

BIM Implementation and Management Processes in Public Tenders – A Subway Project in İstanbul



Emay International Engineering and Consultancy Inc.

PRESENTATION MAP

- ► **EMAY** International Engineering and Consultancy Inc.
- ► Istanbul Metropolitan Municipality (**IMM**)
- ► Istanbul Rail System
 - IMM Metro Projects
 - BIM Integration Process
- ► Kabataş–Mecidiyeköy–Mahmutbey Metro Line (**KMM**)
 - Project Management Portal - **PMP**
- ► BIM Methodologies Used in KMM
 - Pre-Construction Phase
 - Construction Phase
 - Post-Construction Phase
- ► Experienced Difficulties
- ► Conclusion
- ► Comparison



A. Sinan ALEMDAR

Deputy General Manager
Head of PMCM Group

Description Of Duties (Ongoing Projects)

- General Manager of Consultancy Works
- Director of 'Ataköy – İkitelli Metro' Project
- Director of 'Mecidiyekoy - Mahmutbey Metro' Project



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Work Experience

- Emay International Engineering and Consultancy Inc. 1998 - Ongoing
- General Directorate of Highways, 17th Division Directorate 1994 – 1998

Education

- Istanbul Technical University, Civil Engineering (MSc) 1992 – 1996
- Istanbul Technical University, Civil Engineering (BSc) 1988 – 1992

Main Areas Of Expertise

- Project Management
- Railway Project
- Bridge Design
- Bridge/Geotechnical
- Tunnel Design



FIELDS OF ACTIVITIES AND SERVICES



Services

- ► Project Management
- ► Feasibility Study
- ► Architectural and Engineering Design /Geodetic Studies
- ► Transportation/Traffic Planning and Design
- ► Due diligence, Inspection, Analysis and Evaluation





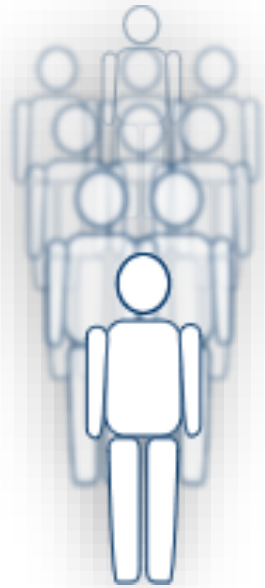
TRANSPORTATION SYSTEMS INVESTMENT



IN LAST 11 YEARS, Istanbul Metropolitan
Municipality SPENT

10,3 BILLION €

2016 ISTANBUL TRANSPORTATION DATA



15

MILLION
POPULATION



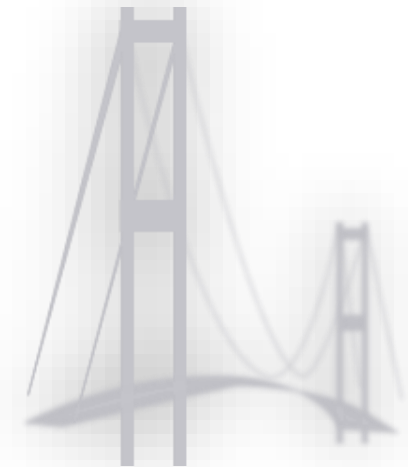
30

MILLION
DAILY TRIPS



520

NEW VEHICLES
ADDED TO
TRAFFIC/DAY



1.7

MILLION TRIPS
BETWEEN TWO
CONTINENTS

2016 ISTANBUL TRANSPORTATION DATA



3.62

MILLION
REGISTERED
VEHICLES



2.46

MILLION
VEHICLES IN
TRAFFIC/DAY



30.000

KM
TOTAL ROAD
NETWORK



45

MINUTES
AVERAGE TRAVEL
TIME /DAY



168

CAR OWNERSHIP
/ 1000 PERSON

Daily travelers and personal vehicles cause traffic congestion largely on highways

COMPARISON OF METROPOLITANS

İSTANBUL

Rail System Length:
145,00 km

of Bus: 6.317

of Taxi: 17.395

Population: 14.657.434

of Car Per 1000
Person: 168

LONDON

Rail System Length:
402,00 km

of Bus: 8.500

of Taxi: 21.500

Population: 13,880,000

of Car Per 1000
Person: 591

NEW YORK

Rail System Length:
369,00 km

of Bus: 4.373

of Taxi: 13.437

Population: 8.491.079

of Car Per 1000
Person: 444

PARIS

Rail System Length:
386,00 km

of Bus: 4.490

of Taxi: 14.900

Population: 12,400,000

of Car Per 1000
Person: 560

POP. (x100,000)/ KM

1,2

1

0,8

0,6

0,4

0,2

0

İSTANBUL

LONDON

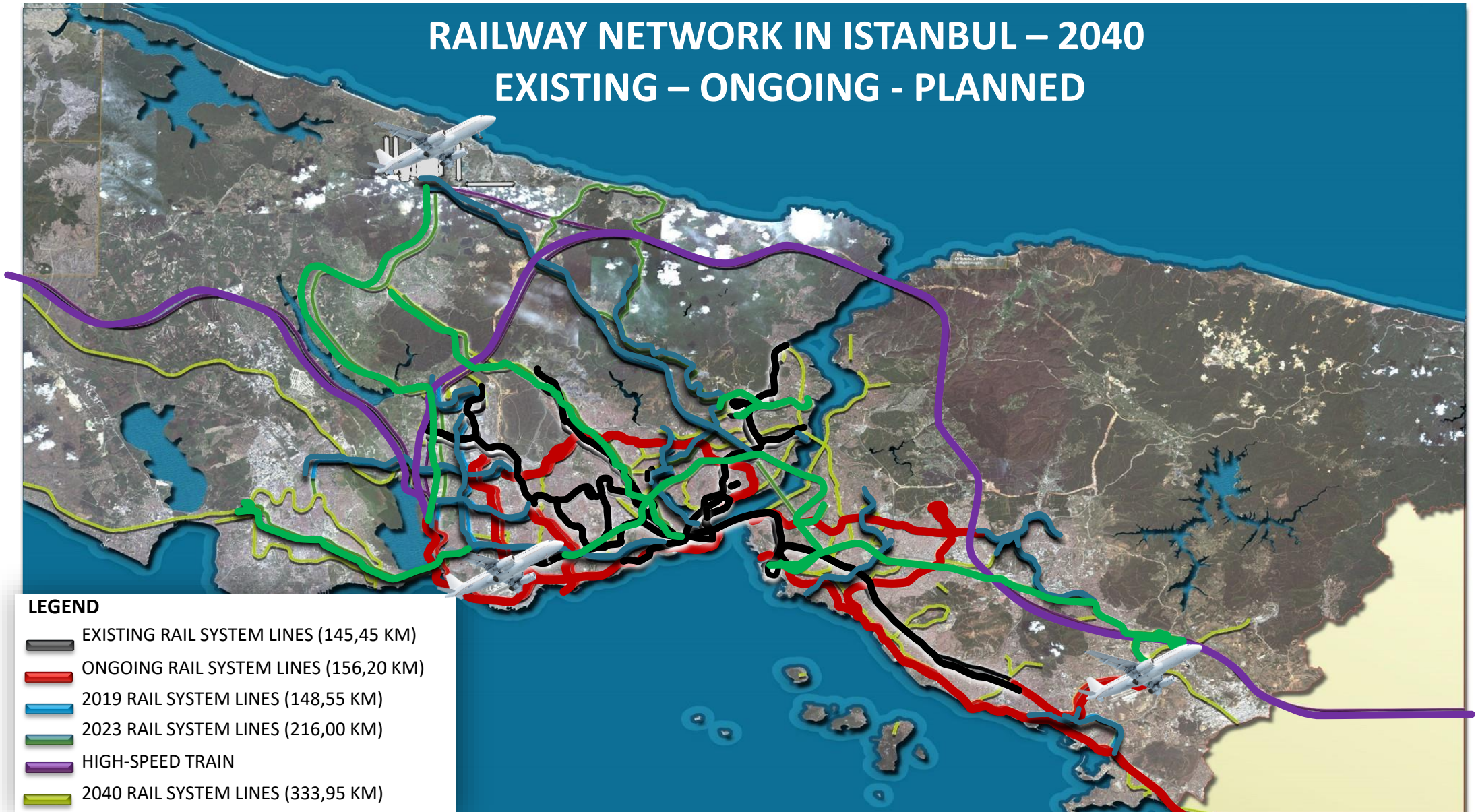
NEW YORK

PARIS

ISTANBUL METROPOLITAN CITY



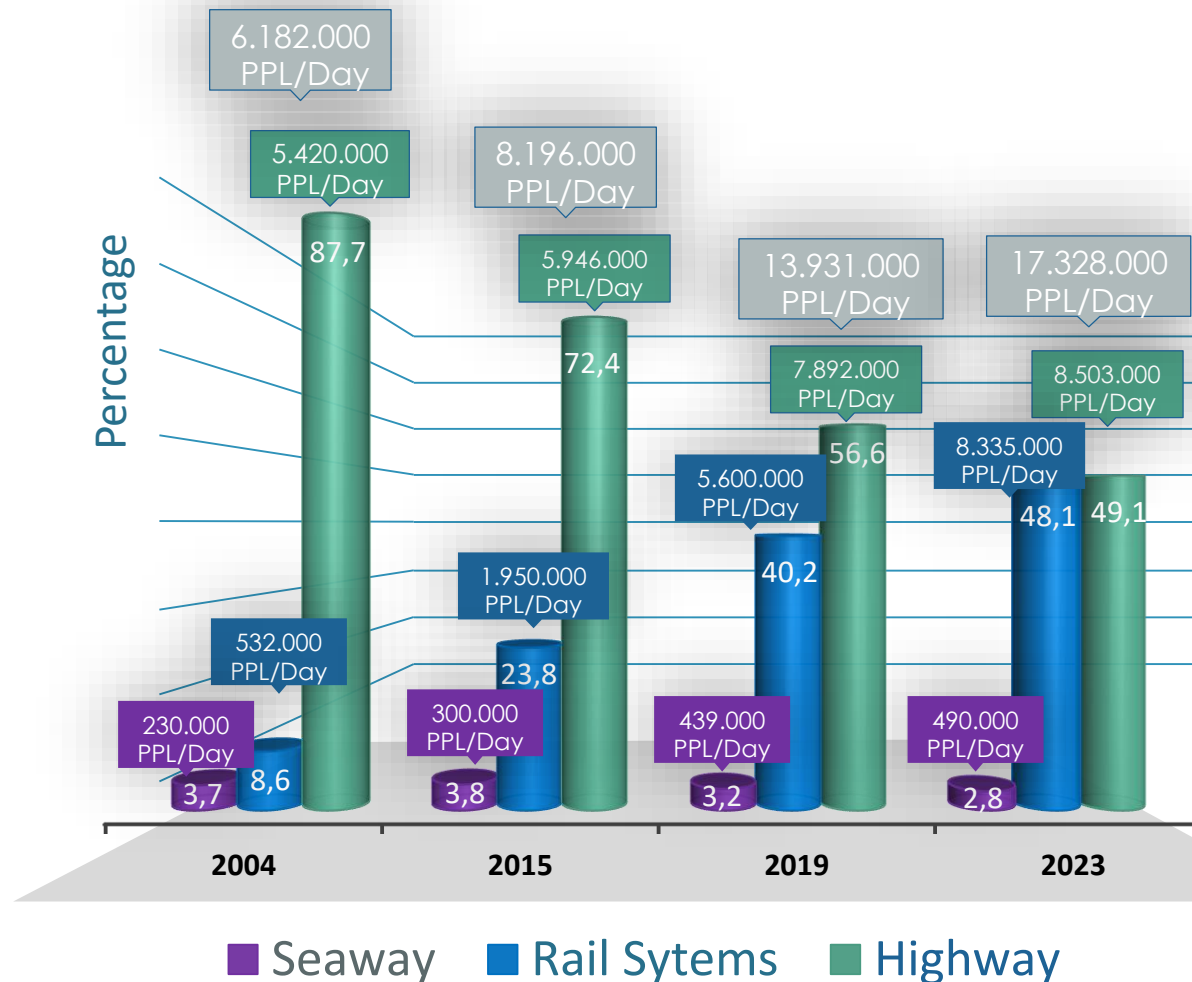
RAILWAY NETWORK IN ISTANBUL – 2040 EXISTING – ONGOING - PLANNED



İSTANBUL RAIL LINE SYSTEMS IN 2019

NO	SITUTATION OF THE METRO LINE	KM
1	EXISTING METRO LINES	145,45
2	ONGOING METRO LINE CONSTRUCTIONS	156,20
3	METRO LINES PLANNED TO BE CONSTRUCTED BY 2019	148,55
	TOTAL	450,78

PUBLIC TRANSPORTATION DATA



IMM AIMS TO
RAISE THE
TRANSPORTATION
RATE
48.1%
IN 2023

BIM MOTIVATION

Global competitiveness for the future projects

Innovative role in the construction sector in Turkey

Analyzing and preventing **additional costs** and **extension of project duration**

Ensuring that **work schedule** is followed

Detailed controlling of construction and finishing works and installation of MEP systems

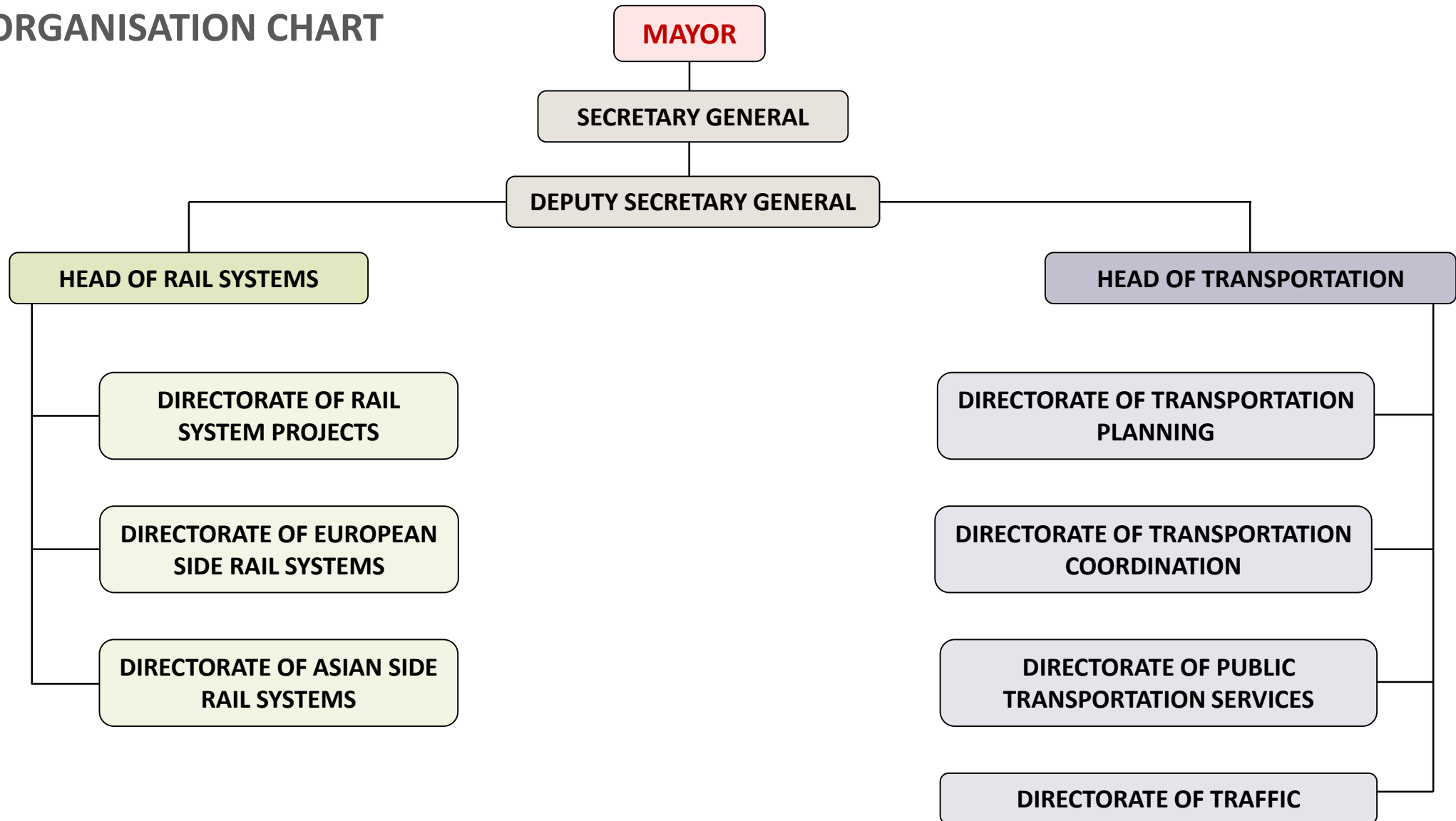
Controlling sketches and shop drawings according to the advanced technical and economical procedures and Turkish and International Standards on time.



