

MASSGIS STANDARD FOR DIGITAL PLAN SUBMITTALS TO MUNICIPALITIES

APPENDIX D: SUMMARY OF REVIEWER QUESTIONS, COMMENTS AND ISSUES FOR DRAFT #1 OF THE MASSGIS STANDARD FOR DIGITAL PLAN SUBMITTALS

The first draft of what was then called the “Standard for CADD File Submittals” resulted in 15 pages of comments. These comments were reviewed and many of them resulted in changes to the standard. Below is an edited version of the issues and concerns raised by reviewers along with how the standard was modified in response.

The questions, comments, and issues received from reviewers have been organized into the following categories:

1. Document Mechanics and Organization
2. Implementing Standard
3. Requirements for SDF Setup and Export
4. Geo-Referencing, Coordinate System, and Vertical Datum Requirements
5. SDF Template (Table 1 of the standard)
6. SDF Metadata

Within some of the above categories an underlined “sub-category” may appear. In these cases, several comments are included before the response appears.

Throughout the discussion below, the acronym “SDF” refers to Single Digital File. The SDF is the subject of the MassGIS Standard for Digital Plan Submission. Some comments included here are “representative” comments on a particular issue; this was done instead of including many comments saying the same thing. In some instances, the “comment” is a summarized version of two or more comments.

1. Document Mechanics and Organization

Comment Why create the term SDF? This term is confusing, being defined both as “Standard Digital File” and “Single Digital File”. There really is not reason for this concept....we are talking about CAD files in DXF format. Do we really need another acronym to confuse folks? If people are unfamiliar with DXF, they will also be unfamiliar with SDF...especially if it means two different things.

The inconsistent definition of SDF has been corrected. The first draft of the standard referred to its being a “CADD standard”. However, the standard is actually one for digital plans and does not cover many elements of a CADD standard and so it has been renamed. In this context the phrase “Single Digital

File” (SDF) is useful. Note also, that in Draft #2, the accepted file format for the SDF is AutoCAD DWG, with an alternative of ASCII DXF format also accepted.

Comment The standard should define the units to be used. Meters, international feet, or US Survey feet.

The standard has been changed so that when the SDF does not require drawing units, it requires that the units be U.S. Survey Feet.

Comment How will discrepancies between submitted plans be dealt with (abutting projects, for example)?

This would be an issue independent of any standard. Whenever independent surveys of adjacent properties are brought together, the potential for discrepancies exist. How they are resolved will be a matter of what practice each municipality follows in updating its assessor’s maps. Note that more advanced tools in some GIS software packages now enable these discrepancies to be stored and displayed as part of the database.

2. Implementing Standard

Comment The standard should not require that the entity delivering the SDF certify that the SDF is free of viruses.

This requirement has been dropped.

Comment Consider eliminating naming plan types, eliminating reference to “planning board” and specifying how the standard will be implemented or enforced by municipalities.

The standard has been edited to remove these kinds of references and related requirements. All of these issues are now left to the individual municipalities to decide as part of implementing the standard.

Comment The [standard] does not specifically state who is required to file (subs and/or ANR’s, etc). Is this something that will be decided by the community?

Yes.

Comment ...the media [on which the SDF is delivered] should be flexible enough to allow all users choice as to the best way to deliver. What if a company did not use Microsoft products? Why not deliver via e-mail or FTP site it will “reduce the time and cost”.

The standard has been modified. While CD-ROM is the suggested media for delivering the SDF, the specifics (including options such as FTP) have been left

up to the municipalities to decide. The standard no longer requires that the SDF be created using Microsoft software products.

Comment Many of the projects we design professionals are involved with have multiple submittals with multiple revisions. How much data is each board or agency going to want to deal with? Typically, the existing conditions are submitted. Then, many versions of the proposed conditions are submitted. And finally, the as-built conditions are submitted. And sometimes, more site work is required and additional as-built plans are prepared before an agency finally signs off on a project. Does a new drawing file need to be submitted with each revision? How will the changes be monitored and incorporated? Do you want only existing conditions and as-built conditions added to the official local GIS?

