Appendix E-4

City of Loveland
Requirements for Public Improvements Construction Plans

Project Name: Foothills Solar and Substation

The two "check list" columns to the left of the plan requirements below are provided for the convenience of both staff and the Developer's Engineer. The applicant should indicate if the items are included in the plans or if they are not applicable for the specific project.

The Stamp and signature of Design Engineer is required for the final plans in accordance with current State Statutes and Board Rules and not required for the plans set submitted for review.

I . Cover (& Notes) Sheet(s)

Applicant Validation		*Requirements*
Included	*N/A*	
☑	☐	A. Preamble title of "Public Improvements Construction Plans". (Can be denoted Preliminary for certain Planning applications.)
☑	☐	B. The legal name of the addition or subdivision (the marketing name may be used on the plans, but must be subordinate to the subdivision name).
☑	☐	C. Signature review blocks for City and other applicable entities, i.e., ditch company, C.D.O.T., County, etc. (See Appendix E-3)
☑	☐	D. Index to all sheets in the plan set. The sheets should be sequentially numbered beginning with 1.
☑	☐	E. The character type and position of benchmark (including elevation) must reference the "City of Loveland 1995 Level Net Survey".
☑	☐	F. Vicinity map, scale and north arrow. The vicinity map must be updated to show all approved projects in the area. 1" = _____.
☑	☐	G. General Construction Notes, Street Construction Notes (Appendix I-B), Storm Drainage Notes, Waterline Note (Appendix E-1), and Specific Notes related to Water/Wastewater (per Water/Wastewater Standards Appendix B)

II . Grading, Drainage & Sediment/Erosion Control Plan(s)

Applicant Validation		*Requirements*
Included	*N/A*	
☑	☐	A. A Grading, Drainage and Sediment/Erosion Control Report done in accordance with the City of Loveland Storm Drainage Criteria Manual. A final drainage report must be accepted by the storm water utility.

☑	☐	B. Existing and proposed contours in a minimum of two foot intervals. 1. Show contours extending a minimum of 50' off-site, and tying into existing contours. 2. Finish grade spot elevations for streets, lot corners, building corners, and finish floor elevation or alternately top of foundation elevation of buildings shown for all lots.
☐	☑	C. This statement: "The top of foundation elevations shown are the minimum elevations required for protection from the 100 year storm. The lowest opening elevations shown are at least one foot above the 100 year storm elevation of adjacent streets, channels, ditches, swales, or other drainage facilities. Minimum finished floor elevations above 100-year water surface in streets, channels, ditches, swales, or other drainage facilities, as illustrated by a master grading plan are to be shown."
☑	☐	D. Plans to have positive drainage to streets (showing drainage arrows across lots) or to an approved discharge facility.
☑	☐	E. All drainage improvements are to be designed to include all necessary improvement details on the detail sheet.
☑	☐	F. Cross-check front lot elevations with plan & profile sheets for continuity. Also check for elevations and datum match where streets will meet an adjoining subdivision, especially when the adjoining street is designed but not built.
☐	☑	G. Show phase lines. If phasing is proposed after the construction plans are signed, the consultant must revise the plans to show the phase lines.
☑	☐	H. Grading Criteria: 1. Minimum of 2.0% profile grade on grass and a maximum side slope of 4:1. If special circumstances warrant a steeper cross slope, it will be evaluated on a case-by-case basis. 2. If three or more rear lots combine their drainage waters in a common rear lot line swale, a concrete trickle channel shall be provided within the common rear lot line swale and extend to the nearest public street. 3. Drainage outlets and ending pans typically should have some type of erosion protection indicated. Example: If rip-rap is to be used, details should include size of rock D-50 and dimensions of placement, length, width, depth.
☑	☐	I. Inlets/catch basins, fire hydrants and utility poles are not to be constructed where they would conflict with handicap ramps, or be a hazard to traffic. Maintain a 2' minimum clearance from flowline.
☐	☑	K. Include phasing of construction & development, if phasing is desired.
☑	☐	L. All applicable items from the Sediment/Erosion Control Development Submittal checklist.

