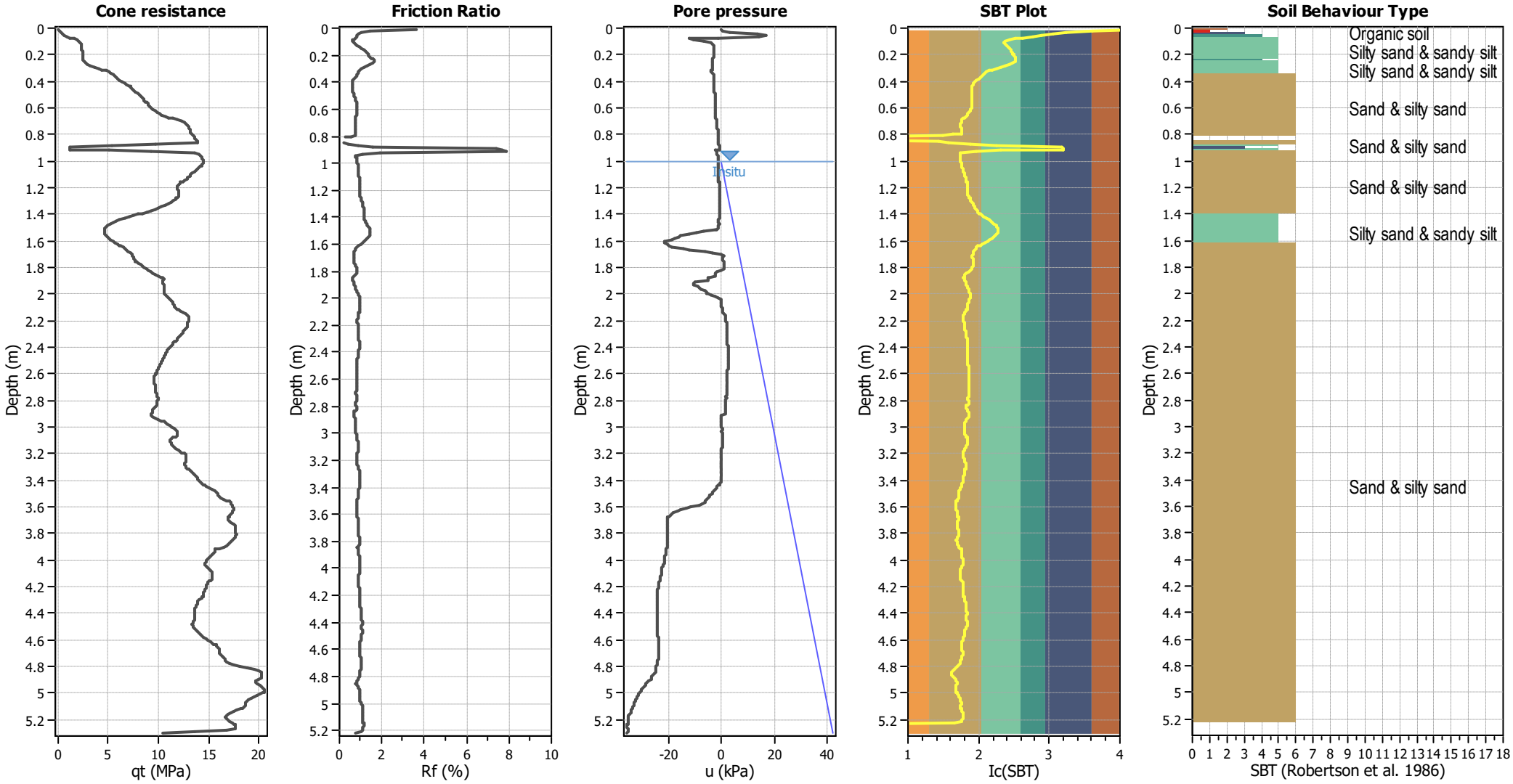






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



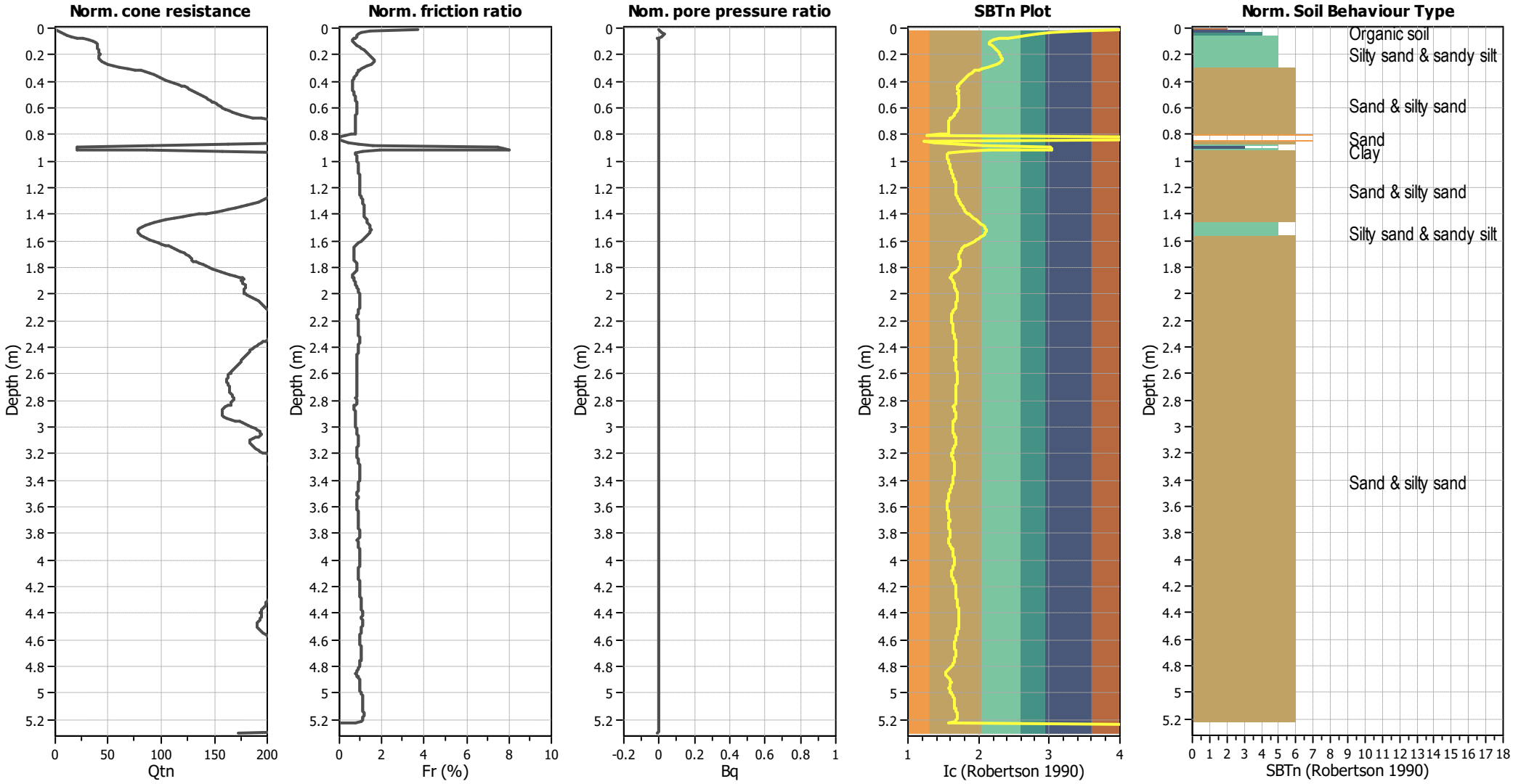
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

