

# **WP 5 ILC Siting in Europe Work Package Report Part II**

**ILC-HiGrade Scientific and Annual Mtng  
CERN · Geneva, Switzerland  
February 25, 2010**

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John Andrew Osborne · CERN & GDE**

Sample Sites

THE ILC ACCELERATOR

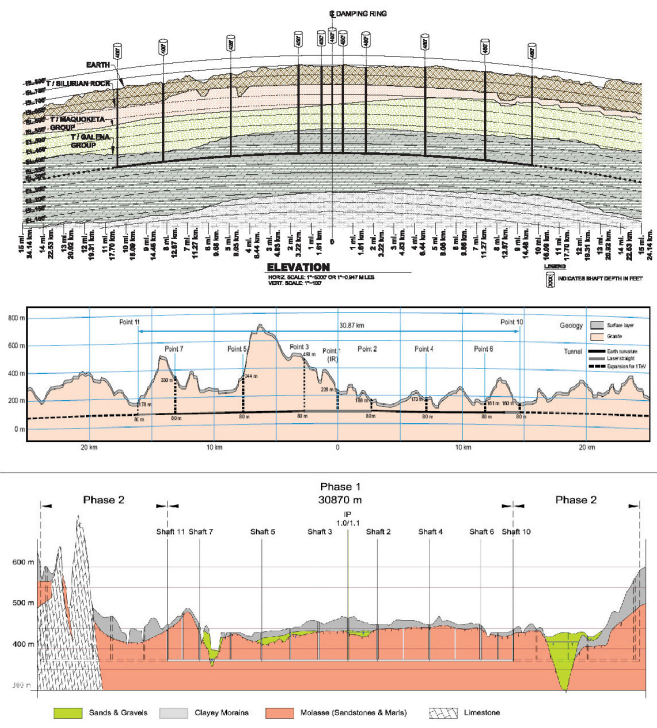


FIGURE 2.13. Geology and tunnel profiles for the three regional sites, showing the location of the major access shafts (tunnels for the Asian site). Top: the Americas site close to Fermilab. Middle: the Asian site in Japan. Bottom: the European site close to CERN.

has approximately one-quarter of the machine on the Fermilab site. The surface is primarily flat. The long tunnels are bored in a contiguous dolomite rock strata (Galena Platteville), at a typical depth of 30-100 m below the surface.

- The Asian site has been chosen from several possible ILC candidate sites in Japan. The sample site has a uniform terrain located along a mountain range, with a tunnel depth ranging from 40 m to 600 m. The chosen geology is uniform granite highly suited to modern tunneling methods. One specific difference for the Asian site is the use of long sloping access tunnels instead of vertical shafts, the exception being the experimental hall at the Interaction Region, which is accessed via two 112 m deep vertical shafts. The sloping access tunnels take advantage of the mountainous location.

- The European site is located at CERN, Geneva, Switzerland, and runs parallel to the Jura mountain range, close to the CERN site. The majority of the machine is located in the 'Molasse' (a local impermeable sedimentary rock), at a typical depth of 370 m.

The elevations of the three sample sites are shown in Figure 2.13. The tunnels for all three sites would be predominantly constructed using Tunnel Boring Machines (TBM), at typical rates of 20-30 m per day. The Molasse of the European site near CERN requires a reinforced concrete lining for the entire tunnel length. The Asian site (granite) requires rock bolts and a 5 cm 'shotcrete' lining. The US site is expected to require a concrete lining for only approximately 20% of its length, with rock-bolts being sufficient for permanent structural support.

A second European sample site near DESY, Hamburg, Germany, has also been developed. This site is significantly different from the three reported sites, both in geology and depth (25 m deep), and requires further study.

In addition, the Joint Institute for Nuclear Research has submitted a proposal to site the ILC in the neighborhood of Dubna, Russian Federation.

The three sites reported in detail here are all 'deep-tunnel' solutions. The DESY and Dubna sites are examples of 'shallow' sites. A more complete study of shallow sites – shallow tunnel or cut-and-cover – will be made in the future as part of the Engineering Design phase.

