CLASS G Software Matrix for: Geospatial Services Software Development Effort					**Tailoring Compliance**			
Section	**NPR SWE #**	**Requirement Text**	**Technical Authority**	**Responsibility**	**Software Class G (Note 4)**	**Comply?** (FC - Fully Compliant, T - Tailored, NA - Not Applicable)	**Tailoring Description**	**Tailoring Rationale**
2.2.4	121	Where approved, the project manager shall document and reflect the tailored requirement in the plans or procedures controlling the development, acquisition, and/or deployment of the affected software.	Center Level	Project	X	FC		
2.2.5	125	Each project manager with software components shall maintain a compliance matrix or multiple compliance matrices against requirements in this NPR, including those delegated to other parties or accomplished by contract vehicles or Space Act Agreements.	Center Level	Project	X	FC		
2.2.6	139	The projects shall comply with the requirements in this NPR that are marked with a “project” responsibility and an ”X” in Appendix D consistent with their software classification.	Center Level	Project	X	FC		
2.2.10	145	When the compliance matrix is used to waive/deviate from applicable “X” requirement(s), the designated Technical Authorities shall indicate their approval by signature(s) in the compliance matrix itself.	Center Level	Project	X	FC		
3.1.2	13	The project manager shall develop, maintain, and execute software plans that cover the entire software life cycle and, as a minimum, address the requirements of this directive with approved tailoring.	Center Level	Project	X	FC		

Section	NPR SWE #	Requirement Text	Technical Authority	Responsibility	Software Class G (Note 4)	Comply? (FC - Fully Compliant, T - Tailored, NA - Not Applicable)	Tailoring Description	Tailoring Rationale
3.1.3	24	The project manager shall track the actual results and performance of software activities against the software plans.	Center Level	Project	X	T	For new SW activities over $50K	Changes to existing apps addressed in regression testing
3.3.1	16	The project manager shall document and maintain a software schedule that satisfies the following conditions: a. Coordinates with the overall project schedule. b. Documents the interactions of milestones and deliverables between software, hardware, operations, and the rest of the system. c. Reflects the critical path for the software development activities. d. Adhere to the guidance provided in NASA/SP-2010-3403, NASA Scheduling Management Handbook.	Center Level	Project	X	T	Guidance on EVM from SP-2010-3403 not applied.	Per NPR 8820.2G, EVM only considered on facility projects with costs of $20 million or more or where there is significant development or technical risk.
3.3.2	18	The project manager shall regularly hold reviews of software activities, status, and results with the project stakeholders and track issues to resolution.	Center Level	Project	X	T	For new SW activities over $50K	Changes to existing apps addressed in regression testing
3.3.3	19	The project manager shall select and document a software development life cycle or model that includes phase transition criteria for each life cycle phase.	Center Level	Project	X (not OTS)	T	Ray as Chuck for example deal with OS/Browser changes?	
3.4.1	17	The project manager shall plan, track, and ensure project specific software training for project personnel.	Center Level	Project	X	FC		

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3.5.1	20	The project manager shall classify each system and subsystem containing software in accordance with the highest applicable software classification definitions for Classes A, B, C, D, E, F, G, and H software in Appendix D.	Center Level	Project	X	FC		
3.5.2	132	The project's software assurance manager shall perform an independent classification assessment.	Center Level	Project	X	FC		
3.5.3	133	The project manager, in conjunction with the Safety and Mission Assurance organization, shall determine the software safety criticality in accordance with NASA-STD-8719.13.	Project and Center SMA	Project and Center S&MA	X	FC		Not safety-critical
3.5.4	21	If a system or subsystem evolves to a higher or lower software classification as defined in Appendix D, or there is a change in the safety criticality of the software, then the project manager shall update their plan to fulfill the applicable requirements per the Requirements Mapping and Compliance Matrix in Appendix C and any approved tailoring.	Center Level	Project	X	NA		Software classification will not change
3.5.5	160	If a software component is determined to be safety critical software then software component classification shall be Software Class D or higher.	Center Level	Project	X	NA		Not safety-critical
3.6.3	131	If software IV&V is performed on a project, project manager shall ensure that an IV&V Project Execution Plan (IPEP) is developed.	Center and the Center SMA organizatio n	Project and Center S&MA	X	NA		Out of scope for IV&V.