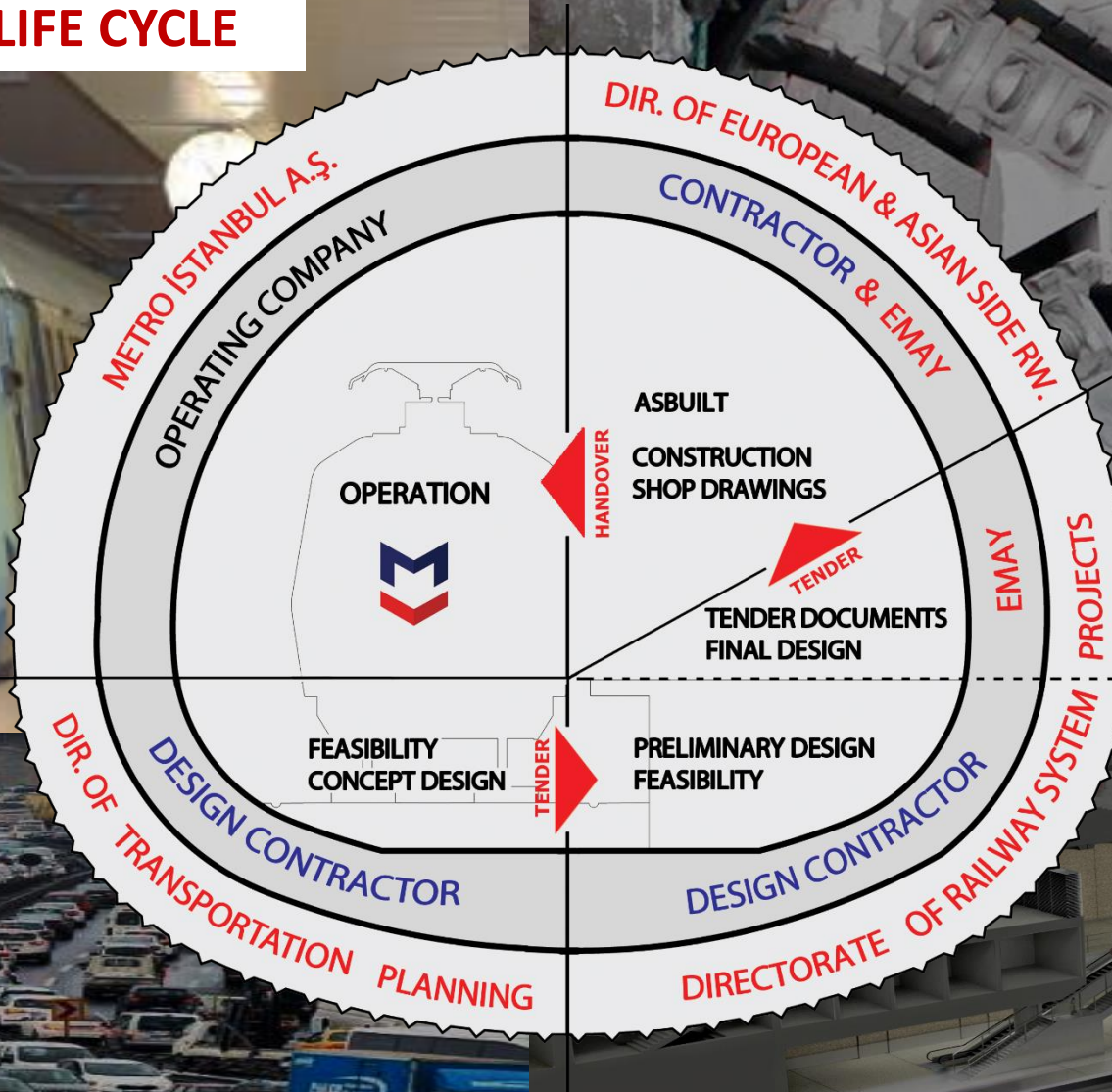
EMAY INVOLVES IN



IMM ORGANISATION CHART



IMM RAIL SYSTEM PROJETS LIFE CYCLE



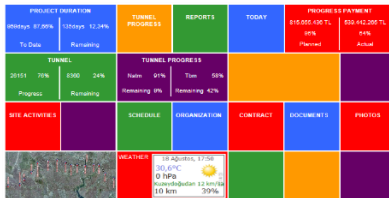
TIMELINE OF BIM INTEGRATION IN IMM METRO PROJECTS

First phase of KMM

Jan 14

2012

- ▶ **EMAY** developed PMP System
Feb 12



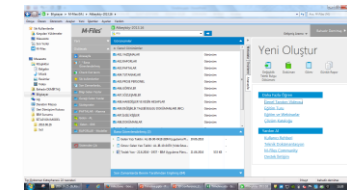
2013

BIM definition has been added in RAIL SYSTEM tenderings

Nov 13

2014

- ▶ **EMAY** use M-Files in KMM
Jan 14



- ▶ **KMM** First 3D models of the stations
Jun 14



- ▶ **RAIL SYSTEM BIM Specifications** are added to the construction tender documents

Dec 14

TIMELINE OF BIM INTEGRATION IN IMM METRO PROJECTS

Second phase of KMM

May 15

NOW

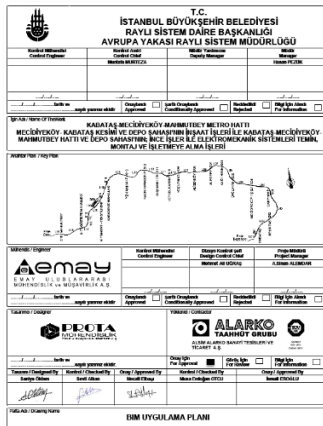
BIM GOALS

2015

2016

2017

- ▶ **KMM BIM Execution Plan is prepared**
Sep 15



- ▶ **RAIL SYSTEM**
Integration of BIM in both Design & Construction tenders
Jan 16
- ▶ **KMM M-Files is being used with stakeholders**
Sep 16
- ▶ **RAIL SYSTEM Updated BIM specifications**
Aug 16

Oct 16

- ▶ **KMM 4D – 5D**
BIM integration
- ▶ **KMM Operation and Maintenance**
- ▶ **KMM Interdisciplinary meetings on 3D models.**

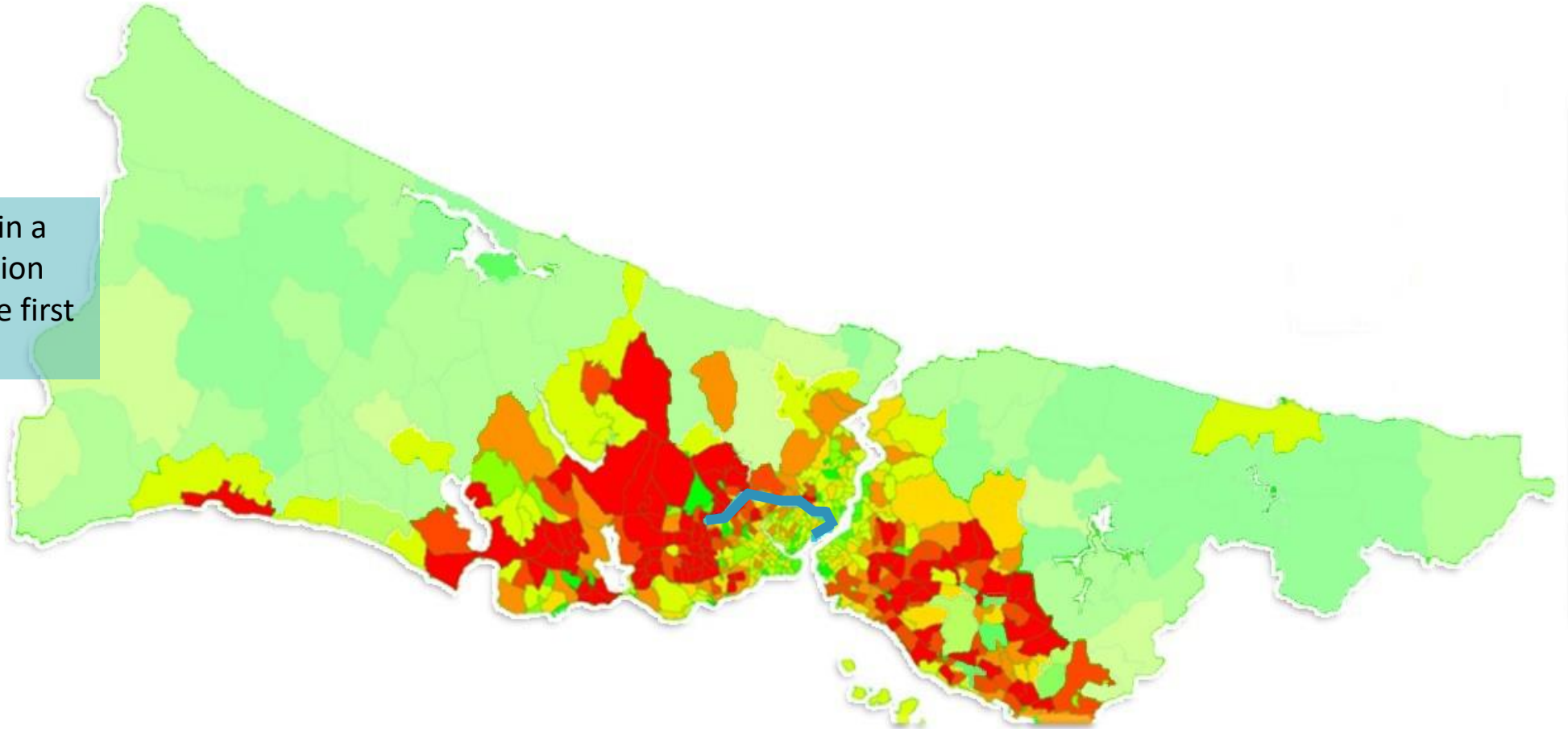


HOW DOES A BIM INTEGRATED METRO PROJECT LOOK LIKE?

IMPORTANCE OF THE METRO LINE

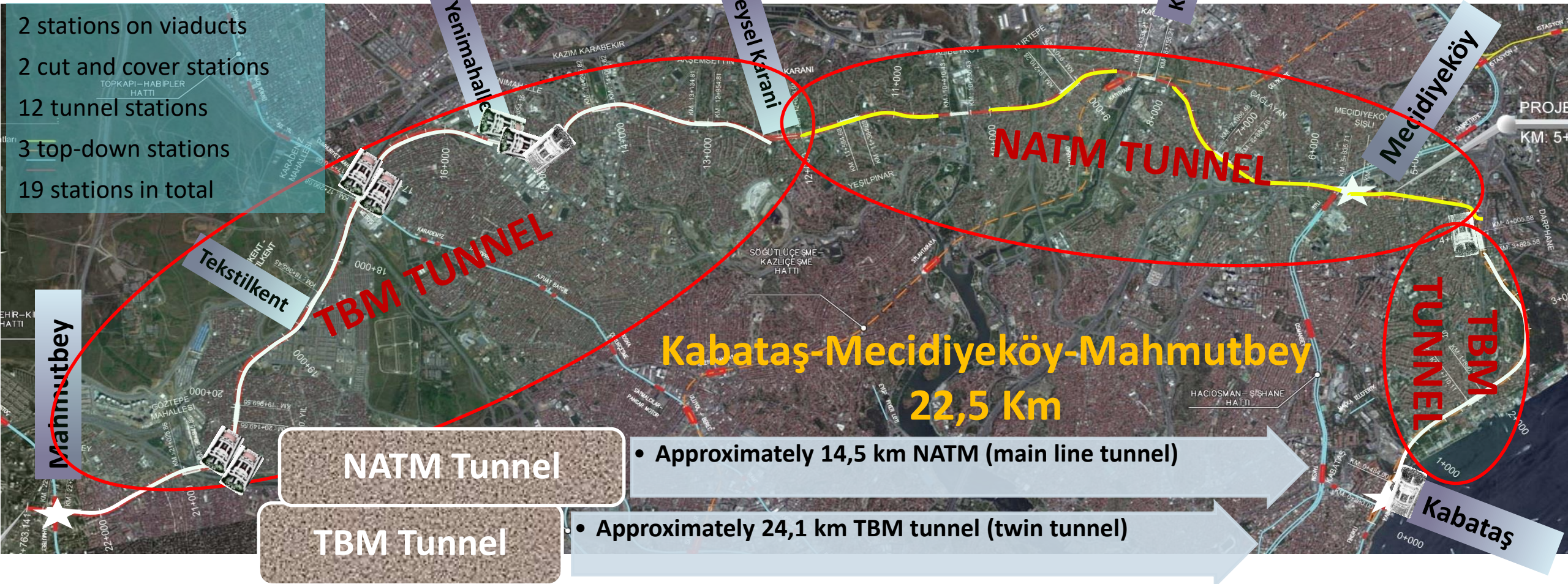
BIM has been added in a Rail System construction works contract for the first time in Turkey.