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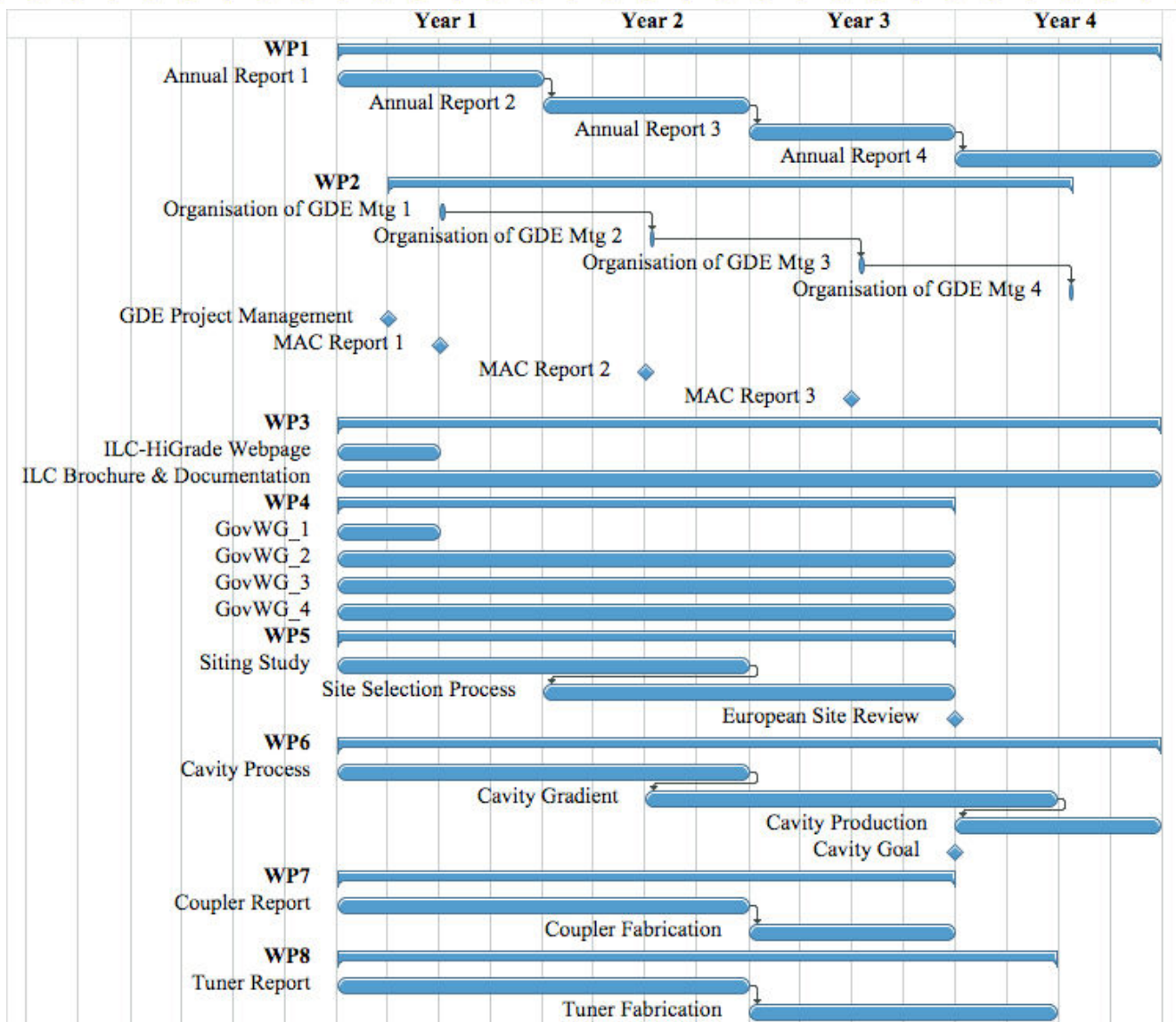


# List of Beneficiaries

<b>Beneficiary number</b>	<b>Beneficiary name</b>	<b>Beneficiary short name</b>	<b>Country</b>
1 (Coordinator)	Stiftung Deutsches Elektronen-Synchrotron	DESY	Germany
2	Commissariat à l'Energie Atomique	CEA	France
3	European Organization for Nuclear Research	CERN	Switzerland
4	Centre National de la Recherche Scientifique	CNRS	France
5	Istituto Nazionale di Fisica Nucleare	INFN	Italy
6	The Chancellor, Masters and Scholars of the University of Oxford	UOXF.DL	UK