III . Street Plan & Profiles

Applicant Validation		*Requirements*
Included	*N/A*	
☑	☐	A. Minimum street widths are per Table 7-2 and 7-4 (unless project is a PUD or a waiver or variance is approved).
☑	☐	B. Profile grades: 1. See Table 7-4 for maximum grades. Minimum grade allowed is 0.5%. 2. Street grades within 100' of an approaching intersection shall be a maximum grade of 4%. 3. Maximum grade through the intersection is 3%. a. 10' min. length for each segment prior to a grade break. 2% max. algebraic difference between segments for Collectors and Arterials. 4% max. grade break on local streets. This is to provide a smooth ride through the intersection. b. Provide flowline grades for intersections with cross-pans. Check the grades for correctness. Make sure they drain. c. Provide the percent grade for all curb returns at intersections.
☑	☐	C. Vertical curve is required when the algebraic difference in grades is >1.0% except flowline grades in sumps. 1. Check actual grades and length for accuracy and correctness. 2. All K-values shall be noted on the profile view; minimum K-values shall be in accordance with design speed. Minimum K=45 for crest vertical curve unless circumstances warrant less than 45 (K=L/Alg. Difference in grades). 3. All proposed streets to match with existing streets and adjacent topography/projects. Show the existing streets profile and topography grade and where the proposed will match it. Existing street and topography grades are to be shown for an adequate distance beyond the proposed improvements to facilitate a smooth transition. 4. Check stationing of plan and profile for errors in design and/or discrepancies between the two. Keep the street names the same. (Don't change names of streets at intersections.)
☐	☑	D. Tapers: When shifting an entire directional stream of traffic the taper length (L) = WS for design speeds of >45mph; and L=WS2/60 for design speeds of <40mph; and for turning bay tapers L=WS/3. (L=length of transitional taper section in feet, W=width of lateral lane shift in feet, S=design speed in m.p.h.)
☑	☐	E. Access ramps shall be constructed at all corners of street intersections, including one ramp opposite from corners of tee intersections. It is recommended by the Handicap Advisory Committee that access ramps be installed midblock when blocks exceed 600 feet in length street.
☑	☐	F. Inlets/catch basins, fire hydrants, utility poles and electric appurtenances are not to be constructed where they would conflict with handicap ramps.
☐	☑	G. Provide 3" P.V.C. schedule 40, 36" deep with pull boxes at intersections that will be signalized now or in the future. Includes 90° sweeps.

☑ ☐ H. Show all raised medians and include all details for construction. Show interior median treatment and design. (i.e., trees, sprinklers, pavement, rock, splash pan, etc.). Trees shall not block signing. For detail see LCUASS Standard drawings.

☑ ☐ I. Gutter cross pans are not to be designed to cross arterial or major collector streets. Gutter pans widths are as follows:

Width	Intersection Type
6’	Local-Local
8’	Local-Collector
8’	Collector-Collector
10’	Local-Arterial
10’	Arterial-Collector
12’	midblock on local street
30’	midblock on collector street

☑ ☐ J. Gutter pans or concrete edge protection may be constructed in place of curb and gutter within industrial zoned areas.

1. Minimum 4’ compacted fill to be placed between back edge of concrete edge protection or gutter and top of slope of roadside ditch.

☑ ☐ K. Minimum curb radii at intersections will be as follows (measured to flowline):

	Local	Collector	Arterial
Local	15’	20’	30’
Collector	20’	25’	30’
Arterial	30’	30’	35’

Note: As per state highway regulations, a minimum of a 50’ flowline radius is required when an arterial street intersects a state highway, unless otherwise approved through traffic engineering.

☑ ☐ L. Verify written easements are received for any required easements not dedicated on the final plat. Check the easements for accuracy and check that all roadway improvement (i.e., curb and gutter, walk, etc.) are located within dedicated public R.O.W. or pedestrian easements when applicable.