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3.8.1	146	The project manager shall define the approach to the automatic generation of software source code including: a. Validation and verification of auto-generation tools. b. Configuration management of the auto-generation tools and associated data. c. Identification of the allowable scope for the use of auto-generated software. d. Verification and validation of auto-generated source code. e. Monitoring the actual use of auto-generated source code compared to the planned use. f. Policies and procedures for making manual changes to auto-generated source code. g. Configuration management of the input to the auto-generation tool, the output of the auto-generation tool, and modifications made to the output of the auto-generation tools.	Center Level	Project	X	NA		Auto-generation tools will not be used.

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3.9.2	27	The project manager shall satisfy the following conditions when a COTS, GOTS, MOTS, or reused software component is acquired or used: a. The requirements to be met by the software component are identified. b. The software component includes documentation to fulfill its intended purpose (e.g., usage instructions). c. Proprietary rights, usage rights, ownership, warranty, licensing rights, and transfer rights have been addressed. d. Future support for the software product is planned and adequate for project needs. e. The software component is verified and validated to the same level required to accept a similar developed software component for its intended use. f. The project has a plan to perform periodic assessments of vendor reported defects to ensure the defects do not impact the selected software components.	Center Level	Project	X	FC		
3.10.2	28	The project manager shall plan software verification activities, methods, environments, and criteria for the project.	Center Level	Project	X	T	For new SW activities over $50K	Will not apply to minor changes/fixes to existing application
3.10.3	29	The project manager shall plan the software validation activities, methods, environments, and criteria for the project.	Center Level	Project	X	T	For new SW activities over $50K	Will not apply to minor changes/fixes to existing application
3.10.4	30	The project manager shall record, address, and track to closure the results of software verification activities.	Center Level	Project	X	T	For new SW activities over $50K	Will not apply to minor changes/fixes to existing application

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3.10.5	31	The project manager shall record, address, and track to closure the results of software validation activities.	Center Level	Project	X	T	For new SW activities over $50K	Will not apply to minor changes/fixes to existing application
3.12.2	33	The project manager shall assess options for software acquisition versus development.	Center Level	Project	X	FC		
3.12.3	34	The project manager shall define and document the acceptance criteria and conditions for the software.	Center Level	Project	X	FC		
3.12.5	36	The project manager shall determine which software processes, software documents, electronic products, software activities, and tasks are required for the project and software suppliers.	Center Level	Project	X (not OTS)	FC		
3.12.6	37	The project manager shall define the milestones at which the software supplier(s) progress will be reviewed and audited as a part of the acquisition activities.	Center Level	Project	X (not OTS)	FC		
3.12.7	38	The project manager shall document software acquisition planning decisions.	Center Level	Project	X (not OTS)	FC		
3.12.8	39	The project manager shall require the software supplier(s) to provide insight into software development and test activities; at a minimum, the software supplier(s) will be required to allow the project manager or designate to: a. Monitor product integration. b. Review the verification activities to ensure adequacy. c. Review trades studies and source data. d. Audit the software development process. e. Participate in software reviews and systems and software technical interchange meetings.	Center Level	Project	X (not OTS)	T	applicable for projects over $50K	considered incidental to overall effort, risk is low

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3.12.9	40	The project manager shall require the software supplier(s) to provide NASA with software products and software process tracking information, in electronic format, including software development and management metrics.	Center Level	Project	X (not OTS)	T	applicable for projects over $50K	considered incidental to overall effort, risk is low
3.12.10	42	The project manager shall require the software supplier(s) to provide NASA with electronic access to the source code developed for the project in a modifiable format, including MOTS software and non-flight software (e.g., ground test software, simulations, ground analysis software, ground control software, science data processing software, and hardware manufacturing software).	Center Level	Project	X (not OTS)	FC		
3.13.1	43	The project manager shall require the software supplier to track software changes and non-conformances and provide the data for the project's review.	Center Level	Project	X (not OTS)	T	applicable for projects over $50K	considered incidental to overall effort, risk is low
3.13.2	45	The project manager shall participate in any joint NASA/supplier audits of the software development process and software configuration management process.	Center Level	Project	X (not OTS)	T	applicable for projects over $50K	considered incidental to overall effort, risk is low
3.13.3	46	The project manager shall require the software supplier(s) to provide a software schedule for the project's review and schedule updates as requested.	Center Level	Project	X (not OTS)	T	applicable for projects over $50K	considered incidental to overall effort, risk is low