SBTn legend

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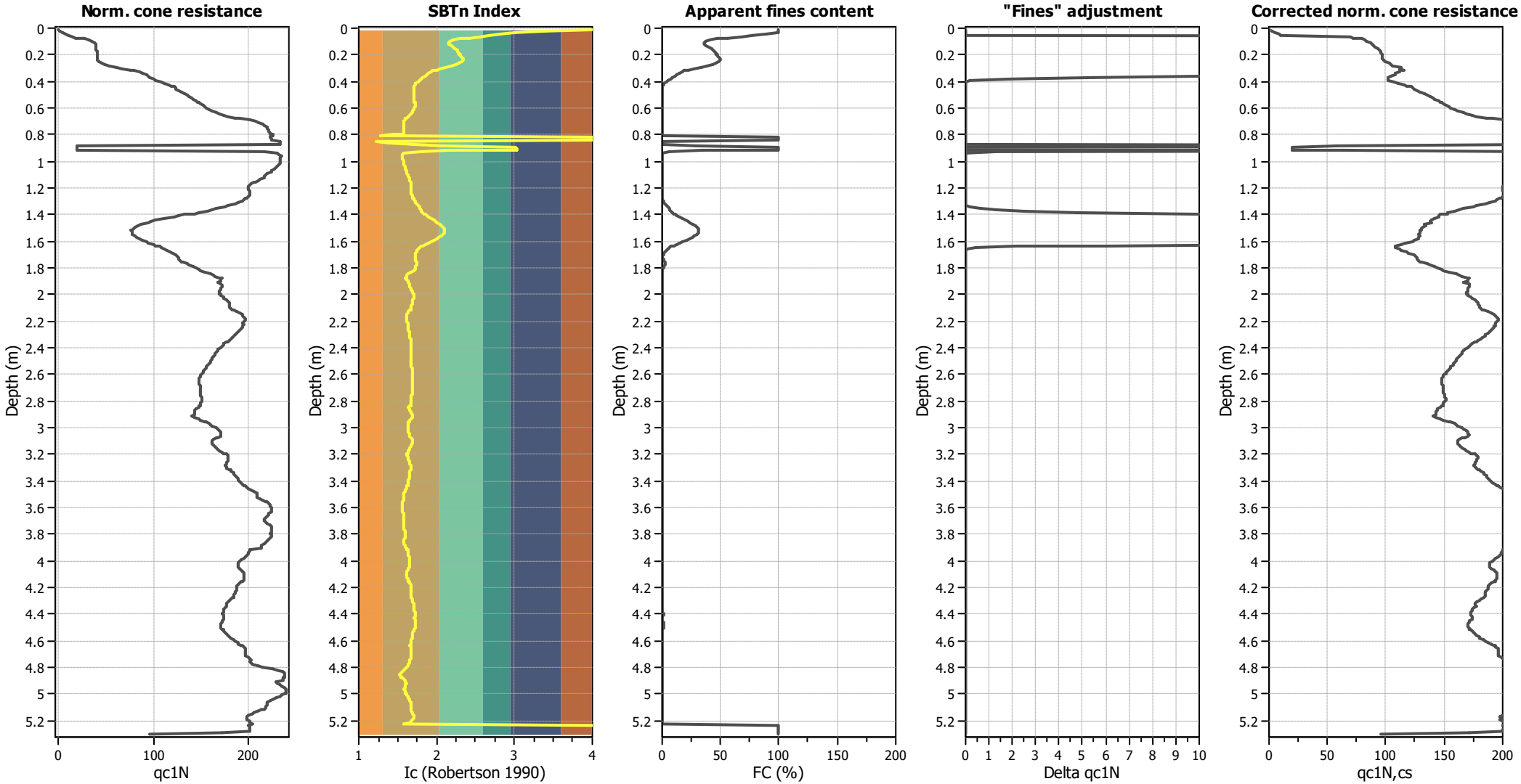
9. Very stiff fine grained

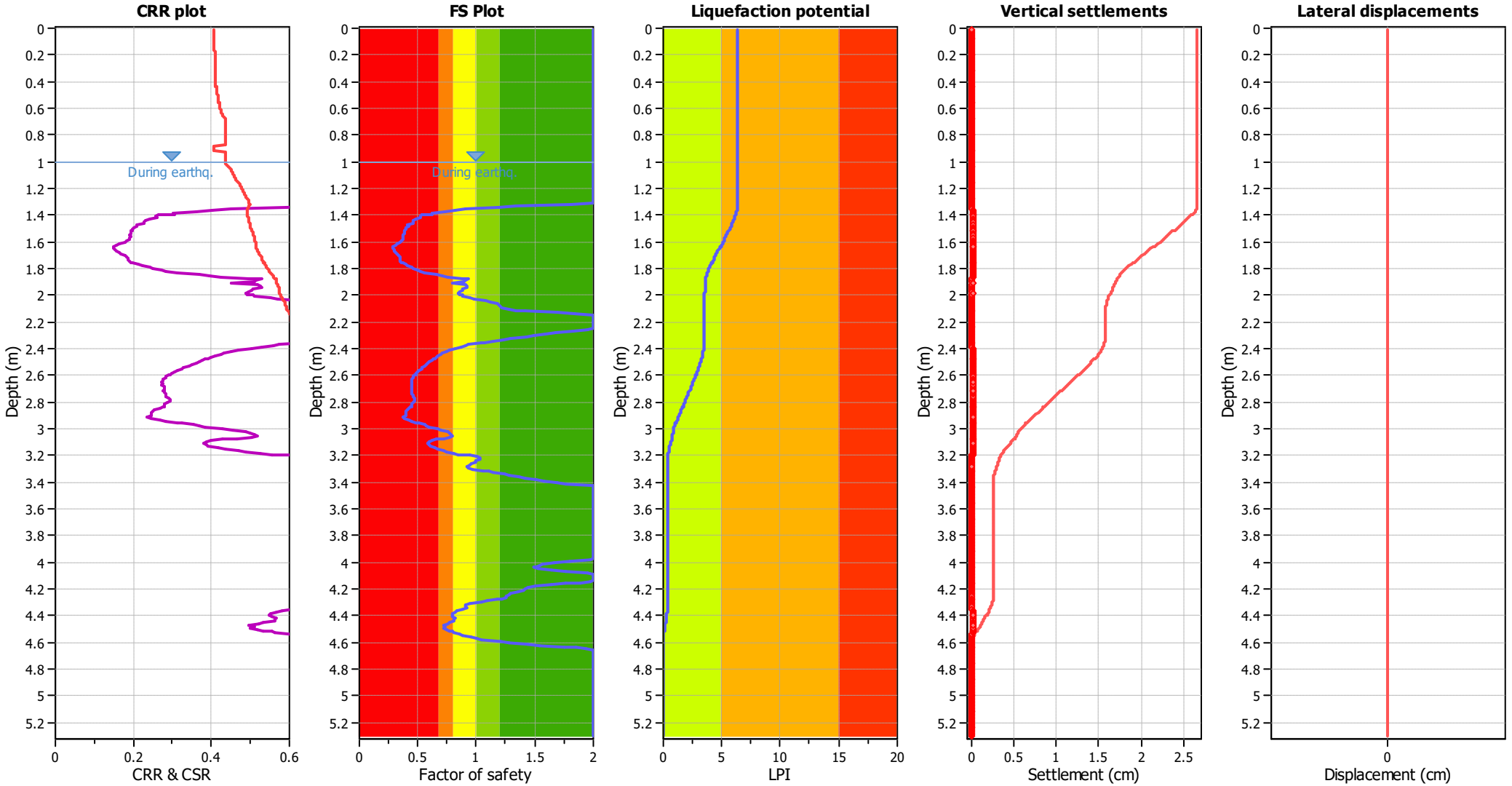
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

