Ground Improvement Case Histories: Enhancing the Geo Engineering Field

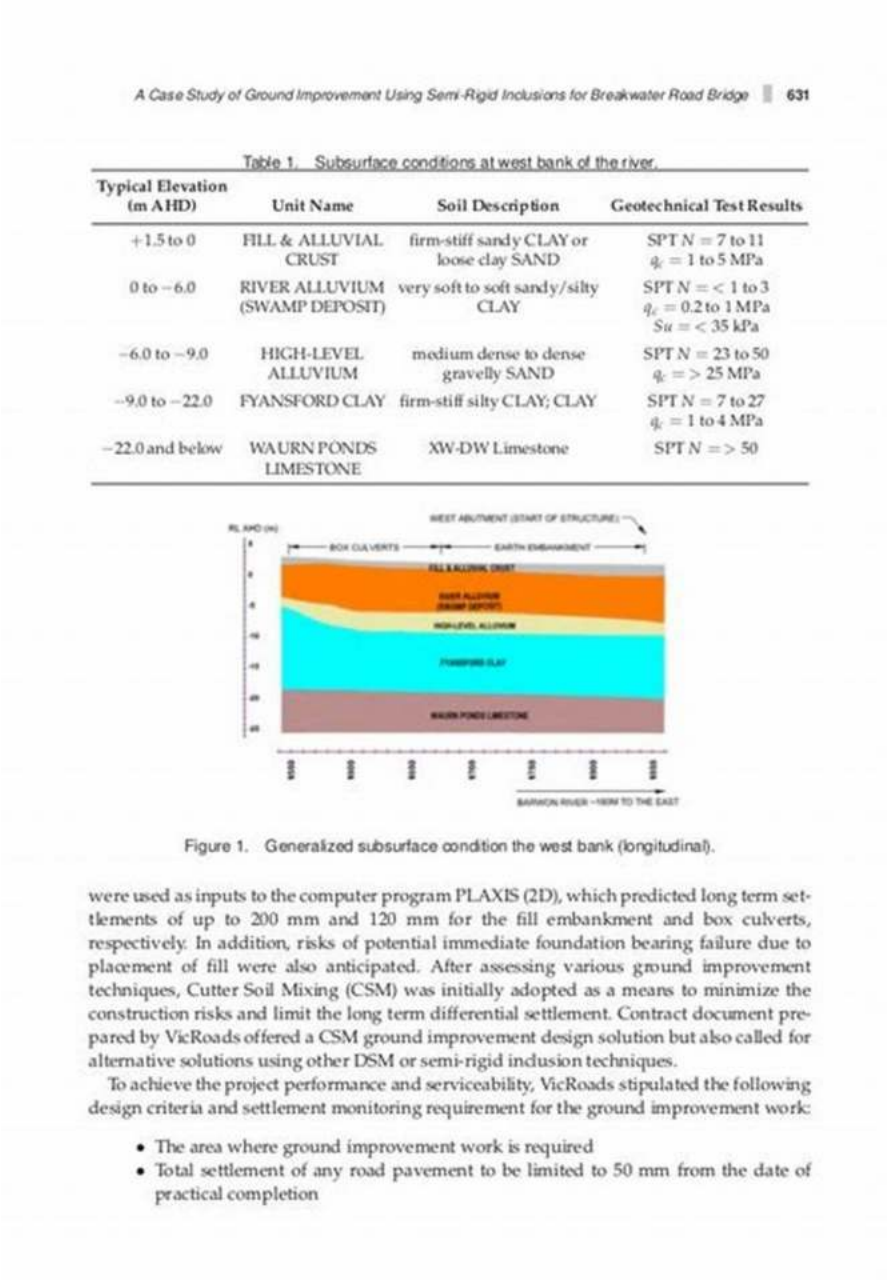


Table 1. Subsurface conditions at west bank of the river.

Typical Elevation (m AHD)	Unit Name	Soil Description	Geotechnical Test Results
+1.5 to 0	FILL & ALLUVIAL CRUST	firm-stiff sandy CLAY or loose clay SAND	SPT N = 7 to 11 q_c = 1 to 5 MPa
0 to −6.0	RIVER ALLUVIUM (SWAMP DEPOSIT)	very soft to soft sandy/silty CLAY	SPT N = < 1 to 3 q_c = 0.2 to 1 MPa Su = < 35 kPa
−6.0 to −9.0	HIGH-LEVEL ALLUVIUM	medium dense to dense gravelly SAND	SPT N = 23 to 50 q_c = > 25 MPa
−9.0 to −22.0	FYANSFORD CLAY	firm-stiff silty CLAY; CLAY	SPT N = 7 to 27 q_c = 1 to 4 MPa
−22.0 and below	WAURN PONDS LIMESTONE	XW-DW Limestone	SPT N = > 50