☐ ☑ M. Identify the numeric phasing designation and the physical limits of each construction phase.

1. Type III barricades with “End of Road” sign, and any related pre-warning signs at all dead-ends of roads and sidewalks. For detail se LCUASS Standard drawings.
2. Secondary access provided for dead ends of length $\geq$ 400’ shall be all weather surface, 20’ wide, 6” minimum thickness of Class 5 or 6 ABC or recycled HBP.
3. 50’ outside radius all weather turn around at dead-end roadways longer than 150’.

☑ ☐ N. Roadway Geometrics

1. Cross-pans
2. Centerline radius data.
3. Design Speed/Posted Speed
4. Street intersections at right angles, max. skew = 10°
5. F_L to F_L dimensions.
6. R.O.W. dimensions and curve data.
7. Curb return radius data.
8. Profile grades, in percent.

		9. Vertical curve data (including K-values, length, etc.). 10. Curb and gutter radius data. 11. Centerline profile and F_L profile on both sides of roadways as required (i.e., curves, intersections, etc.). 12. Label 100' stations and show 50' stations.
☑	☐	O. Document on the plans that there is sufficient sight distance for all movements at intersections, and on crest vertical curves on arterial streets.
☑	☐	P. Existing utilities and structures per Section 3.3.4.A.5 of these Standards.

IV. Street Cross-sections

Applicant Validation		*Requirements*
Included	*N/A*	
☑	☐	A. Surveyed cross-sections in 50' intervals are required on all arterial streets. Cross-sections will also be required on other streets and driveways if special conditions warrant it (i.e., widening of existing streets). The interval frequency may be adjusted where warranted due to unique site topography. The use of aerial photography is not acceptable.
☑	☐	B. Check cross slopes for a minimum of 1.5% and a maximum of 4%.
☑	☐	C. Check cuts and fills on all proposed streets. Check catch points vs. R.O.W. line. Too much of either may result in slopes which overrun the R.O.W. In this case, a construction easement will be required.
☑	☐	D. Information to be shown on each cross section: 1. Curb and gutter, existing and proposed. 2. Roadway surface, existing and proposed. 3. Sidewalk, existing and proposed. 4. Pavement, base and subgrade thickness, existing and proposed. 5. Cross grades, existing and proposed. 6. R.O.W., existing and proposed. 7. Easements, existing and proposed. 8. Sideslopes, existing and proposed.
☑	☐	E. Pavement sections are to be designed using a Soil Investigation Report as a basis for design, or by using the City's default values as found in these Standards. 1. This design will include: a. Methods of stabilizing the subgrade. The most common method is to scarify to a minimum depth of six inches and re-compact to a uniform minimum of 95% relative density as determined by AASHTO T-99. b. Thickness of the aggregate base course. Compacted to 95% in accordance with T-180. c. Thickness of asphalt pavement. 2. "Default pavement design" may be chosen vs. a full pavement design based on a soils report. The default pavement design is based on the following coefficients. a. Aggregate Base Course (A.B.C.) strength coef. = 0.11 per inch, unless R Value tests are submitted which show R values > 78. b. Pavement Grading "C" & "G" Hot Bituminous pavement strength coefficient =0.44 per inch.

c. The minimum sums of the coefficients for the default pavement design are listed below:

Street Clarification	WSN	(full depth HBP)
Local	2.22	5.5"
Minor Collector	2.97	7.0"
Major Collector	3.48	8"
2-lane Arterial	4.08	9.5"
4-lane Arterial	4.51	10.5"
6-lane Arterial	4.77	11"

d. Show the min/max lift thickness for Grading "SX" HBP =1.5" and 2.5" respectively.
e. Show the min/max lift thickness for Grading "S" HBP =2" and 3" respectively.
f. Show the min/max lift thickness for Grading "SG" HBP =3" and 5" respectively.
g. Minimum allowable pavement thickness shall be as shown in Table 10-1.