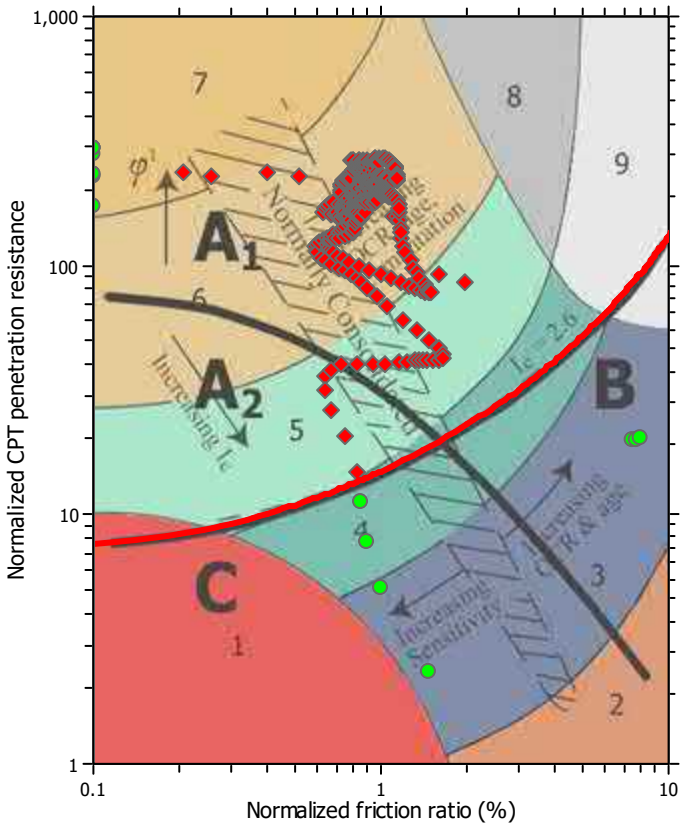
F.S. color scheme

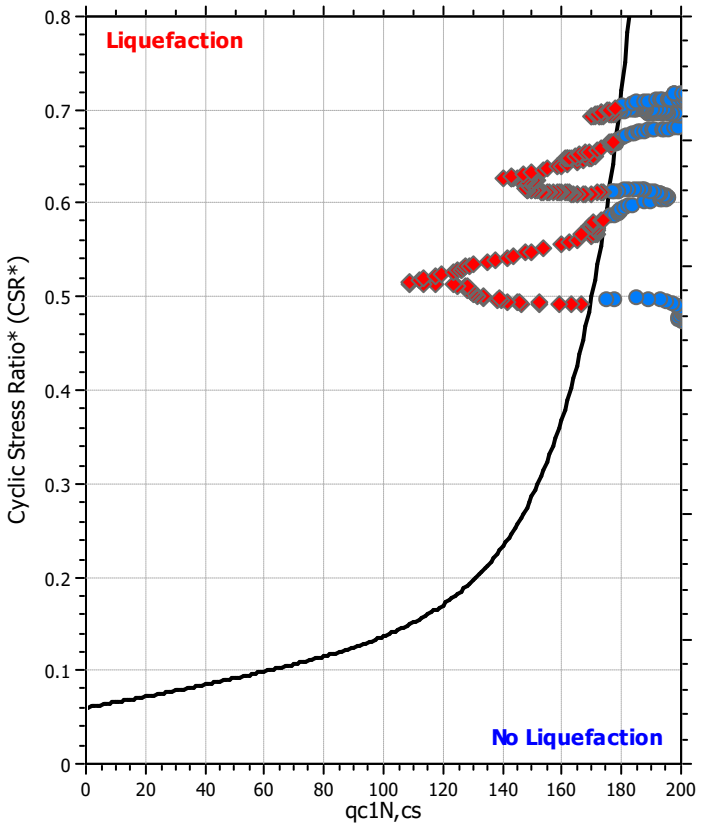
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

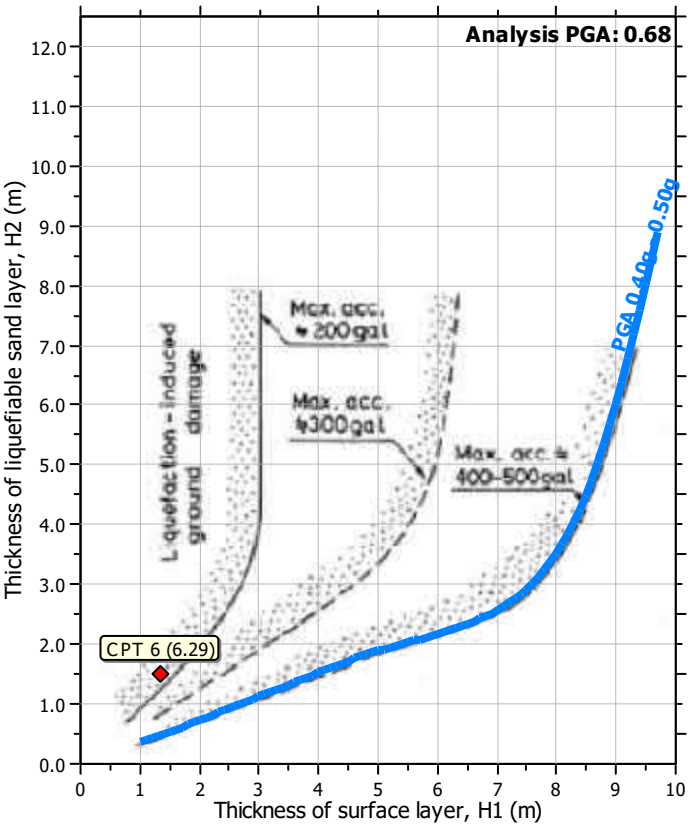
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



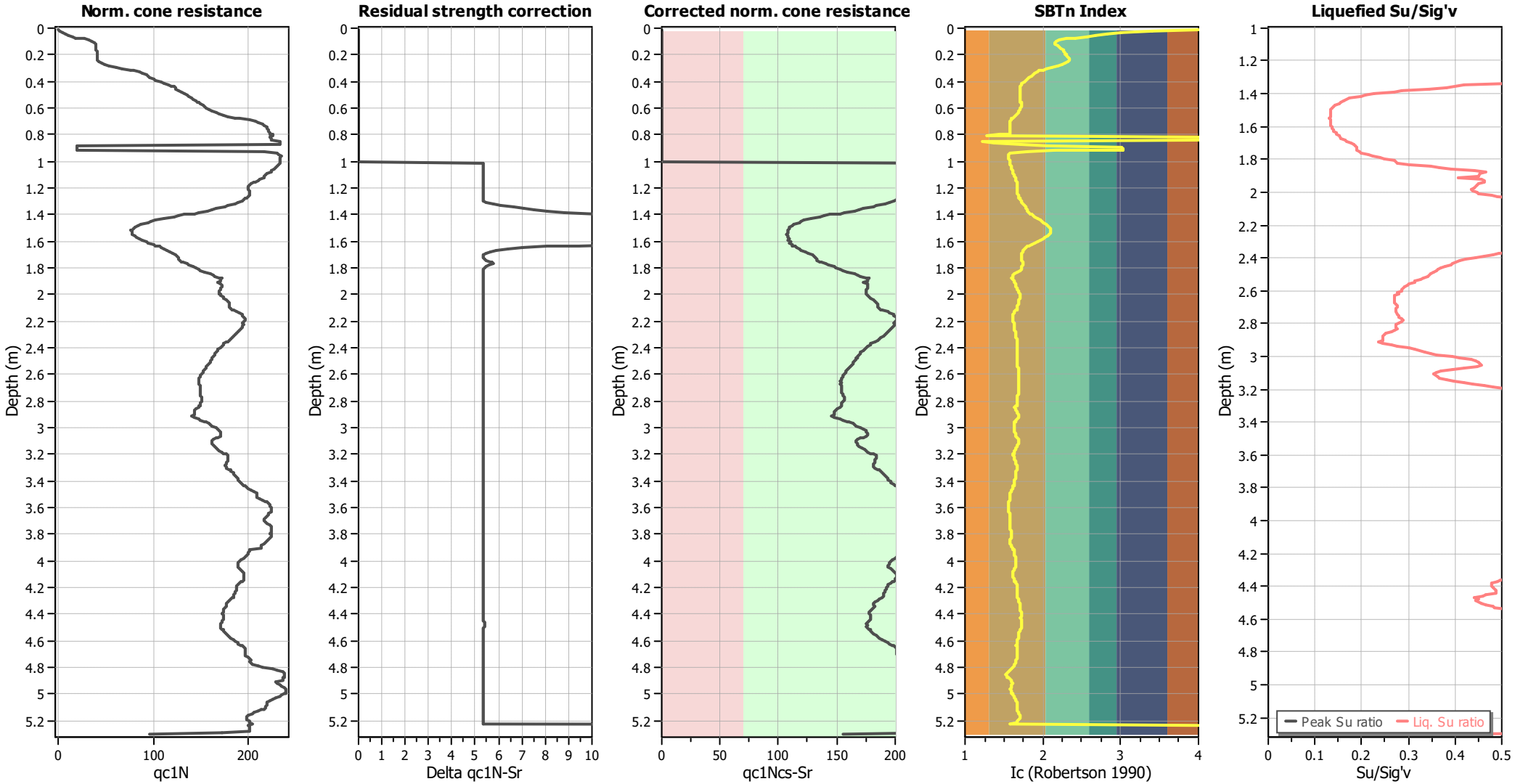




Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	15.00 m

Appendix 15
District Plan Objectives and Policies Assessment

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OBJECTIVES AND POLICIES OF THE PROPOSED DISTRICT PLAN

The relevant objectives and policies of the Proposed District Plan for this application are considered to be:

DO – District Objectives	
Objectives	**Assessment**
DO-O1 Tāngata Whenua To work in partnership with the tāngata whenua of the District in order to maintain kaitiakitanga of the District's resources and ensure that decisions affecting the natural environment in the District are made in accordance with the principles of Te Tiriti o Waitangi (Treaty of Waitangi).	Initial consultation with Te Ātiawa ki Whakarongotai is being concurrently undertaken. The applicant is working with TAKW with the preparation of a Mana Whenua Assessment. The proposal is not contrary to this objective.
DO-O3 Development Management To maintain a consolidated urban form within existing urban areas and a limited number of identified growth areas which can be efficiently serviced and integrated with existing townships, delivering: a. urban areas which maximise the efficient end use of energy and integration with infrastructure; b. a variety of living and working areas in a manner which reinforces the function and vitality of centres; c. resilient communities where development does not result in an increase in risk to life or severity of damage to property from natural hazard events; d. higher residential densities in locations that are close to centres and public open spaces, with good access to public transport; e. management of development in areas of special character or amenity so as to maintain, and where practicable, enhance those special values; f. sustainable natural processes including freshwater systems, areas characterised by the productive potential of the land, ecological integrity, identified landscapes and features, and other places of significant natural amenity; g. an adequate supply of housing and areas for business/employment to meet the needs of the District's anticipated population which is provided at a rate and in a manner that can be sustained within the finite carrying capacity of the District; and h. management of the location and effects of potentially incompatible land uses including any interface between such uses.	The development maintains a consolidated urban form by infilling within an existing urban area that is already zoned for residential purposes and surrounded by urban activities. The proposal is consistent with this objective.

DO-O5 Natural Hazards To ensure the safety and resilience of people and communities by avoiding exposure to increased levels of risk from natural hazards, while recognising the importance of natural processes and systems.	The project site is shown to be subject to a small, mapped natural flood hazard - ponding. The development will not impact on the resilience of people or the community and avoid increased exposure by ensuring the dwellings are above the flood level. The proposal is consistent with this objective.
DO-O8 Strong Communities To support a cohesive and inclusive community where people: a. have easy access and connectivity to quality and attractive public places and local social and community services and facilities; b. have increased access to locally produced food, energy and other products and resources; c. have improved health outcomes through opportunities for active living or access to health services; and d. have a strong sense of safety and security in public and private spaces.	The proposed residential development will enhance the community of Paraparaumu by providing high quality residential living with easy access to quality and attractive public places and local social and community services and facilities. Being connected to Kapiti Road, linking with the wider community, allows owners, occupiers and the public opportunities for active living and connections to public, health and community services by private vehicle or making use of the bicycle lane and bus stop located in front of the site on Kapiti Road. The development has been designed to reflect the existing character of the Paraparaumu area through modern residential design, while still creating a sense of place and safety for the occupiers of the development though clearly defining communal and private areas. The design provides improved passive surveillance in the area. The proposal is consistent with this objective.
DO-O11 Character and Amenity To maintain and enhance the unique character and amenity values of the District's distinct communities so that residents and visitors enjoy: a. relaxed, unique and distinct village identities and predominantly low-density residential areas characterised by the presence of mature vegetation, a variety of built forms, the retention of landforms and unique community identities; b. vibrant, lively town centres supported by higher density residential and mixed use areas; c. neighbourhood centres, village communities and employment areas characterised by high levels of amenity, accessibility and convenience; d. productive rural areas, characterised by openness, natural landforms, areas and corridors of indigenous vegetation, and primary production activities; and e. well managed interfaces between different types of land use areas (e.g. between living, working and rural areas and between potentially conflicting land uses, so as to minimise adverse effects.	The proposed activity is located within the Residential Zone and is of a residential size and scale consistent with the current and future trends of modern residential development in the Wellington region. The colour scheme reflects coastal character and adds to the variety of built forms in the community by providing a differing scale and typology than currently available within the immediate vicinity. The development maintains the presence of mature vegetation which is dominated by a stand of large Pohutukawa trees along the Kapiti Road frontage. The development supports existing centres by enabling a higher density residential activity within close proximity to existing town centres. The proposal is not contrary to this objective.

DO-O12 Housing Choice and Affordability To meet diverse community needs by increasing the amount of housing that: a. is of densities, locations, types, attributes, size and tenure that meets the social and economic wellbeing needs of households in suitable urban and rural locations; b. is affordable and adequate for lower income households; and c. can respond to the changing needs of residents, regardless of age, mobility, health or lifestyle preference; while enhancing the amenity of living environments and contributing to the sustainability of communities and compatibility with the goals of environmental sustainability, in particular resource, water and energy efficiency.	The proposal adds to housing choice on the Kāpiti Coast which typically comprises a single storey dwelling with an attached garage and large outdoor living space, generally on an individual section of at least 500m^2. This form of development enables varying housing form than available in the immediate vicinity but retaining a density appropriate for the Residential Zone. The proposal will be constructed to meet modern building standards which are warmer and more efficient than the type of development typically available in the area and being located in an area which is well serviced with active transport and public transport options. The proposal provides a high level of amenity by being designed with high-quality materials and providing quality outdoor living areas connected to indoor living. The proposal is not contrary to this objective.
DO-O13 Infrastructure To recognise the importance and national, regional and local benefits of infrastructure and ensure the efficient development, maintenance and operation of an adequate level of social and physical infrastructure and services throughout the District that: a. meets the needs of the community and the region; and b. builds stronger community resilience, while avoiding, remedying or mitigating adverse effects on the environment.	All required infrastructure will be provided to the proposed subdivision to meet the needs of the future owners and occupiers The proposal is consistent with this objective.
DO-O14 Access and Transport To ensure that the transport system in the District: a. integrates with land use and urban form and maximises accessibility; b. improves the efficiency of travel and maximises mode choice to enable people to act sustainably as well as improving the resilience and health of communities; c. contributes to a strong economy; d. avoids, remedies or mitigates adverse effects on land uses; e. does not have its function and operation unreasonably compromised by other activities; f. is safe, fit for purpose, cost effective and provides good connectivity for all communities; and g. provides for the integrated movement of people, goods and services.	The proposal provides sufficient and safe access to each of the proposed allotments and is suitably connected to the wider road network. Footpaths are provided throughout the proposed development offering alternative transport modes to the town centre and maintaining pedestrian access from Halsey Grove and Regent Drive to Kapiti Road. The internal access road has been designed for the integrated movement of people, goods and services. The proposed development is consistent with this objective.

UEDI – Urban and Environmental Design and Incentives	
Policies	**Assessment**
UEDI-P1 Urban Design Quality urban design outcomes will be promoted so that public and private places and spaces: 1. are liveable and safe; 2. enhance the local economy, environment and community; 3. are sustainable, enduring and resilient; 4. provide a strong sense of place reflecting cultural values and distinct community identities; 5. are enjoyable, comfortable, welcoming and provide a diversity of experiences; and 6. are easy to move around and through, by encouraging a well-connected and integrated transport network; 7. at all levels of urban design, from macro (urban structure and subdivision) to micro (building details and materials) scale.	The proposal represents quality urban design by creating spaces which are both liveable and safe. This includes providing for good visibility from the units to the internal road and external street network as well as good identification of communal and quality private spaces with good sunlight access. The proposal enhances the local economy by providing for infill development within an existing urban environment and promoting housing choice by enabling a typology of development is not common in the immediate area. The proposal will be designed with modern materials and to meet current building standards being warm and energy efficient. The site is well located provide good connections to public transport and access to wider services and destinations, good access to cycle paths on Kapiti Road, good street frontage/profile to Kapiti Road and proximity to Te Huarahi Raupo. Mature street trees along Kapiti Road provide amenity and opportunity to balance scale of new development, good outlook over airport, opportunity to create a central amenity space as a focus for the development, opportunity to create pedestrian priority and good physical and visual links to Kapiti Road, level change across the site enables some units to be raised above street level which promotes privacy and outlook. The proposal is consistent with this policy.
UEDI-P2 Safety and Crime Prevention Through Environmental Design Development, use and subdivision will be consistent with the Subdivision and Development Principles and Requirements 2012 and Crime Prevention through Environmental Design (CPTED) Guidelines to enhance safety and security of residents and visitors.	The development is considered provides for Crime Prevention through Environmental Design (CPTED) design aspects to enhance safety and security of residents and visitors by enabling passive surveillance both internally and of the existing streets. The design of the through road enables good visibility for occupants and visitors. The proposal is consistent with this policy.