Which version of the project plan will be covered by the standard has been left up to the municipality implementing the standard.

Comment Add text to standard that limits data required in SDF to those GIS data layers presently being maintained or developed by a city or town.

Feedback from municipal reviewers strongly favored that the SDF should contain whatever features are present on the development plan, provided the SDF includes a layer for that feature.

Comment Some reviewers thought that externally referencing files should not be allowed with the SDF. Others thought that on large projects not allowing XREF files would be impractical and unduly burdensome.

The standard now strives for a compromise on this issue as follows: "Reference to external CADD layers ("XREF") should be removed and the referenced information included directly in the SDF. If XREF files must be part of the SDF, the XREF file(s) must be "bound" to the SDF and there must be no duplicate entities and map features must appear on the appropriate layers as presented in Table 1."

3. Requirements for SDF Setup and Export

Comment It wasn't clear that what we [surveyors] would be submitting would be a subset of our actual drawing file; I like that idea better than submitting our actual drawing file. I would take that one step further to propose that we don't include our title block/border/notes etc which I don't think are of importance to the municipalities. Otherwise, we would need some kind of assurance from the municipalities that our drawing files will not be distributed to anyone.

The standard is now much clearer and specifically states that a) the SDF is an extract of the original CADD file, and b) that the SDF does not include title block/border/notes etc. and nor does it include bearing and distance information.

Comment Many Surveyors/Engineers use native (DWG) and (DGN) formats that can be read by GIS systems directly. Why not use them directly. Remember the purpose of this Standard is to “reduce the time and cost” to both the Municipalities and to the Surveyor/Engineer? It seems that there should be a chose of file formats, not mandating a specific format only. Why not either a DWG or DXF?

The standard now specifies that the SDF be delivered in DWG or ASCII DXF format.

Comment Standards for digitizing the island-polygons and Multi-polygons need to be clearly specified.

A feature type of polygon is no longer required for any layer in the SDF. All features are expected to be type line, polyline, point, or text.

4. Geo-Referencing, Coordinate System, and Vertical Datum Requirements

Comment The standard refers to] monumented survey control points, typically Second Order, Class II. I would suggest that the wording “,of FGDC” Second Order, Class II “(FGDC-STD-007.4-2002 Table A-1)” be added for clarification.

The standard now uses this wording.

Comment (from a surveyor) All submissions should be required to have a 1 to 1 DWG scale and the Coordinate System base should be the same as the AutoCAD system coordinate base with the north rotation being up. That is to say the project (N,E,Z) should equal the Cadd (X,Y,Z). The North Rotation (ie. north arrow) should be 0° or up the page when the DVIEW is 0°. These may seem like simple concepts but should be specified in any standard.

This recommendation is now a requirement in the standard.

Comment I would suggest a statement is added that all entities are created in the world coordinate system in model space in an AutoCAD file. I've seen entities created not in the proper space and coordinate system and this can cause huge problems to resolve.

This recommendation is now a requirement in the standard.

Comment (from a municipal GIS person) In <community name> we had a requirement that all subs, ANR's and splits be tied to the GIS monuments regardless of distance ... That way we got survey accuracy parcel features in places. If we are going from utility points at 40 scale, we have accuracy of 1 –2 feet. Are we looking for improving the parcel layer with more accuracy or just trying to make GIS updates easier?

The intent of the standard is simply trying to make GIS updates easier; in many instances, because of the source for the SDF, greater spatial accuracy will be added in the portion of the GIS database covered by a project depicted in an SDF.

Comment The DWG registration points required should be at a minimum of three. Two points are enough to insert a DWG properly but a third point is necessary to ensure that the rotation is correct. It is possible to insert a DWG 180° Out when only two points are used.

Absent any other information, three points are needed for the SDF's orientation to be correct. However, the SDF will be viewed with other features from an existing GIS database and this additional information means that two spatial reference points will be sufficient.