Figure 1. Generalized subsurface condition the west bank (longitudinal).

were used as inputs to the computer program PLAXIS (2D), which predicted long term settlements of up to 200 mm and 120 mm for the fill embankment and box culverts, respectively. In addition, risks of potential immediate foundation bearing failure due to placement of fill were also anticipated. After assessing various ground improvement techniques, Cutter Soil Mixing (CSM) was initially adopted as a means to minimize the construction risks and limit the long term differential settlement. Contract document prepared by VicRoads offered a CSM ground improvement design solution but also called for alternative solutions using other DSM or semi-rigid inclusion techniques.

To achieve the project performance and serviceability, VicRoads stipulated the following design criteria and settlement monitoring requirement for the ground improvement work:

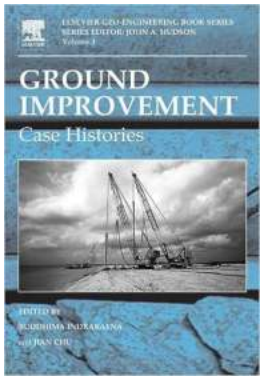
- The area where ground improvement work is required
- Total settlement of any road pavement to be limited to 50 mm from the date of practical completion

In the field of geotechnical engineering, ground improvement techniques play a crucial role in ensuring the stability and safety of various structures. These techniques are designed to enhance the properties of soil and create a favorable ground condition for construction projects. Elsevier is at the forefront of advancing

the geo engineering field through a wide range of case histories that showcase successful ground improvement projects across the globe.

What is Ground Improvement?

Ground improvement can be defined as the method of enhancing and modifying the properties of soil or rock to overcome any challenges posed by weak or unsuitable ground conditions. This is achieved through the application of various techniques that aim to increase the load-bearing capacity, reduce settlement, improve drainage, control seepage, stabilize slopes, and mitigate liquefaction potential.



Ground Improvement: Case Histories (Elsevier Geo-Engineering Book Book 3)

by Matt Jones (Kindle Edition)

4.2 out of 5

Language	: English
File size	: 26551 KB
Text-to-Speech	: Enabled
Screen Reader	: Supported
Word Wise	: Enabled
Print length	: 608 pages

Why are Case Histories Important?

Case histories serve as valuable resources for engineers, researchers, and contractors in the geo engineering field. They provide insights into real-world projects, sharing experiences and lessons learned. These case studies help professionals understand the effectiveness of different ground improvement

techniques in various geological conditions, and inform decision-making processes for future projects.

Elsevier has compiled a vast collection of ground improvement case histories, documenting success stories from around the world. These case studies cover a wide range of applications, including soft ground improvement, deep soil mixing, stone columns, grouting, soil stabilization, and more.

Successful Ground Improvement Case Histories

1. **Taihape River Bridge, New Zealand:** This case study focuses on the ground improvement techniques adopted for the construction of a new bridge over the Taihape River. The engineering team faced significant challenges due to soft soil conditions and the presence of a weak layer. The successful implementation of effective ground improvement methods enabled the construction of a stable and durable bridge structure.

2. **Dublin Port Tunnel, Ireland:** The Dublin Port Tunnel case history highlights ground improvement techniques used in a challenging urban environment. The engineering team encountered complex geology, including mixed ground conditions of clay, sand, gravel, and rock. By incorporating a combination of jet grouting, soil mixing, and ground freezing, they successfully completed the tunneling project while mitigating risks associated with ground instability.

3. **Kansai International Airport, Japan:** This case study explores ground improvement techniques applied during the construction of one of Japan's busiest airports. The site was subjected to weak, compressible soils and the potential risk of liquefaction during earthquakes. Various ground improvement methods, such as prefabricated vertical drains with surcharge loading, were employed to

enhance the soil's strength and reduce settlement, ensuring long-term stability of the airport facilities.

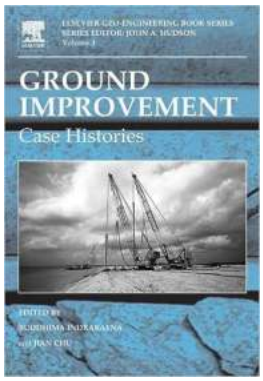
Benefits and Future Trends

Ground improvement techniques have proven to be crucial in optimizing the design, construction, and long-term performance of civil engineering projects. By improving the ground conditions, these techniques reduce the risks associated with settlement, differential settlement, and soil liquefaction. They also enable cost-effective solutions by avoiding the need for excessive soil excavation or the construction of deep foundations.