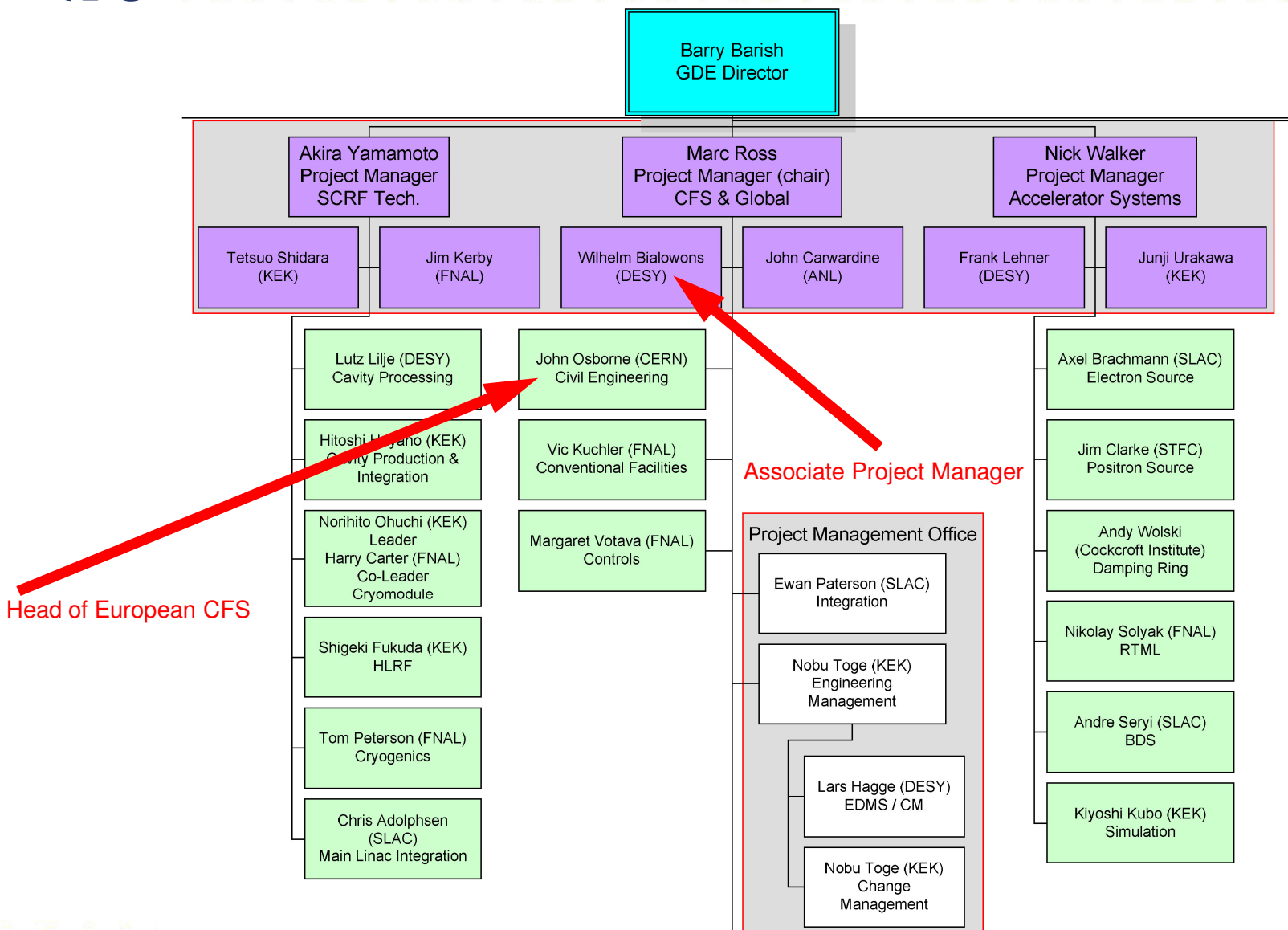


# The Temporal Development for the WPs





# GDE Project Structure for TDP





# Outline

- Introduction
- Mission or justification for Work package 5
- The last ILC-HiGrade Meeting was March 6, last year at LAL .What happened in the meantime?
- (Bi-)Weekly GDE CFS WebEx-Meetings on Tuesday 14:00 to 15:00
- Monthly GDE CFS and Global Systems WebEx-Meetings on Wednesday 15:00 to 16:00
- Monthly CLIC-ILC Cost and Schedule WebEx Mtngs
- TILC09 GDE Meeting on ILC and AAP Review April 17 to 21, 2009 in Tsukuba, Japan

- Joint GDE, ILC-HiGrade and JINR Conventional Facilities and Siting Meeting, June 25 and 26, 2009 at DESY in Hamburg (ILCAgenda 3646)
- 2009 Linear Collider Workshop of the Americas, September 29 to October 3, 2009 in Albuquerque, New Mexico
- AAP Review Meeting January 6 to 8, 2010 at Oxford University
- Preparation of ILC Workshop 2010, March 26 to 30, in Beijing
- (Tunnel) Safety