Comment (from a surveyor) Anything short of requiring the DWG be submitted on Massachusetts State Plane Coordinates (NAD83 FT) will fall short of creating a GIS system with State wide and National potential. Anything less will compromise the system. The more the MA-SPC-NAD83ft system is imposed as the standard for survey submissions the more the control will be propagated. At the present time OPUS is a available and future technology promises to make the acquisition of State Plane Coordinates easier and more economical.

This is certainly a point of view that those maintaining GIS databases would support. However, it does not seem to be universally accepted in the surveying community. One change in Draft #2 of the standard is that at Level III of the standard, the coordinate system of the SDF must be state plane. However, the standard also makes clear that implementing this level of the standard was expected only for projects that the community defined as "large" or "complex".

Issue of "Geo-Referencing"

There were many comments on this issue and a number of them are reproduced here before a discussion of how the standard has been changed in response.

Comment We need to be clear that "reference" to points of spatial reference is not the same as giving the drawing spatial reference that matches these points. Often, the Town will have features that are sub-meter in accuracy, which isn't good enough for the surveyor, but which provides decent reference for the

purposes of getting the plan into the Town's GIS. Making reference by using a unique ID system for these features is a fair compromise for both the surveyor & the Town.

Comment I think that the locked layers should have features with unique IDs. This is important because if the surveyor finds that Town's features are not accurate relative to each other, the surveyor will not want these to appear on the plan. Instead, a surveyed version of these features can appear with reference by unique ID.

Comment How is a minimum of 2 geo-referenced points going to be referenced and located? What is required to achieve "acceptable geo-referencing"? Who will determine what is acceptable? Is a Surveyor/Engineer expected to traverse or locate objects up to 750 feet away (linear distance) from a project even if they are not easily locatable from their project location?

The first draft of the standard was not clear on the role of point features from a GIS database in referencing (i.e., "geo-referencing") features in the SDF. In Draft #2 of the standard, geo-referencing the SDF only involves Level II of the standard. The geo-reference is relative to point features in a GIS database that can be recovered in the field. These features include either monumented survey control points¹ or "point" map feature such as fire hydrants and manholes. The intent is that these features be provided in a "template" SDF along with the unique ID used in the GIS database. The purpose in providing these features would be only to assist in recovering their location in the field. If a project has to be geo-referenced to two features present in the GIS database, these features would have to be within 750 feet (see discussion below of this distance) of the project boundary. Geo-referencing would involve surveying the locations of these reference features relative to a location in the project area; determining these "reference locations" might involve running a survey traverse to the reference features. These locations, in whatever units were being used for the project, would be included in the SDF along with the same unique IDs. The IDs would allow the points referenced in the SDF to be identified in the GIS database, thus enabling the SDF to be transferred to the coordinate space of the GIS database. This would change the coordinates associated with the SDF from drawing coordinates to Massachusetts State Plane Coordinates, but would not change the relative orientation of the plan features. Surveyors would not be required to use locations or a "coordinate system" from some other source.

Comment How was the 750 foot requirement decided? Is this a surveyor recommendation for accuracy? ...750 feet doesn't cover much ground.

First, this requirement for referencing points within this distance only exists for projects to which a community applies Level II of the standard; these are projects that would be defined by the community as larger and/or more complex projects

¹ Specifically, FGDC Second Order, Class II (FGDC-STD-007.4-2002 Table A-1) or better.

for which the reference requirement would be less burdensome. The distance was selected by balancing the importance of having the SDF reference features that could be identified in a municipalities GIS database versus the distance over which a survey, potentially a traverse, would need to be completed in order to “tie in” the reference points. Second, the standard now requires that communities allow an appeal to and possible waiver of the requirement when, “...the physical access to points of reference within 750 feet is blocked by vegetation, terrain, water or private property”.

Comment If we are using State Plane Coordinates (SPC), shouldn't we be asking for a certain level of estimated accuracy for the product (like the old National Map Accuracy Standards) instead of defining the method whereby the coordinates are produced? Level 1 +/- 10 feet, Level 2 +/- 2 feet, Level 3 +/- 0.5 feet.

In Draft #2 of the standard, Levels I and II presume the coordinate system in the SDF will be based on drawing units; at Level III the coordinate system is state plane. As the SDF is an extract or subset of the project's CADD file(s). Therefore, at all three levels, the accuracy of the SDF will be that of the survey work for the project represented in the SDF.