UFD – Urban Growth and Development Policies	
Policies	**Assessment**
UFD-P1 Growth Management New urban development for residential activities will only be located within existing urban areas and identified growth areas, and will be undertaken in a manner which: 1. supports the District's consolidated urban form; 2. maintains the integrity of the urban edge north of Waikanae and Ōtaki; 3. manages residential densities by: a. enabling medium density housing and focused infill housing in identified precinct areas that are close to centres, public open spaces, and public transport nodes; b. retaining a predominantly low residential density in the Residential Zones; c. avoiding any significant adverse effects of subdivision and development in special character areas identified in GRZ-P3; 4. avoids urban expansion that would compromise the distinctiveness of existing settlements and unique character values in the rural environment between and around settlements; 5. can be sustained within and makes efficient use of existing capacity of public services and strategic infrastructure; and 6. promotes the efficient use of energy and water.	The development is located within existing urban areas. The proposal is consistent with this policy.
UFD-P2 Housing Choice An increased mix of housing forms and types will be encouraged within parts of the District where increased variety and densities of housing are able to cater for changing demographics, while maintaining high amenity values. This will include provision for: 1. smaller household sizes, including 1 and 2 bedroom household units; 2. housing for older persons; 3. supported living accommodation; 4. papakāinga; 5. shared and group accommodation; 6. minor flats; and 7. a range of lot sizes and land tenure arrangements to facilitate these typologies.	The proposal increases the mix of housing forms and types on the Kāpiti Coast which typically comprises a single storey dwelling with an attached garage and large outdoor living space, generally on an individual section of at least 500m2. It is considered that the proposed development provides a varying housing form including a large number of 2-bedroom household units, at a density appropriate for the Residential Zone. It has been designed with high-quality materials bringing a high level of amenity. Overall, the development will contribute to wider housing choice. They will be freehold titles, with a separate title for the car parks, and operating within a Resident's Society (like a body corporate). The proposal is well consistent with this policy.

UFD-P3 Managing Intensification Residential intensification will be managed to ensure that adverse effects on local amenity and character are avoided, remedied or mitigated, including through achievement of the following principles: 1. development will complement the existing environment in terms of retaining landforms, yard setbacks and relationship to the street and open spaces; and 2. building bulk and scale will be managed.	The higher density effects have been managed through high quality design, layout, landscaping, and materials. The development has been architecturally designed to reflect a new, modern, streetscape along Kapiti Road. Undertaking the earthworks proposed to create a flatter finished ground level lessens the building bulk over much of the development's external boundaries. Yard setbacks with neighbouring properties are compliant with the standards of the District Plan and therefore a fitting separation between existing residential properties and the subject site are maintained. The proposal is consistent with this policy.
UFD-P4 Residential Density The density of subdivision and development will be managed through an area-specific approach to achieve an appropriate range of housing types across the District, as set out below: 1. the highest densities, including apartments as part of mixed use developments, will be located within and in immediate proximity to centres; 2. medium density housing will be limited to specific precinct areas within walking distance of centres; 3. focused infill will be encouraged in specific areas where there is good access to shops and services; 4. within the Neighbourhood Development Areas identified in the Ngārara Development Area Structure Plan in Appendix 7, the provision of affordable housing will be encouraged at appropriate locations with good access to shops and services; 5. traditional low density residential subdivision will be allowed within the general residential area; 6. overall existing low densities will be maintained in special character areas identified in GRZ-P3; 7. especially low densities will be applied in Low Density Housing Precinct areas (identified on the District Plan Maps) as transitions between rural and urban environments); and 8. in areas where infrastructure constraints exist (such as water, wastewater or roading), densities will reflect those constraints.	The subject site is not located within the medium density housing, focused infill, or low-density housing precinct, nor is it within a neighbourhood development area. However, is located within proximity to the Parparaumu Industrial Zone and Airport Zone, which includes facilities such as New World, Mitre 10, Our Lady of Kāpiti School and a medical centre. No infrastructure constraints have been identified that would either be exacerbated by the proposed development. The proposed development generally aligns with this policy.
UFD-P7 Accessibility Subdivision, land use and development will be undertaken in a manner which enables all urban residences to have access to public open space within a	The proposal includes the creation of open space with ownership and maintenance responsibility shared between the dwelling owners. Supplementary public open space is located approximately 530m to the

distance of 400 metres.	north on Regent Drive. The proposed development generally aligns with this policy.
UFD-P8 Parks and New Development 1. New publicly accessible local parks which are of a size, shape and location that meet the open space and recreational needs of the Community will be provided within new subdivisions; and 2. New parks or upgrades to parks will be provided for to accommodate open space and recreational demand created by infill housing.	The open space area provided as part of this residential development is for owners/occupants use only and has not been designed to carter for the needs of the wider Paraparaumu community.
UFD-P11 Amenity Values 1. New subdivision, land use and development within reserves and areas of significant scenic, ecological, cultural, scientific and national importance will provide for the amenity values of these areas, including (but not limited to) values associated with: a. a sense of openness and visual relief from more intensive urban areas; b. indigenous vegetation (excluding planted vegetation); c. significant landforms; and d. natural character. 2. New subdivision, use and development of land outside of the areas identified in (1.) above will be undertaken in a manner that does not compromise the amenity values of those areas.	The application property is not within, or in close proximity to, any reserves or areas of significant scenic, ecological, cultural, scientific and national importance. The proposed development will have no effect on any of those features or areas, The proposal is therefore considered to be consistent with this policy.
INF-GEN – Infrastructure, Services and Associated Resource Use	
Policies	**Assessment**
INF-GEN-P7 – Infrastructure and Growth Management Subdivision, use and development of land for urban growth and intensification will be focused on certain areas (i.e. in existing urban areas). Subdivision, use and development will be avoided in areas where it: 1. is unable to be efficiently integrated with existing infrastructure, or be serviced by new infrastructure in an efficient and cost-effective manner; 2. does not promote the efficient end use of energy, including energy use associated with private vehicular transport, and efficient use of water; 3. does not align with Council's infrastructure asset management planning; 4. would lead to inefficient or unduly high operation and maintenance costs for public infrastructure;	The development is within an existing urban area. 1. The subject site is able to be efficiently serviced by existing infrastructure including three waters, electricity, telecommunications and transportation. It is close to existing transport routes, retail activities and commercial activities (e.g. medical services). In terms of water and wastewater the development can be appropriately integrated with the reticulated network in Halsey Grove and Kapiti Road. Being accessed via a right of way, the development has been designed with a suitable vehicle access point to ensure the safe and efficient movement of vehicles, with a dedicated pedestrian access through the centre of the

5. is unable to make the most efficient use of the transport network; and 6. would lead to further growth pressures and demand for infrastructure investment ahead of the community's or infrastructure provider's ability to fund, or its desired funding programme.	site. 2. The development makes efficient use of energy by incorporating modern building materials and standards which provide warm, safe and energy efficient housing. The water fixtures will be designed to reduce water use meeting a minimum 3 WELS rating and the private open spaces will be artificial grass which do not require watering. The subject site is located in close proximity to public transport routes and a bicycle lane is located on Kapiti Road reducing car dependence. 3. There are no asset management plans relevant to this subject site. 4. The proposal will not lead to the inefficient operation or maintenance costs for public infrastructure. 5. The proposal will make efficient use of the existing transport network with direct connections to Hasley Grove and pedestrian connection to Kapiti Road. 6. It is undetermined as to whether the development will lead to growth pressures. However, the development will provide for financial and reserve contributions to aid in Council's ability to fund future upgrades. The proposal is consistent with this policy.
INF-GEN – Infrastructure, Services and Associated Resource Use	
Policies	**Assessment**
INF-MENU-P17 – Hydraulic Neutrality – Stormwater Subdivision and development will be designed to ensure that the stormwater runoff from all new impermeable surfaces will be disposed of or stored on-site and released at a rate that does not exceed the peak stormwater runoff when compared to the pre-development situation.	The development has been designed to be hydraulically neutral using soakage crates. It is not proposed to use Council's reticulated infrastructure. It is considered that the development is consistent with this policy.