# (Bi-)Weekly GDE CFS WebEx-Meetings





# Monthly GDE CFS and GS WebEx-Meetings



# CLIC-ILC Cost and Schedule WebEx Meetings



# TILC09 GDE Meeting on ILC and AAP Review



# 2009 Linear Collider Workshop of the Americas



# AAP Review Meeting at Oxford University



# Preparation of ILC Workshop 2010 in Beijing



# (Tunnel) Safety



# Joint GDE, ILC-HiGrade and JINR CFS Meeting

## Thursday 25 June 2009

### Session 1 - Seminarroom 24/121 (09:00-10:15)

- Conveners: Dr. Eken, Eckhard

time	[id] title	presenter
09:00	[1] Welcome (09:00:05)	Dr. EIKEN, Eckhard
09:10	[2] Introduction (09:10:05)	Dr. ROSS, Marc
09:15	[3] Organization of the Joint Meeting (09:15:05)	Mr. BIALOWONIS, Wilhelm
09:55	[6] Potential ILC Site at DESY in Hamburg (09:55:00)	Mr. BIALOWONIS, Wilhelm

### Coffee Break - Seminarroom 24/121 (10:15-10:45)

### Session 2 - Seminarroom 24/121 (10:45-12:00)

- Conveners: Mr. Bialowonis, Wilhelm

time	[id] title	presenter
10:45	[10] Overview of CFS Layout Configuration Study and Opportunities for JINR/CEP Participation (00:00:00)	Mr. KUCHLER, Victor
11:15	[9] Hydrological Report for the XFEL Environmental Impact Study (00:02:00)	Dr. BREITEL, Holger
11:35	[17] Tunneling in Coastal Deposits (00:02:50)	Mr. HANISCH, Lindemans Dr. MITL, Van, Jens

### Lunch - DESY Canteen (12:00-14:00)

### Session 3 - Seminarroom 24/121 (14:00-15:15)

- Conveners: Mr. Kuchler, Victor

time	[id] title	presenter
14:00	[16] A Potential ILC Site at Dubna, Moscow Region (00:01:00)	Prof. SHIRKOV, Gligori
14:15	[14] The Results of the Preliminary Geological Engineering Surveys Along the Supposed Route of the ILC in Dubna Area of Moscow Region (01:00:00)	Dr. DUDARVA, Andrey Dr. SOKOLOV, Valery

### Coffee Break - Seminarroom 24/121 (15:15-15:45)

### Session 4 - Seminarroom 24/121 (15:45-17:00)

- Conveners: Dr. Ross, Marc

time	[id] title	presenter
15:45	[11] Preparation of the Joint Report (00:01:15)	Prof. SHIRKOV, Gligori

## Friday 26 June 2009

### Session 5 - Seminarroom 30b/459 (09:00-10:00)

- Conveners: Dr. Walker, Nicholas

time	[id] title	presenter
09:00	[12] Preparation of the Joint Report (00:00:00)	Prof. SHIRKOV, Gligori

### 93rd ILC@DESY General Project Meeting - Seminarroom 30b/459 (10:00-11:00)

(Tentative schedule - please follow the link for the latest schedule.)

time	[id] title	presenter
10:00	[4] Announcements (00:00:05)	Dr. EIKEN, Eckhard
10:05	[5] Accelerator Design & Integration (00:02:00)	Dr. WALKER, Nicholas
10:35	[3] ILC Activities in Dubna, Russia (00:02:50)	Prof. SHIRKOV, Gligori

### Clusnet - Seminarroom 30b/459 (11:00-12:00)

- Conveners: Dr. Eken, Eckhard

time	[id] title	presenter
11:00	[13] Draft of the Joint Report (00:02:00)	Prof. SHIRKOV, Gligori
11:30	[15] Summary (00:02:00)	

### Lunch - DESY Canteen (12:00-14:00)

### DESY Tour - DESY Campus (14:00-18:00)

SPEL Construction Area, HERA Tunnel, SPEL, Stoeckl p. FLASH-Hall III, PETRA Experimental Hall

- Conveners: Mr. Bialowonis, Wilhelm



- Shallow site studies are *very important* for the ILC – GDE Conventional Facilities Technical Design Phase
  - **Cost**
  - **Comparison and evaluation will lead to cost savings and design improvements**
- JINR – GSPI is the *most extensive* shallow site study undertaken in support of the ILC – GDE Reference Design
  - **No other specific shallow site study is presently planned**