Comment When we use SPC, there is a combined scale factor (reduction to “sea level” and mapping distortion scale factor). The combined scale factor can affect the distances of lines and would be most obvious on property lines with text dimensions. It is conceivable that a deed dimension of 500.00 feet would be shown as 499.98 feet in the GIS import file. It would be even more significant on longer lines such a curve radius data (7,000.00 feet vs. 6,999.30 feet). How will this scaling be addressed? Normally, we show linear and area dimensions reduced to horizontal at the project site's elevation. Adding the SPC scale factor will change information and the frontage or area listed may not meet the required zoning dimensions. How will this be dealt with?

Remember, the information on the printed plan is still the official document. The SDF will provide features depicted as either lines or points; these features will be used to facilitate GIS data update. If there is a small discrepancy between the deed dimensions shown on the printed plan, and the length of the same line as measured by the GIS software it will not matter unless the GIS database is one being maintained by a surveyor as the authoritative record of the boundaries. This is not typically done in Massachusetts, as the official cadastral record of property boundaries is stored at the registries of deeds; boundary information on assessor's maps is not equivalent. The information available through GIS databases that will be updated from the SDF is for planning and display purposes. While it is possible to envision a scenario where someone obtains data from a GIS database and presents it as a true representation of locations and distances, it is still not an authoritative record of those locations and distances unless a professional land surveyor certifies the record as authoritative. The standard has been revised so that this is explicitly recognized.

Comment While it is one thing to require that some reference to a local or statewide geospatial system be provided on the plans, it is entirely another issue to either require or accept engineering documents into a geospatial system, when they are not intended for that purpose. The engineering design of various underground utility structures, pipes, and what have you, for a subdivision include references to the lines and grades shown on the drawings, stations and offsets. Construction documents are intended to allow the contractor to install the structures to the correct line and grade. They are often changed during construction to account for field conditions, contractor preferences, availability of materials, or inspector preferences. These documents should not be represented as surveys of actual locations, and should not be considered record drawings. When the plans are converted to the state plane coordinate system, the distances along the road stations, lot lines, and between utility structures will not match either the distances on the plans or the actual distances in the field.

The information required for the digital plan submittal in the SDF is an extract of the information from a project's CADD file(s). Therefore, it cannot be considered a record drawing. Municipalities require as-built drawings to be submitted; it is expected that the CADD file(s) behind these drawings would be those for which the SDF is required. If communities are not updating their map information from as-built drawings, then that is a flaw in their map update process, not this standard. Also, the information being updated from the SDF is for planning and display purposes only. It is not, and cannot be, presented as the authoritative record of the locations of the features represented; the printed plan remains the official record. The standard has been revised so that this point is made very explicitly. Note that it is common for GIS representations of, say, pipe infrastructure, to include an attribute of the plan ID; this facilitates knowing which plan to reference when more definitive information about that project is needed.

Vertical Datum

Comment I think you should have a single statewide vertical datum standard and it should be NAVD88. I also feel that if you allow the communities to use their own vertical datum, you should have a requirement that the data supplied to the communities contain an equation relationship (for conversion) between the community/agency vertical datum and NAVD88. The vertical transformation method that should be used to create this relationship is the North American Vertical Datum Conversion (VERTCON) algorithm.

Comment In the case of <town name>, developers have always been required to submit plans on the town's datum. We would absolutely want continue this requirement with any digital submission standard. It would be easy enough to leave it to individual towns to decide.

When the standard requires a vertical datum, NAVD88 is specified. However, municipalities implementing the standard can require that the SDF use their vertical datum if they provide the necessary information for transforming to NAVD88.

5. SDF Template

Comment I don't see property boundary points in there such as iron pins, or granite monument, etc. Would they be included in another heading?

These have not been included in the template for the SDF as they do not represent a data layer that is typically maintained at the municipal level.

Comment [The SDF Template is] missing features [such as] manholes, catch basins, valves & hydrants; all as locked features. These features should have unique IDs for reference purposes.