3. The report shall recommend methods of stabilizing the subgrade when groundwater is within 3' of the pavement section. Details of the methods of construction of the roads, in high ground water areas, shall be shown and described in the appropriate typical cross-section.

V. Striping Plan

Applicant Validation		*Requirements-* *NOTE: SIGNING & STRIPING PLANS ARE REQUIRED on all streets classified minor collector and greater. Major Collector and Arterial street signing and striping plans shall have a minimum scale of 1"=30' and shall be per M.U.T.C.D. and the City Standards.*
Included	*N/A*	
☑	☐	A. Bike lanes w/symbols and dimensions (7' min. adjacent to curb and gutter, 5' min. adjacent to travel lanes w/o curb and gutter.).
☑	☐	B. Travel lanes w/dimensions for all tapers, angle points, turning bays, medians, symbols, etc.
☑	☐	C. Location of all existing and proposed signs (i.e., no parking/bike lane, stop, speed, warning, etc.).
☑	☐	D. R.O.W., easements. (All traffic control devices must be located within right-of-way or easements.)
☑	☐	E. All street improvements (i.e., curb and gutter, walk, asphalt, etc.) w/dimensions.
☑	☐	F. Layout data/geometrics to all angle points, end points, symbol locations, and sign locations.
☑	☐	G. Add note to signing and striping sheet: "The layout of all signing and striping using 3-M temporary tape at a minimum of 50' spacing shall be approved by the City Street Inspector prior to the installation."
☑	☐	H. Preformed thermo-plastic for arrows, cross walks, bike symbols, etc.

VI . Utility Plan

Applicant Validation		*Requirements*
Included	*N/A*	
☑	☐	A. Streets 1. R.O.W. and easements. 2. Cross-Pans. 3. Curb and gutter (lines depicting lip and flowline). 4. Walk (attached or detached). 5. Medians, (line depicting both flowlines), if an outfall gutter then show lip and flowline. 6. Signs (speed, stop, warning) general location. 7. Other roadway signs or devices associated with phasing or dead end streets.
☑	☐	B. Include Phasing of development and construction of all Public Improvements. Minimum development phasing shall be 10 lots; all public improvements within each phase shall stand alone. Phase lines shall be shown by heavy dark lines; all phases shall be identified by number or letter.
☑	☐	C. Electric: Provide 3" P.V.C. schedule 40, 36" deep with pull boxes at intersections that will be signalized now or in the future.
☑	☐	D. Water: Show existing and proposed Water Distribution System including valves, hydrants, bends, airvacs, blowoffs, lowerings, crossings, meter pits/vaults, and sizes of all mains and services. See Water/Wastewater Development Standards for further requirements.
☑	☐	E. Wastewater: Show existing and proposed Wastewater System including MHs, C.O.s, services, subdrains (where applicable), crossings, and sizes of all mains and services. See Water/Wastewater Development Standards for further requirements.
☑	☐	F. Storm Drain System 1. MH, junction structures. 2. Inlets / catch basins. 3. Storm sewer pipes. 4. Detention Pond Outlet Structures. 5. Waterways.
☑	☐	G. Street Lighting: Show all public street lights in conformance with Chapter 15 of these Standards.

VII . Water Plan and/or Profile

Applicant Validation		*Requirements*
Included	*N/A*	
☐	☑	A. General 1. Show and dimension R.O.W. and Easements. 2. Surface improvements, curb and gutter, cross-pans, walks, medians, inlets, and other structures. 3. Existing and proposed wastewater and storm drain mains. 4. Existing and proposed dry utilities, e.g. gas, electric, telephone, other. 5. Label named irrigation ditches.