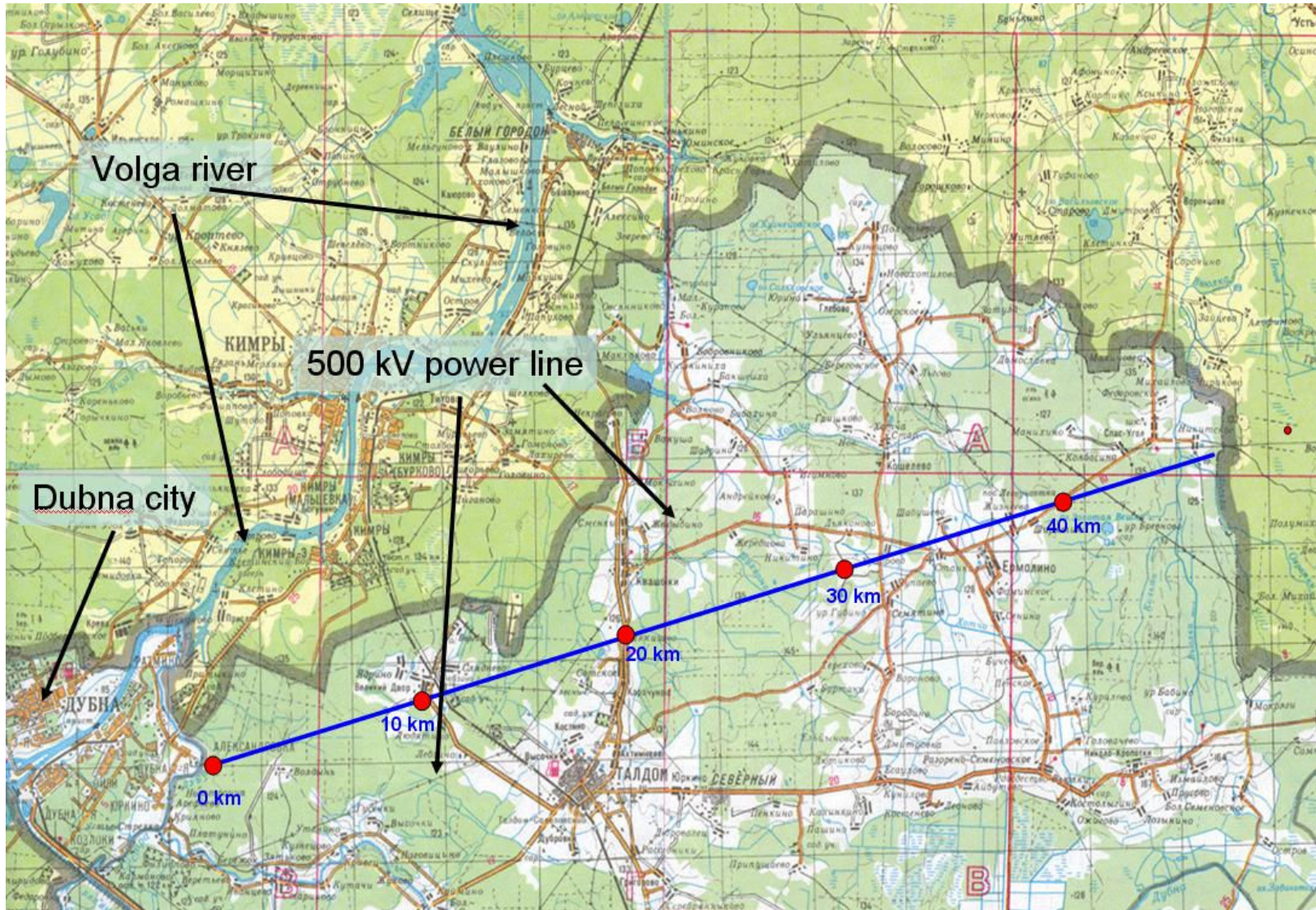
# Potential ILC Site at Dubna in Russia

## ***Siting Studies in Europe***

The Joint Institute of Nuclear Research (JINR) in Dubna has proposed a site near their institute, south of the Volga river. That proposal comprises a machine close to the surface but constructed using tunnel-boring machines. Sufficient power from the Russian national grid is available. The project will assess the potential of such a site and conclude on the benefits and risks.