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3.13.4	47	The project manager shall require the software supplier(s) to make electronically available the software traceability data for the project's review.	Center Level	Project	X (not OTS)	T	applicable for projects over $50K	considered incidental to overall effort, risk is low
3.14.2	147	The project manager shall specify reusability requirements that apply to its software development activities to enable future reuse of the software, including models used to generate the software.	Center Level	Project	X	T	applicable for projects over $50K	considered incidental to overall effort, risk is low
3.14.3	148	The project manager shall evaluate software for potential reuse by other projects across the Agency and contribute reuse candidates to the Agency Software Catalog.	Center Level	Project	X	FC		

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3.15.2	149	The project manager shall ensure that when an open source software component is acquired or used, the following conditions are satisfied: a. The requirements that are to be met by the software component are identified. b. The software component includes documentation to fulfill its intended purpose (e.g., usage instructions). c. Proprietary, usage, ownership, warranty, licensing rights, and transfer rights have been addressed. d. Future support for the software product is planned and adequate for project needs. e. The software component is verified and validated to the same level required to accept a similar developed software component for its intended use.	Center Level	Project	X	FC		
3.15.3	41	The project manager shall require the software supplier(s) to notify the project, in the response to the solicitation, as to whether or not open source software will be included in code developed for the project.	Center Level	Project	X	FC		
4.1.2.1	50	The project manager shall establish, capture, record, approve, and maintain software requirements, including the software quality requirements, as part of the technical specification.	Center Level	Project	X	T	applicable for projects over $50K	considered incidental to overall effort, risk is low

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4.1.2.2	51	The project manager shall perform software requirements analysis based on flowed-down and derived requirements from the top-level systems engineering requirements and the hardware specifications and design.	Center Level	Project	X	T	applicable for projects over $50K	considered incidental to overall effort, risk is low
4.1.2.3	52	The project manager shall perform, record, and maintain bidirectional traceability between the software requirement and the higher-level requirement.	Center Level	Project	X	NA	Delete	Applications are similar to software class D, but with less risk. For class D, this requirement only applies if safety-critical. Since these applications are not safety-critical, and have less risk, this requirement should not apply.
4.1.3.1	53	The project manager shall track and manage changes to the software requirements.	Center Level	Project	X	T	applicable for projects over $50K	considered incidental to overall effort, risk is low
4.1.3.2	54	The project manager shall identify, initiate corrective actions, and track until closure inconsistencies among requirements, project plans, and software products.	Center Level	Project	X	NA	Delete	Applications are similar to software class D, but with less risk. For class D, this requirement only applies if safety-critical. Since these applications are not safety-critical, and have less risk, this requirement should not apply.
4.1.3.3	55	The project manager shall perform requirements validation to ensure that the software will perform as intended in the customer environment.	Center Level	Project	X	T	applicable for projects over $50K	considered incidental to overall effort, risk is low
4.2.3	57	The project manager shall develop and record the software architecture.	Center Level	Project	X(not OTS)	NA		
4.3.2	56	The project manager shall develop, record, and maintain the software design.	Center Level	Project	X(not OTS)	T	For new SW activities over $50K	Risk is low

Section	NPR SWE #	Requirement Text	Technical Authority	Responsibility	Software Class G (Note 4)	Comply? (FC - Fully Compliant, T - Tailored, NA - Not Applicable)	Tailoring Description	Tailoring Rationale
4.3.3	58	The project manager shall develop, record, and maintain a design based on the software architectural design that describes the lower-level units so that they can be coded, compiled, and tested.	Center Level	Project	X(not OTS)	NA		
4.3.4	59	The project manager shall perform, record, and maintain bidirectional traceability between the following: a. Software requirements and software architecture. b. Software architecture and software design. c. Software requirements and software design.	Center Level	Project	X(not OTS)	NA		
4.4.2	60	The project manager shall implement the software design into software code.	Center Level	Project	X(not OTS)	NA		
4.4.3	61	The project manager shall select, adhere to, and verify software coding methods, standards, and/or criteria.	Center Level	Project	X(not OTS)	NA		
4.4.5	62	The project manager shall unit test the software code per the plans for software testing.	Center Level	Project	X(not OTS)	NA		
4.4.6	63	The project manager shall provide a software version description for each software release.	Center Level	Project	X(not OTS)	T	applicable for projects over $50K	considered incidental to overall effort, risk is low
4.4.7	64	The project manager shall perform, record, and maintain bidirectional traceability from software design to the software code.	Center Level	Project	X(not OTS)	NA		
4.4.8	136	The project manager shall validate and accredit software tool(s) required to develop or maintain software.	Center Level	Project	X	NA		