Project Cost: Total
Alignment Length:



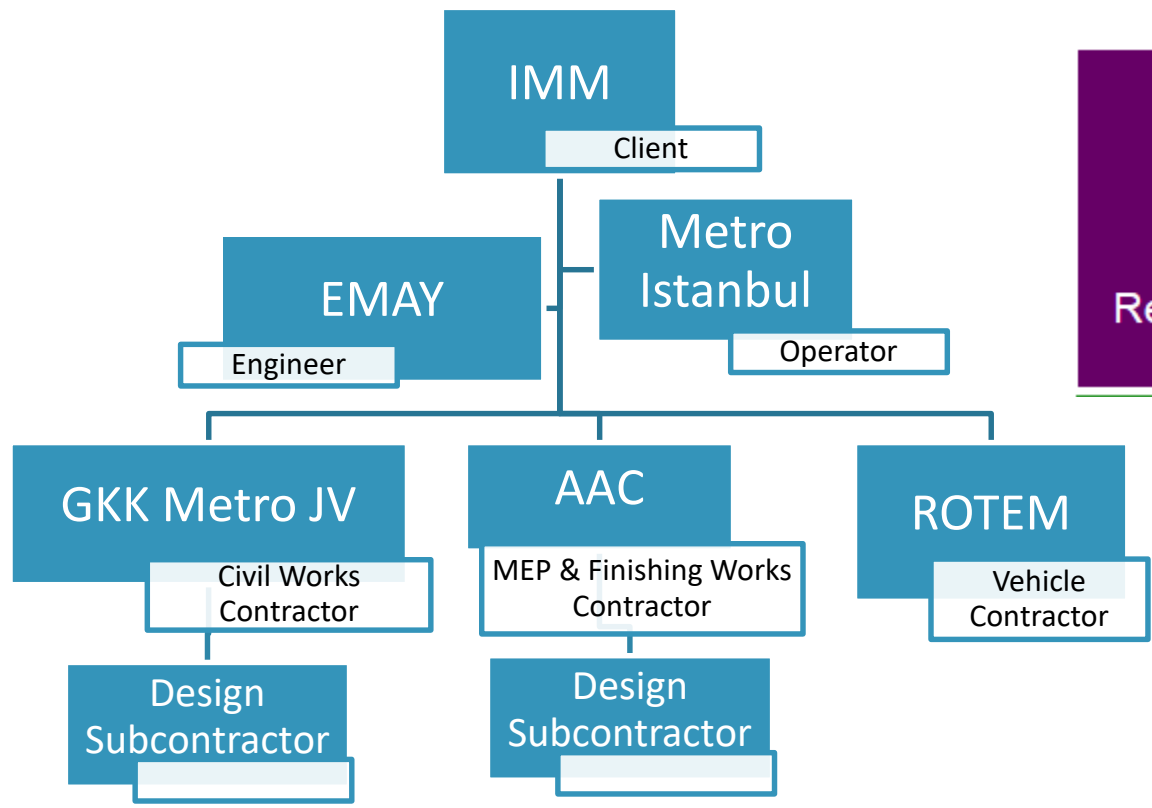
KABATAS – MECIDIYEKÖY MAHMUTBEY (KMM)