# General Layout of the Site Near Dubna





# Geological Investigations of GSPI



GSPI has performed geophysical investigations in 35 points (in red) including three drillings of chinks of 47 m, 43 m and 36 m depth. The probes of soils had been analyzed. The power of loan are 27.5 m (2.0 m – 29.5 m) and 37.4 m (8.1 m – 45.5 m) correspondently. Geophysical investigations with a series of seismic and electrical investigations have been performed as well.

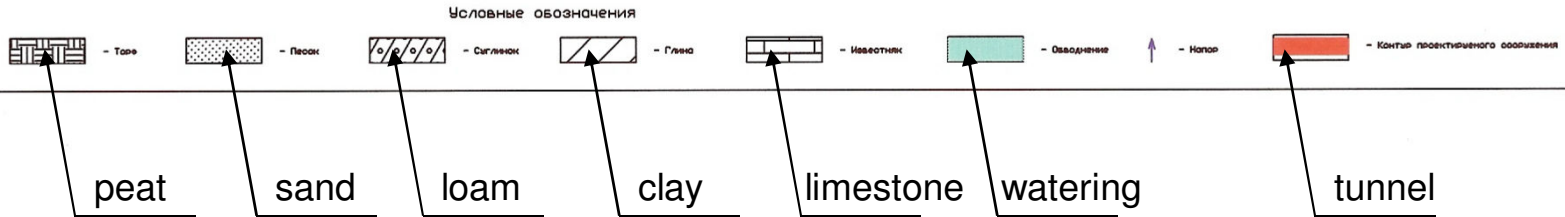
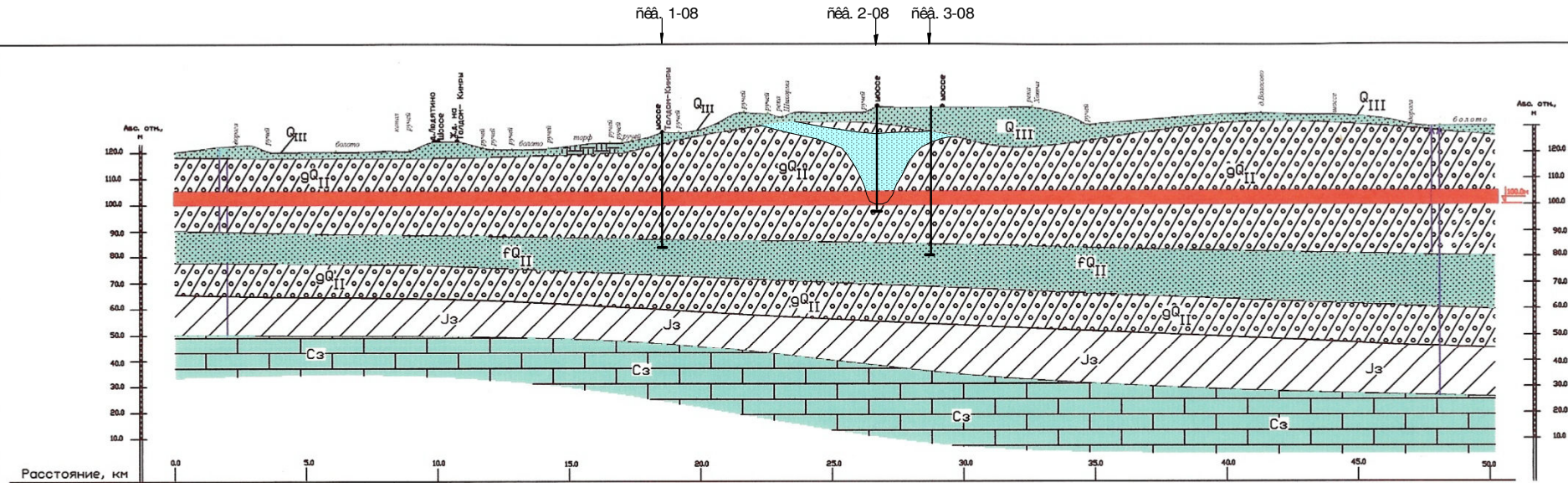