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4.5.2	65	The project manager shall establish and maintain: a. Software test plan(s). b. Software test procedure(s). c. Software test report(s).	Center Level	Project	X	T	For new SW activities over $50K	Changes to existing apps addressed in regression testing
4.5.3	66	The project manager shall perform software testing.	Center Level	Project	X	FC		
4.5.4	67	The project manager shall verify the requirement to the implementation of each software requirement.	Center Level	Project	X	FC		
4.5.5	68	The project manager shall evaluate test results and record the evaluation.	Center Level	Project	X	T	For new SW activities over $50K	Changes to existing apps addressed in regression testing
4.5.6	69	The project manager shall record defects identified during testing and track to closure.	Center Level	Project	X	T	For new SW activities over $50K	Changes to existing apps addressed in regression testing
4.5.8	71	The project manager shall update software test plan(s) and software test procedure(s) to be consistent with software requirements.	Center Level	Project	X	T	For new SW activities over $50K	Changes to existing apps addressed in regression testing
4.5.9	72	The project manager shall provide and maintain bidirectional traceability from the software test procedures to the software requirements.	Center Level	Project	X	NA	Delete	Unnecessary for the software domain and amount of COTS software employed. Also, not required for equivalent software class D applications.
4.5.10	73	The project manager shall validate the software system on the targeted platform or high-fidelity simulation.	Center Level	Project	X	FC		
4.6.2	75	The project manager shall plan and implement software operations, maintenance, and retirement activities.	Center Level	Project	X	NA	Delete	Unnecessary for the software domain and amount of COTS software employed.

Section	NPR SWE #	Requirement Text	Technical Authority	Responsibility	Software Class G (Note 4)	Comply? (FC - Fully Compliant, T - Tailored, NA - Not Applicable)	Tailoring Description	Tailoring Rationale
4.6.3	77	The project manager shall complete and deliver the software product to the customer with appropriate records, including as-built records, to support the operations and maintenance phase of the software's life cycle.	Center Level	Project	X	FC		
5.1.2	79	The project manager shall develop a software configuration management plan that describes the functions, responsibilities, and authority for the implementation of software configuration management for the project.	Center Level	Project	X	FC		
5.1.3	80	The project manager shall track and evaluate changes to software products.	Center Level	Project	X	FC		
5.1.4	81	The project manager shall identify the software configuration items (e.g., software records, code, data, tools, models, scripts) and their versions to be controlled for the project.	Center Level	Project	X	FC		
5.1.5	82	The project manager shall establish and implement procedures to: a. Designate the levels of control through which each identified software configuration item is required to pass. b. Identify the persons or groups with authority to authorize changes. c. Identify the persons or groups to make changes at each level.	Center Level	Project	X	FC		
5.1.6	83	The project manager shall prepare and maintain records of the configuration status of software configuration items.	Center Level	Project	X	T	For new SW activities over $50K	Changes to existing apps addressed in regression testing

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5.1.7	84	configuration audits to determine the correct version of the software configuration items and verify that they conform to the records that define them.	Center Level	Project	X	T	For new SW activities over $50K	Changes to existing apps addressed in regression testing
5.1.8	85	The project manager shall establish and implement procedures for the storage, handling, delivery, release, and maintenance of deliverable software products.	Center Level	Project	X	FC		
5.2.2	86	The project manager shall identify, analyze, plan, track, control, communicate, and record software risks and mitigation plans in accordance with NPR 8000.4.	Center Level	Project	X	NA	Delete	Software risks are minimal. Formality of continuous risk management not warranted. Also, not required for equivalent software class D applications.
5.3.2	87	The project manager shall perform and report the results of software peer reviews or software inspections for: a. Software requirements. b. Software plans. c. Any design items that the project identified for software peer review or software inspections according to the software development plans. d. Software code as defined in the software and or project plans. e. Software test procedures.	Center Level	Project	X (not OTS)	T	For new SW activities over $50K	risk is low