INF-MENU-P18 – Stormwater Quantity and Quality The adverse effects of stormwater runoff from subdivision and development, in particular cumulative effects, will be minimised. The following assessment criteria will be applied when considering resource consent applications for subdivision and development: 1. whether there is capacity of in Council's existing infrastructure; 2. the extent to which the capacity and environmental values of watercourses or drains and the associated catchment areas will be compromised; 3. the extent to which development styles and stormwater management methods mimic natural, pre-development runoff patterns; 4. the extent to which riparian vegetation is protected and enhanced; 5. whether minimal vegetation loss in riparian areas associated with development is achieved; 6. the extent to which water quality is ensured to enhance and maintain aquatic ecosystem health; 7. the extent to which a healthy aquatic system is maintained, including maintenance of sufficient flows and avoidance of unnatural fluctuations in flows; 8. the extent to which degraded, piped or channelled streams are restored and realigned into a more natural pattern; 9. where practicable, the extent to which low impact design, including on-site disposal of stormwater, soft engineering or bioengineering solutions and swales within the legal road are used; 10. the extent to which straightening and piping of streams is avoided.; and 11. the extent to which the adverse effects of stormwater runoff, in particular cumulative effects, from subdivision and development will be minimised.	The proposal is designed to be hydraulically neutral, using soakage crates. It is not proposed to use Council's reticulated infrastructure. A Construction Environmental Management Plan has been prepared to protect neighbouring properties and mitigate any sediment discharge from the proposed earthworks. The proposal is not contrary to this policy.
INF-MENU-P19 – Water Demand Management New residential development connected to the public potable water supply and reticulation network will be required to provide rainwater storage tanks, water re-use systems or other water demand management systems to supply water for toilets and all outdoor non-potable uses.	As discussed in Section 4.2 of this application, the proposal will not incorporate the use of rainwater storage tanks or water re-use systems for each individual residential unit. Instead, it will rely on the use of water meters for each unit to encourage low water use and a number of water saving appliances and connections in the internal design of the dwelling including meeting a minimum 3 WELS rating and use of artificial turf that does not require watering. The proposal is generally aligning with this policy.

INF-MENU-P20 – Water Supply All new subdivision, land use or development will have an adequate supply of water in terms of volume and quality for the anticipated end uses, including fire fighting supply. Where a new connection to the reticulated network is proposed, evidence may be required to support its viability.	The proposal will have adequate water supply, connecting to Council's reticulated network within Halsey Grove and Kapiti Road. The proposal is consistent with this policy.
INF-MENU-P21 – Wastewater Subdivision, land use and development will ensure that the treatment and disposal of wastewater will be adequate for the anticipated end uses appropriate to the location. The treatment and disposal of wastewater will be undertaken in a manner that avoids, remedies or mitigates adverse effects on the environment and maintains public health and safety. Where a new connection to the reticulated network is proposed, evidence may be required to support its viability.	The development will be connected to Council's reticulated wastewater network within Halsey Grove for the disposal of wastewater. The proposal is consistent with this policy.
TR – Transport	
Policies	**Assessment**
TR-P1 Integrated Transport and Urban Form Development and subdivision will be integrated with and consistent with the transport network hierarchy in TR-Table 7, and undertaken in a manner and at a rate to ensure: 1. the transport network is capable of serving the projected demand safely and efficiently; 2. the location of development is appropriate, including providing for the co-location of compatible developments and land use and transport networks to reduce unnecessary travel; 3. travel time and distance to services are minimised for all modes of travel; 4. development is consistent with Council's Subdivision and Development Principles and Requirements 2012; and **5.** enhanced community connectivity is achieved, resulting in more efficient travel patterns from the community.	Parking is provided for each residential unit, with one car space per residential unit. While the overall number of carparks does not allow for two per unit, the applicant's traffic engineer considers that the proposal achieves a satisfactory level of parking for this type of development. Access to the parking will be via a new private road from Halsey Grove. The proposed car parks will achieve compliance with Council's Subdivision and Development Principles and Requirements 2012 and provide adequate on-site parking as set out in the assessment of effects in section 4.2 above. Halsey Grove, Regent Drive, Cedar Drive and the surrounding road network will be able to accommodate the additional traffic demand arising from the proposal. Cycle parks are not specifically provided as part of the development, however there is sufficient space internally or in the rear yards for personal storage by the occupiers of each townhouse. Given the location of the development to public transport routes and local retail, it is considered that alternative options of transport are readily available reducing the demand on private car usage.

	The traffic assessment demonstrates the immediate surrounding road network is capable of accommodating additional vehicles without compromising the function or safety of the network. The proposed parking is consistent with this policy.
TR-P2 Sustainable Transport and Maximising Mode Choice Development and subdivision will be integrated with a transport system that offers a wide range of travel mode choices, which connects residents to essential community services, centres and social infrastructure, through: 1. well-integrated and connected communities; 2. development that is conducive to active modes of travel, particularly walkable communities which reduce demand for vehicular travel, particularly by private vehicle; 3. land use that is integrated with the transport network; 4. improved public transport services to the District; 5. travel plans and transport assessments for major traffic activities as part of an application for consent for new developments; 6. consistency with the Council's Subdivision and Development Principles and Requirements 2012; and **7.** development that ensures adequate access and space for all modes, including pedestrians, people with mobility problems, cyclists, public transport and private car travel.	Within the Paraparaumu area there are a variety of transport routes, public, private, and active. The proposed residential development is in proximity to local road networks including the M2PP Expressway approximately 4min drive to the east, public transport routes with bus stops along Kapiti Road and the Paraparaumu train station on the eastern side of Coastlands, and public walking/cycling pathways. As part of the proposal, a two-way loop road is proposed to cater for private vehicle usage along with a number of walkways connecting Halsey Grove through to Kapiti Road. It is considered that the overall design suitably integrates the existing transport networks. No changes are proposed to the existing public transport services. As the proposed development will be classed as a major traffic activity, a transport assessment has been provided by the applicant's traffic engineer and a copy of this is attached at Appendix 13. The proposal is consistent with this policy.
TR-P5 Effects of Land use on Transport The potential adverse effects on the transport network from development and subdivision will be avoided, remedied or mitigated by identifying both the key existing transport routes and proposed transport routes likely to be required long term as part of the District's transport network and having regard to these when considering applications for subdivision or development.	The existing road network can accommodate the proposed development without generating efficiency or safety issues (as confirmed in the transport assessment at Appendix 8 to this application). The proposal is therefore considered to be consistent with this policy.
TR-P7 Cycling, Walking and Bridleway Links and Safety Subdivision, use and development will be as far as practicable, located and designed to make walking, cycling and the use of bridleways safer, more enjoyable and convenient in accordance with the Crime Prevention Through Environmental Design (CPTED) Guidelines set out in Appendix 6 and the following principles:	As already detailed, the principles of the CPTED guidelines have been provided for in the development layout, including in the design and layout of internal movement pathways for vehicles and pedestrians and in the ability for passive surveillance of public and shared spaces. The proposal is consistent with this policy.