# Bird Eyes View of Bore Hole Positions



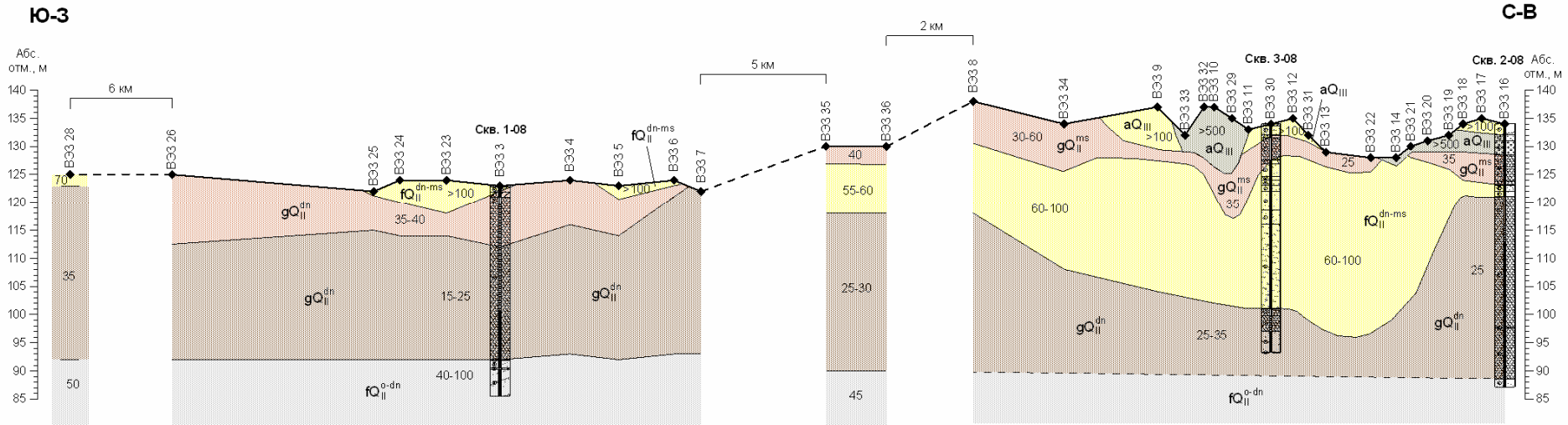


# Geological Cut of the Dubna Sample Site





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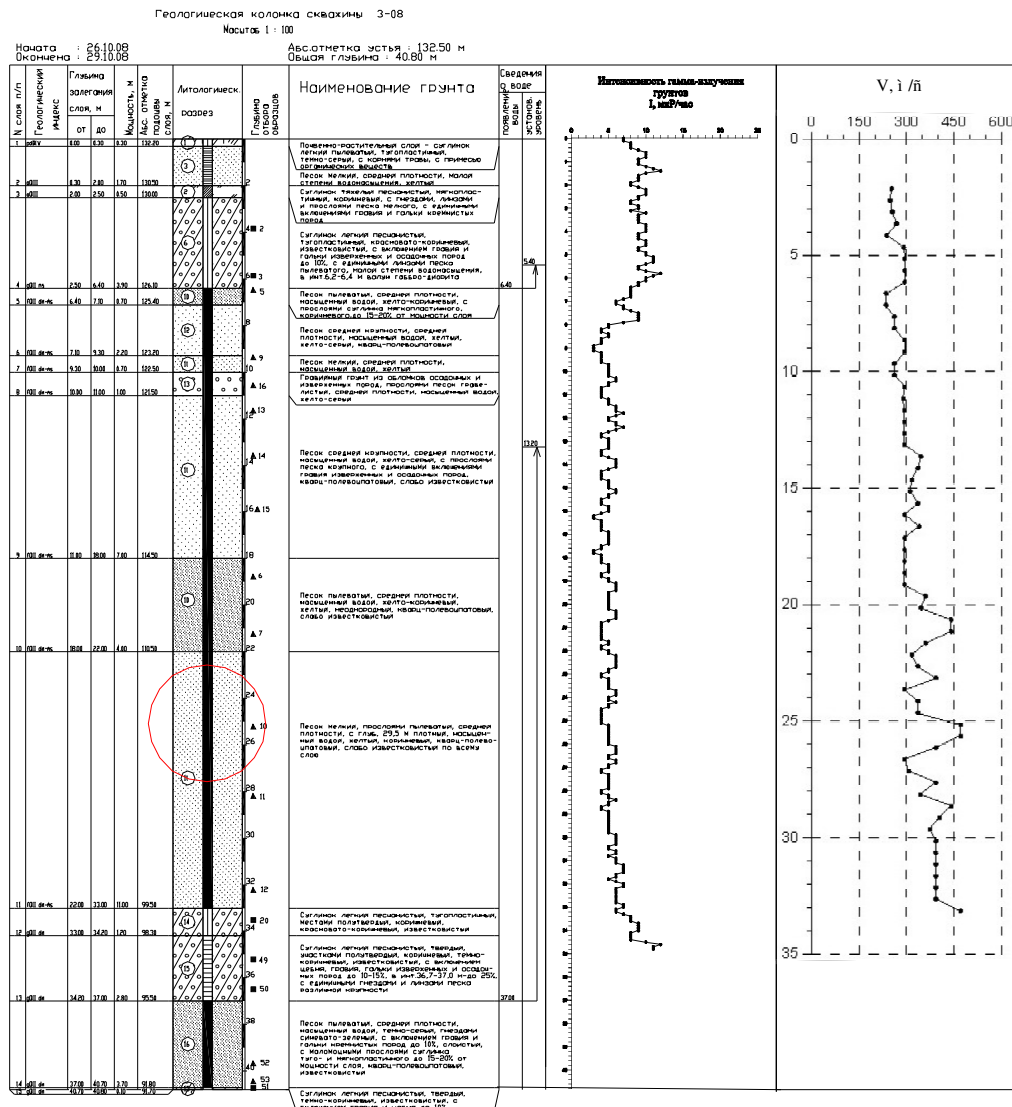