The future of ground improvement lies in continued research and development, aiming to enhance existing techniques and develop new approaches. Elsevier's constant efforts in publishing groundbreaking research, case histories, and technical articles contribute to the advancement of the geo engineering field, allowing professionals to stay updated with the latest insights and innovations.

Ground improvement case histories are an invaluable resource for the geo engineering community, providing a wealth of knowledge and guidance derived from real-world projects. Elsevier's extensive collection of case studies showcases successful ground improvement techniques applied globally, serving as a valuable reference for professionals involved in geotechnical engineering projects.

By continually sharing these case histories and staying informed of the latest trends and research, engineers, researchers, and contractors can enhance their understanding of ground improvement techniques and contribute to safer, efficient, and sustainable construction practices.



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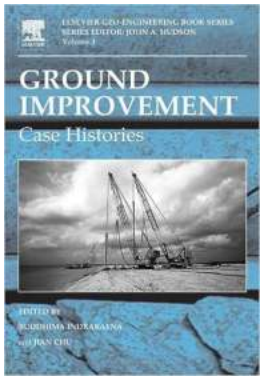
- The first book of its kind, providing over thirty real-life case studies of ground improvement projects selected by the worlds top experts in ground improvement from around the globe.
- Volume 3 of the highly regarded Elsevier Geo-engineering book series coordinated by the Series Editor: Professor John A Hudson FREng.
- An extremely reader friendly chapter format.
- Discusses wider economical and environmental issues facing scientists in the ground improvement.

Ground improvement has been both a science and art, with significant developments observed through ancient history. From the use of straw as blended infill with soils for additional strength during the ancient Roman civilizations, and the use of elephants for compaction of earth dams during the early Asian civilizations, the concepts of reinforced earth with geosynthetics, use of electrokinetics and thermal modifications of soils have come a long way. The

use of large and stiff stone columns and subsequent sand drains in the past has now been replaced by quicker to install and more effective prefabricated vertical drains, which have also eliminated the need for more expensive soil improvement methods.

The early selection and application of the most appropriate ground improvement techniques can improve considerably not only the design and performance of foundations and earth structures, including embankments, cut slopes, roads, railways and tailings dams, but also result in their cost-effectiveness. Ground improvement works have become increasingly challenging when more and more problematic soils and marginal land have to be utilized for infrastructure development.

This edited compilation contains a collection of Chapters from invited experts in various areas of ground improvement, who have illustrated the basic concepts and the applications of different ground improvement techniques using real projects that they have been involved in. The case histories from many countries ranging from Asia, America, Australia and Europe are addressed.



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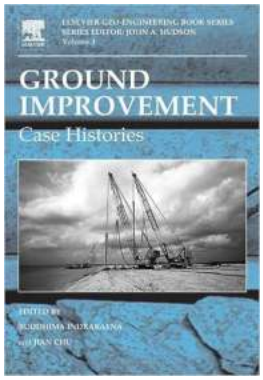

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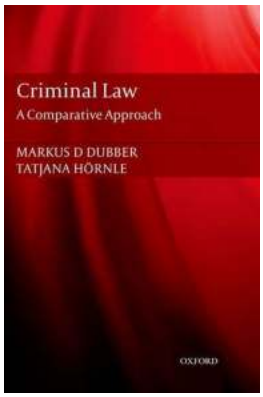

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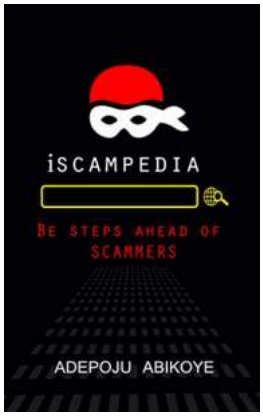

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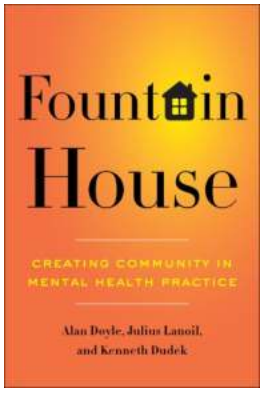

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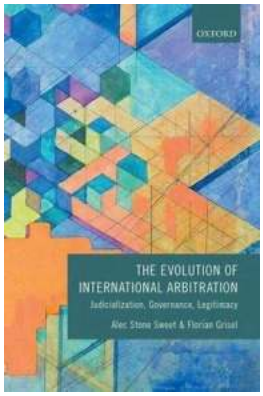

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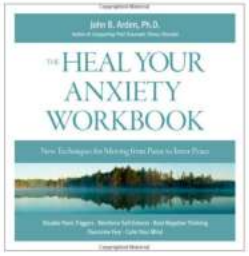

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