These features would appear in the locked layer "Reference Features"; the explanation of this layer and the importance of unique IDs has been explained more clearly in the standard at Draft #2.

Comment This standard goes way beyond what a Surveyor/Engineer normally would produce to create a plan either in hard copy or digital format. The special line segments, polygon formatting and changing the direction of lines is fine for a GIS technician with formatting software. As a Surveyor using CADD systems for most plan production this can be done, but this will require a lot of extra editing time to make all lines continuous without any breaks. Also the scaling of point symbols may need to be changed due to various scales used for details and other hardcopy plans. This process will definitely not "reduce the time and cost" of the average Surveyor/Engineer. I agree this is needed for good GIS data input but this is not needed for a top quality survey plan. Some of this graphic editing process may be best performed by GIS data entry technicians and not Surveyors and Engineers due to fact the data still needs to be edited for correcting old overlapping or less accurate base and utility data and connecting adjacent and interfacing data together as well.

This comment raises a number of issues. First, the second draft of the standard no longer includes some of the time consuming requirements in the graphic specifications for the SDF. Second, remember that communities are starting to require that copies of CADD files used in producing project plans be provided. Some communities are implementing standards of their own; GIS consultants are sometimes asked to prepare these standards. These municipal standards include layer name and feature symbol requirements. Presumably the surveying and engineering community would rather have a single state-level standard around which they can build work flows rather than having to do something

different in every community where they work. Note also, that MALSCE is an active participant in the process of developing this standard, something that would not be true for most standards developed by municipalities.

Comment [The template drawing (Table 1 in Draft #2)] ...is an excellent idea and should be required of any board or agency requiring these standards. Furthermore, the existing GIS data should be available at no charge for incorporation into the submitted drawings.

Obviously the existence of this standard acknowledges the importance of your first point. Use of the “template drawing” is required in implementing this standard. On your second point, the standard now includes a section on requirements for implementing the standard; in this section, communities are required to provide the GIS data needed for a project subject to the standard’s requirements at no cost.

Comment Line features are required to be single continuous line segments but some line types in AutoCAD do not convert to continuous lines in GIS (i.e., tree lines, stonewalls, fences, and lines with imbedded text). Visual, graphical information will be lost in the conversion. This will also create additional work for the design professional as they will need to draw two lines for each of these features (one line for CADD and one for GIS).

This comment nicely summarizes this issue. The standard attempts to impose as few requirements as possible on the graphic representation of features while still yielding a digital file useful for updating GIS databases.

Issue of Layer Naming Convention

This issue drew a lot of comment and the issue remains open for further discussion. For now the layer naming portion of the standard remains largely unchanged. A number of comments are reproduced and then a response is provided.

Comment [The template layers] will likely change over time slightly, and what is needed is a uniform method of notification. If a community needs to add a layer, they can....and they would be asked to send this point to MassGIS for consideration. For example, if a community had large MWRA facilities or State infrastructure through its area, they might wish to develop layers for that information to keep it separate.

Comment ...what do the prefixes “L”, “C”, “P”, “W”, “S”, “D”, and “F” stand for? Do you want to get specific on the layer naming? How far do you go? Do we need different layers for round and square and double and D-shaped catch basins? Do we need different layers for catch basins constructed of brick in poor condition and for those constructed of concrete in new condition? We use a lot

more layers than you have listed. Sometimes we use two layers for the same feature depending on its origin and quality. Should an all-inclusive, comprehensive list of layers be devised or should there be basic layer naming conventions which can be tailored and modified to meet different geographic areas (coastal, vs. mountain vs. urban) and different types of projects, etc.

Comment The layers do not seem consistent or flexible enough to us used as a standard. The levels should be more universal. I think if there is a Federal Spatial Data Standard I think it should be considered or modified to create a more universal standard. I recommend that a formal committee made up of MALSCE and other professional engineering societies members to create a more workable and overall useful CADD standard.