Условные обозначения

- I геоэлектрический горизонт - моренные суглинки московской и днепровской стадии опеденения
- IV геоэлектрический горизонт - аллювиальные песчаные отложения и флювиотепляльные песчаные отложения днепровско-московского межледниковья
- II геоэлектрический горизонт - моренные суглинки днепровской стадии опеденения
- V геоэлектрический горизонт - аллювиальные гравийно-галечниковые отложения
- III геоэлектрический горизонт - песчаные отложения окско-днепровского межледниковья

Нач. БКИИ	Соколов В. С.				Приложение 8						
Глав. спец.	Крестянина А. А.				31805016						
Глав. спец.	Черныгин А. Г.										
Изм. 2-й кат.	Гусакоев И. О.				Трасса размещения международного копейдифера						
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# Profile of Bore Hole 3-08







# Conclusion of Grigori Shirkov · JINR

1. Route of the International Linear Collider passes in sparsely populated area near existent scientific center JINR
2. Climatic conditions are comfortable.
3. Relief of the area is flat with soft outlines and small excess. The most part of the track is forest, the smaller part is meadows and tillage, partly is swamp land.
4. The route passes through the stable, steady structural element of the earth's crust – Russian plate. This territory is related to the 5-point zone under the MSK-64 scale.
5. Geological structure, hydro geological conditions, geotechnical properties of soil are suitable for the ILC construction.
6. The ILC is placed at a shallow depth (13-24m) in layer of firm dense drift clay, partly in layer of water-field sand. Under the further researches of the region it is possible to place the route in drift clay entirely.
7. In general, the assumed route is favorable for the ILC construction. There is a positive experience of automated tunneling in similar soils in the Russian Federation.



# Plans for the Future at JINR

1. Detailed geological investigations on the ILC route.
2. Looking for the best Interaction Point as a center and starting point of ILC, Detectors and Convention Facilities location.
3. Cost Estimation for different solutions of Dubna siting (one tunnel and surface gallery, full cut and cover, combinations of solutions).
4. Conditions and funding of GSPI work and participation in the GDE/CFS activity



# Outline of the Dubna Site Investigation Report

- 1. Executive Summary/Overview**
- 2. GSPI Soil Boring Report**
- 3. Description of Current Dubna Site Design**
  1. Current Status of Preliminary Design
  2. Verification of GSPI Soil Boring Report
  3. Status of Cost Estimating Effort
- 4. Near Term Topics for Further**
  1. Identification of Optimal Location for Dubna Sample Site
  2. Additional Field Investigation for Site Definition
  3. Investigation of Alternative Tunnel Configurations for Shallow Siting
  4. Analysis of Life Safety and Egress Strategies of Altern. Tunnel Configs
  5. Cost Estimates for Alternative Tunnel Configurations
- 5. Longer Term Planning Opportunities and Schedule**
- 6. Summary**
- 7. References**
  1. Soil Boring Report (Original)
  2. Soil Boring Report (English Version)

- An important part of the Technical Design Report in 2012 is a new cost estimate with (hopefully) reduced cost
- A key item for cost reduction are the Conventional Facilities and the Siting
- Shallow sites and single tunnel designs are promising significant cost reduction
- Europe can (and should) bid to host and has the choice between several sites and deep and shallow tunnels



# BackUp Slides