Technical Information

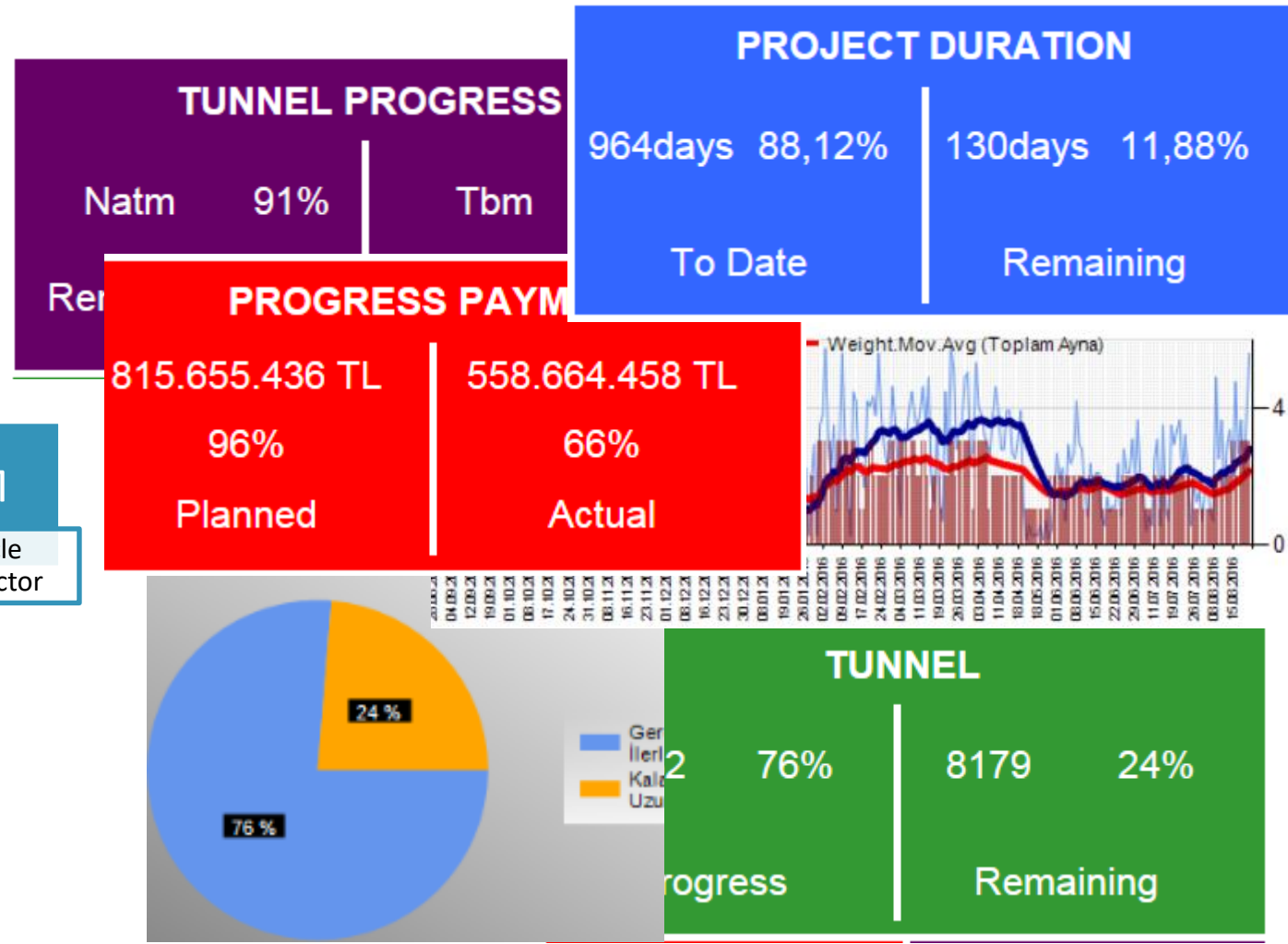


COORDINATION AND COLLABORATION

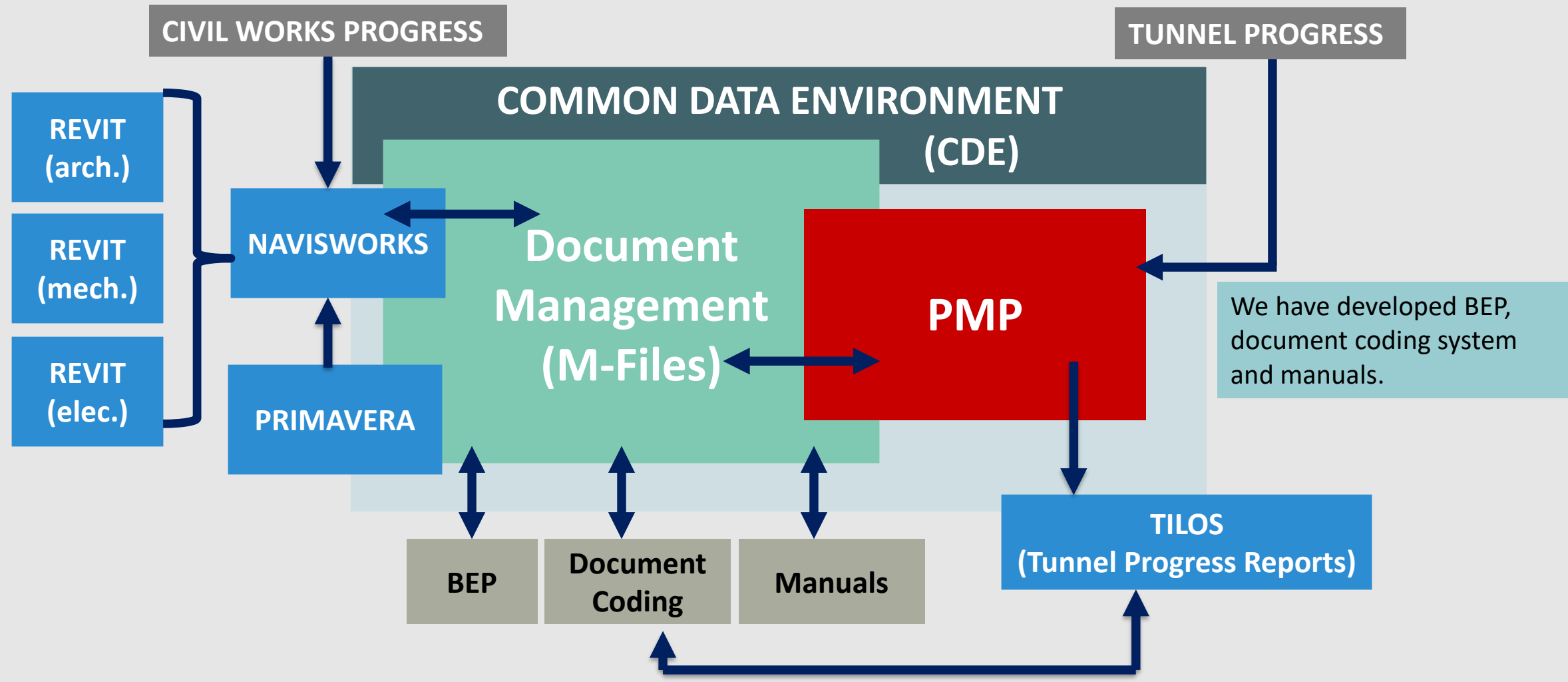
Project Organization

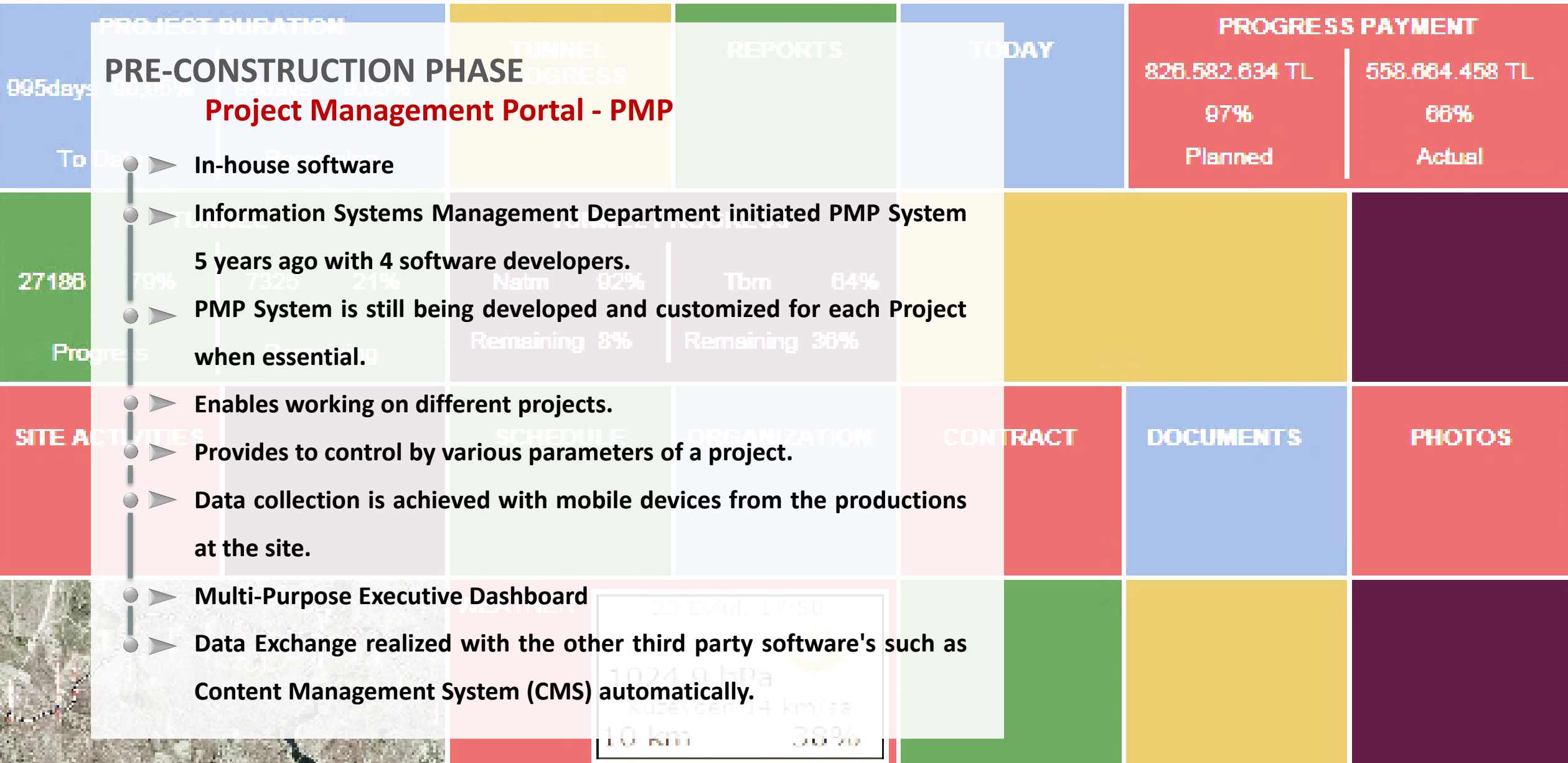


Executive Dashboard



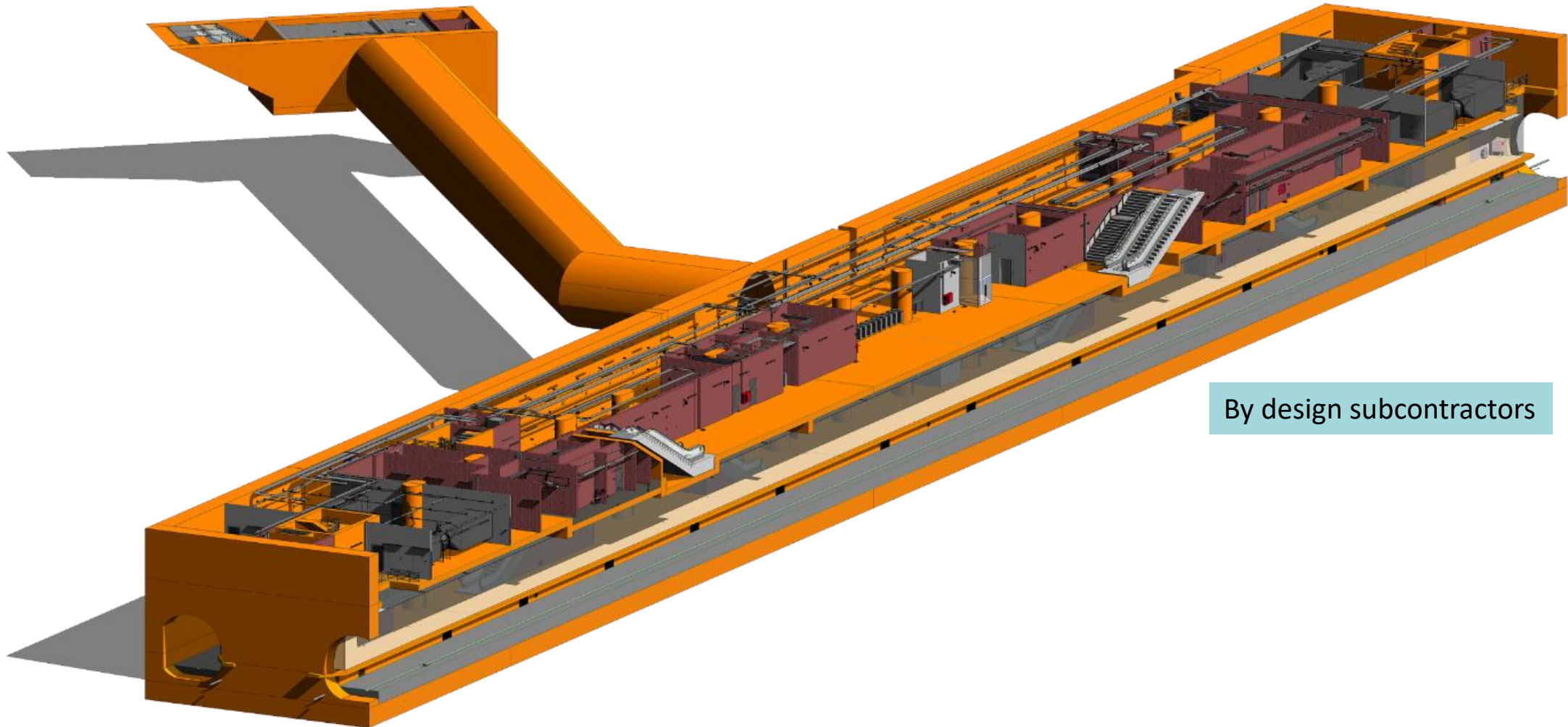
SOFTWARE SYSTEM





PRE-CONSTRUCTION PHASE

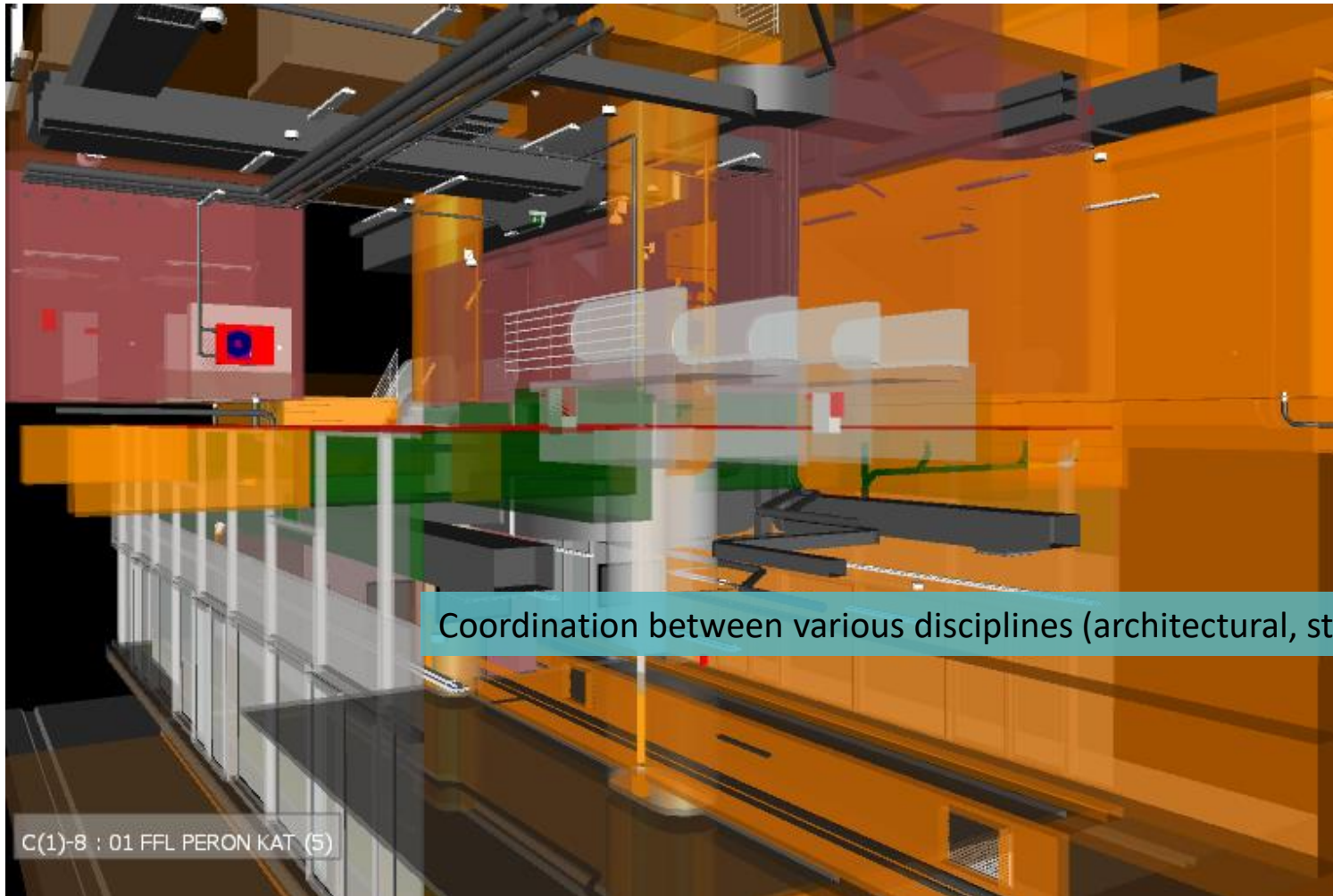
Architectural and Statical Models



By design subcontractors

PRE-CONSTRUCTION PHASE

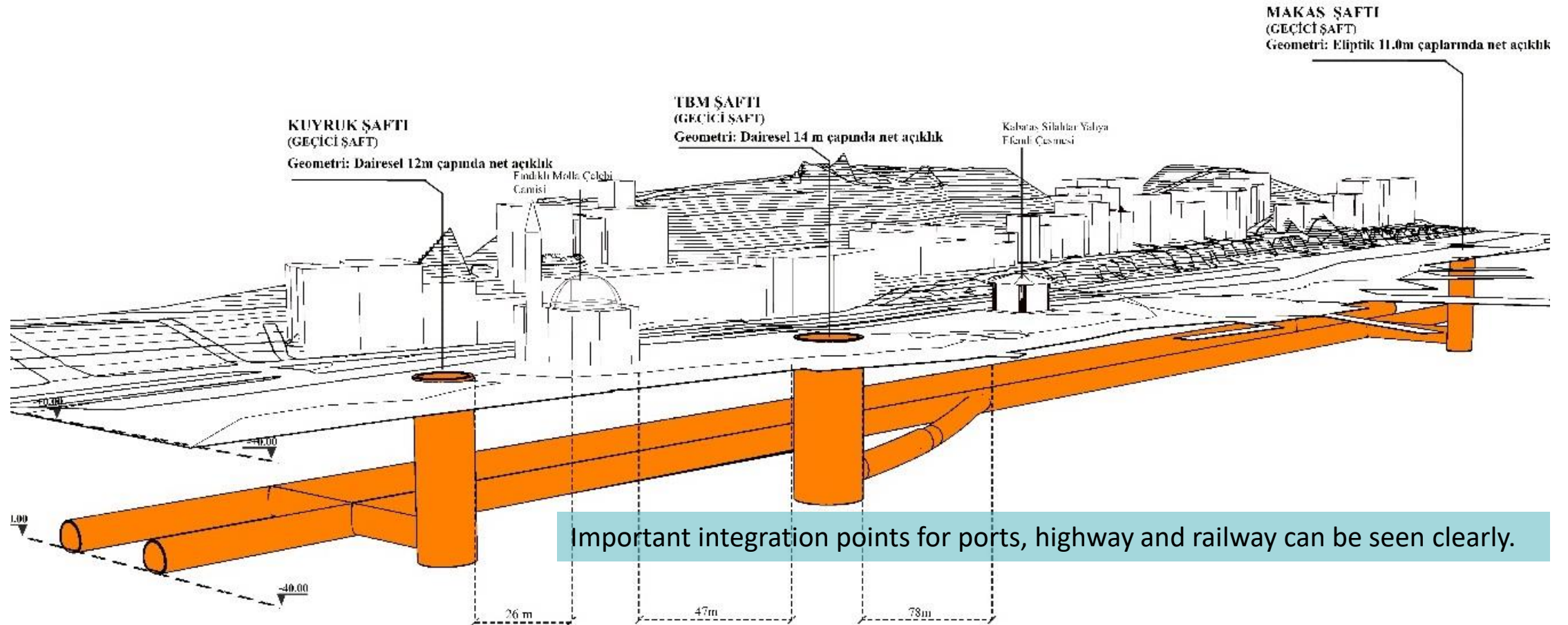
Architectural And MEP Coordinated Models



Coordination between various disciplines (architectural, structural, MEP, etc.) have been easier.

PRE-CONSTRUCTION PHASE

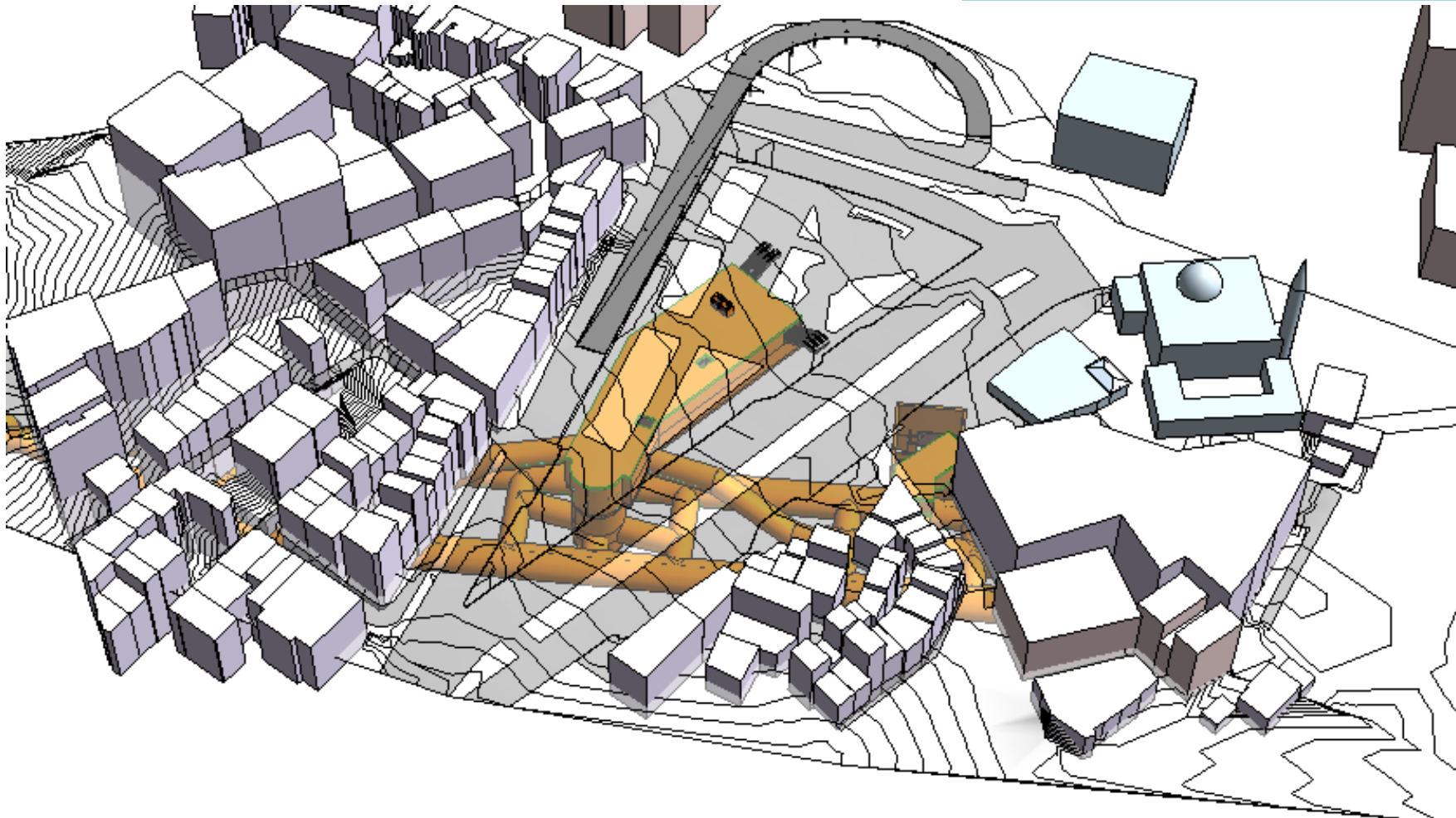
Examples From Station Models



PRE-CONSTRUCTION PHASE

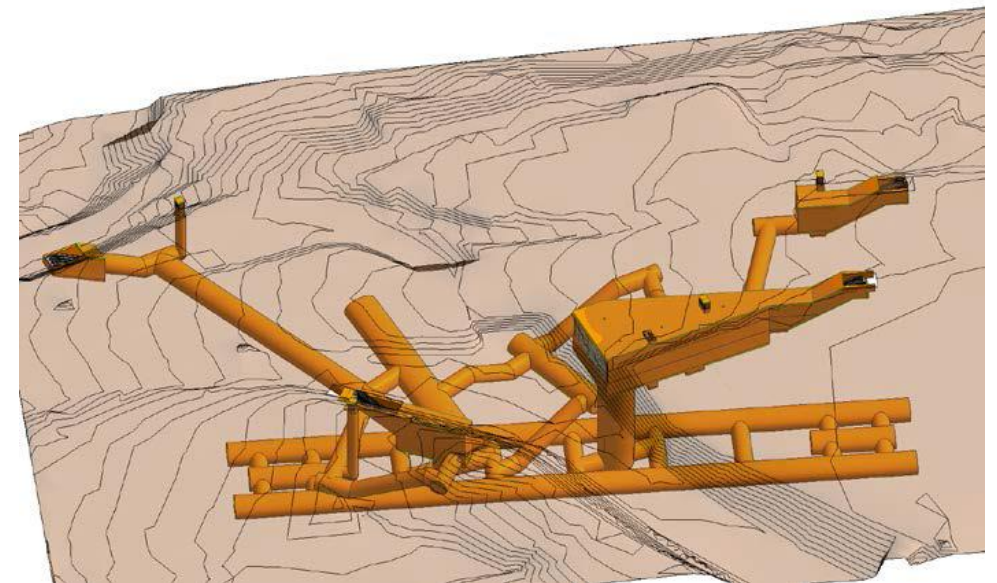
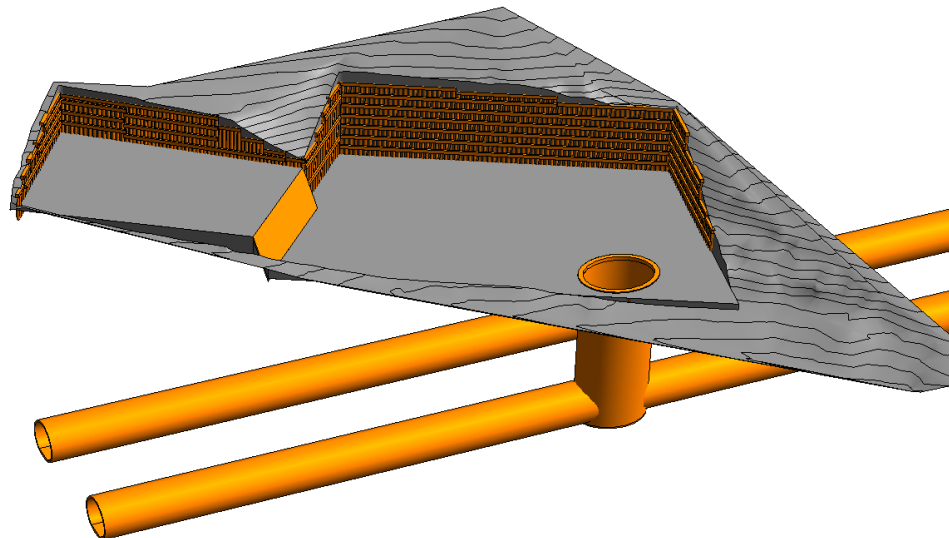
Examples From Station Models

BIM models made it possible to assess all these parameters.