1. new street linkages will provide safe pedestrian access to shops and services and public transport nodes; 2. subdivision and development will: a. enable cycle and pedestrian routes, both on and off road, which offer good continuity; b. avoid large blocks that severe connectivity; and c. consider opportunities to provide bridleways in suitable locations; and 3. development will provide for convenient cycle parking facilities in centres; and 4. pedestrian and cycle routes will have well designed and built facilities including surface conditions, lighting, signage and passive surveillance from adjacent development.	
TR-PARK – Parking	
Policies	**Assessment**
TR-PARK-P8 – Parking All new subdivision and development shall provide for safe vehicular and pedestrian access and appropriate vehicle parking areas by: 1. providing parking numbers, layouts and dimensions consistent with parking standards; 2. supplying adequate off street parking to meet the demand of the land use while having regard to the following factors: a. the intensity, duration location and management of the activity. b. the adequacy of parking in the location and adjacent areas. c. the classification and use of the road (as per transport network hierarchy in TR-Table 7), and the speed restrictions that apply. d. the nature of the subject site, in particular its capacity to accommodate parking. e. the characteristics of the previous activity that utilised the subject site; 3. taking effects on neighbouring areas into account when designing the location, layout and number of parking spaces (including car and cycle parks and disability car parks; 4. ensuring the location, layout and number of disability carparks and cycle parks is safe, user-friendly and appropriate; and **5.** achieving a balance between encouraging mitigation of parking overflow effects (e.g. shared use of car parking), and discouraging car-based travel through use of travel plans.	Parking is provided for each residential unit, with one car space per residential unit. While the overall number of carparks does not allow for two per unit, the applicant's traffic engineer considers that the proposal achieves a satisfactory level of parking for this type of development. The proposed car parks will achieve compliance with Council's Subdivision and Development Principles and Requirements 2012 and provide adequate on-site parking as set out in the assessment of effects in section 4.2 above. Halsey Grove, Regent Drive, Cedar Drive, and the surrounding road network will be able to accommodate the additional traffic demand arising from the proposal. Cycle parks are not specifically provided as part of the development, however there is sufficient space internally or in the rear yards for personal storage by the occupiers of each townhouse. Given the location of the development to public transport routes and local retail, it is considered that alternative options of transport are readily available reducing the demand on private car usage. The proposed parking is considered consistent with this policy.

NH – Natural Hazards	
Policies	**Assessment**
NH-FLOOD-P10 Flood and Erosion Free Building Areas All new allotments must have flood and erosion-free building (excluding minor buildings) areas based on 1% AEP flood modelling.	All proposed residential units will be designed and constructed so they are free of flood and erosion risk based on the 1% AEP flood modelling. The proposal is consistent with this policy.
NH-FLOOD-P13 Ponding, Residual Ponding, Shallow Surface Flow, Flood Storage and Fill Control Areas When assessing applications for subdivision, use or development within a ponding, residual ponding, shallow surface flow, flood storage or fill control area, consider the following: 1. the effects of the development on existing flood mitigation structures; 2. the effects of the development on the flood hazard – in particular flood levels and flow; 3. whether the development redirects floodwater onto adjoining sites or other parts of the floodplain; 4. whether access to the subject site will adversely affect the flood hazard; 5. the extent to which buildings (excluding minor buildings) can be located on areas of the site not subject to flooding; and 6. whether any subdivision or development will or may result in damage to property or harm to people.	The site is not within a river corridor, stream corridor, overflow path or residual overflow path area. Part of the site is within a ponding flood hazard area. The communal open space will provide for an adequate area for "compensatory" ponding area for the fill earthworks to be undertaken in the mapped area. Ponding will not be redirected onto adjoining properties and access to the proposed will not adversely affect the flood hazard. The proposal is not contrary to this policy.
NH-EQ17 – Liquefaction Prone Land When assessing applications for subdivisions which are located on sandy, alluvial or peat soils, a risk management approach shall be adopted and Council will consider a range of matters that seek to reduce the risk to people and property, including: 1. geotechnical information from a suitably qualified person on liquefaction provided with any subdivision or development application; 2. the intensity of the subdivision and nature of future development of the allotment, including building design and construction techniques; and 3. the risk to people and property posed by the liquefaction hazard and the extent to which the activity could increase the risk posed by the natural hazard. These investigations may result in identifying that some allotments are not suitable for development and any such proposal would be declined.	A geotechnical assessment of the subject sites has been undertaken, with the result showing that the property has a low risk of liquefaction and suitable for development. It is considered that the proposed subdivision is consistent with this policy.

SUB-RES – Subdivision in Residential Zones	
Policies	**Assessment**
SUB-RES-P1 General Residential Subdivision Subdivision, including for small-scale infill, will be provided for in general residential areas where it does not compromise local character and amenity.	The proposed development includes residential subdivision to create 139 additional residential units. As the subdivision will occur around existing buildings, the subdivision itself has no effects on local character and amenity. Overall, the proposal is consistent with this policy.
CE – Coastal Environment	
Policies	**Assessment**
CE-P3 – Preservation of Natural Character Preserve natural character in the coastal environment, and protect it from inappropriate subdivision, use and development, including by: 1. avoiding adverse effects of activities on natural character in areas of outstanding natural character; 2. avoiding significant adverse effects, and avoiding, remedying or mitigating other adverse effects of activities on natural character in all other areas of the coastal environment; 3. reinstating dunes which function as natural buffers where practicable; 4. providing managed public access ways to the beach and foreshore and limiting damage to dunes from unmanaged access; 5. regulating encroachment of permanent structures and private uses onto the beach or public land; 6. removing existing unnecessary structures and associated waste materials from the beach; and 7. retaining a natural beach and foreshore including a dry sand beach where practicable.	The proposal is geared towards remedying any adverse effects from natural and human induced effects within the coastal environment. It is acknowledged that the subject sites are located within the coastal environment, however the development will be consistent with the surrounding built development on relatively flat land. It is our opinion that the existing dune does not act as a natural buffer. Public access is proposed and is currently not a feature of the subject site. The subject sites and proposed works will not be within proximity to the beach. Overall, the proposal is consistent with this policy.

EW – Earthworks	
Policies	**Assessment**
EW-P1 – Earthworks Earthworks activities excluding extractive industries, the removal and replacement of underground storage tanks, and earthworks defined in and regulated by the NESPF will: 1. be managed to protect geological features identified in Schedule 6 from disturbance; and 2. be sympathetically located and of a scale that protects the values of outstanding natural features and landscapes identified in Schedule 4; and 3. avoid or mitigate erosion and off-site silt and sediment runoff to the Council's reticulated stormwater system and waterbodies; and 4. be managed to ensure adverse effects on natural landforms, residential amenity values and rural character values are remedied or mitigated. This policy does not apply to extractive industries, the removal and replacement of underground storage tanks, and earthworks defined in and regulated by the NESPF.	Earthworks will be managed to protect any potential waahi tapu and archaeological values and will ensure that coastal environment effects (such as erosion) are minimised. Mitigation will be in place to ensure silt and sediment do not enter Council's reticulated stormwater system. More generally, the earthworks will facilitate the occupation of the land in an apt matter that is considered practical, efficient and appropriate for the site. The subject sites do not contain features identified in Schedules 4 or 6. The proposal is consistent with this policy.

NOISE – Noise	
Policies	**Assessment**
NOISE-P2 – Noise Sensitive Activities Community health and welfare will be maintained and enhanced through appropriate noise limits and through avoiding or managing the location of noise sensitive activities close to land zoned, designated or used for noisy activities.	Household units are considered a noise sensitive activity under the District Plan. The subject site is located within the Airport Outer Control Area. Each of the residential units will be provided with suitable building materials to minimise noise from neighbouring activities. The proposal is not contrary to these policies.
NOISE-P4 – Noise from the Transport Network All noise sensitive activities in close proximity to a transportation noise effect route or the designated rail corridor must be protected by the building owner from adverse effects of noise through the adoption of acoustic mitigation measures.	