		6. Easements shown around meters, fire hydrants, and laterals. 7. Show phase/construction lines.
☐	☑	B. Horizontal 1. Mains located on the north and east sides of public streets, 7 feet from the flowline. 2. Wastewater and storm drain 10 feet or more from the edge of the water mains. Areas of substandard separation to be clearly identified and dimensioned, with reference to the appropriate details. 3. All dry utilities, curb and gutter, and other structures are at least 6 feet from edge of water mains. 4. Label size and type of all bends, tees, crosses, valves, and hydrants. 5. Label tee connection to existing mains as wet-tap or cut-in. 6. Label pipe size, material, and lengths, including hydrant leads. 7. Curved alignments meet minimum radius requirements and labeled with PC, PT, radius, delta, length, joint deflection and the pipe segment length. 8. Dead-end mains, 250 feet or less, with blow-off or hydrant. 9. Valves placed at each leg of crosses and tees, and at every 600 feet or less. 10. Fire hydrants located and spaced according to LFRA requirements. 11. Mains and related appurtenances with horizontal dimensional ties to existing permanent features and/or to a baseline, centerline, R.O.W., or Easement. Coordinates shall not be allowed. 12. No shrubs within 5 feet, no trees within 10 feet, and no berms greater than 2 feet high or slopes greater than 4:1. 13. Location markers when outside pavement.
☐	☑	C. Services 1. Label sizes and material type. 2. 10 feet of separation between water and wastewater services. 3. Label or provide a general note specifying all types of tap, size of tap and all related valves. 4. Label and show all meter pits and vaults with either a general note specifying location or specific dimensions, as necessary. 5. Label all fire service valves to have locking lids.
☐	☑	D. Profile 1. Required for all 12 inch and larger mains. 2. Vertical and horizontal grid with scale shown. 3. Existing and proposed ground, shown and labeled. 4. Water main labeled with the diameter, material, slope, and lengths between all appurtenances. 5. Deflections and bends shown with stations and pipe grades. 6. Lowerings and ditch crossings profiled for 6 inches and larger mains. Profiles show stationing, pipe grade at bends, deflections, valves, and utility crossings. Clearance to other utilities dimensioned and concrete encasement or steel casing shown with reference to appropriate details. 7. Existing and proposed utility crossings, labeled with clearance dimensions.
☐	☑	E. Cathodic Protection 1. Required for DIP. Required for any casings. Provide stationing and horizontal dimensions. 2. Provide anode design and CP Test station location.

VIII . Wastewater Plan and/or Profile

Applicant Validation		*Requirements*
Included	*N/A*	
☐	☑	A. General 1. Show and dimension R.O.W. and Easements. 2. Surface improvements, curb and gutter, cross-pans, walks, medians, inlets, and other structures. 3. Existing and proposed water and storm drain mains. 4. Existing and proposed dry utilities, e.g. gas, electric, telephone, other. 5. Label named irrigation ditches. 6. Show phase/construction lines.
☐	☑	B. Horizontal 1. Mains located at centerline of road or 6 feet west or south of flowline. 2. Edge to edge separation to water main 10 feet or greater or called out when less than 10 feet and references to appropriate details. 3. All storm drain, underdrain, dry utilities, and curb and gutter at least 6 feet from edge of wastewater mains. 4. Mains and related appurtenances with horizontal dimensional ties to existing permanent features and/or to a baseline, centerline, R.O.W., or Easement. Coordinates are not a substitute. 5. No shrubs within 5 feet, no trees within 10 feet, and no berms greater than 2 feet high or slopes greater than 4:1 6. Runs between manholes are straight not curved. 7. Label length between manholes.
☐	☑	C. Manholes 1. Label manholes with unique number and horizontal station. 2. Label rim and invert elevations 3. Label any water-tight features, as applicable. 4. Accessible via all-weather access or hard surface improvements. 5. Location identification markers when outside pavement.
☐	☑	D. Services 1. Label size, slope and material type. 2. Minimum 10 feet of separation between water and wastewater services.
☐	☑	E. Profile 1. Vertical and horizontal grid with scale shown. 2. Existing and proposed ground shown and labeled. 3. Existing manhole rim and invert elevations. 4. Proposed manholes shown and labeled with station, rim, and invert elevations. 5. 0.10 foot minimum drop through straight manholes, 0.20 foot minimum drop through manhole invert deflections greater than 30 degrees and laterals. 6. Proposed mains labeled with diameter, material, slope, and length between manholes. 7. Groundwater barriers are shown upstream of manholes, maximum spacing of 400 feet. 8. Existing and proposed utility crossings, labeled with clearance dimensions. 9. Casing pipes labeled with length, size, type, wall thickness and CP design.