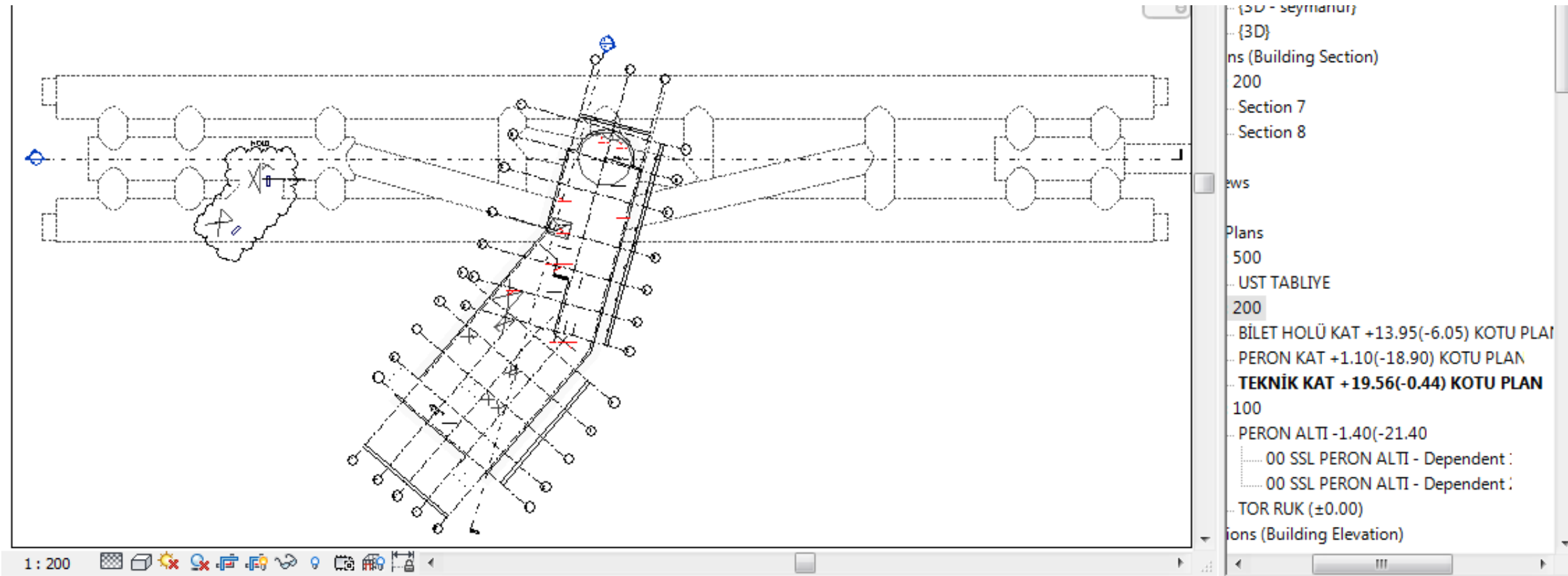
PRE-CONSTRUCTION PHASE

Examples From Station Models



PRE-CONSTRUCTION PHASE

All 2D CAD worksheets are exported from 3D Tunnel/Station models.



KMM CONSTRUCTION PHASE

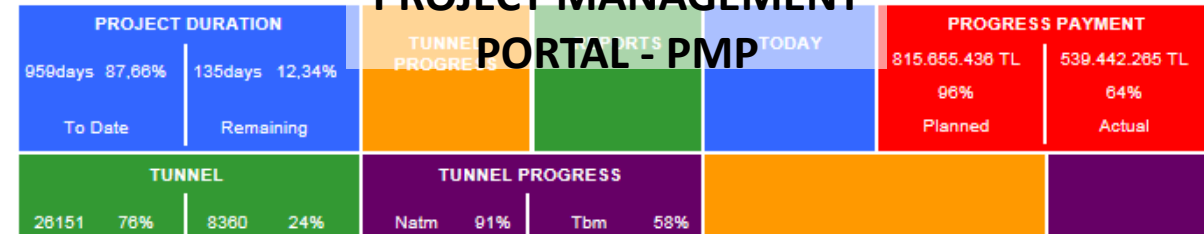


CONSTRUCTION PHASE

Site Management

PROJECT MANAGEMENT

PORTAL - PMP



SITE SUMMARY

İlerleme

- 1- Sahada 2 aynada NATM Tünel kazısı çalışma yapıldı. 6.40 m ilerleme sağlandı. (Kalan NATM Tüneli : 1622.11 m) (18.09.2016)
- 2- Sahada 2 noktada TBM Tünel kazısı çalışma yapıldı. 32.20 m ilerleme sağlandı. (Kalan TBM Tüneli : 5893.93 m) (18.09.2016)
- 3- Sahada 2 aynada NATM Tünel kazısı çalışma yapıldı. 0.80 m ilerleme sağlandı. (Kalan NATM Tüneli : 1628.51 m) (17.09.2016)
- 4- Sahada 2 noktada TBM Tünel kazısı çalışma yapıldı. 26.60 m ilerleme sağlandı. (Kalan TBM Tüneli : 5926.13 m) (17.09.2016)
- 5- Sahada 1 noktada TBM Tünel kazısı çalışma yapıldı. 14.00 m ilerleme sağlandı. (Kalan TBM Tüneli : 5952.73 m) (16.09.2016)
- 6- Sahada 4 aynada NATM Tünel kazısı çalışma yapıldı. 1.60 m ilerleme sağlandı. (Kalan NATM Tüneli : 1629.31 m) (16.09.2016)

	Alan / Açıklama	Alt Alan / Dosya Adı	Seviye	Yükleyen Birim	Dosya
8.2016	S04 Mecidiyeköy İstasyonu Doğu Konkors	CT1 Aç-Kapa 1. Kısım GenelGorunum(2).jpg		İstasyon Kontrol Şefliği Kayıt :Ömer Kurşun Güncelleme :Ömer Kurşun	
8.2016	S04 Mecidiyeköy İstasyonu Doğu Konkors	CT1 Aç-Kapa 1. Kısım GenelGorunum.jpg		İstasyon Kontrol Şefliği Kayıt :Ömer Kurşun Güncelleme :Ömer Kurşun	
8.2016	S18 Mahmutbey İstasyonu E blok +6.95 kotu kazısı	TD2 Top Down 2. Kısım IMG_6938.jpg		İstasyon Kontrol Şefliği Kayıt :Muhammet Erk Güncelleme :Muhammet Erk	
8.2016	S18 Mahmutbey İstasyonu E blok +6.95 kotu kazısı	TD2 Top Down 2. Kısım IMG_6937.jpg		İstasyon Kontrol Şefliği Kayıt :Muhammet Erk Güncelleme :Muhammet Erk	
8.2016	S18 Mahmutbey İstasyonu C blok temel pc102 perdesi	TD1 Top Down 1. Kısım IMG_6919.jpg		İstasyon Kontrol Şefliği Kayıt :Muhammet Erk Güncelleme :Muhammet Erk	
8.2016	S18 Mahmutbey İstasyonu B blok temel pa102 perdesi	TD1 Top Down 1. Kısım IMG_6921.jpg		İstasyon Kontrol Şefliği Kayıt :Muhammet Erk Güncelleme :Muhammet Erk	
8.2016	S18 Mahmutbey İstasyonu A blok TEMEL PA101	TD1 Top Down 1. Kısım IMG_6924.jpg		İstasyon Kontrol Şefliği Kayıt :Muhammet Erk Güncelleme :Muhammet Erk	
8.2016	S18 Mahmutbey İstasyonu A BLOK TEMEL PA102	TD1 Top Down 1. Kısım IMG_6922.jpg		İstasyon Kontrol Şefliği Kayıt :Muhammet Erk Güncelleme :Muhammet Erk	

IMG_6922 i

IMG_6924 i

CONSTRUCTION PHASE

Activity Planing and Progress Track - PMP

- Activities are identified on system and Planned work schedule of the contractor is uploaded into the system

Activities

Sıra	İmalat Sınıfı	Eleman No	Türü	Başlama	Bitiş	KM Başlangıç	KM Bitiş	Ring Başlangıç	Ring Bitiş	Proje Değeri / Gerç. Değer	TBM Araç		+
4	Çağlayan İstasyonu Peron Bağlantı Tüneli Kaplama Beton İmalatı B1 GKK.M7.S05.B1T.01/0.01/0 2/1/1/0	115inv	NATM KAPLAMA	P: 29.09.2016 G: 02.08.2016	P: 21.10.2016 G:	0,00	29,00			29,00 29,00 7,00			 
5	Kazım Karabekir İstasyonu Peron Bağlantı Tüneli Kaplama Beton İmalatı	702k mr	NATM KAPLAMA	P: 27.05.2016 G:	P: 27.12.2016 G:	0,00	13,00			13,00 13,00 0,00			 

Planned work schedule dates

- Actual work progress is uploaded based on the data from the site

Date

Sıra	Tarih	Üretim Bileşen	İşletme Noktası	Ayna Başlangıç KM	Ayna Bitiş KM	İlerleme	Vardiya	Mühendis	UR	Form No	Dosya	+
56	05.03.2016	A - A2	Alibeyköy Batı Portalı	11003,10	11006,70	3,60		Gökhan Çelik				 

Location

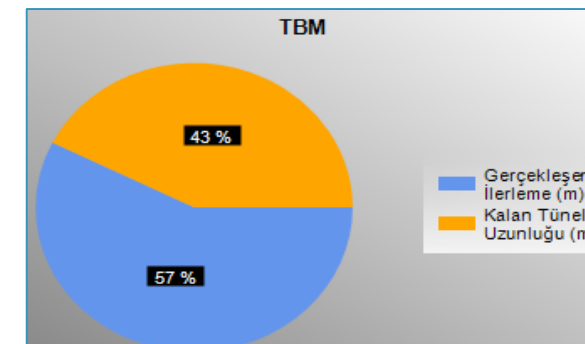
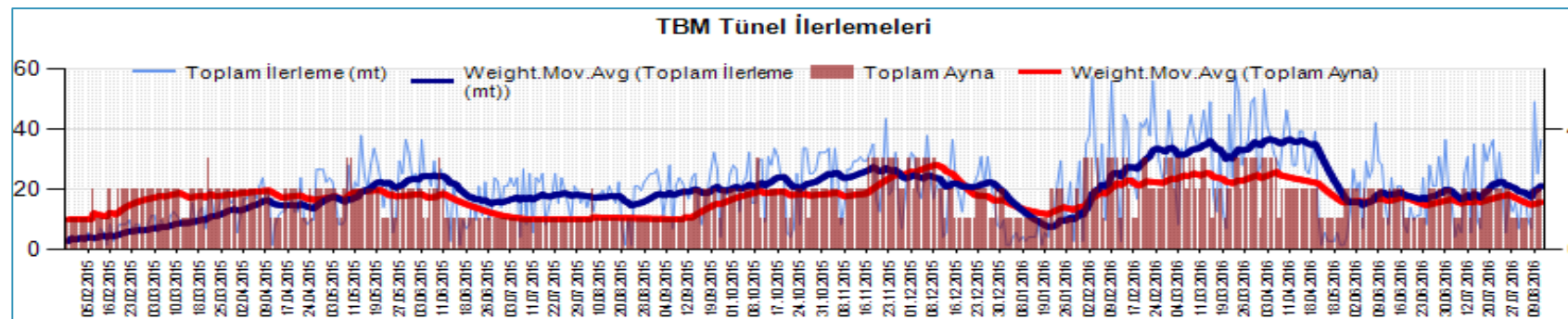
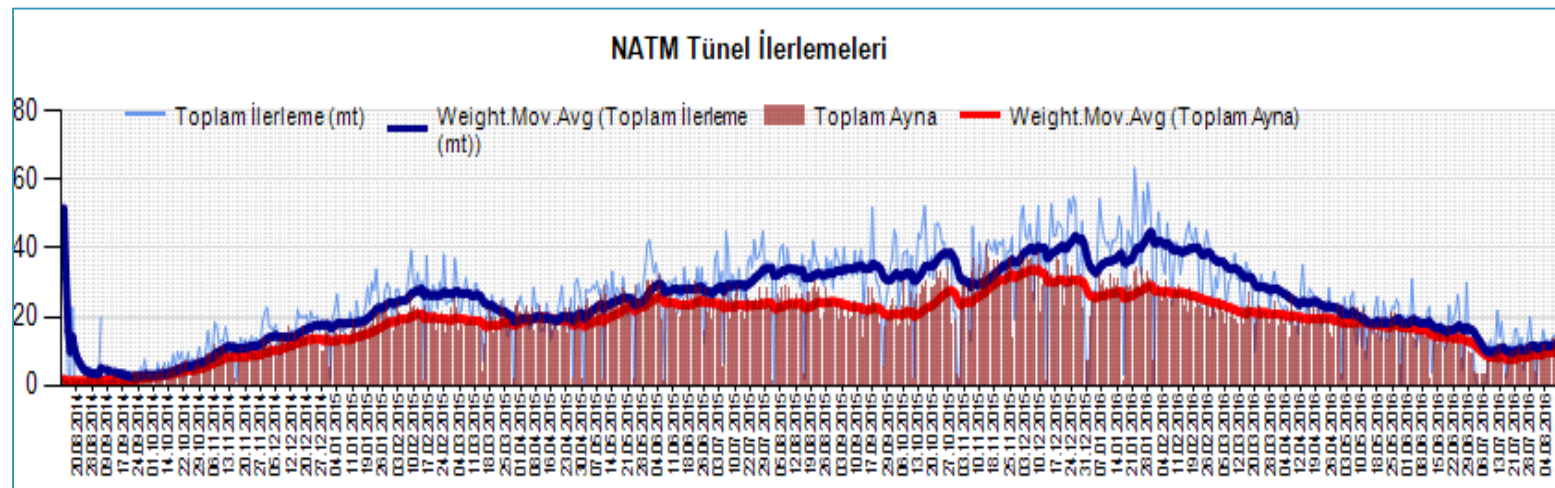
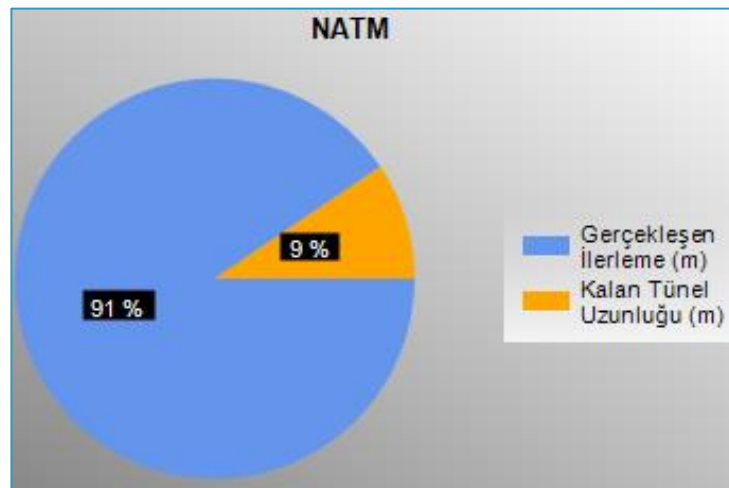
Progress

Tunnel start finish km values

Mevcut kayıtlar açıldı.

