Next-Generation Liquefaction (NGL) Case History Database Structure

PEER Next-Generation Liquefaction Research Program

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Introduction

The Next-Generation Liquefaction (NGL) project is a multi-year communitybased effort consisting of three components:

- (1) <u>A transparent, open-source, community database of liquefaction case</u> histories. Its development is overseen by the NGL Database Working **<u>Group</u>** consisting of S. J. Brandenberg (chair), K. Onder Cetin, Kevin W. Franke, and Robb E.S. Moss;
- (2) <u>Supporting studies</u> for effects that should be captured in models but that cannot be constrained by case history data;



(3) Model development.

The NGL case history database that is accessible via a web interface at http://www.uclageo.com/NGL/ (Figure 1). Registered users can upload, view, and download data. The NGL database is a relational database (RDB), which differs from what many in the natural hazards community intend when they use the term "database". The NGL RDB is a collection of objective data. This is different from a **flatfile** that contains **subjective interpretation** of them.



Figure 1. Screenshot of the NGL database homepage.

NGL Database Structure

In NGL, a case-history consists of three components:

(1) <u>Site</u> (Geotechnical/geological site characterization, Figure 2);





Figure 4. Observed field performance (deformation map) for the Urayasu sea-front case-history in Japan following the 2011 M9.0 Tohoku-Oki event.

0	bservations (FLDO)	Grour	d Motion at site (GMIM)	Obs	ervation Files (FLDF)	Obse	rvation Photos (FLDP)	D	isp. Vectors (FLDD)
<mark>o</mark> r	FLDO_ID	<u></u>	GMIM_ID	<mark>0</mark> 7	FLDF_ID	<u></u>	FLDP_ID	<u></u>	FLDD_ID
07	EVNT_ID	07	FLDO_ID	07	FLDO_ID	07	FLDO_ID	07	FLDO_ID
J	SITE_ID		GMIM_TYPE	07	FILE_ID	07	FILE_ID		FLDD_LAT
	FLDO_NAME		GMIM_VALUE		FLDF_DESC		FLDP_LAT		FLDD_LON
	FLDO_LAT		GMIM_UNIT			-	FLDP_LON		FLDD_AZIM
	FLDO_LON		GMIM_STDDEV				FLDP_DESC		FLDD_HDIS
	FLDO_ELEV		GMIM_METHOD						FLDD_VDIS
	FLDO_SFEV							_	
	FLDO_SNBL								Primary key
	FLDO_LTSP								
	FLDO_STTL								
	FLDO_STDM							((O┌╦ Foreign key
	FLDO_DESC								
		-							

Figure 5. NGL relational database structure for post-earthquake observations.

ers (USER)	Files (FILE)	Sites (SITE)	Lo	ocation (LOCA)	Field	l Test Types (TEST)	
USER ID	FILE ID	SITE ID		LOCA ID	O ,	TEST ID	

- (2) <u>Event</u> and ground motion information (Figure 3). This section mirrors in some respects the data structure used in the **NGA-West2** and **NGA-Subduction** projects;
- (3) **Observation**, including evidence for liquefaction and its effects, ground failure, or non-ground failure (Figures 4 and 5).

The NGL database structure is described by the **<u>database schema</u>** (Figure 6) which represents the blueprint of how the database is constructed. Its current version has been refined through a **community-based** effort performed in the last two years via project coordination meetings and public workshops.



Figure 2. Site characterization and example of the NGL RDB plotting capability.

<mark>0</mark> 7	USER_ID	07	FILE_ID	07	SITE_ID	07	LOCA_ID	07	TEST_ID
	first_name		FILE_NAME	07	TEAM_ID	07	SITE_ID	07	LOCA_ID
	last_name		FILE_TYPE		SITE_NAME		LOCA_NAME		TEST_NAME
	email		FILE_SIZE		SITE_LAT		LOCA_LAT		TEST_TYPE
	reg_date		FILE_FILE		SITE_LON		LOCA_LON		
	organ				SITE_GEOL		LOCA_ELEV	Т	est Files (TESF)
	country				SITE_REM		LOCA_REM	0 7	TESF_ID
	region				SITE_STAT			õ	TEST_ID
	zip				SITE_REVW			07	FILE_ID
	user_pass								TESF_DESC
	num_visit			S	Site Files (SITF)				
	num_download			<mark>0</mark> 7	SITF_ID				
	num_upload			O7	SITE_ID				
				07	FILE_ID			\mathbf{O}	Primary key
1	eams (TEAM)				SITF_DESC				
<mark>0</mark> ,	TEAM_ID							6	- Foreian kev
	TEAM NAME							\mathbb{S}	

Team Members (MEMB)						
0	MEMB_ID					
0	TEAM_ID					
0	USER_ID					
	MEMB_ROLE					

Users

Figure 6. NGL relational database structure for general information.

Conclusion

This poster presents the organizational structure of the NGL relational database by providing a list of tables, fields within those tables, and relationships among the tables. The adoption of a relational database management system is a departure from the more common file repository approach adopted by many engineers in the natural hazards community. The use of a RDB provides significant benefits over traditional file repositories.

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