GRZ – General Residential Zone	
Policies	**Assessment**
GRZ-P1 – Medium Density Housing Medium density housing will be provided for in precinct areas identified on the District Plan Maps, which are in close proximity (i.e. approximately five minutes walk or 400m) to centres, open spaces, public transport networks and where existing infrastructure has sufficient capacity. Medium density housing developments will be designed and developed in a manner which: 1. is of a suitable and compatible location, height, density, scale, and bulk relative to the context, adjacent land uses, streets and reserves; 2. ensures high quality, high-amenity living conditions in comprehensive and coordinated medium density housing developments, including appropriate private outdoor living areas and landscaping which meet the on-site outdoor amenity needs of residents; 3. is consistent with the principles in the Medium Density Housing Design Guide in Appendix 2. The Design Guide will be used as an assessment tool for applications to establish new medium density housing or to modify lawfully established medium density housing; and 4. maintains amenity values of, and is sympathetic to, adjacent residential buildings and areas, and avoids excessive building dominance, including through building height and mass, materials and finishing.	The proposed development, although not within an identified medium density housing precinct, will fit well with the medium density housing provisions in Policy GRZ-P1. In summary (and as detailed in the Urban Design Assessment at Appendix 12 to this application): • the subject site is of a suitable location for this residential development, and while it isn't compatible with existing residences, has been designed to be sensitive along external boundaries. • comprises high quality, living conditions in a comprehensive way with suitable private outdoor living areas and landscaping. • is consistent with the principles in the Medium Density Housing Design Guide in Appendix 2. • the built form proposed is larger in bulk and scale than that currently provided elsewhere in the residential areas of Kāpiti, however it is considered the subject site can accommodate the level of built form proposed and will achieve the housing outcomes currently being supported at both central and local government levels. The proposal is generally consistent with this policy.
GRZ-P9 – Residential Activities (excluding visitor accommodation other than temporary residential rental accommodation) Residential activities will be recognised and provided for as the principal use in the Residential Zones, while ensuring that the effects of subdivision, use and development is in accordance with the following principles: 1. adverse effects on natural systems will be avoided, remedied or mitigated; 2. new built development will relate to local built identity, character values and the density of the surrounding residential environment; 3. transport choice and efficiency will be maximised; 4. housing types which meet the need of households will be provided for;	The proposal will provide residential units within the Residential Zone. Adverse effects on natural systems will be mitigated. The proposal is supported by an urban design assessment and landscape and visual effects assessment on the built form and housing types provided. As per central and local government directives, the number of residential units utilise a finite land resource to its maximum. Being located along Kapiti Road, the development has several transport choices through public, private and active methods. The proposal represents a change in typology typically in the area, and thereby provides for housing choice to meet the needs of the

5. the number of residential units per allotment will be limited; and 6. a limited number of accessory buildings and buildings which are ancillary to residential activities will be provided for.	community. No accessory buildings are proposed. Therefore, the proposal is consistent with this policy.
GRZ-P10 – Residential Amenity Subdivision, use and development in the Residential Zones will be required to achieve a high level of on-site amenity for residents and neighbours in accordance with the following principles: 1. building size and footprint will be proportional to the size of the allotment; 2. usable and easily accessible private outdoor living spaces will be provided; 3. buildings and structures will be designed and located to maximise sunlight access, privacy and amenity for the site and adjoining allotments; 4. buildings and structures will be designed and located to minimise visual impact and to ensure they are of a scale which is consistent with the area's urban form; 5. appropriate separation distances will be maintained between buildings; 6. yards will be provided to achieve appropriate building setbacks from neighbouring areas, the street and the coast; 7. hard and impermeable surfaces will be offset by permeable areas on individual allotments; 8. unreasonable and excessive noise, odour, smoke, dust, light, glare and vibration will be avoided; 9. non-residential buildings will be of a form and scale which is compatible with the surrounding residential environment; and 10. service areas for non-residential activities will be screened, and planting and landscaping will be provided.	In terms of effects on the residential amenity, the building size is considered proportionate to the allotment size at the completion of the subdivision. Whilst the outdoor living areas are easily accessible from internal living areas and a useable space, they are not designed with high levels of on-site amenity. There is limited to no soft landscaping and the outdoor area is primarily artificial turf. They are oriented to ensure adequate solar access to internal and external living areas. The buildings will retain the predominant form being no more than two storeys in height, however, are not of an overall scale that is consistent with the area's urban form. They comprise blocks of dwellings, up to ten, compared to the surrounding urban form of typically one dwelling per allotment of at least 500m^2. Yards are provided to the District Plan requirements, however for directly adjoining neighbours is considered not far enough to reduce the level of bulk and dominance experienced. The dwellings are considered sufficiently setback to avoid dominance on the roads, and their associated footpaths. Noise, odour, and dust will be controlled during the construction phase by implementing the control measures in the Construction Environmental Management Plan. The completed residential activity has been designed to minimise light spill and does not contain any outdoor surfacing that would result in dust arising at the boundary. Additional noise from cumulative outdoor living areas is considered plausible on the directly adjoining neighbours. However, due to the restricted outdoor living space, any gatherings held by future occupants are considered naturally restricted in volume. Based on this assessment, I consider the proposal is not contrary with this policy.

GRZ-P11 – Residential Streetscape Development, use and subdivision will enhance the amenity, functionality and safety of the streetscape in the Residential Zones. To achieve a positive relationship between development and the street, development will be undertaken in accordance with the Council's Streetscape Strategy and Guideline: 1. on-site vehicle parking will be provided to reduce demand for on-street vehicle parking; 2. minimum distance will be maintained between vehicle access ways, and where practicable, the sharing of vehicle access ways will be encouraged; 3. direct pedestrian access will be provided from the street to the front entrance of the primary residential building, where practicable; 4. where practicable, at least one habitable room will be orientated towards the street; 5. the safety of road users, including pedestrians and cyclists, will not be adversely affected; and 6. on-site vehicle manoeuvring will be provided for rear allotments, allotments with significant sloping driveways and on strategic arterial routes.	In terms of effects on the street frontage, the following is taken from the Urban Design Assessment: *Kapiti Road is the primary address for this development and it responds by actively fronting the street with front doors, habitable room windows and interesting facades. Units are located close to the street boundary with narrow front yards. The landscaping, additional footpath, and wide rear berm with existing Pohutukawa trees provides the transition from the carriageway/moving cars to units. Side light windows at front doors provide some visual connection/surveillance of Kapiti Road while maintaining internal privacy for units. Surveillance/outlook over Kapiti road is provided by large bedroom windows at first floor level. Outdoor areas for Kapiti Road units is provided at the rear, away from the busy road and airport.* *Landscaping along the Kapiti Road frontage softens the buildings at ground level, provides visual interest and opportunity for residents to personalise their units. There is a small level change along this frontage, with minor cut along the boundary (less than 500mm).* *The modulation of the facade and roof forms along Kapiti Road provide a visually interesting streetscape, with each unit clearly expressed and providing significant glazed areas. Where new side elevations adjoin* *Kapiti Road (Units 1 and 78), these units have windows in these elevations and additional landscaping. Privacy fencing for the outdoor areas of Units 1 and 78 is set back, preventing any high fencing along the property boundary.* *The development will provide new and striking "infill" along the Kapiti Road frontage, responding to Te Huarahi Raupo and the overall variety of this long road.* Based on this assessment, it is considered the proposal will create a positive street frontage and will result in a less than minor adverse effect on the streetscape of Kapiti Road. On-site vehicle parking and manoeuvring is provided, reducing the on-street demand. We therefore consider the proposal is consistent with this policy.

GRZ-P12 – Landscaping Landscaping will be required for non-residential activities and intensive residential development in the Residential Zones to enhance residential amenity, while promoting water conservation and biodiversity and allowing for the natural infiltration of surface waters through permeable treatments. Landscaping will be located and designed in accordance with the following principles: 1. the visual impact of large buildings will be reduced by appropriate screening and planting; 2. service areas, loading areas and outdoor storage areas will be screened; 3. on-site outdoor living spaces will be defined and enhanced by landscaping; 4. sunlight access and passive surveillance to adjoining areas will not be unreasonably restricted; 5. public infrastructure and services will not be damaged or blocked; 6. planting of locally indigenous vegetation will be encouraged; and 7. permeable surfaces will be provided for the natural infiltration of surface waters.	Landscaping will be provided for the proposal residential development in the Residential Zone to enhance residential amenity for future occupants and the wider environment. Planting will be provided internally around the site to soften the building blocks. All waste collection points will be suitably screened by timber fencing. Timber fencing is also being used to define private outdoor spaces, including service areas. All planting proposed are native species. Passive surveillance is provided along existing and proposed roadways and footpaths. Public infrastructure will be utilised for the development and any damage caused during construction will be mitigated by the applicant. Permeable surfaces are provided in limited areas throughout the entire development. The proposal is not contrary to this policy.