CONSTRUCTION PHASE

NATM & TBM Tunnel Daily Track Graph - PMP



CONSTRUCTION PHASE

NATM Report - PMP

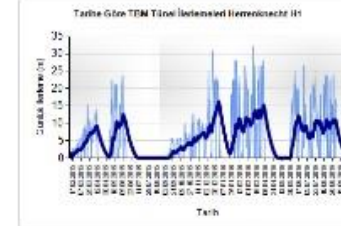
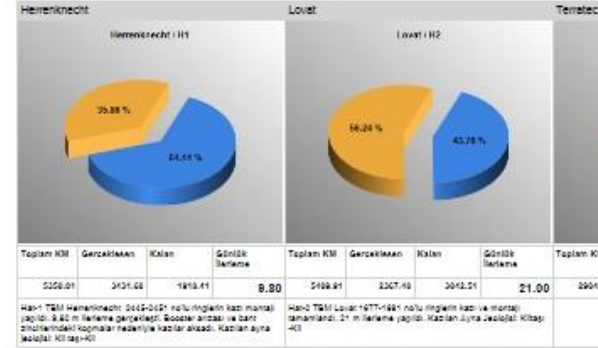
Tarih : 17/09/2016 (NATM)

Tünel Tanı		Genelleştirilmiş Elemen No	Alan	Alan Açıklaması	Sıra	İnşaat Tanımı	İnşaat Sınıfı	KM Başlangıç (a)	KM Bitiş (b)	Proje Derinliği (c)=(b-a)	Aynala İlerleme (d)	Kazı (e)	Ksa (f)	Kazı (g)	Ksa (h)	İlerleme (i) = (e*0.8+i*0.2)	Kalan (u) = c-d	Planlanan Başlangıç (k)	Bitiş (l)	Ortalama Hız (m)=(c-l*(i-k))	Başlangıç (n)	Bitiş (o)	Ortalama Hız (p)=(l-o*(n-m))	Mevcut hızla Kalan İhtimalin Tutarlanması Zamanı (p-n) (c-p)/(1-Tarih)	Planlanan Tarihle Birleşmesi için Gereken Ortalama Hız (q) = (c-p)/(1-Tarih)	Gerçekleşen İlerleme (m)	Planlanan İlerleme (n)	Geçmiş (j) = (r-i)	Tayaron	Tünel Tipi	Durum	Geometri Tipi
NATM	GKK.L04.ATO.H1 (Natr)	L04	Fulya - Mecidiyeköy Kesimi		1	Fulya - Mecidiyeköy Kesimi Anahat Tüneli (A Tipi) NATM Kazı Yapılması	GKK.M7.L04.ATO.01.14/1/0/0	5330.85	5403.59	72.74	73.3	73.3	65	73.3	0	73.3		28/10/2014	31/03/2015	0.47	28/10/2014	20/03/2015	0.51	19/03/2015		73.3	72.74		ESA İNŞAAT TAHHÜT. T.C. ŞTİ	NATM	Tamamlandı	A Tipi
	GKK.L04.ATO.H2 (Natr)	L04	Fulya - Mecidiyeköy Kesimi		2	Fulya - Mecidiyeköy Kesimi Anahat Tüneli (A Tipi) NATM Kazı Yapılması	GKK.M7.L04.ATO.01.14/1/0/0	5272.59	5345.33	72.74	73.28	73.28	75	73.28	0	73.28		09/01/2015	31/03/2015	0.90	09/01/2015	06/04/2015	0.84	05/04/2015		73.28	72.74		5 ESA İNŞAAT TAHHÜT. T.C. ŞTİ	NATM	Tamamlandı	A Tipi
	GKK.L04.BLT.101 (Natr)	L04	Fulya - Mecidiyeköy Kesimi		3	Fulya - Mecidiyeköy İstasyonları Arası Kesim Yaklaşım Tüneli NATM Kazı Yapılması	GKK.M7.L04.BLP.01.14/1/0/0	0	8.02	8.02	8.02	8.02	10	0	0	6.42			27/10/2015						6.42			ZORGİN İNŞAAT TAHHÜT. T.C. ŞTİ	NATM	Devam Ediyor	P Tipi	
	GKK.L04.BLT.102 (Natr)	L04	Fulya - Mecidiyeköy Kesimi		4	Fulya - Mecidiyeköy İstasyonları Arası Kesim Yaklaşım Tüneli NATM Kazı Yapılması	GKK.M7.L04.BLP.01.14/1/0/0	0	7.52	7.52	8.02	8.02	10	0	0	6.42			27/10/2015						6.42			ZORGİN İNŞAAT TAHHÜT. T.C. ŞTİ	NATM	Devam Ediyor	P Tipi	
	GKK.L04.IS1.01 (Natr)	L04	Fulya - Mecidiyeköy Kesimi		5	Darphane - Mecidiyeköy Kesimi Kuyruk Hatlı NATM Tüneli Yaklaşım Şaftı Kazı Yapılması	GKK.M7.L04.IS1.01.02/1/0/0	0	43.43	43.43	43.43	43.43		0		34.74		15/04/2015	13/07/2015	0.49	25/09/2015			23/12/2016	34.74	43.43		529 ZORGİN İNŞAAT TAHHÜT. T.C. ŞTİ	NATM	Devam Ediyor	12x9 m Elips Şaft	
	GKK.L04.TTO.H1 (Natr)	L04	Fulya - Mecidiyeköy Kesimi		6	Fulya - Mecidiyeköy Arası Kesimi Anahat Tüneli (T Tipi) NATM Kazı Yapılması	GKK.M7.L04.TTO.01.14/1/0/0	5278	5330.85	52.85	52.5	52.5	66	52.5	66	52.5	0.35	02/05/2015	29/08/2015	0.44	03/05/2015	24/08/2016	0.11	27/08/2016		52.5	52.85		364 Gülermak Ağır San. İnş. Taah. A.Ş.	NATM	Tamamlandı	A Tipi
	GKK.L04.TTO.H2 (Natr)	L04	Fulya - Mecidiyeköy Kesimi		7	Fulya - Mecidiyeköy Arası Kesimi Anahat Tüneli (T Tipi) NATM Kazı Yapılması	GKK.M7.L04.TTO.01.14/1/0/0	5219.74	5272.59	52.85	36	36	40	0	0	28.8	16.85	01/06/2015	25/02/2016	0.20	25/05/2015			24/10/2017	28.8	52.85		606 Gülermak Ağır San. İnş. Taah. A.Ş.	NATM	Devam Ediyor	T Tipi	
	GKK.L05.ATO.H4a (Natr)	L05	Mecidiyeköy - Çağlayan Kesimi		8	Mecidiyeköy - Çağlayan Kesimi Anahat Tüneli (A Tipi) NATM Kazı Yapılması	GKK.M7.L05.ATO.01.14/1/0/0	5632.05	5892.91	260.86	260.86	260.86	251	260.86	65	260.86		01/04/2015	23/02/2016	0.80	30/03/2015	25/03/2016	0.72	25/03/2016		260.86	260.86		30 ESA İNŞAAT TAHHÜT. T.C. ŞTİ	NATM	Tamamlandı	A Tipi
	GKK.L05.ATO.H4b (Natr)	L05	Mecidiyeköy - Çağlayan Kesimi		9	Mecidiyeköy - Çağlayan Kesimi Anahat Tüneli (A Tipi) NATM Kazı Yapılması	GKK.M7.L05.ATO.01.14/1/0/0	6167.92	6874.88	706.96	694.61	694.61	662.6	684.39	8	692.57	12.35	17/11/2014	13/04/2016	1.38	18/11/2014			01/10/2016	692.57	706.96		170 ESA İNŞAAT TAHHÜT. T.C. ŞTİ	NATM	Devam Ediyor	A Tipi	
	GKK.L05.ATO.H2a (Natr)	L05	Mecidiyeköy - Çağlayan Kesimi		10	Mecidiyeköy - Çağlayan Kesimi Anahat Tüneli (A Tipi) NATM Kazı Yapılması	GKK.M7.L05.ATO.01.14/1/0/0	5597.45	5834.91	237.46	238.21	238.21	241	227.51	79	236.07		25/03/2015	11/02/2016	0.74	30/03/2015			20/09/2016	236.07	237.46		222 ESA İNŞAAT TAHHÜT. T.C. ŞTİ	NATM	Devam Ediyor	A Tipi	
	GKK.L05.ATO.H2b (Natr)	L05	Mecidiyeköy - Çağlayan Kesimi		11	Mecidiyeköy - Çağlayan Kesimi Anahat Tüneli (A Tipi) NATM Kazı Yapılması	GKK.M7.L05.ATO.01.14/1/0/0	6109.29	6831.37	722.08	711.89	711.89	657	692.68	14	708.05	10.19	22/11/2014	29/02/2016	1.56	22/11/2014			30/09/2016	708.05	722.08		214 ESA İNŞAAT TAHHÜT. T.C. ŞTİ	NATM	Devam Ediyor	A Tipi	
	GKK.L05.BLT.401 (Natr)	L05	Mecidiyeköy - Çağlayan Kesimi		12	Mecidiyeköy - Çağlayan İstasyonları Arası Kesim Makas Yaklaşım Tüneli NATM Kazı Yapılması	GKK.M7.L05.BLP.01.14/1/0/0	0	18.26	18.26	18.26	18.26	18	4.2	0	15.45		20/09/2015	21/12/2015	0.29	29/08/2015			26/11/2016	15.45	18.26		371 SARGİN İNŞ. MAK. SAN. T.C.A.Ş.	NATM	Devam Ediyor	B1 Tipi	
	GKK.L05.CPN.01 (Natr)	L05	Mecidiyeköy - Çağlayan Kesimi		13	Mecidiyeköy - Çağlayan Kesimi Anahat Bağlantı Tüneli (B2 Tipi) NATM Kazı Yapılması	GKK.M7.L05.CPN.01.14/1/0/0	4.5	21.68	17.18	16.93	16.93	21	0	0	13.54	0.25	04/12/2014	13/12/2015	0.05	12/10/2014			26/03/2017	13.54	17.18		468 ESA İNŞAAT TAHHÜT. T.C. ŞTİ	NATM	Devam Ediyor	B1 Tipi	
	GKK.L05.CPN.02 (Natr)	L05	Mecidiyeköy - Çağlayan Kesimi		14	Mecidiyeköy - Çağlayan Kesimi Anahat Bağlantı Tüneli (B2 Tipi) NATM Kazı Yapılması	GKK.M7.L05.CPN.01.14/1/0/0	4.5	17.98	13.48	13.23	13.23	16	0	0	10.58	0.25	27/11/2014	06/12/2015	0.04	20/10/2014			27/03/2017	10.58	13.48		476 ESA İNŞAAT TAHHÜT. T.C. ŞTİ	NATM	Devam Ediyor	P Tipi	
	GKK.L05.CPN.03 (Natr)	L05	Mecidiyeköy - Çağlayan Kesimi		15	Mecidiyeköy - Çağlayan Kesimi Anahat Bağlantı Tüneli (B2 Tipi) NATM Kazı Yapılması	GKK.M7.L05.CPN.01.14/1/0/0	0	24.6	24.6	24.6	24.6	26	24.6	0	24.6		20/09/2015	21/11/2015	0.40	22/04/2016	09/05/2016	1.45	09/05/2016		24.6	24.6		170 Gülermak Ağır San. İnş. Taah. A.Ş.	NATM	Tamamlandı	A Tipi
	GKK.L05.CPN.032 (Natr)	L05	Mecidiyeköy - Çağlayan Kesimi		16	Mecidiyeköy - Çağlayan Kesimi Anahat Bağlantı Tüneli (B2 Tipi) NATM Kazı Yapılması	GKK.M7.L05.CPN.01.14/1/0/0	0	7.56	7.56	7.56	7.56	9	7.56	0	7.56		20/09/2015	21/11/2015	0.12	19/11/2015			17/09/2016	7.56	7.56		300 SARGİN İNŞ. MAK. SAN. T.C.A.Ş.	NATM	Devam Ediyor	B1 Tipi	
	GKK.L05.CPN.033 (Natr)	L05	Mecidiyeköy - Çağlayan Kesimi		17	Mecidiyeköy - Çağlayan Kesimi Anahat Bağlantı Tüneli (B2 Tipi) NATM Kazı Yapılması	GKK.M7.L05.CPN.01.14/1/0/0	0	19.35	19.35	19.61	19.61	21	19.61	0	19.61		20/09/2015	21/11/2015	0.31	20/03/2015	12/08/2015	0.14	10/08/2015		19.61	19.35		ENTO MİDENÇİLİK İNŞ. SAN. T.C. LTD. ŞTİ	NATM	Tamamlandı	A Tipi
	GKK.L05.CPN.034 (Natr)	L05	Mecidiyeköy - Çağlayan Kesimi		18	Mecidiyeköy - Çağlayan Kesimi Anahat Bağlantı Tüneli (B2 Tipi) NATM Kazı Yapılması	GKK.M7.L05.CPN.01.14/1/0/0	0	25.54	25.54	25	25	23	21.4	0	24.28	0.54	29/10/2015	24/06/2016	0.11	06/09/2015			07/10/2016	24.28	25.54		104 SARGİN İNŞ. MAK. SAN. T.C.A.Ş.	NATM	Devam Ediyor	A Tipi	
	GKK.L05.CTT.H0C (Natr)	L05	Mecidiyeköy - Çağlayan Kesimi		19	Mecidiyeköy - Çağlayan Kesimi Anahat Tüneli (C Tipi) NATM Kazı Yapılması	GKK.M7.L05.CTT.01.14/1/0/0	5933.17	6105.47	172.3	164.87	164.87	164	172.31	0	166.36	7.43	27/08/2015	06/03/2016	0.90	04/10/2015			0.48	29/09/2016	166.36	172.3		207 SARGİN İNŞ. MAK. SAN. T.C.A.Ş.	NATM	Devam Ediyor	C Tipi
	GKK.L05.IS1.01 (Natr)	L05	Mecidiyeköy - Çağlayan Kesimi		20	Mecidiyeköy - Çağlayan Kesimi NATM Şaftı Kazı Yapılması	GKK.M7.L05.IS1.01.02/1/0/0	0	54.94	54.94	54.94	54.94		0		43.95		03/05/2015	12/05/2015	6.10	27/04/2015			26/08/2015	43.95	54.94		136 SARGİN İNŞ. MAK. SAN. T.C.A.Ş.	NATM	Tamamlandı	12x9 m Elips Şaft	
	GKK.L05.IS1.02 (Natr)	L05	Mecidiyeköy - Çağlayan Kesimi		21	Mecidiyeköy - Çağlayan Kesimi NATM Şaftı Kazı Yapılması	GKK.M7.L05.IS1.01.02/1/0/0	0	56.73	56.73	56.73	56.73		0		45.38		14/08/2014	12/12/2014	0.64	01/08/2014	11/11/2014		06/12/2014	45.38	56.73		ESA İNŞAAT TAHHÜT. T.C. ŞTİ	NATM	Tamamlandı	12x9 m Elips Şaft	
	GKK.L05.TTO.H0Ta (Natr)	L05	Mecidiyeköy - Çağlayan Kesimi		22	Mecidiyeköy - Çağlayan Arası Kesimi Anahat Tüneli (T Tipi) NATM Kazı Yapılması	GKK.M7.L05.TTO.01.14/1/0/0	5892.91	5933.17	40.26	40.26	40.26	41	40.26	0	40.26		17/07/2015	27/08/2015	0.98	26/11/2015			17/09/2016	40.26	40.26		387 SARGİN İNŞ. MAK. SAN. T.C.A.Ş.	NATM	Devam Ediyor	T Tipi	
	GKK.L05.TTO.H0Tb (Natr)	L05	Mecidiyeköy - Çağlayan Kesimi		23	Mecidiyeköy - Çağlayan Arası Kesimi Anahat Tüneli (T Tipi) NATM Kazı Yapılması	GKK.M7.L05.TTO.01.14/1/0/0	6105.47	6167.92	62.45	62.45	62.45	64	62.44	0	62.45		06/03/2016	13/05/2016	0.92	23/01/2016			17/09/2016	62.45	62.45		127 SARGİN İNŞ. MAK. SAN. T.C.A.Ş.	NATM	Devam Ediyor	T Tipi	
	GKK.L06.ATO.H1 (Natr)	L06	Çağlayan - Kağıthane Kesimi		24	Çağlayan - Kağıthane Arası Kesimi Anahat Tüneli (A Tipi) NATM Kazı Yapılması	GKK.M7.L06.ATO.01.14/1/0/0	7104.73	7660.08	555.35	554.78	554.78	564	488.40	40	541.58	0.57	08/08/2015	15/03/2016	2.52	13/06/2015		1.17	29/09/2016	541.58	555.35		197 ESA İNŞAAT TAHHÜT. T.C. ŞTİ	NATM	Devam Ediyor	A Tipi	
	GKK.L06.ATO.H2 (Natr)	L06	Çağlayan - Kağıthane Kesimi		25	Çağlayan - Kağıthane Arası Kesimi Anahat Tüneli (A Tipi) NATM Kazı Yapılması	GKK.M7.L06.ATO.01.14/1/0/0	7061.27	7628.28	567.01	565.8	565.8	587	253.46	62	503.33	1.21	15/08/2015	29/03/2016	2.50	15/08/2015		1.26	06/11/2016	503.33	567.01		222 ENTO MİDENÇİLİK İNŞ. SAN. T.C. LTD. ŞTİ	NATM	Devam Ediyor	A Tipi	
	GKK.L06.CPN.05 (Natr)	L06	Çağlayan - Kağıthane Kesimi		26	Çağlayan - Kağıthane Kesimi Anahat Bağlantı Tüneli (B2 Tipi) NATM Kazı Yapılması	GKK.M7.L06.CPN.01.14/1/0/0	0	24.6	24.6	12	12	14	3.6	0	10.32	12.6	29/10/2015	24/06/2016	0.10	24/07/2016			02/12/2016	10.32	24.6		161 ESA İNŞAAT TAHHÜT. T.C. ŞTİ	NATM	Devam Ediyor	A Tipi	
	GKK.L06.CPN.056 (Natr)	L06	Çağlayan - Kağıthane Kesimi		27	Çağlayan - Kağıthane Kesimi Anahat Bağlantı Tüneli (B2 Tipi) NATM Kazı Yapılması	GKK.M7.L06.CPN.01.14/1/0/0	0	8.8	8.8	7.54	7.54	10	0	0	6.03	1.26	29/10/2015	24/06/2016	0.04	20/04/2016			25/11/2016	6.03	8.8		153 ESA İNŞAAT TAHHÜT. T.C. ŞTİ	NATM	Devam Ediyor	A Tipi	
	GKK.L06.CPN.07 (Natr)	L06	Çağlayan - Kağıthane Kesimi		28	Çağlayan - Kağıthane Kesimi Anahat Bağlantı Tüneli (B2 Tipi) NATM Kazı Yapılması	GKK.M7.L06.CPN.01.14/1/0/0	0	3.92	3.92	0	0	0	0	0	0	3.92	29/10/2015	24/06/2016	0.02					0	3.92		ESA İNŞAAT TAHHÜT. T.C. ŞTİ	NATM	Başlamadı		
	GKK.L06.CTT.H0C (Natr)	L06	Çağlayan - Kağıthane Kesimi		29	Çağlayan - Kağıthane Arası Kesimi Anahat Tüneli (C Tipi) NATM Kazı Yapılması	GKK.M7.L06.CTT.01.14/1/0/0	7713.39	7803.72	90.33	90.38	90.38	230	89.58	115	90.22																