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5.3.3	88	The project manager shall, for each planned software peer review or software inspection: a. Use a checklist or formal reading technique (e.g., perspective based reading) to evaluate the work products. b. Use established readiness and completion criteria. c. Track actions identified in the reviews until they are resolved. d. Identify required participants.	Center Level	Project	X (not OTS)	NA	Delete	Applications are similar to software class D, but with less risk. For class D, this requirement only applies if safety-critical. Since these applications are not safety-critical, and have less risk, this requirement should not apply.
5.3.4	89	The project manager shall, for each planned software peer review or software inspection, record basic measurements.	Center Level	Project	X (not OTS)	NA	Delete	Applications are similar to software class D, but with less risk. For class D, this requirement only applies if safety-critical. Since these applications are not safety-critical, and have less risk, this requirement should not apply.
5.4.2	90	The project manager shall establish, record, maintain, report, and utilize software management and technical measurements.	Center Level	Project	X (not OTS)	NA	Delete	Applications are similar to software class D, but with less risk. For class D, this requirement only applies if safety-critical. Since these applications are not safety-critical, and have less risk, this requirement should not apply.
5.4.3	93	The project manager shall analyze software measurement data collected using documented project-specified and/or Center/organizational analysis procedures.	Center Level	Project	X (not OTS)	NA	Delete	Applications are similar to software class D, but with less risk. For class D, this requirement only applies if safety-critical. Since these applications are not safety-critical, and have less risk, this requirement should not apply.

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5.4.4	94	The project manager shall provide access to the software measurement data, measurement analyses and software development status as requested to the sponsoring Mission Directorate, the NASA Chief Engineer, Center and Headquarters SMA, and Center repositories.	Center Level	Project	X (not OTS)	FC		

Approvals (as required)

Center Engineering Technical Authority: _____

Center Safety and Mission Assurance Technical Authority: _____

HQ Chief Engineer: _____

HQ OSMA: _____

HQ Health&Medical: _____

The rationale for the requirements is contained in the NASA Software Engineering Handbook, NASA-HDB-2203. Programs/Projects may substitute a matrix that documents their compliance with their particular Center's implementation of NPR 7150.2, if applicable. See NASA-HDBK-2203 for compliance matrices organized by class & safety-criticality, tailoring field for each requirement, tailoring rationale, and approval signature lines.

The Compliance Matrix documents the program/project's compliance or intent to comply with the requirements of this NPR or justification for tailoring. The matrix lists:
a. The unique requirement identifier.
b. The section reference.
c. The NPR 7150.2 requirement statement.
d. The Technical Authority Level responsible for assessing a project's compliance matrices, tailoring, waivers, and deviations from requirements in this NPR.
e. The requirement owner (the organization or individual responsible for the requirement).
f. The applicability of the requirements in this NPR to specific systems and subsystems within the Agency's investment areas, programs, and projects is determined through the use of the NASA-wide definition of software classes.

Tailoring Guidance

X - Indicates an invoked requirement by this NPR consistent with Software Classification (ref. SWE-139). May be tailored with Technical Authority approval (ref. Chapter 2.2).

Blank -Optional / Not invoked by this NPR.

X (not OTS)- Does not apply to Off the Shelf (OTS), Commercial Software.

Center Director- Center Director or the Center Director's designated Engineering Technical Authority or Center Director's designated Safety and Mission Assurance Technical Authority.

Note 1 - Project is required to meet this requirement to the extent necessary to satisfy safety critical aspects of the software. All Safety-critical software has to be classified as Class D or Higher.

Note 2 - Applies to Class B software except for Class B software on NASA Class D payloads, as defined in NPR 8705.4. For Class B software, in lieu of a CMMI rating by a development organization, the project will conduct an evaluation, performed by a qualified evaluator selected by the Center Engineering Technical Authority, of the seven process areas listed in SWE-032 and mitigate any risk, if deficient. This exception is intended to be used in those cases in which NASA wishes to purchase a product from the "best of class provider," but the best of class provider does not have the required CMMI rating. When this exception is exercised, the Center Engineering Technical Authority should be notified.

Note 3 - For tailoring of NASA-STD-8739.8 and NASA-STD-8719.13, the Software Assurance Standard and the Software Safety Standard respectively, use the tailoring provided within those documents. They are both risk based and SW Class based tailoring.

Note 4 - The Technical Authority implementation responsibilities for Class F software is at the NASA Headquarters Chief Information Officer (CIO) level , the Technical Authority implementation responsibilities for Class G and H is at the Center CIO organization level or at the level defined in the Center Technical Authority implementation plan. All Safety-critical software has to be classified as Class D or higher.