For this standard to work, the SDF needs to use a standardized layer-naming scheme. Presently, the standard provides an approach to standardizing the naming; other approaches are possible and it may be that before this standard becomes final, another naming convention will be adopted. Features represented in the SDF are supposed to be new features, not existing features.

The A/E/C CADD Standard put out by the CADD/GIS Technology Center (see <https://tsc.wes.army.mil/products/standards/aec/aecstdweb.asp>) is referred to on this web site as the “National CADD Standard”. The layer-naming scheme in this standard has been reviewed in detail. Note that this standard covers everything from building interior (electrical, plumbing, etc.) CADD work, to landscaping, site plans, and subdivisions. This Standard is exhaustive (and exhausting...!). While it makes sense to use an existing standard, there are two issues: 1) The survey community has not yet indicated that they work regularly with the national standard and that they want the naming conventions for the digital plan standard to be the same, and 2) there are some layers in the digital plan standard that do not appear in the national standard. If there seems to be strong interest in using the national standard, then the digital plan standard can be modified.

Comment Shouldn't there be specifications for electric utilities such as streetlights, traffic signals, utility poles, electric manholes etc.

The specifications for the template file have been extended to cover these features.

Comment [The template] layer-list requires a lot more text layers to put Attribute values related to each item e.g. Sewer Mains, Sewer Manholes, Water Meters etc. can be suffixed with –TXT to put text related to corresponding layer. The specification could be modified such that all text should be typed in layer ending with “LayerName-TXT” where LayerName is the layer that contains map-features described by text.

The focus of the standard is facilitating update of map features. While the text listed above would be useful reference for creating feature attributes in GIS, it will not actually save entering the attributes. Given this, the extra burden imposed on requiring standardization of these text features does not seem warranted.

Comment The layering table fails to differentiate between proposed data by civil engineers (that should be preceded by a 'C') and existing data recorded by surveyors (that should be preceded by a 'Y').

Reviewers who manage GIS databases did not think this was a problem.

Comment Continuous Line type. A contours line type is actually a function of display in both major CAD programs (AutoCAD, Microstation) and should not effect the outcome of a file translated out. The real issue is that the features linetype is set to "bylayer" and the whole layer is set to continuous or some other display type.

Reviewers who use CADD software thought the standard covers this issue appropriately.

Issue of Line Directionality

Comment I like having this [requirement for line directionality] in, but it can cause a problem in pressure systems such as a water distribution system that has two potential feeds to it. In these cases water can actually flow in either direction depending on the yield that is needed. I realize that water isn't mentioned here, but one might infer this as well. I think this works if you just qualify this as gravity systems. Water can be done in the same way, but some segments would have to be coded as bi-directional.

Comment Upstream and downstream designations are not always required by every survey effort. Sometimes surveyors are only required to show surface features, and sometimes underground utilities by compilation.

The standard no longer requires that the direction of a line (e.g., that for a sewer main) be captured by creating the line in the direction of flow.

6. SDF Metadata

Comment Another issue that is very important consideration is the accuracy of the data itself. There is a need for updating the survey standards to include levels or classification of accuracy of the surveyed data. The accuracy of the data or (Meta data) needs to be addressed before a survey can be properly connected or classified in a GIS system.

This is an idea worth keeping in mind for future versions of the standard, should they be needed (likely). In particular something like this is increasingly likely to be needed as the overlap between software tools used by surveyors and GIS professionals grows. At present, the expectation is that any surveyed locations included in an SDF would have spatial accuracies that at worst equal that of the features in a municipal GIS database.

Comment Will the metadata be general to the drawing or specific to each layer?

The metadata will apply only to the drawing (SDF).

Comment [Add] date of the survey [to the SDF documentation]. Forty years from now magnetic north is going to be ??? and following the bearings provided in the old survey just isn't going to cut it.

The standard now requires that the dates of the survey work be included in the documentation accompanying the SDF.

Comment How about a standard HTML form for Metadata that would accompany the information in case it was carried forward by the community as a separate database?

This is a creative idea. However, in the interests of keeping implementation and compliance simpler the standard will not incorporate this idea in the first version. Perhaps MassGIS will provide such a file for communities to deploy independently of the standard.