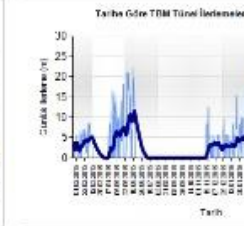
CONSTRUCTION PHASE

Daily TBM Report - PMP

MECİDİYEKÖY - MAHMUTBEY METRO İNŞAATI TBM TÜNELLER İLERLEME RAPORU



Gerçekleşen Ortalama Hız = 7.22 m/gün
 Son Hafta Gerçekleşen Ortalama Hız = 9.80 m/gün
 Son Ay Gerçekleşen Ortalama Hız = 11.48 m/gün



Gerçekleşen Ortalama Hız = 7.22 m/gün
 Son Hafta Gerçekleşen Ortalama Hız = 9.80 m/gün
 Son Ay Gerçekleşen Ortalama Hız = 11.48 m/gün

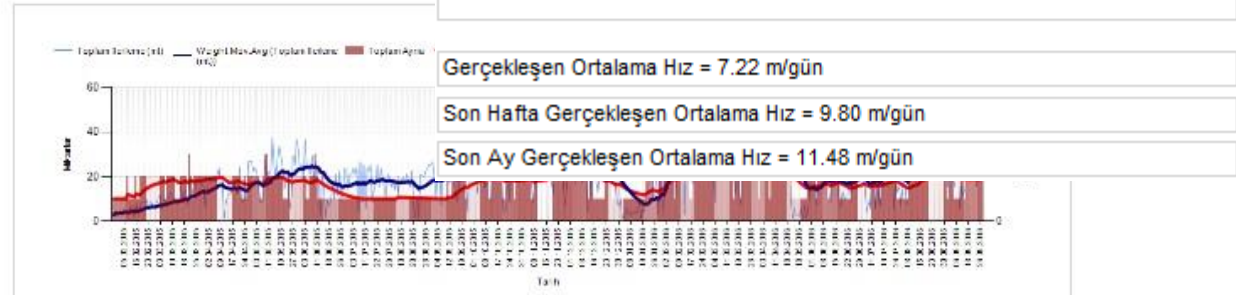
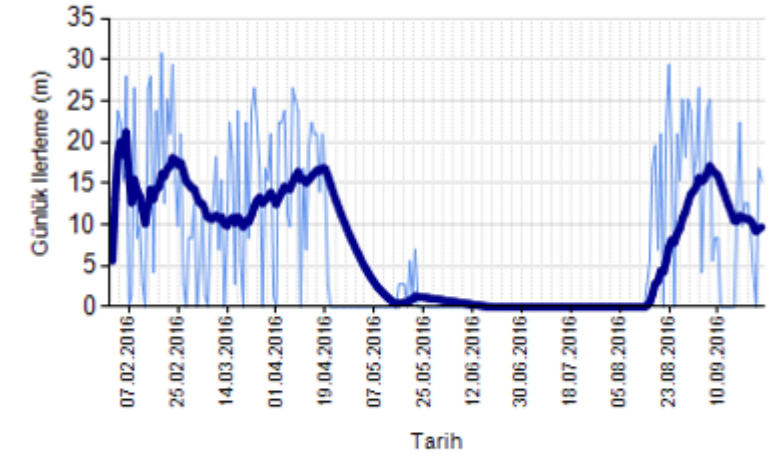
Toplam KM
2435,21

Hat-2 TBM Terra
tamamlandı. 9,8
döküm sahası
Jeolojisi: Kil, Sil

Terratec / H2



Tarihe Göre TBM Tünel İlerlemeleri Terratec H2



CONSTRUCTION PHASE

Schedule & Budget Control - PMP

PROGRESS PAYMENT

815.655.436 TL

96%

Planned

558.664.458

66%

Actual

PROJECT DURATION

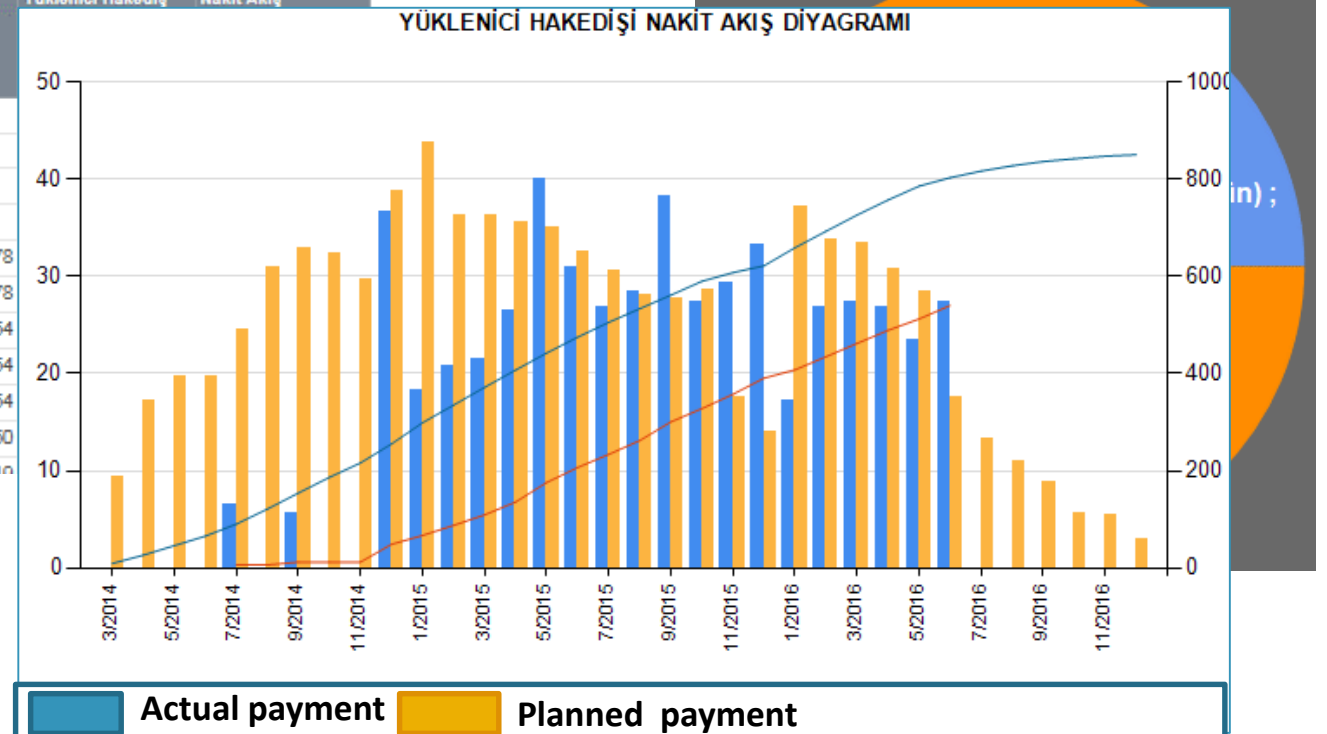
953days 87,11%

To Date

141days 12,89%

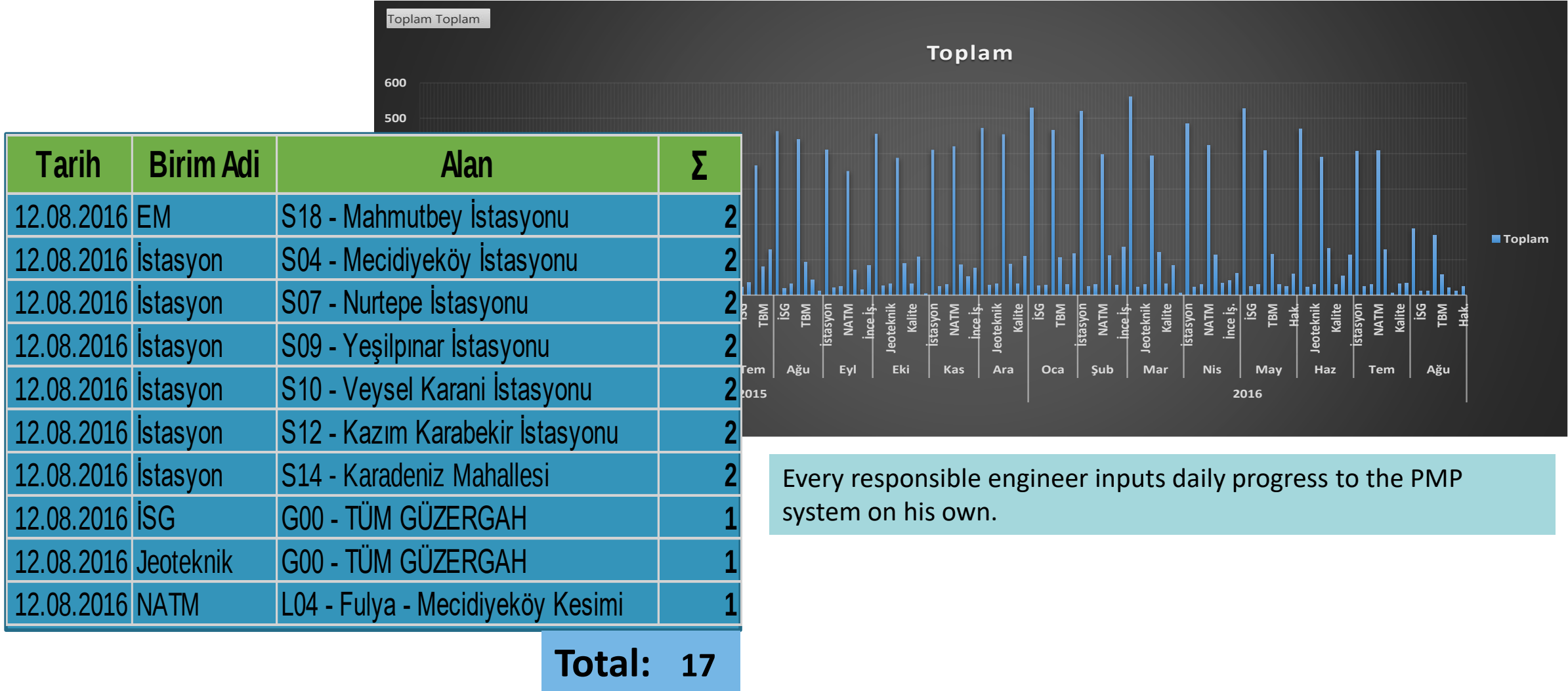
Kalan Süre

Sıra	Aylar	Hakediş Kuru	Aylık Planlanan	Kümülatif Planlanan	Aylık Gerçekleşen	Kümülatif Gerçekleşen
1	Mart 14	TL	9,334,485.54	9,334,485.54		
2	Nisan 14	TL	17,139,829.30	26,474,314.84		
3	Mayıs 14	TL	19,656,162.19	46,130,477.03		
4	Haziran 14	TL	19,624,033.62	65,754,510.65		
5	Temmuz 14	TL	24,572,793.73	90,327,304.38	6,597,565.78	6,597,565.78
6	Ağustos 14	TL	30,909,159.25	121,236,463.63		6,597,565.78
7	Eylül 14	TL	32,905,299.87	154,141,763.50	5,578,111.78	12,173,677.54
8	Ekim 14	TL	32,305,710.83	186,447,474.33		12,173,677.54
9	Kasım 14	TL	29,703,060.27	216,150,534.60		12,173,677.54
10	Aralık 14	TL	38,806,502.18	254,957,036.78	38,551,065.98	48,724,743.50
11	Ocak 15	TL	42,881,738.80	297,838,775.58	49,212,972.80	97,937,716.30