IX . Storm Sewer Plan and/or Profile

Applicant Validation		*Requirements*
Included	*N/A*	
☑	☐	A. Make sure water tight joints are used on all storm drainage pipes.
☑	☐	B. Include Phasing of construction and development if phasing is desired.
☑	☐	C. The profiles must include the hydraulic grade lines of the storm event that the storm sewer is being designed for.
☑	☐	D. Make sure there is a profile for each storm sewer and culvert being proposed.
☑	☐	E. All storm sewer improvements that have not been standardized are required to be fully designed and shown in the Plans, including the following items: 1. Curb inlets and outlets (to have grates for sidewalks). 2. Irrigation boxes. 3. Drainage structure inlets and outlets. 4. Bridges. 5. Drainage pans. 6. Retaining structures.

X . Detail Sheet(s)

Applicant Validation		*Requirements*
Included	*N/A*	
☑	☐	A. All standardized improvements shall be depicted by the appropriate City Standard Detail Drawing (Water/Wastewater, Storm Drainage) or LCUASS standard details (current version).
☑	☐	B. Standard Details 1. Access ramp. 2. Gutter pan. 3. Curb and gutter (vertical or driveover). 4. Sidewalk (detached or attached). 5. Elevated sidewalk crossings at driveway (detached walk only). 6. Monolithic curb and gutter/walk (driveover or vertical). 7. Commercial drive approach (flared or radius). 8. Residential drive approach (flared or radius). 9. Curb chase. 10. Crown transition. 11. Industrial edge protection.
☑	☐	C. Signage (include MUTCD designations): 1. 4” diameter cutout/PVC sleeve in concrete. 2. Sign post and stub. 3. Street name sign and block numbers. 4. Type III barricade with closure sign (road or sidewalk).

		5. No parking sign spacing. 6. Speed limits. 7. With school zones: Routing plans for X-walks, stop signs, school flashers, etc. 8. No signs in sidewalks.
☑	☐	D. Striping 1. Arrow, only, arrow. 2. Diamond, bike, arrow. 3. Intersection detail (crosswalk, stop bar). 4. Crosswalk. (Denver Style).
☑	☐	E. Non-Standard Details – Speed hump, traffic circles, cleanouts, etc.

XI . Landscape Plan

Applicant Validation		*Requirements*
Included	*N/A*	
☐	☑	A. Show all public median treatments (i.e., plants, groundcover, subdrains, etc.) and identify maintenance responsibilities.
☐	☑	B. Show all proposed landscaping within the R.O.W. and access easements. Identify plant species and either caliper size for deciduous trees, height for coniferous trees, or gallon size for shrubs.
☐	☑	C. Show, label and denote size of all existing vegetation and identify what landscaping is to be preserved and what is to be relocated or removed.
☐	☑	D. Annotate intersection sight distance triangles and horizontal curve stopping sight distance triangles on all proposed streets. Private easements may be needed which restrict installation of certain landscape material.
☐	☑	E. Show all proposed and existing underground and above surface utilities including power lines and transformers, water, wastewater, storm drainage facilities, including laterals, services, meter pits/vaults, hydrants, blowoffs, airvacs, etc. Maintain minimum clearance distance of 10’ to any tree and 5’ to any shrub to public utility.
☐	☑	F. Label the location, size and type of water meter that will be used to irrigate the proposed landscaping.
☐	☑	G. Optional Water-Efficient Landscape Plans 1. Hydrozone Plan 2. Irrigation Plan