CONSTRUCTION PHASE

Station Based Remote Data Input Track - PMP



CONSTRUCTION PHASE

Station Construction Is Underway

Finishing Works 3D Model View

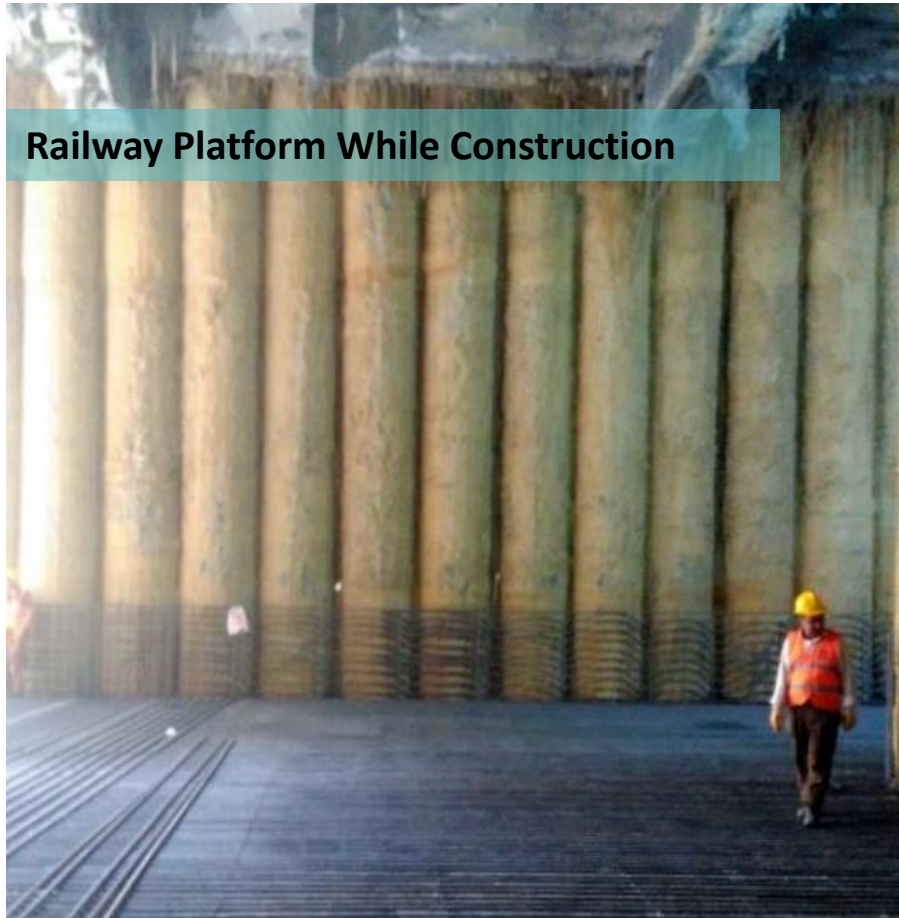


Construction Site Existing Works

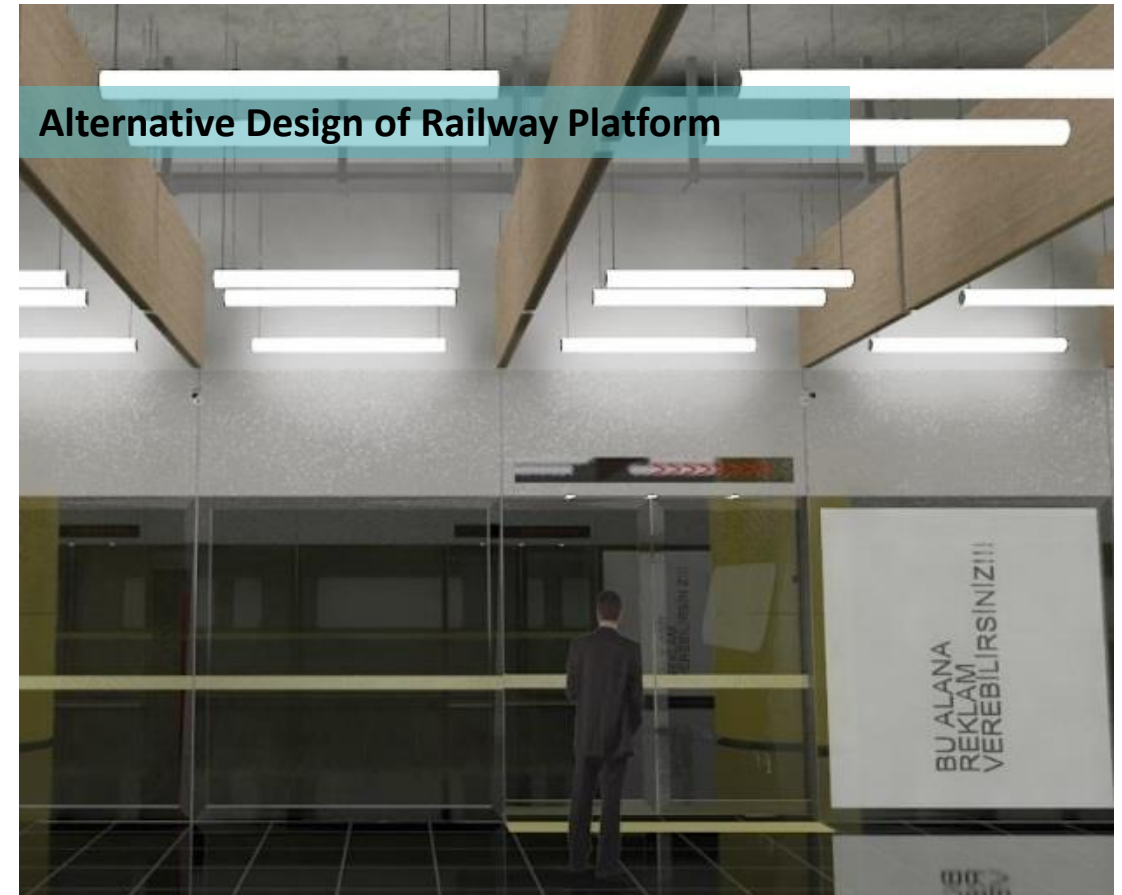


CONSTRUCTION PHASE

Finishing Works of 3D Model View



Alternate concept design models are prepared for Finishing Works



CONSTRUCTION PHASE

Render Models



CONSTRUCTION PHASE

Taking Data From Site To Office



CONSTRUCTION PHASE

Site Progress Track

M-Files

Genisletil...

Yeni

Gidilecek

Anasayfa

* * Bana Görevlendirilmiş

Check Out larım

Sık kullanılanlar

Son Zamanlarda..

Bilgi Gelen Yazılar

Gereği Gelen Yazılar

Sözleşmeler

PAFTALAR - Alanına

Gelen - AL

Gelen - GKK

RAPORLAR - Modeller

Sistemden Çık

Autodesk Navisworks Manage 2016 (STUDENT VERSION) EMY-M7-S00-000.nwf

Architecture Structure System

Home Viewpoint Review Animation View Output BIM 360 Render

Append Refresh Reset All... File Options Select Save Selection Select All Select Same Selection Tree Find Items Quick Find [C]Sets Hide Require Hide Unselected Unhide All Links Quick Properties Properties Clash Detective TimeLiner Quantification Autodesk Rendering Animator Scripter Compare DataTools

Project Select & Search Visibility Display Tools

Sets

- Altyari
- Ustyari
- Kemer
- Invert
- Saft
- 1.Asama
- 2.Asama
- TamKesit

Properties

YP_P1A_12m

Generic Models (1) Edit Type

Mark	
İSTASYON ADI	S10
TİPİ	IST
KISIM	PT1.H2
KAT/ KOT	PK
STRÜKTÜR	TBK
NO.	
ANO	A0
TASARIMCI FIR...	YÜKSEL PROJE
ÇİZEN	ÖÖ

Phasing

Phase Created	New Constru...
Phase Demolis...	None

Other

1.Asama	☒
2.Asama	☒
Altyari	☒
Invert	☒
Kemer	☒
Saft	☒
TamKesit	☒
Ustyari	☒

Properties help Apply

2016.08.27

2016.08.31

- S00-Genel Görünüm
- S00-Genel Görünüm Üst
- S05-Medidiyeköy
- S06-Çağlayan
- S08-Nurtepe
- S10-Yeşilpınar
- S11-Veysel Karani
- S12-Akşemsettin
- S13-Kazım Karabekir
- S14-Yenimahalle
- S15-Karadeniz
- S16-Tekstilkent
- S17-Yüzyıl
- S18-Göztepe
- S19-Mahmutbey
- S10 - S19
- deneme s11

T1A(3066250)-TAA(4919229) : LEVEL Drenaj (127045)

X: 409875024 mm Y: 4549894564 mm Z: 123445 mm

1 of 1

1301 MB

01:58

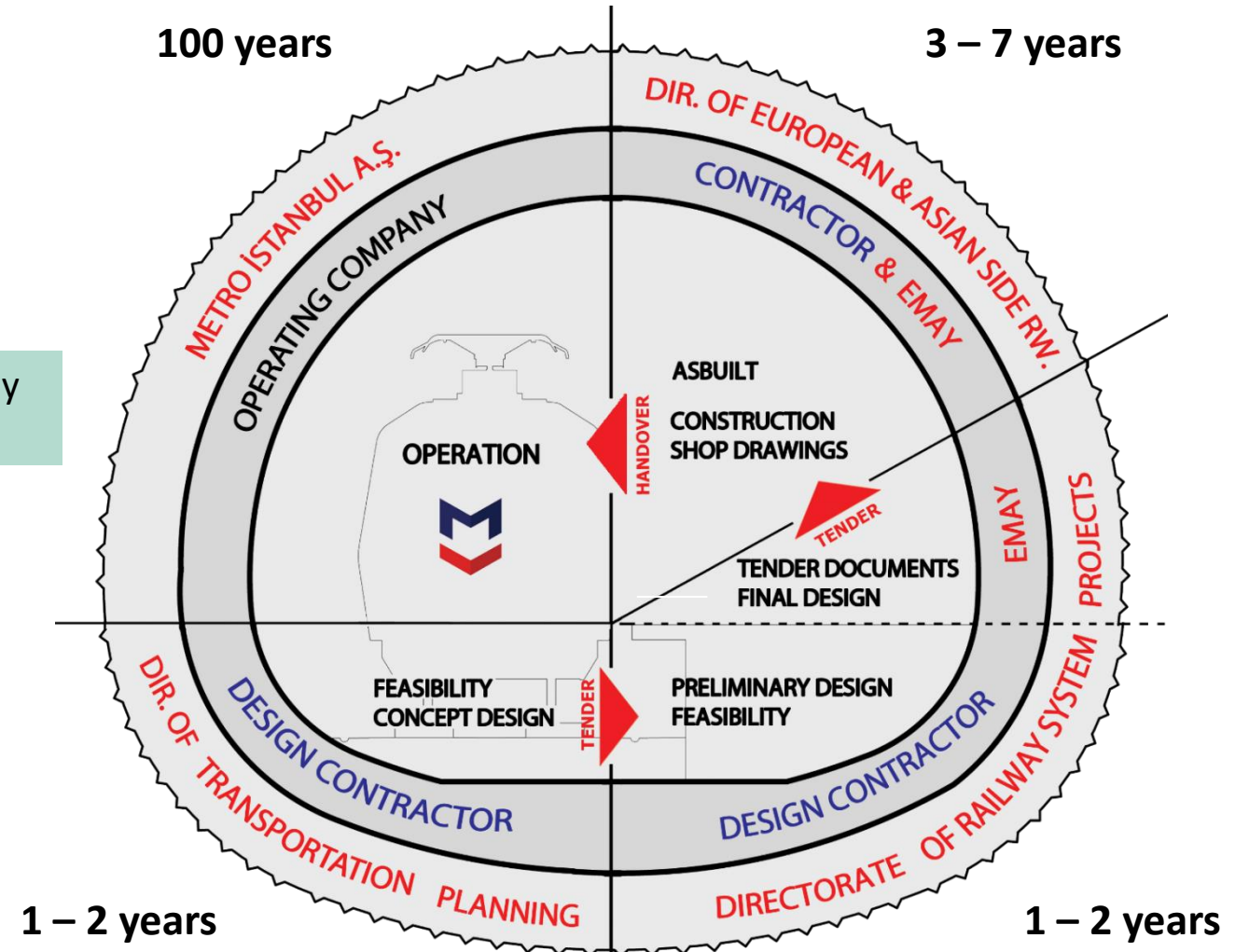
KMM POST-CONSTRUCTION PHASE



POST-CONSTRUCTION PHASE

- Consider Life – Cycle of subway
- Plan for next 100 years

- Add maintenance parameters to models and model family
- Integration of Models & Facility management software



CHALLENGES

- ▶ Changing business culture
- ▶ (Drawings 2D -> 3D)
- ▶ Users tend to use traditional methods for data sharing.
- ▶ Difficulties in preparation of BIM documents
- ▶ No BIM specification or regulation for horizontal construction works in Turkey.
- ▶ Lack of experienced subcontractors



During the project;

New station added to the line: The models were designed based on existing Document Coding System.

We had to number all the stations again. This caused approximately 1 month delay.



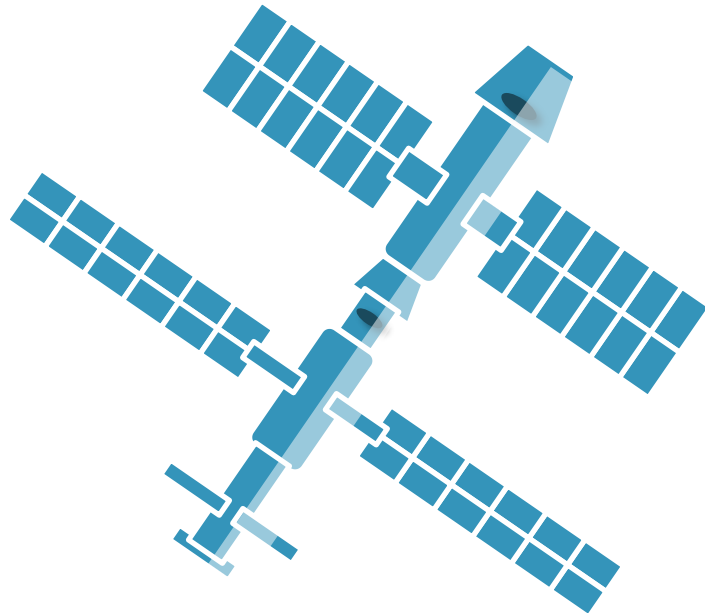
LESSONS LEARNED

- ▶ More detailing BEP document should be developed.
- ▶ The BEP document should include the Document Coding System which Emay developed.
- ▶ Procedures and work flows should be created. All the documents, even the minutes of meetings should be classified under a smart document system.
- ▶ All the stakeholders should be informed about BIM system and training must be mandatory via tender documents.



OUTLOOK

- ▶ Project owners should be involved to process.
- ▶ The implementation of BIM processes should be started immediately.
- ▶ Each project should create its own BIM process.
- ▶ Companies and Municipalities (owners) always have to seek for better solutions. Here, we try different CDE platforms in different projects.



OTOGAR – BAĞCILAR METRO PROJECT

STATUS	OTOGAR - BAĞCILAR	KABATAŞ - MAHMUTBEY
File tracking	Excel	M-Files
File archive method	Hard copy	Soft copy
Drawing tracking	Excel	M-Files
Drawing archive	Hard copy – Limited people	Soft copy - Everybody can Access (authorized)
OUTCOME	Last progress payment: June 2015 Now: 4 people still working for Final account	No delay on office works Expected
Additional Cost	6,200 Euro/month	

In traditional method;
Lack of document management system causes waste of time. You have to ask to related person to find a drawing file and this lowers the performance of people. We expect to finish office works as the site works finish.

IT WOULD ALL BE MUCH HARDER WITHOUT BIM!



